# 1.13 Group 4–Coca Test Stand Summary

## 1.13.1 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 Coca Test Stand 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.

## 1.13.2. Site History

The majority of rocket engine testing and ancillary support operations occurred from the 1950s through the early 1970s, and was conducted by Rocketdyne in Areas I and III in support of various government space programs and in Area II on behalf of NASA. Rocket engine testing frequency decreased during the 1980s and 1990s and ceased in 2005. Currently, no rocket engine test areas are in operation. Engine testing at SSFL primarily used petroleum-based compounds as fuel and LOX as oxidizer. Solvents were used for cleaning rocket engine components. TCE was the primary solvent used for this and other cleaning purposes.

The Coca RFI site, approximately 16 acres, consists of two distinct areas–the Test Stands Area and the Hydrogen Compressor Area (Figure 2.13-1). The Coca Test Stands Area currently consists of two large rocket engine test stands and support infrastructure including buildings, fuel pipeline and electrical distribution systems, concrete-lined drainages, skim pond, control center, and several former leach fields. The test stand area predominantly has been inactive since 1988, with only limited hydrogen tank testing during 2000 and 2005. The RFA (SAIC, 1994) identified two SWMUs, 5.18 and 5.19 (Coca Test Stands and Coca Skim Pond), and three Area II AOCs (B218 Leach Field [LF], B222 LF, and B234 LF) at the Coca RFI Site.

Large amounts of reclaimed water used for noise suppression were channeled through the flame bucket and was then directed into the Coca Skim Pond (SWMU 5.19) (McLaren Hart, 1991a). Early rocket engine cleaning procedures during the 1950s and early 1960s consisted of flushing the rocket engine after engine testing with a solvent, principally TCE, to remove residual carbon and fuel. Like the deluge water, residual TCE and excess fuels reportedly were discharged from each test stand to a gunite-lined channel (spillway) that drained into the Coca Skim Pond (ICF, 1993).

Beginning in 1961, used TCE was recovered and recycled at test stands at SSFL (ICF, 1993). TCE use at the Coca Test Area would have ended in the early 1960s because the area was configured for $LH_2$ and LOX engine testing, which did not use TCE for cleaning. Reportedly, no TCE was used during engine testing from 1970 to 1988 (ICF, 1993); however, the LOX systems might have required periodic cleaning. Test engines at the Coca RFI site also used inhibited red fuming nitric acid (IRFNA) and monomethyl hydrazine (MMH). The Coca Test Area became inactive in August 1988, although it was used for a short period in 2000 and in early 2005 to instrument and test hydrogen tanks. The hydrogen tanks and systems currently are being purged with an inert gas to render them as safe.

### 1.13.2.1 Coca Test Stands Area

#### Coca Test Stands (SWMU 5.18)

Initially, the Coca Test Area (SWMU 5.18) consisted of three rocket engine test stands. Test Stand 1, Test Stand 2, and Test Stand 3 are building numbers 2735, 2734, and 2733, respectively. Large rocket engine testing was conducted at these three stands from 1957 to approximately 1962. The rocket engines tested used a petroleum-based fuel (RP-1) and LOX as the oxidizer. Also, perchlorate was used in small quantities in the igniters used to start the test (Boeing, 1998). In the early 1950s, in support of the Apollo space program, Test Stand 3 was reconfigured and Test Stand 4 (Building 2787) was built. These larger stands were used for testing of the J-2 engine, which used liquid hydrogen ($LH_2$) and LOX propellants, and for testing of the Saturn II-stage (S-II battleship tests). From 1970 to 1973, the site was used intermittently for non-rocket engine testing and probably was undergoing modification for the testing of the Space Shuttle Main Engine (SSME). The area was used for testing the SSME, an $LH_2$ and LOX engine, from 1973 to 1988. Test Stand 1 (Building 2735) has been dismantled and Test Stand 2 (Building 2734) has been dismantled partially.

Each test stand was equipped with hydraulics, fuel filter mechanisms, and deluge water controls. The hydraulic system primarily was used to lift and mount engines to the test facilities. The hydraulic system was controlled by pumps installed at Building 2240. Fuel filters were installed in the subsurface at Coca Test Stands 1, 2, and 3, as shown in Test Stands Preliminary Construction Drawings (Sheet No. 48095 414 D); it is estimated that a fuel filter also was present at Coca Test Stand 4. These filters specifically were identified as having been used to filter JP-4; however, it is likely they would support the filtration of other petroleum-based fuels before testing. Deluge water also was used at the test stands as a noise control and cooling measure. The water would be sprayed through nozzles immediately above the flame buckets during and after an engine test. Valves that control flow have been observed in pits in the vicinity of each test stand; these valves were controlled electrically from the Control Center (Building 2218).

#### Coca Skim Pond (SWMU 5.19)

The Coca Skim Pond (SWMU 5.19) is northwest of the test stands and includes an unlined 300,000-gallon-capacity pond. Associated channels connect the test stands with the skim pond and downgradient drainages also are included in this SWMU. The channels leading from Test Stands 1 to 3 are gunite-lined, and the channel from Test Stand 4 is concrete-lined. Below the Coca Skim Pond, the channel is gunite-lined for about 800 ft. During engine testing and cleaning operations, the skim pond received deluge water and excess RP-1 or residual TCE included in cleaning water. The skim pond partially is surrounded by a concrete skirt, and the bottom probably is unlined (SAIC, 1994). The skim pond began receiving wastes in 1956 when rocket engine testing began at the Coca Test Area (SWMU 5.18) and was used until 1988 as a catchment basin and emergency spill containment for the test area. To remove accumulated fuels from the surface of the skim pond, the fuels reportedly were burned in place (ICF, 1993). Water from the skim pond eventually discharges to the R-2A Pond (SWMU 5.26).

#### Leach Fields (Area II AOC)

Sanitary leach fields associated with the Coca Area include those at the Control Building 2218 (525-gallon septic tank and one 100-ft by 6-ft leach trench), Pretest Building 2222

(1,500-gallon septic tank and six leach trenches [four 30-ft by 6-ft and two 6- ft by 6-ft]), and Upper Pretest Building 2234 (525-gallon septic tank and one 110-ft by 5.5-ft leach trench). These units were identified as AOCs during the RFA (SAIC, 1991 and 1994) (Note: the Building 2218 Leach Field incorrectly was identified as the Building 2216 Leach Field in the RFA) (MWH, 2004). Use of sanitary leach fields at SSFL generally was discontinued in 1961 after a sitewide sewer system was installed (ICF, 1993). The presence and location of the Building 2234 Leach Field (B234 LF), reportedly installed in 1963, was not confirmed during the RFI.

#### Coca Test Stand Area Tanks

There are 58 tanks associated with the Coca Test Stand Area. Three of these tanks are USTs, each of which is a septic tank associated with Building 2218, 2222, or 2234. Two of these septic tanks are decommissioned and inactive, though they currently exist at the site. The septic tank associated with former Building 2234 is reported as having been removed.

Of the 55 ASTs associated with this site, 27 are reported as currently existing onsite. The status (existing or removed) of 2 ASTs is unknown; the locations of ASTs 41H and Unknown-AT-CA-13 have not been confirmed, although their existence during operations has been established through historical reviews of SSFL. The remaining 26 Coca ASTs are confirmed as having been removed. Materials stored in the tanks at this site included Freon, petroleum-based fuel, gaseous and liquid hydrogen, gaseous and liquid nitrogen, LOX, oils, oxidizers (other than LOX), and TCE. The Coca Test Stand Area Tank Inventory is summarized in Table 1.13-1.

### 1.13.2.2 Hydrogen Compressor Area

The Hydrogen Compressor Area, east of the Test Stand Area, consists of three buildings (2237, 2239, and 2933) and the V99 gaseous hydrogen ($GH_2$) AST. The hydrogen compressor plant facility compressed and stored gaseous hydrogen for use in the testing of rocket engines at the Coca Test Stands. Operation controls for the area and compressors are located in Building 2239. Compressors are stored under an open-walled, covered area identified as Building 2933. A compressor vent stack is located on a topographic high west of the buildings. Two bleed-off valves are located along the pipeline leading to the vent stack. The site currently is inactive.

### 1.13.2.3 Additional Coca Area Buildings and Facilities

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

#### Coca Electrical Control Stations

Buildings 2E, 2235, and 2236 were designated as the Coca Electrical Control Stations. Their construction dates are unknown; however, it can be deduced that each facility was constructed along with the construction of the test stands. The buildings house electrical components and switches for the Coca Test Stands. The locations of electrical conduits traversing from these stations to their respective test stands, as well as to the Control Center (Building 2218), are unknown. However, protective conduit casing can be viewed in the grated, concrete-lined corridors just below surface level; it is likely that the electrical system shared these corridors with other transfer piping when feasible.

### Pill Boxes
Pill boxes (Buildings 2A, 2614, and 2B), were used to observe engine testing at the various stands. The construction dates of the pill boxes are unknown.

### Building 2219
Building 2219 was the Terminal House, located between Coca Test Stands 1 and 2. The construction date is unconfirmed, although it is likely to have been constructed during the mid-1950s with the development of the Coca Test Stand Area. The Terminal House stored 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.

### Tunnel
Performance monitoring wiring ran through a tunnel from the ground service building to the Control Center (Building 2218). Chemicals were not used or stored in this tunnel.

### Building 2220
Building 2220 originally was identified as a vehicle shelter. The facility primarily was used for storage. Building 2220 then served as storage for the Rocket Nozzle Test Facility (RNTF). Dates used for RNTF support are approximated between 1994 and 2001, the estimated span during which the RNTF was in operation. It was constructed in 1956, used through 2001, and destroyed by the Topanga Fire in 2005. The building also reportedly was used as a fire house, although the dates of operation as a fire house are unknown.

### Buildings 2222 and 2234 (Lower and Upper Pretest Building, Respectively)
The Pretest Shops were used as workshops to handle the engines and make modifications to parts of the test stands, as required, for the various test and engine configurations. To support machining and engine modification activities, limited quantities of solvents and lubricating oils probably were stored in each pretest shop. Both the Upper and Lower Pretest Buildings were in use from 1953 through 1988; the Upper facility (2234) was destroyed in 2005 by the Topenga Fire.

From approximately 1994 until 2001, Building 2222 served as the RTNF. The RTNF was used to test various nozzles and rocket motor fittings using high-pressure gas. For safety and environmental reasons, gaseous nitrogen commonly was used for high-pressure gas testing at MSFC, and probably at SSFL, as well; however, this assumption has not been confirmed through historical research.

### Building 2240 (Hydraulic Pump House)
Building 2240, reportedly used form 1975 through 2001, is identified as the hydraulic pump house. The building housed hydraulic pumps needed to support testing operations and their related controls, monitors, and transfer pipes; the pumps are no longer in the building. The hydraulic system most notably was used at the test stands to aid in the mounting of engines to the test stand structures. From the southern side of the structure, aboveground piping can be seen exiting Building 2240, leading to grated, concrete-lined trenches. These trenches lead to both Coca Test Stands 3 (2733) and 4 (2787).

During building feature reconnaissance efforts, steel trays were observed where the hydraulic pumps were situated; these trays would have served as secondary containment.

Two relatively small transformers also were observed in Building 2240, neither of which exhibited signs of a potential release.

#### Building 2451 (Carousel Storage)

The Carousel Building 2451, used from 1967 until 2001, is identified as a general and equipment storage facility. The structure, a metal-framed circular enclosure, is situated immediately east of former Building 2234. Chemicals are not recorded to have been stored in this area.

#### Area 2520 (Vault [High Pressure Bottles])

Area 2520 is a cave-like area accessible from the Coca test Stand 4 spillway, commonly referred to as The Vault. The area is concrete-walled on three sides; the ceiling of The Vault is below the ground surface for a majority of the Coca Area; this ceiling/roof was paved and traversed to access operational portions of Coca Test Stand 4. The Vault was used to store tanks of high-pressure gases, most of which reportedly contained GN2. A fire suppression system is plumbed in this area.

#### Building 2751 (Bulk Head Test Facility)

The Bulk Head Test Facility was used between 1958 and approximately 1973. Pressurized gases, including hydrogen, were used to test equipment to simulate conditions during the launch and space flight of the motors. Currently, only the concrete pad that supported the structure, a brick retaining wall, and residual piping and flanges remain at the Building 2751 site. This former structure was to the southwest of the Coca Skim Pond.

#### Building 2919 (Compressor Shelter)

Structure 2919 is an open air, metal-framed canopy that was active from 1955 until approximately 1988. The structure is northeast of Coca test Stand 4, next to the former location of AST V-429, an LN2 storage tank. An industrial application of a vaporizer and compressor system is to relatively quickly turn liquid gases to their ambient gaseous forms through convection; compressed (warmed) ambient air can be used as the heat exchanging material. In lieu, Structure 2919 probably housed the equipment to turn LN2 in AST V-429 into usable GN2 for Coca operations. In 2009, during a site reconnaissance, oil staining was observed on the concrete pad beneath a remaining pump motor.

### 1.13.2.4 Liquid Oxygen Cleaning

LOX is 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 must 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 buildup 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 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 the run tanks on the test stand.

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 mostly is attributable to engine testing activities rather than to LOX cleaning.

## 1.13.3 Chemical Use Areas

This subsection provides a summary of the CUAs identified at the Coca Test Stand Area. Table 1.13-2 highlights these CUAs and the analytical groups of concern within each CUA. The individual CUAs are described in the following subsections.

### CUA 1a to 1d–Coca Test Stands (SWMU 5.18)

The Coca Test Stands were used to test rockets using petroleum-based fuels and hydrogen or oxygen oxidizers. Each stand was equipped with ASTs to hold limited quantities of fuel and oxidizers to support the individual tests. The Coca Test Stands also incorporated a deluge water system for noise reduction and cooling purposes. Also used throughout the Coca Test Stand facilities were hydraulic lift, gas delivery, solvent (TCE) cleaning and rinse, fire suppression, and electrical control systems.

TCE was used as the primary cleaning solvent at the original test stands during the 1950s and 1960s. TCE was flushed from engine components indo downgradient, gunite-lined channels (spillways) and discharged to the Coca Skim Pond. Industrial water that had been affected by solvents and oils also was used during engine testing for noise control and cooling.

Petroleum-based fuels (mainly RP-1) primarily were used at the original test stands. Fuel was delivered to, stored, and ignited within the Coca Testing Stand Area. Samples collected from this area will be analyzed for TPHs, VOCs, and the SVOC (PAHs). This portion of the sampling suite encompasses the chemical constituents expected to be detected if there had been a release of fuel in the testing area.

Engine testing used IRFNA and MMH. Analyses will include fluoride (breakdown product of IRFNA) and formaldehyde and NDMA (breakdown products of MMH).

### CUA 2–Channels to Coca Skim Pond (SWMU 5.19)

On the basis of the COPCs used at the test stands, VOCs, TPHs, SVOCs, PAHs, energetic constituents, fluoride, NDMA, and formaldehyde also are COPCs within the test area channels. The channels are underlain with gunite and identified as PRAs; additional sampling within these channels is not proposed. However, to address the potential cross gradient migrations of COPCs, analyses for parameters described in this section will be performed on samples collected in the vicinity of the channels leading to the Coca Skim Pond, when the topography allows.

### CUA 3–Coca Skim Pond (SWMU 5.19)

The Coca Skim Pond received deluge water and TCE-affected water from the channels leading to each Coca Test Stand. On the basis of the COPCs used at the test stands, VOCs, TPHs, SVOCs, PAHs, energetic constituents, fluoride, NDMA, and formaldehyde analyses will be performed on samples collected in the vicinity of the Coca Skim Pond.

### CUA 4a–Lower Pretest Building (Building 2222)

The Pretest shops were used to analyze and alter various engine components during testing operations. A variety of solvents and oils probably were used and stored at engine testing support facilities, including Building 2222. Building 2222 also was used as the RNTF.

### CUA 4b–Building 2222 Leach Field (Area II AOC)

The Building 2222 leach field is inactive, although it currently exists. The leach field was connected to a 1,500-gallon septic tank and composed of 4four trenches that are 30 ft long by 6 ft wide by 4.5 ft deep. On the basis of the COPCs at Building 2222, analyses for VOCs, TPHs, SVOCs, and PAHs will be performed on samples collected from the leach field. Additionally, the leach field might have received effluent from floor drains in Building 2222, as well as effluent from sinks and restrooms.

### CUA 5a–Upper Pretest Building (Building 2234)

Similar to Lower Pretest Building 2222, a variety of solvents and oils were used and probably stored at Building 2234.

When the sitewide sanitation sewers were installed in the early 1960s, it was connected to Building 2234. Sanitary waste from Building 2222 was pumped to this connection.

### CUA 5b–Building 2234 Leach Field (Area II AOC)

The presence or location of the Building 2234 leach field was not confirmed during the RFI, although additional historical research following the RFI effort has identified the likely position of the leach field. Before sanitary sewer use, a 2,500-gallon septic tank was situated adjacent to the building; effluent from this tank led to a leach field, reportedly made of three trenches, 56 ft long by 10 ft wide. The site of the leach field has been approximated to the south of Building 2234; however, this area is topographically higher in elevation than the building. If the leach field area is accurate, a transfer pump would have to be used. COPCs at Building 2234 mimic those associated with Pretest Shops–VOCs, SVOCs (including PAHs), and TPHs.

### CUA 6a to 6c–TCE, Solvent, and Freon Tanks

Two ASTs within the Coca Area are reported to store TCE–ASTs 245H and Unknown-AT-CA-1. One AST, V-542, is reported as storing Freon. An additional nine ASTs stored unknown materials; the materials probably are related to testing operations and might have held solvents or Freon.

### CUA 7a to 7c–Petroleum Fuel Pipelines, Tanks, and Fuel Filter Pits

Seven ASTs within the Coca Area reportedly stored petroleum-based products, including fuels and oils. As mentioned in the previous CUA subsection, nine ASTs stored unknown materials, some of which might have contained petroleum-based fuels. A piping network also was used in this testing facility. Fuel was carried from the CDFF (RI Group 9) to the Coca Area; this primary fuel transfer line runs along the perimeter of Coca Road and "T's" to each test stand facility. Most petroleum-based fuels, if not all, would have traversed through the fuel filters identified in pits located near each test stand.

### CUA 8a to 8b–Lube Oil Unit Area (Unit and Tank)

Hydraulic and lubricating oils potentially were used or stored in this area.

### CUA 8c–Hydraulic Pump Station (Building 2240)

Building 2240 is presumed to be the mechanical control center for hydraulic needs during testing operations. Hydraulic oil was pumped from this area to lifting equipment located at each test stand. Stainless steel pans currently located where hydraulic pumps were positioned suggest that secondary containment measures were taken at Building 2240, although the implementation date is unknown.

### CUA 9a to 9r–Substations and Transformer Areas

Transformers were confirmed or potentially identified at 18 locations throughout the Coca Test Stand Area. The transformers generally are co-located with the buildings and structures within this site. Historically, oils within the transformers, used as a cooling mechanism, contained PCBs.

### CUA 10–Building 2218 Leach Field

The Building 2218 leach field currently exists, although it is inactive. The leach field consisted of a single trench 100 ft long by 6 ft wide by 4.5 ft below grade. This leach field is located immediately northeast of Building 2218. Building 2218 was a control center; because chemicals were not known to be used in this building, COPCs associated with the leach field might be limited to the lead-based paint used at the control center.

### CUA 11a to 11b–Debris Areas

Two debris areas were identified, one south of the Upper Pretest Building (2234), and the second southeast of the Hydrogen Compressor Area, Building 2933. The debris area south of Building 2234 is mostly co-located with the estimated location of the Building 2234 leach field. These debris areas are generalized locations where various amounts of solid waste have been identified. The debris typically includes paint chips and cans, scrap metal, construction debris (asphalt, concrete, etc.), small equipment pieces, or burned materials. These areas typically are targeted for a wide range of sample analyses, because the former use(s) and/or content(s) of some of the debris is not documented.

### CUA 12–Bulk Test Facility (Building 2751)

The Bulk Test Facility primarily uses gases under high pressure to test nozzles and various engine components. Lubricants and solvents probably were present within this facility to maintain the mechanical equipment used and to prepare and clean the components tested.

### CUA 13–V100 Vacuum Shed

The V-100 Vacuum Shed housed two hydraulic pumps associated with the testing used of liquid hydrogen from AST V-100. These compressors required lubricating and hydraulic oils to maintain operation status. During site reconnaissance, oil staining was observed on the concrete beneath the hydraulic pumps.

### CUA 14 – Vehicle Shelter, Fire House, and RNTF Storage (Building 2220)

Building 2220 served multiple uses, being a vehicle shelter before a Fire House and eventually the RNTF. Relatively large quantities of solvents and oils were not used in this area; however, it is presumed that small quantities of oils, fuels, or solvents might have been used or released under operating conditions.

### CUA 15–Flame Deflector Pump House (Building 2241)

Building 2241 is a metal-framed and walled structure that houses three pumps that supplied industrial water to Coca Test Stands 3 (2733) and 4 (2787). Water was pumped from the pump house to the test stands, via sub-grade piping. Each pump is situated on a raised concrete pad; staining on the concrete floor was observed in Building 2241. An electrical control bank is still present in the building along the southern wall.

### CUA 16a–Hydrogen Compression Building (Building 2239)

Building 2239 is a metal-framed structure that provides shelter to various compressor and motors, as well as their associated piping. Four large compressors, used in conjunction with the nearby hydrogen gas supply (AST 99 S), currently are located within the building. On the basis of the Building Feature Logs, the equipment appears to have been electrically powered. However, lubricating oils and solvents would have been used during maintenance activities. Additionally, several floor drains and concrete-lined trenched can be observed within the structure. Oil staining has been noted on the concrete within Building 2239, mostly beneath the compressors.

### CUA 16b–Hydrogen Compressor Area (Building 2933)

Building 2933 is an open-air metal-frames structure adjacent to Building 2239. Similar to Building 2239, 2933 housed various pumps, motors, and their associated piping. Equipment located beneath this canopy reportedly supported operations associated with hydrogen gas testing

### CUA 17–V99 Bleed-off Valves

Two bleed-off valves have been located along piping leading from AST 99 S, presumably to vent off excess pressure from hydrogen gas during operations. Staining was observed on the concrete in the vicinity of each valve. TPHs and PCBs have been identified as COPCs because of venting through these valves.

### 1.2.4 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 Coca RFI Site. The objective of the aerial photography review was to identify features that were not discussed at the time the RI report was submitted.

Within the Coca RI Area, several additional features were identified during the aerial photography review. These include a drainage leading west from the Coca Skim Pond, a road re-construction area near Building 2222, a sinkhole area, and several temporary structures present during operational activities.

### 1.2.5 Groundwater Contribution to VOC Contamination

There is one location within the Coca Area where detected VOCs in the soil are related to groundwater contamination. Historical VOC samples collected at the Coca Area had elevated concentrations of VOCs reported in the deep subsurface samples. As described in the 2009 Draft Site-Wide Groundwater Remedial Investigation Report, a TCE groundwater plume is located beneath the Coca 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 Coca 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 1.13-2. 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 Coca Area.

### 1.2.6 Sample Locations

Figure 1.13-2 shows the individual proposed sampling locations for the Coca Area. The rationale for these samples is provided in Table 1.13-3, 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 evaluating 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.

# 1.14 Group 4—Delta Area Summary

## 1.14.1 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 Delta 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 to RLs of specific compounds that do not have an established background value.

## 1.14.2 Site History

The Delta Area is an approximately 4-acre site and, while active, consisted of three rocket engine test stands and supporting infrastructure including buildings, a fuel pipeline, electrical distribution systems, drainages, a control center, and a skim pond. The Delta Area was active from 1957 through 1970 and was used to test large, liquid-fueled rocket engines. Three SWMUs and one Area II AOC have been identified for the Delta Area–The Delta Test Area (SWMU 5.23), The Delta Skim Pond and Associated Drainage (SWMU 5.24), The Purge Water Tank near the Delta Treatment System (SWMU 5.25), and the Building 223 Leach Field (Area II AOC B223 LF). A fourth SWMU, The Air Stripping Towers for Groundwater Treatment (SWMU 5.27). also is located with the boundary of the Delta Area, but is managed under the Delta Groundwater Extraction/Treatment System (GWTS) at SSFL. Each SWMU in the Delta Area is described in the following bullets:

- **Delta Test Area (SWMU 5.23).** The Delta Test Area was composed of the three rocket engine test stands. Testing at the open-framed metal stands used petroleum-based fuels (RP-1) with LOX as an oxidizer. In addition, IRFNA, unsymmetrical dimethylhydrazine (UDMH), and fluorine-based rocket fuels were used at Test Stand 3. Small quantities of perchlorate were used in the igniters inserted into the gas generators of the engines to start the test. Aboveground and belowground fuel filter areas have been identified at other testing areas at SSFL; although such fuel filter areas have not been identified at the Delta Area, it is presumed that such equipment was used here during operations. The fuel filters were used in conjunction with petroleum-based fuels.

  Hydraulic systems were intact at each test stand while in operation; hydraulic lifts were used to mount engines to the test structures. These hydraulic systems used oils under pressure to move mechanical equipment, similar to hydraulic lifts today. Deluge water from the reclaimed water system was used as noise suppression during engine testing and for cleaning post testing. The deluge water was piped to the flame bucket on each stand and flowed through channels to the Delta Skim Pond. During the 2009 site reconnaissance field efforts, vaults containing valves were identified in Building Feature Logs (MWH, 2009); these valves were used in controlling deluge water flow.

  Early testing activities also included cleaning using TCE that was flushed through the thrust chamber and the LOX dome to remove hydrocarbon deposits from the engine components. After TCE cleaning, the engines were purged with nitrogen gas to volatilize residual solvents. In 1958, the area under the test stands and the drainage leading to the Delta Skim Pond were lined with gunite to prevent erosion. From 1957 to 1961, the deluge water and

residual solvents were discharged through drainages leading to the Delta Skim Pond. An estimated 45,000 gallons of TCE entered the spillways and ponds in the Delta Area before 1961, at which time a recycling system for TCE was implemented; TCE was reclaimed through the recycling system until 1970, when the test stands became inactive. The test stands were dismantled and nearby support buildings were demolished in 1982.

- **Delta Skim Pond and Associated Drainages (SWMU 5.24).** The Delta Skim Pond was an unlined skim pond with a reported capacity ranging from 572,000 to 723,000 gallons. The associated drainages of SWMU 5.24 consisted of the pond and concrete-lined spillways and drainages. The Delta Skim Pond began receiving wastes in 1957, when testing began at the Delta Test Areas, and continued to receive wastes until 1970. The Delta Skim Pond was used to receive deluge waters, excess RP-1, and residual TCE in cleaning water from the Delta Test Areas operations and also might have received chlorofluorocarbons, fluorides, nitrates, and amines, based on the use of these compounds at the Delta Test Stands.

  From 1957 to 1961, an estimated 45,000 gallons of TCE deluge entered the spillways and ponds in the Delta Area before a TCE recycling system was implemented. To remove accumulated fuel discharged to the Delta Skim Pond, the fuel was burned in place off the surface of the water. Water from the Delta Skim Pond was then discharged through an underground, corrugated metal pipe and a ditch on the western side of an earthen dam to the R-2A Pond. In 1958, the area under the test stands, the drainage leading to the Delta Skim Pond, and the discharge channel to the R-2A Pond were lined to with gunite to prevent erosion. After the Delta Test Areas became inactive in 1970, only precipitation and runoff collected in the impoundment. The closure activities for the Delta Skim Pond began in 1988 and included excavation of areas where elevated TCE concentrations existed in pond sediments. Excavations were backfilled with clean soil from the Burro Flats Area (Area IV); the former Delta Skim Pond was backfilled to depths of up to 20 ft below current ground surface and completed with 6 inches of vegetated topsoil to current grade. A water diversion ditch surrounding the former Delta Skim Pond was installed and closure activities were completed in 1989. The Delta Skim Pond was closed in 1994.

- **Purge Water Tank Delta Treatment System (SWMU 5.25).** The Purge Water Tank is a 6,500-gallon-capacity, double-walled fiberglass tank installed in 1992 as part of the Delta GWTS. The Purge Water Tank was used for temporary storage of purge water until the water was transferred to the Delta Air Stripping Towers (SWMU 5.27) or to the RD-9 Area UV/H2O2 Treatment System (SWMU 5.4). The Purge Water Tank was removed from the Delta Test Area and stored adjacent to the Bravo Stripping Towers. This tank has since been removed from the site.

The AOC associated with the Delta Area is described in the following bullet:

- **Building 223 Leach Field (Area II AOC).** The Building 223 Leach Field (B223 LF), approximately 300 to 400 ft north of Building 223, was a sanitary leach field system consisting of a 1,500-gallon septic tank and three leach trenches measuring 75 by 10 ft. During the RFA site inspection, the only visible component of the B223 LF was a pipe leading out to a field. The B223 LF was listed as active until facility demolition; however, use of the sanitary leach fields at the SSFL generally was discontinued after the facilitywide sewer system was built in 1961. Historic site investigations notate the potential development of a secondary, or replacement, leach field in connection with the existing system described

herein. Although the development and use of this secondary phase is unknown, the planned location of the second leach field has been identified as a potential AOC.

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

**Air Stripping Towers for Groundwater Treatment – Delta (SWMU 5.27).** The Air Stripping Towers are included within the Delta Area site boundary, but are a permitted unit under the active GWTS at SSFL and will be closed under that program. The Delta GWTS is located at approximately the same location as a groundwater treatment system that was in operation during rocket testing and was used to treat extracted groundwater before use as cooling water. The Delta GWTS system consists of two air stripping towers, with the primary tower connected to eight carbon canisters operated in parallel. The primary tower is 36 ft high by 36 inches in diameter and the secondary tower is 28 ft high by 36 inches in diameter. Recovered groundwater is pumped through a tower, removing VOCs by causing them to volatilize through a counter current of air passing through the tower, then goes through the secondary tower. The air goes through the carbon canisters, which remove the vaporized contaminants. The Delta GWTS treats water to below the California Department of Health Services (DHS) action levels.

**Building 2223.** Building 2223 was used from 1956 to 1970 and served as Engineering Tool Storage and as a Pretest Building for operations at the Delta Test Stands. Activities at Building 2223 included rocket engine inspection and equipment assembly, but there was no known chemical use at Building 2223. Building 223 is still present but is inactive.

**Building 2225.** Building 2225 was in use from 1956 to 1970 as a Physical Processes Lab and a Terminal House. The terminal houses at SSFL would have had electrical conduit connecting the terminal house to one or all of the test stands; currently, the locations of these electrical lines are unknown. The conduit potentially traveled the subsurface, grated channels observed at the surface, along with other delivery systems. A 60-inch corrugated metal pipe tunnel connected Building 2225, in the Delta Area, to Building 2224, in the Propellant Load Facility (PLF) Area. A drain located at the low point of the tunnel discharged to the Delta Skim Pond. Building 2225 also historically was used as a Fire Department Training Building, but there was no known chemical use at Building 2225. The building is still present but has been inactive since 2001.

**Building 2227.** Building 2227 served as the Inspection Office from 1956 to 1982 and was used to support operations for testing activities. There is no known chemical use at Building 2227 and it was removed in 1982.

**Building 2727.** Building 2727 was used from 1956 to 1970 and served as the Vacuum Pump House. Activities at Building 2727 were support operations for testing activities, but there was no known chemical use at Building 2727. Building 2727 was removed before the DTSC visit in 1999, but the exact removal date is unknown.

**Structures 2736, 2737, and 2738.** Structures 2736, 2737, and 2738 represented SWMU 5.23: Test Stands 1, 2, and #3, respectively. The Test Stands were used from 1956 to 1970 for large rocket engine testing, mainly using petroleum-based fuel and LOX. TCE flushes were used during engine component cleaning activities; the engine component and LOX system cleaning activities are further discussed in Section 1.14.2.1. Lubricating oils and hydraulic oils also were known

substances used at the test stands. The buildings were inactive after 1970 and were dismantled by 1982. Further information about the test stands is included in Section 1.14.2.

**Electrical Control Stations 1, 2, and 3.** The Electrical Control Stations (ECSs) were used from 1956 to 1970 and served as support operations for testing activities. Each ECS supported testing activities for the equally sequenced Delta test Stand (that is, ECS 1 supported Delta Test Stand 1). There was no known chemical use at ECSs 1, 2, or 3; the ECSs were removed in 1982.

**Lube Oil and Flush Oil Building.** The Lube Oil and Flush Oil Building was used from 1956 to 1970. Specific operations for the building are not described in facility documentation; however, it is known that the test stand structures used mechanical parts. Additionally, hydraulic lift systems were in place and used to mount testing engines. Chemicals used and stored within this facility included machining oils, lubricants, and hydraulic oils. To date, no building identification number has been uncovered during historical research. The Lube Oil and Flush Oil Building was removed in 1982.

**Building 2772.** Building 2772 served as the Clothing Shed from 1956 to 1970 and was used to support operations for testing activities. There was no known chemical use at Building 2772; The building, which was adjacent to Buildings 2906 and 2907/2K, was demolished.

**Building 2906.** Building 2906 was used from 1956 to 1970 and served as the Environmental Equipment Building. Building 2906 was used to support operations for testing activities, but there was no known chemical use associated with it. Building 2906 has been removed, but the exact removal date is unknown.

**Building 2907/2K.** Building 2907/2K was used from 1956 to 1970 and served as the Instrumentation Blockhouse/Recording Blockhouse and Terminal House. Building 907/2K was used to support operations for testing activities, but there was no known chemical use associated with it. The terminal houses at SSFL would have had electrical conduit connecting the terminal house to one or all of the test stands; currently, the locations of these electrical lines are unknown. The conduit potentially traveled the subsurface, grated channels observed at the surface, along with other delivery systems. This building has been documented as removed; however, it is present, although inactive.

**Building 2949.** Building 2949 was used from 1956 to 1970. The exact purpose of Building 2949 is unknown, but presumed to be associated with Test Stand 1 and thus to support operations for testing activities. There was no known chemical use at Building 2949 and it has been removed, probably about 1982 when the Test Stands were dismantled.

**Building 2H.** Building 2H served as the Pillbox for Test Stand 1 from 1956 to 1970. Building 2H was used to support operations for testing activities, but there was no known chemical use associated with it. Building 2H is still present but has been inactive since 2001.

**Building 2J.** Building 2J served as the Pillbox for Test Stand 2 from 1956 to 1970. Building 2J was used to support operations for testing activities, but there was no known chemical use associated with it. Building 2J is still present but has been inactive since 2001.

**Building 601/2L.** Building 601/2L served as the Pillbox for Test Stand 3 from 1956 to 1970. Building 601/2L was used to support operations for testing activities, but there was no known chemical use associated with it. The building is still present, but inactive.

**Loading Dock.** The Loading Dock was used from 1956 to 1970 and contained a Work Shed that served to support operations for testing activities. There was no known chemical use at the Loading Dock; however, a TCE AST (154H) has been located at the east-southeastern edge of the former loading dock. This area might have been used to load or transfer TCE, as well as other materials related to testing in the Delta Area. The Loading Dock was removed before the DTSC visit in 1999, but the exact removal date is unknown.

There are 31 tanks associated with the Delta Area; 30 ASTs and 1 UST. The UST is a 1,500-gallon septic tank west of Building 223, used from 1957 to 1961. The septic tank is inactive but still present at the site. Of the 30 ASTs in the Delta Area, 23 have been removed and 7 remain onsite. The Delta Area Tank Inventory is listed in Table 1.14-1.

The activities and previous sampling at the Delta Area are summarized in the Group 4 RFI Report (MWH, 2007). Additional samples were collected in 2010 and 2011. The 2010 samples were collected to investigate debris piles that had been identified and the 2011 samples were collected to evaluate potential releases related to building features and the GWTS.

#### 1.14.2.1 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, then 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 Delta Area, which supported testing activities at the test stands, were primarily located within each test stand structure (four identified) and in the southern portion of the site (four identified). To the east of the primary testing area, an unidentified tank listed as Unknown-AT-DA-1, or Unknown AST 1, has been reported as containing LOX when in use; its capacity has not been established. There was also a 500-gallon TCE storage tank northeast of Building 2223. It has not been confirmed whether piping from these tanks extends to the LOX tanks that have been identified within each of 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.

## 1.14.3 Chemical Use Areas

This subsection provides a summary of the individual CUAs identified at the Delta Area. These areas were designated based on locations where chemicals were reported to be and/or were used, stored, spilled, or discharged. The individual CUAs are described in the following text. Table 1.14-2 highlights these CUAs and the analytical groups of concern with each CUA.

### 1a, 1b, and 1c: Delta Test Stands 1, 2, and 3 (SWMU 5.23)

The Delta Test Stands were use for large rocket engine testing between 1957 and 1970. The majority of testing performed used petroleum-based fuels and LOX with IRFNA, fluoride, and UDMH used as propellants. During testing, rocket engines and associated equipment were rinsed with water and then cleaned with organic solvents. The Test Stands primarily were supplied with fuel and solvents through pipelines set below grade in concrete-lined access ditches and discharged to gunite-lined channels to the north that drained to the former Delta Skim Pond. Additional sampling is proposed for VOCs, TPHs, SVOCs, PCBs, metals, pH, perchlorate, and inorganic compounds at the Delta Test Areas.

### 2a and 2b: Delta Skim Pond and Associated Drainages (SWMU 5.24)

The Delta Skim Pond (CUA 2b) consisted of an unlined surface impoundment used for storing engine test cooling water and cleaning wastes, including RP-1, TCE, Freon, fluorides, nitrates, and amines. Residual fuels periodically were burned off the top of the liquid in the pond, which possibly could form dioxins. An earthen dam separated the Delta Skim Pond from the R-2 Pond and a 48-inch-diameter corrugated metal pipe discharged from the Delta Skim Pond to a gunite-lined channel leading to the R-2 Pond. The Delta Skim Pond was excavated and backfilled as part of the closure activities. Additional sampling is proposed for VOCs, TPHs, SVOCs, metals, pH, inorganics, and dioxins at the Delta Skim Pond.

The water and waste discharged to the Delta Skim Pond from the Delta Test Stands via the Delta Skim Pond Associated Drainages (CUA 2a). The drainages were gunite-lined channels built in topographic lows between bedrock outcroppings. The drainages currently convey stormwater runoff to the R-2 Ponds. Additional sampling is proposed for VOCs, TPHs, SVOCs, PCBs, and metals at the Delta Skim Pond Associated Drainages.

### 3: Hydrazine Storage Area and Fuel Tank

A hydrazine storage area, drum storage, and a fuel tank were identified on facility drawings from 1959. The type, storage capacity, and secondary containment of the hydrazine and fuel

tanks were not documented; therefore, additional sampling is proposed for VOCs, TPHs, SVOCs, metals, and NDMA at the Hydrazine Storage Area and Fuel Tank.

### 4: TCE AST #154H

The TCE AST #154H was a 500-gallon tank northeast of Building 2223, set on a concrete pad. The tank was used to supply TCE to the Delta Test Stands for engine cleaning. The tank was used from 1956 to 1971, but has been removed. The area near the TCE AST location is relatively flat and slopes gently to the west, with rock outcrops immediately to the north. Additional sampling is proposed for VOCs at TCE AST #154H.

### 5: Fuel Pipeline

The Fuel Pipeline ran aboveground from the Coca Delta Fuel Farm to the Delta Area on the western side of the site. The pipeline has been removed, but additional sampling is proposed for TPH in the vicinity of the former Fuel Pipeline.

### 6: Lube Oil and Flush Oil Building

The Lube Oil and Flush Oil Building was a small structure between Delta Test Stand 2 and Delta Test Stand 3; this facility appears to have been co-located with ECS #2, which supported activities at Delta Test Stand 2. Lubricant oils were used at the building, but the specific operations and activities are not known and the building was removed in 1982. Additional sampling is proposed for TPH in the vicinity of the Lube Oil and Flush Oil Building.

### 7a and 7b: Transformer Areas

Three pole-mounted transformers southeast of Building 2223 (CUA 7a) were identified from facility drawing and aerial photographs. The transformers were installed in 1957; in 2005, a site inspection indicated no evidence of staining or leakage. Three pad-mounted transformers on the eastern portion of the site (CUA 7b) were identified from facility drawings and historical photographs. The photographic records indicate that the pad-mounted transformers were removed in 1999. Additional sampling is proposed for PCBs near the Transformer Areas.

### 8a, 8b, 8c, and 8d: Delta Debris Areas

Debris was identified west of the site (CUA 8a) following the Topanga Fire. The debris at CUA 8a consisted of three empty 55-gallon drums, a bucket containing stained soils, and scrap metal. The debris was removed after the area was located for sampling. Debris also was identified west of the former fuel pipeline (CUA 8b) following the Topanga Fire. The debris at CUA 8b consisted of scrap metal, which was removed after the area was located for sampling. Debris was identified in topographic low areas north of the Delta RFI Site Boundary (CUA 8c). The debris at CUA 8c consisted of four empty 55-gallon drums and scrap metal. No staining was observed from the soil underneath the drums. The drums were removed after the area was located for sampling. Debris was identified west of the Building 2223 Leach Field (CUA 8d) consisting of one empty 55-gallon drum and metal scraps. The debris at CUA 8d was removed after the area was located for sampling. Additional sampling is proposed for SVOCs, TPH, and metals at the Delta Debris Areas.

### 9a, 9b, and 9c: Pretest Building 223, B223 LF (Area II AOC), and Planned Leach Field

The sanitary leach field system was approximately 400 ft northeast of Building 2223 (CUA 9a). The leach field (CUA 9b) consisted of three leach lines approximately 75 ft long and 4 ft wide, and of a 1,500-gallon septic tank. The leach field and septic tank are still present onsite,

although the leach field use generally was discontinued 1961 after a sewer system was built. Facility drawings indicate that there was a planned leach field north of the site (CUA 9c). A clay manhole and a pipeline extending north were observed onsite, but the pipeline was found to be capped about 60 ft north toward the planned location. Because of the uncertainties regarding the Leach Fields, additional sampling is proposed for VOCs, TPHs, SVOCs, and metals.

#### 10: GWTS and Associated Piping and Tanks

The Delta GWTS includes SWMU 5.25 (Purge Water Tank) and SWMU 5.27 (Air Stripping Towers). The purge water tank was used for temporary storage of extracted groundwater from 1992 until it was removed from the site and stored near the Bravo GWTS. No spills or leaks are known to have occurred near the Delta GWTS. Historical records indicate that this was an area used for a fluorine trailer and groundwater treatment during rocket engine testing operations. Additional sampling is proposed for VOCs, SVOCs, and metals at the GWTS Area.

#### 11: Fluorine Scrubber System

The Fluorine Scrubber System was identified west of Delta Test Stand 3 from facility records. The system consisted of a fluorine scrubber tank, a 3,000-gallon catch basin, and a limestone slurry tank. Proposed schematic drawings indicated that the fluorine scrubber system was designed to discharge neutralized effluent to the Delta Skim Pond. Additional sampling is proposed for metals, pH, and inorganics at the Fluorine Scrubber System.

### 1.14.4 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 Delta Area. The objective of the aerial photography review was to identify features that were not discussed at the time the RFI report was submitted. During the aerial photograph review, two vegetation clearing areas were documented north and south of the test area and a new pipeline leading from a LOX tank was identified. The review also indicated several temporary structures, buildings, and storage features in the paved operational area near the Delta Test Stands. Although a few of the structures or storage areas were observed south of Test Stand 3 during the Delta operational period, most appear to have been present after operations ceased and to have acted as soil storage bins or similar containers. Areas around temporary structures, buildings, and storage areas present during testing operations will be subject to further investigation.

Sampling approaches to the newly identified features are as follows:

- **Building Footprints and Features.** Temporary buildings, structures, or storage areas present during operations were identified during the aerial review. It is unknown what use these temporary buildings, structures, and storage areas might have had. Sampling will be proposed for these areas and chemical analyte suites chosen based on potential building, structure, or storage use.

- **Pipeline.** A new pipeline leading from a LOX tank was identified from the aerial review. The pipeline was identified in a drawing as a 6-inch-diameter pipeline below grade in a pipeline access trench. Sampling will be proposed for VOC analyses adjacent to the LOX AST and the pipeline to assess potential solvent releases during tank or pipe and valve cleaning and purging activities.

- **Vegetation Clearance Areas.** Two vegetation clearance areas are evident in historical aerial photographs in 1957, with most vegetation reestablished by 1965. On the basis of DTSC's comments, additional field mapping and geophysical electromagnetic surveys will be considered to identify potential debris or soil disturbance features within the areas. From the results of this screening, sampling will be proposed at appropriate locations.

### 1.14.5 Groundwater Contribution to VOC Contamination

At the Delta site, the VOCs in soil overlie significant groundwater and bedrock VOC contamination, as described in the draft sitewide Groundwater RI Report (MWH, 2009a). Soil vapor VOC soil concentrations near or within the test stands, channels, and pond are considered related to groundwater and vadose bedrock VOC contamination, because they occur adjacent to or within significant solvent release areas associated with former test stand operations (primarily before 1961) and overlie a VOC groundwater plume.

Because the VOC exceedances in the Delta 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. However, to address DTSC's requirements to evaluate other potential solvent impacts outside of these known release areas, additional VOC samples will be proposed at selected locations within the Delta Area.

### 1.14.6 Sample Locations

Figure 1.14-2 shows the individual proposed sampling locations for the Delta Area. The rationale for these samples is provided in Table 1.14-3, 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 evaluating 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 will replace the 5 ft bgs sample.
- If refusal is not encountered, field personnel will note such and the station will be identified as a potential candidate for additional subsurface soil sampling, if warranted.

# 1.15 Group 9–R-2 Ponds Summary

## 1.15.1 Sampling Objectives

This subsection references previous sampling and historical site activities and identifies new information and comments that could affect the proposed sampling approach for the R-2 Ponds Area Site. The objective of additional sampling, as outlined in this sampling approach plan, is to evaluate adequately the nature and extent of COPCs in comparison to available background values for each respective COPC, or to RLs of specific compounds that do not have an established background value.

## 1.15.2 Site History

NASA acquired the R-2 Ponds in 1973, along with the rest of the Area II property (known as USAF Plant 57, under ownership of the USAF); this area has been used since approximately 1958. The II R-2 Ponds Area consists of two adjacent ponds (R-2A and R-2B) and their associated inlet and outlet drainages. The R-2A and R-2B Ponds are unlined surface impoundments with designed capacities of 2.5 million gallons and 200,000 gallons, respectively, and cover approximately 3 acres. Ponds R-2A and R-2B have been combined and designated as SWMU 5.26 (Figure 1.15-1).

The ponds have served as the most downgradient surface water collection points for drainages associated with Areas II and III, and portions of Area IV, at SSFL. Drainage and surface water runoff was received from, but limited to, the Alfa Skim and Retention Ponds, Bravo Skim Pond, Alfa-Bravo Skim Pond, and the SPA surface impoundments by means of a natural drainage channel from the Silvernale Reservoir. The R-2 Ponds also received drainage directly from the Coca Skim Pond, Delta Skim Pond, STL-IV surface impoundments, Engineering Chemistry Laboratory (ECL) Pond, and the Compound A RFI sites. They also received treated effluent from the Area III's STP, which received sewage from Areas II, III, and IV. Currently no process water is received at the R-2 Ponds since operations at the test stands and SPA have ceased; however, surface water continues to collect in these ponds.

Geographically, the R-2B Pond is upgradient of and discharges to the R-2A Pond. The effluent from R-2B Pond was controlled by a gate valve and flowed into the R-2A Pond through a subsurface corrugated metal pipeline. The R-2A Pond then served as a reservoir for cooling water used with testing rockets and fire suppression water at one area in the Delta Area for a hydrogen storage tank. The R-2A Pond had a gate-controlled discharge leading to NPDES Outfall 018 (Southwest Drainage). The discharge currently flows through a concrete-lined stepped sediment control system.

The R-2 Ponds were a part of the reclaimed water system at SSFL. The non-potable reclaimed industrial water that was not used during testing operations at the Alfa and Bravo Areas was transferred to the Alfa-Bravo Skim Pond, which led to the Silvernale Pond, and ultimately to the R-2 Ponds. From the Silvernale or R-2 Ponds, two intakes at R-2A pumped water to a large pump house in the eastern portion of the Coca Area. From the pump house, water was pumped to the Skyline Road Area, where non-potable reclaimed industrial water was stored in a series of ASTs for reuse. The historical document review indicated that when the Coca Pond in Group 4 was filled to capacity from Coca Test Area operations, the water discharged to the R-2 Ponds, which was pumped to the Skyline Road Storage tanks. These tanks also provided some of the process cooling water for the Coca Testing Facility to the south.

If the supply of reclaimed water exceeded the demand, then water was discharged to the south through the R-2A Pond, to Outfall 002 or a sprayfield. Backflow prevention devices and air gaps separated the reclaimed water system from the domestic water supply. The Skyline Road Area currently is inactive and does not receive reclaimed water from the R-2 Ponds.

During a VSI conducted in May 2009, field personnel noted that the R-2B Pond was mostly dry and that a surface water flow vein had developed. This vein probably would collect drainage during wet weather events and leads to the R-2A Pond, and ultimately to the gated outfall (Outfall 018). The portion of the R-2A Pond that holds surface water is significantly smaller than what was suggested historically. Most of the eastern portion of the R-2A Pond is now dry.

Outfall 018 is at the exit point of the R-2A Pond. The estimated discharge from this outfall is 5.9 mgd for a 1-year, 24-hour storm event. There are several practices in place upstream from this location to improve water quality and to reduce sediment loading. These practices include hydromulching, cleaning of culverts, and placement of straw wattles and silt fences. At the exit point of this pond is an advanced structural flow-through treatment system consisting of eight parallel filter cells. Each filter cell is filled with sand, activated carbon, and zeolite. Additionally, plans were underway to install a pre-filter to prevent clogging of the filter beds; however, the installation has not been confirmed. This treated stormwater is discharge to the southern undeveloped portion of the site, where it is again sampled at Outfall 002 and released to the Southwest Drainage.

Outfall 002 is on the southern slope below the R-2A Pond and downstream of Outfall 018. Stormwater discharges from Outfall 002 and flows to the Southwest Drainage. Stormwater flows are estimated to be 11 mgd for a 1-year, 24-hour storm event. Activities conducted to control sediment erosion and improve water quality include hydromulching, straw wattles, and straw bales, in addition to the stormwater control measures in place at the upstream Outfall 018 location.

Findings from a historical document review suggest that VOCs, SVOCs, hydrazines, and potentially, trace metals, have been released to and from the R-2 Ponds. However, surface water discharged to the NPDES-monitored point is monitored routinely, when active, and discharges generally have been in compliance with permitted standards (MWH, 2005d).

Two debris piles are associated with the R-2 Ponds. Debris pile CH-G09-2022 is northwest of the R-2 Ponds Area and was composted of an empty metal can approximately 1 gallon in size. Debris pile CH-G04-2000 is on the southeast edge of the R-2A Pond and is described as a green-and-white surface on the soil with a pipe valve, electrical box, and metal pipe.

## 1.15.3 Chemical Use Areas

The R-2 Ponds Area primarily served as the final collection point for surface water drainage at SSFL. Chemical storage or chemical use areas are not identified with the R-2A and R-2B Ponds. A variety of chemicals used at other facilities have discharged to the surface drainage swales, potentially contaminating the ponds. Primary COPCs would include solvents; TPHs; and other fuel-based compounds, hydrazines, and nitrogen- and fluorine-based compounds. Air agitation has been the historical process for algae growth control at this site, and chemical addition has been noted as an option if agitation is found to be inadequate for algae control. During the most recent VSI and sampling effort at this site (2009), field personnel noted that the air agitator in the R-2A Pond was inactive.

## 1.15.4 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 R-2 Ponds Area. The objective of the aerial photography review was to identify features that were not discussed at the time the RI report was submitted.

Within the R-2 Ponds Area, three new pond impoundments and two new pipelines were identified during the aerial photography review. The three ponds were seen in photographs dating from 1953 through 1957, before significant development of the current R-2 Ponds system was implemented. However, these ponds appear to be within the confines of topographically depressed areas that might have retained surface water when present in the operational R-2A and R-2B Ponds. The two newly identified sections of piping are on the northern side of the R-2A Pond. This piping appears to be associated with the R-2A Pond intakes and the water reclamation system. Figure 1.15-2 depicts features identified in during the 2010 aerial photography review.

Additionally, one structure and several portions of dirt road were identified in Group 9. The structure, seen in photographs from 1959 through 1965, is south of the R-2 Ponds Area, in the central portion of the Group 9 RI reporting area. There is no known information concerning the operations or use of this structure, or if it was related to operations conducted within NASA-administered areas at SSFL.

During compilation of an AST list for SSFL, one former AST was identified as Unknown-AT-R2-1, located outside and north of the R-2 Ponds Area. The contents and size of the AST were reported as unknown. However, in the Draft Group 9 RI Report, one 500-gallon water tank was reported in the same location as Unknown-AT-R2-1. Surface sampling has been conducted in the vicinity of the former AST for PCBs. Laboratory analytical results did not report any exceedances in the samples collected near the former AST.

## 1.15.5 Groundwater Contribution to VOC Contamination

The detected VOCs in this area probably are not related to groundwater contamination. A groundwater plume is beneath the R-2 Ponds Area, as described the 2009 Draft RI Report. COCs (VOCs and metals) have been detected in the near surface groundwater, but it is unlikely that the detected concentrations would contribute to VOCs in the soil. Additional soil VOC sampling is proposed to evaluate the extent present in this area and to address DTSC's comments.

## 1.15.6 Sample Locations

Figure 1.15-2 shows the individual proposed sampling locations for the R-2 Ponds Area. The rationale for these samples is provided in Table 1.15-2, 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 might vary from the 5 ft bgs reported in Table 1.15-2. As a generalized

guidance, field personnel will take the following steps in establishing subsurface soil sample 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 will be identified as a potential candidate for additional subsurface soil sampling, if warranted.

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.

# Tables

**TABLE 1.13-1**

Tank Inventory at The Coca Area

*NASA SSFL Field Sampling Plan*

| Tank ID | Type | Coordinates | | Location Description | Size (gallons) [1] | Contents | Use Period | Use Status |
|---|---|---|---|---|---|---|---|---|
| | | Northing | Easting | | | | | |
| 320a | AST | 264951.343000 | 1789146.090000 | On Test Stand #3 | Unknown | Fuel | | Existing (Inactive) |
| 320b | AST | 264943.213000 | 1789176.172000 | On Test Stand #3 | Unknown | Oxidizer | | Existing (Inactive) |
| 345 H | AST | 265000.423021 | 1788825.805890 | Northeast of Building 2905 | 1,600 | TCE | 1955 - 1962 | Existing (Inactive) |
| 41.H | AST | Unknown | Unknown | Unknown | 3,000 | LOX | | Unknown |
| 94H | AST | Unknown | Unknown | Unknown | 2,500 | LN2 | 1955 - 1973 | Removed |
| 99 S | AST | 264587.786636 | 1790434.404600 | South of Building 2239 | Unknown | Hydrogen | 1962 - 1988 | Existing (Inactive) |
| Accumulator | AST | 264545.162000 | 1790534.977000 | Southwest of Building 2933 | Unknown | Unknown | - | Removed |
| B2905 Oil Storage Tank | AST | 264957.219460 | 1788861.570570 | Inside Building 2905 | 6,000 | Oil | 1950s - 1973 | Removed |
| GN2 Storage | AST | 265247.513029 | 1788211.867390 | Fuel Facility | Unknown | GN2 | - | Removed |
| HX-112 | AST | 264827.824412 | 1788751.853090 | West of Building 2222 | Unknown | Heat Exchanger | - | Existing (Inactive) |
| LN2 Storage | AST | 265231.259109 | 1788197.075780 | Fuel Facility | Unknown | LN2 | - | Removed |
| TS #1 Fuel | AST | 264961.446000 | 1788907.414000 | On Test Stand #1 | Unknown | Fuel | 1955 - 1973 | Removed |
| TS #1 LOX | AST | 264965.232000 | 1788923.139000 | On Test Stand #1 | Unknown | LOX | 1955 - 1973 | Removed |
| Unknown-AT-CA-1 | AST | 264892.389000 | 1789061.894000 | South of Test Stand #2. Location unknown. | Unknown | TCE | | Removed |
| Unknown-AT-CA-10 | AST | Unknown | Unknown | On Test Stand #2. Exact location unknown. | 296,000 | Liquid Hydrogen | 1955 - 1973 | Removed |
| Unknown-AT-CA-11 | AST | Unknown | Unknown | On Test Stand #4. Exact location unknown. | 4,500 | Fuel | | Existing (Inactive) |
| Unknown-AT-CA-12 | AST | Unknown | Unknown | On Test Stand #4. Exact location unknown. | 1,200 | Oxidizer | | Existing (Inactive) |
| Unknown-AT-CA-13 | AST | 264778.809000 | 1789087.011000 | West of Building 2220 | 4710 $ft^3$ | GN2 | | Unknown |
| Unknown-AT-CA-2 | AST | 265220.906000 | 1788471.228000 | North of Building 2751 | Unknown | Unknown | 1960s - ? | Removed |
| Unknown-AT-CA-3 | AST | 264936.028000 | 1789312.344000 | East of Building 2240 | Unknown | Unknown | - | Removed |
| Unknown-AT-CA-4 | AST | 264772.856000 | 1789526.175000 | East of Building 2235 | 500,000 | Possible LOX | 1955 - 1988 | Removed |
| Unknown-AT-CA-5 | AST | 264795.624000 | 1789630.529000 | South of Test Stand #4 | Unknown | Possible LOX | 1955 - 1988 | Removed |
| Unknown-AT-CA-6 | AST | 265001.486000 | 1789710.218000 | Northeast of Test Stand #4 | Unknown | Unknown | 1955 - 1977 | Removed |
| Unknown-AT-CA-7 | AST | 265047.971000 | 1789803.188000 | Northeast of Test Stand #4 | Unknown | Unknown | 1955 - 1977 | Removed |
| Unknown-AT-CA-8 | AST | 265182.872000 | 1789737.729000 | Northeast of Test Stand #4 | Unknown | Unknown | 1955 - 1977 | Removed |
| Unknown-AT-CA-9 | AST | 264976.367000 | 1789017.006000 | On Test Stand #2 | 2,900 | Fuel | 1955 - 1973 | Removed |
| V-100 / 100 S | AST | 264906.790636 | 1788553.422540 | Northwest of Building 2236 | 200,000 | Liquid Hydrogen | 1962 - 1988 | Existing (Inactive) |
| V-108 | AST | 264768.660060 | 1789441.852060 | North of Building 2235 | 210,500 | LOX | 1955 - 1977 | Existing (Inactive) |
| V-1181 | AST | 264964.488000 | 1789605.863000 | On Test Stand #4 | Unknown | Unknown | - | Removed |
| V-142 | AST | 264962.590000 | 1789625.786000 | On Test Stand #4 | Unknown | Unknown | - | Removed |
| V-301a | AST | 264871.547724 | 1788937.128090 | South of Test Stand #2 | 28,000 | LOX | 1955 - 1977 | Removed |
| V-301b | AST | 264854.830892 | 1788937.128090 | South of Test Stand #2 | 28,000 | LOX | 1955 - 1977 | Removed |
| V-301c / 39H | AST | 264870.261956 | 1789019.426570 | South of Test Stand #2 | 28,000 | LOX | 1955 - 1973 | Removed |
| V-301d / 40H | AST | 264853.544796 | 1789019.426570 | South of Test Stand #2 | 28,000 | LOX | 1955 - 1973 | Existing (Inactive) |
| V-302a | AST | 265228.199677 | 1788211.188610 | Fuel Facility | 33,000 | RP-1/JP-4 | 1955 - 1962 | Removed |
| V-302b | AST | 265212.188461 | 1788211.188620 | Fuel Facility | 33,000 | RP-1/JP-4 | 1955 - 1962 | Removed |
| V-305 (12 Bottles) | AST | 264800.532348 | 1789118.945940 | West of Building 2220 | 410 $ft^3$ | GN2 | - | 6 Existing, 6 Removed |
| V-39 | AST | 264806.969468 | 1789590.501030 | South of Test Stand #4 | Unknown | LOX | 1955 - 1988 | Existing (Inactive) |
| V-429 | AST | 264951.235796 | 1789910.591290 | West of Building 2919 | 28,000 | LN2 | 1955 - 1988 | Existing (Inactive) |

**TABLE 1.13-1**

Tank Inventory at The Coca Area

*NASA SSFL Field Sampling Plan*

| Tank ID | Type | Coordinates | | Location Description | Size (gallons) [1] | Contents | Use Period | Use Status |
|---|---|---|---|---|---|---|---|---|
| | | Northing | Easting | | | | | |
| V-542 | AST | 264920.664020 | 1789229.447370 | West of Building 2240 | 70 | Freon | 1955 - 1962/1988 | Removed |
| V-650 | AST | 264657.789000 | 1790518.412000 | Southeast of Building 2239 | Unknown | Unknown | - | Removed |
| V-654 | AST | 264779.118000 | 1789001.809000 | West of Building 2220 | 4710 $ft^3$ | GN2 | - | Existing (Inactive) |
| V-655 | AST | 264779.424000 | 1789008.382000 | West of Building 2220 | 4710 $ft^3$ | GN2 | - | Existing (Inactive) |
| V-656 | AST | 264779.678000 | 1789014.955000 | West of Building 2220 | 4710 $ft^3$ | GN2 | - | Existing (Inactive) |
| V-657 | AST | 264780.112000 | 1789021.436000 | West of Building 2220 | 4710 $ft^3$ | GN2 | - | Removed |
| V-660 | AST | 264780.402000 | 1789028.384000 | West of Building 2220 | 4710 $ft^3$ | GN2 | - | Existing (Inactive) |
| V-711 | AST | 264785.613000 | 1789034.464000 | West of Building 2220 | 4710 $ft^3$ | GN2 | - | Existing (Inactive) |
| V-712 | AST | 264781.125000 | 1789041.267000 | West of Building 2220 | 4710 $ft^3$ | GN2 | - | Existing (Inactive) |
| V-713 | AST | 264781.415000 | 1789048.650000 | West of Building 2220 | 4710 $ft^3$ | GN2 | - | Existing (Inactive) |
| V-714 | AST | 264781.704000 | 1789056.757000 | West of Building 2220 | 4710 $ft^3$ | GN2 | - | Removed |
| V-715 | AST | 264782.283000 | 1789064.718000 | West of Building 2220 | 4710 $ft^3$ | GN2 | - | Removed |
| V-716 | AST | 264782.718000 | 1789072.535000 | West of Building 2220 | 4710 $ft^3$ | GN2 | - | Existing (Inactive) |
| V-717 | AST | 264783.152000 | 1789079.918000 | West of Building 2220 | 4710 $ft^3$ | GN2 | - | Removed |
| V-79 / V-346 | AST | 264966.714444 | 1789721.026470 | Northeast of Test Stand #4 | 28,000 | Liquid Hydrogen | 1955 - 1988 | Existing (Inactive) |
| V-84 | AST | 264945.567444 | 1789120.892680 | On Test Stand#3 | 2,900 | LOX | 1955 - 1965 | Removed |
| Building 2218 Septic Tank | Septic | 265547.984325 | 1788421.324320 | East of Building 2218 | Unknown | Sanitary Wastewater | 1955 - 1961 | Existing (Inactive) |
| Building 2222 Septic Tank | Septic | 264828.973300 | 1788770.261450 | West of Building 2222 | Unknown | Sanitary Wastewater | 1953 - 1961 | Existing (Inactive) |
| Building 2234 Septic Tank | Septic | Unknown | Unknown | Unknown | Unknown | Sanitary Wastewater | | Unknown |

Notes:

AST = aboveground storage tank

$ft^3$ = cubic feet

GN2 = gaseous nitrogen

JP = jet propellant

LN2 = liquid nitrogen

LOX = liquid oxygen

RP = rocket propellant

TCE = trichloroethene

TS = Test Stand

[1] Size is in gallons excpet as noted otherwise

**TABLE 2.13-2**

Chemical Use Areas at the Coca Test Stands Area

*NASA SSFL Field Sampling Plan*

| Chemical Use Area Types and Typical Target Analytical Suites | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Solvent | Petroleum Fuels | Oil-Related Materials and Debris | Energetic Constituents | | Non-metal Inorganic Compounds | Propellants | | Transformers |
| | Chemical Use Area Name | VOCs | TPH, VOCs [1] | SVOCs, PAHs [2], TPH, PCBs, Metals | Energetics, Metals | Metals | Fluoride [3] | Hydrazine, NDMA, UDMH, MMH, NTO, Perchlorate | Formaldehyde[4] | PCBs |
| 1 | Coca Test Stands (SWMU 5.18) | X | X | X | X | | X | X | X | |
| 2 | Channels to Coca Skim Pond (SWMU 5.19) | X | X | X | X | | X | X | X | |
| 3 | Coca Skim Pond (SWMU 5.19) | X | X | X | X | | X | X | X | |
| 4a<br>4b | Lower Pretest Building (B222)<br>B2222 Leach Field (Area II AOC) | X | | X | X | X | X | X | X | |
| 5a<br>5b | Upper Pretest Building (B234)<br>B2234 Leach Field (Area II AOC) | X | | X | | X | | | | |
| 6a<br>6b<br>6c | TCE Tanks<br>Solvent Tank<br>Freon Tank (V-542) | X | | | | | | | | |
| 7a<br>7b<br>7c | Fuel Pipelines<br>Fuel Pits<br>Fuel Tank | | X | X | | | | | | |
| 8a<br>8b<br>8c | Lube Oil Unit<br>Lube Oil Tank<br>Hydraulic Pump Station (B240) | | | X | | | | | | |
| 9(a-r) | Substations and Transformer Areas | | | X | | | | | | X |
| 10 | B2218 Leach Field | X | X | X | X | | X | X | X | X |
| 11a<br>11b | Debris Areas (SW of B234)<br>Debris Areas (S of Compressor Bldg) | | | X | | X | | | | |
| 12 | Bulk Test Facility (B751) | X | X | X | | | | | | |
| 13 | V100 Vacuum Shed | | | X | | | | | | |
| 14 | Firehouse and RNTF Storage (B2220) | X | X | X | | | | | | |

**TABLE 2.13-2**

Chemical Use Areas at the Coca Test Stands Area

*NASA SSFL Field Sampling Plan*

| Chemical Use Area Types and Typical Target Analytical Suites | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Solvent | Petroleum Fuels | Oil-Related Materials and Debris | Energetic Constituents | | Non-metal Inorganic Compounds | Propellants | | Transformers |
| | Chemical Use Area Name | VOCs | TPH, VOCs [1] | SVOCs, PAHs [2], TPH, PCBs, Metals | Energetics, Metals | Metals | Fluoride [3] | Hydrazine, NDMA, UDMH, MMH, NTO, Perchlorate | Formaldehyde[4] | PCBs |
| 15 | Flame Deflector Pump House (B2241) | X | X | X | | | | | | |
| 16a<br>16b | Hydrogen Compressor Buildings (B2239 and B2933) | X | X | X | | | | | | |
| 17 | V99 Bleed-Off Valves | | | X | | | | | | X |

Notes:

AST = aboveground storage tank

GWTS = groundwater treatment system

IRFNA = Inhibited red fuming nitric acid

MMH = monomethyl hydrazine

NDMA = n-nitrosodimethylamine

NTO = nitrogen tetroxide

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

SPA = Storable Propellant Area

SVOC = semivolatile organic compound

TCE = trichloroethene

TPH = total petroleum hydrocarbons

UDMH = unsymetrical dimethyl hydrazine

VOC = volatile organic compound

1. VOCs are a COPC for TPH-gasoline.
2. SVOCs and PAHs are COPCs for TPH-diesel
3. Fluoride is a breakdown product of IRFNA
4. Formaldehyde is a breakdown product of MMH

**TABLE 1.13-3**
Data Quality Objectives: Coca Test Stand 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] 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/ 1613) | Metals (EPA Method 6010/6020B) | Mercury (EPA Method 7471) | Lead (EPA Method 6010/6020B) | Silver (EPA Method 6010/6020B) | Formaldehyde (EPA Method 8315A) | Energetics (EPA Method 8330A) | Fluoride EPA Method 300.0/9056A) | Perchlorate (EPA Method 314.0) | NDMA (EPA Method 1625C) | DTSC GSU Comment No(s). | Rationale / Comments [1, 2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -- | 1 | SS | 0 | | X | X | X | | | X | X | | | | | | | | | | 11, 13 | Data gap and drainage evaluation. COCs include Dioxins, PAHs, SVOCs, and VOCs. Samples CABS26 and CABS57 had dioxin and PAH detections and PAH, SVOC, and VOC concentrations that exceeded screening criteria. A transformer is located upstream; therefore, PCB has been added to the COC list. |
| | | SO | 5 | | X | H | H | | | H | H | | | | | | | | | | | |
| -- | 2 | SS | 0 | | X | X | | X | | | | X | | | | | | | | | 11 | Data gap evaluation for empty drum debris area. COCs include VOCs, SVOCs, TPH, and metals. Sample CABS0521 had metal, TPH, and phthalate detections and TPH and VOC concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | H | | X | | | | H | | | | | | | | | | |
| -- | 3 | SS | 0 | | X | X | | X | | | | X | | | | | | | | | 11 | Data gap evaluation for empty drum debris area. COCs include VOCs, SVOCs, TPH, and metals. Sample CABS0522 had metal, TPH, and phthalate detections and TPH and VOC concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | H | | X | | | | H | | | | | | | | | | |
| 10 | 4 | SS | 0 | | | X | | X | | X | | X | | | | X | | X | X | | 16, 54 | Evaluate cause of sinkhole and extent of COCA-7. COCs include metal, PCB, formaldehyde, flouride, perchlorate, SVOC, and TPH. |
| | | SO | 5 | | | H | | X | | H | | H | | | | H | | H | H | | | |
| 9, 10 | 5 | SS | 0 | | | X | | X | | X | | | | X | | | | | | | 16, 39, 53, 54 | Evaluate cause of sinkhole and extent of COCA-7. COCs include metal (lead), PCB, SVOC, and TPH. Samples CABS35, 37, and 38 had PCB concentrations that exceeded screening criteria. |
| | | SO | 5 | | | H | | X | | H | | | | H | | | | | | | | |
| 10 | 6 | SS | 0 | | | X | | X | | X | | X | | | | X | | X | X | | 16, 54 | Evaluate cause of sinkhole and extent of COCA-7. COCs include metal, PCB, formaldehyde, flouride, perchlorate, SVOC, and TPH. |
| | | SO | 5 | | | H | | X | | H | | H | | | | H | | H | H | | | |
| 10 | 7 | SS | 0 | | | X | | X | | X | | | | X | | | | | | | 16, 54 | Evaluate cause of sinkhole and extent of COCA-7. COCs include metal (lead), PCB, SVOC, and TPH. Samples CABS36 and 0099 had a PCB detection and concentrations that exceeded screening criteria. |
| | | SO | 5 | | | H | | X | | H | | | | H | | | | | | | | |
| -- | 8 | SS | 0 | | X | X | X | X | | | X | | | | | X | X | X | | X | 16 | Drainage evaluation from Coca Skim Pond. COCs include VOCs, TPHs, SVOCs, PAHs, energetic constituents, fluoride, MMH, and formaldehyde. Samples CABS01 and 06 had dioxin, TPH, and VOC detections and TPH, PAH, SVOC, and VOC concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | H | H | X | | | H | | | | | H | H | H | | H | | |
| -- | 9 | SS | 0 | | X | X | X | X | | | X | | | | | X | X | X | | X | 16, 30 | Drainage evaluation from Coca Skim Pond. COCs include VOCs, TPHs, SVOCs, PAHs, energetic constituents, fluoride, MMH, and formaldehyde. Samples CABS01 and 06 had dioxin, TPH, and VOC detections and TPH, PAH, SVOC, and VOC concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | H | H | X | | | H | | | | | H | H | H | | H | | |
| -- | 10 | SS | 0 | | X | X | X | X | | | | | X | | X | X | X | X | | X | 16, 29 | Drainage evaluation from Coca Skim Pond. Also extent evaluation for COCA-6. COCs include VOCs, TPHs, SVOCs, PAHs, energetic constituents, fluoride, MMH, and formaldehyde. Sample CABS0502 had TPH, metal, PAH, and SVOC detections and TPH, PCB, metal, and VOC concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | H | H | X | | | | | H | | H | H | H | H | | H | | |

**TABLE 1.13-3**
Data Quality Objectives: Coca Test Stand 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] 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/ 1613) | Metals (EPA Method 6010/6020B) | Mercury (EPA Method 7471) | Lead (EPA Method 6010/6020B) | Silver (EPA Method 6010/6020B) | Formaldehyde (EPA Method 8315A) | Energetics (EPA Method 8330A) | Fluoride EPA Method 300.0/9056A) | Perchlorate (EPA Method 314.0) | NDMA (EPA Method 1625C) | DTSC GSU Comment No(s). | Rationale / Comments [1, 2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -- | 11 | SS | 0 | | X | X | X | X | | | | | X | | X | X | X | X | | X | 16, 29 | Extent evaluation for COCA-6. COCs include VOCs, TPHs, SVOCs, PAHs, energetic constituents, fluoride, MMH, and formaldehyde. Sample CABS0502 had TPH, metal, PAH, and SVOC detections and TPH, PCB, metal, and VOC concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | H | H | X | | | | | H | | H | H | H | H | | H | | |
| -- | 12 | SS | 0 | | X | X | | X | | | | | | | | | | | | | 11 | Data gap evaluation for fuel tanks and ASTs. COCs include TPH, VOCs, and SVOCs. Sample CABS11 had non-detected concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | H | | X | | | | | | | | | | | | | | |
| -- | 13 | SS | 0 | | X | X | | X | | X | | | | | | | | | | | 11 | Data gap evaluation for fuel tanks and ASTs. COCs include TPH, PCBs, VOCs, and SVOCs. Sample CABS0090S70 had non-detected PCB concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | H | | X | | H | | | | | | | | | | | | |
| 7 | 14 | SS | 0 | | X | X | X | X | | | | | | | | | | | | | 11, 49 | Data gap and pipeline evaluation. COCs include TPH, PAH, SVOC, and VOC. Sample CABS0500 had a TPH detection and non-detected TPH, PAH, SVOC, and VOC concentrations that exceeded screening criteria. Data gap sample is for evaluation of Debris Point ID H2-G04-1022. Sample will be collected at this debris point. |
| | | SO | 5 | | X | H | H | X | | | | | | | | | | | | | | |
| 9, 12 | 15 | SS | 0 | | X | | | | | X | | | | | | | | | | | 39, 53, 56 | Extent evaluation for COCA-5. COCs include PCBs and VOCs. Samples CABS43, 43S01, and 43S03 had PCB detections and non-detected PCB concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | | | | | H | | | | | | | | | | | | |
| 12 | 1SV | SV | 5 | X | | | | | | | | | | | | | | | | | 11, 43 | Data gap and COCA-5 extent evaluation. Sample CASV0023 had non-detected VOC concentrations that exceeded screening criteria. |
| 7 | 16 | SS | 0 | | X | X | | X | | | | | | | | | | | | | 49 | Pipeline and water conveyance evaluation. COCs include TPH, VOCs, and SVOCs. Sample CABS09 had TPH detections and non-detected TPH concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | H | | X | | | | | | | | | | | | | | |
| 7 | 17 | SS | 0 | | X | X | | X | | | | | | | | | | | | | 49 | Pipeline and water conveyance evaluation. COCs include TPH, VOCs, and SVOCs. Sample CABS09 had TPH detections and non-detected TPH concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | H | | X | | | | | | | | | | | | | | |
| 7 | 18 | SS | 0 | | X | X | | X | | | | | | | | | | | | | 49 | Pipeline and water conveyance evaluation. COCs include TPH, VOCs, and SVOCs. Sample CABS09 had TPH detections and non-detected TPH concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | H | | X | | | | | | | | | | | | | | |
| 13 | 19 | SS | 0 | | | X | | X | | X | | | | | | | | | | | 11, 57 | Data gap evaluation. COCs include TPH, SVOC and PCB. Samples CABS73, 1006, 1007 and 0091S70 had TPH detections and non-detected TPH, SVOC and PCB concentrations that exceeded screening criteria. |
| | | SO | 5 | | | H | | H | | H | | | | | | | | | | | | |
| 7 | 20 | SS | 0 | | | | | X | | | | | | | | | | | | | 11, 49 | Data gap and pipeline evaluation. COCs include TPH. Samples CABS10 and 12 had TPH detections and non-detected TPH concentrations that exceeded screening criteria. |
| | | SO | 5 | | | | | H | | | | | | | | | | | | | | |

**TABLE 1.13-3**
Data Quality Objectives: Coca Test Stand 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] 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/ 1613) | Metals (EPA Method 6010/6020B) | Mercury (EPA Method 7471) | Lead (EPA Method 6010/6020B) | Silver (EPA Method 6010/6020B) | Formaldehyde (EPA Method 8315A) | Energetics (EPA Method 8330A) | Fluoride EPA Method 300.0/9056A) | Perchlorate (EPA Method 314.0) | NDMA (EPA Method 1625C) | DTSC GSU Comment No(s). | Rationale / Comments [1, 2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1, 2, 3, 4, 6, 7, 9 | 21 | SS | 0 | | X | X | X | X | | X | X | X | | | | X | | | X | X | 11, 13, 16, 29, 39, 41, 44, 46, | Data gap, pipeline, and COCA-1 and COCA-4 extent evaluation. COCs include TPH, PCB, metal, dioxin, VOC, SVOC, perchlorate, NDMA, formaldehyde, and PAHs. Samples CABS10 and 12 had TPH detections and non-detected TPH concentrations that exceeded screening criteria. Additional COCs have been added based on COPCs at COCA-1 and COCA-4. |
| | | SO | 5 | | X | H | H | X | | H | H | H | | | | H | | | H | H | | |
| 4, 7, 9 | 22 | SS | 0 | | | X | | X | | X | | X | | | | X | | X | X | | 11, 16, 29, 39, 49, 53 | Data gap, pipeline, and COCA-4 extent evaluation. COCs include TPH, PCB, metal, SVOC, perchlorate, formaldehyde, and fluoride. Sample CABS1002 had TPH, PAH, SVOC, and VOC detections and non-detected concentrations that exceeded screening criteria. |
| | | SO | 5 | | | H | | X | | H | | H | | | | H | | H | H | | | |
| 1, 2, 3, 6, 7 | 23 | SS | 0 | | X | | X | X | | X | X | X | | | | X | | | X | X | 11, 13, 16, 29, 30, 41, 46, 49 | Data gap, pipeline, and COCA-1 extent evaluation. COCs include TPH, PCB, metal, dioxin, VOC, perchlorate, NDMA, formaldehyde, and PAHs. COCs have been added based on COPCs at COCA-1. |
| | | SO | 5 | | X | | H | X | | H | H | H | | | | H | | | H | H | | |
| 1, 2, 3, 7 | 24 | SS | 0 | | X | | X | X | | X | X | X | | | | X | | | X | X | 11, 13, 16, 29, 30, 41, 49 | Data gap, pipeline, and COCA-1 extent evaluation. COCs include TPH, PCB, metal, dioxin, VOC, perchlorate, NDMA, formaldehyde, and PAHs. Samples CABS1000, 10 and 12 had TPH, PAH, and SVOC detections and non-detected TPH concentrations that exceeded screening criteria. Additional COCs have been added based on COPCs at COCA-1. |
| | | SO | 5 | | X | | H | X | | H | H | H | | | | H | | | H | H | | |
| 1, 2, 3 | 2SV | SV | 5 | X | | | | | | | | | | | | | | | | | 11, 41 | Data gap and COCA-1 extent evaluation. Sample CASV04 had VOC detections and non-detected VOC concentrations that exceeded screening criteria. |
| 1, 2, 3, 7 | 25 | SS | 0 | | X | | X | X | | X | X | X | | | | X | | | X | X | 11, 13, 16, 29, 41, 49 | Data gap, pipeline, and COCA-1 extent evaluation. COCs include TPH, PCB, metal, dioxin, VOC, perchlorate, NDMA, formaldehyde, and PAHs. Samples CABS02, 17, and 46 had a VOC detection and non-detected TPH and VOC concentrations that exceeded screening criteria. Additional COCs have been added based on COPCs at COCA-1 . |
| | | SO | 5 | | X | | H | X | | H | H | H | | | | H | | | H | H | | |
| 1, 2, 3 | 3SV | SV | 5 | X | | | | | | | | | | | | | | | | | 11, 41 | Data gap and COCA-1 extent evaluation. Sample CASV0024 had non-detected VOC concentrations that exceeded screening criteria. |
| -- | 26 | SS | 0 | | | | | | | X | | X | | | | | | | | | 11 | Data gap evaluation. COCs include metals and PCBs based on DTSC comments. |
| | | SO | 5 | | | | | | | H | | H | | | | | | | | | | |
| 6, 8, 9, 14 | 27 | SS | 0 | | X | | | X | | X | | X | | | | | | | | | 11, 39, 41, 52, 53 | Data gap and water conveyance evaluation. COCs include TPH, VOCs, PCB, and metals. |
| | | SO | 5 | | X | | | X | | H | | H | | | | | | | | | | |
| 8 | 28 | SS | 0 | | X | | | X | | | | | | | | | | | | | 11, 52 | Data gap and water conveyance evaluation. COCs include TPH and VOCs, |
| | | SO | 5 | | X | | | X | | | | | | | | | | | | | | |
| -- | 29 | SS | 0 | | X | | | X | | | | | | | | | | | | | 11 | Data gap and water conveyance evaluation. COCs include TPH and VOCs, |
| | | SO | 5 | | X | | | X | | | | | | | | | | | | | | |
| 15 | 30 | SS | 0 | | X | | | X | | X | | | | | | | | | | | 11 | Data gap, water conveyance, and COCA-3 extent evaluation. COCs include TPH, VOCs, and PCBs. Samples CABS0089, 0093S01, 0093S02, and 0093S03 had PCB detections and non-detected PCB concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | | | X | | H | | | | | | | | | | | | |

**TABLE 1.13-3**
Data Quality Objectives: Coca Test Stand 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] 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/ 1613) | Metals (EPA Method 6010/6020B) | Mercury (EPA Method 7471) | Lead (EPA Method 6010/6020B) | Silver (EPA Method 6010/6020B) | Formaldehyde (EPA Method 8315A) | Energetics (EPA Method 8330A) | Fluoride EPA Method 300.0/9056A) | Perchlorate (EPA Method 314.0) | NDMA (EPA Method 1625C) | DTSC GSU Comment No(s). | Rationale / Comments [1, 2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -- | 31 | SS | 0 | | X | X | | X | | | | | | | | | | | | | 11 | Data gap and debris area evaluation. COCs include TPH, SVOCs, VOCs, Sample CABS0508 had SVOC and VOC detections and non-detected concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | H | | X | | | | | | | | | | | | | | |
| -- | 32 | SS | 0 | | | | | | | X | | | | | | | | | | | 11 | Data gap evaluation. COCs include PCBs. Sample CABS0094S70 had non-detected PCB concentrations that exceeded screening criteria.<br>CABS0094S70 Coordinates: Northing: 264728.743 Easting: 1789832.609 |
| | | SO | 5 | | | | | | | H | | | | | | | | | | | | |
| 7 | 33 | SS | 0 | | | | | | | X | | | | | | | | | | | 11, 49 | Before collecting this sample, verify location in field. Data gap, pipeline, and COCA-3 extent evaluation. COCs include PCBs. |
| | | SO | 5 | | | | | | | H | | | | | | | | | | | | |
| -- | 34 | SS | 0 | | X | | | X | | X | | | | | | | | | | | 11 | Data gap, water conveyance, and COCA-3 extent evaluation. COCs include TPH, VOCs, and PCBs. Samples CABS0093S01, 0093S02, and 0093S03 had PCB detections and non-detected PCB concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | | | X | | H | | | | | | | | | | | | |
| 7 | 35 | SS | 0 | | X | | | X | | | | | | | | | | | | | 49 | Pipeline and water conveyance evaluation. COCs include TPH and VOCs. Sample CABS0110 had a TPH detection and non-detected VOC concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | | | X | | | | | | | | | | | | | | |
| 7 | 36 | SS | 0 | | X | | | X | | | | | | | | | | | | | 49 | Before collecting this sample, verify location in field. Pipeline and water conveyance evaluation. COCs include TPH and VOCs. |
| | | SO | 5 | | X | | | X | | | | | | | | | | | | | | |
| 7, 9 | 37 | SS | 0 | | X | X | | X | | X | | | | | | | | | | | 39, 49, 53 | Pipeline and water conveyance evaluation. COCs include TPH, SVOC, VOC, and PCBs. Samples CABS31 and 32 had non-detected PCB concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | H | | X | | H | | | | | | | | | | | | |
| 7 | 38 | SS | 0 | | X | | | X | | | | | | | | | | | | | 49 | Pipeline and water conveyance evaluation. COCs include TPH and VOCs. |
| | | SO | 5 | | X | | | X | | | | | | | | | | | | | | |
| 7 | 39 | SS | 0 | | X | | | X | | | | | | | | | | | | | 49 | Pipeline and water conveyance evaluation. COCs include TPH and VOCs. |
| | | SO | 5 | | X | | | X | | | | | | | | | | | | | | |
| -- | 40 | SS | 0 | | X | | | X | | | X | | | | | | X | | | | | Evaluation of Coca Aerial Desposition Area; evaluate 70% probability for maximum dispersion based on December 2010 study. COCs include energetics, VOCs, TPH, and dioxins.. |
| | | SO | 5 | | X | | | H | | | H | | | | | | H | | | | | |
| -- | 41 | SS | 0 | | X | | | X | | | X | | | | | | X | | | | | Evaluation of Coca Aerial Desposition Area; evaluate 70% probability for maximum dispersion based on December 2010 study. COCs include energetics, VOCs, TPH, and dioxins.. |
| | | SO | 5 | | X | | | H | | | H | | | | | | H | | | | | |

**TABLE 1.13-3**
Data Quality Objectives: Coca Test Stand 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] 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/ 1613) | Metals (EPA Method 6010/6020B) | Mercury (EPA Method 7471) | Lead (EPA Method 6010/6020B) | Silver (EPA Method 6010/6020B) | Formaldehyde (EPA Method 8315A) | Energetics (EPA Method 8330A) | Fluoride EPA Method 300.0/9056A) | Perchlorate (EPA Method 314.0) | NDMA (EPA Method 1625C) | DTSC GSU Comment No(s). | Rationale / Comments [1, 2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 42 | SS | 0 | | X | X | X | X | | X | | | | | | | | | | | | Extent evaluation for COCA-12. COCs include TPH, PAH, SVOC, and VOC. Sample CABS0511 had TPH, PAH, and SVOC detections and non-detected TPH and VOC concentrations that exceeded screening criteria. PCBs are analyzed due to proximity to CTL-V Drainage. |
| | | SO | 2 | | X | H | H | X | | H | | | | | | | | | | | | |
| -- | 43 | SS | 0 | | X | X | | X | | X | | | | | | X | | X | | | 11, 16, 29, 30 | Data gap and COCA-2 extent evaluation. COCs include metal, VOC, SVOC, TPH, PCB, formaldehyde, and fluoride. Samples CASS03, CABS0507, and CAPV06 had metal and VOC detections and non-detected TPH, metal, and VOC concentrations that exceeded screening criteria. Additional COCs have been added based on COPCs for COCA-2. |
| | | SO | 5 | | X | H | | X | | H | | | | | | H | | H | | | | |
| -- | 6SV | SV | 5 | X | | | | | | | | | | | | | | | | | 11 | Data gap and COCA-2 extent evaluation. COCs include VOCs. Sample CASV06 had VOC detections and non-detected concentrations that exceeded screening criteria. |
| 1, 2, 3 | 44 | SS | 0 | | X | | X | X | | X | X | X | | | | X | | | X | X | 11, 13, 16, 29, 30, 41, 42 | Data gap and COCA-1 extent evaluation. COCs include TPH, PCB, metal, dioxin, VOC, perchlorate, NDMA, formaldehyde, and PAHs. Sample CABS15 has non-detected TPH concentrations that exceeded screening criteria. Additional COCs have been added based on COPCs for COCA-1 |
| | | SO | 5 | | X | | H | X | | H | H | H | | | | H | | | H | H | | |
| 1, 2, 3 | 7SV | SV | 5 | X | | | | | | | | | | | | | | | | | 11, 41 | Data gap and COCA-1 extent evaluation. COCs include VOCs. Sample CASV06 had VOC detections and non-detected concentrations that exceeded screening criteria. |
| 1, 2, 3 | 45 | SS | 0 | | X | | X | X | | X | X | X | | | | X | | | X | X | 13, 16, 29, 30, 41, 42 | Debris area and COCA-1 extent evaluation. COCs include TPH, PCB, metal, dioxin, VOC, perchlorate, NDMA, formaldehyde, and PAH. Sample CABS0503 had TPH, metal, and dioxin detections and TPH, metal, and VOC non-detected concentrations that exceeded screening criteria. Additional COCs were added based on COPCs for COCA-1. |
| | | SO | 5 | | X | | H | X | | H | H | H | | | | H | | | H | H | | |
| 1, 2, 3 | 8SV | SV | 5 | X | | | | | | | | | | | | | | | | | 41 | Debris area and COCA-1 extent evaluation. COCs include VOCs. Sample CASV15 had a VOC detection and non-detected VOC concentrations that exceeded screening criteria. |
| -- | 46 | SS | 0 | | X | | | X | | | X | | | | | | X | | | | | Evaluation of Coca Aerial Desposition Area; evaluate 70% probability for maximum dispersion based on December 2010 study. COCs include energetics, VOCs, TPH, and dioxins.. |
| | | SO | 5 | | X | | | H | | | H | | | | | | H | | | | | |
| 7, 16 | 47 | SS | 0 | | X | X | | X | | X | | | | | | | | | | | 11, 49, 58 | Data gap, pipeline, and water conveyance evaluation. COCs include TPH, SVOC, VOC, and PCBs. Sample CABS62 and CABS0103 had TPH and SVOC detections and non-detected PCB, TPH, and SVOC concentrations that exceeded screening criteria. |
| | | SO | 2 | | X | H | | X | | H | | | | | | | | | | | | |
| 7, 16 | 4SV | SV | 5 | X | | | | | | | | | | | | | | | | | 11, 49, 58 | Data gap, pipeline, and water conveyance evaluation. COCs include VOCs. Sample CASV18 had a VOC detection and non-detected VOC concentrations that exceeded screening criteria. |
| -- | 48 | SS | 0 | | | | | | X | X | X | X | | | | | | | | | 11, 13, 61 | Data gap evaluation. COCs include PCB, dioxin, metals, and pesticides based on COPCs for the CTL-V Drainage. |
| | | SO | 2 | | | | | | H | H | H | H | | | | | | | | | | |
| -- | 49 | SS | 0 | | X | X | X | X | | X | | | | | | | | | | | | Extent evaluation for COCA-12. COCs include TPH, PAH, SVOC, and VOC. Sample CABS0511 had TPH, PAH, and SVOC detections and non-detected TPH and VOC concentrations that exceeded screening criteria. PCBs are analyzed due to proximity to CTL-V Drainage. |
| | | SO | 2 | | X | H | H | X | | H | | | | | | | | | | | | |
| 16 | 50 | SS | 0 | | | | | X | | X | | | | | | | | | | | 11, 58 | Data gap evaluation. COCs include PCB and TPH, which were either detected in sample CABS62 or had concentrations that exceeded screening criteria. |
| | | SO | 2 | | | | | X | | H | | | | | | | | | | | | |

**TABLE 1.13-3**
Data Quality Objectives: Coca Test Stand 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] 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/ 1613) | Metals (EPA Method 6010/6020B) | Mercury (EPA Method 7471) | Lead (EPA Method 6010/6020B) | Silver (EPA Method 6010/6020B) | Formaldehyde (EPA Method 8315A) | Energetics (EPA Method 8330A) | Fluoride EPA Method 300.0/9056A) | Perchlorate (EPA Method 314.0) | NDMA (EPA Method 1625C) | DTSC GSU Comment No(s). | Rationale / Comments [1, 2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6, 16 | 51 | SS | 0 | | X | X | | X | | X | | | | | | | | | | | 11, 30, 41, 58 | Data gap and COCA-8 extent evaluation. COCs include TPH, SVOC, PCB, and VOC. Samples CABS66 and CABS0104 had TPH and VOC detections and non-detected concentrations that exceeded screening criteria. PCB was added based on the COPC for COCA-8. |
| | | SO | 2 | | X | H | | X | | H | | | | | | | | | | | | |
| 6, 16 | 5SV | SV | 5 | X | | | | | | | | | | | | | | | | | 11, 41, 58 | Data gap and COCA-8 extent evaluation. Sample CASV17 had a VOC detection and non-detected VOC concentrations that exceeded screening criteria. |
| 6, 16 | 52 | SS | 0 | | | X | X | X | | X | | X | | | | | | | | | 11, 41, 58 | Data gap and COCA-8 extent evaluation. COCs include TPH, metal, PAH, SVOC, and PCB. Samples CABS76 and CABS84 had TPH detections and non-detected TPH, metal, PAH, and SVOC concentrations that exceeded screening criteria. PCB was added based on the COPC for COCA-8. |
| | | SO | 2 | | | H | H | X | | H | | H | | | | | | | | | | |
| 6, 16 | 53 | SS | 0 | | | X | | X | | X | | | | | | | | | | | 11, 30, 41, 58 | Data gap and COCA-8 extent evaluation. COCs include TPH, SVOC, and PCB. Samples CABS65 had TPH detections and non-detected concentrations that exceeded screening criteria. SVOC and PCB were added based on the COPCs for COCA-8. |
| | | SO | 2 | | | H | | X | | H | | | | | | | | | | | | |
| 16 | 54 | SS | 0 | | | X | | X | | X | | | | | | | | | | | 11, 58 | Data gap evaluation. COCs include TPH, SVOC, and PCB. |
| | | SO | 2 | | | H | | X | | H | | | | | | | | | | | | |
| 16 | 55 | SS | 0 | | | X | | X | | X | | | | | | | | | | | 11, 58 | Data gap evaluation. COCs include TPH, SVOC, and PCB. |
| | | SO | 2 | | | H | | X | | H | | | | | | | | | | | | |
| 6, 16 | 56 | SS | 0 | | X | X | X | X | | X | | | | | | | | | | | 30, 41, 58 | COCA-9 extent evaluation. COCs include TPH, PAH, SVOC, VOC and PCB. Samples CABS67, CABS68, CABS0105 and CABS0106 had TPH and VOC detections and non-detected PAH and SVOC concentrations that exceeded screening criteria. PCB was added based on the COPCs for COCA-9. |
| | | SO | 2 | | X | H | H | X | | H | | | | | | | | | | | | |
| -- | 57 | SS | 0 | | | | | X | | | | | | | | | | | | | 11, 61 | Sample following field confirmation of soil disturbance area. Data gap evaluation. COCs include TPH. |
| | | SO | 2 | | | | | X | | | | | | | | | | | | | | |
| -- | 58 | SS | 0 | | X | | | X | | | | | | X | | | | | | | 61 | COCA-11 extent evaluation. COCs include metal (lead), VOC and TPH. Sample CABS0509 had lead and VOC detections and non-detected TPH and VOC concentrations that exceeded screening criteria. Collect this sample downgradient of debris. |
| | | SO | 2 | | X | | | X | | | | | | H | | | | | | | | |
| -- | 59 | SS | 0 | | | | | X | | | | | | | | | | | | | 11, 61 | Sample following field confirmation of soil disturbance area. Data gap evaluation. COCs include TPH. |
| | | SO | 2 | | | | | X | | | | | | | | | | | | | | |
| -- | 60 | SS | 0 | | X | | | X | | | | | | | | | | | | | 11 | Debris area extent and data gap evaluation. COCs include TPH and VOC. Sample CABS0510 had TPH and VOC detections and non-detected concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | | | X | | | | | | | | | | | | | | |
| 5, 11a | 61 | SS | 0 | | X | | | X | | | | X | | | | | | | | | 11, 45, 55 | Data gap evaluation for leach field and drainage. COCs include metal, TPH and VOC. Sample CABS0514 had metal detections and non-detected TPH and VOC concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | | | X | | | | H | | | | | | | | | | |

**TABLE 1.13-3**
Data Quality Objectives: Coca Test Stand 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] 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/ 1613) | Metals (EPA Method 6010/6020B) | Mercury (EPA Method 7471) | Lead (EPA Method 6010/6020B) | Silver (EPA Method 6010/6020B) | Formaldehyde (EPA Method 8315A) | Energetics (EPA Method 8330A) | Fluoride EPA Method 300.0/9056A) | Perchlorate (EPA Method 314.0) | NDMA (EPA Method 1625C) | DTSC GSU Comment No(s). | Rationale / Comments [1, 2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5, 11a | 62 | SS | 0 | | X | | | X | | | | X | | | | | | | | | 11, 45, 55 | Data gap evaluation for leach field and drainage. COCs include metal, TPH and VOC. Sample CABS0514 had metal detections and non-detected TPH and VOC concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | | | X | | | | H | | | | | | | | | | |
| 5, 11a | 63 | SS | 0 | | | X | X | X | | | | X | | | | | | | | | 11, 45, 55 | Data gap evaluation for drainage. COCs include metal, TPH, PAH, and SVOC. Samples CABS0513, CABS51, CABS53, CABS77, CABS79, and CABS82 had metal and PAH detections and non-detected TPH, metal, PAH, and SVOC concentrations that exceeded screening criteria. |
| | | SO | 5 | | | H | H | X | | | | H | | | | | | | | | | |
| 5, 11a | 64 | SS | 0 | | | X | X | X | | | | X | | | | | | | | | 45, 55 | Data gap evaluation for drainage. COCs include metal, TPH, PAH, and SVOC. Samples CABS0513, CABS51, CABS53, CABS77, CABS79, and CABS82 had metal and PAH detections and non-detected TPH, metal, PAH, and SVOC concentrations that exceeded screening criteria. |
| | | SO | 5 | | | H | H | X | | | | H | | | | | | | | | | |
| 5, 11a | 65 | SS | 0 | | X | | | X | | | | X | | | | | | | | | 11, 45, 55 | Data gap evaluation for leach field and drainage. COCs include metal, TPH and VOC. Sample CABS0514 had metal detections and non-detected TPH and VOC concentrations that exceeded screening criteria. |
| | | SO | 5 | | X | | | X | | | | H | | | | | | | | | | |
| 4, 7, 9 | 66 | SS | 0 | | X | X | | X | | X | | X | | | | X | X | X | X | | 16, 29, 39, 44, 49, 53 | Extent sampling for COCA-4. COCs include PCB, VOC, SVOC, TPH, metal, formaldehyde, fluoride, perchlorate, and energetics. |
| | | SO | 5 | | X | H | | X | | H | | H | | | | H | H | H | H | | | |
| 1, 2, 3 | 67 | SS | 0 | | X | X | | X | | | X | X | | | | X | X | X | X | | 13, 16, 29, 41, 42 | Extent sampling for COCA-1. COCs include TPH, PCB, metal, dioxin, VOC, perchlorate, NDMA, formaldehyde, energetics, and PAH. |
| | | SO | 5 | | X | H | | X | | | H | H | | | | H | H | H | H | | | |
| 15 | 68 | SS | 0 | | | | | | | X | | | | | | | | | | | 11 | Data gap evaluation for PCBs, |
| | | SO | 5 | | | | | | | H | | | | | | | | | | | | |
| 8 | 69 | SS | 0 | | | X | | X | | | | X | | | | | | | | | | Extent evaluation for Coca-1 and CUA8. COCs include TPH, metals and SVOCs. |
| | | SO | 5 | | | H | | X | | | | H | | | | | | | | | | |
| -- | 70 | SS | 0 | | | | | | | X | | | | | | | | | | | | Sample CABS0515 had detected and non-detected TPH concentrations that exceeded screening criteria. CABS0515 coordinates - Northing: 264220.629 Easting: 1789450.66 |
| | | SO | 5 | | | | | | | H | | | | | | | | | | | | |

**TABLE 1.13-3**
Data Quality Objectives: Coca Test Stand 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] 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/ 1613) | Metals (EPA Method 6010/6020B) | Mercury (EPA Method 7471) | Lead (EPA Method 6010/6020B) | Silver (EPA Method 6010/6020B) | Formaldehyde (EPA Method 8315A) | Energetics (EPA Method 8330A) | Fluoride EPA Method 300.0/9056A) | Perchlorate (EPA Method 314.0) | NDMA (EPA Method 1625C) | DTSC GSU Comment No(s). | Rationale / Comments [1, 2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 71 | SS | 0 | | | | | | | X | | | | | | | | | | X | 39, 53 | Extent evaluation for COCA-1 and COCA-3. COCs include TPH, PCB, metals, dioxin, VOC, perchlorate, NDMA, formaldehyde, and PAH. Sample CABS18 had non-detected TPH concentrations that exceeded screening criteria. Additional COCs were added based on the COPC for COCA-1 and COCA-3. |
| | | SO | 5 | | | | | | | H | | | | | | | | | | H | | |

Notes:
CUA = chemical use area
ID = identification
ft bgs = feet below ground surface
VOC = volatile organic compounds
EPA = U.S. Environmental Protection Agency
SVOC = semivolatile organic compound
PAH = polycyclic aromatic hydrocarbon
NDMA = n-nitrosodimethylamine
SIM = select ion monitoring
TPH = total petroleum hydrocarbons
H = Sample will be held until it is needed; e.g., to delineate a detection in shallower samples at the same location or nearby locations
[1] = All soil (SS and SO) VOC samples should be collected from 1-2 feet
[2] = General Comment 4 requests rationale for investigation of specific chemicals at RFI sites.

**TABLE 1.14-1**

Tank Inventory at The Delta Area

*NASA SSFL, Ventura County, California*

| Tank ID | Tank Type | Coordinates | | Location Description | Size (gallons) | Contents | Use Period | Use Status |
|---|---|---|---|---|---|---|---|---|
| | | Northing | Easting | | | | | |
| Building 2223 Septic Tank | Septic | 264619.763516 | 1787584.390290 | West of Building 2223 | 1,500 | Sanitary Wastewater | 1957 - 1961 | Existing (Inactive) |
| Surge Chamber | AST | 264678.889508 | 1787252.677440 | GWTS Area | 3,000 | Extracted Groundwater | 1994 - ? | Existing (Empty and inactive) |
| V-82 | AST | 264567.872000 | 1787252.823000 | South of GWTS Area | 90,000 | Liquid Hydrogen | Unknown | Existing |
| Fluorine Scrubber Tank | AST | 264726.053300 | 1787295.750250 | West of Test Stand #3 | 2,000 | Water | 1953 - ? | Existing |
| Helium Tank 1 | AST | 264623.823524 | 1787731.827780 | North of V-405 | 60 | Helium | Unknown | Existing (Inactive) |
| Helium Tank 2 | AST | 264614.187481 | 1787731.827783 | North of V-405 | 60 | Helium | Unknown | Existing (Inactive) |
| Air Stripping Tower 1 | AST | 264656.631809 | 1787237.303719 | GWTS Area | Unknown | Extracted Groundwater | 1987 - ? | Existing |
| Air Stripping Tower 2 | AST | 264648.908704 | 1787237.303749 | GWTS Area | Unknown | Extracted Groundwater | 1987 - ? | Existing |
| 231 S | AST | 264704.926068 | 1787350.791340 | On Test Stand #3 | 600 | Fuel | 1957 - 1970 | Removed |
| 232 S | AST | 264704.926068 | 1787350.791340 | On Test Stand #3 | 600 | Oxidizer | 1957 - 1970 | Removed |
| Fuel Tank | AST | 264862.921300 | 1787699.621380 | North of Building 2906 and Building 2772 | Unknown | Fuel | 1957 - ? | Removed |
| Hydrazine Storage Area | AST | 264896.827932 | 1787706.829490 | North of Building 2906 and Building 2772 | Unknown | Hydrazine | 1957 - ? | Removed |
| 154 H | AST | 264642.811164 | 1787718.375240 | Northeast of Building 2223 | 500 | TCE | 1957 - 1971 | Removed |
| Storage Tank | AST | 264649.294940 | 1787217.223680 | GWTS Area | Unknown | Extracted Groundwater | 1993 - ? | Removed |
| Purge Water Tank (SWMU 5.25) | AST | 264599.457548 | 1787285.921170 | GWTS Area | 6,500 | Extracted Groundwater | 1992 - ? | Removed (Empty tank stored offsite) |
| Purge Water Tanks (2 Tanks) | AST | 264625.334000 | 1787265.616000 | GWTS Area | 20,000 | Extracted Groundwater | Unknown | Removed (Empty tank stored offsite) |
| V-83 | AST | 264711.097940 | 1787476.904040 | On Test Stand #2 | 90,000 | Liquid Hydrogen | 1957 - 1970 | Removed |
| V-230 | AST | 264704.926068 | 1787350.791340 | On Test Stand #3 | 1,200 | Liquid Oxygen | 1957 - 1970 | Removed |
| V-233 | AST | 264711.097940 | 1787476.904040 | On Test Stand #2 | 28,000 | Liquid Oxygen | 1957 - 1970 | Removed |
| V-234 | AST | 264711.097940 | 1787476.904040 | On Test Stand #2 | 28,000 | Liquid Oxygen | 1957 - 1970 | Removed |
| V-235 | AST | 264809.485524 | 1787617.969480 | On Test Stand #1 | 7,500 | Fuel | 1957 - 1970 | Removed |
| V-236 | AST | 264809.485524 | 1787617.969480 | On Test Stand #1 | 12,000 | Oxidizer | 1957 - 1970 | Removed |
| Slurry Tank | AST | 264718.872044 | 1787317.922120 | West of Test Stand #3 | Unknown | Lime/Limestone | 1954 - ? | Removed |
| Unknown-AT-DA-1 | AST | Unknown | Unknown | Eastern Side of Delta. Exact | Unknown | Liquid Oxygen | 1956 - 1971 | Removed |
| 43 H | AST | 264731.190916 | 1787695.163370 | Southeast of Test Stand #1 | 28,000 | Liquid Oxygen | 1956 - 1971 | Removed |
| 45 H | AST | 264777.814548 | 1787738.711210 | Southeast of Test Stand #1 | 28,000 | Liquid Oxygen | 1956 - 1971 | Removed |

**TABLE 1.14-1**

Tank Inventory at The Delta Area

*NASA SSFL, Ventura County, California*

| Tank ID | Tank Type | Coordinates | | Location Description | Size (gallons) | Contents | Use Period | Use Status |
|---|---|---|---|---|---|---|---|---|
| | | Northing | Easting | | | | | |
| 346 H (1 of 2 Tanks) | AST | 264600.187276 | 1787394.606530 | South of Test Stand #2 & #3 | 28,000 | Liquid Oxygen | 1956 - 1971 | Removed |
| 346 H (2 of 2 Tanks) | AST | 264616.729788 | 1787464.472320 | South of Test Stand #2 & #3 | 28,000 | Liquid Oxygen | 1956 - 1971 | Removed |
| V-403 (12 Bottles) | AST | 264604.134000 | 1787762.645000 | Northeast of Building 2223 | 470 cubic | Gaseous | 1956 - 1971 | All Removed |
| V-405 (12 Bottles) | AST | 264607.423156 | 1787721.479090 | Northeast of Building 2223 | 17,000 | Helium | 1956 - 1971 | All Removed |

Notes:

AST = aboveground storage tank

GWTS = groundwater treatment system

SWMU = solid waste management unit

TCE = trichloroethene

**TABLE 1.14-2**

Chemical Use Areas at The Delta Area

*NASA SSFL, Ventura County, California*

| Chemical Use Area Types and Typical Target Analytical Suites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical Use Area Name | Solvent<br>VOCs | Petroleum Fuels<br>TPH, VOCs[1] | SVOCs | Oil-Related Materials<br>SVOCs, TPH, PCBs, Metals | Metal Wastes (exclusive of debris areas)<br>Metals, pH | Debris Areas/ Fill<br>TPH, Metals, VOCs, SVOCs, PCBs, Dioxins | Energetic Constituents<br>Energetics, Perchlorate, Metals | Propellants<br>Hydrazine, NDMA, UDMH, MMH, NTO, IRFNA, Formaldehyde | Transformers<br>PCBs | Non-metal Inorganic Compounds<br>Fluoride, Chloride, Nitrate, Sulfate, Bromide | Dioxins, Furans | Acids/ Bases<br>pH |
| 1a - Delta Test Stand #1 | X | X | X | X | X | | X | X | | X | X | |
| 1b - Delta Test Stand #2 | X | X | X | X | X | | X | X | | X | X | |
| 1c - Delta Test Stand #3 | X | X | X | X | X | | X | X | | X | X | |
| 2a - Delta Skim Pond Channels | X | X | X | X | X | | | X | | | | |
| 2b - Delta Skim Pond | X | X | X | | X | | | X | | X | X | |
| 3 - Hydrazine Storage Area and Fuel Tank | | X | X | | X | | | X | | | | |
| 4 - TCE AST | X | | | | | | | | | | | |
| 5 - Fuel Pipeline | | X | | | | | | | | | | |
| 6 - Lube Oil and Flush Oil Building | | X | | | | | | | | | | |
| 7a - Transformer Area (near B223) | | | | | | | | | X | | | |
| 7b - Transformer Area (eastern portion of site) | | | | | | | | | X | | | |
| 8a - Debris Area (Western) | | | | | | X | | | | | X | |
| 8b - Debris Area (near pipeline) | | | | | | X | | | | | X | |
| 8c - Debris Area (Northern) | | | | | | X | | | | | X | |
| 8d - Debris Area (near B223 LF) | | | | | | X | | | | | X | |
| 9a - Building 223 | X | | | X | X | | | | | | | |
| 9b - B223 Leach Field | X | | | X | | | | | | | | |
| 9c - Planned Leach Field | X | | | X | | | | | | | | |
| 10 - GWTS | X | | X | | X | | | | | | X | |
| 11 - Fluorine Scrubber System | | | | | X | | | | | X | | X |

Notes:

AST = aboveground storage tank

GWTS = groundwater treatment system

IRFNA = Inhibited red fuming nitric acid

MMH = monomethyl hydrazine

NDMA = n-nitrosodimethylamine

NTO = nitrogen tetroxide

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

SPA = Storable Propellant Area

SVOC = semivolatile organic compound

TCE = trichloroethene

TPH = total petroleum hydrocarbons

UDMH = unsymetrical dimethyl hydrazine

VOC = volatile organic compound

[1] VOCs are a COPC for TPH-gasoline

**TABLE 1.14-3**
Data Quality Objectives: Delta Area
*NASA SSFL Field Sampling Plan*

| CUA | Object ID | Matrix | Targeted Sampling Depth(s) (Top Depth, ft bgs) | VOCs (SV)2 (EPA Method 8260B) | VOCs (EPA Method 8260B) | SVOCs (EPA Method 8270C) | PAHs (EPA Method 8270C [SIM]) | NDMA (EPA Method 1625C) | Perchlorate (EPA 314.0) | Formaldehyde (EPA Method 8315A) | Fluoride (EPA 300.0/9056A) | TPH (EPA Method 8015B) | PCBs (EPA Method 8082) | Dioxins (EPA Method 8290) | Metals (EPA Method 6010/6020B) | Metal, Chromium (EPA 6010/6020B) | Metal, Lead (EPA 6010/6020B) | (EPA 6010/6020B) | Mercury (EPA Method 7471A) | Energetics (EPA Method 8330A) | Rationale/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8a | 1 | SS | 0 | | | | X | | | | | X | | X | | | | | X | | Extent sample of PRA Delta-4; further evaluation of debris area; COCs detected include dioxins, TPH, PAHs, and mercury. |
| | | SO | 5 | | | | H | | | | | H | | H | | | | | H | | |
| | 1SV | SV | 5 | X | | | | | | | | | | | | | | | | | Evaluate soil vapor VOC extent of COCs at station DASV 10 and DASV11. Related to CUA MWH-149: TCE AST. |
| 8a | 2 | SS | 0 | | | | X | | | | | X | | X | | | | | X | | Extent sample of PRA Delta-4; further evaluation of debris area; COCs detected include dioxins, TPHs, PAHs, and mercury. |
| | | SO | 5 | | | | H | | | | | H | | H | | | | | H | | |
| | 2SV | SV | 5 | X | | | | | | | | | | | | | | | | | Evaluate soil vapor VOC extent of COCs at station DASV 10 and DASV11. Related to CUA MWH-149: TCE AST. |
| 8a | 3 | SS | 0 | | | | X | | | | | X | | X | | | | | X | | Extent sample of PRA Delta-4; further evaluation of debris area; COCs detected include dioxins, TPHs, PAHs, and mercury. |
| | | SO | 5 | | | | H | | | | | H | | H | | | | | H | | |
| | 3SV | SV | 5 | X | | | | | | | | | | | | | | | | | Evaluate soil vapor VOC extent of COCs at station DASV 10 and DASV11. Related to CUA MWH-149: TCE AST. |
| 8a | 4 | SS | 0 | | | | X | | | | | X | | X | | | | | X | | Extent sample of PRA Delta-4; further evaluation of debris area; COCs detected include dioxins, TPHs, PAHs, and mercury. |
| | | SO | 5 | | | | H | | | | | H | | H | | | | | H | | |
| 2b | 4SV | SV | 5 | ~~X~~ | | | | | | | | | | | | | | | | | Evaluate northeastern soil vapor extent of station DASP02, located in PRA Delta-1, near outfall of test stand drainage. |
| | 5 | SS | 0 | | X | | | | | | | | | | X | | | | | | West of Unknown AST #1 proposed for investigation. Sample located at apparent former pumping station and pad. Per DTSC comments, analyze sample for suite recommended at the Unknown AST #1; analyze sample for VOCs and metals. |
| | | SO | 5 | | X | | | | | | | | | | H | | | | | | |
| 2b | 5SV | SV | 5 | X | | | | | | | | | | | | | | | | | Evaluate northeastern soil vapor extent of station DASP01, located in PRA Delta-3, near outfall of test stand drainage. |
| 9a | 6 | SS | 0 | | | X | | | | | | X | | | | | X | | | | S-SE extent of DABS0506; detected COCs include SVOCs, TPHs, and Pb. |
| | | SO | 5 | | | H | | | | | | H | | | | | H | | | | |
| 8a | 6SV | SV | 5 | X | | | | | | | | | | | | | | | | | Evaluate northern extent of VOC as soil vapors of debris area sample DASV0508. |
| | 7 | SS | 0 | | | | | | | | | X | | X | | | | X | | | Extent sample for debris point (DABS0507), reported COCs of dioxins, metals, and TPHs. |
| | | SO | 5 | | | | | | | | | H | | H | | | | H | | | |
| 8a | 7SV | SV | 5 | X | | | | | | | | | | | | | | | | | Evaluate southern extent of VOC as soil vapors of debris area sample DASV0508. |

**TABLE 1.14-3**
Data Quality Objectives: Delta Area
*NASA SSFL Field Sampling Plan*

| CUA | Object ID | Matrix | Targeted Sampling Depth(s) (Top Depth, ft bgs) | VOCs (SV)2 (EPA Method 8260B) | VOCs (EPA Method 8260B) | SVOCs (EPA Method 8270C) | PAHs (EPA Method 8270C [SIM]) | NDMA (EPA Method 1625C) | Perchlorate (EPA 314.0) | Formaldehyde (EPA Method 8315A) | Fluoride (EPA 300.0/9056A) | TPH (EPA Method 8015B) | PCBs (EPA Method 8082) | Dioxins (EPA Method 8290) | Metals (EPA Method 6010/6020B) | Metal, Chromium (EPA 6010/6020B) | Metal, Lead (EPA 6010/6020B) | (EPA 6010/6020B) | Mercury (EPA Method 7471A) | Energetics (EPA Method 8330A) | Rationale/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 8 | SS | 0 | | | | | | | | | X | | X | | | | X | | | Extent sample for debris point (DABS0507), reported COCs of dioxins, metals, and TPHs. |
| | | SO | 5 | | | | | | | | | H | | H | | | | H | | | |
| 2b | 8SV | SV | 5 | X | | | | | | | | | | | | | | | | | Evaluate soil vapor VOC extent from station DAPV07, cross-gradient of PRA Delta-3. |
| | 9 | SS | 0 | | | | | | | | | X | | X | | | | X | | | Extent sample for debris point (DABS0507), reported COCs of dioxins, metals, and TPHs. |
| | | SO | 5 | | | | | | | | | H | | H | | | | H | | | |
| 2b | 9SV | SV | 5 | X | | | | | | | | | | | | | | | | | Evaluate soil vapor VOC extent from station DAPV07, cross-gradient of PRA Delta-3. |
| | 10 | SS | 0 | | X | | | | | | | | | | X | | | | | | Sample located west of Unknown AST #1, located along retaining wall near circular cut-outs in retaining wall. Transfer piping believed to transect wall from AST to apparent pump pad (Sample #5). COCs included VOCs and metals. |
| | | SO | 5 | | X | | | | | | | | | | H | | | | | | |
| | 10SV | SV | 5 | X | | | | | | | | | | | | | | | | | Evaluate cross-gradient extent of VOCs as soil vapor from PRA Delta-2; also evaluate VOCs as soil vapors from unknown AST #1. |
| 8b | 11 | SS | 0 | | | | | | | | | X | | X | | | | | | | SW data gap extent sample of DABS27 and southwestern debris area; COCs of TPHs; dioxins proposed for analysis via DTSC comments. |
| | | SO | 5 | | | | | | | | | H | | H | | | | | | | |
| | 11SV | SV | 5 | X | | | | | | | | | | | | | | | | | Evaluate cross-gradient extent of VOCs as soil vapor from PRA Delta-2; also evaluate VOCs as soil vapors from unknown AST #1. |
| 8b | 12 | SS | 0 | | | | | | | | | X | | X | | | | | | | SW data gap extent sample of DABS27 and southwestern debris area; COCs of TPHs; dioxins proposed for analysis via DTSC comments. |
| | | SO | 5 | | | | | | | | | H | | H | | | | | | | |
| | 12SV | SV | 5 | X | | | | | | | | | | | | | | | | | Evaluate VOCs in soil vapor upgradient of PRA Delta-2; also further investigate potential VOC source near Delta Test Stand #1. |
| 8b | 13 | SS | 0 | | | | | | | | | X | | X | | | | | | | Extent sample between PRAs Delta-5 and Delta-6, and additional characterization of southwestern potential debris area. TPHs detected as COCs; dioxins also proposed per DTSC comments. |
| | | SO | 5 | | | | | | | | | H | | H | | | | | | | |
| 6 | 13SV | SV | 5 | X | | | | | | | | | | | | | | | | | Evaluate VOCs in soil vapor near Lubricating Oil and Flushing Oil Building, south of PRA Delta-3. |
| 8b | 14 | SS | 0 | | | | X | | | | | X | | X | | | | | | | Extent sample for PRA Delta-5, and additional characterization of potential southwestern debris area. Sample located along pipeline, downgradient of DABS0504. TPHs and PAHs detected as COCs; dioxins proposed per DTSC comments. |
| | | SO | 5 | | | | H | | | | | H | | H | | | | | | | |
| 4 | 14SV | SV | 5 | X | | | | | | | | | | | | | | | | | Evaluate VOCs in soil vapor near for TCE AST, southeast of former Loading Dock. VOCs are a COC in the area. |

**TABLE 1.14-3**
Data Quality Objectives: Delta Area
*NASA SSFL Field Sampling Plan*

| CUA | Object ID | Matrix | Targeted Sampling Depth(s) (Top Depth, ft bgs) | VOCs (SV)2 (EPA Method 8260B) | VOCs (EPA Method 8260B) | SVOCs (EPA Method 8270C) | PAHs (EPA Method 8270C [SIM]) | NDMA (EPA Method 1625C) | Perchlorate (EPA 314.0) | Formaldehyde (EPA Method 8315A) | Fluoride (EPA 300.0/9056A) | TPH (EPA Method 8015B) | PCBs (EPA Method 8082) | Dioxins (EPA Method 8290) | Metals (EPA Method 6010/6020B) | Metal, Chromium (EPA 6010/6020B) | Metal, Lead (EPA 6010/6020B) | (EPA 6010/6020B) | Mercury (EPA Method 7471A) | Energetics (EPA Method 8330A) | Rationale/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8b | 15 | SS | 0 | | | | X | | | | | X | | | | | | | | | Extent sample for PRA Delta-5, and additional characterization of potential southwestern debris area. Sample located along pipeline, upgradient of DABS0504. TPHs and PAHs detected as COCs; dioxins proposed per DTSC comments. |
| | | SO | 5 | | | | H | | | | | H | | | | | | | | | |
| 8b | 16 | SS | 0 | | | | | | | | | X | | X | X | | | | | | Extent sample for PRA Delta-5, and additional characterization of known southwestern debris area. TPHs and metals detected as COCs; dioxins proposed per DTSC comments. |
| | | SO | 5 | | | | | | | | | H | | H | H | | | | | | |
| 8b | 17 | SS | 0 | | | | | | | | | X | | X | X | | | | | | Extent sample for PRA Delta-5, and additional characterization of known southwestern debris area. TPHs and metals detected as COCs; dioxins proposed per DTSC comments. |
| | | SO | 5 | | | | | | | | | H | | H | H | | | | | | |
| 8b | 18 | SS | 0 | | | | | | | | | X | | X | X | | | | | | Extent sample for PRAs Delta-5 and Delta-6, and additional characterization of known southwestern debris area. TPHs and metals detected as COCs; dioxins proposed per DTSC comments. |
| | | SO | 5 | | | | | | | | | H | | H | H | | | | | | |
| 8b | 19 | SS | 0 | | | | | | | | | X | | X | X | | | | | | Extent sample for PRAs Delta-5 and Delta-6, and additional characterization of known southwestern debris area. TPHs and metals detected as COCs; dioxins proposed per DTSC comments. |
| | | SO | 5 | | | | | | | | | H | | H | H | | | | | | |
| | 20 | SS | 0 | | X | | | | | | | X | | | | | | X | | | Extent sample for COCs detected at DABS1007; sample for VOCs, TPHs, and zinc. |
| | | SO | 5 | | X | | | | | | | H | | | | | | H | | | |
| | 21 | SS | 0 | | X | | | | | | | X | | | | | | X | | | Extent sample for COCs detected at DABS1007; sample for VOCs, TPHs, and zinc. |
| | | SO | 5 | | X | | | | | | | H | | | | | | H | | | |
| | 22 | SS | 0 | | X | | | | | | | X | | | | | | X | | | Extent sample for COCs detected at DABS1007; sample for VOCs, TPHs, and zinc. |
| | | SO | 5 | | X | | | | | | | H | | | | | | H | | | |
| | 23 | SS | 0 | | X | | X | | | | | X | | | | | | | | | Extent sample for COCs detected at DABS1008 and southern extent of PRA Delta-3; sample for VOCs, TPHs, and zinc. |
| | | SO | 5 | | X | | H | | | | | H | | | | | | | | | |
| 1c | 24 | SS | 0 | | X | | X | | | | | X | | | | | | | | | Extent sample for COCs detected at DABS1008 and southern extent of PRA Delta-3; sample for VOCs, TPHs, and zinc. |
| | | SO | 5 | | X | | H | | | | | H | | | | | | | | | |

**TABLE 1.14-3**
Data Quality Objectives: Delta Area
*NASA SSFL Field Sampling Plan*

| CUA | Object ID | Matrix | Targeted Sampling Depth(s) (Top Depth, ft bgs) | VOCs (SV)2 (EPA Method 8260B) | VOCs (EPA Method 8260B) | SVOCs (EPA Method 8270C) | PAHs (EPA Method 8270C [SIM]) | NDMA (EPA Method 1625C) | Perchlorate (EPA 314.0) | Formaldehyde (EPA Method 8315A) | Fluoride (EPA 300.0/9056A) | TPH (EPA Method 8015B) | PCBs (EPA Method 8082) | Dioxins (EPA Method 8290) | Metals (EPA Method 6010/6020B) | Metal, Chromium (EPA 6010/6020B) | Metal, Lead (EPA 6010/6020B) | (EPA 6010/6020B) | Mercury (EPA Method 7471A) | Energetics (EPA Method 8330A) | Rationale/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | SS | 0 | | X | | | | | | | X | | | | | | | | | Extent sample for COCs detected at DABS1005; sample for VOCs and TPHs. |
| | | SO | 5 | | X | | | | | | | H | | | | | | | | | |
| | 26 | SS | 0 | | X | | | | | | | X | | | | | | | | | Extent sample for COCs detected at DABS1005; sample for VOCs and TPHs. |
| | | SO | 5 | | X | | | | | | | H | | | | | | | | | |
| | 27 | SS | 0 | | X | | X | | | | | X | | | | | | | | | Extent sample for COCs detected at DABS1004 and DABS1005; sample for VOCs PAHs, and TPHs. |
| | | SO | 5 | | X | | H | | | | | H | | | | | | | | | |
| 4 | 28 | SS | 0 | | X | | | | | | | | | | X | | | | | | Investigation samples for AST and CUA MWH-374 east of PRA Delta-2, evaluate for VOCs. Additionally, evaluate for metals (specifically antimony) based on DTSC comment on Group 4 RFI report. |
| | | SO | 5 | | X | | | | | | | | | | H | | | | | | |
| 4 | 29 | SS | 0 | | X | | | | | | | | | | X | | | | | | Investigation samples for AST and CUA MWH-374 east of PRA Delta-2, evaluate for VOCs. Additionally, evaluate for metals (specifically antimony) based on DTSC comment on Group 4 RFI report. |
| | | SO | 5 | | X | | | | | | | | | | H | | | | | | |
| 4 | 30 | SS | 0 | | X | | | | | | | | | | X | | | | | | Investigation samples for AST and CUA MWH-374 east of PRA Delta-2, evaluate for VOCs. Additionally, evaluate for metals (specifically antimony) based on DTSC comment on Group 4 RFI report. Sample located at likely transfer point from mobile storage to the former AST. |
| | | SO | 5 | | X | | | | | | | | | | H | | | | | | |
| 8c | 31 | SS | 0 | | X | | | | | | | | | X | | | | | | | Investigate cleared vegetation area north of PRA Delta-1; evaluate area for VOCs based on Work Plan, and dioxins based on DTSC comment on Group 4 RFI report. |
| | | SO | 5 | | X | | | | | | | | | H | | | | | | | |
| 8c | 32 | SS | 0 | | X | | | | | | | | | X | | | | | | | Investigate cleared vegetation area north of PRA Delta-1; evaluate area for VOCs based on Work Plan, and dioxins based on DTSC comment on Group 4 RFI report. |
| | | SO | 5 | | X | | | | | | | | | H | | | | | | | |
| 2b, 8c | 33 | SS | 0 | | X | | X | | | | | X | X | X | X | | | | | | Investigate cleared vegetation area north of PRA Delta-1; evaluate area for VOCs based on Work Plan, and dioxins based on DTSC comment on Group 4 RFI report. Additionally, sampling provides northeastern extent of outfall of PRA Delta-1; also analyze for PAHs, TPHs, PCBs, and metals. |
| | | SO | 5 | | X | | H | | | | | H | H | H | H | | | | | | |
| 8d, 9b/c | 34 | SS | 0 | | X | | | | | | | | | | X | | | | | | Reevaluate non-detect RL and MDL VOC COCs reported at potential Building 2223 and Building 2772 leach field, also analyze for metals per DTSC comments. |
| | | SO | 5 | | X | | | | | | | | | | H | | | | | | |

**TABLE 1.14-3**
Data Quality Objectives: Delta Area
*NASA SSFL Field Sampling Plan*

| CUA | Object ID | Matrix | Targeted Sampling Depth(s) (Top Depth, ft bgs) | VOCs (SV)2 (EPA Method 8260B) | VOCs (EPA Method 8260B) | SVOCs (EPA Method 8270C) | PAHs (EPA Method 8270C [SIM]) | NDMA (EPA Method 1625C) | Perchlorate (EPA 314.0) | Formaldehyde (EPA Method 8315A) | Fluoride (EPA 300.0/9056A) | TPH (EPA Method 8015B) | PCBs (EPA Method 8082) | Dioxins (EPA Method 8290) | Metals (EPA Method 6010/6020B) | Metal, Chromium (EPA 6010/6020B) | Metal, Lead (EPA 6010/6020B) | (EPA 6010/6020B) | Mercury (EPA Method 7471A) | Energetics (EPA Method 8330A) | Rationale/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3, 9b/c | 35 | SS | 0 | | X | | | X | X | X | | | | | X | | | | | | Reevaluate non-detect RL and MDL VOC COCs reported at potential Building 2223 and Building 2772 leach field, also analyze for metals and perchlorate per DTSC comments on Group 4 RFI report. Due to proximity to hydrazine storage area, sample also proposed to evaluate NDMA and formaldehyde. |
| | | SO | 5 | | X | | | H | H | H | | | | | H | | | | | | |
| 8d, 9b/c | 36 | SS | 0 | | X | | X | | | | | X | | | X | | | | | | Evaluate potential leach field for Building 2223 and/or Building 2772 for VOCs, PAHs, TPHs, and metals. Sample location also provides northeastern extent for PRAs Delta-1 and Delta-2. Sample location also addresses comment provided by DTSC on the Group 4 RFI report. |
| | | SO | 5 | | X | | H | | | | | H | | | H | | | | | | |
| | 37 | SS | 0 | | | | X | | | | | | | X | X | | | | | | Sample provides western extent for COCs reported at DABS16, and investigates data gap of potential debris area west of Delta Test Stand #1. Analyze sample for PAHs for extent, and dioxins and metals to provide an adequate initial investigation. |
| | | SO | 5 | | | | H | | | | | | | H | H | | | | | | |
| | 38 | SS | 0 | | | | X | | | | | | | X | X | | | | | | Sample provides western extent for COCs reported at DABS16, and investigates data gap of potential debris area west of Delta Test Stand #1. Analyze sample for PAHs for extent, and dioxins and metals to provide an adequate initial investigation. |
| | | SO | 5 | | | | H | | | | | | | H | H | | | | | | |
| 2b | 39 | SS | 0 | | X | | X | | | | | | | X | X | | | | | | Cross-gradient extent sample for PRA Delta-3, VOCs, PAHs, and metals detected as COCs. Dioxins added to sampling suite per DTSC comments. |
| | | SO | 5 | | X | | H | | | | | | | H | H | | | | | | |
| 2b | 40 | SS | 0 | | X | | X | | | | | | | X | X | | | | | | Cross-gradient extent sample for PRA Delta-3, VOCs, PAHs, and metals detected as COCs. Dioxins added to sampling suite per DTSC comments. |
| | | SO | 5 | | X | | H | | | | | | | H | H | | | | | | |
| 2b | 41 | SS | 0 | | | | X | | | | | X | X | X | | X | | | | | Cross-gradient extent sample for PRA Delta-1; PAHs, TPHs, PCBs, and chromium detected as COCs. Dioxins added to sampling suite per DTSC comments. |
| | | SO | 5 | | | | H | | | | | H | H | H | | H | | | | | |
| 2b | 42 | SS | 0 | | | | X | | | | | X | X | X | | X | | | | | Cross-gradient extent sample for PRA Delta-1; PAHs, TPHs, PCBs, and chromium detected as COCs. Dioxins added to sampling suite per DTSC comments. |
| | | SO | 5 | | | | H | | | | | H | H | H | | H | | | | | |
| 2a | 43 | SO | at bedrock only | | X | X | X | X | X | X | X | X | X | X | X | | | | X | X | Sample along edge of former Delta Skim Pond, extent of VOC, SVOC, and energetics COCs; confirmation sampling of native soils beneath fill cover per DTSC comments. DTSC also comments perchlorate being a potential COC; perchlorate analysis proposed. |
| 2a | 44 | SO | at bedrock only | | X | X | X | X | X | X | X | X | X | X | X | | | | X | X | Sample along edge of former Delta Skim Pond, extent of VOC, SVOC, and energetics COCs; confirmation sampling of native soils beneath fill cover per DTSC comments. DTSC also comments perchlorate being a potential COC; perchlorate analysis proposed. |
| 2a | 45 | SO | at bedrock only | | X | X | X | X | X | X | X | X | X | X | X | | | | X | X | Sample along edge of former Delta Skim Pond, extent of VOC, SVOC, and energetics COCs; confirmation sampling of native soils beneath fill cover per DTSC comments. DTSC also comments perchlorate being a potential COC; perchlorate analysis proposed. |

**TABLE 1.14-3**
Data Quality Objectives: Delta Area
*NASA SSFL Field Sampling Plan*

| CUA | Object ID | Matrix | Targeted Sampling Depth(s) (Top Depth, ft bgs) | VOCs (SV)2 (EPA Method 8260B) | VOCs (EPA Method 8260B) | SVOCs (EPA Method 8270C) | PAHs (EPA Method 8270C [SIM]) | NDMA (EPA Method 1625C) | Perchlorate (EPA 314.0) | Formaldehyde (EPA Method 8315A) | Fluoride (EPA 300.0/9056A) | TPH (EPA Method 8015B) | PCBs (EPA Method 8082) | Dioxins (EPA Method 8290) | Metals (EPA Method 6010/6020B) | Metal, Chromium (EPA 6010/6020B) | Metal, Lead (EPA 6010/6020B) | (EPA 6010/6020B) | Mercury (EPA Method 7471A) | Energetics (EPA Method 8330A) | Rationale/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2a | 46 | SO | at bedrock only | | X | X | X | X | X | X | X | X | X | X | X | | | | X | X | Sample along edge of former Delta Skim Pond, extent of VOC, SVOC, and energetics COCs; confirmation sampling of native soils beneath fill cover per DTSC comments. DTSC also comments perchlorate being a potential COC; perchlorate analysis proposed. |
| 9b/c | 47 | SS | 0 | | X | X | X | | X | | | X | | | X | | | | | | Evaluate potential leach field for Building 2223 and/or Building 2772 for VOCs, PAHs, TPHs, and metals. Station also provides northeastern extent for PRAs Delta-1 and Delta-2. Station also addresses comment provided by DTSC on the Group 4 RFI report; additional analysis for NDMA, formaldehyde, and fluoride. |
| | | SO | 5 | | X | H | H | | H | | | H | | | H | | | | | | |
| 1a, 1b | 48 | SS | 0 | | | | X | X | | X | X | X | | | | | | | | | Extent sample between PRAs Delta-2 and Delta-3 and evaluating COCs reported at DABS1000 and DABS1001. Analyze for PAHs and TPHs. Additionally, providing additional investigation of potential contamination sources in response to agency comments on the Group 4 RFI report; add NDMA, formaldehyde, and fluoride to the sampling suite. |
| | | SO | 5 | | | | H | H | | H | H | H | | | | | | | | | |
| | 49 | SS | 0 | | | | X | X | | X | X | X | | | | | | | | | Extent sample southeast of PRAs Delta-2 and Delta-3 and evaluating COCs reported at DABS1000 and DABS1001. Analyze for PAHs and TPHs. Additionally, providing additional investigation of potential contamination sources in response to agency comments on the Group 4 RFI report; add NDMA, formaldehyde, and fluoride to the sampling suite. |
| | | SO | 5 | | | | H | H | | H | H | H | | | | | | | | | |
| 1b | 50 | SS | 0 | | | | X | | | | | X | | | | | | | | | Southern extent sample for PRA Delta-3, and additional investigation near source (former Delta Test Stand #2). Analyze sample for VOCs and TPHs. |
| | | SO | 5 | | | | H | | | | | H | | | | | | | | | |
| 7b | 51 | SS | 0 | | | | | | | | | | X | | | | | | | | Evaluate transformer CUA, located east of Unknown AST #1, near entrance to Delta Testing Area. Sample located on west side of former transformer area. |
| | | SO | 5 | | | | | | | | | | H | | | | | | | | |
| 7b | 52 | SS | 0 | | | | | | | | | | X | | | | | | | | Evaluate transformer CUA, located east of Unknown AST #1, near entrance to Delta Testing Area. Sample located on east side of former transformer area. |
| | | SO | 5 | | | | | | | | | | H | | | | | | | | |
| 7a | 53 | SS | 0 | | | | | | | | | | X | | | | | | | | Evaluate pole-mounted transformer bank CUA, located southeast of Building 2223. Sample located on west side of former transformer area. |
| | | SO | 5 | | | | | | | | | | H | | | | | | | | |
| 7a | 54 | SS | 0 | | | | | | | | | | X | | | | | | | | Evaluate pole-mounted transformer bank CUA, located southeast of Building 2223. Sample located on east side of former transformer area. |
| | | SO | 5 | | | | | | | | | | H | | | | | | | | |
| | 55 | SS | 0 | | X | | X | | | | | X | | | X | | | | | | Evaluate Former Loading Dock Area, east of Building 2223. Potential chemicals transferred at the site is unknown; however, most likely related to testing operations. Potential COCs identified in this area are VOC, PAH, TPH, and metals. Sample located at the northwestern end of the former Loading Dock, at most likely transfer point. |
| | | SO | 5 | | X | | H | | | | | H | | | H | | | | | | |
| | 56 | SS | 0 | | X | | X | | | | | X | | | X | | | | | | Evaluate Former Loading Dock Area, east of Building 2223. Potential chemicals transferred at the site is unknown; however, most likely related to testing operations. Potential COCs identified in this area are VOC, PAH, TPH, and metals. Sample located along western edge of the former Loading Dock. |
| | | SO | 5 | | X | | H | | | | | H | | | H | | | | | | |

**TABLE 1.14-3**
Data Quality Objectives: Delta Area
*NASA SSFL Field Sampling Plan*

| CUA | Object ID | Matrix | Targeted Sampling Depth(s) (Top Depth, ft bgs) | VOCs (SV)2 (EPA Method 8260B) | VOCs (EPA Method 8260B) | SVOCs (EPA Method 8270C) | PAHs (EPA Method 8270C [SIM]) | NDMA (EPA Method 1625C) | Perchlorate (EPA 314.0) | Formaldehyde (EPA Method 8315A) | Fluoride (EPA 300.0/9056A) | TPH (EPA Method 8015B) | PCBs (EPA Method 8082) | Dioxins (EPA Method 8290) | Metals (EPA Method 6010/6020B) | Metal, Chromium (EPA 6010/6020B) | Metal, Lead (EPA 6010/6020B) | (EPA 6010/6020B) | Mercury (EPA Method 7471A) | Energetics (EPA Method 8330A) | Rationale/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 57 | SS | 0 | | X | | X | | | | | X | | | X | | | | | | Evaluate Former Loading Dock Area, east of Building 2223, and soils in the vicinity of the TCE AST. Potential chemicals transferred at the site is unknown; however, most likely related to testing operations. Potential COCs identified in this area are VOC, PAH, TPH, and metals. Sample located at the southeastern end of the former Loading Dock, adjacent to former TCE AST. |
| | | SO | 5 | | X | | H | | | | | H | | | H | | | | | | |
| 6 | 58 | SS | 0 | | X | X | | | | | | X | | | | | | | | | Evaluate Lubricating and Flushing Oil Building area. Sample located on western edge of former building, to be placed near apparent points of egress if possible to determine. COCs associated with this building and its operations are TPH, VOCs, and SVOCs, |
| | | SO | 5 | | X | H | | | | | | H | | | | | | | | | |
| 6 | 59 | SS | 0 | | X | X | | | | | | X | | | | | | | | | Evaluate Lubricating and Flushing Oil Building area. Sample located on southern edge of former building, to be placed near apparent points of egress if possible to determine. COCs associated with this building and its operations are TPH, VOCs, and SVOCs. |
| | | SO | 5 | | X | H | | | | | | H | | | | | | | | | |

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

**TABLE 1.15-1**

Chemical Use Areas at the R-2 Ponds 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 - R-2A Pond | X | X | X | X | X | X | |
| 2 - R-2B Pond | X | X | X | X | X | X | |

Notes:

MMH = monomethyl hydrazine

NDMA = n-nitrosodimethylamine

NTO = nitrogen tetroxide

PAH = polycyclic aromatic

PCB = polychlorinated biphenyl

SVOC = semivolatile organic compound

TPH = total petroleum hydrocarbons

UDMH = unsymetrical dimethyl hydrazine

VOC = volatile organic compound

[1] VOCs are a COPC for TPH-gasoline.

[2] SVOCs and PAHs are COPCs for TPH-diesel.

**TABLE 1.15-2**
Data Quality Objectives: R2-Ponds Area
*NASA SSFL Field Sampling Plan*

| CUA | Object ID | Matrix | Targeted Sampling Depth(s)** (Top Depth, ft bgs) | VOCs (SV) (EPA Method 8260B) | VOCs * (EPA Method 8260B) | SVOCs (EPA Method 8270C) | PAHs (EPA Method 8270C SIM) | TPH (EPA Method 8015B) | PCBs (EPA Method 8082) | NDMA (EPA Method 1625C) | Dioxins/Furans (EPA Method 8290 1613) | Metals (EPA Method 6010/6020B) | Mercury (EPA Method SW7471A) | DTSC GSU Comment No(s).*** | Building Feature Evaluation Related? | Rationale/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | SS | 0 | | X | X | X | X | X | | X | X | | | No | Extent evaluation southwest of samples DASS04 and R2BS1017, and southeast of DABS0036 and R2BS1000, which had reported ND in excess of applicable RLs and exceedances of VOCs, PAHs, TPH, PCBs, dioxins, and metals. Also evaluates extent of PRA R2-1, and debris point CH2-G04-2000. COPCs include VOCs, SVOCs, PAHs, TPH, PCBs, dioxins, NDMA, and metals. |
| | | SO | 5 | | X | H | H | X | H | | H | H | | | | |
| | | SO | 10 | | X | H | H | X | H | | H | H | | | | |
| | 2 | SS | 0 | | X | | X | | X | X | X | X | X | | No | Extent evaluation northwest of samples R2FS01 and R2BS1006, which had reported ND in excess of applicable RLs and exceedances of VOCs, PAHs, PCBs, dioxins, and metals. Also evaluates extent of PRA R2-1 and a new pond identified during the 2010 aerial photograph review. COPCs include VOCs, PAHs, PCBs, dioxins, metals, NDMA, and mercury. |
| | | SO | 5 | | X | | H | | H | H | H | H | H | | | |
| | | SO | 10 | | X | | H | | H | H | H | H | H | | | |
| | 1SV | SV | 5 | X | | | | | | | | | | | No | Extent evaluation soil vapor sample of a new pond identified during the 2010 aerial photograph review. |
| | 3 | SS | 0 | | X | | X | | X | X | X | X | X | | No | Extent evaluation south of samples R2FS02 and R2BS1007, which had reported ND in excess of applicable RLs and exceedances of VOCs, PAHs, dioxins, and metals. Also evaluates data gap identified during the 2010 aerial photograph review. COPCs include VOCs, PAHs, phthalates, PCBs, dioxins, metals, NDMA, and mercury. |
| | | SO | 5 | | X | | H | | H | H | H | H | H | | | |
| | 4 | SS | 0 | | X | X | X | | | | | X | X | | No | Extent evaluation southwest of samples R2SS01 and PS-3, which had reported ND in excess of applicable RLs and exceedances of VOCs, PAHs, and metals. Also evaluates extent of PRA R2-1, and reclaimed water pipeline. Sample will be collected from beneath the pipeline. COPCs include VOCs, SVOCs, PAHs, NDMA, metals, and mecury. |
| | | SO | 5 | | X | H | H | | | | | H | H | | | |
| | 5 | SS | 0 | | X | | X | X | X | X | X | X | | | No | Extent evaluation northeast of samples DAS0036 and R2BS1000, north of DASS04 and R2BS1017, and northwest of R2BS1016, which had reported ND in excess of applicable RLs and exceedances of VOCs, PAHs, TPH, PCBs, dioxins, and metals. Also evaluates extent of PRA R2-1 and water conveyance pipelines. Sample will be collected from beneath the pipeline. COPCs include VOCs, PAHs, TPH, PCBs, dioxins, NDMA, and metals. |
| | | SO | 5 | | X | | H | H | H | H | H | H | | | | |
| | | SO | 10 | | X | | H | H | H | H | H | H | | | | |

**TABLE 1.15-2**
Data Quality Objectives: R2-Ponds Area
*NASA SSFL Field Sampling Plan*

| CUA | Object ID | Matrix | Targeted Sampling Depth(s)** (Top Depth, ft bgs) | VOCs (SV) (EPA Method 8260B) | VOCs * (EPA Method 8260B) | SVOCs (EPA Method 8270C) | PAHs (EPA Method 8270C SIM) | TPH (EPA Method 8015B) | PCBs (EPA Method 8082) | NDMA (EPA Method 1625C) | Dioxins/Furans (EPA Method 8290 1613) | Metals (EPA Method 6010/6020B) | Mercury (EPA Method SW7471A) | DTSC GSU Comment No(s).*** | Building Feature Evaluation Related? | Rationale/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | SS | 0 | | X | | X | X | X | | X | X | X | | No | Extent evaluation northwest of sample R2BS02 and southwest of R2BS1006, which had reported ND in excess of applicable RLs and exceedances of VOCs, PAHs, TPH, PCBs, dioxins, and metals. Also evaluates data gap identified during the 2010 aerial photograph review. COPCs include VOCs, PAHs, TPH, PCBs, dioxins, NDMA, metals, and mercury. |
| | | SO | 5 | | X | | H | X | H | | H | H | H | | | |
| | | SO | 10 | | X | | H | X | H | | H | H | H | | | |
| | 2SV | SV | 5 | X | | | | | | | | | | | No | Extent evaluation soil vapor sample of a new pond identified during the 2010 aerial photograph review. |
| | 7 | SS | 0 | | X | | X | | X | | X | X | | | No | Extent evaluation southeast of sample R2BS1010, which had reported ND in excess of applicable RLs and exceedances of PCBs, dioxins, and metals. Also evaluates extent of PRA R2-1. COPCs include VOCs, PAHs, PCBs, dioxins, NDMA, and metals. |
| | | SO | 5 | | X | | H | | H | | H | H | | | | |
| | | SO | 10 | | X | | H | | H | | H | H | | | | |
| | 8 | SS | 0 | | X | | X | | X | | X | X | | | No | Extent evaluation southeast of sample R2BS1010, which had reported ND in excess of applicable RLs and exceedances of PCBs, dioxins, and metals. Also evaluates extent of PRA R2-1. COPCs include VOCs, PAHs, PCBs, dioxins, NDMA, and metals. |
| | | SO | 5 | | X | | H | | H | | H | H | | | | |
| | | SO | 10 | | X | | H | | H | | H | H | | | | |
| | 9 | SS | 0 | | X | | | X | X | | | X | | | No | Extent evaluation east of sample R2BS1016, which had reported ND in excess of applicable RLs and exceedances of TPH and metals. Also evaluates pipeline and extent of PRA R2-1. Sample will be collected from beneath the pipeline. COPCs include VOCs, TPH, PCBs, and metals. |
| | | SO | 5 | | X | | | X | H | | | H | | | | |
| | | SO | 10 | | X | | | X | H | | | H | | | | |
| | 10 | SS | 0 | | | | | | X | | X | | | | No | Extent evaluation southwest of sample R2BS1012, which had reported exceedances of PCBs and dioxins. Also evaluates extent of PRA R2-2 and water conveyance pipelines. Sample will be collected from beneath the pipeline. COPCs include PCBs and dioxins. |
| | | SO | 5 | | | | | | H | | H | | | | | |
| | 11 | SS | 0 | | | | | | X | | X | | | | No | Extent evaluation southeast of sample R2BS1012, which had reported exceedances of PCBs and dioxins. Also evaluates extent of PRA R2-2 and water conveyance pipelines. Sample will be collected beneath the pipeline. COPCs include PCBs and |
| | | SO | 5 | | | | | | H | | H | | | | | |
| | 12 | SS | 0 | | | | | | X | | X | | | | No | Extent evaluation northeast of sample R2BS1012, which had reported exceedances of PCBs and dioxins. Also evaluates extent of PRA R2-2 and water conveyance pipelines. Sample will be collected from beneath the pipeline. COPCs include PCBs and dioxins. |
| | | SO | 5 | | | | | | H | | H | | | | | |

**TABLE 1.15-2**
Data Quality Objectives: R2-Ponds Area
*NASA SSFL Field Sampling Plan*

| CUA | Object ID | Matrix | Targeted Sampling Depth(s)** (Top Depth, ft bgs) | VOCs (SV) (EPA Method 8260B) | VOCs * (EPA Method 8260B) | SVOCs (EPA Method 8270C) | PAHs (EPA Method 8270C SIM) | TPH (EPA Method 8015B) | PCBs (EPA Method 8082) | NDMA (EPA Method 1625C) | Dioxins/Furans (EPA Method 8290 1613) | Metals (EPA Method 6010/6020B) | Mercury (EPA Method SW7471A) | DTSC GSU Comment No(s).*** | Building Feature Evaluation Related? | Rationale/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 13 | SS | 0 | | X | | X | | | X | | X | | | No | Extent evaluation southwest of sample R2BS03, which had reported ND in excess of applicable RLs and exceedances of phthalates. Also evaluates extent of PRA R2-1. COPCs include VOCs, PAHs, NDMA, and metals. |
| | | SO | 5 | | X | | H | | | H | | H | | | | |
| | 14 | SS | 0 | | X | X | X | | | | | X | | | No | Extent evaluation southeast of sample R2BS1002 and southwest of R2BS03, which had reported ND in excess of applicable RLs and exceedances of VOCs, PAHs, and pthalates. COPCs include VOCs, SVOCs, PAHs, NDMA, and metals. |
| | | SO | 5 | | X | H | H | | | | | H | | | | |
| | 15 | SS | 0 | | X | | X | | X | | X | X | X | | No | Extent evaluation southeast of sample R2BS1003, northeast of R2BS1002, and northwest of R2BS03, which had reported ND in excess of applicable RLs and exceedances of VOCs, PAHs, PCBs, dioxins, and metals. Also evaluates extent of PRA R2-1. COPCs include VOCs, PAHs, PCBs, dioxins, NDMA, metals and mercury. |
| | | SO | 5 | | X | | H | | H | | H | H | H | | | |
| | | SO | 10 | | X | | H | | H | | H | H | H | | | |
| | 16 | SS | 0 | | | | | | X | | | | | | No | Resample at sample XFBS08, which had reported ND in excess of applicable RLs. COPCs include PCBs. |
| | | SO | 5 | | | | | | H | | | | | | | |
| | 17 | SS | 0 | | | | | | X | | | | | | No | Resample at sample XFBS09, which had reported ND in excess of applicable RLs. Sample will be collected beneath the pipeline. Also evaluates pipeline. COPCs include PCBs. |
| | | SO | 5 | | | | | | H | | | | | | | |
| | 7SV | SV | 5 | X | | | | | | | | | | | No | Extent evaluation soil vapor sample of a pipeline identified during the 2010 aerial photograph review. |
| | 18 | SS | 0 | | X | X | X | X | | | | X | | | No | Evaluation of debris point CH2-G09-2022. COPCs include VOCs, SVOCs, PAHs, TPH, and metals. |
| | | SO | 5 | | X | H | H | X | | | | H | | | | |
| | 19 | SS | 0 | | X | | X | | X | | X | X | | | No | Extent evaluation southwest of sample R2BS1003 and northwest of R2BS1002, which had reported ND in excess of applicable RLs and exceedances of VOCs, PAHs, PCBs, dioxins. Also evaluates extent of PRA R2-1. COPCs include VOCs, PAHs, PCBs, dioxins, NDMA, and metals. |
| | | SO | 5 | | X | | H | | H | | H | H | | | | |
| | 20 | SS | 0 | | X | | | X | | | X | X | | | No | Evaluation of aboveground pipeline identified in the 2010 aerial photo review. COPCs include VOCs, dioxins, metals and TPH. The pipeline will be evaluated for integrity and samples will be located where releases might have occurred. Sample will be collected beneath the pipeline. |
| | | SO | 5 | | X | | | X | | | H | H | | | | |

**TABLE 1.15-2**
Data Quality Objectives: R2-Ponds Area
*NASA SSFL Field Sampling Plan*

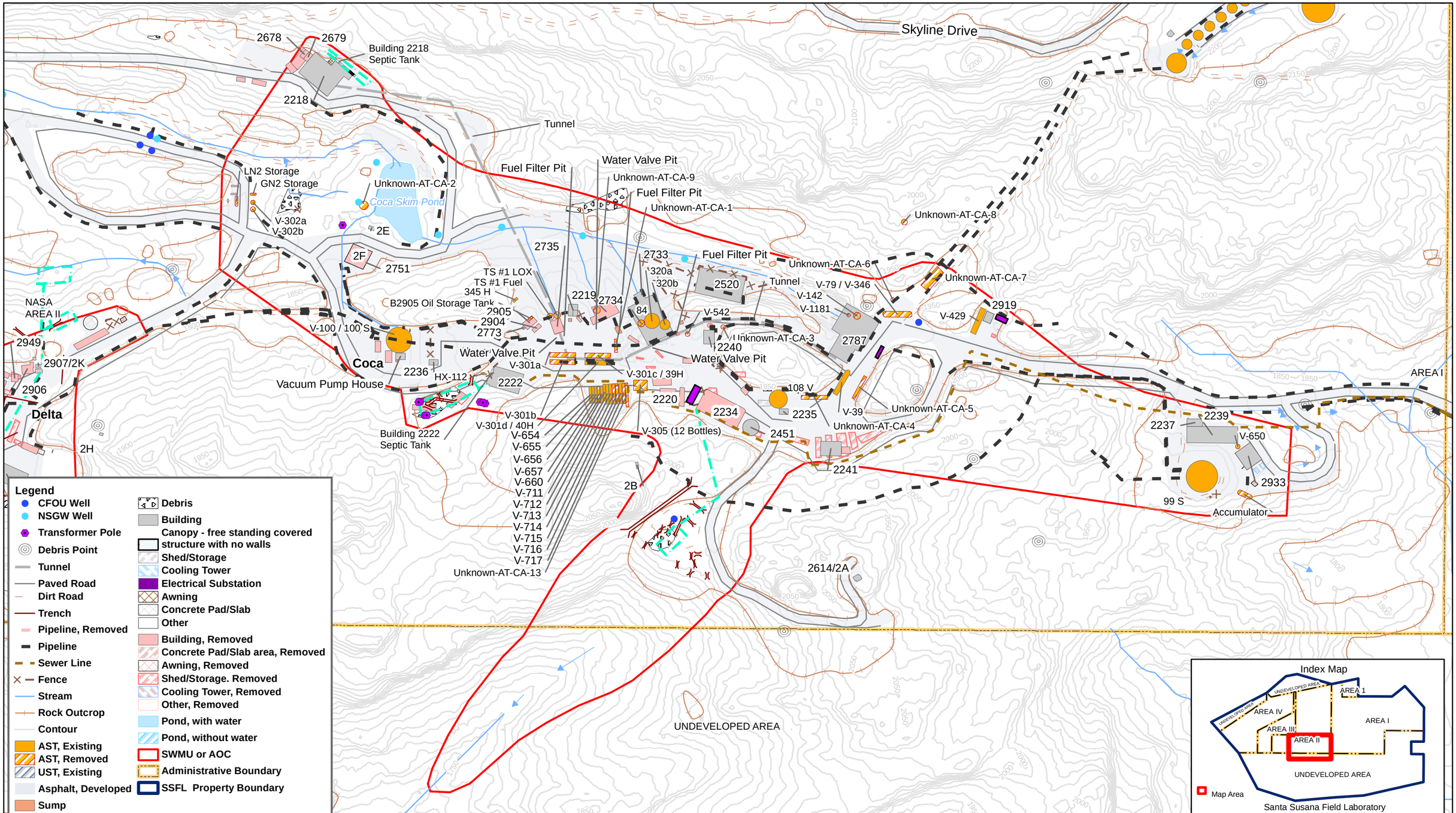
| CUA | Object ID | Matrix | Targeted Sampling Depth(s)** (Top Depth, ft bgs) | VOCs (SV) (EPA Method 8260B) | VOCs * (EPA Method 8260B) | SVOCs (EPA Method 8270C) | PAHs (EPA Method 8270C SIM) | TPH (EPA Method 8015B) | PCBs (EPA Method 8082) | NDMA (EPA Method 1625C) | Dioxins/Furans (EPA Method 8290 1613) | Metals (EPA Method 6010/6020B) | Mercury (EPA Method SW7471A) | DTSC GSU Comment No(s).*** | Building Feature Evaluation Related? | Rationale/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3SV | SV | 5 | X | | | | | | | | | | | No | Extent evaluation soil vapor sample of a pipeline identified during the 2010 aerial photograph review. |
| | 21 | SS | 0 | | X | | | X | | | X | X | | | No | Evaluation of aboveground pipeline identified in the 2010 aerial photo review. COPCs include VOCs, dioxins, metals, and TPH. The pipeline will be evaluated for integrity and samples will be located where releases might have occurred. Sample will be collected beneath the pipeline. |
| | | SO | 5 | | X | | | X | | | H | H | | | | |
| | 4SV | SV | 5 | X | | | | | | | | | | | No | Extent evaluation soil vapor sample of a pipeline identified during the 2010 aerial photograph review. |
| | 22 | SS | 0 | | X | | | X | | | X | X | | | No | Evaluation of aboveground pipeline identified in the 2010 aerial photo review. COPCs include VOCs, dioxins, metals, and TPH. The pipeline will be evaluated for integrity and samples will be located where releases might have occurred. Sample will be collected beneath the pipeline. |
| | | SO | 5 | | X | | | X | | | H | H | | | | |
| | 5SV | SV | 5 | X | | | | | | | | | | | No | Extent evaluation soil vapor sample of a pipeline identified during the 2010 aerial photograph review. |
| | 23 | SS | 0 | | X | | | X | | | X | X | | | No | Evaluation of aboveground pipeline identified in the 2010 aerial photo review. COPCs include VOCs, dioxins, metals, and TPH. The pipeline will be evaluated for integrity and samples will be located where releases might have occurred. Sample will be collected beneath the pipeline. |
| | | SO | 5 | | X | | | X | | | H | H | | | | |
| | 6SV | SV | 5 | X | | | | | | | | | | | No | Extent evaluation soil vapor sample of a pipeline identified during the 2010 aerial photograph review. |
| | 24 | SS | 0 | | X | X | | X | X | X | X | X | | | No | Data gap evaluation of pond identified in the 2010 aerial photo review. COPCs include VOCs, SVOCs, PCBs, dioxins, NDMA, metals, and TPH. |
| | | SO | 5 | | X | H | | X | H | H | H | H | | | | |
| | 8SV | SV | 5 | X | | | | | | | | | | | No | Data gap evaluation of the soil vapor southeast of the R2B Pond. |
| | 25 | SS | 0 | | X | X | | X | X | X | X | X | | | No | Data gap evaluation of pond identified in the 2010 aerial photo review. COPCs include VOCs, SVOCs, PCBs, dioxins, NDMA, metals, and TPH. |
| | | SO | 5 | | X | H | | X | H | H | H | H | | | | |
| | 9SV | SV | 5 | X | | | | | | | | | | | No | Data gap evaluation of the soil vapor south of the R2A Pond. |

**TABLE 1.15-2**
Data Quality Objectives: R2-Ponds Area
*NASA SSFL Field Sampling Plan*

| CUA | Object ID | Matrix | Targeted Sampling Depth(s)** (Top Depth, ft bgs) | VOCs (SV) (EPA Method 8260B) | VOCs * (EPA Method 8260B) | SVOCs (EPA Method 8270C) | PAHs (EPA Method 8270C SIM) | TPH (EPA Method 8015B) | PCBs (EPA Method 8082) | NDMA (EPA Method 1625C) | Dioxins/Furans (EPA Method 8290 1613) | Metals (EPA Method 6010/6020B) | Mercury (EPA Method SW7471A) | DTSC GSU Comment No(s).*** | Building Feature Evaluation Related? | Rationale/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 26 | SS | 0 | | X | X | | X | X | X | X | X | | | No | Data gap evaluation of pond identified in the 2010 aerial photo review. COPCs include VOCs, SVOCs, PCBs, dioxins, NDMA, metals, and TPH. |
| | | SO | 5 | | X | H | | X | H | H | H | H | | | | |
| | 10SV | SV | 5 | X | | | | | | | | | | | No | Data gap evaluation of the soil vapor south of the R2A Pond. |

Notes:
COPC = contaminant of potential concern
CUA = chemical use area
DTSC GSU = California Department of Toxic Substances Control Geological Services Unit
ft bgs = feet below ground surface
H = Sample will be held until it is needed; that is, to delineate a detection in shallower samples at the same or nearby locations.
ID = identification
ND = non detect
NDMA = N-nitrosodimethylamine
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PRA = preliminary remediation area
RBSL = risk-based screening level
RL = reporting limit
SV = soil vapor
SVOC = semivolatile organic compound
SIM = Selected ion monitoring
TPH = total petroleum hydrocarbons
VOC = volatile organic compound
* = Surface samples (SS) for VOCs will be collected at 1 ft bgs.
** Actual vertical profile sampling depths might change as field conditions warrant; however, a sample will be collected from the bottom of each boring except where noted in rationale/comments.

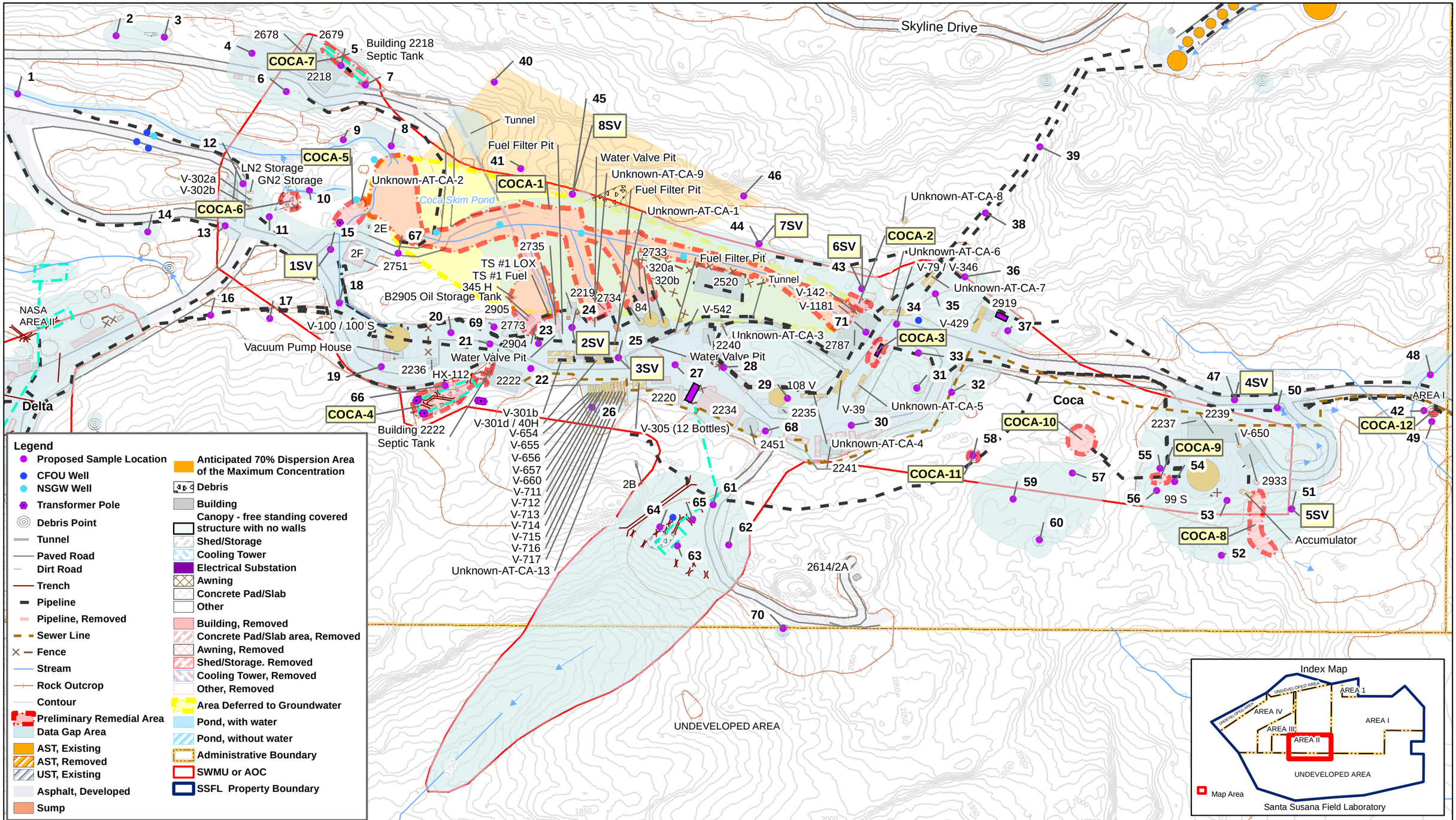
# Figures




02-Feb-2012
Drawn By:
A. Cooley

**Figure 1.13-1 COCA Site Map**
**Field Sampling Plan**
**Santa Susana Field Laboratory**
**Ventura County, California**

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




**Legend**

- Proposed Sample Location
- CFOU Well
- NSGW Well
- Transformer Pole
- Debris Point
- Tunnel
- Paved Road
- Dirt Road
- Trench
- Pipeline
- Pipeline, Removed
- Sewer Line
- Fence
- Stream
- Rock Outcrop
- Contour
- Preliminary Remedial Area
- Data Gap Area
- AST, Existing
- AST, Removed
- UST, Existing
- Asphalt, Developed
- Sump
- Anticipated 70% Dispersion Area of the Maximum Concentration
- Debris
- Building
- Canopy - free standing covered structure with no walls
- Shed/Storage
- Cooling Tower
- Electrical Substation
- Awning
- Concrete Pad/Slab
- Other
- Building, Removed
- Concrete Pad/Slab area, Removed
- Awning, Removed
- Shed/Storage. Removed
- Cooling Tower, Removed
- Other, Removed
- Area Deferred to Groundwater
- Pond, with water
- Pond, without water
- Administrative Boundary
- SWMU or AOC
- SSFL Property Boundary




0 80 160 320 Feet

0 25 50 100 Meters

02-Feb-2012
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A. Cooley

**Figure 1.13-2 COCA Proposed Sample Locations**
**Field Sampling Plan**
**Santa Susana Field Laboratory**
**Ventura County, California**

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

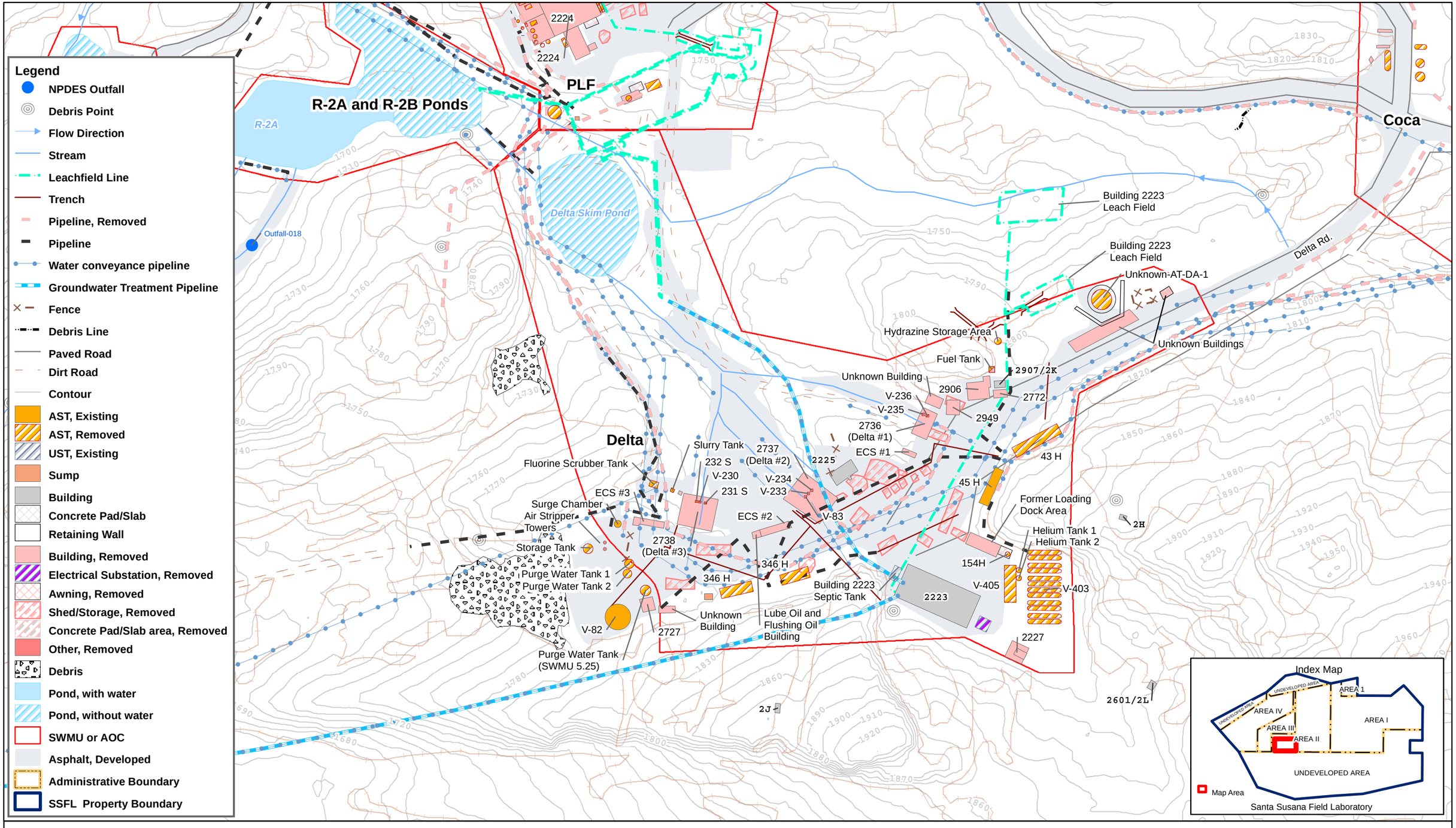


**Figure 1.14-1 Delta Site Map**
**Field Sampling Plan**
**Santa Susana Field Laboratory**
**Ventura County, California**

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

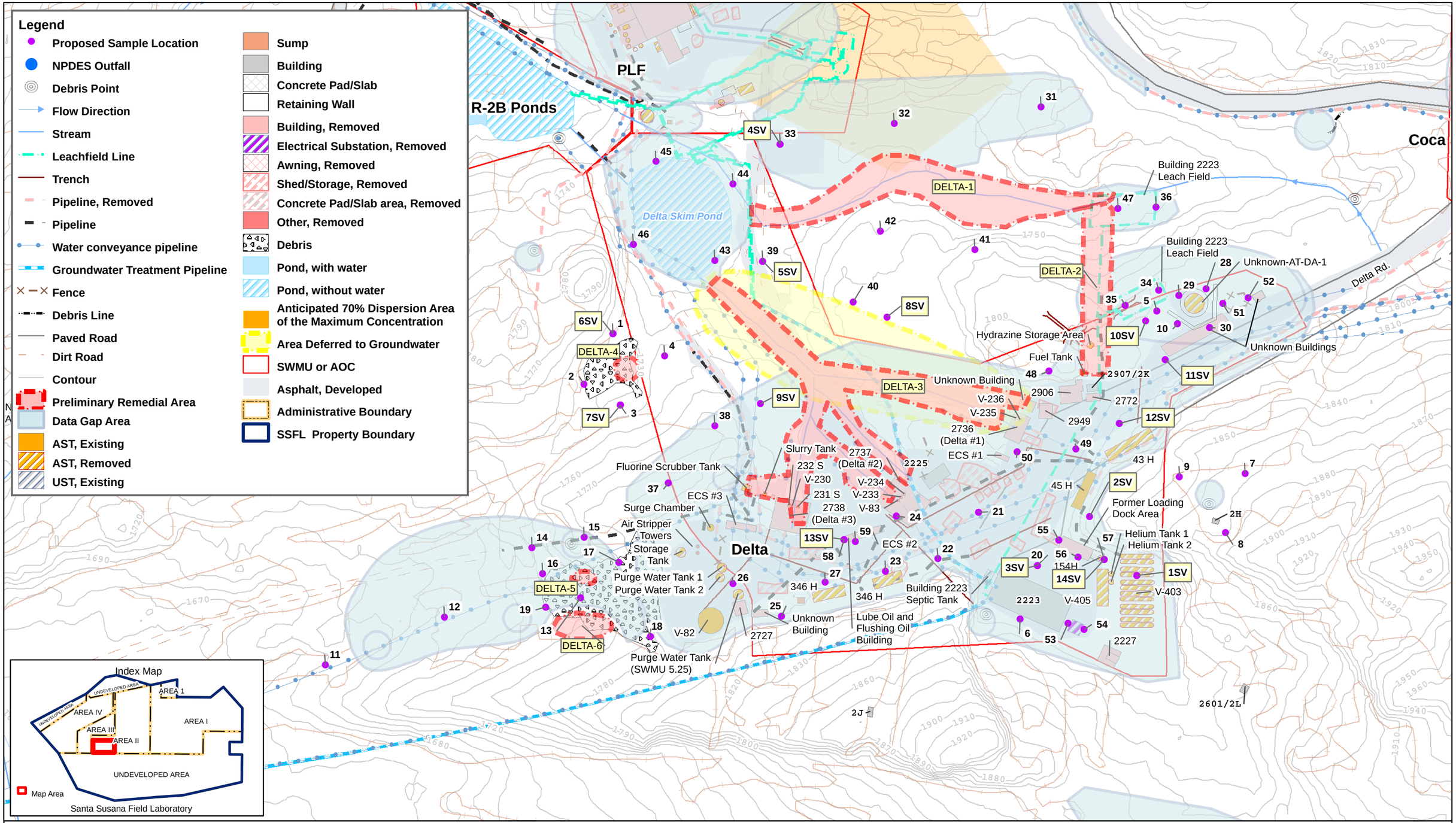


**Figure 1.14-2 Delta Proposed Sample Locations**
**Field Sampling Plan**
**Santa Susana Field Laboratory**
**Ventura County, California**

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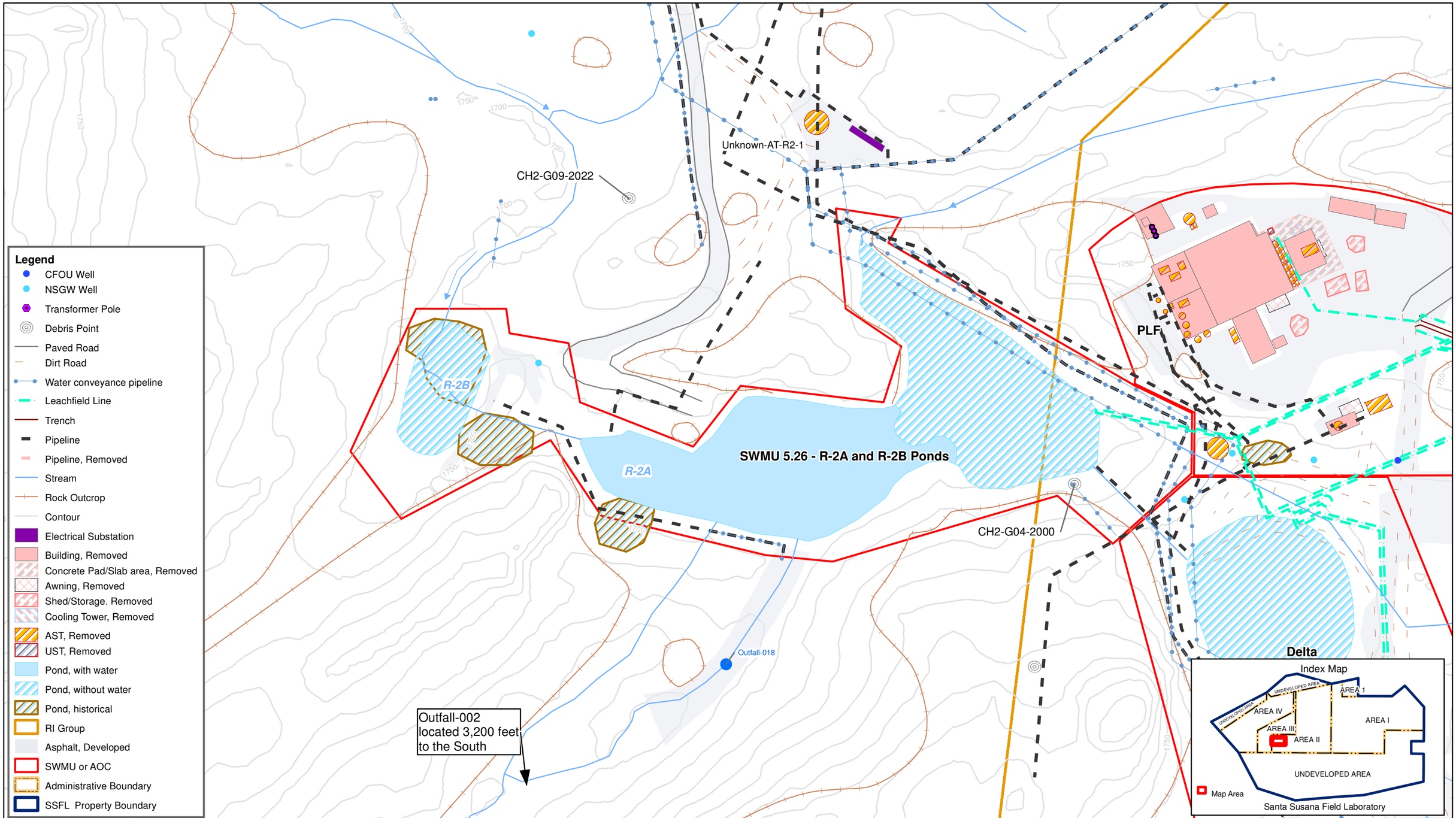


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**Figure1.15-1**
**R2Ponds Site Map**
**Field Sampling Plan**
**Santa Susana Field Laboratory**
**Ventura County, California**

Map Document: O:\NASA\SSFL\maps\FieldSamplingPlan\R2POND_FSPSitemap2.mxd

This portion of the pipeline has been addressed as part of the CDFF FSP

**Legend**

- Proposed Sample Location
- Preliminary Remedial Area
- Data Gap Area
- CFOU Well
- NSGW Well
- Transformer Pole
- Debris Point
- Leachfield
- Paved Road
- Dirt Road
- Water conveyance pipeline
- Trench
- Pipeline
- Pipeline, Removed
- Stream
- Rock Outcrop
- Contour
- Electrical Substation
- Building, Removed
- Concrete Pad/Slab area, Removed
- Awning, Removed
- Shed/Storage. Removed
- Cooling Tower, Removed
- AST, Removed
- UST, Removed
- Pond, with water
- Pond, without water
- Pond, historical
- RI Group
- Asphalt, Developed
- SWMU or AOC
- Administrative Boundary
- SSFL Property Boundary

R-2A and R-2B Ponds

PRA-1

PRA-2

PLF

Outfall-018

Outfall-002 located 3,200 feet to the South

Delta

Index Map

AREA I

AREA II

AREA III

AREA IV

AREA 1

UNDEVELOPED AREA

Map Area

Santa Susana Field Laboratory

0 25 50 100 Feet

0 5 10 20 Meters

02-Feb-2012
Drawn By:
A. Cooley

**Figure1.15-2**
**R2Ponds Proposed Sample Locations**
**Field Sampling Plan**
**Santa Susana Field Laboratory**
**Ventura County, California**

Map Document: O:\NASA\SSFL\maps\FieldSamplingPlan\R2Pond_FSPProposedSampleLocs_SDE.mxd