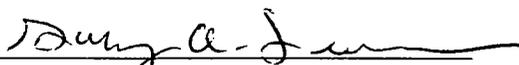


**Environmental Baseline Survey
NASA Research Park Parcel 1
Moffett Federal Airfield
Moffett Field, California**

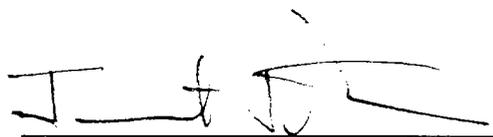
Prepared for

PAI/ISSI
NASA Ames Research Center
Moffett Field, California 94035-1000

HLA Project No. 50487 32



Gary A. Lieberman
Senior Geologist



Janet Peters RG
Principal Geologist

October 18, 2000



Harding Lawson Associates
Engineering and Environmental Services
90 Digital Drive
Novato, CA 94949 — (415) 883-0112

F72

EDC1318

Harding Lawson Associates

**Environmental Baseline Survey
NASA Research Park Parcel 1
Moffett Federal Airfield
Moffett Field, California**

Engineering and Environmental Services



**Environmental Baseline Survey
NASA Research Park Parcel 1
Moffett Federal Airfield
Moffett Field, California**

HLA Project No. 50487 32

This document was prepared by Harding Lawson Associates at the direction of PAI/ISSI for the sole use of PAI/ISSI, NASA, the U.S. Environmental Protection Agency, the California Environmental Protection Agency, Department of Toxic Substances Control, the California Environmental Protection Agency, Regional Water Quality Control Board, the U.S. Navy, the Middlefield-Ellis-Whisman (MEW) Companies, and prospective Nasa partners, the only intended beneficiaries of this work. No other party should rely on the information contained herein without the prior written consent of the PAI/ISSI and NASA. This report and the interpretations, conclusions, and recommendations contained within are based in part on information presented in other documents that are cited in the text and listed in the references. Therefore, this report is subject to the limitations and qualifications presented in the referenced documents.

CONTENTS

1.0	INTRODUCTION.....	1
1.1	Purpose.....	1
1.2	Procedures for Conducting an Environmental Baseline Survey	2
1.3	Limitations	2
1.4	Document Organization	3
2.0	SURVEY METHODOLOGY	4
2.1	Approach and Rationale.....	4
2.2	Program Review	4
2.3	Document Review	5
2.4	Interviews.....	5
3.0	BACKGROUND.....	6
3.1	Physical Setting	6
3.2	History	6
3.3	Environmental Setting.....	7
3.3.1	Physical Characteristics	7
3.3.1.1	Surface Features.....	7
3.3.1.2	Surface Water	7
3.3.1.3	Meteorology and Climatology	8
3.3.1.4	Geology.....	8
3.3.1.5	Hydrogeology	9
3.3.1.6	Habitat and Threatened or Endangered Species	9
3.3.1.7	Archeological Resources	11
3.4	Environmental Restoration Programs	12
3.4.1	Installation Restoration Program.....	13
3.4.2	Groundwater Contamination - West Side Aquifers/Regional Groundwater Plume North of 101	14
3.4.3	Risk Assessments	15
3.5	Environmental Compliance Programs	15
3.5.1	Hazardous Materials and Waste Management	15
3.5.2	Storage Tanks.....	17
3.5.3	Medical/Biohazardous Waste.....	17
3.5.4	Lead-Based Paint	17
3.5.5	Spent Abrasive Materials	18
3.5.6	Radioactive Materials.....	18
3.5.7	Mixed Waste	18
3.5.8	Radon	18
3.5.9	Storm Water Discharges and System.....	19
3.5.10	Wastewater.....	19
3.5.11	Air Quality	20
3.5.11.1	Emissions Inventory	20
3.5.11.2	Indoor Air Testing	20
3.5.11.3	Building 566 Passive Gas Monitoring Survey.....	21
3.5.12	Asbestos	22
3.5.13	Pesticides.....	22
3.5.14	Polychlorinated Biphenyls	23

3.5.15	Ordnance	23
3.5.16	Mold	23
4.0	FINDINGS FOR PARCEL 1	24
4.1	History and Current Usage	24
4.2	Environmental Restoration Programs	24
4.3	Environmental Compliance Programs	24
4.3.1	Hazardous Waste Management	24
4.3.2	Hazardous Materials Management	25
4.3.3	Storage Tanks	25
4.3.3.1	Underground Storage Tanks, Oil/Water Separators and Sumps	25
4.3.3.2	Aboveground Storage Tanks	25
4.3.4	Lead-Based Paint	25
4.3.5	Air Quality	25
4.3.6	Asbestos	26
4.3.7	Polychlorinated Biphenyls	26
4.3.8	Mold	26
4.4	Discussion of Findings	26
5.0	BIBLIOGRAPHY	28

TABLES

1	History of Installation Operations
2	Installation Restoration Program Sites
3	Underground Storage Tank Status
4	Aboveground Storage Tank Status
5	Lead Sampling Results
6	Asbestos Survey/Sampling Results
7	PCB Impacted Transformers/Capacitors
8	Building List Summary
9	Monitoring and Extraction Well Ownership and Total Depth
10	Former Hazardous Materials and Waste Locations
11	Current Hazardous Materials and Waste Locations

PLATES

1	Site Vicinity Map
2	Site and Parcel Location Map
3	IRP Location Map
4	Well and Treatment System Location Map
5	Storage Tank Location Map
6a	Utility Location Map #1
6b	Utility Location Map #2

APPENDICES

- A PARCEL ENVIRONMENTAL SUMMARY REPORTS
- B PLUME AND ALLOCATION MAPS
- C BURROWING OWL LOCATION MAP
- D ARCHEOLOGICAL SENSITIVE AREAS

DISTRIBUTION

ACRONYMS

1,1,1-TCA	1,1,1-Trichloroethane
1,1-DCA	1,1-Dichloroethane
1,1-DCE	1,1-Dichloroethene
1,2-DCE	cis and trans-1,2 -dichloroethene
ACGIH	American Conference of Governmental Industrial Hygienists
ACM	Asbestos Containing Materials
AOIs	Areas of Investigation
AST	Aboveground Storage Tank
BRAC	Base Realignment & Closure Program
CalEPA	California Environmental Protection Agency
CANG	California Air National Guard
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DFG	California Department of Fish and Game
DOI	Department of the Interior
DTSC	Department of Toxic Substances Control
EA	Endangerment Assessment
EBS	Environmental Baseline Survey
ESAs	Environmental Site Assessments
FEMA	Federal Emergency Management Agency
FFA	Federal Facilities Agreement
FOSL	Findings of Suitability to Lease
FS	Feasibility Study
HHRA	Human Health Risk Assessment
HLA	Harding Lawson Associates
HWAAAs	Hazardous Waste Accumulation Areas
HWMP	Hazardous Waste Management Plan
IRP/OU	Installation Restoration and Operable Units Program
LBP	Lead-Based Paint
LTA	Lighter-Than-Air
MCLs	Maximum Contaminant Levels
MFA	Moffett Federal Airfield
MSL	Mean Sea Level
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
National Register	National Register of Historic Places
NEX	Navy Exchange
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
°F	Fahrenheit
OSHA	Occupational Safety & Health Administration
PA	Preliminary Assessment
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PELs	Permissible Exposure Limits
PRGs	Preliminary Remediation Goals
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study Program
ROD	Record of Decision
RWQCB	California Regional Water Quality Control Board
STLC	Soluble Threshold Limit Concentration
SWEAs	Station-Wide Ecological Risk Assessments
TCE	Trichloroethene
TLV-TWAs	Threshold Limit Values-Time Weighted Averages
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds
WATS	West-Side Aquifers Treatment Systems

1.0 INTRODUCTION

Harding Lawson Associates (HLA) has prepared this Environmental Baseline Survey (EBS) to present the results of the assessment of known existing environmental conditions for Parcels 1 through 7 at Moffett Federal Airfield (MFA), formerly part of Naval Air Station (NAS) Moffett Field (NAS Moffett Field), California. The subject parcels are heretofore referred to as the NASA Research Park (NRP) Parcels. The location of Moffett Field is shown on Plate 1 and the NRP is shown on Plate 2. HLA conducted the assessment and prepared this report under contract to PAI/ISSI on behalf of NASA Ames.

As shown on Plate 1, the NRP Parcels are located along the southern boundary of the Moffett Field and comprise an area of approximately 213 acres that is being planned for redevelopment as a collaborative research and educational campus. As discussed above and in Section 2.0, the area is within Moffett Field, which was continuously operated by the U.S. military since it was commissioned in 1933 until it was transferred to the National Aeronautics and Space Administration (NASA) in 1994. As described in the Moffett Field Comprehensive Use Plan, Environmental Assessment (*Brady & Associates, 1994*), portions of Moffett Field will be converted from their former military use and leased for redevelopment as a laboratory and associated offices. In addition, the remainder of NRP is proposed for development as a collaborative research and educational campus as described in the *Notice of Intent to Prepare an Environmental Impact Statement*, published in the Federal Register on June 16, 2000.

1.1 Purpose

The purpose of the EBS is to 1) summarize the known existing environmental condition of the NRP in a manner that is easy to use by future lessees, and 2) evaluate the potential constraints that the existing conditions may have upon future leasing. To the extent that the information was available to the authors, the EBS addresses the following:

- Status of the site investigations and remediation
- Nature and extent of known contamination, if any
- Hazardous materials and waste management
- Underground storage tanks (UST) and aboveground storage tanks (AST)
- Status of building surveys for asbestos, lead-based paint (LBP), and radon
- Other information pertaining to environmental conditions on the parcel.

The EBS focuses on identifying and documenting environmental site characterization and remediation activities and the presence or likely presence of hazardous substances and/or hazardous waste on a portion of real property considered for lease. The EBS addresses hazardous substances or wastes, including certain substances not usually regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and other substances such as petroleum products, asbestos, LBP, PCBs, and mold in structures to the extent that relevant information is available. The EBS considers soil and groundwater contamination, and a description of potential public health and safety issues, for example, those associated with the soil or groundwater contamination or the condition of buildings, that may affect NASA's ability or decision to lease such property. The EBS does not constitute

a complete site characterization because it is based on existing available information. In addition, no confirmation/field verification was conducted.

1.2 Procedures for Conducting an Environmental Baseline Survey

Procedures for conducting an EBS are described in the DoD guidance (*U.S. DoD, 1994*). The EBS is similar to a CERCLA Preliminary Assessment (PA) and may include information from many sources, including ongoing programs, such as CERCLA remedial investigation and remediation, building surveys for asbestos, LBP, and radon, solid and hazardous waste management activities, and other programs, as discussed in Section 2.0. Specific EBS activities may include the following:

- Search, review, and documentation of existing records regarding environmental conditions on the parcel
- Description of known current or past activities on the parcel
- Interviews with current and/or former employees involved in operations on the parcel
- Description of known hazardous substance or hazardous waste management practices on the parcel and on adjacent parcels
- Documentation of observations made during visual and physical inspections (Not conducted for this EBS)
- Description of possible sources of contaminants on the parcel or on adjacent parcels, on the basis of available information
- Documentation and status of ongoing response actions.

1.3 Limitations

This document was prepared at the direction of PAI/ISSI for the sole use of PAI/ISSI, NASA, the U.S. Environmental Protection Agency (USEPA), the California Environmental Protection Agency (CalEPA), Department of Toxic Substances Control (DTSC), the Cal-EPA, Regional Water Quality Control Board (RWQCB), the U.S. Navy, the Middlefield-Ellis-Whisman (MEW) Companies, and prospective NASA partners, the only intended beneficiaries of our work, to support leasing of the NASA Research Park Parcels. No other party should rely on the information contained herein without the prior written consent of NASA and HLA.

HLA's professional services for this EBS, including the preparation of this document, were conducted in accordance with practices and procedures generally accepted in the environmental consulting field at this time; no other warranty is given or implied by this report.

Information about the presence or absence of hazardous substances in the area discussed in this report is based on limited data and observations. Environmental conditions may change over time and may be different away from locations where data or samples were collected or observations made. HLA does not and cannot have complete knowledge of environmental conditions in the area discussed. Furthermore, this report is complete and accurate only to the extent that cited reports and agency information are complete and correct, and to the extent that all relevant information has been provided to HLA. The purpose of the EBS is to identify and describe available information. In the EBS, HLA has not attempted

to independently verify the completeness or accuracy of the information presented, or to independently assess the environmental condition of the described area.

1.4 Document Organization

The remainder of this report is organized as follows:

- Section 2.0 provides a description of the methodology used to complete the EBS
- The background of the site including a physical description, history of the facility, the environmental setting including geology, hydrogeology, surface water, threatened or endangered species and sensitive habitat, and archeological resources, and a summary of the environmental restoration and compliance programs is presented in Section 3.0
- Sections 4.0 describes the Findings for Parcel 1
- References are provided in Section 5.0
- A summary of the information for Parcel 1 is presented in Appendix A
- Appendix B presents plume and environmental cleanup allocation maps for the NRP
- Burrowing owl locations and archeologically sensitive areas are presented in Appendix C and D, respectively.

2.0 SURVEY METHODOLOGY

2.1 Approach and Rationale

A systematic process was followed in which all available reports, records, maps, and interviews were analyzed. Reported conditions were evaluated to determine their impact on the characterization, remediation, reuse, and occupation of the NRP. On the basis of this information, conclusions were drawn relative to the environmental condition of the NRP. As discussed previously, physical inspections of the NRP to identify any new potential environmental concerns or to verify information obtained during the records review, were not conducted as part of this EBS.

Analysis of the ongoing or completed environmental programs at Moffett Field included the following:

- Building surveys for asbestos and lead based paint (LBP)
- Building surveys for mold
- Radon monitoring (limited to residential units and NASA buildings not within the NRP)
- Management of electrical transformers containing polychlorinated biphenyls (PCBs)
- Underground and aboveground storage tank (USTs and ASTs) management
- Basewide Remedial Investigation/Feasibility Study Program (RI/FS)
- Installation Restoration and Operable Unit Programs (IRP/OU)
- Stormwater Pollution Prevention Plan implementation
- Hazardous Waste Management, Minimization and Spill Contingency Plans
- Assessment of impacts from adjoining properties (MEW Superfund Site)
- Evaluation of air quality.

Results of each of these programs for Parcel 1 are described in Section 4.0.

2.2 Program Review

A review of the ongoing environmental restoration and compliance programs (discussed above) for the NRP was performed. NASA and PAI/ISSI program managers provided relevant and updated program data. The examination of these programs provided a comprehensive overview of the past and current environmental status of the NRP. After data evaluation the information was entered into Parcel Summary tables to facilitate record access and summary report production. The table for Parcel 1 is included as Appendix A to support the evaluation of the environmental condition of the NRP.

2.3 Document Review

The document review process focused on identifying parcel specific surveys, inspections, studies, field investigations, and interim and final remedial measures especially those completed subsequent to transfer of the NRP from the Navy.

Documents and information reviewed for this EBS include the following type of reports or investigative and management plans:

- Site reuse plans
- Building preliminary assessment/site inspections
- Work plans and sampling and analysis plans
- Remedial Investigation and Feasibility Study Reports
- Building construction information for buildings
- Results of building surveys for asbestos, LBP, radon, PCBs, and hazardous material/waste
- Inventories and management plans for USTs and ASTs
- Air monitoring reports/emissions inventories.

A complete list of the documents reviewed is provided in Section 5.0.

2.4 Interviews

Interviews were conducted with NASA and PAI/ISSI staff familiar with historic and current environmental restoration and compliance programs. Interviews with past and present employees who worked in the buildings located within the NRP were not performed as part of this EBS. Mr. Joseph Chou of the Cal/EPA Regional Water Quality Control Board and Ms. Roberta Blank of the U.S. EPA were contacted regarding the environmental restoration programs.

3.0 BACKGROUND

This section presents relevant information about Moffett Field with an emphasis on the NASA Research Park Parcels. It includes a description of the physical setting, the history of Moffett Field, a summary of the environmental setting, and the environmental restoration and compliance programs. Moffett Field includes NASA Ames Research Center and MFA. Moffett Field also includes the Army housing, however, the housing is not operated by NASA and is not included in this report.

3.1 Physical Setting

Moffett Field lies 35 miles south of San Francisco, 10 miles north of San Jose, and about 1 mile south of San Francisco Bay (Plate 1). The facility encompasses about 2,000 acres in Santa Clara County and borders the cities of Mountain View and Sunnyvale, California. To the north of Moffett Field are saltwater evaporation ponds and wetlands associated with San Francisco Bay; Stevens Creek lies to the west; U.S. Highway 101 runs along the southern perimeter; and Lockheed-Martin Aerospace facilities are located to the east. NASA Ames Research Center is in the northwest portion of Moffett Field. The area south of U.S. 101 is and has been industrial and includes a group of companies located or formerly located in a 0.5 square-mile area bounded by East Middlefield Road, Ellis Street, Whisman Road, and U.S. 101 referred to as the MEW Superfund Site. These companies are cleaning up soil and groundwater contamination believed to originate within the MEW Superfund site that has also affected groundwater quality beneath the NRP (*Tetra Tech, 1998c*).

The NASA Research Park Parcels (Plate 2) are in the southern portion of Moffett Field and comprise 213 acres. The NASA Ames Research Center lies to the north and west of the NRP, U.S. 101 bounds the NRP to the south, and the runways and hangars of Moffett Federal Airfield lie to the east.

3.2 History

Since the 19th century, the Moffett Field area was used for agriculture. Historic maps show a series of landings along the bay with connecting roads, stage stops, and residences in the area. (*PRC, 1994*).

The U.S. military continuously operated Moffett Field from its date of commission in April 1933 as the Sunnyvale Naval Air Station until it was transferred to NASA on July 1, 1994. A summary of the history of the base operations is provided in Table 1. Moffett Field's original mission was to serve as a base for the West Coast dirigibles of the lighter-than-air (LTA) program. The Navy continued to use the station as an air base until October 1935 when it was transferred to the Army Air Corps for use as a training base. During the Army's tenure, the National Advisory Committee for Aeronautics established Ames Research Center in December 1939 on land adjacent to the Navy at Moffett Field.

In April 1942, the base was returned to the Navy and renamed Naval Air Station (NAS) Moffett Field.

By 1950, Moffett Field was the largest naval air transport base on the West Coast and became the first all-weather air station. Jets first arrived in 1950 and included fighters (F3Ds, F2Hs, and F7Us). In 1953, the base became home to all Navy fixed-wing, land-based antisubmarine craft. A weapons department was formed on the base in 1954.

In 1958, NASA was created and absorbed Ames; thus it became the NASA Ames Research Center.

In February 1966, the base activated its high-speed refueling facilities, and in 1973, it became the headquarters of the Commander Patrol Wings, U.S. Pacific Fleet.

Between 1973 and 1994, Moffett Field's mission involved support of antisubmarine warfare training and patrol squadrons. At one point, Moffett Field was the largest P-3 base in the world, with nearly 100 P-3C Orion Patrol aircraft. These aircraft were assigned to nine squadrons supported by 5,500 military, 1,500 civilian, and 1,000 reserve personnel. No heavy manufacturing or major aircraft maintenance was conducted during the last mission; mostly unit- and intermediate-level maintenance occurred.

The base was designated for closure as an active military base under the U.S. Department of Defense Base Realignment and Closure (BRAC) program. The base was transferred in July 1994 to NASA, except the military housing units and associated facilities, which were transferred to Onizuka Air Force Base.

3.3 Environmental Setting

3.3.1 Physical Characteristics

The following description of physical characteristics discusses surface features, surface water, meteorology and climatology, geology, hydrogeology, and threatened or endangered species and habitat at Moffett Field.

3.3.1.1 Surface Features

Moffett Field is located near the southern end of San Francisco Bay on nearly flat fluvial basin deposits. Elevations range from approximately 36 feet above mean sea level (msl) to 2 feet below msl (*IT, 1993*). Since topographic relief is minimal, manmade structures are the most noticeable surface features and include buildings, aircraft hangars, roads, parking lots, runways, and landscaped areas.

The eastern and western sides of Moffett Field are separated by northwest trending runways. Most buildings are located on the western side of Moffett Field with the most prominent one being the very large Hangar 1 that at one time housed dirigibles. Features on the eastern side of Moffett Field include Hangars 2 and 3, the California Air National Guard (CANG) area, a golf course, and other buildings. Most areas surrounding the buildings are landscaped.

The area north of Moffett Field was once tidal salt marshes and mud flats of San Francisco Bay. These marshes and mud flats have been eliminated or greatly altered by diking and filling (*IT, 1993*). Currently, commercial saltwater evaporation ponds are present north of Moffett Field. A stormwater retention pond exists on 3 separate lands: Midpeninsula Regional Open Space District, NASA Ames, and MFA.

3.3.1.2 Surface Water

San Francisco Bay, California's largest estuary, is approximately 1 mile north of Moffett Field. Historically, tidal salt marsh and mud flats covered extensive areas of the southern portion of the bay including the northern portion of Moffett Field. However, most of these wetlands have been eliminated or greatly altered. The large area north and northeast of Moffett Field was diked several decades ago and is still used as commercial salt evaporation ponds.

Surface water features at Moffett Field include or have included stormwater drainage ditches, several small ponds, and a stormwater retention pond. There are no streams on Moffett Field, although several

streams are present to the east and west. Coyote Creek and Guadalupe Slough drain into San Francisco Bay east of Moffett Field, and Stevens Creek drains into San Francisco Bay to the west.

Stormwater in the eastern portion of the airfield (including the runways and aircraft aprons) drains through a system of surface channels (Patrol Road Ditch and Marriage Road Ditch) and subsurface drains to the Building 191 lift station and is pumped into the Northern Channel at its western end. Water is pumped from the eastern end of Northern Channel to Guadalupe Slough, which drains to San Francisco Bay. During significant rainfall, temporary lift stations pump water from Patrol Road Ditch and Marriage Road Ditch directly into the Northern Channel.

Stormwater in the western portion of the base drains to the stormwater settling basin via underground pipes. From the settling basin, the water flows northward through the Eastern Diked Marsh to the stormwater retention pond.

On the basis of an initial assessment study of Moffett Field performed by the National Energy Environmental Support Activity (NEESA), the Federal Emergency Management Agency (FEMA) projects that the eastern portion of Moffett Field will be inundated by 100-year tidal flooding (NEESA 1984). The 100-year flood is projected to reach 7.5 feet above msl and a significant portion of Moffett Field would be affected.

3.3.1.3 Meteorology and Climatology

Moffett Field experiences a Mediterranean climate with relatively dry, warm summers and cool, wet winters (IT 1993). Influences from the Pacific Ocean, San Francisco Bay, and cool valley breezes help to maintain moderate temperatures. The average annual temperature is 58 degrees Fahrenheit (°F). The average monthly temperature in August is 66° F, and the average monthly temperature in January is 50°F. Maximum temperatures have been recorded above 100°F, and minimum temperatures have been recorded as low as 22°F (IT, 1993).

During the day, moderate northern and northwestern winds are common; during the evening, winds are generally from the west (IT, 1993). Occasionally, winter storms are accompanied by severe southwestern winds. The average annual wind velocity is 7 miles per hour.

The average annual rainfall is 13.2 inches (IT, 1993). Most precipitation falls during the winter. Less precipitation falls during the spring, summer, and fall, with a dry period from May through September. During December, January, and February, the maximum monthly average precipitation is 2.5 inches, which decreases to between 1 and 2 inches per month during the spring and fall. Rainfall during the dry period is usually less than 0.5 inches per month. Thunderstorms are rare and can occur during any month, but are not usually intense. Snow is rare, and if it does fall, it does not accumulate.

Humidity averages 74 percent, with daily highs of 85 percent and lows of 60 percent (IT, 1993). Much of the humidity is attributed to the site's proximity to San Francisco Bay.

3.3.1.4 Geology

Moffett Field is located at the northern end of the Santa Clara Valley Basin, about 1 mile south of San Francisco Bay. The Santa Clara Valley Basin is a Pliocene-age, large, northwest-trending structural depression between the San Andreas and Hayward faults. The basin 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 (*Iwamura, 1980*). Locally, these sediments consist of varying combinations of clay, silt, sand, and gravel that represent interfingering of estuarine and fluvial depositional environments during the late Pleistocene and Holocene epochs. The interfingering of fluvial and estuarine sediments in southern San Francisco Bay is related to world-wide fluctuations in sea level during glacial and interglacial episodes of the late Quaternary period (*Tetra Tech, 1998c*). The fluvial sediments were derived from the Santa Cruz highlands west of the basin and deposited on an alluvial plain bounded by alluvial fan deposits to the west and baylands to the northeast (*Iwamura, 1980*). Surface geologic maps indicate that alluvial fan deposits extend toward the basin approximately to U.S. Highway 101, which forms the southern boundary of Moffett Field. Shallow deposits on Moffett Field are branching river and flood plain deposits. Estuarine deposits are found at the extreme northern end of Moffett Field.

3.3.1.5 Hydrogeology

Within the northern Santa Clara Valley groundwater basin, watershed boundaries are defined by drainage divides in the Santa Cruz Mountains and Diablo Range. The contact between the bedrock and Quaternary alluvium defines the extent of the groundwater basin (*Tetra Tech, 1998c*). Regionally, the Quaternary water-bearing deposits are divided into a deep, confined aquifer, and a shallow, unconfined aquifer based on the extent of a regional confining layer (*Tetra Tech, 1998c*). Four regional subdivisions of the upper 250 feet of Quaternary sediments are as follows:

- Holocene (Recent Interglacial Period) alluvium (A Aquifer zone)
- Late Pleistocene (Wisconsinan Glacial Period) alluvium (B aquifer zone)
- Late Pleistocene (Sangamon) Interglacial deposits (B/C aquitard)
- Pleistocene (Illinoian Glacial Period) alluvium (C aquifer zone).

The shallow aquifer (upper 250 feet) is subdivided into the A, B, and C aquifers. A laterally extensive clay aquitard (B/C aquitard) effectively isolates the C aquifer (160 to 250 feet below ground surface [bgs]) from the upper aquifers. The A/B aquitard may be locally discontinuous.

The remaining discussion focuses on the A aquifer zones beneath the NRP because the aquifer is most accessible and likely to be impacted by contamination and because of the relative lack of contamination in the deeper aquifers.

The A aquifer extends from a depth of 5 to 65 feet bgs at the western side of Moffett Field. The A aquifer is divided into the A1- and A2- aquifer zones by a discontinuous, low-permeability horizon (A1/A2 aquitard) located between 25 and 30 feet bgs (*Tetra Tech, 1998a*). The aquifer consists of sands and gravels with gravel comprising 20 to 90 percent of the coarse material. In general, groundwater flow is toward San Francisco Bay (north) with a horizontal gradient of 0.004 to 0.005 feet per foot (ft/ft) (*PRC, 1996*). Depth to groundwater ranges from 5 to 12 feet bgs (*Tetra Tech, 1998a*).

3.3.1.6 Habitat and Threatened or Endangered Species

This section summarizes the types of habitats occurring at Moffett Field. A comprehensive assessment of Moffett Field ecology can be found in the Phase II Site wide ecological assessment (*SWEA, PRC and Montgomery Watson [MW], 1997*). The habitats at Moffett Field have been classified into two major categories: (1) wetlands and aquatic, and (2) uplands.

The wetlands and aquatic habitats have been defined using the United States Fish and Wildlife Service (USFWS) classification system and the U.S. Army Corps of Engineers (USACE) system discussed in the WESCO (1993) report. The California Department of Fish and Game (DFG) uses the USFWS protocol for wetland classification. The majority of the wetlands are located in the northern section of Moffett Field bordering the commercial salt evaporation ponds. These areas help to support a variety of species including some listed as endangered under the federal Endangered Species Act and as California species of special concern.

The uplands habitat can be further divided into levee banks, disturbed grasslands, and landscaped areas. The disturbed grasslands and landscaped areas occur within the NRP.

The levee banks provide limited upland habitat bordering the saltwater and brackish marshes. They range from 5 to 15 feet in height and are mostly covered by grasses and weeds. This type of vegetation provides cover for species such as the California ground squirrel, mourning dove, and various species of rodents. The location of the banks near the marshes makes them a suitable resting area for waterfowl and wading birds between periods of feeding. They also provide a corridor for predatory mammals that can have an adverse effect on the federally endangered and special status species occupying these areas.

The grasslands are highly disturbed areas that provide limited useable habitat for wildlife. These areas are located between buildings and runways and are mowed on a regular basis. The burrowing owl has been observed foraging in these areas. This species is listed as a California special status species. Appendix C presents a map showing where burrowing owls have been sighted at Moffett Field. Specific mitigation measures have been developed for areas where burrowing owls have been identified and are as follows:

- 1) Early in the planning process, review all proposed projects, programs, and activities to determine if they may occur near (i.e., within 250 feet) areas occupied or recently occupied by burrowing owls. For projects that may occur near owls or their habitat, submit to the Environmental Services Office as soon as possible a preliminary description of the activity, a map showing its proposed location, and a proposed timeline. When applicable, also submit a NEPA Environmental Checklist. A qualified wildlife biologist must survey the project site. For assistance contact the onsite Wildlife Technician, Chris Alderete at 43532 or (650) 280-7643 (cell).
- 2) Whenever possible, avoid potential impacts to burrowing owls and their habitat (see Appendix C) by:
 - a. Considering alternative project locations during the early planning stages. The 23 acres of burrowing owl habitat south of Building 158, and other owl protection areas identified in Appendix C shall be avoided.
 - b. Scheduling work in areas near burrowing owls to occur outside the nesting season. The nesting season is from February 1-August 31.
 - c. Considering alternative approaches that reduces or eliminates potential impacts to burrowing owls.
 - d. Reducing the amount of time spent conducting activities near burrowing owls.
- 3) Avoid disturbing active nesting owl burrows during the nesting season, which occurs from February 1-August 31. For disturbances outside the nesting season, obtain proper regulatory approval through the Environmental Services Office.

- 4) Avoid disturbances that occur within 250 feet of an active owl nest during the nesting season or with 160 feet outside the nesting season. For unavoidable disturbances, work with the Environmental Office to determine specific owl impacts and required mitigation based on the nature of the project or activity, and its timing, location, and duration.
- 5) Obtain approval from the Environmental Services Office prior to conducting activities near burrowing owls or their habitat. Code QE will obtain permits and approvals from regulatory agencies, as needed.
- 6) When applicable, obtain the required Construction Permits (AMI 8829.1) and comply with their conditions, including those related to burrowing owls.

Fund and implement mitigation activities identified in the planning stages. These may include the following:

Avoid impacts to owls by conducting work outside the nesting season, or at a distance from active burrows that avoids disturbances (>250 in nesting season, >160 feet outside of nesting season). Prevent physical impacts to owl burrows by:

- a. Keeping the project footprint as small as possible.
- b. Limiting the movement of construction vehicles, size of staging areas, and other disturbances. Protect areas within 160-foot to 250-foot radius from owl burrows. Use fencing or construction tape to delineate work areas from protected areas.
- c. Placing fencing around active owl burrows for the duration of the project. Barriers must be adequate to prevent disturbance to burrows. Remove fencing when the project is completed.

If active owl burrows must be destroyed, work with the Environmental Services Office to develop a plan to evict owls from their natural burrows. Eviction shall occur outside the nesting season. Owls are evicted using temporary "one-way doors" placed on the natural burrow for at least 48 hours. After 48 hours, excavate the natural burrow, and then fill it in to prevent owls from reoccupying those burrows. Replace lost burrows with artificial burrows at a 3:1 ratio within 300 feet of the destroyed burrows, if possible.

Historically active and satellite burrows can also be very important for burrowing owl survival. These lesser-used burrows will be evaluated on a case by case basis by a qualified wildlife biologist, who will determine if mitigation is required. Artificial burrow placement and design will be developed in coordination with the NASA Environmental Services Office. The project proponent must complete construction of any required artificial burrows prior to project initiation (e.g., beginning construction activities), unless agreed to in writing by the NASA Environmental Services Office. Onsite land set-aside may also be used for mitigation on larger projects.

The landscaped areas provide habitat similar to urban parks. The vegetation is composed of non-native and/or exotic grasses, shrubs, and trees. These areas can be found near the administration buildings, housing complexes, and the golf course. Species commonly observed in this habitat include the mourning dove, house sparrow, American robin, northern mockingbird, and the fox squirrel.

3.3.1.7 Archeological Resources

No archeological resources are known to occur within NRP. However, prehistoric and historic use of the Moffett Field vicinity is well documented and as yet unidentified buried archeological resources could be

encountered during ground disturbing activity. Appendix D presents a plate identifying archeological sensitive areas. To ensure that all resources are properly identified, evaluated and treated (if necessary), the following measures will be initiated:

- Specific language should be included in the General Specifications section of any contract requiring excavation in regard to the required protection of cultural resources and the procedures to be followed by the contractor in an unexpected discovery situation.
- NASA shall develop an Unexpected Discovery Plan to deal with the inadvertent exposure of subsurface archeological resources during construction, in accordance with 36 CFR 800.11.
- In lieu of a formal Unexpected Discovery Plan, any construction operations should stop within 3 meters (10 feet) of the exposure of an unanticipated archeological materials and a qualified archeologist should be contacted to evaluate the materials and recommend an appropriate treatment for them (see 36 CFR 800.11.1).
- It is not considered that there is a high potential for inadvertent exposure of prehistoric Native American skeletal remains and associated grave goods at Moffett Field. However, the region's Native Americans consider the graves of their ancestors to be of utmost importance. The remains and the offerings buried with them are sacred to the Native Americans, and there is a strong desire among this community to prevent disturbance of burial sites. The Native American Graves Protection and Repatriation Act (NAGPRA; Section 3) requires federal agencies to consult with likely descendants and Indian tribes prior to intentional excavation, and requires cessation of activity and notification of tribes when there is an inadvertent discovery of Native American skeletal remains on federal land. The State of California Native American Heritage Commission (ATTN: Execution Secretary, 915 Capitol Mall, Room 288, Sacramento, CA 95814) can provide a list of tribes and most likely descendants on request. In the event of discovery of Native American skeletal remains, the implementing regulations 43 CFR 10, subpart B (Federal Register 60(232); 62134-62169, December 4, 1995) of NAGPRA shall be followed.
- Curation of any recovered archeological materials not associated with Native American skeletal remains shall be curated in accordance with 36 CFR 79, Curation of Federally Owned and Administered Archeological Collections Final Rule (Federal Register 55(177: 5-37639), September 12, 1990). Local repositories meeting the curation standards for archeological materials shall be selected over distant repositories whenever possible.
- All archeological work shall be conducted under the direction of professional archeologists meeting the qualification standards described in Archeology and Historic Preservation; Secretary of the Interior" Standards (Federal Register 48 (190: 44716-44742, September 29, 1983).

3.4 Environmental Restoration Programs

Naval Air Station Moffett Field was added to the National Priorities List (NPL) in July 1987. Work conducted at Moffett Field is being completed under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and coordinated through a Federal Facilities Agreement (FFA) with the U.S. Environmental Protection Agency (EPA), Region IX; the California State EPA Department of Toxic Substances Control (DTSC) and the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). Environmental Restoration Programs at Moffett Field are broken into the CERCLA Installation Restoration Program (IRP) and the non-CERCLA sites, (i.e., Petroleum sites) which were and are being addressed in accordance with applicable state regulations.

Groundwater beneath the NRP is impacted by migration of chemicals from the MEW Superfund Site (south of Moffett Field; see also Section 3.1) and from operations at Moffett Field. This is collectively referred to as the West Side Aquifers or the Regional Plume north of 101 (*Tetra Tech, 1998a; Locus, 1999*). In addition, a number of investigations have been conducted at the adjacent NASA Ames Research Center to evaluate Areas of Investigation (AOIs). However, none of the AOIs are located within the NRP and, therefore, the AOI program is not discussed further.

3.4.1 Installation Restoration Program

Under its IRP, the Navy identified and investigated several locations for the presence of chemical contamination related to site use. Currently, Moffett Field is divided into five Operable Units (OU1, OU2-West, OU2-East, OU5 and OU6), the West Side Aquifers, and two study areas (petroleum sites and station-wide sites). OU1 includes Sites 1 and 2. OU2-West includes Sites 8, 10 (Chase Park), 14-North, 16, 17, and 18. OU2-East includes Sites 3, 4, 6, 7, 10 (runways), 11 and 13. OU5 includes the aquifers on the east side of the Moffett Field, and OU6 includes wetland areas. The West Side Aquifers include the aquifers located under the western portion of the Moffett Field (aquifers west of the runways). The petroleum sites are the non-CERCLA sites and include Sites 5, 9, 12, 14-South, 15, 19, 20 and 24. The Station-Wide Sites include Sites 21 to 23 as well as other areas of investigation.

All OU1, OU2-East, OU5, OU6, the Station-Wide Sites, and Site 8 (OU2-West), lie outside of the area included in the scope of this EBS and are not discussed further. Of the petroleum sites, only Sites 9, 14-South, 15, 19 and 24 are located within the parcels included in this EBS. The following summarizes the IRP Sites that are located within the NRP. Plate 3 presents their locations, and Table 2 provides a summary.

Parcel 1:	West Site Aquifer
Parcel 2:	West Site Aquifer Sites 9, 15, 17
Parcel 3:	West Site Aquifer Site 24
Parcel 4:	West Site Aquifer Site 19
Parcel 5:	West Site Aquifer Sites 10, 14-North and South, 15, 16, 18
Parcel 6:	None
Parcel 7:	None

The next section describes the groundwater contamination (West Side Aquifer and MEW Plume) as it applies to all parcels, and summarizes the risk assessments. The remaining sites are discussed within the parcel findings (Section 4.0).

3.4.2 Groundwater Contamination - West Side Aquifers/Regional Groundwater Plume North of 101

As mentioned above, groundwater contamination beneath the NRP consists of the commingled MFA and MEW Plumes often referred to as the West Side Aquifers or the Regional Plume North of 101. It will be referred to in the remainder of this document as the Westside Aquifers.

The West Side Aquifers include the aquifers located under the western portion of Moffett Field (aquifers west of the runways). In 1992, the EPA determined that because the aquifers on the western side of Moffett Field were being impacted by a groundwater plume from the aforementioned MEW Superfund site to the south of Moffett Field, they were subject to the 1989 MEW Record of Decision (ROD). Additionally, historical operations at Moffett Field (primarily from the former dry cleaning facility at former Building 88 [Site 18; Parcel 5 northern boundary] and fuel operations at Site 9 [Parcel 2 northwestern portion]) also contributed solvents and fuel products to the MEW groundwater plume. Therefore, cleanup technologies and cleanup levels proposed and used by the Navy for site restoration on the western side of the runway follow those specified in the MEW Record of Decision (ROD, U.S. EPA, 1989).

The remedial investigation (RI) of the MEW area was concluded in 1988 (HLA, 1988). The investigation included a regional study area bounded by El Camino Real to the south, San Francisco Bay to the north, Mathilda Avenue to the east, and Stevens Creek to the west; and a local study area focusing on three Superfund sites within the MEW area. Volatile organic compounds (VOCs), especially Trichloroethene (TCE), and 1,1,1-Trichloroethane (1,1,1-TCA), were the most frequently detected. An estimated 98 percent of the mass of TCE and 1,1,1-TCA, and cis- and trans-1,2-dichloroethene (1,2-DCE) in the groundwater that has emanated from the MEW area exists within 100 feet bgs. The regional VOC plume within this shallow zone extends beneath Moffett Field approximately 5,000 feet north of U.S. Highway 101 (PRC, 1996). The MEW companies have completed the RI feasibility study (FS) and remedial design, and are currently conducting remedial action activities under U.S. EPA supervision. Construction of the MEW treatment system was completed and routine operations began in October 1998 (Tetra Tech, 1999a). Their treatment system is located on Parcel 2 (Plate 4). According to the MEW ROD (U.S. EPA, 1989), the VOCs in the groundwater are being cleaned up to maximum contaminant levels (MCLs). Quarterly monitoring is being conducted to evaluate the plume conditions and remedial progress (Locus, 1999).

The remedial investigation work for the Navy portion of West Side Aquifers was completed in 1992 (Tetra Tech, 1998a). Several source areas of potential Navy-related groundwater contamination were identified. Potential groundwater source areas identified included an old fuel storage tank farm and former Navy Exchange (NEX) Service Station (Site 9), a former aircraft wash rack and sump (Site 15), and a former dry cleaners (Site 18). The former tank farm and NEX station, (Site 9) have been identified as sources of petroleum-related contamination, but do not appear to be sources of VOC contamination. The former dry cleaner (Site 18-Parcel 5) has been identified as a source of VOC contamination, particularly tetrachloroethene (PCE). The wash rack (Site 15, Parcel 4) is considered a VOC source (Tetra Tech, 1998a). These sites are discussed in their respective parcels. The Navy designed and installed the West-Side Aquifers Treatment System (WATS) on Parcel 2 (Plate 4) (Tetra Tech, 1999b) to extract VOCs and petroleum contamination from groundwater in the A1- and A2-aquifer zones. Groundwater is being cleaned up to MCLs for VOCs (U.S. EPA, 1989) and for the petroleum hydrocarbons, to the levels shown in the Basewide Petroleum Site Evaluation Methodology Technical Memorandum (Tetra Tech, 1998b). Monitoring is being conducted to monitor the plume conditions and remedial progress. Responsibility for remediation of the Regional Plume has been allocated among

MEW, Navy and NASA in accordance with the Allocation and Settlement Agreement (see Allocation map in Appendix B).

Monitoring of the groundwater contamination plume associated with the MEW site and former Navy activities at Moffett Field (West-side Aquifers) is being conducted; water-levels are measured on a quarterly basis, and groundwater sampling is conducted by the Navy or the MEW Companies. Based on the most recent available data the contaminants of primary concern present in groundwater beneath the parcels include TCE, 1,1,1-TCA, PCE, 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), cis- and trans-1,2-dichloroethene (1,2-DCE), dichlorobenzene, chloroform, freon 113, phenol and vinyl chloride. The VOCs TCE and 1,1,1-TCA are the most frequently detected and widespread.

The current plume limits, for TCE, benzene and TPHs and their respective concentrations are presented in Appendix B. Extraction wells and piping associated with the system are located on Parcels 1, 2, 3, and 5.

3.4.3 Risk Assessments

A human health risk assessment (HHRA) was conducted to evaluate the carcinogenic and noncarcinogenic risk for potential future residential, occupational, and recreational receptors at Moffett Field. The HHRA was included with the station-wide RI report (*PRC, 1996*). In addition station-wide ecological risk assessments (SWEAs) were conducted (*PRC and MW, 1995, and 1997*). Both of these focused on the wetland areas, and the runway and surrounding hangers and maintenance facilities and did not address the areas occupied by the redevelopment property.

According to Joseph Chou of the RWQCB, risk assessments are in the process of being prepared for many of the petroleum sites (*Personal communication, 2000*).

In accordance with the MEW ROD, an Endangerment Assessment (EA) was prepared for the MEW Site (including Moffett Field) to address the potential affects to human health and the environment for the environmental conditions at that time (*ICF-Clement, 1988*). The EA evaluated the potential risks posed by contamination existing in 1988 without considering future remedial actions proposed for the Site. The assessment focused primarily on risks from exposure to contaminated groundwater, but also qualitatively evaluated risks to construction workers as well as a worst-case scenario where residential units would be constructed. The EA concluded that there was not a significant risk over most of the MEW area because of the relatively low volatile organic compounds (VOC) concentrations in exposed surface soils under the then current use conditions. However, the EA did qualitatively note that redevelopment of the Site could lead to significant exposure to contaminants present in subsurface soils through inhalation of vapors or dust assuming that no remedial action was taken at the Site.

No risk assessment has been prepared specifically for the NRP.

3.5 Environmental Compliance Programs

3.5.1 Hazardous Materials and Waste Management

In the early 1990s The Navy implemented several programs to better manage hazardous materials and waste at the facility. The programs were as follows:

- Hazardous Waste Management Plan - The Hazardous Waste Management Plan (HWMP) was drafted in April 1991 to ensure that NAS Moffett Field's program met all federal, state, and local regulations (*NAS Moffett Field, 1991b*)

- Hazardous Waste Minimization Plan - A used oil and solvent recycling management plan was completed for NAS Moffett Field in October 1989 to reduce generation of NAS Moffett Field's hazardous waste output (*Naval Energy and Environmental Support Activity [NEESA], 1989*)
- Spill Contingency Plan - The NAS Moffett Field Spill Contingency plan was completed in February 1989 to present procedures for responding to spills and notification of organizations if spills occur (*NAS Moffett Field, 1991a*).

No evidence of audits/investigations conducted to evaluate the Navy programs performance exists in the records reviewed.

Review of file documents did indicate that several investigations and assessments have been completed to evaluate the status of the management programs for specific buildings and to address whether hazardous materials or waste were present at the facility at the time of base transfer. These investigations/assessments included:

- A number of Phase 1 Environmental Site Assessments (ESAs) were conducted in the early 1990s for NASA by Boeing Aerospace Operations Inc. (*Boeing, 1993a and 1993b*), Chemical Waste Management Inc. (*CWMI, 1993a, 1993b, 1993c and 1993d*), SEC Donahue Inc. (*SEC Donahue, 1993*), and Uribe and Associates (*Uribe, 1993*) for buildings at Moffett Field including buildings within the NRP. The ESAs identified whether hazardous materials or waste were present at the buildings evaluated.
- The Base Realignment and Closure (BRAC) Cleanup Plan (*PRC Environmental Management, Inc [PRC], 1994*), presented a history of hazardous waste generating activities at Moffett Field.
- In August 1995, a multi-media audit was conducted by SAIC (*SAIC, 1995*). As part of the audit, SAIC evaluated hazardous waste management practices. Results of the audit indicated that no significant risk to the environment existed from current hazardous waste management practices.

These investigations/assessments indicated that many of the buildings within the NRP used hazardous materials and generated hazardous wastes.

In 1995, NASA established a three-year schedule for assessing environmental media utilizing the Environmental Protection Agency's (EPA's) *Generic Protocol for Conducting Environmental Audits of Federal Facilities* (1996 Revision). A subset of 15% of the EPA Protocol is required to develop a metric that is used as an indicator of overall compliance. However, users are required to augment the protocol to address new requirements, state requirements and unique operations. In addition, NASA reviews each protocol to identify additional questions applicable to their operations.

Compliance with the various items outlined in the EPA Protocol is established through self-assessments consisting of interviews, site visits, and review of records. If deficiencies are identified during a self-assessment, they are written in draft form and given to the responsible department for a 10-day review period. The purpose of the review period is to allow the affected parties to resolve the issue, correct any inaccuracies in the findings and participate in the recommendations. At the end of the 10-day review period, any deficiencies that could not be fully resolved were included in the final report. Affected parties are required to agree to the recommended corrective action plan and give an estimated date of completion. Progress toward completion is tracked on a monthly basis.

The most recent Environmental Management Self-Assessment to include hazardous materials management and hazardous waste management was conducted in 1998 (*NASA, 1998*). The pertinent

findings from that report (now resolved) indicated that the only non compliance items were labeling deficiencies in hazardous materials storage areas. An inventory of hazardous waste generated between 1994 and the present has been prepared by NASA. A list of buildings where hazardous waste was generated between 1994 and the present is presented as Table 11.

NASA has begun the preparation of closure plans for the buildings within the NRP parcels. The closure activities will include visual surveys and a determination of whether the problems identified in the above investigations/assessments were addressed or if others exist. Sampling will be conducted if necessary (*Personal Communication, 2000b*).

3.5.2 Storage Tanks

A total of 155 former and current USTs, ASTs, oil/water separators (OWS) and sumps have been identified at Moffett Field (*Tetra Tech, 1999a*). Tanks present on the NRP are identified on Plate 5 and summarized on Tables 3 and 4. The numbering system and location of the storage tanks was derived from the BRAC Cleanup Plan, (*PRC, 1994*) and the Baseline Environmental Report (*Tetra Tech, 1994*). According to Tetra Tech (1999a) the majority of tanks/OWS/sumps at Moffett Field have been removed and no further investigations were required. However, documentation indicating regulatory agencies approved closure for the majority of these tanks was not available. In a letter to the Navy dated August 8, 2000, the RWQCB granted closure for 13 tanks at Moffett Field (*RWQCB, 2000*). Five of the former tank locations are present within the NRP. Several of the removed tanks/OWS/sumps required investigations as part of the IRP investigations; discussions for these investigations are included in the parcel findings (Section 4.0).

3.5.3 Medical/Biohazardous Waste

No medical/biohazardous waste has been or is generated within the NRP. The only medical/biohazardous waste generated at Moffett Field was by the Naval Regional Hospital Branch Clinic, which is (*NEESA, 1991*) located outside the NRP west of Parcel 1. Medical/biohazardous waste is not discussed further in this document.

3.5.4 Lead-Based Paint

Lead-based paint (LBP) was in common use prior to 1978, at which point its use was discontinued. No LBP survey has been performed at Moffett Field; therefore, based on the age, it is assumed that the majority of buildings/structures within the NRP contain lead. Some buildings at Moffett Field have been sampled as a result of modifications being performed. Table 5 presents a summary of the building construction dates, lists buildings that were sampled and their sample dates, and identifies which sampled buildings detected LBP.

In July and August 1993, as part of a facility wide investigation to evaluate the presence of lead around the perimeter of buildings that may have had lead based painted exteriors, CWMI collected 332 surface soil samples. Lead was detected above the residential Preliminary Remediation Goal (PRG) of 400 milligrams per kilogram (mg/kg) and/or soluble threshold limit concentration (STLC) of five milligrams per liter (mg/l), in perimeter soil at many of the building locations (*CWMI, 1993e*). In addition, perimeter soil at several locations also exceeded the industrial PRG of 1,000 mg/kg. Table 5 presents a summary of the building perimeters sampled within NRP and lists which buildings exceeded residential and industrial PRGs. The EPA conducted a follow-up sampling investigation around some of the buildings in July 1998. Roy F. Weston (Weston), under the direction of the EPA, collected 120 soil samples around 11 selected buildings. These results indicated that the residential or industrial PRG was exceeded in at

least one sample collected from seven of the building locations (USEPA, 1998). LBP issues for Parcel 1 are discussed in Section 4.0.

Lead surveys of the buildings including sampling of the building material and soil shall be conducted by NASA at the partners expense, if appropriate, prior to demolition, rehabilitation, or occupancy of any buildings within the NRP (*Personal Communications, 2000b*).

3.5.5 Spent Abrasive Materials

Uncontrolled blasting may have occurred in aircraft support zones within the NRP parcels but no documented locations are known. Abrasive materials are not discussed further in this report.

3.5.6 Radioactive Materials

A radiological survey was performed on December 7 and 8, 1993 at the Navy Weapons Storage and Laboratory Buildings (Buildings 459, 484, 486, 487, 490 and 4XC1, all located east of the runway with the exception of Building 459 located in Parcel 5) to declassify and make available the rooms for unrestricted use. The rooms had been used by the Navy for storage of Naval Weapons and handling of hazardous materials used with the weapons. Results of the sampling indicated that all results were below background levels; no radioactive contamination was found during the survey, and the rooms were released for unrestricted use (*CWMI, 1994*).

According to Bill Vermeere, PAI/ISSI Radiologist Specialist (*Personal Communication, 2000*), radiological materials are only used in the Hangar 2 and 3 areas and in several NASA buildings. None of these areas/buildings are located within the NRP. On the basis of this communication, radioactive materials are not discussed further in this document.

3.5.7 Mixed Waste

On the basis of the results of Phase 1 ESAs conducted in the early 1990s for NASA by CWMI (*CWMI, 1993a, 1993b, 1993c and 1993d*), SEC Donahue (*SEC Donahue, 1993*), Uribe (*Uribe, 1993*), and the multi-media audit conducted by SAIC in August 1995, there are no mixed waste storage areas located within the NRP. Mixed waste is not discussed further in this document.

3.5.8 Radon

Federal law requires every federal department or agency that owns federal buildings to conduct a study to evaluate radon contamination in those buildings. Navy policy also requires that all buildings and housing units occupied for more than four hours per day be tested for radon gas. Any structure that has radon levels greater than four pico-curies needs to have mitigation actions performed.

In 1988 and 1989, a radon survey was conducted for 16 NASA buildings that are not part of the NRP. Samples were taken over a 7 day period between December 27, 1988 and January 2, 1989. Results of the sampling indicated that radon was not detected above detection limits ranging between 0.3 and 0.7 picoCuries per liter of air (pCi/L) (*NASA-ARC, 1989*). Additionally in 1989, as part of a NASA radon monitoring program conducted at 13 NASA installations in the United States, 107 canisters were set up at 23 buildings to monitor for radon over an approximate 116 day period. None of the canisters detected radon above 1 pCi/L (*Unknown Source*).

NAS Moffett Field's initial screening process of the housing units reportedly showed high levels of radon (*Tetra Tech, 1994*). Assessment of the housing units began in March 1993 by installing 807 radon detectors in the housing units. Two non-housing units were also reportedly screened. Building 153 (Parcel 5) and another unidentifiable building screening results indicated that high levels of radon were not identified.

On the basis of several memorandums present in NASA files it appears that radon surveys were also performed for 13 other buildings within Moffett Field. Two of the Buildings (23 and 25) are located in Parcel 1, five of the buildings (111, 146, 153, 154, 155) are located in Parcel 5, and the remaining buildings (256, 511, 956B, C, and D and Hanger 3) are scattered throughout Moffett Field. Results of these surveys did not identify radon above 1 pCi/L (*Department of the Army [Army], 1994*).

On the basis of the results of the radon monitoring programs conducted for the Moffett Field buildings and the similarities between those buildings and the NRP buildings, it is unlikely that radon is present in buildings within NRP above the EPA's 4 pCi/L action level, and it is not discussed further in this document.

3.5.9 Storm Water Discharges and System

NASA holds a general industry storm water discharge permit. Additionally, the Navy received a National Pollutant Discharge Elimination System (NPDES) permit from the RWQCB on October 20, 1998 and August 25, 1999 for authorization to discharge treated groundwater from the East-Side and West-Side Aquifer Treatment Systems respectively. After treatment discharge requirements are met, the groundwater is discharged to the storm water sewer system. In 1994 Stanford University received a NPDES permit from the RWQCB to investigate in-situ biodegradation methodologies for restoration of contaminated aquifers. This program, being performed for the EPA, studies the degradation of halogenated compounds and includes the injection and extraction of small quantities of groundwater. After treatment to meet the NPDES discharge requirements, the groundwater is also discharged to the storm water sewer system. The MEW companies also discharge treated groundwater under an NPDES permit to Stevens Creek.

NASA implemented a storm water pollution prevention program plan for Moffett Field in 1992 and currently performs storm water monitoring at seven locations within the Moffett Field facility under the general permit. None of the sampling locations are located within the NRP. Review of the latest available storm water monitoring report indicated that TCE, lead, zinc, and pH exceeded the San Francisco Bay Basin Water Quality Control Plan shallow surface water limits during the latest monitoring round (*SAIC, 1999b*).

Investigations were conducted by Insituform Technologies Inc. (ITI) Salem, Oregon to evaluate the integrity of the storm drain systems. According to the ITI report, the pipelines had problems such as grease inflow, root infiltration, misaligned and broken joints, radial and longitudinal cracks, and holes in pipes. According to the ITI report, the problems have been reconstructed using cured in place pipe and appear in like new condition (*ITI, 1997a*).

3.5.10 Wastewater

The wastewater sewer collection system at Moffett Field connects with a force main to the city of Sunnyvale treatment plant. Industrial wastewater discharge occurs within NRP.

Investigations were conducted by ITI to evaluate the integrity of the sanitary sewer system in May 1997. According to the ITI report, the pipelines had grease inflow, root infiltration, misaligned and broken joints, radial and longitudinal cracks, and holes in the pipe. The pipelines have now been reconstructed using cured in place pipe and appear in "like new" condition (ITI, 1997b).

3.5.11 Air Quality

Air quality issues have been investigated as part of several studies undertaken at the facility as follows:

- Hazardous Air Pollutant Emissions Inventory, 1996 (SAIC, 1996 and 1999)
- Indoor Air Testing, Various Buildings 1999 and 2000 (SAIC, 2000 and HLA, 2000)
- Passive Gas Monitoring Survey of Indoor Ambient Air and Subsurface Organic Vapors, Building 566 (SAIC, 1999).

Each study is summarized below. Additionally NASA and several of the resident agencies have permits to operate Air Pollution Sources from the Bay Area Air Quality Management District (BAAQMD). A list of current sources is provided as applicable for each parcel.

3.5.11.1 Emissions Inventory

The Hazardous Air Pollutant Emissions Inventory measured and evaluated emission rates of chemicals from sources around the Moffett Field facility including those within the NRP. This investigation quantified emissions from:

- Abrasive blasting
- External Combustion
- Internal Combustion
- Fuel Storage and Transfer
- Hazardous Materials
- Welding and Soldering.

NASA Ames and Moffett Field were investigated separately and emission results were evaluated for each area. The most significant air emission at NASA was found to be toluene (1298.71 pounds/year) from predominantly hazardous materials use. The most significant air emission at Moffett Field was found to be ethylene glycol (1379.08 pounds/year), also from predominantly hazardous materials use.

3.5.11.2 Indoor Air Testing

In 1999, SAIC conducted an indoor air quality testing program to measure the levels of VOCs in Hangar 1 and Buildings 6, 21, 22, 111, 148, and 156 at NASA. These buildings were selected based on their location with respect to the West Side Aquifer groundwater plume. Buildings 26 and 269 are not located over the plume, and served as background sampling locations. Outdoor air samples were also collected concurrently outside buildings 6, 111, 148, and 566 in order to determine ambient VOC levels for the area. With the exception of Building 269, all the buildings discussed above are located within the NRP.

Low levels of 21 VOCs were detected in at least some of the buildings tested. Concentrations of all detected VOCs were far below the Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) and the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values – time weighted averages (TLV-TWAs). Eight VOCs were detected above the EPA Region 9 Preliminary Remediation Goals (PRGs), adjusted for a residential exposure scenario of 24 hours per day over 20 years. Those VOCs were TCE, benzene, chloromethane, 1,2-DCA, 1,1,2-trichloroethane, chlorobenzene, 1,4-dichlorobenzene, and 1,4-dioxane. All other compounds detected in the buildings were found at concentrations below their respective PRGs for the adjusted exposure scenario.

In Spring 2000, HLA conducted an indoor air quality testing program to measure the levels of VOCs in Buildings 476 and 543 (located within Parcel 5) at NASA Ames to evaluate the potential for using these buildings as dormitory/living quarters. The analysis for the 26 VOCs was divided into three classes: aromatic hydrocarbons, chlorinated hydrocarbons, and "other VOCs". Results of the testing program were compared to OSHA PELs, ACGIH TLV-TWAs, and EPA Region 9 PRGs adjusted for an exposure period of 16 hours per day over 5 years. The following results were noted:

- Low levels of some aromatic hydrocarbons (benzene and toluene) were present in all of the rooms in both buildings, and in an outside ambient air sample collected in the vicinity of each of the buildings, but did not exceed any of the standards used for comparison.
- No chlorinated hydrocarbons were detected in the ambient air sample. Perchloroethylene was detected at very low concentrations for two of the five samples taken in Building 476. 1,1,1-TCA was detected in one sample of five in Building 543. All other indoor measurements for chlorinated hydrocarbons were non-detects. None of the measured levels exceeded the PEL, the TLV-TWA, or the adjusted EPA PRG.
- The only "other VOC" detected at concentrations above any of the standards used for comparison was 1,4-dioxane, which was detected above its adjusted EPA PRG. The compound was detected in the ambient air sample and for all indoor samples for both buildings. The levels of 1,4-dioxane exceeded the adjusted PRG for one of five samples in Building 476 and for four of five samples within Building 543. The ambient air concentration for 1,4-dioxane also exceeded the adjusted PRG. All of the "other VOC" compounds were either non-detected or below the respective PEL, TLV-TWA, and the adjusted EPA PRG. Based on the sampling conducted to date, it is unclear whether 1,4-dioxane is emanating from the plume, the building materials, or both.

A discussion of these results is presented in Section 4.0.

3.5.11.3 Building 566 Passive Gas Monitoring Survey

In January 1999, SAIC performed a passive gas monitoring survey of indoor ambient air and subsurface organic vapors at building 566 (located within Parcel 1) to evaluate whether chlorinated organic vapors (TCE, PCE, 1,1,1-TCA, cis 1,2-DCE, and vinyl chloride only) have migrated from the groundwater into Building 566 and its surrounding soils. The evaluation used Gore-Sorber technology, a passive soil gas sampling technology that allows transfer of vapors to microporous membranes which absorb the organic materials.

A total of 43 Gore-Sorber modules were used for this evaluation as follows:

- 10 located three-foot bgs around perimeter of building

- 10 located six inches bgs around perimeter of building
- 12 scattered throughout inside of building at floor level
- 5 at in-take vents in ceiling tile inside building
- 1 at floor level of conference room
- 1 in the HVAC unit in north exterior of building
- 1 in the vent intake in north exterior of building
- 3 in "contaminated" groundwater monitoring wells in building vicinity.

Sampling duration was dependent upon whether the module was located above or below ground surface. Modules above ground surface were sampled between January 12 and 19, 1999 and subsurface modules were sampled over a two week period between January 12 and 26, 1999.

Of the five analytes of concern, only TCE and 1,1,1-TCA were detected or exceeded minimum detection limit in subsurface (excluding wells) or building samples. Additionally, Gore-Sorber reported results of other organic compounds which are part of their standard reporting package. Detected compounds included methyl tertiary-butyl ether (MTBE), 2-methyl naphthalene, chlorobenzene, carbon tetrachloride and BTEX.

Due to the detection of TCE and 1,1,1-TCA and BTEX, SAIC recommended additional studies within the building to determine concentrations of the analytes and their risk to human health. An additional air study performed by SAIC in 1999 for Building 566 using air canisters, indicated that the building was not suitable for use as a child care center.

3.5.12 Asbestos

A limited asbestos survey of the housing units was conducted by the Navy in 1988, and a basewide survey was conducted by Tetra Tech in 1993 (*Tetra Tech, 1994b*). The surveys identified both confirmed and suspect asbestos containing materials (ACMs) including pipe lagging, floor and ceiling tile, mastic, sheetrock and tape mud, water lines and gasket material. Results of the survey identified multiple buildings with confirmed and suspect asbestos present within the NRP. Table 6 presents a summary of the buildings with confirmed and suspect asbestos. In addition, some buildings at Moffett Field were also sampled as a result of modifications being performed. Table 6 also presents a summary of the buildings that were sampled and their sample dates, and identifies which sampled buildings detected ACM. A discussion of these results for Parcel 1 is presented in Section 4.0.

Asbestos surveys and sampling, shall be conducted by NASA at the Partners expense if necessary, prior to demolition, rehabilitation, or occupancy of any buildings within the parcel (*Personal Communication, 2000b*).

3.5.13 Pesticides

Normal use of pesticides, herbicides, and fertilizers has occurred, however the extent and types used is unknown. Therefore, there is the potential for residual levels of pesticides in soil and groundwater within the NRP. No pesticide mixing areas were known to be present within the NRP parcels. The presence of pesticides is not discussed further in this document.

3.5.14 Polychlorinated Biphenyls

The NASA Environmental Services Office performs quarterly inspections, completes Annual Document Logs, and submits transformer registration of equipment with concentrations of polychlorinated biphenyls (PCBs) at greater than or equal to 50 ppm in compliance with 40 CFR 761 to the U.S. EPA. In addition, the NASA Facilities Maintenance group completes additional inventories, inspections and testing of the equipment. Historical documentation includes a PCB inventory of the former Naval Air Station, at Moffett Field conducted by the Navy in 1993 (*NAS Moffett Field, 1993*). In this document, a total of 252 items were identified and sampled, including capacitors, regulators, oil fuse cutouts, oil circuit breakers, oil switches, and transformers. PCB concentrations ranged from non-detect to 542,000 ppm. Since the completion of this 1993 report, many pieces of equipment have been removed and disposed of as indicated in the PCB Annual Document Logs.

Twenty transformers or capacitors with PCB concentrations above the California DHS regulated concentration (5 ppm) for hazardous waste are present within the NRP. Four of these transformers are included because they have not been tested for PCBs and in compliance with 40 CFR 761 are assumed to have concentrations of PCBs >500 ppm. However, since these items are inspected regularly and PCB releases have not been observed these items are not considered an environmental concern. Table 7 presents a summary of the buildings with transformers and/or capacitors with concentrations of detected PCBs above the DHS regulated concentrations. Equipment with PCB concentrations of 5 ppm or greater present in Parcel 1 is discussed in Section 4.0. Any buildings with fluorescent lighting may contain PCB light ballasts. These must be removed and disposed of properly prior to demolition.

3.5.15 Ordnance

There is no evidence that ordnance was used or stored within the NRP parcels (*Tetra Tech, 1994a*). Several high explosive magazines, an ordnance shop, and a missile magazine were formerly located on the northeast side of Moffett Field several thousand feet from the parcel. Ordnance is not discussed further in this document.

3.5.16 Mold

On September 14, 2000, in preparation for a visitor tour scheduled for buildings in Parcel 1, PAI/ISSI conducted hazard reviews of Buildings 20 through 27. Results of the review identified substantial visual molds in Buildings 20, 23, and 25. Laboratory analysis of molds observed in Building 25 during a previous visit indicated that a number of different mold types including aspergillus, penicillium and stachybotrys were present within this building. Deleterious health effects can be produced by mold species, including infectious disease, allergenic response, irritation and dermatitis. Because of the mold hazard, NASA issued a memorandum dated September 22, 2000, detailing precautions which need to be taken prior to entering buildings with molds present, specifically Building 25.

4.0 FINDINGS FOR PARCEL 1

This section provides a summary of data collected at Parcel 1 of the NRP, which is designated for reuse as a collaborative research and educational campus. The findings pertaining to this parcel describe past and current environmental restoration and compliance program activities. A discussion of potential environmental constraints is also provided.

4.1 History and Current Usage

The majority of the buildings on Parcel 1 were constructed in the early 1930s and many are included in the National Register of Historic Places (National Register). All of Parcel 1 is within the Shenandoah Plaza Historic District. Demolition and any remodeling or re-habilitation work performed on buildings identified on the National Register must adhere to specific Advisory Council on Historic Preservation (ACHP) guidelines for National Register facilities. Historic use of the buildings was predominantly administration, base support services and housing. Table 8 presents a list of buildings and summarizes the following:

- Historic use
- Building Area
- Year Constructed
- Presence on National Register
- Current occupant and use if known
- Preferred development alternative.

The majority of the buildings are currently used by NASA for administration, research support, storage, or are vacant. Dormitories and administrative buildings associated with the Space Camp Operations are also present in the western portion of the parcel. Utilities present on Parcel 1 include fresh water, sanitary sewer, telephone, storm sewer, and power and steam lines (Plates 6a and b).

4.2 Environmental Restoration Programs

Parcel 1 is underlain by the West Side Aquifers. The West Side Aquifers OU was discussed above in Section 3.4.2. The chemicals detected within Parcel 1 are generally above MCLs (*Locus, 1999 and Tetra Tech, 1999b*). See Appendix B for a recent plume map.

Sixteen groundwater monitoring and extraction wells lie on Parcel 1 (Table 9 and Plate 4). The monitoring and extraction wells monitor and remove the Westside groundwater contamination plume.

4.3 Environmental Compliance Programs

4.3.1 Hazardous Waste Management

On the basis of the review of the documents discussed above in Section 3.5.1, Buildings 19 and 23 historically (prior to 1994) temporarily accumulated hazardous wastes. Hazardous waste is currently

(1994 to present) accumulated at Building 17, 19, 20, 23, and 25. A list of the hazardous wastes historically (pre 1994) and currently (1994 to present) generated in buildings is presented in Tables 10 and 11, respectively.

4.3.2 Hazardous Materials Management

Hazardous materials were historically stored or used at two buildings within Parcel 1 (Buildings 19 and 23; *Uribe, 1993*). Hazardous materials are currently stored and/or used at Buildings 19, 23 and 25.

4.3.3 Storage Tanks

4.3.3.1 Underground Storage Tanks, Oil/Water Separators and Sumps

No USTs, oil/water separators or sumps have been or are currently present within Parcel 1.

4.3.3.2 Aboveground Storage Tanks

One AST was present within the Parcel 1. An 18 gallon diesel AST was located at building 478. The AST formerly present on Parcel 1 is identified on Plate 5 and summarized on Table 4. On the basis of the size of this tank, it is unlikely to have impacted the environment; however, no documentation exists nor was a visual survey conducted to support this conclusion.

4.3.4 Lead-Based Paint

Based on the age of the buildings/structures present within Parcel 1, or sampling results, it is assumed or has been confirmed that 21 of the 26 buildings/structures contain lead. Review of PAI internal files identified seven buildings within Parcel 1 that have been sampled as a result of modifications being performed; all seven buildings sampled detected lead. Table 5 presents a summary of buildings that were sampled, their construction and sample dates, and identifies which buildings showed detected LBP.

Surface soil samples were collected from the perimeter of 11 buildings within Parcel 1. Lead was detected above the EPA Region 9 residential PRG at four of the building locations and above the industrial PRG at one of the building locations. Table 5 presents a summary of the building perimeters sampled within Parcel 1.

4.3.5 Air Quality

No emission sources or permitted air pollution sources are located in Parcel 1, although emission sources have been or are present on adjacent properties (*SAIC, 1996; NASA Internal Documents, 2000*).

Three of the buildings tested as part of the indoor air quality investigations discussed in Section 3.5.11.2 (Buildings 21 and 22 and 566) are located within Parcel 1. No chemicals were detected above the respective OSHA PEL or ACGIH TLV-TWA thresholds, which suggests that VOC infiltration from the regional groundwater plume is unlikely to pose a hazard to onsite workers. Benzene, 1,4-dioxane, and 1,4-dichlorobenzene were detected above adjusted PRGs for a residential scenario, indicating that VOC infiltration may be an issue for any residential development. No studies have been conducted to evaluate the potential exposure to construction workers, if any, from inhalation of VOC vapors associated with the regional groundwater plume. However, the Building 566 Soil gas survey indicated that benzene is above risk levels for children and the building was not suitable for use as a child care center. Any construction work involving soil disturbance shall be performed under a Health and Safety Plan which addresses

appropriate monitoring and personal protective equipment. Workers in the subsurface environment must have 24-hour hazardous waste site training.

4.3.6 Asbestos

Results of the surveys and sampling discussed in Section 3.5.12 identified 13 buildings within Parcel 1 with confirmed or suspect asbestos present (Table 6). All remaining buildings were not sampled, however because of their age, they are assumed to contain ACM except the new Space Camp buildings.

4.3.7 Polychlorinated Biphenyls

In Parcel 1 one transformer, outside and east of Building 181 contains PCB concentrations above the DHS regulated concentration (5 ppm). In addition, two transformers located in a manhole outside Building 23 have not been tested and are therefore assumed to contain at least 500 ppm PCBs per 40 CFR 761. One former transformer (removed 6/10/98 from Building 26) was also located within Parcel 1. Table 7 presents a summary of the Parcel 1 buildings with items, their sample dates, and the concentrations of detected PCBs above the DHS regulated concentration. Because no leak of these active units has been observed during inspections, they are unlikely to have impacted the environment. Quarterly inspections are recorded on field sheets, kept electronically on a database, and reported annually in the PCB Annual Document Log. A visual survey was not conducted as part of this report. Any buildings with fluorescent lights may contain PCB light ballast(s). These must be removed and disposed of properly prior to demolition.

4.3.8 Mold

On September 14, 2000, in preparation for a visitor tour scheduled for buildings in Parcel 1, PAI/ISSI conducted hazard reviews of Buildings 20 through 27. Results of the review identified substantial visual molds in Buildings 20, 23, and 25. Laboratory analysis of molds observed in Building 25 during a previous visit indicated that a number of different mold types including aspergillus, penicillium and stachybotrys were present within this building. Deleterious health effects can be produced by mold species, including infectious disease, allergenic response, irritation and dermatitis. Because of the mold hazard, NASA issued a memorandum dated September 22, 2000, detailing precautions which need to be taken prior to entering buildings with molds present, specifically Building 25.

4.4 Discussion of Findings

The potential environmental constraints for Parcel 1 include the following:

- Many of the buildings within Parcel 1 are on the National Register and the entire Parcel is within a Historic District. As such, demolition and any remodeling or rehabilitation work must adhere to specific ACHP guidelines.
- Concentrations of VOC in the groundwater beneath Parcel 1 were detected above MCLs or cleanup goals. Volatilization of these VOCs may constrain any residential development, and shall require that any construction work involving soil or groundwater disturbance be performed by appropriately trained workers under purview of a Health and Safety Plan.
- NASA is currently working on the preparation of closure plans which will include visual surveys and a documentation of any hazardous materials or wastes that are present and, if present, if they have impacted the environment.

- Lead-based paint and asbestos containing materials have been identified or are suspected in the majority of the buildings within Parcel 1. In addition, LBP has been identified in the soil associated with many of the buildings. The presence of these materials shall be confirmed and remediated prior to demolition, renovation, or reuse of the building. LBP and asbestos surveys shall be conducted prior to commencing demolition, renovation, or reuse activities.
- Several buildings within Parcel 1 (Buildings 20, 23, and 25) contain mold hazards. Special precautions should be taken when entering, demolishing, remodeling or rehabilitating these buildings.

5.0 BIBLIOGRAPHY

- Boeing Aerospace Operations, Inc. (Boeing), 1993a. *Position Paper 148-156*. January 22
- _____, 1993b. *Report of Findings ,Phase I Building Assessment Building 45*. April
- Brady and Associates, Inc. 1994. *Final Environmental Assessment, Moffett Field Comprehensive Use Plan, Moffett Field, California*. August
- Chemical Waste Management Inc., 1993a. *Draft Preliminary Site Assessment, Hangar 1, Buildings 32, 33, 83, 118, 119, 120, 347, and 584, Naval Air Station, Moffett Field, California*. February 1
- _____, 1993b. *Draft Preliminary Site Assessment, Area 8, Buildings 1A, 105, 249, 256A, 329, 331, 400*. May 17
- _____, 1993c. *Phase I Environmental Site Assessment Area 4, Buildings 77, 449, and 454*. June 1
- _____, 1993d. *Phase I Environmental Assessment, Building 567 Public Works Warehouse, Naval Air Station Moffett Field, California*. August 25
- _____, 1993e. *Surface Soil Lead Survey, Naval Air Station, Moffett Field California*. October 29
- _____, 1994. *Naval Weapons Bunkers and Laboratory Declassification Survey, NASA Ames Research Center*. January 12
- Chou, Joseph, Regional Water Quality Control Board, San Francisco Bay Region, 2000. *Personal communication – telephone. Conversation regarding USB and comments and draft EBS*. October 4
- Department of the Army (Army), Headquarters 124th U.S. Army Reserve Command, 1994. Memorandums discussing Radon Survey Results to USAR Aviation Support Facility 27 and to 3rd BN, 12th Special Forces Group. July 8
- Harding Lawson Associates (HLA), 1988. *Remedial Investigation Report, Middlefield – Ellis-Whisman Area, Mountain View, California*
- _____, 2000. *Draft Air Quality Investigation, 476 and 543, Ames Research Center*. July 14
- ICF-Clement, 1988. *Endangerment Assessment for the Middlefield-Ellis-Whisman Site, Mountain View, California*, June 15.
- Insituform Technologies, Inc. 1997a. *BAMSI, Inc. Solicitation #MSSC-C-96-026, Sewer Rehabilitation, Moffett Field, California*. January
- _____, 1997b. *DMJM Engineers, NASA Ames Research Center, Repair Sanitary Sewer System, Moffett Field, California*. May
- IT Corporation, 1993. *Operable Unit 2 Remedial Investigation Report, Naval Air Station Moffett Field, California Vol. 1*. May

- Iwamura, T.I., 1980. *Saltwater Intrusion in the Santa Clara Valley Baylands Area, California*. Santa Clara Valley Water District. September
- Locus Technologies, 1999. *Remedial Action Report Regional Ground Water Remediation Program Middlefield-Ellis-Whisman Site Mountain View, California*. December
- NASA – ARC, 1989. Memorandum to Steve Brisbin from NWT presenting Radon Survey results for period between 12/27/88 and 1/02/89. February 9
- Naval Air Station Moffett Field, Public Works Environmental Division (NAS Moffett Field), 1990. *Hazard Communication Plan for NAS Moffett Field*
- _____, 1991a. *Hazardous Substance Spill Contingency Plan, Naval Air Station, Moffett Field CA*. January
- _____, 1991b. *Hazardous Waste Management Plan, Naval Air Station, Moffett Field CA*. April
- _____, 1991c. *Oil Spill Prevention, Control, and Countermeasures Plan, Naval Air Station, Moffett Field CA*. April
- _____, 1993. *Draft PCB Survey, Naval Air Station, Moffett Field CA*. November
- Naval Energy and Environmental Support Activity (NEESA, Port Hueneme), 1984. *Initial Assessment Study of Naval Air Stations, Moffett Field, California*. March
- _____, 1989. *Hazardous Waste Minimization Plan for Naval Air Station, Moffett Field CA*. October
- _____, 1991. *Solid Waste Management Plan (SWMP) for Naval Air Station, Moffett Field, CA*. September
- NASA, 1998. *Environmental Self Assessment Report of Findings and Corrective Actions Order*.
- _____, 2000. *Internal documents. Various air permits and emission Source Inventory*.
- Olliges, Sandy, NASA Project Manager, 2000b E-mail regarding asbestos sampling and other related activities. August 30
- PRC Environmental Management, Inc. (PRC), 1991. *Site 9 Action Memorandum Volume 1, Naval Air Station Moffett Field, Mountain View, California*. July 3
- _____, 1993. *Final Installation Restoration Program Petroleum Sites (And wastewater Tanks and Sumps) Characterization Report, for Naval Air Station, Moffett Field, California*. October 1.
- _____, 1994. *Base Realignment and Closure Cleanup Plan, Naval Air Station Moffett Field*. March
- _____, 1996. *Final Station-Wide Remedial Investigation Report, Moffett Federal Airfield, California*. May
- _____, 1997. *Base Realignment and Closure Business Plan (BCP) for Naval Air Station, Moffett Field California*. Prepared by PRC EMI. February 21

- _____, and Montgomery Watson (MW), 1995. *Final Phase I Site-wide Ecological Assessment. Moffett Federal Airfield, California.* September
- _____, and Montgomery Watson (MW), 1997. *Final Phase II Site-wide Ecological Assessment, Moffett Federal Airfield, California.* July
- Regional Water Quality Control Board, 2000. *Transmittal off the Closure Letter and Site Summaries for Department of Defense (DOD) Underground Storage Tanks at Moffett Federal Airfield, California.* August 8
- Science Applications International Corporation (SAIC), 1995. *Environmental Multi-Media Audit Results for Code A, Moffett Federal Airfield.* November 20
- _____, 1996. *Hazardous Air Pollutant Emissions Inventory, Nasa Ames Research Center, Moffett Field California.* July 18
- _____, 1999a. *Passive Gas Monitoring Survey of Indoor Ambient Air and Subsurface Organic Vapors, Building 566.* January
- _____, 1999b. *Ames Research Complex. 1998-1999 Annual Report for Stormwater Discharges Associated with Industrial Activities, Volume 1.* July 1
- _____, 2000. *Indoor Air Testing Report, Hangar 1 and Buildings 6, 21, 22, 26, 111, 148, 156, and 269 Nasa Ames Research Center.* July 18
- SEC Donahue, Inc., 1993. *Preliminary Site Assessment NAS Moffett Field, Bldg, 146 and 146A, Santa Clara County, California.* February 12
- Tetra Tech EM Inc. (Tetra Tech), 1994a. *Baseline Environmental Report for Naval Air Station, Moffett Field, California – Administrative Draft.* January
- _____, 1994b. *Asbestos Survey at Naval Air Station, Moffett Field and NALF Crows Landing, California – Final Report.* January
- _____, 1998a. *West-Site Aquifers Treatment System, Final Long Term Groundwater Monitoring Plan.* January 20
- _____, 1998b. *Final Basewide Petroleum Site Evaluation Methodology Technical Memorandum.* October 2
- _____, 1998c. *Final Station-Wide Feasibility Study Report.* October 30
- _____, 1999a. *Remaining UST Sites Investigation, Field Work Plan. Draft.* February 15
- _____, 1999b. *November 1998, Draft Quarterly Report, Moffett Federal Airfield, California.* March 31
- Unknown Source. *Table and Summary presenting results of the NASA Radon Monitoring Program*
- Uribe and Associates, 1993. *Report of Findings Phase I Building Assessments, Area 2, and Buildings 10 and 543 Contract No. ARC860805.* April
- U.S. Department of Defense (DoD), 1994. *Findings of Suitability to Transfer BRAC Property.* June 1

U.S. EPA (USEPA), 1984. *Record of Decision, Middlefield/Ellis/Whisman Study Area (MEW Site), Mountain View, California.* June 9

_____, 1993. *Letter from Mr. Michael Gill concurring with no further action at Sites 10, 16, and 17. NAS Moffett Field, California.* December 17

_____, 1998. *Lead Based Paint Investigation Report for NASA Moffett Field.* October

Vermeere, Bill – PAI/ISSI, Radiological Specialist, 2000. Personal communication - telephone. Conversation regarding radioactive materials. May 23

Western Ecological Services Company (WESCO), 1993. *Phase I Site-Wide Qualitative Habitat and Receptor Characterization, Naval Air Station.* October

TABLES

TABLES

**Table 1. History of Installation Operations
Environmental Baseline Survey
NASA Research Park Parcels
Moffett Federal Airfield, California**

DATES	TYPE OF OPERATION
Pre 1933	Agricultural
1933-1935	Site commissioned as Sunnyvale Naval Air Station to support lighter-than-air (LTA) program
1935-1940	Site transferred to U.S. Army Corps for training purposes
1939	Ames Aeronautical Laboratory established on land adjacent to Moffett Field
1940	Site transferred to U.S. Navy and renamed NAS Moffett Field Station became the West Coast's Air Corps Training Center for air cadets
1942	Heavier-than-air (HTA) program started at NAS Moffett Field
1945	HTA program moved to Half Moon Bay NAS Moffett Field used as major overhaul and repair base
1949	Station became home to the Military Air Transport Service Squadron
1950	Station was the largest naval air transport base on the west coast and became first all weather naval air station Jet air craft introduced
1953	NAS Moffett Field became home to all Navy fixed-wing, land-based antisubmarine craft
1954	Weapons department formed

**Table 1. History of Installation Operations
 Environmental Baseline Survey
 NASA Research Park Parcels
 Moffett Federal Airfield, California**

DATES	TYPE OF OPERATION
1962	NAS Moffett Field selected as the west coast site to operate the P-3 Orion, the Navy's newest, fastest, and most versatile submarine-hunter-patrol airplane
1966	Station reactivated its high-speed refueling facilities
1973-1991	<p>The mission of NAS Moffett Field was to support antisubmarine warfare training and patrol operations</p> <p>Station became headquarters of the Commander Patrol Wings, U.S. Pacific Fleet</p>
1991-1994	NAS Moffett Field designated for closure as an active military base; transferred to NASA in July 1994
1994-Present	NASA Control

Modified from BRAC Cleanup Plan (PRC 1994)

**Table 2. Installation Restoration Program Sites
Environmental Baseline Survey
Parcel 1
Moffett Federal Airfield, California**

Parcel Number	IRP Site	Type of Site	Remedial Action	Confirmation Report/ Approval Reference
1	Regional Plume/ West Side Aquifers*	Groundwater Plume	In Progress	Locus, 1999/Tetra Tech, 1998, West-Side Aquifers Treatment System Final Long-Term Groundwater Monitoring Plan

*West Side Aquifers are the commingled MEW and MFA plumes; also commonly called the Regional Plume North of 101.

**Table 3. Underground Storage Tank Status
Environmental Baseline Survey
NASA Research Park Parcel 1
Moffett Federal Airfield, California**

Bldg# Location	Tank/Sump No.*	Contents	Size Gallons	Year Installed	Date Removed	Comments/status
-----------------------	---------------------------	-----------------	-------------------------	---------------------------	-------------------------	------------------------

Parcel 1

No USTs, Oil/water separators, or sumps are present.

**Table 4. Aboveground Storage Tank Status
Environmental Baseline Survey
NASA Research Park Parcel 1
Moffett Federal Airfield, California**

Bldg#/ Location	Tank No.*	Contents	Size Gallons	Year Installed	Date Removed	Comments
Parcel 1						
478	129	diesel	18	unknown	4/5/94	

* Tank designation No.'s from Tetra Tech 1994 and PRC 1994
Table checked against Tetra Tech Oct. 2, 1998 Report.

**Table 5. Lead Based Paint Sampling Results
Environmental Baseline Survey
NASA Research Park Parcel 1
Moffett Federal Airfield, California**

Bldg#	Building Name	Year constructed	Year sampled/ surveyed *	Confirmed lead present	Assumed lead present **	Lead in soil above residential PRG ***	Lead in soil above industrial PRG ****
-------	---------------	------------------	--------------------------	------------------------	-------------------------	--	--

Parcel 1 Buildings/Structures/Areas

17	Administration/Tele. Exchange	1933	Not sampled	no	yes	no	no
18	Communications Building (CCC)	1933	1998	yes	NA	no	no
19	Research Support Building (NASA Exclusive)	1933	1994	yes	NA	no	no
20	BOQ (NAR)	1933	1999	yes	NA	no	no
21	BOQ/MOQ Garage (NASA Warehouse)	1933	Not sampled	no	yes	no	no
22	BOQ/MOQ Garage (NAR)	1933	Not sampled	no	yes	no	no
23	Administration (Arkenstone)	1933	1999	yes	NA	yes	no
24	Office (Vacant)	1933	Not sampled	no	yes	Not sampled	Not sampled
25	Theatre/Recreation Services (Vacant)	1933	1998	yes	NA	yes	no
26	Pass Office/Main Gate	1933	1994	yes	NA	no	no
34	Storage (Vacant)	1934	Not sampled	no	yes	yes	no
36	Guard Shack	1934	Not sampled	no	yes	Not sampled	Not sampled
38	Playing Court	1936	Not sampled	no	yes	Not sampled	Not sampled
40	Flagpole	1933	Not sampled	no	yes	Not sampled	Not sampled
67	Post Office	1943	Not sampled	no	yes	yes	yes
478	Generator Shelter	1963	Not sampled	no	yes	Not sampled	Not sampled
493	Covered Picnic Area	1963	Not sampled	no	yes	Not sampled	Not sampled
566	Public Works Administration	1979	1994/1998	yes	NA	Not sampled	Not sampled
571	Tennis Courts	1963	Not sampled	no	yes	Not sampled	Not sampled
581	Theatre Marquee	1982	Not sampled	no	yes	Not sampled	Not sampled
943	Space Camp Administration	1941	Not sampled	no	yes	Not sampled	Not sampled
943A	Space Camp Training Center	1995	Not sampled	no	no	Not sampled	Not sampled
T37A	Space Camp Student Dormitories	1995	Not sampled	no	no	Not sampled	Not sampled
T37B	Space Camp Student Dormitories	1995	Not sampled	no	no	Not sampled	Not sampled
T37C	Space Camp Student Dormitories	1995	Not sampled	no	no	Not sampled	Not sampled
T37D	Space Camp Student Dormitories	1995	Not sampled	no	no	Not sampled	Not sampled

- * A full LBP survey has not been completed for any of the sampled buildings
- ** LBP assumed to be present in all pre-1978 buildings or buildings with unknown ages unless sampling confirmed otherwise
- *** Lead exceed the residential PRG of 400 mg/kg and/or Cal-EPA STLC threshold of 5 mg/l, (CWWMI, 1993)
- **** Lead exceed the industrial PRG of 1000 mg/kg (CWWMI, 1993)
- NA Not Applicable

**Table 6. Asbestos Survey/Sampling Results
Environmental Baseline Survey
NASA Research Park Parcels
Moffett Federal Airfield, California**

Bldg# Building Name	year(s) sampled/surveyed	Non-friable asbestos present	Friable asbestos present
Parcel 1 Buildings/Structures/Areas			
17 Administration/Tele. Exchange	1993/1994	confirmed	confirmed
18 Communications Building (CCC)	1993/1998/1999	confirmed	confirmed
19 Research Support Building (NASA Exclusive)	1993/1996/1998/1999	suspect	confirmed
20 BOQ (NAR)	1993/1999	confirmed	confirmed
21 BOQ/MOQ Garage (NASA Warehouse)	not sampled	NA	NA
22 BOQ/MOQ Garage (NAR)	1993	suspect	no
23 Administration (Arkenstone)	1993/1999	suspect	confirmed
24 Office (Vacant)	1993	suspect	no
25 Theatre/Recreation Services (Vacant)	1993	suspect	confirmed
26 Pass Office/Main Gate	1993	confirmed	no
34 Storage (Vacant)	1993	suspect	no
36 Guard Shack	1993	suspect	no
38 Playing Court	NA	NA	NA
40 Flagpole	NA	NA	NA
67 Post Office	1993	confirmed	no
478 Generator Shelter	1993	NA	NA
493 Covered Picnic Area	not sampled	NA	NA
566 Public Works Administration	1993/1994	suspect	no
571 Tennis Courts	NA	NA	NA
581 Theatre Marquee	not sampled	NA	NA
943 Space Camp Administration	1996/1999	no	yes*
943A Space Camp Training Center	not sampled	NA	NA
T37A Space Camp Student Dormitories	not sampled	NA	NA
T37B Space Camp Student Dormitories	not sampled	NA	NA
T37C Space Camp Student Dormitories	not sampled	NA	NA
T37D Space Camp Student Dormitories	not sampled	NA	NA

NA Not applicable

As discussed in Section 3.5.12 Asbestos results from *Tetra Tech, 1992* and various SAIC asbestos/lead ab

* Asbestos abatement conducted in building

**Table 7. PCB Impacted Transformer/Capacitors
Environmental Baseline Survey
NASA Research Park Parcel 1
Moffett Federal Airfield, California**

Bldg#	Date(s) analyzed	PCBs concentration in ppm *	Comments
Parcel 1 Buildings/Structures/Areas			
18	7/2/95, 10/7/96	6, 6	Three transformers (T-15.1, T-15.2, T-15.3) located outside, east of Building 18; only T-15.3 (6ppm) contains PCB concentrations above the CA regulated (5ppm) concentration.
23		**	Five transformers (T-5.1, T-5.2, T-5.3, T-5.4, T-5.5) located in the manhole in front of Building 23. Only transformers T-5.1 and T-5.5 have not been tested and therefore must be assumed to contain 500 ppm concentration of PCBs. (T-5.2, T-5.3, T-5.4 reported zero ppm PCBs from analyses on 7/2/95).
26	7/2/95, 10/7/96	21, 11	Transformer (T-1.2) removed on 6/10/98 on Manifest #98350114

* California DHS regulates liquid PCBs as hazardous waste with concentrations above 5 ppm. PCBs are identified as a haz substance under section 66900, Article 15, Title 22 of the CCR

**Table 8. Building List Summary
Environmental Baseline Survey
NASA Research Park Parcel 1
Moffett Federal Airfield, California**

3ldg#	Building Name/Historical Use	Area (gsf)	Year Constructed	Historic Register	Current Occupant	Fiscal Year 2000 Use	Preferred Development Alternative
Parcel 1 Buildings/Structures/Areas							
17	Administration/Tele. Exchange	20,920	1933	Yes	vacant	office	office
18	Communications Building (CCC)	3,751	1933	Yes	CCC	office	office
19	Research Support Building (NASA Exclusive)	137,994	1933	Yes	NASA	office & dorm	office
20	BOQ (NAR)	35,201	1933	Yes	Exchange	housing	office
21	BOQ/MOQ Garage (NASA Warehouse)	2,350	1933	Yes	vacant	storage	work/flex space
22	BOQ/MOQ Garage (NAR)	2,350	1933	Yes	vacant	storage	work/flex space
23	Administration (Arkenstone)	27,898	1933	Yes	Arkenstone/C	office	office
24	Office (Vacant)	1,350	1933	Yes	ode J	office	office
25	Theatre/Recreation Services (Vacant)	24,286	1933	Yes	vacant	auditorium/office	auditorium/office
26	Pass Office/Main Gate	1,982	1933	No	Code J	badging	badging
34	Storage (Vacant)	480	1934	Yes	vacant	storage	storage
36	Guard Shack	unknown	1934	No	Code J	guard house/utility	demolition
38	Playing Court	unknown	1936	No	vacant	recreation	recreation
40	Flagpole	unknown	1933	Yes	vacant	historical	historical
67	Post Office	2,338	1943	No	post office	post office	post office
478	Generator Shelter	76	1963	No	Code J	Utility	utility
493	Covered Picnic Area	773	1963	No	NEX	recreation	recreation
					Applied Information Technology		
566	Public IWorks Administration	6,800	1979	No	Technology	public works	
571	Tennis Courts	unknown	1963	No	NEX	recreation	recreation
581	Theatre Marquee	116	1982	No	NEX	demo	demolition
943	Space Camp Administration	20,775	1941	No	Space Camp	special Use	demolition
943A	Space Camp Training Center	10,010	1995	No	Space Camp	special Use	demolition
T37A	Space Camp Student Dormitories	3,920	1995	No	Space Camp	dorm	demolition
T37B	Space Camp Student Dormitories	3,920	1995	No	Space Camp	dorm	demolition
T37C	Space Camp Student Dormitories	3,920	1995	No	Space Camp	dorm	demolition
T37D	Space Camp Student Dormitories	3,920	1995	No	Space Camp	dorm	demolition
Total Building Square Footage Parcel 1		315,130					

Explanation:

gsf - gross square feet

Historic - Building identified in the National Register of Historic Places

Code J - Internal Nasa

NAR - Internal Nasa

CCC - Internal Nasa

CANG - Internal Nasa

JP - Internal Nasa

NEX -

Building List and Uses Provided by PAI Corporation, June 2000

**Table 9. Monitoring and Extraction Well Ownership and Total Depth
Environmental Baseline Survey
NASA Research Park Parcel 1
Moffett Federal Airfield, California**

Well Name	Well Owner	Well Type	Well Depth (feet bgs)
Parcel 1			
077B1	MEW	monitoring	unknown
078B1	MEW	monitoring	51
079B1	MEW	monitoring	54
088A	MEW	monitoring	32
089A	MEW	monitoring	30
111B1	MEW	monitoring	52
120A	MEW	monitoring	26
REG-7A	MEW	extraction	27
REG-8B1	MEW	extraction	54
REG-9A	MEW	extraction	27
REG-10B1	MEW	extraction	52
W09-16A1	Navy	monitoring	30
W89-05A1	Navy	monitoring	25
W89-06A1	Navy	monitoring	26.5
W89-08A1	Navy	monitoring	27
W89-09A1	Navy	monitoring	24.5
W89-14A2	Navy	monitoring	61
WU4-12A2	Navy	monitoring	40
WU4-13A2	Navy	monitoring	45

MEW - Middlefield/Ellis/Whisman Study Area
bgs - below ground surface

**Table 10. Former (Prior to 1994) Hazardous Materials and Waste Locations
 Environmental Baseline Survey
 NASA Research Park Parcel 1
 Moffett Federal Airfield, California**

Building Number and Name	Hazardous Materials	Hazardous Waste
Parcel 1 <u>Buildings/Structures/Areas</u>		
19 Research Support Building (NASA exclusive)	caustic solutions, benzyl alcohol	waste water containing silver ions
23 Administration (Arkenstone)	Mercury (in amalgam), photographic fixing solution	Waste mercury

Hazardous Materials/Wastes identified from ESAs completed for MFA (Boeing, 1993a and 1993b, CWMI, 1993a, 1993b, 1993c, and 1993d and SEC Donahue, 1993, and Uribe 1993)

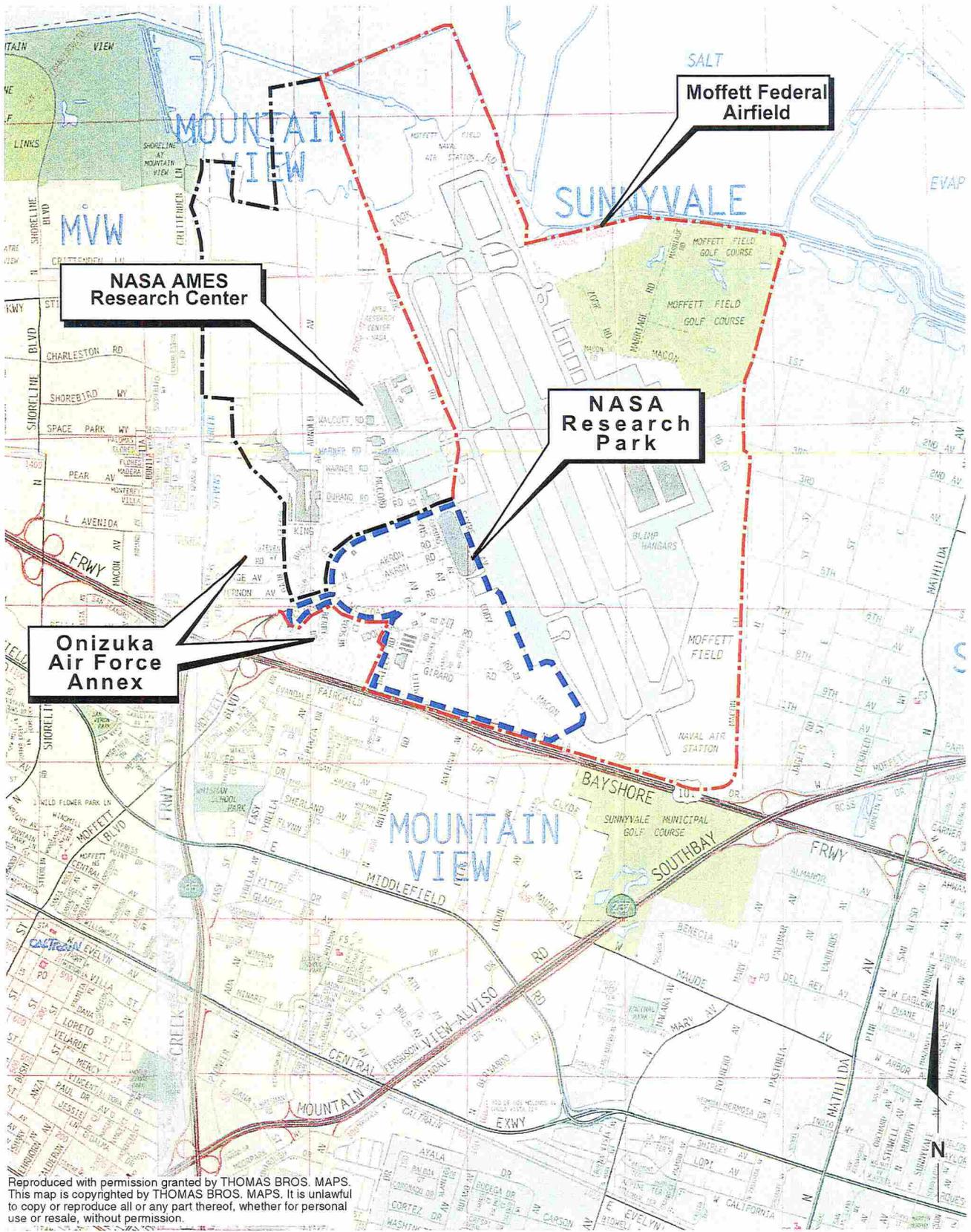
**Table 11. Current (1994-2000) Hazardous Materials and Waste Locations
Environmental Baseline Survey
NASA Research Park Parcel 1
Moffett Federal Airfield, California**

Building Number and Name	Hazardous Materials	Hazardous Waste
<u>Parcel 1 Buildings/Structures/Areas</u>		
17 Administration	None Identified	Lead-acid batteries, asbestos containing solids
19 Research Support Building	Preservatives for sampling only	Water contaminated with inorganics, aerosol spray cans, denatured alcohol, ethyl alcohol, batteries (NiCad and alkaline), hydrochloric acid solutions, latex, light Gullusk, motor oil, hydraulic oil, mercury, contaminated waste, non-tera materials
20 BOQ	Misc. oils, paint thinner, wood stain, glass cleaner, latex paint, rug shampoo	asbestos contaminated materials
23 Administration	Aerosol spray (flammable), inorganic compounds	Oil contaminated rags, mastic remover with asbestos
25 Theater/Recreation Services	Organic compounds, sodium hypochloride, aerosol spray cans (flammable)	Oil contaminated rags, containers with oil residue

Hazardous Materials/Wastes identified from an inventory prepared by NASA

PLATES

PLATES



Reproduced with permission granted by THOMAS BROS. MAPS. This map is copyrighted by THOMAS BROS. MAPS. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.



Harding Lawson Associates
Engineering and Environmental Services

Site Vicinity Map
Environmental Baseline Survey
NASA Research Park
Moffett Field, California

PLATE

1

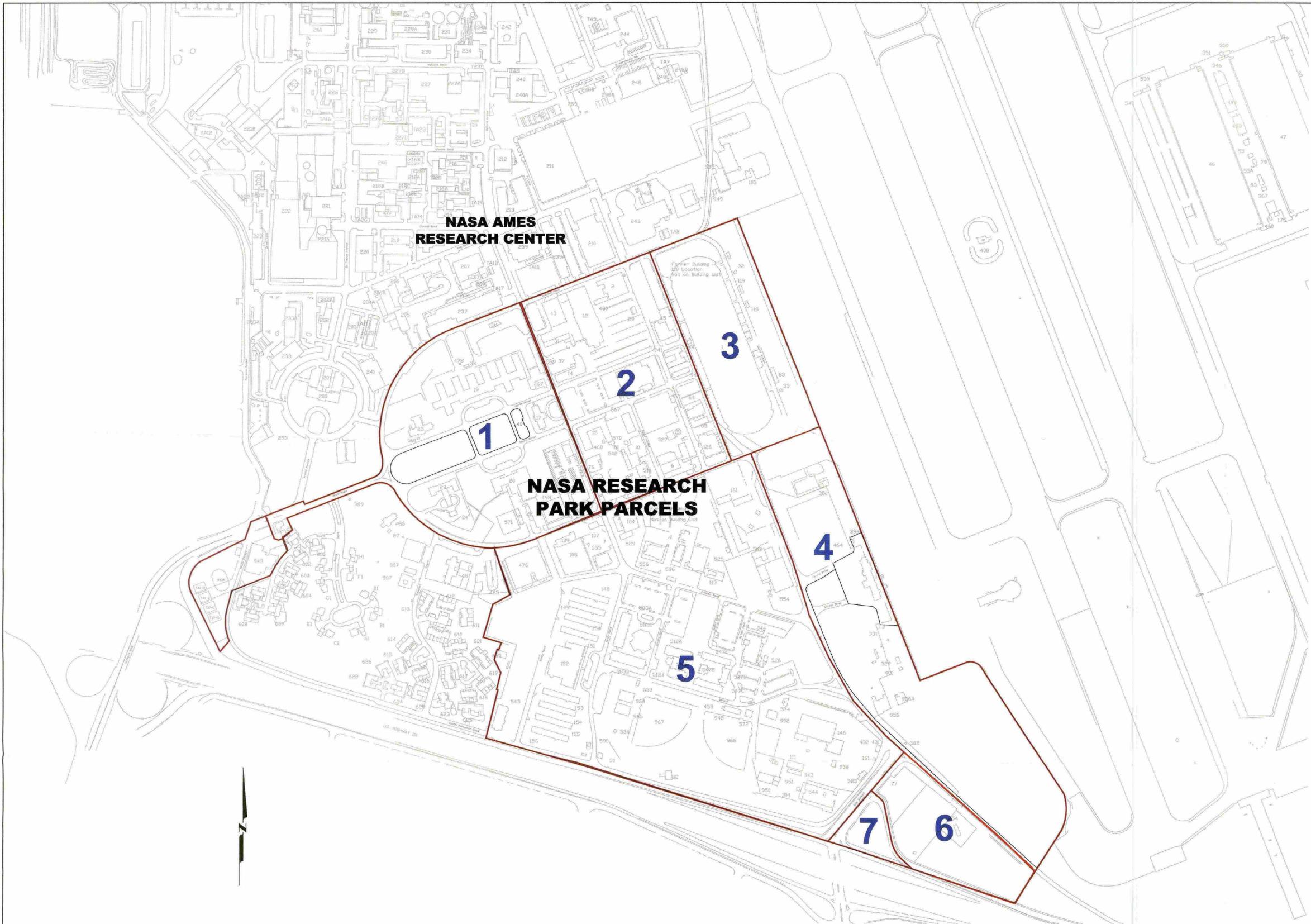
DRAWN
DJP

JOB NUMBER
50487 3.2

APPROVED

DATE
10/00

REVISED DATE



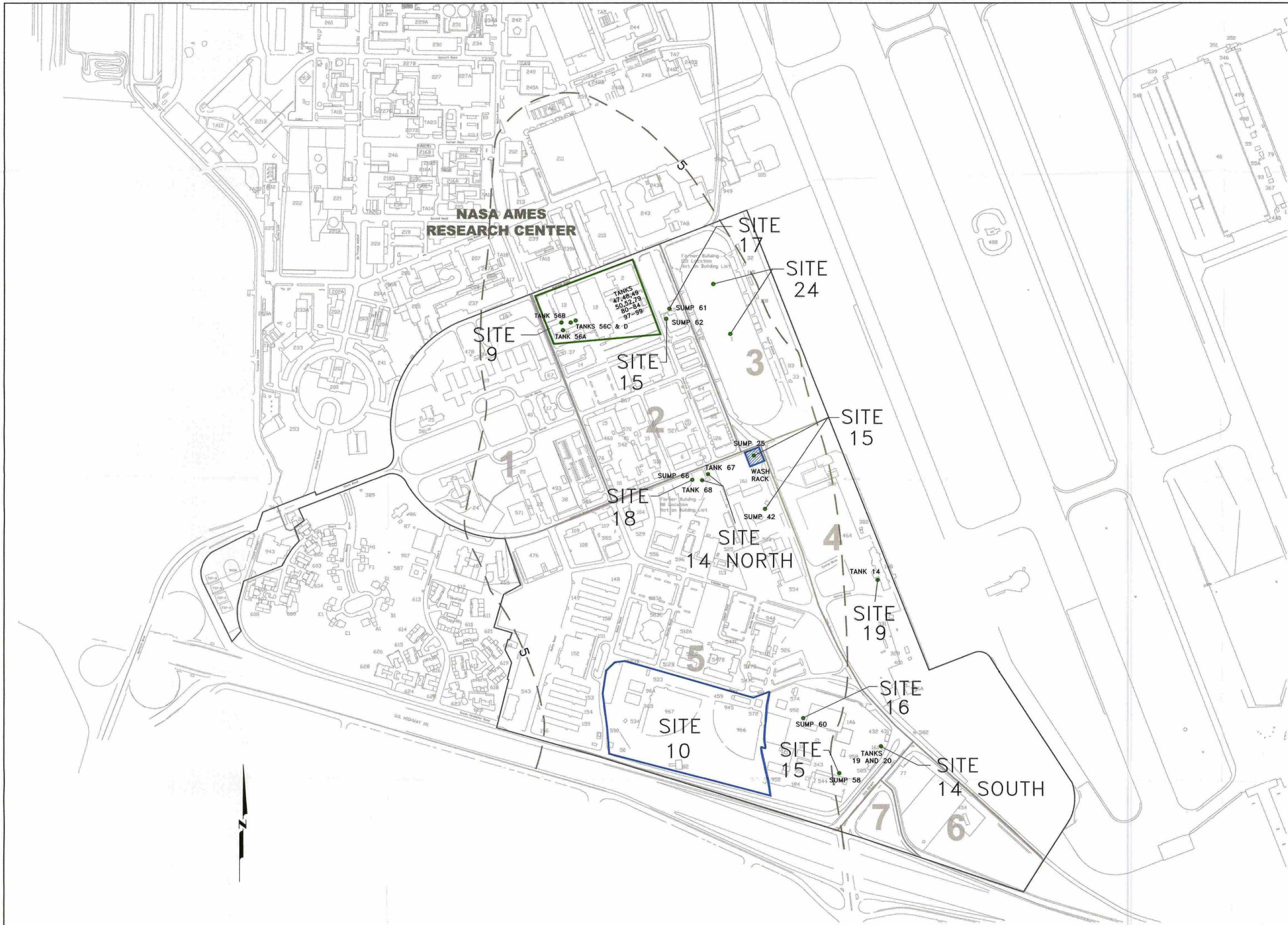
EXPLANATION

2 PARCEL BOUNDARY AND PARCEL NUMBER



 Harding Lawson Associates Engineering and Environmental Services	Property and Parcel Location Map Environmental Baseline Survey NASA Research Park Parcels Moffett Field, California		PLATE 2
	DRAWN 50487 31	JOB NUMBER 50487 31	APPROVED 8/31/00

HARDING LAWSON ASSOCIATES
 1000



EXPLANATION

SITE 10	O ₂ -WEST SITES
SITE 9	PETROLEUM SITES
5	WEST SIDE AQUIFER 5 ug/L PLUME LIMITS



Harding Lawson Associates
Engineering and
Environmental Services

IRP Site Location Map
Environmental Baseline Survey
NASA Research Park Parcels
Moffett Field, California

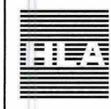
PLATE

3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
	50487 31		9/26/00	



- EXPLANATION**
- ⊕ W07-16C MONITORING WELL
 - MEW GROUNDWATER TREATMENT FACILITY
 - NASA GROUNDWATER TREATMENT FACILITY
 - NAVY WATS TREATMENT FACILITY



Harding Lawson Associates
Engineering and Environmental Services

**Well and Treatment System
Location Map**
Environmental Baseline Survey
NASA Research Park Parcels
Moffett Field, California

PLATE

4

DRAWN	JOB NUMBER 50487 31	APPROVED	DATE 9/26/00	REVISED DATE
-------	------------------------	----------	-----------------	--------------



- EXPLANATION**
- ⊞ UNDERGROUND STORAGE TANK
 - ⊞ ABOVE GROUND STORAGE TANK
 - ⊞ OIL/WATER SEPARATOR
 - ⊞ SUMP

**NASA AMES
RESEARCH CENTER**

	Harding Lawson Associates Engineering and Environmental Services	Tank Location Map Environmental Baseline Survey NASA Research Park Parcels Moffett Field, California	PLATE 5
	DRAWN 50487 31	JOB NUMBER 50487 31	APPROVED 9/26/00



EXPLANATION

- PRIMARY ELECTRIC OVERHEAD
- - - PRIMARY ELECTRIC UNDERGROUND
- SECONDARY ELECTRIC OVERHEAD
- - - SECONDARY ELECTRIC UNDERGROUND
- GAS PIPE
- HIGH PRESSURE AIR PIPE
- STEAM PIPE

0 300 600
SCALE IN FEET



Harding Lawson Associates
Engineering and
Environmental Services

Utilities Location Map #1
Environmental Baseline Survey
NASA Research Park Parcels
Moffett Field, California

PLATE

6a

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
	50487 31		8/31/00	



EXPLANATION

- TELEPHONE OVERHEAD
- - - TELEPHONE UNDERGROUND
- STORM DRAIN
- SANITARY SEWER
- WATER LINE

**NASA AMES
RESEARCH CENTER**

1
2
3
4
5
6
7



Harding Lawson Associates
Engineering and
Environmental Services

Utilities Location Map #2
Environmental Baseline Survey
NASA Research Park Parcels
Moffett Field, California

PLATE

6b

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
	50487 31		8/31/00	

Appendix A

APPENDIX A

PARCEL ENVIRONMENTAL SUMMARY REPORTS

ENVIRONMENTAL SUMMARY REPORT

Parcel No: 1

Parcel Usage: Office

Planned Use: Office/light industrial

Current Uses: Office/commercial/vacant

Former Uses: Office/commercial

Estimated Area: 38 acres

Elevation: 30 feet

Ground Water: Known contamination

Archeological: None identified

Water Level: 7-12 feet

Water Flow Direction: north- northeast

Ecological: None identified

Environmental Summary

Adjacent Redevelopment Parcels:	2	USTs/Oil water/sumps separators:	0	Radiological Surveys:	0	Closed/demolished Buildings:	0
Buildings/Areas:	26	ASTs:	1	Haz Waste Accumulation Sites:	0	Lead in building/ground surface:	21
Utilities by Parcels:	6	PCB Contaminated Equipment:	3	Haz Waste Storage Areas:	5	Lead Paint Survey:	0
IR/OU Sites:	1	Ordnance Locations:	0	Haz Waste Treatment Facilities:	0	Historical Structures:	11
Radon Survey:	1	Asbestos Sites:	13	Haz Materials Storage Areas:	4	Mold in Buildings:	3

Building	Name	Historic	Remarks	Year Built	Year Demolished	Total Square Feet
17	Administration/Tele. Exchange	Yes	Scheduled for re use	1933	Not Applicable	20,920
18	Communications Building (CCC)	Yes	Scheduled for re use	1933	Not Applicable	3,751
19	Research Support Building (NASA Exclusive)	Yes	Scheduled for re use	1933	Not Applicable	137,994
20	BOQ (NAR)	Yes	Scheduled for re use	1933	Not Applicable	35,201
21	BOQ/MOQ Garage (NASA Warehouse)	Yes	Scheduled for re use	1933	Not Applicable	2,350
22	BOQ/MOQ Garage (NAR)	Yes	Scheduled for re use	1933	Not Applicable	2,350
23	Administration (Arkenstone)	Yes	Scheduled for re use	1933	Not Applicable	27,898
24	Office (Vacant)	Yes	Scheduled for re use	1933	Not Applicable	1,350

Building	Name	Historic	Remarks	Year Built	Year Demolished	Total Square Feet
25	Theatre/Recreation Services (Vacant)	Yes	Scheduled for re use	1933	Not Applicable	24,286
26	Pass Office/Main Gate	No	Scheduled for re use	1933	Not Applicable	1,982
34	Storage (Vacant)	Yes	Scheduled for re use	1934	Not Applicable	480
36	Guard Shack	No	Scheduled for re use	1934	Not Applicable	Not available
38	Playing Court	No	Scheduled for re use	1936	Not Applicable	Not available
40	Flagpole	Yes	Scheduled for re use	1933	Not Applicable	Not applicable
67	Post Office	No	Scheduled for re use	1943	Not Applicable	2,338
478	Generator Shelter	No	Scheduled for re use	1963	Not Applicable	76
493	Covered Picnic Area	No	Scheduled for re use	1963	Not Applicable	773
566	Public Works Administration	No	Scheduled for demolition	1979	Not Applicable	6,800
571	Tennis Courts	No	Scheduled for re use	1963	Not Applicable	Not available
581	Theatre Marquee	No	Scheduled for demolition	1982	Not Applicable	116
943	Space Camp Administration	No	Scheduled for demolition	1941	Not Applicable	20,775
943A	Space Camp Training Center	No	Scheduled for demolition	1995	Not Applicable	10,010
T37A	Space Camp Student Dormitories	No	Scheduled for demolition	1995	Not Applicable	3,920
T37B	Space Camp Student Dormitories	No	Scheduled for demolition	1995	Not Applicable	3,920
T37C	Space Camp Student Dormitories	No	Scheduled for demolition	1995	Not Applicable	3,920
T37D	Space Camp Student Dormitories	No	Scheduled for demolition	1995	Not Applicable	3,920

Building/Site Environmental Data Summary

Build- ing	IRP Sites	HMS	HWS	HWAA	PCBs (Removed)	PCBs (In Place)	Ordnance	Asbestos	UST (Removed)	UST (In Place)	AST (Removed)	AST (In Place)	OWS/Sump (Removed)	OWS/Sump (In Place)	Lead Paint	Radiation	Radon Survey
17	yes	no	yes	no	no	no	no	yes	no	no	no	No	no	no	yes	no	no
18	yes	no	no	no	no	yes	no	yes	no	no	no	No	no	no	yes	no	no
19	yes	yes	yes	no	no	no	no	yes	no	no	no	No	no	no	yes	no	no
20	yes	yes	yes	no	no	no	no	yes	no	no	no	No	no	no	yes	no	no
21	yes	no	no	no	no	no	no	NA	no	no	no	No	no	no	yes	no	no
22	yes	no	no	no	no	no	no	yes	no	no	no	No	no	no	yes	no	no
23	no	yes	yes	no	no	yes	no	yes	no	no	no	No	no	no	yes	no	yes
24	no	no	no	no	no	no	no	yes	no	no	no	no	no	no	yes	no	no
25	no	yes	yes	no	no	no	no	yes	no	no	no	no	no	no	yes	no	yes
26	no	no	no	no	yes	no	no	yes	no	no	no	no	no	no	yes	no	no
34	no	no	no	no	no	no	no	yes	no	no	no	no	no	no	yes	no	no

ENVIRONMENTAL REPORT

Building/Site Environmental Data Summary

Building	IRP Sites	HMS	HWS	HWAA	PCB (Removed)	PCB (In Place)	Ordance	Asbestos	UST (Removed)	UST (In Place)	AST (Removed)	AST (In Place)	OWS/Sump (Removed)	OWS/Sump (In Place)	Lead Paint	Radation	Radon Survey
36	no	no	No	no	no	no	no	yes	no	no	no	no	no	no	yes	no	no
38	yes	no	No	no	no	no	no	no	no	no	no	no	no	no	yes	no	no
40	yes	no	No	no	no	no	no	no	no	no	no	no	no	no	yes	no	no
67	yes	no	No	no	no	no	no	yes	no	no	no	no	no	no	yes	no	no
478	no	no	No	no	no	no	no	no	no	no	yes	no	no	no	yes	no	no
493	yes	no	No	no	no	no	no	no	no	no	no	no	no	no	yes	no	no
566	yes	no	No	no	no	no	no	yes	no	no	no	no	no	no	yes	no	no
571	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	yes	no	no
581	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes	no	no
943	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes	no	no
943A	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
T37A	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
T37B	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
T37C	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
T37D	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no

Building/Site Uses

Building	Current Uses	Former Uses	Preferred Alternative Development	Concern
17	office	Administration/Tele. Exchange	office	IRP, asbestos, LBP, HWS
18	office	Communications Building (CCC)	office	IRP, asbestos, LBP, PCBs
19	office & dorm	Research Support Building (NASA Exclusive)	office	IRP, HMS, HWS, asbestos, LBP
20	housing	BOQ (NAR)	office	IRP, asbestos, LBP, HMS, mold, HWS
21	storage	BOQ/MOQ Garage (NASA Warehouse)	work/flex space	IRP, LBP
22	storage	BOQ/MOQ Garage (NAR)	work/flex space	IRP, asbestos, LBP
23	office	Administration (Arkenstone)	office	HMS, HWS asbestos, LBP, mold, PCBs
24	office	Office (Vacant)	office	Asbestos, LBP, mold
25	auditorium/office	Theatre/Recreation Services (Vacant)	auditorium/office	Asbestos, LBP, HMS, HWS, mold
26	badging	Pass Office/Main Gate	badging	Asbestos, LBP, PCBs
34	storage	Storage (Vacant)	storage	LBP, asbestos
36	guard house/utility	Guard Shack	demo	Asbestos, LBP
38	recreation	Playing Court	recreation	IRP, LBP

Building	Current Uses	Former Uses	Preferred Alternative Development	Concern
40	historical	Flagpole	historical	IRP, LBP
67	post office	Post Office	post office	IRP, LBP, asbestos
478	Utility	Generator Shelter	Utility	LBP, AST
493	recreation	Covered Picnic Area	recreation	IRP, LBP
566	Applied Information Technology	Public works	demo	IRP, LBP, asbestos
571	recreation	Tennis Courts	recreation	IRP, LBP
581	demo	Theatre Marquee	demo	LBP
943	special Use	Space Camp Administration	demo	LBP
943A	special Use	Space Camp Training Center	demo	none
T37A	dormitory	Space Camp Student Dormitories	demo	none
T37B	dormitory	Space Camp Student Dormitories	demo	none
T37C	dormitory	Space Camp Student Dormitories	demo	none
T37D	dormitory	Space Camp Student Dormitories	demo	none

Notes: : IRP = Installation Restoration Program HMS = Hazardous materials storage, HWS = Hazardous waste storage, HWAA = Hazardous waste accumulation area, PCB = Polychlorinated bi-phenol, UST = underground storage tank, AST = aboveground storage tank, OWS = Oil Water Separator, LBP = Lead-based paint; NA = Not Applicable

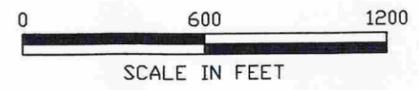
Appendix B

APPENDIX B

PLUME AND ALLOCATION MAPS



EXPLANATION
 ~ 5 ~ TCE CONCENTRATION CONTOUR (ug/L)



SOURCE: NASA AMES RESEARCH CENTER, 5/00



Harding Lawson Associates
 Engineering and
 Environmental Services

DRAWN: TJH
 JOB NUMBER: 50487 3.1

Isoconcentration Map -
Trichloroethene
 Environmental Baseline Survey
 NASA Research Park Parcels
 Moffett Field, California

APPROVED: _____
 DATE: 9/00

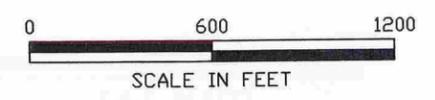
PLATE
B1
 REVISED DATE: _____

50487008.DWG 1000
 20001016.1654



EXPLANATION

— 1 — BENZENE CONCENTRATION
CONTOUR (ug/l)



SOURCE: NASA AMES RESEARCH CENTER, 6/00



Harding Lawson Associates
Engineering and
Environmental Services

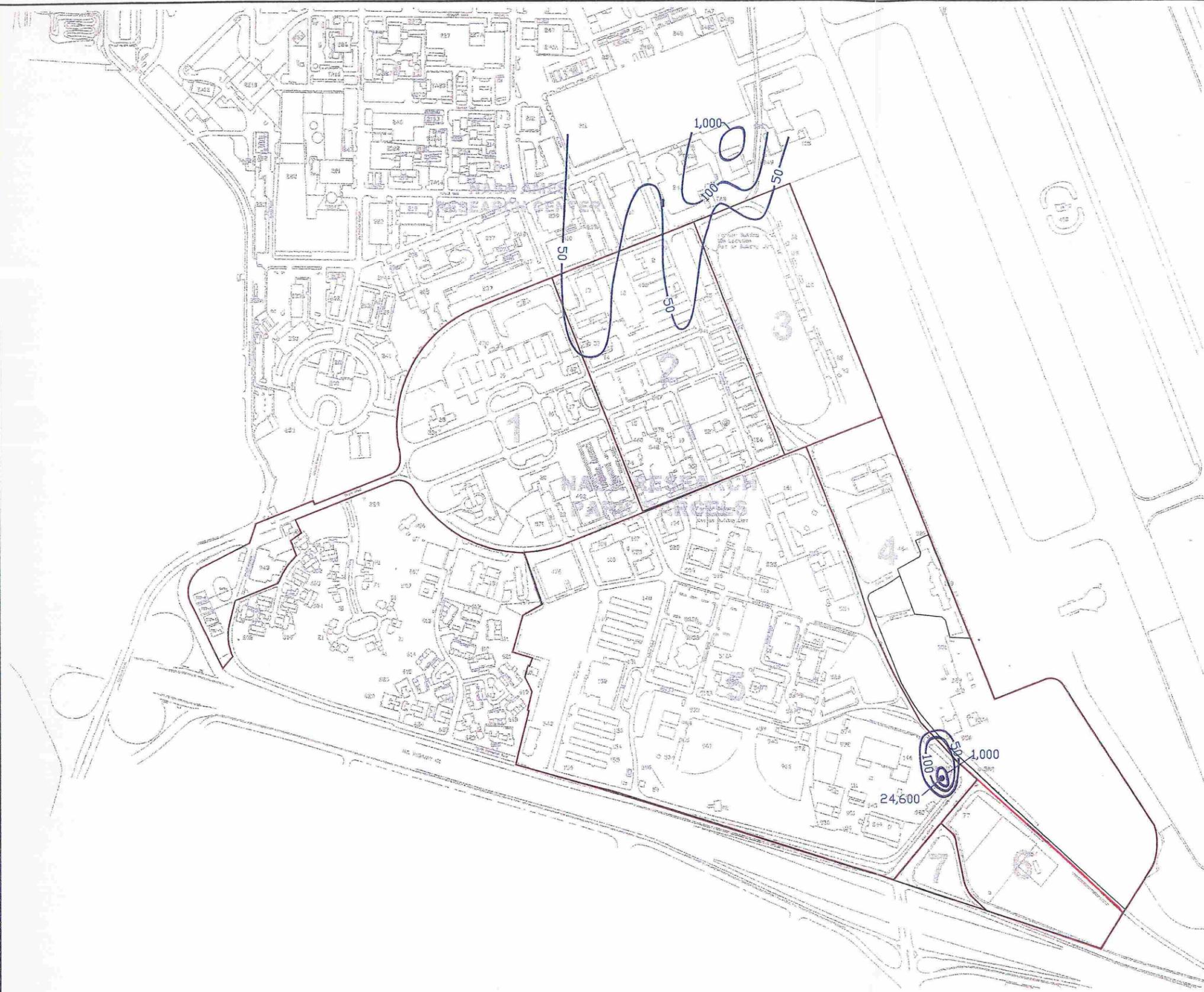
DRAWN: TJH
JOB NUMBER: 50487 3.1

**Isoconcentration Map -
Benzene**
Environmental Baseline Survey
NASA Research Park Parcels
Moffett Field, California

APPROVED: _____ DATE: 9/00

PLATE
B2
REVISED DATE: _____

50487009.DWG 100.0
20000926.2107



EXPLANATION

— 1 — TPHg CONCENTRATION
CONTOUR (ug/l)



SOURCE: NASA AMES RESEARCH CENTER, 6/00



Harding Lawson Associates
Engineering and
Environmental Services

DRAWN TJH
JOB NUMBER 50487 3.1

Isoconcentration Map -
TPH as Gasoline
Environmental Baseline Survey
NASA Research Park Parcels
Moffett Field, California

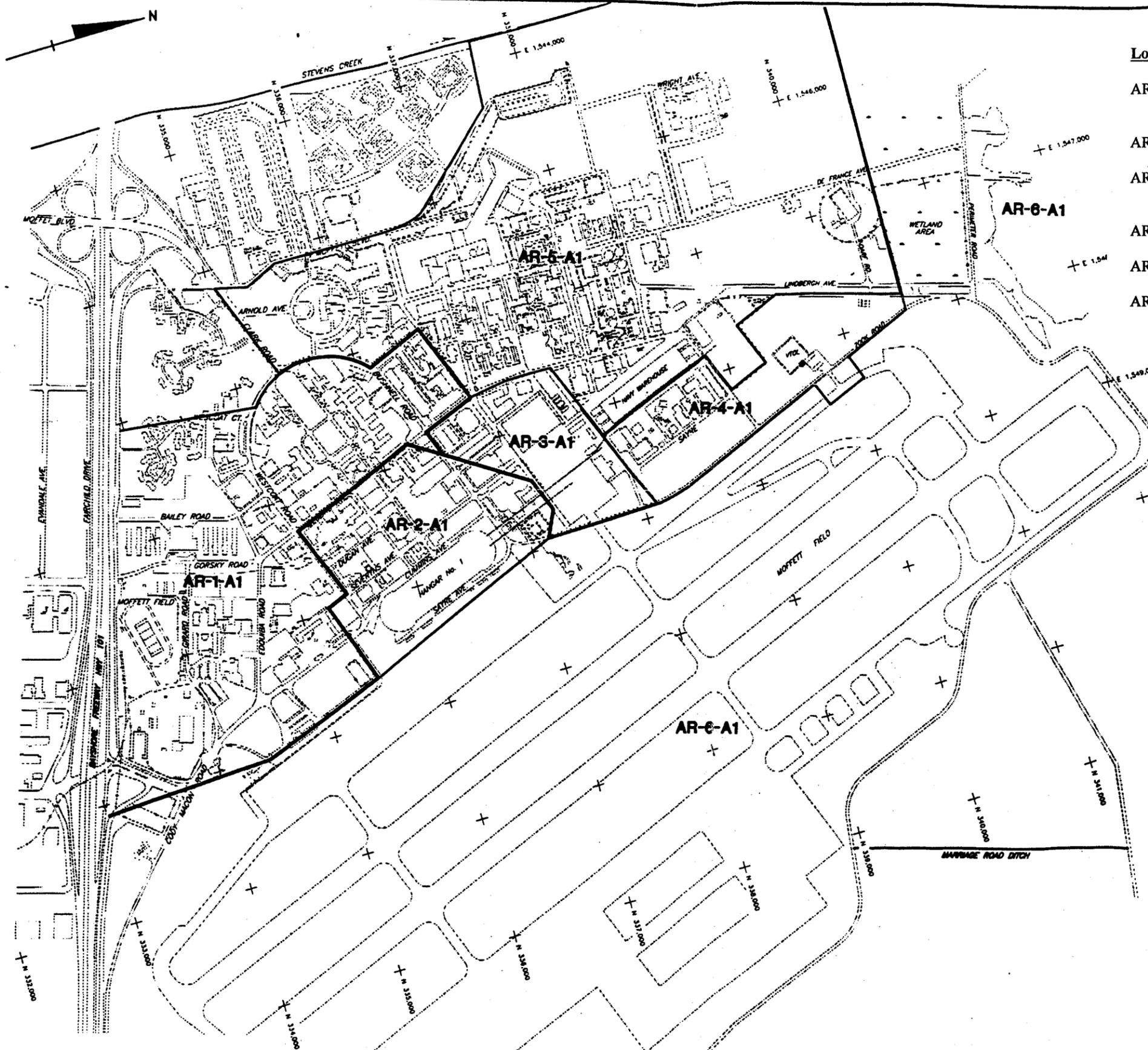
APPROVED
DATE 9/00

PLATE
B3
REVISED DATE

50487010.DWG 100.0
20000926.2109

DRAWING NUMBER 92-023-E504

CD 91-08-03
 02 01-20-93



Location	Responsible Party/Contamination Type
AR-1	MEW/chlorinated solvents in groundwater NAVY/TPH in groundwater
AR-2	NAVY/all soil and groundwater
AR-3	MEW/chlorinated solvents in soil and groundwater NASA/TPH in groundwater
AR-4	NASA/all soil and groundwater
AR-5	NASA/all soil and groundwater
AR-6	NAVY/all soil and groundwater



A/A1 AQUIFER
 CLEANUP RESPONSIBILITY
 MOFFETT FIELD, CALIFORNIA
 PREPARED FOR
 FAIRCHILD
 SEMICONDUCTOR. CORP.
SMITH

No.	DATE	ISSUE / REVISION	OS	EM	JER

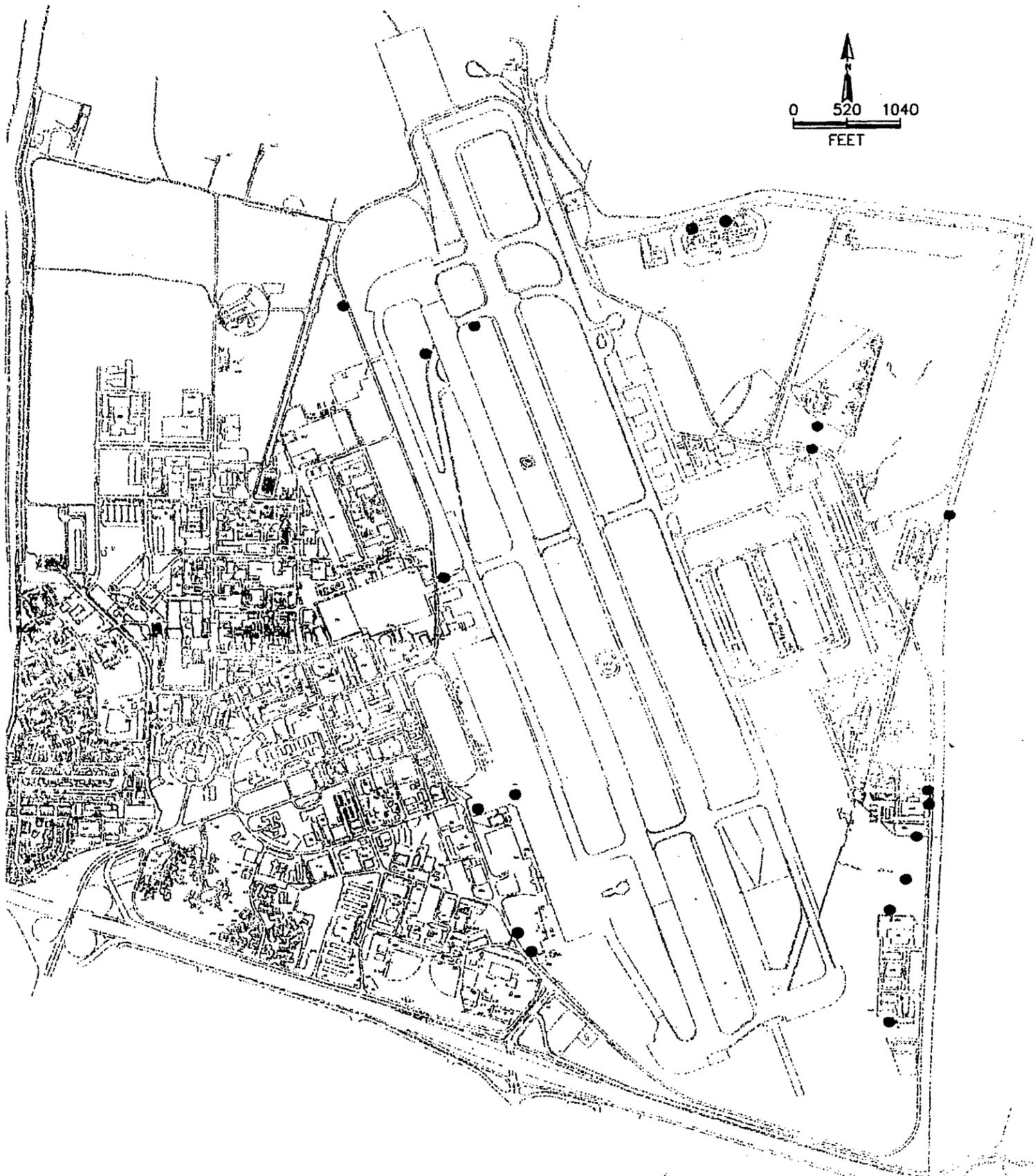
From Allocation and Settlement Agreement

DATE: 8-23-88	EXHIBIT B1	DRAWING NUMBER: 92-023-E504
SCALE: AS SHOWN		

Appendix C

APPENDIX C

BURROWING OWL LOCATION MAP



● Active owl burrow

TITLE: Burrowing Owl Locations July 2000 Survey	DWN:	DES.:	PROJECT NO.:
	CHKD:	APPD:	
	DATE:	REV.:	FIGURE 13

Appendix D

APPENDIX D

ARCHEOLOGICAL SENSITIVE AREAS

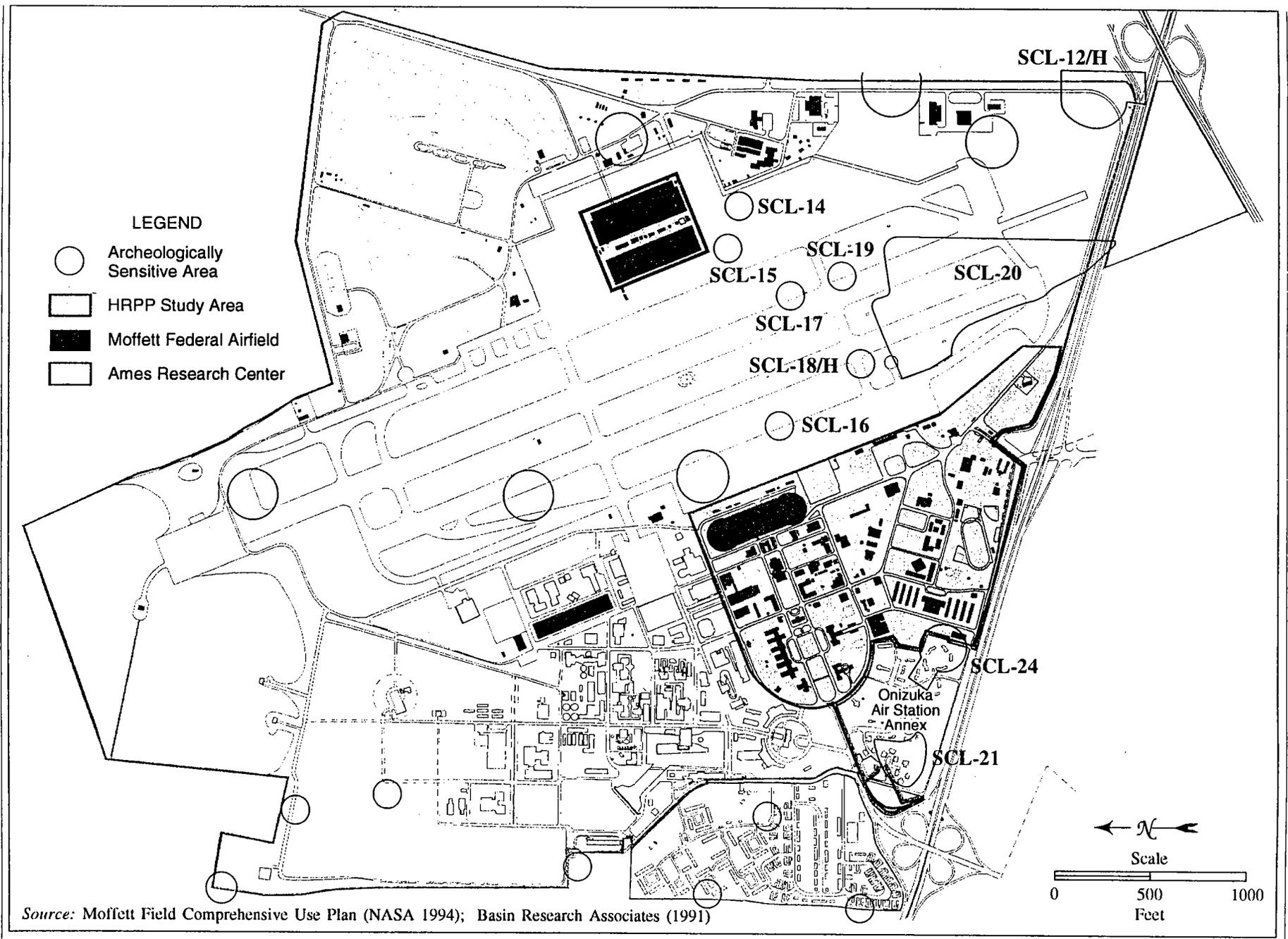


Figure 4-1. Archeological Sensitivity Areas on NASA Ames Research Center, Moffett Field

DISTRIBUTION

Environmental Baseline Survey
NASA Research Park Parcel 1
Moffett Federal Airfield
Moffett Field, California

October 18, 2000

Copy No. 12

- Copies 1-2: Sandy Olliges
NASA Ames Research Center
MS 218-1
Moffett Field, California 94035-1000
- Copy 3: Thomas H Anderson
NASA/Ames Research Center
MS 19-21
Moffett Field, California 94035-1000
- Copy 4: Joann Cola
SFD-7-4
US Environmental Protection Agency
75 Hawthorne Street
San Francisco, California 94105
- Copy 5: Roberta Blank- Superfund Division
SFD-8-2
US Environmental Protection Agency
75 Hawthorne Street
San Francisco, California 94105
- Copy 6: Joseph Chou
California Regional Water Quality Control Board
1515 Clay Street
Oakland, California 94612

DISTRIBUTION

Environmental Baseline Survey
NASA Research Park Parcel 1
Moffett Federal Airfield
Moffett Field, California

October 18, 2000

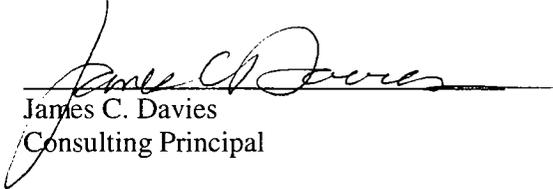
Copy 7: Marianna Potacka
BRAC – Environmental Coordinator
BRAC Operations, Code 06CM.MP
1230 Columbia Street
Suite 1100
San Diego, California 92101

Copy 8: Jim Boarer
Locus Technologies
299 Fairchild Drive
Mountain View, California 94043

Copies 9-11: HLA Files

Copy 12: Corporate Copy

Quality Control Reviewer


James C. Davies
Consulting Principal

GAL/JP:kib/KB56338AA.doc.OFS