DRAFT Final Hangar 1 Engineering Evaluation/Cost Analysis

Former Naval Air Station Moffett Field, California

Prepared for:

Planetary Ventures, LLC

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EXECUTIVE SUMMARY

This DRAFT Final Engineering Evaluation/Cost Analysis ("EE/CA") evaluates several alternatives for managing PCB- and lead-impacted paints at Hangar 1 located within the Former Naval Air Station ("NAS") Moffett Field in California. This EE/CA has been prepared as set forth in 40 CFR §300.415(b)(4)(i) and in accordance with United States Environmental Protection Agency ("U.S. EPA") guidance documents. This EE/CA: (1) summarizes past remedial actions and current conditions at Hangar 1, (2) documents the need for additional removal actions, (3) identifies the removal action objective, (4) identifies possible removal action alternatives, (5) evaluates the effectiveness, implementability, and cost of the identified removal action alternatives, and (6) presents a recommended removal action alternative. The recommended removal action will be performed pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") and the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP") and NASA is the Lead Agency.

Site Background

The former NAS Moffett Field is located approximately 35 miles south of San Francisco, 10 miles north of San Jose, and approximately 1 mile south of San Francisco Bay and is bounded to east by the City of Sunnyvale, to the west and south by the City of Mountain View, and to the north by San Francisco Bay.

The Former NAS Moffett Field, was originally commissioned as the NAS Sunnyvale in 1933 to serve as a base for the West Coast dirigibles of the Lighter-Than-Air program. By 1950, the Former NAS Moffett Field was the largest naval air transport base on the West Coast and became the first all-weather NAS. Management of the Former NAS Moffett Field and Hangar 1 was transferred to NASA in 1994.

In 1987, the U.S. EPA placed NAS Moffett Field on the National Priority List ("NPL") and in 1990 the Navy signed a FFA with the U.S. EPA and Regional Water Board to conduct remedial actions at NAS Moffett Field pursuant to CERCLA regulations (U.S. EPA, 1990). This agreement was amended in December 1993 (U.S. EPA, 1993b).

Hangar 1 is a large steel structure measuring approximately 1,133 feet long by 308 feet wide and 198 feet tall that was constructed to house the United States Ship ("U.S.S.") Macon dirigible. The area surrounding Hangar 1 is paved, with the exception of several small areas of bare soil located on the eastern side of the hangar (Figure 2).

Previous Investigations and Removal Actions

In 1997, a relatively uncommon polychlorinated biphenyl ("PCB") mixture, Aroclor 1268, was detected in a sediment sample collected from a storm water settling basin that receives storm water runoff from the western portion of the Former NAS Moffett Field. In 1999, both Aroclor 1260 and 1268 were detected in a storm water sample collected from a manhole downstream of Hangar 1. Subsequent investigations determined that the Hangar 1 siding, a composite corrugated metal material commercially known as Robertson Protected Metal, contained PCBs and asbestos and that the lead-based paint used to cover both the siding and steel frame of the hangar also contained PCBs at elevated concentrations. Due to the presence of PCBs and lead in Hangar 1 building materials, in 2002, NASA closed the hangar to all personnel except those involved in essential maintenance, abatement, or environmental cleanup activities and the Navy designated Hangar 1 as Installation Restoration ("IR") Site 29.

In September 2003, NASA implemented a Time Critical Removal Action ("TCRA") to remove sediments contaminated with PCBs from the storm water collection trench located around the perimeter of Hangar 1; the TCRA also removed potentially affected sediments present on paved surfaces immediately surrounding the structure. Between September 2003 and February 2004, the Navy implemented a second TCRA to control the migration of PCBs from Hangar 1 to the storm drain system and the environment by coating the exterior siding of the Hangar with an asphalt emulsion; this TCRA was envisioned as a temporary measure until a more permanent solution could be implemented.

In 2008, the Navy prepared an EE/CA that evaluated 13 removal action alternatives based on their implementability and effectiveness at protecting human health and the environment. Based on this comparative analysis, the recommended alternative to limit the migration of contaminants present within the Hangar 1 building materials was to: (1) remove the PCB, lead, and asbestos containing roofing and siding from Hangar 1 and (2) clean the steel structure and any remaining interior structures and encapsulate remaining PCB- and lead-impacted paints on the structural steel elements and concrete surfaces using a weather-resistant epoxy based coating.

Between June 2010 and June 2013, the Navy implemented the recommended alternative and removed the hangar siding and roofing and disposed of these materials at a permitted off-Site facility, cleaned the structural steel and coated it as well as exposed concrete surfaces and other structures that were not demolished with a primer and a finish coat of a weather-resistant epoxy known as Carbomastic-15 ("CM15"), and excavated PCB- and lead- impacted soil outside of Hangar 1. The Navy subsequently prepared a Long-Term Management Plan ("LTMP") that NASA was responsible for implementing.

During pre-lease negotiations between NASA and PV in 2014, NASA indicated that the CM15 epoxy coating had deteriorated in several areas. As a result, PV's consultants performed a visual screening inspection of the CM15 epoxy coating, collected wipe and bulk samples of building materials within the Hangar 1 structure, and collected samples of the sediment that had accumulated on the concrete floor and accessible storm drain trenches. During the visual inspection, deterioration of the CM15 epoxy coating was observed in multiple locations and based on the wipe and sediment sampling results, PV's consultants concluded that failure of the CM15 epoxy coating was the likely source of the PCBs and lead detected in these samples.

Based on the 2014 visual inspections and sampling results, it was apparent that the CM15 epoxy coating would need to be maintained more regularly than anticipated in the LTMP. To avoid the need to maintain the CM15 coating in perpetuity, PV conducted a Pilot Study to assess the feasibility of removing the CM15 encapsulated PCB- and lead-impacted paints from the Hangar 1 structural steel elements and concrete masonry unit ("CMU") walls.

Prior to the Pilot Study abatement activities, a fully encapsulated negative-pressure enclosure was constructed around the Pilot Study area to contain dust, paint chips, liquids, and other potential emissions from the abatement techniques. Based on the perimeter air monitoring data, the enclosure was effective at mitigating potential releases from the blasting activities to the environment and potential off-Site receptors. Of the three abatement techniques assessed, both media blasting and vapor media blasting were capable of removing the existing CM15-coated PCB- and lead-containing paints and meeting the target acceptance criteria.[1] Ultra-high-pressure water blasting was deemed unacceptable because it was not capable of meeting the target acceptance criterion for lead, it was difficult to use, and it damaged the historic finish of the CMU wall.

Removal Action Objective

The Remedial Action Objective ("RAO") of this EE/CA is to control the release of PCBs and lead from the remaining paints at Hangar 1, thereby reducing potential risks to human health and the environment from these chemicals. The removal action will also address the concrete floor of the hangar should impacts from residual PCBs and/or lead be found in this bulk material and remaining asbestos-containing materials will be removed where they are encountered.

While the planned removal action will address potential risks from the structural building materials within the Hangar 1 structure, it will not address: (1) the exposed soil adjacent to Hangar 1 that was previously remediated by the Navy, (2) potential risks from building materials in nearby structures (e.g., Buildings 32 and 33), or (3) other chemicals of concern that may be present in the subsurface (i.e., in soil, groundwater, or soil vapor).

Removal Action Alternatives

This EE/CA evaluates the following removal action alternatives based on the nature, extent, occurrence of impacted materials within the Hangar 1 structure, future land use, and risk reduction goals:

- Alternative 1: No Action;
- Alternative 2: Implementation of Institutional Controls; and
- Alternative 3: Abatement – Media Blasting and Cleaning.

The evaluation of the No Action alternative (i.e., Alternative 1) is required by the NCP (40 CFR §300.430(e)(6)) to provide a baseline that can be used to judge the effectiveness of the other removal action alternatives. Under the No Action alternative, no additional actions will be taken and as a result, this alternative would leave the PCB-, lead-, and asbestos-containing building material present at Hangar 1 in their existing state with no requirement for follow-up inspections or maintenance of the existing CM15 epoxy coating. Under this alternative, no further actions to prevent the release of PCBs, lead, or asbestos to the environment will be performed and any future releases would not be mitigated or monitored.

Under Alternative 2, the protectiveness of the installed CM15 coating will be maintained via institutional controls ("ICs") and the performance of routine operations, maintenance, and monitoring ("OMM") activities such as spot abatement, repair, and recoating activities; the requirement to implement ICs and perform OMM would remain unless future response actions are taken that would allow for unrestricted use of the property. Alternative 2 achieves the RAO

[1] Target acceptance criteria were defined for the Pilot Study (ACC, 2017).

of controlling the release of PCBs and lead from remaining impacted paints at Hangar 1 through encapsulation.

Under Alternative 3, existing PCB- and lead-impacted paints at Hangar 1 will be removed via a combination of media blasting, chemical stripping, and/or scraping with hand tools followed by cleaning. In total, visible paint and coatings will be removed from approximately 1,800,000 square feet of structural steel elements and approximately 36,000 square feet of CMU walls. Once all visible paint has been removed and the area has passed a visual inspection by a qualified surface coating inspector, confirmation samples will be collected to demonstrate that the cleanup goals have been met. Alternative 3 achieves the RAO of controlling the release of PCBs and lead from remaining impacted paints at Hangar 1 by removing these materials and disposing of them at permitted off-site disposal facilities in accordance with applicable laws and regulations.

Comparative Analysis

As required by the NCP, the alternatives were evaluated with respect to their effectiveness, implementability, and cost; this evaluation is summarized in Table 4-1 and below.

Effectiveness: In terms of effectiveness, Alternative 1 does not achieve the RAO or comply with ARARs and is the least effective as no actions will be taken to reduce the toxicity, mobility, or volume of impacted materials at the Site and because further degradation of the existing CM15 epoxy coating could result in potentially unacceptable risks for both human and ecological receptors.

Alternative 2 achieves the RAO, complies with applicable or relevant and appropriate requirements ("ARARs"), and ranks moderate in terms of its overall protectiveness of public health and the environment, the protection of potential future receptors over the short-term, and long-term effectiveness and permanence. This alternative ranks low for the reduction of toxicity, mobility, and volume of impacted materials at the Site.

Alternative 3 achieves the RAO, complies with ARARs and ranks high with respect to its overall protectiveness of public health and the environment, long-term effectiveness and permanence. Alternative 3 ranks moderate to high with respect to the protection of potential future receptors over the short-term and moderate for the reduction of toxicity, mobility, or volume because the impacted paints/coatings will be removed from the Site and disposed of at approved facilities where they can be properly managed to control potential future releases to the environment.

Implementability: All three alternatives rank high in terms of their implementability. Alternative 1 is technically and administratively feasible, and since no actions will be conducted under this alternative, no services or materials will be required to implement this alternative.

Alternative 2 is technically feasible, would require minimal services and materials to implement, and is relatively easy to administratively implement.

Alternative 3 is technically and administratively feasible and the materials and services required to implement this alternative are readily available, and the results of the Pilot Study demonstrated that it can meet the cleanup goals proposed herein.

Cost: Of the three alternatives, Alternative 1 is the least expensive as it would not incur any cost because no actions will be conducted. Alternative 3 is significantly more expensive than Alternative 2 due to costs associated with the removal of all impacted paints at Hangar 1 and the disposal of abatement wastes at permitted off-site disposal facilities. Due to the significant abatement and disposal costs, Alternative 3 is the most expensive alternative.

Recommended Removal Action Alternative

The recommended alternative is Alternative 3 – Media Blasting and Cleaning. This alternative would protect public health and the environment, comply with ARARs, and provides the best balance of the primary balancing criteria (i.e., short-term effectiveness, long-term effectiveness and permanence, implementability, and cost). While the implementation of this alternative does not use treatment to reduce the overall toxicity, mobility, or volume of impacted material, it reduces the toxicity, mobility, and volume of impacted material at the Site through the removal of these materials and their disposal at permitted off-site facilities. The recommended alternative is readily implementable and is expected to be acceptable to the Regulatory Agencies.

Under this alternative, metal scaffolding will be installed within and outside of the Hangar 1 structure and a shrink wrap polyethylene plastic, or similar material, will be installed around the scaffolding and a polyvinyl chloride ("PVC") or rubberized flooring will be installed over horizontal concrete surfaces within the enclosure to provide containment and stability, and to simplify the collection of abatement wastes. The containment enclosure will be maintained under constant negative air pressure via the use of blowers equipped with HEPA filters and interior pressures will be monitored using a digital manometer. In preparation for abatement activities, barriers will be installed over storm drain inlets, and perimeter storm drain trench inlets and exposed soil surfaces adjacent to the Hangar 1 structure will be covered with plastic.

During abatement activities, visual inspections of the containment and barrier devices will be conducted on a daily basis and, during media blasting activities, perimeter air monitoring will be conducted to monitor for potential fugitive particulate emissions from blasting activities.

Based on results from the Pilot Study, media blasting with a copper slag blast media will be used to remove impacted paints/coatings from the structural steel surfaces at Hangar 1; for the CMU walls, chemical paint strippers will be used instead of media blasting to minimize potential impacts to the historical finish of the CMU walls. Throughout the day and at the end of each shift, abatement wastes will be collected in sealed supersacks and placed in a waste accumulation area. On completion of abatement of the above grade structural elements, the floor of the enclosure will be removed and existing paint on the concrete floor (if present) will be removed by media blasting.

Post-abatement cleaning will include HEPA vacuuming and/or wiping the abated structural steel elements, CMU walls, concrete slab of the hangar, and the perimeter storm water trench. On completion of post-abatement cleaning, abated areas will be dry, free of dust and debris and no paint will be visible on the surfaces. A qualified surface coating inspector will inspect the abated surfaces for the presence of residual paint. Areas with visible paint remaining will be removed by additional blasting, chemical stripping, and/or scraping with hand tools. Following the visual inspection and, if necessary, additional cleaning and/or abatement, confirmation wipe samples will be collected from the abated non-porous surfaces (e.g., structural steel surfaces) and confirmation bulk samples will be collected from the abated porous surfaces (e.g., CMU walls and concrete surfaces) and the results for these samples will be compared against the numeric cleanup goals proposed herein.

All personnel leaving the enclosure will exit through a three-stage decontamination chamber that is a part of the negative pressure enclosure; reusable equipment (e.g., blasting equipment, hand tools, etc.) will be decontaminated using a two-stage decontamination chamber and on completion of abatement activities, wipe samples will be collected from reusable equipment to demonstrate that the decontaminated equipment is suitable for unrestricted use. All decontamination wastes will be collected, characterized, managed, and stored in accordance with applicable laws and regulations and disposed of at a permitted off-site facility.

All wastes generated during implementation of the Recommended Alternative will be characterized prior to off-site disposal and managed according to these waste characterization results. Based on the results of the Pilot Study and the estimated mass of blast media required for abatement, it is assumed that up to:

- Approximately 6,500 tons of spent media blasting waste and chemical stripping sludges would need to be disposed of as Toxic Substances Control Act ("TSCA") and Resource Conservation and Recovery Act ("RCRA") regulated waste;
- Approximately 120 cubic yards of personal protective equipment ("PPE") and contaminated containment structure and 20,000 gallons of liquid decontamination wastes will be disposed of as RCRA-regulated waste; and
- Approximately 900 cubic yards of miscellaneous wastes will be disposed of as non-hazardous waste.

Wastes generated pursuant this alternative will be packaged in accordance with all applicable federal, state, and local laws and regulations and placed in shipping containers that meet Department of Transportation requirements for transportation to an off-site disposal facility.

Throughout abatement activities, qualified environmental professionals will (1) observe and record the progress of the abatement activities, (2) conduct perimeter air monitoring, confirmation sampling, and waste characterization sampling, and (3) prepare written periodic progress reports for the Regulatory Agencies that describe all significant developments during the preceding period and developments anticipated during the next reporting period.

On completion of the implementation of the Recommended Alternative, a Non-Time Critical Removal Action ("NTCRA") completion report will be prepared and submitted to the Regulatory Agencies for review and approval.

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ACRONYMS AND ABBREVIATIONS

ACC	ACC Environmental Consultants
ARAR	applicable or relevant and appropriate requirement
BAAQMD	Bay Area Air Quality Management District
BMP	best management practice
BRAC	Base Realignment and Closure
CAM 17 Metals	17 Heavy Metals identified in the California Administrative Manual. Includes: antimony, arsenic, barium, beryllium cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CM15	Carbomastic-15
CMU	concrete masonry unit
DTSC	Department of Toxic Substances Control
EC	engineering control
EE/CA	Engineering Evaluation/Cost Analysis
EKI	EKI Environment & Water, Inc. (formerly known as Erler & Kalinowski, Inc.)
ERM	excluded recyclable material
ESL	Environmental Screening Level
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study
HEPA	high-efficiency particulate arrestor
IC	institutional control
IR	Installation Restoration
LTMP	Long-Term Management Plan
MCL	maximum contaminant level
MEW	Middlefield, Ellis, Whisman
MFA	Moffett Federal Airfield
MFA Leasehold	An approximately 1,000-acre parcel of land within the former NAS Moffett Field
mg/kg	milligrams per kilogram
NACE	National Association of Corrosion Engineers
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NTCRA	Non-Time-Critical Removal Action
OMM	operations, maintenance, and monitoring

OSHA	Occupational Safety and Health Administration
PAL	project action limit
PCB	polychlorinated biphenyl
PPE	personal protective equipment
PV	Planetary Ventures, LLC
PVC	polyvinyl chloride
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
Site	Hangar 1, Former NAS Moffett Field, California
SSPC	Society for Protective Coatings
SWRCB	State Water Resources Control Board
TBC	to be considered
TCRA	Time-Critical Removal Action
TSCA	Toxic Substances Control Act
UCL	upper confidence limit
ug/100 cm^2	micrograms per 100 square centimeters
ug/ft^2	micrograms per square foot
U.S. EPA	United States Environmental Protection Agency
U.S.S.	United States Ship
VI	vapor intrusion
Regional Water Board	State of California Regional Water Quality Control Board, San Francisco Bay Region

1 INTRODUCTION

This DRAFT Final Engineering Evaluation/Cost Analysis ("EE/CA") to address impacted paint at Hangar 1 has been prepared by EKI Environment & Water, Inc. ("EKI") on behalf of Planetary Ventures, LLC ("PV"). Hangar 1 ("Site") is located within the Former Naval Air Station ("NAS") Moffett Field, California (Figure 1). The EE/CA addresses only the remediation of painted elements of the aboveground Hangar 1 structure, concrete masonry unit ("CMU") walls, concrete stem walls, and concrete floor and compares the following active alternatives against the Regulatory required No Action alternative: (a) implementation of a long-term management plan to maintain the Carbomastic 15 ("CM15") coating that the Department of Navy ("Navy") placed on the Hangar 1 structure or (b) implementation of a removal action to abate the Hangar 1 structure. More specifically, the first alternative would include the management and maintenance of the CM15 coating installed by the Navy by implementing a document similar to the Navy's Final Long-Term Management Plan ("LTMP") for Non-Time-Critical Removal Action ("NTCRA") for Polychlorinated Biphenyl ("PCB") Contamination at Installation Restoration Site 29 ("Hangar 1 LTMP"; Navy, 2013d). The second alternative would include implementation of a second NTCRA ("NTCRA2") to abate the lead- and PCB-containing paint based on the results of a recent pilot scale abatement study conducted at Hangar 1 during 2017 (ACC, 2017).

The Former NAS Moffett Field was commissioned in 1933 to serve as a base for the West Coast dirigibles of the Lighter-Than-Air program. Hangar 1 (Figure 2), located to the west of the airfield runways, is a large steel structure measuring approximately 1,133 feet long by 308 feet wide and 198 feet tall. Hangar 1 was constructed to house the United States Ship ("U.S.S.") Macon dirigible and is listed as a Civil Engineering Landmark of Northern California (Navy, 1994). Hangar 1 is a contributing building in the Shenandoah Plaza Historic District, which is listed in the National Park Service's National Register of Historic Places.

In 1991, the Department of Defense Base Realignment and Closure ("BRAC") Program designated NAS Moffett Field for closure as an active military base. Except for military housing units and associated facilities that were transferred to Onizuka Air Force Base and an off-Site area (the NAVAIR manor) that was sold to the City of Sunnyvale, NAS Moffett Field was transferred to National Aeronautics and Space Administration ("NASA") in 1994 and renamed Moffett Federal Airfield ("MFA") (PRC, 1996). As part of the property transfer, the operations, maintenance, and monitoring ("OMM") of Hangar 1 were transferred to NASA (Navy, 2008a).

As described below in Section 2.1,the Hangar 1 structure was covered with Robertson Protected Metal siding, a composite metal material that contained both PCBs and asbestos. The lead-based paint used to cover both the siding and steel frame of the hangar also contained PCBs. In 2000, NASA restricted access to areas of the hangar after lead-contaminated dust was identified as a health concern. Upon the discovery of PCBs and lead in Hangar 1 building materials in 2002, NASA closed the hangar to all personnel except those involved in essential maintenance, abatement, or environmental cleanup activities (AMEC, 2013) and Hangar 1 was designated as Installation Restoration ("IR") Site 29. In 2003, two separate Time-Critical Removal Actions ("TCRAs") were conducted by NASA and the Navy that: (1) removed sediment from the storm water trench around the hangar (NASA's TCRA) and (2) applied a temporary coating to the hangar siding to mitigate migration of PCBs from the hangar coating to the storm drain system (Navy's TCRA).

From 2010 through 2012, the Navy conducted a NTCRA to mitigate PCB releases from Hangar 1 which consisted of the complete removal of the siding, deconstruction of interior structures, the removal of debris from within the hangar with the disposal of these materials at appropriate off-site disposal or recycling facilities, and the application of an epoxy coating system (i.e., CM15) to the hangar's painted structural steel frame and CMU walls (AMEC, 2013). The CM15 epoxy coating was designed to encapsulate the remaining PCBs and lead in paint as an Engineering Control ("EC"). To ensure the long-term effectiveness of the implemented EC, the Navy developed Institutional Controls ("ICs") to verify the effectiveness and maintain the integrity of the epoxy coating (Navy, 2013d). The Navy prepared a draft Focused Feasibility Study ("Draft FFS"; Navy, 2013c) which compared (1) implementation of ICs to provide maintenance of the EC via the Hangar 1 LTMP (Navy, 2013d) with (2) no action. The Draft FFS has not been approved by the United States Environmental Protection Agency ("U.S. EPA") or the State of California Regional Water Quality Control Board ("Regional Water Board").

In 2014, PV entered into a lease with NASA for an approximately 1,000-acre parcel of land ("MFA Leasehold") within the former NAS Moffett Field, including Hangar 1 (Figure 1), for research and development activities.[2] Under the lease agreement, PV is responsible for "re-skinning" Hangar 1.

It is NASA's intent that the Navy's Draft FFS (Navy, 2013c) will be replaced by this EE/CA. As the preferred removal action included herein involves the removal of all impacted paints from Hangar 1, the NTCRA completion report for this work will serve as the final decision document for Hangar 1.

1.1 Regulatory Framework

In letters to the U.S. EPA dated 23 October 2015 and 22 December 2015, NASA confirmed that it would assume the Navy's obligations with respect to IR Site 29 (defined as including the above ground frame and concrete floor of the Hangar and existing exposed surface soils located outside the eastern side of the Hangar, the door opening mechanisms, and the storm water trench that surrounds the Hangar); NASA has not accepted responsibility for any of the contamination that may exist in the soil or groundwater beneath Hangar 1. NASA, the U.S. EPA, and the Regional Water Board have agreed to amend NASA's November 2014 Federal Facility Agreement ("FFA"; U.S. EPA, 2014) to include the IR Site 29 obligations.

In 2016, PV voluntarily entered into an Agreement and Order on Consent for Certain Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"; 42 U.S.C. § 9601, *et seq*.) Response Activities as the Bona Fide Prospective Purchaser ("Agreement") with the U.S. EPA. Under the Agreement, PV agreed to perform a Pilot Study to evaluate the feasibility of several alternatives to remove existing coatings and paints presently existing at Hangar 1 and to potentially implement a NTCRA to remove existing coatings and paints at

[2] Residential development within the MFA Leasehold is not permitted under the Record of Decision for the NASA Ames Development Plan (NASA, 2002)

Hangar 1. The Pilot Study was completed in 2017 (ACC, 2017). This EE/CA, prepared in accordance with U.S. EPA guidance (U.S. EPA, 1993a), evaluates the following alternatives: (1) no action, (2) long-term OMM of the implemented EC (i.e., the Navy's proposed remedy for IR Site 29) and implementation of institutional controls, (3) removal of existing PCB- and lead-containing paints from painted surfaces within Hangar 1 by media blasting and cleaning, and (4) removal of existing PCB- and lead-containing paints from painted surfaces by media blasting with an amendment and cleaning.

1.2 Organization

This EE/CA is organized into seven sections:

- Section 2 describes the Site background, previous removal actions, summarizes potential Cleanup Goals, and evaluates potential risks to human and ecological receptors.
- Section 3 identifies the removal action objective ("RAO") and describes Applicable or Relevant and Appropriate Requirements ("ARARs").
- Section 4 describes removal action alternatives.
- Section 5 compares removal action alternatives based on their effectiveness, implementability, and cost.
- Section 6 describes the recommended removal action alternative.
- Section 7 lists the references used in the EE/CA.

2 SITE CHARACTERIZATION

This section describes the sources, nature, and extent of PCB and lead impacts at Hangar 1. It summarizes previous removal actions and action levels, describes the current condition of Hangar 1, and discusses potential risks to human and ecological receptors from the PCB- and lead-containing paint at Hangar 1.

2.1 Site Description and Background

The former NAS Moffett Field is located approximately 35 miles south of San Francisco, 10 miles north of San Jose, and approximately 1 mile south of San Francisco Bay (United States Geological Survey Topographic Map (1:24,000) for Mountain View, California (2018)). The former NAS Moffett Field is bounded to east by the City of Sunnyvale, to the west and south by the City of Mountain View, and to the north by San Francisco Bay.

The Former NAS Moffett Field was originally commissioned as the NAS Sunnyvale in 1933 to serve as a base for the West Coast dirigibles of the Lighter-Than-Air program. Hangar 1 was constructed to house the U.S.S. Macon dirigible. By 1950, when jet aircraft were introduced, NAS Moffett Field was the largest naval air transport base on the West Coast and became the first all-weather NAS. Between 1973 and 1994, the mission of NAS Moffett Field was to support anti-submarine warfare training and patrol squadrons (PRC, 1996). No major aircraft maintenance was conducted during this last period of operation of NAS Moffett Field, although some unit- and intermediate-level maintenance activity occurred (Harding, 2000). Management of the Former NAS Moffett Field and Hangar 1 was transferred to NASA in 1994.

In 1987, the U.S. EPA placed NAS Moffett Field on the National Priority List ("NPL") and on 10 September 1990 the Navy signed a FFA with the U.S. EPA and Regional Water Board to conduct remedial actions at NAS Moffett Field pursuant to CERCLA regulations (U.S. EPA, 1990). This agreement was amended in December 1993 (U.S. EPA, 1993b).

Hangar 1 (Hangar 1 (Building 001), Moffett Field, CA, 94305; approximately 37.41 degrees North, -122.05 degrees West) is a large steel structure measuring approximately 1,133 feet long by 308 feet wide and 198 feet tall. Hangar 1 is located just west of the airfield runways between Sayre Avenue and Cummings Avenue and is bounded to the north by Bushnell Road and to the south by Wescoat Road. The area surrounding Hangar 1 is paved, with the exception of several small areas of bare soil located on the eastern side of the hangar (Figure 2). A trench drain that discharges to the storm drain system surrounds the perimeter of Hangar 1.

Hangar 1 is located within the NASA Research Park and existing buildings within the NASA Research Park are used for a variety of commercial/light industrial purposes including office space, retail and business services, airfield operations, vehicle maintenance, research facilities and storage; offices, residences, public areas, and industrial facilities are all located within a one-mile radius of Hangar 1.

The nearest surface water body to Hangar 1 is NASA's storm water settling basin that is located approximately 2,000 feet northwest of Hangar 1 (Figure 1); next to the storm water settling basin are NASA's Eastern and Western Diked Marshes, NASA's Stormwater Detention Basin, and the Mid-Peninsula Open Space District's Stevens Creek Shoreline Nature Study Area. Stevens Creek is located approximately 4,300 feet west of Hangar 1.

Hangar 1 is located within the Middlefield-Ellis-Whisman ("MEW") Vapor Intrusion ("VI") Study Area (U.S. EPA, 2010b) and the Navy's West-Side Aquifers Treatment System Area (i.e., IR Site 28) and the Hangar 1 Fuel Pits (a portion of the Navy's IR Site 24) are located beneath the footprint of the Hangar 1 structure (Figure 2). As the risks associated with the MEW VI Study Area and IR Sites 24 and 28 are related to soil, groundwater, and soil vapor impacts due to historical activities, these areas will not be discussed further herein as they do not pertain to the aboveground contamination of the Hangar 1 structure.

Between 1994 and 2002, NASA used Hangar 1 for air shows, open houses, and other various functions. In 2000, NASA restricted access to portions of Hangar 1 due to health concerns due to lead-contaminated dust. In 2002, based on the discovery of PCBs and lead in Hangar 1 building materials (see below) and air sampling within and outside the hangar, NASA further restricted access to Hangar 1 to only those personnel involved in essential maintenance, abatement, or environmental cleanup activities (AMEC, 2013). Due to the presence of PCBs and lead in Hangar 1 building materials, the Navy designated Hangar 1 as IR Site 29 in 2003.

In 1997, a relatively uncommon PCB mixture, Aroclor 1268, was detected in a sediment sample collected from a storm water settling basin that receives storm water runoff from the western portion of the Former NAS Moffett Field. In 1999, both Aroclor 1260 and 1268 were detected in a storm water sample collected from a manhole downstream of Hangar 1 (AMEC, 2013). Subsequent investigations by NASA between 1999 and 2002, determined that the Hangar 1 siding, a composite corrugated metal material commercially known as Robertson Protected Metal, contained PCBs and asbestos and that the lead-based paint used to cover both the siding and steel frame of the hangar also contained PCBs (AMEC, 2013). Bulk samples of the paint on the siding were found to contain Aroclor 1268 at concentrations greater than 6,000 milligrams per kilogram ("mg/kg") and Aroclor 1260 and 1268 were detected in samples of the interior layers of the siding at concentrations up to 5,500 mg/kg and 188,000 mg/kg, respectively. In the paint used to coat the steel support structure, lead was detected at concentrations up to 200,000 mg/kg and both Aroclor 1260 and 1268 were detected at concentrations up to 120 mg/kg and 94 mg/kg, respectively (AMEC, 2013).

2.2 Previous Removal Actions

Between 2003 and 2012, two TCRAs and one NTCRA were implemented to mitigate known PCB, lead, and asbestos impacts from Hangar 1. Additional details regarding these removal actions are provided below.

2.2.1 *Sediment TCRA Conducted by NASA*

In September 2003, NASA implemented a TCRA to remove sediments contaminated with PCBs from the storm water collection trench located around the perimeter of Hangar 1 (TT, 2004). The TCRA also removed potentially affected sediments present on paved surfaces immediately surrounding the structure.

2.2.2 *Structure TCRA Conducted by Navy*

As an interim action prior to the development and implementation of a more permanent response action for Hangar 1, the Navy implemented a TCRA on the Hangar 1 structure to control the migration of PCBs from Hangar 1 to the storm drain system and the environment (TT, 2004). Between 15 September 2003 and 6 February 2004, the Navy:

- Cleaned the exterior of the hangar by pressure washing to remove grease, oil, and dirt that may have inhibited adhesion of the selected coating material;
- Coated the exterior siding with asphalt emulsion;
- Cleaned the paved area around the hangar by pressure washing followed by coating; and
- Installed a chain-link security fence to control access.

2.2.3 *Structure NTCRA Conducted by Navy*

In the process of developing a more permanent response action for the PCB and lead contamination at Hangar 1, in 2008, the Navy prepared an EE/CA (Navy, 2008a) that evaluated 13 removal action alternatives based on their implementability and effectiveness at protecting human health and the environment. Based on this comparative analysis, the recommended alternative to limit the migration of contaminants present within the Hangar 1 building materials was to:

- Remove all interior structures and siding from Hangar 1;
- Demolish all interior structures and dispose of the contaminated and non-contaminated debris at appropriate off-site disposal or recycling facilities; and
- Clean the steel structure and remaining interior structures (e.g., the stem wall around the perimeter of the hangar and CMU walls around the electrical vaults) and encapsulate PCB-containing paints on the steel structure and other remaining interior elements (e.g., the CMU walls) using a weather-resistant epoxy-based coating (Navy, 2008a).

The Navy subsequently prepared an *Action Memorandum for Installation Restoration Site 29, Hangar 1* ("Action Memorandum"; Navy, 2008b) to document the Navy's decision to undertake a NTCRA based on the recommended alternative outlined in the 2008 EE/CA.

The NTCRA Work Plan (Navy, 2010) described collection of (1) pre- and post-removal action soil samples from the unpaved areas adjacent to the hangar; (2) sediment samples from the storm drain trenches in the hangar, if any remained; and (3) confirmation wipe samples from the concrete floor and the storm drain trench to assess the adequacy of the decontamination methods and confirm that PCB and lead concentrations were below Project Action Levels ("PALs").

The PALs for the NTCRA (AMEC, 2010; AMEC, 2013) were as follows:

- In exposed soil: 1 mg/kg for PCBs (i.e., the self-implementing cleanup level for high-occupancy areas per 40 Code of Federal Regulations ("CFR") §761.61(a)(4)(i)(A)), 800 mg/kg for lead, and less than 1% chrysotile asbestos;

- In wipe samples of the storm drain trench and floor: 10 micrograms per 100 square centimeters ("ug/100 cm^2") for PCBs (i.e., the self-implementing cleanup level for high-occupancy areas per 40 CFR §761.61) and 40 micrograms per square foot ("ug/ft^2") for lead (i.e., the lead clearance level for residential houses and/or child-occupied facilities as described in 40 CFR §745.227(e)(8)(viii)[3]; and
- In wipe samples from salvaged historic artifacts: 10 ug/100 cm^2 for PCBs (i.e., the self-implementing cleanup level for high-occupancy areas per 40 CFR §761.61) and 250 ug/ft^2 for lead (i.e., the criteria for horizontal surfaces in public buildings and residences as described in Title 17 of the California Code of Regulations, Division 1, Chapter 8, Section 35035(b)).

The NTCRA Work Plan did not require the collection of wipe samples from the hangar structure (e.g., the structural steel, the CMU walls, the concrete stem wall) "*because the removal action will include either total removal or containment of the source"* (Navy, 2008a) and as a result, no wipe cleanup criteria were established for these surfaces. In addition, as bulk concrete and other structural materials were not sampled as part of the NTCRA, PALs were not established for these media.

In 2010, the Navy conducted a coating condition survey and collected baseline soil samples from the exposed soil adjacent to Hangar 1 and baseline sediment samples from the storm water conveyance system surrounding the hangar to document existing environmental conditions prior to implementation of the NTCRA.

As part of the pre-NTCRA baseline sampling activities, a total of 55 soil samples were collected from exposed soils adjacent to Hangar 1. Of the 35 samples collected between 0 and 0.5 feet below ground surface, Aroclor 1268 was detected in 20 samples at concentrations greater than the PAL of 1 mg/kg.[4] At the locations where PCBs were detected above the PAL, the material between depths of 0.5 and 1 feet below ground surface was also analyzed for PCBs; in these 20 samples, detected PCB concentrations were below the PAL.

Four pre-NTCRA baseline sediment samples were collected from the northeast, southeast, northwest, and southwest corners of the storm water conveyance system and analyzed for PCBs, lead, and asbestos. Total PCBs concentrations in these sediment samples ranged from 4.0 mg/kg to 89 mg/kg. Lead was detected at concentrations ranging from 740 mg/kg to 2,000 mg/kg. Asbestos was identified at a concentration of less than 0.1% in one sediment sample and was not detected in the remaining three samples (AMEC, 2013). In addition, a sediment sample was collected from the sediment that had accumulated in the clam shell door rail tracks and analyzed for PCBs and lead; in this sample PCBs were detected at a concentration of 12 mg/kg and lead was detected at a concentration of 240 mg/kg (AMEC, 2013).

From June 2010 through June 2013, the Navy addressed PCB and lead contamination at Hangar 1 by:

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[3] While the U.S. EPA has not promulgated a clearance standard for lead-impacted dust at commercial/industrial facilities, the Navy selected the TSCA 403 clearance standard for lead (i.e., 40 ug/ft^2) even though this standard was established for residential housing and child-occupied facilities (40 CFR §745.227(e)(8)(viii)).

[4] Bulk samples are reported as a mass of compound divided by mass of material sampled (e.g., mg/kg).

- Preserving and decontaminating historic artifacts;
- Removing hangar windows, doors, siding, and other exterior components;
- Removing the hangar siding and roof;
- Demolishing and deconstructing the interior structures of the hangar;
- Removing all debris and disposing or recycling it at appropriate off-site disposal facilities;
- Abrasive blasting of paints from subfloor utility vaults inside the hangar;
- Pressure washing the remaining hangar structure and interior structures;
- Removing PCB-containing paint on the concrete foundation stem walls by ultra-high-pressure water blasting and abrasive methods and coating the resulting surfaces with a penetrating sealer to help protect the concrete surface from rain water degradation;
- Coating the structural steel frame and other structures within the hangar that were not demolished with a primer and finish coat of weather-resistant epoxy (Carbomastic-15 or "CM15") to encapsulate the PCB- and lead-containing paints;
- Removing sediment from the storm drain trenches and pressuring washing the trenches;
- Excavating PCB- and lead-impacted soil near Hangar 1; and
- Washing the concrete floors.

Confirmation soil samples were collected from the exposed soil outside Hangar 1 and analyzed for PCBs, lead, and asbestos. Confirmation wipe samples were collected from the concrete floor and trenches and salvaged historic artifacts and analyzed for PCBs and lead.

As described in the *Final After Action Completion Report for Non-Time-Critical Removal Action for Polychlorinated Biphenyl (PCB) Contamination* ("NTCRA Completion Report"; AMEC, 2013), two rounds of excavation and confirmation sampling were required to meet the PALs for soil. At the 23 locations where wipe samples were collected from the concrete storm water trench, PCB concentrations were all less than the PAL (i.e., 10 ug/100 cm^2) and lead concentrations were less than the PAL (i.e., 40 ug/ft^2) at 21 locations.[5,6] The lead PAL of 250 ug/ft^2 for lead in wipe samples was not met for every item returned to NASA (AMEC, 2013). In the wipe samples collected from the concrete floor, PCB concentrations were all less than the PAL and lead concentrations exceeded the PAL at several locations. Areas where the concrete floor did not meet the lead PAL were recleaned and resampled, sometimes multiple times.

[5] At the two trench sampling locations where lead concentrations were greater than the PAL, the reported concentrations were 52 ug/ft^2 and 54 ug/ft^2.

[6] Wipe samples are reported as a mass of compound divided by the area over which the wipe sample was collected (e.g., ug/100 cm^2). The use of /100 cm^2 or /ft^2 for PCBs and lead wipe sample results, respectively, is tied to the screening criterion for these compounds.

Because the selected PAL for lead (i.e., 40 ug/ft^2) was not directly applicable to future anticipated conditions at Hangar 1,[7] Navy consulted with the EPA and Regional Water Board regarding cleaning the areas that were greater than the PAL for lead and comparing the wipe sampling data to the lead PAL. Based on these discussions, eight sections of the floor were recleaned and resampled and the geometric mean[8] of the final wipe sampling results at each location was compared to the lead PAL. On conclusion of recleaning the concrete floors, the geometric mean of the final lead confirmation samples was 31.6 ug/ft^2, below the PAL of 40 ug/ft^2.[9]

Following implementation of the NTCRA, the Navy prepared a Long-Term Management Plan (Navy, 2013d) to provide information and guidance to ensure that the implemented remedy (i.e., the encapsulation of remaining PCB- and lead-containing paints) remained effective. The Navy evaluated the implementation of ICs to support the long-term management of Hangar 1 against a No Action alternative in its Draft FFS for IR Site 29 and concluded that the implementation of ICs was rated higher overall in satisfying the balancing criteria (Navy, 2013c); the FFS has not been finalized or approved by the U.S. EPA or Regional Water Board. Based on this evaluation, the Navy proposed the implementation of ICs for Hangar 1 ("Proposed Plan"; Navy, 2013b). The FFS has not been finalized and a Record of Decision ("ROD") for Hangar 1 based on the Proposed Plan has not been prepared.

As NASA has assumed the Navy's obligations with respect to the aboveground elements of Hangar 1 (IR Site 29), NASA is currently implementing elements of the Navy's long-term management plan to document the condition of the CM15 coating and assess the effectiveness of the implemented remedy. It is NASA's intent that the Navy's Draft FFS (Navy, 2013c) will be replaced by this EE/CA. As the preferred removal action included herein involves the removal of all impacted paints from Hangar 1, the NTCRA completion report for this work will serve as the final decision document for Hangar 1 and other documents prepared by the Navy (e.g., Proposed Plan (Navy, 2013b) and Long-Term Management Plan (Navy, 2013d)) will no longer be required.

2.3 Source, Nature, and Extent of Contamination

In removing the siding from Hangar 1, the Navy's NTCRA removed the predominant source of PCBs at Hangar 1; however, as discussed above, PCB- and lead-containing paint on the structural elements of Hangar 1 (e.g., the structural steel members and CMU walls) was not removed. Based on the 2003 investigation (Benchmark, 2003) and the baseline NTCRA sampling (AMEC, 2013) paint chip sampling results, lead was detected at concentrations up to 200,000 mg/kg and both Aroclor 1260 and 1268 were detected at concentrations up to 120 mg/kg and 94 mg/kg, respectively (AMEC, 2013). Because the original paint contained

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[7] See footnote 3.

[8] Because lead concentrations in the confirmation wipe samples were lognormally distributed, the Navy argued that the geometric mean is the appropriate statistic to compare against the lead PAL.

[9] In the final wipe confirmation samples, lead concentrations exceeded the PAL at 15 of the 41 locations; at these locations, lead concentrations range between 42 ug/ft^2 and 150 ug/ft^2, except one location (H19) where the measured concentration was 440 ug/ft^2.

greater than 50 mg/kg PCBs, the wastes generated during abatement were considered PCB bulk product wastes (40 CFR §761.3 and 40 CFR §761.50(b)(4)(i)).

2.4 Current Conditions

During pre-lease negotiations between NASA and PV, PV noticed that the CM15 epoxy coating had deteriorated in several areas. As a result, PV's consultants performed a visual screening inspection of the CM15 epoxy coating, collected wipe and bulk samples of building materials within the Hangar 1 structure, and collected samples of the sediment that had accumulated on the concrete floor and accessible storm drain trenches. The results of the visual inspection and sampling are presented in ACC's *PCB, Lead, and Asbestos Sampling Report*, dated 24 February 2015 (ACC, 2015) and summarized briefly below. The visual inspection encompassed the ground and mezzanine levels and roof-top catwalk area; sampling was limited to areas that could be accessed from the ground and mezzanine levels of Hangar 1.

2.4.1 *Visual Inspection of Structure*

During the visual inspections conducted during April and June 2014, the following four general issues related to the CM15 epoxy coating were reported:

- Isolated coating failure, where the epoxy coating had delaminated from the existing substrate;
- Epoxy coating deterioration around edges and separation of the underlying substrate from the structure (e.g., peeling paint);
- Evidence of rust-related breakthrough of the coatings; and
- Missing or thinly applied coatings.

Several photographs of the deteriorated CM15 epoxy coatings ACC observed in 2014 are included in Photo Log 4 of ACC's *PCB, Lead, and Asbestos Sampling Report*, dated 24 February 2015 (ACC, 2015).

2.4.2 *Structure Sampling and Analysis*

During April and August 2014, wipe samples were collected from accessible various surfaces within Hangar 1 including the floor. During the August 2014 sampling event, 12 wipe samples were also collected from unpainted surfaces upwind and downwind of the Hangar 1 structure (6 upwind and 6 downwind) to assess whether the lead and PCBs reported in the wipe samples collected from accessible surfaces at Hangar 1 were potentially from an off-Site source.

The wipe samples collected in August were analyzed for Aroclor 1254, Aroclor 1260, Aroclor 1268, and CAM 17 metals; wipe samples collected in April were not analyzed for Aroclor 1268. The PCB and lead results for these samples are summarized below. Wipe samples are reported as a mass of compound divided by the area over which the wipe sample was collected (e.g., ug/100 cm^2). The use of /100 cm^2 or /ft^2 for PCBs and lead wipe sample results, respectively, is tied to the screening criterion for these compounds.

A brief summary of the sampling results for PCBs, lead,[10] and asbestos is presented below; additional details (e.g., summary tables, etc.) can be found in ACC's *PCB, Lead, and Asbestos Sampling Report* (ACC, 2015), a portion of which is included in Appendix A.

PCBs: Sixteen wipe samples were collected from the concrete floor of the Hangar in 2014; eight wipe samples were collected where the floor looked visibly clean and eight were collected from areas of sediment accumulation where water had ponded (ACC, 2015). In the eight wipe samples collected from the visibly clean areas of the concrete floor,[11] PCBs were not detected above an analytical reporting limit of 0.005 ug/100 cm^2. In the eight wipe samples collected from the areas where sediment had accumulated, Aroclor 1268 was the only detected Aroclor. Aroclor 1268 concentrations ranged from 100 ug/100 cm^2 to 740 ug/100 cm^2 in the four samples that were analyzed for this Aroclor.[12]

A total of eight wipe samples were collected from horizontal structural steel members where sediment had accumulated due to water ponding; in these samples, Aroclor 1268 was detected in one sample at a concentration of 0.78 ug/100 cm^2. PCBs were not detected in the 11 wipe samples collected from the intact epoxy-coated paints, in the 6 wipe samples collected from the structural steel below deteriorated epoxy-coatings, or in the wipe sample collected from the unencapsulated original paint.

Bulk material collected for analysis of PCBs included original paint on steel beneath intact epoxy coating, CMU wall surfaces, coated stem walls, floor coatings, bituminous concrete expansion joints, sediments in the floor drain and trench, expansion joint caulking, concrete floor and paint on the floor, leveling compounds, and other paints. Bulk samples are reported as a mass of compound divided by mass of material sampled (e.g., mg/kg). PCBs were detected in almost every type of bulk material tested. The highest concentrations of PCBs were reported in the original paint beneath the encapsulated steel and beneath the encapsulated CMU wall where total PCBs were reported at concentrations up to 114.5 mg/kg and 1,900 mg/kg, respectively.

As PCBs were not detected above the analytical reporting limit in any of upwind or downwind wipe samples, ACC concluded that it was unlikely that the PCBs observed in the wipe samples collected within the Hangar 1 structure were from an off-Site source.

Lead: Lead was detected in all the wipe samples collected from accessible exposed surfaces within Hangar 1. Additional information regarding these samples is presented below.

In the wipe samples collected from encapsulated paint surfaces (11 samples), below areas where deteriorated encapsulated paint was observed (6 samples), exposed original paint (1 sample), the base of structural steel columns where sediment had accumulated due to water ponding (6 samples), and horizontal steel surfaces where ponding was observed (8 samples), lead was detected at concentrations greater than the NTCRA PAL (40 ug/ft^2) in one or more of the samples collected from each of the sampled surfaces. The highest lead concentrations were

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[10] Only the lead results are discussed herein as lead is the primary risk driver for metals in surficial dust on the Hangar 1 structure and (2) regulatory guidelines/screening levels are not available for the other CAM 17 metals in wipe samples. Information about the wipe sampling results for other CAM 17 metals is included in Appendix A.

[11] Four of the samples were analyzed for Aroclor 1268 and four were not.

[12] Four of the samples were not analyzed for Aroclor 1268.

measured in the wipe samples collected from the base of the structural steel columns where sediment had accumulated due to water ponding; in these samples, lead concentrations ranged from 85 ug/ft^2 to 30,000 ug/ft^2.

In the 8 wipe samples collected from the visibly clean areas of the concrete floor the maximum lead concentration was 290 ug/ft^2 and the geometric mean was 124.6 ug/ft^2. In the 8 wipe samples collected from the floor where sediment had accumulated due to water ponding, lead concentrations ranged from 320 ug/ft^2 to 6,100 ug/ft^2 and the geometric mean of these samples was 868.6 ug/ft^2.

Bulk material collected for analysis of lead included original paint beneath intact epoxy coating on steel, CMU wall surfaces, coated stem walls, floor coating and gray paint, and bituminous concrete expansion joints. The highest lead concentrations were reported in the original paint beneath the encapsulated steel and beneath the encapsulated CMU wall where lead was reported at concentrations up to 250,000 mg/kg and 54,000 mg/kg, respectively.

As the reported lead concentrations in the upwind and downwind wipe samples were relatively low (i.e., ranging from 3.8 ug/ft^2 to 200 ug/ft^2), ACC concluded that it was unlikely that the elevated lead concentrations observed in the wipe samples collected within the Hangar 1 structure (see below) were from an ambient or off-Site source.

Asbestos: In the 38 bulk material samples collected of the encapsulated paints, floor coatings, concrete stem walls, CMU walls, expansion joints, leveling compounds, surficial sediments, gaskets and adhesives, asbestos was only detected in one sample from a dark brown adhesive on a CMU wall on the western side of Hangar 1. The adhesive covered an area of approximately 40 square feet and contained approximately 2% chrysotile asbestos.

2.5 Summary of Hangar 1 Pilot Scale Abatement Study

Between March and mid-July 2017, PV conducted a Pilot Study (ACC, 2017) to assess (1) the feasibility of removing the CM15 encapsulated PCB- and lead-impacted paints from the Hangar 1 structural steel elements and CMU walls and (2) effectiveness of three blasting techniques: ultra-high-pressure water blasting, media blasting, and vapor media blasting. After blasting, the areas were cleaned using vacuums equipped with high-efficiency particulate arrestor ("HEPA") filters and wiped. The results of the Pilot Study are summarized below; additional information regarding the Pilot Study is presented in Appendix B.

Prior to abatement activities, surficial sediments that had accumulated within and around the structural steel elements, CMW walls, concrete slab, and trench drain in the Pilot Study area were collected using vacuums equipped with HEPA filters; these areas were then wiped and HEPA vacuumed again. A fully encapsulated negative-pressure enclosure was constructed around the Pilot Study area to contain dust, paint chips, liquids, and other potential emissions from blasting activities.

Baseline bulk material samples were collected from the paints/coatings on the structural steel elements and CMU walls within the Pilot Study area and baseline wipe samples were collected from the concrete floor and concrete drainage trench around the Pilot Study area. In the twelve bulk paint/coating samples from the structural steel elements, the maximum PCB and lead concentrations were 12.4 mg/kg and 90,000 mg/kg, respectively, and in the samples from the

CMU walls, the maximum PCB and lead concentrations were 4.38 mg/kg and 4,200 mg/kg, respectively. In the twelve wipe samples from the concrete floor and drainage trench, PCBs were not detected above an analytical reporting limit of 2.5 ug/100 cm^2 and lead was detected in all samples at concentrations between 3.5 ug/ft^2 and 430 ug/ft^2. During baseline sampling, it was determined that the white skim coat beneath the paint on the CMU wall contained 5% chrysotile asbestos.

Each blasting technique was tested on exterior steel members, structural support steel members, the steel under the mezzanine, and the CMU walls to assess equipment performance and efficiency, ease and safety of use, the mass of hazardous and non-hazardous wastes produced, the surface condition of the blasted surfaces, and whether the post-abatement wipe samples achieved target acceptance criteria. Target acceptance criteria were similar to the NTCRA PALs.

Following blasting activities, the areas were cleaned by HEPA vacuuming and wiping with a damp cloth to remove any residual dust and particulates from the blasted areas. Wipe samples were then collected from the abated surfaces to assess whether blasting and cleaning by vacuuming and wiping were capable of achieving the target acceptance criteria. PCBs were not detected above the analytical reporting limit in any of the post-abatement wipe samples[13] and lead concentrations were below the target acceptance criterion of 250 ug/ft^2 in the post-abatement wipe samples for surfaces using both media blasting and vapor media blasting; ultra-high-pressure water blasting post-abatement lead wipe samples did not meet the target acceptance criterion.

Of the blasting techniques, both media blasting and vapor media blasting were capable of removing the existing CM15-coated PCB- and lead-containing paints[14] and, after HEPA vacuuming and wiping the abated surfaces, meeting the target acceptance criteria. Ultra-high-pressure water blasting was deemed unacceptable because it was not capable of meeting the target acceptance criterion for lead, it was difficult to use, and it damaged the CMU wall. Based on the perimeter air monitoring data, the enclosure was effective at mitigating potential releases from the blasting activities to the environment and potential off-Site receptors.

2.6 Streamlined Risk Evaluation for Human-Health and the Environment

As summarized above, building materials at Hangar 1 contain PCBs, lead, and asbestos. This section: (1) summarizes the current and planned future use of Hangar 1, (2) potential receptors and exposure pathways, and (3) summarizes potential threats to human health and the environment.

2.6.1 *Current Site Use and Planned Future Use*

Hangar 1 is currently vacant. Future use of the hangar is not known at this time, but could include research and development activities, testing, light assembly and fabrication, office

[13] PCB reporting limits in these samples were all below the target acceptance criteria.

[14] Both media blasting and vapor media blasting were also capable of removing the asbestos-containing white skim coat beneath the paint on the CMU wall.

space, and public access for events. Additional facilities may be constructed inside the Hangar to support the primary research and development activities.

2.6.2 *Potential Receptors and Exposure Pathways*

For the purpose of this EE/CA, potential future receptors include commercial and industrial workers, the public, and ecological receptors such as worms and other invertebrates as well as nesting birds that may eat those invertebrates. Identified potential human exposure pathways include: dermal contact as well as inhalation and ingestion of particulates. Outside of the Hangar 1 footprint, particulates from Hangar 1 could contaminate exposed surface soil outside the hangar and surface water runoff containing particulates could contaminate nearby surface water bodies and/or sediments. Human receptors outside of Hangar 1 could be exposed to contaminated particulates from dermal contact, inhalation, and ingestion of particulates and impacted soils and sediments and ecological receptors may be exposed to contaminated particulates by direct contact and ingestion.[15]

2.6.3 *Potential Threats*

The Navy's NTCRA Action Memorandum (Navy, 2008b) identified the following threats to human health and the environment from the presence of PCBs in the building materials at Hangar 1.

> <u>Threats to Public Health or Welfare</u>: Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants (e.g., PCBs).
>
> <u>Threats to the Environment</u>: The continued release of PCBs from the Hangar 1 structure is a threat to terrestrial receptors through a food chain that has worms and other small animals that live in sediments ingesting PCBs and then in turn being eaten by other animals, including birds. This results in the bioaccumulation of PCBs in the tissue of these animals.

In addition to the threats from PCBs identified by the Navy, the U.S. EPA considers the release or threat of release of the PCBs, lead, and asbestos in the building materials at Hangar 1 due to the failure of the CM15 epoxy coating to be an imminent and substantial endangerment to the public (U.S. EPA, 2016b).

Based on the visual inspections by ACC in 2014 (Section 2.4.1) and the sampling data collected by ACC in 2014 and 2017 (ACC, 2015; ACC, 2017; Section 2.4.2 and Section 2.5), the release of contaminants from the building materials at Hangar 1 remains a threat to both human health and the environment.

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[15] Ingestion may occur by the direct ingestion of PCB- and lead- impacted materials (e.g., by worms or other small animals living in soils and/or sediments) and the ingestion of these animals by other animals such as birds.

3 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

This section proposes the RAOs, the removal action scope, and the EE/CA schedule. It also identifies potential federal and state ARARs that will, in part, form the basis of the RAOs.

3.1 Statutory Framework

This removal action is being performed pursuant to CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP") and NASA is the Lead Agency for this removal action. The performance of a removal action is appropriate because (1) the release of contaminants from impacted building materials at Hangar 1 represents an actual or potential exposure to nearby human populations, animals, or the food chain (40 CFR §300.415(b)(2)(i)), (2) degradation of the CM15 epoxy coating installed by the Navy could lead to the actual or potential contamination of sensitive ecosystems (40 CFR §300.415(b)(2)(ii)) and the migration and/or release of contaminants (40 CFR §300.415(b)(2)(v)).

This EE/CA has been prepared as set forth in 40 CFR §300.415(b)(4)(i).

3.2 Removal Schedule and Public Participation

Following review and approval of the EE/CA, an Action Memorandum and NTCRA Work Plan will be prepared. The schedule for implementation of the recommended removal action will be included in the Action Memorandum; based on preliminary estimates, the abatement of Hangar 1 is anticipated to begin in the second quarter of 2020.

3.2.1 *Public Participation*

In accordance with 40 CFR §300.415(n), this EE/CA will be available for public review and comment for 30 days; in accordance with NASA's Community Involvement Plan (NASA, 2015), a public notice will be posted in the Mountain View Voice and potentially other local newspapers. EKI, in consultation with PV and NASA, will review the comments and, where appropriate, revise the EE/CA to incorporate responses to public and regulatory agency comments. Responses to all comments will be provided in a Responsiveness Summary as an appendix to a forthcoming Action Memorandum.

In addition to releasing the EE/CA for public review, in accordance with NASA's Community Involvement Plan (NASA, 2015), information about the abatement of Hangar 1 and the availability of the EE/CA for public review and comment will be provided to the community through brief easy-to-understand updates via e-mail and website resources. NASA will hold a public meeting to discuss the EE/CA and, if necessary, will prepare and distribute fact sheets during abatement activities to keep the local community updated regarding the progress and schedule of abatement activities.

3.3 Identification of Potential ARARs and TBCs

RAOs are developed by considering, among other things, ARARs. ARARs are defined in the NCP, 40 CFR §300.5, as follows:

- Applicable Requirements: Cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site.
- Relevant and Appropriate Requirements: Cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site.

ARARs typically are separated into three categories:

- Chemical-specific ARARs: These are health-based or risk-based standards that define the allowable limits of specific chemical constituents found in or discharged to the environment. They can provide cleanup and discharge levels that can determine site remedial goals. Maximum contaminant levels ("MCLs") for drinking water are examples of potential chemical-specific ARARs for sites that can impact potential drinking water sources.
- Location-specific ARARs: These requirements can apply to natural site features, such as wetlands, flood plains, or the presence of endangered species, and to man-made features and institutional factors, including landfills, zoning requirements, and places of historical or archaeological significance. Location-specific ARARs restrict the types of remedial actions that can be implemented based on Site-specific characteristics or location.
- Action-specific ARARs: These ARARs are technology-based or activity-based limitations that can set performance and design restrictions. They specify permit requirements and engineering controls that must be instituted during site activities or restrict particular activities.

Federal and State non-promulgated standards, policies, or guidance documents, and local requirements, are not ARARs. However, according to the NCP guidance, these items are also to be considered when evaluating and selecting removal actions necessary to protect human health and the environment. These non-promulgated, non-binding factors are designated "To Be Considered" or "TBCs." Potential chemical-, location-, and action-specific ARARs and TBCs for Hangar 1 are identified, listed, and described in Table 3-1, Table 3-2, and Table 3-3, respectively; the ARARs and TBCs identified in these tables have been identified solely with respect to the remedies discussed in the EE/CA, with a reservation of rights as to their applicability to any other aspects of the MFA Leasehold. General compliance with the ARARs for each alternative is described in Section 4.3 and each identified ARAR is discussed with respect to the recommended removal action in Section 6.2.

3.4 Removal Action Objective

The RAO in the 2008 Navy EE/CA was "to control the release of COCs at Hangar 1, thereby reducing the potential risks to human health and the environment while minimizing future operation and maintenance activities at the site."

The proposed RAO in this EE/CA is to control the release of PCBs and lead from remaining impacted paints at Hangar 1, thereby reducing potential risks to human health and the environment from these chemicals. The removal action will also address the concrete floor of the hangar should impacts from residual PCBs and/or lead be found in this bulk material. Asbestos-containing materials will also be removed where they are encountered.

While the removal action will address potential risks from the structural building materials within the Hangar 1 structure, it will not address: (1) exposed soil adjacent to Hangar 1[16], (2) potential risks from building materials in nearby structures (e.g., Buildings 32 and 33), or (3) other chemicals of concern that may be present in the subsurface (i.e., in soil, groundwater, or soil vapor).

3.5 Proposed Cleanup Goals

As discussed above, the RAO for this EE/CA is to control the release of PCB- and lead-impacted paint and asbestos containing materials from the structural building materials (e.g., the CMU walls, structural steel elements, and concrete floors, as needed) at Hangar 1 to reduce potential risks to human health and the environment. In this section, Cleanup Goals are proposed and/or developed for removal alternatives that include the removal of impacted paints from non-porous (e.g., structural steel) and porous (e.g., CMU walls and the concrete floor) building materials, and the removal of asbestos containing materials at Hangar 1. The proposed Cleanup Goals presented below are not applicable to removal alternatives that are designed to control the release of release of potential contaminants from impacted paint at Hangar 1 by encapsulation.

3.5.1 *PCBs and Lead - Abated Non-Porous Surfaces*

The proposed Cleanup Goals for abated non-porous surfaces (e.g., structural steel) involve (1) a visual inspection of the abated area by a qualified National Association of Corrosion Engineers ("NACE") and Society for Protective Coatings ("SSPC") inspector to confirm the removal of all visible paint from the non-porous surfaces (i.e., a NACE 3 / SSPC-SP 6 visual cleanliness

[16] The removal action will not address the soil adjacent to Hangar 1 as it was remediated during the NTRCA by the Navy and because baseline soil sampling data collected from a portion of the unpaved area during the Pilot Study (ACC, 2017) were consistent with the Navy's confirmation soil sampling results. Exposed soil adjacent to Hangar 1 will be addressed if (1) baseline sampling indicates that the exposed soil has been impacted by degradation of the CM15 epoxy coating (i.e., if PCB or lead concentrations in the baseline samples exceed 1 mg/kg and/or 320 mg/kg, respectively) or (2) NTCRA2 removal actions result in impacts to the exposed soil (e.g., there is a breach in containment that results in impacts to exposed soil adjacent to the breach). In the event that impacts to exposed soil are determined during baseline sampling or NTCRA2 activities result in impacts to exposed soil, the extent of impacts will be evaluated and on completion of remediation activities, impacted soil will be excavated and disposed of at a permitted off-Site facility that is being operated in accordance with the CERCLA Off-Site Rule.

standard[17]) and (2) the collection of confirmation wipe samples[18] to confirm that representative concentrations of PCBs and lead on the abated surfaces are not greater than 10 ug/100 cm^2 and 250 ug/ft^2, respectively.

The proposed Cleanup Goal for PCBs (i.e., ≤10 ug/100 cm^2) is equal to the unrestricted use surface cleanup standard for PCBs on non-porous surfaces (40 CFR §761.61(a)(4)(ii)). The proposed Cleanup Goal for lead (<250 ug/ft^2) is equal to the dust-lead hazard level (40 CFR §745.65(b)) and California Code of Regulations ("CCR") Title 17 lead-contaminated dust level for interior horizontal surfaces (CCR Title 17 §35035(b)).

Because risks from PCBs and lead are assessed based on exposures to "representative concentrations" of these chemicals, the 95% upper confidence limit ("UCL") of the mean concentrations of PCBs and lead in the confirmation wipe samples will be compared to the proposed Cleanup Goals listed above (U.S. EPA, 2001; DTSC, 2018). The U.S. EPA's ProUCL program (version 5.1.002 or greater; U.S. EPA, 2016a) should be used to calculate 95% UCLs.

Because it is possible that abated surfaces may be "re-contaminated" with impacted dust from nearby areas during cleaning activities, additional cleaning of specific areas may be necessary to achieve the proposed Cleanup Goals. To increase the likelihood that the 95% UCL of the mean PCB and lead concentrations within a given abatement area are less than the proposed Cleanup Goals, the following re-cleaning guidelines will be followed. In the event that:

- A confirmation wipe sample exceeds five times the proposed Cleanup Goals (i.e., 50 ug/100 cm^2 for PCBs and 1,250 ug/ft^2 for lead), the area will be wiped and/or HEPA vacuumed again and resampled and if the results for the confirmation wipe samples still exceed five times the proposed Cleanup Goals, additional blasting and cleaning may be conducted in consultation with the Regulatory Agencies; or
- More than 10% of the confirmation wipe samples within a defined abatement area[19] exceed three times the proposed Cleanup Goal (i.e., 30 ug/100 cm^2 for PCBs and 750 ug/ft^2 for lead), the areas exceeding three times the proposed Cleanup Goal will be wiped and/or HEPA vacuumed again and resampled and if the results for the confirmation wipe samples still exceed three times the proposed Cleanup Goals, additional blasting and cleaning may be conducted in consultation with the Regulatory Agencies.

[17] Photos of steel surfaces blasted to NACE 3 / SSPC-SP 6 visual cleanliness standard are presented in the Pilot Study (Appendix B).
[18] Confirmation wipe samples will be collected after the surfaces have been wiped and/or HEPA vacuumed to remove residual particulates that may remain after blasting activities.
[19] Each defined abatement area will be based on (1) the media being abated, (2) the location of said media (e.g., near the floor, near the roof, etc.), and (3) the abatement enclosures that will be constructed during abatement activities. Additional details regarding each defined abatement area will be developed in the sampling and analysis plan that will be prepared for the NTCRA work plan.

3.5.2 *PCBs and Lead - Abated Porous Surfaces*

The Cleanup Goal for abated porous surfaces (i.e., the substrate beneath the paint including CMU walls and concrete floors) involves (1) a visual inspection of the abated area by a qualified NACE and SSPC inspector to confirm the removal of visible paint from the porous surfaces and (2) the collection of bulk samples[20,21] from the substrate beneath the abated porous surfaces to confirm that representative concentrations of PCBs and lead are not greater than 1 mg/kg and 320 mg/kg, respectively.[22]

The proposed Cleanup Goal for PCBs (i.e., 1 mg/kg) is equal to the unrestricted use cleanup standard for PCBs on porous surfaces (40 CFR §761.61(a)(4)(iii)[23]). The proposed Cleanup Goal for lead (320 mg/kg) is the Regional Water Board Environmental Screening Level ("ESL") for lead in soil under a Commercial/Industrial Land Use Scenario (Regional Water Board, 2019).

Because risks from PCBs and lead are based on exposures to "representative concentrations" of these chemicals, 95% UCL of the mean concentrations of PCBs and lead in the bulk samples will be compared to the proposed Cleanup Goals listed above. The U.S. EPA's ProUCL program (version 5.1.002 or greater; U.S. EPA, 2016a) should be used to calculate 95% UCLs.[24]

3.5.3 *PCBs and Lead – Soil*

As described in Section 2.2.3, as part of its NTCRA, the Navy remediated exposed surface soil outside of Hangar 1 and the project action levels for PCBs and lead in soil were 1 mg/kg total

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[20] Bulk samples of abated porous materials will be collected after the surfaces have been blasted and cleaned to remove residual particulates that may remain after abatement activities. Single depth bulk samples of the substrate beneath abated surfaces of porous materials will be collected in general accordance with the U.S. EPA's Standard Operating Procedure for Sampling Porous Surfaces for PCBs (U.S. EPA, 2011).

[21] The U.S. EPA's risk-based disposal letter for PCB bulk product waste at the Ranier Commons Facility (U.S. EPA, 2013), classified concrete beneath PCB-containing paint as a PCB Remediation Waste and directed the responsible party to collect bulk samples of the substrate beneath the applied dried paint after paint removal to verify that (1) the PCB bulk product waste (i.e., the PCB-containing paint) was removed and (2) that additional cleanup of the concrete substrate was not necessary.

[22] CCR Title 17 recommends that clearance be conducted in accordance with the U.S. Department of Housing and Urban Development's *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("Guidelines"; referenced in CCR Title 17 §35013). Pursuant these Guidelines, "exterior clearance following exterior paint work consists of a visual assessment for visible surface dust, debris and residue only. It is not necessary to sample soil or exterior dust…" (page 15-14 of HUD, 2012). In addition, in the section on Clearance Dust Sampling and Sealant Application (page 15-25 of HUD, 2012), it states that "Wipe samples should be collected after any application of a sealant on a rough, unfinished, horizontal surface, such as a floor or window sill, not before." The 1995 Guidelines (page 15-7 of HUD, 1995) also state: "It is not appropriate to apply the settled leaded dust clearance standard to these [i.e., unsealed floors, interior window sills, and window troughs] components since the bare surface will be sealed with new paint…"). Hence, clearance wipe samples for lead-contaminated dust will not be collected from the abated porous materials at Hangar 1 (e.g., the concrete floor).

[23] 40 CFR §761.61(a)(4)(iii) refers to §761.61(a)(4)(i) which provides a Cleanup Goal of 1 mg/kg for bulk remediation waste for high occupancy areas (i.e., unrestricted use for both commercial and residential use).

[24] Section 3.5.1 includes guidance for when additional cleaning of the abated surfaces may be necessary because it is possible that abated surfaces may be "re-contaminated" with impacted dust from nearby areas during cleaning activities. Given that bulk media samples will be collected from abated porous surfaces, it is unlikely that small amounts of impacted dust will significantly affect concentrations in the bulk media samples and as a result, for abated porous surfaces, additional cleaning is not necessary and will not be conducted.

PCBs and 800 mg/kg for lead. However, field observations and analytical data collected within the Hangar 1 structure indicate that exposure to the elements and other factors may have degraded the protectiveness of the CM15 epoxy coating and resulted in impacts to surficial sediments within the Hangar 1 structure (ACC, 2015).

While abatement activities are not planned for the exposed surface soil outside the Hangar 1 structure, baseline multi-increment soil samples will be collected from these areas to assess whether this soil has been impacted by surficial sediments or flaking from the Hangar 1 structure; baseline sampling will be conducted when the contractor mobilizes to the Site. If the baseline sampling data indicates that exposed soil outside the Hangar 1 structure has been impacted, on completion of building material abatement activities at Hangar 1, impacted soil will be excavated and disposed of at a permitted off-site facility in accordance with applicable laws and regulations.[25]

The proposed Cleanup Goal for PCBs (i.e., 1 mg/kg) is equal to the cleanup level for bulk PCB remediation waste in high occupancy areas (40 CFR §761.61(a)(4)(i)(A)) and the proposed Cleanup Goal for lead is the Regional Water Board ESL for lead in soil under a Commercial/Industrial Land Use Scenario (Regional Water Board, 2019).[26]

3.5.4 *Asbestos*

In preparation for abatement activities, a survey will be conducted to identify whether any additional asbestos-containing materials beyond those identified in the ACC's PCB, Lead, and Asbestos Sampling Report (ACC, 2015) and those identified in the Hangar 1 Pilot Scale Abatement Study. Abatement of asbestos-containing materials discovered during the survey, or at any point during construction activities, will be performed in accordance with applicable laws and regulations; additional details regarding the abatement protocols and procedures will be included in a forthcoming NTCRA2 Work Plan.

The Cleanup Goal for asbestos involves an inspection of the abated area by a qualified asbestos inspector to confirm that (1) the asbestos-containing materials have been removed and (2) that the abated area has been adequately cleaned. As the abated Hangar 1 structure will not be enclosed immediately following abatement and recoating activities, clearance air samples for asbestos will not be collected.

[25] Post-abatement sampling of the exposed soil outside Hangar 1 will not be conducted unless NTCRA2 removal actions result in impacts to the exposed soil (e.g., there is a breach in containment that results in impacts to exposed soil adjacent to the breach).

[26] While the Navy's PAL was 800 mg/kg for lead, 320 mg/kg is proposed as the Cleanup Goal for lead to be consistent with current DTSC and Regional Water Board Screening criteria for lead at commercial/industrial sites. Lead concentrations only exceeded 320 mg/kg in one of the 54 confirmation soil samples collected by the Navy on completion of its soil excavation activities outside Hangar 1 and as a result the 95% UCL of the mean lead concentration for the Navy's data would be less than 320 mg/kg.

4 IDENTIFICATION AND DETAILED ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Based on the analysis of the nature and extent of contamination identified in Section 2.3, three removal action alternatives are identified and evaluated with respect to their effectiveness, implementability, and cost. While Alternative 1, the No Action alternative, is inconsistent with the RAO of controlling the release of PCBs and lead from impacted building materials at Hangar 1, it is assessed to provide a baseline for the comparison of the other two alternatives.

4.1 Criteria

The following sections provide descriptions of the effectiveness, implementability, and cost criteria and their components.

4.1.1 *Effectiveness*

Effectiveness is a measure of an alternative's ability to reduce risk to the public and the environment from exposure to PCB- and lead-impacted particulates[27] (i.e., surficial sediments, dust, and soil) from the Hangar 1 structure from both long-term and short-term perspectives and compliance with ARARs. The following criteria were taken into consideration:

- **Overall Protection of Public Safety and the Environment.** This criterion is a measure of the effectiveness of the alternative to reduce the public's exposure to PCBs and lead from impacted building materials at Hangar 1.
- **Compliance with ARARs:** This criterion is a measure of whether each alternative meets all the potential federal and state ARARs as defined in 40 CFR §300.5 and identified in the EE/CA process.
- **Long-term Effectiveness and Permanence:** This criterion is a measure of the effectiveness of each alternative to protect the public after the risk-reduction measures have been implemented. The remaining potential for exposure to PCB- and lead-impacted particulates and the adequacy and reliability of the controls and maintenance measures (if required) to manage residual risks following implementation of the alternative are considered.
- **Short-term Effectiveness:** This criterion is a measure of the effectiveness of each alternative to protect the public during implementation of the risk-reduction measures. The potential risk to humans, including those in the community, site visitors, and workers implementing the alternatives; potential adverse impact on the environment; and time required to implement the alternative are considered for each alternative.

[27] During the process of removing the PCB- and lead-impacted paints from the Hangar 1 structure, asbestos-containing building material such as the white skim coat on some of the CMU walls at Hangar 1 will also be abated.

- **Reduction of Toxicity, Mobility, or Volume Through Treatment:** This criterion evaluates the ability of each alternative to reduce the toxicity, mobility, and/or volume of the hazardous constituents present at the site through the destruction of toxic contaminants, reduction of total mass of toxic contaminants, irreversible reduction in contaminant mobility, a reduction in total volume of contaminated media, or treatment technologies.

4.1.2 *Implementability*

Implementability is a measure of the technical and administrative feasibility of implementing an alternative and the availability of materials and services to implement the alternative. Stakeholder acceptance of a given alternative is also be considered. Brief descriptions of these criteria are provided below.

- **Technical Feasibility:** This criterion is a measure of the ability to implement each alternative, reliability of the technology, ability to implement future actions (if the remedy does not remove all risk), and ability to monitor the effectiveness of the action relative to its practicality of completing the alternative.
- **Administrative Feasibility:** This criterion is a measure of the ease in which each alternative can be coordinated with multiple offices, agencies, and private property owners, and implemented in terms of permits and right-of-way or alignment agreements. Availability of funds and funding sources for specific types of actions are part of the administrative feasibility considerations.
- **Availability of Services and Materials:** This criterion is a measure of the availability of goods and services to implement each alternative. This is influenced by the availability of personnel and technology suitable to perform the action, adequacy and availability of offsite treatment, storage and disposal capacity, ability to procure services and materials, and the potential effectiveness of prospective technologies at the site.

4.1.3 *Cost*

Present value cost estimates were developed for each alternative to provide a basis for comparison of the alternatives. These estimates are intended to provide an accuracy range of -30 to +50 percent of actual cost and are intended for relative comparison purposes only as actual project costs will depend on actual material and labor cost, productivity, competitive market conditions, final project scope and schedule, and other variable factors.

4.2 Removal Action Alternative Analysis

The removal action alternatives described in this section were developed to meet the RAO identified in Section 3.4 and the ARARs identified in Section 3.3 and are based on the nature, extent, occurrence of impacted materials within the Hangar 1 structure, future land use, and risk reduction goals. The alternatives which will be discussed are:

- Alternative 1: No Action

- Alternative 2: Implementation of Institutional Controls[28]
- Alternative 3: Abatement – Media Blasting and Cleaning.

4.3 Description of and Detailed Analysis of Alternatives

4.3.1 *Alternative 1: No Action*

The no action alternative is required by the NCP (40 CFR §300.430(e)(6)). The purpose of the no action alternative is to provide a baseline that can be used to judge the effectiveness of the other removal action alternatives. Under the no action alternative, no additional actions will be taken and as a result, this alternative would leave the PCB-, lead-, and asbestos-containing building material present at Hangar 1 in their existing state with no requirement for follow-up inspections or maintenance of the existing CM15 epoxy coating. Under this alternative, no further actions to prevent the release of PCBs, lead, or asbestos to the environment will be performed and any future releases would not be mitigated or monitored.

4.3.1.1 Effectiveness

Degradation of the existing epoxy coating could result in potentially unacceptable risks to human and ecological receptors due to incidental exposures the PCB- and lead-impacted paints and asbestos containing materials beneath the CM15 epoxy coating or to impacted particulates (e.g., dust, surficial sediments, and exposed soils) from these materials. The no action alternative does not comply with ARARs and it is not effective in the long-term.

4.3.1.2 Implementability

This alternative is considered technically and administratively feasible as there are no engineering measures required to implement the alternative.

4.3.1.3 Cost

There are no costs associated with this alternative.

4.3.1.4 Summary of Evaluation of Alternative 1

This alternative provides a baseline for comparing other remedial alternatives. Under this alternative, the presence of the known hazards would continue to pose an unacceptable risk for future receptors at the site and it does not comply with ARARs.

[28] As described in Section 2.2.3, the Navy evaluated the No Action alternative against containment and implementation of institutional controls in its Draft FFS (Navy, 2013c) and proposed the implementation of ICs for Hangar 1 in its Proposed Plan (Navy, 2013b). The Navy's recommended ICs are summarized in the Navy's Hangar 1 LTMP (Navy, 2013d). The Draft FFS has not been finalized and a ROD for Hangar 1 based on the Proposed Plan has not been prepared.

4.3.2 *Alternative 2: Implementation of Institutional Controls and Operations, Maintenance, and Monitoring*

Under Alternative 2, the property owner and/or tenant would (1) conduct OMM activities (e.g., spot abatement, repair, and recoating activities) and (2) implement ICs[29] to maintain the protectiveness of the implemented NCTRA (i.e., the integrity of the CM15 epoxy coating) and limit the exposure of potential receptors to hazardous substances. The requirement to implement the ICs would remain in place unless future response actions are taken that would allow for unrestricted use of the property. This Alternative achieves the RAO of controlling the release of PCBs and lead from remaining impacted paints at Hangar 1 through encapsulation.

Under this remedial alternative:

- A long-term management plan would be prepared and implemented. The long-term management plan will include information regarding techniques for inspecting and testing the integrity of the CM15 epoxy coating, coating maintenance, and coating repair as well as coating inspection schedule.
- A sampling and analysis plan for sediment and wipe[30] samples would be prepared and implemented;
- A quality control plan would be prepared and implemented; and
- A site-specific Health and Safety Plan would be prepared and implemented to ensure compliance with Federal Occupational Safety and Health Administration ("OSHA") standards during maintenance and/or repair activities.

Under Alternative 2, the property owner and/or tenant would be responsible for: (1) inspecting, maintaining, and repairing the CM15 epoxy coating, (2) implementing and enforcing the ICs, and (3) the preparation of CERCLA 5-year reviews and any other necessary documentation and/or reports would continue indefinitely as long as contaminated building materials remain at Hangar 1.

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[29] ICs are non-engineered instruments, such as administrative and legal controls, that help to minimize the potential for exposure to contamination and/or protect the integrity of a response action. ICs typically are designed to work by providing information that guides human behavior at a site or by limiting land and/or resource use. ICs may also include educational media to inform the public of the hazards associated with a site. The educational media may include, but is not limited to, fact sheets and notices distributed to the public, formal educational seminars, and press releases.

[30] Once the Hangar 1 has been resided, wipe samples would be collected on a periodic basis (e.g., yearly) from horizontal interior surfaces within occupied areas of the hangar. The purpose of this sampling is to determine whether additional cleaning of the interior spaces may be required to prevent potential exposure of Hangar 1 occupants to PCBs or lead from dust. Additional cleaning would be conducted in areas where wipe sampling results indicate PCB and lead concentrations on the horizontal interior surfaces are greater than 10 ug/100 cm^2 and 250 ug/ft^2, respectively. After the interior horizontal surfaces have been cleaned, additional wipe sampling of the area that was cleaned would be conducted on a more frequent basis to demonstrate that there is not a recurring problem in the area. If a recurring problem is observed, additional visual inspections of the encapsulant would be performed in the area to assess whether the CM15 coating may be failing (e.g., due to rust, peeling paint, etc.) within the area.

For the purpose of this EE/CA, potential ICs and OMM activities at Hangar 1 may include, but are not limited to, the following measures:

- Installation and maintenance of signs notifying of the potential exposure hazards;
- Administrative arrangements for access for future monitoring and/or maintenance activities;
- Inspections, testing, and maintenance (e.g., spot abatement, repair, and recoating) of the CM15 epoxy coating that encapsulates the PCB- and lead-impacted paint at Hangar 1 by the property owner and/or tenant;
- Storm water sediment monitoring to assess the effectiveness of the CM15 epoxy coating in preventing the release of PCBs and lead from the site until new siding is installed on the Hangar 1 structure;
- Wipe sampling within the Hangar 1 structure to confirm the effectiveness of the CM15 coating in preventing future building occupant exposure to PCBs and lead from the site; [31]
- Regulatory agency review of site development and land use changes;
- Regulatory agency approval of building modifications that might damage the CM15 epoxy coating and implementation of procedures to protect and repair the CM15 coating (e.g., during re-skinning of the hangar); and
- Administrative commitment to incorporate appropriate restrictions necessary for long-term management and coating maintenance in any property transfer agreements.

Specific OMM activities, and ICs, would be identified in a ROD.

4.3.2.1 <u>Effectiveness</u>

Overall Protection of Public Health and the Environment - The implementation of ICs and long-term OMM activities would be moderately protective of future receptors by controlling the exposure of these receptors to the PCB- and lead-impacted paint at Hangar 1. As a result, this Alternative achieves the RAO.

Workers involved in the maintenance and/or repair of the CM15 epoxy coating would be protected using proper personal protective equipment ("PPE") and maintenance and/or repair activities would be conducted using appropriate worker safety measures.

Compliance with ARARs – This alternative is expected to comply with ARARs if OMM activities are performed at sufficient frequency such that the coating is adequately maintained.

Future maintenance and/or repair activities would be conducted in accordance with Federal OSHA requirements, NASA's Lead and Asbestos Management Plans, and wastes generated in the course of these activities would be characterized, managed and disposed of properly in compliance with TSCA, Resource Conservation and Recovery Act ("RCRA"), and non-RCRA

[31] See footnote 30.

hazardous waste ARARs. Therefore, the ranking for this alternative for compliance with ARARs is high.

Short-Term Effectiveness – The implementation of ICs would be effective in the short-term for the protection of potential future receptors because the CM15 epoxy coating would not be disturbed except where maintenance activities are required to maintain the integrity of the coating. As a result, no adverse environmental effects or worker exposures to potential health risks are likely to result from implementation of this alternative. Therefore, the ranking for this alternative for short-term effectiveness is moderate to high.

Long-Term Effectiveness and Permanence – Based on the anticipated planned future use of Hangar 1, the implementation of ICs would control risks to potential future receptors, but extra precautions would have to be taken to minimize damage to the CM15 coating and to repair the coating during the re-skinning of Hangar 1. Long-term enforcement of the ICs coupled with adequate monitoring and maintenance would be required to maintain the effectiveness of the implemented remedy. As a result, the long-term effectiveness and permanence of this alternative is moderate.

Reduction of Toxicity, Mobility or Volume Through Treatment – Implementation of the Navy's NTCRA reduced the mobility of the contaminants present in Hangar 1 building materials by encapsulation. While the implementation of this alternative would maintain the effectiveness of the implemented remedy, it would not reduce the overall toxicity, mobility, or volume of contamination through treatment and would not meet the statutory preference for treatment options. Therefore, the ranking for this alternative for the reduction of toxicity, mobility, and volume through treatment is low.

4.3.2.2 Implementability

The establishment of ICs is technically feasible, relatively easy to administratively implement, requires minimal services and materials, and delays or difficulties in coordinating with other regulatory agencies are not likely. Equipment such as 180-foot telescoping boom lifts and trained personnel such as certified riggers, abatement contractors, and coating inspectors will be used to conduct visual inspections, physical testing, spot abatement, and repairs to the CM15 epoxy coating. The implementation of ICs would, however, affect the future use of Hangar 1 because Regulatory Agency notifications and approvals would be required for any activity that could potentially damage the remedy (e.g., installing new lights that are anchored to the structural steel of the hangar). The ranking for implementability for this alternative is high.

4.3.2.3 Cost

Administrative costs would include salaries and legal fees. Additional costs would include periodic inspection and maintenance of the CM15 coating, periodic sediment sampling and 5-year reviews. For the purpose of calculating the present worth of the annual operating and maintenance costs, it was assumed that the costs associated with this alternative will be incurred over a 30-year period.

The total estimated present value cost for the establishment of ICs and implementation of OMM activities is approximately $41,900,000[32] (2018 fiscal year dollars). This cost includes: costs associated with spot abatement and recoating activities at the attachment points for the future Hangar 1 siding; visual assessments of the condition of the CM15 coatings, physical testing, and coating maintenance activities; storm water sampling until the future Hangar 1 siding is installed and wipe sampling within the Hangar 1 structure once the future Hangar 1 siding is installed[33]; and the preparation of CERCLA 5-year reviews and any other necessary documentation and/or reports. Costs associated with re-skinning the hangar are not included in this estimate. Additional details regarding these costs is presented in Table C-1 of Appendix C.

4.3.2.4 Summary of Evaluation of Alternative 2

While the implementation of ICs is a viable, low cost remedy to reduce risk to future human and ecological receptors, there is no reduction in the toxicity, mobility, or volume of impacted material at the Site and the long-term reliability of this alternative depends on the implementation of ICs and OMM activities by the property owner and/or tenant.

4.3.3 *Alternative 3: Removal of Existing Paints – Media Blasting and Cleaning*

Under this alternative, existing PCB- and lead-impacted paints would be removed from the structural elements (e.g., the steel frame, CMU walls, and concrete floors) of Hangar 1 via a combination of media blasting, chemical stripping, and/or scraping with hand tools, followed by cleaning (e.g., by HEPA vacuuming and wiping). The removal of PCB-impacted paints from the Hangar 1 structure is consistent with current TSCA PCB regulations.[34]

Media blasting is a process in which an abrasive media (e.g., sand, copper slag, plastic beads, walnut shells) is introduced into compressed air. The compressed air/abrasive media mixture is then directed through a nozzle at high-velocity towards a desired surface coated with paint or other coatings (e.g., rust) to remove these coatings from the desired surface. It is currently anticipated that a copper slag abrasive media would be used for the abatement of Hangar 1.

Chemical stripping is a process that involves the brushing, troweling, or spraying the chemical stripper onto the coated structure. After a period of between 8- and 24-hours, the chemical and dissolved paint, which has a sludge-like consistency, would be manually scrapped from the coated surface. There are many different chemical strippers that could potentially be used for the abatement of Hangar 1 and the formulation(s) that would be used is not known at this time. Whichever chemical strippers are selected for the abatement of Hangar 1 would be used in accordance with manufacturer instructions and all wastes from chemical stripping (e.g., the sludge-like paints) would be collected, stored, and disposed of in accordance with applicable laws and regulations.

In total, visible paint and coatings would be removed from approximately 1,800,000 square feet of structural steel elements and approximately 36,000 square feet of CMU walls within the

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[32] This is an order-of-magnitude engineering cost estimate that is expected to be within -30 to +50 percent of the actual project cost (U.S. EPA, 1999; U.S. EPA, 2000).
[33] See footnote 30.
[34] Although compliant with the laws existing at the time it was applied, paint containing PCBs at concentrations greater than 50 mg/kg is not currently authorized for use under TSCA PCB regulations.

Hangar 1 structure; if necessary, additional blasting would be conducted to remove residual flecks of paint that may remain following initial blasting activities. Once all visible paint has been removed to a specified SSPC surface preparation and cleanliness standard, and the areas have been cleaned and passed a visual inspection by a qualified (i.e., NACE or SSPC) surface coating inspector, confirmation samples would be collected to demonstrate that the Cleanup Goals (see Section 3.5) have been met. Wastes from abatement activities would be disposed of at permitted off-site disposal facilities in accordance with applicable laws and regulations.[35]

The following activities would be the key components of this alternative and would be further described in a forthcoming NTCRA2 implementation work plan or other appropriate project documentation:

- Erection of scaffolding and construction of negative pressure containment enclosures;
- Media blasting, chemical stripping, and cleaning of the structural steel elements of the Hangar 1 structure, the CMU walls, and the stem walls and/or concrete floors, as necessary;
- Visual inspections and confirmation sampling of the abated surfaces to confirm that the abated surfaces meet the SSPC surface preparation and cleanliness standards and that residual chemical concentrations are consistent with the proposed Cleanup Goals;
- Perimeter air monitoring;
- Personnel health and safety monitoring;
- Personnel and equipment decontamination;
- Recoating the abated surfaces with protective coatings; and
- Management, characterization, and off-site disposal of abatement wastes at permitted hazardous and/or non-hazardous waste facilities.

4.3.3.1 Effectiveness

Overall Protection of Public Health and the Environment - The removal of the existing paints and coatings is an effective long-term and permanent action as it would eliminate the potential for exposure (or reduce it to *de minimis* levels) of future receptors. As a result, this alternative ranks high for the overall protection of public health and the environment. Potential environmental impacts during implementation of this alternative include the release of PCBs, lead, and/or asbestos to air, soil, and/or surface waters. The Pilot Study performed at Hangar 1 (ACC, 2017) demonstrated that blasting and cleaning were effective at removing existing paints

[35] In lieu of disposing of the spent sandblasting grit at a hazardous waste landfill, NASA also evaluated the possibility of amending the blasting media with a granular calcium silicate based additive so that the spent sandblasting grit could potentially be classified as an "excluded recyclable material" pursuant to State of California Health and Safety Code §25143.2(d)(5) which could allow it to be used as an alternate raw material for a cement kiln. Unfortunately, in consultation with the U.S. EPA and Regional Water Board, this option was determined to be infeasible due to regulatory and administrative requirements.

and coatings and that the implemented engineering controls and PPE were effective at protecting the public, the environment, and the on-site workers involved in abatement activities.

To minimize potential impacts to the public during implementation of this alternative, the work area would be properly secured and controlled. To minimize the potential for releases to air, soil, and/or nearby surface water bodies during implementation of this alternative, a fully encapsulating enclosure with proper sealing, negative air pressure, and exhaust mechanisms would be installed over the areas being abated and barriers (e.g., inflatable packers/test plugs) would be installed within the hangar's perimeter storm water collection trench outfalls and filter fabrics and sand bags would be installed around catch basins surrounding the project area to prevent discharges to the storm drain system.

The exposure of on-site workers to PCBs, lead, and asbestos in dust via inhalation, ingestion, and dermal contact during abatement activities would be minimized by using appropriate dust suppression measures and requiring the use of appropriate PPE; monitoring would be performed in accordance with a site-specific Health and Safety Plan. All work would be conducted in accordance with Federal OSHA requirements.

Compliance with ARARs – The ranking for this alternative with respect to compliance with ARARs is high as this alternative would be implemented in a manner to comply with ARARs included in Table 3-1, Table 3-2, and Table 3-3. Section 6.2 details compliance of this alternative for all identified ARARs.

Abatement activities would be performed in accordance with worker health and safety requirements, local air quality regulations, and abatement wastes generated during implementation of this alternative would be characterized, managed, and disposed of properly in compliance with TSCA, RCRA, and non-RCRA hazardous waste ARARs.

Short-Term Effectiveness – Short-term effectiveness would be achieved under this alternative because the migration of contaminants from the hangar would be controlled and public and worker health will be protected.

Public health would be protected in the short-term under this alternative because access to Hangar 1 and other work areas will be restricted to ensure that unprotected personnel are kept a safe distance from the work zones. On-site workers involved in the abatement activities will be protected by appropriate engineering controls (e.g., dust suppression measures), PPE, and by conducting the work in accordance with Federal OSHA requirements.

The migration of potential chemicals of concern from the worksite will be minimized using engineering controls (e.g., negative air pressure enclosures around the abatement areas, storm water Best Management Practices ("BMPs")) and establishing contaminant reduction zones and decontamination procedures. Perimeter air monitoring would be performed to verify short-term effectiveness. As a result, no adverse environmental effects or worker exposures to potential health risks are likely to result from implementation of this alternative. Therefore, the short-term effectiveness of this alternative is moderate to high due to the extensive controls required.

Long-Term Effectiveness and Permanence – The long-term effectiveness and permanence of this alternative is high because the impacted paint will be removed from the Hangar 1 building materials. The RAO would be achieved via this alternative because it eliminates the source of the PCB, lead, and asbestos contamination at Hangar 1.

Reduction of Toxicity, Mobility or Volume Through Treatment – The removal of the impacted paint from the Hangar 1 building materials does not reduce the toxicity, mobility, or volume of contaminants through treatment. However, on Site, the toxicity, mobility, and volume of PCBs, lead, and asbestos would be reduced because the source of these contaminants would be permanently removed and the wastes disposed of at an approved facility where they could be properly managed to control further releases to the environment. Therefore, with respect to the reduction of toxicity, mobility or volume through treatment, this alternative ranks moderate.

4.3.3.2 Implementability

This alternative is technically and administratively feasible and the services and materials required to implement this alternative are available. As media blasting is a standard technology and chemical stripping of painted surfaces is a common practice, the required services, materials, and skilled workers with directly related experience for implementation of this alternative are available. The Pilot Study performed at Hangar 1 (ACC, 2017) demonstrated that this alternative is implementable.

Wastes from abatement activities (e.g., spent media blasting grit, chemical stripping sludges, abatement debris, and PPE) would be characterized for disposal at off-site disposal facilities that are operated in accordance with the CERCLA Off-Site Rule and the wastes would be transported to these facilities by a licensed waste handling company.

Therefore, this alternative ranks high with respect to implementability.

4.3.3.3 Cost

The total estimated capital cost for the removal of impacted paints from the structural elements of Hangar 1 is approximately $85,800,000[36] (2019 fiscal year dollars). This cost includes: the removal of all visible paint[37] from the structural steel elements, CMU walls, and concrete floors within Hangar 1; recoating the structural steel with a protective paint; the rental of scaffolding and other equipment necessary to implement this alternative; procurement and construction costs for the setup of the enclosures; abatement materials (e.g., blasting media and chemical paint strippers); the cost of sampling supplies, the performance perimeter air monitoring and confirmation sampling and analytical fees associated with the analysis of these samples; the off-site disposal of removed paints and coatings as a bulk PCB product and off-site disposal of other abatement wastes in accordance with their chemical characteristics; and construction management and reporting. As OMM activities will not be

[36] This is an order-of-magnitude engineering cost estimate that is expected to be within -30 to +50 percent of the actual project cost (U.S. EPA, 1999; U.S. EPA, 2000).

[37] And asbestos containing materials where present.

necessary under this alternative, no OMM or present worth costs are estimated. Additional details regarding these costs is presented in Table C-2 of Appendix C.

4.3.3.4 Summary of Evaluation of Alternative 3

This alternative would protect public health and the environment, comply with ARARs, and provide long-term effectiveness. While the implementation of this alternative does not use treatment to reduce the overall toxicity, mobility, or volume of impacted material, it reduces the toxicity, mobility, and volume of impacted material at the Site through the removal of these materials and their disposal at permitted off-site facilities.

5 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section presents the comparative analysis of the evaluation criteria for the alternatives based on effectiveness, implementability, and cost. Four alternatives were identified and evaluated based on the evaluation criteria below. The evaluation criteria for each alternative are discussed in detail in the following sections.

5.1 Comparative Analysis of Alternatives

The comparative analysis evaluates the relative performance of each alternative to the other alternatives to identify advantages and disadvantages of each alternative relative to the others. The three alternatives to be evaluated area:

- Alternative 1: No Action
- Alternative 2: Implementation of Institutional Controls and Operations, Maintenance, and Monitoring
- Alternative 3: Removal of Existing Paints – Media Blasting and Cleaning

These alternatives were described in Section 4 and were evaluated in detail in terms of their effectiveness in achieving the RAO for the Site. The focus of the comparative evaluation presented in this section is to assess the effectiveness (Section 5.2), implementability (Section 5.3), cost (Section 5.4) of the alternatives in a comparative setting relative to one another; this evaluation is summarized in Table 4-1 and below.

5.2 Effectiveness

As described in Section 4.1.1, the following five evaluation criteria were considered in evaluating the effectiveness of each alternative:

- Overall Protection of Public Safety and the Environment;
- Compliance with ARARs;
- Long-Term Effectiveness and Permanence;
- Short-Term Effectiveness; and
- Reduction of Toxicity, Mobility, or Volume Through Treatment.

Under the No Action alternative (Section 4.3.1), the PCB-, lead-, and asbestos-containing building material present at Hangar 1 would remain in their existing state and no further actions to prevent the release of PCBs, lead, or asbestos to the environment would be conducted. Degradation of the existing CM15 epoxy coating could result in potentially unacceptable risks for both human and ecological receptors. As a result, the No Action alternative would not (1) achieve the RAO, (2) result in the reduction of the toxicity, mobility, or volume of impacted materials at the Site, and (3) be effective in protecting human health and the environment.

As discussed in Section 4.3.2, the implementation of ICs and long-term OMM activities achieves the RAO and is considered (1) moderate for the protection of future receptors by controlling exposure to the PCB- and lead-impacted paint at Hangar 1, (2) high with respect to compliance with ARARs, and (3) moderate to high for the protection of potential future receptors over the short-term. However, the implementation of ICs and long-term OMM activities ranks (1) moderate for long-term effectiveness and permanence and (2) low for the reduction of toxicity, mobility, and volume of the impacted materials at the Site.

As discussed in Section 4.3.3, Alternative 3 will achieve the RAO. Alternative 3 ranks high with respect to its (1) overall protectiveness of public health and the environment, (2) compliance with ARARs, (3) long-term effectiveness, and (4) moderate to high with respect to the protection of potential future receptors over the short-term. For the reduction of toxicity, mobility, or volume through treatment, Alternative 3 ranks moderate because the impacted paints/coatings would be removed from the Hangar 1 building materials and disposed of at an approved facility where they can be properly managed to control potential future releases to the environment.

5.3 Implementability

As described in Section 4.1.2, the implementability of each alternative was assessed with respect to its:

- Technical Feasibility;
- Administrative Feasibility; and
- Availability of Services and Materials.

The No Action alternative (Section 4.3.1), is technically and administratively feasible, and since no actions will be conducted under this alternative, no services or materials are required to implement this alternative. As a result, the implementability of this alternative is high.

As discussed in Section 4.3.2, the establishment of ICs and implementation long-term OMM activities (Alternative 2) are technically feasible and relatively easy to administratively implement. This alternative would require minimal services and materials and these services and materials are available. As a result, the implementability of this alternative is high.

As discussed in Section 4.3.3, Media Blasting and Cleaning (Alternative 3) is technically feasible and the materials and services required to implement this alternative are available because media blasting is a standard technology and chemical stripping of paints and coatings is a common practice. The results of the Pilot Study (ACC, 2017) demonstrated that media blasting and cleaning is effective at removing impacted paints and coatings at Hangar 1. As Alternative 3 is also administratively feasible, the implementability of this alternative is high.

5.4 Cost

As discussed in Section 4.1.3, present value cost estimates, assuming a performance period of 30 years, developed to compare these alternatives; these costs are developed in Appendix C and summarized in Table 4-1. Of the alternatives, Alternative 1 is the least expensive as it would not incur any cost because no actions would be conducted. The establishment of ICs and implementation of OMM (Alternative 2) is the next least expensive alternative and is estimated to cost approximately $41,900,000 over a 30-year period. Alternatives 3 is the most expensive alternative with an estimated cost of approximately $85,800,000.

5.5 Summary Comparison of Alternatives

Of the three alternatives evaluated in this EE/CA, Alternative 1, the No Action Alternative, is not acceptable because it would not achieve the RAO of controlling the release of PCBs and lead from remaining impacted paints at Hangar 1 and thereby reducing potential risks to human health and the environment from these chemicals. As a result, this alternative is not further discussed in this section.

The remaining two alternatives would: (1) be technically feasible; (2) use standard construction services, equipment, and materials; (3) provide adequate protection of public health and the environment; (4) comply with ARARs; (5) provide adequate short-term effectiveness; and (6) are both administratively feasible. These alternatives differ in the following ways:

- Alternative 2 is less effective than Alternative 3 with respect to long-term effectiveness and permanence because the source of contamination at the Site (i.e., the impacted paints and coatings) is not removed.
- Alternative 2 is less effective than Alternative 3 at reducing the toxicity, mobility, or volume of contamination through treatment.
- Alternative 2 is significantly less expensive than Alternative 3.

6 RECOMMENDED ALTERNATIVE

While Alternative 2, Implementation of ICs and OMM, would be effective if properly implemented and is significantly less costly than Alternative 3, the ongoing long-term OMM of the CM15 epoxy coating and implementation of ICs would be a significant effort that would be required in perpetuity. As a result, the recommended alternative is Alternative 3 – Media Blasting and Cleaning.

This alternative will protect public health and the environment, comply with ARARs, and provides the best balance of the primary balancing criteria (i.e., short-term effectiveness, long-term effectiveness and permanence, implementability, and cost). While the implementation of this alternative does not use treatment to reduce the overall toxicity, mobility, or volume of impacted material, it reduces the toxicity, mobility, and volume of impacted material at the Site through the removal of these materials and their disposal at permitted off-site facilities. The recommended alternative is readily implementable and is expected to be acceptable to the Regulatory Agencies. Additional details regarding the key components of the recommended alternative are presented in Section 6.1, and additional discussion regarding compliance with ARARs is presented in Section 6.2.

6.1 Key Components of Recommended Alternative

Below is a summary of the key components of this alternative. These components will be further described in a forthcoming NTCRA2 implementation work plan or other appropriate project documentation.

Scaffolding Erection and Enclosure Construction

Under this alternative, metal scaffolding will be installed within and outside of the Hangar 1 structure to provide walk through access to both the interior and exterior elements of the structure. Blasting equipment will be installed at the ground level and platforms will be constructed at several locations within the scaffolding to allow the staging of equipment and materials and facilitate equipment and personnel decontamination.

A shrink wrap polyethylene plastic, or similar material, will be installed around the scaffolding[41] and a polyvinyl chloride ("PVC") or rubberized flooring will be installed over horizontal concrete surfaces within the enclosure[42] to provide containment and stability, and to simplify the collection of abatement wastes. Heat guns, if needed, will be used to tighten and shrink the enclosure materials to form a strong exterior surface and seams will be staggered, overlapped,

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[41] Within the hangar structure, the enclosure will encompass the entirety of the scaffolding. On the exterior of the hangar structure, the enclosure will only encompass as much scaffolding as is required to permit abatement activities; the remaining scaffolding will remain unencapsulated.

[42] In general, the PVC/rubberized flooring will be installed within the hangar. If it is necessary to extend the enclosure outside of the hangar and ground access in this area is required, the PVC/rubberized flooring will also be installed outside of the hangar.

and taped and/or heat sealed. The containment enclosure will be maintained under constant negative air pressure via the use blowers equipped with HEPA filters and interior pressures will be monitored using a digital manometer. The enclosure described above was constructed for the implementation of the Pilot Study (ACC, 2017) and this enclosure was found to be an effective and reliable means of preventing releases to the environment.

During abatement activities, barriers will be installed over storm drain inlets and exposed soil surfaces adjacent to the Hangar 1 structure will be covered.[43] Visual inspections of the containment and barrier devices will be conducted on a daily basis.

Abatement Activities

The results of the Pilot Study indicated that both media blasting and vapor media blasting followed by cleaning were effective at removing the paints/coatings and residual dust from the structural steel elements of the Hangar 1 structure. Nevertheless, for full-scale abatement, media blasting is preferred as it will minimize the formation of surface rust on the abated surfaces, which could result in the need for additional surface preparation (e.g., blasting) prior to recoating activities. Based on results from the Pilot Study, it is estimated that up to 5,000 tons of copper slag blast media will be required to remove the visible paint (i.e., achieve a NACE 3 / SSPC-SP 6 cleanliness standard) from the approximately 1,800,000 square feet of structural steel surfaces at Hangar 1. During media blasting activities, perimeter air monitoring will be conducted to monitor for potential fugitive particulate emissions from blasting activities. Post-blasting cleaning would include HEPA vacuuming and/or wiping the abated structural steel elements, CMU Walls, concrete slab of the hangar, and the perimeter storm water trench.[44] On completion of post-blasting cleaning, abated areas will be dry, free of dust and debris and no paint will be visible on the surfaces.

It is unknown whether the structural steel elements of Hangar 1 were coated with lead-based paint prior to the construction of Hangar 1. As a result, it is possible that lead-based paint may remain between tightly mated surfaces (e.g., riveted steel members) on completion of abatement activities. Potential impacts due to the presence of this paint are deemed *de minimis* because of the relatively small area of tightly-mated surfaces (i.e., approximately 66,500 square feet) relative to the area of structural steel surfaces being abated (i.e., approximately 1,800,000 square feet) and because exposure to this paint will be limited to the rare times that personnel have to maintain and/or repair these elements. These workers will be protected through the use of engineering controls and appropriate PPE.

For the CMU walls, a chemical paint stripper and manual scraping will be used to remove impacted paints instead of media blasting to minimize potential impacts to the historical

[43] As the exposed soil adjacent to Hangar 1 will be covered during abatement activities, post-abatement sampling of the exposed soil adjacent to the hangar will not be conducted unless NTCRA2 removal actions result in impacts to the exposed soil (e.g., there is a breach in containment that results in impacts to exposed soil adjacent to the breach).

[44] If necessary, abated surfaces may also be rinsed with recycled water or drinking water. Any water generated or collected during the performance of work will be contained, sampled, analyzed, and disposed of at an off-site facility in accordance with applicable laws and regulations.

finish.[45] The chemical removal process involves the brushing, troweling, or spraying of liquid paint stripping chemicals onto the painted surfaces. After between 8- and 24-hours, the chemical and dissolved paints will be scraped off the CMU walls and if full removal of the paint is not achieved after the first application, a second application may be necessary. The sludge-like wastes from chemical stripping will be segregated from other abatement wastes (e.g., spent media blasting grit) for characterization and disposal. It is anticipated the abatement will be conducted within the enclosure constructed for blasting and cleaning activities. Safety Data Sheets and product application guidance for potential chemical strippers will be reviewed prior to their use at Hangar 1 to confirm (1) that the chemical stripper will have no lasting impacts or result in residual contamination at the Site and (2) the products are being used in accordance with manufacturer specifications.

On completion of abatement of the above grade structural elements, the floor of the enclosure will be removed and existing paint on the concrete floor (if present) will be removed by media blasting.

Throughout the day and at the end of each shift, abatement wastes will be collected in sealed supersacks and placed in a waste accumulation area.

Visual Inspections and Confirmation Sampling

On completion of abatement activities, a qualified surface coating inspector (i.e., a NACE and SSPC-certified inspector) will inspect the abated surfaces for the presence of residual paint. Structural steel surfaces will be cleaned to a NACE 3 / SSPC-SP 6 cleanliness standard and CMU walls and concrete floors will be cleaned such that there is no visible paint remaining. Areas with visible paint remaining will be removed by additional blasting, chemical stripping, and/or scraping with hand tools.

On completion of cleaning activities and visual inspections,[46] confirmation wipe samples will be collected from the abated non-porous surfaces and confirmation bulk samples will be collected from the abated porous surfaces.[47] Results for the confirmation samples will be compared to the Cleanup Goals and if necessary, as described in Section 3.5, additional blasting and cleaning may be conducted.

Decontamination – Personnel and Equipment

All personnel leaving the enclosure will exit through a three-stage decontamination chamber that is a part of the negative pressure enclosure. In the first chamber all visible debris shall be HEPA vacuumed from each person's PPE, in the second chamber, potable water, or treated

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[45] At CMU wall locations where an asbestos-containing skim coat is present beneath the painted surfaces, abrasive blasting, mechanical grinding, and or hand scraping may be used to remove the skim coat. While planned asbestos removal activities would require formal notification to the state pursuant 40 CFR 61.145(c), since the activities will be performed under CERCLA, formal notification of the State of California is not required.

[46] Inspections for residual dust after cleaning will include the use of a colorless and transparent adhesive tape, a display board with contrasting color to the dust, and a magnifying glass. Additional details regarding inspections for residual dust will be included in a forthcoming NTCRA2 work plan.

[47] Single depth bulk samples of the substrate beneath abated surfaces of porous materials will be collected in general accordance with the U.S. EPA's Standard Operating Procedure for Sampling Porous Surfaces for PCBs (U.S. EPA, 2011).

groundwater from the West-Side Aquifers Treatment system, will be used to remove any residual contamination, and in the third chamber, personnel will remove and dispose of their PPE in waste debris bags provided by the contractor.

Reusable equipment (e.g., blasting equipment, hand tools, etc.) leaving the enclosure will be decontaminated using a two-stage decontamination chamber; in the first chamber visible debris will be removed using a HEPA vacuum and in the second stage potable water, or treated groundwater from the West-Side Aquifers Treatment system, will be used to remove residual contamination. On completion of abatement activities, wipe samples will be collected from reusable equipment after decontamination to demonstrate that the decontaminated equipment is suitable for unrestricted use.

All decontamination wastes will be collected, characterized, managed, stored, and disposed of at permitted off-site facilities.

Waste Management and Off-Site Disposal

For the purpose of this EE/CA, assumptions have been made regarding waste classification based on data collected during the Pilot Study; however, all wastes will be characterized prior to off-site disposal and will be managed according to these waste characterization results. Based on the results of the Pilot Study and the estimated mass of blast media required for abatement, it is assumed that up to:

- Approximately 6,500 tons of spent media blasting waste and chemical stripping sludges would need to be disposed of as TSCA- and RCRA-regulated waste;
- Approximately 120 cubic yards of PPE and contaminated containment structure and 20,000 gallons of liquid decontamination wastes will be disposed of as RCRA-regulated waste; and
- Approximately 900 cubic yards of miscellaneous wastes will be disposed of as non-hazardous waste.

Wastes generated pursuant this alternative will be packaged in accordance with all applicable federal, state, and local laws and regulations and placed in shipping containers that meet Department of Transportation requirements for transportation to an off-site disposal facility.

PCB bulk product waste generated (e.g., spent blast media waste) from this project will be managed in accordance with the requirements of 40 CFR §761.65(b) and/or 40 CFR §761.65(c), as applicable, and other applicable laws and regulations. Non-liquid wastes such as PPE, containment structure materials, and non-liquid cleaning materials will be disposed of according to the requirements of 40 CFR §761.61(a)(5)(v). Liquid wastes will be disposed of in accordance with 40 CFR §761.61(a)(5)(iv). Asbestos containing wastes will be managed in accordance with applicable laws and regulations.

Construction Management and Reporting

Throughout the implementation of the Recommended Alternative, qualified environmental professionals working on behalf of PV will (1) observe and record the progress of the abatement activities, (2) conduct perimeter air monitoring, confirmation sampling, and waste characterization sampling, and (3) prepare written periodic progress reports for the Regulatory

Agencies that describe all significant developments during the preceding period and developments anticipated during the next reporting period.

On completion of the implementation of the Recommended Alternative, a NTCRA completion report will be prepared and submitted to the Regulatory Agencies for review and approval.

6.2 Compliance with ARARs

This alternative is expected to comply, and will be implemented in a manner to comply, with the ARARs included in Table 3-1, Table 3-2, and Table 3-3.

Impacted structural elements at Hangar 1 will be decontaminated via media blasting or chemical stripping. While 40 CFR §761.79 lists a variety of decontamination standards and procedures for porous and non-porous surfaces in contact with liquid and non-liquid PCBs (e.g., PCB-containing paints), confirmation sampling requirements, and decontamination waste disposal requirements, it does not list any accepted decontamination procedures or standards for porous surfaces in contact with non-liquid PCBs (e.g., concrete surfaces coated with non-liquid PCBs) and confirmation sampling of non-porous surfaces in accordance with 40 CFR Subpart P is not feasible.[48] U.S. EPA approval of the (1) decontamination procedures and (2) confirmation sample selection procedures and frequencies presented in a forthcoming NTCRA Work Plan will meet the requirements of 40 CFR 40 CFR §761.61(c), 40 CFR 40 CFR §761.62(c), and 40 CFR §761.79(h). To comply with historical preservation ARARs (16 USC §470 et seq) and minimize potential damage to the historical "board form" markings on the CMU walls, it is anticipated that existing paints and coatings on the CMU walls will be removed using chemical paint strippers and manual scraping. NASA will work with the State Historic Preservation Office to obtain concurrence that the proposed remedial actions are in compliance with the National Historic Preservation Act.

Based on the results of the Pilot Study (ACC, 2017), it is anticipated that the attainment of a NACE 3 / SSPC-SP 6 cleanliness standard for the abated structural steel elements and the removal of visible paints and coatings from concrete surfaces (e.g., CMU walls) will be sufficient to reduce residual PCB concentrations below TSCA unrestricted use levels (i.e., ≤10 ug/100 cm^2 for the abated structural steel elements (40 CFR §761.79(b)(3)) and 1 mg/kg for the decontaminated concrete surfaces[49] (40 CFR §761.61(a))) and lead concentrations below the Cleanup Goals (i.e., <250 ug/ft^2 for the abated structural steel elements and 320 mg/kg for the substrate beneath the abated concrete surfaces) and lead hazard levels (66 FR 1205, 40 CFR §745.65(b) and (c), CCR Title 17, Division 1, Chapter 8, §35035 and §35036).

[48] 40 CFR Subpart P (§761.300 to §761.316) is applicable to "large, nearly flat non-porous surfaces, and for small irregularly shaped non-porous surfaces". Hangar 1 is neither flat nor small; the area of the structural steel elements that will be abated is estimated at approximately 1,800,000 square feet of which approximately 1,010,000 square feet is located at heights greater than 80 feet above ground surface and the surfaces of the steel elements are irregularly shaped.

[49] As outlined in the U.S. EPA's risk-based disposal letter for PCB bulk product waste at the Rainier Commons Facility (U.S. EPA, 2013), if PCBs are detected in the substrate beneath a PCB Bulk Product Waste, the substrate is defined as a PCB remediation waste that must be addressed in the manner prescribed in 40 CFR §761.61.

Confirmation samples of bulk concrete surfaces will be collected in general accordance with the U.S. EPA's Standard Operating Procedure for Sampling Porous Surfaces for PCBs (U.S. EPA, 2011).

As discussed in Section 4.3.3, the PCB-containing paint on the structural elements (e.g., the steel frame, CMU walls, and concrete floors) is regulated as a Bulk PCB Product Waste under TSCA, and as a result, paint-containing abatement wastes (e.g., spent media blasting grit and chemical abatement sludges will be disposed at a permitted off-site hazardous waste landfill (40 CFR §761.62(a)) in accordance with applicable laws and regulations. All PCB wastes with concentrations of 50 parts per million or greater will be disposed of within a one-year period (40 CFR §761.65(a)).

Under this alternative, several Bay Area Air Quality Management District ("BAAQMD") regulations related to particulates, lead, asbestos, and sandblasting (i.e., BAAQMD Regulation 6 Rule 1, Regulation 11 Rule 1, Regulation 11 Rule 2, and Regulation 11 Rule 4) are applicable. Implementation of engineering controls such as the use of fully encapsulating enclosures and the maintenance of negative air pressures within the enclosures will limit potential particulate emissions. Perimeter air monitoring data collected during abatement activities will assist in evaluating the success of the engineering control measures and in demonstrating that the air quality ARARs have been achieved.

ARARs involving surface water, drinking water, and groundwater requirements (i.e., 40 CFR §122.26, §122.41(d), §122.41(e), §122.44(d), and §131.38); California Health and Safety Code §25349.5 - §25349.14; California State Water Resources Control Board Resolution 88-63; California Water Code §13240, §13241, and §13242; California Fish and Game Code §5650)[50] will be met through the implementation of BMPs (e.g., filters and/or barriers at stormwater inlets) identified in a site-specific Storm Water Pollution Prevention Plan (as required pursuant the National Pollutant Discharge Elimination System ("NPDES") Industrial General Permit) during the removal action.

Storage and decontamination requirements would comply with the applicable TSCA ARARs (i.e., 40 CFR §761.79(b), 40 CFR §761.65(a), and 40 CFR §761.79(h)). Abatement wastes generated in the course of these activities will be characterized, managed and disposed of properly in compliance with TSCA, RCRA, and non-RCRA hazardous waste ARARs (i.e., 40 CFR §262.11 and §264.554; 49 CFR Parts 107 and 171-177; CCR Title 22 §66261.3(a)(2)(C) and (F), §66261.21, §66261.22(a)(1), §66261.22(a)(3), §66261.22(a)(4), §66261.23, §66261.24(a)(1) through (8), §66261.100, §66261.101, §66262.11, §66262.34, §66264.13 (a) and (b), §66264.171 to §66264.173, §66268.1(f), §66268.7, §66268.9(a), §66268.40, and §66268.105; CCR Title 23 §2510, §2511(d), §2520(a) to (c), and §2521; CCR Title 27 §20080, §20090(d), §20210, and §20220). In the event that treatment of the hazardous wastes generated over the course of the

[50] While discharges to drinking water, groundwater, and surface water bodies are not planned, particulates from the Abatement of Hangar 1 could be transported aerially into nearby surface water bodies or deposited onto surfaces outside of the hangar where surface water runoff could mobilize particulates into the storm drain system. It is unlikely that potential discharges of particulates from the abatement of Hangar 1 will impact drinking water or groundwater.

remedial action is required, such activities will be performed at, and by, the permitted off-site waste disposal facility.

The Hangar 1 structure and surrounding areas do not support state or federally endangered, threatened, or candidate species, or designated critical habitat for such species (16 USC §1536(a) and (h)(1)(B); CCR Title 14 §783). However, nearby areas do provide habitat for burrowing owls and other birds protected by state and federal laws (16 USC §703), and some birds occasionally nest within the structural steel elements of the hangar (California Fish and Game Code §3503, §3503.5, §3511 and §3513). To mitigate potential impacts to migratory birds, burrowing owls, and other nesting birds, measures will be implemented to (1) exclude nesting birds from Hangar 1 before abatement activities commence and while they are underway and (2) to minimize potential disturbances to nearby burrowing owl habitats and any owls using those habitats. No birds or mammals will be taken except in accordance with an approved mitigation plan (California Fish and Game Code §3005).

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TABLE 3-1
LIST OF POTENTIAL CHEMICAL-SPECIFIC ARARs AND TBCs
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

Requirement	Description	ARAR or TBC
TSCA Standards		
Cleanup Levels for PCB Remediation Waste: (a) self-implementing on-site cleanup and disposal of PCB remediation waste [40 CFR §761.61(a)]	Under 761.61(a) the following apply: For unrestricted use: ● ≤10 ug/100 cm^2 for non-porous surfaces; and ● 1 mg/kg for bulk remediation wastes (e.g., soil, decontaminated concrete). For restricted use: ● ≤100 ug/100 cm^2 for non-porous surfaces; and ● 10 mg/kg for bulk remediation wastes (e.g., soil).	Relevant and Appropriate
Water Quality Standards		
Sources of Drinking Water [California State Water Resources Control Board Resolution 88-63]	The resolution states that all surface waters of the State are considered to be suitable, or potentially suitable, for municipal or domestic water supply, unless the surface or ground waters contain total dissolved solids in excess of 3,000 mg/L or the waters contain high levels of contamination (unrelated to pollutant releases from the site).	Relevant and Appropriate
Safe Drinking Water and Toxic Enforcement Act of 1986 (“Proposition 65”) [State of California Health and Safety Code §25349.5 - §25349.14]	Proposition 65 prohibits the discharge, into a source of drinking water, of chemicals listed in 22 CCR §12000 et seq. The statute also requires that a reasonable warning be given to individuals who may be exposed to listed substances at levels posing an unacceptable risk.	Applicable
San Francisco Bay Basin Water Quality Control Plan ("Basin Plan"). Porter-Cologne Water Quality Control Act [California Water Code §13240, §13241, and §13242]	The Basin Plan outlines surface water quality objectives for selected toxic pollutants and quantifies concentrations of chemical constituents in amounts that adversely affect any designated beneficial use. The Basin Plan defines beneficial uses and water quality objectives for waters of the State, including surface water and groundwater. ● Chapter 2 describes beneficial uses of surface water and groundwater. ● Chapter 3 sets forth water quality objectives for surface water and groundwater. ● Chapter 4 describes implementation plans, discharge prohibitions, and other control measures designed to ensure compliance with statewide plans and policies and provide comprehensive water quality planning. ● Chapter 7 includes the TMDL for PCBs to decrease loading of PCBs to San Francisco Bay.	Relevant and Appropriate
Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California [40 CFR §131.38]	The Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California promulgates criteria for priority toxic pollutants in the State of California for inland surface waters and enclosed bays and estuaries. These pollutants include lead and PCBs.	Relevant and Appropriate
National Pollution Discharge Elimination System - Water Qulity Standards [40 CFR §122.44(d)]	Discharges into surface water will achieve federal and state water quality standards (40 CFR §122.44 (d)).	Applicable

TABLE 3-1
LIST OF POTENTIAL CHEMICAL-SPECIFIC ARARs AND TBCs
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

Requirement	Description	ARAR or TBC
	RCRA/Non-RCRA Hazardous Waste Standards	
RCRA Identification and Listing of Hazardous Waste [CCR Title 22 §66264.13 (a) and (b), §66261.21, §66261.22(a)(1), §66261.23, §66261.24(a)(1), and §66261.100]	Definition of RCRA hazardous waste; these regulations define RCRA hazardous waste if "characteristically" hazardous. TCLP criteria classify RCRA hazardous wastes for off-site disposal of remediation waste.	Applicable
Definition of non-RCRA Hazardous Waste [CCR Title 22 §66261.3(a)(2)(C) and (F), §66261.22(a)(3) and (4), §66261.24(a)(2) through (8), §66261.101]	Definition of non-RCRA State of California regulated hazardous waste. Establishes numeric criteria for priority toxic pollutants; lists TTLCs and STLCs for classification in the state of California.	Applicable
Hazardous Waste Determination [40 CFR §262.11 and CCR Title 22 §66262.11]	Person who generates waste shall determine if that waste is a hazardous waste.	Applicable
Land Disposal Restrictions [CCR Title 22 §66268.1(f), §66268.40, and §66268.105]	Land disposal restrictions and requirements for hazardous wastes.	Applicable
Land Disposal Restrictions [CCR Title 22 §66262.34]	On-site RCRA hazardous waste accumulation is allowed and must follow the protocols included in this section.	Applicable
Treatment Standards for Hazardous Waste [CCR Title 22 §66268.40]	Treatment standards for hazardous wastes.	Relevant and Appropriate
	Federal and California Lead Regulations	
Lead; Identification of Dangerous Levels of Lead [66 FR 1205]	Resident Lead-Based Paint Hazard Reduction Act (Title X) defined a lead-based paint hazard as any condition that causes exposure to lead from lead-contaminated dust, lead-contaminated soil, and lead-contaminated paint that is deteriorated or present in accessible surfaces that would result in adverse human health effects (42 USC 4851b(15)). 66 FR 1205 established dust hazard levels for floors and interior window sills (40 ug/ft^2 and 250 ug/ft^2, respectively) and dust clearance standards for floors, interior window sills, and window troughs (40 ug/ft^2, 250 ug/ft^2, and 400 ug/ft^2, respectively).	Relevant and Appropriate
Lead-based paint hazards - Dust [40 CFR §745.65(b)]	Dust-lead hazard is dust in a residential dwelling or child-occupied faciltity that contains a mass-per-area concentration of lead equal to or exceeding 40 ug/ft^2 on floors or 250 ug/ft^2 on interior window sills based on wipe samples.	Relevant and Appropriate
Lead-contaminated dust [CCR Title 17, Division 1, Chapter 8, §35035]	"Lead-contaminated dust" means dust that contains an amount of lead equal to, or in excess of: (a) 40 ug/ft^2 for interior floor surfaces; or (b) 250 ug/ft^2 for interior horizontal surfaces; or (c) 400 ug/ft^2 for exterior floor and exterior horizontal surfaces.	Applicable
Lead-based paint hazards - Soil [40 CFR §745.65(c)]	Soil-lead hazard is bare soil on a residential real property or on the property of a child-occupied factility that contains lead equal to or exceeding 400 parts per million (ug/g) in a play area or average of 1,200 parts per million of bare soil in the rest of the yard based on soil samples.	Relevant and Appropriate
Lead-contaminated soil [CCR Title 17, Division 1, Chapter 8, §35036]	"Lead-contaminated soil" means bare soil that contains an amount of lead equal to, or in excess of, 400 mg/kg in children's play areas and 1,000 mg/kg in all other areas.	Applicable

TABLE 3-1
LIST OF POTENTIAL CHEMICAL-SPECIFIC ARARs AND TBCs
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

Requirement	Description	ARAR or TBC
Other Federal and State Guidance		
U.S. EPA RSLs	RSLs (formerly Region IX PRGs) developed by the U.S. EPA with DOE's ORNL combine current U.S. EPA toxicity values with standardized exposure factors to estimate constituent concentrations in soil, groundwater, and ambient air that are protective of humans, including sensitive groups, over a lifetime on a screening-level basis.	TBC
DTSC HERO HHRA Note 3	DTSC HERO HHRA Note 3 outlines the most recent HERO review of the soil, tap water, and ambient air RSLs. HHRA Note 3 presents recommended SLs derived using DTSC-modified exposure and toxicity factors for constituents in soil and tap water for which the DTSC-SL is at least three-fold more protective than the corresponding RSL.	TBC
DTSC HERO HHRA Note 8	DTSC HERO HHRA Note 8 discusses recommendations for evaluating PCBs at contaminated sites in California. HHRA Note 8 presents recommended SL for PCBs in wipe samples of 0.1 ug/100 cm^2.	TBC
Water Board ESLs	The ESLs were developed by the Water Board to address environmental protection goals presented in the Basin Plan. These goals include protection of surface water, groundwater, soil, and soil vapor for human health, drinking water and non-drinking water resources, aquatic and terrestrial biota, and nuisance conditions.	TBC
Air Quality Standards		
BAAQMD Regulation 6 Rule 1	Regulation 6 Rule 1 limits the emission of particulates.	Applicable
BAAQMD Regulation 11 Rule 1	Regulation 11 Rule 1 prohibits the discharge of lead at concentrations in excess of 1 microgram per cubic meter (as measured at ground level) above background concentrations of lead averaged over 30-days.	Applicable
BAAQMD Regulation 11 Rule 2	Regulation 11 Rule 2 describes the asbestos management requirements during demolition and renovation projects.	Applicable
BAAQMD Regulation 12 Rule 4	Regulation 12 Rule 4 apply to media blasting operations (other than permanent abrasive blasting operations or equipment) and outline standards and requirements for the performance of media blasting activities.	Applicable

TABLE 3-1
LIST OF POTENTIAL CHEMICAL-SPECIFIC ARARs AND TBCs
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

Requirement	Description	ARAR or TBC
Local Guidance		
NASA Lead Management Plan [APR 8715.1, Chapter 35]	Rules set forth for NASA Occupational Safety, Health, and Medical Services with respect to inspecting, assessing, monitoring and remediation of lead.	TBC
NASA Lead Management Plan [APR 8715.1, Chapter 35]	● Floor wipe: <40 ug/ft^2; and ● Interior horizontal surfaces: 400 ug/ft^2.	TBC
NASA Asbestos Management Plan [APR 8715.1, Chapter 30]	Rules set forth for NASA Occupational Safety, Health, and Medical Services with respect to inspecting, assessing, monitoring and remediation of asbestos.	TBC
MFA Leasehold TCLs	● 320 mg/kg for lead in soil; and ● 1 mg/kg for PCBs in soil.	TBC

Abbreviations

ARAR: applicable or relevant and appropriate requirement
CCR: California Code of Regulations
DOE: Department of Energy
DTSC: Department of Toxic Substances Control
ESL: Environmental Screening Level
HERO: Human and Ecological Risk Office
HHRA: human health risk assessment
mg/kg: milligrams per kilogram
mg/L: milligrams per liter
NASA: National Aeronautics and Space Administration
ORNL: Oak Ridge National Laboratory
PCB: polychlorinated biphenyl
PRG: preliminary remediation goals
RSL: Regional Screening Level
SL: screening level
TBC: to be considered
TCL: target concentration level
TMDL: total maximum daily load
TSCA: Toxic Substances Control Act
ug/100 cm^2: micrograms per 100 square centimeters
ug/ft^2: micrograms per square foot
U.S. EPA: United States Environmental Protection Agency
Water Board: Regional Water Quality Control Board, San Francisco Bay Region

Notes

(a) Implementation of Federal Clean Air Act requirements has been delegated, in part, to California. The BAAQMD is the local implementing agency.

TABLE 3-2
LIST OF POTENTIAL LOCATION-SPECIFIC ARARs AND TBCs
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

Requirement	Description	ARAR or TBC
	Federal Regulations	
National Historic Preservation Act of 1966 [as amended 16 USC §470 et seq; 36 CFR, Part 800; 40 CFR §6.301]	Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing on the NRHP. Hangar 1 is included in the Shenandoah Plaza Historic District which was added to the NRHP in 1994.	Applicable
Migratory Bird Treaty Act of 1972 [16 USC §703]	The Act protects migratory birds (listed at 50 CFR §10.13) from unregulated takings which can include poisoning from hazardous waste sites.	Relevant and Appropriate
Endangered Species Act of 1973 [16 USC §1536(a), (h)(1)(B)]	The federal Endangered Species Act requires that actions conserve endangered or threatened species and critical habitat.	Relevant and Appropriate
	State Regulations	
California Endangered Species Act [CCR Title 14 §783]	The California Endangered Species Act protects wildlife and plants listed as threatened and endangered. The act requires state agencies to conserve threatened and endangered species. This section pertains to the incidental take of endgangered, threatened, and candidate species, if required.	Relevant and Appropriate
California Fish and Game Code [§5650]	Prohibits the deposition or placing of material deleterious to plant, fish, or bird life where it can pass into waters of the State.	Relevant and Appropriate
California Fish and Game Code [§3005, §3503, §3503.5, §3511 and §3513]	§3005 prohibits the taking of birds or mammals except in accordance with an approved mitigation plan. Protect nesting birds (including raptors and passerines) under §3503.5 and §3513; birds of prey under §3503.5 (including hawks, falcons and owls); fully protected birds under §3511.	Relevant and Appropriate
	Local Guidance	
NASA ARC Burrowing Owl Habitat Management	Protects western burrowing owl (Athene cunicularia hypogea).	TBC
NASA HRPP	The HRPP established criteria and guideline for the ongoing preservation and maintenance of historic resources within the Shenandoah Plaza Historic District.	TBC

Abbreviations
ARAR: applicable or relevant and appropriate requirement
HRPP: Historic Resources Protection Plan
NRHP: National Register of Historic Places
TBC: to be considered
USC: United States Code

TABLE 3-3
LIST OF POTENTIAL ACTION-SPECIFIC ARARs AND TBCs
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

Requirement	Description	ARAR or TBC
	RCRA/Non-RCRA Hazardous Waste Standards	
Staging Piles [40 CFR §264.554]	Regulation is part of the RCRA corrective action management unit regulations and allows hazardous waste generators to accumulate remediation wastes in staging piles for storage without triggering land disposal restrictions.	Applicable
Management of Hazardous Waste [CCR Title 22 §66268.7 and §66268.9(a)]	Provides testing, tracking, and recordkeeping requirements for generators, treaters, and disposal facilities and special rules for wastes that exhibit RCRA characteristics.	Applicable
Containers for Storing RCRA Hazardous Waste [CCR Title 22 §66264.171 to §66264.173]	Regulations pertain to the condition of the containers to be used to store hazardous wastes, the compatibility of the hazardous waste with the storage containers, and the managment of containers.	Applicable
Dischages of Hazardous Waste to Land - Applicability Exemptions [CCR Title 23 §2510 and §2511(d)]	Actions taken by or at the direction of public agencies to cleanup or abate conditions of pollution or nuisance resulting from unintentional or unauthorized releases of waste or pollutants to the environment; provided that wastes, pollutants, or contaminated materials removed from the immediate place of release shall be discharged according to CCR Title 23 §2520; and further provided that remedial actions intended to contain such wastes at the place of release shall implement applicable provisions of this chapter to the extent feasible.	Relevant and Appropriate
Discharges of Hazardous Waste to Land - Waste Classification and Management [CCR Title 23 §2520(a) to (c) and §2521]	Applicability and classification criteria. Requires that Hazardous Waste be managed according to Chapter 11 of Division 4.5 of Title 22 of this code (i.e., Title 22 §66260 et seq.) and that hazardous wastes only be discharged at Class I management units unless the wastes qualify for a variance under Title 22 §66260.210.	Applicable
Discharge Requirements - Hazardous and Designated Wastes [CCR Title 27 §20080, §20200(c), §20210, and §20220]	Requires that designated waste as defined at California Water Code §13173 be discharged to Class I or Class II waste management units and requires that nonhazardous solid waste as defined at §20210 or §20220 be discharged to a classified waste management unit. CCR Title 27 §20230 allows inert waste to be discharged at units that are not classified. Because this removal action is conducted under CERCLA, all site waste must be disposed of in accordance with the CERCLA Off-Site Rule; therefore, §20230 is not applicable to the removal action.	Applicable
Treatment, Storage, Processing or Disposal of Solid Waste - Exemptions [CCR Title 27 §20090(d)]	Actions taken by or at the direction of public agencies to cleanup or abate conditions of pollution or nuisance resulting from unintentional or unauthorized releases of waste or pollutants to the environment; provided that wastes, pollutants, or contaminated materials removed from the immediate place of release shall be discharged according to the SWRCB-promulgated sections of Article 2, Subchapter 2, Chapter 3, Subdivision 1 of this division (§20200 et seq.); and further provided that remedial actions intended to contain such wastes at the place of release shall implement applicable SWRCB-promulgated provisions of this division to the extent feasible.	Relevant and Appropriate
Hazardous Materials Transportation Regulations [49 CFR Parts 107, 171-177]	Federal regulations were established for the safe and secure transportation of hazardous materials in commerce under the federal hazardous materials transportation law (49 USC §5101 et seq.). These regulations are applicable to those who cause hazardous materials to be transported and to those who manufacture or maintain a packaging or a component of a packaging qualified for use in the transportation of a hazardous material.	Applicable

TABLE 3-3
LIST OF POTENTIAL ACTION-SPECIFIC ARARs AND TBCs
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

Requirement	Description	ARAR or TBC
	TSCA Disposal Standards	
PCB Remediation Waste [40 CFR §761.61(c)]	TSCA §761.3 defines PCB remediation wastes. Concrete impacted by PCBs from a PCB-containing paint is a PCB remediation waste. PCB remediation wastes may be disposed of by self-implementing on-site cleanup and disposal (§761.61(a)) or a performance based disposal option listed under §761.61(b) (e.g., decontamination as described under §761.79). U.S. EPA approval of (1) the sampling, cleanup, or disposal of a PCB remediation waste in a manner other than prescribed §761.61(a) and §761.61(b) or (2) the storage of PCB remediation waste in a manner other than prescribed in §761.65 must be obtained under §761.61(c).	Applicable
PCB Bulk Product Waste [40 CFR §761.62(c)]	TSCA §761.3 defines PCB bulk product waste. Paint that, at the time of manufacturing, contained PCBs at concentrations greater than 50 ppm are considered a PCB bulk product waste. PCB bulk product wastes may be disposed of via one of the performance based disposal options listed under §761.62(a) (e.g., in a hazardous waste landfill, by thermal decontamination, or the decontamination provisions described under §761.79) or in a solid waste landfill based on its leaching characteristics as described in §761.62(b). There are no cleanup levels for PCB bulk product wastes. U.S. EPA approval of (1) the sampling, cleanup, or disposal of a PCB bulk product waste in a manner other than prescribed §761.62(a) and §761.62(b) or (2) the storage of PCB bulk product waste in a manner other than prescribed in §761.65 must be obtained under §761.62(c).	Applicable
PCB Decontamination Standards and Procedures: Alternative Decontamination or Sampling Approval [40 CFR §761.79(h)]	§761.79 lists decontamination standards (§761.79(b)) and confirmation sampling requirements (§761.79(f)) for variety of impacted media, self-implementing decontamination procedures in §761.79(c), and use of decontamination solvents in §761.79(d). §761.79(h) applies to the decontamination of a material in a manner other than described in §761.79(b), the decontamination of a material using a self-implementing procedure other than prescribed in §761.79(c), and to the sampling of a decontaminated material other than that prescribed in §761.79(f). Cleanup levels and sampling locations and frequencies must be developed in consultation with the U.S. EPA.	Applicable
PCB Decontamination Standards and Procedures [40 CFR §761.79(b)]	For unrestricted use of non-porous surfaces, under 761.79(b)(3) the following apply: ● ≤10 ug/100 cm^2 for non-porous surfaces in contact with liquid PCBs; and ● NACE Visual Standard No. 2 for non-porous surfaces in contact with non-liquid PCBs (e.g., PCB-containing paint). For unrestricted use of concrete, under 761.79(b)(f), the following apply: ● ≤10 ug/100 cm^2 if cleanup begins within 72 hours of spill. *(Note: No approved decontamination standards and procedures or cleanup levels are listed for concrete in contact with non-liquid PCBs (e.g., PCB-containing paint))*	Relevant and Appropriate
Disposal of PCB wastes (50 ppm or greater) [40 CFR §761.65(a)]	§761.65(a) requires disposal of PCB wastes with concentrations 50 ppm or greater within one year of storage.	Applicable

TABLE 3-3
LIST OF POTENTIAL ACTION-SPECIFIC ARARs AND TBCs
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

Requirement	Description	ARAR or TBC
	Other Federal Regulations	
NCP [40 CFR §300.430(e)(9)(iii) and 40 CFR §300.430(f)]	The NCP is the federal government's framework for responding to both oil spills and hazardous substance releases. The NCP provides a framework for evaluating removal action alternatives. Potential remedial alternatives will be evaluated against the nine criteria identified in 40 CFR §300.430(e)(9)(iii) and a preferred remedial alternative will be selected in accordance with 40 CFR §300.430(f).	Applicable
NCP [40 CFR §300.415(b)(4)(i)]	Requires the preparation of an EE/CA.	Applicable
	Other State Regulations	
Requirements for Land Use Restrictions [CCR Title 22, §67391.1]	Requires the execution and recording of a land use covenant imposing appropriate limitations on the use of the property when hazardous materials or substances remain on the property at levels not suitable for unrestricted use of the property.	Relevant and Appropriate
	Water Quality Standards	
NPDES Industrial General Permit For Storm Water Discharges and Non-Storm Water Discharges [SWRCB Order No. 97-03-DWQ and SWRCB Order No. 2014-0057-DWQ]	During implementation of the EE/CA, NASA will comply with the requirements of its Industrial General Permit for storm water water discharges.	Relevant and Appropriate
NPDES [40 CFR §122.26, §122.41(d), and §122.41(e)]	Requirements to ensure storm water discharges from remedial action activities do not contribute to a violation of surface water quality standards. All reasonable steps will be taken to minimize or prevent discharges which have a resonable lilelihood of causing adverse impacts on surface water quality (40 CFR §122.41(d)). All treatment and control systems and facilities will be properly operated and maintained (40 CFR §122.41(e)).	Applicable
	Local Guidance	
NASA Construction Safety Management [APR 8715.1, Chapter 27]	Rules set forth for work under the jurisdiction of Ames Research Center.	TBC

TABLE 3-3
LIST OF POTENTIAL ACTION-SPECIFIC ARARs AND TBCs
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

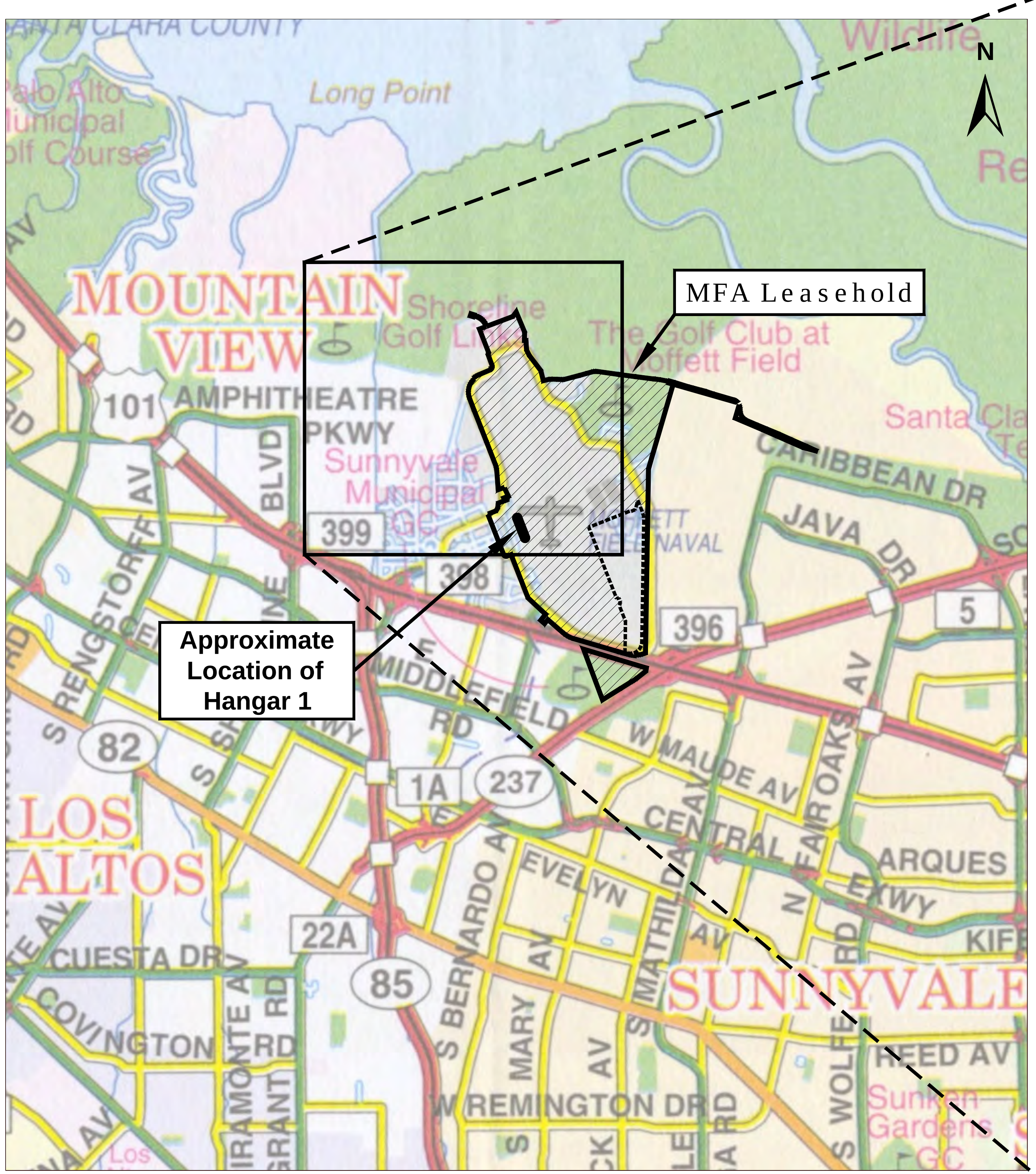
Abbreviations
ARAR: applicable or relevant and appropriate requirement
BAAQMD: Bay Area Air Quality Management District
CCR: California Code of Regulations
CFR: Code of Federal Regulations
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CWA: Clean Water Act
NASA: National Aeronautics and Space Administration
NCP: National Oil and Hazardous Substances Pollution Contingency Plan
NPDES: National Pollutant Discharge Elimination System
PCB: polychlorinated biphenyl
ppm: parts per million
RCRA: Resource Conservation and Recovery Act
STLC: soluble threshold limit concentration
TBC: to be considered
TCLP: toxicity characteristic leaching procedure
TSCA: Toxic Substances Control Act
TTLC: total threshold limit concentration
Water Board: Regional Water Quality Control Board, San Francisco Bay Region

TABLE 4-1
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

Alternative	**Alternative Description**	**Threshold Criteria**		**Primary Balancing Criteria**				
		Overall Protection of Human Health and the Environment	*Compliance with ARARs*	*Short-Term Effectiveness*	*Long-Term Effectiveness and Permanence*	*Reduction of Toxicity, Mobility, or Volume Through Treatment*	*Implementability*	*Present Value Cost*
Alternative 1	No Action	Low: With no action, degradation of the existing CM15 epoxy coating would result in the release of PCBs, lead, and/or asbestos to the environment and in potential unacceptable risks to both human and ecological receptors.	Not applicable: ARARs only apply to removal and/or remedial actions. With no action there will be no removal and/or remedial actions.	Low: With no action, degradation of the existing CM15 epoxy coating would result in the release of chemicals to the environment and result in potential unacceptable risks to both human and ecological receptors.	Low: With no action, the existing CM15 epoxy coating would continue to degrade.	Low: No reduction in toxicity, mobility, or volume of PCBs, lead, and/or asbestos at the Site.	High: This alternative is easy to implement as no actions will be conducted.	$0
Alternative 2	Implementation of ICs and OMM	Moderate: The implementation of ICs and OMM activities would be effective in protecting future receptors by controlling the exposure of these receptors to impacted materials. Workers involved with OMM activities would be protected through engineering controls and PPE.	High: This alternative would comply with ARARs.	Moderate to High: There would be minimal impact to the community and environment during implementation of this alternative. Future on-site receptors would be protected from exposure to impacted materials via the protective CM15 epoxy coating and on-Site workers involved in OMM activities would be protected through engineering controls and PPE.	Moderate: The long-term reliability of this alternative is dependent on the implementation of ICs and OMM activities by the Site owner.	Low: No reduction in toxicity, mobility, or volume of PCBs, lead, and/or asbestos at the Site.	High: The establishment of ICs and implementation of OMM is technically feasible, relatively easy to administratively implement, requires minimal services and materials, and delays or difficulties in coordinating with regulatory agencies are not likely.	$41,900,000
Alternative 3	Removal of Existing Paints - Media Blasting and Cleaning	High: This alternative includes the removal of impacted paints/coatings from the structural building materials at Hangar 1. The removal of the impacted paints/coatings at Hangar 1 would eliminate the potential for the exposure of future on-site receptors to these materials.	High: This alternative would comply with ARARs.	Moderate to High: Public health would be protected by restricting access to the work zones and workers involved in abatement activities would be protected by appropriate engineering controls and PPE. The migration of chemicals of concern from the worksite will be minimized using engineering controls and establishing contaminant reduction zones and decontamination procedures.	High: Impacted paints/coatings will be removed from the Hangar 1 building materials and disposed of at an off-Site facility in accordance with applicable laws and regulations.	Moderate: The toxicity, mobility, and volume of impacted materials at Hangar 1 would be reduced because the impacted paints/coatings would be removed from the Hangar 1 building materials and disposed of at an approved facility where they can be properly managed to control potential future releases to the environment.	High: As media blasting is a standard technology and chemical stripping of paints and coatings is a common practice, the required equipment, services, materials, and skilled workers for the implementation of this alternative are available. CERCLA-approved off-site disposal facilities have sufficient capacity to manage the waste.	$85,800,000

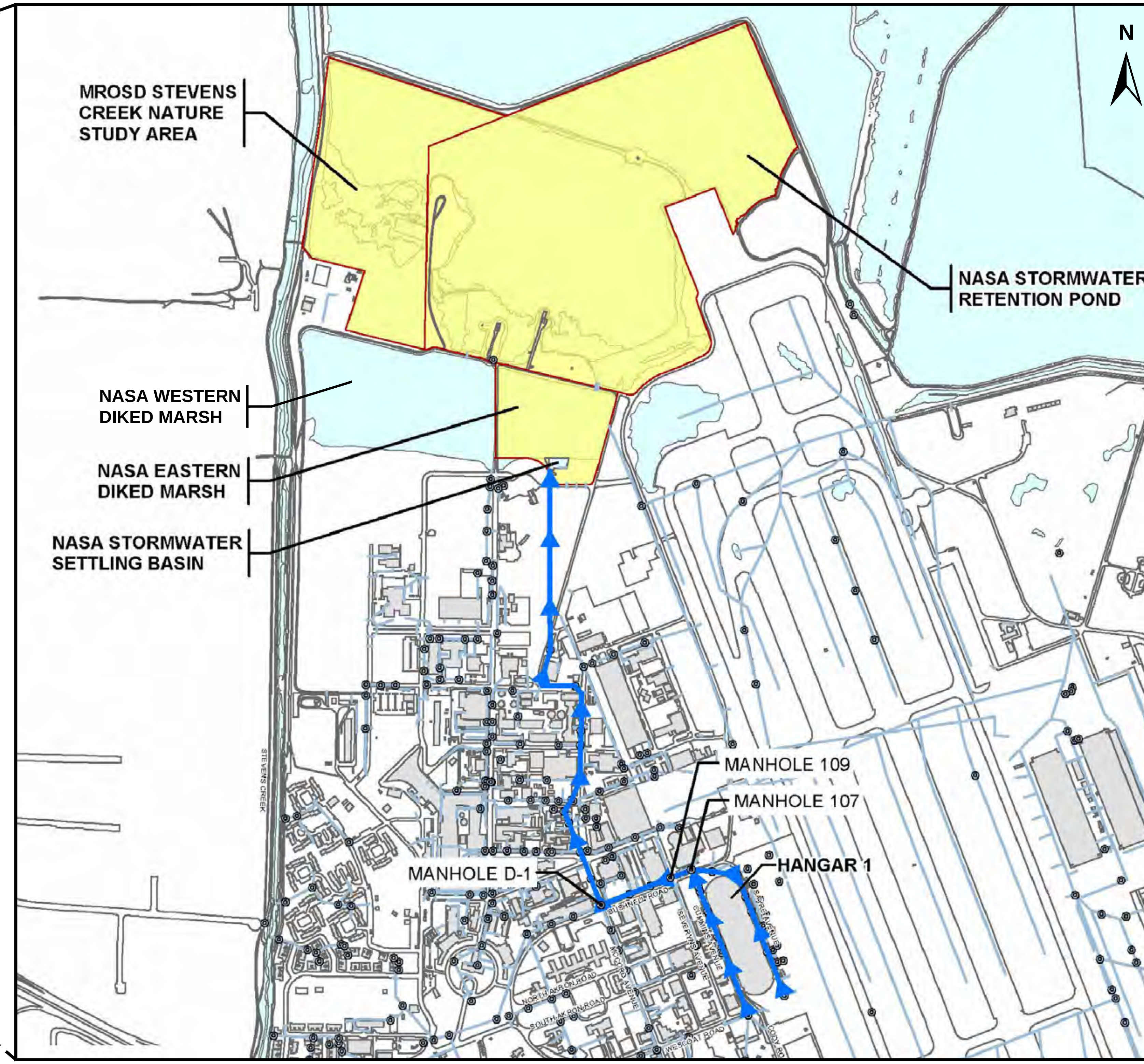
TABLE 4-1
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

Abbreviations
ARAR: applicable or relevant and appropriate requirement
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CM15: Carbomastic 15
IC: institutional control
OMM: operations, maintenance, and monitoring
PCB: polychlorinated biphenyl
PPE: personal protective equipment



Key Map

0 5,000 10,000
(Scale in Feet)



Storm Drain System

0 1,200 2,400
(Scale in Feet)

Legend:

- Manhole
- Base-Wide Stormwater System
- Stormwater Flow from Hangar 1 to Stormwater Settling Basin
- Site 25
- Building
- Water/Wetland

Notes:

1. All locations are approximate.
2. Basemap source: Rand McNally San Francisco Bay Area Regional Map, dated 2013.

Abbreviations:

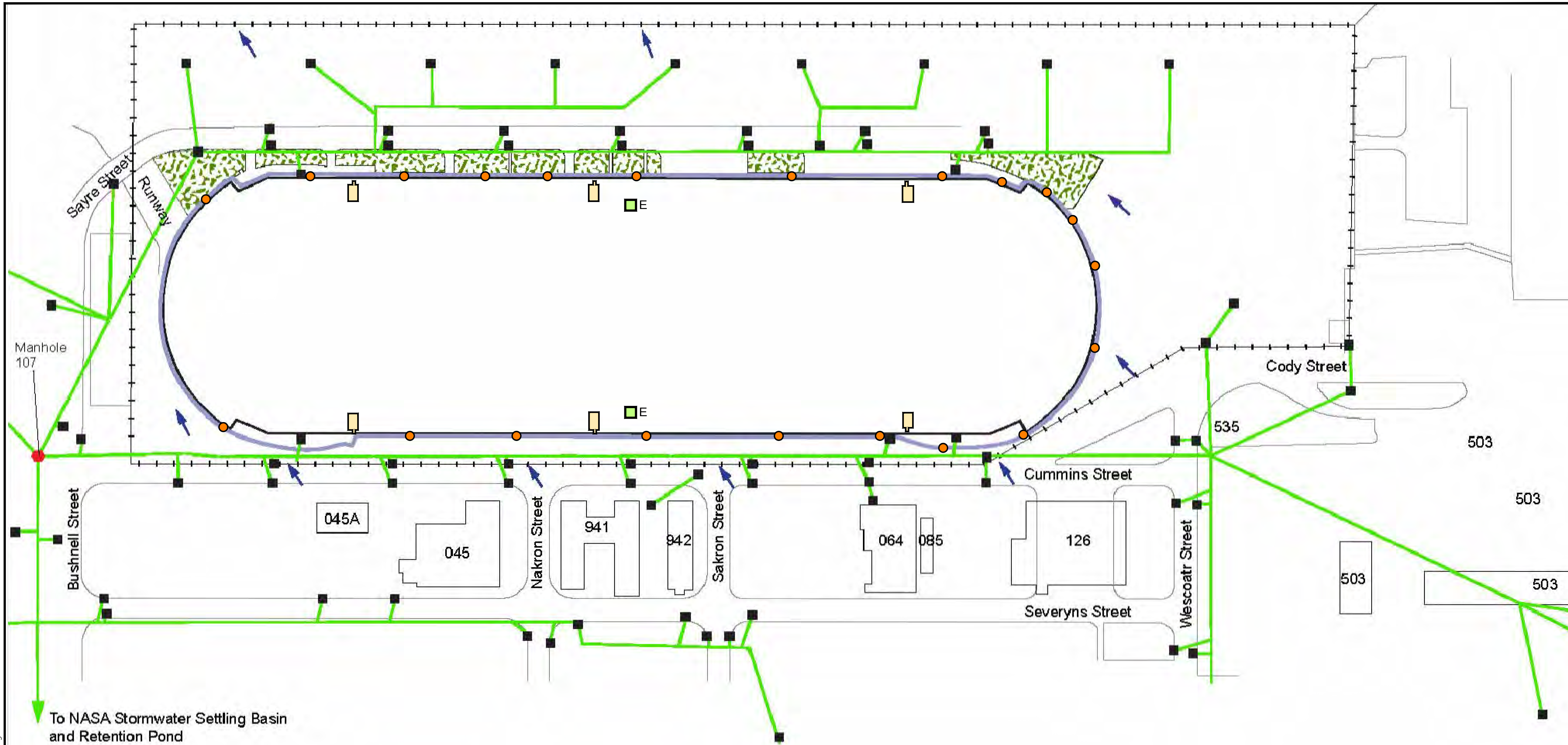
MFA	= Moffett Federal Airfield	MROSD	= MidPeninsula Regional Open Space District
NAS	= Naval Air Station	NASA	= National Aeronautics and Space Administration

MFA Leasehold Location with Storm Drain System Around Hangar 1

Former NAS Moffett Field
Mountain View, CA
August 2019
EKI B20019.19

eki environment & water

Figure 1



Legend:

- Electrical Vault
- E Elevator Pit
- Perimeter Trench Outfalls
- Storm Drain Catch Basin
- Manhole
- Hangar Perimeter Trench
- Site Boundary Fence
- Landscape Soil Areas
- Surface Flow Direction
- Storm Drains

Notes:

1. All locations are approximate.
2. Basemap source for surface features: Final After Completion Report for Non-Time-Critical Removal Action for Polychlorinated Biphenyl (PCB) Contamination, Installation Restoration (IR) Site 29, Hangar 1, Former Naval Air Station (NAS) Moffett Field, Moffett Field, California, AMEC Environment & Infrastructure, Inc., 19 November 2013.
3. Storm Drain source: Final Storm Water Pollution Prevention Plan for Non Time Critical Removal Action for Polychlorinated Biphenyl (PCB) Contamination, Installation Restoration (IR) Site 29, Hangar 1 Former Naval Air Station (NAS) Moffett Field, Moffett Field, California. AMEC Earth & Environmental, Inc., 27 May 2010.

N

0 120 240
(Scale in Feet)

Hangar 1 Footprint, Existing Surface Features, and Surface Flows and Storm Drain System

eki environment & water

Former NAS Moffett Field
Mountain View, CA
August 2019
EKI B20019.19

Figure 2

Appendix A

PCB, Lead, and Asbestos Sampling Report,

dated 24 February 2015

ACC Environmental Consultants

(Text Tables, Figures, and Photo Logs only)

PCB, Lead, and Asbestos Sampling Report
Planetary Ventures
Hangar One, Moffett Federal Airfield
Mountain View, California

ACC Project Number 1591-001.01

Prepared for:

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February 24, 2015

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1.0 INTRODUCTION

1.1 Site Location

Former Naval Air Station (NAS) Moffett Field is a Federal airfield located approximately 30 miles southeast of San Francisco and approximately 10 miles northwest of San Jose, in Mountain View, California, 94035.

1.2 Site Setting/Building Conditions

Moffett Field comprises approximately 2,200 acres and consists of an instrumented flight line with two parallel runways, adjacent taxiways and parking aprons, four maintenance hangars, support and administration buildings, and military housing. The runway system, which is oriented north-northwest to south-southeast, extends across the middle of the installation, dividing the facility in half. Aircraft and flight training operations occupy the eastern portion of the facility, and administrative buildings and base housing are located in the western portion of Moffett Field.

Hangar One is located west of the flight line and runways, situated between Sayre Avenue and Cummins Avenue. The building was originally constructed of a structural steel frame with corrugated siding and measures 1,133 feet (ft) long, 308 ft wide, and 198 ft high. The interior floor is of concrete construction. Hangar One is primarily surrounded by pavement, with several small unpaved areas adjacent to the building.

The US Navy conducted removal of asbestos, lead and Polychlorinated Biphenyls (PCB)-containing materials as part of the Non-Time-Critical Removal Action (NTCRA) at Hangar One, including removal of loose and deteriorated coatings, removal of exterior siding and roofing systems, application of epoxy and other coatings to encapsulate remaining lead and PCB containing paints on structural steel. Per the NTCRA After Action report, the following was the general sequence of remediation:

1. Interior building structures were demolished, including asbestos abatement, lead removal and stabilization and clean-up of settled dusts associated with the interior building structures.

2. Power-wash and stabilize existing interior coatings; demolish existing interior building components (e.g. offices, etc.).

3. Apply Carbomastic 15 (CM15) coating (a low VOC, high aluminum solids, epoxy coating designed to be applied over stable coatings, etc.) to encapsulate existing lead and PCB coatings on Hangar One structural steel. CM15 was reportedly spray applied during this application for a single coating. ACC also observed CM15 was applied to some concrete and CMU surfaces at Hangar One.

4. Remove asbestos, lead and PCB-containing exterior corrugated siding and asbestos-containing roofing materials.

5. Apply CM15 to the inaccessible surfaces exposed during siding removal; CM15 was reportedly brush or roller applied during this phase.

6. High-pressure washing of the concrete stem walls surrounding the perimeter of Hangar One to remove deteriorating Lead and PCB paints and coating exposed concrete with Carbocrete Sealer WB or Carboguard 1340 (the NTCRA After Action Report and Final Management Plan documents differ in which product was used).

7. Excavation of PCB impacted soil from the unpaved areas along the east side of the hangar was conducted.

8. Decontamination of the concrete floor of the hangar as well as the perimeter storm drain trench and conveyance lines adjacent to the hangar was the final stages of NTCRA activities.

As part of the process, the NTCRA activities included removal of all coatings on the metal mezzanine floor (top and bottom surfaces) running the length of each side of the structure. The bare metal mezzanine areas were first coated with Carbozinc 859, an organic zinc-rich epoxy and then over-coated with CM15. Where structural steel placement of the original structure presented “back-to-back” narrow spaces between adjoining steel, the NTCRA After Action Report stated that foam backer rod and/or Sarnafil Sikaflex 1a elastomeric caulking/sealant was applied to these areas allowing for enclosure of the inaccessible spaces.

As Lead and PCB containing paints remain at Hangar One, the Navy published a Final Long Term Management Plan for the NTCRA. The Management Plan was included in the disclosures to Planetary Ventures during the Moffett Federal Airfield (MFA) bidding process. Additionally, ACC understands NASA, the agency primarily responsible for ongoing maintenance at the site, has identified to the Planetary Ventures team that the encapsulant integrity is a concern.

1.3 Objectives and Scope of Work Summary

1.3.1 Summary of Objectives

The primary purpose of the sampling was to screen existing Hangar One conditions for potential Contaminants of Concern (COCs) related to the proposed Planetary Ventures (PV) re-use related to regulatory compliance and project planning, including:

a. Identification screening of PCB, lead and asbestos suspect materials/residues remaining at the Hangar One site per Cal-OSHA Hazard Communication, Lead-in-Construction, and Asbestos-in-construction standard and possible waste management requirements.

b. Determine health and safety work practices for construction, renovation, long term management requirements and other occupancy related activities for potential re-use of the Hangar One facility, including installation of the planned exterior “skin” of the structure.

c. Determine background levels of COCs at the Hangar One facility to document existing conditions prior to PV activities at the site and assist with identification of potential existing conditions to the Navy and NASA for implementation of appropriate management practices, corrective actions and repairs.

Secondary objectives, where feasible, included assisting the Navy, NASA, EPA and Water Board in defining the following conditions where objectives overlap, however PV is not the responsible party for existing site conditions and encourages responsible parties to conduct their own assessment to meet regulatory, site and facility compliance and remediation objectives. The following secondary objectives were included as part of this sampling effort:

d. Upwind and downwind wipe and air sampling (including samples collected beyond the “drip-line” and storm drainage footprint of Hangar One locations relative to Hangar One siting to screen for potential lead migration to the properties from off-site sources. The upwind and downwind samples were collected outside the perimeter Hangar One trench drain system as indicated on Figure 2. Additionally, air sampling inside the Hangar footprint was conducted at the same time for comparison purposes.

The following secondary objectives as stated in the Sampling Plan dated July 28, 2014 were *not* completed due to restrictions placed on PV Team by NASA for accessing the facility, especially at elevated heights:

e. Wipe sampling of accessible, uncoated, and "new" steel roof-top catwalk surfaces at Hangar One to provide additional screening of lead settled dust at the site but not subject to 1) original PCB and Lead containing coatings and 2) above potential storm water run-off over original PCB and Lead containing coatings for comparison purposes.

f. General identification, location and rough order of magnitude of quantities of accessible deteriorated coating conditions based on visual assessment.

2.0 BACKGROUND

2.1 Previous Site Inspection Summary

NASA and the US Navy have communicated to the PV Team that several PCB, Lead and Asbestos surveys have been conducted at Hangar One facility.

The US Navy provided available copies of historical surveys addressing asbestos, lead and PCBs in construction materials. These reports were reviewed in detail by ACC; the reports primarily addressed construction materials related to the original Hangar 1 "Skin" and materials related to interior improvements removed by the NTCRA activities. Very limited information related to the existing coatings was included in the historical survey documentation and are addressed below.

The US Navy forwarded the July 30, 2008 Engineering Evaluation / Cost Analysis (Revision 1) prepared by Tetra Tech, which includes a summary of key results from previous investigations (Table 2-1) and references various sediment, stormwater and building materials surveys; however, the document does not provide specific sampling data with laboratory reports.

The November 2013 Final After Action Completion Report for NTCRA prepared by AMEC Environment & Infrastructure, Inc. summarized the original structural steel and other coatings at Hangar One, which remain at the property over-coated by the CarboLine products used during the NTCRA.

> *"PCBs were also detected in the paint used to coat the steel support structure. Aroclor 1260 was detected in the structural steel paint coating at concentrations up to 120 mg/kg, and Aroclor 1268 was detected at concentrations up to 94 mg/kg. Total PCBs were detected in the paint at concentrations ranging from 65 mg/kg to 214 mg/kg. Paint coatings of similar appearance were present on redwood ceiling and catwalk planks; these were not analyzed but were assumed to contain similar concentrations of PCBs and were removed during demolition. The PCB concentration in the paint samples was found to be orders of magnitude less than the PCB concentration in the siding materials, indicating the source of PCB contamination at the site was primarily derived from the siding, which was ultimately removed during the NTCRA.*
>
> *In addition to PCBs, lead was detected in the paint that covered Hangar One siding, doors and steel support structure, at maximum detected concentrations of 200,000 mg/kg (20 percent by weight). Asbestos was also detected in various building materials, including the siding panels and roofing materials."*

ACC was also provided the following historical surveys of Hangar One for review by the Navy:

- Lead Based Paint Survey Report, Hangar 1, prepared by Benchmark Environmental Engineering, dated December 3, 2001.
- Polychlorinated Biphenyl, Lead and Asbestos Sampling Report, Hangar 1, prepared by Benchmark Environmental Engineering, dated January 9, 2003 (contains duplicate of the December 3, 2001 Lead Paint Survey by Benchmark and certain appendices of the AMEC July 2010 Report).
- Report and Summary of Hangar 1 Environmental Sampling, prepared by DMJMH+N, dated May 7, 2003.
- Hangar 1 Interior Paint Sampling Report, prepared by Integrated Science Solutions, Inc., dated August 30, 2005.

- Asbestos Survey Report Non Time Critical Removal Action for Polychlorinated Biphenyl (PCB) Contamination at Installation Restoration Site 29, Hangar 1, Prepared by AMEC Earth & Environmental, Inc., dated July 2010.

Navy, EPA and the Water Board have suggested that the sampling summary included in the NTCRA and Navy Long Term Management Plan should be adequate for basis of characterization of remaining materials at Hangar One for PV uses. Although these summaries provide a broad range of concentrations for the target COCs, the summaries do not provide adequate documentation necessary to support the data under regulatory requirements (Cal-OSHA, DTSC, EPA, etc.) for characterization of the materials and defensibility of the data.

Criteria for considering inclusion of the historical sampling focused on the presence and availability of the following information as part of each document for PV and compliance purposes:

- A unique sample number
- Description of the component or material tested
- Location of the sample
- Individual sample results for the analytes tested
- Availability of supporting laboratory reports and Chain of Custody forms

Of the historical reports submitted to PV Team for review, the following reports met the above criteria for consideration of historical data for materials that remain at the site:

- Lead Based Paint Survey Report, Hangar 1, prepared by Benchmark Environmental Engineering, dated December 3, 2001.

ACC has included a summary of the historical sampling applicable to current Hangar One conditions in Table 2a. The predominant screening tool used for the historical surveys was an X-ray Florescence device (XRF) designed to identify lead concentrations without disturbance and has limited use for OSHA compliance.

2.2 Current Site Conditions

As reported by PV Team, NASA has commented that the encapsulant applied to remaining PCB and Lead coatings at Hangar One have deteriorated in certain areas. Based on this information, ACC conducted a general visual screening of the CM15 coatings accessible from ground and mezzanine areas during ACC's initial site walk with PV on April 7, 2014, the April 21, 2014 sampling event, and June 24, 2014 visits to the site; however, ACC did not conduct a thorough coating condition survey as identified as part of the ongoing suggested activities as part of Section 3 of Hangar One Long Term Management Plan (LTMP).

The LTMP identifies that a coating condition assessment every three years from completion of the NTCRA, identified as September 2012 (however, the 12-year Coating Warranty was signed and dated July 11, 2013).

ACC observed four general types of coating issues related to the encapsulant:

- Isolated coating failure, where the encapsulant has delaminated from the existing substrate.
- Encapsulant deterioration due to underlying original coatings edges are separating from substrate causing loose and peeling conditions (e.g. poor stabilization/prep work).
- Evidence of substrate rust break-through of the coatings.
- Missing or thinly applied coatings where original substrate or paints were observed.

Based on visual observations of the 1st floor and mezzanine level accessible structural steel, ACC typically found approximately 50 to 100 square feet of delaminated or deteriorated coatings per major truss section, measuring approximately 72 linear feet of perimeter section, with 26 sections per floor, plus hangar doors, ACC estimates that the quantity of deteriorated paint is approximately 2,600 to 5,200 square feet at the 1st floor and mezzanine levels.

The deteriorated coatings observed by ACC were typically found along the reference East and West elevations of the structure at ground and mezzanine levels with no specific pattern to the deteriorated conditions (with exception that the majority of deteriorated conditions appear to be in areas where original coatings were loose and peeling). The largest area of deteriorated coatings ACC observed was approximately 8-10 square feet in size; most deteriorated areas were less than 3 square feet.

Additionally, ACC was provided access to the mezzanine and roof-top catwalk area of the structure on June 24, 2014 for additional visual inspection of paint conditions. ACC observed similar conditions on the mezzanine during this visit as noted above.

ACC's observations for structural steel coatings visible from the roof-top catwalk areas (generally 20-feet out from the catwalk platform) identified rust-through of the coatings as the more predominant deteriorated condition rather than the delamination or lifting edges of underlying coatings prevalent on the ground and mezzanine levels. ACC estimates the roof-top catwalk visible deteriorated surfaces averaged approximately 20-40 square feet for each major truss section each side of the catwalk area.

Example photographs of typical deteriorated conditions are included in Photo Log 4.

3.0 WIPE, BULK & AIR SAMPLING

3.1 Sampling Approach

ACC conducted sampling to characterize existing paints & coatings and screen for potential Contaminants of Concern (COC) related to the Planetary Ventures reuse of Hangar One, including PCB, lead, other metals and asbestos containing building materials. The sampling is designed to confirm, locate and quantify known PCB and lead containing materials and identify additional suspect materials to properly characterize Hangar One facility for compliance with local, state and federal regulations (e.g. OSHA, EPA and DTSC requirements), NASA Health and Safety Programs and other applicable requirements.

The sampling approach included:

a. Targeted wipe sampling of coatings and other surfaces, including at representative site conditions including:

    i. On intact encapsulants/over-coated surfaces
    ii. Below or on deteriorated or exposed original coatings
    iii. Locations of ponding water or where sediment has accumulated (both on concrete and structural steel components).
    iv. Visually clean concrete surfaces
    v. Upwind and downwind wipe sampling including samples collected beyond the "drip-line" and storm drainage footprint of Hangar One locations relative to Hangar One siting.

   Bulk sampling of the existing coatings to determine levels of Lead, PCB and other COCs (e.g. CAM 17 metals), which was encountered as part of O&M responsibilities, planned renovations or abatement activities. Bulk sampling should include characterization of suspect asbestos containing materials remaining at the site (e.g. paints, caulking's, residual construction materials, etc.).

b. Bulk sampling of stem walls and/or concrete slab components to determine possibility of PCB, lead and other metals migration into shallow concrete layers in anticipation of repairs to spalling areas and/or other potential renovation related for impacted foundation areas.

c. Identification of other potential contaminants of concern (COC) (e.g. cadmium, chromium, other compounds (via bulk sampling) which may be of concern to Planetary Ventures and/or their Healthy Materials List. The primary Planetary Ventures / Google Healthy Material List (dated 3/27/13 as provided by Google REWS Team) constituents which may be present at the site include:

    i. Asbestos
    ii. Cadmium
    iii. Lead
    iv. Mercury

d. Additional metals (CAM 17 metals) analysis to screen for potential waste stream concerns and regulatory required waste characterization.

e. Upwind and downwind wipe sampling of unpainted surfaces outside the footprint of the Hangar One structure or its drainage area.

All activities were undertaken in accordance NASA Permit 14PV2.000.002 and in compliance with the NASA Ames Research Center Burrowing Owl Habitat Management Plan (BOHMP). No nesting birds were identified in areas accessed during the sampling events.

3.2 Sampling Rationale

Sampling rationale is based on requirements of the following regulations applicable to Planetary Ventures reuse of Hangar One, including, but not limited to:

a. Cal-OSHA Construction and General Industry Standards
    i. 8 CCR 1532.1 – Lead in Construction Standard
    ii. 8 CCR 5198 – Lead General Industry Safety Orders
    iii. 8 CCR 1529 – Asbestos in Construction Standard
    iv. 8 CCR 5208 – Asbestos General Industry Standard
    v. 8 CCR 5141 – Control of Harmful Exposure to Employees
    vi. 8 CCR 5194 – Hazard Communication

b. US EPA Regulations
    i. 40 CFR 761.61 – PCB Remediation Waste
    ii. 40 CFR 763 – Asbestos Hazard & Emergency Response Act
    iii. 40 CFR 61 subpart M – National Emissions Standard for Hazardous Air Pollutants (Asbestos)

c. California Department of Toxic Substances Control
    i. 22 CCR 66261.24 – California Hazardous Waste Classification (Toxicity)

d. California Department of Public Health
    i. 17 CCR 25001 – Accreditation, Certification and Work Practices for Lead Based Paint and Lead Hazards

e. Bay Area Air Quality Management District
    a. Regulation 11, Rule 2 – Asbestos Demolition, Renovation & Manufacturing

Furthermore, the March 1, 2005 Environmental Issues Management Plan (EIMP) for the NASA AMES Research Park, prepared by Erler & Kalinowski, Inc. (EKI) includes the following information related to asbestos, lead and PCB requirements at the NASA Ames Research Park (Site), including Hangar One building. Based on their summary, Planetary Ventures is required to appropriately characterize current building systems for suspect asbestos, lead and PCB materials.

> *"6.4 Management of Asbestos Containing Debris*
>
> *Asbestos-containing material (ACM) may be present in existing buildings at the Site. In the event an existing building is to be demolished, the developer and its contractor shall abide by the requirements in the NASA-ARC Asbestos Management Plan (Chapter 30 of the NASA-ARC Health and Safety Manual). Among other things, the Asbestos Management Plan requires a pre-demolition survey for the presence of ACM, and the removal and management of ACM in accordance with all applicable government regulations and with oversight by the NASA-ARC Safety, Health & Medical Services Office. As described in Section 2.6.1, NASA has completed ACM surveys for all pre-1998 buildings within the NRP area. The project developer shall contact the NASA-ARC Safety, Health & Medical Services Office to obtain copies of the ACM surveys conducted for the buildings it intends to demolish or renovate.*
>
> *All persons who manage construction or maintenance projects, disturb, handle, store or dispose of ACM located on NASA property shall conduct operations in compliance with the Asbestos Management Plan and all applicable governing regulatory agency regulations and guidelines pertaining to ACM. A copy of the NASA-ARC Asbestos Management Plan may be obtained from the NASA-ARC Safety, Health & Medical Services Office.*
>
> *6.5 Management of Debris Containing Lead-Based Paint*
>
> *Lead-based paint has been used in existing buildings at the NRP, and residues from lead-based paint occur in surface soil adjacent to buildings where lead-based paint was used (CWMI, 1993; Weston, 1998; Mactec, 2003a). As such, lead-containing material ("LCM") will be encountered during redevelopment. In the event an existing building is to be demolished, or when painted debris is encountered during development, the developer and its contractor shall abide by the requirements in the NASA-ARC Lead Management Plan (Chapter 35 of the NASA-ARC Health and Safety Manual). Among other things, the Lead Management Plan requires a pre-demolition survey for the presence of LCM, and the removal and management of LCM in accordance with all applicable government regulations and with oversight by the NASA-ARC Safety, Health & Medical Services Office. As described in Section 2.6.2, NASA has conducted surveys for the presence of lead-based paints in all pre-1998 buildings within the NRP area. The project developer shall contact the NASA-ARC Safety, Health & Medical Services Office to obtain copies of the lead-based paint surveys that have been conducted at buildings it intends to demolish or renovate.*
>
> *All persons who manage construction or maintenance projects, disturb, handle, store or dispose of LCM located on NASA property shall conduct operations in compliance with the Lead Management Plan and all applicable governing regulatory agency regulations and guidelines pertaining to LCM. A copy of the NASA-ARC Lead Management Plan may be obtained from the NASA-ARC Safety, Health & Medical Services Office. Procedures for managing soil impacted by lead-based paint are discussed further in Section 6.10.1.*
>
> *6.6 Removal of PCB-Containing Equipment*
>
> *Equipment containing PCBs may be located on sites subject to redevelopment. In the event removal of PCB-containing equipment is to be performed during redevelopment, NASA and the developer shall abide by the requirements in NASA-ARC's Polychlorinated Biphenyl Management policy (Chapter 9 of the NASA Ames Environmental Management Handbook). Among other things, NASA's Polychlorinated Biphenyl Management policy requires the removal and management of PCB-containing equipment in accordance with all applicable government regulations and with oversight by the NASA-ARC Environmental Services Office.*
>
> *A copy of the NASA-ARC Polychlorinated Biphenyl Management policy may be obtained from the NASA-ARC Environmental Services Office."*

3.3 Wipe Sampling for PCB and Metals

NASA authorized the ACC/Planetary Ventures team to conduct preliminary wipe sampling at Hangar One structure on Monday, April 24, 2012 under observation of NASA representatives. The preliminary wipe sample screening was conducted by ACC in a non-destructive manner and did not undermine the integrity of original paints and/or overcoat/encapsulants applied as part of the NTCRA efforts.

NASA required all wipe sampling for the April 24, 2014 effort to be conducted from the ground level of the structure without the use of ladders or other access devices per NASA's approval of the wipe sampling strategy, thereby limiting representative sampling areas generally accessible from the mezzanine and higher elevations. As an example, ACC would have liked to collect wipe samples from horizontal members at the mezzanine level that are prone to collecting rain water and condensation from dew and fog.

Given the access limitations requested by NASA, ACC collected the following targeted sampling of representative coating conditions for PCB and lead wipe characterization as part of the preliminary April 24, 2014 screening:

- Intact encapsulant/paint over structural steel (9 samples)
- Structural steel below deteriorated encapsulant/exposed original paint (6 samples)
- Base of steel columns where water/sediment pools (4 samples)
- Visually clean concrete floor areas (4 samples)
- Concrete floors where water/sediment pools (4 samples)
- Concrete/Concrete Masonry Unit (CMU) walls (4 samples)

A total of 31 samples were collected (not including field QA/QC blanks) during the April 24, 2014 screening.

ACC conducted subsequent wipe sampling at the Hangar One location between August 6, 2014 and August 13, 2014. The sampling included collection of the following targeted conditions present at the site per the Sampling Plan:

- Intact encapsulant/paint over structural steel (2 additional samples)
- Structural steel at exposed original paint (1 sample)
- Base of steel columns where water/sediment pools (2 additional samples)
- Visually clean concrete floor areas (4 additional samples)
- Concrete floors where water/sediment pools (4 additional samples)
- Horizontal structural steel components where evidence of pooling water or sediment is visible (8 samples)
- Upwind areas outside the Hangar One footprint/storm water run-off areas (6 samples)
- Downwind areas outside the Hangar One footprint/storm water run-off areas (6 samples)

33 additional samples were collected (not including field QA/QC blanks) during the August 2014 screening, for a total of 64 wipe samples.

The prevailing upwind and downwind wipe sampling was requested by the EPA and Water Board for comparison purposes to the Hangar One wipe sampling to ascertain if lead concentrations identified during the April 21, 2014 sampling event may have originated from or contributed to sources beyond Hangar One; samples were collected from ground level, unpainted surfaces (e.g. concrete) outside the footprint of Hangar One and its watershed area.

Furthermore, ACC collected a total of 13 QA/QC field blanks during the two sampling events. Refer to Section 4.8.3 for a discussion of Wipe Sample Field Blanks.

All wipe samples were collected in accordance with applicable sampling protocol identified in Sections 3.31 and 4. Samples were delivered under standard chain of custody protocol to McCampbell Analytical, Inc. (MAI), an independent laboratory accredited under the California Department of Public Health (CDPH) Environmental Laboratory Accreditation Program (ELAP/NELAP) for PCBs, Lead and other metals. MAI's ELAP certificate number is 1644 and expires October 31, 2015; their NELAP certificate number is 12283CA and expires June 30, 2014.

Tables 1 and 1a summarizes the preliminary screening PCB, lead and other metals wipe sample analytical results; Figure 1 identifies sample locations of the wipe sampling at Hangar One and Figure 2 for upwind and downwind sample locations; and the McCampbell Analytical, Inc. Analytical Reports for the Wipe Sample Screening are included in the Appendices.

3.3.1 Standard Procedures for Wipe Sampling

ACC collected wipe samples of representative surfaces, including coated structural steel components and floor surfaces. Samples will screen for PCB and metals concentrations (e.g. lead) to supplement existing data available from the NTCRA activities. Sampling will follow appropriate EPA sampling guidelines and analytical methodology (e.g. EPA 8082 for PCB analysis, etc.).

For floors and other flat surfaces: ACC identified the sample area (the area to be wiped). The sample area for floor samples were a minimum of 1 square foot for metals and 100 square centimeters for PCBs. Reusable templates or taped areas defining the extent of the sampling area were used to define the boundary of each wipe sampling area. Templates were cleaned after each use, tape used to define sampling areas was not be reused. Taped sampling areas provided at least 1/2 inches wide boundary, applied to the perimeter of the sample area to form a square or rectangle and be positioned in a straight line and corners should be nominally at right angles.

2" wide low-tack painters tape was used to outline sampling areas where template use is not feasible. The low-tack painters tape use was designed to not lift or otherwise disturb intact and well adhered painted surfaces. No incident was encountered where the tape used by ACC caused delamination of the existing NTCRA coatings.

PCB wipe samples were collected in accordance with EPA requirements and ASTM D6661-10 "Standard Practice for Field Sampling of Organic Compounds from Surfaces Using Wipe Sampling" using clean sample wipes saturated with hexane. Each sample was collected over an area of 100 square centimeters and immediately placed in a glass vial with a tight fitting cap. All samples were maintained in chilled condition, delivered under standard chain-of-custody protocols and analyzed in accordance with EPA Method 8082 by McCampbell Analytical, Inc., located in Pittsburg, CA.

Metals (e.g. Lead) wipe samples were collected in accordance with EPA, CDPH, and ASTM E1728-10 "Standard Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination" (or for other metals, ASTM D6966-13 "Standard Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Determination of Metals") requirements using clean sample wipes saturated with deionized water or premoistened wipe. Each sample was collected over an area of 1 square foot and immediately containerized in a plastic, non-porous centrifuge tube. All samples were maintained in chilled condition, delivered under standard chain-of-custody protocols and analyzed in accordance with NIOSH Method 9100/7082 and/or /EPA Method 6010/6020 by McCampbell Analytical, Inc., located in Pittsburg, CA or Forensic Analytical Laboratories, Inc. in Hayward, CA.

Wipe Sampling activities were conducted according to the following steps:

a. Clean the Sampling Template
b. Don new, powder-free disposable gloves
c. Install the sampling template on the surface to be sampled without disturbing coatings or settled dust; tape down
d. Select wipe, ensure moist & free from dust, fungus or material
e. Place at one corner, make first pass side to side in an "s" motion for template opening

f. Fold wipe over (dirty side in), make second pass, top to bottom in an "s" motion
g. (For lead/metals only) Fold wipe over (dirty side in), make third pass, around the edge of the template
h. Fold wipe over and place in centrifuge tube
i. Label container, note sample location on drawing & log on chain of custody form
j. Place in cooler / transport container
k. Note sampling area dimension or size
l. Discard gloves

3.3.2 PCB Wipe Sample Results

All (31) PCB wipe samples collected during the April 24, 2014 sampling event were below the reporting limit of 0.005 micrograms per 100 square centimeters (0.005 µg/100 cm2) and also below the NTCRA published target criteria of 10 µg/100 cm2.

Wipe sample results from the August 2014 sampling event deviated from the April 2014 findings with detectable levels of PCBs in certain samples. The following table summarizes the August 2014 findings as divided by the Sample System/Coating Condition used to identify sampling groups:

Sampling Group	**# of Wipe Samples** *(August 2014 Only)*	**PCB Results – Geographic Mean** *(µg/100 cm2)*	**NTCRA PCB Target Clearance Level**
Concrete Floor – Clean	4	No PCB's Detected	***10 µg/100 cm2***
Exposed Original Paint (on Structural Steel)	1	No PCB's Detected	
Intact Encapsulant/Paint over Structural Steel (Vertical, ground accessible components)	2	No PCB's Detected	
Concrete Floor – Evidence of Pooling/Sediment	4	**262.3**	
Ponding Water Areas – Horizontal Structural Steel	8	**0.78**	
Base of Steel Column – Evidence of Evidence of Pooling/Sediment	2	No PCB's Detected	
Upwind Wipe Sampling *(Includes sampling areas of clean concrete, evidence of pooled water/sediment, clean metal substrates)*	6	No PCB's Detected	
Downwind Wipe Sampling *(Includes sampling areas of clean concrete, evidence of pooled water/sediment, clean metal substrates)*	6	No PCB's Detected	

Presence of detectable PCBs in the August 2014 wipe sampling event indicates PCB contamination continues to exist within Hangar One. The source of PCB concentrations found in both the concrete floor and horizontal structural steel members where water and sediment pools (geometric mean of 262.3 and 0.78 µg/100 cm2 respectively) is likely from either residual PCB concentrations on structural steel left from the NTCRA activities or from water washing over deteriorated NTCRA encapsulants. Furthermore, the geometric mean concentrations found in the pooled areas of the ground floor concrete slab exceeds the NTCRA PCB Target Clearance Level. *(Note: The published NTCRA clearance levels appear to be used only for wipe sampling of the concrete floor after the NTCRA activities.)*

The absence of PCBs in the upwind and down-wind PCB samples outside the Hangar One footprint and drainage areas further reinforces that the source of PCB concentrations is unlikely from an off-site source.

Refer to the Table 1 Summary and attached laboratory results for more information. Figure 1 identifies wipe sampling locations; Figure 1.1 identifies ground level wipe sample locations relative to the NTCRA clearance wipe sampling locations.

3.3.3 Metals Wipe Sampling Results

Out of 31 lead wipe samples, 19 samples were found to have lead concentrations above the NTCRA published target criteria of 40 micrograms per square foot (µg/ft2).

The individual representative sampling surfaces are summarized below:

Sampling Group	**# of Wipe Samples** *(August 2014 Only)*	**Lead Results – Geographic Mean** *(µg/ft2)*	**NTCRA Lead Target Clearance Level**
Concrete Floor – Clean	8	**124.6**	***40 µg/ft2*** ***(NASA Lead Management Plan allows for 400 µg/ft2)***
Concrete/CMU (Coated with CM-15)	4	15.4	
Structural Steel below Deteriorated Encapsulant/Paint (Vertical, ground accessible components)	6	**47.0**	
Exposed Original Paint (on Structural Steel)	1	**67.0**	
Intact Encapsulant/Paint over Structural Steel (Vertical, ground accessible components)	11	**41.3**	
Concrete Floor – Evidence of Pooling/Sediment	8	**868.6**	
Ponding Water Areas – Horizontal Structural Steel	8	**784.7**	
Base of Steel Column – Evidence of Evidence of Pooling/Sediment	6	**2,744.7**	
Upwind Wipe Sampling *(Includes sampling areas of clean concrete, evidence of pooled water/sediment, clean metal substrates)*	6	22.8	
Downwind Wipe Sampling *(Includes sampling areas of clean concrete, evidence of pooled water/sediment, clean metal substrates)*	6	30.8	

Presence of detectable lead concentrations from both the April and August 2014 wipe sampling events were identified, in the case of where water and sediment pools, concentrations are significantly above the NTCRA Target Clearance Criteria of 40 µg/ft2 and NASA's current Lead Management Plan criteria of 400 µg/ft2. *(Note: The published NTCRA clearance levels appear to be used only for wipe sampling of the concrete floor after the NTCRA activities.)*

Like the PCB findings, the source of lead concentrations found in both the concrete floor, horizontal structural steel members where water and sediment pools and the addition of the Base of Steel Columns where water and sediment pools (geometric mean of 868.6, 784.7 and 2,744.7 µg/ft2 respectively) is likely from either residual lead concentrations on structural steel left from the NTCRA activities or from water washing over deteriorated NTCRA encapsulants.

The relatively low lead concentrations identified in the upwind and down-wind metals samples outside the Hangar One footprint and drainage areas further reinforces that the source of Lead concentrations is unlikely from an off-site source.

Additionally, concentrations of other CAM 17 metals were identified in the wipe sample results. While there are no established regulatory guidelines for acceptable levels from wipe sampling, the information is useful as a screening tool for project planning activities, including protection of workers from exposure to certain constituents.

Refer to the Table 1 Summary and attached laboratory results for more information. Figure 1 identifies wipe sampling locations; Figure 1.1 identifies ground level wipe sample locations relative to the NTCRA clearance wipe sampling locations.

3.4 Bulk Sampling for PCBs, Metals & Asbestos

ACC collected representative bulk samples of existing paint coatings and other suspect materials at Hangar One to identify PCB, metals (e.g. lead) and asbestos as required by regulatory requirements prior to renovation, repair and other construction activities. Bulk sampling required removal of small areas of coatings (generally less than one square foot) to the original substrate allowing for adequate volume for characterization of the existing materials.

Sampling and analysis will follow appropriate EPA sampling guidelines and analytical methodology:

PCB Analysis:	EPA 8082
Lead/ Metals Analysis:	EPA 3050/6020 or NIOSH Method 9100/7082
Asbestos:	Polarized Light Microscopy (PLM)

Sampling was limited to accessible materials located on the ground floor due to limits imposed by NASA with the exception of the paints and coating sampling of the structure, which are considered homogenous for the structure. Additional sampling may be warranted prior to any renovation or demolition activities. Subsequent sampling should be minimal due to the “shell” nature of the structure.

3.4.1 PCB Specific Bulk Sampling

ACC sampled representative suspect accessible paints, caulkings, sealants for the presence of PCBs. Samples were delivered to an EPA accredited laboratory for analysis by the EPA 8082 Method. Samples were delivered to McCampbell Analytical, Inc. of Pittsburg, California, an American Industrial Hygiene Association (AIHA ELLAP) and California Department of Public Health certified laboratory. PCBs are most likely to be found in materials and systems installed prior to the 1979 ban.

ACC was unable to collect hydraulic fluid as originally identified in the Sampling Plan from the Hangar One Door mechanisms due to restrictions initiated by NASA. Additional sampling of hydraulic fluid is appropriate prior to any repairs and/or renovations impacting the door assemblies.

PCBs are mixtures of synthetic organic chemicals with the same basic chemical structure and similar physical properties ranging from oily liquids to waxy solids. Due to their non-flammability, chemical stability, high boiling point and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics and rubber products;

in pigments, dyes and carbonless copy paper and many other applications. More than 1.5 billion pounds of PCBs were manufactured in the United States prior to cessation of production in 1977.

PCBs have been demonstrated to cause a variety of adverse health effects, including cancer in animals. PCBs have also been shown to cause a number of serious non-cancer health effects in animals, including effects on the immune system, reproductive system, nervous system, endocrine system and other health effects. Studies in humans provide supportive evidence for potential carcinogenic and non-carcinogenic effects of PCBs. The different health effects of PCBs may be interrelated, as alterations in one system may have significant implications for the other systems of the body.

The proper identification and handling of PCB-contaminated equipment and wastes is critical to the prevention of future waste management problems. All equipment or waste containing PCBs should be properly labeled, alerting people to the requirement for special handling procedures. While procedures may vary depending on the industry or specific operation, as a general rule, any time there is a risk of contact with PCBs, appropriate protective equipment should be worn to limit contact with the skin and eyes and to protect against inhalation of PCB fumes. Such equipment may include plastic or rubber gloves, boots, overalls, aprons, face shields or self-contained breathing apparatus. For workers cleaning up a major spill containing high concentrations of PCBs, a full suit of non-porous material should be worn. Clothing that has become contaminated should be disposed of along with other PCB wastes.

PCB manufacture, use, storage and disposal are regulated by U.S. EPA under TSCA and Part 761, Title 40 of the Code of Federal Regulations (40 CFR Part 761). TSCA regulates any materials or wastes that contain PCBs at concentrations of 50 ppm (parts per million) or greater. PCB wastes are also regulated as hazardous waste by DTSC under the Health and Safety Code (HSC) and Title 22 of the California Code of Regulations (22 CCR). Criteria for determining PCB wastes are:

- total threshold limit concentration (TTLC) of 50 ppm of PCBs, and/or
- soluble threshold limit concentration (STLC) of 5 ppm of PCBs as oily liquid.

3.4.2 Lead/Metals Specific Bulk Sampling

ACC perform bulk sampling of suspect construction materials and coatings to determine lead and other metals concentrations to determine whether special handling is required during renovation & demolition activities.

ACC collected 36 bulk samples to establish lead-paint concentration for OSHA compliance and waste management purposes. Samples with detectable amounts of lead must be properly removed and disposed of according to local, state and federal regulations. Lead sampling was conducted to identify suspect lead-containing coatings that may be disturbed by project activities for the purpose of compliance with Cal-OSHA's Lead in Construction Standard and is not intended to be a "Lead Inspection" or "Lead Risk Assessment" as defined by the California Department of Public Health.

For suspect paint, ACC collected samples of major representative paints at the subject property. One to six samples of each homogenous suspect lead-containing materials was collected. Visible color, texture and substrate of suspect materials was used to determine homogeneity. Analysis of lead/metals samples was by EPA 3050/6020 or NIOSH 7082 Flame Atomic Absorption (Flame AA).

Samples were delivered to McCampbell Analytical, Inc. of Pittsburg, California, an American Industrial Hygiene Association (AIHA ELLAP) and California Department of Public Health certified laboratory, for metals analysis using NIOSH 7082.

3.4.2.1 OSHA Lead Regulation Summary

The Federal Occupational Safety and Health Administration (OSHA), has enacted a lead standard, which was adopted by the Cal/OSHA as 8 CCR 1532.1. The purpose of both standards is to protect construction workers from exposure to lead. OSHA is primarily concerned with activities that disturb paints with any detectable amounts of lead. Lead was used in most paints until the mid 1950's and was banned in amounts in excess of 0.06% by weight in 1978 for most non-industrial paints by the Consumer Product Safety Commission (CPSC).

The Cal/OSHA standard requires contractors and employers to notify the State of California Division of Occupational Safety and Health (DOSH) prior to disturbing greater than 100 square feet or 100 linear feet of material containing lead greater than 0.5%, 5,000 parts per million (weight by weight), or 1.0 mg/cm^2. The Cal/OSHA standard also requires contractors and employers who perform paint removal activities to monitor their employees to determine whether they are being exposed in excess of the action level of 30 micrograms per cubic meter of air (µg/m^3) over an eight-hour time weighted average (TWA) or the "Permissible Exposure Limit" (PEL) of 50 µg/m^3 TWA. Monitoring is performed by personal air sampling.

Even when concentrations are below the action level, an employer must provide employees with High Efficiency Particulate Air (HEPA) filtered vacuums, wetting agents and hand-washing facilities. If the exposure exceeds the action level or the PEL, other procedures such as containing the area, local exhaust ventilation, respiratory and worker protection, worker training, decontamination facilities and medical monitoring are required.

OSHA has identified several work practices that pose varying levels of lead exposure to laborers disturbing lead-containing paint. Estimated exposure levels of lead are founded on the activity itself, rather than the concentrations of lead present in paint. Therefore, as an example, paint that contains 0.5% versus 15% of lead by weight or 0.8 mg/cm^2 versus 3.5 mg/cm^2 of lead in paint could pose the same exposure levels to workers depending on the activities that cause the disturbance and the administrative and engineering controls that are followed.

The following is a summary of work activities that disturb paint, the expected exposure and the respiratory protection requirements that result as outlined in the OSHA standards:

Activities	Potential Exposure	Minimum Respiratory Protection
Class I activities include: Manual demolition, manual scraping, manual sanding, heat gun applications, general cleanup, power tool cleaning with dust collection systems and spray painting activities	50 µg/m^3 to 500 µg/m^3	Half mask air purifying respirator equipped with HEPA filters having a protection factor of 10
Class II activities include: Using lead-containing mortars, lead burning, lead riveting, rivet busting, power tool cleaning without dust collection systems, cleanup of dry expendable abrasives and abrasive blasting	500 µg/m^3 to 2,500 µg/m^3	Full face powered air purifying respirators equipped with HEPA filters having a protection factor of 100
Class III activities include: Abrasive blasting, welding, cutting and torch burning on steel structures	Greater than 2,500 µg/m^3	Full face supplied air respirator operated in pressure demand mode or other positive pressure mode (type "C")

3.4.3 Asbestos Specific Bulk Sampling

ACC perform a survey to determine the locations and quantities of all accessible friable and non-friable asbestos containing building materials (ACBMs) at Hangar One per 40 CFR 763 and 40 CFR 61 Subpart M.
The material sampling strategy was in accordance with the guidelines as outlined in the EPA publication "Asbestos in Building: Simplified Sampling Scheme for Friable Surfacing Materials". At minimum, 3 to 7 samples per homogeneous area of accessible friable material was obtained for analysis. For non-friable materials 1 to 3 samples of each homogeneous material was obtained and analyzed.

Additionally, ACC collected representative shallow bulk samples of the existing concrete foundation / stem wall at the perimeter base of Hangar One to identify PCB, metals (e.g. lead) and asbestos also prior to renovation, repair and other construction activities. ACC collected the concrete samples in areas where concrete exhibited spalling or was otherwise in poor condition.

The samples were delivered to Forensic Analytical Laboratories, Inc. of Hayward, California, an independent laboratory that participates in the bulk sample proficiency analysis program conducted by the United States Environmental Protection Agency (EPA) and is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). The samples were analyzed using Polarized Light Microscopy (PLM) with dispersion staining to estimate percent composition by volume. Samples with less than 1% (<1%) asbestos are designated as "Trace asbestos." Samples with no observable asbestiform minerals are designated as "no asbestos detected."

EPA's NESHAPS regulations define categories of asbestos-containing materials (ACM) based on their potential of asbestos fiber release when disturbed:

- Friable - Any material containing more than 1 percent asbestos that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.
- Category I Non-friable ACM (Cat 1 NF) - Asbestos-containing packings, gaskets, resilient floor covering and asphalt roofing products containing more than 1 percent asbestos.
- Category II Non-friable ACM (Cat II NF) - Any material, excluding Category I non-friable ACM containing more than 1 percent asbestos as determined using the methods specified under AHERA, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

OSHA's Asbestos in Construction Standard (Federal - 29 CFR 1910.126 and California – 8 CCR 1529) define specific "Classes" of work based on the risk of exposure to employees with the potential for disturbance of asbestos-containing materials. The classes of work are defined as

- Class 1 - Asbestos-related activities involving the removal of thermal systems insulation (TSI) and surfacing ACM or presumed ACM.
- Class 2 - Asbestos-related activities involving the removal of ACM which are not TSI or surfacing ACM.

3.4.4 PCB, Lead & Asbestos Bulk Sampling Results

Material Description	# of Samples	PCB Concentration (mg/kg)	Lead Concentration (mg/kg)	Asbestos Concentration (%)
Multi-layer/multi-color original paint on structural steel, encapsulated with CM15	7	**3.4 to 114.5**	**110,000 to 250,000**	None Detected
Multi-layer / multi-color original paint on concrete / CMU wall surfaces, encapsulated with CM15	4	**None Detected to 1,900**	**450 to 54,000**	None Detected
Carbocrete coated concrete perimeter stem walls	4	**None Detected to 1.1**	**99 to 240**	None Detected
Multi-color textured/sanded entry floor coating (Column 3 East Entry)	1	**13.0**	**140**	None Detected
Bituminous concrete expansion joint	3	**None Detected to 18**	**140 to 330**	None Detected

Material Description	# of Samples	PCB Concentration (mg/kg)	Lead Concentration (mg/kg)	Asbestos Concentration (%)
Floor trench, door trench and trench drain sediment	2	**12 to 36**	**1,300 to 12,000**	None Detected
Sanded floor paint - SW Hangar floor	1	**11**	**6,000**	None Detected
Lt. gray expansion joint caulking	2	None Detected	**54 to 590**	None Detected
Gray textured/ sanded floor paint	2	**4 to 44.6**	**260 to 15,000**	None Detected
Original concrete floor	2	**None Detected to 9.3**	**39 to 150**	None Detected
Gray cementitious leveling compound	2	**None Detected to 1.4**	**51 to 450**	None Detected
White cementitious leveling compound	2	**1.6 to 12.0**	**100 to 660**	None Detected
Lt. green floor paint	1	**2.2**	**200**	None Detected
Yellow-orange mortar/leveling compound	2	**2.6 to 7.8**	**100 to 270**	None Detected
Oil-soaked poly tape - NE Hangar Door Truck	1	None Detected	**500**	None Detected
Dr. brown Adhesive (West CL 2.5 concrete walls)	1	N/A	N/A	**2% Chrysotile** (EPA Category I Non Friable; OSHA Class 2; Approximately 40 Square Feet)
Hangar door gasket material	1	N/A	N/A	None Detected

3.5 Air Sampling Results

Prevailing upwind and downwind air sampling was requested by NASA, EPA and Water Board for comparison purposes to the Hangar One wipe sampling to ascertain if lead concentrations identified during the April 21, 2014 sampling event may have originated from or contributed to sources beyond Hangar One; samples were collected from ground level, unpainted surfaces (e.g. concrete) outside the footprint of Hangar One and its watershed area. Refer to Figure 2 for upwind and downwind sample locations.

ACC collected nine air samples (3 upwind, 3 at Hangar One and 3 downwind of Hangar One). Air samples were collected using a Sensidyne BDX-II Personal Sampling pump. All samples were collected using closed face 37-millimeter diameter cassettes equipped with 0.8-micron pore size mixed-cellulose-ester filters. All samples were properly calibrated at the beginning of sampling and checked again at the end of sampling. Samples were collected for a period of 421 to 466 minutes over three days. At the end of the sampling day, ACC packaged the samples and delivered them under standard Chain-of Custody protocols to Forensic Analytical Laboratories in Hayward, CA for analysis. All samples were analyzed in accordance with the NIOSH 7303 Method for CAM 17 metals analysis.

Additionally, ACC collected one metals air sample field blank each day of sampling.

All upwind, downwind and Hangar One air samples had no reportable lead or other CAM 17 Metals constituents reported. All air sampling field blanks were also below the limit of detection for lead and the other CAM 17 constituents.

Tables 3 summarizes the air sample results; Figure 2 for upwind and downwind sample locations; and the Forenis Analytical Laboratories, Inc. Analytical Reports for the Wipe Sample Screening are included in the Appendices.

4.0 SAMPLE HANDLING, ANALYTICAL METHODOLOGY & QUALITY CONTROL

4.1 Sample Containers

Wipe samples, lead/metals and PCB bulk samples were collected in sterile centrifuge tubes (Lead/Metals) or glass VOAs (PCBs).

Asbestos samples were collected in clean, disposable resealable plastic bags.

Samples were labeled with a unique sample number and immediately placed in a pre-chilled (if the EPA Method dictates), insulated container maintained at four degrees Celsius pending transport to the analytical laboratory. Each sample cooler was chilled with ice and no blue ice containers was used.

Standard chain of custody documentation was maintained at all times.

4.2 Sample Documentation

Each sample was designated with a unique sample number based on type of sample analysis, location of sample and other appropriate unique identifiers.

4.3 Decontamination Procedures

All sampling equipment was new disposable equipment. New clean nitrile surgical gloves was worn at each new sample location. Gloves was replaced before the collection and/or handling of every sample.

Sampling templates was cleaned between each use following ASTM D6661-10 (PCBs), D6966-13 (Metals), or E1728-10 (Lead).

4.4 ASTM Standards and EPA Analytical Methods

4.4.1 ASTM Standards

- ASTM E1728-10 - Standard Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination
- ASTM D6966-13 - Standard Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Determination of Metals
- ASTM D6661-10 - Standard Practice for Field Sampling of Organic Compounds from Surfaces Using Wipe Sampling

4.4.2 EPA Analytical Methods

An California CDPH / EPA certified analytical laboratory will analyze all samples. Select samples were analyzed by the following:

- PCBs by EPA Method 8082
- Lead by NIOSH Method 9100/7082 and/or /EPA Method 3050/6020
- Metals by EPA Method 3050/6020
- Asbestos by Polarized Light Microscopy

4.5 Laboratory Selection & Qualifications

All samples collected from Hangar One were submitted to independent laboratories with the necessary laboratory accreditations for the designated analytical methods. Laboratory accreditations are included in the Appendices. ACC used the following laboratories for sample analysis:

PCBs
McCampbell Analytical, Inc., Pittsburg, CA (MAI)

Lead/Metals
McCampbell Analytical, Inc., Pittsburg, CA (MAI)
Forensic Analytical Laboratories, Inc., Hayward, CA (FALA)

Asbestos
Forensic Analytical Laboratories, Inc., Hayward, CA (FALA)

4.6 Sampling & Analysis Quality Control

4.6.1 Field Quality Control Sampling Objectives

Field Quality Control (QC) objectives identified in ACC's sampling Plan were met during the sampling activities.

4.6.2 Technical Holding Times

All samples were analyzed within method specific holding times.

4.6.3 Wipe Sample Field Blanks

Field-equipment blank samples were collected according to ACC's Sampling Plan. For each field blank, a clean wipe (with solvent) was placed in an unused sample container after handling and exposure to a cleaned template surface. This type of blank was used to determine whether the wipes and possibly the solvent are contaminated.

ACC collected wipe sample field blanks with a minimum quantity of two or 10% of the total wipe samples collected each day for each type of constituents (e.g. metals, PCBs, etc.). ACC generally collected field blank samples at the start (prior to the start of wipe sampling) and end (after the last wipe sample is collected) of each sampling shift and at appropriate intervals (e.g. mid-morning, at lunch break, mid afternoon) where feasible.

4.6.3.1 Wipe Sample Field Blank Results

Over the course of two sampling events (April 21,2014 and August 2014), ACC collected 13 wipe sample field blanks for PCB and metals analysis. None of the 13 wipe sample field blanks were reported to contain PCBs, lead or other CAM 17 metals.

4.6.4 General Laboratory Quality Assurance

Each Laboratory followed appropriate quality control methods identified in applicable methodology and laboratory specific protocols. Quality control records are included as part of the McCampbell Analytical, Inc. reports. Where applicable, instrument performance checks, initial and continuing calibration verifications, method blanks and continuing calibration blanks, and laboratory control samples were conducted by the laboratories and no issues were reported as part of the laboratory quality assurance process.

4.6.5 Laboratory Surrogate Spike Samples

Surrogate spikes are a laboratory QA/QC method used to evaluate accuracy, method performance, and extraction efficiency during certain types of laboratory analyses. Chemical compounds utilized as surrogate spikes are compounds not normally found in environmental samples, but which are similar to target analytes in both chemical composition and behavior during the sample extraction and analytical process. The surrogate spike is added to the sample matrix and accompanies potentially existing target analytes throughout the sample extraction and analytical process.

The surrogate spike concentration is analyzed and reported as a surrogate recovery percentage (REC%), which refers to the percentage of the surrogate spike that was recovered at the end of the spiking, extraction and analytical processes. Ideally the surrogate REC% is 100% indicating that the entire surrogate spike was recovered during the extraction process and subsequently detected during the analytical process, however the REC% typically varies from more or less than 100% based on various factors.

Because surrogate REC% varies, certain EPA analytical methods dictate the use of upper and lower acceptable surrogate REC%. If the surrogate REC% is less than the lower acceptable recovery limit, it can be concluded that the analytical instrument detected significantly less of the surrogate spike than was present. If this is this case than the target analytes are typically considered biased low, meaning the reported concentration is lower than what was actually extracted from the sample media.

If the surrogate REC% is greater than the upper recovery limit, it can be concluded that the analytical instrument detected significantly more of the surrogate spike than was present. If this is this case the target analytes are typically considered biased high, meaning the reported concentration is higher than what was actually extracted from the sample media.

When the surrogate REC% is outside the acceptable limits the laboratory qualifies the data as such and validation of the data may be warranted. When the surrogate REC% is below the acceptable lower limit, the sample is biased low and often considered invalid. On the contrary, when the surrogate percentage recovery exceeds the acceptable upper limit, the data is considered biased high and may still be considered valid for the intended purpose because the conclusion can be drawn that the detected concentration of the target analyte (or corresponding reporting limit) is still a conservative measure of the highest concentration of the analyte that could be present in the sample. In the case where the upper surrogate recovery limit is exceeded and the analytical results are non-detect with sufficient reporting levels to meet the data quality objectives of the project, the data is typically considered valid for its intended purpose.

In the case of wipe samples being analyzed for lead and other metals there are no EPA-established surrogate control limits or requirements. When analyzing wipe samples for PCBs, it is customary for laboratories to conduct surrogate recovery measures based on their own upper and lower surrogate REC% limits in order to monitor their own performance in a transparent manner. Based on ACC's experience with McCampbell Analytical, Inc. (MAI) (the laboratory analyzing the Hangar One Wipe Samples), as well with other environmental laboratories, it would be unusual for a laboratory to not conduct surrogate recoveries associated with PCBs analyses for wipe samples.

Due to the nature of metals, lead and other metals are typically not "lost" during the extraction and analytical process and surrogate spikes for lead are less likely to be conducted or reported by laboratories.

When analyzing wipe samples for PCBs, the standard policy of MAI (ELAP #1644) is to use their standard upper and lower surrogate REC% limits used for soil and groundwater sampling based on EPA methods and standard industry criteria (70% -130%).

4.6.5.1 Surrogate Spike Data for Hangar One Samples

In regards to the wipe samples collected at the Hangar One project site and analyzed for PCBs by EPA method 8082 and lead by EPA method 6020, the first 18 wipe samples from the April 21, 2014 sampling event were analyzed for PCBs using MAI instrument #GC5A. The surrogate recovery percentage for seventeen of these eighteen samples slightly exceeded the acceptable upper limit of 130% (up to 139%). The eighteenth sample was reported at 130%.

Based on discussions with MAI the most likely potential cause of the high recoveries is instrument drift for the specific instrument used to analyze the first 18 samples for PCBs, meaning that the instrument had been calibrated but was becoming slightly less responsive over time. Instrument drift is an ongoing occurrence for analytical equipment. According to MAI, all MAI instruments are calibrated at intervals specified by EPA regulations and re-calibration of this specific instrument, at the specific time of use, for analyses of wipe samples, was not required per EPA regulations.

Based on conversations with MAI, if the surrogate REC% were below the lower REC% limit, or if PCBs were detected *and* the surrogate REC% were outside the laboratory-established acceptable limits, the sample extracts would have been re-analyzed subsequent to re-calibrating the instrument or re-analyzed on a different instrument. Because the upper REC% limit was only slightly exceeded and the results for PCBs were non-detect with acceptable reporting limits to meet the project data quality objectives, MAI made the decision to report the data as valid. It can be concluded that the analytical results for these samples are biased high and that any PCB concentrations present in the samples would have been detected higher than the actual concentrations. In other words, the data user can be even *more* confident that the wipe samples are non-detect for PCBs. It is not unusual for labs to report data as valid in these scenarios and in ACC's opinion the data is valid for its intended purpose.

The remaining seventeen wipes were analyzed using MAI instruments #GC22 or #GC23 and all surrogate REC% for these samples were within the acceptable REC% limits chosen by the laboratory. This data is valid for its intended purpose.

Although it was not necessary to conduct and report surrogate REC% for lead analyses (and not all laboratories choose to do so), MAI customarily does so unless otherwise requested by the consultant. Thirty-four of the thirty-five wipe samples analyzed for lead were reported as having REC% within the laboratory established criteria, indicating that the instrument was properly calibrated and the control surrogate process was generally successful. The surrogate REC% listed for sample 2ESC- was reported as 0%, very likely because a surrogate spike was erroneously not added to this wipe sample during laboratory procedures for this one particular sample. Based on successful surrogate REC% for the remaining lead analyses, it is ACC's opinion that only the surrogate recovery process was compromised for sample 2ESC- and that the detected lead concentration is representative of what was contained in the wipe sample. Because the surrogate REC% was less than the lower REC% limit, the result was reported as "estimated" based on standard laboratory protocol. If MAI had not chosen to voluntarily establish upper and lower surrogate REC% limits, the analytical result for sample 2ESC- would not have been flagged as "estimated". ACC considers the data valid for its intended purpose.

As a quality assurance measure for the August 2014 sampling event, ACC request that a method blank with control spike (LCS) be run prior to each 20 wipe samples to confirm that the instrument drift has not occurred. No surrogate issues were reported for these samples.

Surrogate spike issues were reported in eleven of the 38 bulk samples collected from the coatings and other suspect PCB, lead and asbestos-containing materials. All eleven samples were reported above the surrogate range, as discussed above, also indicate the reported concentrations were biased high, meaning the reported concentration is likely higher than what was actually extracted from the sample media.

5.0 SUMMARY OF FINDINGS, CONCLUSIONS & RECOMMENDATIONS

5.1 Wipe Sampling Findings

- Presence of detectable PCBs in the August 2014 wipe sampling event indicates PCB contamination continues to exist within Hangar One. The source of PCB concentrations found in both the concrete floor and horizontal structural steel members where water and sediment pools (geometric mean of 262.3 and 0.78 µg/100 cm2 respectively) is likely from either residual PCB concentrations on structural steel left from the NTCRA activities or from water washing over deteriorated NTCRA encapsulants.

- The absence of PCBs in the upwind and down-wind samples outside the Hangar One footprint and drainage areas further reinforces that the source of PCB concentrations is unlikely from an off-site source.

- Presence of detectable lead concentrations from both the April and August 2014 wipe sampling events were identified, in the case of where water and sediment pools, concentrations are significantly above the NTCRA Target Clearance Criteria of 10 µg/ft2 and NASA's current Lead Management Plan criteria of 400 µg/ft2. *(Note: The published NTCRA clearance levels appear to be used only for wipe sampling of the concrete floor after the NTCRA activities).*

- Like the PCB findings, the source of lead concentrations found in both the concrete floor, horizontal structural steel members where water and sediment pools and the addition of the Base of Steel Columns where water and sediment pools (geometric mean of 868.6, 784.7 and 2,744.7 µg/ft2 respectively) is likely from either residual lead concentrations on structural steel left from the NTCRA activities or from water washing over deteriorated NTCRA encapsulants.

- The relatively low lead concentrations identified in the upwind and down-wind metals samples outside the Hangar One footprint and drainage areas further reinforces that the source of Lead concentrations is unlikely from an off-site source.

- Additionally, concentrations of other CAM 17 metals were identified in the wipe sample results. While there are no established regulatory guidelines for acceptable levels from wipe sampling, the information is useful as a screening tool for project planning activities, including protection of workers from exposure to certain constituents.

- Over the course of two sampling events (April 21,2014 and August 2014), ACC collected 13 wipe sample field blanks for PCB and metals analysis. None of the 13 wipe sample field blanks were reported to contain PCBs, lead or other CAM 17 metals.

5.2 Bulk Sample Findings

- Bulks sampling of paints, coatings and other suspect materials have identified PCB, lead and other metals within most of the remaining materials; including concrete surfaces. Presence of these materials a) are likely the source of PCB and lead concentrations found in the wipe sampling, b) will require special work practices during removal or other disturbance (including, but not limited to engineering controls, worker protection, use of qualified personnel, etc.), and c) in many cases, require packaging, labeling and transportation as restricted or hazardous wastes.

- One material (a residual dark brown adhesive near the western column line 2.5 concrete wall) out of the 17 materials sampled for asbestos was reported with concentrations at 2% chrysotile asbestos. This material is relatively minor in quantity (approximately 40 square feet). Disturbance of the material will require special work practices during removal or other disturbance (including, but not limited to engineering controls, worker protection, use of qualified personnel, etc.), and c) proper waste disposal.

5.3 Air Sampling Findings

- All upwind, downwind and Hangar One air samples had no reportable lead or other CAM 17 Metals constituents reported. All air sampling field blanks were also below the limit of detection for lead and the other CAM 17 constituents.

5.4 Conclusions & Recommendations

a. PCB and Lead wipe sampling results presents a compelling case that existing deteriorated conditions, exposure to weather and continued weathering allows for leaching and settling of lead concentrations at the building. Rainwater running off the building is the likely source for the majority of elevated lead wipe levels.

   It is unknown if lead is 1) leaching through the existing encapsulant or 2) more of a condition of water exposure /runoff flowing along or past deteriorated areas. Sampling of the steel surfaces with intact encapsulant would indicate that the elevated lead wipe samples are more likely a cause from the latter.

b. Sampling has confirmed detectable lead levels in most of the representative surfaces. Appropriate training, engineering controls and work practices will be required in accordance to Cal-OSHA requirements.

c. Improper paint stabilization and/or preparation during the NTCRA is the likely cause of localized paint deterioration.

d. Wipe sampling results for lead also reinforce the need to inspect and repair the encapsulant, including accelerating the frequency until Hangar One is re-skinned and the coating is protected from the elements

e. The results of the wipe sampling indicate the facility should not be considered for any child-occupied uses until additional remedial work is conducted.

f. Given the potential uses for the facility and the likely upgrades (structurally, MEP, fire/life safety systems) required for reuse and restoration of the Hangar, fairly extensive impact to the existing NTCRA encapsulants will be necessary. The extent of these upgrades will likely drive at least partial abatement of the PCB and lead containing materials. Add to this the long term management requirements, accessibility to perform inspections and maintenance to coatings, and expected lifespan of the NTCRA solution, full removal of the coatings should be considered.

g. Abatement activities (whether full removal, partial removal or spot abatement) will not allow full removal of some lead and/or PCB containing constituents or related residue in areas where surfaces are mated together (e.g. riveted structural steel connections, under concrete topping slabs, and other closely mated surfaces exposed to the PCB or lead containing materials (or runoff from these materials). Although these conditions exist throughout the structure, special precautions and work practices (e.g. not using welded connections near these areas, etc.) should be established while these conditions exist.

6.0 SITE RESTORATION

6.1 Bulk Sample Area Recoating & Other Inadvertent Damage

Bulk sample locations of the NTCRA coatings have been 1) noted on drawings for use by repair contractors and coating inspectors, 2) repaired with Carbomastic 15, Carbocrete or other appropriate repair/replacement coating per the NTCRA LTMP and per manufactiurer's instructions by qualified coating contractors, 3) inspected by qualified coating inspectors.

All repairs were performed by DPR, Inc. subcontractors under separate contract with PV. Additionally, all work was perfomred under NASA Construction Permits, inspected by NASA and DRP contracted 3rd party independent inspectors.

Photo Log 2 documents the NTCRA coating conditions prior to ACC's sampling, immediately after ACC's sampling and after DPR facilitated repairs. A separate 3rd party inspection report is available from PV.

7.0 LIMITATIONS

ACC performed the Work in a manner consistent with the level of standards of care and skill ordinarily exercised by professionals performing comparable services under comparable circumstances at the time ACC's services are performed. PV recognizes that those standards may subsequently change because of modifications in the state of practice and acknowledges that ACC shall not be required to foresee or perform in accordance with such standards. No express or implied warranty or guarantee is included in or intended by the Agreement. No statements contained in any report, opinion, document or otherwise, whether prepared prior to, at the same time as, or subsequent to the Agreement constitute any warranty or guarantee by ACC as to the Work.

The following limiting conditions were identified during ACC's sampling activities:

a. *Access to the top of the structure and catwalk areas were restricted by NASA at the time of sample collection, likewise was general foot traffic on the mezzanine and stair tower access.*

b. *The following secondary objectives as stated in the Sampling Plan dated July 28, 2014 were not completed due to restrictions placed on PV team by NASA for accessing the facility, especially at elevated heights:*

   i. *Wipe sampling of accessible, uncoated, and "new" steel roof-top catwalk surfaces at Hangar One to provide additional screening of lead settled dust at the site but not subject to 1) original PCB and Lead containing coatings and 2) above potential storm water run-off over original PCB and Lead containing coatings for comparison purposes.*

   ii. *General identification, location and rough order of magnitude of quantities of accessible deteriorated coating conditions based on visual assessment.*

c. *ACC was unable to collect hydraulic fluid from the Hangar One Door mechanisms due to restrictions initiated by NASA. Additional sampling of hydraulic fluid is appropriate prior to any repairs and/or renovations impacting the door assemblies.*

d. *Electrical vaults, subgrade utility vaults & tunnels, elevator pits and other subgrade utility areas were inaccessible and not included as part of this scope of work.*

It is possible that materials currently existing, or that may exist in the future, at the site may be considered hazardous. Regulatory evaluation criteria are constantly changing, and concentrations of contaminants presently considered low may, in the future, fall under more stringent regulatory standards that require remediation.

Judgments and opinions expressed by ACC, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.

Unless otherwise noted in the proposal or scope of work, the following conditions apply to all Work:

1. ACC shall not be responsible for identifying asbestos-containing materials, lead-paint, biological growth, or other contaminant, environmental concern or hazard concealed behind walls, under or above surface finishes, behind or below furnishings and fixtures, or areas otherwise inaccessible during any investigation or other related work on the project. Written direction shall be provided by PV to ACC to perform intrusive and/or destructive sampling on specific building systems. Intrusive and/or destructive sampling was performed if the subject area(s) are unoccupied at the time of the survey and performing destructive/intrusive sampling does not create unsafe conditions. ACC will temporarily cover or patch sampling wounds on Thermal Systems Insulation (TSI) and roofing. It is PV's responsibility to provide final repair to all sampling wounds, including roofing systems.

2. ACC shall not be responsible for inspecting inaccessible areas. PV shall make its best effort to provide unencumbered access to all project areas.

3. ACC excludes sampling concrete and asphalt paving as suspect asbestos-containing materials as part of the scope of work. Aggregate found in these materials, if supplied from quarries located in known ultra-mafic areas may contain asbestos. It is possible that prior to recycling and/or disposal, recycling agents or landfills may require sampling of these materials to determine the presence of asbestos prior to acceptance.=

4. ACC excludes characterization of soils in areas on known ultramafic rock (where naturally occurring asbestos may be found in soils). ACC can conduct a geologic evaluation and subsequent sampling to determine the presence of naturally occurring asbestos at additional costs if requested. The project area is located within a known ultramafic rock area and provisions should be made to address regulatory requirements for any planned excavation and grading as part of the project.

5. Sampling of single-ply membrane roof systems are excluded unless specifically directed to disturb the membrane roofing system by PV. Suspect Roofing materials underlying membrane systems may not be identified and should be sampled prior to disturbance.

6. ACC will provide temporary patching of roof sampling wounds but does not guarantee repairs and will not be responsible for and subsequent damage. ACC recommends using a qualified roofing contractor to facilitate any needed repairs to the roofing systems.

7. Laboratories quantify asbestos concentrations by calibrated visual estimation using standard PLM methodology, with detection of asbestos is material/matrix dependent. Detection of trace asbestos (<1%) may not be reliable or reproducible by PLM and percentage of asbestos weight can not be determined with standard PLM methodology. Confirmation of asbestos concentrations within complex matrices (i.e. plaster, gypsum wallboard/taping/joint compounds, stucco, resilient flooring, roofing) or when asbestos concentrations are 1% or less may warrant additional analysis by PLM point counting, gravimetric reduction or Transmission Electron Microscopy for proper characterization of asbestos-containing materials and/or waste-stream analysis.

8. ACC shall not be obligated to retain project related reports, notes, submittals, or other documentation (including final documentation) as ACC deems necessary for longer than five (5) years after the issuance of any final survey report, specifications, and/or project documentation. ACC shall not be obligated to notify PV prior to any discharge of said documentation. ACC shall not be obligated to preserve such soil, rock, water, air and/or other samples obtained from the Project Site(s) as ACC deems necessary for longer than

thirty (30) days after the issuance of any document that includes the date of sample collection. ACC shall not be obligated to notify PV prior to any discharge of said samples. This Article shall survive termination of the Agreement.

TABLES

Table 1: Hangar One PCB & Lead Wipe Sampling Screening Summary • September 26, 2014 • ACC Environmental Consultants, Inc.

Condition Grouping	Sample Number / Location	Sample System / Condition	Date	Time	PCB - Aroclor 1254 (µg/100 cm2)	PCBs (Aroclor 1260) (µg/100 cm2)	PCBs (Aroclor 1268) (µg/100 cm2)	PCBs - Aroclor 1268 - Geometric Mean (µg/100 cm2)	Lead Results (µg/ft2) (ND = <Reporting Limit of 0.5 µg/ft2)	*Lead Results - Arithmetic Mean*	*Lead Results - Geometric Mean*	*Reference NTCRA PCB "Clearance Level"*	*Reference NTCRA Lead "Clearance Level"*	Lab Notes	Surrogate Spike Limits (Above/Below)
CC	11ECC		4/21/14	955	ND	ND			**64.0**						
CC	13WCC		4/21/14	1009	ND	ND	NA	NA	**120.0**						
CC	6WCC		4/21/14	1030	ND	ND			**290.0**						
CC	2ECC		4/21/14	1051	ND	ND			**77.0**						
CC	12.5ECC0807	Concrete Floor - Clean	8/7/14	1032	ND	ND			**130.0**	***144.8***	***124.6***				
CC	8WCC0807		8/7/14	1104	ND	ND	ND	ND	**67.0**						
CC	2.5WCC0807		8/7/14	1131	ND	ND			**150.0**						
CC	7.5ECC0807		8/7/14	1321	ND	ND			**260.0**						
CON	12ECON - CMUWall Ledge		4/21/14	1252	ND	ND			**49.0**						
CON	13WCON - CMU Wall		4/21/14	1332	ND	ND			**49.0**						
CON	3WCON - Stem Wall	Concrete / CMU	4/21/14	1428	ND	ND	NA	NA	2.5	*27.5*	*15.4*				
CON	2ECON - Stem Wall		4/21/14	1501	ND	ND			9.3						
DP	14WDP		4/21/14	1323	ND	ND			**58.0**					S	*Above*
DP	12WDP		4/21/14	1344	ND	ND			31.0					S	*Above*
DP	2WDP	Structural Steel below Deteriorated Encapsulant/Paint - (Vertical - ground accessible steel)	4/21/14	1440	ND	ND	NA	NA	**100.0**	***72.2***	***47.0***			S	*Above*
DP	3EDP		4/21/14	1506	ND	ND			19.0					S	*Above*
DP	6EDP		4/21/14	1518	ND	ND			**210.0**					S	*Above*
DP	13EDP		4/21/14	1533	ND	ND			15.0						
EP	12WEP0807	Exposed Original Paint	8/7/14	1414	ND	ND	ND	ND	**67.0**	***67.0***	***67.0***				
IE	1EO		4/21/14	1111	ND	ND			**110.0**					S	*Above*
IE	5EO		4/21/14	1133	ND	ND			**33.0**					S	*Above*
IE	7EO		4/21/14	1142	ND	ND			27.0					S	*Above*
IE	9EO		4/21/14	1156	ND	ND			3.9					S	*Above*
IE	14WI		4/21/14	1330	ND	ND	NA	NA	**89.0**					S	*Above*
IE	11WI	Intact Encapsulant/paint over Structural Steel - (Vertical - ground accessible steel)	4/21/14	1353	ND	ND			**34.0**	***234.2***	***41.3***			S	*Above*
IE	6WO		4/21/14	1407	ND	ND			21.0					S	*Above*
IE	8WO		4/21/14	1410	ND	ND			8.3					S	*Above*
IE	5WO		4/21/14	1420	ND	ND			10.0					S	*Above*
IE	8EI0811		8/11/14	831	ND	ND	ND	ND	**140.0**						
IE	3WI0811		8/11/14	907	ND	ND			**2,100.0**						
SC	11ESC		4/21/14	1002	ND	ND			**560.0**					h4	
SC	14WSC		4/21/14	1018	ND	ND	NA	NA	**320.0**					h4	
SC	5WSC		4/21/14	1036	ND	ND			**780.0**					h4	
SC	2ESC		4/21/14	1100	ND	ND			**320.0**					S,c5,c10	*Below*
SC	14.5ESC0807	Concrete Floor - Evidence of Pooling/Sediment	8/7/14	1035	ND	ND	**100.0**		**1,200.0**	***1,410.0***	***868.6***	*tion Completion Report)*	*' Level mpletion Report)*		

SC	9.5WSC0807		8/7/14	1119	ND	ND	**740.0**	**262.3**	**1,100.0**			***10 µg/100 cm2*** *(per the November 2013 Final After Ac*	***40 µg/ft2*** *NTCRA Target "Clearance" (per the November 2013 Final After Action Con*		
SC	1.5WSC0807		8/7/14	1252	ND	ND	**200.0**		**900.0**						
SC	6.5ESC0807		8/7/14	1308	ND	ND	**320.0**		**6,100.0**						
SP	12WSP0813 - Horizontal Channel		8/13/14	1000	ND	ND	**0.78**		**200.0**						
SP	8WSP0813 - Horizontal Channel		8/13/14	1030	ND	ND			**1,300.0**						
SP	9ESP0813 - Horizontal Channel		8/13/14	1130	ND	ND			**320.0**						
SP	5ESP0813 - Horizontal Channel	Ponding Water Areas - Horizontal Structural Steel	8/13/14	1150	ND	ND		**0.78**	**1,100.0**	***1,513.8***	***784.7***				
SP	1ESP0813 - Horizontal Channel		8/13/14	1330	ND	ND	ND		**140.0**						
SP	4WSP0813 - Horizontal Channel		8/13/14	1405	ND	ND			**850.0**						
SP	2EISS0813 - Mezzanine Floor		8/13/14	1423	ND	ND			**6,000.0**						
SP	12WISS0813 - Mezzanine Floor		8/13/14	1445	ND	ND			**2,200.0**						
SS	12ESS		4/21/14	1314	ND	ND			**2,700.0**					h4	
SS	9WSS		4/21/14	1400	ND	ND			**2,300.0**					h4	
SS	0WSS	Base of Steel Column at evidence of Pooling/Sediment	4/21/14	1450	ND	ND	NA	NA	**85.0**	***7,964.2***	***2,744.7***				
SS	5ESS		4/21/14	1515	ND	ND			**2,700.0**						
SS	10/11 EOSS0811		8/11/14	850	ND	ND			**10,000.0**						
SS	4/5 EOSS0811		8/11/14	920	ND	ND			**30,000.0**					a2,h4	
UW	UW0806-01 - Gate C Horz. Fence Support - Galv. Metal		8/6/14	931	ND	ND			11.0						
UW	UW0806-02 - Gate C Clean Concrete		8/6/14	939	ND	ND			24.0						
UW	UW0806-03 - Gate C Concrete w/ Pooling	Upwind Location - Outside H1 Drainage Area	8/6/14	1008	ND	ND	ND	ND	**140.0**	*40.1*	*22.8*				
UW	UW0806-04 - Stainless Panels (EA-22) w/ Sediment		8/6/14	1019	ND	ND			23.0						
UW	UW0806-05 - Fire Station Flag Pole Walkway Clean Concrete		8/6/14	1038	ND	ND			4.3						
UW	UW0806-06 - N243 Southeast Middle Stainless Utility Cover w/ Sediment		8/6/14	1110	ND	ND			38.0						
DW	DW0806-01 - Hangar 1 Perimeter SE Gate - Galv. Metal		8/6/14	1248	ND	ND			3.8						
DW	DW0806-02 - Hangar 1 SE Fenced Area - Ponding Water		8/6/14	1306	ND	ND			31.0						
DW	DW0806-03 - Bldg 503 Pump Island - Clean Concrete	Downwind Location - Outside H1 Drainage Area	8/6/14	1328	ND	ND	ND	ND	**200.0**	*77.0*	*30.8*				
DW	DW0806-04 - Bldg 158 N Steam Trench - Metal Cover		8/6/14	1342	ND	ND			13.0						
DW	DW0806-05 - Hangar 1 SW Fence Support - Galv. Metal		8/6/14	1351	ND	ND			**200.0**						
DW	DW0806-06 - H1 SE Fenced Area - Clean Concrete		8/6/14	1431	ND	ND			14.0						
FB	FBAM		4/21/14	939	ND	ND			ND						
FB	FB10		4/21/14	1020	ND	ND	NA	NA	ND					S	*Above*
FB	FB13		4/21/14	1307	ND	ND			ND					S	*Above*
FB	FBPM		4/21/14	1545	ND	ND			ND					S	*Above*
FB	FB0806 AM		8/6/14	920	ND	ND			ND						
FB	FB0806 1 PM		8/6/14	1257	ND	ND			ND						
FB	FB0806 PM	Field Blanks	8/6/14	1448	ND	ND			ND	*ND*	*ND*				
FB	FB0807 AM		8/7/14	1027	ND	ND			ND						
FB	FB0807 3 PM		8/7/14	14556	ND	ND	ND	ND	ND						
FB	FB0811 AM		8/11/14	807	ND	ND			ND						
FB	FB0811 10 AM		8/11/14	930	ND	ND			ND						
FB	FB0813 AM		8/13/14	832	ND	ND			ND						
FB	FB0813 PM		8/13/14	1500	ND	ND			ND						

*PCB ND = < Reporting Limit of 0.5 µg/100 cm2

NA - Not analyzed for particular constituent

Lab Notes: *S - spike recovery outside accepted recovery limits; a1 - sample diluted due to matrix interface; a2 - sample diluted due to cluttered chromatogram; c5 - estimated value due to low surrogate recovery; c10 - estimated value; h4 - sulfuric acid permanganate (EPA 3665) cleanup*

Table 1a: Hangar One Metals Sampling Screening Summary • September 26, 2014 • ACC Environmental Consultants, Inc.

Condition Grouping	Sample Number / Location	Sample System / Condition	Date	Time	Antimony (µg/ft2)	Arsenic (µg/ft2)	Barium (µg/ft2)	Beryllium (µg/ft2)	Cadmium (µg/ft2)	Chromium (µg/ft2)	Cobalt (µg/ft2)	Copper (µg/ft2)	Mercury (µg/ft2)	Molybdenum (µg/ft2	Nickel (µg/ft2)	Selenium (µg/ft2)	Silver (µg/ft2)	Thallium (µg/ft2)	Vanadium (µg/ft2)	Zinc (µg/ft2)	Surrogate Spike Limits (Above/Below)
CC	11ECC	Concrete Floor - Clean	4/21/14	955	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
CC	13WCC		4/21/14	1009	0.7	ND	25.0	ND	0.6	7.7	1.2	8.8	ND	ND	9.8	0.5	ND	ND	4.3	110.0	
CC	6WCC		4/21/14	1030	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
CC	2ECC		4/21/14	1051	ND	ND	17.0	ND	0.6	5.5	1.0	5.7	ND	ND	6.7	ND	ND	ND	2.6	90.0	
CC	12.5ECC0807		8/7/14	1032	1.3	ND	36.0	ND	1.1	8.4	1.4	210.0	ND	0.6	9.7	ND	ND	ND	6.1	190.0	
CC	8WCC0807		8/7/14	1104	3.2	ND	29.0	ND	1.0	7.0	1.3	11.0	ND	ND	5.8	ND	ND	ND	5.8	110.0	
CC	2.5WCC0807		8/7/14	1131	1.4	ND	31.0	ND	1.0	6.7	1.0	14.0	ND	0.5	5.5	ND	ND	ND	4.7	170.0	
CC	7.5ECC0807		8/7/14	1321	6.5	2.3	80.0	ND	2.3	47.0	6.2	29.0	0.1	0.9	33.0	ND	ND	ND	27.0	450.0	
CON	12ECON - CMUWall Ledge	Concrete / CMU	4/21/14	1252	1.0	ND	6.0	ND	ND	9.9	ND	1.4	ND	1.1	0.9	ND	ND	ND	ND	35.0	
CON	13WCON - CMU Wall		4/21/14	1332	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
CON	3WCON - Stem Wall		4/21/14	1428	ND	ND	ND	ND	ND	1.1	ND	3.8	ND	ND	0.8	ND	ND	ND	ND	9.0	
CON	2ECON - Stem Wall		4/21/14	1501	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
DP	14WDP	Structural Steel below Deteriorated Encapsulant/Paint - (Vertical - ground accessible steel)	4/21/14	1323	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	*Above*
DP	12WDP		4/21/14	1344	ND	ND	ND	ND	ND	ND	ND	0.5	ND	ND	ND	ND	ND	ND	ND	5.2	*Above*
DP	2WDP		4/21/14	1440	ND	ND	10.0	ND	ND	2.0	ND	15.0	ND	ND	ND	ND	ND	ND	1.0	12.0	*Above*
DP	3EDP		4/21/14	1506	ND	ND	ND	ND	ND	ND	ND	1.3	ND	ND	ND	ND	ND	ND	ND	9.4	*Above*
DP	6EDP		4/21/14	1518	1.1	ND	15.0	ND	ND	1.9	ND	6.7	ND	ND	1.2	ND	ND	ND	1.0	37.0	*Above*
DP	13EDP		4/21/14	1533	ND	ND	ND	ND	ND	ND	ND	1.4	ND	ND	ND	ND	ND	ND	ND	7.4	
EP	12WEP0807	Exposed Original Paint	8/7/14	1414	9.3	ND	ND	ND	2.6	1.0	ND	1.2	0.2	ND	ND	ND	ND	ND	ND	420.0	
IE	1EO	Intact Encapsulant/paint over Structural Steel - (Vertical - ground accessible steel)	4/21/14	1111	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	*Above*
IE	5EO		4/21/14	1133	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	*Above*
IE	7EO		4/21/14	1142	ND	ND	ND	ND	ND	0.7	ND	1.4	ND	ND	ND	ND	ND	ND	ND	5.7	*Above*
IE	9EO		4/21/14	1156	ND	ND	ND	ND	ND	ND	ND	0.8	ND	ND	ND	ND	ND	ND	ND	ND	*Above*
IE	14WI		4/21/14	1330	ND	ND	5.5	ND	ND	1.1	ND	1.2	ND	ND	0.7	ND	ND	ND	ND	42.0	*Above*
IE	11WI		4/21/14	1353	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	*Above*
IE	6WO		4/21/14	1407	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	*Above*
IE	8WO		4/21/14	1410	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	*Above*
IE	5WO		4/21/14	1420	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	*Above*
IE	8EI0811		8/11/14	831	1.0	ND	30.0	ND	ND	4.5	0.7	10.0	ND	ND	4.2	ND	ND	ND	4.1	55.0	
IE	3WI0811		8/11/14	907	6.0	2.2	170.0	ND	0.7	25.0	3.6	71.0	0.1	2.7	23.0	ND	ND	ND	22.0	150.0	
SC	11ESC	Concrete Floor - Evidence of Pooling/Sediment	4/21/14	1002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
SC	14WSC		4/21/14	1018	0.6	ND	130.0	ND	1.5	17.0	1.1	23.0	ND	ND	9.2	ND	ND	ND	4.9	150.0	
SC	5WSC		4/21/14	1036	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
SC	2ESC		4/21/14	1100	0.8	1.2	65.0	ND	2.0	22.0	3.7	28.0	0.1	ND	20.0	ND	ND	ND	13.0	360.0	*Below*
SC	14.5ESC0807		8/7/14	1035	4.1	2.4	160.0	ND	12.0	40.0	6.6	74.0	0.1	2.0	28.0	ND	ND	ND	22.0	2500.0	
SC	9.5WSC0807		8/7/14	1119	7.2	4.3	410.0	ND	15.0	85.0	13.0	84.0	0.2	2.4	83.0	0.8	ND	ND	54.0	1800.0	
SC	1.5WSC0807		8/7/14	1252	9.2	4.1	240.0	ND	8.3	68.0	10.0	79.0	0.2	2.4	66.0	ND	0.6	ND	44.0	1100.0	
SC	6.5ESC0807		8/7/14	1308	40.0	16.0	840.0	0.8	22.0	190.0	26.0	670.0	0.4	12.0	140.0	2.3	3.1	1.0	110.0	5300.0	
SP	12WSP0813 - Horizontal Channel	Ponding Water Areas - Horizontal Structural Steel	8/13/14	1000	2.4	1.1	48.0	ND	ND	10.0	1.3	17.0	ND	1.0	8.4	ND	ND	ND	8.6	57.0	
SP	8WSP0813 - Horizontal Channel		8/13/14	1030	ND	44.0	ND	ND	ND	1400.0	ND	1400.0	ND	300.0	600.0	ND	ND	ND	77.0	1500.0	
SP	9ESP0813 - Horizontal Channel		8/13/14	1130	3.2	1.2	68.0	ND	ND	11.0	1.7	28.0	0.1	1.4	13.0	ND	ND	ND	10.0	76.0	
SP	5ESP0813 - Horizontal Channel		8/13/14	1150	ND	ND	92.0	ND	5.1	19.0	ND	38.0	ND		18.0	ND	ND	ND	14.0	160.0	
SP	1ESP0813 - Horizontal Channel		8/13/14	1330	0.9	1.0	32.0	ND	ND	7.5	1.3	54.0	ND	0.9	5.4	ND	ND	ND	5.8	130.0	

SP	4WSP0813 - Horizontal Channel		8/13/14	1405	ND	ND	94.0	ND	ND	11.0	ND	45.0	ND	ND	12.0	ND	ND	ND	16.0	76.0	
SP	2EISS0813 - Mezzanine Floor		8/13/14	1423	13.0	6.4	420.0	ND	2.8	67.0	9.4	150.0	ND	6.2	52.0	ND	ND	ND	54.0	1200.0	
SP	12WISS0813 - Mezzanine Floor		8/13/14	1445	8.6	9.7	300.0	ND	ND	220.0	14.0	290.0	ND	44.0	130.0	ND	ND	ND	50.0	750.0	
SS	12ESS		4/21/14	1314	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
SS	9WSS		4/21/14	1400	2.8	1.0	60.0	ND	0.4	9.6	1.5	17.0	0.1	1.2	10.0	ND	ND	ND	7.0	100.0	
SS	0WSS	Base of Steel Column at evidence of Pooling/Sediment	4/21/14	1450	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
SS	5ESS		4/21/14	1515	8.1	4.4	320.0	ND	2.0	46.0	8.1	83.0	0.2	3.6	44.0	0.8	0.6	ND	42.0	570.0	
SS	10/11 EOSS0811		8/11/14	850	27.0	11.0	1300.0	ND	11.0	240.0	23.0	260.0	ND	ND	160.0	ND	ND	ND	110.0	5300.0	
SS	4/5 EOSS0811		8/11/14	920	44.0	50.0	2800.0	ND	25.0	540.0	89.0	990.0	3.3	32.0	530.0	ND	ND	ND	460.0	6500.0	
UW	UW0806-01 - Gate C Horz. Fence Support - Galv. Metal		8/6/14	931	0.6	ND	ND	ND	ND	21.0	ND	4.7	ND	ND	1.1	ND	ND	ND	0.6	3900.0	
UW	UW0806-02 - Gate C Clean Concrete		8/6/14	939	ND	ND	180.0	ND	0.4	12.0	2.8	9.9	0.1	ND	15.0	ND	ND	ND	12.0	430.0	
UW	UW0806-03 - Gate C Concrete w/ Pooling	Upwind Location - Outside H1 Drainage Area	8/6/14	1008	2.9	4.3	240.0	ND	2.5	36.0	7.2	39.0	0.1	2.0	38.0	0.5	ND	ND	32.0	1300.0	
UW	UW0806-04 - Stainless Panels (EA-22) w/ Sediment		8/6/14	1019	2.5	0.8	57.0	ND	ND	50.0	1.6	26.0	ND	1.9	23.0	ND	ND	ND	7.6	210.0	
UW	UW0806-05 - Fire Station Flag Pole Walkway Clean Concrete		8/6/14	1038	ND	ND	53.0	ND	ND	3.4	0.7	6.7	ND	ND	4.0	ND	ND	ND	3.1	36.0	
UW	UW0806-06 - N243 Southeast Middle Stainless Utility Cover w/ Sediment		8/6/14	1110	2.2	0.9	95.0	ND	2.3	24.0	2.5	36.0	ND	3.0	19.0	ND	ND	ND	9.1	150.0	
DW	DW0806-01 - Hangar 1 Perimeter SE Gate - Galv. Metal		8/6/14	1248	0.6	ND	ND	ND	ND	5.2	ND	4.7	ND	ND	2.0	ND	ND	ND	0.9	3300.0	
DW	DW0806-02 - Hangar 1 SE Fenced Area - Ponding Water		8/6/14	1306	ND	0.5	67.0	ND	0.8	10.0	1.7	78.0	ND	ND	12.0	ND	ND	ND	8.8	180.0	
DW	DW0806-03 - Bldg 503 Pump Island - Clean Concrete	Downwind Location - Outside H1 Drainage Area	8/6/14	1328	0.9	ND	73.0	ND	6.8	7.9	1.8	20.0	ND	ND	10.0	ND	ND	ND	9.4	550.0	
DW	DW0806-04 - Bldg 158 N Steam Trench - Metal Cover		8/6/14	1342	ND	0.6	35.0	ND	ND	6.9	1.7	8.2	ND	ND	8.3	ND	ND	ND	7.7	44.0	
DW	DW0806-05 - Hangar 1 SW Fence Support - Galv. Metal		8/6/14	1351	1.1	0.6	ND	ND	ND	5.6	ND	8.8	ND	ND	1.9	ND	ND	ND	1.2	7200.0	
DW	DW0806-06 - H1 South Fenced Area - Clean Concrete		8/6/14	1431	ND	ND	150.0	ND	0.3	3.3	0.6	4.0	ND	ND	3.8	ND	ND	ND	2.8	86.0	
FB	FBAM		4/21/14	939	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
FB	FB10		4/21/14	1020	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	*Above*
FB	FB13		4/21/14	1307	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	*Above*
FB	FBPM		4/21/14	1545	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	*Above*
FB	FB0806 AM		8/6/14	920	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
FB	FB0806 1 PM		8/6/14	1257	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
FB	FB0806 PM	Field Blanks	8/6/14	1448	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
FB	FB0807 AM		8/7/14	1027	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
FB	FB0807 3 PM		8/7/14	14556	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
FB	FB0811 AM		8/11/14	807	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
FB	FB0811 10 AM		8/11/14	930	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
FB	FB0813 AM		8/13/14	832	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
FB	FB0813 PM		8/13/14	1500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	

Lab Notes: *S - spike recovery outside accepted recovery limits; a1 - sample diluted due to matrix interface; a2 - sample diluted due to cluttered chromatogram; c5 - estimated value due to low surrogate recovery; c10 - estimated value; h4 - sulfuric acid permanganate (EPA 3665) cleanup*

Table 2: Hangar One PCB, Lead & Metals Bulk Sampling Summary • September 29, 2014 • ACC Environmantal Consultants, Inc.

Homogenous Material	Sample Number	Material Description	Date	Total PCB Results (mg/kg) (ND = < Reporting Limit of 0.5 mg/kg)	PCBs - Aroclor 1254 (mg/kg)	PCB - Aroclor 1260 (mg/kg)	PCB - Aroclor 1268 (mg/kg)	Lead Results (mg/kg) (ND = <Reporting Limit of 1000 mg/kg)	Asbestos (%)	Antimony (mg/kg)	Arsenic (mg/kg))	Barium (mg/kg)
01	PT-01-01	Multi-layer/multi-color original paint on structural steel, encapsulated with CM15	8/11/14	3.4	ND	ND	3.4	250,000.0	ND	32.0	ND	1,200.0
01	PT-01-02		8/11/14	130.0	ND	ND	130.0	130,000.0	ND	31.0	44.0	3,500.0
01	PT-01-03		8/11/14	12.9	2.0	3.6	7.3	120,000.0	ND	31.0	28.0	4,300.0
01	PT-01-04		8/11/14	114.5	ND	4.5	110.0	110,000.0	ND	ND	ND	1,500.0
01	PT-01-05		8/11/14	23.3	ND	3.3	20.0	140,000.0	ND	27.0	33.0	2,400.0
01	PT-01-06		8/11/14	22.1	ND	4.1	18.0	140,000.0	ND	1,400.0	ND	2,500.0
01	PT-01-07		8/11/14	12.8	ND	6.1	6.7	130,000.0	ND	8,600.0	27.0	370.0
02	PT-02-01	Multi-layer / multi-color original paint on concrete / CMU wall surfaces, encapsulated with CM15	8/11/14	9.8	ND	1.2	8.6	450.0	ND	8.4	2.4	1,800.0
02	PT-02-02		8/11/14	1,900.0	1,900.0	ND	ND	2,600.0	ND	16,000.0	17.0	580.0
02	PT-02-03		8/11/14	ND	ND	ND	ND	2,200.0	ND	240.0	3.2	1,100.0
02	PT-02-04		8/11/14	ND	ND	ND	ND	54,000.0	ND	3,600.0	9.8	800.0
04	MI-04-01	Carbocrete coated concrete perimter stem walls	8/11/14	ND	ND	ND	ND	240.0	ND	110.0	2.9	290.0
04	MI-04-02		8/11/14	0.8	ND	ND	0.75	170.0	ND	ND	4.2	130.0
04	MI-04-03		8/11/14	0.7	ND	ND	0.74	99.0	ND	1.0	3.3	120.0
04	MI-04-04		8/11/14	1.1	ND	ND	1.1	190.0	ND	8.7	3.5	140.0
05	PT-05-01	Multi-color textured/sanded entry floor coating (Column 3 East Entry)	8/11/14	13.0	ND	ND	13.0	140.0	ND	0.6	1.2	62.0
06	EJ-06-01	Bituminous concrete expansion joint	8/11/14	ND	ND	ND	ND	330.0	ND	0.8	3.0	66.0
06	EJ-06-02		8/11/14	ND	ND	ND	ND	140.0	ND	0.6	3.2	38.0
06	EJ-06-03		8/11/14	18.0	ND	ND	18.0	670.0	ND	14.0	1.2	140.0
07	SE-07-01	Floor trench, door trench and trench drain sediment	8/11/14	36.0	ND	ND	35.0	12,000.0	ND	11.0	17.0	460.0
07	SE-07-02		8/11/14	12.0	ND	ND	12.0	1,300.0	ND	6.0	3.9	270.0
08	PT-08-01	Sanded floor paint - SW hangar floor	8/11/14	11.0	ND	1.0	10.0	6,000.0	ND	170.0	9.1	450.0
09	CK-09-01	Lt. gray expansion joint caulking	8/11/14	ND	ND	ND	98.0	590.0	ND	17.0	1.3	ND
09	CK-09-02		8/11/14	ND	ND	ND	ND	54.0	ND	1.3	ND	11.0
10	PT-10-01	Gray textured/sanded floor paint	8/11/14	44.6	ND	4.6	40.0	15,000.0	ND	290.0	9.1	4,700.0
10	PT-10-02		8/11/14	4.0	ND	ND	4.0	260.0	ND	2.0	2.6	98.0
11	CON-11-01	Original concrete floor	8/11/14	ND	ND	ND	ND	39.0	ND	1.7	6.6	97.0
11	CON-12-01		8/11/14	9.3	ND	ND	9.3	150.0	ND	2.7	5.9	130.0
13	LC-13-01	Gray cementitious leveling compund	8/11/14	ND	ND	ND	ND	51.0	ND	98.0	5.6	410.0
13	LC-13-02		8/11/14	1.4	1.4	ND	ND	450.0	ND	2.0	1.5	320.0
14	LC-14-01	White cementitious leveling compound	8/11/14	1.6	ND	ND	1.6	100.0	ND	6.4	3.8	110.0
14	LC-14-02		8/11/14	12.0	ND	ND	12.0	660.0	ND	1.6	3.9	590.0
15	PT-15-01	Lt. green floor paint	8/11/14	2.2	ND	ND	2.2	200.0	ND	ND	1.1	170.0
16	MT-16-01	Yellow-orange mortar/leveling compound	8/11/14	7.8	ND	ND	7.8	100.0	ND	1.7	2.1	52.0
16	MT-16-02		8/11/14	2.6	ND	ND	2.6	270.0	ND	3.1	4.2	120.0
17	MI-17-01	Oil-soaked poly tape - NE Hangar Door Truck	8/13/14	ND	ND	ND	ND	500.0	ND	7.6	ND	76.0
18	AD-18-01	Dr. brown Adhesive (West CL 2.5 concrete walls)	8/13/14	NA	NA	NA	NA	NA	2% CH	NA	NA	NA
19	MI-19-01	Hangar door gasket material	8/13/14	NA	NA	NA	NA	NA	ND	NA	NA	NA

Lab Comments: S - spike recovery outside accepted recovery limits; a1 - sample diluted due to matrix interface; a2 - sample diluted due to cluttered chromatogram; a3 - sample diluted due to high organic conter
thecontrol limits due to the dilution of the sample; h4 - sulfuric acid permanganate (EPA 3665) cleanup; j1 - sample pulverized prior to extraction & analysis; j2 - estimated A1260 concentration due to the partial c

Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg))	Copper (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg))	Thallium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	Lab Notes	Surrogate Spike Limits (Above/Below)
ND	310.0	62.0	66.0	51.0	82.0	ND	ND	ND	ND	ND	ND	50,000.0	S,a1,a4,a16,c1,h4,j3	*Above*
ND	320.0	ND	ND	72.0	7.4	ND	ND	ND	ND	ND	ND	43,000.0	S,a1,a4,a16,c1,h4,j3	*Above*
ND	360.0	1,200.0	130.0	82.0	ND	30.0	ND	ND	ND	ND	ND	77,000.0	a1,a16,h4,j2,j3	
ND	73.0	61.0	ND	160.0	ND	ND	49.0	ND	ND	ND	ND	10,000.0	a1,a16,h4,j2,j3	
ND	180.0	26.0	ND	50.0	4.5	ND	ND	ND	ND	ND	ND	30,000.0	a1,a16,h4,j2,j3	
ND	280.0	130.0	32.0	110.0	ND	ND	ND	ND	ND	ND	ND	62,000.0	a1,a16,h4,j2,j3	
ND	180.0	220.0	48.0	46.0	14.0	ND	ND	ND	ND	ND	ND	40,000.0	a1,a16,h4	
ND	2.0	83.0	4.2	240.0	0.2	12.0	15.0	ND	ND	ND	22.0	120.0	h4,j2,j3	
ND	22.0	320.0	64.0	57.0	17.0	0.8	17.0	ND	1.8	ND	8.7	43,000.0	S,c1,h4	*Above*
ND	11.0	100.0	74.0	23.0	1.0	0.8	9.7	ND	ND	ND	13.0	13,000.0	S,a1,a4,c1,h4	*Above*
ND	120.0	170.0	70.0	29.0	0.4	0.5	9.4	ND	1.0	3.8	7.3	########	S,a1,a4,c1,h4	*Above*
1.0	9.2	48.0	4.7	150.0	0.3	2.1	29.0	ND	0.6	ND	36.0	900.0	a1,a4,h4,j1	
ND	36.0	170.0	11.0	67.0	0.1	2.7	96.0	ND	ND	ND	64.0	660.0	a4,h4,j1,j3	
ND	2.8	350.0	12.0	56.0	0.2	5.3	130.0	ND	ND	ND	54.0	72.0	a4,h4,j1,j3	
ND	1.6	190.0	13.0	26.0	0.1	11.0	110.0	ND	ND	ND	68.0	140.0	a4,h4,j1,j3	
ND	3.0	5.9	110.0	8.9	0.6	ND	4.2	ND	0.6	ND	4.9	2,400.0	a4,h4,j3	
ND	1.0	50.0	3.0	3.0	1.4	5.4	15.0	5.6	ND	ND	120.0	72.0	S;a2,a4,c1,h4,j3	*Above*
ND	ND	27.0	2.7	250.0	1.2	ND	12.0	ND	ND	ND	99.0	100.0	a2,a4,h4,j3	
ND	88.0	94.0	2.7	46.0	0.2	18.0	18.0	ND	0.8	ND	7.4	420.0	S,a2,a4,c1,h4,j3	*Above*
ND	28.0	160.0	16.0	240.0	ND	ND	56.0	ND	ND	ND	33.0	2,900.0	S,a2,a4,c1,h4,j3	*Above*
ND	8.5	70.0	7.6	110.0	0.4	3.3	46.0	0.7	ND	ND	49.0	4,700.0	a2,a4,h4,j3	
ND	210.0	340.0	150.0	110.0	0.5	ND	49.0	ND	ND	ND	25.0	52,000.0	h4,j1,j2,j3	
32.0	6.3	21.0	4.9	16.0	0.2	1.3	11.0	ND	ND	ND	13.0	700.0	S,a2,a4,c1,h4,j3	*Above*
ND	0.7	26.0	1.2	4.3	ND	1.8	11.0	ND	ND	ND	1.9	58.0	a2,a4,h4,j1,j3	
ND	85.0	310.0	120.0	130.0	52.0	5.7	39.0	ND	ND	ND	23.0	29,000.0	S,c1,h4,j1,j2,j3	*Above*
ND	5.3	140.0	6.6	130.0	0.1	7.9	30.0	0.5	ND	ND	27.0	810.0	a4,h4,j1,j3	
0.6	2.1	760.0	21.0	89.0	0.5	38.0	290.0	ND	ND	ND	110.0	83.0	a4,h4,j1	
ND	7.3	320.0	18.0	40.0	1.0	3.4	160.0	0.8	ND	ND	83.0	330.0	a2,a4,c1,h4,j1,j3	
ND	0.6	200.0	4.2	35.0	0.1	9.8	55.0	0.5	ND	ND	61.0	180.0	a4,h4,j1	
ND	3.7	200.0	3.8	18.0	ND	2.8	31.0	ND	ND	ND	65.0	220.0	h4,j1	
ND	17.0	130.0	12.0	71.0	0.2	1.3	130.0	ND	ND	ND	59.0	210.0	a4,h4,j1,j3	
1.4	14.0	66.0	5.6	230.0	0.1	1.5	42.0	0.6	ND	ND	53.0	1,200.0	a2,a4,h4,j1,j3	
ND	1.5	17.0	2.9	30.0	0.1	ND	7.1	ND	ND	ND	11.0	140.0	a2,a4,h4,j3	
ND	1.6	210.0	7.1	19.0	0.9	11.0	120.0	ND	ND	ND	39.0	130.0	a3,a4,h4,j1,j3	
ND	6.4	190.0	8.9	46.0	0.7	9.5	88.0	ND	ND	ND	62.0	460.0	a4,h4,j1,j3	
ND	ND	ND	ND	48.0	ND	ND	5.8	ND	ND	ND	ND	180.0	S,a4,a3,c1,h4	*Above*
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		

nt; a4 - the reporting limits were raised due to sample's matrix prohibiting a full volume extraction; a16 - reporting limit raised due to high metals content; c1 - surrgate recovery outside of
ongener peak coelution by A1268; j3 - A1260 is calculated using less than 3 congener peaks due to congener peak coelution by A1268

Table 2a: Historical Navy & NASA Hangar One PCB, Lead & Metals Bulk Sampling Summary • September 29, 2014 • ACC Environmantal Consultants, Inc.

			Lead																		
Source	Component / Description	Reading* / Sample Number	*XRF Result (mg/cm2)*	*EPA 3050B / NIOSH 7420 Flame AA Results (% by Weight)*	*Flame AA Results (PPM)*	PCBs (Aroclor 1260) (mg/kg)	PCBs (Aroclor 1268) (mg/kg)	Total PCBs (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Selinium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Zinc (mg/kg)	Notes
a	Truss Support	8957	18.46																		
a	Support Beam	8958	3.303																		
a	Truss Support	8993 / #3	13.316	22.797	227,970																
a	Support Beam	9009	1.751																		
a	Truss Support	9037	6.44																		
a	Truss Support	9077	16.041																		
a	Truss Support	10941	20.735																		
a	Truss Support	10951	13.714																		
a	Truss Support	11031	14.291																		
a	Cross Beam	11032	11.604																		
a	Truss Support	11049	18.138																		
a	Truss Support	11059	15.442																		
a	Truss Support	11093	12.395																		
a	Truss Support	11121	10.393																		
a	Truss Support	11153	17.294																		
a	Truss Support	11163	18.163																		
a	Truss Support	11178	17.6																		
a	Truss Support	11185	2.275																		
a	Truss Support	11205	15.601																		
a	Truss Support	11213	18.891																		
a	Truss Support	11232	16.206																		
a	Truss Support	11233	11.579																		
a	Truss Support	11296	11.801																		
a	Cross Beam	11357	13.927																		
a	Truss Support	11368	9.862																		
a	Cross Beam	11394	23.666																		
a	Truss Support	11395	11.227																		
a	Truss Support	11414	17.984																		
a	Truss Support	11438	15.184																		
a	Truss Support	11454	8.98																		
a	Truss Support	11498	12.84																		
a	Truss Support	11510	16.381																		
a	Truss Support	11528	12.943																		
a	Truss Support	11541	11.325																		
a	Truss Support	11562	14.634																		
a	Truss Support	11563	14.76																		
a	Truss Support	11574	17.404																		
a	Truss Support	11580	17.47																		
a	Truss Support	11593	9.307																		
a	Truss Support	11618	18.079																		
a	Truss Support	11631	11.892																		

Source	Component / Description	Reading* / Sample Number	Lead			PCBs (Aroclor 1260) (mg/kg)	PCBs (Aroclor 1268) (mg/kg)	Total PCBs (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Selinium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Zinc (mg/kg)	Notes
			XRF Result (mg/cm2)	*EPA 3050B / NIOSH 7420 Flame AA Results (% by Weight)*	*Flame AA Results (PPM)*																
a	Truss Support	11671	12.124																		
a	Truss Support	11759	16.681																		
a	Truss Support	11790	2.387																		
a	Truss Support	11791	26.495																		
a	Truss Support	11809	12.239																		
a	Truss Support	11862	18.459																		
a	Truss Support	11883	22.997																		
a	Truss Support	11903	14.603																		
a	Truss Support	11915	15.365																		
a	Truss Support	12025	18.361																		
a	Truss Support	12038	18.655																		
a	Truss Support	12363	0.152																		
a	Truss Support	12364	13.477																		
a	Truss Support	12378	20.785																		
a	Truss Support	12400	15.301																		
a	Truss Support	12401	1.758																		
a	Truss Support	12423	14.046																		
a	Truss Support	12457	18.034																		
b	Catwalk 1E Bent 1 E	Catwalk 1E Bent 1E			120,000	120.0	94.0	214.0	27.0	58.0	ND	410.0	23.0	84.0	2.1	15.0	ND	13.0	ND	58,000.0	**1*
b	Catwalk 9E Bents 4E-5E	Catwalk 9E Bents 4E-5E			130,000	41.0	37.0	78.0	25.0	8.9	ND	15.0	120.0	100.0	0.5	22.0	ND	5.3	ND	510.0	**1*
b	Catwalk 9E Bent 0	Catwalk 9E Bent 0			140,000	120.0	93.0	213.0	27.0	10.0	ND	8.6	75.0	190.0	0.7	44.0	ND	3.3	ND	540.0	**1*
b	Catwalk 4E Bent 7.5 E	Catwalk 4E Bent 7.5 E			200,000	33.0	32.0	65.0	21.0	ND	ND	4.9	410.0	59.0	0.4	5.9	ND	3.0	ND	1,200.0	**1*
c	Interior Paint Sample	P-4					11.6														**1*

Sources

a - Lead Based Paint Survey Report, Hangar 1, Benchmark Environmental Engineering, Inc., December 3, 2001

b - Hangar 1 Interior Paint Sampling, Integrated Science Solutions, Inc., August 30, 2005

c - Report andd Summary of Hangar 1 Environmental Sampling, DMJMH+N, May 7, 2003

Notes

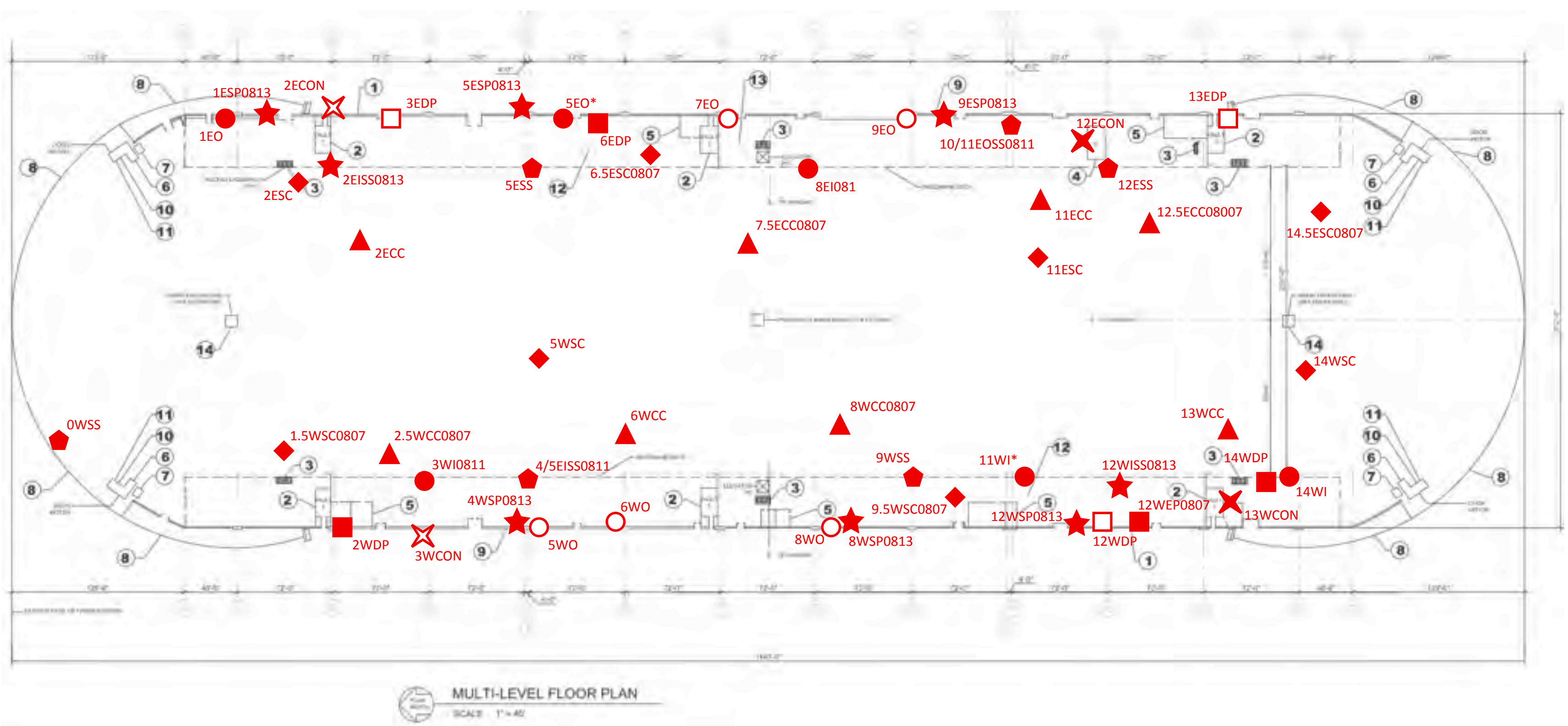
*1 - Source did not include Analytical Laboratory Report, results should be verified with additional sampling

Table 3: Preliminary Hangar One Lead & Other Metals Air Sampling Summary • September 26, 2014 • ACC Environmantal Consultants, Inc.

Sample Number / Location	Sample Location	Date	Lead Results (µg/ft2) (ND = <Reporting Limit of 0.5 µg/ft2)	Antimony (µg/m3)	Arsenic (µg/m3)	Barium (µg/m3)	Beryllium (µg/m3)	Cadmium (µg/m3)	Chromium (µg/m3))	Cobalt (µg/m3)	Copper (µg/m3)	Molybdenum (µg/m3)	Nickel (µg/m3)	Selenium (µg/m3)	Silver (µg/m3)	Thallium (µg/m3)	Vanadium (µg/m3)	Zinc (µg/m3)	Lab Notes
N1	North of Hangar 1 at MFA Gate C	8/6/14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
S1	South of Hagar 1 at SE MFA Access Gate	8/6/14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
H1	Hangar 1 at Central East Pump Station	8/6/14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
FB1	Field Blank	8/6/14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
N2	North of Hangar 1 at MFA Gate C	8/7/14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
S2	South of Hagar 1 at SE MFA Access Gate	8/7/14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
H2	Hangar 1 at Central East Pump Station	8/7/14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
FB2	Field Blank	8/7/14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
N3	North of Hangar 1 at Control Panel EA22	8/11/14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
S3	South of Hagar 1 at SE MFA Access Gate	8/11/14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
H3	Hangar 1 at Central East Pump Station	8/11/14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
FB3	Field Blank	8/11/14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-

FIGURES

East



Reference NTCRA Goals

Below / Above

LEGEND

- *Intact Encapsulant / Paint over Structural Steel*
- *Structural Steel below Deteriorated Encapsulant / Paint*
- *Base of Steel Column at Pooling / Sediment*
- *Clean Concrete Floor*
- *Concrete Floor with Pooling / Sediment*
- *Concrete / CMU*
- *Horizontal Steel with Pooling / Sediment* *(between ground floor and upper mezzanine structural steel)*

West

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(213) 353-1240

accenv.com

Client:

Google Planetary Ventures

Project/Sheet:

Moffett Federal Airfield Hanger One

Figure 1

PCB, Lead & Other Metals Wipe Sampling Locations & Results

ACC Project Number:

1591-001.00

Date:

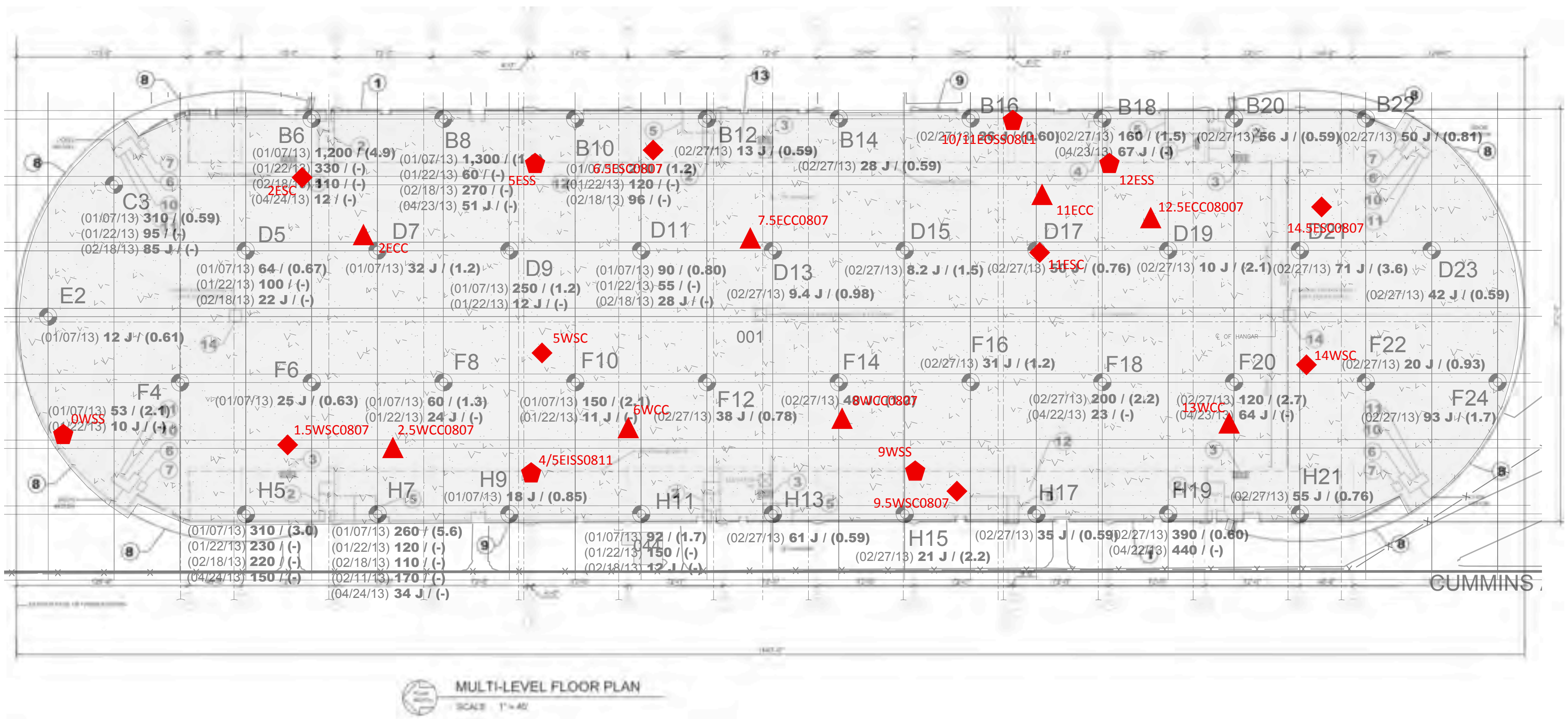
9/26/2014

Scale:

Not to Scale

N E S W

East



Reference NTCRA Goals
Below / Above

LEGEND
- Intact Encapsulant / Paint over Structural Steel
- Structural Steel below Deteriorated Encapsulant / Paint
- Base of Steel Column at Pooling / Sediment
- Clean Concrete Floor
- Concrete Floor with Pooling / Sediment
- Concrete / CMU
- Horizontal Steel with Pooling / Sediment (between ground floor and upper mezzanine structural steel)

West

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Hanger One

Figure 1.1

PCB, Lead & Other Metals

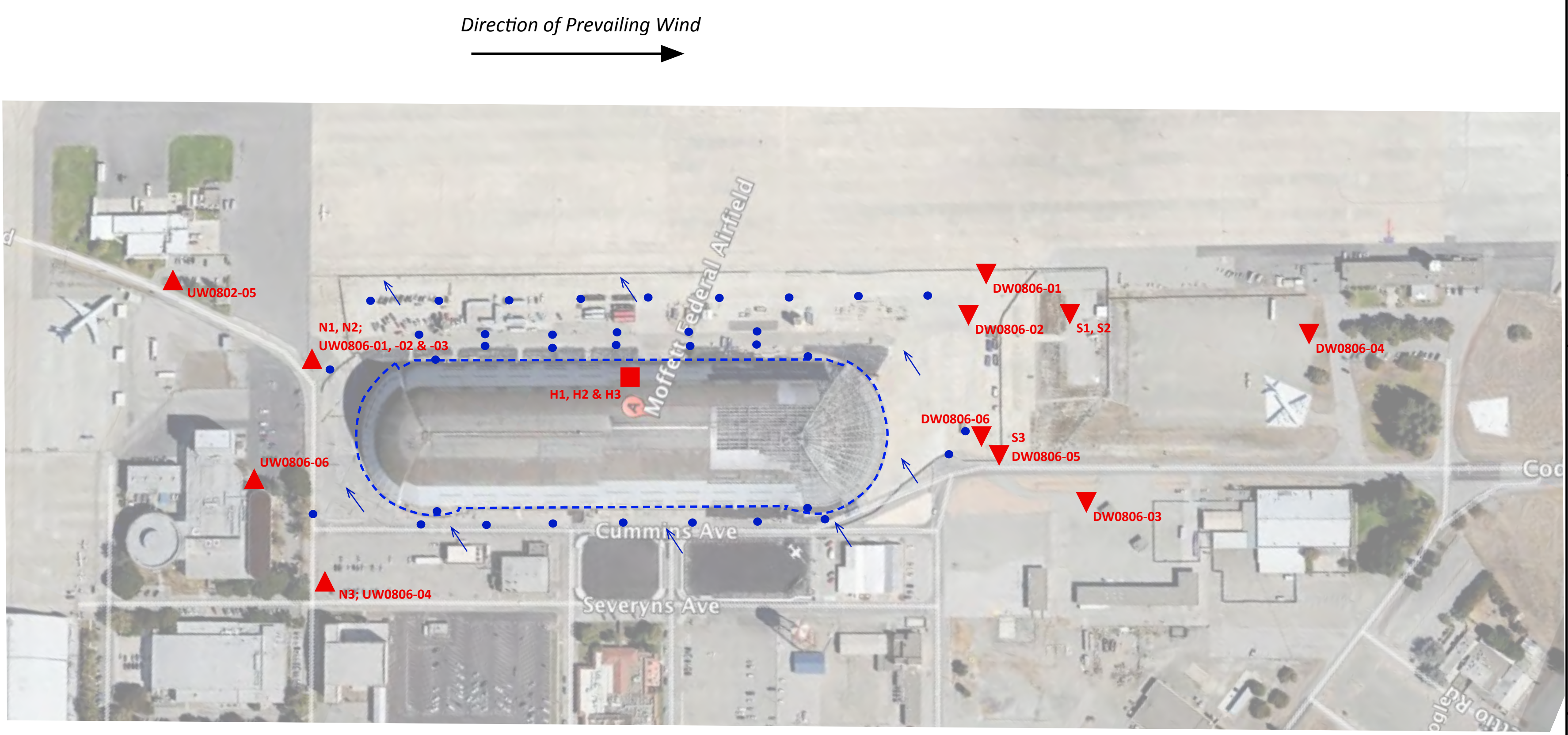
Ground Floor Wipe Sample Locations with NTCRA After Action Floor Decontamination Confirmation Sample Locations

ACC Project Number:
1591-001.00

Date:
9/26/2014

Scale:
Not to Scale

N E S W



LEGEND

- *Upwind Sample Locations (WIpe & Air Samples)*
- *Downwind Sample Locations (Wipe & Air Samples)*
- *Hangar 1 Air Sample Location*
- *Hangar 1 Perimeter Trench Drain System* *(derived from NTCRA Final After Action Report Figure 8)*
- *Hangar 1 Storm Drain Locations* *(derived from NTCRA Final After Action Report Figure 8)*
- *General Surface Flow Direction* *(derived from NTCRA Final After Action Report Figure 8)*

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Figure 2

PCB, Lead & Other Metals Upwind & Downwind Wipe Sampling Locations

with Storm Drain & Surface Water Flow Direction

ACC Project Number:

1591-001.00

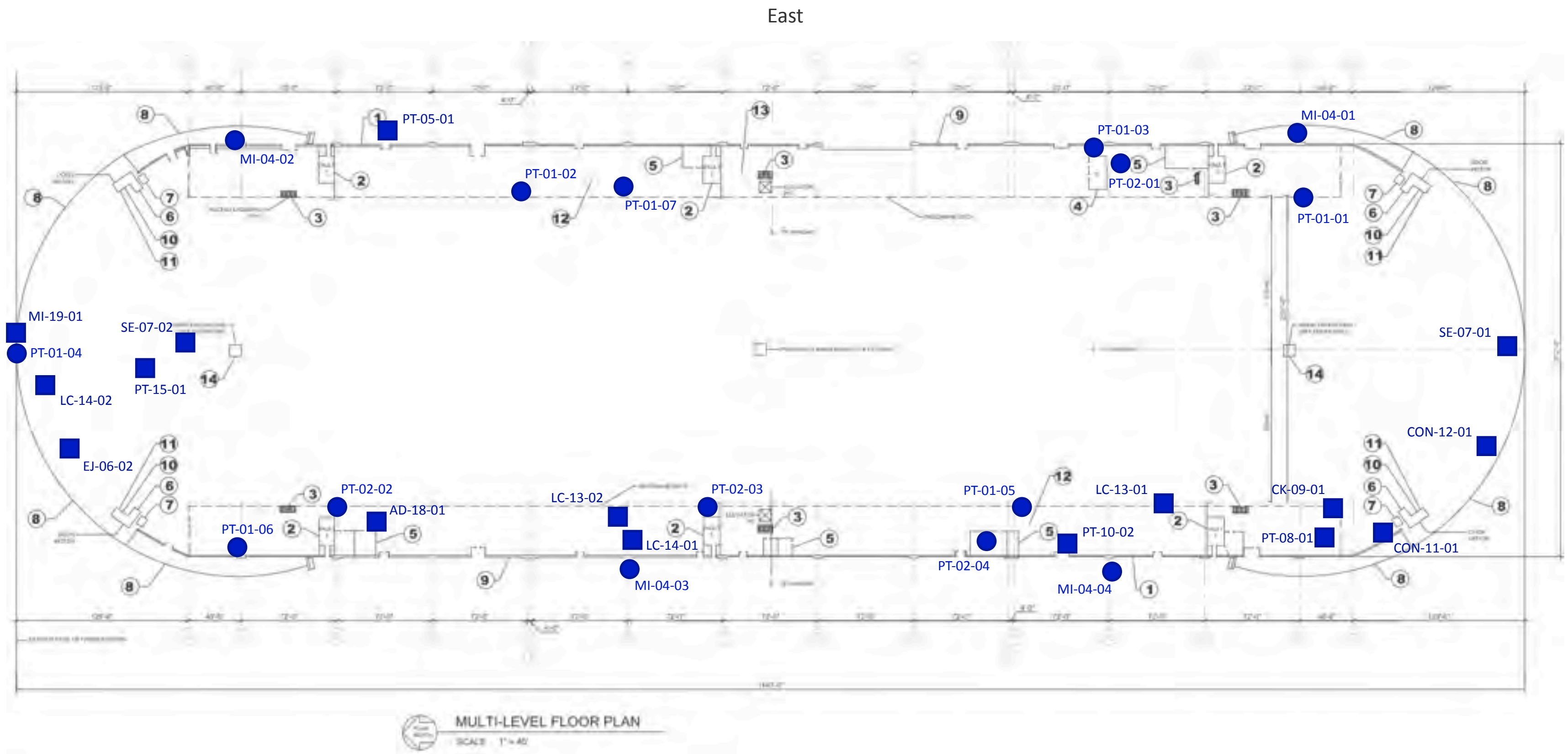
Date:

9/26/2014

Scale:

Not to Scale

N E S W



LEGEND

- Bulk Sample Locations of Coatings, Including Repairs (circle)
- Bulk Sample Locations of Misc. Materials (square)

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Figure 3

PCB, Lead & Other Metals Bulk Sampling Locations & Results

ACC Project Number:

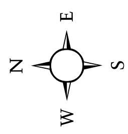
1591-001.00

Date:

9/26/2014

Scale:

Not to Scale



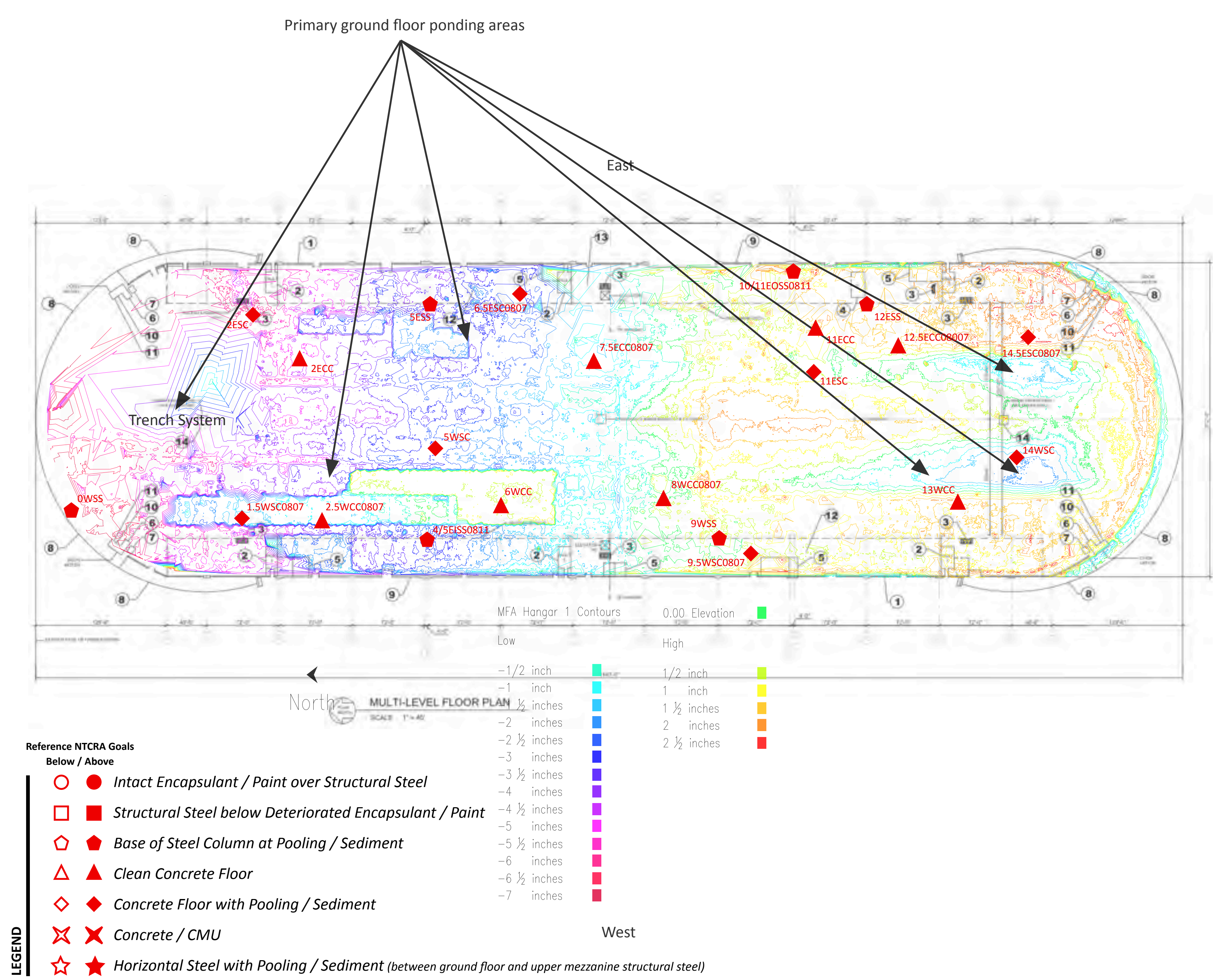


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Figure 4

Interior Floor Elevations & Ponding Locations

ACC Project Number:

1591-001.00

Date:

9/26/2014

Scale:

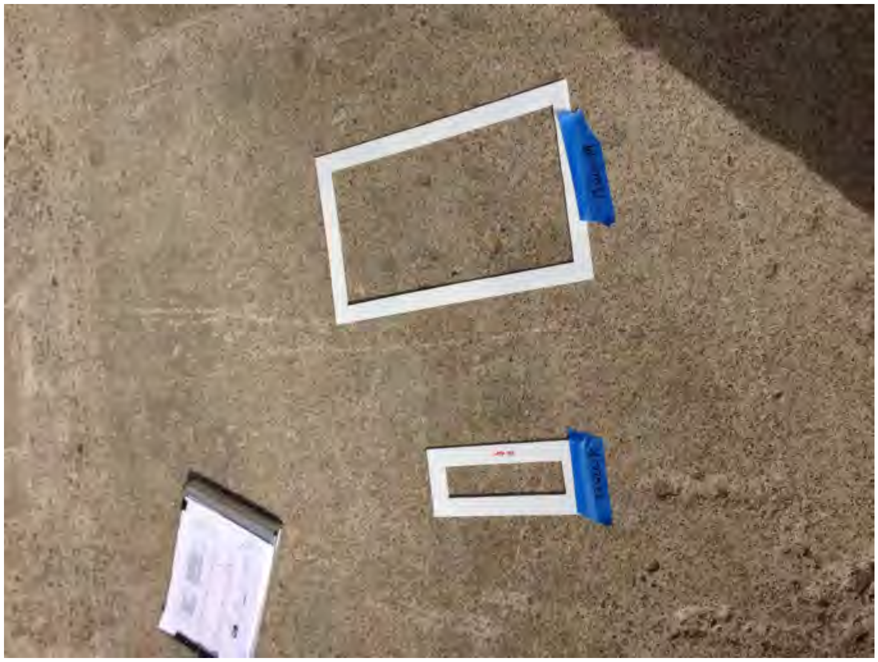
Not to Scale

N E S W

PHOTOGRAPHS

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 13, West Side
Sample Number: 13WCC
Sample System / Condition: Concrete Floor - Clean



Sample Location: Ground Floor, Column Line 6, West Side
Sample Number: 6WCC
Sample System / Condition: Concrete Floor - Clean

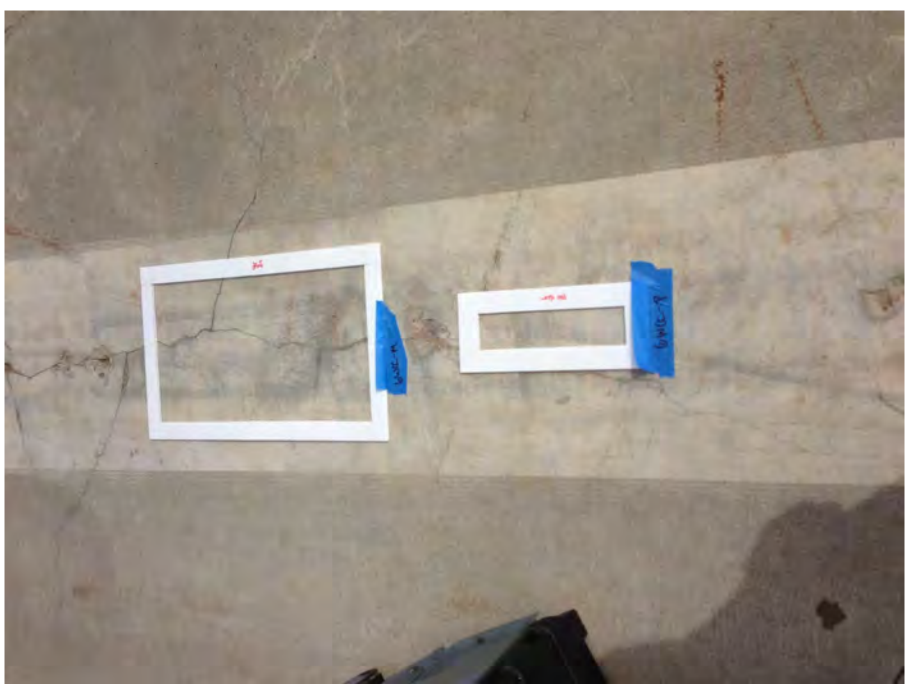
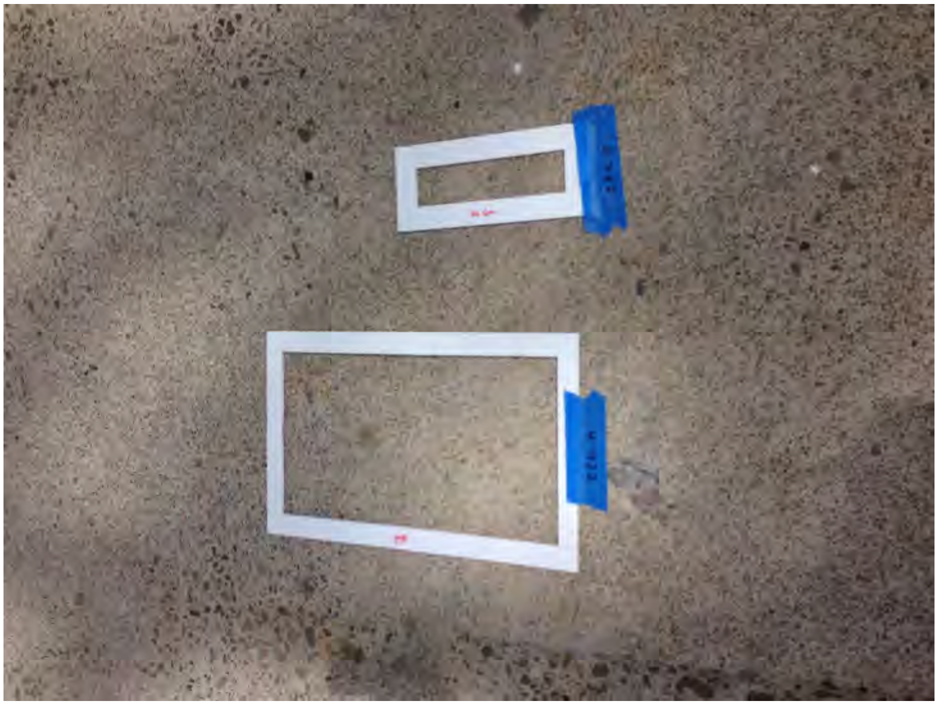


Photo Log 1 – Hangar 1 Wipe Sampling

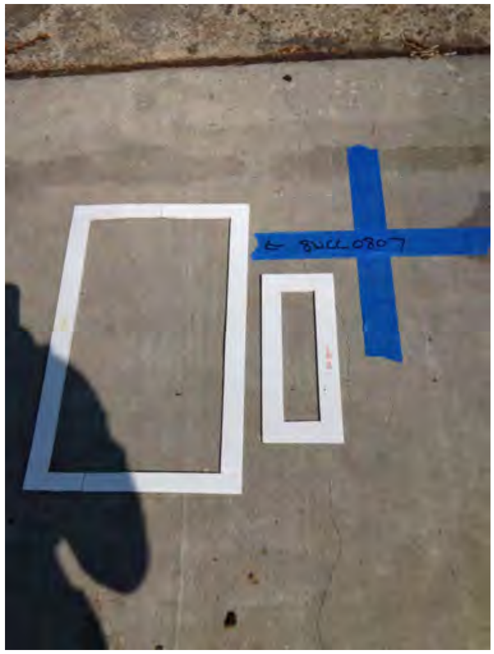
Sample Location: Ground Floor, Column Line 6, West Side
Sample Number: 2ECC
Sample System / Condition: Concrete Floor - Clean



Sample Location: Ground Floor, Column Line 12.5, East Side
Sample Number: 12.5ECC0807
Sample System / Condition: Concrete Floor - Clean

Photo Log 1 – Hangar 1 Wipe Sampling

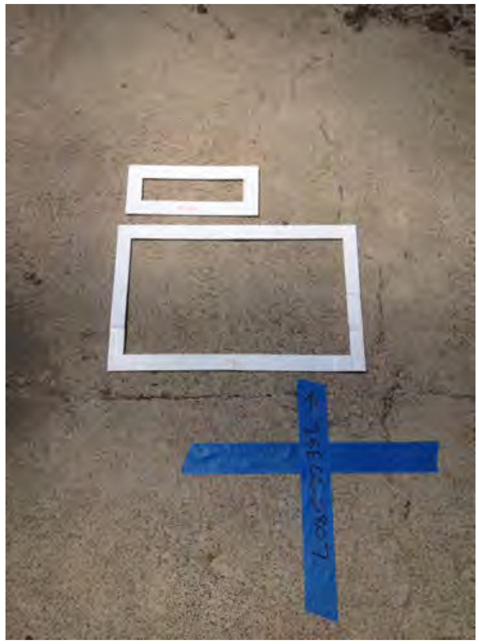
Sample Location: Ground Floor, Column Line 8, West Side
Sample Number: 8WCC0807
Sample System / Condition: Concrete Floor - Clean



Sample Location: Ground Floor, Column Line 2.5, West Side
Sample Number: 2.5WCC0807
Sample System / Condition: Concrete Floor - Clean

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 7.5, East Side
Sample Number: 7.5ECC0807
Sample System / Condition: Concrete Floor – Clean



Sample Location: Ground Floor, Column Line 12, East Side
Sample Number: 12ECON – CMU Wall Ledge
Sample System / Condition: Concrete/CMU

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 13, West Side
Sample Number: 13WCON - CMU Wall
Sample System / Condition: Concrete/CMU

Sample Location: Ground Floor, Column Line 3, West Side
Sample Number: 3WCON - Stem Wall
Sample System / Condition: Concrete/CMU

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 2, East Side
Sample Number: 2ECON - Stem Wall
Sample System / Condition: Concrete/CMU

Sample Location: Ground Floor, Column Line 14, West Side
Sample Number: 14WDP
Sample System / Condition: Structural Steel below Deteriorated Encapsulant/Paint

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 12, West Side
Sample Number: 12WDP
Sample System / Condition: Structural Steel below Deteriorated Encapsulant/Paint

Sample Location: Ground Floor, Column Line 2, West Side
Sample Number: 2WDP
Sample System / Condition: Structural Steel below Deteriorated Encapsulant/Paint

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 3, East Side
Sample Number: 3EDP
Sample System / Condition: Structural Steel below Deteriorated Encapsulant/Paint

Sample Location: Ground Floor, Column Line 6, East Side
Sample Number: 6EDP
Sample System / Condition: Structural Steel below Deteriorated Encapsulant/Paint

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 13, East Side
Sample Number: 13EDP
Sample System / Condition: Structural Steel below Deteriorated Encapsulant/Paint

Sample Location: Ground Floor, Column Line 12, West Side
Sample Number: 12WEP0807
Sample System / Condition: Exposed Original Paint

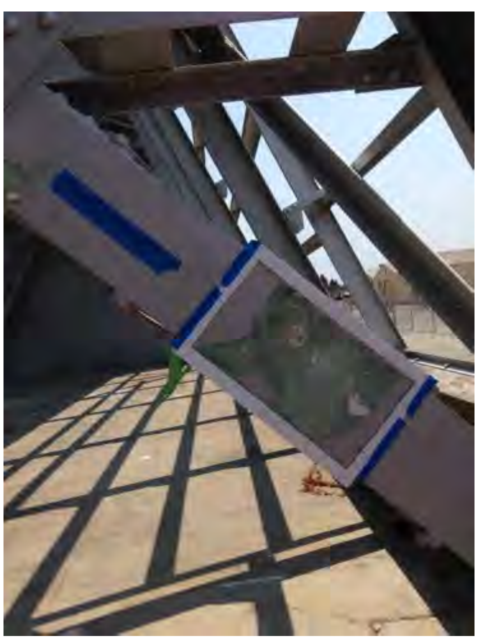


Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 1, East Side
Sample Number: 1EO
Sample System / Condition: Intact Encapsulant/paint over Structural Steel

Sample Location: Ground Floor, Column Line 7, East Side
Sample Number: 7EO
Sample System / Condition: Intact Encapsulant/paint over Structural Steel

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 9, East Side
Sample Number: 9EO
Sample System / Condition: Intact Encapsulant/paint over Structural Steel

Sample Location: Ground Floor, Column Line 14, West Side
Sample Number: 14WI
Sample System / Condition: Intact Encapsulant/paint over Structural Steel

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 11, West Side
Sample Number: 11WI
Sample System / Condition: Intact Encapsulant/paint over Structural Steel

Sample Location: Ground Floor, Column Line 8, West Side
Sample Number: 8WO
Sample System / Condition: Intact Encapsulant/paint over Structural Steel

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 5, West Side
Sample Number: 5WO
Sample System / Condition: Intact Encapsulant/paint over Structural Steel

Sample Location: Ground Floor, Column Line 8, West Side
Sample Number: 8EI0811
Sample System / Condition: Intact Encapsulant/paint over Structural Steel

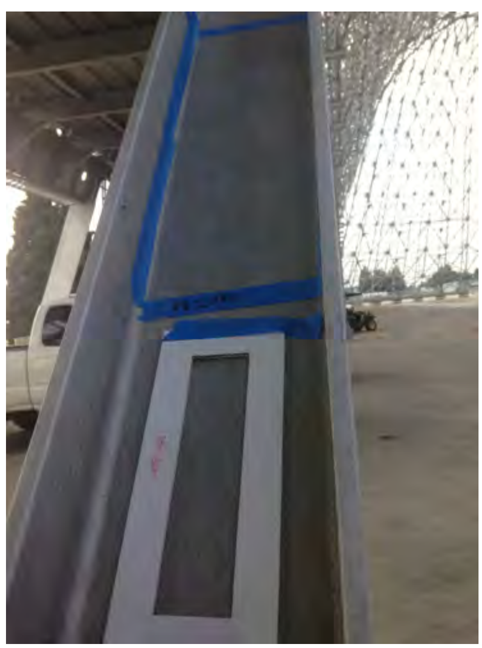


Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 3, West Side
Sample Number: 3WI0811
Sample System / Condition: Intact Encapsulant/paint over Structural Steel

Sample Location: Ground Floor, Column Line 11, East Side
Sample Number: 11ESC
Sample System / Condition: Concrete Floor - Evidence of Pooling/Sediment

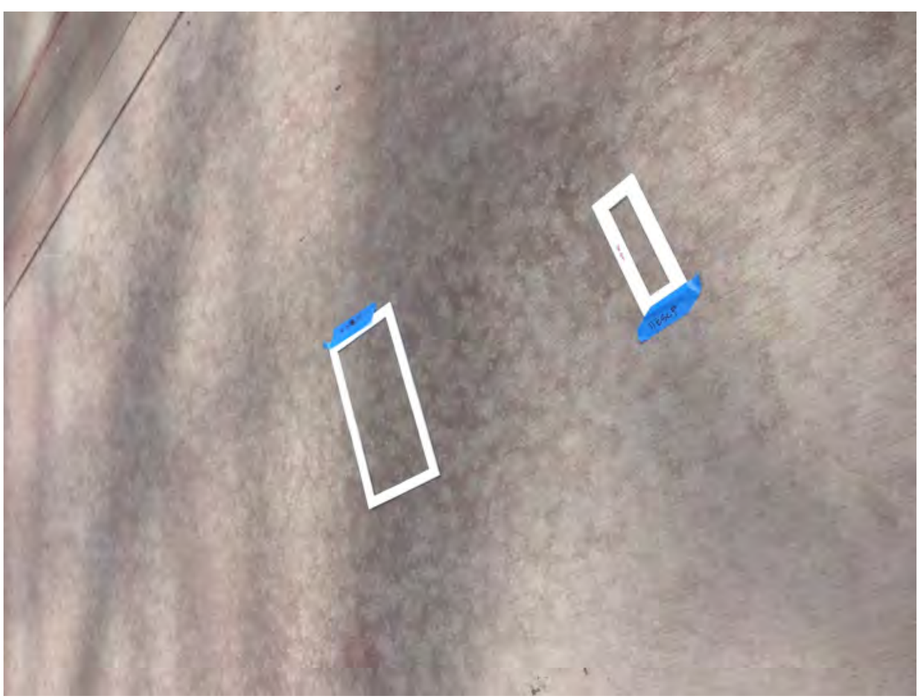
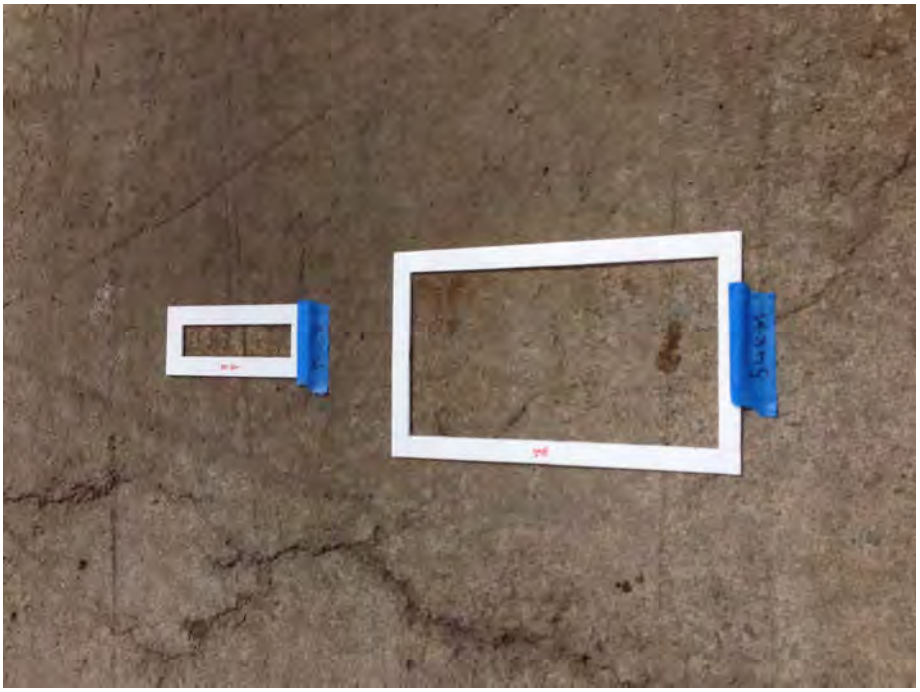


Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 5, West Side
Sample Number: 5WSC
Sample System / Condition: Concrete Floor - Evidence of Pooling/Sediment



Sample Location: Ground Floor, Column Line 2, East Side
Sample Number: 2ESC
Sample System / Condition: Concrete Floor - Evidence of Pooling/Sediment

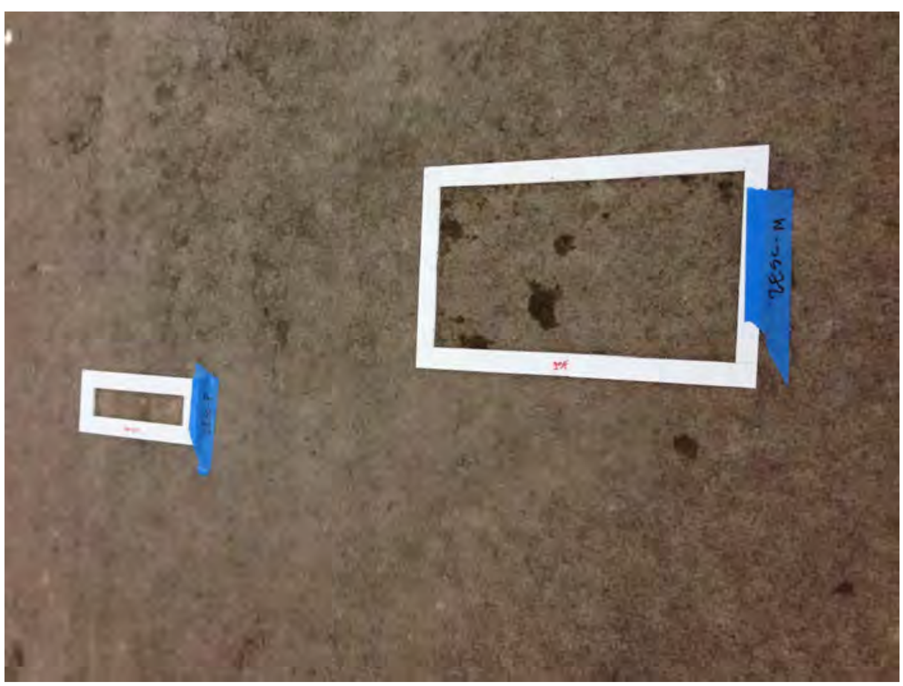


Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 14.5, East Side
Sample Number: 14.5ESC0807
Sample System / Condition: Concrete Floor - Evidence of Pooling/Sediment

Sample Location: Ground Floor, Column Line 9.5, West Side
Sample Number: 9.5WSC0807
Sample System / Condition: Concrete Floor - Evidence of Pooling/Sediment

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 1.5, West Side
Sample Number: 1.5WSC0807
Sample System / Condition: Concrete Floor - Evidence of Pooling/Sediment

Sample Location: Ground Floor, Column Line 6.5, East Side
Sample Number: 6.5ESC0807
Sample System / Condition: Concrete Floor - Evidence of Pooling/Sediment

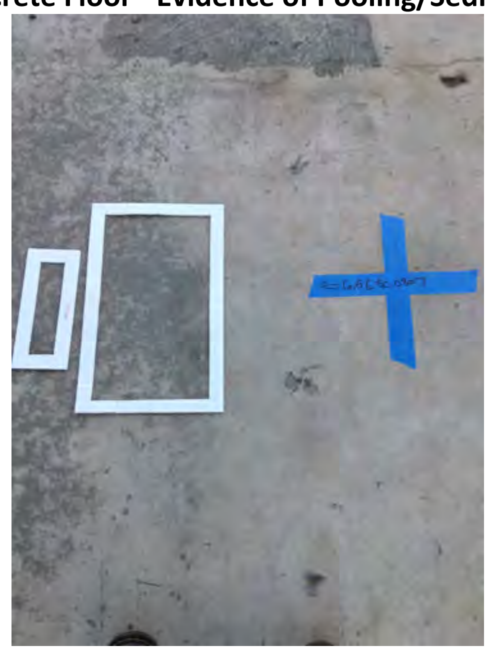


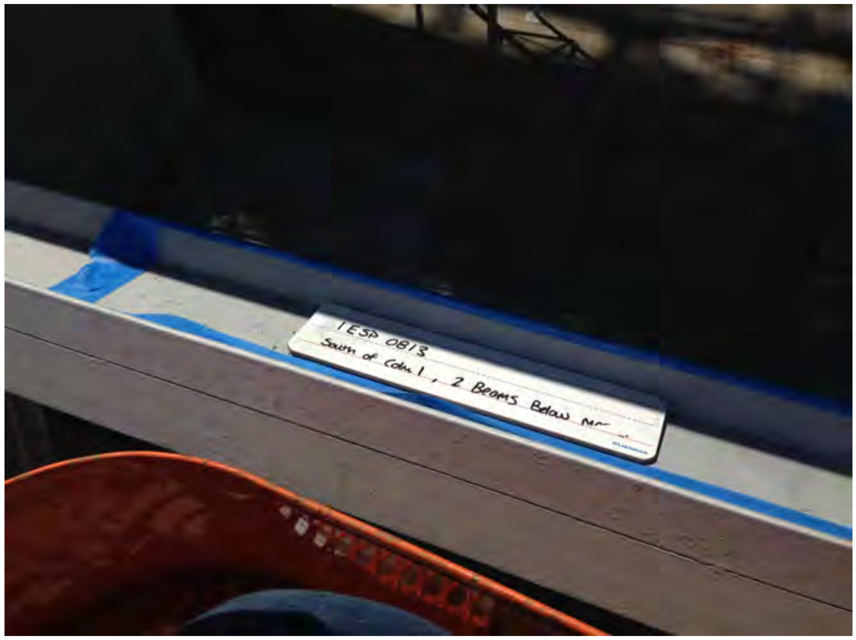
Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 9, East Side
Sample Number: 9ESP0813
Sample System / Condition: Ponding Water Areas - Horizontal Structural Steel

Sample Location: Ground Floor, Column Line 5, East Side
Sample Number: 5ESP0813
Sample System / Condition: Ponding Water Areas - Horizontal Structural Steel

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 1, East Side
Sample Number: 1ESP0813
Sample System / Condition: Ponding Water Areas - Horizontal Structural Steel



Sample Location: Ground Floor, Column Line 4, West Side
Sample Number: 4WSP0813
Sample System / Condition: Ponding Water Areas - Horizontal Structural Steel

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 12, West Side
Sample Number: 12WISS0813
Sample System / Condition: Ponding Water Areas - Horizontal Structural Steel

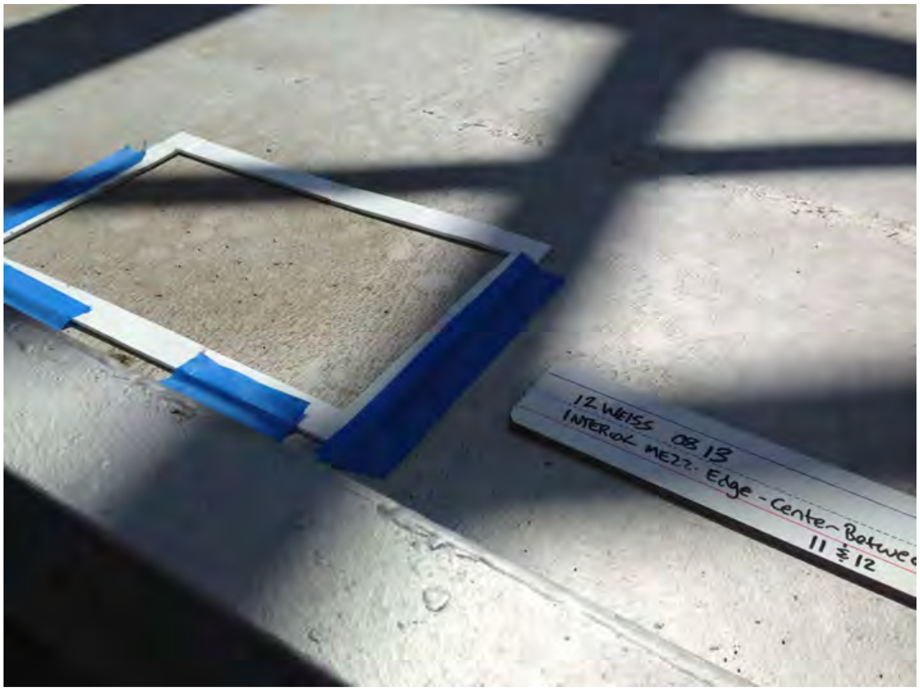


Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 12, East Side
Sample Number: 12ESS
Sample System / Condition: Base of Steel Column at evidence of Pooling/Sediment

Sample Location: Ground Floor, Column Line 9, West Side
Sample Number: 9WSS
Sample System / Condition: Base of Steel Column at evidence of Pooling/Sediment

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 0, West Side
Sample Number: 0WSS
Sample System / Condition: Base of Steel Column at evidence of Pooling/Sediment

Sample Location: Ground Floor, Column Line 5, East Side
Sample Number: 5ESS
Sample System / Condition: Base of Steel Column at evidence of Pooling/Sediment

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Column Line 10/11, Outside Column, East Side
Sample Number: 10/11EOSS0811
Sample System / Condition: Base of Steel Column at evidence of Pooling/Sediment

Sample Location: Ground Floor, Column Line 4/5, Outer Column, East Side
Sample Number: 4/5EOSS0811
Sample System / Condition: Base of Steel Column at evidence of Pooling/Sediment

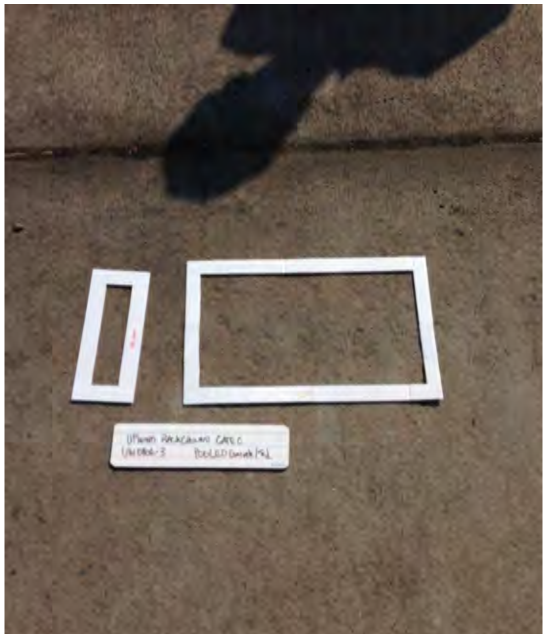
Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Upwind
Sample Number: UW0806-01
Sample System / Condition: Upwind Location - Outside H1 Drainage Area

Sample Location: Ground Floor, Upwind
Sample Number: UW0806-02
Sample System / Condition: Upwind Location - Outside H1 Drainage Area

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Upwind
Sample Number: UW0806-03
Sample System / Condition: Upwind Location - Outside H1 Drainage Area



Sample Location: Ground Floor, Upwind
Sample Number: UW0806-04
Sample System / Condition: Upwind Location - Outside H1 Drainage Area

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Upwind
Sample Number: UW0806-05
Sample System / Condition: Upwind Location - Outside H1 Drainage Area

Sample Location: Ground Floor, Upwind
Sample Number: UW0806-06
Sample System / Condition: Upwind Location - Outside H1 Drainage Area

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Downwind
Sample Number: DW0806-01
Sample System / Condition: Downwind Location - Outside H1 Drainage Area

Sample Location: Ground Floor, Downwind
Sample Number: DW0806-02
Sample System / Condition: Downwind Location - Outside H1 Drainage Area

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Downwind
Sample Number: DW0806-03
Sample System / Condition: Downwind Location - Outside H1 Drainage Area

Sample Location: Ground Floor, Downwind
Sample Number: DW0806-04
Sample System / Condition: Downwind Location - Outside H1 Drainage Area

Photo Log 1 – Hangar 1 Wipe Sampling

Sample Location: Ground Floor, Downwind
Sample Number: DW0806-05
Sample System / Condition: Downwind Location - Outside H1 Drainage Area

Sample Location: Ground Floor, Downwind
Sample Number: DW0806-06
Sample System / Condition: Downwind Location - Outside H1 Drainage Area

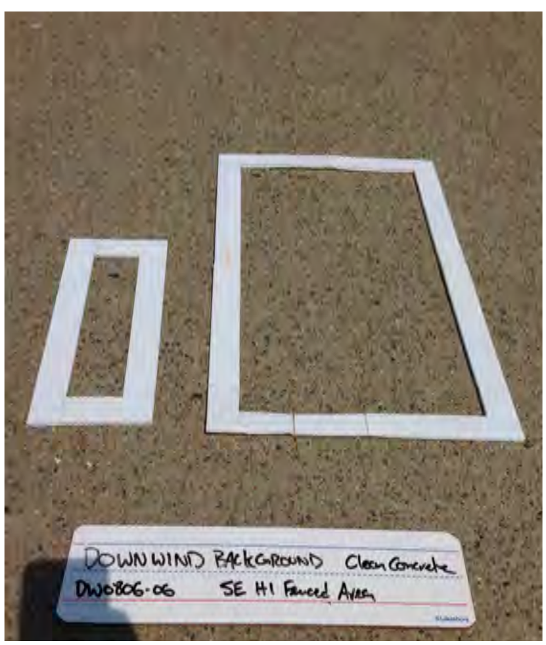


Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 14, East Hangar
Sample Number: PT-01-01
Material Description: Multi-color paint under CM15 encapsulant over structural steel

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 4, East Hangar
Sample Number: PT-01-02
Material Description: Multi-color paint under CM15 encapsulant over structural steel

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 12, East Hangar
Sample Number: PT-01-03
Material Description: Multi-color paint under CM15 encapsulant over structural steel

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor North Column
Sample Number: PT-01-04
Material Description: Multi-color paint under CM15 encapsulant over structural steel

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Sample Location: Ground Floor Column Line 11, West Hangar
Sample Number: PT-01-05
Material Description: Multi-color paint under CM15 encapsulant over structural steel

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Sample Location: Ground Floor Column Line 1, West Hangar
Sample Number: PT-01-06
Material Description: Multi-color paint under CM15 encapsulant over structural steel

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: **Ground Floor Column Line 6, East Hangar**
Sample Number: **PT-01-07**
Material Description: **Multi-color paint under CM15 encapsulant over structural steel**

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 12, East Hangar
Sample Number: PT-02-01
Material Description: Multi-color paint under CM15 encapsulant over concrete

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

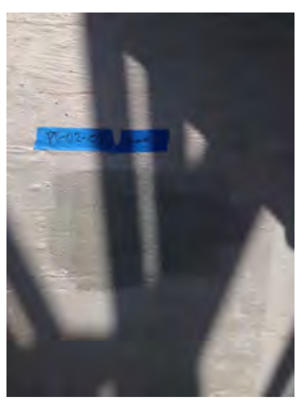


Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Location: **Ground Floor Column Line 2, West Hangar**
Sample Number: **PT-02-02**
Material Description: **Multi-color paint under CM15 encapsulant over concrete**

Prior to Sampling

<Photo File Damaged>

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 14, East Hangar
Sample Number: PT-02-03
Material Description: Multi-color paint under CM15 encapsulant over concrete

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 10, West Hangar
Sample Number: PT-02-04
Material Description: Multi-color paint under CM15 encapsulant over concrete

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 14, East Hangar
Sample Number: MI-04-01
Material Description: Carbocrete coated concrete perimeter stem wall

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 1, East Hangar
Sample Number: MI-04-02
Material Description: Carbocrete coated concrete perimeter stem wall

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: MI-04-03
Material Description: Carbocrete coated concrete perimeter stem wall

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: **Ground Floor Column Line 12, West Hangar**
Sample Number: **MI-04-04**
Material Description: **Carbocrete coated concrete perimeter stem wall**

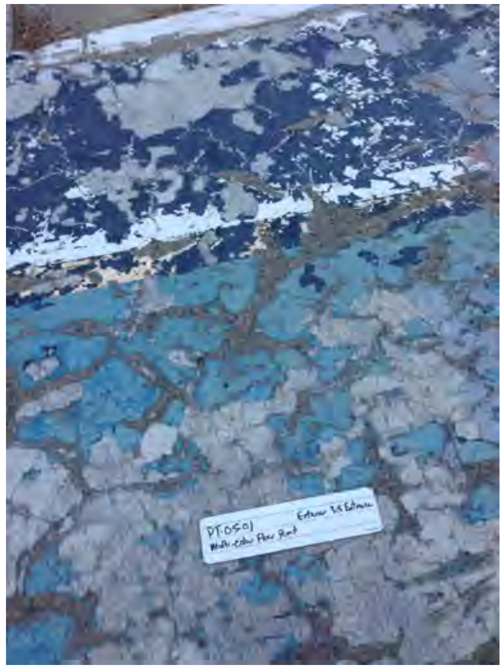
Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 - Hangar 1 Misc. Suspect Materials

Sample Location: Ground Floor Column Line 3, East Entry Of Hangar
Sample Number: PT-05-01
Material Description: Multi-color textured/sanded entry floor coating



Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: EJ-06-02
Material Description: Bituminous concrete expansion joint

Photo Log 3 - Hangar 1 Misc. Suspect Materials

Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: EJ-06-03
Material Description: Bituminous concrete expansion joint

Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: SE-07-01
Material Description: Floor trench, door trench and trench drain sediment

Photo Log 3 - Hangar 1 Misc. Suspect Materials

Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: SE-07-02
Material Description: Floor trench, door trench and trench drain sediment

Sample Location: Ground Floor, Southwest Hangar Floor
Sample Number: PT-08-01
Material Description: Sanded Floor Paint

Photo Log 3 - Hangar 1 Misc. Suspect Materials

Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: CK-09-01
Material Description: Gray expansion joint caulking

Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: PT-10-01
Material Description: Gray textured/sanded floor paint

Photo Log 3 - Hangar 1 Misc. Suspect Materials

Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: PT-10-02
Material Description: Gray textured/sanded floor paint

Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: CON-11-01
Material Description: Original Concrete Floor

Photo Log 3 - Hangar 1 Misc. Suspect Materials

Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: CON-12-01
Material Description: Original Concrete Floor

Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: LC-13-01
Material Description: Gray Cementitious Leveling Compound

Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: LC-13-02
Material Description: Gray Cementitious Leveling Compound

Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: LC-14-01
Material Description: White Cementitious leveling compound

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 4, East Hangar
Sample Number: PT-01-02
Material Description: Multi-color paint under CM15 encapsulant over structural steel

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 12, East Hangar
Sample Number: PT-01-03
Material Description: Multi-color paint under CM15 encapsulant over structural steel

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor North Column
Sample Number: PT-01-04
Material Description: Multi-color paint under CM15 encapsulant over structural steel

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Sample Location: Ground Floor Column Line 11, West Hangar
Sample Number: PT-01-05
Material Description: Multi-color paint under CM15 encapsulant over structural steel

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 1, West Hangar
Sample Number: PT-01-06
Material Description: Multi-color paint under CM15 encapsulant over structural steel

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 6, East Hangar
Sample Number: PT-01-07
Material Description: Multi-color paint under CM15 encapsulant over structural steel

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 12, East Hangar
Sample Number: PT-02-01
Material Description: Multi-color paint under CM15 encapsulant over concrete

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

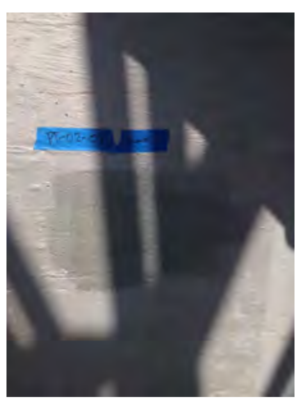


Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Location: Ground Floor Column Line 2, West Hangar
Sample Number: PT-02-02
Material Description: Multi-color paint under CM15 encapsulant over concrete

Prior to Sampling

<Photo File Damaged>

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 14, East Hangar
Sample Number: PT-02-03
Material Description: Multi-color paint under CM15 encapsulant over concrete

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: **Ground Floor Column Line 10, West Hangar**
Sample Number: **PT-02-04**
Material Description: **Multi-color paint under CM15 encapsulant over concrete**

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Sample Location: Ground Floor Column Line 14, East Hangar
Sample Number: MI-04-01
Material Description: Carbocrete coated concrete perimeter stem wall

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 1, East Hangar
Sample Number: MI-04-02
Material Description: Carbocrete coated concrete perimeter stem wall

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 6, West Hangar
Sample Number: MI-04-03
Material Description: Carbocrete coated concrete perimeter stem wall

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

Photo Log 3 – Hangar 1 NTCRA related Coating Samples & Repairs

Sample Location: Ground Floor Column Line 12, West Hangar
Sample Number: MI-04-04
Material Description: Carbocrete coated concrete perimeter stem wall

Prior to Sampling

After Sampling

After Recoating/Repairs by DPR

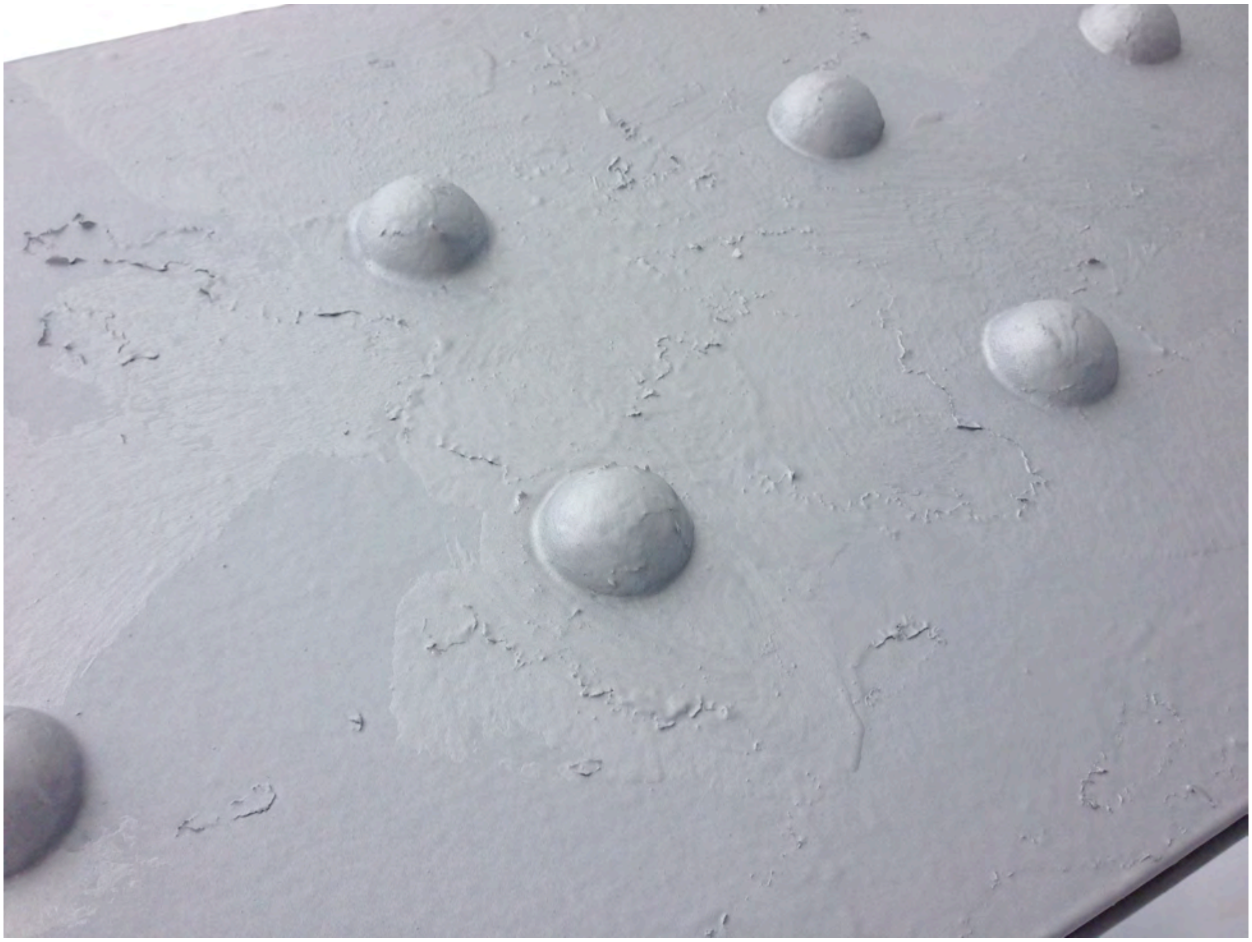
Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings

Pooled Water & Deteriorating Paint Edges (Horizontal Steel Framing)

Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings

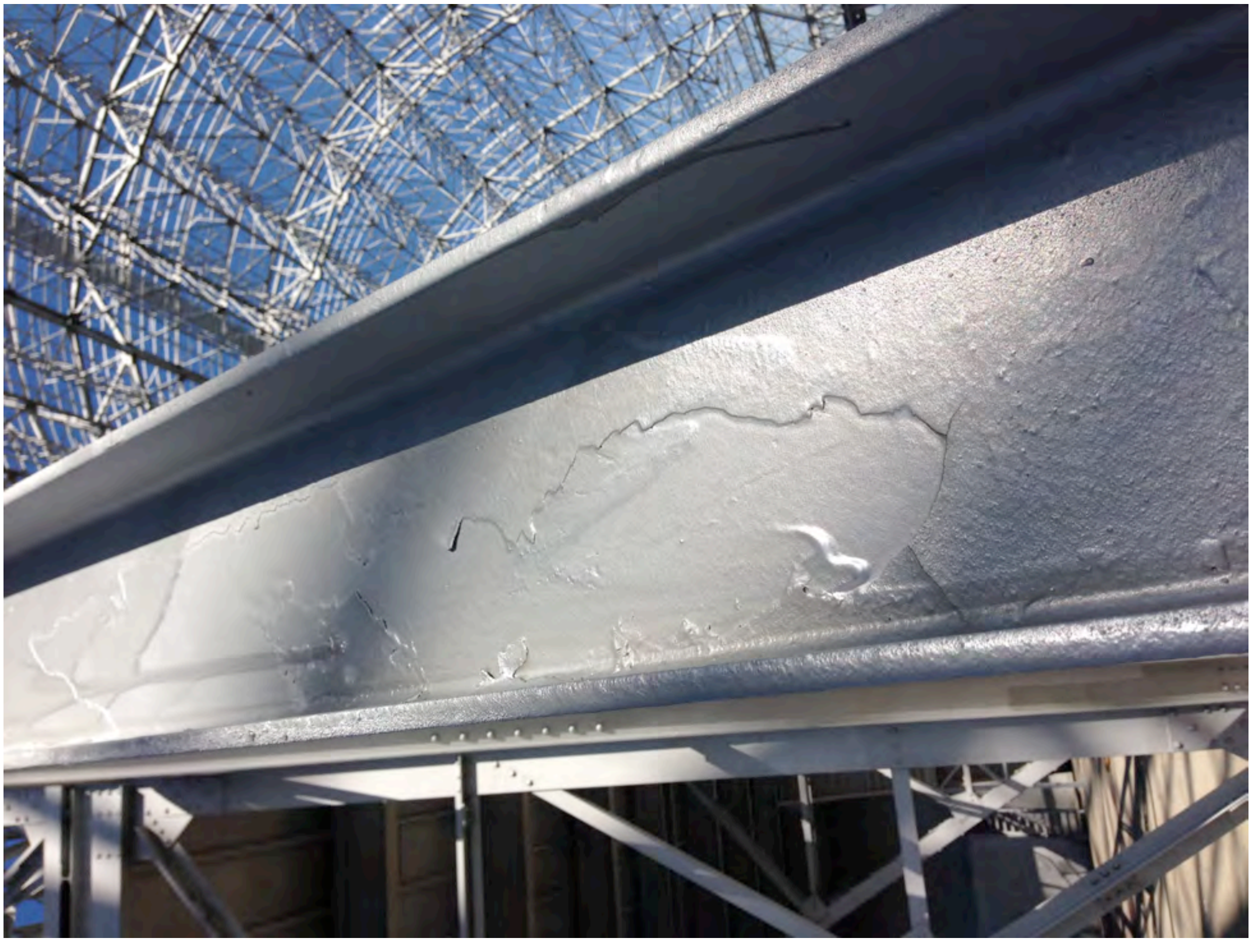
Deteriorated paint, underside of horizontal steel

Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings



Peeling Edges of Original Coating, vertical steel

Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings



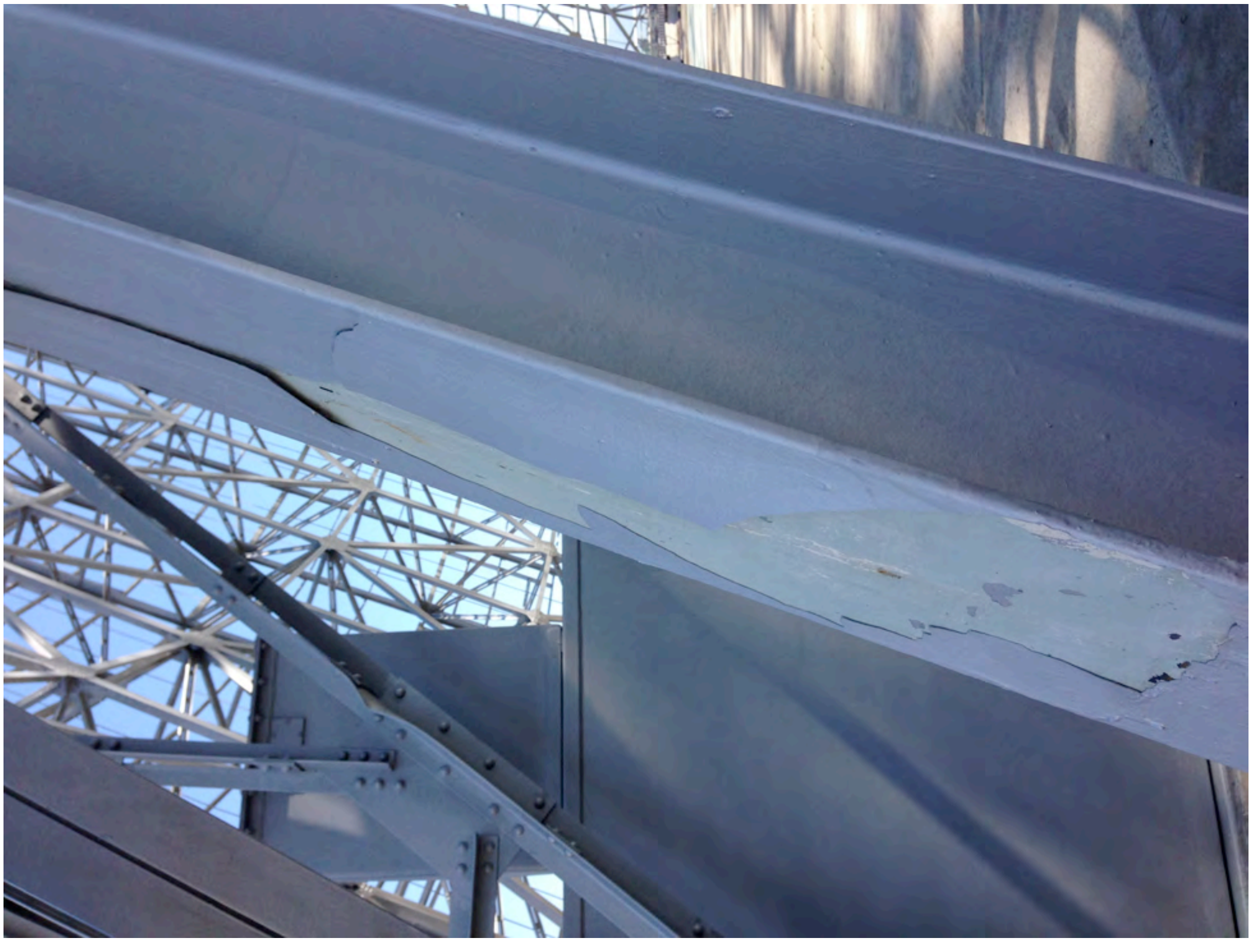
Poor stabilization of original coatings, horizontal steel

Delaminating encapsulant and original paint, vertical steel

Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings

Delaminating encapsulant and original paint, vertical steel

Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings



Delaminated encapsulant and original paint, vertical steel

Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings

Delaminating encapsulant, horizontal steel

Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings

Small rust spots on horizontal steel beam and plate

Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings

Loose & peeling original coatings, horizontal steel

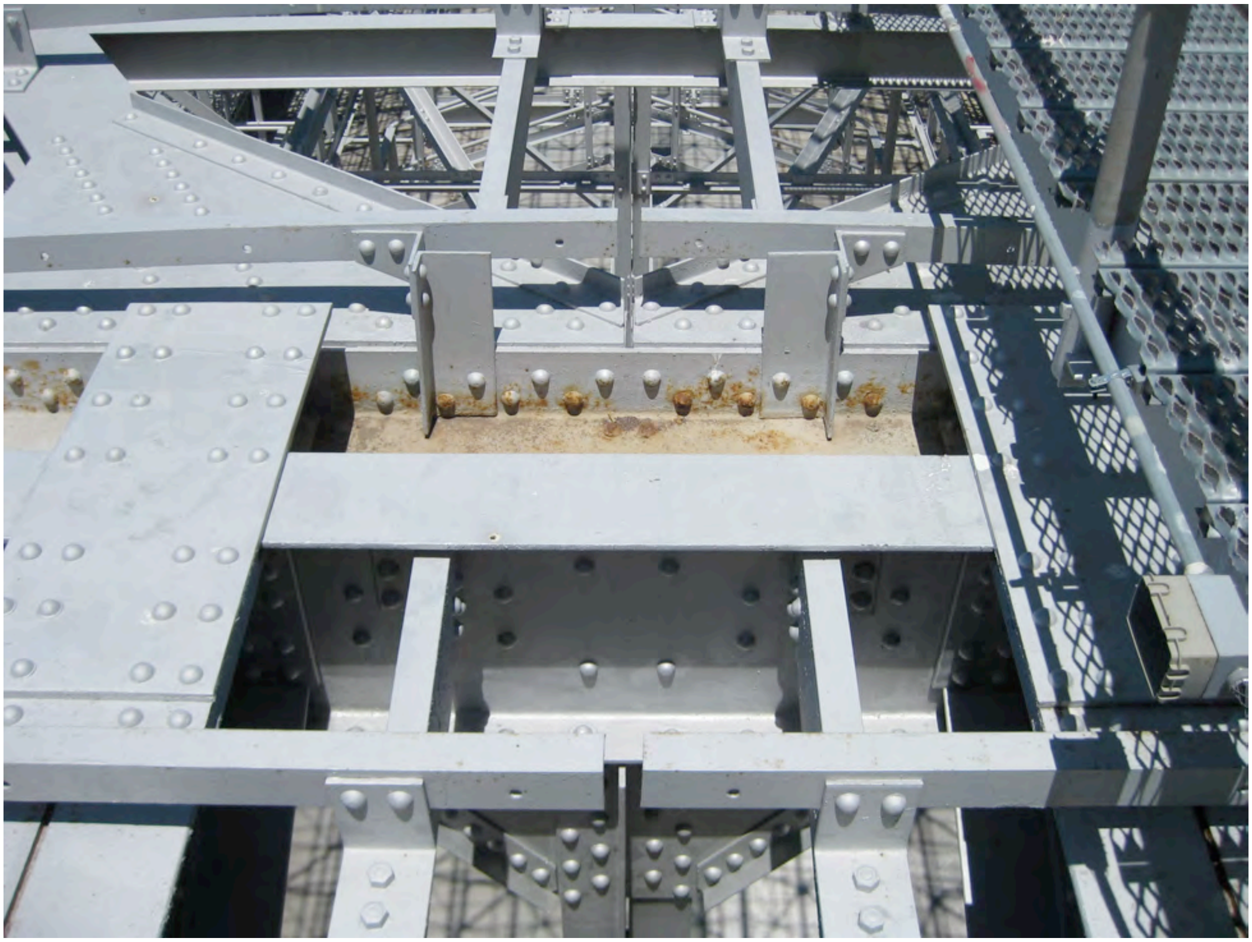
Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings

Peeling Edges of Original Coating, vertical steel

Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings

Mezzanine Pooling Water & Sediment

Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings

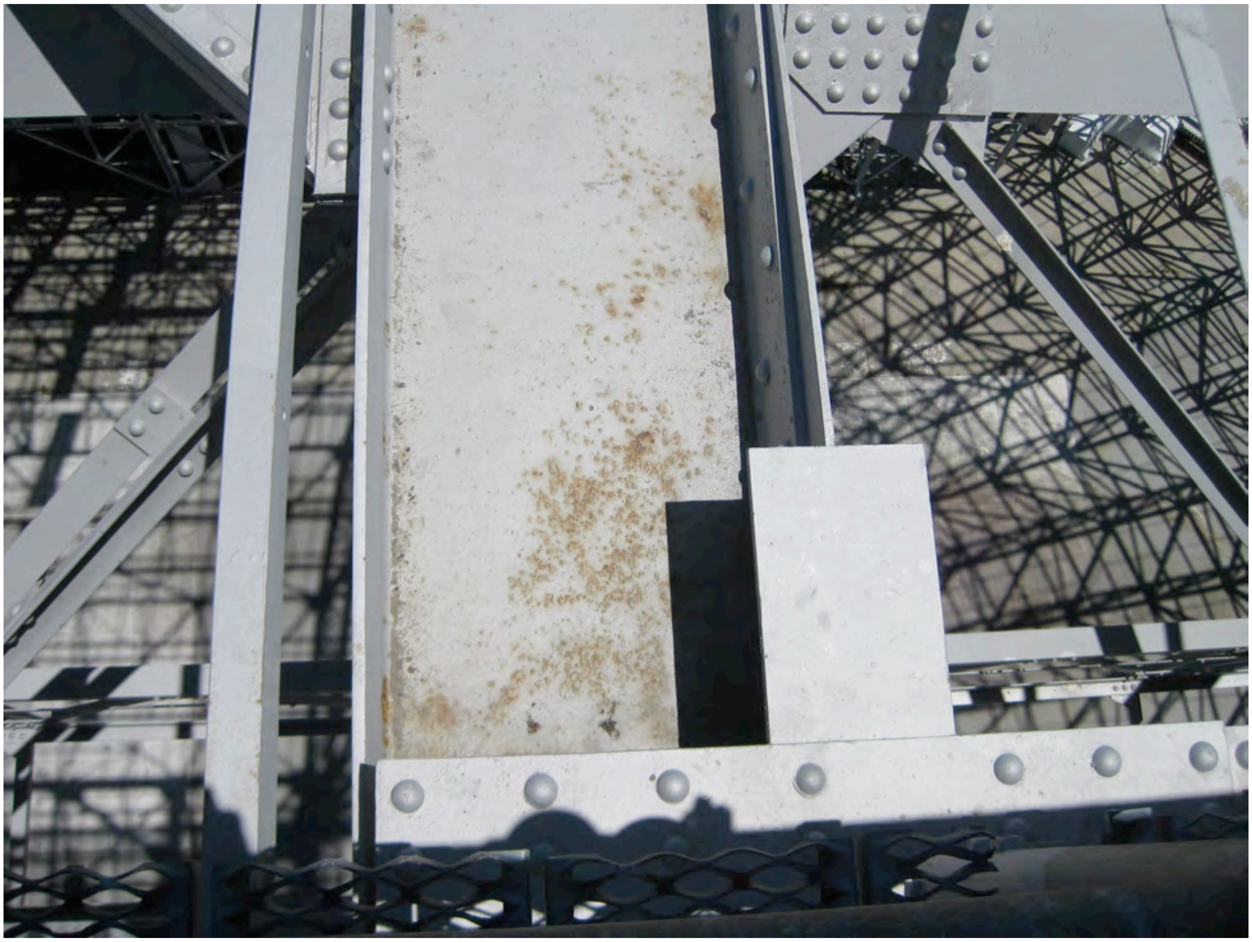


Roof-top rusting of NTCRA Coating, area where water pools

Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings

Roof-top rusting of NTCRA Coating

Photo Log 4 – Example Pictures of Deteriorated Hangar 1 NTCRA Coatings



Roof-top rusting of NTCRA Coating

Appendix B

Pilot Scale Abatement Study of Hangar 1,

dated October 2017

ACC Environmental Consultants

(Text Tables, and Appendices A through K only)

Pilot Scale Abatement Study of Hangar 1

October 9, 2017

Hangar One, Moffett Federal Airfield
Mountain View, California

Prepared For:

Planetary Ventures, LLC
Kevin Antonelli, Project Executive, Development
1600 Amphitheater Parkway, Mountain View CA. 94043

ACC Project #: 1591-011.01



Pilot Scale Abatement Study of Hangar 1

Hangar 1, Moffett Federal Airfield
Mountain View, California

Prepared For:
Planetary Ventures, LLC
Kevin Antonelli, Project Executive, Development
1600 Amphitheater Parkway, Mountain View CA. 94043

Prepared By:

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An Employee Owned Company

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Stephen Jackson, Senior Project Manager
Certified Asbestos Consultant #95-1782
CDPH Lead Inspector/Assessor/Supervisor/Project Monitor #9148

Reviewed by:
Jim Wilson, CEO
Certified Asbestos Consultant #06-4043

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LIST OF ABBREVIATIONS

ACC: ACC Environmental Consultants
ACM: Asbestos-Containing Material
ANSI: American National Standards Institute
BAAQMD: Bay Area Air Quality Management District
BRAC: Base Realignment and Closure
CAAQS: California Ambient Air Quality Standards
CAM: California Administrative Manual
CCR: California Code of Regulations
CEL: Consolidated Engineering Laboratories
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CFR: Code of Federal Regulations
CM15: Carbomastic 15 epoxy coating
CMU: Concrete Masonite Unit
COC: Chain-of-Custody
CTS: Construction Testing Services
DIR: The State of California Department of Industrial Relations
DOSH: The State of California Division of Occupational Safety & Health
EcoBay: EcoBay Services, Inc.
EE/CA: Engineering Evaluation/Cost Analysis
EIMP: Environmental Issues Management Plan
EPA: Environmental Protection Agency
FFA: Federal Facilities Agreement
FFS: Focused Feasibility Study
GFCI: Ground-fault Circuit Interrupter
gpm: gallons per minute
HAZWOPER: Hazardous Waste Operations and Emergency Response Standard
HEPA: High-Efficiency Particulate Air
ICC: International Code Council
ICP/MS: Inductively coupled plasma mass spectrometry
ITRC: Interstate Technology & Research Council
ISM: Incremental Sampling Methodology
LTMP: Long-Term Management Plan
m^3: cubic meter

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ABBREVIATIONS (continued)

mg/cm^2: milligrams per square centimeter
mg/m^3: milligrams per cubic meter
MFA: Moffett Federal Airfield
mg/kg: milligrams per kilogram
NA: Not applicable
NACE: National Association of Corrosion Engineers
NAS: Naval Air Station
NASA: National Aeronautics and Space Administration
Navy: U.S. Department of the Navy
NIOSH: National Institute of Occupational Safety and Health
NIST: National Institute of Standards and Technology
NTCRA: Non-Time-Critical Removal Actions
OSHA: Occupational Safety and Health Administration
PAPR: Powered Air Purifying Respirators
PCB: Polychlorinated Biphenyls
PPE: Personal Protective Equipment
PV: Planetary Ventures, LLC.
PVC: Polyvinyl Chloride
RCRA: Resource Conservation and Recovery Act
SCBA: Self-Contained Breathing Apparatus
SDS: Safety Data Sheet
SF: square feet
SSHSP: Site Specific Health and Safety Plan
TAT: Turn Around Time
TCRA: Time-Critical Removal Action
TWA: time-weighted average
µg: micrograms
µg/100 cm^2: micrograms per 100 square centimeters
µg/ft^2: micrograms per square foot
µg/m^3: micrograms per cubic meter
UHPW: ultra-high pressure water
U.S.: United States
USEPA: U.S. Environmental Protection Agency
VOC: Volatile Organic Compounds
Water Board: Regional Water Quality Control Board, San Francisco Bay Region
XRF: X-Ray Fluorescence Spectrometer

1. Executive Summary

From March 14, 2017 through July 11, 2017, ACC Environmental Consultants (ACC) oversaw the Pilot Scale Abatement Study of Hangar 1 at Moffett Field (Pilot Study). EcoBay Services, Inc., completed the contractor portion of the Pilot Study as requested and approved by Planetary Ventures, LLC. The purpose of the Pilot Study was to determine the feasibility of large-scale abatement of lead and polychlorinated biphenyl (PCB) contamination present on the accessible structural steel elements and concrete masonry unit (CMU) walls located at the Hangar 1 structure. ACC collected samples at each phase of the Pilot Study, as described in the Final Work Plan for the Pilot Scale Abatement Study of Hangar 1 (Work Plan). The purpose of the sampling was to confirm the presence of lead and PCBs in paints/coatings applied to the structure and determine if Target Acceptance Criteria[1] (see Table 5 of the Work Plan) were achievable with each of the abatement methods tested during the Pilot Study.

ACC collected baseline samples within the Pilot Study area prior to abatement activities on site. Bulk samples were collected from the coatings over the structural steel elements, and the CMU wall within the Pilot Study area. Lead and PCBs were detected within the coatings on both surface types. The highest concentrations of lead were 90,000 mg/kg and 4,200 mg/kg on the structural steel elements and CMU wall coatings respectively. The highest concentrations of PCBs were 12,400 µg/kg and 4,380 µg/kg on the structural steel elements and CMU wall coatings respectively.

Three abatement methods were considered during the Pilot Study: Ultra-High Pressure Water Blasting, Media Blasting, and Vapor Media Blasting. Each of the three abatement methods were evaluated based on the following elements: did the abatement reach target acceptance criteria, post-abatement steel and CMU wall surface conditions, mass of hazardous waste (solid and liquid) produced, ease and safety of use according to EcoBay, and equipment performance efficiency.

In accordance with the Work Plan, ACC collected post-abatement wipe samples from surfaces abated by each of the three methods. PCBs were not detected in post-abatement wipe samples for any of the abatement methods on both the structural steel elements and the CMU wall. Lead concentrations were below the target acceptance criterion of 250 micrograms per square foot (µg/ft^2) for every surface abated using the Media Blasting and Vapor Media Blasting methods. Lead concentrations were above the Target Acceptance Criterion on both the structural steel elements and CMU wall in areas abated using the Ultra-High Pressure Water Blasting method.

Based on these criteria, it was determined that either the Media Blasting or Vapor Media Blasting abatement methods would be acceptable for full-scale abatement. Either of these abatement methods would yield acceptable results during a full-scale abatement. The Ultra-High Pressure Water Blasting was deemed unacceptable because it was not capable of meeting the acceptance criterion for several surfaces and it was difficult to use.

2. Introduction

On behalf of Planetary Ventures, LLC (PV), ACC Environmental Consultants (ACC) has prepared this Final Report for the Pilot Scale Abatement Study (Pilot Study) of Hangar 1, which was implemented to determine the feasibility of reducing PCB and lead concentrations in accessible structural steel elements and concrete masonry unit (CMU) walls within the Hangar 1 structure for possible future occupancy.

---

[1] Target Acceptance Criteria for full-scale abatement will be provided in a future document.

Hangar 1 is a large steel structure, measuring approximately 1,133 feet long by 308 feet wide and 198 feet tall, is located within the former Naval Air Station (NAS) Moffett Field approximately 35 miles south of San Francisco and 10 miles north of San Jose. Hangar 1 is listed as a National Landmark on the National Park Service Historic Registry and is a Civil Engineering Landmark of Northern California. Originally, the steel frame of Hangar 1 was covered with corrugated siding and a built-up asphalt roof. The interior contained multi-story offices and shops located on both sides of the hangar deck, concrete electrical vaults, and a concrete floor. Currently, the area surrounding the hangar is paved, with the exception of several small areas of bare soil located on the eastern side of the hangar. A trench drain that discharges to the storm drain system surrounds the perimeter of Hangar 1.

The former NAS Moffett field was commissioned in 1933 to serve as a base for the West Coast dirigibles of the lighter-than-air program and Hangar 1, located to the west of the airfield runways, was constructed to house the USS Macon dirigible. Between 1933 and 1994, the station was operated continuously by the United States (U.S.) Military. By 1950 when jet aircraft were introduced, NAS Moffett Field was the largest naval air transport base on the West Coast and became the first all-weather NAS. Between 1973 and 1994, the mission of NAS Moffett Field was to support anti-submarine warfare training and patrol squadrons (PRC, 1996). No heavy manufacturing or major aircraft maintenance was conducted during this last period of operation of NAS Moffett Field, although some maintenance activity occurred (Harding, 2000).

In 1987, the United States Environmental Protection Agency (USEPA) placed NAS Moffett Field on the National Priority List and on 10 September 1990 the U.S. Department of the Navy (Navy) signed a Federal Facility Agreement (FFA; USEPA, 1990) with the USEPA and the Regional Water Quality Control Board, San Francisco Bay Region (Water Board) to conduct remedial actions at NAS Moffett Field pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and attendant regulations. This agreement was amended in December 1993 (USEPA, 1993).

In 1991, NAS Moffett Field was designated for closure as an active military base under the Department of Defense Base Realignment and Closure (BRAC) Program. In 1994, NAS Moffett Field was transferred to the National Aeronautics and Space Administration (NASA) and renamed Moffett Federal Airfield (MFA) (PRC, 1996).

In 2015, PV entered into a lease with NASA for an approximately 1,000-acre parcel of land (MFA Leasehold) within NAS Moffett Field and includes Hangar 1. As part of the lease agreement, PV is responsible for “re-skinning” Hangar 1.

2.1 Prior Investigations and Remedial Actions

In 1997, NASA detected the presence of Aroclor 1268, a relatively uncommon polychlorinated biphenyl (PCB) mixture, in a storm water settling basin that receives storm water runoff from the western portion of the former NAS Moffett Field. In 1999, Aroclor 1260 and 1268 were detected in a storm water sample collected from a manhole downstream of Hangar 1. Subsequent investigations, implemented between 1999 and 2002 by NASA, determined that the Hangar 1 siding, commercially known as Robertson Protected Metal, contained PCBs and asbestos and that the lead-based paint used to cover both the siding and steel frame of the hangar also contained PCBs. Bulk samples of the lower (gray) siding were found to contain Aroclor 1260 and 1268 at concentrations as high as 5,500 mg/kg and 35,000 mg/kg, respectively (Benchmark, 2003).

In 2003, NASA and the Navy completed Time-Critical Removal Actions (TCRAs) that consisted of removing contaminated sediments from the storm water collection trench and coating the corrugated siding with an asphalt emulsion to mitigate the migration of PCBs from the exterior surfaces of the hangar. Following the TCRAs, the Navy proposed to perform a Non-Time-Critical Removal Actions (NTCRA) to address the known PCB contamination present in the Hangar 1 siding materials as a more effective long-term remedy than the Navy’s TCRA. Thirteen alternatives to mitigate the known PCB contamination at Hangar 1 and reduce the potential negative impacts to human health and the environment from these materials were evaluated in the Engineering Evaluation/Cost Analysis (EE/CA; Navy, 2008) for the NTCRA. The preferred alternative involved the following:

- The complete removal of the Hangar 1 siding;
- The deconstruction of interior structures;
- The removal of debris to appropriate off-site disposal or recycling facilities; and,
- The application of an epoxy coating (Carbomastic® 15; CM15) to the hangar's structural steel frame (AMEC, 2013).

Implementation of the NTCRA began in June 2010 and was completed in December 2012. During the NTCRA, with the exception of the (1) structural steel frame; (2) CMU walls surrounding six electrical vaults, the former hazardous materials storage room, and former restrooms; and (3) the door operating mechanisms, all other areas of the hangar (e.g., the surface of the concrete floor, the top and bottom sides of the metal mezzanine decks and I-beams supporting the mezzanine decks, etc.) were remediated completely to remove all PCB contamination. In areas where PCBs remain (i.e., the structural steel frame, CMU walls, and door operating mechanisms), the structures were over coated with a CM15 epoxy coating (RORE, 2013; AMEC, 2013). The NTCRA completion efforts included a final wash down and decontamination of the Hangar 1 structural steel frame, concrete floor, and storm water conveyance trenches and drains.

Following implementation of the NTCRA, a Focused Feasibility Study (FFS; RORE, 2013) was prepared for the Navy to evaluate short- and long-term options to ensure the protectiveness of the NTCRA. The Navy's Proposed Plan for Hangar 1 (Navy, 2013) summarized the information detailed in the FFS and announced that the Navy's preferred alternative was the implementation of institutional controls.[2]

As paint containing PCBs and lead remain at Hangar 1, the Navy prepared a Long-Term Management Plan (LTMP) for PCB contamination at Hangar 1 (AMEC, 2013) that outlines the coating inspection, maintenance methods and procedures, as well as the storm water sediment monitoring program that are required to maintain the viability and effectiveness of the NTCRA; the LTMP has not been approved by the regulatory agencies. The LTMP indicated that these long-term management activities would present various job hazards to workers, including the potential for PCB exposure. In addition, the LTMP indicated that the owner/operator of the Hangar 1 structure would need to develop procedures for controlling the use of the hangar and modifications to the hangar such as cutting, drilling, grinding, abrasion, welding, fastening, or impact that could damage the CM15 epoxy coating and expose the underlying PCB contamination.

[2] Select potential institutional controls identified in the Navy's Proposed Plan (Navy, 2013) include: (1) installation and maintenance of signs notifying of the potential exposure hazard, (2) administrative arrangements for access for future monitoring/maintenance, (3) property owner and tenant commitment to inspection and maintenance of the CM15 epoxy coating, (4) sediment sampling, and (5) regulatory agency approval of building modifications that might damage the remedy components.

2.2 Description and Purpose of Pilot Scale Abatement Study

The primary objectives of the Pilot Study were to determine the feasibility of reducing PCB and lead concentrations in accessible[3] structural steel elements and CMU walls within the Hangar 1 structure to:

1) Concentrations that could potentially eliminate the need for institutional or engineering controls at Hangar 1;
2) Minimize the potential exposure of future workers to PCBs and lead during long-term operations and maintenance activities; and,
3) Minimize the need for institutional controls such as the installation and maintenance of signage regarding the potential exposure hazard and the necessity of obtaining regulatory agency approval of building modifications that might damage remedy components.

2.3 Pilot Scale Study Location and Background

The Pilot Study work area is located in the southeastern corner of Hangar 1 (Figure A-1, Appendix A) and is approximately 120 feet long by 30 feet wide by 20 feet high (Figures A-2 and A-3, Appendix A). A trench drain is located along the eastern edge of the study area and small area of bare soil is present east/southeast of the Pilot Study Area (Figure C-1, Appendix C).

The Pilot Study Area was selected as it contains a number of different structural steel elements and CMU[4] walls, and is considered representative of the entire Hangar 1 structure. Figures E-1, E-2, and E-4 (Appendix E) illustrate the different types of interior and exterior structural steel elements and Figure E-3 (Appendix E) illustrates a typical CMU wall.

3. Sample Collection, Handling and Analysis

In order to assess baseline conditions, the effectiveness of the different blasting technologies, and whether the Pilot Study resulted in adverse impacts to the environment, wipe samples, bulk samples, air samples, and soil samples were collected as part of the Pilot Study. In addition, disposal characterization samples were collected from the various waste streams. This section describes the various sampling, handling, and analytical procedures used.

3.1 Wipe Samples

3.1.1 *PCB Wipe Samples*

PCB wipe samples were collected in accordance with USEPA 40 CFR Part 761 and ASTM D6661-10 “Standard Practice for Field Sampling of Organic Compounds from Surfaces Using Wipe Sampling” using clean sample wipes saturated with hexane. ACC personnel responsible for collecting these samples were trained in the sampling methodology and reviewed a copy of the method prior to the start of the project. Each sample was collected over an area of 100 square centimeters and immediately placed in a glass jar with a tight-fitting cap and placed in a cooler with

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[3] Accessible surfaces are all surfaces throughout the Hangar 1 structure that are not tight-tolerance mated surfaces (e.g., steel members riveted together) and include all mated surfaces with greater than a ½” gap. Caulk or other coatings will be removed prior to determining whether a surface is a tight-tolerance mated surface.

[4] The CMU wall included in the Pilot Study is part of an electrical vault and was not abated as part of the NTCRA.

bagged ice. Samples were delivered under standard chain-of-custody protocols to Curtis and Tompkins Laboratories in Berkeley, California (C&T) and analyzed for PCBs using USEPA Method 8082.

3.1.2 *Lead Wipe Samples*

Lead wipe samples were collected in accordance with CDPH Title 17 25001, and ASTM E1728-10 “Standard Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination” requirements using pre-moistened wipes. All lead samples were collected by CDPH certified lead professionals. Each sample was collected over an area of one square foot and immediately placed in a glass jar with a tight-fitting cap and placed in a cooler with bagged ice. Samples were delivered under standard chain-of-custody protocols to C&T and analyzed for lead using USEPA Method 6010B/6020[5].

3.2 Bulk Samples

3.2.1 *Bulk Paint and Coating Samples*

Bulk paint and coating sampling required the removal of small areas of paints and coatings from the original substrate. In general, a sampling area of less than one square foot provided sufficient material for analysis. Chips of the paints/coatings were scraped into disposable aluminum pans and transferred to glass jars with tight-fitting lids and placed in a cooler with bagged ice. Approximately 20-30 grams of the paints/coatings were collected for PCB analysis and 10 grams were collected for lead analysis. Samples were delivered under standard chain-of-custody protocols to C&T and analyzed for PCBs and lead by USEPA Method 8082 and USEPA Method 6010B, respectively.

3.2.2 *Shallow Surface Bulk Sampling of CMU Wall*

ACC used a roto-hammer with a ¾- to 1-inch masonry drill bit to collect bulk samples of the CMU wall from the surface of the wall to a depth of approximately 1-inch. Samples were collected by taping a disposable aluminum pan under the location of the drilling and transferred to glass jars with tight-fitting lids and placed in a cooler with bagged ice. Approximately 20-30 grams of powder were collected for PCB analysis and 10 grams were collected for lead analysis. Samples were delivered under standard chain-of- custody protocols to C&T and analyzed for PCBs and lead by USEPA Method 8082 and USEPA Method 6010B, respectively.

3.3 Air Samples

Perimeter air particulate matter concentrations were monitored using direct-read aerosol monitors (TSI AM510) equipped with PM10 impactor inlets and calibrated in accordance with manufactures’ instructions. Particulate matter with an effective diameter of 10 micrometers or less is representative of respirable dust. The inlet to the aerosol monitor was positioned between 5 and 6 feet above the ground surface (i.e., within the average person’s breathing zone). At the end of each day, data from the particulate aerosol monitors was downloaded and reviewed and the time-weighted average concentration was compared against the PM10 Action Level.

Air samples for lead, copper, and PCBs were collected using personal air sampling pumps and filters and the air inlets were positioned between 5 and 6 feet above ground surface.

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[5] The change from Method 6020 to Method 6010B is a variance to the Work Plan and is discussed in Section 4.3.

Air samples for lead and copper[6] were collected at a flow rate of 1 to 4 liters per minute using 37-millimeter diameter cassettes equipped with 0.8-micron pore size mixed cellulose ester filters. Lead samples were analyzed by NIOSH Method 7105 / USEPA Method 6010B and copper samples were analyzed by NIOSH Method 7303 / USEPA Method 6010B (when copper is analyzed).[7]

Air samples for PCBs were collected at a flow rate of 0.2 liters per minute using Florisil glass sorbent tubes fitted with a glass fiber filter and analyzed for PCBs by NIOSH Method 5503. All air samples were collected over an 8-hour period.

The perimeter air samples for metals and PCBs were submitted to C&T, on ice, under standard chain-of-custody procedures.

3.4 Soil Samples

Multi-increment surface soil samples were collected from the exposed soil immediately adjacent to the Pilot Study Area to determine pre-abatement PCB and lead concentrations in shallow soil. The collection and analysis of the multi-increment soil samples was performed in accordance with the Interstate Technology & Research Council's (ITRC) *Incremental Sampling Methodology* (ISM) guidance document (ITRC, 2012). The multi-increment soil samples were collected in 32-ounce glass jars, placed on ice, and submitted to C&T under standard chain-of-custody procedures. The laboratory was directed to subsample the soil samples in accordance with the techniques and procedures presented in the ITRC's ISM guidance document. C&T reports that 30 subsamples were collected utilizing a stainless steel rectangular spatula. Each subsample was of approximately equal size. The total mass of the 30 subsamples for PCB analysis was approximately 30 grams and the entire 30-gram subsample was extracted for analysis by USEPA Method 8082. The total mass of the 30 subsamples for lead analysis was approximately 10 grams and the entire 10-gram subsample was digested for analysis by USEPA Method 6010B/6020.

3.5 Waste Characterization Samples

Waste characterization samples were collected from all construction wastes, including water effluents, particulates and spent blast media, and other solids generated by the abatement methods. The samples were transported to C&T under standard chain-of-custody procedures and characterized for PCBs by USEPA Method 8082 and Title 22 Metals by USEPA Methods 6010B/6020 and 7470A/7471A. As necessary, WET and TCLP extractions and analyses were also performed.

4. Summary of Pilot Study Field Activities

The Pilot Study assessed three different blasting technologies: ultra-high pressure water blasting, media blasting, and vapor-media blasting. Each blasting technology was tested on representative samples of 1) lighter steel beams (i.e., Exterior Steel Members) (Figure E-1), 2) thicker structural support steel beams (i.e., Structural Steel Support Members) (Figure E-2), 3) the mezzanine deck and steel beams beneath the mezzanine deck (i.e., Steel Under Mezzanine) (Figure E-4), and the CMU walls (Figure E-3). The primary purposes of assessing the multiple blasting technologies within the Pilot Study Area were to:

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[6] Air samples for copper were only collected during blasting activities which involved the use of a copper slag abrasive media (i.e., Media Blasting and Vapor Media Blasting Activities).
[7] The change from Method 6020 to Method 6010B is a variance to the Work Plan and is discussed in Section 4.3.

1) Determine the implementability of each blasting technology and effectiveness at removing existing coatings from the different types of structural elements within the Pilot Study Area; and
2) Identify which technologies are most effective at abating tight-tolerance mated surfaces (e.g., steel members riveted together).

4.1 Discussion of Abatement Techniques Tested

As indicated above, during Abatement Activities in the Pilot Study Area, EcoBay tested three different blasting technologies on structural steel members and CMU walls within the enclosure. Brief descriptions of each of these blasting technologies are provided below.

Ultra-High Pressure Water (UHPW) Blasting: Water, at pressures between 20,000 to 40,000 pounds per square inch, was used to remove existing coatings within the Pilot Study Area. Unlike media blasting, this technique does not generate dust, would not result in the impregnation of abrasive media into the structural surfaces being abated, and would not result in large quantities of solid wastes. While much of the water generated may be able to be filtered and reused during a large-scale abatement, a significant amount of waste water would need to be characterized and disposed at an off-site facility on completion of abatement activities. Actual volumes of waste water generated during the Pilot Study and waste production rates are discussed in Section 8.

Media Blasting: *Kleen Blast* Abrasive media was used with standard “sand blasting” equipment (air compressor, abrasive media pot, hoses and blast nozzles) to remove existing coatings within the Pilot Study Area. Preliminary estimates by the Abatement Contractor indicated that between three and four pounds of abrasive media would be required per square foot area being abated, which suggested that a significant amount of solid waste would need to be disposed of at an off-site facility on completion of abatement activities. Actual mass of media used during the Pilot Study and waste production rates are discussed in Section 8.

Vapor Media Blasting: Aerosolized water and abrasive media was used to remove existing coatings within the Pilot Study Area. Similar to the ultra-high-pressure water blasting, vapor media blasting is a gentler blasting technology than media blasting and would generate dust or result in impregnation of abrasive media into the structural surfaces being abated. In comparison with media blasting and ultra-high-pressure water blasting, however, smaller quantities of both water and abrasive media would be expected to be required which would help minimize the amount of waste water and solid wastes to be disposed of on completion of abatement activities. Preliminary estimates by the Abatement Contractor suggested that approximately 0.5 gpm of water would be used during abatement and approximately 0.5 pounds of abrasive media would be required per square foot of area being abated. Actual mass of media used and waste water generated during the Pilot Study and waste production rates are discussed in Section 8.

4.2 Project Schedule as Executed

On May 23, 2016, under direction from PV, ACC commenced with implementation of the Pilot Study. In accordance with the schedule of tasks defined in the Final Work Plan for the Pilot Scale Abatement Study of Hangar 1 (Work Plan), dated May 20, 2016, Eco Bay Services, Inc. (EcoBay) (the abatement contractor for the Study) mobilized to the site and performed pre-cleaning activities, scaffold erection and containment setup of the Pilot Study work area. ACC also mobilized to perform project oversight and baseline sampling per the requirements of the Work Plan.

In June of 2016, PV directed ACC and EcoBay to suspend work pending execution of the Bona Fide Prospective Purchaser agreement dated 10 January 2017 between PV and the USEPA. During the negotiation period ACC continued to perform periodic visual inspection of the containment and reported conditions to the project team. By November 2016 it was apparent that the containment was beginning to deteriorate due to the weather and it was decided by the Project team that it needed to be dismantled. EcoBay removed the vertical containment structure. The scaffolding and PVC floor membrane installed after pre-cleaning of the Pilot Study work area remained for use as part of future Pilot Study work. EcoBay's vapor media system remained onsite during the postponement of work.

On February 21, 2017, PV directed ACC and EcoBay to restart the Pilot Study implementation. EcoBay mobilized to the site and proceeded with re-cleaning of the work area floor and construction of the containment. In accordance with the Work Plan, ACC oversaw the construction of the containment and re-cleaning by EcoBay and collected a new set of baseline air and wipe samples. On March 28, 2017, EcoBay substantially completed construction of the containment and established negative pressure as required by the Work Plan. ACC performed visual inspection of the Work Area and approved the containment in accordance with the Work Plan. EcoBay commenced abatement activities on April 3, 2017 and continued work per the Work Plan through April 28, 2017. ACC provided project oversight and monitoring per the Work Plan for the duration of the Pilot Study work. Upon completion of all prescribed removal work by EcoBay, including a detailed cleaning of all affected areas and completion of all post-abatement wipe sampling by ACC, abated areas were recoated with CM15 epoxy coating and the containment system removed. Waste characterization samples of all representative waste streams were collected for proper waste disposal. All waste generated as part of the Pilot Study was removed from the site on July 11, 2017. Refer to Table 1 below for the Project Schedule as executed.

The data collected and observations made during this Pilot Study aided in determining the best means and methods to achieve the overall project goal of the safe removal of accessible PCB- and lead-impacted coatings from the Hangar 1 structure. The Pilot Study assessed whether target Post-Abatement Criteria[8] can be achieved using any of the three different abatement technologies and analyzed the implementability and production rates of these technologies. The following criteria were considered in selecting the appropriate technology for full-scale abatement.

- Effectiveness in achieving post abatement target acceptance criteria
- Were surfaces damaged during abatement?
- Waste minimization: Which method produced the least waste?
- Water use: Which method used the least amount of water?
- Ease of use
- Safety of use: PPE efficiency, personal air sampling comparisons
- Equipment performance: Which equipment required least maintenance? Which equipment abated the quickest?

This analysis is included in Section 10.

[8] Target Acceptance Criteria for full-scale abatement will be provided in a future document.

Table 1: Pilot Study Schedule of Tasks

Task	Dates
2016 Pilot Study Efforts	May-June 2016
2017 Pre-cleaning	March 14-15, 2017
2017 Baseline Air and Wipe Sampling	March 16-17 and 23, 2017
2017 Containment Setup	March 16-28, 2017
2017 Baseline Bulk Sampling	March 28-29, 2017
2017 Soil Sampling	March 29-30, 2017
Abatement Method 1 – UHPW Blasting	April 3-7, 2017 and April 11, 2017
Abatement Method 1 – UHPW Blasting Post-Abatement Verification Wipe Sampling	April 13, 2017
Abatement Method 2 – Media Blasting	April 17-18, 2017
Abatement Method 2 – Media Blasting, Post-Abatement Verification Wipe Sampling	April 21, 2017
Abatement Method 3 – Vapor Media Blasting	April 27-28, 2017
Abatement Method 3 – Vapor Media Blasting, Post-Abatement Verification Wipe Sampling	May 1-2, 2017
Final Containment Detail Cleaning	May 4-10, 2017
Post-Abatement CMU Bulk Sampling (All Methods)	May 2, 2017
Post-Abatement Wipe Sampling After Removal of Containment	May 30-31, 2017
Containment Removal and CM15 Recoating and Inspection Activities	May 15, 2017 – June 19, 2017
Waste Characterization	May 10, 2017 – June 23, 2017
Waste Hauling	July 11, 2017

4.3 Summary of Deviations from the Pilot Study Work Plan

During the collection of baseline bulk samples for the Pilot Study, a white skim coat suspect for asbestos was noted on the CMU wall within the Pilot Study work area. Three bulk samples of this material were submitted to Forensic Analytical Laboratories in Hayward, California for analysis for Bulk Asbestos Analysis by EPA Method 600/R-93-116. The skim coat was found to contain five percent chrysotile asbestos. To comply with asbestos requirements, EcoBay utilized workers certified to remove asbestos. Appropriate notifications were provided to Cal-OSHA and to the Bay Area Air Quality Management District. Appropriate warning signs were added to the exterior of the containment.

The Work Plan stated that metals samples would be analyzed by EPA Method 6020. However, due to concerns about over calibration range errors created by the first set of bulk samples causing problems with the ICP/MS equipment, C&T

recommended and ACC agreed that metals samples be analyzed by EPA 6010B instead. As described in Appendix O, Method 6010 met all the reporting requirements in the Work Plan; the data reviewer concluded that the change of methods had a negligible effect on data quality.

E2 Consulting, a coatings consultant retained by PV, recommended testing a plastic media abrasive as an alternative to Kleen Blast. If effective, the plastic media abatement has potential for recycling. EcoBay proposed using PLASTI-GRIT Type VI (Plastic Media) manufactured by Composition Materials Company. Safety Data Sheets are available in Appendix R.

For vapor media blasting EcoBay proposed utilizing Kleen Blast instead of the ultra-fine garnet blast media as identified in the Work Plan. Between when the Work Plan was developed and the implementation of the Pilot Study, EcoBay had the opportunity to utilize the vapor media system with the ultra-fine garnet blast media. Their experience demonstrated little success with this method. However, experience told them that Kleen Blast had the potential to yield better results than the ultra-fine garnet and the cost differential was minor. ACC accepted this substitution.

The work plan proposed conducting XRF screening of surfaces after abatement. This XRF post-abatement screening was omitted from the Pilot Study after visual inspection determined that paint/coatings could be visually removed with the media blast and vapor media systems and wipe samples were reported with results below the target acceptance criteria. Based on these results it was determined that any lead remaining on surfaces would be below the 1.0 mg/cm^2 reporting limit of XRF, and that XRF screening would not prove beneficial in evaluating the effectiveness of the abatement methods.

5. Pre-Abatement Field Data

5.1 Discussion of Mobilization and Enclosure Construction

5.1.1 *Pre-Cleaning*

On March 15, 2017 EcoBay mobilized to Hangar 1 to commence with re-cleaning of the work areas and construction of the containment. ACC oversaw the re-cleaning and construction of the containment by EcoBay. Prior to conducting pilot scale abatement activities within the Pilot Study Area, debris and surficial sediments on the concrete slab (and subsequently the PVC membrane), around the structural steel members, and within the trench drains adjacent to the Pilot Study Area were removed using vacuums equipped with high-efficiency particulate air (HEPA) filters. After vacuuming the Pilot Study Area, the structural steel elements, CMU walls, concrete slab, and trench drains were cleaned using a combination of wet wiping and HEPA vacuuming. Waste from these activities was included with the miscellaneous project waste steam.

5.1.2 *Enclosure Construction*

EcoBay installed a fully encapsulated negative-pressure enclosure around the Pilot Study Area. The enclosure was constructed of 12-mil thickness fire retardant shrink-wrap polyethylene; a 50-mil thickness polyvinyl chloride (PVC) membrane was used for the floor of the enclosure. The PVC floor of the enclosure was installed to allow for the creation of a pan by wrapping approximately 12-inches of the PVC membrane vertically up the sides of the containment to the anticipated water and/or media wastes that accumulated during abatement activities. All seams were staggered, overlapped, taped and heat-sealed.

A three-stage decontamination chamber with shower and a watertight pan was connected to the enclosure for the decontamination of personnel and equipment. ACC inspected the containment enclosure on March 31, 2017 and the enclosure was deemed consistent with the specifications in the Work Plan. Negative pressure was observed with a digital manometer at -0.05 inches of water column. The enclosure was constructed with three spare negative air machines to adjust for potential changes in negative pressure.

5.2 Baseline Sampling Results and Observations

During the 2016 phase of the Pilot Study, ACC began collecting baseline samples as described in the Pilot Scale Study Work Plan. Pre-project verification wipe samples of equipment, the concrete floor inside and outside of the Pilot Study Area, and the concrete trench were collected. Additionally, soil samples were collected according to the Pilot Study Work Plan. No bulk samples were collected in 2016.

When directed to resume the Pilot Study, ACC recommended that all baseline samples collected be recollected to verify current conditions. The PVC membrane, scaffolding and vapor media blast equipment referenced in Section 1.4 were re-cleaned prior to collecting baseline samples as well as the concrete drainage trench. Once re-construction of the containment was substantially complete, ACC commenced bulk sampling the paint/coatings and CMU walls as described in the Work Plan.

Table 2: Proposed and Completed Baseline Samples (Excluding 2016 Sampling)

Sample Type	Sample Media	Proposed Number of Samples (Number of Duplicates)	Proposed Sampling Location Description [Number of Locations]	Actual Number of Samples (Number of Duplicates)	Appendix with Data
Wipe	Surface	8 (2) PCBs 8 (2) lead	Concrete Floor [8]	8 (2) PCBs 8 (2) lead	D
Wipe	Surface	4 (1) PCBs 4 (1) lead	Concrete Drainage Trench [4]	4 (1) PCBs 4 (1) lead	D
Wipe	Surface	3 (1) PCBs 3 (1) lead	Scaffolding [3]	3 (1) PCBs 3 (1) lead	J
Wipe	Surface	6 (3) PCBs 6 (3) lead	Reusable Equipment [6]	6 (3) PCBs 6 (3) lead	J
Bulk Material	Coatings	3 (1) PCBs and lead	Exterior Steel Members [3]	3 (1) PCBs and lead	E
Bulk Material	Coatings	3 (1) PCBs and lead	Structural Support Steel Members [3]	3 (1) PCBs and lead	E
Bulk Material	Coatings	3 (1) PCBs and lead	Steel Under Mezzanine [3]	3 (1) PCBs and lead	E
Bulk Material	Coatings	3 (1) PCBs and lead	CMU Wall [3]	3 (1) PCBs and lead	E
Bulk Material	CMU Wall	3 (1) PCBs and lead	CMU Wall [3]	3 (1) PCBs and lead	E
Bulk Material	Soil	6 (2) PCBs and lead	Exposed soil [6]	6 (2) PCBs and lead	C
Air	Air	6 (1) PCBs 6 (1) lead 6 (1) copper	Upwind and Downwind [2 locations per day for 3 days]	6 (1) PCBs 6 (1) lead 6 (1) copper	B

5.2.1 *Air Sampling*

In accordance with the Work Plan, baseline air samples were collected in May 2016 and again in March 2017. One upwind and downwind location was established as described in the Work Plan. At each location samples were collected for lead, copper, PCBs and a PM10 monitor was placed. With the exception of the detection of 0.16 micrograms per cubic meter ($\mu g/m^3$) of copper in one of the upwind samples, no other detections were reported in the baseline air samples.

PM10 monitoring indicated that baseline PM10 readings at both the upwind and downwind sampling locations were below the action level of 0.11 mg/m^3 defined in the Work Plan. Please see Appendix B for a summary of the PM10 monitoring results.

5.2.2 *Wipe Sampling*

In May 2016 ACC collected baseline samples of reusable equipment as described in the Work Plan as the materials were delivered to the site. Scaffolding and hoses from the Media Blast system were found to have lead above the Target Acceptance Criterion of 40 micrograms per square foot ($\mu g/ft^2$). These items were cleaned by EcoBay and retested by ACC. Where cleaning was required, EcoBay performed all cleaning activities on 6-mil polyethylene drop sheets utilizing wet wipe methods and HEPA vacuums. After verification samples verified that these items met the Target Acceptance Criterion, the equipment was deemed acceptable for use on site.

Results of wipe samples collected from scaffolding and reusable equipment are available in Appendix J.

In May 2016 ACC collected baseline wipe samples for lead and PCBs from concrete floor surfaces inside and outside of the Pilot Study work area as described in the Work Plan. Wipe samples were also collected from within the Concrete Drainage Trench. The results of this sampling are summarized in Table 3 below.

Table 3 – 2016 Baseline Wipe Sampling Results Summary

Sample Location	Number of Samples Collected (Duplicates)	Range of Lead Results ($\mu g/ft^2$)	Range Total of PCB Results ($\mu g/100\ cm^2$)
Concrete Floor Inside Pilot Study Area	4 (1)	160 – 2,200	<2.5 – 5.6
Concrete Floor Outside Pilot Study Area	4 (1)	100 – 1,400	<2.5 – 2.3
Concrete Drainage Trench	4 (1)	150 – 710	<2.5 – 6.2

For baseline wipe sample locations and a detailed summary of laboratory results see Tables D-1 and D-2 in Appendix D.

In May 2017, ACC re-collected baseline wipe samples for lead and PCBs in the same locations as 2016 as described in the Pilot Study Work Plan. Wipe samples from the inside the Pilot Study work area were collected from the PVC membrane installed by EcoBay in 2016. The membrane was pre-cleaned by EcoBay prior to sampling by ACC. The results of this sampling are summarized in Table 4 below.

Table 4 – 2017 Baseline Wipe Sampling Results Summary

Sample Location	Number of Samples Collected (Duplicates)	Range of Lead Results ($\mu g/ft^2$)	Range of Total PCB Results ($\mu g/100\ cm^2$)
Membrane on Concrete Floor Inside Pilot Study Area	4 (1)	13 – 430	<2.5
Concrete Floor Outside Pilot Study Area	4 (1)	3.5 – 310	<2.5
Concrete Drainage Trench	4 (1)	38 – 230	<2.5

For baseline wipe sample locations and a detailed summary of laboratory results see Tables D-1 and D-2 in Appendix D. Laboratory reports can be found in Appendix M.

The acceptance criterion for lead on the concrete floor in the NTCRA was 40 $\mu g/ft^2$. According to the Final Long Term Management Plan For Non-Time-Critical Removal Action For PCB Contamination (AMEC, 2013), the Navy's wipe sample results for lead achieved a geometric mean of <40 $\mu g/ft^2$. ACC collected 13 lead wipe samples from the concrete floor in 2014 and the geometric mean of the wipe sample results was 868.6 $\mu g/ft^2$. In 2016, ten additional samples were collected during baseline sampling activities from locations on the concrete floor and the geographic mean of these lead wipe sample results was 935 $\mu g/ft^2$. Five additional wipe samples were collected from the concrete floor during baseline sampling activities in 2017. Excluding samples collected from the PVC membrane the geometric mean of these lead wipe samples was 146.7 $\mu g/ft^2$. After removal of the containment system, an additional ten lead wipe samples were collected from the concrete floor; the geometric mean of these lead wipe samples was 223 $\mu g/ft^2$.

5.2.3 *Bulk Sampling*

ACC collected samples of paint from the twelve structural steel sampling locations described in the Pilot Study Work Plan. Samples from each location were analyzed for lead and PCBs. Additionally, three samples plus one duplicate were collected from paint/coating on the CMU wall and three shallow surface bulk samples were collected from the CMU wall. Paint/coating samples were analyzed for lead and PCBs. As discussed in Section 3.3, ACC noted the presence of a white skim coat, suspected of containing asbestos, under the paint applied to the CMU wall. Three samples of this material were collected and analyzed for asbestos; chrysotile asbestos was detected in two of the three samples at 5%. The results of the bulk samples collected are summarized in Table 5 below. Figures of the sampling locations and individual sampling results are provided in Appendices E and F.

Table 5 – Summary of Baseline Bulk Paint Sampling Results

Sampled Component	Number of Samples Collected (Duplicates)	Range of Lead Results (mg/kg)	Range of Total PCB Results ($\mu g/kg$)
Exterior Structural Steel	3 (1)	62,000 – 75,000	5,600 – 11,300
Structural Steel Support Member	3 (1)	55,000 – 66,000	4,700 – 12,400
CMU Coating	3 (1)	92 – 4,200	520 – 4,380
Steel Under Mezzanine	3 (1)	80,000 – 90,000	6,800 – 12,300
CMU, Shallow Surface Bulk	3 (1)	5 – 23	78 – 125

The presence of lead and PCBs in coating samples collected from the CMU wall supports the fact that the CMU wall included in the Pilot Study was not abated as part of the NTCRA.

5.2.4 *XRF Screening*

On May 24, 2016 and June 3, 2016 ACC utilized a Niton XLP 303A Lead Paint Analyzer (XRF) to test for the presence of lead in paints and coatings and from the concrete slab within the Pilot Study work area. In total, 48 tests were taken from painted surfaces and eight were taken from the concrete slab. Of the 28 tests taken from structural steel all 28 tests identified lead based paint.[9] Eight tests were taken from the under side of the mezzanine. None of the tests taken from the underside of the mezzanine measured lead based paint. Twelve tests were taken from the CMU wall. Lead based paint was identified in six of the tests and lead was detected in the other six tests. In general, the XRF confirmed the results of the bulk samples collected that lead-based paint exists on all structural support members. Additionally, the testing seemed to confirm reports that the underside of the mezzanine (excluding the structural steel supports) had been previously abated.

Eight tests were taken from the concrete slab detected. Lead was detected in all of the tests, but not above the 1.0 milligrams per square centimeter (mg/cm^2) reporting limit of the XRF analyzer. See Appendix H for a detailed presentation of the XRF testing results and figures of the testing locations.

5.2.5 *Soil Sampling*

ACC collected soil samples as described in the Pilot Study Work Plan in both 2016 and 2017. A summary of the results of the baseline soil samples is described in Table 6 below. A detailed description of sample locations and results is provided in Appendix C.

Table 6 – Summary of Soil Sampling Results

Sampling Period	Number of Samples Collected (Duplicates)	Range of Lead Results (mg/kg)	Range of Total PCB Results (µg/kg)
2016 Soil Sample Results	6 (2)	11 – 83	40 – 920
2017 Soil Sample Results	6 (2)	9.1 – 46	44 – 402

The soil on the east side of Hangar 1 was removed and replaced as part of the NTCRA. Confirmation sampling after excavation confirmed PCB results below the NTCRA clean up level of 1 mg/kg. Results of the soil samples collected during the Pilot Study are below this level. Results of lead in soil samples collected during the Pilot Study are below the RWQCB Environmental Screening Level of 320 mg/kg. After completion of soil sampling and prior to abatement activities, the soil was covered with reinforced polyethylene sheeting and weighed down with sandbags to prevent the potential contamination of this material from abatement activities.

[9] Lead based paint is defined by HUD as 1.0 mg/kg when measured with an XRF.

6. Abatement Activities – Observations and Collected Data

6.1 Discussion of Project Activities by Abatement Method

6.1.1 *Method 1: Ultra-High Pressure Water*

On April 3, 2017, EcoBay with their sub contractor, KR Surface Industries (KRSI), mobilized UHPW blasting equipment to the site to remove coatings from each of the four test areas of the Pilot Study work area. EcoBay worked for two days with the UHPW equipment and KRSI demobilized on April 4, 2017. Upon completion of the detail cleaning of the test area, ACC observed paint/coatings present in tight-tolerance mated surfaces and visible in the rough surfaces of the mill scale present on the steel. See Photograph 1 below, which shows the presence of mill scale, paint/coatings remaining on tight-tolerance mated surfaces and rough surfaces. ACC subsequently advised EcoBay that the area required additional cleaning to meet the level of cleanliness required by the Work Plan prior to the performance of surface wipe verification sampling. EcoBay and KRSI returned to the site on April 11, 2017 to conduct additional abatement with the UHPW equipment.

ACC performed a visual inspection of the work area and collected confirmation wipe samples on April 13, 2017.

Photograph 1 – Structural Steel after abatement with UHPW. Note the presence of black mill scale, paint/coatings in tight-tolerance mated surfaces and rough surfaces.

While utilizing the UHPW equipment, workers in containment utilized cut resistant coveralls to protect from errant water spray. EcoBay collected personal air samples for lead during the UHPW Blasting abatement activities. The highest lead concentration in breathing zone air during UHPW abatement activities was 90 $\mu g/m^3$.[10]

6.1.2 *Method 2: Media Blasting*

EcoBay began evaluating the media blast method on April 17, 2017 and completed their evaluation on April 18, 2017. EcoBay initially used the plastic media to perform the abatement and quickly determined that while this media was capable of removing paint/coatings from the CMU wall, it was ineffective at removing paint/coatings from the structural steel. EcoBay utilized Kleen Blast to perform the abatement work in each of the four test areas of the Pilot Study.

While in containment EcoBay employees wore disposable protective suits, gloves, steel toe boots, hard hats and powered air-purifying respirators. EcoBay collected personal air samples for lead during the Media Blasting abatement activities. The highest reported lead concentration in breathing zone air during Media Blasting abatement activities was 230 $\mu g/m^3$.

After cleaning of the work area on April 19 and 20, 2017, ACC performed a visual inspection of the work area and collected confirmation wipe samples on April 21, 2017.

6.1.3 *Method 3: Vapor Media Blasting*

EcoBay began evaluating the media blast method on April 27, 2017 and completed their evaluation on April 28, 2017. After cleaning of the work area on April 29 through May 1, 2017,

While in containment EcoBay employees wore disposable protective suits, gloves, steel toe boots, hard hats and powered air-purifying respirators. EcoBay collected personal air samples for lead during the Vapor Media Blasting abatement activities. The highest reported lead concentration in breathing zone air during Vapor Media Blasting abatement activities was 210 $\mu g/m^3$.

ACC performed a visual inspection of the work area and collected confirmation wipe samples on May 1 and 2, 2017.

6.1.4 *Discussion of Abatement Field Performance*

This section describes the field performance of each abatement method. Additional information is included in Appendix P, EcoBay's project narrative. Section 6 describes post-abatement visual observations and includes chemical analytical data with the results of wipe sample analyses. Table 7 below provides a comparison of the field performance of each abatement method. The production rates estimated do not include containment, support staff, supervision or management. Additionally, production rates may decrease with increased working heights. Section 7 includes information regarding waste generated for each abatement method.

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[10] During abatement activities, all workers within the Pilot Study enclosure wore powered air-purifying respirators.

Table 7 - Comparison of Field Performance for Each Abatement Method

Method	Approximate Production Rate (square feet per hour)	Number of Passes Required to Meet Target Acceptance Criteria	Ease of Use	Safety	Personal Exposure – Lead Monitoring
UHPW	NA*	>3	Hard	Highest Risk	Lowest Exposure
Media Blasting	10-25**	1	Moderate	Moderate Risk	Highest Exposure[11]
Vapor Media Blasting	20	1	Moderate	Moderate Risk	Highest Exposure[11]

* - Production rates were not evaluated for UHPW as the method was deemed ineffective at removing the paint coatings from the CMU wall and the under side of the mezzanine. (see Section 7.2.1 for additional details).
** - Lower rates estimated utilizing small hand held nozzles for hard to reach areas. Higher estimate based on traditional nozzle.

6.2 Discussion of Enclosure Condition and Maintenance During Abatement Activities

The containment enclosure performed as expected for the duration of the Pilot Study work. Daily inspections of the enclosure were conducted before the start of work, periodically during the work shift and at the end of each work shift. Minor repairs were conducted periodically where tape sealing appeared to deteriorate, primarily at complex tape seams, which were required around columns and beams. The pressure of the enclosure was measured throughout the Pilot Study using a digital manometer. Negative pressure less than 0.05" water column was maintained at all times while work was performed. Negative air machines ran for the full duration of the Pilot Study.

The vertical containment, which was constructed from shrink-wrap polyethylene, maintained its integrity for the duration of the Pilot Study Work. No failure of the polyethylene was observed during the Pilot Study project. Minor pitting was observed in areas where abrasive blasting occurred adjacent to the vertical containment. In areas were abrasive blasting occurred within close proximity to the polyethylene sheeting, EcoBay utilized wood shields to protect the containment enclosure.

The PVC floor membrane remained intact for the duration of the project and was not damaged by the work or the powered scissor lift used during the work. Minor failure of the sealing of the PVC membrane during the work required the application of new tape to prevent blast media from accumulating behind the membrane. These repairs were conducted prior to the start of each abatement method.

Following deconstruction of the Pilot Study enclosure and removal of the PVC flooring, a small quantity (<1 ounce) of the Kleen Blast abrasive media was noted near one of the structural steel pillars in the southeastern portion of the Pilot Study area. While no abatement activities were conducted on the structural steel in this area, EcoBay did use the area for setting up and testing the blasting equipment. Upon noticing this material, ACC inspected it for the presence of flecks of paint or CM15 coatings and none were observed. In addition, ACC inspected the areas around the other structural steel pillars within the Pilot Study area for the presence of blast media and paint chips, none was observed.

[11] Results for the personal air samples collected during Media Blasting and Vapor Media Blasting were similar (i.e., 230 $\mu g/m^3$ and 210 $\mu g/m^3$, respectively).

Based on these observations, ACC concluded that a small amount of the unused Kleen Blast abrasive media may have been trapped behind the tape joining the shrinkwrap polyethylene and the PVC floor membrane and that there was no breach of the containment structure. As a result, ACC directed EcoBay to clean up the unused Kleen Blast abrasive media noted near the structural pillar in the southeastern portion of the Pilot Study area with a HEPA vacuum and to dispose of this material with the rest of the Pilot Study wastes.

These observations indicate that there is the potential for blast media to become trapped in the enclosure and that during future full-scale abatement activities, care must be taken to ensure that none of this material is inadvertently released during deconstruction/movement of the containment structure.

6.3 Perimeter Sampling Results and Observations During Abatement

6.3.1 *Perimeter Particulate Sampling Results*

As described in the Pilot Study Work Plan, ACC utilized two TSI Sidepack AM-510 aerosol monitors at upwind and downwind locations to the Pilot Study work area. The monitors were activated for each shift when active abatement was scheduled. In total, the monitors were utilized for 11 days during the project. Three days of measurement were collected as baseline samples, and eight days of measurements were collected during abatement activities. PM10 measurements were well below the action level of 0.11 milligrams per cubic meter (mg/m^3) as described in the Pilot Study Work Plan. A summary of the PM10 results is provided in Appendix B.

6.3.2 *Perimeter Air Sampling Results*

Upwind and downwind air samples were collected in accordance with the Pilot Study Work Plan on all days when abatement was performed. Samples were collected for PCBs, lead and asbestos each day of active abatement. The asbestos air sampling was implemented due to the discovery of an asbestos-containing skim coat on the concrete wall within the Pilot Study work area (see Section 4.3). Additionally, air samples for copper were collected during Media Blasting and Vapor Media Blasting as Kleen Blast media used contained copper. A summary of the air samples collected, their results, and a sample location diagram can be found in Appendix B. Laboratory reports are located in Appendix M.

With the exception of copper detected in the April 19, 2017 downwind sample, all upwind and downwind samples were reported below laboratory detection limits. The detection limits were less than airborne action levels set forth in Table 6 of the Work Plan. Copper was reported in the downwind sample on April 19, 2017 at 0.16 µg/m^3 and confirmed by reanalysis on June 28, 2017 at 0.17 µg/m^3. The reporting limit for copper in this sample was 0.016 µg/m^3. No action level was established for copper in the Work Plan. According to the safety data sheet (SDS) for *Kleen Blast*, copper may be present in the parts per million range. The PM10 data for April 19, 2017 do not indicate any abnormal peak or average measurements. Additionally, since copper was also detected at 0.16 µg/m^3 in the baseline air sample collected on May 26, 2016 the source of the copper detection on April 19, 2017 appears to be unrelated to the Pilot Study.

6.3.3 *Meteorological Data*

Weather data was obtained for abatement days from the NOAA website.[12] With the exception of April 11, 2017 the predominant wind direction was from the North or Northwest during the work. On April 11, 2017 the wind direction was

[12] http://www.nws.noaa.gov/data/MTR/CLINUQ

primarily from the Southeast. Wind speed averages ranged from three to ten miles per hour on days with active abatement.

In general winds were calm in the morning with variable slow gusts. Winds increased during the day with predominant winds from the North-Northwest. According the data obtained, winds increased throughout the afternoon and into the evening after work was completed. A summary of the meteorological data during active abatement activities is presented in Appendix B.

6.3.4 *Visual Observations*

ACC provided full time oversight of the Pilot Study. At the start of each shift and at least hourly during each work shift ACC's representative would conduct an inspection of the containment enclosure. These inspection activities included observing critical seals where the containment was attached to columns and beams, areas where abatement activities were occurring to inspect for damage to the containment and checking the manometer to verify negative pressure differential of at least 0.02 inches of water column. The negative pressure differential was maintained for the duration of abatement activities. No damage to the containment was observed from any of the abatement methods. On two occasions, both at the start of the day, critical seals at the south end of the containment were observed to be slightly separated from columns. When this occurred, EcoBay repaired these areas by applying new tape seals.

6.4 Overall Effectiveness of Mitigation Measures

The results of perimeter air samples collected during the abatement activities are comparable to those from the baseline samples. The single copper detection during abatement was also detected in one baseline sample. PM10 monitoring indicated that no significant increase in PM10 concentrations occurred downwind of the Pilot Study area during abatement activities.

As such, the work practices followed by EcoBay when combined with the containment structure and negative pressure differential maintained during the work were adequate to 1) prevent exposure to off-site receptors to concentrations of concern and 2) the release of contaminants to the environment.

7. Post-Abatement Field Data

7.1 Contractor Activities

At the end of each day, EcoBay collected and placed each waste stream into labeled drums for future characterization sampling by ACC. At the completion of abatement for each method, EcoBay cleaned the work area to allow for visual inspection and verification sampling by ACC. The cleaning helped ensure that dust and particles from abatement activities from higher surfaces would not dislodge and contaminate surfaces where wipe sampling was to be conducted.

After all abatement technologies had been tested and prior to the removal of the containment enclosure, EcoBay conducted another thorough cleaning of all surfaces including the interior of the containment structure.

7.2 Visual Inspection Observations by Method

7.2.1 *Ultra-High Pressure Water Removal Observations*

Based on ACC's visual inspection of the abated surfaces, UHPW blasting produced the least desirable removals and least acceptable surfaces of all the abatement technologies tested. During ACC's inspection, abated surfaces were dull due to the presence of mill scale[13] on the steel, which was present under the paint/coatings. In addition, red primer was observed in pits and grooves in the mill scale, paint and coatings were present in tight-tolerance mated surfaces, such as where rivets and bracing were present, and the UHPW system did not provide complete removal of paint/coatings in locations where the blast nozzle could not maintain a perpendicular approach to the painted surface. See Photographs 2 through 5 for photos of surfaces after UHPW removal operations. In addition, removal was slow and ineffective on the steel members on the underside of the mezzanine, as the blast nozzle was difficult to operate overhead especially while trying to maintain a perpendicular approach for the abatement.

Photograph 2 – Mill scale present on structural steel after paint/coating removal with UHPW system.

[13] A black scale of magnetic oxide of iron formed on iron and steel when heated for rolling, forging, or other processing.

Photograph 3 – Primer evident around rivet head after UHPW removal.

Photograph 4 – Poor removal of paint/coatings where UHPW nozzle was difficult to aim in tight access areas.

Photograph 5 – Underside of mezzanine after UHPW method was utilized.

On the concrete wall, the UHPW system was not effective at removing the coatings at pressures under 40,000 PSI. At 40,000 PSI, the concrete wall was damaged by the water, causing the smooth cement surface to be removed exposing the aggregate. Photographs 6 and 7 below illustrate the poor removal of paint/coatings from the CMU wall and the damage caused to the underlying substrate.

Photograph 6 – CMU wall after removal of paint/coatings with UHPW system.

Photograph 7 – Damage to concrete and paint/coatings remaining on surface of CMU wall.

7.2.2 *Media Blasting Removal Observations*

The visual inspection of the surfaces abated by Media Blasting noted mostly clean white metal[14] and removal of the mill scale where *Kleen Blast* media was utilized. In the areas where plastic bead media was utilized, only partial removal of paint/coatings was noted. With removal of paint/coatings and the underlying mil scale, visual inspections were easier to perform. The *Kleen Blast* media was very effective at removing visible paint/coatings from tight-tolerance mated surfaces and the "ricochet" effect of the hard media allowed for removal of paint/coatings from hard to reach areas. Photographs 8-11 depict surfaces after removal of paint/coatings by the media blast system.

[14] A white metal blast cleaned surface is a coating preparation that involves the eradication of all foreign matter which leave a metal gray or even white in appearance.

Photograph 8 – Structural steel after removal of paint/coatings with media blast system. Light areas are referred to as 'white metal." Darker areas are residual mill scale.

Photograph 9 – Tight-tolerance mated flange/beam connection after removal of paint/coatings with media blasting. (Note: the brown areas in the photo correspond to areas of rust formation due to the wet decontamination of the abated steel)

Photograph 10 – Structural steel with tight-tolerance mated brace and rivet head after removal of paint/coatings with media blasting. (Note: the brown areas in the photo correspond to areas of rust formation due to the wet decontamination of the abated steel)

Photograph 11 – Under side of mezzanine after removal of paint/coatings with media blasting.

On the concrete wall, the *Kleen Blast* and plastic media both appeared capable of removing the paint/coatings and asbestos-containing skim coat. Although less than the damage observed by the UHPW, both blast medias caused minor damage to the CMU wall finish by removing the “board form” markings. Photographs 12 and 13 below show the CMU wall after removal of paint/coatings by media blasting.

Photograph 12 – CMU wall after removal of paint/coatings with media blasting. Left side (lighter color) was removed with Kleen blast media. Right side (darker color) was removed using plastic media.

Photograph 13 – CMU wall after removal of paint/coatings by plastic bead media blasting. Removal method exposes aggregate and caused minor damage to “board form” markings on the CMU wall.

7.2.3 *Vapor Media Blasting Removal Observations*

Visually, the surfaces abated by Vapor Media Blasting appeared very similar to the surfaces that were abated by Media Blasting. The steel surfaces abated were noted to be clean white steel; however, due to the use of water vapor as a propellant, surface rust appeared much sooner with this method. Photographs 14-17 below illustrate surfaces after the removal of paints/coatings with the vapor media system.

Photograph 14 – Structural steel after removal of paint/coatings by vapor media system. This photo was taken before cleaning the Pilot Study enclosure and black areas (see the red arrow) are areas where spent abrasive media has accumulated.

Photograph 15 – Structural steel after removal of paint/coatings at time of verification sampling.

Photograph 16 – Structural steel after removal of paint/coatings with vapor media system at time of verification sampling. Note the formation of surface rust.

Photograph 17 – Under side of mezzanine after removal of paint/coatings at time of verification sampling. Note the formation of surface rust.

On the concrete wall, the vapor media system appeared capable of removing the paint/coatings and asbestos-containing skim coat. The amount of damage noted was similar to that of Media Blasting. Photograph 18 below shows the CMU wall after removal of paint/coatings with the vapor media system.

Photograph 18 – CMU wall after removal of paint/coatings with vapor media system.

7.2.4 *Summary of Visual Inspections*

Steel surfaces abated utilizing the UHPW method generally produced unacceptable results. The UHPW failed to remove the mill scale from the steel. Removing the mill scale would be required to meet surface preparation requirements for recoating adhesion. Additionally, the UHPW did not completely remove paint/coatings from the steel, especially in hard to reach areas and tight-tolerance mated surfaces.

Steel surfaces abated by both Media Blasting (Kleen Blast) and Vapor Media Blasting produced acceptable results visually. Both of these methods removed the paint/coatings as well as the underlying mill scale. Removal of paint/coatings from the edges of tight-tolerance mated surface was achieved in the areas where abatement was tested.

Table 8 below provides a summary of the findings noted after visual inspection of surfaces from each of the three abatement methods.

Table 8 - Abatement Methods and Summary of Visible Inspections

Abatement Method	Steel Surfaces	CMU
Ultra-High Pressure Water Blasting	Not Acceptable	Not Acceptable
Media Blasting	Acceptable	Acceptable, except for minor damage to surface finish
Vapor Media Blasting	Acceptable	Acceptable, except for minor damage to surface finish

7.3 Post Abatement Sampling Results and Observations

Table 9 below provides a summary of the proposed post-abatement samples and those that were actually collected. Additionally a reference is provided to the appropriate summary appendix where data are located.

Table 9: Proposed and Completed Post-Abatement Samples

Sample Type	Sample Media	Sampling Location Description [Number of Sampling Locations]	Proposed Post-Abatement Number of Samples (duplicates)	Actual Post-Abatement Number of Samples (duplicates)	Appendix
Wipe	Surface	Concrete Floor [8]	8 (2) PCBs 8 (2) lead	8 (2) PCBs 8 (2) lead	G
		Concrete Trench Drain [0]	(a)	(a)	Not applicable (NA)
		Scaffolding [3]	3 (1) PCBs 3 (1) lead	3 (1) PCBs 3 (1) lead	G
		Reusable Equipment [6]	6 (3) PCBs 6 (3) lead	6 (3) PCBs 6 (3) lead	G
		Exterior Steel Members [9]	9 (3) PCBs 9 (3) lead	9 (3) PCBs 9 (3) lead	G
		Structural Support Steel Members [9]	9 (3) PCBs 9 (3) lead	9 (3) PCBs 9 (3) lead	G
		Steel Under Mezzanine [9]	9 (3) PCBs 9 (3) lead	7 (2) PCBs 7 (2) lead	G
		CMU Wall [9]	9 (3) PCBs 9 (3) lead	7 (3) PCBs 7 (3) lead	G
Bulk Material	CMU Wall	CMU Wall[15] [3]	3 (1) PCBs and lead	3 (1) PCBs and lead	F
	Soil	Soil [0]	(a)	(a)	NA

Notes:
(a) Post-abatement multi-increment soil samples and concrete trench drain wipe samples were not collected because there was no breach in containment during abatement activities.

7.3.1 *Post-Abatement Wipe Samples*

ACC collected wipe samples for lead and PCBs from abated surfaces after each method. With the exception of the Ultra-High Pressure Water Blasting, samples were collected as described in the Pilot Study Work Plan. For the Ultra-High Pressure Water Blasting, an insufficient area for sampling was removed from the concrete wall and from the underside of the mezzanine. As such, fewer samples were collected in these areas. Of the total 36 proposed wipe sampling locations, samples were collected from 32 locations.

[15] A roto-hammer with a masonry drill bit was used to collect samples from the surface of the CMU wall to approximately 1-inch deep.

7.3.1.1 Steel Surfaces

As described in the Pilot Study Work Plan, wipe samples for lead and PCBs were collected from structural members including exterior structural steel, structural steel support members and the steel under mezzanine. PCBs were not detected in any of the post-abatement wipe samples that were collected. Lead was detected in all of the post-abatement wipe samples collected at concentrations ranging between 2.9 and 240 µg/ft^2 for samples in the media blast and vapor media areas[16]. The lead concentrations in all of the post-abatement steel wipe samples from the media blasting and vapor media blasting were all less than the lead acceptance criterion of 250 µg/ft^2 with the lowest results reported in samples collected from the vapor media removal method. Samples collected from the UHPW area ranged between 66 and 17,000 µg/ft^2. These higher results are likely due to the partial removal of the paint/coatings observed with this method.

A summary of the confirmation wipe samples collected from steel surfaces is presented in Table 10 below.

Table 10 – Summary of Confirmation Wipe Sampling Results from Steel Surfaces

Method	Number of Samples Collected (Duplicates)	Range of Lead Wipe Sample Results (µg/ft^2)	Range of Total PCB Wipe Sample Results (µg/100 cm^2)
Ultra-High Pressure Water Blasting	7 (2)	66 – 17,000*	<2.5
Media Blasting	9 (3)	22 – 240	<2.5
Vapor Media Blasting	9 (3)	2.9 – 88	<2.5

* - The 17,000 µg/ft^2 result was reported for a sample collected from the UHPW area. The highest lead concentration in the vapor media and media blast abated areas was 240 µg/ft^2.
PCB Target Acceptance Criterion (≤10 µg/100 cm^2)
Lead Target Acceptance Criterion (<250 µg/ft^2)

A detailed summary of the wipe sample results and sample location diagrams for steel surface samples are provided in Appendix G. Laboratory reports are available in Appendix M.

7.3.1.2 CMU Wall Surfaces

As described in the Pilot Study Work Plan, wipe samples for lead and PCBs were collected from locations on the concrete wall. No PCBs were detected in any of the wipe samples collected. Lead was detected in all of the wipe samples collected. All results for lead wipe samples collected from the UHPW removal area were above the Target Acceptance Criterion. With additional cleaning in the vapor media area, the Target Acceptance Criterion was achieved for all samples in both the media blast and vapor media area. To minimize potential damage to the finish of the CMU walls, it may be necessary to remove the paints/coatings from the CMU walls by chemical removal techniques and then to use abrasive blasting or mechanical grinding to remove the asbestos skim coat, as necessary. Several additional test methods may require evaluation to achieve clean up goals and while maintaining an acceptable architectural finish. A summary of the confirmation wipe samples collected from the concrete wall is presented in Table 11 below.

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[16] Additional cleaning with wet wiping and HEPA vacuuming was required in the Vapor Media area to achieve the Target Acceptance Criterion.

Table 11 – Summary of CMU Wall Wipe Sampling Results

Method	Number of Samples Collected (duplicates)	Range of Lead Wipe Sample Results (µg/ft²)	Range of Total PCB Wipe Sample Results (µg/100 cm²)
Ultra-High Pressure Water Blasting	1 (1)	280 – 320	<2.5
Media Blasting	3 (1)	35 – 170 µg/ft²	<2.5
Vapor Media Blasting	3 (1)	10 – 58* µg/ft²	<2.5

* - One of the initial post-abatement wipe samples collected from area abated by vapor media blasting exceeded the Target Acceptance Criterion for lead (A-VM-WIPE-L-CMU-050117-2). This area was re-cleaned by EcoBay by wiping with a damp cloth and an additional wipe sample was collected.
PCB Target Acceptance Criterion (≤10 µg/100 cm²)
Lead Target Acceptance Criterion (<250 µg/ft²)

A detailed summary of the wipe sample results and sample location diagrams for CMU wall samples are provided in Appendix G. Laboratory reports are available in Appendix M.

7.3.2 *Bulk Material Sampling Results*

7.3.2.1 Shallow Surface Bulk Sampling

The CMU wall included in the Pilot Study is part of an electrical vault and was not abated as part of the NTCRA. Prior to abatement, PCB concentrations in the CMU ranged from 78 to 125 µg/kg (see Table 4 and Table 12, below). As described in the Work Plan, post-abatement shallow surface bulk samples were collected from locations representative of each of the three removal methods. After abatement PCBs were not detected in any of the shallow bulk samples collected. Lead was detected in each of the samples collected. Prior to abatement, lead concentrations in the CMU ranged from 5 to 23 mg/kg (see Table 4 and Table 12 below). After abatement, the highest lead result was reported for the sample collected in the UHPW work area and the result for the media blast and vapor media samples were both below 10 mg/kg.

A summary of the confirmation shallow surface bulk samples collected is presented in Table 12 below.

Table 12 – Comparison of Pre- and Post-Abatement CMU Wall Shallow Bulk Sampling Results

Method	Pre-Abatement PCB Shallow Bulk Sample Results (µg/kg)	Post-Abatement PCB Shallow Bulk Sample Results (µg/kg)	Pre-Abatement Lead Shallow Bulk Sample Results (mg/kg)	Post-Abatement Lead Shallow Bulk Sample Results (mg/kg)
Ultra-High Pressure Water Blasting	78-125	<6.6	5-23	190
Media Blasting		<6.5		6.5
Vapor Media Blasting		<6.5		4.0-4.8

No target acceptance criteria were defined in the Pilot Study Plan for lead or PCB concentrations shallow CMU wall samples.

No PCBs were detected in any of the shallow surface bulk samples for any of the three methods. A detailed summary of the bulk sample results and sample location diagrams for shallow surface bulk samples are provided in Appendix F. Laboratory reports are available in Appendix M.

7.3.3 *Deviations and Changes to Proposed Pilot Study Work Plan Sampling*

As discussed further in Section 9.1 below, the UHPW Blasting did not produce desirable results in most of the areas tested due to the presence of residual paint and or degradation of the abated surface (i.e., CMU walls). On the underside of the mezzanine and the CMU wall, the Ultra-High Pressure Water blasting method was considered to be ineffective. As a result, the location and quantity of verification wipe samples from these areas were not collected as described in the Pilot Study Work Plan.

8. Waste Generation and Characterization Results

8.1 Summary of Waste Profiles and Sampling Results

A total of nine waste streams were generated during the Pilot Study. These included: miscellaneous waste (which includes waste from pre-cleaning activities, used personal protective equipment and general trash), decontaminated containment waste (polyethylene sheeting and PVC membrane), limited containment components with tape having paint/coatings from non-abated surfaces attached, two solid waste streams from abrasive blast media (*Kleen Blast* and plastic bead), a solid and liquid waste stream from vapor media, and a solid and liquid waste stream from the Ultra-High Pressure Water blasting method.

In accordance with the Pilot Study Work Plan, each waste stream was sampled for PCBs and the Title 22 metals. PCB and lead results of the waste stream samples are summarized in Table 13 below. Antimony, chromium, copper and cadmium were detected in concentrations requiring TCLP and WET analysis. Only chromium in Plastic Bead (Media Blast) waste stream was classified as RCRA hazardous waste. See Appendix K for a summary of the waste stream characterization and results. Waste stream volumes are summarized in Table 14 below.

Table 13 – Summary of Waste Stream Sampling Results

Waste Stream	PCB Result		Lead		TCLP Lead (mg/L)	WET Lead (mg/L)	Waste Classification
	Liquid (µg/L)	Solid (µg/kg)	Liquid (mg/L)	Solid (mg/kg)			
Miscellaneous Waste	N/A	<0.35	N/A	84	N/A	5.8	Non-RCRA Hazardous
Clean Containment Waste	N/A	<0.59	N/A	610	2.1	0.91	Non-Hazardous
Containment Waste with Paint/Coatings	N/A	<0.18	N/A	2,900	6.2	37	RCRA Hazardous
Media Blast (*Kleen Blast*)	N/A	0.231	N/A	3,900	16	230	RCRA Hazardous
Media Blast (plastic bead)	N/A	0.8	N/A	1,300	0.93	77	Non-RCRA Hazardous
Vapor Media	<0.001	0.11	5.6	300	5.7	62	RCRA Hazardous (for both Liquid and Solid Waste Streams)
Ultra-High Pressure Water	<0.001	0.37	2.5	13,000	55	210	RCRA Hazardous (for Solid Waste Stream) Non-Hazardous (for Liquid Waste Stream)

Table 14: Approximate Waste Stream Volumes and Masses

Waste Stream	Approximate Surface Area of Paint/Coatings Removed (Square Feet)	Approximate Liquid Volume (Gallons)	Approximate Solid Volume (kg)
Containment Waste	NA	NA	750
Containment Waste with Paint/Coatings	NA	NA	10
Media Blast (*Kleen Blast*)	90	NA	250
Media Blast (plastic bead)	10	0	125
Vapor Media	120	125	425
Ultra-High Pressure Water	80	275	150

8.2 Summary of Waste Hauling Activities

Upon receiving the results of the waste profile sampling, EcoBay consolidated the waste streams for shipping and used Aqualockit Polymer (SDS located in Appendix R) to solidify liquid waste streams. All waste was packaged for disposal and packed into a 20-yard dumpster. The waste was hauled to the Clean Harbors Buttonwillow Facility in Buttonwillow, California on July 11, 2017 as a RCRA hazardous waste. World Environmental and Energy transported waste from the site. A summary of the laboratory results of waste characterization sampling is included as Appendix K. Laboratory reports can be found in Appendix M, and a copy of the Hazardous Waste Manifest can be found in Appendix N.

9. Site Repair and Re-Application of Carbomastic 15

After the collection of all verification wipe samples and removal of the containment by EcoBay, C&O Painting (C&O) applied Carbomastic 15 (CM15) to all abated surfaces within the Pilot Study work area. Additionally, C&O applied CM15 in areas where the existing CM15 was damaged by the installation and removal of the containment tape seals. This damage occurred primarily at the top of the mezzanine and where the containment was sealed to beams and columns. C&O applied between two and four applications of CM15 to achieve the manufacturer specified thickness (7-10 mils). Once their work was completed a third-party inspector, Consolidated Engineering Laboratories (CEL)[17] measured the thickness of the CM15 applied by C&O using a DeFelsko PosiTector 6000 Coating Thickness Gage and confirmed thickness between 10 and 30 mils. A copy of CEL's inspection can be found in Appendix Q.

[17] The Pilot Study Work Plan identified Construction Testing Services (CTS) to perform mil thickness testing. However, CEL was under contract with PV at the time of the Pilot Study for other testing and inspection at Hangar 1. CEL used an ICC certified fireproofing inspector to conduct the thickness testing at Hangar 1 because CEL considered the ICC fireproofing certification to be similar to NACE certification with respect to determining the thickness of the applied coating.

10. Evaluation of Effectiveness of each Abatement Method

A discussion of each method is presented below. Additionally, a narrative of the project findings as observed by EcoBay is provided in Appendix P.

10.1 Method 1: Ultra-High Pressure Water Blasting

After clean up by EcoBay, ACC collected surface wipe sample from the abated areas to evaluate the effectiveness of the removal in accordance with the Work Plan. As the method was ineffective at removing paint/coatings from the CMU wall and the under side of the mezzanine, there was insufficient surface area to collect wipe samples as outlined in the Work Plan. Results of the sampling for the UHPW samples are summarized below.

Table 15 – Summary of Surface Wipe Verification Samples – Ultra-High Pressure Water

Sample Location	Number of Locations Sampled	PCB Results (µg/100 cm²)	Lead Results (µg/ft²)	Percentage of Samples that Achieved Target Acceptance Criteria
Exterior Structural Steel	3	<2.5	130-200	100%
Structural Steel Support Member	3	<2.5	66-1,800	33%
Steel Under Mezzanine*	1	<2.5	17,000**	0%
Concrete Wall	1	<2.5	280-320	0%

* - Samples locations were selected as noted on Figure 3D in the Pilot Study Work Plan. An insufficient surface area was abated by UHPW to allow for collection of samples from the locations suggested.
** - The 17,000 µg/ft² result was for a sample collected in an area of incomplete abatement.
PCB Target Acceptance Criterion (≤10 µg/100 cm²)
Lead Target Acceptance Criterion (<250 µg/ft²)

In general, the UHPW was determined to be an ineffective method for removing paint/coating from the CMU wall and the under side of the mezzanine. The UHPW method caused significant damage to the CMU wall. Additionally, skim coat and paint/coatings remained on the surface of the CMU wall after multiple passes. On the under side of the mezzanine, the UHPW method was extremely slow and was difficult for the workers to see what they were doing with water spray obscuring their vision.

On structural steel, the UHPW method was effective at removing paint/coatings when direct access of the spray equipment allowed for a perpendicular approach for removal. When angles and hard-to-reach areas were encountered, the UHPW method was not effective at removing the coatings. Additionally, it was noted that the UHPW method was not able to remove the mill scale from the surface of the steel. As such, it is likely that additional surface preparation for repainting would be necessary after abatement.

The UHPW system requires a full-time mechanic to be onsite with the equipment to provide maintenance and repairs to the equipment. According to EcoBay, their calculations suggest that the UHPW equipment would need to be replaced at least once during a full-scale abatement of Hangar 1. This would significantly impact project costs.

10.2 Method 2: Media Blasting

On April 17 and 18, 2017, EcoBay utilized media blast technology to remove paint/coatings from each of the four test areas within the Pilot Study work area. After a brief test with plastic media, Kleen Blast was used to remove paint/coatings from the steel elements. Both the Kleen Blast and plastic media were used to remove paint/coatings from CMU wall test area.

Upon completion of clean up by EcoBay, ACC performed a visual inspection of each of the test areas and deemed the abated areas sufficiently clean visually to perform wipe samples. Per the requirements of the Work Plan, ACC collected surface wipe sample from the abated areas to evaluate the effectiveness of the removal. Results of the sampling for the media blast samples are summarized below.

Table 16 – Summary of Surface Wipe Verification Samples – Media Blasting

Sample Location	Number of Samples Collected	PCB Results (µg/100 cm^2)	Lead Results (µg/ft^2)	Percentage of Samples that Achieved Target Acceptance Criteria
Exterior Structural Steel	3	<2.5	24-220	100%
Structural Steel Support Member	3	<2.5	33-240	100%
Steel Under Mezzanine*	3	<2.5	22-75	100%
Concrete Wall	3	<2.5	35-170	100%

* - Samples locations were selected as noted on Figure 3D in the Pilot Study Work Plan.
PCB Target Acceptance Criterion (≤10 µg/100 cm^2)
Lead Target Acceptance Criterion (<250 µg/ft^2)

Post-abatement visual inspections of the abated areas showed that media blasting using "Kleen Blast" media was effective in removing the paint/coatings as well as the underlying mill scale from structural steel. In addition, the "ricochet" effect of the media allowed for easy removal from hard to reach areas as well as from around rivet heads. The Kleen Blast and plastic media was effective at removing paint/coatings and skim coat from the concrete wall, but some damage to the concrete was observed. The results of the wipe samples suggest that achieving clean up goals with media blasting technology is possible.

According to the EcoBay's workers, the media blast system is more effective at removing the paint/coatings than the UHPW system and also was reportedly easier to control the blast nozzle due to lower required pressures. The reduced visibility created by the dry abrasive blasting did make it difficult to see the work at times, especially in hard to reach areas.

As expected the media blasting system proved to be reliable during the removal work. The equipment required includes a diesel-powered air compressor, a media pot, compressed air hoses and blast nozzles. During a large-scale abatement project, the compressors would require periodic maintenance. Hoses and blast nozzles are considered wear items and would require periodic replacement. These items are not a significant expense relative to the overall project.

10.3 Method 3: Vapor Media Blasting

On April 27 and 28, 2017, EcoBay used the final method, vapor media technology to remove paint/coatings from each of the four test areas of the Pilot Study work area.

Upon completion of clean up by EcoBay, ACC performed a visual inspection of each of the test areas and deemed the abated areas sufficiently clean visually to perform wipe samples. Per the requirements of the Work Plan ACC collected surface wipe sample from the abated areas to evaluate the effectiveness of the removal. Results of the sampling for the vapor media samples are summarized below.

Table 17 – Summary of Surface Wipe Verification Samples – Vapor Media Blasting

Sample Location	Number of Locations Sampled	PCB Results (µg/100 cm²)	Lead Results (µg/ft²)	Percentage of Samples that Achieved Target Acceptance Criteria
Exterior Structural Steel	3	<2.5	3.9-88	100%
Structural Steel Support Member	3	<2.5	2.9-42	100%
Steel Under Mezzanine*	3	<2.5	6.1-11	100%
Concrete Wall	3	<2.5	10-58**	100%

* - Samples locations were selected as noted on Figure 3D in the Pilot Study Work Plan. All three samples were collected from the underside of the mezzanine.
** - One sample was reported with a result of 300 µg/ft². After additional cleaning (wet wiping/vacuuming) another wipe sample was collected from this area; in this sample, the reported lead concentration was 58 µg/ft².
PCB Target Acceptance Criterion (≤10 µg/100 cm²)
Lead Target Acceptance Criterion (<250 µg/ft²)

The vapor media system was effective at visually removing paint/coatings as well as the underlying mill scale from structural steel. The process allowed for easy removal from hard to reach areas as well as from around rivet heads. Paint/coatings and skim coat from the concrete wall were removed but some damage to the concrete was observed. The results of the wipe samples suggest that achieving clean up goals with vapor media blasting technology is possible.

The vapor system was the preferred system to work with according to EcoBay's crew. The benefits of the media blast were also recognized with the vapor blast system.

The vapor media system was finicky during setup and required the replacement of a pressure regulator and blast nozzle switch before the start of work. During the first day of vapor media blasting an oil leak was found on the air compressor. Work was stopped and EcoBay's rental equipment provider replaced the compressor before the end of the day. These breakdowns are expected and a spare compressor on-site during a large-scale abatement project would help to minimize down time.

11. Evaluation of Effectiveness for Each Abatement Method

Of the three methods tested, both Vapor Media Blasting and Media Blasting were determined to be viable for removing the paint/coatings from the H1 steel surfaces. As documented by the wipe samples, both methods are capable of achieving post-abatement lead and PCB wipe sample Target Acceptance Criteria on structural steel elements and on the CMU walls.

Based on observations during the Pilot Study, evaluation of wipe sample results, performance of each abatement method, including input from EcoBay, each removal method tested has been assessed using the criteria presented in the Pilot Study Work Plan and are summarized in Table 18 below.

Table 18 – Summary of Removal Method Evaluation

	Ultra-High Pressure Water Blasting	Media Blasting	Vapor Media Blasting
Achieves Target Acceptance Criteria (Table 10)	Not Acceptable	Acceptable	Acceptable
Steel surface condition (Table 8)	Not Acceptable	Acceptable	Acceptable
CMU wall surface condition (Table 8)	Not Acceptable	Acceptable, except for minor damage to finishes	Acceptable, except for minor damage to finishes
Waste Minimization (Table 14)	As Expected	As Expected	Greater Volume Than Expected
Water Use (Table 14)	Not Acceptable	Best	Acceptable
Ease of Use (Table 7)	Not Acceptable	Acceptable	Best
Safety of Use (Table 7)	Acceptable*	Acceptable	Acceptable
Equipment Performance (Table 7)	Acceptable	Best	Acceptable

* - When working with ultra high-pressure water, workers must wear cut resistant clothing. The risk of injury from the ultra-high pressure water is genuine. During the Pilot Study, EcoBay demonstrated that with appropriate safety precautions work with UHPW can be completed without incident.

Other than excluding Ultra-High Pressure Water Blasting as a viable removal option, no clear best method was identified. Both vapor media and media blasting are viable options for large scale abatement as they have demonstrated the ability to safely remove PCBs to no detectable level, remove lead to below the target acceptance criterion and leave a surface suitable for recoating. Ultimately the contractor who performs the abatement of the structure should determine the best removal method based on their approach to the project and cost to complete the work.

12. Evaluation of Enclosure, Sampling Techniques, and Possible Improvements for Full-Scale Abatement

The containment enclosure performed well for the duration of the Pilot Study. Only minor repairs were necessary to maintain its integrity during the work. As demonstrated with air monitoring data and visual observations, the containment prevented the migration of contaminants outside the work area. The containment system as constructed for the Pilot Study appears suitable for full abatement of the structure.

Due to high XRF detection limits, this technology provides little value for the full-scale abatement of Hangar 1. While the XRF is useful for identifying the presence of lead-based paints, the presence of lead-based paint at Hangar 1 has already been demonstrated.

During full-scale abatement collection of baseline bulk coating and wipe samples will be unnecessary, as the presence of lead and PCBs in paints/coatings, on floor surfaces inside and outside of Hangar 1 has been documented. While relative percent difference (RPD) values in post-abatement wipe samples were often greater than the acceptance criteria specified in the Project Plan for Quality Assurance (Attachment E of the Work Plan), with few exceptions, the duplicate sampling results confirmed when Target Acceptance Criteria were achieved. Collecting samples at regular intervals from varying types of surfaces (i.e. beam flange, beam webbing, brackets, etc.) and the occasional duplicate sample and ensuring that proper sample collection practices are followed are anticipated to be adequate to determine whether the target acceptance criteria have been met. The required frequency of verification sampling should be evaluated and selected prior to full-scale abatement. At a minimum, based on the results of this Pilot Study, a reduced sampling frequency for PCBs seems reasonable as PCBs were not detected in any of the post-abatement verification wipe samples collected as part of this Study.

13. Summary of Laboratory and Field Quality Assurance and Quality Control

13.1 Summary of Field Quality Assurance and Quality Control

All samples collected as part of the Pilot Study were collected in accordance with the procedures identified in the Work Plan. Field blanks were collected as prescribed and all blank samples were reported below the limit of detection for all samples. Field duplicate samples were collected as prescribed in the Work Plan. Laboratory results for duplicate wipe samples showed variability, which likely resulted from the fact that the duplicate wipe samples were not collected from the exact same location, but rather immediately adjacent to the original sampling location. As the presence of lead and PCBs on surfaces is not uniform, the variability observed in these sampled is not unexpected. The advisability of collection duplicates during verification sampling should be evaluated prior to full-scale abatement.

The sample identification nomenclature used as part of the Pilot Study was complicated. As such, data entry errors were noted on occasion. A simpler sample identification system would reduce these data entry errors.

Samples collected as part of the Pilot Study were delivered to the laboratory daily. PCB and lead samples were delivered on ice. However, after delivering the samples to the analytical laboratory, ACC retained the cooler for use the next day. As such, the laboratory did not consistently document that presence of ice when samples were delivered. For future sample collection, a two cooler exchange program is recommended.

13.2 Summary of Laboratory Quality Assurance and Quality Control

The quality assurance reviews of the laboratory data have been performed in accordance with the processes described for Stage 2B Verification and Validation checks found in “Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use” (USEPA, 2009) and guidelines described in Appendix O.

To gather all information necessary to perform the Stage 2B Verification and Validation, Level 4 data packages were requested from the laboratory; these data packages included the required deliverables described in Tables A 12 and A 13 of the Work Plan. The Level 4 data deliverables were examined to determine the usability of the analytical results and compliance relative to requirements specified by the reported methodology. A review of findings is included in Appendix O. Qualifier codes have been entered into the appropriate fields in the electronic data, where necessary, so that the data user can quickly assess the qualitative and/or quantitative reliability of any result based on the criteria evaluated.

The QA review process has identified aspects of the analytical data that required qualification due to negative blank response issues; calibration issues; surrogate, LCS/LCSD, and post digestion spike recovery issues, serial dilution %D issues, agreement between columns comparison issues, and quantitation of results below the reporting limit. None of the data warranted rejection (flagged “R”); however, two reported positive results were changed to not-detected (flagged “U”) due to blank contamination. In general, the majority of the lead and copper and all of the PCB blanks were free of contamination, the instruments were calibrated properly with few exceptions, surrogate recoveries were either acceptable or greater than the control limit (in these instances, the associated sampling results were not impacted because the target compounds were not present above the analytical reporting limit), and post digestion spike recoveries were within control limits with few exceptions. The agreement between GC columns was poor in several instances, and several serial dilution %Rs and 11.4% of the field duplicate pairs RPDs were outside of control limits, necessitating qualification of the data as estimates (flagged “J” or “UJ”),

It is concluded that the data collected during the Pilot Study are valid and usable to assess:

- The effectiveness of the three different abatement techniques that were described in the Work Plan.
- The concentrations of fugitive dust, lead, copper, and PCBs on particulates at the perimeter of the Pilot Study area to aid in establishing engineering controls and an air monitoring program during full-scale abatement and coating removal activities.
- The chemical concentrations in waste streams to enable appropriate disposal of wastes created during the pilot study and to aid in determining the waste classification and quantities that are likely to be generated by the full-scale abatement project.

14. References

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Appendix A

Pilot Study Location Maps

A·C·C ENVIRONMENTAL CONSULTANTS
An Employee Owned Company

Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

Scale

0 200 400

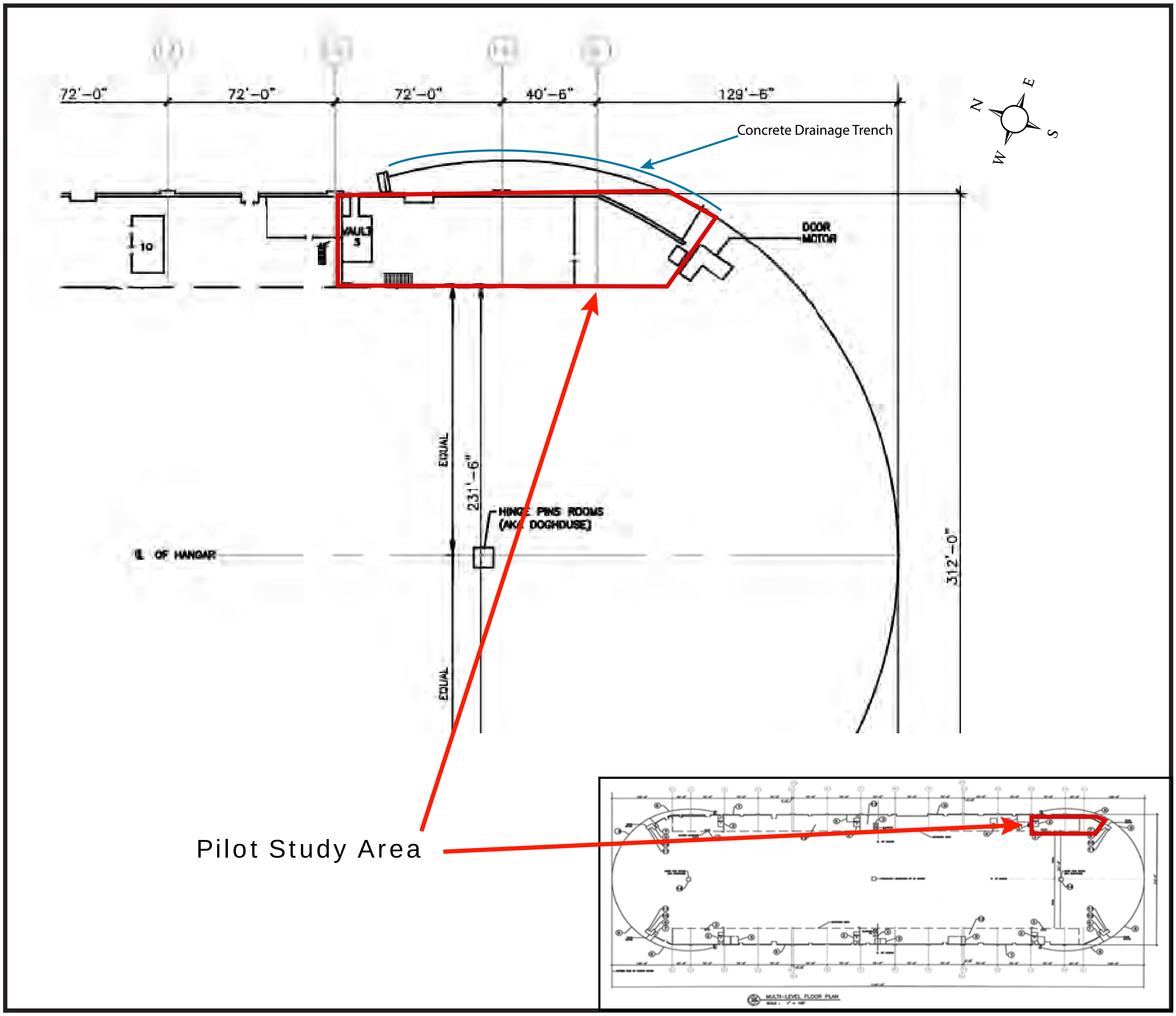
Pilot Study Location Map		
Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure A-1

A·C·C ENVIRONMENTAL CONSULTANTS

An Employee Owned Company

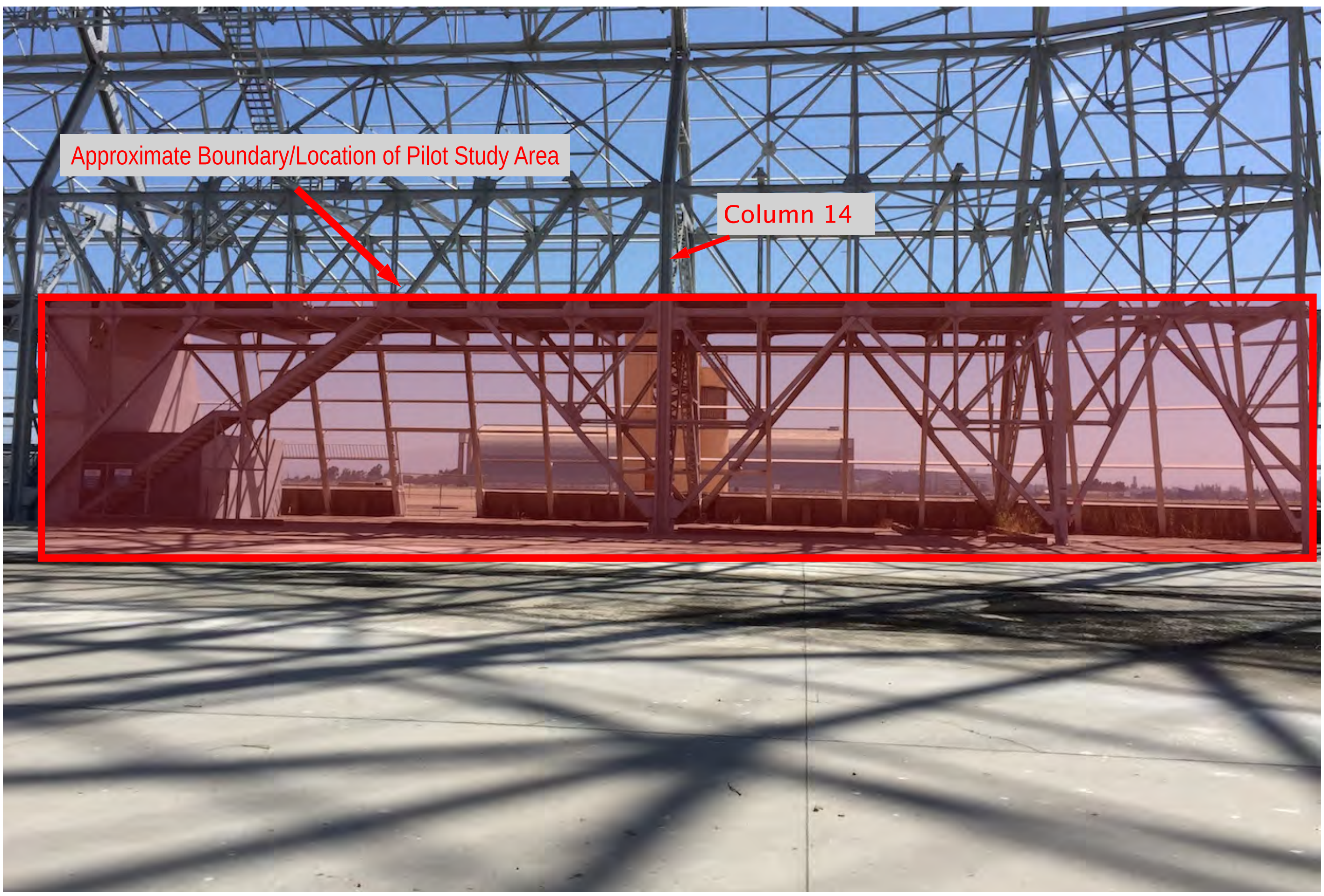
Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California



Pilot Study Area Plan		
Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure A-2

Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

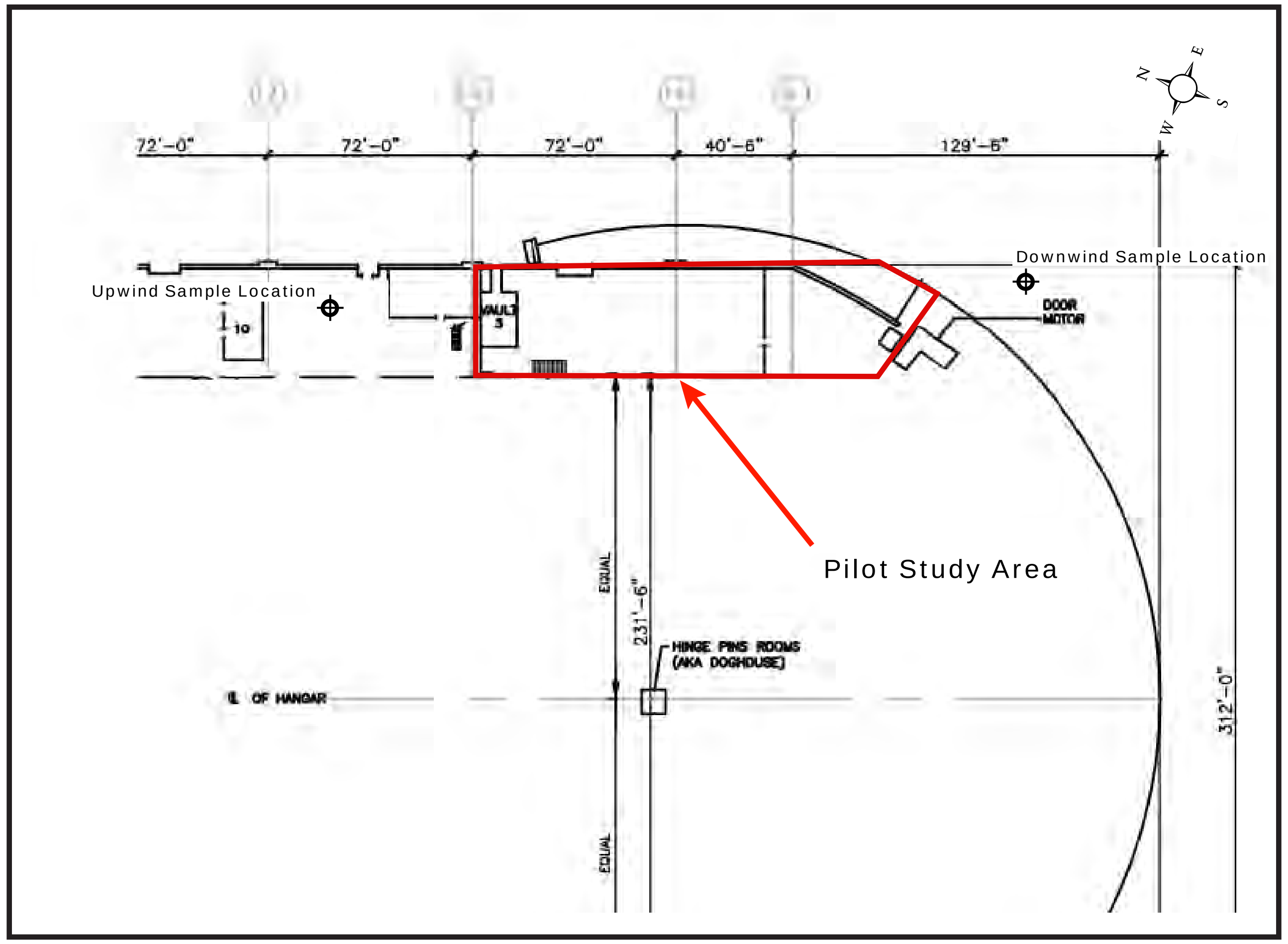


Pilot Study Area Photograph		
Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure A-3

Appendix B

Air Sampling Locations and Results with Site Meteorological Data and PM10 Summary



Note: Results for air monitoring are located in Table B-1 in this Appendix.

Hangar One Pilot Scale Study

Site Meterological Data and PM10 Summary — **Sampling Co.: ACC Environmental Consultants, Inc.**

Date	Average Wind Speed (mph)	Average Wind Direction	Weather Conditions	Upwind PM10 (mg/m^3) Shift Average	Upwind PM10 (mg/m^3) Shift Peak	Downwind PM10 (mg/m^3) Shift Average	Downwind PM10 (mg/m^3) Shift Peak	Work Activity
3/16/17	6	North	Overcast	0.009	0.039	0.010	0.018	Baseline
3/17/17	3	North	Clear	0.009	0.017	0.013	0.021	Baseline
3/23/17	4	North	Cloudy	0.009	0.034	0.022	0.024	Baseline
4/3/17	6	North	Clear	0.008	0.037	0.012	0.025	Ultra High Pressure Water
4/4/17	7	North	Clear	0.007	0.051	0.013	0.018	Ultra High Pressure Water
4/11/17	10	Southeast	Overcast	0.012	0.035	0.010	0.024	Ultra High Pressure Water
4/17/17	7	North	Clear	0.005	0.009	0.009	0.014	Media Blasting
4/18/17	6	North	Overcast	0.007	0.030	0.007	0.012	Media Blasting
4/19/17	6	Northwest	Clear	0.014	0.032	0.017	0.022	Media Blasting
4/27/17	8	Northwest	Clear	0.010	0.049	0.011	0.015	Vapor Media Blasting
4/28/17	8	Northwest	Clear	0.009	0.051	0.013	0.016	Vapor Meda Blasting

Notes:
Averages based on typical work hours of 7AM - 3PM
PM10 data collected utilizing TSI AM-510 equipped with a PM10 impactor inlet

mg/m^3 - miligrams per cubic meter
mph - miles per hour
PM10 - Particulate Matter less than 10 microns

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Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

Air Sampling Location Map
with Site Meteorlogical Data
and PM10 Summary

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure B-1

Hangar One Pilot Scale Study

Table B-1: Air Sampling Results

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Abatement Method	Sample Location	Sample Identification	Date	Lead ($\mu g/m^3$) [1]	Copper ($\mu g/m^3$) [1]	Total PCB Result ($\mu g/m^3$) [1]	PCB - Aroclor 1016 ($\mu g/m^3$) [1]	PCB - Aroclor 1221 ($\mu g/m^3$) [1]	PCB - Aroclor 1232 ($\mu g/m^3$) [1]	PCB - Aroclor 1242 ($\mu g/m^3$) [1]	PCB - Aroclor 1248 ($\mu g/m^3$) [1]	PCB - Aroclor 1254 ($\mu g/m^3$) [1]	PCB - Aroclor 1260 ($\mu g/m^3$) [1]	PCB - Aroclor 1268 ($\mu g/m^3$) [1]	Asbestos (f/cc) [2]	Laboratory Report Number
Baseline	Upwind, Day 1	B-AIR-L/C-UP1-052416-1	5/24/16	<0.095	<0.090	-	-	-	-	-	-	-	-	-	-	277138
Baseline	Downwind, Day 1	B-AIR-L/C-DW1-052416-2	5/24/16	<0.094	<0.089	-	-	-	-	-	-	-	-	-	-	277138
Baseline	Downwind, Day 1, Duplicate	B-AIR-L/C/DW1-DUP-052416-7	5/24/16	<0.094	<0.089	-	-	-	-	-	-	-	-	-	-	277138
Baseline	Media Blank	B-AIR-L/C-MB-052416-8 (µg/s)	5/24/16	<0.18	<0.17	-	-	-	-	-	-	-	-	-	-	277138
Baseline	Downwind, Day 1	B-AIR-P-DW1-052416-2	5/24/16	-	-	<0.0056	<0.011	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	-	-	277139
Baseline	Downwind, Day 1, Duplicate	B-AIR-P-DW1-DUP-052416-7	5/24/16	-	-	<0.0055	<0.011	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	-	-	277139
Baseline	Media Blank	B-AIR-P-MB-052416-8 (µg/s)	5/24/16	-	-	<0.26	<0.52	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	-	-	277139
Baseline	Upwind, Day 2	B-AIR-L/C-UP2-052516-3	5/25/16	<0.097	<0.091	-	-	-	-	-	-	-	-	-	-	277184
Baseline	Downwind, Day 2	B-AIR-L/C-UP2-052516-4	5/25/16	<0.094	<0.089	-	-	-	-	-	-	-	-	-	-	277184
Baseline	Upwind, Day 2	B-AIR-P-UP2-052516-3	5/25/16	-	-	<0.0054	<0.011	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	-	-	277183
Baseline	Downwind, Day 2	B-AIR-P-UP2-052516-4	5/25/16	-	-	<0.0053	<0.011	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	-	-	277183
Baseline	Upwind, Day 3	B-AIR-L/C-UP3-052616-5	5/26/16	0.038	0.16 J	-	-	-	-	-	-	-	-	-	-	277266
Baseline	Downwind, Day 3	B-AIR-L/C-DW3-052616-6	5/26/16	0.015 U	0.063 U	-	-	-	-	-	-	-	-	-	-	277266
Baseline	Upwind, Day 3	B-AIR-P-UP3-052616-5	5/26/16	-	-	<0.0052	<010	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	-	-	277265
Baseline	Upwind, Day 3	B-AIR-P-UP1-053116-1	5/31/16	-	-	<0.0054	<0.011	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	-	-	277302
Baseline	Downwind, Day 3	B-AIR-P-DW3-053116-6	5/31/16	-	-	<0.0053	<0.011	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	-	-	277302
Baseline	Upwind, Day 1	B-AIR-L/C-UW1-031617-1	3/16/17	<0.12	<0.12 UJ	-	-	-	-	-	-	-	-	-	-	287078
Baseline	Downwind, Day 1	B-AIR-L/C-DW1-031617-2	3/16/17	<0.13	<0.13 UJ	-	-	-	-	-	-	-	-	-	-	287078
Baseline	Downwind, Day 1, Duplicate	B-AIR-L/C/DW1-DUP-031617-7	3/16/17	<0.13	<0.13 UJ	-	-	-	-	-	-	-	-	-	-	287078
Baseline	Media Blank	B-AIR-L/C-MB-031617-8 (µg/s)	3/16/17	<0.25	<0.25 UJ	-	-	-	-	-	-	-	-	-	-	287078
Baseline	Upwind, Day 1	B-AIR-P-UW1-031617-1	3/16/17	-	-	<5.21	<2.61	<5.21	<2.61	<2.61	<2.61	<2.61	<2.61	<2.61	-	287079
Baseline	Downwind Day 1	B-AIR-P-DW1-031617-2	3/16/17	-	-	<5.36	<2.68	<5.36	<2.68	<2.68	<2.68	<2.68	<2.68	<2.68	-	287079
Baseline	Downwind, Day 1, Duplicate	B-AIR-P-DW1-DUP-031617-7	3/16/17	-	-	<5.36	<2.68	<5.36	<2.68	<2.68	<2.68	<2.68	<2.68	<2.68	-	287079
Baseline	Media Blank	B-AIR-P-MB-031617-8 (µg/s)	3/16/17	-	-	<0.52	<0.26	<0.52	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	-	287079
Baseline	Upwind, Day 2	B-AIR-L/C-UW2-031717-3	3/17/17	<0.13	<0.13	-	-	-	-	-	-	-	-	-	-	287122
Baseline	Downwind, Day 2	B-AIR-L/C-UW2-031717-4	3/17/17	<0.13	<0.13	-	-	-	-	-	-	-	-	-	-	287122
Baseline	Upwind, Day 2	B-AIR-P-UW2-031717-3	3/17/17	-	-	<5.64	<2.82	<5.64	<2.82	<2.82	<2.82	<2.82	<2.82	<2.82	-	287123

Hangar One Pilot Scale Study

Table B-1: Air Sampling Results

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Abatement Method	Sample Location	Sample Identification	Date	Lead (µg/m³) (1)	Copper (µg/m³) (1)	Total PCB Result (µg/m³) (1)	PCB - Aroclor 1016 (µg/m³) (1)	PCB - Aroclor 1221 (µg/m³) (1)	PCB - Aroclor 1232 (µg/m³) (1)	PCB - Aroclor 1242 (µg/m³) (1)	PCB - Aroclor 1248 (µg/m³) (1)	PCB - Aroclor 1254 (µg/m³) (1)	PCB - Aroclor 1260 (µg/m³) (1)	PCB - Aroclor 1268 (µg/m³) (1)	Asbestos (f/cc) (2)	Laboratory Report Number
Baseline	Downwind, Day 2	B-AIR-P-DW2-031717-4	3/17/17	-	-	<5.70	<2.85	<5.70	<2.85	<2.85	<2.85	<2.85	<2.85	<2.85	-	287123
Baseline	Upwind, Day 3	B-AIR-L/C-UP3-032317-5	3/23/17	<0.13	<0.13 UJ	-	-	-	-	-	-	-	-	-	-	287335
Baseline	Downwind, Day 3	B-AIR-L/C-DW3-032317-6	3/23/17	<0.13	<0.13 UJ	-	-	-	-	-	-	-	-	-	-	287335
Baseline	Upwind, Day 3	B-AIR-P-UW3-032317-5	3/23/17	-	-	<5.45	<2.72	<5.45	<2.72	<2.72	<2.72	<2.72	<2.72	<2.72	-	287333
Baseline	Downwind, Day 3	B-AIR-P-DW3-032317-6	3/23/17	-	-	<5.45	<2.72	<5.45	<2.72	<2.72	<2.72	<2.72	<2.72	<2.72	-	287333
UHPW	Downwind	A-AIR-L-W-DW1-04-03-17	4/3/17	<0.16	-	-	-	-	-	-	-	-	-	-	-	287624
UHPW	Upwind	A-AIR-L-W-UP1-04-03-17	4/3/17	<0.15	-	-	-	-	-	-	-	-	-	-	-	287624
UHPW	Downwind	A-AIR-P-W-DW1-04-03-17	4/3/17	-	-	<7.89	<3.94	<7.89	<3.94	<3.94	<3.94	<3.94	<3.94	<3.94	-	287626
UHPW	Upwind	A-AIR-P-W-UP1-04-03-17	4/3/17	-	-	<6.32	<3.16	<6.32	<3.16	<3.16	<3.16	<3.16	<3.16	<3.16	-	287626
UHPW	Downwind	A-AIR-A-W-DW1-04-03-17	4/3/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	231129
UHPW	Upwind	A-AIR-A-W-UP1-04-03-17	4/3/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	231129
UHPW	Downwind	A-AIR-L-W-DW1-04-04-17	4/4/17	<0.14	-	-	-	-	-	-	-	-	-	-	-	287658
UHPW	Upwind	A-AIR-L-W-UP1-04-04-17	4/4/17	<0.14	-	-	-	-	-	-	-	-	-	-	-	287658
UHPW	Downwind	A-AIR-P-W-DW1-04-04-17	4/4/17	-	-	<1.18	<0.59	<1.18	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	-	287657
UHPW	Upwind	A-AIR-P-W-UP1-04-04-17	4/4/17	-	-	<1.20	<0.60	<1.20	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60	-	287657
UHPW	Downwind	A-AIR-A-W-DW1-04-04-17	4/4/17	-	-	-	-	-	-	-	-	-	-	-	<0.001	231186
UHPW	Upwind	A-AIR-A-W-UP1-04-04-17	4/4/17	-	-	-	-	-	-	-	-	-	-	-	<0.001	231186
UHPW	Downwind	A-AIR-L-W-DW1-04-11-17	4/11/17	<0.17	-	-	-	-	-	-	-	-	-	-	-	287929
UHPW	Upwind	A-AIR-L-W-UP1-04-11-17	4/11/17	<0.16	-	-	-	-	-	-	-	-	-	-	-	287929
UHPW	Downwind	A-AIR-P-W-DW1-04-11-17	4/11/17	-	-	<6.98	<3.49	<6.98	<3.49	<3.49	<3.49	<3.49	<3.49	<3.49	-	287928
UHPW	Upwind	A-AIR-P-W-UP1-04-11-17	4/11/17	-	-	<6.41	<3.21	<6.41	<3.21	<3.21	<3.21	<3.21	<3.21	<3.21	-	287928
UHPW	Downwind	A-AIR-A-W-DW1-04-11-17	4/11/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	A220934
UHPW	Upwind	A-AIR-A-W-UP1-04-11-17	4/11/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	A220934
Media Blast	Upwind	A-AIR-L-MB-UW1-041717-1	4/17/17	<0.16	<0.16 UJ	-	-	-	-	-	-	-	-	-	-	288098
Media Blast	Downwind	A-AIR-L-MB-DW1-041717-2	4/17/17	<0.16	<0.16 UJ	-	-	-	-	-	-	-	-	-	-	288098

Hangar One Pilot Scale Study

Table B-1: Air Sampling Results

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Abatement Method	Sample Location	Sample Identification	Date	Lead (µg/m³) (1)	Copper (µg/m³) (1)	Total PCB Result (µg/m³) (1)	PCB - Aroclor 1016 (µg/m³) (1)	PCB - Aroclor 1221 (µg/m³) (1)	PCB - Aroclor 1232 (µg/m³) (1)	PCB - Aroclor 1242 (µg/m³) (1)	PCB - Aroclor 1248 (µg/m³) (1)	PCB - Aroclor 1254 (µg/m³) (1)	PCB - Aroclor 1260 (µg/m³) (1)	PCB - Aroclor 1268 (µg/m³) (1)	Asbestos (f/cc) (2)	Laboratory Report Number
Media Blast	Downwind	A-AIR-L-MB-DW1-FD-041717-3	4/17/17	<0.16	<0.16 UJ	-	-	-	-	-	-	-	-	-	-	288098
Media Blast	Upwind	A-AIR-P-MB-UW1-041717-1	4/17/17	-	-	<8.39	<4.19	<8.39	<4.19	<4.19	<4.19	<4.19	<4.19	<4.19	-	288099
Media Blast	Downwind	A-AIR-P-MB-DW1-041717-2	4/17/17	-	-	<7.54	<3.77	<7.54	<3.77	<3.77	<3.77	<3.77	<3.77	<3.77	-	288099
Media Blast	Downwind	A-AIR-P-MB-DW1-FD-041717-3	4/17/17	-	-	<8.39	<4.19	<8.39	<4.19	<4.19	<4.19	<4.19	<4.19	<4.19	-	288099
Media Blast	Upwind	A-AIR-A-MB-UW1-041717-1	4/17/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	A221154
Media Blast	Downwind	A-AIR-A-MB-DW1-041717-2	4/17/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	A221154
Media Blast	Upwind	A-AIR-L-MB-UW1-041817-5	4/18/17	<0.15	<0.15	-	-	-	-	-	-	-	-	-	-	288139
Media Blast	Downwind	A-AIR-L-MB-DW1-041817-6	4/18/17	<0.14	<0.14	-	-	-	-	-	-	-	-	-	-	288139
Media Blast	Upwind	A-AIR-P-MB-UW1-041817-5	4/18/17	-	-	<5.99 UJ	<3.00 UJ	<5.99 UJ	<3.00 UJ	<3.00 UJ	<3.00 UJ	<3.00 UJ	<3.00 UJ	<3.00 UJ	-	288138
Media Blast	Downwind	A-AIR-P-MB-DW1-041817-6	4/18/17	-	-	<5.89 UJ	<2.94 UJ	<5.89 UJ	<2.94 UJ	<2.94 UJ	<2.94 UJ	<2.94 UJ	<2.94 UJ	<2.94 UJ	-	288138
Media Blast	Upwind	A-AIR-A-MB-UW1-041817-3	4/18/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	A221201
Media Blast	Downwind	A-AIR-A-MB-DW1-041817-4	4/18/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	A221201
Media Blast	Upwind	A-AIR-L/C-MB-UW1-041917-7	4/19/17	<0.14	<0.14	-	-	-	-	-	-	-	-	-	-	288179
Media Blast	Downwind	A-AIR-L/C-MB-DW1-041917-7	4/19/17	<0.15	0.1679	-	-	-	-	-	-	-	-	-	-	288179
Media Blast	Upwind	A-AIR-P-MB-UW1-041917-7	4/19/17	-	-	<6.27	<3.14	<6.27	<3.14	<3.14	<3.14	<3.14	<3.14	<3.14	-	288178
Media Blast	Downwind	A-AIR-P-MB-DW1-041917-8	4/19/17	-	-	<6.27	<3.13	<6.27	<3.13	<3.13	<3.13	<3.13	<3.13	<3.13	-	288178
Media Blast	Upwind	A-AIR-A-MB-UW1-041917-5	4/19/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	A221262
Media Blast	Downwind	A-AIR-A-MB-DW1-041917-6	4/19/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	A221262
Vapor Media	Upwind	A-AIR-L-VM-UW1-042717-1	4/27/17	<0.15	<0.15 UJ	-	-	-	-	-	-	-	-	-	-	288454
Vapor Media	Downwind	A-AIR-L-VM-DW1-042717-2	4/27/17	<0.16	<0.16 UJ	-	-	-	-	-	-	-	-	-	-	288454
Vapor Media	Upwind	A-AIR-P-VM-UW1-042717-3	4/27/17	-	-	<6.81	<3.40	<6.81	<3.40	<3.40	<3.40	<3.40	<3.40	<3.40	-	288455
Vapor Media	Downwind	A-AIR-P-VM-DW1-042717-4	4/27/17	-	-	<6.30	<3.15	<6.30	<3.15	<3.15	<3.15	<3.15	<3.15	<3.15	-	288455
Vapor Media	Upwind	A-AIR-A-VM-UW1-042715-5	4/27/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	A221572
Vapor Media	Downwind	A-AIR-A-VM-DW1-042717-6	4/27/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	A221572
Vapor Media	Upwind	A-AIR-L-VM-UW2-042817-1	4/28/17	<0.16	<0.16 UJ	-	-	-	-	-	-	-	-	-	-	288498
Vapor Media	Downwind	A-AIR-L-VM-DW2-042817-2	4/28/17	<0.16	<0.16 UJ	-	-	-	-	-	-	-	-	-	-	288498
Vapor Media	Upwind	A-AIR-P-VM-UW2-042817-3	4/28/17	-	-	<6.72	<3.36	<6.72	<3.36	<3.36	<3.36	<3.36	<3.36	<3.36	-	288499

Hangar One Pilot Scale Study

Table B-1: Air Sampling Results

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Abatement Method	Sample Location	Sample Identification	Date	Lead (µg/m^3) (1)	Copper (µg/m^3) (1)	Total PCB Result (µg/m^3) (1)	PCB - Aroclor 1016 (µg/m^3) (1)	PCB - Aroclor 1221 (µg/m^3) (1)	PCB - Aroclor 1232 (µg/m^3) (1)	PCB - Aroclor 1242 (µg/m^3) (1)	PCB - Aroclor 1248 (µg/m^3) (1)	PCB - Aroclor 1254 (µg/m^3) (1)	PCB - Aroclor 1260 (µg/m^3) (1)	PCB - Aroclor 1268 (µg/m^3) (1)	Asbestos (f/cc) (2)	Laboratory Report Number
Vapor Media	Downwind	A-AIR-P-VM-DW2-042817-4	4/28/17	-	-	<6.96	<3.48	<6.96	<3.48	<3.48	<3.48	<3.48	<3.48	<3.48	-	288499
Vapor Media	Upwind	A-AIR-A-VM-UP2-042817-5	4/28/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	A221660
Vapor Media	Downwind	A-AIR-A-VM-DW2-042817-6	4/28/17	-	-	-	-	-	-	-	-	-	-	-	<0.002	A221660

Notes:
Air Sample Location Diagram (Figure B-1) is provided in this Appendix Section.
All analytical data have been validated in accordance with the processes described for Stage 2B Verification and Validation checks and the applicable National Functional Guidelines
See Appendix M For Laboratory Reports and chain of custody documentation.
"-" indicates analyte not analyzed in sample.
1 - blank sample results reported as micrograms/sample.
2 - Asbestos air sampling perfomed due to discovery of asbesots-containing skim coat on CMU walls under paint coatings.
J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
UJ - The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
U - The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

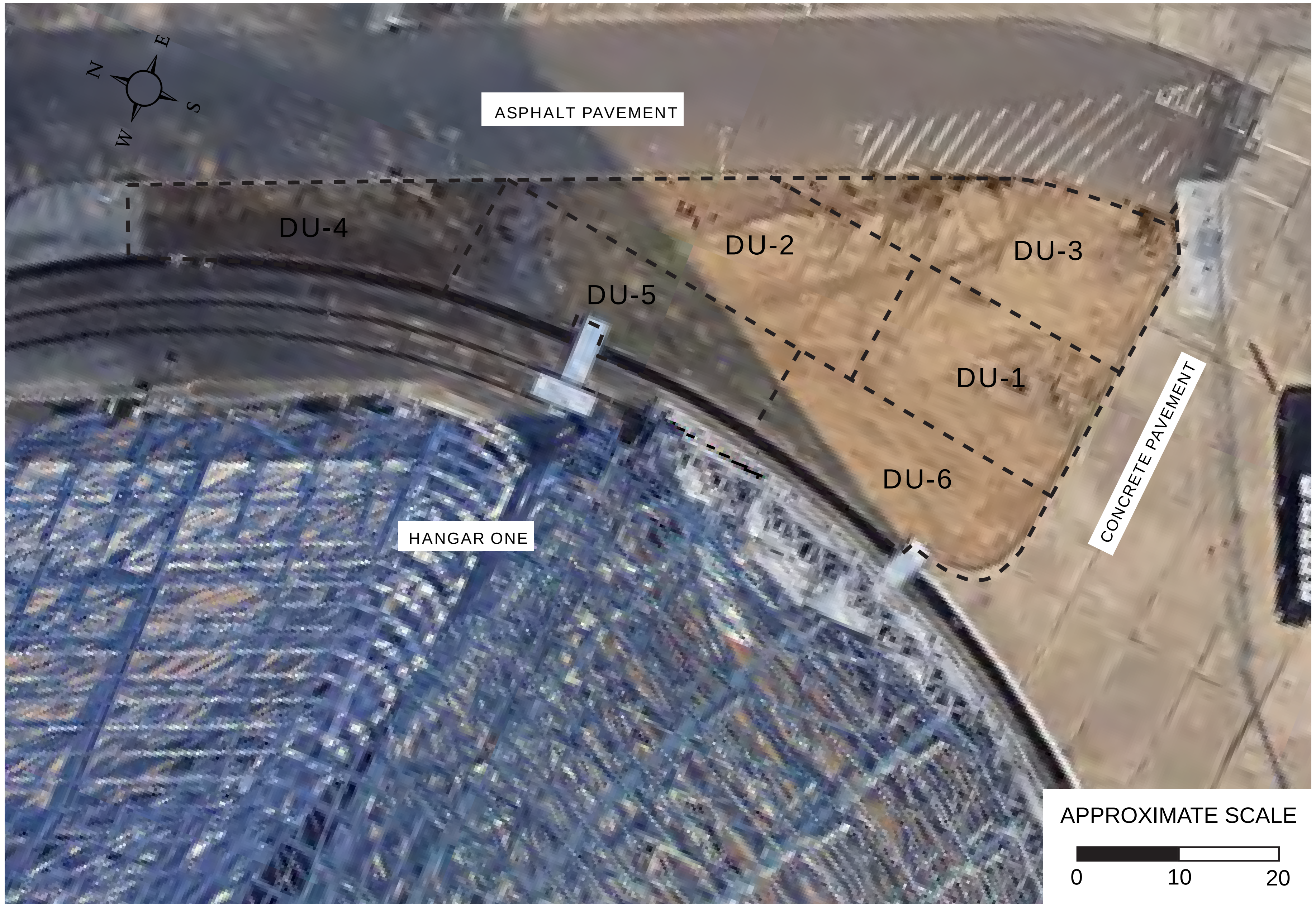
Airbone Action Levels from the Final Work Plan for the Pilot Scale Abatement Study of Hangar 1 (ACC, 2016):
Lead - 1.0 µg/m^3
PCB - 13.0 µg/m^3

Airbone Action Level for Asbesots defined as 0.01 f/cc (EPA - Asbestos Hazard Emergency Response Act).

PCB - Polychlorinated Biphenyls
UHPW - Ultra High Pressure Water
CMU - Concrete Masonty Unit
µg/m^3 - micrograms per cubic meter
f/cc - fibers per cubic centimeter

Appendix C

Soil Sampling Locations and Results



Note: Lead and PCB Soil Sampling Results Included in Table C-1 in this Appendix.

SAMPLE LOCATION	SAMPLE COLLECTION YEAR	SAMPLE NUMBER	LEAD RESULTS (mg/kg)	TOTAL PCB RESULTS (µg/kg)
DU-1	2016	B-SOIL-P/L-ES-052416-1	69	40
	2017	B-SOIL-P/L-ES-032917-1	9.1	46
	2017	B-SOIL-P/L-ES-FD-032917-7	12	44
DU-2	2016	B-SOIL-P/L-ES-052416-2	39	206
	2017	B-SOIL-P/L-ES-032917-2	46	168
DU-3	2016	B-SOIL-P/L-ES-052416-3	20	43
	2017	B-SOIL-P/L-ES-032917-3	21	119
DU-4	2016	B-SOIL-P/L-ES-052616-4	41	770
	2016	B-SOIL-P/L-ES-052616-7	83	920
	2017	B-SOIL-P/L-ES-033017-4	40	242
DU-5	2016	B-SOIL-P/L-ES-052616-5	66	570
	2017	B-SOIL-P/L-ES-033017-5	32	402
	2017	B-SOIL-P/L-ES-FD-033017-8	37	336
DU-6	2016	B-SOIL-P/L-ES-052616-6	11	89
	2016	B-SOIL-P/L-ES-052616-8	17	131
	2017	B-SOIL-P/L-ES-033017-6	18	102

A·C·C ENVIRONMENTAL CONSULTANTS

An Employee Owned Company

Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

LEGEND

- AREA OF EXPOSED SOIL

DU-6 - DESCISION UNIT ID

Soil Sampling Decision Units
Baseline Soil Investigation

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure C-1

Hangar One Pilot Scale Study

Table C-1: Baseline Lead and PCB Soil Sampling Results

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Decision Unit	Sample Number	Lead Results (mg/kg) [1]	Total PCBs Results (µg/kg)(1)	PCB - Aroclor 1016 (µg/kg)	PCB - Aroclor 1221 (µg/kg)	PCB - Aroclor 1232 (µg/kg)	PCB - Aroclor 1242 (µg/kg)	PCB - Aroclor 1248 (µg/kg)	PCB - Aroclor 1254 (µg/kg)	PCB - Aroclor 1260 (µg/kg)	PCB - Aroclor 1268 (µg/kg)	Percent Moisture	Sample Collection Date	Laboratory Report Number
Decision Unit # 1	B-SOIL-P/L-ES-052416-1	69 J	40 J	<3.0	<8.1	<3.9	<3.9	<3.9	<3.1	16 J	24 J	1%	5/24/16	277164
Decision Unit # 1	B-SOIL-P/L-ES-032917-1	9.1 J	46 J	<1.3	<3.4	<1.7	<1.5	<1.6	<1.3	<0.83 UJ	46 J	6%	3/29/17	287623
Decision Unit # 1, Field Duplicate	B-SOIL-P/L-ES-FD-032917-7	12 J	40 J	<1.3	<3.4	<1.6	<1.5	<1.6	<1.3	12 J	32 J	5%	3/29/17	287623
Decision Unit # 2	B-SOIL-P/L-ES-052416-2	39 J	206 J	<3.0	<8.0	<3.9	<3.6	<3.8	<3.1	96 J	110 J	2%	5/24/16	277164
Decision Unit # 2	B-SOIL-P/L-ES-032917-2	46	168 J	<1.2	<3.4	<1.6	<1.5	<1.6	25 J	47	96 J	6%	3/29/17	287623
Decision Unit # 3	B-SOIL-P/L-ES-052416-3	20 J	43 J	<2.9	<7.8	<3.8	<3.5	<3.7	<3.0	<1.9	43 J	1%	5/24/16	277164
Decision Unit # 3	B-SOIL-P/L-ES-033017-3	21	119 J	<1.2	<3.3	<1.6	<1.5	<1.6	<1.3	37	82 J	4%	3/30/17	287623
Decision Unit # 4	B-SOIL-P/L-ES-052616-4	41 J	770 J	<15	<40	<19	<18	<19	<15	300 J	470 J	6%	5/26/16	277242
Decision Unit # 4 Field Dupicate	B-SOIL-P/L-ES-052616-7	83 J	920 J	<15	<39	<19	<18	<19	<15	400 J	520 J	6%	5/26/16	277242
Decision Unit # 4	B-SOIL-P/L-ES-033017-4	40	242 J	<1.2	<3.4	<1.6	<1.5	<1.6	<1.3	52	190 J	5%	3/30/17	287623
Decision Unit # 5	B-SOIL-P/L-ES-052616-5	66	570 J	<15	<39	<19	<18	<19	<15	260 J	310 J	6%	5/26/16	277242

Hangar One Pilot Scale Study

Table C-1: Baseline Lead and PCB Soil Sampling Results

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Decision Unit	Sample Number	Lead Results (mg/kg) (1)	Total PCBs Results (µg/kg)(1)	PCB - Aroclor 1016 (µg/kg)	PCB - Aroclor 1221 (µg/kg)	PCB - Aroclor 1232 (µg/kg)	PCB - Aroclor 1242 (µg/kg)	PCB - Aroclor 1248 (µg/kg)	PCB - Aroclor 1254 (µg/kg)	PCB - Aroclor 1260 (µg/kg)	PCB - Aroclor 1268 (µg/kg)	Percent Moisture	Sample Collection Date	Laboratory Report Number
Decision Unit # 5	B-SOIL-P/L-ES-033017-5	32	402 J	<1.2	<3.4	<1.6	<1.5	<1.6	<1.3	72	330 J	5%	3/30/17	287623
Decision Unit # 5, Field Duplicate	B-SOIL-P/L-ES-FD-033017-8	37	336 J	<1.3	<3.4	<1.7	<1.5	<1.6	<1.3	66	270 J	6%	3/30/17	287623
Decision Unit # 6	B-SOIL-P/L-ES-052616-6	11 J	89 J	<15	<40	<20	<18	<19	<15	31 J	58 J	3%	5/26/16	277242
Decision Unit # 6 Field Duplicate	B-SOIL-P/L-ES-052616-8	17 J	131 J	<2.9	<7.9	<3.8	<3.5	<3.8	<3.0	42 J	89 J	3%	5/26/16	277242
Decision Unit # 6	B-SOIL-P/L-ES-033017-6	18	102 J	<1.2	<3.3	<1.6	<1.5	<1.6	<1.3	18	84 J	5%	3/30/17	287623

Hangar One Pilot Scale Study

Table C-1: Baseline Lead and PCB Soil Sampling Results

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Decision Unit	Sample Number	Lead Results (mg/kg) [1]	Total PCBs Results (µg/kg)(1)	PCB - Aroclor 1016 (µg/kg)	PCB - Aroclor 1221 (µg/kg)	PCB - Aroclor 1232 (µg/kg)	PCB - Aroclor 1242 (µg/kg)	PCB - Aroclor 1248 (µg/kg)	PCB - Aroclor 1254 (µg/kg)	PCB - Aroclor 1260 (µg/kg)	PCB - Aroclor 1268 (µg/kg)	Percent Moisture	Sample Collection Date	Laboratory Report Number
N/A (Equipment Blank)	B-SOIL-P/L-ES-EB-052416-9	<1.0	<1.0	<0.16	<0.32	<0.14	<0.16	<0.16	<0.16	<0.13	<0.14	-	5/24/16	277164
N/A (Equipment Blank)	B-SOIL-P/L-ES-EB-052616-10	<1.0	<1.0	<0.16	<0.32	<0.14	<0.16	<0.16	<0.16	<0.13	<0.14	-	5/26/16	277242
N/A (Equipment Blank)	B-SOIL-P/L-ES-EB-032917-9	<5.0	<0.94	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	-	3/29/17	287623
N/A (Equipment Blank)	B-SOIL-P/L-ES-EB-033017-10	<5.0	<0.94	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	-	3/30/17	287623

Notes:
Soil Sample Location Diagram (Figure C-1) is provided in this Appendix Section.
All analytical data have been validated in accordance with the processes described for Stage 2B Verification and Validation checks and the applicable National Functional Guidelines
See Appendix M for laboratory reports and chain of custody documentation.
Equipment blank samples collected in accordance with sampling plan. Neither PCBs nor lead were detected above the analytical reporting limit in these samples.

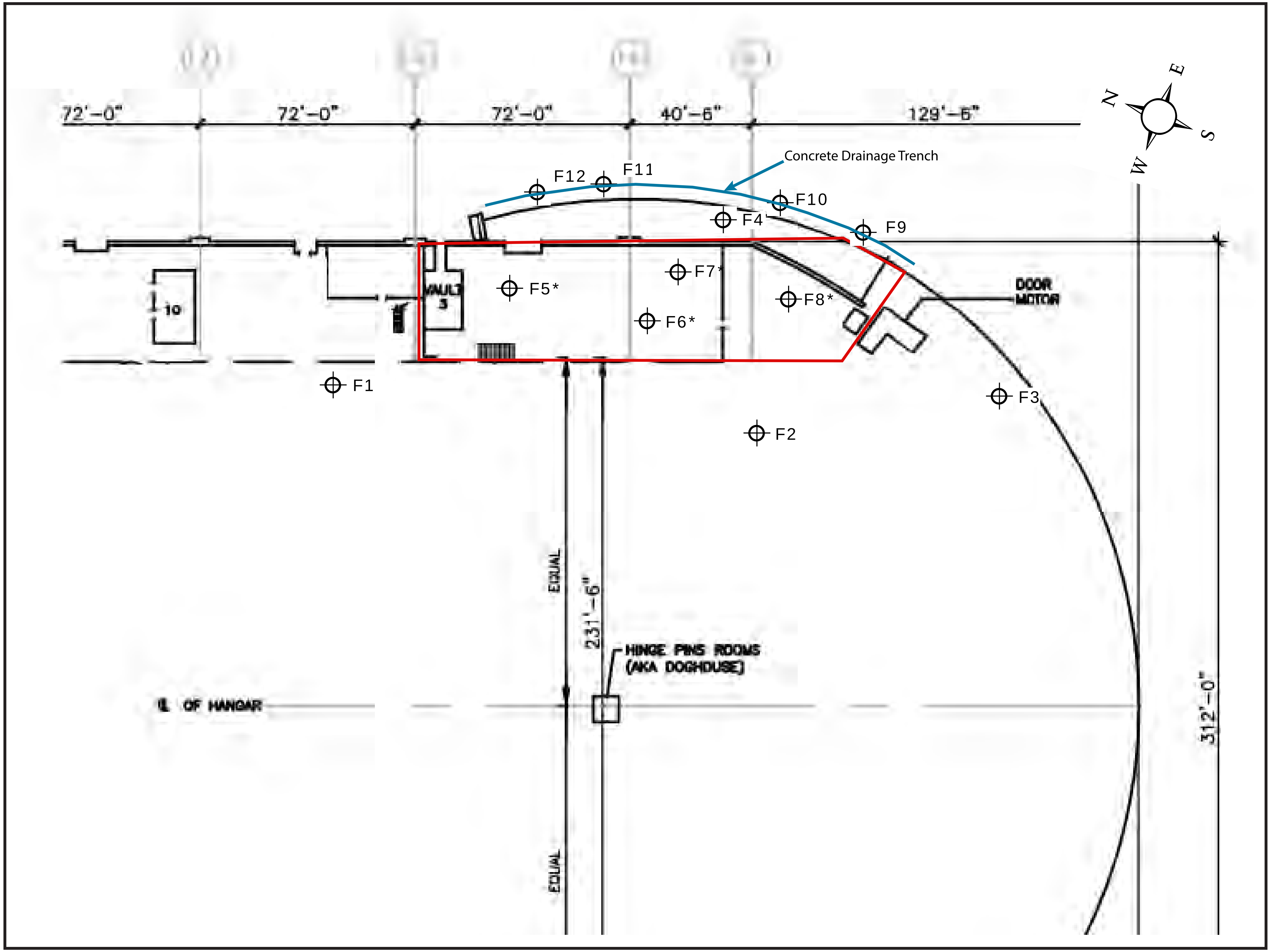
[1] - Soil analysis reported as dry weitght.
J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
UJ - The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

PCB - Polychlorinated Biphenyls
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram

Appendix D

Wipe Sampling Locations and Results

Cement Floor and Concrete Drainage Trench



Note: Lead and PCB Wipe Sampling Results Included in Tables D-1 and D-2 in this Appendix.

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Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

LEGEND

- Wipe Sampling Locations
- Pilot Study Area

*Baseline Wipe Samples from the concrete floor within the Pilot Study Area were collected in 2016. Samples collected in 2017 were collected from the floor of the PVC membrane installed within the Pilot Study Area in 2016.

Wipe Sampling Locations:
Concrete Floor/Concrete Drainage Trench

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure D-1

Hangar One Pilot Scale Study

Table D-1: Lead Wipe Sampling Results: Concrete Floor and Drainage Trench

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Location ID	Sample Location Description and Phase	Lead Results (µg/ft^2)[(1), (2)]	Sample Identification	Sample Collection Date	Time	Laboratory Report Number
F1	Concrete Floor, Outside Study Area, Baseline	1,200 J	B-WIPE-L-CF-052616-1	5/26/16	13:15	277267
	Concrete Floor, Outside Study Area, Baseline	130 J	B-WIPE-L-CF-031617-1	3/16/17	12:33	287074
	Concrete Floor, Outside Study Area, Post-Abatement	230	P-WIPE-L-CF-053017-1	5/30/2017[(4)]	10:00	289431
F2	Concrete Floor, Outside Study Area, Baseline	770 J	B-WIPE-L-CF-052616-2	5/26/16	13:36	277267
	Concrete Floor, Outside Study Area, Baseline	130 J	B-WIPE-L-CF-031617-2	3/16/17	12:45	287074
	Concrete Floor, Outside Study Area, Baseline Duplicate of (B-WIPE-L-CF-031617-2)	310 J	B-WIPE-L-CF-FD-031617-10	3/16/17	12:48	287074
	Concrete Floor, Outside Study Area, Post-Abatement	190 J	P-WIPE-L-CF-053017-2	5/30/2017[(4)]	10:08	289431
	Concrete Floor, Outside Study Area, Post-Abatement, Duplicate of (P-WIPE-L-CF-053017-2)	300 J	P-WIPE-L-CF-FD-053017-10	5/30/2017[(4)]	10:12	289431
F3	Concrete Floor, Outside Study Area, Baseline	1,400 J	B-WIPE-L-CF-052616-3	5/26/16	13:45	277267
	Concrete Floor, Outside Study Area, Baseline	160 J	B-WIPE-L-CF-031617-3	3/16/17	13:05	287074
	Concrete Floor, Outside Study Area, Post-Abatement	140	P-WIPE-L-CF-053017-3	5/30/2017[(4)]	10:27	289431
F4	Concrete Floor, Outside Study Area, Baseline	140 J	B-WIPE-L-CF-052616-4	5/26/16	14:11	277267
	Concrete Floor, Outside Study Area, Baseline, Duplicate of (B-WIPE-L-CF-052616-4)	100 J	B-WIPE-L-CF-FD-052616-10	5/26/16	14:14	277267
	Concrete Floor, Outside Study Area, Baseline	3.5 J	B-WIPE-L-CF-031617-4	3/16/17	13:22	287074
	Concrete Floor, Outside Study Area, Post-Abatement	5.5	P-WIPE-L-CF-053017-4	5/30/2017[(4)]	11:38	289431
F5	Concrete Floor, Inside Study Area, Baseline	1,700 J	B-WIPE-L-CF-052616-5	5/26/16	14:53	277267
	Concrete Floor, Inside Study Area, Baseline, Duplicate of (B-WIPE-L-CF-052616-5)	1,400 J	B-WIPE-L-CF-FD-052616-11	5/26/16	14:56	277267
	PVC Membrane on Concrete Floor, Inside Study Area, Baseline [(3)]	36 J	B-WIPE-L-CF-031617-5	3/16/17	13:30	287074
	Concrete Floor, Inside Study Area, Post-Abatement	160	P-WIPE-L-CF-053017-5	5/30/2017[(4)]	10:49	289431

Hangar One Pilot Scale Study

Table D-1: Lead Wipe Sampling Results: Concrete Floor and Drainage Trench

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Location ID	Sample Location Description and Phase	Lead Results ($\mu g/ft^2$)(1), (2)	Sample Identification	Sample Collection Date	Time	Laboratory Report Number
F6	Concrete Floor, Inside Study Area, Baseline	2,200 J	B-WIPE-L-CF-052616-6	5/26/16	14:59	277267
	PVC Membrane on Concrete Floor, Inside Study Area, Baseline (3)	13 J	B-WIPE-L-CF-031617-6	3/16/17	13:45	287074
	PVC Membrane on Concrete Floor, Inside Study Area, Baseline, Duplicate of (B-WIPE-L-CF-031617-6) (3)	16 J	B-WIPE-L-CF-FD-031617-11	3/16/17	14:48	287074
	Concrete Floor, Inside Study Area, Post-Abatement	340	P-WIPE-L-CF-053017-6	5/30/2017(4)	10:57	289431
	Concrete Floor, Inside Study Area, Post-Abatement, Duplicate of (P-WIPE-L-CF-053017-6)	430	P-WIPE-L-CF-FD-053017-11	5/30/2017(4)	11:00	289431
F7	Concrete Floor, Inside Study Area, Baseline	280 J	B-WIPE-L-CF-052616-7	5/26/16	15:01	277267
	PVC Membrane on Concrete Floor, Inside Study Area, Baseline (3)	58 J	B-WIPE-L-CF-031617-7	3/16/17	13:58	287074
	Concrete Floor, Inside Study Area, Post-Abatement	340	P-WIPE-L-CF-053017-7	5/30/2017(4)	11:12	289431
F8	Concrete Floor, Inside Study Area, Baseline	160	B-WIPE-L-CF-052616-8	5/26/16	15:04	277267
	PVC Membrane on Concrete Floor, Inside Study Area, Baseline (3)	13 J	B-WIPE-L-CF-031617-8	3/16/17	14:10	287074
	Concrete Floor, Inside Study Area, Post-Abatement	93	P-WIPE-L-CF-053017-8	5/30/2017(4)	11:21	289431
F9	Concrete Drainage Trench, Baseline	710	B-WIPE-L-CDT-053116-1	5/31/16	10:50	277303
	Concrete Drainage Trench, Baseline	140 J	B-WIPE-L-CDT-031717-1	3/17/17	10:47	287121
	Concrete Drainage Trench, Baseline, Duplicate of (B-WIPE-L-CDT-031717-1)	84 J	B-WIPE-L-CDT-FD-031717-6	3/17/17	10:50	287121
F10	Concrete Drainage Trench, Baseline	230	B-WIPE-L-CDT-053116-2	5/31/16	11:12	277303
	Concrete Drainage Trench, Baseline, Duplicate of (B-WIPE-L-CDT-053116-2)	190	B-WIPE-L-CDT-FD-053116-6	5/31/16	11:25	277303
	Concrete Drainage Trench, Baseline	74 J	B-WIPE-L-CDT-031717-2	3/17/17	11:04	287121
F11	Concrete Drainage Trench, Baseline	180	B-WIPE-L-CDT-053116-3	5/31/16	12:01	277303
	Concrete Drainage Trench, Baseline	38 J	B-WIPE-L-CDT-031717-3	3/17/17	11:19	287121

Hangar One Pilot Scale Study

Table D-1: Lead Wipe Sampling Results: Concrete Floor and Drainage Trench

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Location ID	Sample Location Description and Phase	Lead Results ($\mu g/ft^2$)(1), (2)	Sample Identification	Sample Collection Date	Time	Laboratory Report Number
F12	Concrete Drainage Trench, Baseline	150	B-WIPE-L-CDT-053116-4	5/31/16	12:18	277303
	Concrete Drainage Trench, Baseline	79 J	B-WIPE-L-CDT-031717-4	3/17/17	11:23	287121
NA	Concrete Floor, Field Blank	<0.50 UJ	B-WIPE-L-CF-FB-052616-9	5/26/16	14:08	277267
	Concrete Floor, Field Blank	<0.50 UJ	B-WIPE-L-CF-FB-031617-9	3/16/17	13:07	287074
	Concrete Floor, Field Blank	<0.50	P-WIPE-L-CF-FB-053017-9	5/30/2017(4)	10:35	289431
	Concrete Drainage Trench, Field Blank	<0.50	B-WIPE-L-CDT-FB-053116-5	5/31/16	10:55	277303
	Concrete Drainage Trench, Field Blank	<0.50 UJ	B-WIPE-L-CDT-FB-031717-5	3/17/17	11:38	287121

Notes:

$\mu g/ft^2$ - micrograms per square foot

Wipe Sample Location Diagram (Figure D-1) is provided in this Appendix.

All analytical data have been validated in accordance with the processes described for Stage 2B Verification and Validation checks and the applicable National Functional Guidelines

See Appendix M for laboratory reports and chain of custody documentation

1 - No Acceptance Criterion was defined in Pilot Scale Abatement Study of Hangar 1 (ACC, 2016) for these samples.

2 - Blank samples reported as micrograms per sample.

3 - Samples collected from PVC membrane floor, which was installed in the Pilot Study Area in 2016 after initial baseline sampling of the concrete floor.

4 - Post-Abatement Wipe Samples.

J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

UJ - The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

Hangar One Pilot Scale Study														
Table D-2: PCB Wipe Sampling: Concrete Floor and Drainage Trench										Sampling Co.: ACC Environmental Consultants, Inc. QA/QC: Jill Henes				
Sample Location ID	Sample Location	Total PCBs (µg/100 cm^2) (1), (2)	PCB - Aroclor 1016 (µg/100 cm^2) (2)	PCB - Aroclor 1221 (µg/100 cm^2) (2)	PCB - Aroclor 1232 (µg/100 cm^2) (2)	PCB - Aroclor 1242 (µg/100 cm^2) (2)	PCB - Aroclor 1248 (µg/100 cm^2) (2)	PCB - Aroclor 1254 (µg/100 cm^2) (2)	PCB - Aroclor 1260 (µg/100 cm^2) (2)	PCB - Aroclor 1268 (µg/100 cm^2) (2)	Sample Identification	Sample Collection Date	Time	Laboratory Report Number
F1	Concrete Floor, Outside Study Area, Baseline	2.3 J	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	1.9	0.37 J	B-WIPE-P-CF-052616-1	5/26/16	13:17	277268
	Concrete Floor, Outside Study Area, Baseline	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-031617-1	3/16/17	12:30	287073
	Concrete Floor, Outside Study Area, Post-Abatement	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	P-WIPE-P-CF-053017-1	5/30/2017(4)	10:03	289434
F2	Concrete Floor, Outside Study Area, Baseline	1.66 J	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	1.2 J	0.46 J	B-WIPE-P-CF-052616-2	5/26/16	13:41	277268
	Concrete Floor, Outside Study Area, Ba	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-031617-2	3/16/17	12:51	287073
	Concrete Floor, Outside Study Area, Baseline, Duplicate of (B-WIPE-P-CF-031617-2)	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-FD-031617-10	3/16/17	12:54	287073
	Concrete Floor, Outside Study Area, Post-Abatement	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	P-WIPE-P-CF-053017-2	5/30/2017(4)	10:17	289434
	Concrete Floor, Outside Study Area, Post-Abatement, Duplicate of (P-WIPE-CF-053017-2)	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	P-WIPE-P-CF-FD-053017-10	5/30/17	10:22	289434

Hangar One Pilot Scale Study

Table D-2: PCB Wipe Sampling: Concrete Floor and Drainage Trench											Sampling Co.: ACC Environmental Consultants, Inc. QA/QC: Jill Henes			
Sample Location ID	Sample Location	Total PCBs (µg/100 cm^2) (1), (2)	PCB - Aroclor 1016 (µg/100 cm^2) (2)	PCB - Aroclor 1221 (µg/100 cm^2) (2)	PCB - Aroclor 1232 (µg/100 cm^2) (2)	PCB - Aroclor 1242 (µg/100 cm^2) (2)	PCB - Aroclor 1248 (µg/100 cm^2) (2)	PCB - Aroclor 1254 (µg/100 cm^2) (2)	PCB - Aroclor 1260 (µg/100 cm^2) (2)	PCB - Aroclor 1268 (µg/100 cm^2) (2)	Sample Identification	Sample Collection Date	Time	Laboratory Report Number
F3	Concrete Floor, Outside Study Area, Baseline	1.5 J	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	0.90 J	0.61 J	B-WIPE-P-CF-052616-3	5/26/16	13:48	277268
	Concrete Floor, Outside Study Area, Baseline	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-031617-3	3/16/17	13:10	287073
	Concrete Floor, Outside Study Area, Post-Abatement	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	P-WIPE-P-CF-053017-3	5/30/2017(4)	10:27	289434
F4	Concrete Floor, Outside Study Area, Baseline	0.2 J	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	0.19 J	<1.3	B-WIPE-P-CF-052616-4	5/26/16	14:19	277268
	Concrete Floor, Outside Study Area, Baseline, Duplicate of (B-WIPE-P-CF-052616-4)	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-FD-052616-10	5/26/16	14:21	277268
	Concrete Floor, Outside Study Area, Baseline	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-031617-4	3/16/17	13:24	287073
	Concrete Floor, Outside Study Area, Post-Abatement	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	P-WIPE-P-CF-053017-4	5/30/2017(4)	11:42	289434

Hangar One Pilot Scale Study

Table D-2: PCB Wipe Sampling: Concrete Floor and Drainage Trench											Sampling Co.: ACC Environmental Consultants, Inc. QA/QC: Jill Henes			
Sample Location ID	Sample Location	Total PCBs (µg/100 cm^2) (1), (2)	PCB - Aroclor 1016 (µg/100 cm^2) (2)	PCB - Aroclor 1221 (µg/100 cm^2) (2)	PCB - Aroclor 1232 (µg/100 cm^2) (2)	PCB - Aroclor 1242 (µg/100 cm^2) (2)	PCB - Aroclor 1248 (µg/100 cm^2) (2)	PCB - Aroclor 1254 (µg/100 cm^2) (2)	PCB - Aroclor 1260 (µg/100 cm^2) (2)	PCB - Aroclor 1268 (µg/100 cm^2) (2)	Sample Identification	Sample Collection Date	Time	Laboratory Report Number
F5	Concrete Floor, Inside Study Area, Baseline	2.28 J	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	1.6 J	0.68 J	B-WIPE-P-CF-052616-5	5/26/16	15:06	277268
	Concrete Floor, Inside Study Area, Baseline, Duplicate of (B-WIPE-P-CF-052616-5)	5.6 J	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	4.2 J	1.4 J	B-WIPE-P-CF-FD-052616-11	5/26/16	15:07	277268
	PVC Membrane on Concrete Floor, Inside Study Area, Baseline (3)	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-031617-5	3/16/17	13:36	287073
	Concrete Floor, Inside Study Area, Post-Abatement	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	P-WIPE-P-CF-053017-5	5/30/2017(4)	10:49	289434

Hangar One Pilot Scale Study

Table D-2: PCB Wipe Sampling: Concrete Floor and Drainage Trench

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Location ID	Sample Location	Total PCBs (µg/100 cm^2) (1), (2)	PCB - Aroclor 1016 (µg/100 cm^2) (2)	PCB - Aroclor 1221 (µg/100 cm^2) (2)	PCB - Aroclor 1232 (µg/100 cm^2) (2)	PCB - Aroclor 1242 (µg/100 cm^2) (2)	PCB - Aroclor 1248 (µg/100 cm^2) (2)	PCB - Aroclor 1254 (µg/100 cm^2) (2)	PCB - Aroclor 1260 (µg/100 cm^2) (2)	PCB - Aroclor 1268 (µg/100 cm^2) (2)	Sample Identification	Sample Collection Date	Time	Laboratory Report Number
F6	Concrete Floor, Inside Study Area, Baseline	1.5 J	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	1.1 J	0.41 J	B-WIPE-P-CF-052616-6	5/26/16	15:09	277268
	PVC Membrane on Concrete Floor, Inside Study Area, Baseline (3)	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-031617-6	3/16/17	13:49	287073
	PVC Membrane on Concrete Floor, Inside Study Area, Baseline, Duplicate of (B-WIPE-P-CF-031617-6)(3)	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-FD-031617-11	3/16/17	13:52	287073
	Concrete Floor, Inside Study Area, Post-Abatement	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	P-WIPE-P-CF-053017-6	5/30/2017(4)	11:02	289434
	Concrete Floor, Inside Study Area, Post-Abatement, Duplicate of (P-WIPE-CF-053017-6)	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	P-WIPE-P-CF-FD-053017-11	5/30/2017(4)	11:05	289434
F7	Concrete Floor, Inside Study Area, Baseline	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-052616-7	5/26/16	15:13	277268
	PVC Membrane on Concrete Floor, Inside Study Area, Baseline (3)	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-031617-7	3/16/17	14:00	287073
	Concrete Floor, Inside Study Area, Post-Abatement	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	P-WIPE-P-CF-053017-7	5/30/2017(4)	11:15	289434

Hangar One Pilot Scale Study

Table D-2: PCB Wipe Sampling: Concrete Floor and Drainage Trench

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Location ID	Sample Location	Total PCBs (µg/100 cm^2) (1), (2)	PCB - Aroclor 1016 (µg/100 cm^2) (2)	PCB - Aroclor 1221 (µg/100 cm^2) (2)	PCB - Aroclor 1232 (µg/100 cm^2) (2)	PCB - Aroclor 1242 (µg/100 cm^2) (2)	PCB - Aroclor 1248 (µg/100 cm^2) (2)	PCB - Aroclor 1254 (µg/100 cm^2) (2)	PCB - Aroclor 1260 (µg/100 cm^2) (2)	PCB - Aroclor 1268 (µg/100 cm^2) (2)	Sample Identification	Sample Collection Date	Time	Laboratory Report Number
F8	Concrete Floor, Inside Study Area, Baseline	0.90 J	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	0.55 J	0.30 J	B-WIPE-P-CF-052616-8	5/26/16	15:15	277268
	PVC Membrane on Concrete Floor, Inside Study Area, Baseline (3)	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-031617-8	3/16/17	14:13	287073
	Concrete Floor, Inside Study Area, Post-Abatement	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	P-WIPE-P-CF-053017-8	5/30/2017 (4)	11:35	289434
F9	Concrete Drainage Trench, Baseline	2.7 J	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	1.3 J	1.4	B-WIPE-P-CDT-053116-1	5/31/16	10:52	277304
	Concrete Drainage Trench, Baseline	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CDT-031717-1	3/17/17	10:53	287126
	Concrete Drainage Trench, Baseline, Duplicate of (B-WIPE-P-CDT-031717-1)	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CDT-FD-031717-6	3/17/17	10:56	287126
F10	Concrete Drainage Trench, Baseline	1.0 J	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	0.4 J	0.64 J	B-WIPE-P-CDT-053116-2	5/31/16	11:15	277304
	Concrete Drainage Trench, Baseline, Duplicate of (B-WIPE-P-CDT-053116-2)	6.2 J	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	2.8 J	3.4 J	B-WIPE-P-CDT-FD-053116-6	5/31/16	11:29	277304
	Concrete Drainage Trench, Baseline	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CDT-031717-2	3/17/17	11:08	287126
F11	Concrete Drainage Trench, Baseline	1.7 J	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	0.80 J	0.93 J	B-WIPE-P-CDT-053116-3	5/31/16	12:05	277304
	Concrete Drainage Trench, Baseline	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CDT-031717-3	3/17/17	11:22	287126
F12	Concrete Drainage Trench, Baseline	5.2 J	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	3.2 J	2.0	B-WIPE-P-CDT-053116-4	5/31/16	12:22	277304
	Concrete Drainage Trench, Baseline	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CDT-031717-4	3/17/17	11:33	287126

Hangar One Pilot Scale Study

Table D-2: PCB Wipe Sampling: Concrete Floor and Drainage Trench

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Location ID	Sample Location	Total PCBs (µg/100 cm²) (1), (2)	PCB - Aroclor 1016 (µg/100 cm²) (2)	PCB - Aroclor 1221 (µg/100 cm²) (2)	PCB - Aroclor 1232 (µg/100 cm²) (2)	PCB - Aroclor 1242 (µg/100 cm²) (2)	PCB - Aroclor 1248 (µg/100 cm²) (2)	PCB - Aroclor 1254 (µg/100 cm²) (2)	PCB - Aroclor 1260 (µg/100 cm²) (2)	PCB - Aroclor 1268 (µg/100 cm²) (2)	Sample Identification	Sample Collection Date	Time	Laboratory Report Number
N/A	Concrete Drainage Trench, Field Blank	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CDT-FB-053116-5	5/31/16	10:57	277304
	Concrete Drainage Trench, Field Blank	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CDT-FB-031717-5	3/17/17	11:41	287126
	Concrete Floor, Field Blank	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-FB-052616-9	5/26/16	14:17	277268
	Concrete Floor, Field Blank	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	B-WIPE-P-CF-FB-031617-9	3/16/17	13:12	287073
	Concrete Floor, Field Blank	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	P-WIPE-P-CF-FB-053017-9	5/30/2017(4)	10:38	289434

Notes:

Wipe Sample Location Diagram (Figure D-1) is provided in this Appendix.

All analytical data have been validated in accordance with the processes described for Stage 2B Verification and Validation checks and the applicable National Functional Guidelines

See Appendix M For Laboratory Reports and chain of custody documentation

1 - Acceptance Criterion from the Final Work Plan for the Pilot Scale Abatement Study of Hangar 1 (ACC, 2016).

2 - Blank samples reported as micrograms per sample.

3 - Samples collected from PVC membrane floor, which was installed in Pilot Study Area in 2016 after initial baseline sampling of the concrete floor.

4 - Post-Abatement Wipe Samples.

J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

PCBs - Polychlorinated Biphenyls

µg/100 cm² - micrograms per 100 square centimeters

Appendix E

Bulk Paint Sampling Locations and Results

Abatement Area

Note: Lead and PCB Bulk Sampling Results Included as Tables E-1 and E-2 in this Appendix.

A·C·C ENVIRONMENTAL CONSULTANTS
An Employee Owned Company

Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

LEGEND
- Media Blasting Area
- High Pressure Water Blasting Area
- Vapor Media Blasting Area
- Bulk Sampling Location

Bulk **Paint** Sampling Locations**:**
Exterior Steel Member

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure E-1

Note: *Lead and PCB Bulk Sampling Results Included as Tables E-1 and E-2 in this Appendix.*

A·C·C ENVIRONMENTAL CONSULTANTS
An Employee Owned Company

Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

LEGEND
- Media Blasting Area
- High Pressure Water Blasting Area
- Vapor Media Blasting Area
- Bulk Sampling Location

Bulk **Paint** Sampling Locations**:**
Structural Steel Support Member

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure E-2

Note: Lead and PCB Bulk Sampling Results Included as Tables E-1 and E-2 in this Appendix.

A·C·C ENVIRONMENTAL CONSULTANTS
An Employee Owned Company

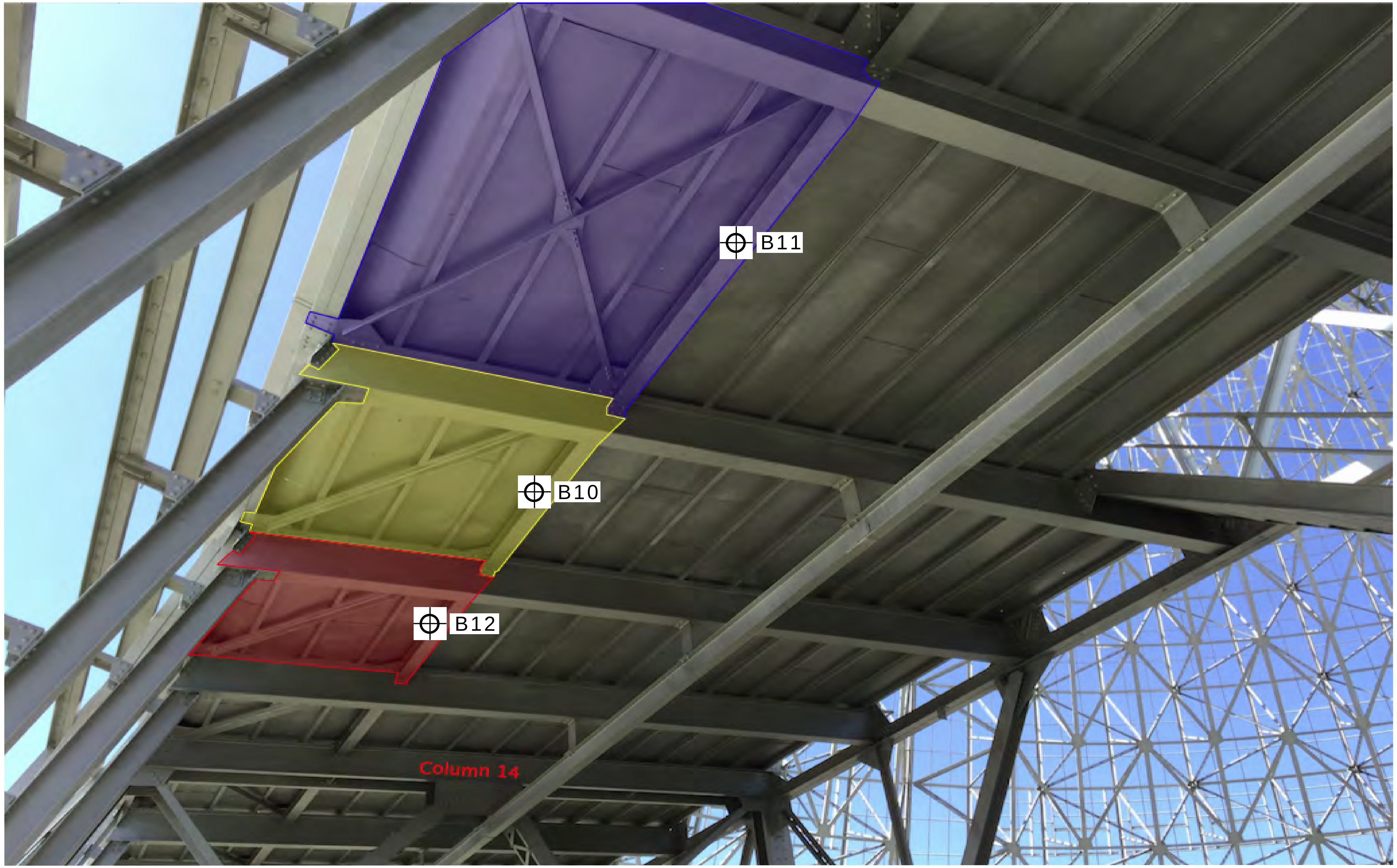
Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

LEGEND
- Media Blasting Area
- High Pressure Water Blasting Area
- Vapor Media Blasting Area
- Bulk Sampling Location

Bulk **Paint** Sampling Locations**:**
CMU Wall Coating

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure E-3



Note: Lead and PCB Bulk Sampling Results Included as Tables E-1 and E-2 in this Appendix.

A·C·C ENVIRONMENTAL CONSULTANTS
An Employee Owned Company

Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

LEGEND
- Media Blasting Area
- High Pressure Water Blasting Area
- Vapor Media Blasting Area
- Bulk Sampling Location

Bulk **Paint** Sampling Locations**:**
Structural Member Under Mezzanine

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure E-4

Hangar One Pilot Scale Study

Table E-1: Lead Bulk Paint Material Sampling Results			**Sampling Co.: ACC Environmental Consultants, Inc. QA/QC: Jill Henes**			
Sample Location ID	**Sample Location**	**Lead Results (mg/kg)**	**Sample Number**	**Sample Collection Date**	**Time**	**Laboratory Report Number**
B1	Exterior Structural Steel Paint	66,000	B-BULK-L-ESM-032817-1	3/28/17	8:20	287447
B2	Exterior Structural Steel Paint	75,000	B-BULK-L-ESM-032817-2	3/28/17	10:25	287447
B3	Exterior Structural Steel Paint	63,000	B-BULK-L-ESM-032817-3	3/28/17	9:00	287447
	Exterior Structural Steel Paint, Field Duplicate (B-BULK-L-ESM-032817-3)	62,000	B-BULK-L-ESM-FD-032817-4	3/28/17	9:40	287447
B4	Structural Steel Support Member	66,000	B-BULK-L-SSSM-032817-1	3/28/17	11:05	287447
	Structural Steel Support Member, Field Duplicate (B-BULK-L-SSSM-032817-1)	55,000	B-BULK-L-SSSM-FD-032817-4	3/28/17	13:16	287447
B5	Structural Steel Support Member	62,000	B-BULK-L-SSSM-032817-2	3/28/17	10:40	287447
B6	Structural Steel Support Member	59,000	B-BULK-L-SSSM-032817-3	3/28/17	11:20	287447
B7	Paint Coating on CMU Wall	590 J	B-BULK-L-CMUC-032817-1	3/28/17	13:25	287447
	Paint Coating on CMU Wall, Field Duplicate (B-BULK-L-CMUC-032817-1)	92 J	B-BULK-L-CMUC-FD-032817-4	3/28/17	13:50	287447
B8	Paint Coating on CMU Wall	4,200	B-BULK-L-CMUC-032817-2	3/28/17	13:17	287447
B9	Paint Coating on CMU Wall	340	B-BULK-L-CMUC-032817-3	3/28/17	13:40	287447
B10	Structural Member Under Mezzanine, Paint	88,000	B-BULK-L-SMUM-032917-1	3/29/17	11:50	287496
B11	Structural Member Under Mezzanine, Paint	87,000	B-BULK-L-SMUM-032917-2	3/29/17	10:50	287496
	Structural Member Under Mezzanine, Paint, Field Duplicate (B-BULK-L-SMUM-032917-2)	80,000	B-BULK-L-SMUM-FD-032917-4	3/29/17	11:19	287496

Hangar One Pilot Scale Study

Table E-1: Lead Bulk Paint Material Sampling Results

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Location ID	Sample Location	Lead Results (mg/kg)	Sample Number	Sample Collection Date	Time	Laboratory Report Number
B12	Structural Member Under Mezzanine, Paint	90,000	B-BULK-L-SMUM-032917-3	3/29/17	12:18	287496

Notes:

mg/kg - milligrams per kilogram

Bulk Sample Location Diagrams (Figures E-1 through E-4) are provided in this Appendix Section.

All analytical data have been validated in accordance with the processes described for Stage 2B Verification and Validation checks and the applicable National Functional Guidelines

See Appendix M For Laboratory Reports and chain of custody documentation.

J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

Hangar One Pilot Scale Study

Table E-2: PCB Bulk Paint Material Sampling Results

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Location ID	Sample Location	Total PCBs Results (µg/kg)	PCB - Aroclor 1016 (µg/kg)	PCB - Aroclor 1221 (µg/kg)	PCB - Aroclor 1232 (µg/kg)	PCBs - Aroclor 1242 (µg/kg)	PCB - Aroclor 1248 (µg/kg)	PCB - Aroclor 1254 (µg/kg)	PCB - Aroclor 1260 (µg/kg)	PCB - Aroclor 1268 (µg/kg)	Sample Number	Sample Collection Date	Time	Laboratory Report Number
B1	Exterior Structural Steel Paint	11,300 J	<65	<170	<85	<78	<83	2,600	3700 J	5,000	B-BULK-P-ESM-032817-1	3/28/17	8:20	287445
B2	Exterior Structural Steel Paint	5,800	<35	<95	<46	<43	<45	<36	2,400	3,400	B-BULK-P-ESM-032817-2	3/28/17	10:25	287445
B3	Exterior Structural Steel Paint	7,800 J	<37	<100	<49	<45	<48	<38	2,300	5500 J	B-BULK-P-ESM-032817-3	3/28/17	9:00	287445
	Exterior Structural Steel Paint, Field Duplicate of (B-BULK-P-ESM-032817-3)	5,600 J	<37	<100	<49	<45	<48	<38	2000 J	3600 J	B-BULK-P-ESM-FD-032817-4	3/28/17	9:40	287445
B4	Structural Steel Support Member Paint	4,700 J	<72	<190	<94	<87	<92	<74	1300 J	3400 J	B-BULK-P-SSSM-032817-1	3/28/17	11:05	287445
	Structural Steel Support Member Paint, Field Duplicate of (B-BULK-P-SSSM-032817-1)	6,600 J	<72	<200	<95	<88	<93	<75	2000 J	4600 J	B-BULK-P-SSSM-FD-032817-4	3/28/17	11:16	287445
B5	Structural Steel Support Member, Paint	8,500 J	<61	<160	<80	<74	<79	<63	3000 J	5500 J	B-BULK-P-SSSM-032817-2	3/28/17	10:40	287445
B6	Structural Steel Support Member, Paint	12,400 J	<63	<170	<82	<76	<81	<65	7600 J	4800 J	B-BULK-P-SSSM-032817-3	3/28/17	11:20	287445
B7	Paint Coating on Concrete Wall	4,380 J	<70	<190	<91	<84	<90	780 J	2,200	1,400	B-BULK-P-CMUC-032817-1	3/28/17	13:25	287445
	Paint Coating on Concrete Wall, Field Duplicate of (B-BULK-P-CMUC-032817-1)	4,100 J	<77	<210	<100	<93	<99	1200 J	1,800	1100 J	B-BULK-P-CMUC-FD-032817-4	3/28/17	13:50	287445
B8	Paint Coating on Concrete Wall	3,700 J	<70	<190	<92	<85	<91	1100 J	1300 J	1300 J	B-BULK-P-CMUC-032817-2	3/28/17	13:17	287445
B9	Paint Coating on Concrete Wall	520	<66	<180	<86	<80	<85	<68	<43	520	B-BULK-P-CMUC-032817-3	3/28/17	13:40	287445
B10	Structural Member Under Mezzanine, Paint	8,100 J	<40	<110	<52	<48	<51	<41	2300 J	5,800	B-BULK-P-SMUM-032917-1	3/29/17	11:50	287495
B11	Structural Member Under Mezzanine, Paint, Field Duplicate of (B-BULK-P-SMUM-032917-4)	7,900 J	<44	<120	<58	<54	<57	<46	1900 J	6,000	B-BULK-P-SMUM-032917-2	3/29/17	10:50	287495
	Structural Member Under Mezzanine, Paint	12,300 J	<41	<110	<54	<50	<53	<42	4600 J	7,700	B-BULK-P-SMUM-FD-032917-4	3/29/17	11:19	287495
B12	Structural Member Under Mezzanine, Paint	6,800 J	<26	<70	<34	<31	<33	<27	1800 J	5,000	B-BULK-P-SMUM-032917-3	3/29/17	12:18	287495

Notes:
Bulk Sample Location Diagrams (Figures E-1 throught E-4) are provided in this Appendix Section.
All analytical data have been validated in accordance with the processes described for Stage 2B Verification and Validation checks and the applicable National Functional Guidelines
See Appendix M For Laboratory Reports and chain of custody documentation.
J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

PCB - Polychlorinated Bipheyls
µg/kg - micrograms per kilogram

Appendix F

Shallow Bulk Sampling Locations and Results

CMU Wall

Note: Lead and PCB Bulk Sampling Results Included as Table F-1 in this Appendix.

A·C·C ENVIRONMENTAL CONSULTANTS
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Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

LEGEND

- Media Blasting Area
- High Pressure Water Blasting Area
- Vapor Media Blasting Area
- Bulk Sampling Location

Shallow Bulk Sampling Locations**:**
CMU Wall

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure F-1

Hangar One Pilot Scale Study

Table F-1: Shallow Bulk Lead and PCB Sampling Results

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Sample Location	Removal Method	Lead Results (mg/kg)	Total PCBs (µg/kg)	PCB - Aroclor 1016 (µg/kg)	PCB - Aroclor 1221 (µg/kg)	PCB - Aroclor 1232 (µg/kg)	PCB - Aroclor 1242 (µg/kg)	PCB - Aroclor 1248 (µg/kg)	PCB - Aroclor 1254 (µg/kg)	PCB - Aroclor 1260 (µg/kg)	PCB - Aroclor 1268 (µg/kg)	Laboratory Report Number
3/29/17	S1	B-BULK-L-CMU-032917-1	CMU Wall	Baseline	4.6	-	-	-	-	-	-	-	-	-	287496
3/29/17		B-BULK-P-CMU-032917-1	CMU Wall, Shallow Surface	Baseline	-	78 J	<4.8	<13	<6.3	<5.8	<6.2	<4.9	29 J	49 J	287495
3/29/17		B-BULK-L-CMU-FD-032917-4	CMU Wall, Field Duplicate (B-BULK-L-CMU-032917-1)	Baseline	4.7	-	-	-	-	-	-	-	-	-	287496
3/29/17		B-BULK-P-CMU-FD-032917-4	CMU Wall, Shallow Surface, Field Duplicate (B-BULK-P-CMU-032917-1)	Baseline	-	108 J	<4.8	<13	<6.3	<5.8	<6.2	<4.9	34 J	74 J	287495
3/29/17	S2	B-BULK-L-CMU-032917-2	CMU Wall	Baseline	23	-	-	-	-	-	-	-	-	-	287496
3/29/17		B-BULK-P-CMU-032917-2	CMU Wall, Shallow Surface	Baseline	-	110 J	<4.8	<13	<6.4	<5.9	<6.2	<5.0	39 J	71 J	287495
3/29/17	S3	B-BULK-L-CMU-032917-3	CMU Wall	Baseline	4.5	-	-	-	-	-	-	-	-	-	287496
3/29/17		B-BULK-P-CMU-032917-3	CMU Wall, Shallow Surface	Baseline	-	125 J	<4.7	<13	<6.2	<5.7	<6.1	<4.9	56 J	69	287495
5/2/17	S4	A-W-BULK-L-CMU-050217-1	CMU Wall	UHPW	190 J	-	-	-	-	-	-	-	-	-	288551
5/2/17		A-W-BULK-P-CMU-050217-1	CMU Wall	UHPW	-	<6.6	<2.4	<6.6	<3.2	<3.0	<3.1	<2.5	<1.6	<3.3	288550

Hangar One Pilot Scale Study

Table F-1: Shallow Bulk Lead and PCB Sampling Results

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Sample Location	Removal Method	Lead Results (mg/kg)	Total PCBs (µg/kg)	PCB - Aroclor 1016 (µg/kg)	PCB - Aroclor 1221 (µg/kg)	PCB - Aroclor 1232 (µg/kg)	PCB - Aroclor 1242 (µg/kg)	PCB - Aroclor 1248 (µg/kg)	PCB - Aroclor 1254 (µg/kg)	PCB - Aroclor 1260 (µg/kg)	PCB - Aroclor 1268 (µg/kg)	Laboratory Report Number
5/2/17	S5	A-MB-BULK-L-CMU-050217-2	CMU Wall	Media Blast	6.5 J	-	-	-	-	-	-	-	-	-	288551
5/2/17		A-MB-BULK-P-CMU-050217-2	CMU Wall	Media Blast	-	<6.5	<2.4	<6.5	<3.2	<2.9	<3.1	<2.5	<1.6	<3.2	288550
5/2/17	S6	A-VM-BULK-L-CMU-050217-3	CMU Wall	Vapor Media	4.0 J	-	-	-	-	-	-	-	-	-	288551
5/2/17		A-VM-BULK-P-CMU-050217-3	CMU Wall	Vapor Media	-	<6.5	<2.4	<6.5	<3.2	<2.9	<3.1	<2.5	<1.6	<3.2	288550
5/2/17		A-VM-BULK-L-CMU-FD-050217-4	CMU Wall, Duplicate of (A-VM-BULK-L-CMU-050217-3)	Vapor Media	4.8 J	-	-	-	-	-	-	-	-	-	288551

Hangar One Pilot Scale Study

Table F-1: Shallow Bulk Lead and PCB Sampling Results

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Sample Location	Removal Method	Lead Results (mg/kg)	Total PCBs (µg/kg)	PCB - Aroclor 1016 (µg/kg)	PCB - Aroclor 1221 (µg/kg)	PCB - Aroclor 1232 (µg/kg)	PCB - Aroclor 1242 (µg/kg)	PCB - Aroclor 1248 (µg/kg)	PCB - Aroclor 1254 (µg/kg)	PCB - Aroclor 1260 (µg/kg)	PCB - Aroclor 1268 (µg/kg)	Laboratory Report Number
5/2/17	S6	A-VM-BULK-P-CMU-FD-050217-4	CMU Wall, Duplicate of (A-VM-BULK-P-CMU-050217-3)	Vapor Media	-	<6.5	<2.4	<6.5	<3.1	<2.9	<3.1	<2.5	<1.6	<3.2	288550

Note:
Bulk Sample Location Diagram (Figure F-1) is provided in this Appendix Section.
All analytical data have been validated in accordance with the processes described for Stage 2B Verification and Validation checks and the applicable National Functional Guidelines
See Appendix M for Laboratory Reports and Chain of Custody Documentation.
"-" indicates analyte not included in sample.
Target criterion for shallow surface bulk samples were not developed in the Final Work Plan for the Pilot Scale Abatement Study of Hangar 1 (ACC, 2016).
J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

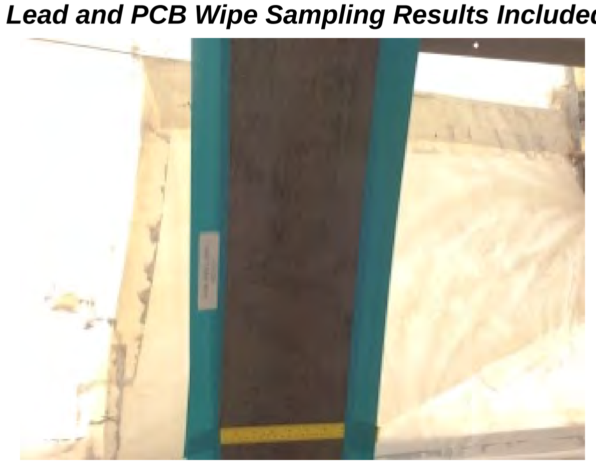
UHPW - Ultra High Pressure Water Removal
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram

Appendix G

Post-Abatement Wipe Sampling Locations and Results

Abatement Area

Note: Lead and PCB Wipe Sampling Results Included as Tables G-1 and G-2 in this Appendix.



A-MB-WIPE-L-ESM-042117-1 (A4)

A-W-WIPE-L-ESM-041317-2 (A2)

A-VM-WIPE-L-ESM-050117-1 (A8)

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Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

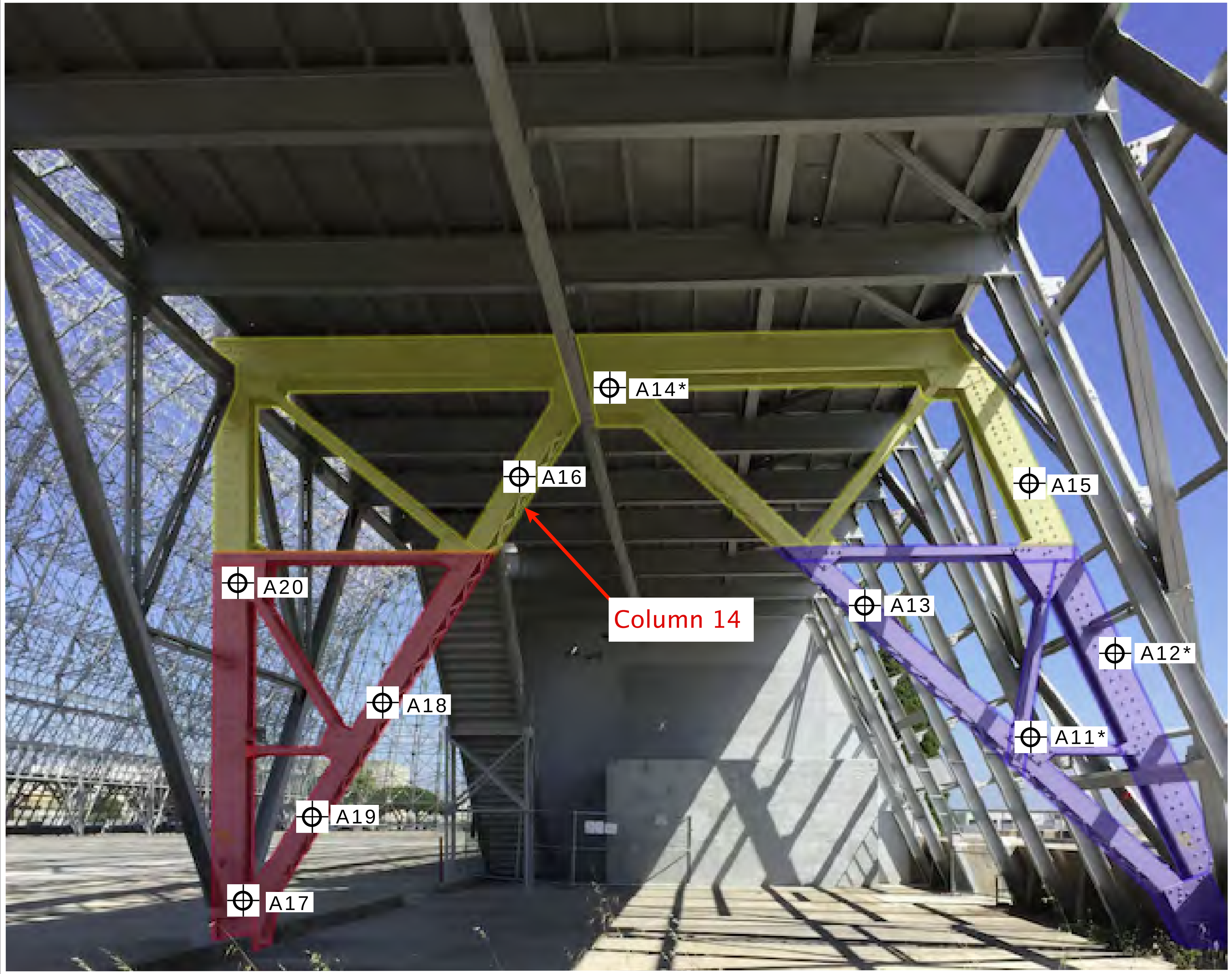
LEGEND

- Media Blasting Area
- High Pressure Water Blasting Area
- Vapor Media Blasting Area
- Wipe Sampling Location

Post-Abatement Wipe Sampling Locations: Exterior Steel Member

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure G-1



Note: Lead and PCB Wipe Sampling Results Included as Tables G-1 and G-2 in this Appendix.

A-VM-WIPE-L-SSSM-050117-1 (A17)

A-MB-WIPE-L-SSSM-042117-1 (A14)

A-W-WIPE-L-SSSM-041317-1 (A11)

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Mountain View, California

LEGEND

- Media Blasting Area
- High Pressure Water Blasting Area
- Vapor Media Blasting Area
- Wipe Sampling Location

A11* - Sampled on Other Side

Post-Abatement Wipe Sampling Locations: Structural Steel Support Member

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure G-2

Note: Lead and PCB Wipe Sampling Results Included as Tables G-1 and G-2 in this Appendix.

A-W-WIPE-L-CMU-041317-1 (A21)

A-MB-WIPE-L-CMU-042117-1 (A22)

A-VM-WIPE-L-CMU-050117-1 (A25)

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Mountain View, California

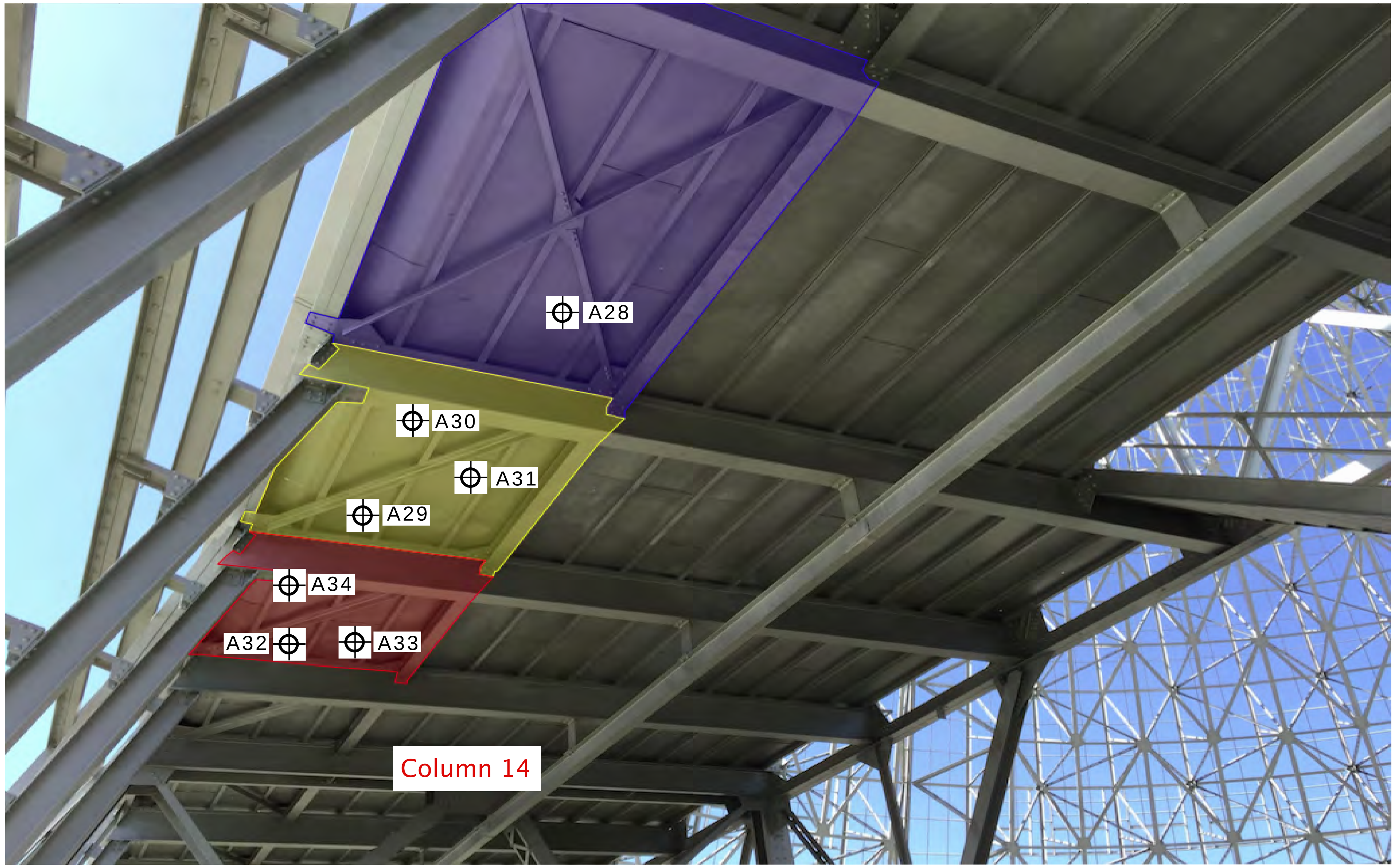
LEGEND

- Media Blasting Area
- High Pressure Water Blasting Area
- Vapor Media Blasting Area
- Wipe Sampling Location

Post-Abatement Wipe Sampling Locations: CMU Wall

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure G-3



Note: Lead and PCB Wipe Sampling Results Included as Tables G-1 and G-2 in this Appendix.

A-VM-WIPE-L-SMUM-050117-1 (A32)

A-MB-WIPE-L-SMUM-042117-1 (A29)

A-W-WIPE-L-SMUM-041317-1 (A28)

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Moffett Federal Airfield
Mountain View, California

LEGEND

- Media Blasting Area
- High Pressure Water Blasting Area
- Vapor Media Blasting Area
- Wipe Sampling Location

Post-Abatement Wipe Sampling Locations: Structural Member Under Mezzanine

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure G-4

Hangar One Pilot Scale Study

Table G-1: Post-Abatement Lead Wipe Sampling Results
Analyte: Lead, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion (µg/ft²) (1)	Lead Results (µg/ft²)	Laboratory Report Number
4/13/17	A1	A-W-WIPE-L-ESM-041317-1	UHPW	Exterior Structural Member	≤250	130 J	288016
4/13/17		A-W-WIPE-L-ESM-FD-041317-4	UHPW	Exterior Structural Member, Duplicate (A-W-WIPE-L-ESM-041317-1)	≤250	190 J	288016
4/13/17	A2	A-W-WIPE-L-ESM-041317-2	UHPW	Exterior Structural Member	≤250	170	288016
4/13/17	A3	A-W-WIPE-L-ESM-041317-3	UHPW	Exterior Structural Member	≤250	170	288016
4/21/17	A4	A-MB-WIPE-L-ESM-042117-1	Media Blast	Exterior Structural Member	≤250	52 J	288246
4/21/17		A-MB-WIPE-L-ESM-FD-042117-4	Media Blast	Exterior Structural Member, Duplicate (A-MB-WIPE-L-ESM-042117-1)	≤250	24 J	288246
4/21/17	A6	A-MB-WIPE-L-ESM-042117-2	Media Blast	Exterior Structural Member	≤250	96	288246
4/21/17	A7	A-MB-WIPE-L-ESM-042117-3	Media Blast	Exterior Structural Member	≤250	220	288246
5/1/17	A8	A-VM-WIPE-L-ESM-050117-1	Vapor Media	External Structural Member	≤250	7.6	288533
5/1/17	A9	A-VM-WIPE-L-ESM-050117-2	Vapor Media	External Structural Member	≤250	3.9 J	288533
5/1/17		A-VM-WIPE-L-ESM-FD-050117-4	Vapor Media	External Structural Member, Duplicate of (A-VM-WIPE-L-ESM-050117-2)	≤250	25 J	288533
5/1/17	A10	A-VM-WIPE-L-ESM-050117-3	Vapor Media	External Structural Member	≤250	88	288533

Hangar One Pilot Scale Study

Table G-1: Post-Abatement Lead Wipe Sampling Results
Analyte: Lead, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion (µg/ft²) (1)	Lead Results (µg/ft²)	Laboratory Report Number
4/13/17	A11	A-W-WIPE-L-SSSM-041317-1	UHPW	Structural Steel Support Member	≤250	**360 J**	288016
4/13/17	A11	A-W-WIPE-L-SSSM-FD-041317-4	UHPW	Structural Steel Support Member, Duplicate (A-W-WIPE-L-SSSM-041317-1)	≤250	**1,800 J**	288016
5/8/17	A11	A-W-WIPE-L-SSSM-050817-1 (2)	Vapor Media	Structural Steel Support Member	≤250	**920 J**	288720
5/8/17	A11	A-W-WIPE-L-SSSM-FD-050817-4 (2)	Vapor Media	Structural Steel Support Member	≤250	**690 J**	288720
4/13/17	A12	A-W-WIPE-L-SSSM-041317-2	UHPW	Structural Steel Support Member	≤250	66	288016
4/13/17	A13	A-W-WIPE-L-SSSM-041317-3	UHPW	Structural Steel Support Member	≤250	200	288016
4/21/17	A14	A-MB-WIPE-L-SSSM-042117-1	Media Blast	Structural Steel Support Member	≤250	33	288246
4/21/17	A15	A-MB-WIPE-L-SSSM-042117-2	Media Blast	Structural Steel Support Member	≤250	59 J	288246
4/21/17	A15	A-MB-WIPE-L-SSSM-FD-042117-4	Media Blast	Structural Steel Support Member, Duplicate (A-MB-WIPE-L-SSSM-042117-2)	≤250	240 J	288246
4/21/17	A16	A-MB-WIPE-L-SSSM-042117-3	Media Blast	Structural Steel Support Member	≤250	52	288246
5/2/17	A17	A-VM-WIPE-L-SSSM-050217-1	Vapor Media	Structural Steel Support Member	≤250	22	288549

Hangar One Pilot Scale Study

Table G-1: Post-Abatement Lead Wipe Sampling Results
Analyte: Lead, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion ($\mu g/ft^2$) (1)	Lead Results ($\mu g/ft^2$)	Laboratory Report Number
5/2/17	A18	A-VM-WIPE-L-SSSM-050217-2	Vapor Media	Structural Steel Support Member	≤250	2.9 J	288549
5/2/17		A-VM-WIPE-L-SSSM-FD-050217-4	Vapor Media	Structural Steel Support Member, Duplicate of (A-VM-WIPE-L-SSSM-050117-2)	≤250	42 J	288549
5/2/17	A20	A-VM-WIPE-L-SSSM-050217-3	Vapor Media	Structural Steel Support Member	≤250	2.9	288549
4/13/17	A21	A-W-WIPE-L-CMU-041317-1 (2)	UHPW	CMU Wall Coating	≤250	**320**	288016
4/13/17		A-W-WIPE-L-CMU-FD-041317-4 (2)	UHPW	CMU Wall Coating, Duplicate (A-W-WIPE-L-CMU-041317-1)	≤250	**280**	288016
4/21/17	A22	A-MB-WIPE-L-CMU-042117-1	Media Blast	CMU Wall	≤250	150	288246
4/21/17		A-MB-WIPE-L-CMU-FD-042117-4	Media Blast	CMU Wall, Duplicate (A-MB-WIPE-L-CMU-042117-1)	≤250	170	288246
4/21/17	A23	A-MB-WIPE-L-CMU-042117-2	Media Blast	CMU Wall	≤250	98	288246
4/21/17	A24	A-MB-WIPE-L-CMU-042117-3	Media Blast	CMU Wall	≤250	35	288246
5/1/17	A25	A-VM-WIPE-L-CMU-050117-1	Vapor Media	CMU Wall	≤250	16	288533

Hangar One Pilot Scale Study

Table G-1: Post-Abatement Lead Wipe Sampling Results
Analyte: Lead, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion ($\mu g/ft^2$) [1]	Lead Results ($\mu g/ft^2$)	Laboratory Report Number
5/1/17	A26	A-VM-WIPE-L-CMU-050117-2	Vapor Media	CMU Wall	≤250	**300 J**	288533
5/1/17		A-VM-WIPE-L-CMU-FD-050117-4	Vapor Media	CMU Wall, Duplicate of (A-VM-WIPE-L-CMU-050117-2)	≤250	10 J	288533
5/8/17		A-V-WIPE-L-CMU-050817-2	Vapor Media	CMU Wall, Retest after additional cleaning (A-VM-WIPE-L-CMU-050117-2)	≤250	58	288720
5/1/17	A27	A-VM-WIPE-L-CMU-050117-3	Vapor Media	CMU Wall	≤250	41	288533
4/13/17	A28	A-W-WIPE-L-SMUM-041317-1 [2]	UHPW	Structural Member Under Mezzanine	≤250	**17,000**	288016
4/21/17	A29	A-MB-WIPE-L-SMUM-042117-1	Media Blast	Structural Member Under Mezzanine	≤250	22	288246
4/21/17	A30	A-MB-WIPE-L-SMUM-042117-2	Media Blast	Structural Member Under Mezzanine	≤250	75	288246
4/21/17	A31	A-MB-WIPE-L-SMUM-042117-3	Media Blast	Structural Member Under Mezzanine	≤250	52 J	288246
4/21/17		A-MB-WIPE-L-SMUM-FD-042117-4	Media Blast	Structural Member Under Mezzanine, Duplicate (A-MB-WIPE-L-SMUM-042117-3)	≤250	35 J	288246
5/1/17	A32	A-VM-WIPE-L-SMUM-050117-1	Vapor Media	Structural Member Under Mezzanine	≤250	7.0 J	288533

Hangar One Pilot Scale Study

Table G-1: Post-Abatement Lead Wipe Sampling Results
Analyte: Lead, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion (µg/ft²) [1]	Lead Results (µg/ft²)	Laboratory Report Number
5/1/17	A33	A-VM-WIPE-L-SMUM-050117-2	Vapor Media	Structural Member Under Mezzanine	≤250	11 J	288533
5/1/17		A-VM-WIPE-L-SMUM-FD-050117-4	Vapor Media	Structural Member Under Mezzanine, Duplicate of (A-VM-WIPE-L-SMUM-050117-2)	≤250	7.2 J	288533
5/1/17	A34	A-VM-WIPE-L-SMUM-050117-3	Vapor Media	Structural Member Under Mezzanine	≤250	6.1 J	288533
4/13/17	N/A	A-W-WIPE-L-ESM-MB-041317-5	UHPW	Exterior Structural Member, Blank	NA	<0.5	288016
4/21/17		A-MB-WIPE-L-ESM-MB-042117-5	Media Blast	Exterior Structural Member, Blank	NA	<0.5	288246
5/1/17		A-VM-WIPE-L-ESM-MB-050117-5	Vapor Media	External Structural Member, Blank	NA	<0.50	288533
4/21/17		A-MB-WIPE-L-CMU-MB-042117-5	Media Blast	CMU Wall, Blank	NA	<0.5	288246
5/2/17		A-VM-WIPE-L-SSSM-MB-050217-5	Vapor Media	Structural Steel Support Member, Blank	NA	<0.5	288549

Hangar One Pilot Scale Study

Table G-2: Post-Abatement PCB Wipe Sampling Results
Analyte: PCB, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion (µg/100cm²) (1)	Total PCBs Result (µg/100 cm²)	PCB - Aroclor 1016 (µg/100 cm²)	PCB - Aroclor 1221 (µg/100 cm²)	PCB -Aroclor 1232 (µg/100 cm²)	PCB - Aroclor 1242 (µg/100 cm²)	PCB - Aroclor 1248 (µg/100 cm²)	PCB - Aroclor 1254 (µg/100 cm²)	PCB - Aroclor 1260 (µg/100 cm²)	PCB - Aroclor 1268 (µg/100 cm²)	Laboratory Report Number
4/13/17	A1	A-W-WIPE-P-ESM-041317-1	UHPW	Exterior Structural Steel Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288015
4/13/17		A-W-WIPE-P-ESM-FD-041317-4	UHPW	Exterior Structural Steel Member, Duplicate of (A-W-WIPE-P-ESM-FD-041317-1)	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288015
4/13/17	A2	A-W-WIPE-P-ESM-041317-2	UHPW	Exterior Structural Steel Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288015
4/13/17	A3	A-W-WIPE-P-ESM-041317-3	UHPW	Exterior Structural Steel Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288015
4/21/17	A5	A-MB-WIPE-P-ESM-042117-1	Media Blast	Exterior Structural Steel Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
4/21/17	A5	A-MB-WIPE-P-ESM-FD-042117-4	Media Blast	Exterior Structural Steel Member, Duplicate of (A-MB-WIPE-P-ESM-042117-1)	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244

Hangar One Pilot Scale Study

Table G-2: Post-Abatement PCB Wipe Sampling Results
Analyte: PCB, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion (µg/100cm²) (1)	Total PCBs Result (µg/100 cm²)	PCB - Aroclor 1016 (µg/100 cm²)	PCB - Aroclor 1221 (µg/100 cm²)	PCB -Aroclor 1232 (µg/100 cm²)	PCB - Aroclor 1242 (µg/100 cm²)	PCB - Aroclor 1248 (µg/100 cm²)	PCB - Aroclor 1254 (µg/100 cm²)	PCB - Aroclor 1260 (µg/100 cm²)	PCB - Aroclor 1268 (µg/100 cm²)	Laboratory Report Number
4/21/17	A6	A-MB-WIPE-P-ESM-042117-2	Media Blast	Exterior Structural Steel Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
4/21/17	A7	A-MB-WIPE-P-ESM-042117-3	Media Blast	Exterior Structural Steel Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
5/1/17	A8	A-VM-WIPE-P-ESM-050117-1	Vapor Media	Exterior Structural Steel Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531
5/1/17	A9	A-VM-WIPE-P-ESM-050117-2	Vapor Media	Exterior Structural Steel Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531
5/1/17	A9	A-VM-WIPE-P-ESM-FD-050117-4	Vapor Media	Exterior Structural Steel Member, Duplicate of (A-VM-WIPE-P-ESM-050117-2)	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531
5/1/17	A10	A-VM-WIPE-P-ESM-050117-3	Vapor Media	Exterior Structural Steel Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531

Hangar One Pilot Scale Study

Table G-2: Post-Abatement PCB Wipe Sampling Results
Analyte: PCB, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion (µg/100cm^2) (1)	Total PCBs Result (µg/100 cm^2)	PCB - Aroclor 1016 (µg/100 cm^2)	PCB - Aroclor 1221 (µg/100 cm^2)	PCB -Aroclor 1232 (µg/100 cm^2)	PCB - Aroclor 1242 (µg/100 cm^2)	PCB - Aroclor 1248 (µg/100 cm^2)	PCB - Aroclor 1254 (µg/100 cm^2)	PCB - Aroclor 1260 (µg/100 cm^2)	PCB - Aroclor 1268 (µg/100 cm^2)	Laboratory Report Number
4/13/17	A11	A-W-WIPE-P-SSSM-041317-1	UHPW	Structural Steel Support Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3 UJ	288015
4/13/17		A-W-WIPE-P-SSSM-FD-041317-4	UHPW	Structural Steel Support Member, Duplicate of (A-W-WIPE-P-SSSM-041317-1)	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3 UJ	288015
4/13/17	A12	A-W-WIPE-P-SSSM-041317-2	UHPW	Structural Steel Support Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3 UJ	288015
4/13/17	A13	A-W-WIPE-P-SSSM-041317-3	UHPW	Structural Steel Support Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3 UJ	288015
4/21/17	A14	A-MB-WIPE-P-SSSM-042117-1	Media Blast	Structural Steel Support Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244

Hangar One Pilot Scale Study

Table G-2: Post-Abatement PCB Wipe Sampling Results
Analyte: PCB, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion (µg/100cm²) (1)	Total PCBs Result (µg/100 cm²)	PCB - Aroclor 1016 (µg/100 cm²)	PCB - Aroclor 1221 (µg/100 cm²)	PCB -Aroclor 1232 (µg/100 cm²)	PCB - Aroclor 1242 (µg/100 cm²)	PCB - Aroclor 1248 (µg/100 cm²)	PCB - Aroclor 1254 (µg/100 cm²)	PCB - Aroclor 1260 (µg/100 cm²)	PCB - Aroclor 1268 (µg/100 cm²)	Laboratory Report Number
4/21/17	A15	A-MB-WIPE-P-SSSM-042117-2	Media Blast	Structural Steel Support Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
4/21/17		A-MB-WIPE-P-SSSM-FD-042117-4	Media Blast	Structural Steel Support Member, Duplicate of (A-MB-WIPE-P-SSSM-042117-2)	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
4/21/17	A16	A-MB-WIPE-P-SSSM-042117-3	Media Blast	Structural Steel Support Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
5/2/17	A17	A-VM-WIPE-SSSM-050217-1	Vapor Media	Structural Steel Support Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288548
5/2/17	A19	A-VM-WIPE-SSSM-050217-2	Vapor Media	Structural Steel Support Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288548
5/2/17		A-VM-WIPE-SSSM-FD-050217-4	Vapor Media	Structural Steel Support Member, Duplicate of (A-VM-WIPE-SSSM-050217-2)	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288548

Hangar One Pilot Scale Study

Table G-2: Post-Abatement PCB Wipe Sampling Results
Analyte: PCB, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion (µg/100cm^2) [1]	Total PCBs Result (µg/100 cm^2)	PCB - Aroclor 1016 (µg/100 cm^2)	PCB - Aroclor 1221 (µg/100 cm^2)	PCB -Aroclor 1232 (µg/100 cm^2)	PCB - Aroclor 1242 (µg/100 cm^2)	PCB - Aroclor 1248 (µg/100 cm^2)	PCB - Aroclor 1254 (µg/100 cm^2)	PCB - Aroclor 1260 (µg/100 cm^2)	PCB - Aroclor 1268 (µg/100 cm^2)	Laboratory Report Number
5/2/17	A20	A-VM-WIPE-SSSM-050217-3	Vapor Media	Structural Steel Support Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288548
4/13/17	A21	A-W-WIPE-P-CMU-041317-1 [2]	UHPW	CMU Wall	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3 UJ	288015
4/13/17	A21	A-W-WIPE-P-CMU-FD-041317-4 [2]	UHPW	CMU Wall, Duplicate of (A-W-WIPE-P-CMU-041317-1)	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288015
4/21/17	A22	A-MB-WIPE-P-CMU-042117-1	Media Blast	CMU Wall	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
4/21/17		A-MB-WIPE-P-CMU-FD-042117-4	Media Blast	CMU Wall, Duplicate of (A-MB-WIPE-P-CMU-042117-1)	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
4/21/17	A23	A-MB-WIPE-P-CMU-042117-2	Media Blast	CMU Wall	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
4/21/17	A24	A-MB-WIPE-P-CMU-042117-3	Media Blast	CMU Wall	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
5/1/17	A25	A-VM-WIPE-P-CMU-050117-1	Vapor Media	CMU Wall	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531

Hangar One Pilot Scale Study

Table G-2: Post-Abatement PCB Wipe Sampling Results
Analyte: PCB, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion (µg/100cm^2) (1)	Total PCBs Result (µg/100 cm^2)	PCB - Aroclor 1016 (µg/100 cm^2)	PCB - Aroclor 1221 (µg/100 cm^2)	PCB -Aroclor 1232 (µg/100 cm^2)	PCB - Aroclor 1242 (µg/100 cm^2)	PCB - Aroclor 1248 (µg/100 cm^2)	PCB - Aroclor 1254 (µg/100 cm^2)	PCB - Aroclor 1260 (µg/100 cm^2)	PCB - Aroclor 1268 (µg/100 cm^2)	Laboratory Report Number
5/1/17	A26	A-VM-WIPE-P-CMU-050117-2	Vapor Media	CMU Wall, Duplicate of (A-VM-WIPE-P-CMU-050117-2)	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531
5/1/17		A-VM-WIPE-P-CMU-FD-050117-4	Vapor Media	CMU Wall	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531
5/1/17	A27	A-VM-WIPE-P-CMU-050117-3	Vapor Media	CMU Wall	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531
4/13/17	A28	A-W-WIPE-P-SMUM-041317-1 (2) A-W-WIPE-P-SSSM-041317-1 on COC)	UHPW	Structural Member Under Mezzanine	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3 UJ	288015
4/21/17	A29	A-MB-WIPE-P-SMUM-042117-1	Media Blast	Structural Member Under Mezzanine	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
4/21/17	A30	A-MB-WIPE-P-SMUM-042117-2	Media Blast	Structural Member Under Mezzanine	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244

Hangar One Pilot Scale Study

Table G-2: Post-Abatement PCB Wipe Sampling Results
Analyte: PCB, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion (µg/100cm²) (1)	Total PCBs Result (µg/100 cm²)	PCB - Aroclor 1016 (µg/100 cm²)	PCB - Aroclor 1221 (µg/100 cm²)	PCB -Aroclor 1232 (µg/100 cm²)	PCB - Aroclor 1242 (µg/100 cm²)	PCB - Aroclor 1248 (µg/100 cm²)	PCB - Aroclor 1254 (µg/100 cm²)	PCB - Aroclor 1260 (µg/100 cm²)	PCB - Aroclor 1268 (µg/100 cm²)	Laboratory Report Number
4/21/17	A31	A-MB-WIPE-P-SMUM-042117-3	Media Blast	Structural Member Under Mezzanine	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
4/21/17		A-MB-WIPE-P-SMUM-FD-042117-4	Media Blast	Structural Member Under Mezzanine, Duplicate of (A-MB-WIPE-P-SMUM-042117-3)	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
5/1/17	A33	A-VM-WIPE-P-SMUM-050117-1	Vapor Media	Structural Member Under Mezzanine	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531
5/1/17	A32	A-VM-WIPE-SMUM-050117-2	Vapor Media	Structural Member Under Mezzanine, Duplicate of (A-VM-WIPE-P-SMUM-050117-1)	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531
5/1/17		A-VM-WIPE-SMUM-FD-050117-4	Vapor Media	Structural Member Under Mezzanine	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531
5/1/17	A34	A-VM-WIPE-SMUM-050117-3	Vapor Media	Structural Member Under Mezzanine	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531

Hangar One Pilot Scale Study

Table G-2: Post-Abatement PCB Wipe Sampling Results
Analyte: PCB, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion (µg/100cm^2) [1]	Total PCBs Result (µg/100 cm^2)	PCB - Aroclor 1016 (µg/100 cm^2)	PCB - Aroclor 1221 (µg/100 cm^2)	PCB -Aroclor 1232 (µg/100 cm^2)	PCB - Aroclor 1242 (µg/100 cm^2)	PCB - Aroclor 1248 (µg/100 cm^2)	PCB - Aroclor 1254 (µg/100 cm^2)	PCB - Aroclor 1260 (µg/100 cm^2)	PCB - Aroclor 1268 (µg/100 cm^2)	Laboratory Report Number
4/13/17	N/A	A-W-WIPE-P-ESM-MB-041317-5	UHPW	Exterior Structural Steel Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3 UJ	288015
4/21/17		A-MB-WIPE-P-ESM-MB-042117-5	Media Blast	Exterior Structural Steel Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
5/1/17		A-VM-WIPE-P-ESM-MB-050117-5	Vapor Media	Exterior Structural Steel Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531
4/21/17		A-MB-WIPE-P-CMU-MB-042117-5	Media Blast	CMU Wall	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288244
5/2/17		A-VM-WIPE-SSSM-MB-050217-5	Vapor Media	Structural Steel Support Member	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288548

Hangar One Pilot Scale Study

Table G-2: Post-Abatement PCB Wipe Sampling Results
Analyte: PCB, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion (µg/100cm²) (1)	Total PCBs Result (µg/100 cm²)	PCB - Aroclor 1016 (µg/100 cm²)	PCB - Aroclor 1221 (µg/100 cm²)	PCB -Aroclor 1232 (µg/100 cm²)	PCB - Aroclor 1242 (µg/100 cm²)	PCB - Aroclor 1248 (µg/100 cm²)	PCB - Aroclor 1254 (µg/100 cm²)	PCB - Aroclor 1260 (µg/100 cm²)	PCB - Aroclor 1268 (µg/100 cm²)	Laboratory Report Number
5/1/17	N/A	A-VM-WIPE-P-CMU-MB-050117-5	Vapor Media	CMU Wall	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288531

Notes:
Wipe Sample Location Diagrams (Figures G-1 through G-4) are provided in this Appendix Section.
All analytical data have been validated in accordance with the processes described for Stage 2B Verification and Validation checks and the applicable National Functional Guidelines
See Appendix M For Laboratory Reports and Chain of Custody Documentation.
1 - Acceptance Criterion from the Final Work Plan for the Pilot Scale Abatement Study of Hangar 1 (ACC, 2016).
2 - UHPW method was not suitable for removal of paint coatings from CMU and SMUM areas. Attempts to remove paint coatings from these areas did not yield complete removal of paint coatings. Visible paint paint and chips were present in these area after abatement efforts. Additionally, not enoµgh surface area was abated to allow for the planned post-abatement verifcation sampling in these areas. See photograhs in the report that document this condition.
J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

µg/100 cm² - micrograms per 100 square centimeters
CMU - Concrete Masonry Wall
SMUM - Structural Member under Mezzanine
UHPW - Ultra High Pressure Water Blasting

Hangar One Pilot Scale Study

Table G-1: Post-Abatement Lead Wipe Sampling Results
Analyte: Lead, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Location ID	Sample Number	Removal Method	Sample Location	Acceptance Criterion ($\mu g/ft^2$) [1]	Lead Results ($\mu g/ft^2$)	Laboratory Report Number
5/1/17	N/A	A-VM-WIPE-L-CMU-MB-050117-5	Vapor Media	CMU Wall, Blank	NA	<0.50	288533

Notes:
Wipe Sample Location Diagrams (Figures G-1 through G-4) are provided in this Appendix Section.
Bolded Results indicate sample result above Acceptance Criterion.
All analytical data have been validated in accordance with the processes described for Stage 2B Verification and Validation checks and the applicable National Functional Guidelines
See Appendix M For Laboratory Reports and Chain of Custody Documentation.

[1] - Acceptance Criterion from the Final Work Plan for the Pilot Scale Abatement Study of Hangar 1 (ACC, 2016).

[2] - UHPW method was not suitable for removal of paint coatings from CMU and SMUM areas. Attempts to remove paint coatings from these areas did not yield complete removal of paint coatings. Visible paint paint and chips were present in these area after abatement efforts. Additionally, not enough surface area was abated to allow for the planned verifcation sampling in these areas. See photograhs in the report that document this condition.

[3] - The abatement method "VM" recorded on these samples was incorrect. These samples were collected after additional cleaning in this area. The sample numbers should have included W as the removal method.

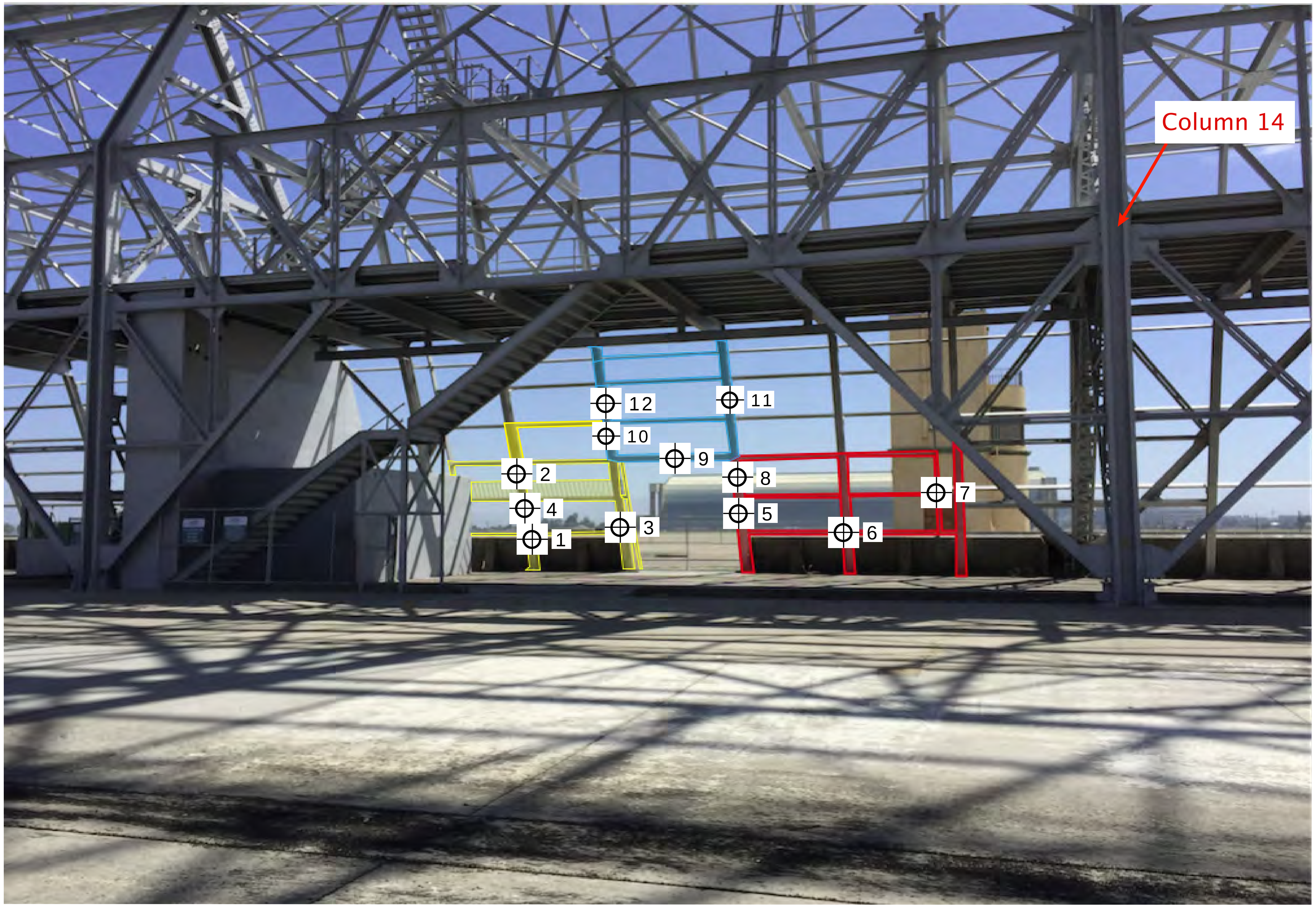
J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

$\mu g/ft^2$ - micrograms per square foot
CMU - Concrete Masonry Wall
SMUM - Structural Member under Mezzanine
UHPW - Ultra High Pressure Water Blasting
NA - Not Applicable

Appendix H

Baseline XRF Testing Locations and Results

Abatement Area and Cement Floor



Note: XRF Test Results Included as Table H-1 in this Appendix.

A·C·C ENVIRONMENTAL CONSULTANTS
An Employee Owned Company

Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

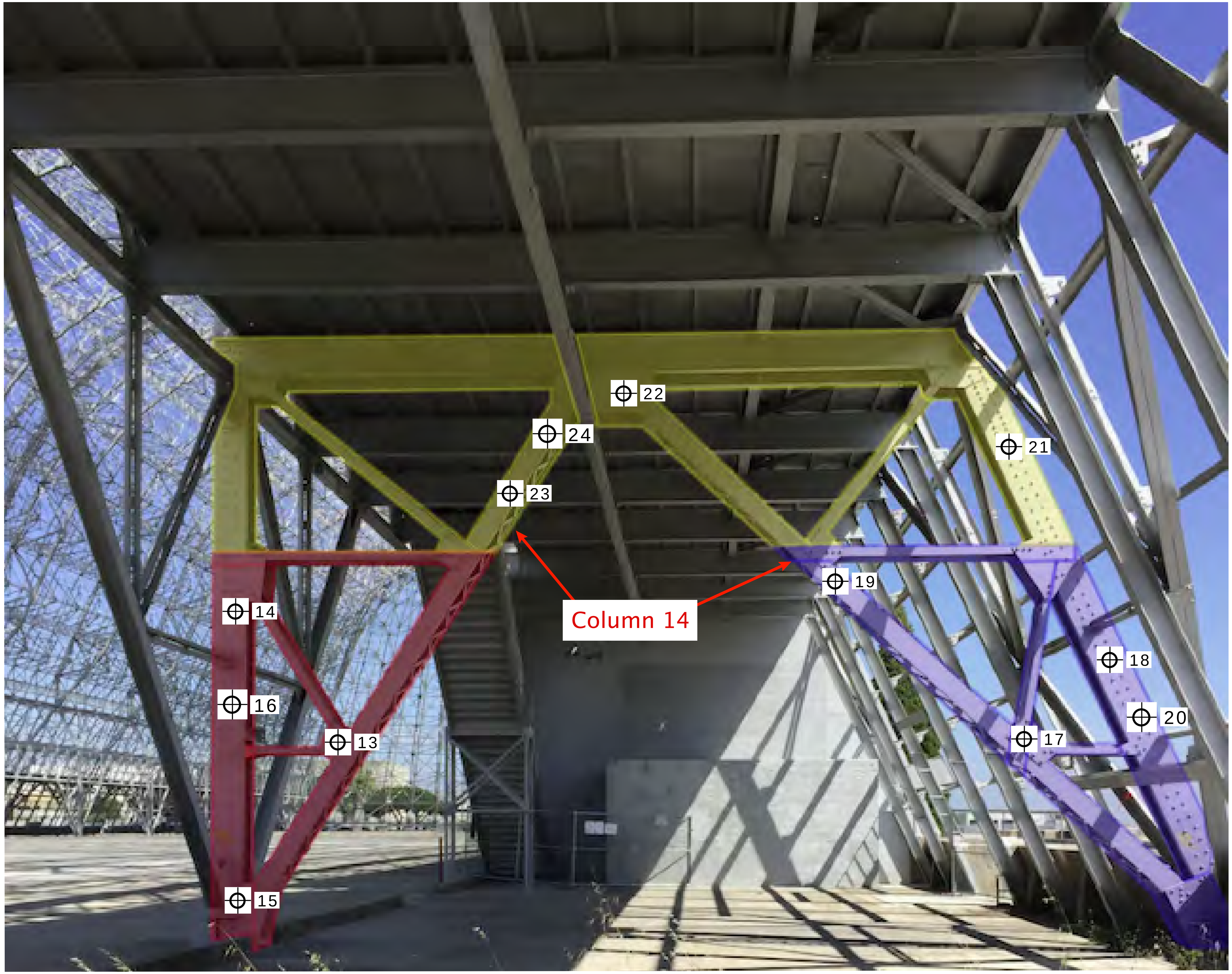
LEGEND

- Media Blasting Area
- High Pressure Water Blasting Area
- Vapor Blasting Area
- XRF Test Location

Baseline XRF Test Locations:
Exterior Steel Member

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure H-1



Note: XRF Test Results Included as Table H-1 in this Appendix.

ACC ENVIRONMENTAL CONSULTANTS
An Employee Owned Company

Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

LEGEND

- Media Blasting Area
- High Pressure Water Blasting Area
- Vapor Blasting Area
- XRF Test Location

Baseline XRF Test Locations:
Structural Steel Support Member

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure H-2

Note: XRF Test Results Included as Table H-1 in this Appendix.

A·C·C ENVIRONMENTAL CONSULTANTS
An Employee Owned Company

Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

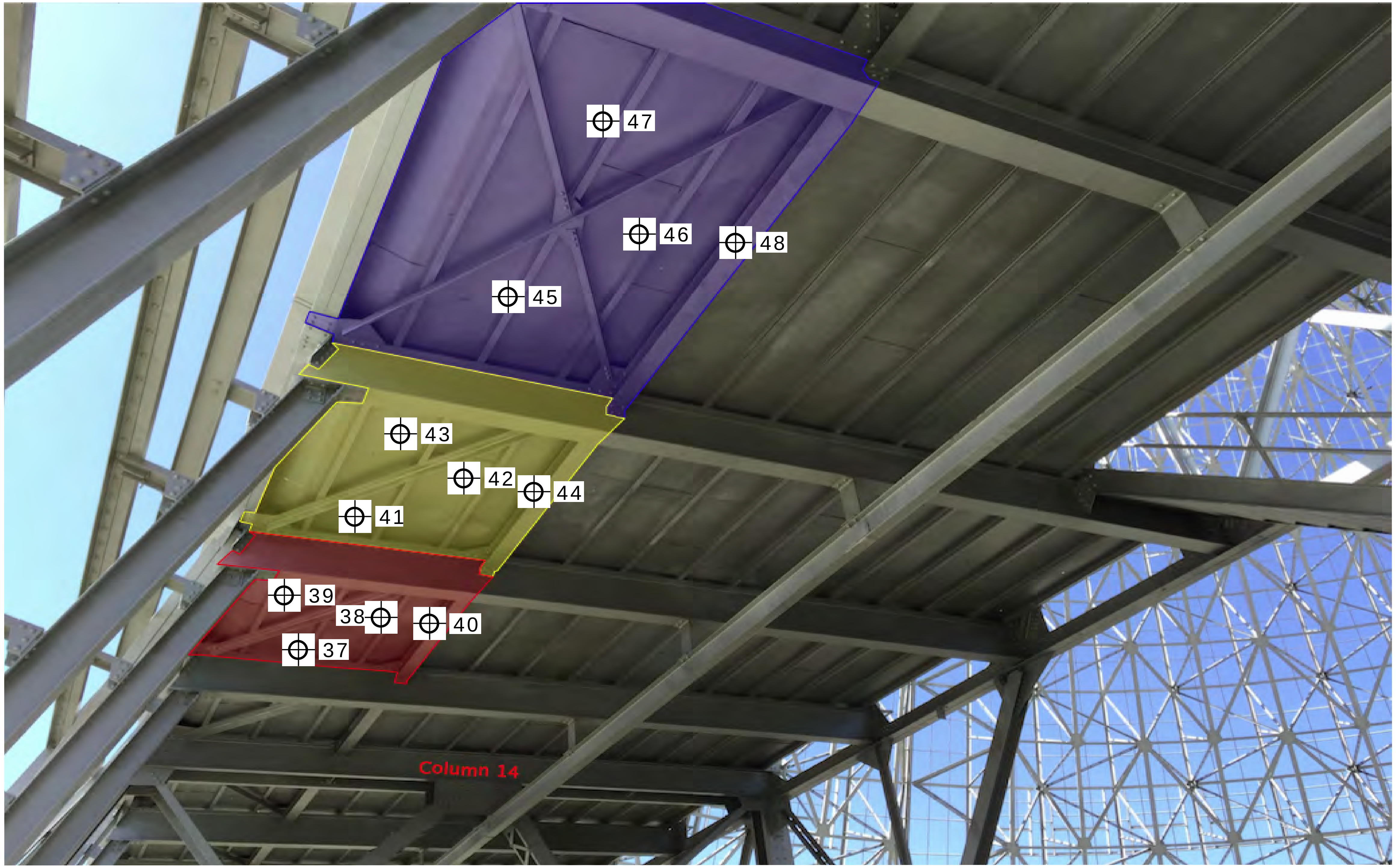
LEGEND

- Media Blasting Area
- High Pressure Water Blasting Area
- Vapor Blasting Area
- XRF Test Location Area

Baseline XRF Test Locations:
CMU Wall

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure H-3



Note: *XRF Test Results Included as Table H-1 in this Appendix.*

A·C·C ENVIRONMENTAL CONSULTANTS

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Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

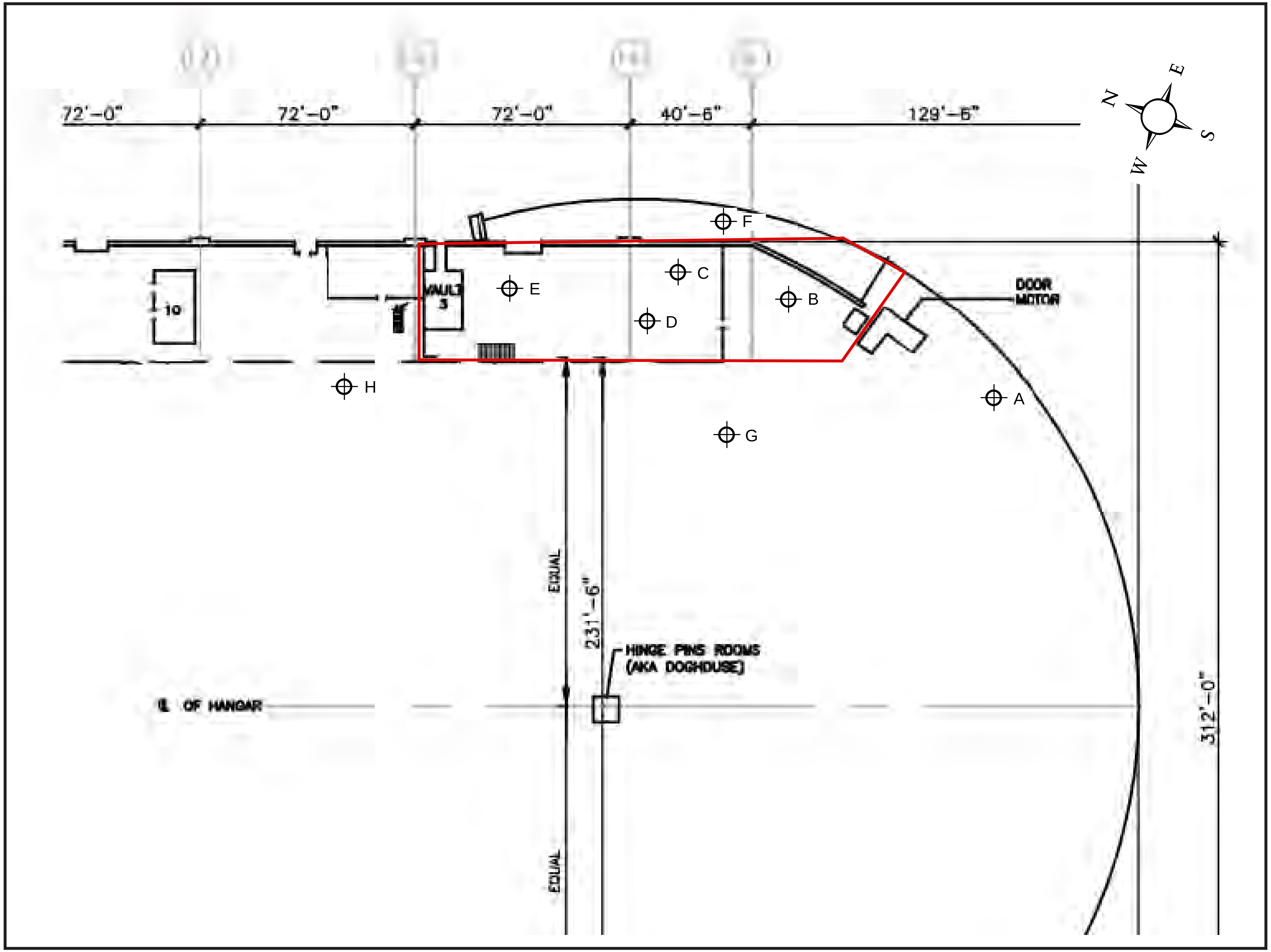
LEGEND

- Media Blasting Area
- High Pressure Water Blasting Area
- Vapor Blasting Area
- XRF Test Location

Baseline XRF Test Locations:
Structural Member Under Mezzanine

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure H-4



Note: XRF Test Results Included as Table H-1 in this Appendix.

A·C·C ENVIRONMENTAL CONSULTANTS
An Employee Owned Company

Hangar One
Pilot Scale Abatement Study
Moffett Federal Airfield
Mountain View, California

LEGEND
- XRF Test Locations
- Pilot Study Area

Baseline XRF Test Locations:
Cement Floor - Inside Study Area

Drawn By: NA	Date: 7/10/17	Project Number: 1591-011.01

Figure H-5

Hangar One Pilot Scale Study

Table H-1: Baseline XRF Lead Testing Results — **Sampling Co.: ACC Environmental Consultants, Inc.**

Test Location	Date/Time	Component	Substrate	Paint Color	Lead Based Paint Result [1]	Lead Measurement (mg/cm^2)
1	5/24/16 7:31	Steel Structure	Metal	Silver	Positive	14.1
2	5/24/16 7:48	Steel Structure	Metal	Silver	Positive	14.7
3	5/24/16 7:34	Steel Structure	Metal	Silver	Positive	13.1
4	5/24/16 7:33	Steel Structure	Metal	Silver	Positive	14.1
5	5/24/16 7:35	Steel Structure	Metal	Silver	Positive	3.4
6	5/24/16 7:36	Steel Structure	Metal	Silver	Positive	16.5
7	5/24/16 7:38	Steel Structure	Metal	Silver	Positive	16.8
8	5/24/16 7:59	Steel Structure	Metal	Silver	Positive	10.1
9	5/24/16 7:55	Steel Structure	Metal	Silver	Positive	9.3
10	5/24/16 7:52	Steel Structure	Metal	Silver	Positive	10.1
11	5/24/16 8:12	Steel Structure	Metal	Silver	Positive	14.8
12	5/24/16 8:07	Steel Structure	Metal	Silver	Positive	14.8
13	5/24/16 8:17	Steel Structure	Metal	Silver	Positive	26.9
14	5/24/16 8:24	Steel Structure	Metal	Silver	Positive	13.3
15	5/24/16 8:19	Steel Structure	Metal	Silver	Positive	21.7
16	5/24/16 8:20	Steel Structure	Metal	Silver	Positive	14.3
17	5/24/16 8:28	Steel Structure	Metal	Silver	Positive	21.7
18	5/24/16 8:33	Steel Structure	Metal	Silver	Positive	24.2
19	6/3/16 14:09	Steel Structure	Metal	Silver	Positive	11.2
20	5/24/16 8:30	Steel Structure	Metal	Silver	Positive	17.2
21	6/3/16 14:16	Steel Structure	Metal	Silver	Positive	30.5
22	6/3/16 14:11	Steel Structure	Metal	Silver	Positive	10.1
23	6/3/16 14:13	Steel Structure	Metal	Silver	Positive	24.2
24	6/3/16 14:12	Steel Structure	Metal	Silver	Positive	20.5

Hangar One Pilot Scale Study							
Table H-1: Baseline XRF Lead Testing Results			**Sampling Co.: ACC Environmental Consultants, Inc.**				
Test Location	**Date/Time**	**Component**	**Substrate**	**Paint Color**	**Lead Based Paint Result (1)**	**Lead Measurement (mg/cm^2)**	
25	5/24/16 9:01	Wall	Concrete	Silver	Positive	3.9	
26	5/24/16 9:03	Wall	Concrete	Silver	Positive	1.4	
27	5/24/16 9:08	Wall	Concrete	Silver	Positive	1.6	
28	5/24/16 9:05	Wall	Concrete	Silver	Positive	1.4	
29	5/24/16 9:13	Wall	Concrete	Silver	Negative	0.29	
30	5/24/16 9:16	Wall	Concrete	Silver	Negative	0.1	
31	5/24/16 9:19	Wall	Concrete	Silver	Positive	1.6	
32	5/24/16 9:17	Wall	Concrete	Silver	Negative	0.08	
33	5/24/16 9:20	Wall	Concrete	Silver	Negative	0.29	
34	5/24/16 9:22	Wall	Concrete	Silver	Negative	0.1	
35	5/24/16 9:23	Wall	Concrete	Silver	Positive	1.6	
36	5/24/16 9:21	Wall	Concrete	Silver	Negative	0.06	
37	6/3/16 14:21	Ceiling	Metal	Silver	Negative	0	
38	6/3/16 14:23	Ceiling	Metal	Silver	Negative	0	
39	6/3/16 14:22	Ceiling	Metal	Silver	Negative	0	
40	6/3/16 14:26	Steel Structure Beam	Metal	Silver	Positive	21.5	
41	6/3/16 14:28	Ceiling	Metal	Silver	Negative	0	
42	6/3/16 14:29	Ceiling	Metal	Silver	Negative	0	
43	6/3/16 14:29	Ceiling	Metal	Silver	Negative	0	
44	6/3/16 14:30	Steel Structure Beam	Metal	Silver	Positive	22.5	
45	6/3/16 14:33	Joist (Horizontal Ceiling Support)	Metal	Silver	Positive	9.3	
46	6/3/16 14:35	Ceiling	Metal	Silver	Negative	0	
47	6/3/16 14:35	Ceiling	Metal	Silver	Negative	0	

Hangar One Pilot Scale Study

Table H-1: Baseline XRF Lead Testing Results			**Sampling Co.: ACC Environmental Consultants, Inc.**			
Test Location	**Date/Time**	**Component**	**Substrate**	**Paint Color**	**Lead Based Paint Result (1)**	**Lead Measurement (mg/cm^2)**
48	6/3/16 14:36	Steel Structure Beam	Metal	Silver	Positive	19.6
A	5/24/16 10:11	Floor	Concrete	No Paint	Negative	0.11
B	5/24/16 10:13	Floor	Concrete	No Paint	Negative	0.04
C	5/24/16 10:14	Floor	Concrete	No Paint	Negative	0.07
D	5/24/16 10:15	Floor	Concrete	No Paint	Negative	0.21
E	5/24/16 10:20	Floor	Concrete	No Paint	Negative	0.15
F	5/24/16 10:18	Floor	Concrete	No Paint	Negative	0.01
G	5/24/16 10:16	Floor	Concrete	No Paint	Negative	0.03
H	5/24/16 10:21	Floor	Concrete	No Paint	Negative	0.06

Notes:

XRF Testing Location Diagrams (Figures H-1 through H-5) are provided in this Appendix Section.

XRF testing completed using Nitox XLP 303A Lead Paint Analyizer

[1] - Lead Based Paint Defined as 1.0 mg/cm^2

mg/cm^2 - milligrams per square centimeter

Appendix J

Equipment Wipe Sampling Results

Hangar One Pilot Scale Study

Table J-1: Equipment Wipe Sampling Results
Analytes: Lead and PCB, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Number	Sample Location	Lead Acceptance Criterion (µg/ft^2) (1)	Lead Results (µg/ft^2)	Total PCBs Acceptance Criterion (µg/100 cm^2) (1)	Total PCBs Results (µg/100 cm^2)	PCB - Aroclor 1016 (µg/100 cm^2)	PCB - Aroclor 1221 (µg/100 cm^2)	PCB - Aroclor 1232 (µg/100 cm^2)	PCB - Aroclor 1242 (µg/100 cm^2)	PCB - Aroclor 1248 (µg/100 cm^2)	PCB - Aroclor 1254 (µg/100 cm^2)	PCB - Aroclor 1260 (µg/100 cm^2)	PCB - Aroclor 1268 (µg/100 cm^2)	Laboratory Report Number
6/2/16	B-WIPE-L-EQ-UHPW-060216-3	Reusable Equipment: Ultra High Pressure Water	≤40	**73**	-	-	-	-	-	-	-	-	-	-	277384
6/2/16	B-WIPE-P-EQ-UHPW-060216-3	Reusable Equipment: Ultra High Pressure Water	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277382
6/2/16	B-WIPE-L-EQ-UHPW-060216-4	Reusable Equipment: Ultra High Pressure Water	≤40	**130 J**	-	-	-	-	-	-	-	-	-	-	277384
6/2/16	B-WIPE-P-EQ-UHPW-060216-4	Reusable Equipment: Ultra High Pressure Water	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277382
6/2/16	B-WIPE-L-EQ-UHPW-FD-060216-9	Reusable Equipment: Vapor Media, Field Duplicate for (B-WIPE-L-EQ-UHPW-060216-4)	≤40	**43 J**	-	-	-	-	-	-	-	-	-	-	277384
6/2/16	B-WIPE-P-EQ-UHPW-FD-060216-9	Reusable Equipment: Vapor Media, Duplicate of (B-WIPE-P-EQ-UHPW-060216-4)	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277382
6/20/16	B-WIPE-L-EQ-UHPW-062016-13	Reusable Equipment: Ultra High Pressure Water	≤40	23	-	-	-	-	-	-	-	-	-	-	277821

Hangar One Pilot Scale Study															
Table J-1: Equipment Wipe Sampling Results **Analytes: Lead and PCB, Sample Media: Wipe**			**Sampling Co.: ACC Environmental Consultants, Inc.** **QA/QC: Jill Henes**												
Sample Collection Date	**Sample Number**	**Sample Location**	**Lead Acceptance Criterion (µg/ft²) (1)**	**Lead Results (µg/ft²)**	**Total PCBs Acceptance Criterion (µg/100 cm²) (1)**	**Total PCBs Results (µg/100 cm²)**	**PCB - Aroclor 1016 (µg/100 cm²)**	**PCB - Aroclor 1221 (µg/100 cm²)**	**PCB - Aroclor 1232 (µg/100 cm²)**	**PCB - Aroclor 1242 (µg/100 cm²)**	**PCB - Aroclor 1248 (µg/100 cm²)**	**PCB - Aroclor 1254 (µg/100 cm²)**	**PCB - Aroclor 1260 (µg/100 cm²)**	**PCB - Aroclor 1268 (µg/100 cm²)**	**Laboratory Report Number**
6/20/16	B-WIPE-L-EQ-UHPW-062016-14	Reusable Equipment: Ultra High Pressure Water	≤40	33	-	-	-	-	-	-	-	-	-	-	277821
6/20/16	B-WIPE-L-EQ-UHPW-FD-062016-19	Reusable Equipment: Ultra High Pressure Water, Duplicate of (B-WIPE-L-EQ-UHPW-062016-13)	≤40	27	-	-	-	-	-	-	-	-	-	-	277821
6/2/16	B-WIPE-L-EQ-MB-060216-1	Reusable Equipment: Media Blasting	≤40	**130**	-	-	-	-	-	-	-	-	-	-	277384
6/2/16	B-WIPE-P-EQ-MB-060216-1	Reusable Equipment: Media Blasting	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277382
6/2/16	B-WIPE-L-EQ-MB-060216-2	Reusable Equipment: Media Blasting	≤40	**93**	-	-	-	-	-	-	-	-	-	-	277384
6/2/16	B-WIPE-P-EQ-MB-060216-2	Reusable Equipment: Media Blasting	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277382
6/2/16	B-WIPE-L-EQ-MB-FD-060216-8	Reusable Equipment: Media Blasting, Duplicate of (B-WIPE-L-EQ-MB-060216-1)	≤40	**150**	-	-	-	-	-	-	-	-	-	-	277384

Hangar One Pilot Scale Study															
Table J-1: Equipment Wipe Sampling Results **Analytes: Lead and PCB, Sample Media: Wipe**			**Sampling Co.: ACC Environmental Consultants, Inc.** **QA/QC: Jill Henes**												
Sample Collection Date	**Sample Number**	**Sample Location**	**Lead Acceptance Criterion (µg/ft^2) (1)**	**Lead Results (µg/ft^2)**	**Total PCBs Acceptance Criterion (µg/100 cm^2) (1)**	**Total PCBs Results (µg/100 cm^2)**	**PCB - Aroclor 1016 (µg/100 cm^2)**	**PCB - Aroclor 1221 (µg/100 cm^2)**	**PCB - Aroclor 1232 (µg/100 cm^2)**	**PCB - Aroclor 1242 (µg/100 cm^2)**	**PCB - Aroclor 1248 (µg/100 cm^2)**	**PCB - Aroclor 1254 (µg/100 cm^2)**	**PCB - Aroclor 1260 (µg/100 cm^2)**	**PCB - Aroclor 1268 (µg/100 cm^2)**	**Laboratory Report Number**
6/2/16	B-WIPE-P-EQ-MB-FD-060216-8	Reusable Equipment: Media Blasting, Duplicate of (B-WIPE-P-EQ-MB-060216-1)	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277382
6/20/16	B-WIPE-L-EQ-MB-062016-11	Reusable Equipment: Media Blasting (Resample after cleaning)	≤40	**46 J**	-	-	-	-	-	-	-	-	-	-	277821
6/20/16	B-WIPE-L-EQ-MB-062016-12	Reusable Equipment: Media Blasting (Resample after cleaning)	≤40	32	-	-	-	-	-	-	-	-	-	-	277821
6/20/16	B-WIPE-L-EQ-MB-FD-062016-18	Reusable Equipment: Media Blasting, Duplicate of (B-WIPE-L-EQ-MB-062016-11)	≤40	30 J	-	-	-	-	-	-	-	-	-	-	277821
6/2/16	B-WIPE-L-EQ-VM-060216-5	Reusable Equipment: Vapor Media	≤40	**190**	-	-	-	-	-	-	-	-	-	-	277384

Hangar One Pilot Scale Study															
Table J-1: Equipment Wipe Sampling Results Analytes: Lead and PCB, Sample Media: Wipe			**Sampling Co.: ACC Environmental Consultants, Inc. QA/QC: Jill Henes**												
Sample Collection Date	**Sample Number**	**Sample Location**	**Lead Acceptance Criterion ($\mu g/ft^2$) (1)**	**Lead Results ($\mu g/ft^2$)**	**Total PCBs Acceptance Criterion ($\mu g/100\ cm^2$) (1)**	**Total PCBs Results ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1016 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1221 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1232 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1242 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1248 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1254 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1260 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1268 ($\mu g/100\ cm^2$)**	**Laboratory Report Number**
6/2/16	B-WIPE-P-EQ-VM-060216-5	Reusable Equipment: Vapor Media	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277382
6/2/16	B-WIPE-L-EQ-VM-060216-6	Reusable Equipment: Vapor Media	≤40	**100**	-	-	-	-	-	-	-	-	-	-	277384
6/2/16	B-WIPE-P-EQ-VM-060216-6	Reusable Equipment: Vapor Media	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277382
6/2/16	B-WIPE-L-EQ-VM-FD-060216-10	Reusable Equipment: Vapor Media, Duplicate of (B-WIPE-L-EQ-VM-060216-6)	≤40	**180**	-	-	-	-	-	-	-	-	-	-	277384
6/2/16	B-WIPE-P-EQ-VM-FD-060216-10	Reusable Equipment: Vapor Media, Duplicate of (B-WIPE-P-EQ-VM-060216-5)	-	-	N/A	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277382
6/20/16	B-WIPE-L-EQ-VM-062016-15	Reusable Equipment: Vapor Media (Resample after cleaning)	≤40	1.7 J	-	-	-	-	-	-	-	-	-	-	277821
6/20/16	B-WIPE-L-EQ-VM-062016-16	Reusable Equipment: Vapor Media (Resample after cleaning)	≤40	2.0	-	-	-	-	-	-	-	-	-	-	277821

Hangar One Pilot Scale Study															
Table J-1: Equipment Wipe Sampling Results Analytes: Lead and PCB, Sample Media: Wipe			Sampling Co.: ACC Environmental Consultants, Inc. QA/QC: Jill Henes												
Sample Collection Date	Sample Number	Sample Location	Lead Acceptance Criterion (µg/ft^2) (1)	Lead Results (µg/ft^2)	Total PCBs Acceptance Criterion (µg/100 cm^2) (1)	Total PCBs Results (µg/100 cm^2)	PCB - Aroclor 1016 (µg/100 cm^2)	PCB - Aroclor 1221 (µg/100 cm^2)	PCB - Aroclor 1232 (µg/100 cm^2)	PCB - Aroclor 1242 (µg/100 cm^2)	PCB - Aroclor 1248 (µg/100 cm^2)	PCB - Aroclor 1254 (µg/100 cm^2)	PCB - Aroclor 1260 (µg/100 cm^2)	PCB - Aroclor 1268 (µg/100 cm^2)	Laboratory Report Number
6/20/16	B-WIPE-L-EQ-VM-FD-062016-20	Reusable Equipment: Vapor Media, Duplicate of (B-WIPE-L-EQ-VM-062016-15) (Resample after cleaning)	≤40	2.4 J	-	-	-	-	-	-	-	-	-	-	277821
6/2/16	B-WIPE-L-EQ-FB-060216-7	Reusable Equipment: Field Blank	NA	<0.50	-	-	-	-	-	-	-	-	-	-	277384
6/2/16	B-WIPE-P-EQ-FB-060216-7	Reusable Equipment: Field Blank	-	-	NA	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277382
6/20/16	B-WIPE-L-EQ-FB-062016-17	Reusable Equipment: Field Blank	NA	<0.50	-	-	-	-	-	-	-	-	-	-	277821
3/29/17	B-WIPE-L-EQ-UHPW-032917-3	Reusable Equipment: Ultra High Pressure Water	≤40	8.8 J	-	-	-	-	-	-	-	-	-	-	287494
3/29/17	B-WIPE-P-EQ-UHPW-032917-3	Reusable Equipment: Ultra High Pressure Water	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287493
3/29/17	B-WIPE-L-EQ-UHPW-032917-4	Reusable Equipment: Ultra High Pressure Water	≤40	21	-	-	-	-	-	-	-	-	-	-	287494
3/29/17	B-WIPE-P-EQ-UHPW-032917-4	Reusable Equipment: Ultra High Pressure Water	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287493

Hangar One Pilot Scale Study															
Table J-1: Equipment Wipe Sampling Results **Analytes: Lead and PCB, Sample Media: Wipe**			**Sampling Co.: ACC Environmental Consultants, Inc.** **QA/QC: Jill Henes**												
Sample Collection Date	**Sample Number**	**Sample Location**	**Lead Acceptance Criterion ($\mu g/ft^2$) [1]**	**Lead Results ($\mu g/ft^2$)**	**Total PCBs Acceptance Criterion ($\mu g/100\ cm^2$) [1]**	**Total PCBs Results ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1016 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1221 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1232 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1242 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1248 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1254 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1260 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1268 ($\mu g/100\ cm^2$)**	**Laboratory Report Number**
3/29/17	B-WIPE-L-EQ-UHPW-FD-032917-9	Reusable Equipment: Ultra High Pressure Water, Duplicate of (B-WIPE-L-EQ-UHPW-032917-3)	≤40	5.9 J	-	-	-	-	-	-	-	-	-	-	287494
3/29/17	B-WIPE-P-EQ-UHPW-FD-032917-9	Reusable Equipment: Ultra High Pressure Water, Duplicate of (B-WIPE-P-EQ-UHPW-032917-3)	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287493
3/23/17	B-WIPE-L-EQ-MB-032317-1	Reusable Equipment: Media Blasting	≤40	1.8 J	-	-	-	-	-	-	-	-	-	-	287337
3/23/17	B-WIPE-P-EQ-MB-032317-1	Reusable Equipment: Media Blasting	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287336
3/23/17	B-WIPE-L-EQ-MB-032317-2	Reusable Equipment: Media Blasting	≤40	4.2 J	-	-	-	-	-	-	-	-	-	-	287337
3/23/17	B-WIPE-P-EQ-MB-032317-2	Reusable Equipment: Media Blasting	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287336
3/23/17	B-WIPE-L-EQ-MB-FB-032317-7	Reusable Equipment: Media Blasting, Field Blank	NA	<0.50 UJ	-	-	-	-	-	-	-	-	-	-	287337

Hangar One Pilot Scale Study																
Table J-1: Equipment Wipe Sampling Results **Analytes: Lead and PCB, Sample Media: Wipe**			**Sampling Co.: ACC Environmental Consultants, Inc.** **QA/QC: Jill Henes**													
Sample Collection Date	**Sample Number**	**Sample Location**	**Lead Acceptance Criterion (µg/ft^2) (1)**	**Lead Results (µg/ft^2)**	**Total PCBs Acceptance Criterion (µg/100 cm^2) (1)**	**Total PCBs Results (µg/100 cm^2)**	**PCB - Aroclor 1016 (µg/100 cm^2)**	**PCB - Aroclor 1221 (µg/100 cm^2)**	**PCB - Aroclor 1232 (µg/100 cm^2)**	**PCB - Aroclor 1242 (µg/100 cm^2)**	**PCB - Aroclor 1248 (µg/100 cm^2)**	**PCB - Aroclor 1254 (µg/100 cm^2)**	**PCB - Aroclor 1260 (µg/100 cm^2)**	**PCB - Aroclor 1268 (µg/100 cm^2)**	**Laboratory Report Number**
3/23/17	B-WIPE-P-EQ-MB-FB-032317-7	Reusable Equipment: Media Blasting, Field Blank	-	-	NA	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287336
3/23/17	B-WIPE-L-EQ-MB-FD-032317-8	Reusable Equipment: Media Blasting, Duplicate of (B-WIPE-L-EQ-MB-032317-1)	≤40	1.6 J	-	-	-	-	-	-	-	-	-	-	287337
3/23/17	B-WIPE-P-EQ-MB-FD-032317-8	Reusable Equipment: Media Blasting, Duplicate of (B-WIPE-P-EQ-MB-032317-1)	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287336
4/14/17	B-WIPE-L-VM-041417-1 (5)	Reusable Equipment: Vapor Media, Resample for (B-WIPE-L-EQ-VM-032317-5) after recleaning	≤40	24	-	-	-	-	-	-	-	-	-	-	288059
4/14/17	B-WIPE-L-VM-FD-041414-2 (5)	Reusable Equipment: Vapor Media, Duplicate of (B-WIPE-L-VM-041417-1), Resample for (B-WIPE-L-EQ-VM-FD-032317-10) after recleaning	≤40	26	-	-	-	-	-	-	-	-	-	-	288059

Hangar One Pilot Scale Study														
Table J-1: Equipment Wipe Sampling Results **Analytes: Lead and PCB, Sample Media: Wipe**			**Sampling Co.: ACC Environmental Consultants, Inc.** **QA/QC: Jill Henes**											
Sample Collection Date	**Sample Number**	**Sample Location**	**Lead Acceptance Criterion ($\mu g/ft^2$) (1)**	**Lead Results ($\mu g/ft^2$)**	**Total PCBs Acceptance Criterion ($\mu g/100\ cm^2$) (1)**	**Total PCBs Results ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1016 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1221 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1232 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1242 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1248 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1254 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1260 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1268 ($\mu g/100\ cm^2$)**	**Laboratory Report Number**
3/23/17	B-WIPE-L-EQ-VM-032317-5	Reusable Equipment: Vapor Media	≤40	**160 J**	-	-	-	-	-	-	-	-	-	-	287337
3/23/17	B-WIPE-P-EQ-VM-032317-5	Reusable Equipment: Vapor Media	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287336
3/23/17	B-WIPE-L-EQ-VM-032317-6	Reusable Equipment: Vapor Media	≤40	21 J	-	-	-	-	-	-	-	-	-	-	287337
3/23/17	B-WIPE-P-EQ-VM-032317-6	Reusable Equipment: Vapor Media	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287336
3/23/17	B-WIPE-L-EQ-VM-FD-032317-10	Reusable Equipment: Vapor Media, Duplicate (B-WIPE-L-EQ-VM-032317-5)	≤40	**83 J**	-	-	-	-	-	-	-	-	-	-	287337
3/23/17	B-WIPE-P-EQ-VM-FD-032317-10	Reusable Equipment: Vapor Media, Duplicate of (B-WIPE-P-EQ-VM-032317-5)	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287336
5/9/17	P-WIPE-L-EQ-UHPW-050917-1	Reusable Equipment: Ultra High Pressure Water	≤40	23	-	-	-	-	-	-	-	-	-	-	288746

Hangar One Pilot Scale Study															
Table J-1: Equipment Wipe Sampling Results Analytes: Lead and PCB, Sample Media: Wipe			Sampling Co.: ACC Environmental Consultants, Inc. QA/QC: Jill Henes												
Sample Collection Date	Sample Number	Sample Location	Lead Acceptance Criterion ($\mu g/ft^2$) (1)	Lead Results ($\mu g/ft^2$)	Total PCBs Acceptance Criterion ($\mu g/100\ cm^2$) (1)	Total PCBs Results ($\mu g/100\ cm^2$)	PCB - Aroclor 1016 ($\mu g/100\ cm^2$)	PCB - Aroclor 1221 ($\mu g/100\ cm^2$)	PCB - Aroclor 1232 ($\mu g/100\ cm^2$)	PCB - Aroclor 1242 ($\mu g/100\ cm^2$)	PCB - Aroclor 1248 ($\mu g/100\ cm^2$)	PCB - Aroclor 1254 ($\mu g/100\ cm^2$)	PCB - Aroclor 1260 ($\mu g/100\ cm^2$)	PCB - Aroclor 1268 ($\mu g/100\ cm^2$)	Laboratory Report Number
5/9/17	P-WIPE-P-EQ-UHPW-050917-1	Reusable Equipment: Ultra High Pressure Water	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288747
5/9/17	P-WIPE-L-EQ-UHPW-050917-2	Reusable Equipment: Ultra High Pressure Water	≤40	**200** (2)	-	-	-	-	-	-	-	-	-	-	288746
5/9/17	P-WIPE-P-EQ-UHPW-050917-2	Reusable Equipment: Ultra High Pressure Water	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288747
5/30/17	P-WIPE-L-EQ-UHPW-050917-2	Reusable Equipment: Ultra High Pressure Water	≤40	12 J	-	-	-	-	-	-	-	-	-	-	289432
5/9/17	P-WIPE-L-EQ-UHPW-FD-050917-3	Reusable Equipment: Ultra High Pressure Water, Duplicate of (P-WIPE-L-EQ-UHPW-050917-2)	≤40	**190** (2)	-	-	-	-	-	-	-	-	-	-	288746
5/30/17	P-WIPE-L-EQ-UHPW-FD-053017-3	Reusable Equipment: Ultra High Pressure Water, Duplicate of (P-WIPE-L-EQ-UHPW-053017-2)	≤40	6.1 J	-	-	-	-	-	-	-	-	-	-	289432
5/9/17	P-WIPE-P-EQ-UHPW-FD-050917-3	Reusable Equipment: Ultra High Pressure Water, Duplicate of (P-WIPE-P-EQ-UHPW-050917-2)	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288747

Hangar One Pilot Scale Study

Table J-1: Equipment Wipe Sampling Results
Analytes: Lead and PCB, Sample Media: Wipe

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Collection Date	Sample Number	Sample Location	Lead Acceptance Criterion (µg/ft^2) [1]	Lead Results (µg/ft^2)	Total PCBs Acceptance Criterion (µg/100 cm^2) [1]	Total PCBs Results (µg/100 cm^2)	PCB - Aroclor 1016 (µg/100 cm^2)	PCB - Aroclor 1221 (µg/100 cm^2)	PCB - Aroclor 1232 (µg/100 cm^2)	PCB - Aroclor 1242 (µg/100 cm^2)	PCB - Aroclor 1248 (µg/100 cm^2)	PCB - Aroclor 1254 (µg/100 cm^2)	PCB - Aroclor 1260 (µg/100 cm^2)	PCB - Aroclor 1268 (µg/100 cm^2)	Laboratory Report Number
5/9/17	P-WIPE-L-EQ-UHPW-FB-050917-4	Reusable Equipment: Ultra High Pressure Water, Field Blank	NA	<0.50	-	-	-	-	-	-	-	-	-	-	288746
5/9/17	P-WIPE-P-EQ-UHPW-FB-050917-4	Reusable Equipment: Ultra High Pressure Water, Field Blank	-	-	NA	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288747
5/9/17	P-WIPE-L-EQ-MB-050917-1	Reusable Equipment: Media Blast	≤40	7.9	-	-	-	-	-	-	-	-	-	-	288746
5/9/17	P-WIPE-P-EQ-MB-050917-1	Reusable Equipment: Media Blast	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288747
5/9/17	P-WIPE-L-EQ-MB-050917-2	Reusable Equipment: Media Blast	≤40	**52** [3]	-	-	-	-	-	-	-	-	-	-	288746
5/30/17	P-WIPE-L-EQ-MB-053017-2	Reusable Equipment: Media Blast	≤40	**48 J** [4]	-	-	-	-	-	-	-	-	-	-	289432
6/9/17	P-WIPE-L-EQ-MB-060917-2	Reusable Equipment: Media Blast	≤40	7.2 J	-	-	-	-	-	-	-	-	-	-	289705
5/9/17	P-WIPE-P-EQ-MB-050917-2	Reusable Equipment: Media Blast	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288747

Hangar One Pilot Scale Study															
Table J-1: Equipment Wipe Sampling Results Analytes: Lead and PCB, Sample Media: Wipe			Sampling Co.: ACC Environmental Consultants, Inc. QA/QC: Jill Henes												
Sample Collection Date	Sample Number	Sample Location	Lead Acceptance Criterion (µg/ft^2) [1]	Lead Results (µg/ft^2)	Total PCBs Acceptance Criterion (µg/100 cm^2) [1]	Total PCBs Results (µg/100 cm^2)	PCB - Aroclor 1016 (µg/100 cm^2)	PCB - Aroclor 1221 (µg/100 cm^2)	PCB - Aroclor 1232 (µg/100 cm^2)	PCB - Aroclor 1242 (µg/100 cm^2)	PCB - Aroclor 1248 (µg/100 cm^2)	PCB - Aroclor 1254 (µg/100 cm^2)	PCB - Aroclor 1260 (µg/100 cm^2)	PCB - Aroclor 1268 (µg/100 cm^2)	Laboratory Report Number
5/9/17	P-WIPE-L-EQ-MB-FD-050917-3	Reusable Equipment: Media Blast, Duplicate of (P-WIPE-L-EQ-MB-050917-2)	≤40	**62** [3]	-	-	-	-	-	-	-	-	-	-	288746
5/30/17	P-WIPE-L-EQ-MB-FD-053017-3	Reusable Equipment: Media Blast, Duplicate of (P-WIPE-L-EQ-MB-053017-2)	≤40	28 J [4]	-	-	-	-	-	-	-	-	-	-	289432
5/9/17	P-WIPE-L-EQ-MB-FD-050917-3	Reusable Equipment: Media Blast, Duplicate of (P-WIPE-L-EQ-MB-060917-2) (after recleaning)	≤40	5.0 J	-	-	-	-	-	-	-	-	-	-	289705
5/9/17	P-WIPE-P-EQ-MB-FD-050917-3	Reusable Equipment: Media Blast, Duplicate of (P-WIPE-P-EQ-MB-050917-2)	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288747
5/9/17	P-WIPE-L-EQ-VM-050917-1	Reusable Equipment: Vapor Media (after recleaning)	≤40	8.6	-	-	-	-	-	-	-	-	-	-	288746
5/9/17	P-WIPE-P-EQ-VM-050917-1	Reusable Equipment: Vapor Media	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288747

Hangar One Pilot Scale Study																
Table J-1: Equipment Wipe Sampling Results **Analytes: Lead and PCB, Sample Media: Wipe**			**Sampling Co.: ACC Environmental Consultants, Inc.** **QA/QC: Jill Henes**													
Sample Collection Date	**Sample Number**	**Sample Location**	**Lead Acceptance Criterion ($\mu g/ft^2$) (1)**	**Lead Results ($\mu g/ft^2$)**	**Total PCBs Acceptance Criterion ($\mu g/100\ cm^2$) (1)**	**Total PCBs Results ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1016 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1221 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1232 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1242 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1248 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1254 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1260 ($\mu g/100\ cm^2$)**	**PCB - Aroclor 1268 ($\mu g/100\ cm^2$)**	**Laboratory Report Number**
5/9/17	P-WIPE-L-EQ-VM-050917-2	Reusable Equipment: Vapor Media (after recleaning)	≤40	30	-	-	-	-	-	-	-	-	-	-	288746
5/9/17	P-WIPE-P-EQ-VM-050917-2	Reusable Equipment: Vapor Media	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288747
5/9/17	P-WIPE-L-EQ-VM-FD-050917-3	Reusable Equipment: Vapor Media, Duplicate of (P-WIPE-L-EQ-VM-050917-2)	≤40	36	-	-	-	-	-	-	-	-	-	-	288746
5/9/17	P-WIPE-P-EQ-VM-FD-050917-3	Reusable Equipment: Vapor Media, Duplicate of (P-WIPE-P-EQ-VM-050917-2)	-	-	N/A	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288747
5/26/16	B-WIPE-L-SCFLD-052616-1	Scaffolding	≤40	19 J	-	-	-	-	-	-	-	-	-	-	277267
5/26/16	B-WIPE-P-SCFLD-052616-1	Scaffolding	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277268
5/26/16	B-WIPE-L-SCFLD-052616-2	Scaffolding	≤40	35 J	-	-	-	-	-	-	-	-	-	-	277267
5/26/16	B-WIPE-P-SCFLD-052616-2	Scaffolding	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277268
5/26/16	B-WIPE-L-SCFLD-052616-3	Scaffolding	≤40	**340 J**	-	-	-	-	-	-	-	-	-	-	277267
5/26/16	B-WIPE-P-SCFLD-052616-3	Scaffolding	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277268
5/26/16	B-WIPE-L-SCFLD-FB-052616-4	Scaffolding, Field Blank	NA	<0.50 UJ	-	-	-	-	-	-	-	-	-	-	277267

Hangar One Pilot Scale Study

Table J-1: Equipment Wipe Sampling Results | **Sampling Co.: ACC Environmental Consultants, Inc.**

Analytes: Lead and PCB, Sample Media: Wipe | **QA/QC: Jill Henes**

Sample Collection Date	Sample Number	Sample Location	Lead Acceptance Criterion ($\mu g/ft^2$) (1)	Lead Results ($\mu g/ft^2$)	Total PCBs Acceptance Criterion ($\mu g/100\ cm^2$) (1)	Total PCBs Results ($\mu g/100\ cm^2$)	PCB - Aroclor 1016 ($\mu g/100\ cm^2$)	PCB - Aroclor 1221 ($\mu g/100\ cm^2$)	PCB - Aroclor 1232 ($\mu g/100\ cm^2$)	PCB - Aroclor 1242 ($\mu g/100\ cm^2$)	PCB - Aroclor 1248 ($\mu g/100\ cm^2$)	PCB - Aroclor 1254 ($\mu g/100\ cm^2$)	PCB - Aroclor 1260 ($\mu g/100\ cm^2$)	PCB - Aroclor 1268 ($\mu g/100\ cm^2$)	Laboratory Report Number
5/26/16	B-WIPE-P-SCFLD-FB-052616-4	Scaffolding, Field Blank	-	-	NA	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277268
5/26/16	B-WIPE-L-SCFLD-FD-052616-5	Scaffolding, Duplicate of (B-WIPE-L-SCFLD-052616-1)	≤40	23 J	-	-	-	-	-	-	-	-	-	-	277267
5/26/16	B-WIPE-P-SCFLD-FD-052616-5	Scaffolding, Duplicate of (B-WIPE-P-SCFLD-052616-1)	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	277268
6/7/16	B-WIPE-L-SCFLD-060716-6	Scaffolding Reclean	≤40	21	-	-	-	-	-	-	-	-	-	-	277489
6/7/16	B-WIPE-L-SCFLD-060716-7	Scaffolding Reclean	≤40	17	-	-	-	-	-	-	-	-	-	-	277489
6/7/16	B-WIPE-L-SCFLD-060716-8	Scaffolding Reclean	≤40	1.0	-	-	-	-	-	-	-	-	-	-	277489
6/7/16	B-WIPE-L-SCFLD-FB-060716-9	Scaffolding, Reclean, Field Blank	NA	<0.50	-	-	-	-	-	-	-	-	-	-	277489
6/7/16	B-WIPE-L-SCFLD-FD-060716-10	Scaffolding, Reclean, Duplicate of (B-WIPE-L-SCFLD-060716-8)	≤40	0.82	-	-	-	-	-	-	-	-	-	-	277489
3/17/17	B-WIPE-L-SCFLD-031717-1	Scaffolding	≤40	2.8 J	-	-	-	-	-	-	-	-	-	-	287121
3/17/17	B-WIPE-P-SCFLD-031717-1	Scaffolding	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287126
3/17/17	B-WIPE-L-SCFLD-031717-2	Scaffolding	≤40	14 J	-	-	-	-	-	-	-	-	-	-	287121
3/17/17	B-WIPE-P-SCFLD-031717-2	Scaffolding	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287126
3/17/17	B-WIPE-L-SCFLD-031717-3	Scaffolding	≤40	7.3 J	-	-	-	-	-	-	-	-	-	-	287121

Hangar One Pilot Scale Study															
Table J-1: Equipment Wipe Sampling Results Analytes: Lead and PCB, Sample Media: Wipe			Sampling Co.: ACC Environmental Consultants, Inc. QA/QC: Jill Henes												
Sample Collection Date	Sample Number	Sample Location	Lead Acceptance Criterion ($\mu g/ft^2$) (1)	Lead Results ($\mu g/ft^2$)	Total PCBs Acceptance Criterion ($\mu g/100\ cm^2$) (1)	Total PCBs Results ($\mu g/100\ cm^2$)	PCB - Aroclor 1016 ($\mu g/100\ cm^2$)	PCB - Aroclor 1221 ($\mu g/100\ cm^2$)	PCB - Aroclor 1232 ($\mu g/100\ cm^2$)	PCB - Aroclor 1242 ($\mu g/100\ cm^2$)	PCB - Aroclor 1248 ($\mu g/100\ cm^2$)	PCB - Aroclor 1254 ($\mu g/100\ cm^2$)	PCB - Aroclor 1260 ($\mu g/100\ cm^2$)	PCB - Aroclor 1268 ($\mu g/100\ cm^2$)	Laboratory Report Number
3/17/17	B-WIPE-P-SCFLD-031717-3	Scaffolding	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287126
3/17/17	B-WIPE-L-SCFLD-FB-031717-4	Scaffolding, Field Blank	NA	<0.50 UJ	-	-	-	-	-	-	-	-	-	-	287121
3/17/17	B-WIPE-P-SCFLD-FB-031717-4	Scaffolding, Field Blank	-	-	NA	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287126
3/17/17	B-WIPE-L-SCFLD-FD-031717-5	Scaffolding, Field Duplicate of (B-WIPE-L-SCFLD-031717-3)	≤40	6.8 J	-	-	-	-	-	-	-	-	-	-	287121
3/17/17	B-WIPE-P-SCFLD-FD-031717-5	Scaffolding, Field Duplicate	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	287126
5/8/17	P-WIPE-L-SCFLD-050817-1	Scaffolding	≤40	**690 J**	-	-	-	-	-	-	-	-	-	-	288721
5/8/17	P-WIPE-P-SCFLD-050817-1	Scaffolding	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288722
5/8/17	P-WIPE-L-SCFLD-050817-2	Scaffolding	≤40	**260 J**	-	-	-	-	-	-	-	-	-	-	288721
5/8/17	P-WIPE-P-SCFLD-050817-2	Scaffolding	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288722
5/8/17	P-WIPE-L-SCFLD-050817-3	Scaffolding	≤40	**67 J**	-	-	-	-	-	-	-	-	-	-	288721
5/8/17	P-WIPE-P-SCFLD-050817-3	Scaffolding	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288722
5/8/17	P-WIPE-L-SCFLD-FD-050817-4	Scaffolding, Field Duplicate of (P-WIPE-L-SCFLD-050817-3)	≤40	**650 J**	-	-	-	-	-	-	-	-	-	-	288721
5/8/17	P-WIPE-P-SCFLD-FD-050817-4	Scaffolding, Duplicate of (P-WIPE-P-SCFLD-050817-3)	-	-	≤10	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288722

Hangar One Pilot Scale Study															
Table J-1: Equipment Wipe Sampling Results **Analytes: Lead and PCB, Sample Media: Wipe**			**Sampling Co.: ACC Environmental Consultants, Inc.** **QA/QC: Jill Henes**												
Sample Collection Date	**Sample Number**	**Sample Location**	**Lead Acceptance Criterion (µg/ft²) (1)**	**Lead Results (µg/ft²)**	**Total PCBs Acceptance Criterion (µg/100 cm²) (1)**	**Total PCBs Results (µg/100 cm²)**	**PCB - Aroclor 1016 (µg/100 cm²)**	**PCB - Aroclor 1221 (µg/100 cm²)**	**PCB - Aroclor 1232 (µg/100 cm²)**	**PCB - Aroclor 1242 (µg/100 cm²)**	**PCB - Aroclor 1248 (µg/100 cm²)**	**PCB - Aroclor 1254 (µg/100 cm²)**	**PCB - Aroclor 1260 (µg/100 cm²)**	**PCB - Aroclor 1268 (µg/100 cm²)**	**Laboratory Report Number**
5/8/17	P-WIPE-L-SCFLD-FB-050817-5	Scaffolding, Field Blank	NA	<0.50 UJ	-	-	-	-	-	-	-	-	-	-	288721
5/8/17	P-WIPE-P-SCFLD-FB-050817-5	Scaffolding, Field Blank			NA	<2.5	<1.3	<2.5	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	288722
5/16/17	P-WIPE-L-SCFLD-050817-1	Scaffolding	≤40	**61** (3)	-	-	-	-	-	-	-	-	-	-	288968
5/16/17	P-WIPE-L-SCFLD-FD-050817-4	Scaffolding Field Duplicate of (P-WIPE-L-SCFLD-050817-1)	≤40	**77** (3)	-	-	-	-	-	-	-	-	-	-	288968
5/16/17	P-WIPE-L-SCFLD-050817-2	Scaffolding	≤40	**57** (3)	-	-	-	-	-	-	-	-	-	-	288968
5/16/17	P-WIPE-L-SCFLD-050817-3	Scaffolding,	≤40	**67** (3)	-	-	-	-	-	-	-	-	-	-	288968
5/16/17	P-WIPE-L-SCFLD-FB-050817-5	Scaffolding, Field Blank	NA	<0.50	-	-	-	-	-	-	-	-	-	-	288968
5/30/17	P-WIPE-L-SCFLD-053017-1	Scaffolding	≤40	21 J (4)	-	-	-	-	-	-	-	-	-	-	289432
5/30/17	P-WIPE-L-SCFLD-FD-053017-4	Scaffolding Field Duplicate of (P-WIPE-L-SCFLD-053017-1)	≤40	8.0 J (4)	-	-	-	-	-	-	-	-	-	-	289432
5/30/17	P-WIPE-L-SCFLD-053017-2	Scaffolding	≤40	6.5 (4)	-	-	-	-	-	-	-	-	-	-	289432
5/30/17	P-WIPE-L-SCFLD-053017-3	Scaffolding,	≤40	18 (4)	-	-	-	-	-	-	-	-	-	-	289432
5/30/17	P-WIPE-L-SCFLD-FB-053017-5	Scaffolding, Field Blank	NA	<0.50	-	-	-	-	-	-	-	-	-	-	289432

Hangar One Pilot Scale Study															
Table J-1: Equipment Wipe Sampling Results Analytes: Lead and PCB, Sample Media: Wipe			Sampling Co.: ACC Environmental Consultants, Inc. QA/QC: Jill Henes												
Sample Collection Date	Sample Number	Sample Location	Lead Acceptance Criterion (µg/ft^2) (1)	Lead Results (µg/ft^2)	Total PCBs Acceptance Criterion (µg/100 cm^2) (1)	Total PCBs Results (µg/100 cm^2)	PCB - Aroclor 1016 (µg/100 cm^2)	PCB - Aroclor 1221 (µg/100 cm^2)	PCB - Aroclor 1232 (µg/100 cm^2)	PCB - Aroclor 1242 (µg/100 cm^2)	PCB - Aroclor 1248 (µg/100 cm^2)	PCB - Aroclor 1254 (µg/100 cm^2)	PCB - Aroclor 1260 (µg/100 cm^2)	PCB - Aroclor 1268 (µg/100 cm^2)	Laboratory Report Number

Notes:

Bolded Results indicate sample result above Acceptance Criterion.

All analytical data have been validated in accordance with the processes described for Stage 2B Verification and Validation checks and the applicable National Functional Guidelines

See Appendix M For Laboratory Reports and Chain of Custody Documentation.

[1] - Acceptance Criterion from the Final Work Plan for the Pilot Scale Abatement Study of Hangar 1 (ACC, 2016).

[2] - Lead wipe samples collected on 5/9/17 from the UHPW equipment exceeded the Acceptance Criterion. Additional samples were collected on 5/30/17 after additional cleaning.

[3] - Lead wipe samples collected on 5/9/27 from the Media Blast equipment exceeded the Acceptance Criterion. Additional samples were collected on 5/30/17 after additional cleaninig.

[4] - Lead wipe samples collected on 5/30/17 from the Media Blast equipment exceeded the Acceptance Criterion. Additional samples were collected on 6/9/17 after additional cleaning.

[5] -Vapor Media equipment remained onsite since May 2016. Sample results from 3/23/2017 were above Acceptance Criterion. The equipment was recleaned and resampled.

J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

UJ - The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

µg/ft^2 - micrograms per square foot

µg/100 cm^2 - micrograms per 100 square centimeters

NA - Not Applicable

Appendix K

Waste Profile Sampling Results

Hangar One Pilot Scale Study

K-1: Ultra High Pressure Water Waste Profile Results
Analyte: PCBs and Metals

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Sample Matrix	**Liquid (mg/L)**	**Solid**		
Total PCBs	<0.001	0.37 mg/kg		
Analysis Type	**Total Concentration**	**Total Concentration (mg/kg)**	**TCLP (mg/L)**	**WET (mg/L)**
Antimony	0.039	2,100	-	1.9
Arsenic	0.23	11	-	-
Barium	0.032	660	-	-
Beryllium	0.0006	0.11	-	-
Cadmium	0.0007	17	-	0.07
Chromium	0.039	290	0.18	0.61
Cobalt	0.012	33	-	-
Copper	0.018	19	-	-
Lead	2.5	13,000	55	210
Mercury	0.0006	15	<0.001	<0.001
Molybdenum	0.002	0.51	-	-
Nickle	0.006	26	-	-
Selenium	0.002	0.26	-	-
Silver	0.0001	0.38	-	-
Thallium	<0.0001	0.41	-	-
Vanadium	0.006	15	-	-
Zinc	0.52	20,000	-	39

Notes:
See Appendix M for Laboratory Reports and Chain of Custody Documentation
TCLP extraction and analysis was performed when the total concentration exceeded 20x the TCLP and WET extraction and analysis were performed when the total concentration exceeded 10x the STLC
"-" indicates concentration did not exceed 10x the STLC or

TCLP - Toxicity Characteristic Leaching Proceedure
WET - Waste Extraction Test
mg/L - miligrams per liter
mg/kg - milligrams per kilogram

Hangar One Pilot Scale Study

K-2: Media Blast Waste Profile Results
Analyte: PCBs and Metals

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Abatement Media	**Keen Blast**			**Plastic Bead**		
Sample Matrix	**Solid**			**Solid**		
Total PCBs	0.23 mg/kg			0.8 mg/kg		
Analysis Type	**Total Concentration (mg/kg)**	**TCLP (mg/L)**	**WET (mg/L)**	**Total Concentration (mg/kg)**	**TCLP (mg/L)**	**WET (mg/L)**
Antimony	52	-	14	350	-	-
Arsenic	19	-	-	10	-	-
Barium	590	-	-	540	-	-
Beryllium	0.64	-	-	0.33	-	-
Cadmium	1.2	-	-	6.2	-	-
Chromium	73	0.81	3.4	130	0.81	5.4
Cobalt	22	-	-	22	-	-
Copper	1,900	-	<0.25	950	-	3.4
Lead	3,900	16	230	1,300	0.93	77
Mercury	0.45	-	-	2.1	-	<0.001
Molybdenum	2.8	-	-	1.4	-	-
Nickle	27	-	-	20	-	-
Selenium	0.57	-	-	0.37	-	-
Silver	1.1	-	-	0.6	-	-
Thallium	0.15	-	-	0.0069	-	-
Vanadium	71	-	-	35	-	-
Zinc	960	-	-	4,500	-	230

Notes:
See Appendix M for Laboratory Reports and Chain of Custody Documentation
TCLP extraction and analysis was performed when the total concentration exceeded 20x the TCLP and WET extraction and analysis were performed when the total concentration exceeded 10x the STLC
"-" indicates concentration did not exceed 10x the STLC or TCLP, as applicable, and as a result, the analyte was not analyzed in the WET or TCLP extracts

TCLP - Toxicity Characteristic Leaching Proceedure
WET - Waste Extraction Test
mg/L - miligrams per liter
mg/kg - milligrams per kilogram

Hangar One Pilot Scale Study

K-3: Vapor Media Waste Profile Results Analyte: PCBs and Metals		Sampling Co.: ACC Environmental Consultants, Inc. QA/QC: Jill Henes		
Sample Matrix	**Liquid (mg/L)**	**Solid**		
Total PCBs	<0.001	0.11 mg/kg		
Analysis Type	**Total Concentration**	**Total Concentration (mg/kg)**	**TCLP (mg/L)**	**WET (mg/L)**
Antimony	0.29	46	-	-
Arsenic	0.86	13	-	-
Barium	0.35	650	-	-
Beryllium	<0.1	0.63	-	-
Cadmium	0.006	1.6	-	-
Chromium	0.31	67	-	2.5
Cobalt	0.013	23	-	-
Copper	0.6	1,600	-	0.076
Lead	5.6	300	5.7	62
Mercury	NA	0.32	-	-
Molybdenum	0.006	2.8	-	-
Nickle	0.023	32	-	-
Selenium	0.002	0.59	-	-
Silver	0.0004	1	-	-
Thallium	0.0001	0.007	-	-
Vanadium	0.01	63	-	-
Zinc	8.8	1,600	-	-

Notes:
See Appendix M for Laboratory Reports and Chain of Custody Documentation
TCLP extraction and analysis was performed when the total concentration exceeded 20x the TCLP and WET extraction and analysis were performed when the total concentration exceeded 10x the STLC
"-" indicates concentration did not exceed 10x the STLC or TCLP, as applicable, and as a result, the analyte was not analyzed in the WET or TCLP extracts

TCLP - Toxicity Characteristic Leaching Proceedure
WET - Waste Extraction Test
mg/L - miligrams per liter
mg/kg - milligrams per kilogram

Hangar One Pilot Scale Study

K-4: Containment Structure and Miscellaneous Waste Profile Results
Analyte: PCBs and Metals

Sampling Co.: ACC Environmental Consultants, Inc.
QA/QC: Jill Henes

Waste Source	**Containment**			**Containment with Tape/Paint**			**Miscellaneous Waste**	
Sample Matrix	**Solid**			**Solid**			**Solid**	
Total PCBs	<0.18 mg/kg			<0.59 mg/kg			<0.35 mg/kg	
Analysis Type	Total Concentration (mg/kg)	TCLP (mg/L)	WET (mg/L)	Total Concentration (mg/kg)	TCLP (mg/L)	WET (mg/L)	Total Concentration (mg/kg)	WET (mg/L)
Antimony	740	-	-	8.5	-	0.18	7.7	-
Arsenic	45	-	-	1.6	-	-	<0.67	-
Barium	130	-	-	110	-	-	32	-
Beryllium		-	-	0.079	-	-	<0.25	-
Cadmium	1.6	-	-	0.77	-	-	0.083	-
Chromium	10	-	-	9.5	-	-	2.1	-
Cobalt	2.1	-	-	5	-	-	0.48	-
Copper	36	-	0.14	280	-	-	26	-
Lead	610	2.1	0.91	2,900	6.2	37	84	5.8
Mercury	0.13	-	-	0.1	-	-	0.015	-
Molybdenum	0.64	-	-	0.65	-	-	0.15	-
Nickle	8.3	-	-	5.6	-	-	0.87	-
Selenium	<2	-	-	<2.0	-	-	<2.0	-
Silver	0.082	-	-	0.059	-	-	0.067	-
Thallium	0.1	-	-	0.098	-	-	<0.25	-
Vanadium	5	-	-	11	-	-	1	-
Zinc	270	-	-	290	-	-	42	-

Notes:
See Appendix M for Laboratory Reports and Chain of Custody Documentation
TCLP extraction and analysis was performed when the total concentration exceeded 20x the TCLP and WET extraction and analysis were performed when the total concentration exceeded 10x the STLC
"-" indicates concentration did not exceed 10x the STLC or TCLP, as applicable, and as a result, the analyte was not analyzed in the WET or TCLP extracts

TCLP - Toxicity Characteristic Leaching Proceedure
WET - Waste Extraction Test
mg/L - miligrams per liter
mg/kg - milligrams per kilogram

Appendix C

Cost Estimates for Remedial Alternatives

Table C-1	Alternative 2: Establishment of Institutional Controls and Implementation of Operations, Maintenance, and Monitoring Activities; and
Table C-2	Alternative 3: Media Blasting and Cleaning

TABLE C-1
Alternative 2: Establishment of Institutional Controls and Implementation of Operations, Maintenance, and Monitoring Activities
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

Item	Opinion of Estimated Costs (a)				
	Unit	**Quantity**	**Unit Cost**	**Line Totals**	**Subtotals**
CAPITAL COSTS					
CONSTRUCTION COSTS (b)(c)					
● General Site Preparation					
Mobilization (Assumed 3% of construction costs excluding transport and disposal)	%	3%	$6,320,000	$189,600	
Site Cleanup and Demobilization (Assumed 1% of contractor costs excluding transport and disposal)	%	1%	$6,320,000	$63,200	
Health and Safety Monitoring Costs (Assumed 2% of contractor costs excluding transport and disposal)	%	2%	$6,320,000	$126,400	
Subtotal: General Site Preparation					$380,000
● Installation of Signs					
Furnish signs	ls	1	$5,000	$5,000	
Two days of work by Contractor	hrs	16	$50	$800	
Subtotal: Installation of Signs					$6,000
● Baseline soil sampling (Assumed up to 20 multi-increment soil samples will be analyzed for PCBs and lead. Assumed sampling will require 5 days of field work for 2 individuals).	ls	1	$20,000	$20,000	$20,000
Coating Maintenance					
Assumed that approximately 5% of the entire Hangar 1 structure (approximately 1,800,000 square feet in area) will need to be maintained in Year 0.					
● General Coating Conditions Assessment (d)					
Assumed 2 days of inspection will be necessary and that a coatings inspector, quality control manager, and Site superintendent will be required.	ls	1	$6,000	$6,000	
● Detailed Visual Inspection (d)	ls	1	$168,000	$168,000	
Assumed 5 days will be necessary to perform the detailed visual inspection and various lift equipment (e.g., lifts, booms, cranes) will be required.					
● Surface Preparation, Spot Abatement (including asbestos), Maintenance, and Recoating Activities					
Up to 80 feet (e)	sf	45,000	$57	$2,565,000	
Up to 135 feet (e)	sf	36,000	$72	$2,592,000	
Greater than 135 feet (e)	sf	9,000	$107	$963,000	
● Waste Characterization and Disposal (includes stripped paints and coatings, PPE, etc.) (f)					
Waste characterization (1 sample/15 tons of waste)	ea	9	$700	$6,300	
TSCA and RCRA waste transport and disposal (stabilization)	tons	121.5	$300	$36,450	
TSCA waste transport and disposal	tons	6.8	$230	$1,553	
RCRA waste transport and disposal	tons	6.8	$200	$1,350	
Subtotal: Coating Maintenance					$6,340,000
Subtotal: Construction Costs without Markup					$6,750,000
Construction Markup (10% of Construction Subtotal)	ls	10%	$6,750,000	$675,000	$675,000
Subtotal: Construction Costs					***$7,400,000***

TABLE C-1
Alternative 2: Establishment of Institutional Controls and Implementation of Operations, Maintenance, and Monitoring Activities
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

Item	Opinion of Estimated Costs (a)				
	Unit	Quantity	Unit Cost	Line Totals	Subtotals
CAPITAL COSTS (continued)					
Capital Contingency Costs					
● Bid Contingency (15% of estimated capital costs (g))	%	15%	$7,400,000	$1,110,000	
● Scope Contingency (10% of estimated capital costs (g))	%	10%	$7,400,000	$740,000	
Subtotal: Capital Contingency Costs					$1,850,000
Subtotal: Estimated Capital Costs and Contingencies					$9,250,000
Capital Professional/Technical Costs					
● Project Management (5% of estimated capital costs and contingencies (g))	%	5%	$9,250,000	$462,500	
● Remedial Design (6% of estimated capital costs and contingencies (g)(h))	%	6%	$9,250,000	$555,000	
● Construction Management (6% of estimated capital costs and contingencies (g))	%	6%	$9,250,000	$555,000	
Subtotal: Capital Professional/Technical Costs					$1,570,000
Subtotal: Capital Costs + Contingencies + Professional/Technical Costs					***$10,800,000***
INSTITUTIONAL CONTROLS DOCUMENTATION COSTS					
Access and Administrative Agreements (c)					
● Legal Fees	hrs	80	$500	$40,000	
● Environmental Consulting Support	hrs	40	$240	$9,600	
Subtotal Access and Administrative Agreements (c)					$50,000
Documentation (c)					
● Work Plans					
Long-term management plan	hrs	200	$240	$48,000	
Sampling and analysis plan	hrs	80	$240	$19,200	
Site-specific health and safety plan	hrs	20	$240	$4,800	
Quality Control plan	hrs	40	$240	$9,600	
Subtotal Work Plans					*$82,000*
Subtotal: Institutional Controls Documentation Costs					***$130,000***
TOTAL CAPITAL COSTS (i)					**$10,900,000**

TABLE C-1

Alternative 2: Establishment of Institutional Controls and Implementation of Operations, Maintenance, and Monitoring Activities

DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis

Former Naval Air Station Moffett Field, California

Item	Opinion of Estimated Costs (a)				
	Unit	Quantity	Unit Cost	Line Totals	Subtotals
PERIODIC COSTS					
INSPECTIONS, SAMPLING, AND PERIODIC REPORTING COSTS					
General Coatings Assessment and Detailed Visual Inspections *Conducted every three years until Hangar 1 is re-sided (i.e., Year 7) and every 3 years thereafter. Involves: Performance of a general coating conditions assessment and a detailed visual inspection and the preparation of reports summarizing these activities.*	ea	9	$16,000	$144,000	
Sediment Sampling (outside of Hangar 1) *Conducted annually until Hangar 1 is re-sided (i.e., Year 7). Involves: (1) the collection of sediment samples from 4 locations once per year, (2) the characterization of these samples (and associated quality assurance/ quality control samples) for PCBs and lead, and (3) the preparation of an annual sediment sampling report.*	ea	7	$12,000	$84,000	
Wipe Sampling (within Hangar 1) *Conducted annually after Hangar 1 is re-sided (i.e., Year 7). Involves: (1) the collection of wipe samples from 50 locations once per year, (2) the characterization of these samples (and associated quality assurance/ quality control samples) for PCBs and lead, and (3) the preparation of an annual wipe sampling report.*	ea	24	$19,000	$456,000	
Long-Term Management Reports (5-Year Reviews) *Involves the preparation/review of 5-Year Review Reports.*	ea	6	$14,400	$86,400	
TOTAL PRESENT WORTH OF INSPECTIONS, SAMPLING, AND PERIODIC REPORTING COSTS (30 YEARS) (j)(k)					**$370,000**
PERIODIC LONG-TERM MANAGEMENT AND COATING MAINTENANCE COSTS					
Surface Preparation, Coating Maintenance, and Waste Characterization/Disposal					
Years 3 and 6: Conduct maintenance on 2% of total Hangar 1 surface area (approximately 1,800,000 square feet)	ea	2	$2,700,000	$5,400,000	
Year 7: Conduct maintenance on 15% of total Hangar 1 surface area (includes attachment points for Hangar 1 siding and areas where structural upgrades are required (see Note (b)).	ls	1	$20,200,000	$20,200,000	
Years 10, 13, 16, 19, 22, 25, and 28: Conduct maintenance on 0.5% of total Hangar 1 surface area	ea	7	$700,000	$4,900,000	
TOTAL PRESENT WORTH OF PERIODIC LONG-TERM MANAGEMENT AND COATING MAINTENANCE COSTS (30 YEARS) (j)(l)					**$30,600,000**
TOTAL PERIODIC COSTS (i)					**$31,000,000**
ESTIMATED TOTAL PRESENT WORTH (CAPITAL AND PERIODIC COSTS) (i)					**$41,900,000**

TABLE C-1

Alternative 2: Establishment of Institutional Controls and Implementation of Operations, Maintenance, and Monitoring Activities

DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis

Former Naval Air Station Moffett Field, California

Abbreviations

ea = each
EPA = Environmental Protection Agency
hrs = hours
ICs = institutional controls
ls = lump sum
OMM = operations, maintenance, and monitoring
PCBs = polychlorinated biphenyls
sf = square feet
U.S. = United States

Notes

(a) This opinion of estimated cost has been prepared to provide estimated ranges of costs for use in comparing the alternatives described in this Engineering Evaluation/Cost Analysis, actual costs may differ. Unit costs and quantities for this estimate have been obtained from several sources, including recent cost estimates provided by construction and abatement contractors (as cited herein) and past estimates prepared by others (e.g., estimates included in the Navy's 2013 Focused Feasibility Study (RORE, 2013)). Some unit costs and quantities have been estimated based on EKI's professional judgement and project experience in the San Francisco Bay Area. Totals may not sum exactly due to rounding.

(b) Construction costs do not include the costs associated with the scaffolding required (estimated to cost between $40 and 50 million) to conduct the seismic upgrades (estimated to cost approximately $23 million; estimate provided by Power Engineering Construction Company in 2018) that would be conducted following spot abatement and preceding the recoating activities.

(c) Costs are based on the conceptual-level design and professional judgement for projects of this scale.

(d) Estimated costs for this task are generally consistent with those presented in the Navy's 2013 Focused Feasibility Study (RORE, 2013).

(e) Abatement cost estimates provided by EcoBay Services, Inc., a lead and asbestos abatement and coating removal contractor, and recoating cost estimates provided by Power Engineering Construction Company and Currie & Brown in 2018.

(f) Waste production rates provided by EcoBay Services, Inc. Waste characterization and disposal costs based on estimates obtained by EKI from analytical laboratories and waste disposal facilities.

(g) Exhibits 5-6 through 5-8 in Section 5.5 of U.S. EPA, 2000 were used to estimate OMM and capital contingency and professional/technical costs.

(h) Remedial design for the implementation of ICs and OMM will be significantly more intensive than the remedial design for the full-scale abatement of the Hangar 1 structure.

(i) This is an order-of-magnitude engineering cost estimate that is expected to be within -30 to +50 percent of the actual project cost (U.S. EPA, 1999; U.S. EPA, 2000).

(j) Present worth costs are shown in 2018 dollars calculated assuming a 30-year duration and a discount rate of 7% (U.S. EPA, 2000).

(k) Costs include a 15% contingency (5% scope, 10% bid) and project management equal to 8% of costs plus contingencies.

(l) Costs include a 25% contingency (10% scope, 15% bid) and professional/technical cost equal to 33% (8% project management, 15% remedial design, 10% construction management) of costs plus contingencies.

References

RORE, 2013. Focused Feasibility Study, Installation Restoration Site 29 (Hangar 1), Former Naval Air Station Moffett Field, California, RORE, Inc., May 2013.

U.S. EPA, 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents. EPA/540/R-98/031. United States Environmental Protection Agency. July 1999.

U.S. EPA, 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study.* EPA 540-R-00-002. U.S. Army Corps of Engineers, Hazardous, Toxic, and Radioactive Waste Center of Expertise and U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, July 2000.

TABLE C-2

Alternative 3: Removal of Existing Paints - Media Blasting and Cleaning

DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis

Former Naval Air Station Moffett Field, California

Item	Unit	Quantity	Unit Cost	Line Totals	Subtotals
	Opinion of Estimated Costs (a)				
CAPITAL COSTS					
CONSTRUCTION COSTS (b)(c)					
● General Site Preparation					
Mobilization (Assumed 3% of construction costs excluding transport and disposal	%	3%	$46,800,000	$1,400,000	
Site Cleanup and Demobilization (Assumed 1% of contractor costs excluding transport and disposal	%	1%	$46,800,000	$470,000	
Health and Safety Monitoring Costs (Assumed 2% of contractor costs excluding transport and disposal	%	2%	$46,800,000	$940,000	
Subtotal: General Site Preparation					$2,810,000
● Baseline soil sampling (Assumed up to 20 multi-increment soil samples will be analyzed for PCBs and lead. Assumed sampling will require 5 days of field work for 2 individuals)	ls	1	$20,000	$20,000	$20,000
● Construction of Containment, Asbestos Abatement (as necesssary), Media Blasting/Chemical Abatement and Cleaning (e Includes costs related to the construction of the containment enclosures and floor membranes, blast media, abatemen labor, ground support labor, equipment rental costs, industrial health and safety monitoring, etc	ls	1	$28,800,000	$28,800,000	$28,800,000
● Re-coat structural steel with Paint/Primer (d)	ls	1	$18,000,000	$18,000,000	$18,000,000
● Waste Management (Characterization, Transportation, and Disposal) (f)					
Waste Characterization - Media Blasting Wastes (1 sample/250 ton)	ea	26	$1,350	$35,100	
Waste Characterization - PPE and Containment Structure Wastes (1 sample/10 CY)	ea	12	$1,350	$16,200	
Waste Characterization - Liquid Decontamination Wastes (1 sample/5,000 gallons)	ea	4	$1,350	$5,400	
Costs include: sample collection, analysis, evaluation, and Agency notifications					
Media Blasting Wastes (TSCA- and RCRA-regulated)	ton	6,500	$300	$1,950,000	
PPE and Containment Structure Wastes (RCRA-regulated waste)	ton	9	$250	$2,300	
Approximately 120 cubic yards					
Liquid Decontamination Wastes (RCRA-regulated waste)	ton	8	$250	$2,100	
Approximately 20,000 gallons, solidified					
Miscellaneous wastes (Non-Hazardous)	ton	68	$130	$8,800	
Approximately 900 cubic yards					
Subtotal: Waste Management (Characterization, Transportation, and Disposal					$2,000,000
Subtotal: Construction Costs without Markup					$51,600,000
Construction Markup (10% of Construction Subtotal)	ls	10%	$51,600,000	$5,160,000	$5,160,000
Subtotal: Construction Costs					***$56,800,000***

TABLE C-2

Alternative 3: Removal of Existing Paints - Media Blasting and Cleaning

DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis

Former Naval Air Station Moffett Field, California

Item	Opinion of Estimated Costs (a)				
	Unit	**Quantity**	**Unit Cost**	**Line Totals**	**Subtotals**
CAPITAL COSTS (Continued)					
ENGINEERING SERVICES					
● Remedial design (c)	ls	1	$1,000,000	$1,000,000	$1,000,000
● Environmental Sampling and Monitoring (for lead and PCBs) (c)					
Costs include: sample collection, analysis, evaluation, data management, and communication of results					
Perimeter Air Monitoring (30 months; 21 working days per month)	day	252	$2,200	$554,400	
Assumed media blasting and perimeter air monitoring occurs on 2 out of every 5 days					
Includes sampling for PCBs, lead, and copper, and real-time dust monitoring					
Confirmation Sampling					
Wipe Sampling (assumed 1 sample per 1,000 square feet; 25 samples/day; approximately 1,800 wipe samples)	day	72	$10,500	$756,000	
Bulk Media Sampling (assumed 1 sample per 500 square feet; 10 samples/day; approximately 140 bulk samples	day	14	$4,500	$64,800	
Subtotal: Environmental Sampling and Monitoring (for lead and PCBs) (c					$1,400,000
● Engineering Oversight during Abatement Activities (c)					
Pre-Mobilization Contractor Coordination	ls	1	$20,000	$20,000	
Senior Engineering Manager (Assumed 1/3 time)	mo	30	$14,000	$420,000	
On-Site Engineering Support (Assumed full-time)	mo	30	$34,000	$1,020,000	
Engineering Office Support (Assumed 1/2 time)	mo	30	$12,400	$372,000	
Lease vehicle for field engineer	mo	30	$1,300	$39,000	
Subtotal: Engineering Oversight during Abatement Activities					$1,900,000
● Regulatory Agencies Approvals					
Obtain Regulatory Agency Approvals Pursuant 40 CFR §761.79(h)	ls	1	$300,000	$300,000	$300,000
● Reporting (c)					
Preparation of NTCRA Work Plan and associated documents	ls	1	$150,000	$150,000	
Preparation of After-Action Completion Report	ls	1	$250,000	$250,000	
Subtotal: Reporting					$400,000
Subtotal: Engineering Services					$5,000,000
Subtotal: Construction Costs + Engineering Services					***$61,800,000***
Capital Contingency Costs					
● Bid Contingency (15% of estimated capital costs (g))	%	15%	$61,800,000	$9,270,000	
● Scope Contingency (10% of estimated capital costs (g))	%	10%	$61,800,000	$6,180,000	
Subtotal: Capital Contingency Costs					$15,450,000
Subtotal: Estimated Capital Costs and Contingencies					$77,250,000

TABLE C-2
Alternative 3: Removal of Existing Paints - Media Blasting and Cleaning
DRAFT - Hangar 1 Engineering Evaluation/Cost Analysis
Former Naval Air Station Moffett Field, California

Item	Opinion of Estimated Costs (a)				
	Unit	Quantity	Unit Cost	Line Totals	Subtotals
CAPITAL COSTS (Continued)					
Capital Professional/Technical Costs					
● Project Management (5% of estimated capital costs and contingencies (g))	%	5%	$77,250,000	$3,862,500	
● Construction Management (6% of estimated capital costs and contingencies (g))	%	6%	$77,250,000	$4,635,000	
Subtotal: Capital Professional/Technical Costs					$8,500,000
Subtotal: Construction Costs + Engineering Services + Contingencies + Professional/Technical Costs					***$85,800,000***
ESTIMATED TOTAL CAPITAL COST (h)					**$85,800,000**

Abbreviations

CFR = Code of Federal Regulations
CY = cubic yards
ea = each
EPA = Environmental Protection Agency
ls = lump sum
NTCRA = non-time critical removal action
PCB = polychlorinated biphenyl
PPE = personal protective equipment
RCRA = Resource Conservation and Recovery Act
sf = square feet
TSCA = Toxic Substances Control Act
U.S. = United States

Notes

(a) This opinion of estimated cost has been prepared to provide estimated ranges of costs for use in comparing the alternatives described in this Engineering Evaluation/Cost Analysis, actual costs may differ. Unit costs and quantities for this estimate have been obtained from several sources, including recent cost estimates provided by construction and abatement contractors (as cited herein). Some unit costs and quantities have been estimated based on EKI's professional judgement and project experience in the San Francisco Bay Area. Totals may not sum exactly due to rounding.
(b) Construction costs do not include the costs associated with scaffolding (estimated at approximately $54 million by Currie & Brown in 2018) or the required seismic upgrades (estimated at approximately $17 million by Power Engineering Construction Company in 2018) that would be conducted following abatement and preceding the recoating activities.
(c) Costs are based on the conceptual-level design and professional judgement for projects of this scale.
(d) Cost provided by Currie & Brown in 2018.
(e) Cost presented based on cost estimates provided by EcoBay Services, Inc., a lead and asbestos abatement and coating removal contractor, Power Engineering Construction Company, and Currie & Brown in 2018.
(f) Waste production volumes provided by EcoBay Services, Inc. Waste characterization and disposal costs based on estimates obtained by EKI Environment & Water, Inc. from analytical laboratories and waste disposal facilities.
(g) Exhibits 5-6 through 5-8 in Section 5.5 of U.S. EPA, 2000 were used to estimate capital contingency and professional/technical costs.
(h) This is an order-of-magnitude engineering cost estimate that is expected to be within -30 to +50 percent of the actual project cost (U.S. EPA, 1999; U.S. EPA, 2000).

References

U.S. EPA, 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents. EPA/540/R-98/031. United States Environmental Protection Agency. July 1999.
U.S. EPA, 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* EPA 540-R-00-002. U.S. Army Corps of Engineers, Hazardous, Toxic, and Radioactive Waste Center of Expertise and U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, July 2000