Erler & Kalinowski, Inc.

ENVIRONMENTAL ISSUES MANAGEMENT PLAN

MFA Leasehold
Former NAS Moffett Field, California

(Text, Tables, and Figures)

3 March 2015

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President

ENVIRONMENTAL ISSUES MANAGEMENT PLAN
MFA Leasehold
Former NAS Moffett Field, California

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LIST OF ACRONYMS / ABBREVIATIONS

ACM	asbestos-containing materials
ARC	NASA Ames Research Center
AST	aboveground storage tank
BAAQMD	Bay Area Air Quality Management District
bgs	below ground surface
BMPs	best management practices
BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene and xylenes
Cal-EPA	California Environmental Protection Agency
CBC	California Building Code
CDF	controlled density fill
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cis-1,2-DCE	cis-1,2-dichloroethene
COPC	chemical of potential concern
CWMI	Chemical Waste Management, Inc.
1,1-DCA	1,1-dichloroethane
1,2-DCA	1,2-dichloroethane
1,1-DCE	1,1-dichloroethene
DERP	Defense Environmental Restoration Program
DHS	Department of Health Services
DTSC	Department of Toxic Substances Control
EATS	East-Side Aquifer Treatment System
EEC	Existing Environmental Conditions
EIMP	Environmental Issues Management Plan
EIS	Environmental Impact Statement
EKI	Erler & Kalinowski, Inc.
ESL	Environmental Screening Level
FFA	Federal Facility Agreement
GAC	granular activated carbon
GWTS	groundwater treatment system
HAZWOPER	hazardous waste site operations
HDPE	high-density polyethylene
HI	Hazard Index
H&SP	health and safety plan
LCM	lead-containing material
LTA	lighter-than-air
LUC	land use restrictions and institutional controls
MCL	maximum contaminant level
MEW	Middlefield-Ellis-Whisman
MFA	Moffett Federal Airfield
MFA Leasehold	An approximately 1,000-acre parcel that was formerly part of Naval Air Station Moffett Field in Santa Clara County, California
mg/kg	milligrams per kilogram
mph	miles per hour
NADP EIS	NASA Ames Development Plan Environmental Impact Statement
NASA	National Aeronautics and Space Administration
NAS	Naval Air Station
Navy	Department of the Navy
NEX	Naval Exchange
NPDES	National Pollutant Discharge Elimination System

NPL	National Priorities List
NRP	NASA Research Park
NTCRA	Non-Time-Critical Removal Action
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PEL	Permissible Exposure Limit
PID	photo-ionization detector
POTW	Publicly-Owned Treatment Works
PPE	personal protective equipment
ppm	parts per million
ppmv	parts per million by volume
PPV	positive-pressure ventilation
PRG	Preliminary Remediation Goal
PV	Planetary Ventures, LLC
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSL	Regional Screening Level
SCVWD	Santa Clara Valley Water District
Site	Naval Air Station Moffet Field Superfund Site
SMD	sub-membrane depressurization
SSD	sub-slab depressurization
SSV	sub-slab ventilation
STLC	Soluble Threshold Limit Concentration
SVOC	semi-volatile organic compound
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
1,1,1-TCA	1,1,1-trichloroethane
TCE	trichloroethene
TCL	target concentration level
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbons
TPHd	total petroleum hydrocarbons as diesel
TPHg	total petroleum hydrocarbons as gasoline
TSCA	Toxic Substances Control Act
TTO	total toxic organics
trans-1,2-DCE	trans-1,2-dichloroethene
TCSA	Toxic Substances Control Act
TTLC	total threshold limit concentration
ug/L	micrograms per liter
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VI	vapor intrusion
VOC	volatile organic compound
Water Board	California Regional Water Quality Control Board, San Francisco Bay Region
WATS	West-Side Aquifers Treatment System
WET	waste extraction test

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EXECUTIVE SUMMARY

The National Aeronautics and Space Administration ("NASA") has entered into a lease ("Lease") for an approximately 1,000-acre parcel ("MFA Leasehold") that was formerly part of Naval Air Station Moffett Field in Santa Clara County, California (Figure 1) with Planetary Ventures, LLC ("Master Lessee"). The MFA Leasehold is located within the Naval Air Station Moffett Field Superfund Site ("Site") and soil and groundwater within the MFA Leasehold have been impacted by historical use by the Navy, as well as by the migration of groundwater containing chlorinated volatile organic compounds ("VOCs") from the upgradient Middlefield-Ellis-Whisman ("MEW") Superfund Site located south and west of the MFA Leasehold in the City of Mountain View and the NASA Ames Research Center.

This Environmental Issues Management Plan ("EIMP") provides a decision framework for the management of residual chemicals in soil, groundwater, and existing stuctures within the MFA Leasehold during occupancy and development. The EIMP is intended to describe procedures to address the known remaining environmental conditions within the MFA Leasehold, as well as contingency actions to be taken in the event that previously unknown environmental conditions are encountered during development of the MFA Leasehold. The purpose of the EIMP is to provide sufficient information to the Master Lessee, its tenants, and Project Developers,[1] to comply with land use restrictions and institutional controls ("LUCs") and take reasonable steps with respect to environmental conditions within the MFA Leasehold to help ensure that occupancy and development activities within the MFA Leasehold do not exacerbate environmental conditions or adversely impact ongoing response actions by the Responsible Parties.

It is the intent of the Master Lessee and NASA that the parties that have been named by U.S. Environmental Protection Agency ("U. S. EPA") or the California Regional Water Quality Control Board, San Francisco Bay Region ("Water Board") as, or are otherwise, the Responsible Parties (i.e., Navy, MEW Companies, and NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their ongoing obligations such as, but not limited to, investigation, monitoring, remediation, operations, maintenance, and reporting, independent of the Master Lessee.[2] Figure 4 and Figure 5 illustrate the Responsible Parties for soil, groundwater, and vapor intrusion issues within the MFA Leasehold. The Navy is the Responsible Party for Hangar 1.

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[1] In this document, "Project Developer" refers to the entity performing the project in question.

[2] Refer to the 1990 Federal Facility Agreement ("FFA"; U.S. EPA, 1990) as amended in 1993 (U.S. EPA, 1993); the 1992 Memorandum of Understanding (NASA/Navy, 1992) and 1993 clarification letter (Navy, 1993); the 2014 FFA (U.S. EPA, 2014c); and Records of Decision ("ROD") for OU 2 (Navy, 1994), OU 5 (Navy, 1996), OU 1 (Navy, 1997), OU 00 (No Action Sites; Navy, 2002a), IR Site 22 Landfill (Navy, 2002b), IR Site 27 (Navy, 2005), IR Site 25 (Navy, 2010); Navy ROD Amendment (Navy, 2014); and MEW Superfund Study Area ROD Amendment (U.S. EPA, 2010b).

The implementation of this EIMP by NASA, Master Lessee, tenants, Project Developers, and other entities, is not intended to relieve the Responsible Parties of their responsibilities and ongoing obligations. Rather, this EIMP allocates as between NASA and Master Lessee who will take actions to address environmental conditions in the event of non-performance or delayed performance by the Responsible Party, but such actions will not result in Master Lessee becoming a Responsible Party. NASA will facilitate communication between the Master Lessee and the Responsible Party when requested.

The EIMP was developed with input from the U.S. EPA and the Water Board as lead regulatory agencies[3] for the MFA Leasehold to identify and describe the measures to be taken during Site development to address environmental conditions within the MFA Leasehold. By prescribing procedures to be followed if contaminated structures, soil, and groundwater are encountered during development activities within the MFA Leasehold, the potential for delays due to environmental conditions can be reduced.

The EIMP provides a baseline of minimum design considerations for new construction, risk management measures to be implemented during construction at the Site, post-construction risk management procedures for future subsurface activities at the Site, as well as procedures for long-term compliance with this EIMP, CERCLA, and other environmental requirements. All Master Lessee partners, tenants, Project Developers and other entities with responsibility for activities within the MFA Leasehold shall have the independent obligation to: (1) review available information concerning environmental conditions within the MFA Leasehold; (2) determine the adequacy of this EIMP with respect to expected environmental conditions as well as the conditions actually encountered during development and the intended land use; (3) evaluate the current understanding of the health and environmental effects of identified chemicals of potential concern ("COPCs"), to the extent the understanding of health and environmental effects assumed in this EIMP may change; (4) comply with applicable policies, laws and regulations; and (5) establish management procedures to ensure that risk management measures are properly implemented and maintained.

In addition to the responsibilities listed above, the Master Lessee and NASA will: (1) inform the applicable regulatory agencies of any relevant changes within the MFA Leasehold; and (2) ensure that the EIMP is reviewed by qualified environmental professionals and modified periodically, as necessary, to address relevant changes and seek review and approval from the applicable regulatory agencies for any relevant changes to the EIMP. Relevant changes include changes in environmental conditions, land uses and/or applicable laws and regulations.

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[3] With respect to the contamination within the MEW Superfund Study Area, the U.S. EPA is the lead regulatory agency and with respect to contamination within the Naval Air Station Moffett Field Superfund Site, the Navy is the lead agency and the U.S. EPA and Water Board are the lead environmental regulatory agencies.

Existing Environmental Conditions

Numerous potential source areas within the MFA Leasehold have been investigated and remediated by the Navy and NASA; these sources are primarily associated with underground storage tanks ("USTs") and sumps that contained petroleum hydrocarbon products and/or chlorinated VOCs.

A large regional plume of chlorinated VOCs is present west of the MFA Leasehold; this plume extends onto the MFA Leasehold in two areas on the western side of the leasehold. The primary source of this contamination is migration of contaminated groundwater from the upgradient MEW Superfund Site that has commingled with groundwater contamination from Navy chlorinated solvent sources located within the NASA Research Park ("NRP") and NASA sources within the NASA Ames Research Center. A second chlorinated solvent plume is located northeast of Hangar 3. In addition, petroleum hydrocarbons and fuel-related constituents, such as benzene, toluene, ethylbenzene and xylenes ("BTEX"), from sources at Moffett Field have also impacted groundwater beneath the MFA Leasehold. While the Navy is the only entity that has installed and is operating a groundwater remediation system within the MFA Leasehold,[4] the companies remediating the MEW Superfund Site ("MEW Companies") and NASA have installed and are operating groundwater remediation systems just outside the MFA Leasehold and several of their groundwater monitoring wells are located within the MFA Leasehold.

As a result of investigations and remedial actions that have been performed within the MFA Leasehold, the identified environmental conditions and primary COPCs that need to be considered during redevelopment are:

- the presence of chlorinated VOCs in groundwater and in soil within the MFA Leasehold;
- the presence of total petroleum hydrocarbons and other fuel-related constituents, including BTEX compounds, in groundwater and in soil within the MFA Leasehold;
- the presence of elevated concentrations of polychlorinated biphenyls ("PCBs") in soil surrounding buildings or transformers;
- the presence of elevated concentrations of lead in soil surrounding buildings;
- the presence of chlorinated VOCs in sub-slab vapors beneath Hangars 2 and 3;[5]

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[4] While the Navy's West-Side Aquifers Treatment System ("WATS") is primarily located outside of the MFA Leasehold, a few groundwater extraction wells and their associated piping, and several groundwater monitoring wells are located within the MFA Leasehold.

[5] Due to the presence of chlorinated VOCs in shallow groundwater beneath Hangar 1 and within the utility tunnel between Building 10 and Hangar 1, chlorinated VOCs are anticipated in the sub-slab vapors beneath Hangar 1.

- existing subsurface structures (e.g., sumps or tanks) that may need to be removed; and,

- building materials containing hazardous materials (e.g., asbestos-containing materials in existing buildings and the presence of lead and PCBs in the structural materials at Hangar 1).

During all redevelopment activities within the MFA Leasehold, the Project Developer will comply with LUCs and conduct development activities in a manner that is protective of on-site construction workers and any implemented remedies (or remedies still being investigated or that are under development) within the development area.

POTENTIAL EXPOSURE PATHWAYS

The Preferred Alternative in the 2002 Final Programmatic Environmental Impact Statement for the NASA Ames Research Center specified that all of the land that has become the MFA Leasehold be designated for commercial/industrial land use only. The intended land use for the MFA Leasehold includes research and development or light industrial uses and the continued operation of the airfield and its associated fueling facilities. As a result, the primary potential future receptors include (a) construction workers and maintenance workers, (b) indoor workers, such as office personnel and lab workers, (c) recreational users of the golf course, and (d) visitors (adults and children) to a potential future museum. Potential future receptors may be exposed to COPCs by one or more of the following pathways:

- inhalation of volatile chemicals from groundwater or soil;

- dermal absorption due to direct soil and/or groundwater contact;

- inhalation of airborne suspended soil particulates; and

- incidental soil ingestion.

VOCs are the primary COPCs found within the MFA Leasehold. VOCs in groundwater and soil can volatilize into the pore spaces within unsaturated zone soils and migrate through the soil column and through cracks or penetrations in floors into enclosed indoor spaces, where they can be inhaled by potential receptors. The migration of COPCs from the subsurface into indoor air is called “vapor intrusion.” Vapor intrusion is the primary potentially complete exposure pathway that could affect future indoor workers within the MFA Leasehold. Areas where vapor intrusion may be a potential concern include the MEW Site VI Study Area, Hangar 1, Hangar 2, Hangar 3, portions the IR Site 26 Land Use Control Area (Figure 6), and the potential non-MEW Site VI Study Areas east of the airfield runways (Figure 5).

Target Concentration Levels ("TCLs")

While cleanup standards have been developed for many areas at the MFA Leasehold, to simplify implementation of the EIMP, TCLs were developed for soil, groundwater, sub-slab vapor, soil gas, and indoor air within the MFA Leasehold using the screening levels currently promulgated by applicable regulatory agencies (i.e., U.S. EPA's Regional Screening Levels or "RSLs" and the Water Board's Environmental Screening Levels or "ESLs"). These TCLs should be used to determine (a) groundwater management or disposal options (Section 6.3.4), (b) whether excavated soil can be reused as fill within the MFA Leasehold and whether additional soil removal should be considered[6] at locations where potential soil contamination is observed during development (as described further in Section 6.10), and (c) whether vapor intrusion mitigation measures (Section 5.1.3) may need to be installed in existing and/or new buildings.

The identified TCLs should also be protective[7] of short-term construction workers, maintenance workers performing periodic subsurface activities, indoor workers within the MFA Leasehold, recreational users of the golf course, and visitors (adults and children) to a potential future museum because the exposure pathways, potential receptors, and exposure assumptions used in developing the U.S. EPA's RSLs and the Water Board's ESLs are similar to (or more conservative than) those anticipated within the MFA Leasehold. Unless specific unique exposure assumptions that could result in more intensive exposure to workers or other populations are identified for a proposed development project, neither the Master Lessee nor the Project Developer will be required to prepare a human health risk assessment for the proposed development.

Based on historic soil and groundwater data collected within the MFA Leasehold, TCLs were identified for several chlorinated VOCs, petroleum hydrocarbons and BTEX compounds, PAHs, PCBs, and Title 22 metals. Generally, the selected TCL is the lower of the U.S. EPA's Regional Screening Level (U.S. EPA, 2014) and the Regional Water Quality Control Board's Environmental Screening Level (Water Board, 2013) assuming a commercial/industrial land use scenario.

TCLs for soil, groundwater, sub-slab soil vapors, soil gas, and indoor air are summarized below and listed in Tables 2, 3, and 4.

- For soils, with the exception of PCBs and Title 22 metals, the selected TCL is the lowest value from the RSLs under an industrial land use scenario or the ESLs under a commercial/industrial land use scenario where groundwater is a potential

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[6] Should the construction project be located within the boundary of a previously closed site, the cleanup standards used to close the site will be used, unless otherwise directed by the lead regulatory agency, in place of the TCLs to determine whether additional excavation is required.

[7] Human health risks are expressed as either (a) an incremental lifetime excess cancer risk or (b) a Hazard Index ("HI") for non-cancer adverse health effects. Based on the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300.430), cancer risks are compared to a risk threshold between 10^{-6} (one-in-a-million) and 10^{-4} (one-in-ten-thousand), and the non-cancer HI is compared to a threshold level of 1, a level at or below which there are unlikely to be adverse health effects, even for sensitive populations.

source of potable water (considering the direct contact, gross contamination, and groundwater protection pathways). In open space, ecological preserve, or wetland areas (Figure 8), the Water Board Urban Area Ecotoxicity ESLs were also considered applicable.

- For PCBs, the TCL is the PCBs cleanup level promulgated in Toxic Substances Control Act ("TSCA") regulations (40 CFR §761) for high occupancy areas.

- For Title 22 metals, the selected TCL is the lowest value from the (a) RSLs and (b) ESLs to account for potential dermal contact and incidental soil ingestion, unless that value is less than (c) "background" concentrations for metals in soil (Scott, 1995), in which case the soil TCL will be the "background" value.

- For COPCs not listed in Table 2, the lowest of the current RSLs and ESLs should be used as the TCL. If the work area is within an open space, ecological preserve, or wetland area (Figure 8), the Water Board Urban Area Ecotoxicity ESL should also be considered when developing the TCL.

- For groundwater, the selected TCL (Table 3) is the lowest value from the California EPA Maximum Contaminant Levels ("MCLs"; CDPH, 2014)[8], the Water Board (2013) Groundwater to Indoor Air ESLs under a commercial/industrial land use scenario, or Ceiling Values.[9] For COPCs not listed in Table 3, the lowest of the current RSLs and ESLs should be used as the TCL.

- For sub-slab soil vapors, the selected TCL (Table 4) is the lowest of (a) the U.S. EPA RSL for ambient air under an industrial land use scenario and (b) the Water Board ESL for ambient and indoor air, multiplied by an attenuation factor of 20[10] between indoor air and sub-slab soil vapor, based on guidance from Cal-EPA (2011). For COPCs not listed in Table 4, the lowest of the current RSLs and ESLs multiplied by an attenuation factor of 20 should be used as the TCL.

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[8]Federal MCLs were not included as TCLs for groundwater because California EPA MCLs are more stringent.

[9] As the purpose of the groundwater TCL is to determine the appropriate management option for dewatering water produced during development activities (e.g., on-site dust control, discharge to storm drains, to the sanitary sewer, treatment at one of the Regional Groundwater Plume groundwater extraction and treatment systems, or offsite disposal), the Water Board Estuary Aquatic Habitat Goals were not considered applicable. Rather, discharge to storm drains and sanitary sewers typically have permitted discharge criteria and the Project Developer will comply with the permitted discharge criteria.

[10] The U.S. EPA (2013) recommends a generic attenuation factor of approximately 33 (i.e., 1/0.03) between indoor air and sub-slab soil vapor. As this value is less conservative that the Cal-EPA guidance attenuation factor, only the Cal-EPA guidance attenuation factor was used in Table 4.

- For soil gas, the selected TCL (Table 4) is the lower of the Water Board ESLs for Soil Gas to Indoor Air and the selected TCL for indoor air divided by an attenuation factor of 0.03 (U.S. EPA, 2013). For COPCs not listed in Table 4, the lowest of the current ESLs or the selected TCL for indoor air divided by an attenuation factor of 0.03 should be used as the TCL.

- For indoor air, the selected TCL (Table 4) is the lowest of the U.S. EPA RSL, the Water Board ESL, and the MEW 2010 VI ROD Amendment indoor air cleanup levels.[11] For COPCs not listed in Table 4, the lowest of the current RSLs, ESLs, and MEW 2010 VI ROD Amendment values should be used as the TCL.

Cleanup levels for sites that are being addressed as part of the NAS Moffett Field Superfund Site and the MEW Superfund Site are those determined by the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") lead agency and presented in the applicable NAS Moffett Field Superfund Site cleanup documents.

RISK MANAGEMENT

As discussed below, the measures described in Sections 5, 6 and 7 of the EIMP are intended to address the potential risks from the inhalation of volatile chemicals from impacted soil, groundwater, soil gas or sub-slab vapors, direct contact with impacted soil, groundwater, or impacted building materials, the inhalation of airborne particulates, and the ingestion of impacted soil or groundwater such that human health is protected during and after development of the MFA Leasehold.

Redevelopment within the MFA Leasehold must be conducted in a manner that does not damage or interfere with the implementation of selected Site remedies. NASA will notify U.S. EPA and Water Board regarding relevant redevelopment and construction activities within the MFA Leasehold.

Risk Management Design Considerations for New Construction

<u>Measures to Reduce Potential Exposure to VOCs in Indoor Air</u>

COPCs in groundwater in some areas within the MFA Leasehold could potentially result in human health risks above the above-described TCLs in indoor air through vapor intrusion. These risks stem primarily from the migration of TCE in shallow groundwater or soil gas. In its *ROD Amendment for the Vapor Intrusion Pathway at the MEW Superfund Study Area* ("2010 VI ROD Amendment"; U.S. EPA, 2010b), the U.S. EPA defined the MEW Vapor Intrusion ("VI") Study Area (Figure 5) based on the approximate extent of the 5 microgram per liter ("ug/L") TCE in groundwater contour and developed different response actions for existing and future residential and commercial buildings within this area. Using this criterion for groundwater

[11] Within the MEW Site VI Study Area, the MEW indoor air cleanup level (5 ug/m^3) will be applied in lieu of the TCL.

contamination in the eastern portion of the MFA Leasehold, two potential non-MEW Site VI Study Areas are located in the MFA Leasehold (Figure 6). In addition to the MEW Site VI Study Area and the potential non-MEW Site VI Study Areas northeast of Hangar 3, vapor intrusion must be considered as a potential exposure pathway and vapor intrusion mitigation measures may be required in additional areas where soil, soil vapor, and/or sub-slab vapor sampling results indicate the potential for vapor intrusion. These additional areas include Hangars 2 and 3 and portions of the IR Site 26 Land Use Control Area (Figure 6).

As specified in the 2010 VI ROD Amendment, the selected remedy for existing buildings within the MEW Site VI Study Area with TCE or other Site contaminants of concern at concentrations in indoor air above the applicable cleanup levels is the installation of an appropriate sub-slab/sub-membrane ventilation system, monitoring, and institutional controls or, for commercial buildings (with the agreement of the property owner[12]), the use of the building's heating, ventilation, and air conditioning systems to mitigate vapor intrusion. For future buildings located within the MEW Site VI Study Area, the selected remedy is the installation of a vapor barrier, a sub-slab ventilation system that can be made active or the installation of an active sub-slab ventilation system, and indoor air sampling to confirm that there is no vapor intrusion risk. See Section 5.1.3 in this EIMP for discussion of the selected remedies and other engineering controls that may be used to mitigate the potential for vapor intrusion into existing buildings with written approval from the U.S. EPA.

Long-term VI monitoring plans for the MEW Site VI Study Area will be developed by the Responsible Parties in accordance with the 2010 VI ROD Amendment and VI Statement of Work. The Master Lessee and Project Developer will allow access to the appropriate Responsible Party (Navy, MEW Companies, or NASA) and the U.S. EPA to conduct the appropriate building-specific monitoring to ensure the implemented VI remedy's effectiveness.

For non-MEW Site VI Study Areas, the Master Lessee and the Project Developer will work with the U.S. EPA and the appropriate Responsible Party (Navy or NASA) to design remedies and other engineering controls that may be used to mitigate the potential for vapor intrusion into existing and future buildings in areas where vapor intrusion must be considered as a potential exposure pathway (i.e., Hangars 2 and 3, and portions of the IR Site 26 Land Use Control Area) and to develop appropriate monitoring programs to verify the implemented remedy's effectiveness.

Measures to Mitigate Groundwater Movement

Due to the groundwater contamination in the aquifer underlying the MFA Leasehold, measures must be taken to prevent new construction from creating potential pathways for

[12] For purposes of the EIMP, within the MFA Leasehold, the Master Lessee is assumed to be the entity to approve of the use of HVAC as a remedy within a given building, rather than the property owner (i.e., NASA).

migration of COPCs in groundwater or soil gas. Utility lines installed in trenches or horizontal boreholes in areas where contaminated groundwater or soil gas could potentially flow through utility line backfill material must include the use of low permeability backfill or cutoff walls to reduce potential contaminant migration. Similarly, if new construction requires piles that extend to depths greater than 20 feet (i.e., potentially below the shallow aquifer impacted by COPCs), mitigation measures must be included in their design to reduce the potential for driving impacted soil deeper or creating conduits for downward contaminant migration. In both situations, the Project Developer will prepare a design report for review by NASA (and for Santa Clara Valley Water District review in the case of construction piles) describing the measures that will be taken and demonstrating their effectiveness in preventing potential migration of COPCs. The Project Developer will also submit the design report to the applicable regulatory agencies for review and concurrence.

Protecting Existing Site Remedies

Close coordination between the Project Developer, the Navy, the MEW Companies, and/or NASA, as the case may be, and the applicable regulatory agencies, must occur during the design and construction phase of development to ensure that measures are taken to protect implemented Site remedies (or remedies still being investigated or that are under development) for groundwater (i.e., existing remediation systems[13] and their monitoring wells), and at Hangar 1 and the landfills during construction; any regulatory agency-approved modifications or disturbances[14] to the implemented Site remedies will be appropriately repaired. Procedures have been developed to allow for the modification of the existing remediation systems and their monitoring wells if potential conflicts occur between the planned development and the location of the existing systems; these procedures are presented in further detail in the EIMP. Any such modifications are subject to approval by U.S. EPA, the Water Board, and the Navy, the MEW Companies, and/or NASA, as the case may be. The cost of implementing any necessary system modifications will be the responsibility of the Project Developer.

Risk Management During Construction

This EIMP summarizes risk management measures to be implemented during construction to mitigate potential risks to human health and the environment from COPCs. These measures include:

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[13] A portion of the Navy's WATS is located within the MFA Leasehold (Figure 3), and several of the monitoring wells associated with the MEW and NASA GWTSs are located within the MFA Leasehold. On 30 September 2014, the Navy adopted in-situ biostimulation/bioaugmentation as the selected remedy for the southern plume at IR Site 26 (Navy, 2014); while the EATS groundwater extraction system is no longer required, several of its monitoring wells may be required for the in-situ biostimulation/bioaugmentation remedy and approval from the U.S. EPA and Water Board needs to be sought before any portion of the EATS system is removed or relocated.

[14] Any disturbances to the implemented Site remedies must be timely reported to the Responsible Party, NASA, the U.S. EPA, and Water Board.

- review of available information (e.g., NASA's EECs, LUCs, Table 1, and Figure 6) to identify COPCs;

- development and implementation of a Site-specific health and safety plan ("H&SP") that describes health and safety training requirements for on-site workers, personal protective equipment to be used, and other precautions to be undertaken to minimize direct contact with soil, groundwater, and soil vapors;

- implementation of construction impact mitigation measures, such as implementing dust and odor control measures, decontaminating construction and transportation equipment, implementing storm water pollution controls, and sampling and analyzing groundwater extracted during construction to determine appropriate storage and disposal practices;

- proper management of asbestos-containing material ("ACM"); debris and structures containing lead-based paint and/or PCB-containing paint; and PCB-containing equipment or structures that are removed during development within the MFA Leasehold;

- procedures for the management of abandoned USTs, sumps, pipes, and buried drums or containers that may be encountered during development activities within the MFA Leasehold;

- procedures for the management of dewatering water generated during construction activities;

- procedures for protecting implemented remedies (e.g., Hangar 1) and the existing groundwater remediation systems (including monitoring wells) during development activities within the MFA Leasehold and implementing any approved modifications to the remediation systems and/or remedies; and

- procedures for the management of soil potentially impacted by COPCs that is handled during construction activities. The soil management protocols include screening procedures to identify and manage COPC-impacted soil that is excavated during development within the MFA Leasehold, as well as contingency procedures to be followed in the event that previously unknown soil contamination is encountered.

In general,[15] the Project Developer shall conduct the necessary environmental sampling and screening of soil and groundwater during development within the MFA Leasehold.

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[15] The implementation of this EIMP by NASA, Master Lessee, tenants, Project Developers, and other entities, does not relieve the Responsible Parties of their responsibilities and ongoing obligations. Rather, this EIMP allocates as between NASA and Master Lessee who will take actions to address environmental conditions in the event of non-performance or delayed performance by the Responsible Party, but such actions will not result in Master Lessee becoming a Responsible Party.

The Project Developer will also be responsible for the necessary excavation or removal of potentially impacted soil or groundwater encountered within construction limits/boundaries during construction, as well as subsurface structures, such as USTs that are encountered within construction areas during construction excavation. The Project Developer will dispose of potentially impacted soils and subsurface structures at a permitted off-site facility in accordance with all applicable laws and regulations; NASA will be designated as generator of the wastes and will sign all manifests to the extent not timely signed by the Navy or MEW Companies.

Groundwater produced during dewatering of excavations will be either (a) used for dust control within the MFA Leasehold, (b) with permission of the Responsible Party for any existing or future groundwater treatment system (depending on the area in which the excavation occurs and the COPCs detected in groundwater), transported to such groundwater treatment system for treatment and ultimate disposal or (c) discharged to the sanitary sewer (if a discharge permit can be obtained). Should the Project Developer be unable to dispose of the dewatering water by one of the options listed above, the Project Developer will arrange for the treatment and/or disposal of this water at a permitted off-site facility and NASA will be designated as generator of the wastes and will sign all manifests to the extent not timely signed by the Navy or MEW Companies.

In addition to the risk management procedures listed above, the Project Developer shall comply with the *MFA Wildlife Management Plan* attached to the Lease (PV, 2014a). The Project Developer shall review the applicable and related documents listed in the MFA Wildlife Management Plan and NASA's *Environmental Resources Document* (NASA, 2009) during the planning and implementation stages to identify procedures that should be followed to protect sensitive ecological species and wildlife habitat in a manner consistent with applicable State and Federal regulations.

Post-Construction Risk Management

The EIMP also describes precautions that will be implemented by NASA, Master Lessee, Project Developers and tenants (i.e., the "interested parties") to mitigate long-term risks to human health and the environment related to potential exposure to COPCs during periods of normal non-construction activity. These precautions include:

- NASA, Master Lessee, and Project Developers will notify future property managers and tenants of known environmental conditions within the MFA Leasehold, LUCs and the requirements of the EIMP;

- Master Lessee will conduct additional risk analysis and modify the EIMP, as appropriate, if any relevant change in land use is proposed for the MFA Leasehold, if there is a relevant change in any of the implemented remedies within the MFA Leasehold, or if any significant change in toxicity values for COPCs occurs;

- Master Lessee will not permit groundwater within the MFA Leasehold to be used for drinking water or any other purpose not allowed pursuant to this EIMP (i.e.,

dust control) unless its use is approved by NASA, the U.S. EPA, the Water Board, and the Santa Clara Valley Water District; an exception is that treated groundwater may be used for irrigation and/or industrial heating or cooling or other processes;

- Master Lessee will ensure that health and safety procedures similar to those described for construction activities at the MFA Leasehold are followed for future activities that disturb subsurface soil (e.g., utility repairs) within the MFA Leasehold. In addition, the Master Lessee will ensure that other procedures developed for construction activities (e.g., soil management) are also followed;

- Master Lessee will review all VI monitoring reports prepared by Responsible Parties who inspect maintain and monitor same, as they pertain to buildings located within the MFA Leasehold;

- Master Lessee shall obtain U. S. EPA, Water Board, NASA, and Navy approval of planned activities that may disturb the Hangar 1 remedy (Section 5.5);

- Master Lessee shall ensure compliance with LUCs within the MFA Leasehold;

- Master Lessee and tenants will cooperate with NASA, the Navy, the MEW Companies, applicable regulatory agencies, and any other entities involved in the remediation of, or that are responsible to remediate, existing or future contamination to provide reasonable access to known or suspected areas of contamination or other areas upon which any containment system, treatment system, monitoring system, or other environmental response action is installed or implemented (or will be installed or implemented) for the purposes of complying with environmental law and requirements provided that such work be undertaken in a manner that will minimize interference with the Master Lessee and tenants;

- The Responsible Party will perform ongoing operation and maintenance as needed to verify the continued adequacy of implemented remedy, as required by environmental decision documents or the regulatory agencies; and,

- NASA and Master Lessee will monitor changes in COPC toxicity parameters to assess if additional or lesser mitigation may be needed based on an updated understanding of chemical toxicity of reported COPCs within the MFA Leasehold.

Master Lessee will review and evaluate ongoing environmental monitoring data to determine if there are any relevant changes in environmental conditions and update the EIMP as necessary to address:

- new environmental conditions identified based on data review and COPCs not addressed in the existing EIMP;

- updated available toxicological data regarding the potential health effects of COPCs;
- changes in any of the implemented remedies within the MFA Leasehold;
- implementation of a new remedy; and,
- information regarding any intended changes in land use.

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1. INTRODUCTION

This Environmental Issues Management Plan ("EIMP") is intended to describe procedures to address known environmental conditions and contingency actions to be taken in the event that previously unknown environmental conditions are encountered during occupancy and development at the Moffett Federal Airfield ("MFA") Leasehold, an approximately 1,000-acre parcel that was formerly part of Naval Air Station ("NAS") Moffett Field in Santa Clara County, California (Figure 1), which the National Aeronautics and Space Administration ("NASA") has leased to Planetary Ventures, LLC ("Master Lessee"). The purpose of the EIMP is to provide sufficient information to the Master Lessee, its tenants, and Project Developers,[16] to comply with land use restrictions and institutional controls ("LUCs") within the Naval Air Station Moffett Field Superfund Site ("Site") and take reasonable steps with respect to environmental conditions within the MFA Leasehold to help ensure that occupancy and development activities within the MFA Leasehold do not exacerbate environmental conditions or adversely impact ongoing response actions by the Responsible Parties.

The EIMP provides a decision framework to manage residual chemicals in soil, groundwater, and existing structures within the MFA Leasehold in a manner that is (a) satisfactory to the United States Environmental Protection Agency ("U.S. EPA") and the California Regional Water Quality Control Board, San Francisco Bay Region ("Water Board") as lead regulatory agencies, and other involved regulatory agencies with oversight authority, (b) protective of human health and the environment, and (c) consistent with planned future land uses. This EIMP contains the following:

- a description of the MFA Leasehold background, including a brief history of usage and a brief summary of identified remaining environmental conditions (Section 2);
- a brief description of current and planned land use within the MFA Leasehold (Section 3);
- a summary of potential exposure pathways and target concentration levels ("TCLs") (Section 4);
- a description of risk management measures to be considered during design for new construction planned within the MFA Leasehold (Section 5);
- a description of short-term risk management protocols to be implemented during construction within the MFA Leasehold, which includes worker health and safety planning requirements, construction impact mitigation measures, and soil and

[16] In this document, "Project Developer" refers to the entity performing the project in question.

dewatering water management protocols, and compliance with LUCs (Section 6); and,

- a description of post-construction risk management protocols for mitigation of any long-term risks to human health and the environment, which includes protocols for future subsurface activities within the MFA Leasehold, and procedures to ensure long-term compliance with this EIMP, Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") activities and remedies, and other environmental requirements (Section 7).

1.1. Representations

The risk management protocols specified in this EIMP are based on a current understanding of Site environmental conditions and current policies, laws, and regulations. No representation is made as to the applicability of this EIMP with respect to future Site conditions, as conditions may change or new information may become available.

This EIMP is based solely on data and documentation provided by NASA with regard to the existing environmental conditions within the MFA Leasehold. The accuracy of this information has been assumed in the preparation of this document. Information and opinions contained herein are preliminary and are for use only in further planning.

Erler & Kalinowski, Inc. ("EKI") shall have no responsibility for the discovery, presence, handling, removal, disposal or exposure of persons to hazardous materials in any form within the MFA Leasehold. Hazardous materials are deemed to include, but not be limited to: petroleum products, asbestos, asbestos-containing products, lead, polychlorinated biphenyl ("PCBs"), and any other substances identified as hazardous or toxic by the U.S. EPA or the California Environmental Protection Agency ("Cal-EPA").

1.2. Responsibilities

Master Lessee, tenants, Project Developers, and other entities with responsibility for activities within the MFA Leasehold shall have a continuing obligation to:

- Review available information concerning environmental conditions within the MFA Leasehold;

- determine the adequacy of this EIMP with respect to expected environmental conditions as well as the conditions actually encountered during development and the intended land use;

- evaluate the current understanding of the health effects of identified chemicals of potential concern ("COPCs"), to the extent information about health effects assumed in this EIMP may change;

- comply with applicable policies, laws, and regulations, and all CERCLA Site remedies; and,

- establish management procedures for inspection, maintenance, and monitoring of the risk management measures that are implemented and to establish protocols for future sub-surface activity to ensure long-term compliance with the EIMP.

In addition to the responsibilities listed above, the Master Lessee and NASA will:

- inform the applicable regulatory agencies of any relevant changes within the MFA Leasehold;

- ensure that the EIMP is reviewed by qualified environmental professionals and modified periodically, as necessary, to address relevant changes and seek review and approval from the applicable regulatory agencies for any relevant changes to the EIMP. Relevant changes include changes in environmental conditions, land uses and/or applicable laws and regulations.

It is the intent of the Master Lessee and NASA that the parties that have been named by U. S. EPA or the Water Board as the Responsible Parties (i.e., Navy, MEW Companies, and NASA) or are the Responsible Party under statutory or common law for contamination at the MFA Leasehold retain this responsibility and continue to perform their ongoing obligations such as, but not limited to, monitoring, remediation, operations, maintenance, and reporting, independent of the Master Lessee. Figure 4 and Figure 5 illustrate the Responsible Parties for soil, groundwater, and vapor intrusion issues within the MFA Leasehold. The Navy is the Responsible Party for Hangar 1.

More specifically, on December 22, 1992, the Navy and NASA signed a Memorandum of Understanding ("MOU") which states that the Navy is responsible for the investigation and remediation of its environmental contamination notwithstanding its transfer of MFA to NASA. In addition to the groundwater contamination, the MOU includes Navy responsibility for petroleum in the soil and groundwater, and for lead in the soil caused by lead-based paint on the buildings. The MOU was further clarified by the Navy in a letter signed on 4 October 1993, which states that "The Navy's obligations under the MOU shall include taking possession of and properly managing any contaminated soil or groundwater that has been left in place, in accordance with a CERCLA, RCRA, or other cleanup remedy, but subsequently upon its excavation, disturbance, or discharge by NASA or a tenant of NASA during development for reuse of Moffett Field becomes hazardous waste, or requires treatment prior to discharge." Accordingly, Figure 5 reflects that the Navy is the Responsible Party for the majority of the MFA Leasehold.

The implementation of this EIMP by NASA, Master Lessee, tenants, Project Developers, and other entities does not relieve the Responsible Parties of their responsibilities and ongoing obligations nor does it impose additional requirements that the Responsible Parties otherwise would not have under their respective contractual agreements (FFAs, Consent Decrees, and MOUs), as well as Orders, statutes, and/or common law. Rather, this EIMP allocates as between NASA and Master Lessee who will take actions to

address environmental conditions in the event of non-performance or delayed performance by the Responsible Party, but such actions will not result in Master Lessee becoming a Responsible Party. NASA will facilitate communication between the Master Lessee and the Responsible Party when requested.

2. SITE BACKGROUND

2.1. Site Setting

The MFA Leasehold (Figure 1) is an approximately 1,000-acre property that is located on the eastern portion of NASA Ames Research Center ("ARC"). ARC is located in Santa Clara County, California, approximately 35 miles south of San Francisco and 10 miles north of San Jose. To the south and west is the NASA Research Park ("NRP") and to the north and west are the Ames Campus and Bayview Areas; to the south is U.S. Highway 101 and the City of Mountain View. The MFA Leasehold includes the triangular portion of the ARC located south of U.S. Highway 101; this parcel of land is currently a portion of the Sunnyvale Golf Course.

ARC is located near the southwestern edge of San Francisco Bay on nearly flat fluvial basin deposits. The elevation of ARC ranges from approximately 36 feet above mean sea level to 2 feet below mean sea level (IT, 1993). The predominant surface features are man-made structures including buildings, hangars, roads, parking lots, and landscaped areas (golf course).

The areas just north of ARC were previously tidal salt marshes and mud flats of San Francisco Bay. However, these marshes and mud flats have been eliminated or greatly altered by diking and filling (IT, 1993). Currently, stormwater retention ponds separated by roads and levees and former saltwater evaporation ponds are present north of ARC. The former saltwater evaporation ponds have been transferred to the U.S. Fish & Wildlife Service for restoration.

There are no streams on ARC, although several streams are present to the east (Coyote Creek and Guadalupe Slough) and to the west (Stevens Creek). Surface water features include stormwater drainage ditches, several small ponds, seasonal marshes, and stormwater retention ponds (PRC, 1996).

For discussion of current and proposed future land uses, see Sections 3.1 and 3.2.

2.1.1. Hydrogeology

The Santa Clara Valley Basin is a large, northwest trending structural depression between the San Andreas and Hayward faults. The valley is bordered on the west by the Santa Cruz Mountains and on the east by the Diablo Range. Regionally, the Santa Clara Valley contains up to 1,500 feet of interbedded alluvial, fluvial, and estuarine deposits (Tetra Tech, 1998).

The shallow aquifer (upper 250 feet) is subdivided into the A, B, and C aquifers.

The A aquifer consists of sands and gravels found between approximately 15 feet below ground surface ("bgs") and approximately 77 feet bgs (SES-TECH, 2014).[17]

The A-aquifer is divided into the A1- and A2- aquifer zones by a discontinuous low-permeability horizon (A1/A2 aquitard); the shallow A1-aquifer zone extends to approximately 35 to 40 feet bgs and the lower A2-aquifer zone extends to approximately 45 to 77 feet bgs, depending on the location. In general, the groundwater flow direction in the A aquifer is toward San Francisco Bay (north) with a horizontal gradient of 0.004 to 0.005 feet per foot (ft/ft). Vertical gradients between the A1- and A2- aquifer zones are weak and locally variable. Depth to groundwater ranges from 5 to 12 feet bgs (Tetra Tech, 1998).

The A/B aquitard is a discontinuous clay zone generally encountered between the depths of approximately 45 to 85 feet bgs (SES-TECH, 2014); the aquitard may be locally continuous under the western portion of ARC (PRC, 1996). The B aquifer (approximately 70-160 feet bgs) includes permeable deposits characterized by interbedded fine- to medium-grained sands, and clayey sands. Significant upward vertical gradients exist between the B aquifer and the overlying A2-aquifer in the ARC. A laterally extensive clay aquitard (B/C aquitard) effectively isolates the C aquifer from the overlying B aquifer (160 to 250 feet bgs) (Tetra Tech, 1998).

2.2. Site History

Before it was commissioned as the Sunnyvale Naval Air Station in 1933, the former NAS Moffett Field was used for agriculture. Between 1933 and 1994, the station was operated continuously by the U.S. Military; on 1 July 1994, the U.S. Military transferred the NAS Moffett Field to NASA. It was transferred from the Navy to the Army Air Corps for use as a training base in 1935, but was later returned to Navy control.

The original mission of the naval air station was to serve as a base for the West Coast dirigibles of the lighter-than-air program ("LTA"). 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 U.S. EPA placed NAS Moffett Field on the National Priority List and on 10 September 1990 the Navy signed a Federal Facility Agreement ("FFA"; U.S. EPA, 1990) with the EPA and the Water Board to conduct remedial actions at NAS Moffett Field pursuant to CERCLA regulations. This agreement was amended in December 1993 (U.S. EPA, 1993).

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[17] The Middlefield-Ellis-Whisman ("MEW") Companies refer to the A1-aquifer zone as the "A" aquifer zone and the A2-aquifer zone as the "B1" aquifer.

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. 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 NASA in 1994 and renamed Moffett Federal Airfield ("MFA") (PRC, 1996).

Between 1994 and 2010, the Navy has issued eight Records of Decision ("RODs") which set forth selected remedies for specific areas of the NAS Moffett Field Superfund Site, including Operable Unit ("OU") 2 (Navy, 1994), OU 5 (Navy, 1996), OU 1 (Navy, 1997), OU 00 (No Action Sites) (Navy, 2002a), IR Site 22 Landfill (Navy, 2002b), IR Site 27 (Navy, 2005), IR Site 25 (Navy, 2010), and one ROD Amendment (Navy, 2014) and the U.S. EPA has issued one ROD Amendment for the MEW Superfund Study Area (U.S. EPA, 2010b). In 2014, NASA signed an FFA with the U.S. EPA and the Water Board to address its CERCLA responsibilities at NASA Ames Research Center and the portion of the NAS Moffett Field Superfund Site (listed on the NPL in 1987) currently owned by NASA (U.S. EPA, 2014c). These responsibilities include both NASA's cleanup responsibilities and its responsibilities for implementing LUCs at the NAS Moffett Field Superfund Site.

2.3. Summary of Known Environmental Conditions and Potential Chemicals of Concern within the MFA Leasehold

Environmental investigations, removal actions, and remedial actions have been implemented at former NAS Moffett Field since 1984. The following is a list of types of potential COPCs that have been detected in soil or groundwater samples within the MFA Leasehold at least once above background levels:

- volatile organic compounds ("VOCs");
- purgeable and extractable total petroleum hydrocarbons ("TPH");
- benzene, ethylbenzene, toluene, and xylenes ("BTEX");
- semi-volatile organic compounds ("SVOCs");
- PCBs; and,
- metals.

As a result of investigations that were performed within the MFA Leasehold, the identified environmental conditions and primary COPCs that should be considered during redevelopment are:

- the presence of chlorinated VOCs in groundwater and soil within the MFA Leasehold;

- the presence of total petroleum hydrocarbons and other fuel-related constituents, including BTEX compounds, in groundwater and soil within the MFA Leasehold;

- the presence of elevated concentrations of PCBs in soil surrounding buildings and transformers;

- the presence of elevated concentrations of lead in soil surrounding buildings;

- the presence of chlorinated VOCs in sub-slab vapors beneath Hangars 2 and 3;

- existing subsurface structures (e.g., sumps or tanks) that may need to be removed; and,

- building materials containing hazardous materials (e.g., asbestos-containing materials in existing buildings and the presence of lead and PCBs in the structural materials at Hangar 1).

In addition to the primary COPCs, previous investigations within the MFA Leasehold have also detected low levels of certain SVOCs, including bis(2-ethylhexyl)phthalate, naphthalene and 2-methylnaphthalene in soil or groundwater within MFA Leasehold; however, these chemicals are generally present in concentrations below U.S. EPA Regional Screening Levels ("RSLs") for residential or industrial/commercial land use (U.S. EPA, 2014a). Metals have also been detected in soils within the MFA Leasehold; soil metal concentrations have generally been within expected background concentrations or slightly elevated above expected background concentrations (with the exception of lead as described above and in Section 2.4.8), but below U.S. EPA RSLs.

A large regional plume of chlorinated VOCs is present just west of the MFA Leasehold; a portion of this plume extends into the MFA Leasehold in two areas. The source of this contamination is migration of contaminated groundwater from the upgradient MEW Superfund Site (see Section 2.4.3) that has commingled with groundwater contamination from chlorinated solvent sources located at the former NAS Moffett Field and Ames Research Center. In addition, petroleum hydrocarbons and fuel-related constituents, such as BTEX compounds, from sources at Moffett Field have also impacted groundwater beneath the MFA Leasehold.

Numerous potential source areas have been investigated and remediated within the MFA Leasehold, primarily releases associated with underground storage tanks and sumps that contained petroleum hydrocarbon products, although a few source areas of chlorinated VOC contamination have also been investigated and are being remediated.

Investigations of lead in soil surrounding buildings have been conducted within the MFA Leasehold and elevated concentrations of lead were detected in shallow soil surrounding a number of buildings. The results of these surveys of lead in soil surrounding existing buildings are summarized in Section 2.4.8.

Other conditions that must be considered during redevelopment within the MFA Leasehold, such as existing subsurface structures (e.g., sumps or tanks) or hazardous materials associated with existing buildings (e.g., asbestos-containing materials and PCBs at Hangar 1), are summarized in Sections 2.5 and 2.6.

2.4. Summary of Site Investigations and Remedial Actions

This section summarizes the investigations and remedial actions that have been conducted within the MFA Leasehold. This summary is provided only for information purposes. The Project Developer should review original source documents and data as part of its own assessment and evaluation of expected conditions during development activities within the MFA Leasehold. Available documents are described in Section 2.4.1.

2.4.1. Available Documents

Numerous investigations of soil and groundwater conditions have occurred within the MFA Leasehold and are summarized in various technical memoranda, remedial investigation and feasibility study reports and other documents. A list of documents reviewed is provided in Section 8.

2.4.1.1. Environmental Baseline Survey

In lieu of an Environmental Baseline Survey, NASA has prepared Existing Environmental Conditions ("EEC") Statements which summarize the known existing environmental conditions within the MFA Leasehold area; NASA's EECs are included in Appendix A.

2.4.2. Installation Restoration Program

The Navy, as part of its Installation Restoration ("IR") Program has been investigating and remediating soil and groundwater impacted by past use of chemicals at former NAS Moffett Field. The Navy's remedial program was initiated in 1984 when an initial assessment study of former NAS Moffett Field was completed in response to the Defense Environmental Restoration Program ("DERP"). NAS Moffett Field was placed on the National Priorities List ("NPL") by the U.S. Environmental Protection Agency in 1987 and the investigation and remediation of NAS Moffett Field became subject to the CERCLA. The Navy began conducting a Remedial Investigation/Feasibility Study ("RI/FS") for NAS Moffett Field coordinating its actions through a Federal Facility Agreement ("FFA") with U.S. EPA and the Cal-EPA including the Department of Toxic Substances Control ("DTSC"), and Water Board (U.S. EPA, 1990). Initially, a total of 19 sites were identified in NAS Moffett Field for investigation. Subsequent investigations identified ten additional sites for further study as part of the IR process.

As described above and pursuant to the terms of the MOU, the Navy is responsible for the investigation and remediation of its environmental contamination including groundwater contamination, petroleum in the soil and groundwater, and for lead in the

soil caused by lead-based paint on the buildings (NASA/Navy, 1992).

After the initial phases of the Navy's remedial investigation were conducted, the Navy, U.S. EPA, DTSC, and Water Board agreed to organize the RI/FS process into separate Operable Unit areas to address specific areas of NAS Moffett Field. In addition, in 1993, all IR Sites containing only petroleum and petroleum constituents were removed from the CERCLA process and are being managed according to applicable state regulations (PRC, 1996).

In 2014, NASA signed an FFA with the U.S. EPA and the Water Board to address its CERCLA responsibilities at NASA Ames Research Center and the portion of the NAS Moffett Field Superfund Site (listed on the NPL in 1987) currently owned by NASA (U.S. EPA, 2014c). These responsibilities include both NASA's cleanup responsibilities and its responsibilities for implementing LUCs at the NAS Moffett Field Superfund Site.

Section 2.4.3 provides a summary of the COPCs detected in groundwater from the West Side Aquifers, as well as a description of groundwater remedial actions that have been implemented. Section 2.4.4 provides a summary of the COPCs detected in groundwater from the East Side Aquifer, as well as a description of groundwater remedial actions that have been implemented. Sections 2.4.5 and 2.4.6 list the IR Sites located within the MFA Leasehold, additional information on these sites is presented in Table 1 and Appendix A.

2.4.3. West Side Aquifers Groundwater Contamination

The West Side Aquifers, which underlies a portion of the MFA Leasehold, was identified as one of the original Operable Units for NAS Moffett Field. In October 1992, U.S. EPA determined that the aquifers within this area were affected by regional groundwater contamination migrating from a group of companies located within an area bounded by East Middlefield Road, Ellis Street, Whisman Road, and U.S. Highway 101; this area is commonly referred to as the "MEW Superfund Site" and is located south of NAS Moffett Field in the City of Mountain View. The Navy, the U.S. EPA, and the State of California agreed that the area would be treated in accordance with the 1989 ROD already written for the MEW Site, which selected appropriate actions for soil and groundwater remediation to address groundwater within the aquifer impacted by VOCs (PRC, 1996).

A regional plume of chlorinated VOCs within the shallow aquifers (A1/A2) has migrated north from the MEW Site located south of U.S. Highway 101 and extends approximately 5,000 feet north of U.S. Highway 101 (PRC, 1996) slightly west of the MFA Leasehold. The area of contamination is generally to the west of the MFA Leasehold, with the exception of a limited area beneath Hangar 1 and beneath a small portion of the airport runways. The primary chemicals of concern are trichloroethene ("TCE") and cis-1,2-dichloroethene ("cis-1,2-DCE"), although several other VOCs are frequently detected including 1,1,1-trichloroethane ("1,1,1-TCA"), 1,1-dichloroethene ("1,1-DCE"), trans-1,2-dichloroethene ("trans-1,2-DCE"), 1,1-dichloroethane ("1,1-DCA"), tetrachloroethene ("PCE") and vinyl chloride. Figure 2, shows the approximate extent of TCE contamination at the West Side A1-aquifer of September 2013.

The MEW Companies have constructed a regional groundwater recovery system that began routine operation in October 1998 (Tetra Tech, 1999). The groundwater remediation system consists of 15 groundwater extraction wells that pump groundwater to a treatment system located on the north side of Wescoat Road and east of McCord Avenue between Buildings 16 and 510 (see Figures 3 and 6). The Groundwater Treatment System ("GWTS") consists of two low-profile air strippers in series with vapor-phase granular activated carbon ("GAC") used to treat off-gas from the lead air stripper (Locus, 1999). The MEW Companies' regional groundwater recovery system layout of extraction wells, conveyance pipelines, and treatment system is shown on Figures 3 and 6. The groundwater cleanup levels for the MEW Site chemicals of concern are listed in the MEW ROD (U.S. EPA, 1989).

The Navy's remedial investigation of the West Side Aquifers was completed in 1992. Results of the investigation indicated that contamination from several source areas at NAS Moffett Field had impacted groundwater (IR Site 28) and commingled with the regional groundwater plume migrating from the MEW Site. The primary sources potentially contributing to the regional groundwater plume are located west and southwest of Hangar 1, such as the dry cleaner located at the former Building 88 (IR Site 18) and fuel operations at IR Site 9 (PRC, 1996). In 2008 (Tetra Tech EC, 2008), the Navy identified a sanitary sewer line beneath the traffic island area just southwest of Hangar 1 as a potential source area; this sanitary sewer line received wastewater from the former Building 88.

The Navy, through negotiations with U.S. EPA and the MEW Companies, agreed to remediate a portion of the regional groundwater contamination plume and in 1993, the Navy adopted the U.S. EPA's 1989 ROD for the MEW Superfund Study Area (U.S. EPA, 1989) to address the Navy's source areas and the resulting groundwater contamination that had commingled with the MEW regional groundwater plume (U.S. EPA, 1993).

Five areas within the Navy's treatment area were identified as sources or potential sources of fuel-related or VOC groundwater contamination. These areas include: (1) 13 former Underground Storage Tanks ("USTs") and one aboveground storage tank located in the Building 29 area located slightly west of the MFA Leasehold; (2) four former USTs at the site of a former Naval Exchange ("NEX") gasoline service station (Building 31) that was located slightly west of the MFA Leasehold; (3) the NEX service station (Building 503), located east of former Building 88, where a steel UST was found to be leaking[18]; (4) a former dry cleaning facility located in former Building 88 (located slightly west of the MFA Leasehold), which has been demolished, and the associated traffic island area (located within the MFA Leasehold); and (5) the former aircraft wash rack sumps (Sumps 25 and 25A) located within the MFA Leasehold just south of Hangar 1. The first three sources have been identified as sources of fuel-related

[18] A portion of the NEX Service Station is located within the MFA Leasehold and two of the eight USTs (UST 39 and UST 40) that were formerly located at the NEX Service Station were located on-Site.

contamination, Building 88 has been identified as a source of VOC contamination, primarily PCE, and the wash rack area was considered a potential VOC source (Tetra Tech, 1998).

Downgradient of the Navy plume, the most frequently detected VOCs include TCE and cis-1,2-dichloroethene, with lesser amounts of PCE and vinyl chloride. PCE is found in both the A1- and A2-aquifers, but is confined primarily to the area downgradient from the former Building 88 dry cleaning facility, which was identified as a source of PCE contamination, and extends beneath Hangar 1. Vinyl chloride was most frequently detected in areas that also contain fuel-related contamination, and is likely the result of cometabolic biodegradation (PRC, 1997). Groundwater contaminated by fuel-related chemicals is limited to the shallow A1-aquifer zone, with the old fuel farm (Building 29) and old NEX service station (Building 31) being the primary sources. Another localized area of contamination by fuel-related chemicals is associated with Tanks 19 and 20, which are located just outside the south east corner of the MFA Leasehold near the Ellis Street entrance (Figure 6).

From 1993 to 1997, the Navy operated three small groundwater extraction and treatment systems as source control measures within the West-Side Aquifer area to address VOCs and fuel-related chemicals from source areas at Buildings 29, 31, and 88 (IR Sites 9 and 18). Groundwater was extracted from converted 4-inch monitoring wells. In addition, water was pumped from two sumps to collect groundwater that had infiltrated into the storm drain system. The groundwater was treated by either liquid-phase granular activated carbon ("GAC") or a low-profile air stripping system. In 1997, the Navy began construction of the West-Side Aquifers Treatment System ("WATS"; Figures 3 and 6) to extract and treat groundwater impacted by VOCs and petroleum hydrocarbons in the A1- and A2- aquifer zones. The Navy began operating the WATS in 1998, which currently treats groundwater pumped from six A1-aquifer zone extraction wells, three A2-aquifer zone wells, and the storm drain sumps (SES-TECH, 2014). Extracted groundwater is treated using an advanced oxidation process and GAC units; after treatment, the water is discharged to the Moffett storm drain system that conveys the water to a settling basin and ultimately discharges to NASA's Eastern Diked Marsh and Storm Water Retention Ponds (SES-TECH, 2014). As shown on Figures 3 and 6, some of the piping associated with the WATS is location within the MFA Leasehold; the WATS treatment system itself is located west of the MFA Leasehold. The locations of WATS groundwater extraction and monitoring wells are presented on Figures 2-1 through 2-3 of the *2013 Annual Groundwater Report for Installation Restoration Sites 26 and 28* ("2013 Navy Annual Report"; SES-TECH, 2014); extraction and monitoring well owners are identified in Table 2a of the *2013 Annual Progress Report – Regional Groundwater Remediation Program* ("2013 MEW Annual Report"; Geosyntec, 2014).

NASA and the MEW Companies entered into an Allocation and Settlement Agreement to allocate responsibility for soil and groundwater remediation north of Highway 101; Figure 4 identifies the party responsible for soil and groundwater remediation in different areas north of U.S. Highway 101. Although the Navy participated in negotiations of the Allocation and Settlement Agreement, the Navy is not a party to the document.

However, EKI understands that the Navy generally fulfills the obligations described as those of the Navy under the Allocation and Settlement Agreement.

Pursuant to the Allocation and Settlement Agreement, NASA is responsible for a portion of the Regional Plume north of the NRP area; the primary contaminants in groundwater in this area are TCE, cis-1,2-DCE, and vinyl chloride. To address this contamination, NASA constructed a GWTS (Figures 3 and 6), located slightly west of the MFA Leasehold, in 2000 consisting of four groundwater extraction wells (NASA-1A through NASA-4A) and two 5,000-pound GAC vessels operated in series; following treatment, the groundwater is discharged to Stevens Creek. In 2009, pumping from NASA-2A and NASA-4A was suspended with approval from the U.S. EPA and Water Board (ERT, 2014). In 2014, NASA entered into an FFA with the EPA and the State that addresses NASA's CERCLA responsibilities under the 1989 ROD for the MEW Superfund Study Area, as Amended, and the Allocation and Settlement Agreement (U.S. EPA, 2014c).

In 2010, to address the vapor intrusion pathway for the MEW Superfund Study Area, the U.S. EPA amended the 1989 ROD. In its *ROD Amendment for Vapor Intrusion Pathway at the MEW Superfund Study Area* ("2010 VI ROD Amendment"; U.S. EPA, 2010b) the U.S. EPA defined the MEW Site Vapor Intrusion ("VI") Study Area based on the approximate extent of the 5 microgram per liter ("ug/L") TCE in groundwater contour and developed a series of Tiered Response Actions for existing and future commercial and residential buildings located within the MEW Site VI Study Area. In December 2011, the U.S. EPA prepared a map of the vapor intrusion study area north of U.S. Highway 101 and identified which parties were responsible for implementing the selected remedy within the various portions of the MEW Site VI Study Area (Figure 5).

2.4.4. East Side Aquifer Groundwater Contamination

Groundwater beneath the majority of the MFA Leasehold is part of Operable Unit 5 (OU5) and includes all portions of the aquifers beneath the MFA Leasehold east of the runways that are not affected by the regional chlorinated VOC plume associated with the MEW Site, and excluding the groundwater beneath the Runway Landfill area (IR Site 1) and the Golf Course Landfill 1 (IR Site 2).

Two separate VOC plumes were identified in the A1-aquifer of OU5, the northern plume and southern plume; these plumes are commonly referred to as IR Site 26. The Navy's resulting OU5 ROD, signed in 1996, identified six COCs, namely TCE, PCE, vinyl chloride, 1,2-dichloroethane ("1,2-DCA"), 1,2-dichloroethene ("1,2-DCE"), and 1,1-DCE. In addition to the analytes identified in the ROD, petroleum hydrocarbon contamination was identified at several sites in the eastern airfield area. The Navy's 1996 ROD selected groundwater extraction and ex-situ treatment as the remedy for the southern plume and natural attenuation was selected as the remedy for the northern plume. The 1996 ROD also specified that the groundwater cleanup goals for the identified COCs were MCLs.

The Navy constructed another groundwater treatment system, the East-Side Aquifer Treatment System ("EATS"), to hydraulically control affected groundwater in the

southern plume at OU5 and to restore groundwater quality to the cleanup standards specified in the ROD. The EATS groundwater remediation system (Figures 3 and 6) consists of 5 groundwater extraction wells located in the A1-aquifer that pump groundwater to a treatment system consisting of an air stripper and GAC unit; treated groundwater was discharged to the Moffett storm drain system. The EATS is wholly located within the MFA Leasehold.

In 2003, the EATS system was taken offline to evaluate plume stability, COC rebound, natural attenuation and the efficiency of injecting additional electron donor into the subsurface in remediating plume hot spots. Since this time, the EATS system has remained off. Between 2009, and 2011, an abiotic/biotic treatability study was conducted using a different electron donor and in 2012, the Navy finalized a Focused Feasibility Study (Shaw, 2012) to evaluate remedial alternatives to address the low VOC concentrations currently present at IR Site 26 that may be more efficient than currently selected pump and treat remedy. In 2013, the Navy proposed in-situ biostimulation/bioaugmentation as an alternative to groundwater extraction and treatment in the IR Site 26 area (Navy, 2013a). On 30 September 2014, the Navy adopted a ROD Amendment selecting in-situ biostimulation/bioaugmentation as the new remedy for the southern plume at IR Site 26 (Navy, 2014).

Figure 2, shows the approximate extent of TCE contamination in the East Side A1-aquifer as of September 2013 (SES-TECH, 2014).

2.4.5. Non-Petroleum IR Sites

The following non-petroleum IR Sites are partially, or wholly, within the MFA Leasehold:

- the runway landfill (IR Site 1; part of Operable Unit 1);
- the golf course landfill (IR Site 2);
- Marriage Ditch Road (IR Site 3);
- the former industrial wastewater surface impoundment (IR Site 4);
- the runway apron (IR Site 6);
- Hangars 2 and 3 and the surrounding unpaved areas (IR Site 7);
- the runways (IR Site 10);
- the engine test stand area (IR Site 11);
- the equipment parking area (IR Site 13);
- Patrol Road ditch (IR Site 21);

- Golf Course Landfill No. 2 (IR Site 22);
- the golf course fill area (IR Site 23);
- the stormwater retention basin (IR Site 25);
- EATS area (IR Site 26);
- the northern channel (IR Site 27);
- WATS area (IR Site 28);
- Hangar 1 (IR Site 29);
- the weapons storage bunkers;
- the former industrial wastewater flux ponds;
- upland soils; and,
- Station-wide Remedial Investigation Human Health Risk Assessment Exposure Area 4158.

The evaluation of these sites and corrective actions at these sites were conducted under the regulatory oversight of the U.S. EPA and Water Board. With the exceptions of IR Site 1, IR Site 22, IR Site 25, IR Site 26, IR Site 28, and IR Site 29, all of these sites have been classified as No Further Action by the U.S. EPA.

Additional details on these sites are presented in Table 1 and Appendix A. Figure 6 shows the locations of each of these sites.

2.4.6. Petroleum IR Sites

Six of the Navy's eleven Installation Restoration (IR) petroleum sites are located within the MFA Leasehold area. These sites include:

- a portion of the fuel farm area (IR Site 5);
- the firefighting training area (IR Site 12);
- several of the sumps and tanks within IR Site 15;
- underground storage tanks 2, 14, 43, and 53 (IR Site 19);
- the Zook Road fuel spill (a portion of IR Site 20); and,
- the Hangar 1 fuel pits and the high-speed fuel hydrants (portions of IR Site 24).

The evaluation of these sites and corrective actions at these sites were conducted under the guidance of the California Regional Water Quality Control Board, San Francisco Bay Region ("Water Board"). With the exception of Tank 43 in IR Site 19, all of these sites have been classified as No Further Action by the Water Board.

Additional details on these sites are presented in Table 1 and Appendix A. Figure 6 shows the locations of each of these sites.

2.4.7. Non-Navy Sites

In addition to the Navy's IR Sites, there are several non-Navy sites located within the MFA Leasehold that are associated with operations conducted after cessation of Navy operations in these areas. Historical Navy operations in these sites and any associated contamination by these Navy operations remain Navy responsibility. These sites include:

- NASA's AOI 15, oil-filled transformers, and stationary and mobile aboveground fuel storage tanks (e.g., generators and pumps);
- CANG ASTs within CANG operational areas (e.g., the CANG Defueling Pad); and
- Defense Logistics Agency ("DLA") tanks and associated piping (i.e., the North Fuel Farm (IR Site 5) USTs and ASTs and the Day Tank Area) and related facilities (e.g., the fuel farm offices). DLA is not responsible for soil or groundwater contamination that has resulted from the Navy's operation of these systems.

Additional details on these sites are presented in Table 1 and Appendix A. Figure 6 shows the locations of these sites.

2.4.8. Survey of Lead in Soil

As further discussed in Section 2.6.2, lead-based paints were previously used at Moffett Field. In 1993, Chemical Waste Management, Inc. ("CWMI") conducted a facility wide investigation to assess the potential presence of lead in soil surrounding buildings that may have used lead-based paints on exterior surfaces (CWMI, 1993). CWMI collected 332 discrete surface soil samples from within 2 feet of the periphery of 96 buildings. The sample collection strategy involved the collection of a single discrete sample from each 30-foot long sample cell alongside the building perimeter. These samples were analyzed for total lead and for soluble lead using the Waste Extraction Test ("WET") if the total lead concentration was in excess of 50 milligrams per kilogram ("mg/kg"). The survey showed that the soils around most of the buildings were impacted by lead (i.e., lead was detected above background levels) and at many buildings, lead concentrations were detected at levels above the then current U.S. EPA Region IX residential land use Preliminary Remediation Goal ("PRG") of 400 mg/kg (U.S. EPA, 2002a; the current U.S. EPA RSL under a commercial land use scenario is 320 mg/kg). The total lead concentration at several locations also exceeded the U.S. EPA industrial land use PRG of 1,000 mg/kg, which is also the concentration (Total Threshold Limit Concentration or "TTLC") at which excavated soil would be considered hazardous waste under California hazardous waste regulations if it were excavated and disposed. Soluble lead levels analyzed with the WET test exceeded the Soluble Threshold Limit Concentration

("STLC") of 5 mg/L at several locations, as well. Detections of lead at levels above the TTLC and STLC levels were generally more sporadic.

A major limitation to the CWMI work was the use of discrete soil samples to establish the presence or absence of lead contamination instead of composite samples. Because of the sporadic way in which lead-based paint chips can be distributed in the soil, results from discrete soil samples can be highly variable depending on whether paint chips are present or absent in the sample. A multiple-increment composite (as discussed in the Interstate Technology Research Council's ("ITRC") Incremental Sampling Methodology ("ISM") guidance document (ITRC, 2012)) would likely be more representative of bulk soil conditions in each 30-foot sample cell. In addition, since the CWMI study was designed to only provide an overview of lead concentrations in surface soil surrounding buildings at Moffett Field, no data were collected regarding the lateral and vertical extent of elevated levels of lead detected in the soils.

A more detailed follow-up investigation was conducted by Roy F. Weston ("Weston") for the U.S. EPA (Weston, 1998). One hundred twenty discrete surface soil samples were collected from selected areas around ten buildings and one former building site, most of which had detectable lead-based paint on their exteriors. Insofar as the samples were collected along short transects, the Weston study provided some data on the lateral extent of lead contamination away from a building source. Samples collected as far away as 7.5 feet from the building wall were found at some locations to contain lead above the TTLC or STLC levels.

The Weston study is similar to the CWMI study in terms of limitations. Discrete sample data were collected instead of multi-increment composite data. Also, there were no data generated defining the depth to which the lead contamination had penetrated. Although horizontal transect sampling was performed, the sampling transects were not extended far enough to give an indication of the maximum lateral distance within which elevated concentrations of lead could still be encountered.

2.4.9. Survey of VOCs in Sub-Slab Vapor and Indoor Air at Hangars 2 and 3

Samples of sub-slab vapor and indoor air were collected at Hangars 2 and 3 during August and September 2014 (EKI, 2014a; EKI, 2014b, NASA, 2014b). Several VOCs were detected in the samples. Sample locations maps and summaries of analytical data collected by EKI are provided in Appendix C.

2.5. Summary of Existing Subsurface Structures That May Require Removal

With the exception of the Navy's Day Tank, North Fuel Farm USTs 10 through 13, and Sump 59, all known sumps and USTs within the MFA Leasehold have been removed and the Navy has conducted investigations to evaluate and characterize the extent of potential contamination. Remedial actions have been conducted at many of the former UST locations and closure of these sites has been received from the Water Board for all sumps and USTs that have been removed with the exception of Tank 43 (IR Site 19), located at the northeastern end of Hangar 3. The Navy's request for closure of UST 43 was not

granted because the "contents and associated contamination from this UST were not solely petroleum products" and as a result, the investigation and closure of the UST "must be addressed as part of the IR Site 26 remediation effort under the NAS Moffett Field Federal Facility Agreement" (Water Board, 2008).

2.6. Summary of Hazardous Materials Associated With Existing Structures And Current Operations

Many of the existing buildings within the MFA Leasehold contain hazardous materials, such as asbestos-containing materials, lead-based paints, and electrical equipment and building materials containing PCBs. In addition, hazardous materials have been or are being stored, and hazardous waste has been or is being generated at existing buildings within the MFA Leasehold. The following sections describe hazardous materials associated with existing structures or operations within the MFA Leasehold.

2.6.1. Asbestos-Containing Materials

Many of the existing buildings within the MFA Leasehold are known to contain asbestos-containing materials ("ACM") as a result of a base-wide asbestos survey conducted by Tetra Tech in 1993, and sampling of several individual buildings that was conducted as a result of building modifications being performed. In addition to the buildings with confirmed or suspect ACM present, other buildings are assumed to likely contain ACM due to their age (Harding, 2000).

Hard copy reports of the asbestos surveys conducted to date within the MFA Leasehold are located in the NASA ARC Occupational Safety Health & Medical Services Office.

2.6.2. Lead-Based Paints

Given the age of buildings within the MFA Leasehold and the common usage of lead-based paints prior to 1978, it is assumed that the majority of buildings/structures within the MFA Leasehold contain lead. Soil sampling has also been previously conducted around the perimeter of buildings that may have had lead-based paints used on exterior surfaces. This soil sampling program was described in Section 2.4.8.

2.6.3. PCBs in Electrical Equipment and Building Materials

Transformers or capacitors containing PCBs at concentrations above the Department of Health Services ("DHS") regulated concentration for hazardous waste (50 parts per million or "ppm") were historically used within the MFA Leasehold.

The NASA Environmental Services Office performs quarterly inspections, completes Annual Document Logs, and submits transformer registration of equipment with PCBs at greater than or equal to 50 ppm to the U.S. EPA in compliance with the Toxic Substances Control Act ("TSCA" in 40 CFR 761). While several transformers historically contained PCBs within the MFA Leasehold, as of September 2007, only one such transformer (T-60-M, located at Building 953) containing PCBs at greater than 50 ppm was located

within the MFA Leasehold. While an SPCC inspection report from January 2013 appears to indicate that this transformer has been replaced and that the new transformer does not contain PCBs (NASA, 2013), a transformer was observed within the Navy's Day Tank compound during a 2014 site walk of the MFA Leasehold; the transformer identified in the 2013 SPCC Inspection was observed outside the Navy's Day Tank compound.

In addition to PCB-containing transformers or capacitors, buildings with fluorescent lighting may contain PCB light ballasts (Harding, 2000).

Another significant historical source of PCBs at the Site is Hangar 1 (IR Site 29). Most notably, bulk samples of the lower (gray) walls 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). Lower PCB concentrations were detected in roofing materials, sealant, and wall materials. As a consequence, the Navy has conducted a Non-Time Critical Removal Action ("NTCRA") to limit the migration of contaminants present within the Hangar 1 building materials.[19] The NTCRA consisted of the complete removal of the siding, deconstruction of interior structures, removal of debris to appropriate off-site disposal or recycling facilities, and the application of an epoxy coating system to the hangar's structural steel frame (AMEC, 2013). The Navy has developed a Long-Term Management Plan for Hangar 1 that has not been approved by the regulatory agencies. A ROD for Hangar 1 is forthcoming.

2.6.4. Other Hazardous Materials and Hazardous Waste

NASA's 2013 SPCC identifies several active aboveground storage tanks ("ASTs") that contain gasoline and diesel fuel within the MFA Leasehold area; several of these ASTs lack secondary containment and spills or failures would result in spills to the surrounding soils and potentially the San Francisco Bay.

Building 498 is a covered hazardous waste storage area located between Hangars 2 and 3. The building is divided into cells for hazard class separation and each cell is surrounded by a concrete berm and the concrete floor is sealed with a chemically resistant coating. Bulk waste materials are stored in drums and segregated according to hazard class.

Analytical data from wood timbers from Hangar 3 indicate that these materials contain elevated concentrations of chromium; should redevelopment or preservation activities require the removal of these materials, additional testing will be necessary to determine whether the wood would need to be managed and disposed of as a federally regulated hazardous waste.

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[19] Paint on the remaining structural steel frame elements of Hangar 1 contains PCB concentrations ranging from 65 to 214 mg/kg (Navy, 2013b).

2.6.5. Site Walk Observations

On 7 July 2014 and 18 July 2014, EKI personnel conducted site walks within the MFA Leasehold. In the course of these site walks, EKI personnel observed the following additional environmental conditions:

- significant chemical/petroleum use and staining on the paved surfaces located
  - to the east of the CANG Ground Support Building (Building 684);
  - in the Golf Course Maintenance Area; and,
  - in the fenced storage area at Building 499;
- a circular pad located off the eastern taxiway (slightly south of Golf Course Landfill 1) was being actively used for the defueling of aircraft and the storage of hazardous materials. This area is currently known as the CANG Defueling Area and was formerly known as the Ordinance Handling Pad;
- a fuel laboratory and sump are located in the Fuel Farm Offices (Building 545);
- a cargo elevator is located outside the northeastern side of Hangar 3; and,
- an active aircraft washrack is located northeast of Hangar 3, near the EATS treatment system.

3. CURRENT LAND USE AND PLANNED DEVELOPMENT OF MFA LEASEHOLD

3.1. Current Land Use

The MFA Leasehold is approximately 1,000-acre in size and is comprised of the airfield and areas east of the airfield runways ("Eastside/Airfield area"), a small portion of the NRP area that contains Hangar 1, approximately 38 acres of the Sunnyvale Municipal Golf course located south of the airfield and Highway 101, and the Northern Channel (approximately 9.3 acres in size) (Figure 2). The Eastside/Airfield area is approximately 952 acres in size that primarily comprises the airfield runways and the land to the east of it. The primary use of the Eastside/Airfield area are the aircraft runways and fueling areas which are currently utilized by NASA, the California Air National Guard ("CANG"), and some limited use by other Federal agencies and private entities. Other uses of the Eastside/Airfield area include a golf course and CANG's munitions storage facilities. All land within the MFA Leasehold is designated for commercial/industrial land use only.

Existing buildings within the Eastside/Airfield area (primarily Hangars 2 through 3 and the aircraft control tower, located on the western side of the airfield) contain approximately 80,000 square meters (860,000 square feet) of space (DCE, 2002). Immediately west of the airfield is Hangar 1, the most prominent structure in the former NAS Moffett Field that was originally constructed in 1935 to house the USS Macon Dirigible (NASA, 2002). While Hangars 1, 2, and 3 are considered to be in violation of federal airspace regulations because they exceed the Transitional Surface (see Section 3.2), they predate existing federal regulations and they are part of the Shenandoah Plaza National Historic District.

3.2. Planned Land Use

The planned land use for NASA Ames Research Center ("ARC") is described in detail in the Final Programmatic Environmental Impact Statement ("EIS") prepared by Design, Community, and Environment (DCE, 2002). The EIS analyzed five land use alternatives, ranging from Alternative 1, the "No Project Alternative", to Mitigated Alternative 5, the "Preferred Alternative." The Preferred Alternative is summarized in Figure 2.6 of the EIS and the intended land use for the MFA Leasehold includes research and development or light industrial uses and the continued operation of the airfield and its associated fueling facilities.

In general, because of issues regarding chemicals of potential concern in soil and groundwater at the MFA Leasehold, Project Developers should design planned construction projects with a minimum of soil excavation (i.e., without basement or other subgrade floors). However, soil excavation and trenching is expected to occur in conjunction with installation of utility lines, elevator shafts, and building foundations.

The major land use considerations for the areas within the Eastside/Airfield area are to ensure that any new land uses do not interfere with the safety clearances established by federal regulations and will not be adversely affected by the noise generated by airfield operations. For any proposed development, the Project Developer would need to ensure that none of the proposed construction would violate or affect the navigable airspace of the airfield, specifically, no proposed development should penetrate the Transitional Surface and no structures shall be built within the Building Restriction line or Taxiway Object Free Area (Figures 3.2-3 through 3.2-4 of DCE, 2002). The Transitional Surface is determined by calculating a slope of 7:1 extending from the edge of the Primary Surface (an imaginary surface extending approximately 152 meters (500 feet) on either side of the centerline of each runway). The Building Restriction Line is located approximately 234 meters (769 feet) from the centerline of each runway and the Taxiway Object Free Area prohibits the placement of buildings within approximately 59 meters (193 feet) of the taxiway centerline.

4. POTENTIAL EXPOSURE PATHWAYS AND TARGET CONCENTRATION LEVELS

As described in Section 2, soil and groundwater within the MFA Leasehold have been impacted by chemicals, primarily chlorinated VOCs, petroleum hydrocarbons, BTEX, and lead. Although impacted soils are present within the MFA Leasehold, most of the source areas and surrounding soils have been removed and generally only residual contamination remains. As a result, groundwater is the primary contaminated medium of concern within the MFA Leasehold. Exposure to chemicals in the groundwater is primarily the result of transport of VOC vapors from the groundwater to the ground surface. Once at the surface, these VOCs enter the outdoor atmosphere or infiltrate the indoor building environment.

The following sections provide (a) a general summary of the exposure pathways that are potentially associated with planned development within the MFA Leasehold and (b) a summary of target concentration levels for soil, groundwater, sub-slab vapor, soil gas, and indoor air.

4.1. Potential Exposure Pathways

The permitted uses specified in the lease include research and development, including testing and light assembly uses related to space aviation, rover/robotics and other emerging technologies and any other uses permitted under Applicable Laws.

Based on the permitted uses specified in the Lease, primary potential future receptors include (a) construction workers and maintenance workers, (b) indoor workers, such as office personnel and lab workers, (c) recreational users of the golf course, and (d) visitors (adults and children) to a potential future museum.

Potential future receptors may be exposed to COPCs by one or more of the following pathways:

- inhalation of volatile chemicals from groundwater or soil;
- dermal absorption due to direct soil and/or groundwater contact;
- inhalation of airborne suspended soil particulates; and
- incidental soil ingestion.

These pathways are described more fully below.

VOCs are the primary COPCs found within the MFA Leasehold. VOCs in groundwater and soil can volatilize into the pore spaces within unsaturated zone soils and migrate through the soil column and through cracks or penetration in floors into enclosed indoor

spaces, where they can be inhaled by potential receptors. The migration of COPCs from the subsurface into indoor air is called "vapor intrusion". This is the primary potentially complete exposure pathway that could affect future indoor workers within the MFA Leasehold. This mechanism is illustrated on Figure 7 and discussed further in Section 5.1.1. The same mechanism can also lead to exposure to COPCs in ambient outdoor air; however, due to dilution by typical winds in the area, potential exposures are much less than in enclosed spaces. Construction workers and maintenance workers may also be exposed to COPCs through the inhalation pathway during soil excavation or trenching activities that may expose soil or groundwater containing COPCs directly to ambient air leading to increased volatilization of COPCs.

Exposure to COPCs can also occur through dermal absorption due to direct contact with soil or groundwater containing COPCs. COPCs can then be absorbed through the skin. This potentially complete exposure pathway could affect construction workers and maintenance workers within the MFA Leasehold, particularly when excavation or trenching or other activities involve disturbance of the subsurface and expose workers to direct contact with soil or groundwater containing COPCs.

Potential exposure through inhalation of airborne suspended soil particles can occur when the wind lifts soil particles into ambient air that are subsequently inhaled by potential receptors. COPCs sorbed to the soil particles can be absorbed into the bloodstream when inhaled.

Incidental ingestion of soil particles can also occur, primarily through hand-to-mouth contact after the hand comes in contact with soil containing COPCs.

4.2. Target Concentration Levels

While cleanup standards have been developed for many areas at the MFA Leasehold, for simplicity TCLs were developed for soil, groundwater, sub-slab vapor, soil gas, and indoor air within the MFA Leasehold using the screening levels currently promulgated by applicable regulatory agencies (i.e., U.S. EPA's Regional Screening Levels or "RSLs" and the Water Board's Environmental Screening Levels or "ESLs"). These TCLs should be used to determine (a) groundwater management or disposal options (Section 6.3.4), (b) whether excavated soil from construction areas can be reused as fill within the MFA Leasehold and whether additional soil removal should be considered[20] within the limits of construction at locations where potential soil contamination is observed during development (as described further in Section 6.10), and (c) whether vapor intrusion mitigation measures (Section 5.1.3) may need to be installed in existing and/or new buildings.

[20] Should the construction project be located within the boundary of a previously closed site, the cleanup levels used to close the site will be used, unless otherwise directed by the lead regulatory agency, in place of the TCLs to determine whether additional excavation is required.

Cleanup levels for sites that are being addressed as part of the NAS Moffett Field Superfund Site are those determined by the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") lead agency and presented in NAS Moffett Field Superfund Site cleanup documents.

The identified TCLs should be protective[21] of short-term construction workers, maintenance workers performing periodic subsurface activities, indoor workers within the MFA Leasehold, recreational users of the golf course, and potential visitors (adults and children) to potential future museum because the exposure pathways, potential receptors, and exposure assumptions used in developing the U.S. EPA's RSLs and the Water Board's ESLs are similar to (or more conservative than) those anticipated within the MFA Leasehold. Unless specific unique exposure assumptions that could result in more intensive exposure to workers or other populations are identified for a proposed development projects, neither the Master Lessee nor the Project Developer will be required to prepare a human health risk assessment for the proposed development.

The use of the Water Board Tier 1 commercial/industrial land-use ESLs within the MFA Leasehold is justified as the exposure pathways and potential receptors used to develop the ESLs are similar to the expected exposure pathways and potential receptors within the MFA Leasehold for commercial/industrial workers. In addition, as anticipated exposure parameters (e.g., exposure frequency, exposure time, exposure duration, ingestion rate, etc.) for individuals other than commercial/industrial workers within the MFA Leasehold are significantly lower than the default values used to develop the Tier 1 ESL (e.g., for commercial/industrial workers the assumed exposure time, exposure frequency, and exposure duration are 8 hours per day, 250 days per year, over a 25 year period, respectively), the use of the Water Board's Tier 1 ESLs as a cleanup levels within the MFA Leasehold should be protective of all potential future receptors.[22]

Based on historic soil and groundwater data collected within the MFA Leasehold, TCLs were identified for several chlorinated VOCs, petroleum hydrocarbons and BTEX compounds, PAHs, PCBs, and Title 22 metals. The TCLs for a commercial/industrial land use scenario are summarized below and listed in Tables 2, 3, and 4.

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[21] Human health risks are expressed as either (a) an incremental lifetime excess cancer risk or (b) a HI for non-cancer adverse health effects. Based on the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300.430), cancer risks are compared to a risk threshold between 10^{-6} (one-in-a-million) and 10^{-4} (one-in-ten-thousand), and the non-cancer HI is compared to a threshold level of 1, a level at or below which there are unlikely to be adverse health effects, even for sensitive populations.

[22] While several of the exposure parameters (e.g., body weight or inhalation rate) for a hypothetical child visiting a future museum within the MFA Leasehold are significantly lower than those used in developing the commercial/industrial land-use ESLs, the commercial/industrial land-use scenario ESLs should still be protective because most of the museum area would be paved and because the child's actual exposure would be significantly lower than that of an onsite construction or maintenance worker (e.g., an exposure frequency of 12 days per year for a child versus 250 days per year for a construction or maintenance worker, an exposure duration of 4 hours per day for a child versus 8 hours per day for a construction or maintenance worker, and an exposure duration of 10 years for a child versus 25 years for a construction or maintenance worker).

- For soils, with the exception of PCBs and Title 22 metals, the selected TCL is the lowest value from the U.S. EPA Regional Screening Levels ("RSLs"; U.S. EPA, 2014a) under an industrial land use scenario or the Water Board Environmental Screening Levels ("ESLs"; Table A-2, Water Board, 2013) under a commercial/industrial land use scenario where groundwater is a potential source of potable water (considering the direct contact, gross contamination, and groundwater protection pathways). For all areas outside the open space, ecological preserve, and wetland areas (Figure 8) within the MFA Leasehold, only the Ceiling Value, Human Health, and Protection of Groundwater ESLs (Table A-2) were considered applicable pathways or populations to protect. In open space, ecological preserve, or wetland areas, the Water Board Urban Area Ecotoxicity ESLs were also considered applicable; these values are presented in parentheses in Table 2 and should only be used within the open space, ecological preserve, and wetland areas shown on Figure 8.

    - For PCBs, the TCL is the PCB cleanup level promulgated in Toxic Substances Control Act ("TSCA") regulations (40 CFR §761) for high occupancy areas.

    - For Title 22 metals, the selected TCL is the lowest value from the (a) RSLs and (b) ESLs to account for potential dermal contact and incidental soil ingestion, unless that value is less than (c) "background" concentrations for metals in soil (Scott, 1995), in which case the soil TCL will be the "background" value.

    - For COPCs not listed in Table 2, the lowest of the current RSLs and ESLs should be used as the TCL. If the work area is within an open space, ecological preserve, or wetland area (Figure 8), the Water Board Urban Area Ecotoxicity ESL should also be considered when developing the TCL.

- For groundwater, the selected TCL (Table 3) is the lowest value from the California Maximum Contaminant Levels ("MCLs"; CDPH, 2014), the Water Board (2013) Groundwater to Indoor Air under a commercial/industrial land use scenario (Table E-1), or Ceiling Value (Table F-1a).[23] For COPCs not listed in Table 3, the lowest of the current RSLs and ESLs (excluding aquatic habitat goals) should be used as the TCL.

- For sub-slab soil vapors, the selected TCL (Table 4) is the lowest of (a) the U.S. EPA RSL for ambient air under an industrial land use scenario and (b) the Water

[23] As the purpose of the groundwater TCL is to determine the appropriate management option for dewatering water produced during development activities (e.g., on-site dust control, discharge to storm drains, to the sanitary sewer, treatment at one of the Regional Groundwater Plume groundwater extraction and treatment systems, or offsite disposal), the Water Board Estuary Aquatic Habitat Goals were not considered applicable. Rather, discharge to storm drains and sanitary sewers typically have permitted discharge criteria and the Project Developer will comply with the permitted discharge criteria.

Board ESL for ambient and indoor air (Table E-3), multiplied by an attenuation factor of 20[24] between indoor air and sub-slab soil vapor, based on guidance from Cal-EPA (2011). For COPCs not listed in Table 4, the lowest of the current RSLs and ESLs multiplied by an attenuation factor of 20 should be used as the TCL.

- For soil gas, the selected TCL (Table 4) is the lower of the Water Board ESLs for Soil Gas to Indoor Air (Table E-2) and the selected TCL for indoor air divided by an attenuation factor of 0.03 (U.S. EPA, 2013). For COPCs not listed in Table 4, the current RSL should be used as the TCL.

- For indoor air, the selected TCL (Table 4) is the lowest of the U.S. EPA RSL, the Water Board ESL, and the MEW 2010 VI ROD Amendment indoor air screening levels. For COPCs not listed in Table 4, the lowest of the current RSLs, ESLs, and MEW 2010 VI ROD Amendment values should be used as the TCL.

Within the MFA Leasehold, the concentrations of some chemicals in groundwater and soil exceed their respective TCLs. This indicates that:

- for future building occupants within the MFA Leasehold, VOC vapors may potentially migrate from groundwater, soil gas, or sub-slab vapor to indoor air inside buildings at levels of concern, a process called "vapor intrusion"; and,

- for construction workers and maintenance workers, direct contact with groundwater or soil may result in estimated cancer risks and non-cancer hazards at levels of concern.

Additional information on the Water Board ESLs, U.S. EPA RSLs, and Cal-EPA MCLs is presented below.

4.2.1. Water Board ESLs

The Water Board's ESLs are conservative guideline concentrations developed by the Water Board for screening of environmental data collected at a site. According to the Water Board, risks to human health and the environment can generally be considered to be "insignificant" at sites where concentrations do not exceed the ESLs. The ESLs shown in Tables 2 through 4 address the protection of human health from the potential ingestion, inhalation, and dermal contact of chemicals in soil, groundwater, and air and the protection ecological receptors from chemicals in soil and groundwater (Water Board, 2013). Unlike the U.S. EPA RSLs, described below, the ESLs for volatile compounds in soil and groundwater are based in part on consideration of the vapor intrusion exposure pathway.

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[24] The U.S. EPA (2013) recommends a generic attenuation factor of approximately 33 (i.e., 1/0.03) between indoor air and sub-slab soil vapor. As this value is less conservative that the Cal-EPA guidance attenuation factor, only the Cal-EPA guidance attenuation factor was used in Table 4.

4.2.2. U.S. EPA RSLs

The U.S. EPA RSLs are intended to address human health concerns related to the ingestion, inhalation, and dermal exposure to chemicals in soil, air, and water.

4.2.3. Cal-EPA MCLs

California EPA MCLs[25] for drinking water are intended to address human health concerns related to the ingestion of chemicals in water.

4.2.4. Background Metals Concentrations in Soil

The background metal concentrations in soil listed in Table 2 were obtained from Scott's *Background Metal Concentrations in Soil in Northern Santa Clara County*, California (1995). The background concentrations presented in Table 2 are the maximum values observed in the background metal dataset and are selected as the TCLs for metals when the background concentration is higher than the RSL or ESL listed in Table 2.

[25] Federal MCLs were not included as TCLs for groundwater because California EPA MCLs are more stringent.

5. RISK MANAGEMENT DESIGN CONSIDERATIONS

New buildings and utilities that are installed as part of redevelopment can be constructed with mitigation measures that will assist in limiting exposures to chemicals in soil, groundwater,[26] soil gas or sub-slab vapor, and impacted building materials, and in limiting future migration of groundwater containing chemicals of concern. In some cases, the integration of mitigation measures into new construction can increase effectiveness and reduce costs, as compared to adding mitigation measures to existing facilities. Mitigation measures that are required in new construction within the MFA Leasehold are described in the Sections 5.1 through 5.3.[27]

In addition, as described previously, the Navy and MEW Companies have constructed, and are currently operating, groundwater remediation systems within the MFA Leasehold and the Navy has implemented several Site remedies within the MFA Leasehold. Redevelopment within the MFA Leasehold must be conducted in a manner that allows for the continued operation of these remediation systems and does not interfere with their operation nor damage or interfere with the implementation of selected Site remedies. Section 5.4 describes procedures that must be followed to coordinate development activities within the MFA Leasehold with the Navy and MEW Companies' existing remediation systems and other implemented Site remedies.

NASA will notify U.S. EPA and Water Board regarding relevant redevelopment and construction activities within the MFA Leasehold. Relevant redevelopment and construction activities would include the following: (1) subsurface work in areas with known soil, groundwater, or soil gas contamination, (2) new buildings within the various VOC areas, (3) construction that could result in disturbance of existing remedies.

5.1. Measures to Address VOC Vapor Intrusion into New Construction and Existing Buildings

A potentially complete exposure pathway for indoor workers in some areas of the MFA Leasehold is the migration of VOCs from the subsurface into overlying buildings where occupants could be exposed to VOC vapors through inhalation of indoor air. The process

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[26] In general, because of issues regarding chemicals of potential concern in soil and groundwater at the MFA Leasehold, Project Developers should design planned construction projects with a minimum of soil excavation (i.e., without basement or other subgrade floors).

[27] It is the intent of the Master Lessee and NASA that the parties that have been named by U. S. EPA or the Water Board as, or are otherwise, the Responsible Parties (i.e., Navy, MEW Companies, and NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their obligations independent of the Master Lessee. The implementation of the mitigation measures discussed in Sections 5.1, 5.2, and 5.3 by the Master Lessee and NASA does not relieve the Responsible Parties of their responsibilities and obligations, and such actions will not result in Master Lessee becoming a Responsible Party. NASA will facilitate communication between the Master Lessee and the Responsible Party when requested.

of VOC migration in the vapor phase from the subsurface to indoor air is termed "vapor intrusion." For existing and future buildings within the MEW Vapor Intrusion study Area, portions of the IR Site 26 Land Use Control Area, the potential non-MEW Site VI Study Areas east of the airfield runways, and Hangars 2 and 3 (Figure 5) , vapor intrusion must be considered as a potential exposure pathway and vapor intrusion mitigation measures may be required.

5.1.1. The Vapor Intrusion Process

The vapor intrusion process occurs through several chemical transport processes, as summarized below. A generalized illustration of the vapor intrusion process is shown on Figure 7.

The vapor intrusion process begins when VOCs in soil or groundwater volatilize into soil gas in the subsurface. The degree to which VOCs volatilize into soil gas depends on the chemical properties, i.e., VOCs with higher vapor pressures, lower water solubilities, and less tendency to adsorb to soil particles tend to partition into soil gas more readily than other VOCs. Chlorinated solvents such as those found in groundwater within the MFA Leasehold readily partition into soil gas.

Once in the soil gas, VOCs may migrate upwards or laterally by both diffusion and convection. In general, VOCs diffuse more readily in drier, granular soil than in wetter, clayey and silty soil. Diffusion is a relatively slow transport process as compared to convection, which occurs when soil gases containing the VOCs are drawn to the surface by pressure gradients. Pressure gradients can be caused by barometric pressure changes, as well as the reduced pressure that occurs inside many buildings, as discussed below.

After VOCs in soil gas migrate to the area directly beneath a building (e.g., the baserock beneath the floor slab), vapor intrusion into the building can occur. Soil gases containing VOCs may migrate into the building by diffusing through cracks in the floor or through penetrations through the concrete slab (e.g., for utilities). Soil gases may also be swept into the building through cracks in the floor and preferential pathways by convective flow, driven by a lower pressure inside the building. Lower pressures inside of buildings are sometimes referred to as the "stack effect". The stack effect can be caused by:

- warmer air inside the building, which tends to rise and draw in air from the lower parts of the building;
- wind, which tends to impart a lower pressure inside the building;
- appliance exhausts, which tend to draw air into the building and lower the interior pressure; and
- active ventilation systems that exhaust outside the building and induce a slight negative pressure inside the building.

Considering the mechanisms of vapor intrusion, vapor intrusion prevention or mitigation tends to be based on (a) eliminating soil gas flow into the building by creating either a lower pressure (slight vacuum) beneath the floor of the building, or a higher pressure inside the building, (b) preventing VOCs from migrating to the area beneath the building floor, using barriers or source removal, and/or (c) sealing cracks and penetrations in the floor through which vapor intrusion might otherwise occur.

5.1.2. Vapor Intrusion Study Areas

In the 2010 VI ROD Amendment (U.S. EPA, 2010b), the U.S. EPA defined the MEW Site VI Study Area based on the approximate extent of the 5 ug/L TCE in groundwater contour in the shallow A/A1 aquifer zone. Using this criterion for groundwater contamination in the eastern aquifer (IR Site 26) indicates that there are two potential non-MEW Site VI Study Areas in the MFA Leasehold as shown on Figure 2 and Figure 5.

Hangar 1, the North and South Floodlight Towers (Buildings 032 and 033), and a covered storage area (Building 120) are the only structures within the MFA Leasehold that are currently located within the MEW Site VI Study Area. Hangar 3, the EATS treatment facility, Building 69, and Building 143 (a munitions storage bunker) are the only structures within the potential non-MEW Site VI Study Areas located on the eastern side of the MFA Leasehold (Figure 5).

5.1.3. Vapor Intrusion Mitigation Engineering Controls

The 2010 VI ROD Amendment developed different response actions ("Response Action Tiering System") for existing and future residential and commercial buildings within the MEW Site VI Study Area. In accordance with the 2010 VI ROD Amendment, the Navy prepared its *Draft Air Sampling and Vapor Intrusion Tier Response Evaluation Report* (Navy, 2012). Through this EIMP, the Response Action Tiering System approach is being adopted for VI Study Areas within the MFA Leasehold.

In the non-MEW Site VI Study Areas on the MFA Leasehold, vapor intrusion mitigation engineering controls shall be selected and designed as outlined by the Response Action Tiering System developed by the U.S. EPA for the MEW Site VI Study Area in its 2010 VI ROD Amendment. For existing buildings within the VI Study Areas where VOCs in indoor air exceed the cleanup levels, the selected engineering remedy is the installation of an appropriate sub-slab/sub-membrane ventilation system, monitoring, and institutional controls. Where property owners[28] of existing commercial buildings agree to the use, operation and monitoring of a building's indoor air ventilation system ("Positive Pressure Ventilation"), the building's indoor air ventilation system may be used as an alternative remedy. Existing buildings within the VI Study Area are classified into 5 Tiers based on

[28] For the purposes of the EIMP, within the MFA Leasehold, the Master Lessee is assumed to be the entity to approve the use of HVAC as a remedy within a given building, rather than the property owner.

detected concentrations of COCs in indoor air (Tables 6A and 6B of the 2010 VI ROD Amendment).

- Buildings with operational passive or active engineering controls where indoor air concentrations are:
  - above indoor air cleanup levels and outdoor, or background, air concentrations are classified as Tier 1; and,
  - below indoor air cleanup levels are classified as Tier 2.
- Buildings without engineering controls or inactive engineering controls where indoor air concentrations are:
  - above indoor air cleanup levels and outdoor, or background, air concentrations are classified as Tier 1;
  - below cleanup levels but above outdoor, or background, air concentrations are classified as Tier 3A;
  - below cleanup levels and at or within outdoor, or background, air concentrations are classified as Tier 3B; and,
- Buildings without engineering controls or inactive engineering controls where converging lines of evidence demonstrate that there is no potential for vapor intrusion into the building at concentrations exceeding indoor air cleanup levels are classified as Tier 4.

After implementation of additional engineering controls at Tier 1 buildings and monitoring results indicate that indoor air cleanup levels are met, Tier 1 buildings shall be re-categorized as Tier 2 buildings. With the exception of Tier 4 buildings, monitoring and institutional controls are required to ensure that the engineering controls are being operated correctly and demonstrate that indoor air cleanup levels are met.

Future buildings within the VI Study Areas are presumed to be Tier A unless multiple lines of evidence sufficiently indicate that there is no potential for vapor intrusion above indoor air cleanup levels in which case, the building is classified as Tier B. For all Tier A buildings the selected engineering remedy is a vapor barrier and a passive sub-slab ventilation system that can be converted to an active sub-slab ventilation system. On completion of construction, the Tier A building shall be re-categorized as a Tier 2 building. For Tier B buildings, after the building has been constructed, indoor air sampling shall be conducted to confirm that there is no potential vapor intrusion risk and that indoor air cleanup levels are met; if sampling confirms that there is no vapor intrusion risk, the Tier B building shall be re-categorized as a Tier 4 building.

Additional details on the Response Action Tiering System are presented in the 2010 VI ROD Amendment (U.S. EPA, 2010b); additional details on the requirements for implementing the vapor intrusion remedy and documentation required within the MEW Site VI Study Area (Figure 5) are presented in the U.S. EPA's Statement of Work for the

Remedial Design and Remedial Action to Address the Vapor Intrusion Pathway at the MEW Superfund Study Area (U.S. EPA, 2011). For buildings that are potentially located above shallow subsurface TCE, PCE, or vinyl chloride contamination (Figure 5), the design of mitigation measures and monitoring requirements will be discussed with the U.S. EPA, Water Board, the Responsible Party, NASA, and the Master Lessee. The selected mitigation measures and monitoring requirements need to be approved by the U.S. EPA, Water Board, NASA, and the Master Lessee.

Additional details on potential VI mitigation engineering controls are provided below.

5.1.3.1. Sub-Slab Ventilation ("SSV")

A SSV system is designed to function by venting sub-slab soil gases or providing a pathway to allow soil gas to migrate to the exterior of the building rather than entering a building. SSV systems function by drawing in outside air to the sub-slab area, which dilutes and reduces VOC concentrations. SSV systems typically consist of a layer of venting material (e.g., sand or gravel) emplaced below a floor slab to allow soil gas to move laterally under natural diffusion or pressure gradients to a collection piping system for discharge to the atmosphere. SSV systems include a sub-slab liner that is installed on top of the venting layer. To the extent that the liner is intact, the sub-slab liner aids venting of sub-slab soil gas via collection pipes rather than upward into the building. SSV systems include air inlet pipes to allow fresh air into the sub-slab region, and vent pipes to exhaust sub-slab soil gas. A passive SSV system may include wind-driven turbine ventilators on each vent pipe to create air flow. For an active SSV system, a fan would be installed on the vent pipes to create continuous air flow. An SSV system can be also be converted to an active SSD system (see below), typically by plugging or capping the air inlets and installing a fan on one or more of the exhaust vent pipes.

5.1.3.2. Sub-Slab Depressurization ("SSD")

The components of a SSD system are similar to a SSV system except that the SSD is equipped with a fan or blower that draws soil gas through the sub-slab venting layer.

The SSD system is operated continuously to create a slight vacuum beneath the concrete floor slab of the building. The induced vacuum beneath the building floor slab overcomes the lower pressure that is sometimes found inside buildings. Therefore, when the SSD system is in operation, soil gases generally cannot flow from beneath the floor slab into the building. Rather, at the location of any cracks on the floor, indoor air will be drawn from inside the building into the lower pressure zone beneath the floor slab, thereby mitigating the vapor intrusion process.

An SSD system requires installation of a vent intake pipe in one or more central or other appropriately selected location(s) in the baserock layer beneath a concrete floor slab. As an alternative, a geocomposite drainage mat or other liner with lateral permeability can be installed beneath the building and used as the means for withdrawing air from beneath the entire floor area. The vent pipe or drainage mat is connected to a blower to continuously create ventilation and a slight vacuum beneath the floor slab. The vacuum level created

beneath the floor must be at a level sufficient to overcome the anticipated vacuum level inside the building. The air and soil gases withdrawn from beneath a building during SSD operation are exhausted to the atmosphere. The emissions from the SSD systems may need to be treated to remove VOCs to the extent required by the Bay Area Air Quality Management District ("BAAQMD") based on the estimated VOC emission rate for each system.

5.1.3.3. Continuous Positive-Pressure Ventilation ("PPV")

Vapor intrusion primarily occurs when there is a lower pressure inside the building, i.e., causing soil gas to flow into a building through cracks in the floor (U.S. EPA, 2002b). As such, the vapor intrusion process may be mitigated by creating a positive pressure (i.e., a pressure slightly higher than the outside air pressure) inside the building. When there is a positive pressure inside a building, air inside the building will flow outward through any cracks in the floor, i.e., toward the lower outdoor pressure. The U.S. EPA recognizes this in its vapor intrusion guidance, indicating:

> *A building may be positively pressurized as an inherent design of the heating, ventilation, and air conditioning system. It may be possible to show that the [vapor intrusion] pathway, in this case, is incomplete, at the current time, by demonstrating a significant pressure differential from the building to the atmosphere*. (U.S. EPA, 2002b)

Similarly, the California Building Code ("CBC"), Section 1202.2.7, requires positive pressure ventilation in ticket booths and other occupied spaces inside of parking garages. The purpose in that case is to prevent fumes from the parking garage from entering those spaces, i.e., to mitigate vapor intrusion from the parking garage into those occupied spaces.

Positive-pressure ventilation is effectively the same as active SSD (Section 5.1.3.1) in that both methods use an air pressure gradient to mitigate vapor intrusion routes. However, the effectiveness of PPV is dependent on proper operation and maintenance of the building ventilation system to maintain continuous positive pressure inside the building.

Positive-pressure ventilation involves designing the building's ventilation system to continuously impart a slight positive pressure inside the lowest floor of the building relative to the pressure below the floor slab. [29] The mechanical ventilation systems in commercial buildings are often designed to operate with a slight positive pressure inside the building. However, for energy efficiency, such systems are also commonly turned off during non-working hours, potentially allowing for some vapor intrusion during time periods when the system is not operating. Within the MFA Leasehold, for buildings

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[29] The use of PPV within a commercial building is subject to the agreement of the property owner. For the purposes of the EIMP, within the MFA Leasehold, the Master Lessee is assumed to be the entity to approve the use of HVAC as a remedy within a given building, rather than the property owner (i.e., NASA).

where vapor intrusion mitigation is provided by PPV, the PPV system must be continuously operated in the lowest level of the building, i.e., 24 hours per day and 7 days per week, excepting for periodic shutdowns for normal maintenance. Heating and cooling conditions may be adjusted during non-working hours as long as the fan operation continues to impart the positive pressure to the building interior.

VOC vapors migrating from groundwater may tend to accumulate in soil gas beneath a building that is operated using PPV. As such, it is recommended that passive ventilation be installed beneath buildings designed for PPV. The passive ventilation could be installed in the same manner as the sub-slab infrastructure for an active SSD system, i.e., perforated vent pipes in the sub-slab base rock with a header vent pipe plumbed to outside the building, but without the SSD blower. The passive ventilation system would provide a means for VOC vapors to migrate from the sub-slab area to outside the building to reduce potential vapor accumulation beneath the building. The passive ventilation system could also be converted to an active SSD system (i.e., by the addition of the SSD blower) in the event the building use is changed in the future such that continuous PPV is rendered infeasible or impractical.

5.1.3.4. Ventilated Parking Garage Construction

Vapor intrusion into buildings can be mitigated using ventilated parking garage construction at ground level beneath the occupied space, as discussed below. Currently, parking garages with overlying occupied space are not contemplated within the MFA Leasehold; however, if such construction is approved by NASA in the future, this section provides criteria for parking structures as vapor intrusion mitigation systems.

If a parking garage will be constructed in areas where VI must be considered, the Project Developer will submit subsurface sampling results and the parking garage design documents to the U.S. EPA and Water Board for review and approval. Additional mitigation measures and/or post-construction monitoring may be required by the U.S. EPA to ensure that the COPC concentrations in the overlying occupied spaces are at acceptable levels.

Specific requirements for ventilation of parking garages are identified in Sections 406.5.2 and 406.6 of the CBC (CBC, 2014), and other comparable, local building codes. Under requirements such as these, above ground parking garages can be ventilated using either openings to the atmosphere or mechanical systems to draw in fresh air and to exhaust fumes. The purpose of these systems is to provide adequate ventilation of car exhausts that are generated within the garage. These systems can be utilized to mitigate vapor migration from chemically impacted groundwater within the MFA Leasehold into overlying indoor living/working spaces, as described below.

For parking garages that are constructed on or above ground level without mechanical ventilation, the primary driving force for vapor intrusion, i.e., the lower pressure inside buildings, is removed. In these cases, the air pressure inside the parking garage will be essentially the same as outside barometric pressure, and the vapor intrusion flux of VOCs into the parking garage would be driven primarily by diffusion through cracks in the

floor, a process significantly slower than the pressure-driven flux between a building and the sub-slab directly beneath it. In addition, the natural ventilation in the parking garage would serve to reduce the concentrations of any VOCs that do migrate into the parking garage.

Section 403.7 of the California Mechanical Code ("CMC"; CMC, 2014) describes alternative requirements for ventilating garages using mechanical ventilation systems:

- 0.75 cubic feet per minute ("cfm") of fresh air ventilation per square foot ("sf") of parking garage floor[30];
- 14,000 cfm of fresh air ventilation per operating vehicle; or
- ventilation adequate to maintain an average carbon monoxide level of 50 parts per million ("ppm") over an 8-hour period, not to exceed 200 ppm over any one-hour period.

Consistent with these requirements, the ventilation system for each parking garage employing mechanical ventilation within the MFA Leasehold that will also serve as vapor intrusion mitigation will be designed with a capacity of at least 0.75 cfm/sf. Operation of the ventilation system in the lowest level of the parking garage should not be modulated based on either (a) 14,000 cfm per operating vehicle or (b) carbon monoxide levels, as allowed by the CMC (see above). Rather, the systems should be designed to operate at a ventilation rate of 0.75 cfm/sf, 24 hours a day, seven days a week.

If parking garages with overlying occupied space are approved as part of future development, the parking garages within the MFA Leasehold will also be designed to minimize the negative pressure that may be induced inside the parking garage by the ventilation systems. Maintaining the parking garages near atmospheric pressure will reduce the potential for advective flow of subsurface vapors into the parking garage, and will be accomplished by (a) maximizing open area at the perimeter of the garage, and (b) distributing the ventilation system intakes around the garage.

In summary, the potential for vapor intrusion into parking garages within the MFA Leasehold, and the magnitude of any vapor intrusion that may occur, will be mitigated by the parking garages in two ways:

- air pressure in the parking garage will be at or very near ambient pressure due to the openings at the perimeter of the parking garage, thereby substantially reducing the pressure driving force for vapor intrusion; and

[30] Exhaust rate is not required for enclosed parking garages having a floor area of 1,000 square feet or less or parking garages that are used for the storage of five motorized vehicles or less (CMC, 2014).

- ventilation in the parking garage will provide substantial reductions in concentrations of any VOCs that may migrate into the parking garage.

While it is possible that air in the parking garages will enter overlying occupied spaces (i.e., vapor intrusion), (a) VOC levels in the parking garages resulting from vapor intrusion from groundwater may be acceptable for occupied spaces due to the vapor intrusion mitigation provided by the parking garage, as described above, and (b) further reductions in VOC concentrations would be expected in the overlying occupied spaces (e.g., residences, educational facilities) due to fresh air ventilation in those spaces.

5.1.3.5. Sub-Membrane Depressurization ("SMD") for Crawl Spaces

In a SMD system, a membrane is placed over the dirt at the base of the crawl space. The membrane may be a flexible liner, such as high-density polyethylene ("HDPE"), a layer of asphalt or concrete, or another durable membrane material. Air is withdrawn from beneath the membrane in a similar manner as air is withdrawn from beneath the floor of a building using SSD for vapor intrusion mitigation (Section 5.1.3.2).

5.1.3.6. Vapor Intrusion Barrier

A vapor barrier may be installed beneath the floor slab to reduce the advective flow of gases into the overlying building. However, the effectiveness of a barrier is largely dependent on the quality of the installation and long-term maintenance (i.e., prevention of punctures and tears). Air leakage may be substantial if there are voids at seams with utility penetrations or holes in the barrier.

5.1.3.7. Sealing Cracks and Utility Penetrations in the Floor

Vapor intrusion is believed to occur primarily through cracks and penetrations in the floor that is in contact with the ground. Cracks in the concrete floor should be minimized through proper design and installation of the concrete floor. Cracks at control joints can be sealed with flexible sealants, such as polyurethane caulk. Cracks around utility penetrations in the floor can also be avenues for vapor intrusion. Such cracks can also be sealed with flexible sealants at the top of the concrete, and mechanical devices are available for placement around utility pipes to form a better seal with the concrete. Similarly, conduit conveying electrical, telecommunications, or other lines can be preferential pathways for vapor intrusion into buildings. Such conduit should be sealed with a foam sealant to mitigate potential vapor intrusion.

5.1.4. Design of Vapor Intrusion Mitigation Measures

Within the MEW Site VI Study Area, the U.S. EPA's Statement of Work for the Remedial Design and Remedial Action to Address the Vapor Intrusion Pathway at the MEW Superfund Study Area (U.S. EPA, 2011) describes requirements for the implementation of vapor intrusion remedies and documentation required by the U.S. EPA.

In areas where vapor intrusion must be considered as a potential exposure pathway (i.e., the potential non-MEW Site VI Study areas, Hangars 2 and 3, and portions of the IR Site 26 Land Use Control Area), the Master Lessee and the Project Developer will work with the U.S. EPA, Water Board and the appropriate Responsible Party (Navy or NASA) to design remedies and other engineering controls that may be used to mitigate the potential for vapor intrusion into existing and future building areas and to develop appropriate monitoring programs to verify the implemented remedy's effectiveness.

The Project Developer will design and implement adequate measures to mitigate vapor intrusion into buildings within the MFA Leasehold and will demonstrate that the system will effectively mitigate the vapor intrusion exposure pathway and meet indoor air cleanup levels[31]; costs related to the design and implementation of these mitigation measures should be the responsibility of the Responsible Party, as shown on Figure 5. The proper design, installation, operation and maintenance of an SSV system (Section 5.1.3.1), SSD system (Section 5.1.3.2), a continuous PPV ventilation system for the building (Section 5.1.3.3), a ventilated parking garage beneath occupied spaces (Section 5.1.3.4) or an SMD system (Section 5.1.3.5) is considered effective mitigation of the vapor intrusion exposure pathway. While vapor intrusion barriers (Section 5.1.3.6) and sealing of cracks in the floor (Section 5.1.3.7) are not sufficient to mitigate the vapor intrusion pathway alone, they should also be used, where appropriate, to further reduce the potential for vapor intrusion to occur.

5.1.5. Monitoring Vapor Intrusion Mitigation Effectiveness

VI monitoring programs will ultimately be developed as part of the 2010 VI ROD Amendment, but such programs do not currently exist. Until VI monitoring programs have been developed, the Master Lessee and the Project Developer will work with the U.S. EPA and the appropriate Responsible Party (Navy, MEW Companies, or NASA) to develop an appropriate monitoring program to verify the long-term effectiveness of any implemented VI mitigation measures installed within the MFA Leasehold.

The U.S. EPA's Statement of Work for the Remedial Design and Remedial Action to Address the Vapor Intrusion Pathway at the MEW Superfund Study Area (U.S. EPA, 2011) provides additional details on response action activities and deliverables for buildings within the MEW Site VI Study Area (Figure 5). For existing and future buildings that are located in areas where vapor intrusion must be considered as a potential exposure pathway (i.e., the potential non-MEW Site VI Study Areas, Hangars 2 and 3, and portions of the IR Site 26 Land Use Control Area), monitoring requirements will be

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[31] It is the intent of the Master Lessee and NASA that the parties that have been named by U. S. EPA or the Water Board as, or are otherwise, the Responsible Parties (i.e., Navy, MEW Companies, and NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their obligations independent of the Master Lessee. The design and implementation of the VI mitigation measures by the Master Lessee and NASA does not relieve the Responsible Parties of their responsibilities and obligations, and such actions will not result in the Master Lessee becoming a Responsible Party. NASA will facilitate communication between the Master Lessee and the Responsible Party when requested.

discussed with the U.S. EPA, Water Board, the Responsible Party, and the Master Lessee.

5.2. Reducing the Potential for Lateral Migration of VOCs in Utility Corridors

As discussed in Section 2.1.1, groundwater within the MFA Leasehold is typically located at approximately 5 to 12 feet below ground surface. If utilities are buried below the groundwater, it is possible that groundwater or soil gas containing VOCs may migrate through utility backfill material. As such, mitigation measures shall be utilized during installation of new utilities to reduce the potential for the lateral migration of VOCs in groundwater or soil gas in utility backfill.

Utilities most likely to be buried below the groundwater table are sanitary sewers and storm drains, although other utilities may in some cases also be buried below the water table. If possible based on infrastructure needs and design requirements, it is preferable, from an environmental perspective, to place utilities in trenches located above the water table.

5.2.1. Utilities Subject To Mitigation Measures

A utility is subject to the mitigation requirements in this Section 5.2 if:

- it is installed in a trench or horizontal borehole that extends to within two feet of the seasonal high elevation of the groundwater table[32]; and,
- it is located within an area within the MFA Leasehold where VOCs or TPH compounds occur in groundwater or soil gas at concentrations above TCLs (Figure 6).

If these conditions are met, the mitigation measures described below will be implemented.

5.2.2. Measures to Mitigate Groundwater or Soil Gas Movement in Utility Backfill

For utilities subject to the mitigation requirement, as described in Section 5.2.1, mitigation measures shall include:

- the use of low permeability backfill; and/or
- cutoff features.

[32] Seasonal high groundwater elevations around IR Site 26 and IR Site 28 can be obtained from the annual groundwater reports for Installation Restoration Sites 26 and 28 (e.g., Tables 2-3 and 3-1 and Figures 2-54 through 2-57 and Figures 3-18 and 3-19 of SES-TECH, 2014).

Low permeability backfill may include a low strength grout mix known as controlled density fill ("CDF"), or "flowable fill". This material is poured like grout, has low strength and therefore can be excavated by hand, and flows into gaps and around utilities. It can provide a low permeability restriction to water flow when used as utility backfill. Other low permeability fill materials may also be used.

If a granular backfill material is used in a trench, a cutoff feature will be installed a minimum of every 300 feet, and within 50 feet of branches in the distribution system. The cutoff feature will be a wall of low permeability material, such as bentonite, concrete, or CDF. The cutoff feature will be at least 2 feet thick and will span the width of the trench from the base of the trench to an elevation at least 3 feet above the highest expected groundwater level in areas with groundwater contamination or to the ground surface in areas with soil gas contamination. The sides of the cutoff feature shall be keyed into native soil.

Some utilities subject to the mitigation requirement of this section may be installed in horizontal boreholes with no backfill. If it is determined that the native soil will collapse around the utility, no further mitigation is required. If, however, the borehole may remain open or a granular backfill is installed around the utility line, cutoff features will be installed as described above for trenches. This may require potholing to the borehole to install the cutoff feature, or installing plugs of low permeability material around the utility when it is installed.

5.2.3. Measures to Reduce Groundwater Infiltration into Utility Pipes

In non-pressurized utilities buried below the water table (e.g., sanitary sewer, storm drain), groundwater containing chemicals of concern can infiltrate into the utility line at leaky pipe joints. Such infiltration, should it occur, would cause migration of the VOCs to other areas within the MFA Leasehold or off-site, and in the case of the storm drain, to the receiving water body. Therefore, utility pipes and their joints must be designed and installed to be watertight. Butt-fused high-density polyethylene pipe shall be used for all utility piping. Following installation, a four-hour hydrostatic leakage test or other equivalent pressure test shall be performed on each length of utility piping to confirm that the piping is watertight.

5.2.4. Measures to Protect Drinking Water

All new piping within the MFA Leasehold should be installed at least two feet above the water table, if possible. Since it is still possible that this piping could be submerged in chemical-containing groundwater from time to time, the infiltration of chemicals from groundwater into the drinking water is a potential concern. In addition, concerns about whether chemicals may leach from the piping material into the drinking water have also been raised.

Potential piping materials for potable water distribution were evaluated in the NRP EIMP Addendum concerning Acceptable Materials for Drinking Water Distribution Piping at NASA Research Park (EKI, 2007). In this addendum, four piping materials (plastic,

cement, metal, and fiberglass) were evaluated and in conclusion, the addendum recommended:

1) the use of metallic piping material suitable for geotechnical conditions within the MFA Leasehold and that incorporates appropriate protective coatings or corrosion control techniques to prevent corrosion; and,
2) welding or soldering pipe joints. If gasketed joints are used instead, the materials and installation methods should be selected to ensure that the joints are water tight and resistant to chemical permeation.

These recommendations are also recommended for the installation of new drinking water piping within the MFA Leasehold.

5.2.5. Design of Utility Lines

If a planned utility line is subject to the mitigation requirements of Section 5.2.1 and the Project Developer does not plan to use low permeability backfill and/or cutoff features (see Section 5.2.2), the Project Developer will prepare a design report describing the mitigation measures that will be implemented to reduce the potential for lateral migration of COPCs in utility corridors and submit it to the U.S. EPA, the Water Board, and the Santa Clara Valley Water District ("SCVWD") for review and approval.

5.2.6. Soil and Groundwater Handling During Utility Line Construction

Soil and groundwater handled during construction of utility lines shall be managed as described in Sections 6.3 and 6.10.

5.3. Reducing the Potential for Creating Conduits to Deeper Groundwater Zones During Pile or Elevator Shaft Installation

It is possible that designs for new construction will include pile foundations or elevator shafts. Piles are commonly driven into the ground or placed in drilled boreholes, and extend as deep as 50 to 100 feet bgs, although actual depths of piles or elevator shaft excavations that may be used for development within the MFA Leasehold are not currently known. If piles or elevator shaft excavations are used in future construction and penetrate the A1-aquifer zone underlying the MFA Leasehold (i.e., 20 feet below ground surface) in areas with VOC contamination (e.g., within the VI Study Areas), mitigation measures will be employed to minimize (a) the potential to drive shallow, chemically-impacted soil into deeper soils, (b) the potential to create conduits for the migration of shallow, chemically-impacted groundwater to deeper groundwater, and (c) the potential for more highly contaminated groundwater in the western A2-aquifer (the B1-aquifer under the MEW nomenclature) to migrate upward to the western A1-aquifer from which there would be greater exposure risks.

A permit must be obtained from the SCVWD for any drilling or installation of elevator shafts. The SCVWD currently has no permitting requirements for the driving of piles. However, the SCVWD has a general policy regarding driven piles that would require

measures to be taken to prevent the creation of potential conduits for contaminant migration via groundwater. Therefore, SCVWD will be involved in the review of any mitigation measures proposed by the Project Developer as described below.

Mitigation measures may include pre-drilling through chemically-impacted soil or groundwater and using conductor casing to prevent downward or upward migration of COPCs. Alternatively, if a geotechnical evaluation indicates that the aquitard sediments will seal around the installed piles to prevent formation of conduits, piles may be installed using a cone-shaped tip on the end of the pile to prevent migration of soil to deeper zones. The Project Developer will prepare a design report for submittal to the SCVWD, U.S. EPA, and Water Board for review and approval that describes the mitigation measures that will be implemented and demonstrates their effectiveness in preventing downward or upward migration of COPCs.

Other mitigation measures that can effectively reduce the potential for driving impacted soil deeper or creating conduits for groundwater migration may also be used if their effectiveness can be demonstrated to the satisfaction of the SCVWD, U.S. EPA, and Water Board. If alternate mitigation measures are proposed, a design report describing the alternate measures and demonstrating their effectiveness shall be submitted to the SCVWD, U.S. EPA, and Water Board for review and approval prior to implementation.

5.4. Protecting Existing Site Remedies and Groundwater Remediation Systems

As described in Sections 2.2 and 2.4, the Navy has implemented several remedies and owns two groundwater extraction and treatment systems and their associated monitoring wells within the MFA Leasehold. In addition, the MEW Companies, and NASA own several groundwater monitoring wells located within the MFA Leasehold. The layout of major features of the existing groundwater treatment systems are shown on Figure 3. Components of the remediation systems include groundwater extraction wells, single and double-contained pipelines, air relief structures, electrical power and instrumentation conduits, fiber-optic instrument systems, electrical field control panels, leak detection systems, radio frequency communication links, settlement pin monuments, groundwater treatment systems, and a network of groundwater monitoring wells. The location of existing groundwater monitoring and extraction wells for the Navy's WATS and EATS treatment systems are identified in the 2013 Navy Annual Report (SES-TECH, 2014). The location of existing groundwater monitoring and extraction wells for the MEW Companies' GWTS are presented in the 2013 MEW Annual Report (Geosyntec, 2014). The location of existing groundwater monitoring and extraction wells for the NASA's GWTS are presented in the *2013 Annual Progress Report for the NASA AMES Groundwater Treatment System* ("2013 NASA Annual Report"; ERT, 2014). Figures showing the locations of the groundwater monitoring and extraction wells and Tables identifying the well owners as identified in the 2013 Navy, MEW, and NASA Annual Reports, are provided in Appendix B.

The Navy is required to operate the WATS groundwater remediation systems on a continuous basis except for required maintenance. On 30 September 2014, the U.S. EPA adopted in-situ biostimulation/bioaugmentation as the selected remedy for the southern

plume at IR Site 26 (Navy, 2014). As a result, the Navy's EATS groundwater extraction system is no longer required. Nevertheless, as several of its monitoring wells may be required for the new in-situ biostimulation/bioaugmentation remedy, approval from the U.S. EPA and Water Board should be sought before any portion of the EATS system is removed or relocated. Therefore, consideration must be given during the design of development projects to identify measures to protect the integrity of implemented Site remedies and the Navy's WATS to allow for its continued operation while minimizing any shutdowns of system components.

The MEW Companies' and NASA's GWTSs are located west of the MFA Leasehold (Figure 3). However, several of the MEW Companies' and NASA's groundwater monitoring wells are located within the MFA Leasehold.[33] As such, the relevant procedures described in this Section 5.4 should be implemented with the involvement of the MEW Companies in the event that future construction may be in the vicinity of an MEW well(s).

5.4.1. Coordination of Development with Implemented Site Remedies and Groundwater Remediation Systems

The following section describes coordination activities that must occur during design and pre-construction planning. Measures to protect implemented Site remedies and remediation system components during construction are described in Section 6.9, and procedures for managing soil, groundwater, and impacted building materials produced during construction activities are described in Section 6.10.

5.4.1.1. Pre-Construction Coordination

In the event that the location of existing remediation system wells and pipelines conflicts with the planned development, it may be possible to remove or relocate the affected well or pipeline. Relocation or removal of any remediation system components, however, may only occur with the prior approval of the U.S. EPA and Water Board. In addition, U.S. EPA and Water Board must also approve in advance any planned shutdown of the remediation system for more than 24 hours.

In identifying potential conflicts between existing remediation system components and planned development, the following criteria will be used:

- All wells located within 5 feet of the outer wall of a new building are considered in conflict with planned development and must be properly abandoned and

[33] The locations of MEW Companies groundwater extraction and monitoring wells are presented on Figures 8 through 11 and Figures 18 through 20 of the 2013 MEW Annual Report (Geosyntec, 2014). The locations of NASA's groundwater extraction and monitoring wells are presented on Figures 15 through 17 of the 2013 NASA Annual Report (ERT, 2014). Figures from the 2013 annual groundwater monitoring reports are presented in Appendix B. The Project Developer should consult NASA's and the MEW Companies' most recent annual groundwater monitoring reports for the locations of existing extraction and monitoring wells.

relocated, if required, because they will be too difficult to access once the building is constructed. Wells located more than 5 feet from building walls may also be considered in conflict with planned development subject to a site-specific evaluation.

- All pipelines located within five feet of the outer edge of the footing or foundation of a new building are considered in conflict with planned development and must be removed and relocated.

- Wells, pipelines, or other remediation system components that do not meet either criteria above, but are identified as potentially in conflict with the layout of the planned development or planned construction activities by the Project Developer, for example, a monitoring well in the center of a planned roadway.

Modifications to existing Site remedies or modifications to or planned shutdowns of the remediation systems will be coordinated with the Responsible Party for such system (e.g., the Navy, the MEW Companies, or NASA). In addition, it is contemplated that the design and construction of any modifications to the remediation systems so approved will be performed by the Responsible Party's contractor(s), as applicable, at the Project Developer's expense. A flow chart describing the preconstruction planning process for coordination with existing Site remedies and operation of existing remediation systems is shown on Figure 9.

To effectively coordinate the development within the MFA Leasehold with implemented Site remedies and the operation and modification of the remediation systems, the Project Developer and its contractors, NASA representatives, and contractors for the Navy and MEW Companies will need to be communicating frequently. The Project Developer and NASA shall each designate to one another in writing a primary and alternate single point of contact for communication, and shall specify the methods for communication among the designated contacts (e.g., telephone numbers, email addresses, and facsimile numbers). Project Developer and NASA will continue to communicate with the Navy's BRAC Environmental Coordinator for MFA and the environmental coordinator for the MEW Companies. It is contemplated that an initial meeting among the involved parties be scheduled as early as possible during project planning and that the Project Developer be provided with detailed drawings showing the location of remedial system components in CAD form so they can be integrated into the Project Developer's design plans. In addition, as the Project Developer's design and construction plans are developed, the Navy, the MEW Companies, and NASA, as applicable, must be provided with the Project Developer's planned construction schedule and a full set of civil, landscaping, foundation, and utility plans and specifications. Updates to the project schedule, and plans and specifications must be provided to the Navy, the MEW Companies, the Navy, and NASA, as applicable, and the U.S. EPA and Water Board as they become available.

5.5. Hangar 1

As indicated previously, the Navy has implemented a NTCRA that included the complete removal of the siding and the application of an epoxy coating system to the Hangar 1's

structural steel frame (AMEC, 2013). The forthcoming ROD for Hangar 1 will include institutional controls monitoring requirements to maintain the protectiveness of the Hangar 1 remedy; Master Lessee will work with the U.S. EPA, the Water Board, NASA, and the Responsible Party regarding LUCs for Hangar 1. Development planning for the reuse of Hangar 1, including re-siding activities, will need to account for the existing condition of Hangar 1. Until such time as the on-going obligations are defined in the Hangar 1 ROD, when planning future development activities at or around Hangar 1, the Project Developer will:

- obtain approval from the lead regulatory agency if planned activities may disturb the Hangar 1 remedy;
- conduct the proposed activities in a manner that is protective of both the implemented Hangar 1 remedy and of on-site construction workers;
- allow access for the maintenance and monitoring activities as may be required to maintain and evaluate the protectiveness of the implemented remedy.

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6. RISK MANAGEMENT DURING CONSTRUCTION

During development activities within the MFA Leasehold, construction risk management addresses precautions that will be taken to mitigate risks to human health and the environment from COPCs at the Site.

Section 6.1 describes the general approach to conducting environmental sampling and treatment or disposal of impacted soil and groundwater and other materials relating to chemical impacts (e.g., USTs or chemical containers encountered during construction) during development activities within the MFA Leasehold. The respective roles of the Project Developer and NASA are described in this section.

Precautions to be taken during construction will include the following:

- review of available information (e.g., NASA's EECs, LUCs, Table 1 and Figure 6) to identify COPCs and potential development restrictions;
- establishment of health and safety training and worker protection objectives for construction workers who may directly contact soil or groundwater containing COPCs (e.g., during site preparation, grading, foundation construction, or landscape installation) (Section 6.2);
- implementation of construction impact mitigation measures, including control of dust generation within the MFA Leasehold, decontamination of equipment, prevention of sediment from leaving the MFA Leasehold in storm water runoff, and management of groundwater extracted from excavations for dewatering (Section 6.3);
- implementation of procedures for managing asbestos-containing (Section 6.4) and lead-based paint containing debris and/or building materials (Section 6.5);
- implementation of procedures for removing PCB-containing materials and/or equipment (Section 6.6) and building materials containing other chemicals (Section 6.7);
- implementation of procedures for managing abandoned underground storage tanks, sumps, abandoned pipes, or buried drums and containers (Section 6.8);
- implementation of procedures to protect existing Site remedies, groundwater monitoring wells and other remediation system components, such as pipelines (Section 6.9); and,
- establishment of procedures to characterize and manage soil during construction excavation and trenching activities within the MFA Leasehold, including

procedures to follow if visibly contaminated or odorous soil is encountered during development (Section 6.10).

In addition to the risk management procedures highlighted above, the Project Developer shall comply with the *MFA Wildlife Management Plan* attached to the Lease (PV, 2014a). The Project Developer shall review the applicable and related documents listed in the MFA Wildlife Management Plan and NASA's *Environmental Resources Document* (NASA, 2009) during the planning and implementation stages to identify procedures that should be followed to protect sensitive ecological species and wildlife habitat in a manner consistent with applicable State and Federal regulations.

To ensure implementation of the EIMP during construction, the Project Developer shall incorporate the appropriate provisions of the EIMP into the technical specifications of construction contracts.

6.1. General Approach for Conducting Environmental Sampling and Treatment/Disposal of Impacted Material during Development

Many of the risk management measures described in Section 6 of this EIMP involve collection and analyses of soil or groundwater samples to determine appropriate measures for handling potentially impacted soil or groundwater encountered during construction activities. In addition, the EIMP describes actions involving removal and onsite treatment or off-site disposal of impacted soil, groundwater, or other materials, such as underground storage tanks or sumps encountered during construction.

This section describes the general approach to addressing these issues and the respective roles of NASA and the Project Developer in the event of non-performance or delayed performance of the Responsible Party.[34]

6.1.1. Environmental Sampling

The EIMP describes environmental sampling of soil and groundwater that is handled during construction activities to determine how these materials must be managed (see Sections 6.3.4 and 6.10). This sampling will be conducted in close coordination with construction activities. Additional environmental sampling may be necessary in conjunction with the removal of tanks, sumps, containers, abandoned pipes or other

[34] It is the intent of the Master Lessee and NASA that the parties that have been named by U. S. EPA or the Water Board as, or are otherwise, the Responsible Parties (i.e., Navy, MEW Companies, and NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their obligations independent of the Master Lessee. The implementation of the sampling, treatment, and disposal measures discussed in Section 6.1 by the Master Lessee and NASA does not relieve the Responsible Parties of their responsibilities and obligations; rather, Section 6.1 allocates as between NASA and Master Lessee who will take actions to address environmental conditions in the event of non-performance or delayed performance by the Responsible Party, but such actions will not result in Master Lessee becoming a Responsible Party. NASA will facilitate communication between the Master Lessee and the Responsible Party when requested.

subsurface structures associated with potential impacts to soil or groundwater within the MFA Leasehold (see Section 6.8), or in the event that previously unknown soil contamination is encountered during construction.

In general, the Project Developer will conduct the environmental sampling described in the EIMP. The Project Developer will be responsible for using a qualified environmental contractor, appropriately staffed with licensed, certified, or registered environmental professionals. For each development project, the Project Developer will agree to conduct the necessary environmental sampling activities during development activities within the MFA Leasehold.

6.1.2. Excavation or Removal of Impacted Soil or Groundwater and Other Materials Relating to Potential Chemical Impacts

The Project Developer will be responsible for excavation or removal of impacted soil and groundwater that must be removed as part of development activities within the MFA Leasehold. In addition, the Project Developer will also be responsible for the removal of other materials or subsurface structures associated with potential chemical impacts, such as USTs, sumps, or abandoned pipes, encountered during development.

In situations where the removal of structures, such as USTs, are subject to regulatory agency oversight, NASA will facilitate coordination with the appropriate regulatory agencies.

6.1.3. Treatment or Disposal of Impacted Soil and Groundwater, Tanks, Sumps, Abandoned Pipes or Chemical Containers

As described in this EIMP, environmental sampling will be conducted to determine if potentially impacted soil or groundwater that is handled during development activities within the MFA Leasehold must be treated or disposed off-site at a licensed disposal facility. NASA will facilitate communication between the Project Developer and the Navy or MEW Companies, as applicable. In the absence of a Construction Coordination Agreement with the Navy or MEW Companies, as applicable, the procedures below shall apply.

Based on the appropriate discharge requirements, groundwater produced during dewatering of excavated areas during development activities within the MFA Leasehold will either be used for dust suppression if concentrations are below TCLs, discharged to the storm drain system, discharged to the sanitary sewer system, or, if approved by the Responsible Party for any existing groundwater treatment system operating at the time, transported by the Project Developer to the permitted groundwater treatment system (see Section 6.3.4). Once the Project Developer has transported extracted groundwater to tanks next to the groundwater treatment system, the Responsible Party for such system who approved the discharge through the system will be responsible for ensuring that it is appropriately treated and disposed of. In the event that the groundwater will be treated at NASA's GWTS, the Project Developer shall obtain any necessary permits for discharge

of the treated groundwater to the sanitary sewer or storm drain and will provide copies of these permits to NASA.

If groundwater cannot be managed by one of the above management/disposal options, the Project Developer will transport the extracted groundwater to a permitted off-site facility for treatment and/or disposal. NASA shall be designated as the generator of the wastewater and shall sign all waste manifests to the extent not timely signed by the Navy or MEW Companies.

If soil excavated during development activities within the MFA Leasehold is determined to require treatment or off-site disposal, the Project Developer will arrange for the off-site disposal of these materials at a permitted off-site facility that is in compliance with the CERCLA Off-Site Rule.[35] NASA shall be designated as the generator of the impacted soil and shall sign all waste manifests to the extent not timely signed by the Navy or MEW Companies. Section 6.10 describes soil management protocols for determining when excavated soil requires treatment or off-site disposal.

This EIMP also provides procedures to be used in the event that tanks, sumps, abandoned pipes, or chemical containers (e.g., drums) are encountered during development activities within the MFA Leasehold. In general, while the Project Developer will be responsible for excavating or removing the structure or container, as required for development, and disposing of these materials, NASA shall be designated as the generator of these wastes and shall sign all waste manifests to the extent not timely signed by the Navy or MEW Companies.

6.2. Site-Specific Health And Safety Worker Planning Requirements

The Project Developer has the responsibility to manage its operations in a safe manner and in compliance with all State and Federal occupational safety and health requirements. The Project Developer shall notify NASA of any operation that endangers or has the potential to endanger NASA employees or the public. NASA reserves the right to conduct oversight of the Project Developer's activities to assure effective coordination of health and safety issues and adequate protection of NASA employees and the public.

6.2.1. Planning Requirements for Contractors

Each construction contractor with workers who may directly contact soil or groundwater (e.g., during preparation, grading, and foundation construction) or potentially impacted building materials (e.g., Hangar 1) will prepare its own site-specific health and safety plan ("H&SP"), consistent with State and Federal Occupational Safety and Health Administration ("OSHA") standards for hazardous waste operations (California Code of

[35] The CERCLA Off-Site Rule, CERCLA 121(d)(3) indicates that CERCLA wastes may only be placed in facilities that are operating in compliance with the Resource Conservation and Recovery Act or other applicable Federal or State Requirements and prohibits the transfer to CERCLA wastes to a land disposal facility that is releasing contaminants into the environment and requires that any releases from other waste management units must be controlled.

Regulations, Title 8, Section 5192 and 29 Code of Federal Regulations 1910.120, respectively) and any other applicable health and safety standards. Each contractor will provide copies of its H&SP for review by Master Lessee. However, the contractor maintains overall responsibility for ensuring the health and safety of its workers. Among other things, the H&SPs will include a description of health and safety training requirements for on-site personnel, a description of the level of personal protective equipment to be used and any other applicable precautions to be undertaken to minimize direct contact with soil and groundwater.

Consistent with the OSHA standards, a H&SP would not be required for contractors engaged in work such as carpentry, painting or other such work that will not disrupt the subsurface or existing CERCLA remedies in such a manner that the contractor's employees would encounter COPCs in groundwater, soil, or building materials. When constructed, buildings and cover materials such as roadways and walk-ways will prevent exposure to COPC-containing soil. It remains the responsibility of the Project Developer to determine if a H&SP is required for compliance with other federal, state, or local requirements.

It is the responsibility of the contractor preparing the site-specific H&SP to verify that the components of the H&SP are consistent with applicable OSHA standards and currently available toxicological information. Each contractor must require its employees who may directly contact COPCs in groundwater or soils to perform all activities in accordance with the contractor's H&SP. Each construction contractor will assure that its on-site construction workers will have the appropriate level of health and safety training and will use the appropriate level of personal protective equipment, as determined in the relevant H&SP based upon the evaluated job hazards and monitoring results.

6.2.2. Worker Training

Workers who may directly contact soil or groundwater within the MFA Leasehold will have the appropriate level of health and safety training and will use the appropriate level of personal protective equipment, as determined in the relevant H&SP. In general, due to the presence of COPCs in soil and groundwater within the MFA Leasehold, it is expected that construction activities involving excavation of soil may constitute "clean-up operations" or "hazardous substance removal work" as defined in the OSHA standards for Hazardous Waste Operations and Emergency Response ("HAZWOPER"), 29 Code of Federal Regulations 1910.120. Therefore, each construction contractor will ensure that its on-site personnel conducting such activities, who may contact COPCs in subsurface soil or groundwater, have had training, and are subject to medical surveillance, in accordance with OSHA standards ("HAZWOPER-trained personnel").

In general, workers involved in soil or groundwater removal operations or other construction activities that involve soil handling (e.g., grading) must have completed 40 hours of HAZWOPER training, with annual 8-hour refresher training, as required under 29 Code of Federal Regulations 1910.120. Exceptions can be made for certain types of work and conditions at the MFA Leasehold with limited exposure levels in accordance with 29 CFR 1910.120.

6.2.3. Components of the Health and Safety Plan

The minimum content required for all H&SPs is outlined below. However, each H&SP shall be tailored to current conditions within the MFA Leasehold, current occupational safety and health standards, and task-specific activities then known to the preparer of the H&SP. It is the responsibility of the contractor preparing the site-specific H&SP to verify that the components of the H&SP are consistent with applicable OSHA standards and currently available toxicological information.

General Information

This section of the H&SP will contain general information about the site, including the location of the site, the objectives of the work that the H&SP is intended to cover, and the name of the individual(s) who prepared the H&SP. This section will also contain a brief summary of the possible hazards associated with the soil and groundwater conditions at the site. Based on the known conditions at the site, the principal hazards posed by the soils and groundwater that construction workers may encounter will be direct contact with the COPCs potentially present in soil and groundwater and inhalation of vapors from volatile COPCs or dust containing lead.

Key Personnel/Health and Safety Responsibilities

This section of the H&SP will identify the contractor's key personnel by name and will include identification of the Project Manager, the site Supervisor, site Safety Officer, and the subcontractors that will be working at the site. The contractor will provide its employees who will potentially contact groundwater or previously unidentified soil contamination a copy of the H&SP and brief its employees as to its contents. The health and safety responsibilities of each individual worker will be described in this section of the H&SP.

Facility/Site Background

This section of the H&SP provides background information concerning past operations at the project location, the types of contaminants that may be encountered, and a brief description of the types of construction activities that the contractor will perform within the MFA Leasehold. The description of the construction activities will focus on those activities that will result in the movement of soil or activities that may involve potentially contaminated structures, soil, or groundwater. This section will provide a general map showing the portion of the project location where construction will occur, highlighting those particular areas where soil movement activities or direct contact with groundwater may occur. The types of contaminants that may be encountered during the construction activities will be identified in the H&SP and should consider the COPCs discussed in Section 2 as appropriate to the construction site.

Job Hazard Analysis/Hazard Mitigation

A description of the hazards associated with the specific construction activities planned will be provided in this section of the H&SP. The description of job hazards will include potential physical hazards (e.g., hazards associated with work around heavy equipment, trenches, electrical equipment, etc.) as well as construction activities that may give rise to contact or potential contact with COPCs on existing structures, in soil or groundwater, or previously unidentified contamination. The hazards that will be discussed include, at a minimum, chemical, temperature, and explosion hazards, if applicable. As part of the job hazard analysis, the H&SP will identify the chemicals likely to be encountered during the construction activities and will present a table indicating the symptoms of exposure and the relevant regulatory exposure limits for each compound (i.e., the OSHA Permissible Exposure Limit ("PEL")). The procedures to mitigate the hazards identified in the job hazard analysis will also be presented in this section of the H&SP. The use of appropriate engineering controls and personal protective equipment ("PPE") will likely be the principal mitigation procedures.

Air Monitoring Procedures

Air monitoring procedures will be detailed in the H&SP. Depending on the areas of planned construction, air monitoring may include monitoring for volatile constituents, lead, and/or respirable dust. The objectives for each are described below.

Air Monitoring for Volatiles

Air monitoring for volatile constituents will be conducted in those areas where contamination is known to exist and where previously unknown contamination is encountered during construction activities. The purpose of the air monitoring will be to verify that the workers are not exposed to levels of volatiles that exceed the OSHA PELs, the relevant occupational standards for airborne exposures. The presence of those constituents with the lowest OSHA PELs will dictate the level of PPE that will be required.

In light of U.S. EPA's 9 July 2014 guidance regarding TCE, in areas of known or suspected TCE contamination (Figure 5), the contractor should consider monitoring the breathing-zone of workers for the presence of VOCs using direct-read instruments (e.g., an organic vapor analyzer ("OVA") capable of measuring down to at least 10 parts per billion by volume ("ppbv")). If breathing-zone OVA readings exceed 500 ppbv for 10 seconds or longer, the contractor should consider (a) collecting air samples (within and downwind of the excavation area) using SUMMA canisters during excavation activities or (b) monitoring TCE concentrations within the breathing-zone using TCE sampling badges (e.g., Radiello 130) to evaluate whether TCE concentrations in the breathing-zone exceed the EPA's accelerated or urgent response action levels for TCE (7 ug/m^3 and 21 ug/m^3, respectively; U.S. EPA, 2014b). The TCE monitoring program

described above is an example of a program used by contractors performing subsurface activities within the MEW site, south of Highway 101. The contractor preparing the H&SP should assess current guidance and identify an appropriate monitoring program for its workers that could potentially be exposed to TCE.

If the TCE accelerated response action level (7 ug/m^3) in air is exceeded, the Master Lessee will notify the U.S. EPA and the Water Board within 24 hours of being notified by the Project Developer.

Air Monitoring for Particulates

Air monitoring for particulates at work area perimeters will be conducted to demonstrate that the fugitive dust generated during the development/construction activities is not affecting the health and safety of off-site populations. Personal air monitoring for worker exposures to dust, and potentially for lead, where appropriate, will be conducted within work zones where soil is disturbed or contacted.

Personal Protective Equipment

This section of the H&SP will identify the PPE that will be used to protect workers from the identified COPCs present in groundwater or soil. Personal protective equipment will be selected based on the known contaminants present at the work site, and the known potential route(s) of entry into the human body. The primary exposure routes include direct contact with contaminated structures, groundwater, or soil and the inhalation of vapors.

Certain construction activities, such as the installation of deep utility trenches or foundations, could result in workers coming into direct contact with COPCs in groundwater. This contact is expected to be minimal, because OSHA regulations prohibit accumulation of water in open excavations. However, limited direct contact with COPCs in groundwater could occur. In the event that excavations are conducted in areas with shallow groundwater, the H&SP will identify any additional PPE required to minimize direct contact with COPCs in water, including water repellant gloves and boots, Tyvek coveralls, etc.

For construction activities conducted on or around contaminated structures (e.g., Hangar 1) or building materials (e.g., asbestos containing materials), the H&SP will identify PPE required to minimize direct contact with and/or inhalation of COPCs (e.g., Tyvek coveralls, gloves, respirators, etc.).

Work Zones and Site Security Measures

This section of the H&SP will identify the specific work zones of the construction site and describe the site security measures, such as the placement of barricades, fencing, access control, and access logs. The work zones will be defined as the areas of the construction site where construction workers may come into contact

with COPCs in contaminated soil or groundwater. All workers within the work zone, who will have direct contact with groundwater or soil, will perform the work in compliance with relevant aspects of the H&SP. The support zone will be located outside of the work zone, but within the boundaries of the construction site. All end-of-the day cleanup operations, such as cleaning of truck wheels (for vehicles exiting the construction site that could be tracking contaminated soils off-site), and the removal of any PPE, will occur in the support zone. If possible, the support zone will be located in close proximity to the entry and exit point of the construction site. The entire construction site will be fenced to control pedestrian and vehicular entry, except at controlled (gated) points. The fences will remain locked during non-construction hours.

Decontamination Measures

This section of the H&SP will describe the specific procedures that will be used to decontaminate both equipment and personnel that have been performing work in direct contact with soil, groundwater, and/or contaminated building materials or debris. Decontamination measures will include cleaning the wheels of all vehicles that have been in contact with soil and/or groundwater in the support zone prior to their exiting the site and may include the cleaning of potentially impacted surfaces, if applicable (e.g., from the concrete floors of Hangar 1). Procedures to collect and sample decontamination water will be described. Additionally, workers will be required to remove any contaminated PPE and place it in a designated area in the support zone prior to leaving the site.

General Safe Work Practices

This section of the H&SP will discuss the general safe work practices to be followed at the construction site, including entry restrictions, tailgate safety meetings, use of PPE, personal hygiene, hand washing facilities, eating and smoking restrictions, the use of warning signs and barricades, precautions near heavy equipment, confined space entry, and any special precautions that may be specific to the construction site and construction worker.

Contingency Plans/Emergency Information

This section of the H&SP will provide information regarding the procedures to be followed in the event of an emergency. The location of specific emergency equipment, such as eyewash, first aid kit, and a fire extinguisher, and emergency telephone numbers and contacts will be identified. A map indicating the route to the nearest hospital will also be provided in this section of the H&SP.

Medical Surveillance

This section of the H&SP will describe medical surveillance that would be required for certain workers. In general, due to the presence of COPCs in soil and groundwater within the MFA Leasehold, it is expected that construction activities

involving excavation of soil may constitute “clean-up operations” or “hazardous substance removal work” as defined in the OSHA standards for HAZWOPER. Therefore, each construction contractor will ensure that its on-site personnel conducting such activities, who may contact COPCs in subsurface soil or groundwater are HAZWOPER-trained personnel.

6.3. Construction Impact Mitigation Measures

This section outlines measures that will be implemented to mitigate potential impacts to human health and the environment during earthwork construction or construction involving potentially impacted building materials. Measures will be implemented to mitigate the potential impacts of the following activities:

- dust generation associated with soil excavation, loading activities, construction or transportation equipment traveling over on-site soil, and wind traversing COPC-containing soil stockpiles or particulate generation associated with activities such as the scraping or sanding of building materials;
- tracking soil or potentially impacted particulate debris (e.g., paint chips) off the site with construction or transportation equipment;
- transporting sediments or potentially impacted particulate debris (e.g., paint chips) from the site in surface water run-off; and,
- managing groundwater extracted while performing below-grade construction activities.

The mitigation measures for these potential activities will include, but are not limited to, the following:

- implementing dust, particulate generation, and odor control measures (Section 6.3.1);
- decontaminating construction and transportation equipment or potentially impacted surfaces (Section 6.3.2);
- implementing storm water pollution prevention plans, best management practices, and applicable controls (Section 6.3.3); and
- sampling and analyzing extracted groundwater to determine appropriate storage and disposal practices (e.g., evaluation before its use for dust control within the MFA Leasehold or disposal to the storm drain, to the sanitary sewer, to nearby groundwater treatment systems or at an appropriate off-site facility that is operating in compliance with the CERCLA Off-Site Rule) (Section 6.3.4).

These mitigation measures are discussed in more detail below.

The Project Developer shall prepare a plan describing construction mitigation measures that will be implemented during development activities within the MFA Leasehold. The plan will, at a minimum, include the mitigation measures described in Sections 6.3.1 through 6.3.4 and will describe management procedures to ensure that the mitigation measures are properly implemented during construction. Mitigation measures associated with working on and around contaminated structures (e.g., Hangar 1) will be incorporated into the design plans for the structure's reuse which will be provided to the applicable regulatory agencies for review and approval.

6.3.1. Dust and Particulate Control Measures

Dust and particulate control measures will be implemented during construction activities at the project area to minimize the generation of dust and/or particulates. It is particularly important to minimize the exposure of on-site construction workers to dust and/or particulates containing COPCs and to prevent nuisance dust and dust and/or particulates containing COPCs from migrating off-site. Dust generation may be associated with excavation activities, truck traffic, ambient wind traversing soil stockpiles, loading of transportation vehicles, and other earthwork. Particulate generation activities may include activities such as scraping or sanding impacted materials in preparation for painting and/or coating.

Dust control measures may include the following:

- mist or spray water on active construction areas while performing excavation activities and loading transportation vehicles;
- cover all trucks transporting soil or impacted materials off-site;
- limit vehicle speeds on the property to 25 kilometers per hour (15 miles per hour ("mph"));
- suspend excavation and grading activities when instantaneous wind speeds exceed 40 kilometers per hour (25 mph);
- if necessary, install windbreaks, or plant trees/vegetative windbreaks at the windward side(s) of construction areas;
- control excavation, grading, and other construction activities to minimize the generation of dust;
- minimize drop heights while loading transportation vehicles;
- hydro seed or apply non-toxic soil stabilizers to graded areas that have been inactive for 10 days or more;

- prior to the disturbance (or removal) of materials suspected to contain asbestos, lead, or other toxic air contaminants, contact the Bay Area Air Quality Management District ("BAAQMD"); and

- cover with plastic sheeting or tarps any soil stockpiles generated as a result of excavating soil potentially impacted by COPCs (e.g., visibly contaminated or odorous soil or soil from areas known to contain lead-based paint). Inactive soil stockpiles potentially impacted by COPCs should be kept covered at all times.

Additional dust control measures must be implemented, as necessary, especially if windy conditions persist. Other potential mitigation measures for dust control are presented in the *NASA Ames Development Plan, Final Programmatic Environmental Impact Statement* ("NADP EIS"; DCE, 2002).

Particulate control measures may include, but are not limited to, the following:

- misting water in active construction areas;

- the use of enclosures or encapsulation; and,

- the use of vacuum filtration systems to entrain particulates.

Specific particulate control measures for work conducted on or around contaminated structures such as Hangar 1 will be incorporated into the design plans for the structure's reuse which will be provided to the applicable regulatory agencies for review and approval.

6.3.2. Decontamination

Construction equipment and transportation vehicles that contact soil or impacted particulates containing COPCs within the construction site (i.e., in areas where chemically-impacted soil is potentially located) will be decontaminated prior to leaving the construction site in order to minimize the potential for this equipment to track COPC-containing soil onto roadways. Areas of potentially impacted soils are shown on Figure 6; other soil should also be considered potentially impacted if there is evidence of unnaturally stained, discolored, or odorous soil.

Decontamination methods may include scraping, brushing, rumble strips, and/or vacuuming to remove dirt on vehicle exteriors and wheels or from potentially impacted surfaces (e.g., the concrete floor of Hangar 1). The above dry decontamination procedures are illustrative and the Project Developer may propose alternate techniques. In the event that the dry decontamination methods are not adequate, methods such as steam cleaning, high-pressure washing, and cleaning solutions will be used, as necessary, to thoroughly remove accumulated dirt and other materials. Wash water resulting from decontamination activities will be collected and managed in accordance with all applicable laws and regulations. Collected wash water (containing no soap or detergent)

may be filtered and managed along with construction dewatering water as described in Section 6.3.4 and shown on Figure 10.

6.3.3. Storm Water Pollution Controls

The MFA Leasehold is subject to storm water regulations enforced by the State Water Resources Control Board ("SWRCB"). The Project Developer shall be responsible for obtaining necessary storm water permits and filing a Notice of Intent consistent with SWRCB Order Nos. 2012-0006-DWQ, effective 17 July 2012 ("Construction General Permit" or any amended or revised applicable permit as of the date construction work commences) to the SWRCB and other regulatory agencies concerning the Project Developer's construction project. As required by Construction General Permit, the Project Developer shall prepare a Construction Storm Water Pollution Prevention Plan ("SWPPP") and will submit it to the SWRCB for approval.

The construction SWPPP will identify for storm water best management practices ("BMPs") to be implemented as part of the Project Developer's construction activities. The primary objectives of the BMPs are to minimize soil erosion from the construction site(s) and to prevent contact of storm water with chemicals that may be used during construction. BMPs may include, but are not limited to the following:

- constructing berms or erecting silt fences at entrances to the site, perimeters of work areas, or as needed to divert runoff from contacting exposed soil;
- placing straw bale barriers around entrances to storm drains and catch basins;
- during significant rainfall events, covering all soil stockpiles with plastic sheeting or tarps;
- protecting and/or closing storm drains located at the site during construction activities; and
- storing chemical products inside buildings, sheds, or beneath water repellant tarps, and refraining from applying or dispensing chemicals (e.g., paints, lacquers, solvents, diesel fuels) outside during inclement weather.

The above BMPs are illustrative. It is anticipated that the Project Developer will propose specific BMPs appropriate to the construction plans and specifications. Additional BMPs may also be required to protect water quality post-construction and to ensure that the quantity, rate, and duration of storm water runoff does not increase.

6.3.4. Dewatering

Within the MFA Leasehold, the depth to groundwater varies between 5 and 12 feet bgs. If dewatering is to be performed as part of construction activities, then the groundwater will be sampled in planned work areas and analyzed to determine appropriate management and disposal practices. Dewatering water shall initially be collected and

analyzed for VOCs and TPH (gasoline, diesel, and motor oil) by U.S. EPA Methods 8260 and 8015m, respectively. Groundwater in portions of the MFA Leasehold may not contain COPCs.

Depending on the analytical results, and with appropriate governmental agency approvals, extracted groundwater may be:

- used for dust control within the MFA Leasehold with NASA approval;
- discharged to the storm drain;
- discharged to an existing groundwater treatment system with approval of the Responsible Party for such system;
- discharged to the sanitary sewer; or,
- transported off-site for disposal at an authorized facility.

A flow chart illustrating dewatering water management options is shown on Figure 10.

If analytical results indicate chemical concentrations are below TCLs, dewatering water from construction activity may be used for dust control within the MFA Leasehold (with NASA approval) or discharged to the storm drain in accordance with the discharge of construction dewatering water if allowed under the SWRCB Construction General Permit. In the event that new data or observations indicate that the dewatering water is contaminated, the Project Developer shall cease to use this water for dust control and shall not discharge it to the storm drain.

If the dewatering water cannot be used for dust control or disposed to the storm drain, the water can be transported to one of the nearby groundwater treatment systems with approval of the Responsible Party for such system (the WATS, MEW GWTS, or the NASA GWTS) for treatment and disposal; Figure 4 identifies the Responsible Party for groundwater contamination within the MFA Leasehold. The Project Developer and NASA shall inform the treatment system owner of the location where the dewatering water was generated and coordinate with the treatment system's owner or owner's contractor for the treatment and disposal of this groundwater. The Project Developer will deliver the extracted groundwater to clean storage tanks that it provides at a location selected by the treatment system owner. Prior to initial use, the storage tanks are to be inspected and the contents sampled by the Project Developer for analytical parameters specified by the treatment system owner. Sample results will be provided to the treatment system owner. In addition, the treatment system owner shall have the right to inspect the storage tanks prior to their use. The dewatering water must be filtered before it is pumped into the clean storage tanks. All solids removed from the groundwater shall be managed and disposed of in accordance with the procedures for managing potentially contaminated soil described in Section 6.10. The Project Developer shall arrange for the off-site disposal of these materials at a permitted off-site facility and NASA shall be designated the generator for any solids or filter wastes shipped for off-site disposal. The

treatment system owner or its contractor will manage the treatment and disposal of filtered groundwater through the groundwater treatment system within a reasonable time-frame.

If dewatering water cannot be discharged to the storm drain, used for dust control, or treated at the Navy's, MEW Companies, or NASA's (as applicable) groundwater treatment systems, it may be possible to discharge dewatering water to the Sunnyvale Waste Water Treatment Plant through the NASA sanitary sewer system. The Sunnyvale Publicly-Owned Treatment Works ("POTW") limits the concentration of Total Toxic Organics ("TTO") in any discharge to a maximum of 1.0 mg/L (Sunnyvale, 2014). If analytical results indicate that the discharge of dewatering water would meet this limitation, the Project Developer's contractor shall apply for an industrial wastewater discharge permit from the POTW providing sanitary sewer service for the area of the MFA Leasehold where the discharge would occur. No discharge of extracted groundwater to the sanitary sewer can occur unless a Wastewater Discharge Permit is first obtained. It is expected that all groundwater that cannot be used for dust control or discharged to the storm drain will be eligible for discharge to the sanitary sewer.

To the extent that the Navy and/or the MEW Companies do not accept dewatering groundwater, NASA shall accept the dewatering groundwater at its groundwater treatment facility to the extent of its capacity. The Master Lessee shall obtain any necessary permits for the discharge of extracted groundwater to the sanitary sewer or storm drain and copies of such permits will be provided to NASA.

Dewatering water may also be transported off-site for treatment at a permitted wastewater treatment facility, in accordance with applicable laws and regulations.[36] The Project Developer shall transport this groundwater to a permitted off-site facility for treatment and/or disposal. NASA shall be designated as the generator of the wastewater and shall sign all waste manifests to the extent not timely signed by the Navy or MEW Companies.

6.4. Management of Asbestos Containing Debris

As described in Section 2.6.1, asbestos-containing material (ACM) may be present in existing buildings within the MFA Leasehold. In the event an existing building is to be demolished, the Project Developer and its contractor shall conduct a pre-demolition survey for the presence of ACM and will manage and dispose of ACM and debris in a

[36] It is the intent of the Master Lessee and NASA that the parties that have been named by U. S. EPA or the Water Board as, or are otherwise, the Responsible Parties (i.e., Navy, MEW Companies, and NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their obligations independent of the Master Lessee. The dewatering management options discussed in Section 6.3.4 are does not relieve the Responsible Parties of their responsibilities and obligations. Rather, these management options allocates as between NASA and Master Lessee who will take actions to address environmental conditions in the event of non-performance or delayed performance by the Responsible Party, but such actions will not result in Master Lessee becoming a Responsible Party. NASA will facilitate communication between the Master Lessee and the Responsible Party when requested.

manner consistent with state laws and the CERCLA Off-Site Rule. NASA shall be designated as the generator of the wastes and shall sign all waste manifests.

6.5. Management of Debris Containing Lead-Based Paint

As described in Section 2.6.2, lead-based paint has been used in existing buildings within the MFA Leasehold, and residues from lead-based paint occur in surface soil adjacent to buildings where lead-based paint was used (CWMI, 1993; Weston, 1998). As such, lead-containing materials ("LCM") may be encountered during redevelopment. In the event an existing building is to be demolished, or when painted debris is encountered during development, the Project Developer and its contractor shall conduct a pre-demolition survey for the presence of LCM and will manage and dispose of LCM and debris in a manner consistent with state laws and the CERCLA Off-Site Rule. NASA shall be designated as the generator of the wastes and shall sign all waste manifests, except to the extent that the Navy signs manifests for the Hangar 1 Remediation.

Procedures for managing soil impacted by lead-based paint are discussed further in Section 6.10.1.

6.6. Management of PCB-Containing Electrical Equipment

Electrical equipment containing PCBs may be located within the MFA Leasehold in areas or buildings subject to redevelopment. In the event that the removal of PCB-containing electrical equipment is to be performed during redevelopment, the Project Developer shall manage and dispose of the PCB-containing electrical equipment in a manner consistent with applicable government regulations and the CERCLA Off-Site Rule. NASA shall be designated as the generator of the wastes and shall sign all waste manifests.

6.7. Management of Building Materials Containing Other Chemicals

In the event that the removal of building materials containing other chemicals is required for redevelopment (e.g., the wood timbers in Hangars 2 and 3 that contain elevated levels of chromium), the Project Developer shall assess, manage, and implement appropriate measures for the management and disposal of these materials consistent with state laws and the CERCLA Off-Site Rule. NASA shall be designated as the generator of the wastes and shall sign all waste manifests.

6.8. Management and Disposal of Abandoned Underground Storage Tanks, Sumps, Abandoned Pipes, or Buried Drums and Containers

It is the intent of the Master Lessee and NASA that the parties that have been named by U. S. EPA or the Water Board as, or are otherwise, the Responsible Parties (i.e., Navy, MEW Companies, and NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their obligations independent of the Master Lessee. The implementation of the management and disposal measures discussed in

Section 6.8 by the Master Lessee and NASA is not intended to relieve the Responsible Parties of their responsibilities and obligations.

6.8.1. Underground Storage Tanks and Sumps

As described in Section 2.5, numerous USTs and sumps were known to exist within the MFA Leasehold (Table 1 and Figure 6). With the exception of the Navy's Day Tank, the North Fuel Farm USTs 10 through 13, and Sump 59, all known USTs and sumps within the MFA Leasehold have been removed; with the exception of Tank 43, the Water Board has classified the removed USTs and sumps as requiring no further action.

In the event an unknown UST or sump is discovered during construction activities, NASA and the Navy will be contacted promptly. NASA will facilitate communication between the Project Developer and the Navy. In the absence of a Construction Coordination Agreement with the Navy, the procedures below shall apply.

As indicated on Figure 11, the UST or sump will be removed by the Project Developer in accordance with Santa Clara County regulations and guidance.

Soil and groundwater samples will be collected by Project Developer from the UST or sump excavation in accordance with Section 6.10 and analyzed as required by the regulatory guidance and under the supervision of Santa Clara County inspectors. If COPC concentrations exceed soil TCLs, the soil management protocols described in Section 6.10 will be followed.

The tank, sump, associated piping, and any impacted materials generated during removal of the tank or sump will be disposed of by the Project Developer in accordance with applicable laws and regulations and the CERCLA Off-Site Rule; NASA shall sign all manifests as generator of the wastes to the extent not timely signed by the Navy or MEW Companies. The Project Developer will prepare a report that describes the field activities conducted, the findings, actions taken, photographs, and analytical results for the samples collected by the Project Developer. The report will also include a figure depicting the location where the action was taken, chain-of-custody forms, and photographs as well as information regarding the disposal of the impacted materials. Documentation of actions relating to removal of abandoned USTs or sumps will be in accordance with Santa Clara County's regulation and guidance for closure of USTs and sumps. This report will be submitted to the applicable regulatory agencies (e.g., U.S. EPA, the Water Board, and Santa Clara County Department of Environmental Health), NASA, and the Navy as documentation of the completion of the remedial action within 60 days of completion of the field activities. The Project Developer will revise the report as necessary to adequately document the actions taken.

6.8.2. Buried Drums or Containers

In the event buried drums or containers that contain unknown materials are discovered during construction activities within the MFA Leasehold, the NASA and the Navy will be contacted promptly, and the procedures shown on Figure 11 will be followed. NASA

will facilitate communication between the Project Developer and the Navy. In the absence of a Construction Coordination Agreement with the Navy, the procedures below shall apply.

The term "containers" in this EIMP is intended to include containers that may contain or may have contained hazardous substances. In the absence of labels or other knowledge of the container's contents, the Project Developer in consultation with NASA will use professional judgment, including evaluating any observed odors or soil staining, to assess whether the procedures summarized in Figure 11 should be triggered.

As indicated in Figure 11, if drums and containers discovered within the limits of construction are not accessible to allow sampling and inspection, the Project Developer will notify NASA, the Navy, and the applicable regulatory agencies. If the drums or containers are empty, the Project Developer will remove them from the excavation. If the drums or containers contain liquid wastes and the drums can be removed such that a spill during removal is unlikely, the Project Developer may remove them from the excavation and subsequently characterized their contents for disposal. If the drums or containers cannot be removed from the excavation such that a spill is unlikely, the Project Developer will sample each container of like material[37]; the Project Developer will subsequently remove the contents from the drums and place it in appropriate containers.

The Project Developer will dispose of the drums, containers, and other impacted materials discovered within the limits of construction at a permitted off-site facility in accordance with applicable laws and regulations and the CERCLA Off-Site Rule; NASA shall be designated as the generator of the waste and shall sign all waste manifests to the extent not timely signed by the Navy or MEW Companies. After removal of the drum or container, a discrete confirmation sample will be collected by the Project Developer at the former location of the drum or container. Determination of the specific laboratory analyses to be performed will be based on field observation and professional judgment of a licensed or certified hazardous material manager or registered environmental professional and on characterization of the contents of the drum or container. If COPC concentrations exceed soil TCLs, the soil management protocols described in Section 6.10 will be followed.

The implementation of the protocol for managing buried drums or containers shall be documented through the use of field notes and photographs. After completion of the removal of the drums or containers and the subsequent management of any potentially impacted soil located within the limits of construction (conducted in accordance with the procedures described in Section 6.10) or groundwater (Section 6.3.4), the Project Developer will prepare a report that describes the field activities conducted, the findings, actions taken, photographs, and analytical results for the samples collected by the Project Developer. The report will also include a figure depicting the location where the action was taken, chain-of-custody forms, and photographs as well as information regarding the

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[37] Determination of the specific laboratory analyses to be performed will be based on field observation and professional judgment of a licensed or certified hazardous material manager.

disposal of the impacted materials. This report will be submitted to the applicable regulatory agencies (e.g., U.S. EPA and/or the Water Board), NASA, and the Navy as documentation of the completion of the remedial action within 60 days of the completion of field activities. The Project Developer will revise the report as necessary to adequately document the actions taken.

6.8.3. Abandoned Pipes

If an abandoned pipe that had been used to transmit hazardous materials or COPCs (e.g., fuel lines, industrial wastewater sewers, sanitary sewers in areas of past chemical use, etc.) is encountered within the limits of construction, the procedures presented in decision diagram shown on Figure 12 will be followed. The objectives of this protocol for abandoned pipe management are (a) to remove potential sources of contamination, including impacted soil and (b) to prevent pipes from acting as a future conduit for contaminant migration.

Upon encountering an abandoned pipe, NASA, the Navy, the U.S. EPA, and the Water Board will be notified. The Project Developer will review available historic information, Table 1 and Figure 6 of the EIMP, and NASA's EEC's (Appendix A) for the construction area to assess whether the hazardous materials could have formerly been contained in the pipe. If this review indicates that the pipe may have historically contained hazardous materials, NASA, the Navy, and the applicable regulatory agencies will be notified and confirmation sampling beneath the pipe (which could include grab groundwater beneath the pipe) may be conducted if the applicable regulatory agencies determine that additional sampling is warranted.

If the pipe is associated with a tank, then the pipe will be removed with the tank in accordance with Santa Clara County requirements for UST removal as described in Section 6.8.1. Otherwise, the pipe will be managed as outlined below and summarized in the decision diagram shown on Figure 12.

If the pipe contains liquid or sludge, the following actions will be taken:

- the liquid or sludge will be removed from the pipe, if feasible, and placed in an appropriate container prior to removal of the pipe;

- the liquid or sludge will be tested for hazardous constituents. In the event that the analytical results indicate that hazardous constituents are present in the liquid or sludge, NASA, the Navy, and the applicable regulatory agencies will be notified, and confirmation sampling beneath the pipe shall be conducted to determine whether additional characterization and/or soil removal may be necessary within the limits of construction. In addition, at the direction of the applicable regulatory agencies, grab groundwater samples beneath the pipe may also be collected;

- the pipe and the liquid or sludge will be disposed at an appropriate off-site facility; and,

- stained, discolored or odorous soil located within the limits of construction will be sampled in accordance with the procedures described in Section 6.10.3.

If not all of the pipe is removed for purposes of the planned construction activities, the ends of the pipe that remain in place will be capped. The Project Developer shall characterize and dispose of the abandoned piping and any impacted materials in accordance with applicable laws and regulations and the CERCLA Off-Site Rule; NASA shall be designated as the generator of the wastes and shall sign all waste manifests to the extent not timely signed by the Navy or MEW Companies.

The implementation of the protocol for abandoned pipes shall be documented through the use of field notes and photographs. After completion of the removal of abandoned pipes and any subsequent actions managing potentially impacted soil located within the limits of construction in accordance with the soil management protocols in Section 6.10, the Project Developer will prepare a report that describes the field activities, findings, actions taken, and analytical results for activities conducted by the Project Developer. The report will also include a figure depicting the location where the action was taken, chain-of-custody forms, and photographs as well as information regarding the disposal of the impacted materials. This report will be submitted to the applicable regulatory agencies (e.g., U.S. EPA and/or the Water Board), NASA, and the Navy as documentation of the completion of the remedial action within 60 days of the completion of field activities. The Project Developer will revise the report as necessary to adequately document the actions taken.

The procedures presented in Figure 12 do not apply to active or abandoned utilities, such as sanitary sewer, water, gas, or steam lines because they are not anticipated to have contained potentially hazardous materials. An exception, however, is the case of steam lines that are insulated with asbestos-containing materials, in which case the provisions of Section 6.4 apply.

6.9. Protection of Existing Site Remedies and Removal/Relocation of Monitoring Wells and Remediation System Components

As described in Section 2.2 and Section 2.4, the Navy has implemented several remedies within the MFA Leasehold and currently operates a groundwater remediation system located within the MFA Leasehold and MEW Companies and NASA monitoring wells are present within the MFA Leasehold. The locations of the treatment system piping are shown on Figure 3 and the locations of existing extraction and monitoring wells are presented in the 2013 Navy Annual Report (SES-TECH, 2014), the 2013 MEW Annual Report (Geosyntec, 2014), and the 2013 NASA Annual Report (ERT, 2014); sections of these reports are reproduced in Appendix B.

As discussed in Sections 5.4 and 5.5, measures must be taken to protect the integrity of the implemented Site remedies and the Navy's groundwater remediation system and its monitoring wells and the MEW Companies and NASA monitoring wells during development within the MFA Leasehold. In addition, no changes can be made to existing Site remedies without concurrence from the U.S. EPA and the Water Board. Any

regulatory agency-approved modifications or disturbances[38] to implemented Site remedies (e.g., Hangar 1, the Runway Landfill, etc.) will be appropriately repaired.

A flow chart describing the process for protecting existing Site remedies and the groundwater remediation system and monitoring wells and coordinating construction activities with the Navy's contractors is shown on Figure 13; a pre-construction planning flowchart is shown on Figure 9. NASA will facilitate communication between the Project Developer and the Navy. In the absence of a Construction Coordination Agreement with the Navy, the procedures below shall apply.

While the MEW Companies' GWTS and NASA's GWTS are not located within the MFA Leasehold, several of their monitoring wells are located on the MFA Leasehold. Measures must be taken to protect the integrity of these monitoring wells during development within the MFA Leasehold. A flow chart describing the process for protecting the MEW Companies' and NASA's existing groundwater monitoring wells and coordinating construction activities with the MEW Companies' and/or NASA's contractors is shown on Figure 13; a pre-construction planning flowchart is shown on Figure 9. In the absence of a Construction Coordination Agreement with the MEW Companies and NASA, the procedures below shall apply.

6.9.1. Removal, Relocation, or Modifications to Existing Site Remedies

Potential conflicts between the Project Developer's planned project and the location of existing Site remedies or remediation system components and/or groundwater monitoring wells should be identified and resolved during the design stage and, as described in Section 5.4.1.1. It is contemplated that the contractor(s) for the Responsible Party for the treatment system, will complete (at the Project Developer's expense) the design and implementation of any changes to the remediation system, such as properly sealing groundwater wells designated to be closed, installing and developing any replacement groundwater wells, and installing and connecting any rerouted pipelines or other system components that need to be relocated. The Project Developer should use reasonable efforts to work with such contractor(s) and coordinate the schedule for completion of any regulatory agency-approved modifications to the remediation system and/or groundwater monitoring wells with the Project Developer's construction schedule. NASA will facilitate communication between the Project Developer and the Navy and the Project Developer and the MEW Companies, as applicable.

It is contemplated that following completion of final grade by the Project Developer's contractor, contractor(s) for the Responsible Party for the treatment system will make final changes (at the Project Developer's expense) to the impacted wells, well vaults, and pull boxes, based on the final grade established by the Project Developer's contractor.

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[38] Any disturbances to the implemented Site remedies must be timely reported to the Responsible Party, NASA, the U.S. EPA, and Water Board.

On completion of the modifications, final as-built drawings will be provided to the U.S. EPA, Water Board, NASA, and the Responsible Party.

6.9.2. Protection of Groundwater Wells and Remediation System Components

It is contemplated that prior to the start of construction, contractors for the Responsible Parties will show the Project Developer the locations of all of the groundwater extraction and monitoring wells in the field. Before initiating building demolition or other construction work, the Project Developer's contractors shall install brightly painted steel bollards around each groundwater monitoring or extraction well. The painted bollard shall extend above ground not less than four feet, so as to be highly visible, and shall be buried sufficiently below the ground surface to protect the wellhead. Alternative equivalent well protection measures may be used by the Project Developer provided the alternative is approved in writing by the contractor(s) responsible for the system. The Project Developer's contractor shall provide and place steel plate or equivalent protective measures over the existing Navy's pipelines and power and control conduits that are within the project development area.

Additionally, all construction work within two feet of all groundwater wells shall be performed manually with hand tools. Fine grading work performed in areas more than two feet from the wells but within close proximity shall be performed by light grading equipment.

6.9.3. Shutdown of Remediation Systems

The Navy's WATS is required to be operated on a continuous basis; any planned shutdown of the system for more than 24 hours in duration must be approved by the U.S. EPA Water Board, and the Navy. In the event that planned construction activities would require a planned shutdown of any portion of the WATS[39], the Project Developer shall provide the Navy with written notice at least ten working days in advance of the proposed shutdown. In the event the Project Developer's activities results in an unplanned shutdown of any components of the remediation system, immediate verbal notification must be given to the Navy, the U.S. EPA, and the Water Board. Within 72 hours of an unplanned shutdown of the remediation system, the Master Lessee will provide written notification to NASA, the Navy, the U.S. EPA and the Water Board describing the reason for the shutdown, the duration of the shutdown, the nature of the potential release, response actions taken, potential impacts, and proposed next steps.

6.9.4. Access to Existing Site Remedies

Development within the MFA Leasehold must be performed in such a way that all existing Site remedies (e.g., Hangar 1, the Runway Landfill, etc.), groundwater wells,

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[39] As neither the MEW Companies' nor NASA's GWTS are located within the MFA Leasehold, development activities on the MFA Leasehold should not require the shutdown of either of these treatment systems. The Navy's EATS is not discussed herein as the system is no longer required pursuant the U.S. Navy's ROD Amendment (Navy, 2014) for the southern plume at IR Site 26, as discussed in Section 2.4.4.

pull boxes and the groundwater treatment system and associated components are made accessible to the Navy's, MEW Companies', and/or NASA's contractors, as applicable, and their equipment for sampling, operation, maintenance, removal and replacement of pumps, and well sealing during and after development. If access to a well or other remediation system component is restricted during construction, the Master Lessee will provide written notice to and coordinate activities with the Navy or MEW Companies, as appropriate, in advance of creating the restriction, with an explanation of the reason for and the expected duration of the proposed restricted access and request a planned schedule for well sampling and other remedial activities from such Responsible Party.

6.9.5. Accidental Releases of Untreated Groundwater

Prior to the initiation of construction activities, the Project Developer shall prepare a contingency plan to outline actions that would be taken in the event that the Project Developer's contractors damage any remediation system component in a manner that causes the release of untreated groundwater. During planning meetings with the Navy, emergency contacts and procedures to initiate emergency shutdown of system components, if necessary, shall be reviewed. The plan shall identify any emergency equipment the Project Developer may need to retain on-site during construction activities to control or contain potential releases of untreated groundwater. The plan shall be submitted to NASA and the Navy for review and approval prior to the start of construction activities in areas where remediation system components are located.

In the event that construction activities result in the release of untreated groundwater, the Project Developer shall immediately notify NASA and the Navy. NASA shall promptly notify the U.S. EPA and the Water Board following receipt of any such notice. If the remediation system is shut down due to damage to the system or to control the release of untreated groundwater, the Project Developer will provide a written explanation for the shutdown to NASA, the Navy, and to the U.S. EPA and Water Board as described in Section 6.9.3.

The Project Developer will take immediate action to control the source of the spill and contain untreated groundwater that has been released in accordance with its approved contingency plan. Effort shall be made to avoid release of untreated groundwater into storm sewers.

After any continued release has been stopped or controlled, any areas where the release may have come in contact with or infiltrated subsurface soils shall be identified. Potentially impacted soil will be screened using the soil management protocols for excavated soils described in Section 6.10. Soils found to contain COPCs above the TCLs will be excavated and treated on-site or disposed of off-site at a licensed disposal facility at the Project Developer's expense. NASA will sign manifests as generator for any impacted soil that must be sent for off-site disposal to the extent not timely signed by the Navy or MEW Companies.

6.10. Soil Management Protocols

Soil will be imported, excavated, or relocated at construction sites within the MFA Leasehold during demolition work, grading, foundation excavation, utility installation, and other construction-related activities.

Whenever soil is being excavated or exposed, the contractor performing the work shall monitor the soil to determine if the soil is contaminated. Figure 4 identifies the Responsible Party for soil contamination within the MFA Leasehold,[40] and Figure 6 shows the approximate locations of potentially contaminated soils (e.g., locations of existing and/or former oil-filled transformers or aboveground storage tanks). The Project Developer need only excavate to the extent required for construction. In addition, additional soil management procedures are applicable when surface soils that may potentially be impacted by lead from the historical use of lead-based paints area are planned to be excavated during development. Procedures for monitoring excavated soil, and for managing soil that is found to be contaminated, are shown on the decision diagram on Figure 14. Procedures for managing soil potentially impacted by lead from historical use of lead-based paints are shown on the decision diagram on Figure 15. The following sections describe:

- requirements for managing potential lead-impacted soil surrounding buildings (Section 6.10.1);
- procedures for screening soil excavated during construction activity for VOCs and petroleum hydrocarbons, and/or evidence of staining, discoloration, or odors[41] (Section 6.10.2);
- procedures for testing and managing soil that potentially contains VOCs, petroleum hydrocarbons, and other COPCs at concentrations above levels of concern (Section 6.10.3);
- reusing soil within the MFA Leasehold (Section 6.10.4);

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[40] It is the intent of the Master Lessee and NASA that the parties that have been named by U. S. EPA or the Water Board as, or are otherwise, the Responsible Parties (i.e., Navy, MEW Companies, and NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their obligations independent of the Master Lessee. The implementation of the soil management protocols discussed in Section 6.10 by the Master Lessee and NASA does not relieve the Responsible Parties of their responsibilities and obligations, and will not result in Master Lessee becoming a Responsible Party. NASA will facilitate communication between Master Lessee and the Responsible Party when requested.

[41] While chemicals other than VOCs and petroleum hydrocarbons have been detected (e.g., PCBs) in Site soils, detections of these compounds are typically limited to small areas. Prior to conducting development activities, the Project Developer should review Table 1, Figure 6, and NASA's EECs (Appendix A) to identify any potential contaminants of concern and if any are identified, an environmental professional should screen the soil for visible impacts and the excavated materials should be analyzed for the potential contaminants of concern before the on-site reuse or off-site disposal of the excavated materials.

- contingency actions for the observation, investigation, and removal of additional impacted soil (Section 6.10.5); and,

- import fill requirements (Section 6.10.6).

6.10.1. Lead-Impacted Soil

As discussed in Section 2.4.8, lead has been found to occur in surface soil near existing buildings where lead-based paint was used historically (CWMI, 1993; Weston, 1998). Lead-impacted soils that exceed the Water Board ESL for commercial/industrial land use (320 mg/kg), or currently applicable criteria, shall be disposed at an off-site facility prior to or during development activities within the MFA Leasehold. As described in Section 2.4.8, the criteria for classifying lead-impacted excavated soil for disposal purposes in California can be summarized as follows:

- If the total lead concentration of excavated soil is greater than 1,000 mg/kg (or currently applicable criteria), it is classified as California (non-RCRA) hazardous waste for disposal purposes;

- If the soluble lead concentration (using the Waste Extraction Test ("WET") test) of excavated soil is greater than 5 mg/L (or currently applicable criteria), it is classified as California (non-RCRA) hazardous waste for disposal purposes;[42] and

- If the total lead concentration of excavated soil is between 320 and 1,000 mg/kg, but the soluble lead concentration based on the WET is less than 5 mg/L (or currently applicable criteria) the soil could be classified as non-hazardous and disposed at an off-site non-hazardous waste landfill in accordance with the disposal facility's permit.

This section describes a general approach for identifying and managing lead-impacted soil encountered during redevelopment within the MFA Leasehold. This approach is based on the assumption that excavation and off-site disposal is NASA's preferred method for handling lead-impacted soil encountered during redevelopment and the general approach to managing potentially lead-impacted soils is shown schematically on Figure 15. For buildings that are to be demolished as part of redevelopment, lead-impacted soil shall be removed prior to building demolition.

Under the approach outlined in this section, the lead concentration of soil remaining after excavation will be at or below the Water Board ESL for lead in commercial/industrial soil (320 mg/kg). The use of the Water Board Tier 1 commercial/industrial land-use ESL for lead within the MFA Leasehold is justified as the exposure pathways and potential receptors used to develop the ESL are similar to the expected exposure pathways and

[42] If lead concentrations in soil are greater than 100 mg/kg (or currently applicable criteria), the sample will also have to be subjected to the Toxicity Characteristic Leaching Procedure ("TCLP"). If lead concentrations in the TCLP extract exceed 5 mg/L (or currently applicable criteria), such soil is classified as a RCRA hazardous waste if excavated.

potential receptors within the MFA Leasehold. In addition, as anticipated exposure parameters (e.g., exposure frequency, exposure time, exposure duration, ingestion rate, etc.) for potential receptors within the MFA Leasehold are significantly lower than the default values used to develop the Tier 1 ESL (e.g., 8 hours per day, 250 days per year, over a 25 year period), the use of the Water Board's Tier 1 ESL for lead as a cleanup level should be protective of all potential future receptors[43] within the MFA Leasehold.

6.10.1.1. Lead-Based Paint Survey

Previous investigations conducted within the MFA Leasehold indicate that lead-impacted soil surrounding buildings is likely due to the historical use of lead-based paints. The 1998 investigation conducted on behalf of U.S. EPA (Weston, 1998) concluded that elevated levels of lead in soil were not found near buildings that did not have lead-based paints. Therefore, if the building has not already been surveyed for lead-containing material, the initial step is for the Project Developer to conduct a survey to determine if lead-based paints are found in painted exterior surfaces. If no evidence of the presence of lead-containing material is found and lead-impacted soil has not been identified during any previous soil sampling, no further action is required regarding lead. However, any soil excavated during construction activities shall be screened for VOCs and petroleum hydrocarbons according to the procedures in Section 6.10.2.

6.10.1.2. Initial Soil Lead Assessment

If a building survey has confirmed the presence of lead-based paints, an initial assessment of lead in soil shall be conducted in the planned construction area to determine if soils surrounding the building perimeter are impacted by elevated concentrations of lead.

The initial soil assessment at buildings where lead-based paints are confirmed to be present involves collecting a suite of composite samples at the building corners, near focused discharge points such as downspouts, and at regular intervals around the periphery of the building. By collecting multiple-increment composite samples rather than discrete soil samples, a better representative sample of bulk soil conditions can be obtained. For sampling purposes, a soil sampling (and potential excavation) "cell" is assumed to be approximately 30-feet long by 5-feet wide by 6 inches deep. This geometry assumes that elevated levels of lead generally do not extend farther than 5 feet from the building nor more than 6 inches deep into the soil column; however additional confirmation sampling will be conducted during excavation of lead-impacted soils to

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[43] While several of the exposure parameters (e.g., body weight or inhalation rate) for a hypothetical child visiting a future museum within the MFA Leasehold are significantly lower than those used in developing the commercial/industrial land-use ESL, the commercial/industrial land-use scenario ESL for lead should still be protective because most of the museum area would be paved and because the child's actual exposure would be significantly lower than that of an onsite construction or maintenance worker (e.g., an exposure frequency of 12 days per year for a child versus 250 days per year for a construction or maintenance worker, an exposure duration of 4 hours per day for a child versus 8 hours per day for a construction or maintenance worker, and an exposure duration of 10 years for a child versus 25 years for a construction or maintenance worker).

identify areas where lead-impacted soils may extend further from building walls or at greater depth (see Section 6.10.1.3). All samples will be collected from 0 to 6 inches below the surface at the drip-line (or no more than 2-feet from the building wall if no drip-line is apparent). A 30-point multi-increment sample will be collected from each 5 foot by 30 foot cell. Collection and analysis of the multi-increment confirmation samples will be performed in accordance with ITRC's ISM guidance document (ITRC, 2012) or an updated version of this document. If a composite sample contains lead at a concentration greater than 50 mg/kg then the sample shall be tested for soluble lead using the WET method.

If any of the initial soil assessment sample results for lead exceed 320 mg/kg (or currently applicable Water Board ESL for lead under a commercial/industrial land-use scenario), then significant lead-related contamination is deemed to be present around the building and excavation and disposal of lead-impacted soil located within the limits of construction will be conducted prior to or as part of development activities within the MFA Leasehold. Using these criteria, soil in areas where lead has been detected at concentrations exceeding the Water Board ESL for commercial/industrial soil (320 mg/kg) will be excavated and properly disposed of. If the impacted materials contain between 320 mg/kg and 1,000 mg/kg and WET-soluble lead less than 5 mg/L (or currently applicable criteria) may be classified as non-hazardous and disposed at a non-hazardous waste landfill in accordance with the disposal facility's permit. Any soil containing total lead in excess of the TTLC of 1,000 mg/kg (or currently applicable criteria) and/or containing WET-soluble lead in excess of the STLC of 5.0 mg/L (or currently applicable criteria) will be managed as a non-RCRA hazardous waste. Lastly, any soil containing TCLP-soluble lead in excess of the RCRA regulatory criterion of 5.0 mg/L (or currently applicable criteria) will be managed as a RCRA hazardous waste.

If none of the initial soil assessment results exceed the 320 mg/kg total lead concentration, no further action is required regarding lead for protection of human health. However, soils that contain total lead less than 320 mg/kg and soluble lead in excess of the STLC of 5.0 mg/L (or then currently applicable criteria) shall be properly disposed in a Class I landfill if they are to be excavated and moved from their current location. Soil excavated during construction will be screened for VOCs and petroleum hydrocarbons according to the procedures in Section 6.10.2.

6.10.1.3. Excavation and Disposal of Lead-Impacted Soil

Prior to building demolition or other construction within the building drip-line, an initial excavation will be conducted to remove shallow (e.g., approximately 6 inches in depth) soil surrounding the building in areas identified for remediation to a set distance from the building (e.g., approximately 10 feet). A determination of whether additional excavation is required will be made based on the results of multi-increment confirmation sampling of the sidewall and floor of the excavation (see below).

Treatment, if necessary, and disposal of lead-impacted soil excavated prior to or during development within the MFA Leasehold will be performed in accordance with applicable laws and regulations at permitted off-site treatment facilities. Disposal characterization

samples can be collected *in situ* from disposal cells established from previous sampling data or from bins or stockpiles in accordance with the needs of the disposal/treatment facility. The Project Developer will arrange for off-site disposal of lead-impacted soil and NASA will sign manifests as generator of the waste.

Multi-increment confirmation samples will be collected from the floor and the excavation sidewalls for each excavation cell. As with the initial soil assessment sampling, the floor and sidewall samples shall be 30-point multi-increment composite samples, properly homogenized and subsampled in accordance with ITRC ISM guidance. Samples shall be analyzed for total lead and soluble lead (WET and TCLP) if the total lead concentration exceeds 50 mg/kg and 100 mg/kg, respectively (or currently applicable criteria). These results will be used to confirm that lead-impacted soils have been successfully excavated. Additional excavation may be necessary if confirmation sample analytical results indicate additional lead-impacted soils remain.

After lead-impacted soils have been excavated and removed, soil excavation for site development can continue using the soil screening procedures described in Section 6.10.2. The Project Developer will dispose of the excavated lead-impacted soils at a permitted off-site facility that is in compliance with the CERCLA Off-Site Rule; NASA will be designated as the generator of the waste and will sign all manifests. The Project Developer will prepare a report that describes the field activities, findings, actions taken, and analytical results for activities conducted by the Project Developer. The report will also include a figure depicting the location where the action was taken, chain-of-custody forms, and photographs as well as information regarding the disposal of the impacted materials. This report will be submitted to the applicable regulatory agencies (e.g., U.S. EPA and/or the Water Board), NASA, and the Navy to document compliance with the soil management protocol for lead-impacted soils (Section 6.10.1) within 60 days of the completion of field activities. The Project Developer will revise the report as necessary to adequately document the actions taken.

6.10.2. Excavated Soil Screening Procedures

As described in Section 2.4, there are a number of areas within the MFA Leasehold where it is likely that soil containing COPCs may be encountered during construction activities. Areas of potentially impacted soils are identified in Table 1 (see the EIMP Approach column) and the locations are shown on Figure 6. This section describes the soil screening procedures that will be implemented in these areas.

6.10.2.1. General Screening Procedures for all Excavated Soil

During all redevelopment activities, the Project Developer's contractor will visually monitor soil that is excavated during construction activity. The soil shall be visually observed for evidence of discoloration or staining. If soil is encountered that is visibly stained, discolored, shiny, or oily or has a noticeable solvent-like or hydrocarbon odor, contingency procedures described in Section 6.10.3 will be implemented. The soil

screening procedures shown on Figure 14 and described below will be used to assess whether the excavated soil is impacted.

If, during any earthwork or building demolition activities within the MFA Leasehold, soil is encountered that is visibly stained, discolored, shiny, or oily or has a noticeable solvent-like or hydrocarbon odor, actions will be taken as outlined in the decision diagram on Figure 16 and as summarized below.

6.10.2.2. Additional Screening Procedures for VOCs in Excavated Soil

Screening for VOCs should be conducted in the following areas:

- the MEW Site VI Study Area using the field headspace soil screening criteria described in Section 6.10.2.3 and the field headspace soil screening method described in Section 6.10.2.6;

- the potential non-MEW Site VI Study Areas east of the airfield, Hangars 2 and 3, and portions of the IR Site 26 Land Use Control area (Figures 5 and 6) using the field headspace soil screening criteria described in Section 6.10.2.4 and the field headspace soil screening method described in Section 6.10.2.6;

- additional areas as identified in the EIMP Approach column of Table 1 by the statement: "An environmental professional should perform soil screening during subsurface work in accordance with EIMP" using the field headspace soil screening criteria described in Section 6.10.2.5 and the field headspace soil screening method described in Section 6.10.2.6;

- additional locations as may be identified by the Project Developer's environmental professional in locations where the Project Developer's contractor has observed evidence of unnaturally stained, discolored, or odorous soil, and using the field headspace soil screening criteria described in Section 6.10.2.5 and the field headspace soil screening method described in Section 6.10.2.6.

The VOC screening procedures do not apply to soil that is moved around the project site during rough or final grading or to excavate hardscape or landscaping materials.

6.10.2.3. Field Headspace Soil Screening Criteria within the MEW Site VI Study Area

During redevelopment activities within the MEW Site VI Study Area the Project Developer's environmental consultant shall field-screen the soil for the presence of VOCs using a ppbv OVA. If a continuous reading of 500 ppbv or greater is observed in a representative Field Headspace Soil sample for 10 seconds or more, the soil will be considered as "potentially contaminated with volatile chemicals" and will be segregated from the other excavated materials. If the OVA screening criterion is exceeded, the Project Developer will notify the Master Lessee, NASA, the Navy, the U.S. EPA, and the Water Board.

Excavated soil not exceeding 500 ppbv in the headspace for 10 seconds or more during soil screening can be reused within the project area for backfill or cover without any further soil sampling or analyses.

6.10.2.4. Field Headspace Soil Screening Criteria in Areas Overlying Potential Shallow Subsurface Chlorinated VOC Contamination

During redevelopment activities within the potential Vapor Intrusion Study areas east of the airfield, Hangars 2 and 3, and portions of the IR Site 26 Land Use Control area (Figures 5 and 6), the Project Developer's environmental consultant shall field-screen the soil for the presence of VOCs using an OVA capable of measuring down to the 0.1 parts per million by volume ("ppmv") range ("ppmv OVA"). If a continuous reading of 5.0 ppmv or greater is observed in a representative Field Headspace Soil sample for 10 seconds or more, the soil will be considered as "potentially contaminated with volatile chemicals" and will be segregated from the other excavated materials. If the OVA screening criterion is exceeded, the Project Developer will notify the Master Lessee, NASA, the Navy, the U.S. EPA, and the Water Board.

Excavated soil not exceeding 5 ppmv in the headspace for 10 seconds or more during soil screening can be reused within the project area for backfill or cover without any further soil sampling or analyses.

6.10.2.5. Field Headspace Soil Screening Criteria in Areas Where there is no Known or Likely Shallow Subsurface Chlorinated VOC Contamination

During redevelopment activities that require screening for petroleum hydrocarbons or non-chlorinated VOCs (as identified in Table 1) or in areas where soil that is unnaturally stained, discolored, or odorous is observed, the Project Developer's environmental consultant shall field-screen the soil for the presence of VOCs using a ppmv OVA. If a continuous reading of 25 ppmv[44] or greater is observed in a representative Field Headspace Soil sample for 10 seconds or more, the soil will be considered as "potentially contaminated with volatile chemicals" and will be segregated from the other excavated materials. If the OVA screening criterion is exceeded, the Project Developer will notify the Master Lessee, NASA, the Navy, the U.S. EPA, and the Water Board.

Excavated soil not exceeding 25 ppmv in the headspace for 10 seconds or more during soil screening can be reused within the project area for backfill or cover without any further soil sampling or analyses.

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[44] Based on professional experience, OVAs often report low concentrations (<10 ppmv) of volatile organics in moist, recently excavated materials; subsequent analyses of these materials at the analytical laboratory typically reveals no significant contamination. As a result, the screening criterion presented herein was selected as a conservative threshold, based on professional judgment, to minimize potential false positive results.

6.10.2.6. Field Headspace Soil Screening Method

Soil samples will be screened in the field for the presence of VOCs using the following screening method:

- at a minimum, a representative soil sample will be collected from every 15 cubic yards of excavated soil and placed into an unused re-sealable plastic bag with a minimum volume of one quart, until the container is approximately one-half full;
- the plastic bag will be sealed and the soil within it will be crumbled by hand, if possible, to expose fresh surfaces;
- after at least 2 minutes, the plastic bag will be opened just enough to allow the probe of the OVA to be inserted into the headspace of the plastic bag;
- if the OVA reading exceeds the applicable screening limit[45] continuously for 10 seconds or more, the soil will be considered "potentially contaminated with volatile chemicals."

The OVA used in the above analysis will utilize a photo-ionization detector ("PID") that shall be field-calibrated in accordance with the manufacturer's requirements. Both the ppbv OVA and ppmv OVA will be zero calibrated using ambient air; the ppbv OVA will also be calibrated using a 10 ppmv isobutylene in air calibration standard and the ppmv OVA will also be calibrated using a 100 ppmv isobutylene in air calibration standard.

6.10.2.7. Additional Testing of Potentially Contaminated Soil

Excavated materials that are considered to be potentially contaminated will be segregated from soil with no indications of contamination, and transferred to a stockpile at a location in the construction area. The Project Developer's contractor will place a plastic liner underneath the stockpile(s) of potentially contaminated soil and will cover the stockpile(s) with a plastic liner at all times except when material is being handled. The top covering will be adequately secured so that all surface areas are covered. Berms will be constructed by the Project Developer's contractor around the stockpile area to control precipitation run-on and run-off. All handling of contaminated soil must comply with BAAQMD Regulation 8, Rule 40. Soils from the saturated and unsaturated zones will be stockpiled separately.

Samples will be collected by the Project Developer's environmental professional from potentially contaminated soil stockpiles.

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[45] 500 ppbv within the MEW Site VI Study Area (Section 6.10.2.3), 5 ppmv in areas overlying potential shallow subsurface chlorinated VOC contamination (Section 6.10.2.4), and 25 ppmv elsewhere (Section 6.10.2.5).

- Two five-point composite samples, representative of the stockpiled material, will be collected for every 50 cubic yards of stockpiled soil.

- The samples should be collected in accordance with U.S. EPA Method 5035 from freshly exposed soil surfaces using 5-gram EnCore™ Samplers; a total of five 5-gram EnCore Samplers™ and one 16-ounce glass jar[46] will be collected for each composite sample. The capped samplers and glass jar should be placed into plastic bags for storage and transported to a state-certified analytical laboratory, on ice, under chain-of-custody protocols.

- The Encore™ samples should be composited at the analytical laboratory and analyzed for (a) VOCs, using U.S. EPA Method 8260, and (b) total purgeable petroleum hydrocarbons, gasoline range organics ("TPHg") using U.S. EPA Method 8015m; the sample collected in the 16-ounce glass jar should be analyzed for total extractable petroleum hydrocarbons, diesel range organics ("TPHd") using U.S. EPA Method 8015m[47]. Analytical results for the samples should be compared to soil TCLs presented in Table 2.

The sample collected in the 16-ounce glass jar will also be used for additional analyses if there is evidence that chemicals other than volatile chemicals may be present that could pose a potential health risk through direct contact by subsurface workers. Determination of whether additional sample analyses should be conducted will be based on the location of the excavation in relation to known past COPC release or use and on the field observation and judgment of the Project Developer's environmental professional.

- Additional analyses may include the following:

    - Title 22 metals by U.S. EPA Method 6020;

    - SVOCs (or PAHs) by U.S. EPA Method 8270;

    - PCBs by U.S. EPA Method 8082;

    - Pesticides by U.S. EPA Method 8081; or

    - Herbicides by U.S. EPA Method 8151.

If chemical concentrations in the soil samples do not exceed the soil TCLs (Table 2), the soil can be reused within the MFA Leasehold for backfill. If chemical concentrations in the soil samples exceed the soil TCLs, the Project Developer will notify NASA, the

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[46] For moisture content determination, the analysis of diesel range petroleum hydrocarbons, and additional analyses, if appropriate.
[47] Samples analyzed for total extractable petroleum hydrocarbons by U.S. EPA Method 8015m should be prepared for analysis using a silica gel cleanup method.

Navy, and the appropriate regulatory agencies as described in Section 6.10.2.8 and the Project Developer will manage the soil as described in Section 6.10.3.

6.10.2.8. Notification of Soil Containing Chemicals and Impacted Soil

NASA, the Navy, the U.S. EPA, and the Water Board must be notified when the results of chemical screening indicates excavated soil contains or possibly contains chemicals of concern.

- If the OVA screening criterion is exceeded, the Project Developer will notify NASA, the Navy, the U.S. EPA, and the Water Board promptly.
- If analytical data are obtained that indicate excavated soil containing COPCs would require treatment or disposal (as described in Section 6.10.3), NASA, the Navy, and the applicable regulatory agencies will be notified and provided with copies of analytical reports for review.

The notification provided to NASA, the Navy, and the applicable regulatory agencies shall include relevant information such as:

- the approximate location and depth of the excavated soil;
- whether the soil was visibly stained, discolored, shiny, or oily or had a noticeable solvent-like or hydrocarbon odor;
- OVA screening results; and,
- the number of samples collected for laboratory analysis and any analytical results already obtained.

The notification documentation will be made part of the final report documenting implementation of the excavated soil screening procedures and will be submitted to the applicable regulatory agencies within 60 days of completing field activities.

In accordance with BAAQMD Rule 8-40-402, the BAAQMD will be notified at least 5 days before the excavation of known contaminated soil. If previously unknown soil contamination is discovered, the BAAQMD shall be notified as soon as possible per Rule 8-40-405 with written verification shall follow not later than 30 working days after excavation is completed.

6.10.2.9. Documentation of Soil Screening

The Project Developer shall prepare a report documenting implementation of the excavated soil screening procedures. The report shall include, as a minimum, the following information:

- a summary of field headspace soil screening results, an estimate of the volume of excavated soil which exceeded the headspace soil screening criterion, and

identification of the approximate location of excavated soil which exceeded the headspace soil screening criterion;

- a summary of laboratory analytical results of soil stockpile sampling and a compilation of laboratory analytical data reports; and
- documentation regarding the off-site disposal or treatment of the impacted materials and estimates of the volume or mass of the impacted materials. NASA shall sign all manifests as generator of the wastes to the extent not timely signed by the Navy or MEW Companies.

The report shall be submitted to NASA, the Navy, and the applicable lead regulatory agency to document implementation of the soil screening procedures of this EIMP within 60 days of the completion of field activities, unless it is included as an appendix or attachment to a report submitted to the lead regulatory agency by the Project Developer documenting the treatment or disposal of the excavated soil. The Project Developer will revise the report as necessary to adequately document the actions taken.

6.10.3. Management of Impacted Excavated Soils

Excavated soil that is determined to contain COPCs at concentrations above the soil TCLs (Table 2) by the procedures described in Section 6.10.2 ("impacted soil") is required to be treated or removed from the site per BAAQMB Rule 8-40-406. Prior to disposing the impacted soil at a permitted off-site facility, the Project Developer will notify NASA and the Navy and will provide NASA and the Navy with copies of analytical data for review. The Project Developer will dispose of the soil at a permitted off-site disposal facility[48] in accordance with the soil characteristics and applicable laws and regulations. NASA will sign all manifests as generator of the waste to the extent not timely signed by the Navy or MEW Companies.

6.10.4. Soil Re-Use Within the MFA Leasehold

Soil with COPC concentrations that do not exceed the applicable soil TCLs may be reused as backfill within the project area from which it was excavated. Excess soil with COPC concentrations that do not exceed applicable soil TCLs but cannot be reused within the project area based on its physical characteristics or the final site grading limits may be reused as fill elsewhere within the MFA Leasehold provided that the analytical data for this material meets applicable soil TCLs for the area in which it will be placed.

6.10.5. Management of Impacted Soils after Construction Excavation is Complete

The Project Developer need only excavate to the extent required for construction. If the concentrations of COPCs in excavated soil samples exceed soil TCLs (Table 2), discrete

[48] That is in compliance with the CERCLA Off-Site Rule.

confirmation samples[49] will be collected from in-place soils at the limits of the excavation as follows:

- for each approximately 50 linear feet of exposed excavation sidewalls, a discrete confirmation sidewall sample will be collected from freshly exposed soils between the ground surface and the total excavation depth.

- for each approximately 2,500 square feet of exposed excavation bottom, a confirmation sample will be collected from the excavation floor if the excavation does not extend to the groundwater table or if soils were impacted by COPCs other than VOCs or TPH.

- a minimum of one bottom sample and one sidewall sample per excavation sidewall face will be collected from each excavation.

If the results of the confirmation sample analyses indicate that COPCs remain in unexcavated soils at concentrations that exceed soil TCLs[50], NASA, the Navy, and the applicable regulatory agencies shall be notified and the Project Developer will manage the unexcavated soil according to one of the three general approaches summarized below and shown on Figure 16. The procedures below allow for over-excavation of identified contamination, if desired, and the subsequent collection and analysis of soil samples to determine chemical impacts, if any, in the remaining unexcavated soil.

Selection of which of the three approaches, or "tracks," will be followed will depend on the apparent extent of contamination, the construction schedule, and physical constraints. The first two tracks described below are designed to be implemented relatively quickly by the Project Developer in coordination with NASA and to completely address relatively limited source areas in locations that potentially impact the construction project. The third track is potentially appropriate for larger source areas for which excavation may not be practicable or if the source area extends into areas that do not affect the construction project schedule; in this track, the Project Developer defers additional actions to the Responsible Party who will be responsible for agency coordination and for the implementation of any remedial actions.

- *Track 1 - Excavate and Remove, Collect Confirmation Samples*: Track 1 is considered a "Fast Track" remedial approach, and is designed to allow development work to proceed with minimal delay. Unsaturated zone soils that appear to contain chemicals above TCLs are excavated from within the limits of construction, screened, stockpiled, and managed as described in the previous sections. Confirmation soil samples are then collected from remaining soil in the

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[49] The sample should be collected from a freshly exposed soil surface. Five 5-gram EnCore™ Samplers and one 16-ounce glass jar should be collected and transported to a state-certified analytical laboratory, on ice, under chain-of-custody protocols.

[50] Should the construction project be located within the boundary of a previously closed site, the cleanup standards used to close the site will be used, unless otherwise directed by the lead regulatory agency, in place of the TCLs to determine whether additional excavation is required.

excavation sidewalls and floor (if the excavation did not extend to the groundwater table) to assess whether impacted soils have been removed. Confirmation samples shall be collected at the same frequency as described above. Excavation is considered complete if confirmation soil sample results are below TCLs, the top of the groundwater table is encountered, or the boundary of the construction area have been reached. After soil excavation is considered complete, the excavation may be backfilled with clean soil and development work may continue.

- *Track 2 - Characterize In-Situ*: Track 2 is considered the "Middle Track" remedial approach because in-situ characterization requires significantly more time than the direct excavation approach. Track 2 may be more appropriate (a) if the construction schedule allows for *in-situ* characterization, or (b) if the potentially impacted construction area is suspected to be large. Under Track 2, the extent of impacted soils is characterized *in-situ* by installing soil borings in advance of the soil removal action (i.e., extent characterized in advance with borings, rather than confirmation sampling). Based on the nature and extent of contamination, the Project Developer can decide whether to proceed with the removal and disposal of impacted soils, or to defer any action to the Responsible Party for coordination with the regulatory agencies if excavation does not appear to be practicable at that time.

- *Track 3 – Standard Agency Oversight*: Track 3, involving direct regulatory agency involvement in decision making, may be more appropriate (a) if excavation is not practicable at the time of construction (e.g., the potentially impacted area is particularly large in size or there are physical constraints like a building), (b) if the Project Developer's construction schedule is not adversely affected by the impacted area, (c) if no further action is believed to be necessary due to the nature of the source (e.g., not mobile, low toxicity), or (d) because an existing approved remedy adequately addresses the issue (e.g., operation of the regional groundwater remediation system adequately addresses any potential impact due to the identified impacted soil). Any further assessment will be conducted by the Responsible Party in coordination with the regulatory agencies. NASA will facilitate communication between the Master Lessee and the Responsible Party when requested.

The implementation of actions to manage impacted soil in construction areas that remains in-place shall be documented through the use of field notes and photographs. After completion of a contingency action, the Project Developer will prepare a report that describes the field activities, findings, actions taken, and analytical results for activities conducted by the Project Developer. The report will also include a figure depicting the location where the action was taken, chain-of-custody forms, and photographs as well as information regarding the disposal of the impacted materials. This report will be submitted to the applicable regulatory agencies (e.g., U.S. EPA and/or the Water Board), NASA, and the Navy to as documentation of the contingency actions taken. The Project Developer will revise the report as necessary to adequately document the actions taken.

6.10.6. Import Fill

All imported soils will be certified clean with supporting documentation per DTSC fill guidance (Cal-EPA, 2001; Cal-EPA, 2006). The Project Developer will provide certification documents to NASA's Environmental Management Division prior to the placement of imported soil within the MFA Leasehold.

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7. POST-CONSTRUCTION AND LONG-TERM RISK MANAGEMENT

This section of the EIMP addresses precautions that shall be implemented to mitigate long-term risks to human health and the environment related to exposure to COPCs during periods of normal non-construction activity. Any construction that will disturb the soil, building foundations, or pavement shall be completed in a manner that is consistent with the EIMP, particularly Sections 5 and 6, and all then-applicable environmental policies, laws, and regulations.

Components of the EIMP for long-term risk management activities are as follows:

- Providing required notification to future property managers and tenants of the known environmental conditions within the MFA Leasehold (e.g., the applicable Existing Environmental Conditions summaries in Appendix A and closure plans), lead and asbestos surveys, results of available air monitoring data, and the requirements of the EIMP (Section 7.1);

- Ensuring that future land uses are consistent with the planned land-use assumed in this EIMP in terms of exposure risk assumptions (Section 7.2);

- Prohibiting the use of untreated groundwater within the MFA Leasehold (Section 7.3);

- Establishing a notification procedure and protocols for future subsurface activity to ensure long-term compliance with this EIMP (Section 7.4);

- Vapor intrusion monitoring by NASA, the Navy, and the MEW Companies (Section 7.5);

- Ensuring compliance with LUCs and Navy remedies within the MFA Leasehold (Section 7.6); and,

- Periodically reviewing and modifying this EIMP, as necessary, to address any new COPCs encountered within the MFA Leasehold, any newly-developed toxicological data relating to COPCs, and any significant changes in exposure assumptions because of an intended land use that is different from the planned land use upon which this EIMP is based (Section 7.7).

7.1. Rights and Notifications

Subject to the terms and conditions of the Lease, NASA, the U.S. EPA, the Water Board, the State of California, the Navy, the MEW Companies, and other entities and governmental agencies that are involved in the remediation of, or that are responsible to remediate, existing or future contamination on or about the Property, shall have the right

to reasonable access to known or suspected areas of contamination or other areas upon which any containment system, treatment system, monitoring system, or other environmental response action is installed or implemented, or to be installed or implemented, for the purposes of complying with environmental law and requirements provided, however, that any such installation and implementation shall be undertaken so as to cause as little interference to Master Lessee as reasonably practicable. NASA shall cooperate with Master Lessee in locating such required equipment in locations and installing and implementing such systems in a manner that are compatible with the Master Lessee's development plans.

The Master Lessee and NASA shall both be responsible for providing notification of the known environmental conditions within the MFA Leasehold and of the requirements of this EIMP to the property manager, and tenants and other entities leasing or otherwise exercising control over space within the MFA Leasehold. The Master Lessee shall provide written documentation of any required notification it makes to tenants or other parties to NASA's development office, which will maintain overall records documenting that required notifications have been made to all appropriate parties.

Project Developers, property managers, tenants, or others exercising control over space within the MFA Leasehold shall be responsible for informing construction contractors and maintenance workers about the EIMP, as necessary, to ensure compliance with the procedures laid out herein.

7.2. Maintaining Planned Land Use

Development on the MFA Leasehold is subject to the NASA Ames Development Plan (NASA, 2002), the NASA Ames Development Plan Final Programmatic Environmental Impact Statement (DCE, 2002), and Ames Procedural Requirements 8500.1. The planned land use for the MFA Leasehold, as permitted by the Lease, is commercial/industrial. If any significant change in the land use is proposed in the future, the Master Lessee shall conduct a risk analysis to support any proposed changes to this EIMP. Changes in the planned land use must be approved by NASA and applicable environmental regulatory agencies.

7.3. Prohibiting Use of Groundwater within the MFA Leasehold

Because chlorinated solvents are known to be present in groundwater at concentrations that exceed U.S. and California maximum contaminant levels for drinking water, NASA, the Master Lessee, Project Developers, and tenants are responsible for ensuring that groundwater beneath the MFA Leasehold will not be used for drinking water or for any other purpose until such time that a risk assessment is performed that demonstrates the proposed use of groundwater does not represent a significant risk and the use of groundwater within the MFA Leasehold is approved by NASA, the U.S. EPA, the Water Board, and the SCVWD. Notwithstanding the foregoing sentence, treated groundwater that meets TCLs may be used for irrigation and/or industrial heating or cooling, or other processes.

7.4. Protocols for Future Subsurface Activities

Prior to the initiation of future subsurface activities, the Project Developer should review available historic information, Table 1 and Figure 6 of the EIMP, and NASA's EEC's (Appendix A) for the planned construction area to identify potential COPCs and LUCs. Should the area be located in a known area of contamination, the Project Developer will notify the applicable regulatory agencies of the proposed subsurface activities and will comply with existing LUCs.

Health and safety procedures, as described in Section 6.2, will be followed for all individuals engaged in activities that disturb subsurface soil (e.g., utility repairs, work on building foundations, changes to paved areas, and changes to landscaping and unpaved recreational areas) within the MFA Leasehold. Such work will follow the soil handling and other protocols discussed in Section 6.10 unless a future evaluation results in regulatory agency approval of alternate procedures. Utility clearances will be conducted prior to any subsurface drilling.

NASA, Master Lessee, and tenants within the MFA Leasehold will require each contractor with workers that may contact Site groundwater or disturb Site soil to prepare its own site-specific H&SP, as described in Section 6.2. The requirement for preparation of a site-specific H&SP also applies to activities involving work in utility vaults or other subgrade areas (e.g., utility maintenance or modifications in subfloor areas of buildings) where potential exposure to accumulated VOC vapors may occur. Each H&SP will be consistent with State, Federal, and any other applicable health and safety standards and regulations. Among other things, a contractor's H&SP will include a description of health and safety training requirements for on-site personnel, a description of the level of personal protective equipment to be used, air monitoring requirements, confined space entry procedures, if applicable (e.g., work in utility vaults), and any other applicable precautions to be undertaken to minimize direct contact with soil and groundwater or exposure to COPC vapors. Workers will have the appropriate level of health and safety training and will use the appropriate level of personal protective equipment, as determined in the relevant H&SP.

7.5. Vapor Intrusion Monitoring

Periodically monitoring and verification of the adequacy of vapor intrusion mitigation measures may be necessary depending on the specific measures implemented, as described in Section 5.1.5. In addition, regular inspections of system components, such as blowers in SSD systems, shall be conducted to ensure their proper operation. Master Lessee shall review all vapor intrusion monitoring reports prepared by NASA, the Navy and the MEW Companies.

In the event that work on utility lines or subfloor areas occurs in buildings that have implemented vapor mitigation measures as described in Section 5.1.3 or are located within the MEW Site VI Study Area or in other areas where the potential for vapor intrusion has been identified (Figure 6), cracks in the concrete floor and around utility penetrations shall be sealed. In addition, if a vapor intrusion barrier (Section 5.1.3.6) has

been installed, work shall be completed in a manner that does not tear, penetrate, or otherwise compromise the vapor intrusion barrier. If penetration of the vapor barrier is unavoidable or occurs inadvertently, measures shall be taken to reseal the vapor barrier.

7.6. Compliance with LUCs and Navy Remedies

Master Lessee shall ensure future development is conducted in compliance with LUCs within the MFA Leasehold. Master Lessee shall participate in future discussions between the applicable regulatory agencies and the Responsible Parties regarding future LUCs (e.g., Hangar 1) within the MFA Leasehold.

Specific sites with LUCs located within the MFA Leasehold area include the:

- OU 2-East;
- Runway Landfill (IR Site 1);
- Golf Course Landfill No. 2 (IR Site 22);
- Golf Course Landfill No. 3 (IR Site 23);
- East-Side Aquifer Treatment System Area (IR Site 26);
- West-Side Aquifers Treatment System Area (IR Site 28); and,
- Hangar 1 (LUCs are to be developed).

LUCs for IR Sites within OU 2-East include:

- Restricted development in the golf course area, including the Marriage Road Ditch (IR Site 3). As specified in the NASA Ames Development Plan under Mitigated Alternative 5, land use within the golf course area is restricted to open space. In addition, the Marriage Road Ditch (IR Site 3) is classified as a jurisdictional wetland;
- Restricted development near the airfield runways (IR Site 10) due to Federal Aviation Administration restrictions; and,
- Prohibition of groundwater extraction for potable or non-potable purposes.

LUCs for the Runway Landfill (IR Site 1) include:

- Maintain the integrity of the landfill cap and prevent the disturbance or excavation of waste materials;
- Operations and maintenance of the Building 191 pump station and drain/sub-drain system (NASA responsibility);

- Fencing and signage around the landfill (Navy responsibility);
- Landfill cap inspections (Navy responsibility);
- Semi-annual (April and October) groundwater monitoring from 9 wells and two collection trenches and semi-annual (April and October) landfill gas monitoring from 19 gas vents, four landfill gas monitoring wells, and 21 perimeter landfill gas monitoring locations (Navy responsibility).

LUCs for the Golf Course Landfill No. 2 (IR Site 22) include:

- Maintain the integrity of the landfill cap and prevent the disturbance or excavation of waste materials;
- Prohibition of residential land use;
- Land use at the golf course, including the IR Site 22 area, is restricted to open space by the NASA Ames Development Plan, Mitigated Alternative 5;
- Prohibition of groundwater extraction for potable or non-potable purposes;
- Prohibition of alterations to surface contours and/or drainage patterns; and,
- Quarterly groundwater, landfill gas monitoring, semi-annual landfill cap inspections, and annual reporting to the U.S. EPA (Navy responsibility).

LUCs for the Golf Course Landfill No. 3 (IR Site 23) include:

- Prohibition of residential land use; and,
- Land use at the golf course, including the IR Site 23 area, is restricted to open space by the NASA Ames Development Plan, Mitigated Alternative 5.

LUCs for OU5 and the East-Side Aquifer Treatment System Area (IR Site 26) include:

- Prohibition of residential land use;
- Prohibition of groundwater extraction for potable or non-potable purposes;
- Operations and maintenance of the Building 191 pump station and drain/sub-drain system (NASA responsibility);
- Fencing of the EATS treatment system area (Navy responsibility); and
- Semi-annual, annual, and/or biennial groundwater monitoring, depending on the well (Navy responsibility).

LUCs for the West-Side Aquifers Treatment System Area (IR Site 28) include:

- Operations and maintenance of the WATS (Navy responsibility);
- Semi-annual or annual groundwater monitoring, depending on the well (Navy responsibility);
- Sampling of the WATS effluent in accordance with the National Pollutant Discharge Elimination System ("NPDES") permit (Navy responsibility); and,
- Operation and maintenance of installed VI mitigation measures and indoor air monitoring within the Navy allocation area (Navy responsibility).

Master Lessee will work with the U.S. EPA, Water Board, NASA, and the Responsible Party to develop LUCs for future Site remedies or implemented remedies for which LUCs have not yet been developed (e.g., Hangar 1). The forthcoming ROD for Hangar 1 will include institutional controls and monitoring requirements to maintain the protectiveness of the Hangar 1 remedy.

Until such time as the on-going obligations are defined in the Hangar 1 ROD, the Project Developer will:

- obtain approval from the lead regulatory agency if any planned activities may disturb the Hangar 1 remedy;
- conduct the proposed activities in a manner that is protective of both the implemented Hangar 1 remedy and of on-site construction workers;
- allow access for the maintenance and monitoring activities as may be required to maintain and evaluate the protectiveness of the implemented remedy.

7.7. Long-Term Compliance: Periodic Review and Update of EIMP

Management measures will be implemented to ensure long-term compliance with this EIMP. The Master Lessee and NASA shall maintain documentation of notification of the known environmental conditions within the MFA Leasehold and of the requirements of this EIMP to the property manager, and tenants and other entities leasing or otherwise exercising control over space within the MFA Leasehold as described in Section 7. Property managers, tenants, or others exercising control over space within the MFA Leasehold will inform their construction contractors and maintenance workers about the EIMP, as needed, to ensure compliance.

To the extent that subsurface work is conducted, documentation shall be maintained to show that the protocols for the subsurface activities described in Section 7.4 were followed as required by the EIMP.

The Master Lessee will review and evaluate ongoing environmental monitoring data to determine if there are any relevant changes in environmental conditions within the MFA Leasehold that may require modification of the EIMP.

This EIMP, and any addenda, will be periodically reviewed by the Master Lessee as necessary to address new COPCs encountered within the MFA Leasehold and not addressed in the existing EIMP, any newly available toxicological data relating to COPCs, or any relevant changes in land use from the planned land use on which this EIMP is based. Updates to the EIMP and any addenda will be reviewed by NASA and submitted to the U.S. EPA and Water Board for approval.

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Table 1
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Area (a)	ID (b)	NASA EEC Reference	COCs (c)	Regulatory Status	LUCs (d)(e)	OM&M (e)	Potential Environmental Concerns	EIMP Approach (e)
Airfield	AOI 15 Fuel Supply Pipeline	Fuel Supply Pipeline	Petroleum hydrocarbons	NFA	None	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. Implement EIMP if stained or odorous soil is encountered during subsurface work.
Airfield	Engine Test Stand Area (OU2-East, IR Site 11)	OU2 EEC	Petroleum hydrocarbons Chlorinated organics PAHs	NFA	1. Restricted development due to Federal Aviation Administration restrictions. 2. No extraction of groundwater.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.
Airfield	Former Fire-Fighting Training Area (OU2-West, IR Site 12)	Site 12 EEC	Petroleum hydrocarbons BTEX compounds Chlorinated organics	NFA	1. Restricted development due to Federal Aviation Administration restrictions.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.
Airfield	Outdoor Storage Area (f)	Potential Additional Cleanup Liabilities	Petroleum hydrocarbons VOCs	Not Applicable	None	None	1. Unknown contamination in soil could be encountered during subsurface work in nearby areas.	1. If stained or odorous soil is encountered during subsurface work in nearby areas, implement procedures in the EIMP.
Airfield	NASA Ames GWTS	--	Chlorinated organics	Active	1. Extract and treat groundwater as set forth in the ROD. 2. Monitor groundwater as set forth in the ROD. 3. Institutional and engineering controls have been implemented although they were not prescribed in the ROD.	None	1. Because of known solvent impacts, soil with COCs could be encountered during subsurface work. 2. Vapor intrusion if VOCs are present beneath building. 3. Because of known solvent impacts to groundwater, dewatering water will have to be managed appropriately.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil is encountered during subsurface work, follow procedures in the EIMP. 3. If development is proposed over the known groundwater plume, sample soil gas and assess if VI mitigation is needed. 4. Manage dewatering water in accordance with EIMP.
Airfield	Ordinance Handling/CANG Defueling Pad	--	Petroleum hydrocarbons BTEX compounds PCBs	Not Applicable	1. Restricted development due to Federal Aviation Administration restrictions.	None	1. Active AST with fuel storage and no secondary containment. 2. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work. 3. Potential impacts in soil from potential historical leaking PCB-containing transformers. 4. Active defueling and hazardous materials storage area.	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.
Airfield	Runway Area (OU 2-East, IR Site 10)	OU2 EEC	Petroleum hydrocarbons	NFA	1. Restricted development due to Federal Aviation Administration restrictions. 2. No extraction of groundwater.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.
Airfield	Station-wide Remedial Investigation HHRA Exposure Area 4158 (OU2-East)	No Further Action Sites	Metals Petroleum hydrocarbons PAHs	NFA	1. Restricted development due to Federal Aviation Administration restrictions. 2. No extraction of groundwater.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.
Airfield	Tank 104 (IR Site 10)	Tanks Other USTs/ASTs	Petroleum hydrocarbons BTEX compounds	NFA	1. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.
Airfield	Tank 132 (IR Site 10)	Tanks Other USTs/ASTs	Petroleum hydrocarbons	NFA	1. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.
Airfield	Tank 133 (IR Site 10)	Tanks Other USTs/ASTs	Petroleum hydrocarbons	NFA	1. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.
Airfield	Tank 14 (OU2-West, IR Site 19)	Site 19 EEC	Petroleum hydrocarbons BTEX compounds	NFA	1. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
Airfield	Tank 15 (IR Site 10)	Tanks Other USTs/ASTs	Petroleum hydrocarbons BTEX compounds	Closure	1. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.

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Airfield	Tank 55 (IR Site 10)	Tanks Other USTs/ASTs	Petroleum hydrocarbons BTEX compounds	Closure	1. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.
Airfield	Transformer Pads on Runway	--	PCBs	Not Applicable	None	None	1. Potential impacts in soil from potential historical leaking PCB-containing transformers.	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work, follow procedures in the EIMP.
Airfield	Windsock Transformers	--	PCBs	Not Applicable	None	None	1. Potential impacts in soil from potential historical leaking PCB-containing transformers.	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work, follow procedures in the EIMP.
Airfield	Zook Road Fuel Spill Area (IR Site 20)	Site 20 EEC	Petroleum hydrocarbons BTEX compounds PAHs Chlorinated organics	NFA	1. No residential land use. 2. No grading excavation, or subsurface activities without a soil management plan. 3. Notify Water Board in writing of proposed changes in future land or groundwater use. 4. Restricted development due to Federal Aviation Administration restrictions.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.
Fueling	115-12kV Electrical Substation (Building 591)	--	PCBs	Not Applicable	None	None	1. Potential impacts in soil from potential historical leaking PCB-containing transformers	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
Fueling	Aircraft Equipment Maintenance Shop (Building 142)	OU2 EEC	PCBs	Not Applicable	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Potential impacts in soil from potential historical leaking PCB-containing transformers	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work, implement procedures in the EIMP.
Fueling	Fuel Truck Loading Rack (Building 141)	Abandoned Fuel System	Petroleum hydrocarbons	Open	None	None	1. Active AST with fuel storage. 2. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. Inspect the area for potential historic spills or leaks. 2. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
Fueling	COCO ASTs	Tanks Other USTs/ASTs	Petroleum hydrocarbons	Not Applicable	None	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. Inspect the area for potential historic spills or leaks. 2. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.

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Area (a)	ID (b)	NASA EEC Reference	COCs (c)	Regulatory Status	LUCs (d)(e)	OM&M (e)	Potential Environmental Concerns	EIMP Approach (e)
Fueling	CANG Ground Support Equipment Facility (Building 684)	--	Petroleum hydrocarbons PCBs	Not Applicable	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Potential impacts in soil from potential historical leaking PCB-containing transformers. 2. Active hazardous waste materials area. 3. Staining observed in paved areas. 4. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
Fueling	Cryogenics Facility Transformer (Building 901)	--	PCBs	Not Applicable	None	None	1. Potential impacts in soil from potential historical leaking PCB-containing transformers	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
Fueling	Day Tank Area - Tanks 16, 17, and 90 (Building 953)	Abandoned Fuel System	Petroleum hydrocarbons PCBs	NFA (Tank 17); Open (Tank 16); Open (Tank 90) Open - pipeline from the day tank area to high speed fuel hydrants Open - underground pipeline from Site 5.	1. No residential land use. 2. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work. 2. Potential impacts in soil from potential historical leaking PCB-containing transformers. Transformer T-60-M formerly contained >500,000 mg/kg PCBs.	1. Inspect the area for potential historic spills or leaks. 2. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 3. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 4. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 5. Manage dewatering water in accordance with EIMP.
Fueling	Equipment Parking Area (IR Site 13)	OU2 EEC	Petroleum hydrocarbons	NFA	1. Restricted development due to Federal Aviation Administration restrictions. 2. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Petroleum hydrocarbon and other contamination could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement the EIMP.
Fueling	Former Aircraft Ground Support Equipment Shed (Former Building 483)	--	PCBs	Not Applicable	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Potential impacts in soil from potential historical leaking PCB-containing transformers	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
Fueling	Former Industrial Wastewater Holding Pond (OU2-East, IR Site 4)	OU2 EEC	Petroleum hydrocarbons Chlorinated organics VOCs SVOCs Metals	NFA	1. Located within the IR Site 26 area and is subject to the LUCs for this area. 2. The potential for vapor intrusion in new buildings requires assessment with oversight by the regulatory agencies.	None	1. Petroleum hydrocarbon or other contamination in soil could be encountered during subsurface work. 2. This area is located within IR Site 26 and is subject to the IR Site 26 ROD Amendment which specifies institutional controls for the area and requires the consideration of vapor intrusion.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil is encountered during subsurface work implement the EIMP. 3. Manage dewatering water in accordance with EIMP.

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Area (a)	ID (b)	NASA EEC Reference	COCs (c)	Regulatory Status	LUCs (d)(e)	OM&M (e)	Potential Environmental Concerns	EIMP Approach (e)
Fueling	Fuel Farm Offices Transformer (Building 545)	--	Petroleum hydrocarbons VOCs SVOCs PCBs	Not known	None	None	1. Potential impacts in soil from potential historical leaking PCB-containing transformers. 2. Potential petroleum hydrocarbon or other contamination in soil from oil/water separator located in fuel testing laboratory.	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
Fueling	High-Speed Fuel Hydrants (IR Site 24)	Site 24 EEC	Petroleum hydrocarbons	Open	1. Restricted development due to Federal Aviation Administration restrictions. 2. No extraction of groundwater.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil is encountered during subsurface work implement the EIMP.
Fueling	Industrial Wastewater Flux Ponds	Flux Ponds EEC	Petroleum hydrocarbons Chlorinated organics VOCs SVOCs Metals	NFA	1. Located within the IR Site 26 area and is subject to the LUCs for this area. 2. The potential for vapor intrusion in new buildings requires assessment with oversight by the regulatory agencies.	None	1. Petroleum hydrocarbon or other contamination in soil could be encountered during subsurface work.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil is encountered during subsurface work implement the EIMP. 3. Manage dewatering water in accordance with EIMP.
Fueling	North Fuel Farm ASTs (Tanks 72 through 75, IR Site 5)	Site 5 EEC	Petroleum hydrocarbons PCBs	Open	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work. 2. Potential impacts in soil from potential historical leaking PCB-containing transformers	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 4. Manage dewatering water in accordance with EIMP.
Fueling	North Fuel Farm Dry Wells (Dry Wells 1 through 5, IR Site 5)	Site 5 EEC	Petroleum hydrocarbons	NFA	1. No residential land use 2. The use of groundwater as a potable water source is prohibited 3. Notify Water Board of proposed changes in future land or groundwater use. 4. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. Manage dewatering water in accordance with EIMP.
Fueling	North Fuel Farm USTs (Tank 26, IR Site 5)	Site 5 EEC	Petroleum hydrocarbons	NFA	1. No residential land use 2. The use of groundwater as a potable water source is prohibited 3. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. Manage dewatering water in accordance with EIMP.
Fueling	North Fuel Farm USTs (Tanks 10 through 13, IR Site 5)	Site 5 EEC	Petroleum hydrocarbons	Open	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil is encountered during subsurface work implement the EIMP. 3. Manage dewatering water in accordance with EIMP.
Fueling	North Fuel Farm USTs (Tanks 30 and 31, IR Site 5)	Site 5 EEC	None	NFA	1. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Unknown contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.

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Area (a)	ID (b)	NASA EEC Reference	COCs (c)	Regulatory Status	LUCs (d)(e)	OM&M (e)	Potential Environmental Concerns	EIMP Approach (e)
Fueling	Runway Apron (OU2-East, IR Site 6)	OU2 EEC	Petroleum hydrocarbons Chlorinated organics VOCs SVOCs	NFA	1. Located within the IR Site 26 area and is subject to the LUCs for this area. 2. The potential for vapor intrusion in new buildings requires assessment with oversight by the regulatory agencies.	None	1. Unknown contamination in soil could be encountered during subsurface work. 2. This area is located within IR Site 26 and is subject to the IR Site 26 ROD Amendment which specifies institutional controls for the area and requires the consideration of vapor intrusion. 3. Active aircraft washrack located in area.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil is encountered during subsurface work implement the EIMP. 3. Manage dewatering water in accordance with EIMP.
Fueling	South Fuel Farm USTs (Tanks 8 and 9, IR Site 5)	--	Petroleum hydrocarbons	NFA	1. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Unknown contamination in soil could be encountered during subsurface work.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil is encountered during subsurface work implement the EIMP. 3. Manage dewatering water in accordance with EIMP.
Fueling	Sump 59 (IR Site 15)	Site 15 EEC	Petroleum hydrocarbons	Active	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Petroleum hydrocarbon impacted soil could be encountered during subsurface work. 2. Piping could be encountered during subsurface work.	1. If stained or odorous soil or piping is encountered during subsurface work implement procedures in the EIMP.
Fueling	Sump 63 (IR Site 15)	Site 15 EEC	Petroleum hydrocarbons BTEX compounds Chlorinated organics	NFA	1. No residential land use 2. No grading, excavation, or subsurface activities without a soil management plan. 3. Notify Water Board of proposed changes in future land or groundwater use. 4. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. COC impacted soil could be encountered during subsurface work. 2. Piping that was abandoned in place could be encountered during subsurface work.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil or abandoned piping is encountered during subsurface work implement procedures in the EIMP.
Golf Course	Building 191 Storm Water Lift Station	Site 26 EEC	Petroleum hydrocarbons PCBs	Active	<u>Record of Decision</u> 1. The Building 191 Storm Water Lift Station must be fenced. <u>Memorandum of Agreement between the Navy and NASA for OU1 and OU5</u> 1. Describes NASA agreement with Navy to operate and maintain the Building 191 Pump Station and implement Institutional Controls	1. Per its 1999 MOA with the Navy, NASA is responsible for operating and maintaining the Building 191 Storm Water Lift Station and the drain/subdrain system.	1. Active AST with fuel storage. 2. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work. 3. Potential impacts in soil from potential historical leaking PCB-containing transformers. 4. Operations and maintenance of the Building 191 Storm Water Lift Station by NASA.	1. Inspect the area for potential historic spills or leaks. 2. In areas that historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 4. Obtain approval from the applicable regulatory agencies if any planned activities may disturb operation of the Building 191 Pump Station.
Golf Course	Building 56 (Marriage Road Sewage Lift Station)	--	Petroleum hydrocarbons PCBs	Not Applicable	1. Located within the Golf Course, development restricted to open space.	None	1. Active AST with fuel storage. 2. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work. 3. Potential impacts in soil from potential historical leaking PCB-containing transformers	1. Inspect the area for potential historic spills or leaks. 2. In areas that historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
Golf Course	Former Sewage Treatment Plant (f)	Potential Additional Cleanup Liabilities	Metals	Not Applicable	1. Located within the Golf Course, development restricted to open space.	None	1. Soil and groundwater with elevated metals concentrations could be encountered during subsurface work.	1. Sample soil to determine appropriate soil management options (on-Site reuse or off-Site disposal). 2. Manage dewatering water in accordance with EIMP.
Golf Course	Building 561	--	None known	Not Applicable	1. Located within the Golf Course, development restricted to open space.	None	1. Storage of CANG ammunition and restricted access.	1. If stained or odorous soil is encountered during subsurface work implement procedures in EIMP.

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Area (a)	ID (b)	NASA EEC Reference	COCs (c)	Regulatory Status	LUCs (d)(e)	OM&M (e)	Potential Environmental Concerns	EIMP Approach (e)
Golf Course	Building 934 (Golf Course Club House)	--	PCBs	Not Applicable	1. Located within the IR Site 26 area and is subject to the LUCs for this area. 2. Located within the Golf Course, development restricted to open space.	None	1. Potential impacts in soil from potential historical leaking PCB-containing transformers	1. In areas that currently or historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 2.If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
Golf Course	Gate 14A Storm Water Lift Station	--	Petroleum hydrocarbons	Not Applicable	None	None	1. Active AST with fuel storage. 2. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. Inspect the area for potential historic spills or leaks. 2. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
Golf Course	Gate 14B Storm Water Lift Station	--	Petroleum hydrocarbons	Not Applicable	None	None	1. Active AST with fuel storage. 2. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. Inspect the area for potential historic spills or leaks. 2. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 3. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
Golf Course	Golf Course Landfill 1 (IR Site 2; OU1)	OU1 EEC	Petroleum hydrocarbons BTEX compounds Chlorinated organics VOCs SVOCs PCBs	NFA	1. Located within the Golf Course, development restricted to open space.	None	1. Unknown contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in EIMP.
Golf Course	Golf Course Landfill 2 (IR Site 22)	Site 22 EEC	Petroleum hydrocarbons Chlorinated organics VOCs SVOCs PAHs Pesticides PCBs	Active	Record of Decision 1. Maintain the integrity of the landfill cap and prevent the disturbance or excavation of waste materials 2. No residential land use 3. No groundwater extraction for potable or non-potable purposes 4. No modifications or alterations of surface contours and/or drainage patterns 5. Notify the Water Board of proposed changes in future land or groundwater use 6. Annual reporting to the EPA Memorandum of Agreement ("MOA") between the Navy and NASA 1. Access restrictions to be included in NASA's land use planning documents and will be designed to maintain the integrity of the biotic barrier and to limit surface excavation that could disturb the refuse. Specific restrictions and responsibilities are included in the MOA. NASA Ames Development Plan 1. Land use is restricted to open space.	1. Quarterly inspections and landfill gas and groundwater monitoring 2. Maintain the landfill drainage system. 3. Monitor and control vegetation within the landfill area.	1. Unknown contamination in soil could be encountered during subsurface work in nearby areas. 2. Ongoing landfill gas and groundwater monitoring	1. If stained or odorous soil is encountered during subsurface work in nearby areas implement procedures in EIMP. 2. Obtain approval from the applicable regulatory agencies if any planned activities may disturb the implemented remedy.

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Golf Course	Golf Course Landfill 3 (IR Site 23)	Site 23 EEC; No Further Action Sites	Petroleum hydrocarbons SVOCs PAHs Pesticides	NFA	1. Residential land use is not permitted. 2. Land use restricted to open space. 3. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Unknown contamination in soil could be encountered during subsurface work in nearby areas.	1. If stained or odorous soil is encountered during subsurface work in nearby areas implement procedures in EIMP.
Golf Course	Golf Course Maintenance Area	Tanks Other USTs/ASTs	Petroleum hydrocarbons BTEX compounds	Not Applicable	1. Located within the Golf Course, development restricted to open space.	None	1. Active AST with fuel storage and waste oil storage area. Active equipment maintenance area with staining. 2. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. Inspect the area for potential historic spills or leaks. 2. If stained or odorous soil is encountered during subsurface work implement procedures in EIMP.
Golf Course	IR Site 27 (OU6)	Site 27 EEC	PCBs Pesticides Metals	NFA	1. Jurisdictional wetland 2. Land use is restricted to open space.	None	1. Unknown contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in EIMP. 2. Obtain approval from the applicable regulatory agencies if any planned activities may disturb the implemented remedy.
Golf Course	Marriage Road Ditch (IR Site 3, OU6)	OU2 EEC; Site 27 EEC	Petroleum hydrocarbons Chlorinated organics VOCs SVOCs PAHs	NFA	1. Jurisdictional wetland 2. Land use is restricted to open space. 3. No extraction of groundwater.	None	1. Unknown contamination in soil could be encountered during subsurface work. 2. A portion of this area is located within IR Site 26 and is subject to the IR Site 26 ROD Amendment which specifies institutional controls for the area and requires the consideration of vapor intrusion.	1. If stained or odorous soil is encountered during subsurface work implement procedures in EIMP.
Golf Course	Munitions Maintenance Transformer	--	PCBs	Not Applicable	None	None	1. Potential impacts in soil from potential historical leaking PCB-containing transformers.	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work implement procedures in EIMP.
Golf Course	Northern Weapons Storage Bunkers (OU00)	No Further Action Sites	Petroleum hydrocarbons	NFA	1. Located within the IR Site 26 area and is subject to the LUCs for this area. 2. Located within the Golf Course, development restricted to open space.	None	1. Storage of CANG ammunition and restricted access. 2. Petroleum hydrocarbon and unknown contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in EIMP.
Golf Course	Patrol Road Ditch (IR Site 21, OU6 and IR Site 27)	Site 27 EEC	Petroleum hydrocarbons Chlorinated organics	NFA	1. Located within the Golf Course, development restricted to open space.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work. 2. Piping that was abandoned in place could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in EIMP. 2. Obtain approval from the applicable regulatory agencies if any planned activities may disturb the implemented remedy.
Golf Course	Southern Weapons Storage Bunkers (OU00)	No Further Action Sites	None	NFA	1. Located within the IR Site 26 area and is subject to the LUCs for this area. 2. Located within the Golf Course, development restricted to open space.	None	1. Unknown contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. Manage dewatering water in accordance with EIMP.
Golf Course	Tank 102 (Northern Weapons Storage Bunker, OU2-East)	Tanks Other USTs/ASTs	Petroleum hydrocarbons	NFA	1. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in EIMP.

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Golf Course	Tank 22 (Northern Weapons Storage Bunker, OU2-East)	Tanks Other USTs/ASTs	Petroleum hydrocarbons	Closure	1. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in EIMP.
Golf Course	Tank 53 (OU2-East, IR Site 19)	Site 19 EEC	Petroleum hydrocarbons BTEX compounds	NFA	1. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in EIMP.
Golf Course	Upland Soils (OU00)	No Further Action Sites	Petroleum hydrocarbons PAHs PCBs Pesticides Metals	NFA	None	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in EIMP.
Hangar 2/3	Building 498 and Building 499	--	Petroleum hydrocarbons	NFA	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Because of history of solvent storage, impacted soil could be encountered during subsurface work. 2. Staining observed in paved areas at Building 499. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. If assessment of potential VI mitigation is needed, sample sub-slab soil gas.
Hangar 2/3	Building 55	--	Petroleum hydrocarbons PCBs	NFA	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work. 2. Potential impacts in soil from potential historical leaking PCB-containing transformers	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. If assessment of potential VI mitigation is needed, sample sub-slab soil gas.
Hangar 2/3	Building 55 Sump Area (IR Site 7)	OU2 EEC	Petroleum hydrocarbons	NFA	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Petroleum hydrocarbon impacted soil could be encountered during subsurface work. 2. Piping that was abandoned in place could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. Manage dewatering water in accordance with EIMP.
Hangar 2/3	Building 780 (IR Site 7)	OU2 EEC	Petroleum hydrocarbons	Not Applicable	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Active AST with fuel storage and no secondary containment. 2. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. If assessment of potential VI mitigation is needed, sample sub-slab soil gas.

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Hangar 2/3	EATS Area (OU5, IR-Site 26)	Site 26 EEC	Petroleum hydrocarbons BTEX compounds Chlorinated organics	Active; A ROD Amendment has been issued for this area requiring in situ biostimulation/ bioaugmentation as an alternative to groundwater extraction and treatment.	1. No domestic use of groundwater; no extraction of groundwater. 2. The treatment system area must be fenced and NASA is responsible for maintaining Building 191 and the surrounding stormwater drainage system. 3. Residential land use is not permitted. 4. Potential development subject to NASA Ames Development Plan, the Environmental Impact Statement, and Ames Procedural Requirements 8500.1. 5. The potential for vapor intrusion in new buildings requires assessment with oversight by the regulatory agencies. 6. The IR Site 26 ROD Amendment requires assessment of the potential for vapor intrusion within new and existing buildings with oversight by the regulatory agencies.	1. Semi-annual, annual, and/or biennial groundwater monitoring depending on the well. 2. Any potential requirements associated with the in situ biostimulation/bioaugmentation remedy.	1. Because of known solvent impacts, soil with COCs could be encountered during subsurface work. 2. Potential for vapor intrusion if development sited nearby. 3. Because of known solvent impacts to groundwater, dewatering water will have to be managed appropriately. 4. The IR Site 26 ROD Amendment specifies institutional controls for the area and requires the consideration of vapor intrusion.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. If assessment of potential VI mitigation is needed, sample sub-slab soil gas. 3. Obtain approval from the applicable regulatory agencies if any planned activities may disturb the implemented remedy. 4. Allow access to the Navy, NASA, regulatory agencies, and other entities responsible for the remediation and monitoring of contamination pursuant the IR Site 26 ROD Amendment. 5. Manage dewatering water in accordance with EIMP.
Hangar 2/3	Hangar 2 (OU2-East; IR Site 7)	OU2 EEC	Chlorinated organics Petroleum hydrocarbons	NFA	1. Restricted development due to Federal Aviation Administration restrictions. 2. No extraction of groundwater. 3. The potential for vapor intrusion in new buildings requires assessment with oversight by the regulatory agencies.	None	1. Unknown contamination in soil could be encountered during subsurface work. 2. Vapor intrusion from VOCs beneath building.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. Future development must consider potential vapor intrusion issues. 3. Manage dewatering water in accordance with EIMP.
Hangar 2/3	Hangar 2 Vault	Tanks Other USTs/ASTs	Petroleum hydrocarbons BTEX compounds Chlorinated organics	NFA	None	None	1. Unknown contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
Hangar 2/3	Hangar 3 (OU2-East; IR Site 7)	OU2 EEC	Petroleum hydrocarbons Chlorinated organics	NFA	1. LUCs for EATS includes a portion of the Hangar 3 footprint. 2. No extraction of groundwater. 3. The potential for vapor intrusion in new buildings requires assessment with oversight by the regulatory agencies. 4. Restricted development due to Federal Aviation Administration restrictions.	None	1. In areas with known solvent use, impacted soil could be encountered during subsurface work. 2. Unknown contamination in soil could be encountered during subsurface work. 3. Vapor intrusion from VOCs beneath building. 4. Potential impacts in soil from potential historical leaking PCB-containing transformers. 5. Part of this area is located within IR Site 26 and is subject to the IR Site 26 ROD Amendment which specifies institutional controls for the area and requires the consideration of vapor intrusion.	1. An environmental professional should perform soil screening during subsurface work in accordance with the EIMP in the northeastern area of Hangar 3 as shown on Figure 6. 2. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 3. Future development must consider potential vapor intrusion issues. 4. Allow access to the Navy, NASA, regulatory agencies, and other entities responsible for the remediation and monitoring of contamination pursuant the IR Site 26 ROD Amendment. 5. Obtain approval from the applicable regulatory agencies if any planned activities may disturb the implemented remedy.

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Hangar 2/3	Tank 100 (IR Site 7)	Tanks Other USTs/ASTs	Petroleum hydrocarbons	NFA	None	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. If assessment of potential VI mitigation is needed, sample sub-slab soil gas.
Hangar 2/3	Tank 114 (IR Site 7)	Tanks Other USTs/ASTs	Petroleum hydrocarbons	Closure	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. If assessment of potential VI mitigation is needed, sample sub-slab soil gas.
Hangar 2/3	Tank 131 (IR Site 7)	Tanks Other USTs/ASTs	Petroleum hydrocarbons BTEX compounds	Closure	None	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. If assessment of potential VI mitigation is needed, sample sub-slab soil gas.
Hangar 2/3	Tank 2 (IR Site 19)	Site 19 EEC	Petroleum hydrocarbons BTEX compounds Chlorinated organics	NFA	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Because of known solvent impacts, soil with COCs could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. If assessment of potential VI mitigation is needed, sample sub-slab soil gas. 3. Manage dewatering water in accordance with EIMP.
Hangar 2/3	Tank 3 (IR Site 7)	Tanks Other USTs/ASTs	Petroleum hydrocarbons	Closure	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. If assessment of potential VI mitigation is needed, sample sub-slab soil gas.
Hangar 2/3	Tank 43 (IR Site 19)	Site 19 EEC	Petroleum hydrocarbons BTEX compounds Chlorinated organics	Open	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Because of known solvent impacts, soil with COCs could be encountered during subsurface work.	1. An environmental professional should perform soil screening during subsurface work in accordance with the EIMP nearTank 43. 2. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 3. If assessment of potential VI mitigation is needed, sample sub-slab soil gas. 4. Manage dewatering water in accordance with EIMP.
Hangar 2/3	Tank 54 (IR Site 15)	Site 15 EEC	Chlorinated organics	NFA	1. Located within the IR Site 26 area and is subject to the LUCs for this area.	None	1. Because of known solvent impacts, soil with COCs could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. If assessment of potential VI mitigation is needed, sample sub-slab soil gas. 3. Manage dewatering water in accordance with EIMP.
Hangar 2/3	Tank 69	Tanks Other USTs/ASTs	BTEX compounds	Closure	None	None	1. Unknown contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. If assessment of potential VI mitigation is needed, sample sub-slab soil gas.
Hangar 2/3	Tank 88	Tanks Other USTs/ASTs	Petroleum hydrocarbons BTEX compounds VOCs	Closure	None	None	1. Unknown contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. If assessment of potential VI mitigation is needed, sample sub-slab soil gas.
Runway Landfill	Eastern Diked Marsh and Stormwater Retention Basin (OU6, IR Site 25)	Site 25 EEC	Metals Petroleum hydrocarbons Pesticides PCBs	Active	1. Jurisdictional wetland. 2. Restricted development due to Federal Aviation Administration restrictions.	1. Maintenance and monitoring of habitat restoration.	1. Unknown contamination in soil could be encountered during subsurface work in nearby areas.	1. If stained or odorous soil is encountered during subsurface work in nearby areas implement procedures in EIMP. 2. Obtain approval from the applicable regulatory agencies if any planned activities may disturb the implemented remedy.

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Runway Landfill	Runway Landfill (OU1, IR Site 1)	OU1 EEC	Petroleum hydrocarbons BTEX compounds VOCs SVOCs Pesticides PCBs	Active	1. Maintain the integrity of the landfill cap and prevent the disturbance or excavation of waste materials. 2. Maintain fencing and signage around the landfill. 3. No residential land use 4. No groundwater extraction for potable or non-potable purposes 5. Notify the Water Board of proposed changes in future land or groundwater use 6. Annual reporting to the EPA	1. Quarterly inspections and semiannual landfill gas and groundwater monitoring 2. Maintain fencing and signage around the landfill. 3. Maintain the landfill drainage system. 4. Monitor and control vegetation within the landfill area.	1. Unknown contamination in soil could be encountered during subsurface work in nearby areas. 2. Ongoing landfill gas and groundwater monitoring	1. If stained or odorous soil is encountered during subsurface work in nearby areas, implement procedures in the EIMP. 2. Obtain approval from the applicable regulatory agencies if any planned activities may disturb the implemented remedy.
Runway Landfill	TACAN Facility	--	PCBs	Not Applicable	1. Jurisdictional wetland. 2. Restricted development due to Federal Aviation Administration restrictions.	None	1. Potential impacts in soil from potential historical leaking PCB-containing transformers.	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
Sunnyvale Golf Course	Sunnyvale Golf Course	--	None known	Not Applicable	None	None	1. Airfield Runway Protection Zone	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
West Airfield	Airfield Flight Operations (Building158)	--	Petroleum hydrocarbons PCBs	Not Applicable	1. Restricted development due to Federal Aviation Administration restrictions.	None	1. Active AST with fuel storage. 2. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work. 3. Potential impacts in soil from potential historical leaking PCB-containing transformers	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
West Airfield	Airfield Lighting Vault (Building 105)	--	Petroleum hydrocarbons BTEX compounds PCBs	Not Applicable	None	None	1. Active AST with fuel storage. 2. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work. 3. Potential impacts in soil from potential historical leaking PCB-containing transformers.	1. Inspect the area for potential historic spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.
West Airfield	Hangar 1 (IR Site 29)	Site 29 EEC	PCBs Metals	Open	1. Long-term risk management activities are described in a Long-Term Management Plan for Hangar 1 (IR Site 29), unless an alternate remedy is implemented under the oversight of U.S. EPA and Water Board. 2. Located withn IR Site 28 and MEW VI Study areas and is subject to the LUCs for these areas.	1. Inspection and maintenance of the epoxy coating 2. Storm water sediment sampling 3. After Hangar 1 is restored and redeveloped, VI monitoring and maintenance of installed VI mitigation measures by the Navy.	1. Vapor intrusion from groundwater (see MEW VI Study Area) or the WATS (IR Site 28) 2. Vapor intrusion via the utility tunnel.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. Until on-going obligations are defined in the Hangar 1 ROD, the developer will: 2. Obtain approval from the lead regulatory agency if any planned activities may disturb the remedy. 3. Conduct the proposed activities in a manner that is protective of the remedy and on-site construction workers. 4. Allow access for maintenance and monitoring activities as may be required to maintain and evaluate the protectiveness of the implemented remedy. 5. Manage dewatering water in accordance with EIMP.

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West Airfield	Hangar 1 Fuel Pits (IR Site 24)	Site 24 EEC	Petroleum hydrocarbons	NFA	1. Located withn IR Site 28 area and is subject to the LUCs for this area.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work. 2. Piping that may have been abandoned in place could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. Manage dewatering water in accordance with EIMP.
West Airfield	Hangar 1 Sump (IR Site 29)	Site 28 EEC	Chlorinated organics VOCs	Active	1. Located withn IR Site 28 area and is subject to the LUCs for this area.	None	1. Vapor intrusion (see MEW VI Study Area) or the WATS (IR Site 28)	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. Manage dewatering water in accordance with EIMP.
West Airfield	Hangar 1 Subsurface (f)	Potential Additional Cleanup Liabilities	Chlorinated organics	Not Applicable	1. Located withn IR Site 28 area and is subject to the LUCs for this area.	None	1. Soil with COCs could be encountered during subsurface work. 2. Vapor intrusion if VOCs are present beneath building. 3. Because of known solvent impacts to groundwater, dewatering water will have to be managed appropriately.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 3. If development is proposed over the known groundwater plume, sample soil gas and assess if VI mitigation is needed. 4. Manage dewatering water in accordance with EIMP.
West Airfield	Former Hazardous Waste Storage Area (f)	Potential Additional Cleanup Liabilities	Petroleum hydrocarbons VOCs Metals	Not Applicable	1. Located withn IR Site 28 area and is subject to the LUCs for this area.	None	1. Unknown contamination in soil could be encountered during subsurface work in nearby areas.	1. If stained or odorous soil is encountered during subsurface work in nearby areas, implement procedures in the EIMP. 2. Manage dewatering water in accordance with EIMP.
West Airfield	MEW Regional Groundwater Remediation Program ("MEW Plume")	--	Chlorinated organics	Active	1. Potential development subject to the MEW ROD Amendment for the Vapor Intrusion Pathway. 2. Potential development subject to NASA Ames Development Plan, the Environmental Impact Statement, and Ames Procedural Requirements 8500.1.	1. Semi-annual, annual, and/or biennial groundwater monitoring depending on the well. 2. Operations and maintenance of installed VI mitigation measures and quarterly indoor air monitoring within the MEW VI allocation area.	1. Because of known solvent impacts, soil with COCs could be encountered during subsurface work. 2. Vapor intrusion if VOCs are present beneath building. 3. Because of known solvent impacts to groundwater, dewatering water will have to be managed appropriately.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 3. If development is proposed over the known groundwater plume, sample soil gas and assess if VI mitigation is needed. 4. Manage dewatering water in accordance with EIMP.
West Airfield	NEX Service Station (IR Site 28)	--	Petroleum hydrocarbons BTEX compounds Chlorinated organics	NFA	1. No residential land use 2. No potable use of groundwater 3. Notify Water Board of proposed changes in future land or groundwater use.	None (outside of those required for IR Site 28)	1. Vapor intrusion (see MEW VI Study Area) or the WATS (IR Site 28)	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. Manage dewatering water in accordance with EIMP.
West Airfield	North Floodlight Tower (Building 32)	--	PCBs	Not Applicable	None	None	1. Potential impacts in soil from potential historical leaking PCB-containing transformers	1. Inspect the area for potential historical spills or leaks. 2. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 3. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
West Airfield	Sump 25 and 25A (IR Site 15)	Site 28 EEC (referred to as O/W 25 and 25A)	Petroleum hydrocarbons	NFA	1. Located within IR Site 28 area and is subject to the LUCs for this area. 2. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work. 2. Piping that was abandoned in place could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 2. Manage dewatering water in accordance with EIMP.
West Airfield	Tank 118	Tanks Other USTs/ASTs	Petroleum hydrocarbons BTEX compounds	NFA	1. No residential land use 2. Groundwater may not be used as a drinking water source 3. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.

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West Airfield	Tank 94 and Tank 95	Tanks Other USTs/ASTs	Petroleum hydrocarbons BTEX compounds	NFA	1. No residential land use 2. Groundwater may not be used as a drinking water source 3. Notify Water Board of proposed changes in future land or groundwater use.	None	1. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work.	1. If stained or odorous soil is encountered during subsurface work, follow procedures in EIMP.
West Airfield	Traffic Island Area (IR Site 28)	Site 28 EEC	Chlorinated organics	Open	1. Potential development subject to the MEW ROD Amendment for the Vapor Intrusion Pathway. 2. Potential development subject to NASA Ames Development Plan, the Environmental Impact Statement, and Ames Procedural Requirements 8500.1.	1. Semi-annual, annual, and/or biennial groundwater monitoring depending on the well.	1. Because of known solvent impacts, soil with COCs could be encountered during subsurface work. 2. Vapor intrusion if VOCs are present beneath building. 3. Because of known solvent impacts to groundwater, dewatering water will have to be managed appropriately.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 3. If development is proposed over the known groundwater plume, sample soil gas and assess if VI mitigation is needed. 4. Manage dewatering water in accordance with EIMP. 5. Allow access to the Navy, NASA, regulatory agencies, and other entities responsible for the remediation and monitoring of contamination in this area.
West Airfield	UHF/VHF Transmission Building (Building 454)	Tanks Other USTs/ASTs	Petroleum hydrocarbons PCBs	Not Applicable	None	None	1. Active AST with fuel storage. 2. Petroleum hydrocarbon contamination in soil could be encountered during subsurface work. 3. Piping that may have been abandoned in place could be encountered during subsurface work. 4. Potential impacts in soil from potential historical leaking PCB-containing transformers	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. Inspect the area for potential historic spills or leaks. 3. In areas that may have historically contained transformers, an environmental professional should screen the soil for visible impacts during subsurface work and excavated soils should be analyzed for PCBs before disposal. 4. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP.
West Airfield	WATS Area (IR Site 28)	Site 28 EEC	Petroleum hydrocarbons BTEX compounds Chlorinated organics	Active	1. Potential development subject to the MEW ROD Amendment for the Vapor Intrusion Pathway. 2. Potential development subject to NASA Ames Development Plan, the Environmental Impact Statement, and Ames Procedural Requirements 8500.1.	1. Semi-annual, annual, and/or biennial groundwater monitoring depending on the well. 2. Operations and maintenance of the WATS. 3. Sampling of the WATS effluent in accordance with the NPDES permit. 4. Operations and maintenance of installed VI mitigation measures and quarterly indoor air monitoring within the Navy allocation area.	1. Because of known solvent impacts, soil with COCs could be encountered during subsurface work. 2. Vapor intrusion if VOCs are present beneath building. 3. Because of known solvent impacts to groundwater, dewatering water will have to be managed appropriately.	1. An environmental professional should perform soil screening during subsurface work in accordance with EIMP. 2. If stained or odorous soil is encountered during subsurface work implement procedures in the EIMP. 3. If development is proposed over the known groundwater plume, sample soil gas and assess if VI mitigation is needed. 4. Manage dewatering water in accordance with EIMP. 5. Obtain approval from the lead regulatory agency if any planned activities may disturb the remedy.

Table 1
Summary of Environmental Conditions
MFA Leasehold
Former NAS Moffett Field, California

Notes:
(a) Area refers to the approximate location on the MFA Leasehold based. Figure 6 presents a key of the identified Areas.
(b) See Appendices for additional information regarding each of the sites identified in this table.
(c) Where analytical data were available, COCs are listed. In the absence of analytical data, potential COCs were identified based on site use history.
(d) This Table 1 summarizes site-specific LUCs which are in addition to the LUCs imposed by the *NASA Ames Development Plan, Final Programmatic Environmental Impact Statement, NASA Ames Research Center* by Design, Community, and Environment, July 2002.
(e) NASA, Master Lessee, Project Developers, contractors, tenants, and other entities engaged in activities that disturb subsurface soil or impacted groundwater within the MFA Leasehold should not rely on the information in this column. Prior to engaging in any such work within the MFA Leasehold, such entities should review the EIMP as well as NASA EECs, site-specific regulatory documents, and other available information, to identify LUCs that must be complied with, OMM activities, and other procedures and requirements (e.g., Health and Safety) that should be implemented during the proposed activities.
(f) Additional information on these locations is presented in NASA's Potential Additional Cleanup Liabilities EEC, included in Appendix A.

Abbreviations:

A "--" indicates that the indicated area is not included in NASA's EECs

AST = aboveground storage tank
BTEX - benzene, toluene, ethylbenzene, and xylenes
COC = chemical of concern
COC = contractor owned contractor operated
EATS = East-side Aquifer Treatment System
EIMP = Environmental Issues Management Plan
IR = Installation Restoration
LUC = land use restrictions and institutional controls
MEW = Middlefield-Ellis-Whisman
MOA = Memorandum of Agreement
NASA = National Aeronautics and Space Administration
NFA = no further action
NPDES = National Pollutant Discharge Elimination System
OM&M = operation, maintenance, and monitoring
OU = operable unit
PAHs = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
ROD = Record of Decision
Water Board = Regional Water Quality Control Board, San Francisco Bay Region
SVOCs = semi-volatile organic compounds
UST = underground storage tank
VI = vapor intrusion
VOCs = volatile organic compounds (includes BTEX compounds, chlorinated organics, and other solvents such as acetone)
WATS = West-side Aquifers Treatment System

Table 2
Soil Target Concentration Levels
MFA Leasehold
Former NAS Moffett Field, California

Chemical of Potential Concern	Concentration in Soil (mg/kg)			
	U.S. EPA RSL (a)	Water Board ESL (b)(c)	Maximum Background Metal Concentration (d)	Target Concentration Level ("TCL") (c)(e)
Chlorinated Volatile Organic Compounds ("VOCs")				
Chloroform	1.4	2.4	-	1.4
1,2-Dichlorobenzene	9,300	1.1	-	1.1
1,1-Dichloroethane	16	0.2	-	0.2
1,2-Dichloroethane	2	0.0045	-	0.0045
1,1-Dichloroethene	1,000	1	-	1
cis-1,2-Dichloroethene	2,300	0.19	-	0.19
trans-1,2-Dichloroethene	23,000	0.67	-	0.67
Tetrachloroethene	100	0.7	-	0.7
1,1,1-Trichloroethane	36,000	7.8	-	7.8
Trichloroethene	6	0.46	-	0.46
Vinyl chloride	1.7	0.085	-	0.085
Petroleum Hydrocarbons and BTEX Compounds				
TPH as gasoline	-	500	-	500
TPH as diesel	-	110	-	110
TPH as motor oil	-	500	-	500
Benzene	5.1	0.044	-	0.044
Toluene	47,000	2.9	-	2.9
Ethylbenzene	25	3.3	-	3.3
Xylenes	2,500	2.3	-	2.3
Methyl tert-butyl ether	210	0.023	-	0.023
Polynuclear Aromatic Hydrocarbons ("PAHs")				
Acenaphthene	45,000	16	-	16
Acenaphthylene	-	13	-	13
Anthracene	230,000	2.8	-	2.8
Benzo[a]anthracene	2.9	1.3	-	1.3
Benzo[a]pyrene	0.29	0.13	-	0.13
Benzo[b]fluoranthene	2.9	1.3	-	1.3
Benzo[k]fluoranthene	29	1.3	-	1.3
Chrysene	290	13	-	13
Fluoranthene	30,000	60 (40)	-	60 (40)
Fluorene	30,000	8.9	-	8.9
Naphthalene	17	1.2	-	1.2
Pyrene	23,000	85	-	85
PCBs				
Polychlorinated Biphenyls	1	0.74	-	1 (f)

Table 2
Soil Target Concentration Levels
MFA Leasehold
Former NAS Moffett Field, California

Chemical of Potential Concern	Concentration in Soil (mg/kg)			
	U.S. EPA RSL (a)	Water Board ESL (b)(c)	Maximum Background Metal Concentration (d)	Target Concentration Level ("TCL") (c)(e)
Metals				
Antimony	470	410 (40)	-	410 (40)
Arsenic	3	1.6	20	20
Barium	220,000	190,000 (1,500)	-	190,000 (1,500)
Beryllium	230	230 (8)	3.2	230 (8)
Cadmium	980	980 (12)	14	980 (14)
Chromium	6.3	110 (8)	170	170
Cobalt	350	300 (80)	-	300 (80)
Copper	47,000	41,000 (230)	67	41,000 (230)
Lead	820	320	54	320
Mercury	40	88 (10)	1.3	40 (10)
Molybdenum	5,800	5,100 (40)	-	5,100 (40)
Nickel	22,000	19,000 (150)	145	19,000 (150)
Selenium	5,800	5,100 (10)	4	5,100 (10)
Silver	5,800	5,100 (40)	4.8	5,100 (40)
Thallium	7	10	3.8	7
Vanadium	5,800	5,100 (200)	-	5,100 (200)
Zinc	350,000	310,000 (600)	120	310,000 (600)

Notes
(a) RSLs from U.S. EPA (2014), *Regional Screening Level (RSL) Industrial Soil Table (TR=1E-6, HQ=1) May 2014.*
(b) ESLs from Water Board (2013), Table A-2, Shallow Soil Screening Levels (< 3m bgs) Commercial/Industrial Land Use *(groundwater is a current or potential drinking water resource).*
(c) Urban Area Ecotoxicity ESLs are presented in parentheses where these values were lower than the Human Health ESLs and Ceiling Values. Urban Area Ecotoxicity ESLs are only applicable in the areas indicated on Figure 8.
(d) Maximum background metal concentrations from Scott (1995).
(e) With the exceptions of the TCL for PCBs, the selected TCL is the lower of the U.S. EPA RSL and the Water Board ESL; For metals, if the lowest of the U.S. EPA RSL and the Water Board ESL is lower than background levels, the background level was selected as the TCL.
(f) Value is from the Toxic Substances Control Act ("TSCA") (USC Title 15, Section 2601 et. seq. and 40 CFR 761.1 et. seq.)

Abbreviations
BTEX = benzene, toluene, ethylbenzene, xylene
Eco = ecological
ESL = environmental screening level
m bgs = meters below ground surface
MTBE = methyl tert-butyl ether
mg/kg = milligrams per kilogram of soil
NAS = naval air station
PCBs = polychlorinated biphenyls
RSL = regional screening level
TPH = total petroleum hydrocarbons
U.S. EPA = U.S. Environmental Protection Agency
VOC = volatile organic compound
Water Board = Regional Water Quality Control Board, San Francisco Bay Region

References
Scott, C.M. 1995. *Background Metal Concentrations in Soils in Northern Santa Clara County, California* in: Recent Geological Studies in the San Francisco Bay Area, Pacific Section of the Society of Economic Paleontologists and Mineralogists, Volume 76.
U.S. EPA, 2014. *Regional Screening Level (RSL) Industrial Soil Table (TR=1E-6, HQ=1) May 2014,* U. S. EPA, May 2014. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/indsoil_sl_table_run_MAY2014.pdf
Water Board, 2013. Environmental Screening Levels, Interim Final - December 2013. California Regional Water Quality Control Board, San Francisco Bay Region, December 2013.

Table 3
Groundwater Target Concentration Levels
MFA Leasehold
Former NAS Moffett Field, California

Chemical of Potential Concern	Concentration in Groundwater (ug/L)			
	CA MCL (a)	Water Board GW to IA ESL (b)	Water Board GW ESL (c)	Target Concentration Level ("TCL") (d)
Chlorinated Volatile Organic Compounds ("VOCs")				
Chloroform	-	1,700	80	80
1,2-Dichlorobenzene	600	1,600	10	10
1,1-Dichloroethane	5	-	5	5
1,2-Dichloroethane	0.5	1,000	0.5	0.5
1,1-Dichloroethene	6	130,000	6	6
cis-1,2-Dichloroethene	6	26,000	6	6
trans-1,2-Dichloroethene	10	120,000	10	10
Tetrachloroethene	5	640	5	5
1,1,1-Trichloroethane	200	-	200	200
Trichloroethene	5	1,300	5	5
Vinyl chloride	0.5	18	0.5	0.5
Petroleum Hydrocarbons and BTEX Compounds				
TPH as gasoline	-	-	100	100
TPH as diesel	-	-	100	100
TPH as motor oil	-	-	100	100
Benzene	1	270	1	1
Toluene	150	-	40	40
Ethylbenzene	300	3,100	30	30
Xylenes	1,750	-	20	20
MTBE	13	100,000	5	5
Polynuclear Aromatic Hydrocarbons ("PAHs")				
Acenaphthene	-	-	20	20
Acenaphthylene	-	-	2,000	2,000
Anthracene	-	-	22	22
Benzo[a]anthracene	-	-	0.056	0.056
Benzo[a]pyrene	0.2	-	0.2	0.2
Benzo[b]fluoranthene	-	-	0.056	0.056
Benzo[k]fluoranthene	-	-	0.056	0.056
Chrysene	-	-	0.56	0.56
Fluoranthene	-	-	130	130
Fluorene	-	-	630	630
Naphthalene	-	1,600	6.1	6.1
Pyrene	-	-	68	68
PCBs				
Polychlorinated Biphenyls	0.5	-	0.5	0.5

Table 3
Groundwater Target Concentration Levels
MFA Leasehold
Former NAS Moffett Field, California

Chemical of Potential Concern	Concentration in Groundwater (ug/L)			
	CA MCL (a)	Water Board GW to IA ESL (b)	Water Board GW ESL (c)	Target Concentration Level ("TCL") (d)
Metals				
Antimony	6	-	6	6
Arsenic	10	-	10	10
Barium	1,000	-	1,000	1,000
Beryllium	4	-	4	4
Cadmium	5	-	5	5
Chromium	50 (e)	-	0.02 (f)	0.02
Cobalt	-	-	4.7	4.7
Copper	1,300	-	1,000	1,000
Lead	15	-	15	15
Mercury	2	-	2	2
Molybdenum	-	-	78	78
Nickel	100	-	100	100
Selenium	50	-	50	50
Silver	-	-	100	100
Thallium	2	-	2	2
Vanadium	-	-	50	50
Zinc	-	-	5,000	5,000

Notes

(a) CA MCLs from Title 22 California Code of Regulations Sections 64431, 64672.3, and 64444 (CA MCL, 2014).

(b) Groundwater to indoor air ESLs from Water Board (2013), Table E-1, Groundwater Screening Levels for Evaluation of Potential Vapor Intrusion for a fine to coarse soil mixture under commercial/industrial land use.

(c) Groundwater ESLs from Water Board (2013), Table F-1a, Groundwater Screening Levels (groundwater is a current or potential drinking water *resource)*. The value presented is the lower of the Gross Contamination/Ceiling Value and the Drinking Water Goal. Because the purpose of the proposed groundwater TCLs are to determine the appropriate management option for dewatering water generated during Site development activities, the screening of dewatering water against Aquatic Habitat Goals for Estuaries was not considered appropriate.

(d) The selected TCL is the lower of the Water Board ESLs and California MCLs. In the absence of an MCL, the ESL is used.

(e) The value presented is for Total Chromium.

(f) The value presented is for Chromium VI; the value for Chromium III is 23,000 ug/L. No value for Total Chromium is available.

Abbreviations

BTEX = benzene, toluene, ethylbenzene, xylene
CA = California
ESL = environmental screening level
MCL = maximum contaminant level
MTBE = methyl tert-butyl ether
NAS = naval air station
PCBs = polychlorinated biphenyls
RSL = regional screening level
TPH = total petroleum hydrocarbons
ug/L = micrograms per liter
VOC = volatile organic compound
Water Board = Regional Water Quality Control Board, San Francisco Bay Region

References

CA MCL, 2014. *MCLs, DLRs, and PHGs for Regulated Drinking Water Contaminants, Updated 1 July 2014.* California Department of Pulbic Health. http://www.cdph.ca.gov/certlic/drinkingwater/Documents/MCLreview/MCLs-DLRs-PHGs.xls

Water Board, 2013. Environmental Screening Levels, Interim Final - December 2013. California Regional Water Quality Control Board, San Francisco Bay Region, December 2013.

Table 4
Indoor Air, Sub-Slab Vapor, and Soil Gas Target Concentration Levels
MFA Leasehold
Former NAS Moffett Field, California

Chemical of Potential Concern	Screening Level Concentration (ug/m^3)					Target Concentration Levels ("TCL"; ug/m^3)		
	Indoor Air			Sub-Slab Vapor (d)				
	U.S. EPA RSL (a)	Water Board ESL (b)	MEW 2010 VI ROD (c)	U.S. EPA RSL	Water Board ESL	Indoor Air (e)	Sub-Slab Vapor (f)	Soil Gas (g)
Chlorinated Volatile Organic Compounds ("VOCs")								
Chloroform	0.53	2.30	-	11	46	0.53	11	18
1,2-Dichlorobenzene	880	880	-	17,600	17,600	880	17,600	29,333
1,1-Dichloroethane	7.7	7.7	6.0	154	154	6.0	154	200
1,2-Dichloroethane	0.47	0.58	-	9	11.6	0.47	9	16
1,1-Dichloroethene	880	880	700	17,600	17,600	700	17,600	23,333
cis-1,2-Dichloroethene	-	31	210	-	620	31	620	1,033
trans-1,2-Dichloroethene	-	260	210	-	5,200	210	5,200	7,000
Tetrachloroethene	47	2.1	2.0	940	42	2.0	42	67
1,1,1-Trichloroethane	22,000	22,000	-	440,000	440,000	22,000	440,000	733,333
Trichloroethene	3	3	5	60	60	3 (h)	60	100
Vinyl chloride	2.8	0.16	2	56	3.2	0.16	3.2	5
Petroleum Hydrocarbons and BTEX Compounds								
TPH as gasoline	-	2,500	-	-	50,000	2,500	50,000	83,333
TPH as diesel	-	570	-	-	11,400	570	11,400	19,000
TPH as motor oil	-	-	-	-	-	-	-	-
Benzene	1.6	0.42	-	32	8.4	0.42	8.4	14
Toluene	22,000	1,300	-	440,000	26,000	1,300	26,000	43,333
Ethylbenzene	4.9	4.9	-	98	98	5	98	163
Xylenes	440	440	-	8,800	8,800	440	8,800	14,667
MTBE	47	47	-	940	940	47	940	1,567
Polynuclear Aromatic Hydrocarbons ("PAHs")								
Acenaphthene	-	-	-	-	-	-	-	-
Acenaphthylene	-	-	-	-	-	-	-	-
Anthracene	-	-	-	-	-	-	-	-
Benzo[a]anthracene	-	-	-	-	-	-	-	-
Benzo[a]pyrene	-	-	-	-	-	-	-	-
Benzo[b]fluoranthene	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	-	-	-	-	-	-	-	-
Chrysene	-	-	-	-	-	-	-	-
Fluoranthene	-	-	-	-	-	-	-	-
Fluorene	-	-	-	-	-	-	-	-
Naphthalene	0.36	0.36	-	7.2	7.2	0.36	7.2	12
Pyrene	-	-	-	-	-	-	-	-

Table 4
Indoor Air, Sub-Slab Vapor, and Soil Gas Target Concentration Levels

MFA Leasehold

Former NAS Moffett Field, California

Chemical of Potential Concern	Screening Level Concentration (ug/m^3)					Target Concentration Levels ("TCL"; ug/m^3)		
	Indoor Air			Sub-Slab Vapor (d)				
	U.S. EPA RSL (a)	Water Board ESL (b)	MEW 2010 VI ROD (c)	U.S. EPA RSL	Water Board ESL	Indoor Air (e)	Sub-Slab Vapor (f)	Soil Gas (g)
PCBs								
Polychlorinated Biphenyls	-	-	-	-	-	-	-	-
Metals								
Antimony	-	-	-	-	-	-	-	-
Arsenic	-	-	-	-	-	-	-	-
Barium	-	-	-	-	-	-	-	-
Beryllium	-	-	-	-	-	-	-	-
Cadmium	-	-	-	-	-	-	-	-
Chromium	-	-	-	-	-	-	-	-
Cobalt	-	-	-	-	-	-	-	-
Copper	-	-	-	-	-	-	-	-
Lead	-	-	-	-	-	-	-	-
Mercury	1.3	0.13	-	26	2.6	0.13	2.6	4.3
Molybdenum	-	-	-	-	-	-	-	-
Nickel	-	-	-	-	-	-	-	-
Selenium	-	-	-	-	-	-	-	-
Silver	-	-	-	-	-	-	-	-
Thallium	-	-	-	-	-	-	-	-
Vanadium	-	-	-	-	-	-	-	-
Zinc	-	-	-	-	-	-	-	-

Notes

(a) RSLs from U.S. EPA (2014a), *Regional Screening Level (RSL) Industrial Air Supporting Table (TR=1E-6, HQ=1) May 2014.*

(b) Indoor air screening levels from Water Board (2013), Table E-3, Ambient and Indoor Air Screening Levels under a commercial/industrial. land use scenario.

(c) The MEW 2010 VI ROD Amendment (U.S. EPA, 2010) indoor air cleanup levels are for commercial buildings.

(d) Sub-slab soil vapor screening levels are based on the indoor air ESL (or RSL) multiplied by an attenuation factor of 20 between indoor air and sub-slab soil vapor, based on guidance in Cal-EPA (2011). The U.S. EPA's generic attenuation factor is approximately 33 (i.e., 1/0.03) between indoor air and sub-slab soil vapor; as this value is less conservative than the Cal-EPA attenuation factor, only the Cal-EPA attenuation factor was used for sub-slab vapors in this table.

(e) The selected indoor air TCLs are the lowest of the U.S. EPA RSL, Water Board ESL, and the MEW 2010 VI ROD Amendment indoor air values.

(f) The selected sub-slab soil vapor TCLs are the lowest of the sub-slab soil vapor screening levels.

(g) Soil gas screening levels are the lowest of the Water Board (2013), Table E-2, Soil Gas Screening Levels for Evaluation of Potential Vapor Intrusion under a commercial/industrial land use scenario and the U.S. EPA's RSLs for Indoor Air divided by an attenuation factor of 0.03.

Table 4
Indoor Air, Sub-Slab Vapor, and Soil Gas Target Concentration Levels
MFA Leasehold
Former NAS Moffett Field, California

Notes (continued)

(h) On 9 July 2014, the U.S. EPA Region 9 issued interim indoor air response action levels for short-term exposures to trichloroethene. Under a commercial/ industrial exposure scenario, the Accelerated Response Action Levels (HQ = 1) are 8 ug/m^3 and 7 ug/m^3 and the Urgent Response Action Levels (HQ = 3) are 24 ug/m^3 and 21 ug/m^3 for 8-hour and 10-hour workdays, respectively (U.S. EPA, 2014b)

Abbreviations

BTEX = benzene, toluene, ethylbenzene, xylene
ESL = environmental screening level
HQ = hazard quotient
MEW = Middlefield-Ellis-Whisman
MTBE = methyl tert-butyl ether
NAS = naval air station
PCBs = polychlorinated biphenyls
ROD - record of decision
RSL = regional screening level
TPH = total petroleum hydrocarbons
ug/m^3 = micrograms per cubic meter
U.S. EPA = U.S. Environmental Protection Agency
VI = vapor intrusion
VOC = volatile organic compound
Water Board = Regional Water Quality Control Board, San Francisco Bay Region

References

Cal-EPA, 2011. *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance),* California Environmental Protection Agency, Department of Toxic Substances Control. October 2011.

U.S. EPA, 2010. *Record of Decision Amendment for the Vapor Intrusion Pathway, Middlefield-Ellis-Whisman (MEW)* Superfund Study Area, Mountain View and Moffett Field, California, 16 August 2010.

U.S. EPA, 2014a. *Regional Screening Level (RSL) Industrial Air Supporting Table (TR=1E-6, HQ=1) May 2014,* U. S. EPA, May 2014. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/indair_sl_table_run_MAY2014.pdf

U.S. EPA, 2014b. *EPA Region 9 Response Action Levels and Recommendations to Address Near-Term Inhalation Exposures to TCE in Air from Subsurface Vapor Intrusion* . Memorandum from Enrique Manzanilla to Region 9 Superfund Division Staff and Management, U.S. EPA Region 9, dated 9 July 2014.

Water Board, 2013. *Environmental Screening Levels, Interim Final - December 2013.* California Regional Water Quality Control Board, San Francisco Bay Region, December 2013.

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Notes:

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

Abbreviations:

MFA = Moffett Federal Airfield
NAS = Naval Air Station

0 10,000 20,000
(Approximate Scale in Feet)

N

Erler & Kalinowski, Inc.

MFA Leasehold Location

Former NAS Moffett Field
Mountain View, CA

March 2015
EKI B20019.11

Figure 1

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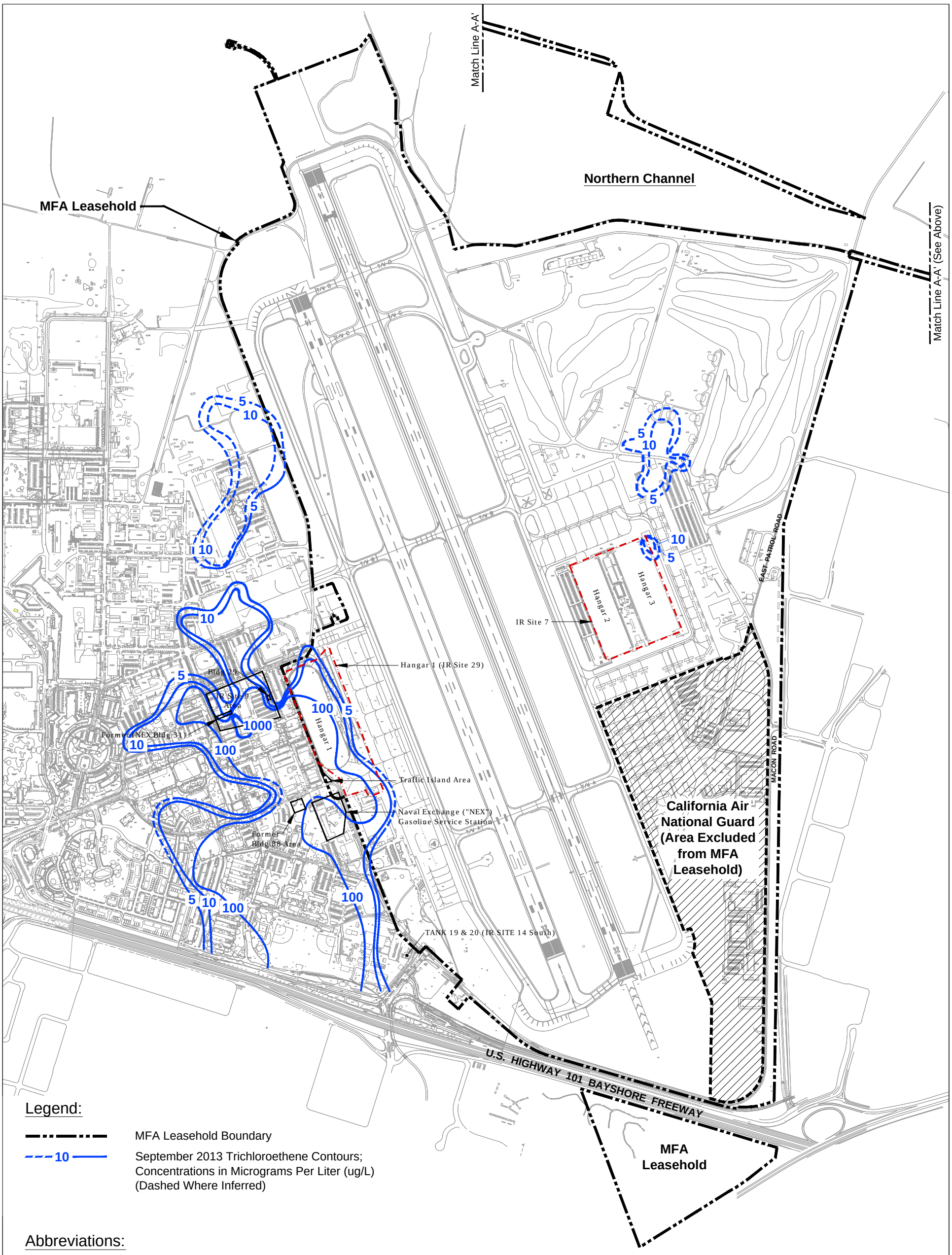

Legend:

MFA Leasehold Boundary

10 — September 2013 Trichloroethene Contours; Concentrations in Micrograms Per Liter (ug/L) (Dashed Where Inferred)

Abbreviations:

MEW = Middlefield-Ellis-Whisman
MFA = Moffett Federal Airfield
NAS = Naval Air Station
TPH = Total petroleum Hydrocarbons

Reference:

Final 2013 Annual Groundwater report for Installation Restoration Sites 26 and 28, Former Air Station Moffett Field, California, dated April 2014.

Notes:

1. All locations are approximate.

0 1000 2000
(Approximate Scale in Feet)

N

Erler & Kalinowski, Inc.

Trichloroethene Concentrations in Groundwater in the Upper Portion of the A-Aquifer, September 2013

Former NAS Moffett Field
Mountain View, CA

March 2015
EKI B20019.11

Figure 2

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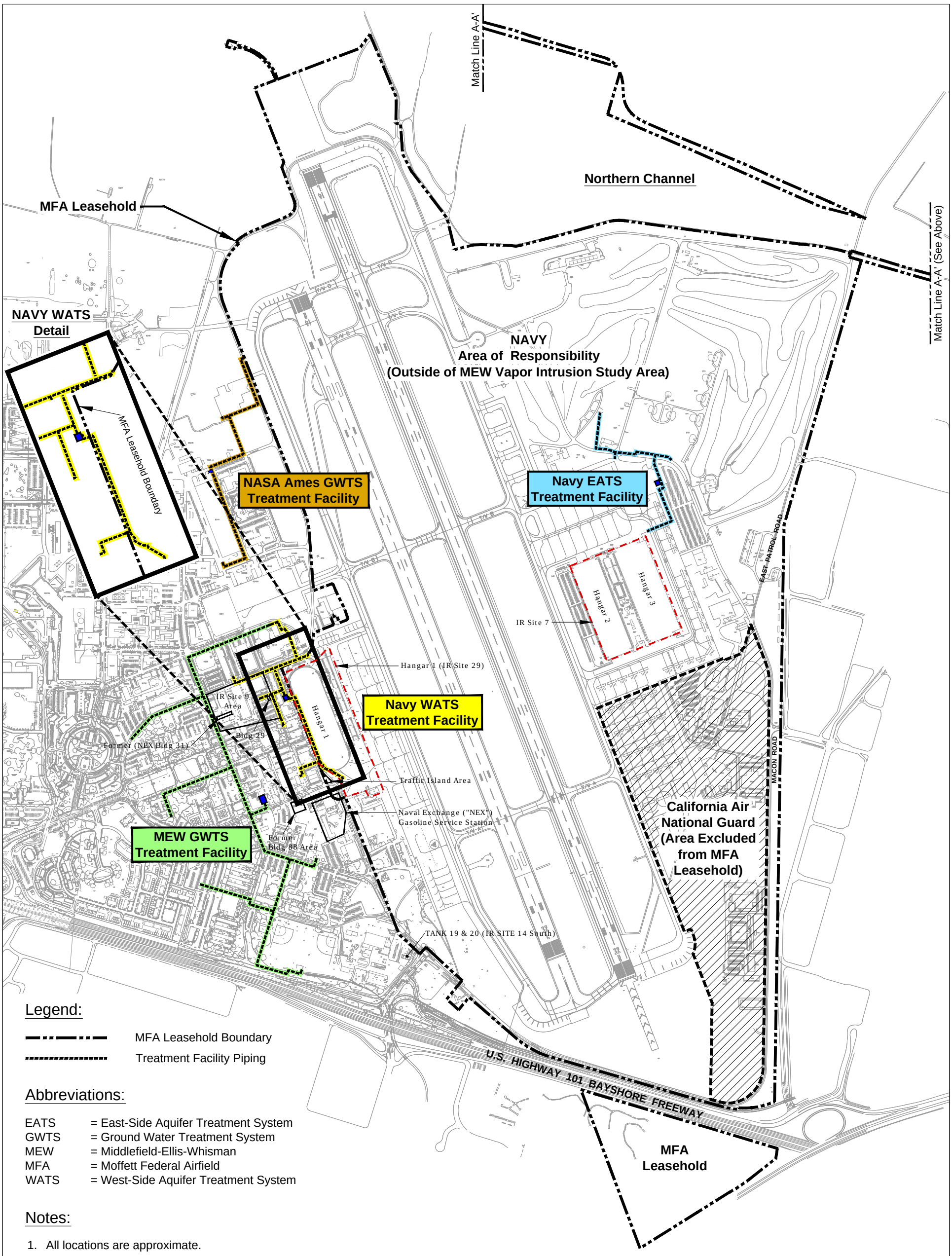

Legend:

- MFA Leasehold Boundary
- Treatment Facility Piping

Abbreviations:

EATS = East-Side Aquifer Treatment System
GWTS = Ground Water Treatment System
MEW = Middlefield-Ellis-Whisman
MFA = Moffett Federal Airfield
WATS = West-Side Aquifer Treatment System

Notes:

1. All locations are approximate.
2. The layout of the MEW GWTS piping was obtained from the 2012 Annual Progress Report - Regional Groundwater Remediation Program Middlefield-Ellis-Whisman ("MEW") Area, Mountain View, California, dated 15 April 2013.
3. The layout of the NAVY WATS piping was obtained from the Environmental Issues Management Plan, NASA Research Park, Santa Clara County, California, Final, dated 1 March 2005.
4. The layout of the NASA Ames GWTS was obtained from the 2013 Annual Progress Report NASA Ames Groundwater Treatment System, Regional Groundwater Remediation Program, NASA Ames Research Center, Middlefield, Califonia, dated 15 April 2014.
5. The layout of the NAVY EATS piping was obtained from the Final Focused Feasibility Study, Installation Restoration Site 26 Former Naval Air Station, Moffett Field, California, dated 18 July 2012.

0 1000 2000
(Approximate Scale in Feet)

N

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MEW GWTS, WATS, NASA GWTS, and EATS System Layouts

Former NAS Moffett Field
Mountain View, CA

March 2015
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Figure 3

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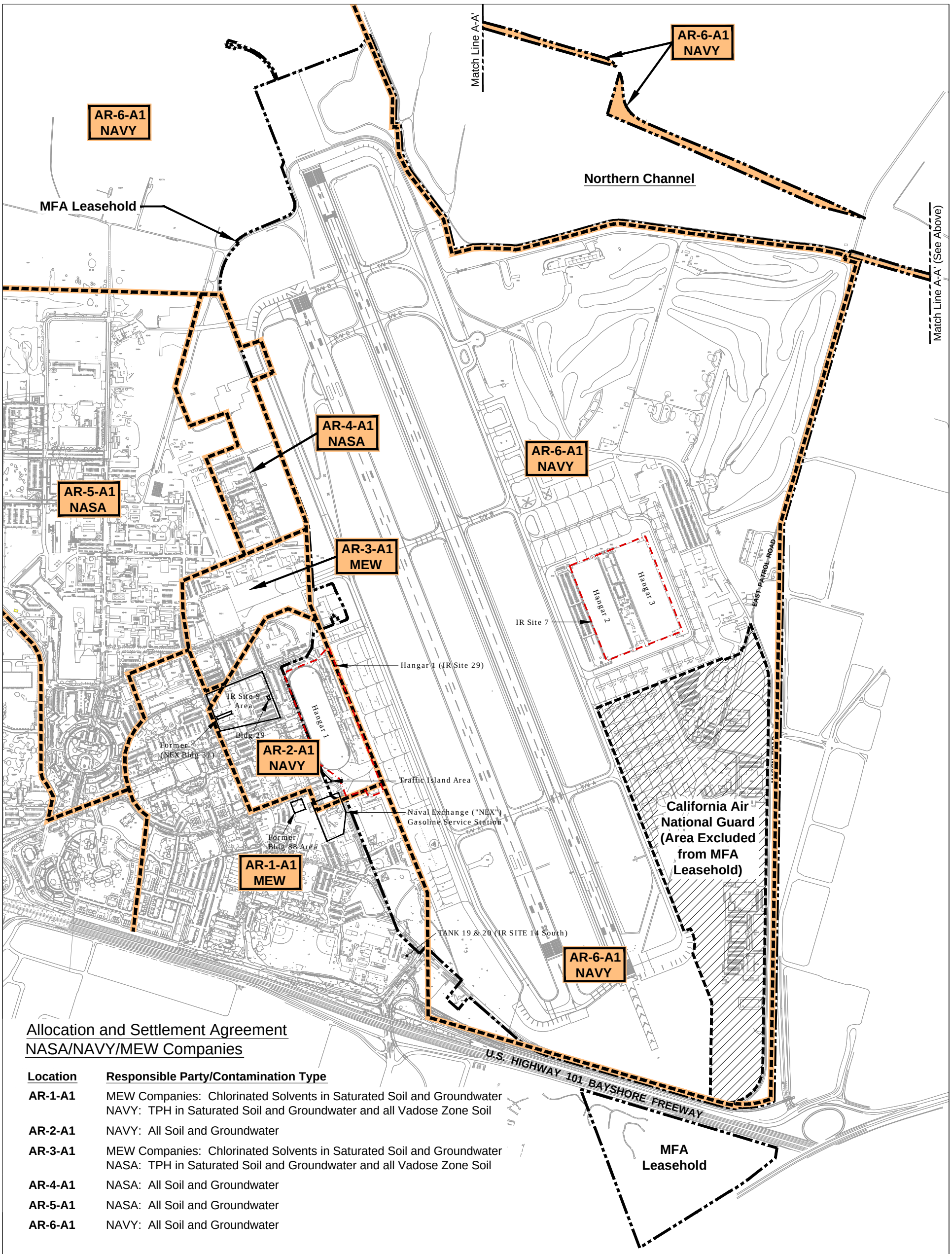

Allocation and Settlement Agreement
NASA/NAVY/MEW Companies

Location	Responsible Party/Contamination Type
AR-1-A1	MEW Companies: Chlorinated Solvents in Saturated Soil and Groundwater NAVY: TPH in Saturated Soil and Groundwater and all Vadose Zone Soil
AR-2-A1	NAVY: All Soil and Groundwater
AR-3-A1	MEW Companies: Chlorinated Solvents in Saturated Soil and Groundwater NASA: TPH in Saturated Soil and Groundwater and all Vadose Zone Soil
AR-4-A1	NASA: All Soil and Groundwater
AR-5-A1	NASA: All Soil and Groundwater
AR-6-A1	NAVY: All Soil and Groundwater

Legend:

MFA Leasehold Boundary

Area of Responsibility Boundary

Abbreviations:

MEW = Middlefield-Ellis-Whisman
NASA = National Aeronautical and Space Administration
TPH = Total petroleum Hydrocarbons

Notes:

1. All locations are approximate.
2. Areas of Responsibility from Exhibit B1 of the Allocation and Settlement for MEW Remedial Program Management Between the National Administration and Fairchild Semiconductor Corporation, Raytheon Company, and Intel Corporation, dated 16 March 1998.

0 1000 2000
(Approximate Scale in Feet)

N

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NASA, Navy, and MEW Companies
Allocation Areas, Soil and Groundwater

Former NAS Moffett Field
Mountain View, CA

March 2015
EKI B20019.11

Figure 4

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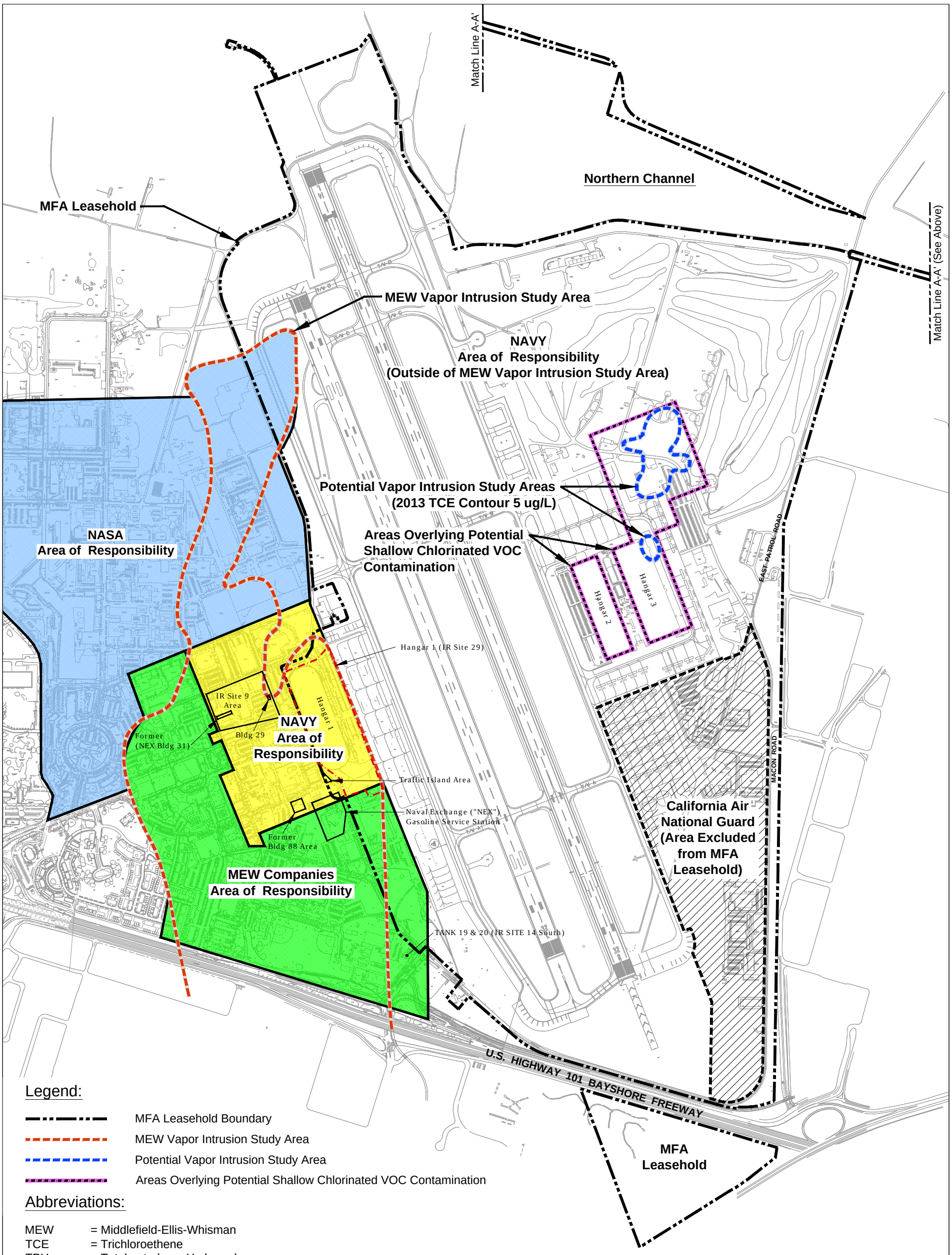

Legend:

- MFA Leasehold Boundary
- MEW Vapor Intrusion Study Area
- Potential Vapor Intrusion Study Area
- Areas Overlying Potential Shallow Chlorinated VOC Contamination

Abbreviations:

MEW = Middlefield-Ellis-Whisman
TCE = Trichloroethene
TPH = Total petroleum Hydrocarbons
VOC = Volatile Organic Compound

Notes:

1. All locations are approximate.
2. "Areas of Responsibility" obtained from the U.S. EPA Vapor Intrusion Study Area North of U.S. Highway 101 - Moffett Field Area, dated December 2011. The Vapor Intrusion Study Area is defined as being the area in which TCE concentrations are >5 micrograms per liter ("ug/L") based on 2010 data from the site.
3. The potential Vapor Intrusion Study Areas on the MFA Leasehold are based on the 5 microgram per liter Trichloroethene contour presented in the Final 2013 Annual Groundwater Report for Installation Restoration Sites 26 and 28, Fomer Naval Air Station Moffett Field, Moffett Field, California, dated April 2014.

0 1000 2000
(Approximate Scale in Feet)

N

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NASA, Navy, and MEW Companies
Areas of Responsibility, Vapor Intrusion

Former NAS Moffett Field
Mountain View, CA

March 2015
EKI B20019.11

Figure 5

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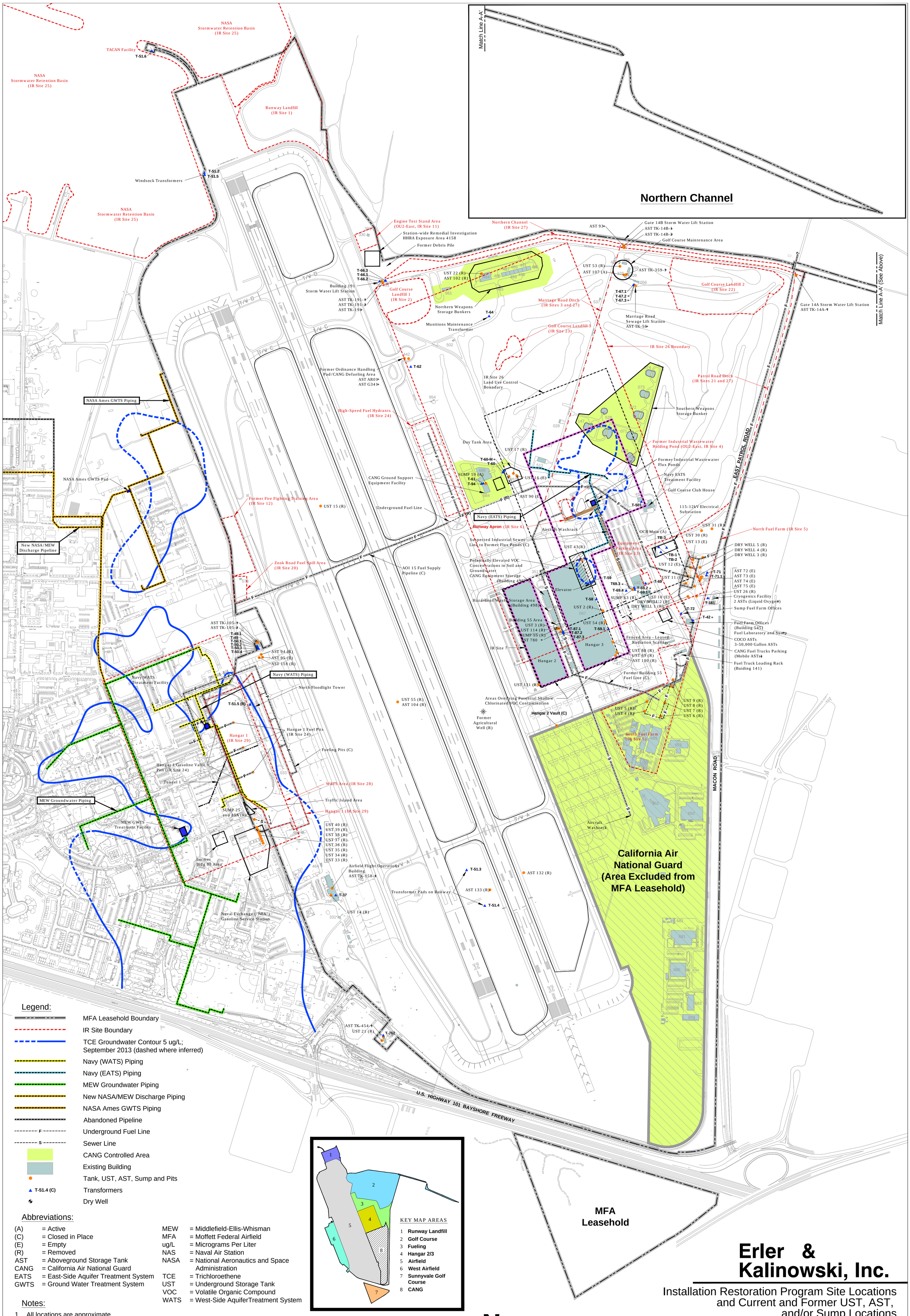

Abbreviations:

(A)	= Active	MEW	= Middlefield-Ellis-Whisman
(C)	= Closed in Place	MFA	= Moffett Federal Airfield
(E)	= Empty	ug/L	= Micrograms Per Liter
(R)	= Removed	NAS	= Naval Air Station
AST	= Aboveground Storage Tank	NASA	= National Aeronautics and Space Administration
CANG	= California Air National Guard		
EATS	= East-Side Aquifer Treatment System	TCE	= Trichloroethene
GWTS	= Ground Water Treatment System	UST	= Underground Storage Tank
		VOC	= Volatile Organic Compound
		WATS	= West-Side AquiferTreatment System

Notes:

1. All locations are approximate.
2. This figure includes features observed during site visits on 7 and 18 July 2014.
3. Refer to NASA EECs in Appendix A for additional maps showing potential areas of interest.
4. (" * ") = The indicated feature was not confirmed by NASA, but historical records or site walk observations indicate that it may have been located at the location shown.

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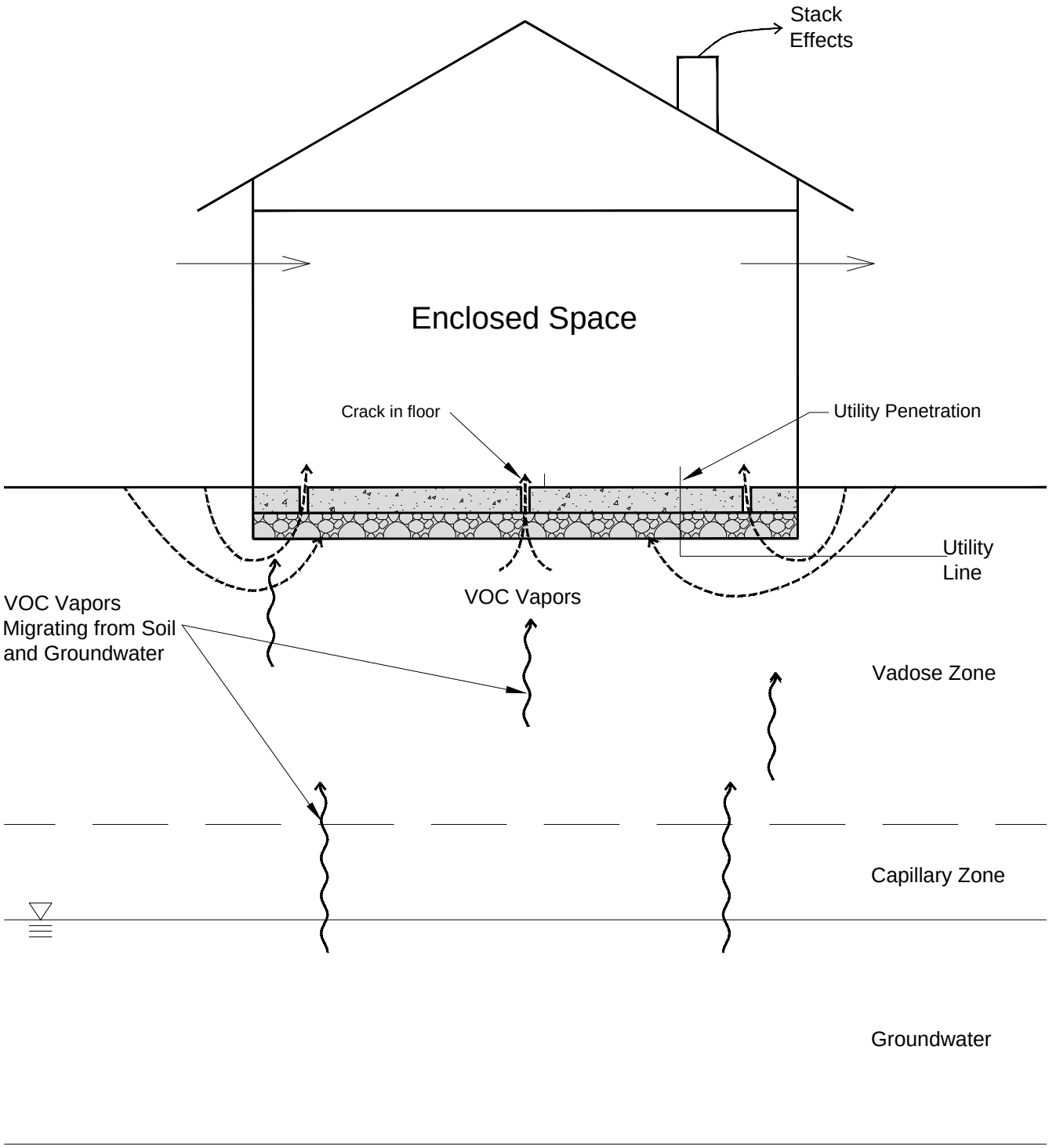
Installation Restoration Program Site Locations and Current and Former UST, AST, and/or Sump Locations

Former NAS Moffett Field
Mountain View, CA

March 2015
EKI B20019.11

Figure 6



Legend

VOC Vapor Migrating from Soil or Groundwater

Air Streamline

Concrete Floor

Baserock Beneath Floor

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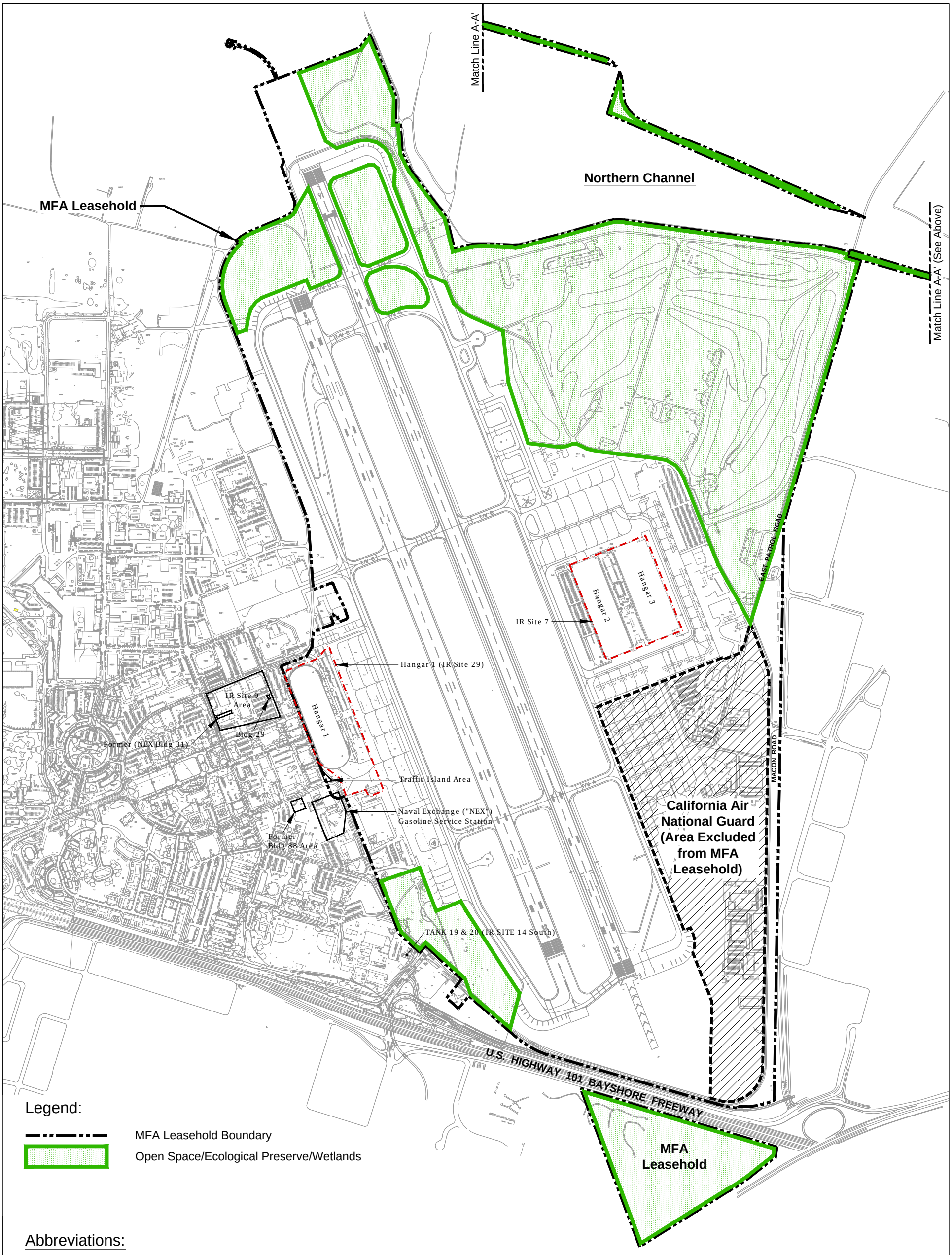
Generalized Vapor Intrusion Process

Moffett Federal Airfield
Mountain View, California

March 2015
EKI B20019.11

Figure 7



Legend:

MFA Leasehold Boundary

Open Space/Ecological Preserve/Wetlands

Abbreviations:

MEW = Middlefield-Ellis-Whisman
MFA = Moffett Federal Airfield
NAS = Naval Air Station
NASA = National Aeronautics and Space Administration
TPH = Total petroleum Hydrocarbons

Notes:

1. All locations are approximate.
2. Approximate locations of open space, ecological preserve, and wetland areas are from the NASA Ames Research Center's 2013 Spill Prevention, Control, & Countermeasures (SPCC) Plan.

0 1000 2000
(Approximate Scale in Feet)

N

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Approximate Locations of Open Space, Ecological Preserve, and Wetland Areas

Former NAS Moffett Field
Mountain View, CA

March 2015
EKI B20019.11

Figure 8

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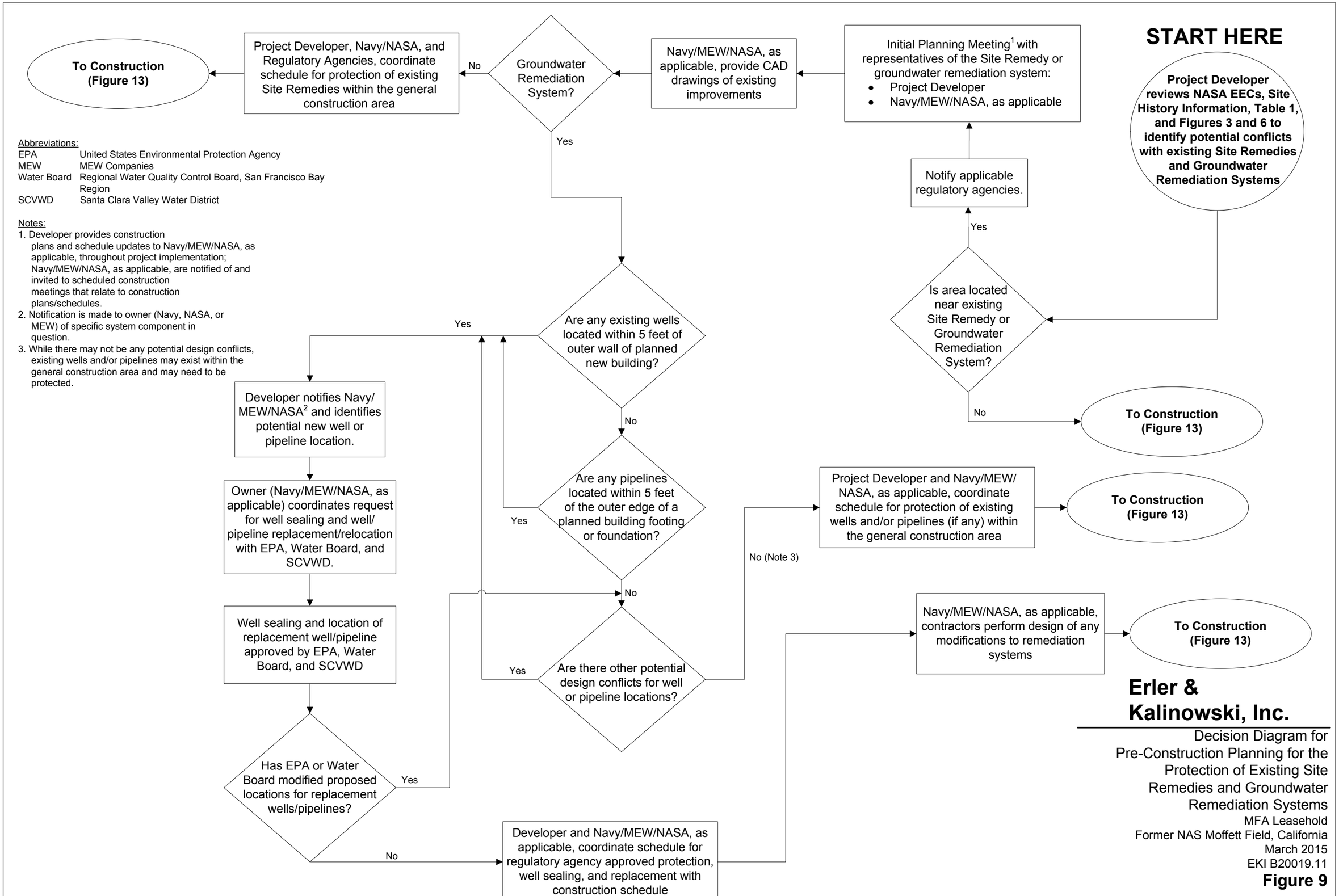
START HERE
Project Developer reviews NASA EECs, Site History Information, Table 1, and Figures 3 and 6 to identify potential conflicts with existing Site Remedies and Groundwater Remediation Systems
Is area located near existing Site Remedy or Groundwater Remediation System?
Yes
Notify applicable regulatory agencies.
Initial Planning Meeting[1] with representatives of the Site Remedy or groundwater remediation system:
• Project Developer
• Navy/MEW/NASA, as applicable
No
To Construction (Figure 13)
Navy/MEW/NASA, as applicable, provide CAD drawings of existing improvements
Groundwater Remediation System?
No
Project Developer, Navy/NASA, and Regulatory Agencies, coordinate schedule for protection of existing Site Remedies within the general construction area
To Construction (Figure 13)
Yes
Are any existing wells located within 5 feet of outer wall of planned new building?
Yes
Developer notifies Navy/MEW/NASA[2] and identifies potential new well or pipeline location.
Owner (Navy/MEW/NASA, as applicable) coordinates request for well sealing and well/pipeline replacement/relocation with EPA, Water Board, and SCVWD.
Well sealing and location of replacement well/pipeline approved by EPA, Water Board, and SCVWD
Has EPA or Water Board modified proposed locations for replacement wells/pipelines?
Yes
No
Developer and Navy/MEW/NASA, as applicable, coordinate schedule for regulatory agency approved protection, well sealing, and replacement with construction schedule
No
Are any pipelines located within 5 feet of the outer edge of a planned building footing or foundation?
Yes
No
Are there other potential design conflicts for well or pipeline locations?
Yes
No (Note 3)
Project Developer and Navy/MEW/NASA, as applicable, coordinate schedule for protection of existing wells and/or pipelines (if any) within the general construction area
To Construction (Figure 13)
Navy/MEW/NASA, as applicable, contractors perform design of any modifications to remediation systems
To Construction (Figure 13)
Abbreviations:
EPA United States Environmental Protection Agency
MEW MEW Companies
Water Board Regional Water Quality Control Board, San Francisco Bay Region
SCVWD Santa Clara Valley Water District
Notes:
1. Developer provides construction plans and schedule updates to Navy/MEW/NASA, as applicable, throughout project implementation; Navy/MEW/NASA, as applicable, are notified of and invited to scheduled construction meetings that relate to construction plans/schedules.
2. Notification is made to owner (Navy, NASA, or MEW) of specific system component in question.
3. While there may not be any potential design conflicts, existing wells and/or pipelines may exist within the general construction area and may need to be protected.
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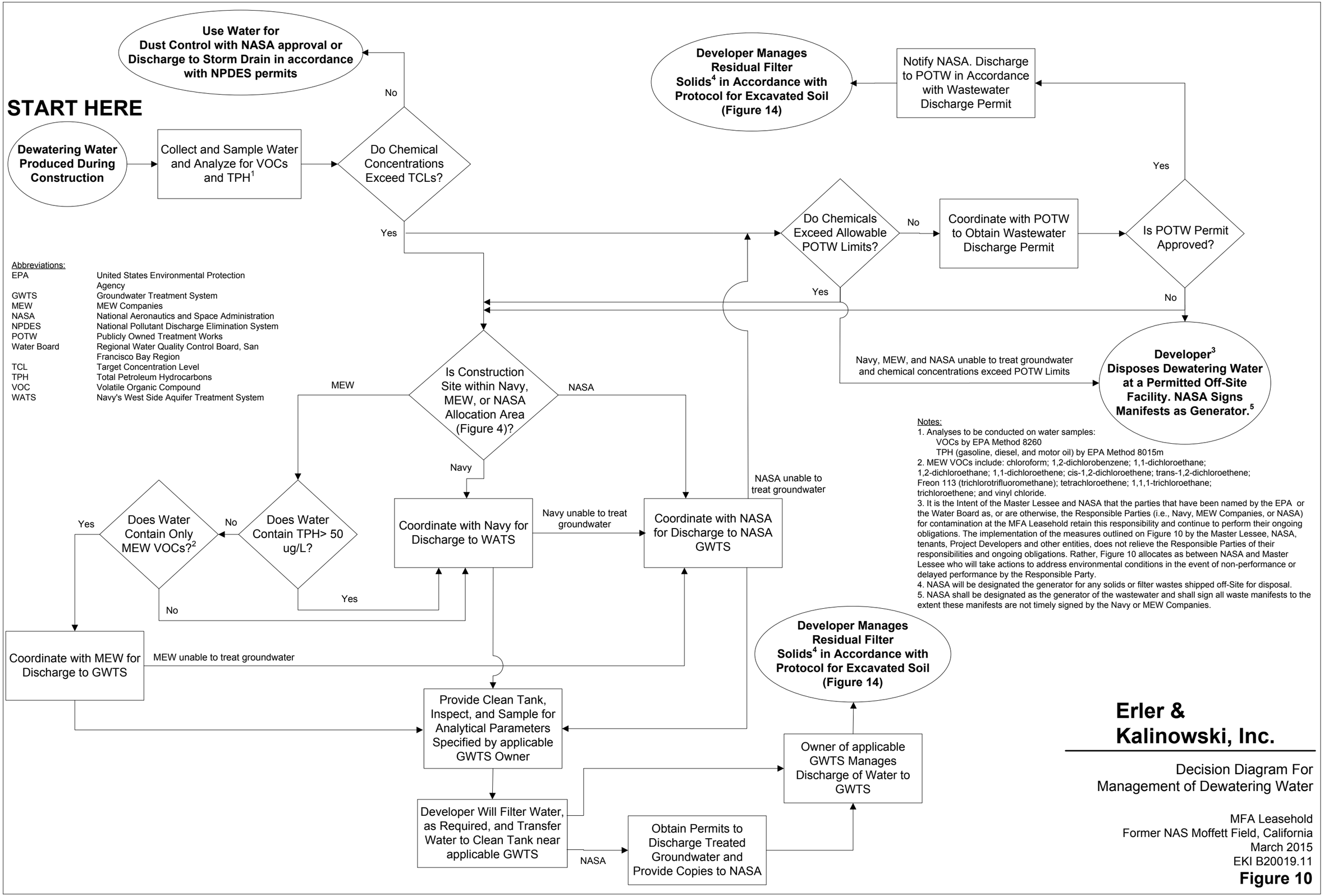
Decision Diagram for Pre-Construction Planning for the Protection of Existing Site Remedies and Groundwater Remediation Systems
MFA Leasehold
Former NAS Moffett Field, California
March 2015
EKI B20019.11
Figure 9



Abbreviations:

EPA	United States Environmental Protection Agency
GWTS	Groundwater Treatment System
MEW	MEW Companies
NASA	National Aeronautics and Space Administration
NPDES	National Pollutant Discharge Elimination System
POTW	Publicly Owned Treatment Works
Water Board	Regional Water Quality Control Board, San Francisco Bay Region
TCL	Target Concentration Level
TPH	Total Petroleum Hydrocarbons
VOC	Volatile Organic Compound
WATS	Navy's West Side Aquifer Treatment System

Notes:
1. Analyses to be conducted on water samples:
   VOCs by EPA Method 8260
   TPH (gasoline, diesel, and motor oil) by EPA Method 8015m
2. MEW VOCs include: chloroform; 1,2-dichlorobenzene; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; cis-1,2-dichloroethene; trans-1,2-dichloroethene; Freon 113 (trichlorotrifluoromethane); tetrachloroethene; 1,1,1-trichloroethane; trichloroethene; and vinyl chloride.
3. It is the Intent of the Master Lessee and NASA that the parties that have been named by the EPA or the Water Board as, or are otherwise, the Responsible Parties (i.e., Navy, MEW Companies, or NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their ongoing obligations. The implementation of the measures outlined on Figure 10 by the Master Lessee, NASA, tenants, Project Developers and other entities, does not relieve the Responsible Parties of their responsibilities and ongoing obligations. Rather, Figure 10 allocates as between NASA and Master Lessee who will take actions to address environmental conditions in the event of non-performance or delayed performance by the Responsible Party.
4. NASA will be designated the generator for any solids or filter wastes shipped off-Site for disposal.
5. NASA shall be designated as the generator of the wastewater and shall sign all waste manifests to the extent these manifests are not timely signed by the Navy or MEW Companies.

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Decision Diagram For Management of Dewatering Water

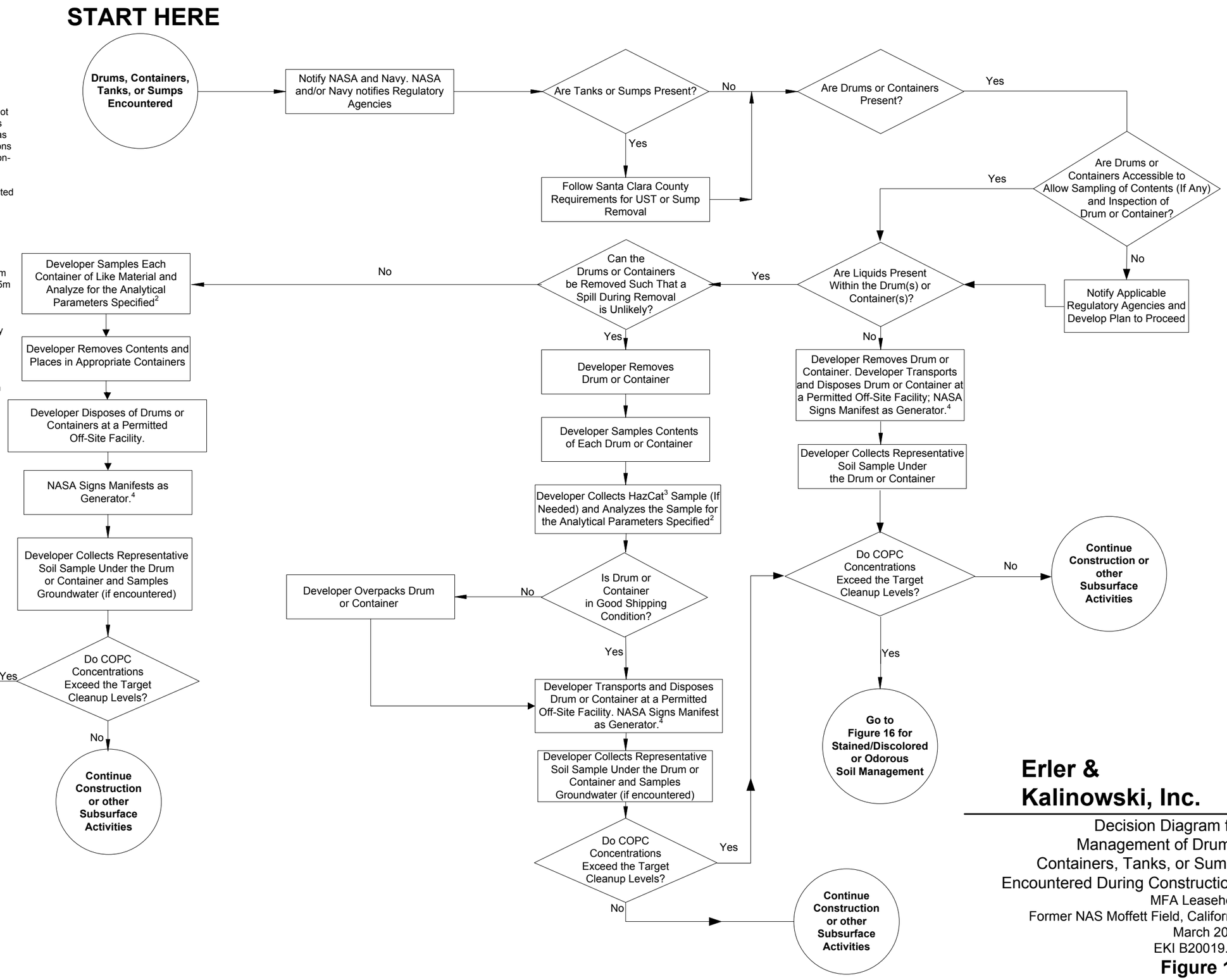
MFA Leasehold
Former NAS Moffett Field, California
March 2015
EKI B20019.11

Figure 10

Notes:
1. It is the Intent of the Master Lessee and NASA that the parties that have been named by the EPA or the Water Board as, or are otherwise, the Responsible Parties (i.e., Navy, MEW Companies, or NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their ongoing obligations. The implementation of the measures outlined on Figure 11 by the Master Lessee, NASA, tenants, Project Developers and other entities, does not relieve the Responsible Parties of their responsibilities and ongoing obligations. Rather, Figure 11 allocates as between NASA and Master Lessee who will take actions to address environmental conditions in the event of non-performance or delayed performance by the Responsible Party.
2. Analyses that may be conducted on samples collected from drums or containers may include:
   VOCs by EPA Method 8260, including Freon 113
   SVOCs (including PAHs) by EPA Method 8270
   PCBs by EPA Method 8082
   Organochlorine Pesticides by EPA Method 8081
   Herbicides by EPA Method 8151
   TPH purgeable compounds by EPA Method 8015m
   TPH extractable compounds by EPA Method 8015m
   Title 22 Metals by EPA Method 6020
3. HazCat: Hazard Categorization
4. NASA shall sign all manifests as generator of the wastes in the event that these manifests are not timely signed by the Navy or MEW Companies.

Abbreviations:

COPC	Chemical of Potential Concern
EPA	United States Environmental Protection Agency
NASA	National Aeronautics and Space Administration
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
Water Board	Regional Water Quality Control Board, San Francisco Bay Region
SVOCs	Semi-Volatile Organic Compounds
VOCs	Volatile Organic Compounds
UST	Underground Storage Tank



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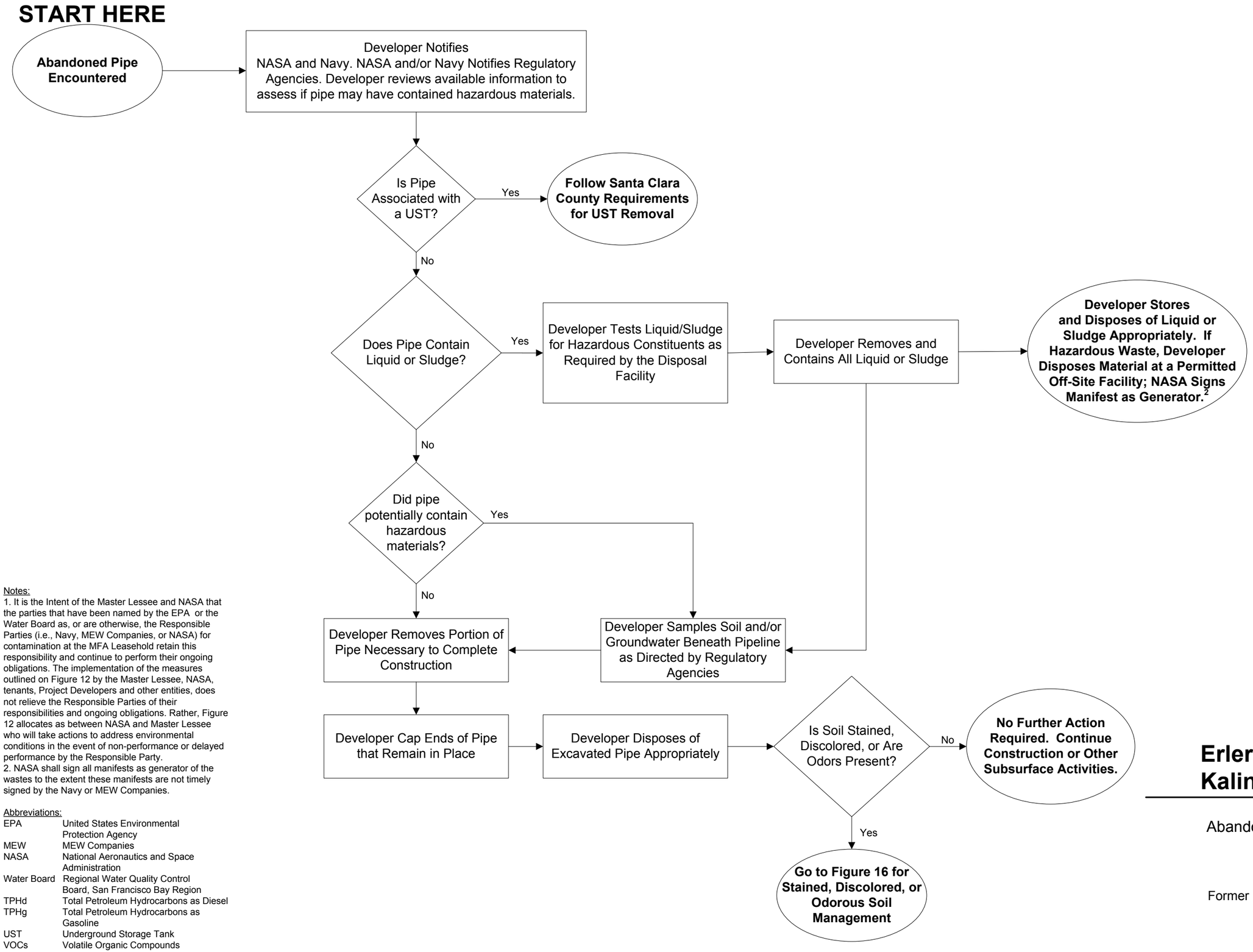
Decision Diagram for Management of Drums, Containers, Tanks, or Sumps Encountered During Construction[1]
MFA Leasehold
Former NAS Moffett Field, California
March 2015
EKI B20019.11

Figure 11



Notes:
1. It is the Intent of the Master Lessee and NASA that the parties that have been named by the EPA or the Water Board as, or are otherwise, the Responsible Parties (i.e., Navy, MEW Companies, or NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their ongoing obligations. The implementation of the measures outlined on Figure 12 by the Master Lessee, NASA, tenants, Project Developers and other entities, does not relieve the Responsible Parties of their responsibilities and ongoing obligations. Rather, Figure 12 allocates as between NASA and Master Lessee who will take actions to address environmental conditions in the event of non-performance or delayed performance by the Responsible Party.
2. NASA shall sign all manifests as generator of the wastes to the extent these manifests are not timely signed by the Navy or MEW Companies.

Abbreviations:

EPA	United States Environmental Protection Agency
MEW	MEW Companies
NASA	National Aeronautics and Space Administration
Water Board	Regional Water Quality Control Board, San Francisco Bay Region
TPHd	Total Petroleum Hydrocarbons as Diesel
TPHg	Total Petroleum Hydrocarbons as Gasoline
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds

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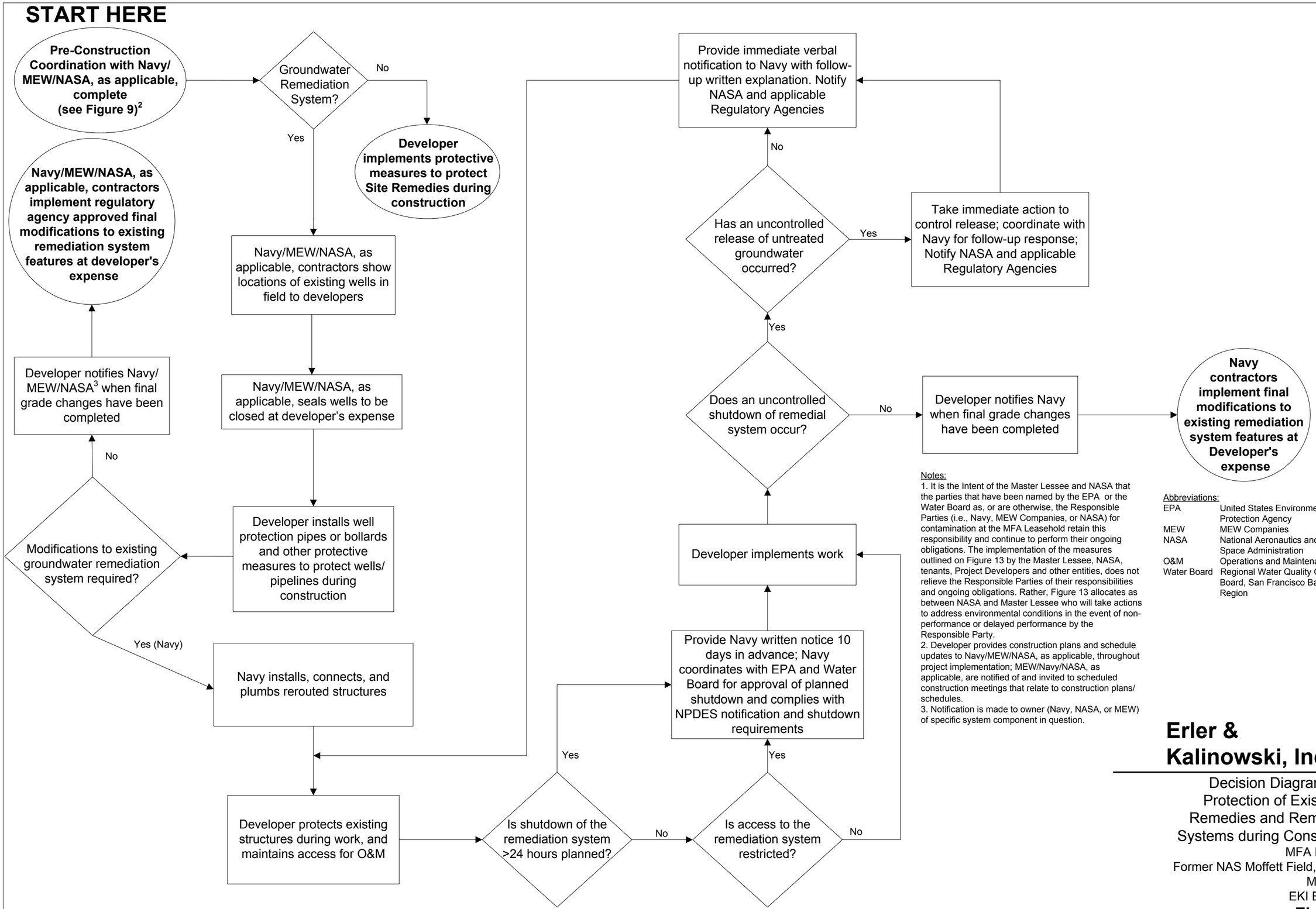
Decision Diagram for Abandoned Pipe Management during Construction[1]

MFA Leasehold
Former NAS Moffett Field, California
March 2015
EKI B20019.11

Figure 12



Notes:
1. It is the Intent of the Master Lessee and NASA that the parties that have been named by the EPA or the Water Board as, or are otherwise, the Responsible Parties (i.e., Navy, MEW Companies, or NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their ongoing obligations. The implementation of the measures outlined on Figure 13 by the Master Lessee, NASA, tenants, Project Developers and other entities, does not relieve the Responsible Parties of their responsibilities and ongoing obligations. Rather, Figure 13 allocates as between NASA and Master Lessee who will take actions to address environmental conditions in the event of non-performance or delayed performance by the Responsible Party.
2. Developer provides construction plans and schedule updates to Navy/MEW/NASA, as applicable, throughout project implementation; MEW/Navy/NASA, as applicable, are notified of and invited to scheduled construction meetings that relate to construction plans/ schedules.
3. Notification is made to owner (Navy, NASA, or MEW) of specific system component in question.

Abbreviations:

EPA	United States Environmental Protection Agency
MEW	MEW Companies
NASA	National Aeronautics and Space Administration
O&M	Operations and Maintenance
Water Board	Regional Water Quality Control Board, San Francisco Bay Region

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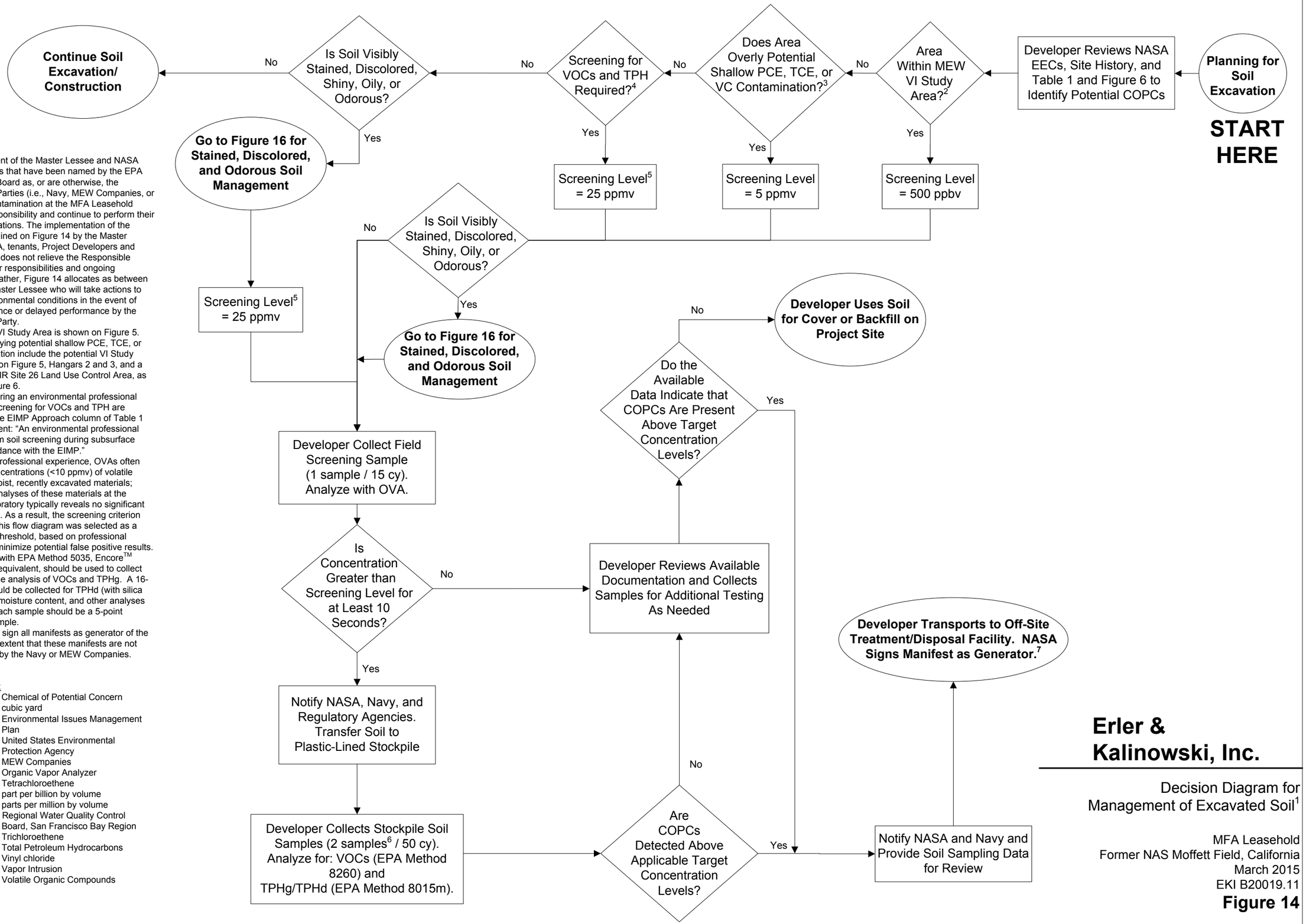
Decision Diagram for the Protection of Existing Site Remedies and Remediation Systems during Construction[1]
MFA Leasehold
Former NAS Moffett Field, California
March 2015
EKI B20019.11

Figure 13



Notes:

1. It is the Intent of the Master Lessee and NASA that the parties that have been named by the EPA or the Water Board as, or are otherwise, the Responsible Parties (i.e., Navy, MEW Companies, or NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their ongoing obligations. The implementation of the measures outlined on Figure 14 by the Master Lessee, NASA, tenants, Project Developers and other entities, does not relieve the Responsible Parties of their responsibilities and ongoing obligations. Rather, Figure 14 allocates as between NASA and Master Lessee who will take actions to address environmental conditions in the event of non-performance or delayed performance by the Responsible Party.
2. The MEW VI Study Area is shown on Figure 5.
3. Areas overlying potential shallow PCE, TCE, or VC contamination include the potential VI Study Areas shown on Figure 5, Hangars 2 and 3, and a portion of the IR Site 26 Land Use Control Area, as shown on Figure 6.
4. Areas requiring an environmental professional perform soil screening for VOCs and TPH are identified in the EIMP Approach column of Table 1 by the statement: "An environmental professional should perform soil screening during subsurface work in accordance with the EIMP."
5. Based on professional experience, OVAs often report low concentrations (<10 ppmv) of volatile organics in moist, recently excavated materials; subsequent analyses of these materials at the analytical laboratory typically reveals no significant contamination. As a result, the screening criterion presented in this flow diagram was selected as a conservative threshold, based on professional judgment, to minimize potential false positive results.
6. Consistent with EPA Method 5035, Encore™ Samplers, or equivalent, should be used to collect samples for the analysis of VOCs and TPHg. A 16-ounce jar should be collected for TPHd (with silica gel cleanup), moisture content, and other analyses (if needed). Each sample should be a 5-point composite sample.
7. NASA shall sign all manifests as generator of the wastes to the extent that these manifests are not timely signed by the Navy or MEW Companies.

Abbreviations:

COPC	Chemical of Potential Concern
cy	cubic yard
EIMP	Environmental Issues Management Plan
EPA	United States Environmental Protection Agency
MEW	MEW Companies
OVA	Organic Vapor Analyzer
PCE	Tetrachloroethene
ppbv	part per billion by volume
ppmv	parts per million by volume
Water Board	Regional Water Quality Control Board, San Francisco Bay Region
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbons
VC	Vinyl chloride
VI	Vapor Intrusion
VOCs	Volatile Organic Compounds

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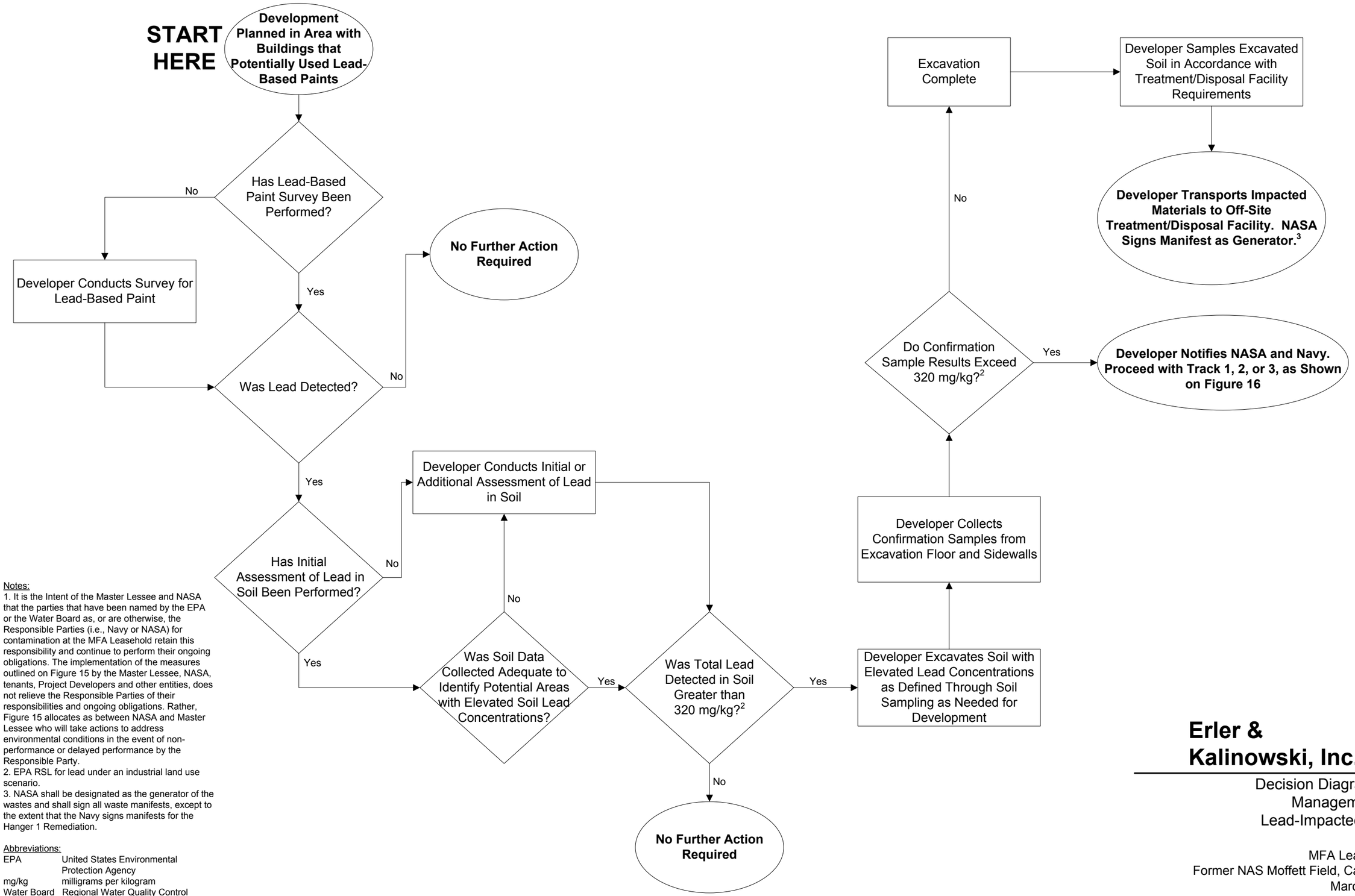
Decision Diagram for Management of Excavated Soil[1]

MFA Leasehold
Former NAS Moffett Field, California
March 2015
EKI B20019.11

Figure 14



Notes:
1. It is the Intent of the Master Lessee and NASA that the parties that have been named by the EPA or the Water Board as, or are otherwise, the Responsible Parties (i.e., Navy or NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their ongoing obligations. The implementation of the measures outlined on Figure 15 by the Master Lessee, NASA, tenants, Project Developers and other entities, does not relieve the Responsible Parties of their responsibilities and ongoing obligations. Rather, Figure 15 allocates as between NASA and Master Lessee who will take actions to address environmental conditions in the event of non-performance or delayed performance by the Responsible Party.
2. EPA RSL for lead under an industrial land use scenario.
3. NASA shall be designated as the generator of the wastes and shall sign all waste manifests, except to the extent that the Navy signs manifests for the Hanger 1 Remediation.

Abbreviations:

EPA	United States Environmental Protection Agency
mg/kg	milligrams per kilogram
Water Board	Regional Water Quality Control Board, San Francisco Bay Region

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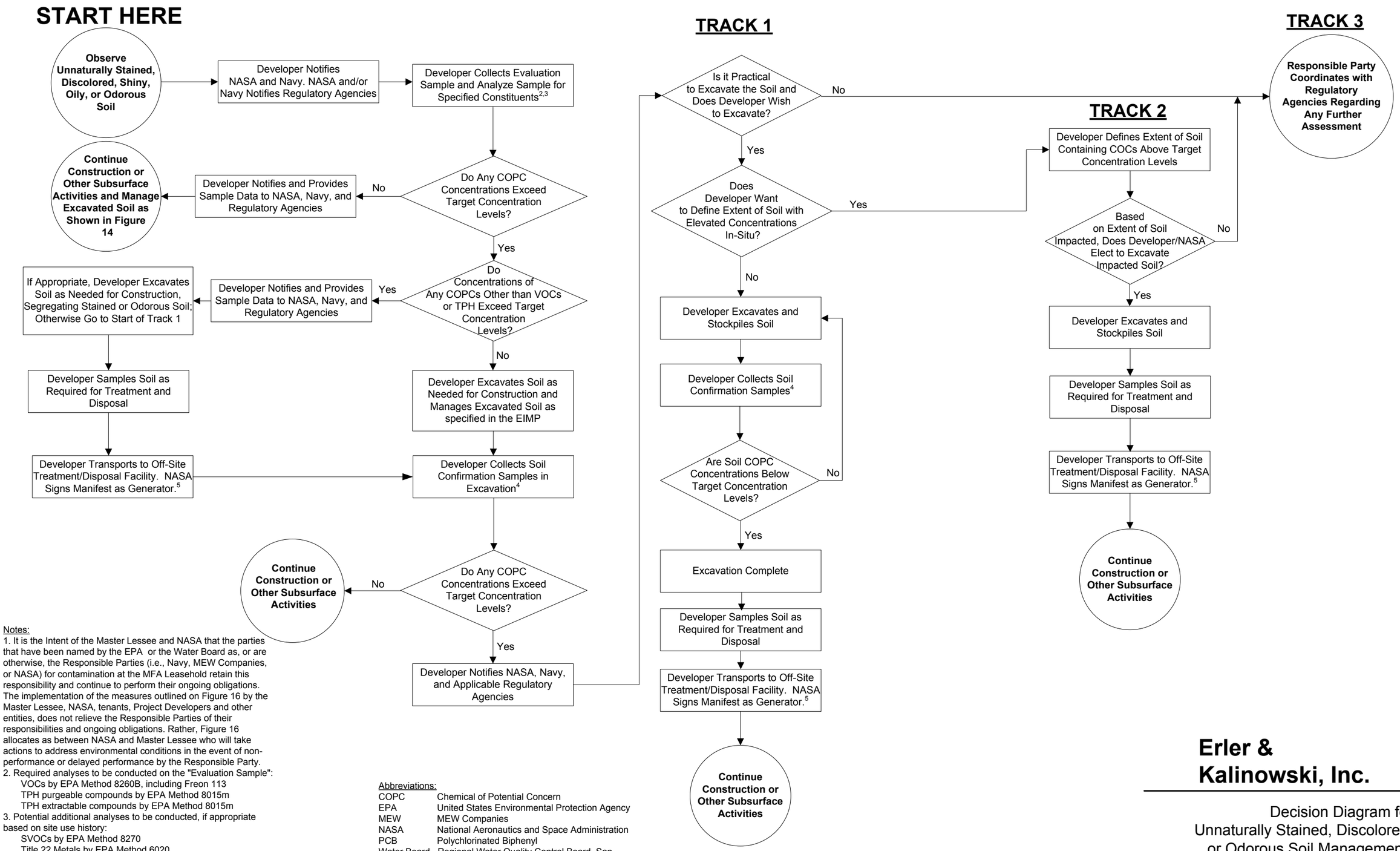
Decision Diagram for Management of Lead-Impacted Soil[1]

MFA Leasehold
Former NAS Moffett Field, California
March 2015
EKI B20019.11

Figure 15



Notes:
1. It is the Intent of the Master Lessee and NASA that the parties that have been named by the EPA or the Water Board as, or are otherwise, the Responsible Parties (i.e., Navy, MEW Companies, or NASA) for contamination at the MFA Leasehold retain this responsibility and continue to perform their ongoing obligations. The implementation of the measures outlined on Figure 16 by the Master Lessee, NASA, tenants, Project Developers and other entities, does not relieve the Responsible Parties of their responsibilities and ongoing obligations. Rather, Figure 16 allocates as between NASA and Master Lessee who will take actions to address environmental conditions in the event of non-performance or delayed performance by the Responsible Party.
2. Required analyses to be conducted on the "Evaluation Sample":
   VOCs by EPA Method 8260B, including Freon 113
   TPH purgeable compounds by EPA Method 8015m
   TPH extractable compounds by EPA Method 8015m
3. Potential additional analyses to be conducted, if appropriate based on site use history:
   SVOCs by EPA Method 8270
   Title 22 Metals by EPA Method 6020
   PCBs by EPA Method 8082
   Organochlorine Pesticides by EPA Method 8081
   Herbicides by EPA Method 8151
4. Analyses to be conducted on the soil confirmation samples will depend on the COPCs identified in the Evaluation Samples (see Notes 2 and 3).
5. NASA shall sign all manifests as generator of the wastes to the extent that these manifests are not timely signed by the Navy or MEW Companies.

Abbreviations:

COPC	Chemical of Potential Concern
EPA	United States Environmental Protection Agency
MEW	MEW Companies
NASA	National Aeronautics and Space Administration
PCB	Polychlorinated Biphenyl
Water Board	Regional Water Quality Control Board, San Francisco Bay Region
SVOC	Semi-Volatile Organic Compound
TPH	Total Petroleum Hydrocarbon
VOCs	Volatile Organic Compound

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Decision Diagram for Unnaturally Stained, Discolored, or Odorous Soil Management[1]
MFA Leasehold
Former NAS Moffett Field, California
March 2015
EKI B20019.11

Figure 16