

Ames
RESEARCH CENTER

Area of Investigation 14 Action Memorandum

**National Aeronautics and Space Administration
Ames Research Center
Moffett Field, CA**

March 2017





Area of Investigation 14 Action Memorandum

Prepared for:

**National Aeronautics and Space Administration
Ames Research Center
Moffett Field, CA**

March 2017

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ATTACHMENT

1 Federal and State Applicable or Relevant and Appropriate Requirements

ACRONYMS AND ABBREVIATIONS

§	Section
°F	degree Fahrenheit
AOI	Area of Investigation
ARAR	Applicable or relevant and appropriate requirement
bgs	Below ground surface
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	CERCLA Information System
CFR	Code of Federal Regulations
CWA	Clean Water Act
DDT	Dichlorodiphenyltrichloroethane
DTSC	Department of Toxic Substances Control
EE/CA	Engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement
FSFA	Former soil fill area
HRS	Hazard Ranking System
IC	Institutional control
ICAM	Interim corrective action measure
IR	Installation Restoration
LSI	Listing site inspection
mg/kg	Milligram per kilogram
MOU	Memorandum of Understanding
MROSD	Midpeninsula Regional Open Space District
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
NASA Ames	NASA Ames Research Center
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NTCRA	Non-time-critical removal action
PCB	Polychlorinated biphenyl

ACRONYMS AND ABBREVIATIONS (CONTINUED)

RAO	Removal action objective
RCRA	Resource Conservation and Recovery Act
SWRCB	State Water Resources Control Board
TSCA	Toxic Substances Control Act
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
Water Board	California Regional Water Quality Control Board, San Francisco Bay Region

ACTION MEMORANDUM

**NASA Ames Research Center
Moffett Field, California**

March 2017

**SUBJECT: Action Memorandum for Non-Time-Critical Removal Action at Area of Investigation 14, Former Soil Fill Area
NASA Ames Research Center, Moffett Field, California**

Site Status:	Non-NPL
Category of Removal:	Non-Time-Critical Removal Action
CERCLIS ID:	CA1800005034
Site ID:	Area of Investigation 14

1.0 PURPOSE

The purpose of this Action Memorandum is to document, for the Administrative Record, the decision by the National Aeronautics and Space Administration (NASA) to undertake a non-time-critical removal action (NTCRA) at Area of Investigation (AOI) 14, NASA Ames Research Center (NASA Ames), Moffett Field, California. The purpose of the NTCRA is to prevent erosion of contaminated soil and the release of contaminants from AOI 14 to adjacent Navy Installation Restoration (IR) Site 25. However, NASA intends this NTCRA to be the final action at AOI 14; therefore, risks to all potential human or ecological receptors were evaluated and are addressed in this NTCRA. In 2013, the U.S. Environmental Protection Agency (EPA) issued a Resource Conservation and Recovery Act (RCRA) 7003(a) Unilateral Administrative Order (RCRA-7003-09-2013-0002) requiring NASA to conduct immediate and long-term response actions for AOI 14 (EPA 2013). NASA, EPA, and the State of California (through the California Regional Water Quality Control Board, San Francisco Bay Region [Water Board]) signed a Federal Facility Agreement (FFA), effective March 11, 2015. EPA terminated the RCRA Order on the effective date of the FFA. NASA has the authority to undertake response actions, including removal actions, under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Title 42 United States Code (U.S.C.) Section (§) 9604 and Federal Executive Order 12580.

Site-specific investigations have not identified an urgent threat that must be addressed to prevent significant human or ecological exposure to contamination at AOI 14. Therefore, a planning period of at least 6 months exists for NASA to evaluate an appropriate removal action and identify the appropriate extent of the removal action. In September 2015, NASA submitted an engineering evaluation/cost analysis (EE/CA) that evaluated technologies and alternatives for the NTCRA at AOI 14 (Tetra Tech 2015). The selected removal action for the NTCRA consists of excavation and off-site disposal of soil containing concentrations of contaminants exceeding cleanup goals, and restoration of the excavated area to appropriate ecological habitat. After excavation and ecological restoration, the site will be available for unrestricted use.

The NTCRA for AOI 14 is consistent with four of the eight factors set forth in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at Title 40 of the Code of Federal Regulations (CFR) Part 300. The following factors set forth within the NCP pertain to AOI 14:

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants
- Actual or potential contamination of drinking water supplies or sensitive ecosystems
- High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate
- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released

No nationally significant or precedent-setting issues exist for this site.

2.0 SITE CONDITIONS AND BACKGROUND

NASA Ames is one of several centers within NASA, a federal agency. It is an active facility with no plans for closure or transfer. NASA Ames consists of the NASA Ames Research Center campus and the majority portion of former Naval Air Station (NAS) Moffett Field transferred to NASA on July 1, 1994. The former NAS Moffett Field is a Superfund site listed on the National Priorities List (NPL) in 1987.

NASA, EPA Region IX and the Water Board entered into the NASA Moffett FFA, effective March 11, 2015. The NASA Moffett FFA provides the roles and responsibilities of the parties for implementing response actions for NASA sites identified in the NASA Moffett FFA in accordance with applicable environmental requirements of CERCLA, the NCP, RCRA, and applicable state law. Under the NASA Moffett FFA, NASA is the lead agency for implementing response actions, and EPA and the Water Board are the lead regulatory oversight agencies. AOI 14 is an identified NASA site in the NASA Moffett FFA.

This section presents the site description, actions taken to date, and the role of the state and local regulatory agencies.

2.1 SITE DESCRIPTION

The following sections describe the site location, characteristics, history, and nature of contamination at AOI 14.

2.1.1 Physical Location

NASA Ames is located in Santa Clara County, California approximately 1 mile south of San Francisco Bay, 35 miles southeast of San Francisco, and 10 miles northwest of San Jose, at 37°24' N, 122° 3' W (Figure 1). NASA Ames is separated from San Francisco Bay by former salt evaporation ponds. The City of Mountain View is adjacent to the western and southern boundaries of NASA Ames, and the City of Sunnyvale is adjacent to the southern and eastern boundaries.

NASA Ames has a Mediterranean climate with dry warm summers and mild winters. Temperatures vary from an average high of 79 degrees Fahrenheit (°F) in July and August to an average low of 39°F in December. Average precipitation is 14.72 inches per year and occurs almost entirely between late fall and early spring. Most precipitation (an average of 2 to 3.5 inches per month) occurs in December, January, February, and March.



Figure 1. NASA Ames Location Map

AOI 14 is located at the northern end of NASA Ames (Figure 2) and consists of three peninsulas (the former soil fill area [FSFA], N217 area, and N217A area) that extend into a stormwater retention pond (Figure 3). The western boundary of AOI 14 borders the portion of the stormwater retention pond located within the Midpeninsula Regional Open Space District (MROSD). Navy IR Site 25 comprises the entire stormwater retention pond surrounding AOI 14 and the Eastern Diked Marsh to the south of the stormwater pond (Figure 4). The Navy conducted a remedial action at IR Site 25 in 2012 that included excavation and off-site disposal of contaminated sediment, focused restoration of wetland excavation areas, and ecological monitoring.



Figure 2. Composition of NASA Ames

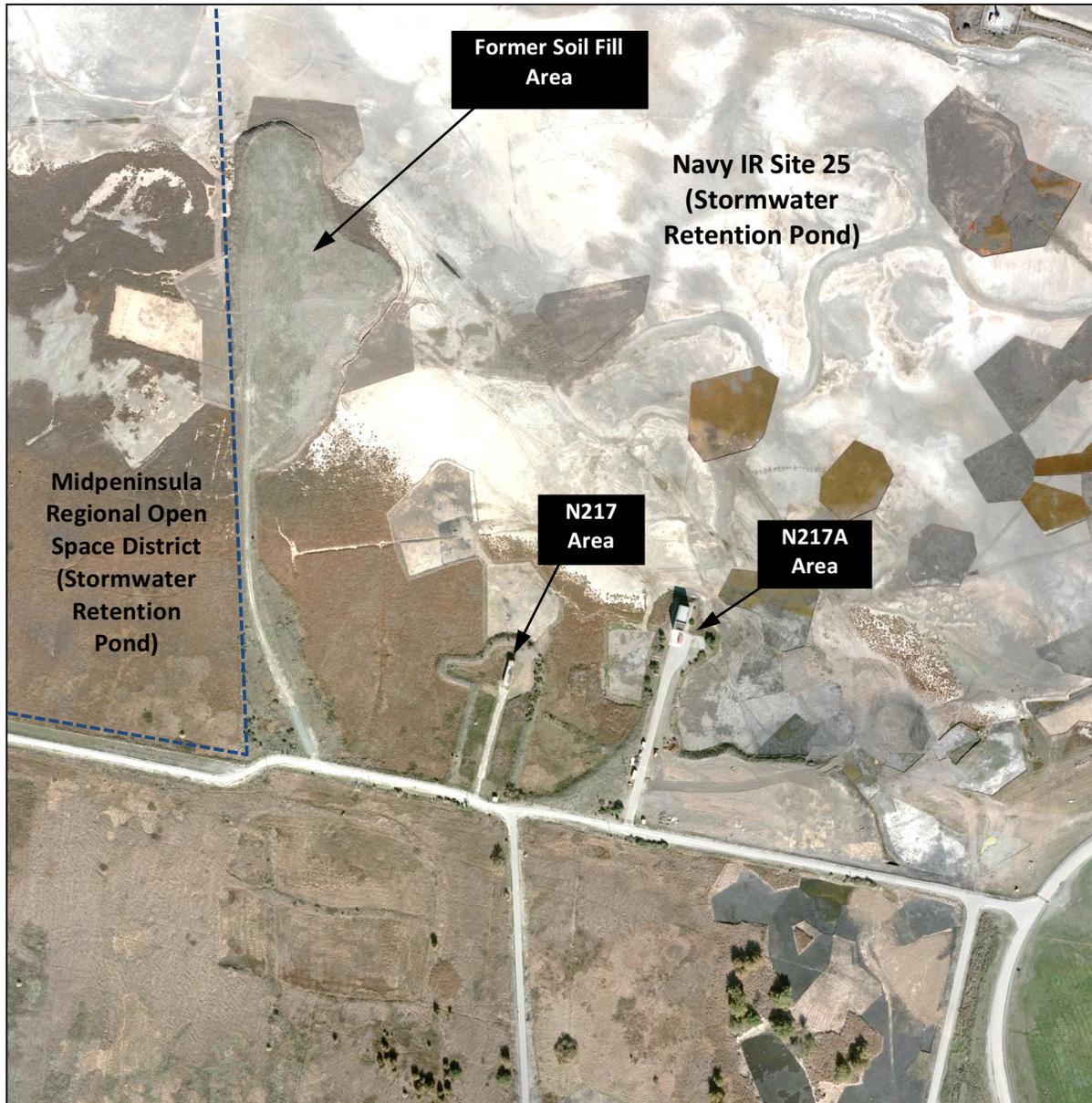


Figure 3. Aerial View of AOI 14
Note: The darker polygon shapes are areas remediated by the Navy in IR Site 25.
(NASA photograph #1-7525 dated 2012)

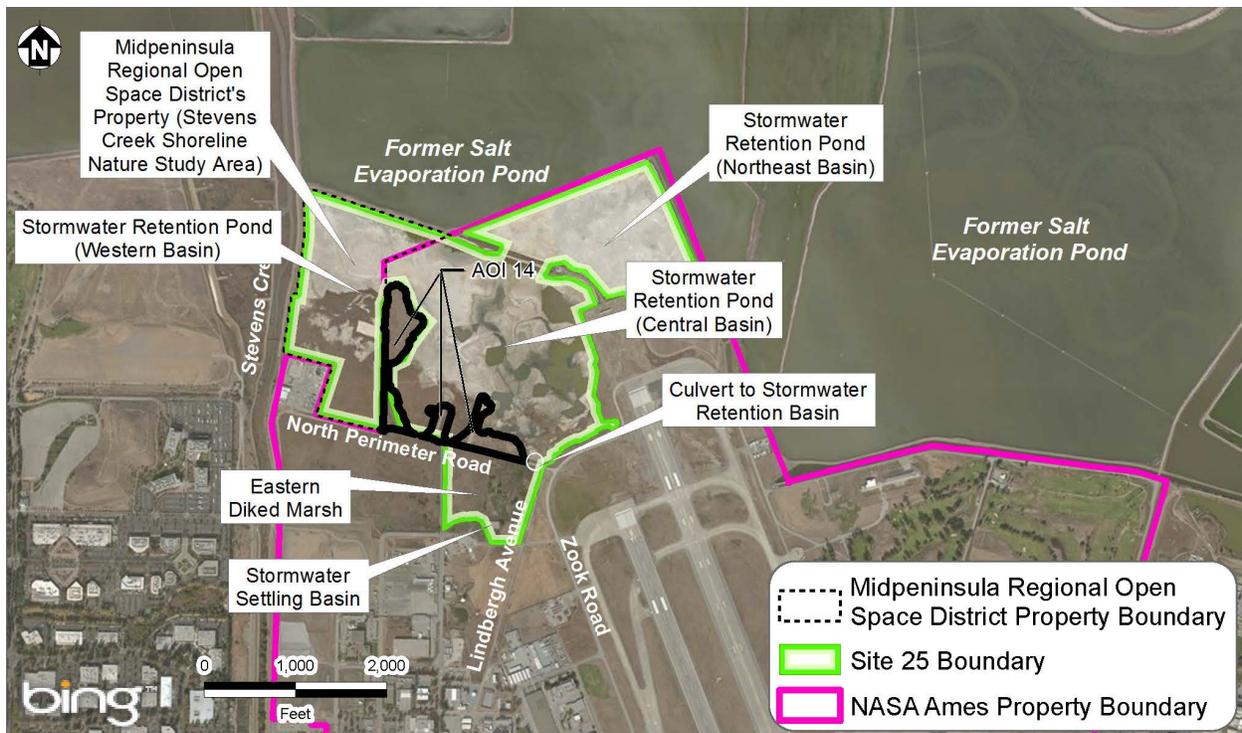


Figure 4: Features of Navy IR Site 25

2.1.2 Site Characteristics

The Ames Aeronautical Laboratory of the National Advisory Committee for Aeronautics was established in 1939 on land adjacent to NAS Moffett Field and consisted of wind tunnels, hangars, aircraft operations, and other research facilities. In 1958, NASA was established under the Space Act, and Ames Aeronautical Laboratory became NASA Ames Research Center.

In 1991, the Navy Base Realignment and Closure Commission identified NAS Moffett Field for closure. In 1994, a majority portion of NAS Moffett Field was transferred from the Navy to NASA, excluding the military housing at Orion Park and Wescoat Housing, which was transferred initially to the U.S. Air Force, and then to the U.S. Army. The Navy and NASA entered into a Memorandum of Understanding (MOU) that established roles and responsibilities for environmental restoration and ongoing environmental compliance at former NAS Moffett Field.

Historical aerial photographs indicate the N217 peninsula consists of native soil and the FSFA and N217A peninsulas were constructed by depositing fill material on the existing surface of the stormwater retention pond. The peninsulas provide mainly terrestrial habitat and are adjacent to the wetland habitat of the stormwater retention pond, which supports wetland species. Wetland vegetation, including pickleweed (*Salicornia pacifica*), extends onto the lower portion of the slopes of the peninsulas before it transitions to upland species (Aldrete 2013). Groundcover varies across AOI 14 and includes tall grasses and low-lying brush. Special status species may occur at AOI 14 or in the adjacent wetland habitat, including federally or state-listed as threatened or endangered, and state species of special concern.

The FSFA is not actively used, and access to this area is restricted by the NASA Ames security fence to the south and by NASA's stormwater retention pond on all other sides. There are two buildings on the N217 and N217A areas that are currently used for periodic research, development, and testing of magnetic field equipment.

No historical or cultural resources have been identified on or adjacent to AOI 14.

This NTCRA will be the first removal action at AOI 14; however, NASA completed an Interim Corrective Action Measure (ICAM) at the FSFA in December 2013 in response to a RCRA Order. The purpose of the ICAM was to prevent risks to the environment by controlling and monitoring potential soil and contaminant erosion from the FSFA into the adjacent stormwater retention pond. The ICAM is described in [Section 2.2](#).

2.1.3 Removal Site Evaluation

The area of AOI 14 subject to the NTCRA is contaminated fill that was deposited in the northern portion of the FSFA peninsula. The N217 and N217A areas do not require remediation and are not included in the NTCRA due to the depths and limited extent of contaminants in these areas. This conclusion is discussed in more detail in Section 2.4.1.3 and 2.4.2.3 of the EE/CA (Tetra Tech 2015). Concentrations of lead and polychlorinated biphenyls (PCB) exceeded human health and ecological screening criteria in the N217 and N217A areas in 3 of 60 samples; however, these samples were collected from 8 to 10 feet below ground surface (bgs). Ecological receptors would not be exposed to contaminants at these depths, and human receptors would be exposed to these concentrations only if intrusive development of the area brings that soil to the surface. In addition, the frequencies of detections above screening levels were low for both lead and PCBs in the N217 and N217A areas (2 of 60 samples for lead and 1 of 60 samples for PCBs).

The fill material, which varies in thickness from 2 feet to 16 feet across the FSFA, extends over an area of approximately 270,000 square feet and is a heterogeneous mixture of gravel, sand, silt, clay and miscellaneous construction debris. The native soil underneath the fill material is primarily clay. Metals, PCBs, and pesticides (expressed as total dichlorodiphenyltrichloroethane [DDT]) detected within the FSFA are distributed non-uniformly throughout the fill, both vertically and horizontally. Knowledge of the site history and contaminant distribution suggests that the source of the contaminants is not an on-site source, but rather a source from the original location of the fill brought to the site (Tetra Tech 2015).

The primary purpose of the NTCRA is to prevent erosion of contaminated fill soil and the release of contaminants from the FSFA into the surrounding stormwater retention pond. Because NASA intends this NTCRA to be the final action at AOI 14, risks to all potential human and ecological receptors are also addressed in this NTCRA. To select an appropriate removal action, NASA completed an EE/CA (Tetra Tech 2015), which assessed risks, identified cleanup goals and evaluated technologies and alternatives for this NTCRA.

2.1.4 Release or Threatened Release into the Environment of a Hazardous Substance, or Pollutant or Contaminant

The results of past investigations and the streamlined human health and ecological risk evaluations in the EE/CA (Tetra Tech 2015) have documented the release of the CERCLA hazardous substances lead, total PCBs, and total DDT within the northern portion of the AOI 14 FSFA at concentrations that should be addressed to protect human health and the environment.

The source of the contamination at AOI 14 is contaminated fill that was placed on native soil. There are no known records indicating the source of the fill, but it is believed to be from construction projects at NASA Ames.

Soil is the only exposure medium for the site; groundwater, surface water, and soil gas are not identified as potential exposure media. Groundwater was not identified as a medium of concern because fill material is not in contact with groundwater, and sampling results indicate that fill contaminants have not affected groundwater (Tetra Tech 2015). There is no surface water at AOI 14, and there is no surface water in the portion of the stormwater pond adjacent to the FSFA during the dry season. Rising water levels in the stormwater retention pond during the wet season could inundate the sides of AOI 14 and carry soil and contaminants into the stormwater pond. This pathway is currently controlled by the ICAM silt fence. In addition, transport of contaminants from soil into surface water is not considered a significant exposure pathway based on the conclusions of the Navy IR Site 25 risk assessment (SulTech 2007). Therefore, surface water was not identified as a medium of concern for the removal action at AOI 14. The contaminants detected in soil or groundwater at AOI 14 are not volatile, except trichloroethene detected in one groundwater sample in 1995. Therefore, soil gas was not identified as a medium of concern for AOI 14.

Potential human receptors were identified as current and future industrial workers and hypothetical future residents. Although future residential use of the site is not anticipated, the residential scenario is considered for unrestricted future use of the site and to achieve a cleanup that is the final action for AOI 14. Concentrations of lead, pesticides (total DDT) and PCBs exceed screening criteria and may pose a potential risk to industrial workers and residents through incidental ingestion of soil, dermal exposure to soil, and inhalation of soil.

Potential ecological receptors include terrestrial plants, soil invertebrates, amphibians, reptiles, birds, and mammals that could be exposed if contaminated soil is exposed by burrowing animals or erodes on to the surface of the stormwater retention pond. Exposure routes, or the points of entry of a chemical into a receptor, include root uptake and leaf sorption for plants, and dermal contact and ingestion of contaminated soil and food for animals.

The transport of contaminated soil from AOI 14 into the stormwater pond could cause concentrations of lead, total DDT, and total PCBs to exceed levels protective of wetland receptors. Potential ecological exposure pathways for chemical mobilization and transport within the site or to other off-site locations include: (1) erosion and transport of dissolved chemicals or chemicals

adsorbed to suspended particles and (2) biotic transport of chemicals in plant and animal tissue from one area of the site to another or to off-site locations. Biotic transfer of contaminants at AOI 14 can occur through the movement and activities of animals. Contaminants in the tissues of mobile receptors such as insects and migratory birds may be carried off site and deposited at other locations in feces and corpses. In addition, chemicals may be transferred through the food web by incidental ingestion of contaminated soil or through ingestion of contaminated food items such as plants or prey.

The following removal action objectives (RAO) are identified for AOI 14:

- Prevent erosion of soil where concentrations of lead, total DDT, and total PCBs exceed cleanup goals for the surrounding stormwater pond (Navy IR Site 25) to protect wetland receptors.
- Prevent exposure to surface and subsurface soil containing concentrations of lead, total DDT, and total PCBs above levels that are protective of terrestrial ecological receptors.
- Prevent exposure to surface and subsurface soil containing concentrations of Aroclor-1260 and 4,4-DDT above levels that are protective of industrial workers.

Numeric cleanup goals were identified in the EE/CA (Tetra Tech 2015) to be protective of human and ecological receptors (Table 1). The cleanup goals were set equal to the do-not-exceed remediation goals identified for Navy IR Site 25, which were developed for the protection of wetland receptors. The cleanup goals also address risk to terrestrial receptors. These goals are also protective of human health because they are more conservative (less) than the human health screening levels for industrial workers

Chemical	Cleanup Goal (mg/kg)
Lead	93.8
Total DDT ^a	0.109
Total PCBs ^b	0.210

Notes:

a Total DDT concentrations were calculated by summing the detected concentrations of 4,4-DDT, 4,4-dichlorodiphenyldichloroethane, and 4,4-dichlorodiphenyldichloroethene.

b Total PCBs was calculated by summing the detected concentrations of Aroclor congeners. Aroclor-1254, Aroclor-1260, and Aroclor-1268 were detected at AOI 14.

AOI Area of Investigation

DDT Dichlorodiphenyltrichloroethane

mg/kg Milligrams per kilogram

PCB Polychlorinated biphenyls

To ensure that residual concentrations are protective of wetland receptors at Navy IR Site 25 (Tetra Tech 2015), the residual site-wide average concentrations at AOI 14 will be calculated and compared to the Navy IR Site 25 site-wide (area-weighted) average remediation goals. The Navy IR Site 25 site-wide average remediation goals are 33 milligrams per kilogram (mg/kg) for lead, 0.016 mg/kg for total DDT, and 0.200 mg/kg for total PCBs. If residual site-wide average concentrations of lead, total PCBs, and total DDT at AOI 14 exceed the Navy IR Site 25 site-wide average remediation goals, additional evaluation or removal will be conducted at AOI 14.

This NTCRA addresses the northern portion of the FSFA where concentrations of lead, total DDT, and total PCBs exceed the cleanup goals. This area is estimated to be 270,000 square feet, and the estimated volume of fill is approximately 99,000 cubic yards (Tetra Tech 2015). This area is shown on [Figure 5](#).

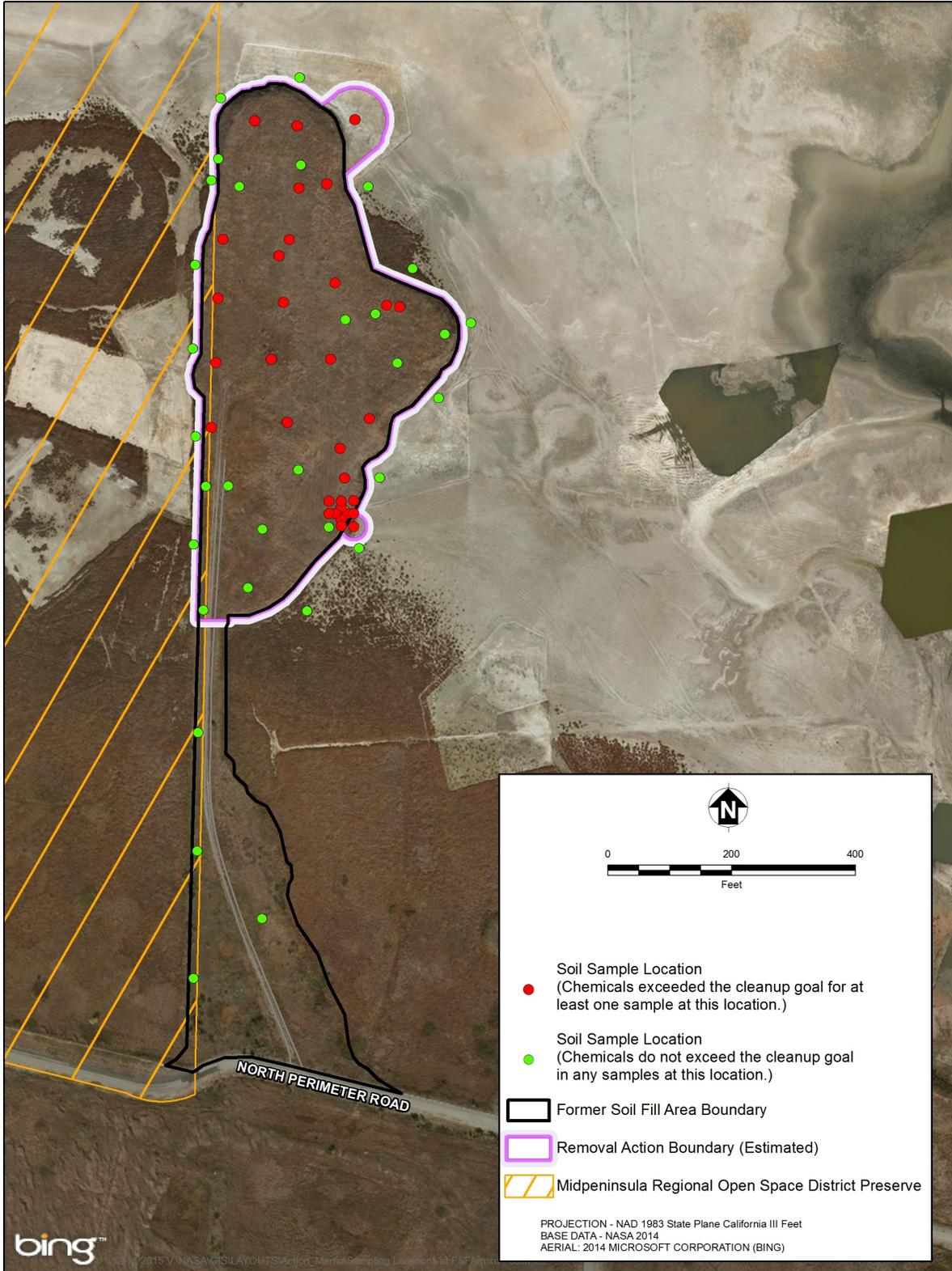


Figure 5. Extent of Non-Time-Critical Removal Action

2.1.5 National Priorities List Status

AOI 14 is located on NASA Ames Research Center. NASA Ames Research Center and AOI 14 are not listed on the NPL. In 1992, NASA completed a listing site inspection (LSI) for NASA Ames Research Center that included the AOI 14 area. The primary objective of the LSI was to generate a preliminary site ranking using the revised Hazard Ranking System (HRS) by evaluating all available groundwater, surface water, shallow soil, and air sampling data collected to date at NASA Ames Research Center. The LSI concluded that the combined HRS score for the groundwater, surface water, soil exposure, and air migration pathways was 15.77, less than the cutoff score of 28.5 EPA uses to determine whether a site should be included on the NPL (Erler and Kalinowski, Inc. 1992). Therefore, NASA Ames Research Center was not proposed for inclusion on the NPL.

As stated in this Action Memorandum, contamination located at AOI 14 may erode onto adjacent properties, including Navy IR Site 25. The purpose of the NTCRA is to prevent erosion of contaminated soil and the release of contaminants from AOI 14 to Navy IR Site 25.

2.2 OTHER ACTIONS TO DATE

The Navy conducted a remedial action at Navy IR Site 25 in 2012. The remedy included excavation and off-site disposal of contaminated sediment, focused restoration of wetland excavation areas, and ecological monitoring. The remedial action at Navy IR Site 25 targeted the most sensitive ecological receptors at the site if it would contain tidal marsh habitat in the future. The Navy concluded that, after remedial actions were complete in December 2012, Navy IR Site 25 “presents no hazard to human health or the environment and is available for unrestricted use” (ITSI Gilbane 2013).

In 2013, EPA issued an RCRA Order (RCRA-7003-09-2013-0002) requiring NASA to conduct immediate and long-term response actions for AOI 14 (EPA 2013). The stated purpose of the RCRA Order was to stabilize and address soil contaminated with PCBs, pesticides, and metals that threatened to discharge pollutants into the surrounding Navy IR Site 25, which includes the stormwater retention pond that serves as actual and potential habitat for several ecological receptors. In response, NASA implemented an ICAM consisting of an erosion control barrier (silt fencing) along the base of the northern portion of the FSFA. Silt fencing was not installed around the N217 and N217A areas because contaminants present at depth in these areas do not present a risk to Navy IR Site 25 through erosion of surface soil (Earth Resource Technology Corporation 2014). The ICAM was completed in consultation with the U.S. Fish and Wildlife Service (USFWS) to monitor potential impacts to endangered species, habitat, and natural resources present in the area. NASA conducts monthly inspections of the ICAM and annual sediment sampling and submits quarterly reports to EPA and the Water Board. These activities will continue until the NTCRA is completed. NASA, EPA, and the State of California (through the Water Board) signed a FFA, effective March 11, 2015. NASA is now implementing cleanup activities for AOI 14 under the FFA in accordance with CERCLA. EPA terminated the RCRA order on the effective date of the FFA.

2.3 STATE AND LOCAL AUTHORITIES' ROLES

This section discusses the roles of regulatory agencies with potential involvement in the NTCRA for AOI 14.

2.3.1 State and Local Actions to Date

NASA is the lead federal agency at AOI 14 pursuant to CERCLA and the delegation of Presidential authority under Executive Order 12580 and is responsible for conducting CERCLA response actions at AOI 14. EPA Region IX and the State of California (through the Water Board) provide regulatory oversight of NASA's CERCLA activities at AOI 14. In addition, NASA Ames has initiated formal consultation with USFWS with participation by the California Department of Fish and Wildlife (CDFW) in implementing this NTCRA.

2.3.2 Potential for Continued State/Local Response

EPA, Water Board, USFWS, and CDFW are expected to continue to provide technical advice, environmental regulatory oversight, and assistance with implementation of this NTCRA.

3.0 THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT AND STATUTORY AND REGULATORY AUTHORITIES

In accordance with the NCP at 40 CFR § 300.415(b)(2), the following factors must be considered in evaluating the appropriateness of a removal action to address threats to public health and the environment:

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants
- Actual or potential contamination of drinking water supplies or sensitive ecosystems
- Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release
- High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate
- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released
- Threat of fire or explosion

- Availability of other appropriate federal or state response mechanisms to respond to the release
- Other situations or factors that may pose threats to public health or welfare of the United States or the environment

This section discusses threats to public health or welfare and the environment from soil contamination at AOI 14.

3.1 THREATS TO PUBLIC HEALTH OR WELFARE

The following public health or welfare threat listed in 40 CFR § 300.415(b)(2) applies to conditions at AOI 14:

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants

The streamlined human health risk evaluation conducted as part of the EE/CA concluded that there is potential for exposure to contaminants in soil and unacceptable risk to industrial workers and hypothetical residents from lead, 4,4'-DDT, Aroclor-1254, Aroclor-1260, and Aroclor-1268 in soil in the northern portion of the FSFA (Tetra Tech 2015). Only soil was considered as an exposure medium of concern for the site. Potential exposure pathways for soil included incidental ingestion of, dermal exposure to, and inhalation of vapors from soil. All three of these exposure pathways are included in the calculations of EPA RSLs and California Department of Toxic Substances Control (DTSC) screening levels (EPA 2014; DTSC 2014). Concentrations of lead, 4,4'-DDT, Aroclor-1254, Aroclor-1260, and Aroclor-1268 in soil exceed the screening levels.

The FSFA is not currently used, so the immediacy of the threat to public health or welfare is low.

3.2 THREATS TO THE ENVIRONMENT

The following environmental threats listed in 40 CFR § 300.415(b)(2) apply to conditions at AOI 14:

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants
- Actual or potential contamination of drinking water supplies or sensitive ecosystems
- High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate

- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released

The streamlined ecological risk evaluation conducted as part of the EE/CA concluded that there is potential exposure to animals and the food chain from contaminants in FSFA soil. Although the contaminants in FSFA soil would not contaminate drinking water supplies, the contamination may affect sensitive ecosystems and federally and state-listed species on and adjacent to the FSFA.

The site currently provides terrestrial habitat suitable for ecological receptors such as terrestrial plants, soil invertebrates, amphibians, reptiles, birds and mammals. In addition, ecological receptors are present in the surrounding wetland habitat and include wetland plants, benthic invertebrates, birds, and mammals. Special status species that may occur at AOI 14 or in the adjacent wetland habitat, including those federally or state-listed as threatened or endangered, and state species of special concern, include the following:

- California least tern (*Sternula antillarum browni*) (federally endangered; state endangered; state fully protected)
- Ridgway's rail (formerly California clapper rail) (*Rallus obsoletus*) (federally endangered; state endangered; state fully protected)
- Salt marsh harvest mouse (*Reithrodontomys raviventris*) (federally endangered; state endangered; state fully protected)
- Western snowy plover (*Charadrius alexandrinus nivosus*) (federally threatened; state species of special concern)
- California black rail (*Laterallus jamaicensis coturniculus*) (state threatened; state fully protected)
- Swainson's hawk (*Buteo swainsoni*) (state threatened)
- Alameda song sparrow (*Melospiza melodia pusillula*) (state species of special concern)
- California burrowing owl (*Athene cunicularia*) (state species of special concern)
- Northern harrier (*Circus cyaneus*) (state species of special concern)
- Pallid bat (*Antrozous pallidus*) (state species of special concern)

- Salt marsh common yellowthroat (*Geothlypis trichas sinuosa*) (state species of special concern)
- Salt marsh wandering shrew (*Sorex vagrans halicoetes*) (state species of special concern)
- Townsend's big-eared bat (*Corynorhinus townsendii*) (state candidate for listing as threatened)

There is both current and potential future exposure of ecological receptors to contaminated FSFA soil. There are potentially complete current exposure pathways for terrestrial receptors exposed to FSFA soil via dermal contact, direct uptake (plants), ingestion of contaminated prey, or incidental ingestion while foraging. In addition, there is potential exposure of wetland receptors to contaminated FSFA soil if the soil erodes or is transported into the surrounding stormwater pond of Navy IR Site 25, which was remediated for the protection of wetland receptors (ITSI Gilbane 2013).

Heavy rains in the area may accelerate erosion of contaminants in soil at AOI 14 into the surrounding stormwater retention pond at Navy IR Site 25. Heavy rains may also cause the stormwater retention pond to fill, which may further erode soil from the slopes of the FSFA. If the stormwater pond is modified to be in hydraulic communication with San Francisco Bay, the slopes of the FSFA may be subject to tidal changes and increases in sea level, which also may cause erosion of contaminated soil into Navy IR Site 25.

Concentrations of lead, total DDT, and total PCBs in soil at the FSFA exceed the cleanup goals developed for adjacent Navy IR Site 25. Currently, heavy vegetation on the peninsula and the ICAM silt fence prevent soil from eroding from AOI 14 into Navy IR Site 25, and so the immediacy of the threat is low.

4.0 ENDANGERMENT DETERMINATION

Actual or threatened releases of pollutants or contaminants from this site may present an imminent and substantial endangerment to public health, or welfare, or the environment. If no action is taken, lead, total DDT and total PCBs in soil pose potential risk to industrial workers and ecological receptors at AOI 14 and within the surrounding stormwater retention pond.

5.0 PROPOSED ACTIONS AND ESTIMATED COSTS

This section describes the selected NTCRA to address the RAOs for AOI 14. The NTCRA is designed to prevent erosion of contaminated soil and the release of contaminants from AOI 14 to the adjacent stormwater retention pond (Navy IR Site 25). The NTCRA addresses contaminated fill that was deposited in the northern portion of the FSFA peninsula. The N217 and N217A areas do not require remediation and are not included in the NTCRA due to the depths and limited extent of contamination in these areas. Because NASA intends this NTCRA to be the final action at AOI

14, potential risks to all human and ecological receptors were evaluated and also will be addressed by the NTCRA. This section also describes alternative actions considered in the EE/CA, discusses applicable or relevant and appropriate requirements (ARARs), and presents the estimated costs and timeframes for the selected NTCRA.

Cleanup goals for AOI 14 were set equal to the do-not-exceed remediation goals applied for Navy IR Site 25, which were developed for the protection of wetland receptors. These goals are deemed protective of other potential receptors at AOI 14 because the cleanup goals are less than human health and ecological screening levels, except for the lead cleanup goal (93.8 mg/kg). The lead cleanup goal is greater than the DTSC residential screening level (80 mg/kg) (DTSC 2014). However, all detected concentrations of lead at AOI 14 that exceeded the DTSC screening level also exceeded the cleanup goal (that is, no concentrations of lead were detected at concentrations between 80 and 93.8 mg/kg). Therefore, the cleanup goal is protective of hypothetical residents based on the current site characterization and current soil data. In addition, detected concentrations of lead at AOI 14 were less than the EPA Regional Screening Level (RSL) for lead (400 mg/kg) (EPA 2015). Furthermore, residential use of the site is not planned. The areas at AOI 14 where concentrations of lead, total DDT, and total PCBs exceed the cleanup goals and are addressed by this NTCRA are indicated on [Figure 5](#).

In addition to the cleanup goals in [Table 1](#), site-wide (or area-weighted) average remediation goals developed for the Navy IR Site 25 remedial action will be considered. Although these goals are not cleanup goals for AOI 14, the site-wide average remediation goals will be used to ensure that residual concentrations of these chemicals at AOI 14 will be protective of wetland receptors, using the results of confirmation sampling with respect to the site-wide average remediation goals developed for Navy IR Site 25. If residual site-wide average concentrations of lead, total PCBs, and total DDT exceed Navy IR Site 25 site-wide average remediation goals, additional evaluation or removal of soil at AOI 14 will be conducted.

5.1 PROPOSED ACTIONS

This section describes the NTCRA for AOI 14.

5.1.1 Proposed Action Description

The NTCRA (identified as Alternative 3 in the EE/CA) includes the following components:

- Excavation of all fill material in the northern portion of the FSFA where contaminant concentrations exceed cleanup goals.
- Transportation of excavated fill off site to an appropriate disposal facility.
- Grading of disturbed areas for stormwater drainage.

- Ecological mitigation and monitoring, including habitat restoration, of areas where sensitive habitat was disturbed during NTCRA activities.

NASA may implement institutional controls (IC) as part of the NTCRA or any subsequent removal actions. Residual concentrations of lead, total DDT, and total PCBs at AOI 14 will be evaluated to determine the need for ICs to address future residential use of the site.

The fill material containing concentrations of lead, total PCBs, and total DDT above cleanup goals will be excavated and transported off site for disposal. The estimated maximum horizontal extent of the excavation within the NTCRA boundary is shown on [Figure 5](#). The excavation will extend vertically until clean fill material is encountered (based on the results of previous investigations and confirmation sampling) or until native soil beneath the fill (based on visual inspection) is encountered. The side slopes of the remaining, uncontaminated fill material or native soil at the FSFA will be sloped to drain and minimize erosion of the material into the stormwater retention pond. The existing ICAM silt fence or other erosion control barriers will be maintained to prevent erosion of contaminated material into the stormwater retention pond until the NTCRA is complete.

Samples will be collected from the fill to dictate the extent of excavation to meet cleanup goals and to calculate the residual site-wide average concentrations.

The design parameters — such as the volume of material to be excavated, sampling requirements, habitat mitigation, and species and sources of selected vegetation — will be specified in the removal action design and detailed mitigation plan. These design specifications were assumed in the EE/CA for evaluation of the removal alternatives, particularly for the cost analysis. General assumptions of the scope of the NTCRA are described in the following paragraphs. More detailed assumptions are included in Appendix C of the EE/CA for cost estimating purposes. Actual quantities and materials used may vary from this estimate. The accuracy of the cost estimate for the NTCRA was intended to be within the range of plus 50 percent to minus 30 percent of actual costs (EPA 1988).

It is estimated that approximately 90 percent of the contaminated fill material will meet the requirements for disposal at a nonhazardous waste landfill, 5 percent will meet the requirements for disposal at a hazardous waste landfill, and 5 percent will be disposed of off site as construction debris.

It is estimated that the total volume of material to be excavated will be 71,000 (bank) cubic yards, which is based on the previous soil data collected at the FSFA and assuming that the excavation areas will extend to sample locations with contaminant concentrations below the cleanup goals. Approximately 12,000 (bank) cubic yards of clean overburden will be returned to the FSFA to be used for grading. Approximately 53,000 (bank) cubic yards will be excavated, sampled, and disposed of at a nonhazardous waste landfill, and approximately 3,000 (bank) cubic yards are estimated to require disposal at a hazardous waste landfill. Approximately 3,000 (bank) cubic yards of construction debris will be transported and disposed of as solid waste at either a California

Class II landfill or as construction debris. NASA will comply with the CERCLA Off-Site Rule in the NCP at 40 CFR § 300.440 for off-site disposal of contaminated fill and debris.

NASA will continue to work with USFWS and CDFW to protect special status species during the NTCRA and to restore disturbed ecological habitat. A qualified biologist will monitor the NTCRA and oversee mitigation activities. Habitat includes pickleweed immediately surrounding and on the existing slopes of the FSFA and upland habitat that covers the remaining surface of the FSFA. The mitigation area will be monitored to ensure the mitigation is effective. The specific mitigation criteria and actions to be conducted will be detailed in subsequent site removal action documents.

After the ecological mitigation is complete, no further maintenance or monitoring will be required for AOI 14 because no contamination exceeding the cleanup goals will be left in place.

5.1.2 Contribution to Remedial Performance

This NTCRA is designed to address potential human health and ecological risks from exposure to contamination at AOI 14 and to address the potential erosion of contaminated soil and the release of contaminants into the adjacent stormwater retention pond. Current data indicate that AOI 14 will be available for unrestricted use after the NTCRA is completed and that no long-term monitoring or ICs will be necessary to maintain the effectiveness of the NTCRA because soil exceeding cleanup goals would not remain on AOI 14. However, NASA may implement ICs as part of the NTCRA if necessary. NASA intends the NTCRA to be the final action for AOI 14 because the NTCRA will address all potential risks at AOI 14.

5.1.3 Engineering Evaluation/Cost Analysis

The Final EE/CA for AOI 14 was issued in September 2015, and reflects review by EPA, the Water Board, USFWS and CDFW, as well as public review. The EE/CA evaluated technologies and alternatives that could be used to achieve the RAOs at AOI 14. The following general response actions were identified to meet the RAOs for contaminants in soil at AOI 14:

- No Action: The no-action alternative serves as a baseline for comparison with other alternatives and is required by the NCP.
- Land Use Controls: Land use controls include engineering controls and ICs such as administrative or legal controls. Land use controls can minimize or prevent human exposure to contaminants. They also can limit changes to site conditions that alter exposure mechanisms.
- Containment: Containment includes covers over contaminated soil to prevent direct exposure of receptors through the dermal contact and ingestion exposure pathways and transport of contaminated soil off site.

- Removal: Removal technologies include excavation and off-site disposal of contaminants in surface or subsurface soil. Contaminants are physically removed and transported to another location designed to handle them.
- Treatment: Treatment processes actively or passively reduce the toxicity, mobility, or volume of contaminants. Treatment processes include biological and monitored natural attenuation, physical/chemical, or thermal technologies.

Technologies were identified under each general response action and evaluated for their effectiveness, implementability and cost. The following alternatives were developed from the list of technologies retained to address the soil contamination at the FSFA:

- Alternative 1: No Action
- Alternative 2: Soil Cover and ICs
- Alternative 3: Excavation and Off-site Disposal

Under Alternative 1, no action would be taken at AOI 14 to reduce, control, or prevent exposure to contamination in soil. This alternative was retained throughout the evaluation process as required by the NCP to provide a baseline for comparison with other alternatives.

Alternative 2 included: (1) construction of a soil cover over contaminated soil on the northern portion of the FSFA; (2) ICs to prohibit residential use of the site and require maintenance of the cover; (3) ecological restoration of sensitive habitat disturbed during construction of the cover; and (4) long-term monitoring to ensure the effectiveness of the remedy.

Alternative 3 included excavation and off-site disposal of contaminated soil in the northern portion of the FSFA, where concentrations of contaminants exceed cleanup goals, and restoration of the excavation area to appropriate ecological habitat. After excavation and ecological restoration, the site would be available for unrestricted use.

The alternatives were evaluated and compared using the nine NCP evaluation criteria. Alternative 3 was chosen as the preferred alternative because it will provide overall protection of human health and the environment and comply with the ARARs identified, while providing the best long-term effectiveness, habitat for special status species, and anticipated state and community acceptance. Alternative 3 would not rely on long-term monitoring or ICs, and NASA anticipates that the site will be available for unrestricted use after the NTCRA is complete.

The evaluation of NTCRA alternatives for AOI 14 did not include the NCP modifying criteria of state and community acceptance. However, the Final EE/CA reflects EPA, Water Board, and CDFW review comments; these comments indicated their preference for Alternative 3. NASA announced a public comment period from September 4 through October 3, 2015, and presented a

summary of the Final EE/CA at the November 12, 2015, Navy Restoration Advisory Board Meeting. No significant public comments were received on the final EE/CA from the public review.

5.1.4 Applicable or Relevant and Appropriate Requirements

This section describes federal and state ARARs for the NTCRA. Only substantive requirements were considered in the evaluation of ARARs for this NTCRA because on-site CERCLA response actions do not require permitting. Administrative requirements such as issuance of permits, documentation, reporting, and approval or consultation with administrative bodies are not ARARs and are not identified.

As the lead federal agency, NASA identified federal ARARs for the NTCRA. NASA requested state ARARs on September 22, 2014. The Water Board provided potential state ARARs on October 27, 2014, CDFW provided potential state ARARs on November 18, 2014, and DTSC provided potential ARARs on November 24, 2014. NASA evaluated these potential state ARARs in the EE/CA. All federal and state ARARs accepted by NASA for the NTCRA are identified below and in [Attachment 1](#).

The NTCRA will comply with all substantive provisions of the chemical-, location-, and action-specific ARARs identified below.

5.1.4.1 Chemical-Specific ARARs

Chemical-specific ARARs are numerical values promulgated for a specific environmental medium. If available, chemical-specific ARARs can be used as the basis for establishing cleanup levels. No chemical-specific ARARs were identified for the contaminants at AOI 14 that present a numerical cleanup goal or were used to develop RAOs.

Chemical-specific ARARs are identified for the NTCRA, which would generate waste for off-site disposal. The waste generated must be characterized to dispose of the waste at an appropriate facility. The federal RCRA requirements at 40 CFR Part 261 do not apply in California because the state RCRA program has been authorized by the EPA. As a result, the authorized state RCRA requirements are federal ARARs. NASA has not found any information indicating the waste at AOI 14 is RCRA-listed waste, primarily because the fill at AOI 14 was placed in the late 1970s, before the Hazardous and Solid Waste Amendments to RCRA were enacted. Therefore, the waste would be analyzed to determine if it is RCRA characteristic waste prior to off-site disposal. The federal ARARs for characterizing the waste are:

- California Code of Regulations Title 22 (22 CCR), § 66261.21 – defining the RCRA characteristic of ignitability
- 22CCR § 66261.22(a)(1) – defining the RCRA characteristic of corrosivity

- 22 CCR § 66261.23 – defining the RCRA characteristic of reactivity
- 22 CCR § 66261.24(a)(1) – defining the RCRA characteristic of toxicity
- 22 CCR § 66261.100 – defining a RCRA hazardous waste

NASA has also accepted the following state ARARs for determining if the waste is state-regulated hazardous waste:

- 22 CCR §§ 66261.3, 66261.22(a)(3) and (4), 66261.24(a)(2) through (8), and 66261.101 – defining state-regulated hazardous waste

If concentrations of contaminants cause the waste to meet the definitions of RCRA characteristic waste, then it must be managed and disposed of as hazardous waste.

If the waste does not meet the definition of RCRA hazardous waste, it must still be characterized according to state requirements to determine if it must be disposed of at a classified facility. The state ARARs are:

- 27 CCR § 20210, 20220, and 20230 – defining a designated waste, nonhazardous solid waste, and inert waste

5.1.4.2 Location-Specific ARARs

Location-specific ARARs are identified based on certain site-specific characteristics or protected resources present at the site. Biological resources and wetlands are the only protected resources present or potentially present at or around AOI 14.

NASA has identified the following federal location-specific ARARs for the protection of biological resources:

- Endangered Species Act of 1973 at 16 U.S.C. §§ 1536(a) and (h)(1)(B) – which prohibits federal agencies from jeopardizing the continued existence or the critical habitat of federal threatened or endangered species
- Migratory Bird Treaty Act at 16 U.S.C. § 703 – which protects migratory birds (listed at 50 CFR § 10.13) from unregulated takings

NASA has accepted the following state location-specific ARARs for the protection of biological resources:

- California Fish and Game Code § 1908 – which prohibits the taking of endangered or rare native plants
- California Endangered Species Act at California Fish and Game Code § 2080 – which prohibits the taking, possessing, purchasing, or selling of any state threatened or endangered species
- California Fish and Game Code § 3511 – which prohibits the taking of fully protected birds including the Ridgway’s rail, California black rail, and California least tern
- California Fish and Game Code § 4700 – which prohibits the taking of fully protected mammals or their parts
- California Fish and Game Code § 5650 – which prohibits the deposition or placing of material deleterious to plant, fish, or bird life where it can pass into waters of the state

This NTCRA will protect potential ecological receptors from exposure to contamination in fill at AOI 14. Pursuant to CERCLA § 121(e), a permit, that is, a biological opinion, is not required for the portion of the removal action that occurs on site. Because the excavation of contaminated soil will occur on site, NASA is not required to obtain a biological opinion. However, NASA is working with USFWS on the implementation of avoidance and mitigation measures under the Federal Endangered Species Act of 1973 in the NTCRA. NASA will continue to work with USFWS and CDFW to develop reasonable avoidance and mitigation actions and, NASA will determine which avoidance and mitigation actions to implement in the removal action work plan. In addition, ecological restoration and monitoring are components of the NTCRA in compliance with these ARARs.

NASA has identified the following federal location-specific ARARs for protection of wetlands:

- Clean Water Act § 404 – which prohibits the discharge of dredge and fill material into Waters of the U.S., including adjacent wetlands, without a permit
- Executive Order 11990 – which requires federal agencies to avoid undertaking new construction in wetlands unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm to wetlands

NASA will determine in the remedial design if the excavation results in more than incidental fallback of material. If only incidental fallback will occur, then the requirement to comply with Clean Water Act § 404 and Executive Order 11990 will not be triggered. If material other than incidental fallback will be discharged into the wetland, then compliance with Clean Water Act § 404 and Executive Order 11990 will be required. Pursuant to CERCLA § 121(e), a permit is not required for the portion of the removal action that occurs on site. Because the excavation and discharge of dredge and fill material will occur on site, NASA is not required to obtain a permit or

submit a notice of intent to discharge under a nationwide permit. However, NASA will use the substantive provisions of the U.S. Army Corps of Engineers Nationwide Permit 38 as a means of complying with Clean Water Act § 404. In addition, issuance of a federal permit typically triggers a state water quality certification pursuant to Clean Water Act § 401. Clean Water Act § 401 is not an ARAR because it is procedural. However, NASA will use the substantive provisions of the Water Board's certification application as a means of complying with the Clean Water Act state water quality discharge requirements.

The excavation in the jurisdictional wetland will not result in the loss of any portion of the wetland; therefore, a compensatory mitigation plan is not necessary.

5.1.4.3 Action-Specific ARARs

The following federal action-specific ARARs are identified for the NTCRA:

Resource Conservation and Recovery Act

- RCRA at 22 CCR §§ 66262.10(a) and 66262.11 – these provisions require generators of waste to determine if the waste is RCRA hazardous. Contaminated soil excavated for off-site disposal would be considered waste. NASA will characterize the waste at the time it is generated for appropriate off-site disposal.
- RCRA at 22 CCR § 66264.13(a) and (b) – these provisions present requirements for analyzing waste to determine if it is RCRA hazardous. NASA will characterize the waste (excavated soil) at the time it is generated for appropriate off-site disposal.
- RCRA at 40 CFR § 264.554 – this regulation is part of the RCRA corrective action management unit regulations and allows generators to accumulate remediation waste in a staging pile for storage without triggering land disposal restrictions. NASA will construct a temporary staging pile to hold excavated soil prior to off-site disposal.
- RCRA at 22 CCR § 66264.111(a) and (b) – if constructed during the NTCRA, the temporary staging pile would be closed in a way that minimizes or eliminates the need for further maintenance and controls.
- RCRA at 22 CCR § 66264.258(a) and (b) – these provisions require that all contaminated staging pile components, equipment, and contaminated subsoil be removed at closure of the staging pile (if constructed during the NTCRA).
- RCRA at 22 CCR §§ 66268.7 and 66268.9(a) – these provisions require the generator of waste to identify each EPA hazardous waste code and to determine if the waste is subject to land disposal restrictions and, if so, the applicable land disposal treatment standards. NASA will make this determination when it generates the waste.

Toxic Substances Control Act (TSCA)

- TSCA at 40 CFR § 761.61(c) – this provision allows for risk-based disposal of PCB remediation waste. This risk-based disposal is predicated on EPA approval, which EPA has indicated it will provide under separate cover. This provision was used to support the determination that NASA will sample for and clean up concentrations of PCBs exceeding the risk-based PCB cleanup level at AOI 14. NASA will dispose of PCB-contaminated soil at a permitted off-site disposal facility licensed to accept PCB remediation waste generated during excavation.
- TSCA at 40 CFR § 761.61(a)(5)(i)(B)(2)(ii) and (iii) – this provision requires PCB remediation waste with PCB concentrations equal to or exceeding 50 mg/kg to be disposed of in a landfill permitted under RCRA § 3004 or in a permitted PCB disposal facility.
- TSCA at 40 CFR § 761.65(c)(4) – this provision requires movable equipment used to handle PCB remediation waste with PCB concentrations equal to or exceeding 50 mg/kg to be decontaminated as specified in 40 CFR § 761.79.
- TSCA at 40 CFR § 761.79(b)(1) – this provision presents the decontamination standard for water containing PCBs that was used to decontaminate the movable equipment.

Clean Water Act (CWA)

- CWA § 402(p) and its implementing regulations at 40 CFR § 122.44(k)(2) and (4) – these provisions require the use of best management practices to control stormwater discharges from construction activities that disturb at least 1 acre. The excavation will affect more than 1 acre. NASA will develop appropriate stormwater control practices in the removal action design.

Clean Air Act

- Bay Area Air Quality Management District Rule 6-1-305 – this provision requires control of the emission of visible particles. Because excavation will generate dust, NASA will develop appropriate dust control practices in the removal action design.

The following state action-specific ARARs are accepted for the NTCRA:

Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste

- Solid Waste at 27CCR § 20090(d) – this provision exempts public agency cleanup actions from complying with State Water Resources Control Board (SWRCB)-promulgated requirements, provided that the public agency complies with SWRCB-promulgated

requirements that wastes, pollutants, or contaminated materials removed from the immediate place of release must be discharged according to the SWRCB-promulgated sections of Article 2, Subchapter 2, Chapter 3, Subdivision 1.

- Solid Waste at 27CCR §§ 20210 and 20220(b), (c), and (d) – these provisions require generators of waste to characterize the waste for appropriate disposal at a classified waste management unit.

Clean Water Act

- Chapters 2, 3, and 4 of the Comprehensive Water Quality Control Plan for the San Francisco Bay Region – as they pertain to the jurisdictional wetland. If the excavation results in the discharge of dredge or fill into the jurisdictional wetland, NASA will comply with the state water quality discharge requirements.
- SWRCB Order 2009-0009-DWQ, as amended by SWRCB Orders 2010-0014 and 2012-0006 – this order is the SWRCB’s permit for controlling stormwater discharges from construction activities that affect at least 1 acre. The excavation will affect at least 1 acre, and NASA has identified CWA § 402(p) and its implementing regulations at 40 CFR § 122.44(k)(2) and (4) as potential federal ARARs. NASA will comply with the substantive requirements of this construction activity stormwater permit as a means of complying with the potential CWA ARARs.

5.1.5 Project Schedule

NASA intends to implement the NTCRA and maintain the effectiveness of the ICAM until the NTCRA is complete. The schedule for implementation of the NTCRA will be detailed in the removal action work plan and will reflect the FFA schedule. To minimize effects to special status species, major site work will be conducted from September to March, as feasible, to avoid the breeding seasons of special status species. Based on this constraint, it is anticipated that construction will begin in September 2017 pending funding and contracting actions and that the NTCRA will be completed in 12 months. However, site work may be interrupted or modified based on ecological concerns. The design will discuss contingency measures to be taken if NTCRA activities are required over two or more breeding seasons.

The RAOs will be met after excavation is complete. However, ecological mitigation may require monitoring for several years.

5.2 ESTIMATED COSTS

NASA estimated the cost of the NTCRA in the EE/CA (Alternative 3). Cost assumptions and the capital, maintenance and monitoring, and present value costs are included in Appendix C of the EE/CA. These costs are summarized in [Table 2](#). The accuracy of the cost estimate for the NTCRA

was intended to be within the range of plus 50 percent to minus 30 percent of actual costs (EPA 1988). The level of detail in developing these estimates is considered appropriate for making choices among alternatives, but the cost estimates are not intended for use in detailed budgetary planning.

Table 2: Estimated Costs of Non-Time-Critical Removal Action	
Description	Estimated Cost
Capital Cost	\$9,938,000
Operation and Maintenance and Periodic Cost	\$324,000
Total Future Value	\$10,262,000
Total NTCRA Present Value Cost¹	\$10,803,00

Notes:

1 The total present value cost was calculated in Appendix C of the final EE/CA (Tetra Tech 2015).

The costs for the NTCRA are based on the assumptions listed in the EE/CA, including (1) the volume of fill material excavated and disposed of off site, and (2) the percentage of fill material disposed of as nonhazardous waste or hazardous waste. The actual costs of the NTCRA may vary significantly if these assumptions are changed or if there are significant changes to current transportation and disposal costs. A sensitivity analysis included in Appendix C of the EE/CA describes the potential impacts of some of the major cost assumptions.

6.0 EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If action should be delayed or not taken, soil with concentrations of lead, total PCBs, and total DDT above cleanup goals may erode into the surrounding stormwater pond within Navy IR Site 25 where a remedial action has been completed by the Navy. Currently, a silt fence barrier is being maintained to prevent erosion of contaminated soil and the release of contaminants into the stormwater pond. In addition, human and ecological receptors at AOI 14 may be exposed to soil with concentrations of lead, pesticides, and PCBs exceeding cleanup goals.

If the NTCRA is interrupted or modified by ecological concerns (for example, the breeding seasons of special status species), contingency measures will be implemented to prevent erosion of contaminated soil into adjacent Navy IR Site 25 until the NTCRA is complete. The design will specify these contingency measures.

7.0 OUTSTANDING POLICY ISSUES

No outstanding policy issues are associated with AOI 14 or this NTCRA.

8.0 RECOMMENDATION

This Action Memorandum documents, for the Administrative Record, NASA's decision to undertake a NTCRA at AOI 14 and was developed in accordance with current EPA guidance documents for removal actions under CERCLA (EPA 2009).

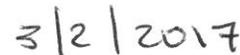
The purpose of the recommended NTCRA is to prevent erosion of contaminated soil and the release of contaminants from AOI 14 to adjacent Navy IR Site 25. However, NASA intends this NTCRA to be the final action at AOI 14; therefore, potential risks to human and ecological receptors were evaluated and are also addressed by the NTCRA. The actions to be conducted for the NTCRA are recommended because they provide a high degree of protection of human health and the environment, do not involve significant administrative or technical constraints, and are not cost-prohibitive.

Excavation and Off-site Disposal (Alternative 3 in the Final EE/CA) is the recommended alternative to address potential risks to human health and the environment from contamination in soil at AOI 14. This action meets the two threshold criteria of overall protection of human health and the environment and compliance with ARARs and provides the best balance of long-term protectiveness, short-term exposure, implementability, and cost.

This decision document represents NASA's selected NTCRA for AOI 14 at NASA Ames, California, developed in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act, and is not inconsistent with the NCP. This decision is based on the Administrative Record for the site.



Donald M. Chuck
Chief, Environmental Management Division
NASA Ames Research Center



Date

9.0 REFERENCES

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**ATTACHMENT 1
FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE
REQUIREMENTS**

ATTACHMENT 1, TABLE 1: FEDERAL AND STATE CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action Memorandum for AOI 14, NASA Ames, Moffett Field, California

Requirement	Prerequisite	Citation	ARAR Determination	Comments
FILL				
Federal				
Resource Conservation and Recovery Act				
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the TCLP, if the concentration exceeds the TCLP maximum concentrations.	Waste	22 CCR § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100	Applicable	The substantive provisions of these requirements are applicable to activities that generate waste. NASA will generate waste from the excavation of contaminated fill for off-site disposal. NASA will characterize the waste at the time it is generated for appropriate off-site disposal.
State				
State and Regional Water Quality Control Boards				
Waste classification definitions of designated waste, nonhazardous solid waste, and inert waste	Waste	27 CCR §§ 20210, 20220, and 20230	Applicable	These requirements are applicable for activities that discharge classified waste to land. NASA will generate waste from the excavation of contaminated fill for off-site disposal. The excavated fill will be characterized for appropriate off-site disposal.
Department of Toxic Substances Control				
Definition of California hazardous waste	Waste	22 CCR §§ 66261.3, 66261.22(a)(3) and (4), 66261.24(a)(2)-(a)(8) and 66261.101	Applicable	These regulations define non-RCRA, state regulated hazardous waste. NASA will generate waste from the excavation of contaminated fill for off-site disposal. The excavated fill will be characterized for appropriate off-site disposal.

Notes:

- § Section
- ARAR Applicable or relevant and appropriate requirement
- CCR California Code of Regulations
- NASA National Aeronautics and Space Administration
- RCRA Resource Conservation and Recovery Act

ATTACHMENT 1, TABLE 2: FEDERAL AND STATE LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action Memorandum for AOI 14, NASA Ames, Moffett Field, California

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
BIOLOGICAL RESOURCES					
Federal					
Endangered Species Act of 1973					
Presence of federal threatened or endangered species	Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat.	Presence or potential presence of federal listed species or designation of critical habitat	16 U.S.C. § 1536(a), (h)(1)(B)	Applicable	<p>The substantive requirements of these sections are applicable because the salt marsh harvest mouse, Ridgeway’s rail (formerly known as the California clapper rail), the California least tern, the Western snowy plover, and others, all federal endangered species are present or potentially present at AOI 14. NASA is not required to obtain a Biological Opinion, a permit, pursuant to CERCLA § 121(e)(1) because that is a procedural requirement.</p> <p>The objective of this CERCLA removal action is to protect ecological receptors and neighboring Navy IR Site 25 from exposure to contamination at AOI 14. NASA is already working with the U.S. Fish and Wildlife Service to mitigate the effects of its actions on the pickleweed habitat around the site and will continue to work with the U.S. Fish and Wildlife Service to develop appropriate avoidance actions in the removal action design. In addition, ecological restoration and monitoring are components of the selected removal action.</p>
Migratory Bird Treaty Act					
Presence of listed migratory birds	Protects migratory birds listed at 50 CFR § 10.13 from a taking.	Presence of migratory birds.	16 U.S.C. § 703	Applicable	<p>The substantive provisions of this section are applicable because federal endangered birds, such as the Ridgeway’s rail, the Western snowy plover, the California least tern, and migratory birds are present or potentially present at AOI 14. NASA will work with the U.S. Fish and Wildlife Service pursuant to the Endangered Species Act ARAR to develop appropriate avoidance actions for these migratory birds in the removal action design. In addition, ecological restoration and monitoring are components of the selected removal action.</p>

ATTACHMENT 1, TABLE 2: FEDERAL AND STATE LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action Memorandum for AOI 14, NASA Ames, Moffett Field, California

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
BIOLOGICAL RESOURCES					
State					
California Fish and Game Code					
Presence of an endangered native or a rare native plant	No person shall import into this state, or take, possess, or sell within this state, except as incident to the possession or sale of the real property on which the plant is growing, any native plant, or any part or product thereof that the commission determines to be an endangered native plant or rare native plant.	Presence of endangered or rare native plant	California Fish and Game Code § 1908	Relevant and appropriate	California Fish and Game Code § 1908 is not applicable because the United States of America has not waived sovereign immunity in the Federal Endangered Species Act (identified as a federal ARAR) for this State of California requirement. NASA accepts the substantive provisions of California Fish and Game Code § 1908 as a relevant and appropriate state ARAR because endangered or rare native plants may occur on AOI 14. NASA will complete plant surveys prior to implementing the removal to determine if endangered or rare native plants occur on the site. If endangered or rare native plants are found on the site, NASA will work with CDFW to determine reasonable protective measures; however, NASA will determine which measures it will implement.
Presence of state threatened or endangered species	No person shall take a state threatened or endangered species	Presence or potential presence of state listed species or designation of critical habitat	California Fish and Game Code § 2080	Relevant and appropriate	NASA's analysis of California Fish and Game Code § 1908 described in the comment column is also applicable to § 2080. NASA accepts the substantive provisions of California Fish and Game Code § 2080 as a relevant and appropriate state ARAR because there are state protected species, the salt marsh harvest mouse, Ridgeway's rail (formerly known as the California clapper rail), California least tern, California black rail, and Swainson's hawk, all state endangered species, present or potentially present at AOI 14. The objective of this CERCLA removal action is to protect potential on-site ecological receptors and neighboring Navy IR Site 25 ecological receptors from exposure to contaminants at concentrations exceeding the AOI 14 cleanup goals. NASA will work with CDFW to develop reasonable avoidance actions in the removal action design; however, NASA will determine which avoidance actions to implement. In addition, ecological restoration and monitoring are components of the selected removal action.
Presence of fully protected birds	Fully protected birds or parts thereof may not be taken or possessed at any time	Presence of fully protected birds	California Fish and Game Code § 3511	Relevant and appropriate	NASA's analysis of California Fish and Game Code § 1908 described in the comment column is also applicable to § 3511. NASA accepts the substantive provisions of California Fish and Game Code § 3511 as a relevant and appropriate State ARAR because the Ridgeway's rail, California black rail, and the

ATTACHMENT 1, TABLE 2: FEDERAL AND STATE LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action Memorandum for AOI 14, NASA Ames, Moffett Field, California

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
BIOLOGICAL RESOURCES					
State					
					California least tern, state fully protected birds, are present or potentially present at AOI 14 and neighboring Navy IR Site 25. The objective of this CERCLA removal action is to protect potential on-site ecological receptors and neighboring Navy IR Site 25 ecological receptors from exposure to contaminants at concentrations exceeding the AOI 14 cleanup goals. NASA will work with CDFW to develop reasonable avoidance actions in the removal action design; however, NASA will determine which avoidance actions to implement. In addition, ecological restoration and monitoring are components of the selected removal action.
Presence of fully protected mammals	Fully protected mammals or parts thereof may not be taken or possessed at any time	Presence of fully protected mammals	California Fish and Game Code § 4700	Relevant and appropriate	NASA's analysis of California Fish and Game Code § 1908 described in the comment column is also applicable to § 4700. NASA accepts the substantive provisions of California Fish and Game Code § 4700 as a relevant and appropriate State ARAR because the Salt marsh harvest mouse is a state fully protected mammal that is present or potentially present at AOI 14. The objective of this CERCLA removal action is to protect potential on-site ecological receptors and neighboring Navy IR Site 25 ecological receptors from exposure to contaminants at concentrations exceeding the AOI 14 cleanup goals. NASA will work with CDFW to develop appropriate avoidance actions in the removal action design; however, NASA will determine which avoidance actions to implement. In addition, ecological restoration and monitoring are components of the selected removal action.
Waters of the State	Prohibits the deposition or placement of listed materials that are deleterious to fish, plant life, or bird life where they can pass into waters of the state	Unauthorized discharge	California Fish and Game Code § 5650	Relevant and appropriate	California Fish and Game Code § 5650 is not applicable because the United States of America has not waived sovereign immunity for this State of California requirement. However, NASA accepts the substantive provisions of California Fish and Game Code § 5650 as a relevant and appropriate State ARAR because there will be excavation in a jurisdictional wetland. NASA will work with CDFW to develop reasonable controls in the removal action design to prevent a discharge deleterious to fish, plant, or bird life to waters of the state; however, NASA will determine which controls to implement.

ATTACHMENT 1, TABLE 2: FEDERAL AND STATE LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action Memorandum for AOI 14, NASA Ames, Moffett Field, California

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
WETLANDS RESOURCES					
Federal					
Executive Order No. 11990, Protection of Wetlands					
Wetland	Federal agencies must avoid undertaking new construction in wetlands unless the head of the agency finds: (1) that there is no practicable alternative to such construction; and (2) that the proposed action includes all practicable measures to minimize harm to wetlands	A wetland area inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions.	Executive Order 11990	To Be Considered criteria	Executive orders are not legally enforceable, and therefore are not identified as ARARs. As a result, this Executive Order was identified as to be considered criteria. AOI 14 is surrounded by jurisdictional wetlands and the selected removal action will include activities within the jurisdictional wetland. NASA has identified CWA § 404 as a location-specific ARAR and has identified the substantive provisions of Nationwide Permit 38, and the substantive provisions of the state's §401 water quality certification application, promulgated under CWA authority, as a means of complying with CWA § 404. Complying with these ARARs will result in compliance with Executive Order 11990.
Clean Water Act					
Waters of the U.S., including adjacent wetlands	The discharge of dredge and fill material into waters of the U.S., including adjacent wetlands, is prohibited unless authorized by permit.	Discharge of dredge and fill material into waters of the U.S.	CWA § 404 (33 U.S.C. § 1344)	Applicable	AOI 14 is surrounded by jurisdictional wetlands and the selected removal action will include activities within the jurisdictional wetland. CWA § 404 prohibits the discharge of dredge and fill material without a permit. The discharge of dredge and fill material does not include incidental fallback of material pursuant to 33 CFR § 323.2(d)(2)(iii). Therefore, if, during removal action design, NASA concludes that its activities would result in incidental fallback, then CWA § 404 would not be an ARAR, and other actions triggered by CWA § 404 (complying with the substantive provisions of Nationwide Permit 38 and state water quality discharge requirements) would not be required. NASA is not required to obtain a permit pursuant to CERCLA § 121(e)(1). However, NASA will comply with the substantive provisions of Nationwide Permit 38 and the state's § 401 water quality certification application as a means of complying with CWA § 404 and state water quality discharge requirements (as contained in Chapters 2, 3, and 4

ATTACHMENT 1, TABLE 2: FEDERAL AND STATE LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action Memorandum for AOI 14, NASA Ames, Moffett Field, California

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
WETLANDS RESOURCES					
Federal					
					of the Basin Plan, identified as state action-specific ARARs). NASA does not anticipate any wetland losses from implementation of the selected removal action, and pursuant to Nationwide Permit 38, compensatory mitigation is not required for wetland losses that are one-tenth of an acre or less.

Notes:

- § Section
- AOI Area of Investigation
- ARAR Applicable or relevant and appropriate requirement
- CDFW California Department of Fish and Game
- CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
- CFR Code of Federal Regulations
- CWA Clean Water Act
- ESA Endangered Species Act
- NASA National Aeronautics and Space Administration
- U.S.C United States Code

ATTACHMENT 1, TABLE 3: FEDERAL AND STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action Memorandum for AOI 14, NASA Ames, Moffett Field, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
SELECTED REMOVAL ACTION: EXCAVATION AND OFF-SITE DISPOSAL, GRADING OF DISTURBED AREAS, AND ECOLOGICAL MITIGATION AND MONITORING					
Federal					
Resource Conservation and Recovery Act					
Excavate fill	Person who generates waste shall determine if the waste is a RCRA hazardous waste.	Generator of waste.	22 CCR §66262.10(a), 66262.11	Applicable	These regulations are applicable to activities that generate waste. The excavation of contaminated fill will generate waste for off-site disposal. NASA will determine whether the fill is RCRA hazardous waste when it is generated.
Excavate fill	Provides requirements for analyzing waste for determining whether waste is hazardous.	Generator of waste.	22 CCR §66264.13(a) and (b)	Applicable	These regulations are applicable to activities that generate waste. The excavation of contaminated fill will generate waste for off-site disposal. NASA will determine whether the fill is RCRA hazardous waste when it is generated.
Stage fill for off-site disposal	Allows generators to accumulate solid remediation waste in a EPA-designated pile for storage only up to 2 years during remedial operations without triggering LDRs.	RCRA hazardous waste temporarily stored in piles.	40 CFR §264.554	Relevant and appropriate	These requirements are ARARs if excavated fill or waste is temporarily staged for off-site disposal. NASA does not anticipate that all fill would be RCRA hazardous waste; however, NASA has determined that these requirements are relevant and appropriate for all stockpiled fill. In addition, the fill contains concentrations of PCBs above 50 mg/kg. Storing PCB-contaminated fill in RCRA staging piles will also comply with TSCA storage requirements.
Close temporary fill staging pile	Minimize the need for further maintenance controls and minimize or eliminate, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated rainfall or runoff, or waste decomposition products to groundwater or surface water or to the atmosphere.	RCRA hazardous waste management facility	22 CCR, § 66264.111(a) and (b)	Relevant and appropriate	These requirements are ARARs for closing the temporary fill stockpile if a temporary stockpile is constructed.

ATTACHMENT 1, TABLE 3: FEDERAL AND STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action Memorandum for AOI 14, NASA Ames, Moffett Field, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
SELECTED REMOVAL ACTION: EXCAVATION AND OFF-SITE DISPOSAL, GRADING OF DISTURBED AREAS, AND ECOLOGICAL MITIGATION AND MONITORING					
Federal					
Close temporary fill staging pile	At closure, owner shall remove or decontaminate all waste residues, contaminated containment system components, contaminated subsoil, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste. If waste is left on site, post-closure care shall be performed in accordance with the closure and post-closure care requirements that apply to landfills.	RCRA hazardous waste pile.	22 CCR, § 66264.258(a) and (b)	Relevant and appropriate	These requirements are ARARs for closing the temporary fill stockpile if a temporary stockpile is constructed.
Excavate fill	A generator of waste shall determine if the waste has to be treated before it can be land disposed.	Waste	22 CCR § 66268.7	Applicable	These regulations are applicable to activities that generate waste. The excavation of contaminated fill will generate waste for off-site disposal. NASA will determine whether the fill is RCRA hazardous waste and needs to be treated prior to land disposal when it is generated.
Excavate fill	The initial generator of waste shall determine each EPA hazardous waste number (waste code) to determine the applicable treatment standards, which may be made concurrently with the hazardous waste determination required in § 66262.11.	Waste	22 CCR § 66268.9(a)	Applicable	These regulations are applicable to activities that generate waste. The excavation of contaminated fill will generate waste for off-site disposal. NASA will determine whether the fill is RCRA hazardous waste and needs to be treated prior to land disposal when it is generated.

ATTACHMENT 1, TABLE 3: FEDERAL AND STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action Memorandum for AOI 14, NASA Ames, Moffett Field, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
SELECTED REMOVAL ACTION: EXCAVATION AND OFF-SITE DISPOSAL, GRADING OF DISTURBED AREAS, AND ECOLOGICAL MITIGATION AND MONITORING					
Federal					
Toxic Substances Control Act					
Excavate fill contaminated with PCBs	Any person wishing to sample, cleanup, or dispose of PCB remediation waste in a manner other than prescribed in § 761.61(a) or (b) may apply to the Regional administrator in the Region where the sampling, cleanup, disposal, or storage site is located.	PCB remediation waste at concentrations equal or greater than 50 mg/kg.	40 CFR § 761.61(c)	Relevant and appropriate	The fill material contains concentrations of PCBs. The maximum detected concentration at AOI 14 was a detection of Aroclor-1260 at a concentration of 180 mg/kg. The primary objective of the removal action is to protect ecological receptors at AOI 14 and neighboring Navy IR Site 25. To accomplish the objective, the cleanup goal for PCBs was set at 0.21 mg/kg, a risk based concentration, and 40 CFR § 761.61(c) was used as the basis for the risk based concentration identified as the cleanup goal for PCBs in Table 1 of the AM. PCB concentrations in the fill material above 0.21 mg/kg would be excavated and disposed of off-site at an appropriate facility. This disposal is protective of human health and the environment because contaminants at concentrations exceeding cleanup goals would be removed from the site.
Off-site disposal of PCB remediation waste	PCB remediation waste with PCB concentrations above 50 mg/kg must be disposed of in a landfill permitted under RCRA § 3004 or in a permitted PCB disposal facility.	PCB remediation waste at concentrations equal or greater than 50 mg/kg.	40 CFR § 761.61(a)(5)(i)(B)(2)(ii) and (iii)	Relevant and appropriate	The fill material contains concentrations of PCBs. NASA will characterize the waste generated in the excavation to determine appropriate disposal requirements.
Decontamination of equipment	Movable equipment used to handle PCB remediation waste must be decontaminated as specified in 40 CFR § 761.79	PCB remediation waste at concentrations equal or greater than 50 mg/kg.	40 CFR § 761.65(c)(4)	Relevant and appropriate	NASA will decontaminate equipment used in the excavation of PCB-contaminated fill.
Decontamination of equipment	Decontamination standard for water containing PCBs used to decontaminate the movable equipment.	PCB remediation waste at concentrations equal or greater than 50 mg/kg.	40 CFR § 761.79(b)(1)	Relevant and appropriate	NASA will comply with this ARAR for water used in decontaminating movable equipment used in the excavation of PCB-contaminated fill.

ATTACHMENT 1, TABLE 3: FEDERAL AND STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action Memorandum for AOI 14, NASA Ames, Moffett Field, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
SELECTED REMOVAL ACTION: EXCAVATION AND OFF-SITE DISPOSAL, GRADING OF DISTURBED AREAS, AND ECOLOGICAL MITIGATION AND MONITORING					
Federal					
Clean Water Act					
Excavate fill	Construction that disturbs at least 1 acre must use best management practices to control storm water discharges.	Construction activities at least 1 acre in size.	Clean Water Act § 402 40 CFR §122.44(k)(2) and (4)	Applicable	The Phase II stormwater requirements are applicable to small construction activity, as defined in 40 CFR § 122.26(b)(15), that affects at least 1 acre. The excavation would disturb at least 1 acre. NASA will use the substantive provisions of the state stormwater permit, identified below, to comply with the stormwater discharge requirements under the CWA.

ATTACHMENT 1, TABLE 3: FEDERAL AND STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action Memorandum for AOI 14, NASA Ames, Moffett Field, California

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
SELECTED REMOVAL ACTION: EXCAVATION AND OFF-SITE DISPOSAL, GRADING OF DISTURBED AREAS, AND ECOLOGICAL MITIGATION AND MONITORING					
Federal					
Clean Air Act					
Excavate fill	A person shall not emit particles from an operation sufficient to cause annoyance to another person, large enough to be visible as particles at the emission point or of such size and nature as to be visible individually as incandescent particles	Emission of visible particles that could fall on real property other than the person responsible for the emission.	BAAQMD Rule 6-1-305	Applicable	The excavation would emit dust that could fall on the property of another. As a result, NASA would use dust suppression techniques to control emissions.
State					
Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste					
Address contamination at AOI 14	Cleanup actions taken by or at the direction of public agencies are exempt from the SWRCB-promulgated provisions of this subdivision except that waste shall be discharged appropriately.	Action taken by or at the direction of a public agency	27 CCR § 20090(d)	Applicable	NASA is addressing the unintentional release of pollutants at AOI 14. Waste removed from the place of release will be characterized and disposed of at an appropriate off-site disposal facility
Excavate soil for off-site disposal	Designated and nonhazardous solid waste must be discharged to a classified waste management unit.	Designated or nonhazardous solid waste	27 CCR § 20210 and 20220(b), (c), and (d)	Applicable	These regulations are ARARs for characterizing and disposing of waste off site.
State Water Resources Control Board and San Francisco Bay Basin Regional Water Quality Board					
Discharge dredge or fill material during excavation of fill	Designates beneficial uses, identifies narrative and numerical water quality objectives protective of designated beneficial uses, and presents implementation	Waters of the State	Chapters 2, 3, and 4 of the Comprehensive Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) as they pertain to the	Applicable	NASA accepts the substantive provisions of Chapters 2, 3, and 4 as they pertain to the jurisdictional wetland that is adjacent to and surrounds AOI 14. The selected removal action includes excavation in the jurisdictional wetland. If NASA determines that the excavation will result in the discharge of

ATTACHMENT 1, TABLE 3: FEDERAL AND STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

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Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
SELECTED REMOVAL ACTION: EXCAVATION AND OFF-SITE DISPOSAL, GRADING OF DISTURBED AREAS, AND ECOLOGICAL MITIGATION AND MONITORING					
	requirements to meet the designated beneficial uses.		discharge of dredge and fill material into wetlands		dredge and fill material into the wetland, NASA will comply with the substantive state water quality discharge requirements as they pertain to the discharge into wetlands. NASA has also identified Clean Water Act § 404 as a federal location-specific ARAR if the excavation results in the discharge of dredge and fill material into the jurisdictional wetland. As part of the Clean Water Act § 404 process, the discharger must comply with state water quality discharge requirements. The process for ensuring compliance with state water quality standards is the Clean Water Act § 401 water quality certification. Clean Water Act § 401 certification is a procedural requirement and so is not an ARAR. However, NASA will use the substantive provisions of the state's § 401 water quality certification application as a means of complying with Clean Water Act § 404 and state water quality discharge requirements (contained in Chapters 2, 3, and 4 of the Basin Plan).
Excavate fill	BMPs are required to prevent, monitor, and control stormwater discharges. Regulates pollutants in stormwater discharges.	Construction activity that affects at least 1 acre	SWRCB Order 2009-0009-DWQ, as amended by Orders 2010-0014 and 2012-006	Applicable	The excavation will affect at least 1 acre. NASA has identified CWA § 402(p) and its implementing regulations at 40 CFR § 122.44 (k)(2) and (4) as federal ARARs. NASA will use the substantive provisions of these SWRCB Orders as a means of complying with the federal stormwater ARARs. Pursuant to CERCLA § 121(e), permits are not required for CERCLA actions conducted on the CERCLA site, so it is not necessary to obtain an actual permit.

Notes:

§	Section	BMP	Best management practices
AOI	Area of Investigation	CCR	California Code of Regulations
ARAR	Applicable or relevant and appropriate requirement	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
BAAQMD	Bay Area Air Quality Management District		

ATTACHMENT 1, TABLE 3: FEDERAL AND STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action Memorandum for AOI 14, NASA Ames, Moffett Field, California

CFR	Code of Federal Regulations
CWA	Clean Water Act
EPA	U.S. Environmental Protection Agency
IC	Institutional controls
IR	Installation restoration
mg/kg	Milligrams per kilogram
NASA	National Aeronautics and Space Administration
RCRA	Resource Conservation and Recovery Act
SWRCB	State Water Resources Control Board