MOFFETT FEDERAL AIRFIELD
FINAL OPERABLE UNIT 1
RECORD OF DECISION

(Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act)

August 1, 1997

Issued By:

U.S. Department of the Navy - Engineering Field Activity West
Naval Facilities Engineering Command

and

U.S. Environmental Protection Agency
Region 9 - San Francisco, California

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August 25, 1997

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Engineering Field Activity West
Naval Facilities Engineering Command
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CLEAN Contract Number N62474-88-D-5086
Contract Task Order 0236

Subject: Final Operable Unit 1 Record of Decision, Moffett Federal Airfield

Dear Messrs. Chao and Chan:

Enclosed is the final version of the Final Operable Unit 1 Record of Decision (ROD) prepared by PRC Environmental Management, Inc. (PRC) for your records. Copies have been distributed to the regulatory agencies, project staff, and other interested parties.

If you have any questions, please call me at (303) 312-8874.

Sincerely,

Timothy E. Mower
Project Manager

TEM/jem

Enclosures

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FINAL OPERABLE UNIT 1
RECORD OF DECISION

MOFFETT FEDERAL AIRFIELD

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ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or relevant and appropriate requirement
AWQC	Ambient water quality criteria
BCDC	Bay Conservation and Development Commission
bls	Below land surface
BRAC	Base realignment and closure
Caltrans	California Department of Transportation
Cal/EPA	California Environmental Protection Agency
CAMU	Corrective Action Management Unit
CBCEC	California Base Closure Environmental Committee
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIWMB	California Integrated Waste Management Board
CLEAN	Comprehensive Long-term Environmental Action Navy
cm/sec	Centimeters per second
COE	U.S. Army Corps of Engineers
COPC	Chemical of potential concern
CPT	Cone penetrometer test
CRC	Coastal Resources Coordination
CRP	Community relations plan
DFG	State of California Department of Fish and Game
DoD	Department of Defense
DTSC	California EPA Department of Toxic Substances Control
EFA West	Engineering Field Activity West
EPA	U.S. Environmental Protection Agency
ESD	Explanation of significant differences
FFA	Federal Facilities Agreement
FS	Feasibility study
FWS	U.S. Fish and Wildlife Service
HELP	Hydrologic Evaluation of Landfill Performance
HLA	Harding Lawson Associates
HP	HydroPunch
HTA	heavier-than-air
IAS	Initial Assessment Study
IRP	Installation Restoration Program
IT	International Technology Corporation
LDR	Land disposal restriction
LEA	Local enforcement agency
LEL	Lower explosive limit
LGCW	Landfill gas characterization well

ACRONYMS AND ABBREVIATIONS (Continued)

LGMW	Landfill gas monitoring well
LTA	Lighter-than-air
LWV	League of Women Voters
MCL	Maximum contaminant level
MEK	Methyl ethyl ketone (2-butanone)
MEW	Middlefield, Ellis, and Whisman
ϒg/kg	Micrograms per kilogram
ϒg/L	Micrograms per liter
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MOU	Memorandum of understanding
msl	Mean sea level
MTR	Minimum technology requirement
NAS	Naval air station
NASA	National Aeronautics and Space Administration
NAVFAC	Naval Facilities Engineering Command
NBA	North base area
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NEPA	National Environmental Policy Act
NEX	Naval exchange
NOAA	National Oceanic and Atmospheric Administration
NMOC	Nonmethane organic compound
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NWP	Nationwide Permit
O&M	Operation and maintenance
OU	Operable unit
PAH	Polynuclear aromatic hydrocarbon
ppb	Parts per billion
PCB	Polychlorinated biphenyl
PG&E	Pacific Gas and Electric Company
POTW	Publicly owned treatment works
PPE	Personal protective equipment
PRC	PRC Environmental Management, Inc.
QA/QC	Quality assurance and quality control
RAB	Restoration advisory board
RAO	Remedial action objective
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial design and remedial action
RI/FS	Remedial investigation and feasibility study
ROD	Record of decision
RWQCB	California Regional Water Quality Control Board, San Francisco Bay Region

ACRONYMS AND ABBREVIATIONS (Continued)

SARA	Superfund Amendments and Reauthorization Act
SCVWD	Santa Clara Valley Water District
SMHM	Salt marsh harvest mouse
SVOC	Semivolatile organic compound
SVTC	Silicon Valley Toxics Coalition
SWAT	Solid Waste Assessment Test
SWRCB	State Water Resources Control Board
SWRP	Stormwater retention pond
TAG	Technical assistance grant
TCE	Trichloroethene
TDS	Total dissolved solids
T&E	Threatened and endangered
THE	Technical, Historical, and Educational
TPH	Total petroleum hydrocarbons
TRC	Technical Review Committee
USC	United States Code
USCS	Unified Soil Classification System
UST	Underground storage tank
VOC	Volatile organic compound
WQPS	Water quality protection standard

1.0 DECLARATION STATEMENT FOR OPERABLE UNIT 1

Site Name and Location

Moffett Federal Airfield (formerly Naval Air Station Moffett Field) Mountain View, California

This federal facility is on the National Priorities List (NPL). Moffett Federal Airfield (Moffett Field) has been closed as an active military facility under the Base Realignment and Closure (BRAC) program. Control of base operations was transferred to the National Aeronautics and Space Administration (NASA) on July 1, 1994.

Statement of Basis and Purpose

This decision document presents the selected remedial action for Operable Unit 1 (OU1) at Moffett Field. OU1 consists of two landfills (Sites 1 and 2); the selected remedial action for Site 2 is consolidation of waste from Site 2 to Site 1 and groundwater monitoring and for Site 1 is capping, gas and groundwater collection trenches, and gas and groundwater monitoring. The remedial action (RA) was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is supported by information contained in the administrative record for OU1. The U.S. Environmental Protection Agency (EPA) and the State of California Environmental Protection Agency concur with the selected remedy.

Assessment of Site

Actual or threatened releases of hazardous substances from OU1, if not addressed by implementing the response action selected in this record of decision (ROD), may present a current or potential threat to public health, welfare, or the environment.

Description of the Selected Remedy

The selected response action addresses the principal threat posed by the site through consolidation and containment of wastes. The major components of the selected response action include:

1. Consolidating wastes from the Site 2 landfill to the Site 1 landfill in accordance with substantive provisions of Title 23 California Code of Regulations (CCR) Chapter 15, backfilling and restoring Site 2, and designating the Site 1 landfill as a corrective action management unit (CAMU) in accordance with 22 CCR, Division 4.5, Chapter 14, Article 15.5, Section 66264.552. Containers of hazardous wastes excavated at Sites 1 and 2 will be characterized and shipped off site for disposal.

2. Capping the Site 1 landfill in accordance with California Solid Waste Management Regulations, in CCR, Title 14 - Natural Resources, Division 7, Chapter 3, Article 7.8 - Disposal Site Standards, Closure and Postclosure (14 CCR) and 23 CCR Chapter 15 or federal regulations in 40 Code of Federal Regulations (CFR) 258.60, whichever are more stringent.

3. Conducting groundwater monitoring at Sites 1 and 2 in accordance with provisions of 14 CCR and 23 CCR Chapter 15. Conducting groundwater monitoring at Site 2 for a minimum period of 3 years after Site 2 waste is consolidated at Site 1 to ensure groundwater at Site 2 is not adversely affected. Pursuant to 23 CCR, Chapter 15, Article 5, Section 2550.4, the Navy will derive and propose concentration limits for each constituent of concern. Federal ambient water quality criteria (AWQC) and RWQCB Basin Plan water quality objectives will be considered in deriving the concentration limits.

4. Installing a subsurface groundwater collection trench along the northern border of Site 1 to intercept potential future leachate migration before it reaches surface water, if necessary. If groundwater monitoring data exceed the criteria derived in accordance with 23 CCR Chapter 15, Article 5 (item 3 above), the Navy will immediately notify the regulatory agencies and will evaluate the groundwater contamination in accordance with CERCLA, and will obtain concurrence from EPA and the State on remediation decisions.

5. Conducting landfill gas monitoring at Site 1 in accordance with applicable provisions of 14 CCR and 23 CCR Chapter 15.

6. Installing a passive gas venting trench along the western boundary of Site 1 to prevent off-site, subsurface migration of landfill gases.

7. Conducting postclosure maintenance activities at Site 1 in accordance with applicable provisions of 14 CCR and 23 CCR Chapter 15 or 40 CFR 258.61, whichever is more stringent.

8. Institutional controls - Fencing, signs, operation and maintenance (O&M) of Building 191 pump station and drain/subdrain system, and restrictions on cap disturbances. The Navy will resolve any issues with NASA regarding the process to develop appropriate

restrictive provisions to ensure continued O&M of the Building 191 pump station and to maintain the integrity of the Site 1 cap. The Navy will enter into an agreement with NASA or develop another appropriate vehicle to accomplish this task. The Navy will resolve any issues concerning the necessary restrictive provisions within 1 year of the date of this ROD.

OU1 remedy selection is consistent with overall remedial investigation and feasibility study (RI/FS) activities at Moffett Field. The selected response actions described in this ROD will address the source of contamination by containing on-site wastes. The response action will reduce Sites 1 and 2 as sources to groundwater contamination by consolidating the waste material located above and below the water table at Site 2 to Site 1 and by capping Site 1. Consolidation and capping also reduce the risk associated with exposure to contaminated materials. In addition, because of the proximity of surface water to the northern boundary of the Site 1 landfill, the selected remedy also includes construction of a groundwater collection trench as a contingency measure to provide immediate protection to this adjacent surface water (component 4 above). Qualified professionals will be used to conduct the work required by this ROD.

Groundwater within the subsurface collection trench will be monitored at the same frequency as at the Site 1 groundwater monitoring wells. If chemical concentrations exceeding concentration limits set pursuant to 23 CCR Chapter 15 Article 5 are observed, the Navy will immediately notify the regulatory agencies and will evaluate the groundwater contamination in accordance with CERCLA, and will obtain concurrence from EPA and the State on remediation decisions. Potential actions may include additional or more frequent sampling or groundwater extraction and treatment, depending on the nature and levels of the chemicals detected.

The collection trench can be activated if, based on the monitoring data and the consultation process described above, the groundwater poses a threat to ecological receptors. OU1 includes surrounding groundwater, however, the remedy does not include active leachate extraction or active groundwater remediation. Groundwater monitoring will be conducted at Site 2 in accordance with provisions of 23 CCR Chapter 15. Monitoring will occur for a minimum of 3 years to confirm that groundwater contamination is no longer a concern and to provide data to support discontinuation of groundwater monitoring at Site 2. Groundwater monitoring will continue at Site 1 during the postclosure period and, should groundwater become contaminated by the landfill in the future and require remediation, the collection trench can be activated as an initial, immediate response. Implementing the collection trench will protect surface water while allowing time to implement a more permanent remedy, if necessary.

Any groundwater contamination exceeding federal AWQC or RWQCB basin plan water quality objectives will be evaluated in accordance with CERCLA.

If it becomes necessary to collect, treat, and discharge leachate, any means of discharge must comply with the substantive requirements of applicable or relevant and appropriate requirements (ARARs) if the discharge is on site (such as to Marriage Road Ditch, North Patrol Road Ditch, or the stormwater retention pond), or be subject to a permit if the discharge is off site (such as to a publicly owned treatment works [POTW]). An explanation of significant differences (ESD) or ROD amendment will be prepared, as appropriate, for the collection, treatment, and discharge of leachate. Prior to adoption of the ESD or ROD amendment, the Navy will solicit federal and state ARARs and will comply with CERCLA public participation requirements. The Navy will obtain concurrence from EPA and the State on remediation decisions.

The OU1 remedy includes O&M of the Building 191 pump station and drain/subdrain system. This pump station and associated drainage system support the Moffett Federal Airfield storm drainage system. Currently, pumping at Building 191 influences groundwater gradients, as the drainage system that feeds the pump station is below the water table in some areas. At Site 1, the regional groundwater gradient is reversed by Building 191 pumping, as the groundwater flows from north to south (away from San Francisco Bay). At Site 2, the groundwater gradient is south to north, which is normal. The gradient is steeper, however, as a result of pumping at Building 191. Should Building 191 O&M discontinue, the northern portion of Moffett Federal Airfield (including OU1) may be prone to flooding. Therefore, O&M of the pump station was included as a component of the remedy to prevent potential flooding of the OU1 landfill areas. The need for continued Building 191 O&M will be referenced in appropriate land use documents and federal real property records, along with restrictive provisions to maintain the integrity of the Site 1 cap. The Navy will resolve any issues with NASA regarding the process to develop appropriate restrictive provisions to ensure continued O&M of the Building 191 pump station and to maintain the integrity of the Site 1 cap. The Navy will enter into an agreement with NASA or develop another appropriate vehicle to accomplish this task. The Navy will resolve any issues concerning the necessary restrictive provisions within 1 year of the date of this ROD.

This OU is one of four active OUs at Moffett Field. Other OUs where concurrent RI/FS activities have occurred include OU2-East (soils at Sites 3, 4, 6, 7, 10, 11, and 13), OU5 (east-side aquifers), and

OU6 (wetland areas). A station-wide RI/FS which addresses all sites is also underway. Other activities are being conducted as source control measures for the west-side aquifers and soils and through corrective measures for petroleum sites. All investigations, remedial designs, and schedules are coordinated to provide an overall basewide management strategy for cleanup.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy uses permanent solutions and alternative treatment technologies to the maximum extent practicable for this OU. However, because treatment of the principal threats of the OU was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. A remedy in which contaminants could be treated effectively has been precluded because of the size of the Site 1 landfill and because there are no known homogeneous hot spots that represent the major sources of contamination at Sites 1 or 2. Therefore, in accordance with EPA's 1993 presumptive remedy for CERCLA municipal landfill sites guidance, a containment technology was selected.

Because this remedy will result in hazardous substances remaining on site, a review will be conducted within 5 years after implementation to ensure that the remedy continues to meet objectives.

Stephen G. Chao
BRAC Environmental Coordinator, Navy EFA West
Date: 8/6/97

for Daniel Opalski
Director Federal Facilities Cleanup Office, EPA Region 9
Date: 8/14/97

Anthony J. Landis, P.E.
Chief
Northern California Operations
Office of Military Facilities
California Department of Toxic Substances Control
Date: 8-19-97

for Loretta K. Barsamian
Executive Officer, California Regional Water Quality
Control Board, San Francisco Bay Region
Date: 8/13/97

2.0 DECISION SUMMARY FOR OPERABLE UNIT 1

This section contains information regarding site description and history, community participation, scope and role of OU1, site characteristics and risks, FS evaluations, the selected remedy, significant changes, and statutory determinations.

2.1 SITE NAME, LOCATION, AND DESCRIPTION

Moffett Field is located near the southwestern edge of San Francisco Bay in Santa Clara County, California (Figure 1).

The address of the facility is:

Moffett Federal Airfield
Moffett Field, California 94035

Moffett Field is bounded by saltwater evaporation ponds to the north, Stevens Creek to the west, U.S. Highway 101 to the south, and Lockheed Missile and Space Company's Lockheed Aerospace Center (Lockheed) to the east. Moffett Field also borders the cities of Mountain View and Sunnyvale, California. The City of Sunnyvale is located east of Mountain View and both are adjacent to the southern portion of Moffett Field. NASA's Ames Research Center is located to the west and north of the runways.

Ground surface elevations at Moffett Field range from approximately 36 feet above mean sea level (msl) to 2 feet below msl. A sizable portion of Moffett Field is situated on previously submerged land or marshlands that have been filled to their existing elevations with backfill material.

Wetlands located along the northern portion of Moffett Field are the only natural surface water features at the station. The wetlands on Moffett Field are approximately 40 acres in size; all of the wetland area is below sea level. An area of wetlands consisting of approximately 80 acres lies between Moffett Federal Airfield and Stevens Creek. About half of this area is below sea level. The portion above sea level is a critical habitat for a variety of mammals and birds. Approximately 1 mile beyond the northern boundary of Moffett Field is the San Francisco Bay. Coyote Creek and Guadalupe Slough drain into San Francisco Bay to the east of Moffett Field, and Stevens Creek drains into the San Francisco Bay to the west.

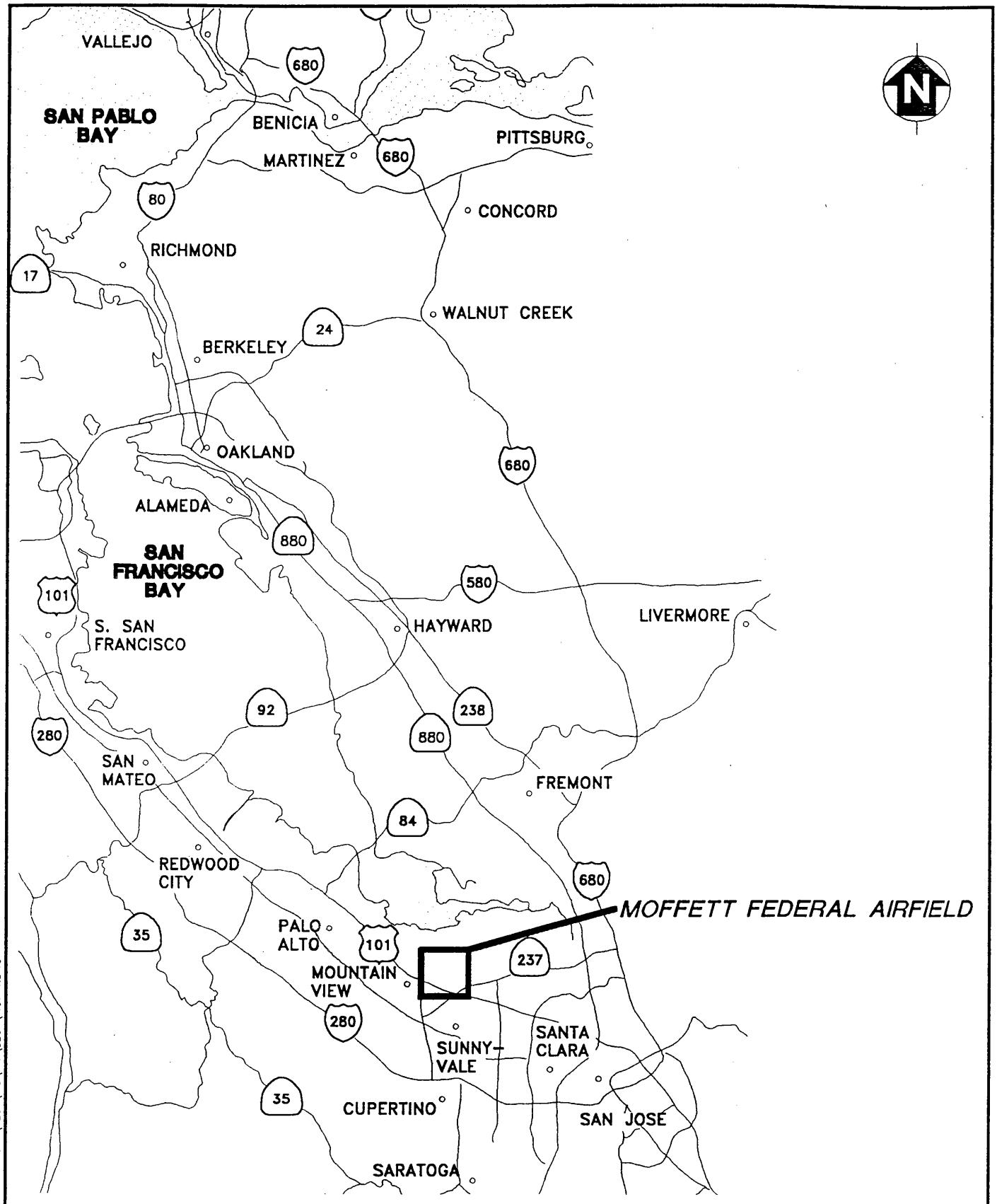

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FIGURE 1
MOFFETT FEDERAL AIRFIELD
REGIONAL LOCATION MAP

San Francisco Bay is California's largest estuary. Historically, tidal salt marsh and mud flats covered extensive areas of the southern portion of the bay; however, most of these wetlands have been eliminated or greatly altered. A large area to the north and northeast of Moffett Field was diked and is now used as commercial saltwater evaporation ponds. There are no streams on Moffett Field, although several streams are present to the east and west. No other surface water features are present at Moffett Field, with the exceptions of several small ponds maintained on the Moffett Field golf course as water hazards, stormwater drainage ditches and retention ponds, standing water after floodings or rainfall, and the wetlands described above.

The northern Santa Clara Valley groundwater basin is part of the down-dropped structural trough lying between the San Andreas and Hayward faults. The erosion of the uplifted Santa Cruz Mountains has contributed sediment that has been transported by northward-flowing streams. Moffett Field lies on the San Jose alluvial plain near the toe of alluvial fans emanating from the Santa Cruz Mountains. On a regional scale, the overall sediment grain size becomes finer northward away from the mountains. On a local scale, alluvial processes have juxtaposed clay, silt, sand, and gravel in adjacent depositional environments.

The hydrogeologic setting at Moffett Field consists of alluvial sand aquifers or sand and gravel aquifers separated by low permeability silt and clay aquitards. In the interior part of the Santa Clara Valley, the numerous aquifers have been divided into two broad zones or sequences: the upper-aquifer sequence (A and B aquifers) and the lower-aquifer sequence (C aquifer) (PRC 1992). The distinction between the two aquifer sequences is that the upper-aquifer sequence is generally unconfined, although in places it is semiconfined. The lower-aquifer sequence is confined under a laterally extensive clay aquitard at depths of 140 to 200 feet below land surface (bls). Aquifers in the upper zone are generally thin and discontinuous. Aquifer materials range from silty to fine sand to coarse gravel. The A and B aquifers are not presently used. NASA uses one C-aquifer well for agricultural supply at Moffett Field. The C aquifer, however, is used as a source of municipal drinking water for the nearby communities of Mountain View and Sunnyvale.

The water table at Moffett Field is not a static boundary, but fluctuates in response to changes in evaporation, precipitation, and groundwater pumping. The water table at Moffett Field ranges from approximately 5 to 15 feet bls. Tidal influence on the water table elevation is negligible.

Current and potential beneficial uses applicable to the main groundwater basins in the San Francisco Bay region are outlined in the San Francisco Bay Region Water Quality Control Plan (basin plan) and include municipal supply, industrial service, industrial process water supply, and agricultural supply. With the exception of the northern portion of the A aquifer (including Sites 1 and 2), the aquifers at Moffett Field (A, B, and C aquifer zones) meet the state standards for yield (200 gallons per day) and total dissolved solids (TDS) (less than 3,000 milligrams per liter [mg/L]). Therefore, under State Water Resources Control Board (SWRCB) Resolution 88-63, the A, B, and C aquifers are considered potential drinking water sources (except northern areas of the A aquifer). Surface water replenishment, provided by the upper aquifers, helps maintain wildlife habitats associated with the nearby wetlands.

2.2 SITE HISTORY

Moffett Field has been continuously operated by the U.S. government or military since it was commissioned in 1933 to support the West Coast dirigibles (blimps) of the lighter-than-air (LTA) program. In 1935, the station was transferred to the U.S. Army Air Corps, which used it for training purposes. In 1939, a permit was granted to Ames Aeronautical Laboratory to use part of the station.

In 1942, the station was returned to Navy control and was named Naval Air Station Moffett Field. In late 1942, the heavier-than-air (HTA) program was initiated and began to take precedence over the LTA program. In 1945, the HTA program was moved to Half Moon Bay Field and Moffett Field was used as a major overhaul and repair base. The LTA program was discontinued at Moffett Field in 1947. In 1949, the station became home to the Military Air Transport Service Squadron.

By 1950, Moffett Field was the largest naval air transport base on the West Coast and became the first all-weather naval air station. In 1953, the station became home to all Navy fixed-wing, land-based antisubmarine efforts. A weapons department was formed on the base in 1954, and in February 1966 the base activated its high-speed refueling facilities. During the station reorganization in 1973, it became the headquarters of the Commander Patrol Wings, U.S. Pacific Fleet.

During the 1980s and early 1990s, the mission of Moffett Field was to support antisubmarine warfare training and patrol squadrons. The station supported more than 70 tenant units, including the Commander Patrol Wings, U.S. Pacific Fleet, and the California Air National Guard. Moffett Field

was the largest P-3 Orion patrol aircraft base in the world, with nearly 100 aircraft. These aircraft were assigned to nine squadrons supported by 5,500 military, 1,500 civilian, and 1,000 reservist personnel. No heavy manufacturing or major aircraft maintenance were conducted at Moffett Field, but a significant amount of unit- and intermediate-level maintenance occurred.

In April 1991, Moffett Field was designated for closure as an active military base under the Department of Defense (DoD) BRAC program. On July 1, 1994, control of the base was transferred to NASA, which operates the Ames Research Center on the northwestern side of Moffett Field. The Navy and NASA signed a memorandum of understanding (MOU) on December 22, 1992 concerning environmental activities at the station. Under the MOU, the Navy will continue with environmental restoration activities and remain responsible for remediating Navy contaminant sources. NASA is responsible for nonenvironmental operations and ongoing environmental compliance activities.

Wastes have been generated at Moffett Field through maintenance operations, fuel management, and fire training since the early 1930s. Chemicals of potential concern (COPCs) include waste oils and jet fuels; solvents and cleaners; washing compounds; and lesser amounts of gasoline, hydraulic fluids, asbestos, paints, pesticides, battery acid, and polychlorinated biphenyls (PCBs). Wastes were disposed of in unlined landfills, drained through drainage ditches and unpaved areas, and stored temporarily in unlined wastewater ponds. In addition, some underground storage tanks (USTs) and sumps (many of them now removed) were found to have leaked petroleum hydrocarbons and fuels, and lesser amounts of waste oils and solvents.

Environmental studies began at Moffett Field in 1984. The Navy initiated these environmental restoration activities as part of the Installation Restoration Program (IRP). The Navy conducted an initial assessment study (IAS) in 1984 to gather data on the past use and disposal of hazardous materials at Moffett Field (NEESA 1984). Nineteen sites were identified as potential sources of wastes, including nine sites identified in the IAS and 10 sites added during subsequent investigations. EPA proposed Moffett Field as an NPL site in June 1986 and placed it on the NPL in 1987. Placement on the NPL initiated the RI/FS process under CERCLA. Data collected during the initial studies were used to plan the RI/FS. The RI/FS work is coordinated through the August 1990 federal facilities agreement (FFA) with EPA and the California Environmental Protection Agency (Cal/EPA) (including the Department of Toxic Substances Control [DTSC] and the Regional Water Quality Control Board, San Francisco Bay Region [RWQCB]).

The RI was implemented in two phases. During Phase I, the types and concentrations of chemical contaminants at 19 sites were identified. The Phase I characterization was completed in August 1990. The Phase II investigations were initiated in 1990 to provide more detailed, site-specific data. Phase II investigations revealed a need to organize the RI/FS process into six separate OUs. Subsequently, Moffett Field was divided into six OUs to help expedite the RI/FS process.

OU1 - Soils and groundwater at Sites 1 and 2 landfills
OU2 - Soils at Sites 3 through 11, 13, 14, and 16 through 19
OU3 - Soils at Sites 12 and 15
OU4 - Aquifers on the western side of Moffett Field
OU5 - Aquifers on the eastern side of Moffett Field
OU6 - Wetland areas

In October 1992, however, EPA determined that the aquifers on the western side of Moffett Field were affected by a regional volatile organic compound (VOC) plume emanating from the Middlefield-Ellis-Whisman (MEW) Superfund site south of Moffett Field. EPA determined that these aquifers were subject to the 1989 ROD already written for the MEW site. Consequently, OU4 was deleted and OU5 was modified to include all aquifers not part of the regional VOC plume. OU2 was separated into OU2-West (Sites 8, 16, 17, 18, and the western portion of Site 10, which overlie the regional VOC plume) and OU2-East (Sites 3, 4, 6, 7, 11, 13, and the eastern portion of Site 10, which do not overlie the regional VOC plume).

In February 1993, the Navy recommended to the regulatory agencies that all sites containing petroleum and petroleum constituents be removed from the CERCLA process (CERCLA contains an exclusion for petroleum and petroleum constituents). The Navy also recommended that these sites be addressed in a manner consistent with the Resource Conservation and Recovery Act (RCRA) Subtitle I and appropriate state regulations for underground storage tanks. The agencies agreed to the modification and corrective actions at petroleum sites are underway. Therefore, OU3 (which contained petroleum contaminated Sites 12 and 15) was removed, and Sites 5, 9, 14, and 19, which also contain petroleum-contamination, have been deferred to the IRP petroleum sites program and will not be addressed through RODs. Five additional sites have been identified; the current OU definitions and study areas are listed below.

OU1	-	Soils and groundwater at Sites 1 and 2 landfills
OU2-East	-	Soils at Sites 3, 4, 6, 7, 10 (runways), 11, 13,
OU2-West	-	Soils at Sites 8, 10 (Chase Park), 14-North, 16, 17, and 18
OU5	-	Aquifers on the eastern side of Moffett Field
OU6	-	Wetland areas
Petroleum Sites	-	Sites 5, 9, 12, 14-South, 15, 19, 20, and 24
Station-wide Sites	-	Sites 21, 22, 23, Weapons Storage Bunkers, Industrial Wastewater Flux Ponds, and Potential Runway Wetland

Figure 2 depicts all the RI/FS site locations at Moffett Field. This ROD addresses the OU1 landfill refuse, leachate, surrounding groundwater, adjacent surface water, and landfill gases. Site-specific information for the sites included in OU1 are provided in the OU1 RI report (IT 1993a), the OU5 RI report (IT 1993b), the OU1 FS report (PRC 1995), and Section 2.5 of this ROD. Figure 2 depicts the locations of the OU1 sites at Moffett Field.

2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

In May 1989, the Navy developed a Moffett Field community relations plan (CRP). The CRP outlined specific activities based on concerns voiced by the community. Since 1993, the EPA has provided a technical assistance grant (TAG) to the Silicon Valley Toxics Coalition (SVTC), a local environmental group. The TAG allowed SVTC to hire a consultant to assist in reviewing Moffett Field environmental documents. In addition, the Navy formed a technical review committee (TRC), which met quarterly to discuss environmental progress at the site. The TRC evolved into what is now known as the restoration advisory board (RAB). The RAB is made up of members of the TRC and community and holds regular public meetings to discuss environmental progress at Moffett Field.

The OU1 RI report was released in March 1993 (IT 1993a). The FS report and proposed plan for OU1 were released to the public in May 1995 (PRC 1995). The RI report, FS report, and proposed plan were made available to the public through both the administrative record and the information repository. The notice of availability for the proposed plan and related documents was published in the *San Jose Mercury News* and *San Francisco Chronicle* on May 29, 1995. A public comment period was held from May 30, 1995, through August 30, 1995. A public meeting was held on Thursday,

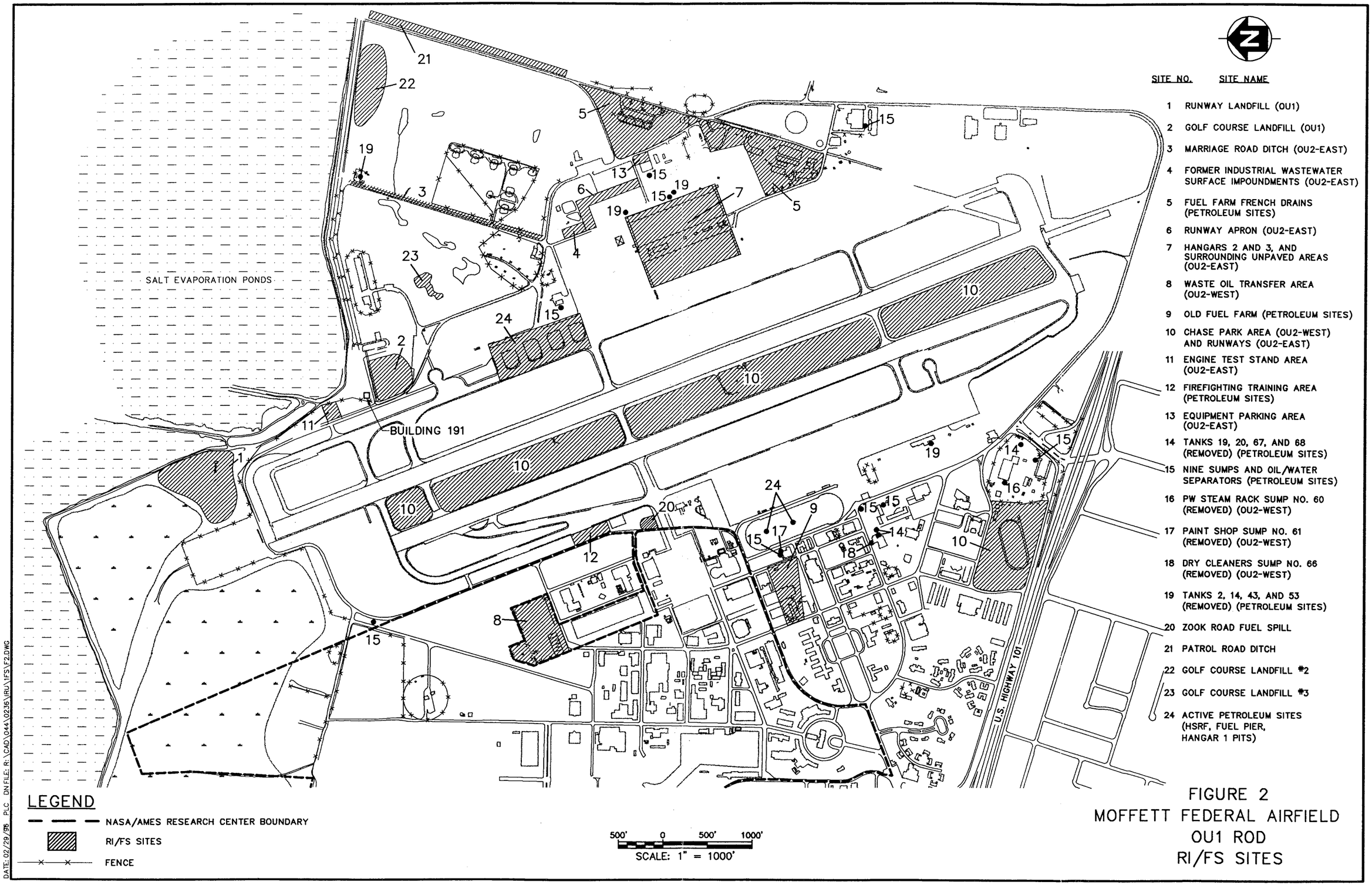


FIGURE 2
MOFFETT FEDERAL AIRFIELD
OU1 ROD
RI/FS SITES

June 15, 1995. At this meeting, representatives from the Navy, EPA, and the State of California answered questions about OU1 and supplied the basis for proposing the selected response action for Sites 1 and 2. A response to the comments received during this public meeting and the public comment period is included in Sections 3.1 and 3.2 of the responsiveness summary (Section 3.0).

Following the first public comment period, the Navy modified the preferred alternative based on public and regulatory agency comments. As a result, a revised proposed plan was released to the public in December 1995. The revised proposed plan was made available to the public through both the administrative record and the information repository. The notice of availability for the revised proposed plan and related documents was published in the *San Jose Mercury News* on January 4, 1996. A second public comment period was held from January 4, 1996, through February 5, 1996. A second public meeting was held on Tuesday, January 16, 1996. At this meeting, representatives from the Navy, EPA, and the State of California answered questions about OU1 and supplied the basis for revising the original proposal and presented the modified response action for Sites 1 and 2. A response to the comments received during the second public meeting and public comment period is included in Sections 3.3 and 3.4 of the responsiveness summary (Section 3.0).

New information collected as part of OU1 remedial design (RD) efforts indicated that the Site 2 landfill is much smaller than initially estimated. Consequently, the Navy proposed a change in the preferred alternative for OU1. The change involves excavating the waste at the Site 2 landfill and consolidating that waste at the Site 1 landfill. The Site 1 landfill would be designated as a CAMU and capped. The Navy issued a revised proposed plan describing the consolidation and capping preferred alternative for OU1 and published a notice of availability of the consolidation and capping proposed plan in the *San Jose Mercury News* and *Sunnyvale Sun* on March 10, 1997. The public comment period was held from March 7, 1997 to April 11, 1997. A public meeting was held on March 20, 1997. A response to comments received during the public meeting and public comment period for the consolidation and capping preferred alternative is included in Sections 3.5 and 3.6 of the responsiveness summary (Section 3.0).

These community participation activities fulfill the requirements of Sections 113(k)(2)(B)(i-v) and 117(a)(2) of CERCLA.

2.4 SCOPE AND ROLE OF OPERABLE UNIT WITHIN SITE STRATEGY

The selected response actions described in this ROD will address the source of the contamination by containing wastes on-site and reducing the risk associated with exposure to contaminated materials. In addition, the response action will limit Sites 1 and 2 as sources to groundwater contamination by removing waste from Site 2 and consolidating it a Site 1 and by incorporating low-permeability cap layers.

Selection of the remedy for OU1 is consistent with overall RI/FS activities at Moffett Field. Moffett Field is a large federal facility containing numerous potential sources of contamination. As discussed in Section 2.2, 24 sites at Moffett Field have been identified to date and are in some phase of the assessment process. In addition to OU1, OUs addressed by RODs are as follows:

OU Designation	OU Description	ROD Schedule
OU2-East	Sites 3, 4, 6, 7, 11, and 13	December 1994
OU5	East Side Aquifers	June 1996
OU6	Wetland Areas	Covered by Station-wide ROD
Station-wide	Station-wide	July 1998

The installation management strategy is to accelerate actions at the OUs while identifying and closing out assessment activities at sites not requiring action. This strategy, which uses no-action RODs, allows resources to be concentrated on the OUs requiring action.

2.5 SITE CHARACTERIZATION

Based on experience, EPA has developed presumptive remedies to accelerate cleanup for certain types of sites. Presumptive remedies are preferred technologies based on an evaluation of performance data from previous technology implementation. EPA has established the expectation that engineering controls, such as containment, will be used for wastes that pose a relatively low, long-term threat or where treatment is impracticable (40 CFR 300.430(a)(1)(iii)(B)). EPA's September 1993 guidance, Presumptive Remedy for CERCLA Municipal Landfill Sites and the preamble to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) published in the Federal Register on March 8, 1990, identify landfills as areas where treatment may be impracticable because of the size and heterogeneity of municipal waste (EPA 1993). OU1 field investigations during the RI/FS

incorporated this presumptive remedy approach. In accordance with EPA's February 1991 guidance, Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites, complete characterization of the landfill refuse is not necessary because containment, which is often the most practical technology for landfills, does not require such information (EPA 1991). In addition, the heterogeneity of contaminant distribution and concentrations typically associated with landfills make accurate characterization of landfill refuse impractical and virtually impossible. As a result, OU1 RI/FS field investigations focused on OU1 hydrogeology, groundwater chemistry, surface water chemistry, and landfill gas composition to evaluate whether contamination from the landfills was migrating past landfill boundaries into the surroundings. Additional groundwater investigations at Site 1 and radiological surveys at Sites 1 and 2 were conducted in September 1996. The radiological survey did not detect radioactive materials above background concentrations. The groundwater investigation did not indicate conditions significantly different than those reported in the OU1 RI and FS reports. The results of the additional investigations are presented in the Draft Final OU1 Field Investigation Technical Memorandum (PRC 1997). The following two subsections discuss Site 1 and Site 2 general characteristics, hydrogeology, and summarize the general nature and extent of contamination. More detailed site-specific information for the sites can be found in the OU1 RI report (IT 1993a), the OU5 RI report (IT 1993b), and the OU1 FS report (PRC 1995).

2.5.1 Site 1 Characteristics

The Runway Landfill (Site 1) is located in the northernmost portion of Moffett Field at the end of the runways between Zook Road and the Cargill Salt Company evaporation ponds (Figure 2). This site encompasses an area of approximately 12 acres. The surface of Site 1 is covered with weeds, gravel, and minor amounts of debris. Surface elevations range from approximately 3 feet below msl near the perimeter to approximately 23 feet above msl toward the center of the landfill. Site 1 was operated from 1965 until the late 1970s as a landfill. Subsequently, the site was used as a pistol range. Unexploded ordnance was removed from the site prior to the RI in 1988. Any contamination associated with pistol range operations will be addressed by the landfill remedy.

Detailed operation records for the Runway Landfill were not maintained; however, a solid waste facility permit was obtained from Santa Clara County in 1979. This permit states that the landfill operated as a sanitary landfill and that the landfill received wastes such as cardboard, lawn cuttings, prunings, wood waste, and asbestos insulation wrapped in double plastic bags. According to civilian

and military personnel interviews, the landfill received domestic refuse as well as waste from maintenance and military operations, such as refuse, scrap equipment, paint and paint thinners, solvents, lacquer, ash, asbestos, jet fuels, waste oil, fuel filters (containing fuel sludge, lead compounds, and rust), transformer oil, transformer filters, and PCB-contaminated sawdust. However, data collected during field investigations support the information found in the permit and indicate that the Site 1 landfill was operated much like a solid waste landfill. Low contaminant concentrations were found in leachate and surface debris and subsurface borehole logs show that demolition and construction debris was disposed of in the landfill (PRC 1995).

Information obtained from civilian and military personnel interviews indicate that refuse was placed in an excavation that typically ranged from 8 to 12 feet below msl. The refuse material was then covered with soil that ranged from 0.6 to 7 feet in thickness. Although no disposal records for the landfill exist, a conservative maximum estimate of the total volume of refuse at Site 1 is approximately 423,000 cubic yards. The refuse has not been fully characterized. The heterogeneity of contaminant distribution and concentrations typically associated with landfills makes accurate characterization of landfill refuse impractical. Accurate characterization is generally not necessary because containment, which is often the most practicable technology, does not require such information (EPA 1991).

Portions of refuse are located below the water table and are saturated at Site 1. Approximately the bottom one-third of the refuse at Site 1 is saturated. Refuse saturation (or refuse subsidence relative to the water table) may have been caused by past regional aquifer pumping coupled with excavating prior to placing wastes. Borehole logs indicate that a silty clay aquitard several feet thick exists below the landfill and above the uppermost aquifer zone. The thickness of this aquitard varies, and the hydraulic conductivity has been measured in the 1×10^{-8} centimeters per second (cm/sec) range. It is not known conclusively whether this aquitard is continuous beneath the landfill.

Beneath the aquitard, the A-aquifer exists and consists of silty sand or sand and gravel deposits separated by low-permeability silts and clays. The A-aquifer zone extends from approximately 15 to 65 feet below msl and has been divided into two zones, the A1-aquifer and the A2-aquifer zones. In general, groundwater in the A1-aquifer zone beneath the landfill (the uppermost aquifer) flows north to south. The regional gradient is south to north toward San Francisco Bay. The southward gradient at Site 1 is opposite from the regional gradient due to active pumping of the storm drainage system. Pumping occurs at the Building 191 pump station (located south of Site 1, but just north of Site 2 [see

Figure 2]). The pump station influences groundwater gradients because the drainage system that feeds the pump station is below the water table in some areas. Should pumping at Building 191 cease, the northern area of Moffett Federal Airfield, including Site 1, may be prone to flooding.

Four water bodies or zones are associated with Site 1: the leachate zone, surrounding groundwater, the man-made ephemeral stormwater retention pond (SWRP) to the north, and the saltwater evaporation pond (termed Jagel Slough) to the east. It appears that low-permeability barriers exist between the four water bodies in the area (measured hydraulic conductivities are 1×10^{-8} cm/sec). The barriers limit water movement between each body. As a result, head differences are maintained between each water body. Since the Site 1 landfill is relatively isolated from the other water bodies by low-permeability barriers, elevated water levels are maintained. Potential for flow from the landfill to the other bodies exists, but actual flow is limited or constrained by these barriers.

Chemical data from groundwater samples collected to date at the landfill perimeter show that the landfill is not significantly impacting groundwater. Some chemicals have been detected infrequently and at low concentrations in samples collected from surrounding groundwater monitoring wells (PRC 1995). However, the data do not show any consistent patterns or trends that would indicate the presence of any leachate plumes emanating from the landfill. No contaminants have been detected consecutively from the same well except acetone and carbon disulfide. Furthermore, no compounds were consecutively detected above detection limits in any one well or in any two consecutive rounds. The bay muds surrounding the landfill appear to be retarding contaminant migration outside landfill boundaries. At Site 1, there is a clay layer below the refuse with a laboratory-tested hydraulic conductivity of 1×10^{-8} cm/sec. It is not known if the layer is completely continuous, but it is present in all borehole logs from Site 1. The low hydraulic conductivity, high organic content associated with the clays, and low contaminant source concentrations combine to restrict flow and limit contaminant migration.

2.5.2 Site 2 Characteristics

Several investigations and studies have been conducted to characterize Site 2. Section 2.5.2.1 summarizes the characteristics of Site 2 evaluated as part of the OU1 RI/FS activities. Section 2.5.2.2 summarizes the new Site 2 characteristics discovered during OU1 design efforts that resulted in the consolidation alternative for Site 2. These data indicate that the volume of waste at Site 2 is much smaller than was estimated during the RI/FS.

2.5.2.1 Summary of Site 2 Characteristics Based on OU1 RI/FS Activities

The Golf Course Landfill (Site 2) is located in the northern portion of the base just west of the golf course and adjacent to a saltwater evaporation pond (Figure 2). It is bordered by Zook Road on the west, Macon Road on the south, Patrol Road on the north, and Building 561 and its enclosure on the east. The site covers an area of approximately 5 acres and is approximately 1,600 feet from Site 1 (see Figure 2) and has a similar habitat.

Site 2 is flanked by the golf course which is landscaped and maintained. Ornamental pines, acacia, and eucalyptus are typical landscape trees present in this area. Salt grass is the predominant turf in many areas of the golf course. Landscaped areas were observed to support opportunistic species common to suburban and park settings.

Site 2 appeared as a shallow excavation in aerial photographs of the site taken in 1947. An aerial photograph dated July 23, 1952 shows the Site 2 area as flat with no debris piles and indicates the end of disposal activities. The photograph shows the site is covered by vegetation and no activities are occurring at the site. A burn pit in the present golf course landfill area was used for disposal of outdated flares and cartridge-activated devices until 1971. Later photographs also show operation of a small arms range from the early 1960s to about 1976. Surface dumping of construction debris appears in a 1983 photograph, but no excavation activity is evident. No activities at Site 2 are indicated by a photograph dated November 3, 1987. In summary, analysis of aerial photographs indicates that waste disposal at Site 2 ended in 1952.

Site 2 is relatively flat, overgrown with vegetation, contains several mounded areas where debris is occasionally visible, and has a perimeter fence. Earthen fill and refuse placed at the site generally extend from 1 to 7 feet below msl. The area is graded for flood control to drain surface water runoff into local drainage ditches which convey runoff to the North Patrol Road Ditch (formerly the Navy Channel) along the northern boundary of the station. Water is then pumped from this perimeter channel to the Northern Channel that eventually discharges to Guadalupe Slough.

Because records of the landfill operations were not maintained, the history of the landfill was researched by studying aerial photographs and previous reports and by interviewing past and present base personnel. Site 2 was operated from the 1940s until approximately 1952. The landfill received

domestic refuse as well as waste from maintenance and military operations, such as refuse, scrap equipment, paint and paint thinners, solvents, lacquer, oil, fuel filters, and sawdust contaminated with PCBs. The limited characterization data collected during field investigations indicate that the Site 2 landfill was operated much like a solid waste landfill (see Section 2.5.1) and that Site 2 was used in a similar manner as Site 1. Personnel interviews indicated that this site was used by the same shops as the more recent Site 1 landfill.

Although no disposal records for the landfill exist, the FS report conservatively estimated that the total maximum volume of refuse at Site 2 is approximately 169,400 cubic yards. This estimate assumed waste was 20 feet thick over an area of 5 acres. The refuse has not been fully characterized. Complete characterization of landfill refuse is impractical because of the heterogeneity of contaminant distribution and concentrations that are typically associated with landfills. Accurate characterization is generally not necessary because containment, which is often the most practicable technology, does not require such information (EPA 1991).

Stratigraphic units penetrated by borings at Site 2 are representative of estuarine environments and changes in an estuarine/alluvial boundary resulting from sea-level fluctuations. Saturated zones of silty sand and sandy clay below the uppermost clay layers make up the upper A1-aquifer zone. Similar to Site 1 soils, test results indicated low hydraulic conductivity values on the order of $1x10^{-7}$ cm/sec for soils below and surrounding Site 2.

Groundwater elevations at Site 2 are below msl because of diking and the existing Moffett Field storm drain system. Water levels in monitoring wells at the site range from 4 to 7 feet below msl. Groundwater flow patterns in the vicinity of Site 2 are influenced by the storm sewer lift station (Building 191). The groundwater at Site 2 flows to the north toward San Francisco Bay. The gradient is slightly steeper due to active pumping of the storm drainage system. Pumping occurs at the Building 191 pump station (located just north of Site 2 [see Figure 2]). The pump station influences groundwater gradients because the drainage system that feeds the pump station is below the water table in some areas. Should pumping at Building 191 cease, the northern area of Moffett Federal Airfield, including Site 2, may be prone to flooding.

The majority of landfill refuse at Site 2 appears to be above the water table (PRC 1993). Eight borings have been drilled inside the boundaries of the landfill and borehole logs from seven show no refuse

below the water table. One borehole log, however, indicates that some refuse is below the water table. In addition, borehole logs show that there is inert fill (gravels and sand) devoid of refuse located below the water table within landfill boundaries.

Chemicals from leachate have been detected infrequently and at low concentrations in samples from downgradient groundwater monitoring wells (PRC 1995). However, the data do not indicate consistent patterns or trends for any organic contaminant plumes emanating from the landfill. The low-level detections are random in nature. No compounds were consecutively detected above detection limits in any one well or in any two consecutive rounds. Plumes of leachate are not migrating past Site 2 boundaries even though Site 2 does not have a documented, engineered barrier between the landfill and surrounding groundwater. Low source contaminant concentrations and low hydraulic conductivity soils surrounding the landfill are reasons for the absence of migrating contaminants.

2.5.2.2 Summary of Site 2 Characteristics Based on New Information

The new information regarding Site 2 is discussed in more detail in the Final Operable Unit 1 Alternatives Analysis Technical Memorandum dated April 14, 1997. This section summarizes the information presented in the April 14, 1997 technical memorandum.

Since early studies began at the site, the Navy has acknowledged the presence of an underground natural gas pipeline at Site 2. The gas pipeline is a 36-inch diameter, high pressure main operated by Pacific Gas and Electric Company (PG&E) and one of three pipelines that provides primary service to the City of San Francisco. However, detailed utility investigations conducted for the cap design uncovered significant new information. The Navy excavated four test pits along the pipeline alignment at Site 2 during July 1996 and confirmed the location and depth of the pipeline. The pipeline is located above the water table and does not function as a horizontal migration pathway.

Since completion of the OU1 RI/FS, several investigations have been conducted to better define the extent of waste material at Site 2. Trenching conducted by the Navy during April 1996 to define more accurately the landfill boundary showed the presence of inert fill and construction debris, but not large amounts of waste materials. Two test pits excavated during the pipeline investigation in July 1996 indicated the presence of only inert materials such as construction debris. In September 1996, the Navy excavated eight additional trenches in the northern half of Site 2 to obtain additional information concerning visual waste identification, the location of waste relative to the water table, and the overall

volume of waste at Site 2. Municipal-type wastes were found to be isolated in a specific waste area and were easily distinguished from inert construction debris (above and surrounding the waste area) or native clays (beneath the waste area). The eastern limit of the waste area was found during excavation activities (see Figure 3). The other boundaries can be estimated based on previous trenches excavated during investigation of the natural gas pipeline and historical aerial photographs. Trenching indicates that portions of the waste are saturated, as expected.

Based on the trenching results, the volume of waste at Site 2 is likely much smaller than earlier estimates. Trenching results indicate that the area used for waste disposal probably was less than 1 acre and waste thicknesses appear to be less than 10 feet at most locations. Therefore, the in-place volume of waste at Site 2 is likely less than 20,000 cubic yards. Furthermore, based on field observations, only minimal, if any, hazardous waste is likely to be present at Site 2.

2.6 SUMMARY OF SITE RISKS

The following subsections discuss the human health risk assessment and the ecological assessment conducted for OU1.

2.6.1 Human Health Risk Assessment

A quantitative human health risk assessment has limited use in evaluating whether landfill refuse requires remediation. The decision to remediate (cap) a landfill is typically not dependent on risk assessment results. In fact, EPA presumptive remedy guidance does not advocate performing quantitative risk assessments for landfill refuse. Quantifying risks from landfill refuse has little practical use because an underlying assumption has to be made that the landfill content is well characterized, which is a questionable assumption at best. The heterogeneity of contaminant distribution and concentrations makes characterization of landfill content an impractical and virtually impossible task. Characterizing landfill content is also a health and safety hazard for field crews. Because of these circumstances, EPA has developed a strategy to address landfills that is based on containment of contaminants. Containment is known as the presumptive remedy for landfills and does not require accurate characterization of landfill content or a quantified assessment of associated risks. The Navy has employed the presumptive remedy strategy for Site 1. Even though a human health risk assessment has limited use, one was conducted and is contained in the OU1 remedial investigation report (IT 1993a).

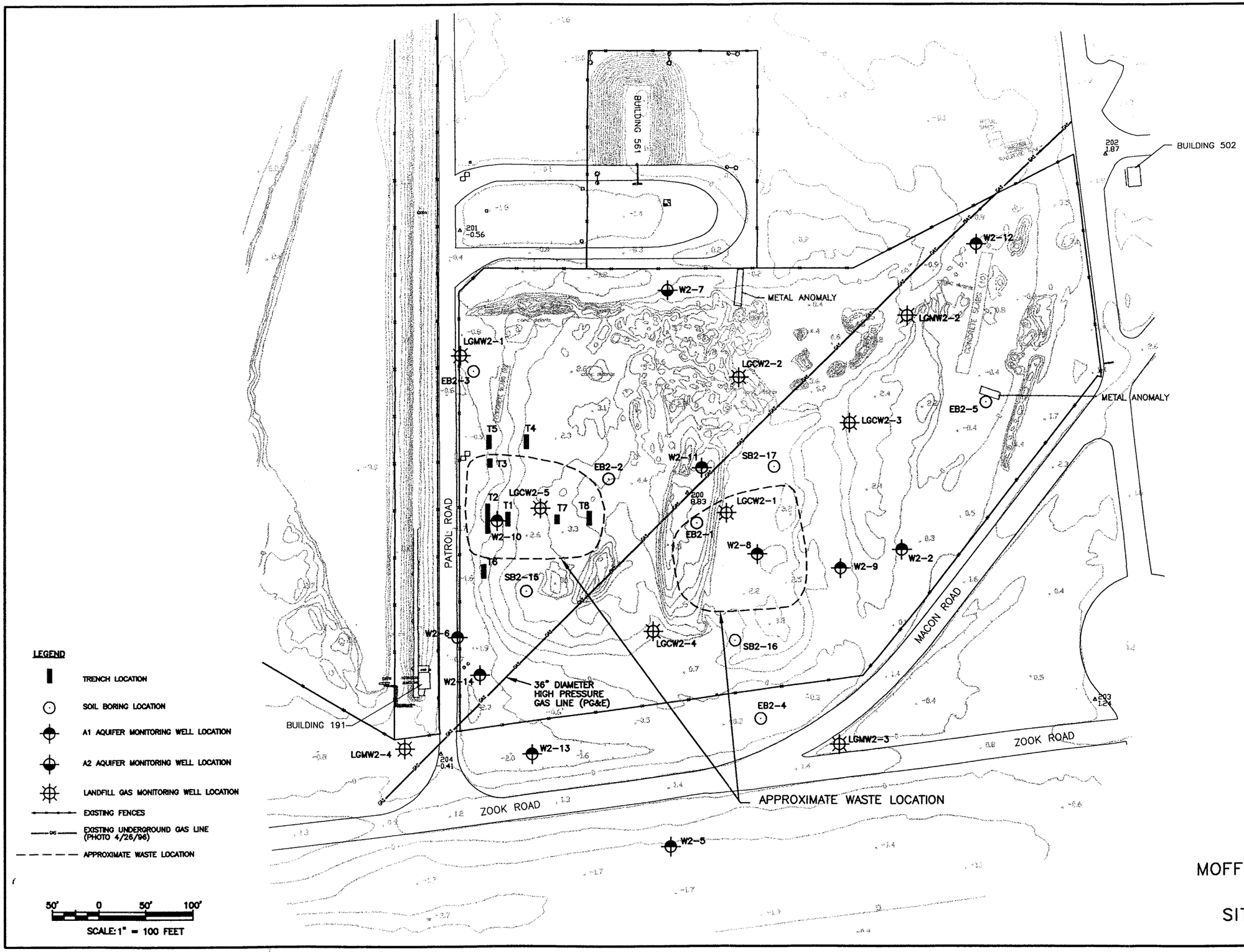


FIGURE 3
MOFFETT FEDERAL AIRFIELD
OUI ROD
SITE 2 LOCATION MAP

As stated above, quantified risk assessment results have limited use for landfills. Qualitatively however, the following exposure pathways are associated with constituents in refuse and landfill gas and the remedial alternatives were developed considering these hazards:

- Ingestion of and dermal contact with surface soils
- Inhalation of particulate matter from wind-eroded surface soils
- Inhalation or explosion of landfill gas

For groundwater, exposure pathways associated with human health are incomplete because the groundwater is not a current drinking water supply and it is not reasonably expected to be a drinking water supply in the future. The groundwater has high TDS (greater than 20,000 mg/L) which limits its use. Water with a TDS level greater than 3,000 mg/L is not considered a potential source of drinking water under California State Water Resources Control Board (SWRCB) Resolution 88-63. TDS concentrations at Sites 1 and 2 exceed these limits.

In addition to the groundwater being nonpotable, groundwater surrounding OU1 will not likely be extracted for future beneficial use because of previous problems that occurred while pumping groundwater. During a period extending from 1915 to about 1965 (California Department of Water Resources Bulletin 118-1, 1968), shallow groundwater was used to irrigate farmlands and for public supply (IT 1989). Groundwater pumping from shallow aquifers subsequently caused salt water from the San Francisco Bay to flow into shallow aquifers in the region. As pumping increased, saltwater intrusion spread inland.

Another adverse side effect of shallow groundwater extraction was related to land subsidence. At Moffett Field, subsidence was about 2 to 8 feet, and as much as 12 to 13 feet at San Jose (IT 1989). The subsidence caused changes in drainage patterns, inundation of coastal areas, and additional salt water intrusion into shallow aquifers.

A rigid basin-wide groundwater management plan, consisting in part of pumping controls, was implemented to prevent additional destructive effects of overpumping. Since about 1970, there has been no increased salt water intrusion and land subsidence. The stabilization is related to a decline in pumping, which is attributed to both groundwater basin management and land use factors that discourage groundwater pumping (IT 1989). The Santa Clara Valley Water District (SCVWD)

requires a 50-foot deep seal on any extraction well to prevent downward vertical migration of shallow groundwater (SCVWD 1989).

For the above reasons, groundwater surrounding Sites 1 and 2 will not likely be used as a water supply and therefore, exposure pathways to leachate and groundwater are incomplete.

2.6.2 Ecological Assessment Summary

Ecological receptors could be potentially exposed to OU1 contaminants through the following mechanisms:

- Contact with surface refuse
- Contact with subsurface refuse via burrowing
- Chemical uptake into plant root systems
- Contact with landfill gas
- Leachate migration into adjacent surface waters

Containment is the presumptive remedy for landfills, and capping the waste will minimize the potential for ecological receptors to come in contact with surface refuse. In addition, landfill caps can be designed to deter animals from burrowing into the landfill, thereby reducing the potential for contact with subsurface refuse. Similarly, landfill caps can be designed to prevent plant roots from extending beyond a certain depth, which reduces the potential for chemical uptake into root systems. Finally, a landfill cap can include gas vents to reroute subsurface gases and reduce the potential for contact with landfill gas. Because the presumptive remedy addresses four of the above-mentioned pathways, attempts have not been made to quantify ecological risks from refuse. This information is not necessary because containment, the most practical technology, does not require such information (EPA 1991).

As stated above, there is a potential for leachate to migrate into adjacent surface waters and subsequently impact aquatic or ecological receptors which inhabit surface waters. The SWRP is located downgradient from the leachate zone at Site 1 and the North Patrol Road Ditch is downgradient from Site 2. To evaluate whether ecological impacts have occurred from the landfills, groundwater data were compared to AWQC for the protection of aquatic life. If these levels are exceeded in

groundwater, ecological receptors in surface water could potentially be affected since groundwater recharges surface water in the SWRP near Site 1 and the North Patrol Road Ditch at Site 2. This evaluation is conservative because groundwater concentrations do not represent the resulting concentrations in surface water from leachate migration. Groundwater contaminants will likely dilute and disperse as contamination migrates toward surface water bodies. These characteristics must be taken into consideration during evaluation monitoring and any corrective action that is implemented.

This evaluation concluded that OU1 perimeter groundwater constituent concentrations are either below AWQC or similar to constituent concentrations found in north base area (NBA) groundwater monitoring wells. Data from the groundwater monitoring wells located between the landfills and surface water bodies do not show that leachate plumes are migrating from the landfills.

As stated above, the exposure pathways for ecological receptors are incomplete based on containment of the OU1 wastes through use of the presumptive remedy and groundwater data. Therefore, the ecological assessment for OU1 was streamlined. The purpose of the ecological assessment was to evaluate potential impacts to the habitats and surrounding environments resulting from capping at OU1. The potential ecological impacts from consolidation of the Site 2 wastes to Site 1 are similar to those associated with capping Site 2, except that long-term impacts from exposure to subsurface waste at Site 2 are no longer a concern.

During this evaluation, the Navy found that Sites 1 and 2 consist of disturbed, low-value habitats that support predominantly non-native plant and animal species (PRC 1994). This habitat will be destroyed during consolidation of wastes from Site 2 to Site 1 and capping, and some changes will occur during re-establishment. These detrimental impacts to the habitat are expected to be short term and it is reasonable to assume that the landfill habitat will recover rapidly following consolidation and capping activities. In addition, consolidation and capping are protective of the long-term welfare of the environment.

During the streamlined ecological assessment, field survey results found that no threatened and endangered (T&E) species or special status species are known to currently inhabit these sites. Two species were of special concern since they are known to inhabit other areas of Moffett Field. These two species are the burrowing owl and the salt marsh harvest mouse (SMHM). OU1 does not provide suitable habitat for the burrowing owl and it has not been observed at the sites. However,

potential SMHM habitat exists adjacent to Site 1. Stands of pickleweed have been observed and potentially represents habitat for the SMHM, which is a federal T&E species. These stands of pickleweed are isolated. Corridors do not exist between these stands and nearby wetland areas, indicating that it is unlikely that the SMHM inhabits Site 1.

Because results are often inconclusive, extensive trapping has not been done in these areas to confirm or deny the presence of the SMHM. In addition, the U.S. Fish and Wildlife Service (FWS) indicated that there is reasonable chance that the SMHM may exist adjacent to Site 1. Therefore, FWS recommended that the Navy assume that the SMHM exists and prepare a replacement plan, which would address each acre of lost habitat. The draft replacement plan is scheduled for delivery in mid-1997.

The proposed landfill capping will affect potential wetlands in the vicinity of Site 1. Wetland areas were delineated in accordance with U.S. Army Corps of Engineers (COE) criteria, and the results are contained in the Final Phase I Site-wide Ecological Assessment Report (PRC and MW 1995). Specifically, three limited potential wetlands are near Site 1. These areas include 1.25 acres southwest of Site 1within the fenced landfill area, 0.4 acres on the northern border of Site 1 along the fringe of the stormwater retention pond, and 0.1 acres in the central portion of Site 1. However, the Navy and regulatory agencies have determined that a landfill cap is necessary to protect the environment. Filling small segments of potential wetlands will be required to cap the Site 1 landfill. Therefore, the Navy will meet the substantive requirements of Nationwide Permit (NWP) 38 through the U.S. Army Corps of Engineers (COE). This permit allows for fill to be placed in wetlands if filling is associated with the remediation of hazardous and toxic waste. The Navy has determined that NWP 38 and Section 404 of the Clean Water Act (CWA) are applicable to the action at Site 1. The Navy has further determined that the planned activities at OU1 will meet all the substantive requirements of NWP 38 and CWA Section 404 except the requirement concerning mitigation. Mitigation of wetlands destroyed during activities at OU1 will be addressed in the stationwide ROD. The Navy will consult with RWQCB to review the wetland areas affected by Site 1 activities and obtain concurrence to determine potential mitigation requirements.

2.7 DESCRIPTION OF THE ALTERNATIVES

Alternatives for OU1 have been developed and evaluated in two documents. The OU1 FS report evaluated three alternatives each for Site 1 and Site 2. Section 2.7.1 describes these alternatives. The alternatives analysis technical memorandum developed and evaluated an additional alternative for Site 2, the consolidation alternative. Section 2.7.2 describes the consolidation alternative.

2.7.1 Description of Alternatives Presented in the FS

The alternatives assembled in the FS for Site 1 are as follows:

- Alternative 1: No action, Groundwater and Gas Monitoring, Institutional Controls
- Alternative 2: Native Soil Cap, Groundwater Collection Trench, Gas Vent Trench, Groundwater and Gas Monitoring, Institutional Controls
- Alternative 3: Multilayer Cap, Groundwater Collection Trench, Gas Vent Trench, Groundwater and Gas Monitoring, Institutional Controls

The alternatives assembled in the FS for Site 2 are as follows:

- Alternative 1: No action, Groundwater and Gas Monitoring, Institutional Controls
- Alternative 2: Native Soil Cap, Groundwater and Gas Monitoring, Institutional Controls
- Alternative 3: Multilayer Cap, Groundwater and Gas Monitoring, Institutional Controls

The following subsections describe the remedial alternatives in more detail.

2.7.1.1 Alternative 1: No Action

Under the no-action alternative, no remedial actions would be implemented. Only gas and groundwater monitoring would be conducted. The no-action alternative is identified to provide a baseline against which other alternatives can be compared.

2.7.1.2 Alternative 2: Native Soil Cap, Trench Vent

Alternative 2 consists of institutional controls, a native soil cap, a trench vent (Site 1 only), and gas and groundwater monitoring. The following paragraphs describe these components.

2.7.1.2.1 Institutional Controls

Institutional controls would be implemented as part of Alternative 2 to protect human health. Access to the sites would be restricted by fences with posted signs. Sites 1 and 2 are currently fenced in with a locked gate. Both landfills are on government property and are not accessible by the general public. The need for continued Building 191 O&M will be referenced in appropriate land use documents and federal real property records, along with restrictive provisions to maintain the integrity of the Site 1 cap.

O&M of the Building 191 pump station and drain/subdrain system would be included as an institutional control under Alternative 2. This pump station and associated drainage system support the Moffett Federal Airfield storm drainage system. Currently, pumping at Building 191 influences groundwater gradients, as the drainage system that feeds the pump station is below the water table in some areas. At Site 1, the regional groundwater gradient is reversed by Building 191 pumping, as the groundwater flows from north to south (away from San Francisco Bay). At Site 2, the groundwater gradient is south to north, which is normal. The gradient is relatively steeper, however, as a result of pumping at Building 191. Should Building 191 O&M discontinue, the northern portion of Moffett Federal Airfield (including OU1) may be prone to flooding. Therefore, O&M of the pump station was included as a component of the remedy to prevent potential flooding of the OU1 landfill areas. Restrictive provisions and notice requirements concerning the continued O&M of the Building 191 pump station and the associated drain system continues would be placed in land use planning documents and federal real property records. The Navy will resolve any issues with NASA regarding the process to develop appropriate restrictive provisions to ensure continued O&M of the Building 191 pump station and to maintain the integrity of the Site 1 cap. The Navy will enter into an agreement with NASA or develop another appropriate vehicle to accomplish this task. The Navy will resolve any issues concerning the necessary restrictive provisions within 1 year of the date of this ROD.

The Navy will coordinate with NASA, as the federal property holding agency, to notify the California Integrated Waste Management Board (CIWMB) and local enforcement agency in the event of property

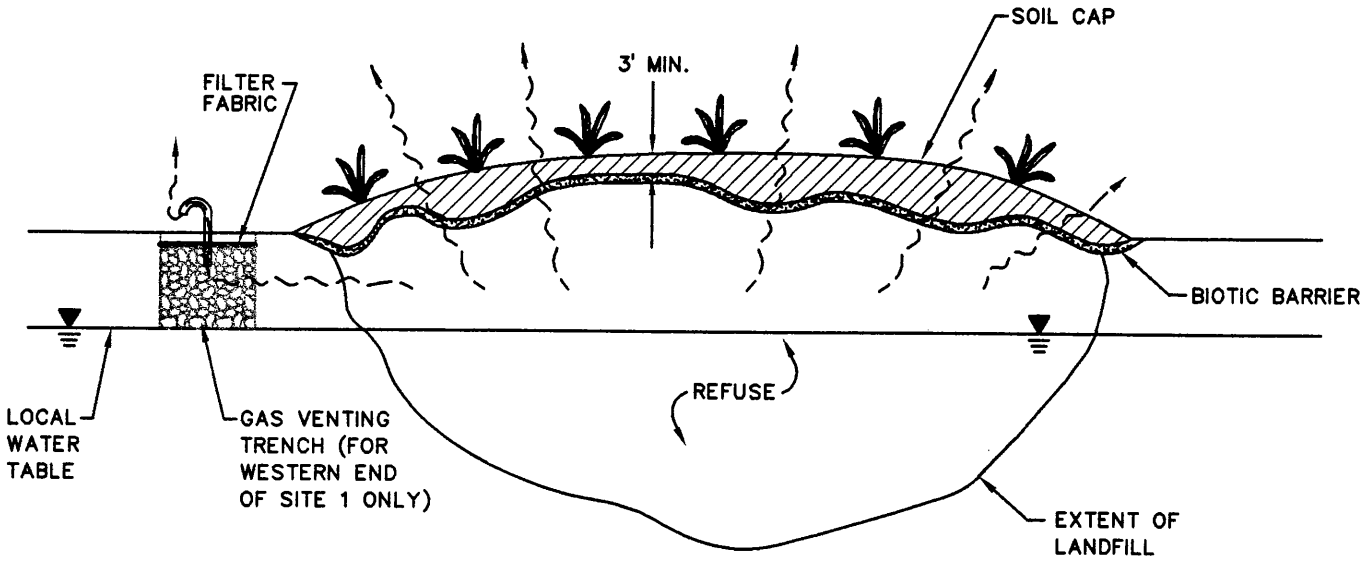
transfer or land use change at Site 1 so that issues related to postclosure land use at Site 1 are managed appropriately.

2.7.1.2.2 Native Soil Cap

A native soil cap would be implemented under this alternative to isolate landfill refuse, eliminate direct contact with surface refuse, and reduce erosion, infiltration, and surface contaminant migration. A biotic barrier and gas vents would also be installed to minimize plant root uptake of chemicals and reduce inhalation exposures for burrowing animals. The soil cap would consist of a 3-foot layer of soil. The cap would be sloped so rainwater will drain off the landfill to a perimeter ditch or the SWRP. The cap would be designed to minimize erosion, thereby reducing the potential for surface contaminant migration. The native soil cap would also reduce infiltration into the landfills and reduce the formation of leachate by promoting vegetation, evapotranspiration, and runoff. The purpose of the soil cap is to prevent direct contact, minimize erosion, and reduce infiltration. Gases generated beneath the soil cap under Alternative 2 would be allowed to escape upward through the cap, as no low-permeability layer exists in the cap to impede gas flow. Figure 4 is a conceptual diagram of the cap under Alternative 2.

2.7.1.2.3 Groundwater Monitoring

The groundwater monitoring program would be in accordance with provisions of Title 23 CCR, Chapter 15, Article 5, which have been identified as applicable for Sites 1 and 2. The groundwater monitoring program would be contained in an appropriate remedial design document. The groundwater monitoring program development will consider the March 1994 Long-term Ground Water Monitoring Program Guidance (CBCEC 1994), which was prepared for the California Base Closure Environmental Committee (CBCEC). For groundwater monitoring, detection monitoring and, if needed, evaluation monitoring would be implemented based on substantive requirements in Title 23 CCR and contained in an appropriate remedial design document. As part of detection monitoring, groundwater constituent concentrations would be monitored, and, if chemical concentrations exceeding concentration limits set pursuant to 23 CCR Chapter 15 Article 5 are observed, the Navy will immediately notify the regulatory agencies and will evaluate the groundwater contamination in accordance with CERCLA, and will obtain concurrence from EPA and the State on remediation decisions. Potential response action could include hydraulic control of the groundwater and leachate through pump and treat methods.



LEGEND

LANDFILL GAS MIGRATION

VEGETATION

FIGURE 4
MOFFETT FEDERAL AIRFIELD
OU1 ROD
CONCEPTUAL DIAGRAM
OF ALTERNATIVE 2

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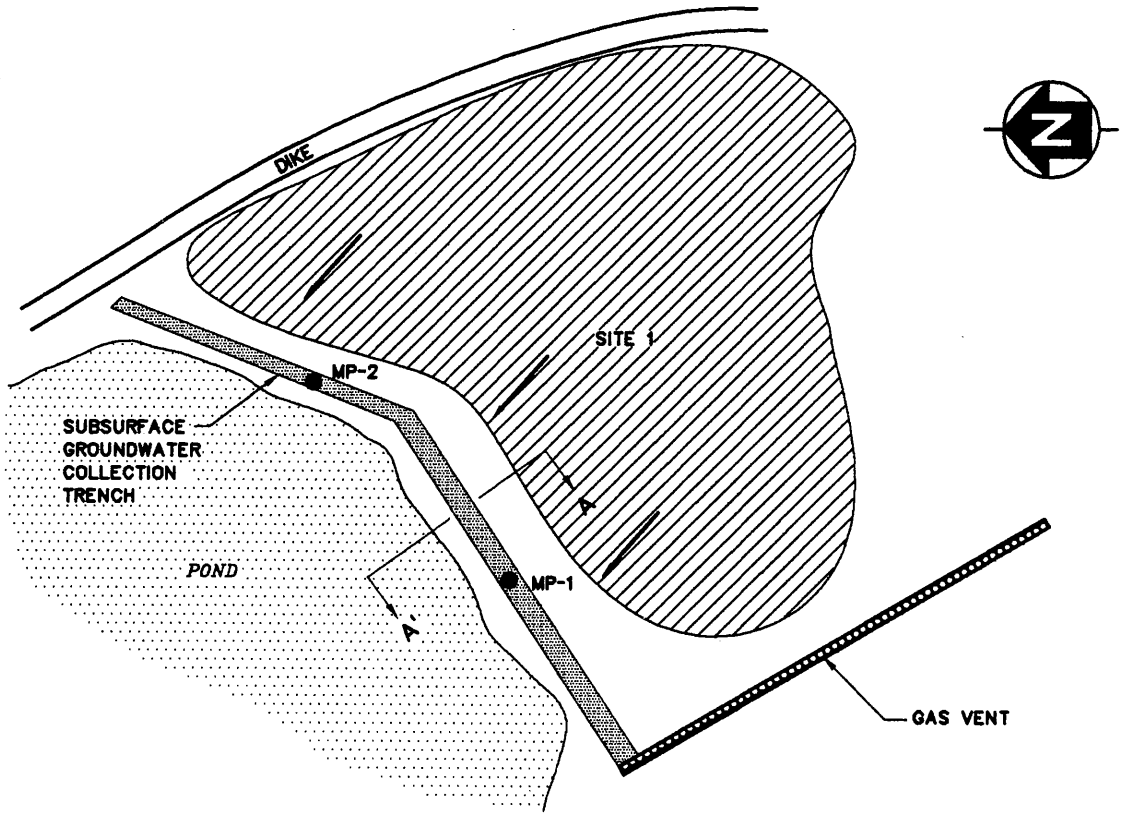
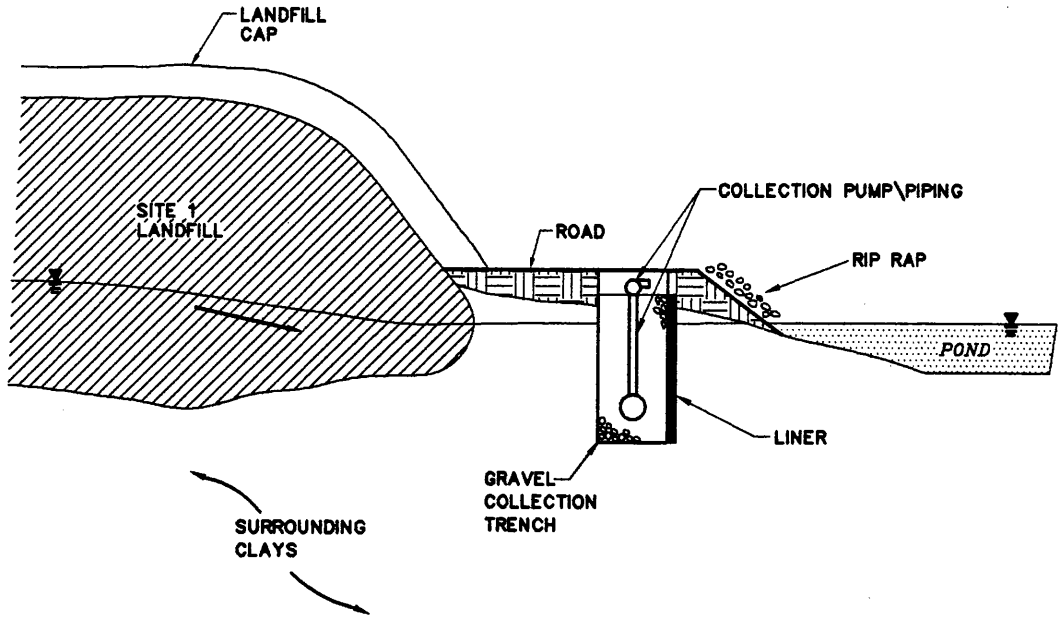
A contingency measure would be implemented as part of Alternative 2 at Site 1 and would be in place in the event nearby surface water is threatened. The contingency measure is proposed at Site 1 due to the proximity and potential impact of landfill contamination to ecological receptors and habitats in the adjacent northern area. The contingency measure includes enhancing the containment provided by the bay muds at Site 1 with a vertical subsurface barrier and collection trench along the northern boundary of Site 1. Figure 5 shows a conceptual design of the subsurface collection trench and vertical barrier.

Groundwater within the subsurface collection trench would be monitored at the same frequency as at the Site 1 groundwater monitoring wells. If chemical concentrations exceeding concentration limits set pursuant to 23 CCR Chapter 15 Article 5 are observed, the Navy will immediately notify the regulatory agencies and will evaluate the groundwater contamination in accordance with CERCLA, and will obtain concurrence from EPA and the State on remediation decisions. Potential actions may include additional or more frequent sampling or groundwater extraction and treatment, depending on the nature and levels of the chemicals detected.

The subsurface collection trench would be designed to intercept any leachate that may migrate into shallow groundwater and protect the SWRP receptors while a more permanent remedy could be evaluated. Initially, collected leachate can be stored in tanks. The leachate can then be sampled, treated (if necessary), and disposed of. The available treatment and disposal options will depend on the nature and volume of contaminated leachate. If treatment is necessary, the Navy will first evaluate using existing on-site treatment systems, such as the OU5 treatment system or the west-side aquifers treatment system. Again, depending on the volume and nature of the release, the Navy may also consider using a package treatment system to reduce contaminant concentrations prior to discharge or directly discharging the water to the local publicly owned treatment works (POTW). Other possible discharge options include reuse at the Moffett Field golf course or discharge to surface waters under a National Pollutant Discharge Elimination System (NPDES) permit. Leachate migration has not occurred at Site 1 and is not expected to in the future (PRC 1995). However, the contingency measure would protect against the possibility of any buried waste mobilizing and migrating off site in the future. The Navy will obtain concurrence from EPA and the State on remediation decisions regarding leachate.

Only the northern boundary of Site 1 is selected for additional containment because leachate is upgradient to a sensitive ecosystem. Releases along other borders could be addressed by hydraulic control with downhole pumps, if needed. A contingency measure is not considered for Site 2 since hydraulic control could be readily achieved, as demonstrated by the pumping at the Building 191 lift station.





SECTION A - A

LEGEND

LEACHATE GRADIENT

NOT TO SCALE

FIGURE 5
MOFFETT FEDERAL AIRFIELD
OU1 ROD
GAS AND GROUNDWATER
COLLECTION TRENCHES

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2.7.1.2.4 Gas Monitoring

Gas monitoring would be conducted under Alternative 2. The gas monitoring program would be in accordance with substantive provisions of Title 14 CCR, Chapter 3, Article 7.8, or 40 CFR 258.61(a)(4), whichever is more stringent, which have been identified as applicable for OU1. Methane concentrations would be monitored and if the lower explosive limit (LEL) (concentration of 5 percent by volume in air) is exceeded at site boundaries, a corrective action program would be implemented according to applicable requirements. An example of a corrective action includes extending the gas collection trench (described below). According to San Francisco Bay Area Air Quality Management District (BAAQMD) regulation 8-34-111.1, landfills smaller than 1 million tons are exempt from BAAQMD requirements for landfill gas monitoring and collection. Sites 1 and 2 are both smaller than 1 million tons. However, landfill gas monitoring is required by federal and state landfill closure regulations.

At Site 2, methane has not been detected inside or at the perimeter. If this trend continues, the need for gas monitoring would be re-evaluated and may no longer be required at Site 2.

2.7.1.2.5 Gas Trench Vent

Methane gas was detected at the western end of Site 1 in landfill gas monitoring well (LGMW) 1-3 at a concentration of 31 percent by volume and was potentially migrating westward during the air solid waste assessment test (SWAT) (IT 1992). Under Alternative 2, a gas collection trench has been included at Site 1 to intercept and vent gas to the atmosphere before it migrates off site. The north-south trench would extend along the western end of the landfill for approximately 300 feet, and tie into the east-west groundwater collection gravel trench. The trench vent depth would extend to the water table (roughly 5 feet) and vertical riser vents would be included to allow accumulated gases to escape from the trench to the surface. The trench is located near the runway extension to minimize impacts to the wetland area to the west of the landfill. A trench vent is not included for Site 2 because no methane migration was detected during the air SWAT (IT 1992).

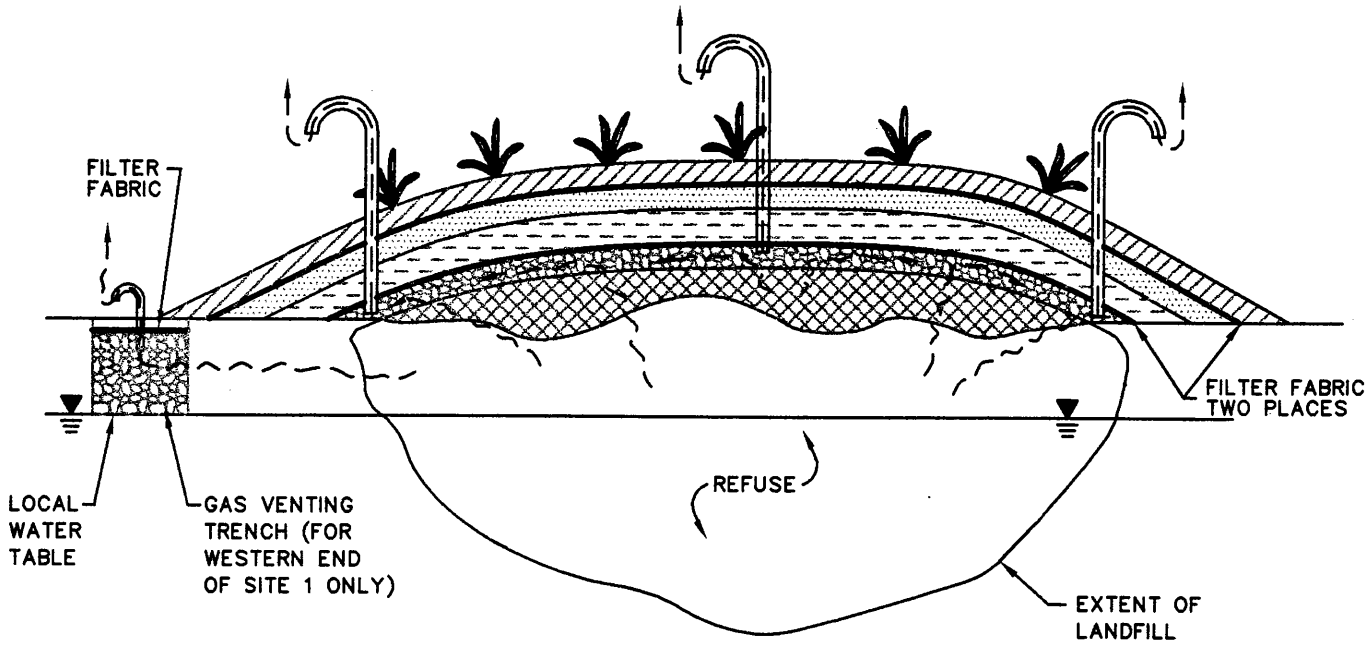
2.7.1.3 Alternative 3: Multilayer Cap, Trench Vent

Alternative 3 consists of similar features as Alternative 2 (institutional controls, gas and groundwater collection trenches, and gas and groundwater monitoring) with the addition of a multilayer cap. Previous sections discussed institutional controls, collection trenches, and monitoring. Therefore, the multilayer cap will be the only component of Alternative 3 discussed below.

A multilayer cap would be implemented under this alternative to isolate landfill refuse, eliminate direct contact of surface soils, reduce erosion, reduce surface contaminant migration, and limit infiltration. The function of the multilayer cap is the same as the native soil cap function identified in Alternative 2. The main difference is that the multilayer cap is specifically designed to reduce infiltration. The multilayer cap includes a low-permeability layer of material in the cap. The other layers mainly function to protect this low-permeability layer and maintain its function. Above the low-permeability layer (or barrier layer), a drainage layer may be required to transport water away from the barrier layer. This drainage layer reduces the hydraulic head on top of the barrier layer and therefore limits the driving force of vertical migration. Above the drainage layer, a soil layer which supports vegetation is typically installed. This layer mainly functions to protect the barrier layer by reducing erosion and desiccation. A biotic barrier can also be included to prevent burrowing animals from destroying the integrity of the barrier layer. Lastly, to support the barrier layer and provide a foundation for its construction, a layer of soil is placed before the barrier layer. Figure 6 is a conceptual diagram of Alternative 3.

At Site 1, methane was detected at significant levels inside landfill boundaries. Low-permeability caps placed over landfills generating gas can cause gas pressure to build up. The increase in gas pressure can damage the cap and increase horizontal migration. Therefore, passive gas control has been included under this alternative for Site 1 to protect the integrity of the low-permeability cap and to mitigate any increase in horizontal migration caused by the low-permeability cap.

Passive gas control would consist of gas vents incorporated into the multilayer cap at Site 1. The gas vents would be placed beneath the barrier layer and would provide a low resistance path for the gas. Gas vent riser pipes would be located around the perimeter or within the landfill to passively carry gas to the surface (see Figure 6). Gas vents are not required for the multilayer cap proposed for Site 2 because gases are not being generated.



LEGEND

- VEGETATION LAYER
- DRAINAGE LAYER
- BARRIER LAYER
- GAS VENTING LAYER (SITE 1 ONLY)
- FOUNDATION LAYER
- LANDFILL GAS MIGRATION
- VEGETATION

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FIGURE 6
MOFFETT FEDERAL AIRFIELD
OU1 ROD
CONCEPTUAL DIAGRAM
OF ALTERNATIVE 3

2.7.2 Description of Consolidation Alternative

Based on new information discovered during OU1 design activities; the volume of waste in Site 2 is much less than estimated in the OU1 FS report. The OU1 FS estimated that Site 2 contained about 5 acres and about 169,000 cubic yards of waste. The new information indicates that wastes at Site 2 cover about 1 acre and are about 20,000 cubic yards in volume. The new information indicates that the presumptive remedy of capping for Site 2 should be re-evaluated. In consideration of these new data and EPA's December 1996 guidance Application of the CERCLA Municipal Landfill Remedy to Military Landfills, the Navy re-evaluated the Site 2 remedial approach. The guidance considers the practical application of excavation as a key factor in the decision process and suggests that landfills smaller than 100,000 cubic yards may under some circumstances be suitable for excavation. Based on this information, the Navy, in consultation with EPA, DTSC, and RWQCB, has developed a consolidation alternative as described below:

- Excavation of waste from Site 2 and consolidation of the wastes at Site 1
- Backfill and restoration of the land surface at Site 2
- Groundwater monitoring at Site 2

The wastes from Site 2 would be contained within the cap already planned for the Site 1 landfill. Provisions for cap construction, groundwater and landfill gas monitoring, and postclosure maintenance at Site 1 would be the same as described in Section 2.7.1.

Excavation activities at Site 2 would begin near the location of wells W2-10 and W2-8 where waste materials were identified during previous investigations. These well locations and the estimated extent of the waste to be excavated are shown on Figure 3. The excavation would continue radially from each well until visual screening indicates that all waste materials have been removed. The Navy plans to remove all waste materials to the fullest extent technically and economically feasible. Prior to backfilling the excavation, the Navy will collect and analyze confirmatory horizontal and vertical soil samples after all waste identified by visual screening has been removed. The Navy will consult with the regulatory agencies to select the number and locations of these samples. The Navy will consult with the regulatory agencies to determine the final limits of the excavation based on the sample results. If concurrence is not reached, further evaluation of the nature and extent of the Site 2 landfill contamination will be required and further remediation may be necessary. Inert materials, such as

construction debris, would remain at Site 2 but would be covered by a least 12 inches of clean fill to minimize safety hazards from protruding debris.

The Navy will not place containers of hazardous waste excavated from Site 2 at Site 1. Furthermore, free liquids observed in the Site 2 excavation that are clearly not groundwater (for example, free-phase paints, oils, or solvents) will be removed and not placed at Site 1. Similarly, containers of hazardous waste encountered during activities at Site 1 will be removed. These containers will be tested and disposed of appropriately off site. Freely mobile waste materials will not be placed or allowed to remain at Site 1 but will be shipped off site to an appropriate disposal facility.

Wastes from Site 2 are expected to be solid (nonhazardous) wastes. Waste classification requirements in Title 23 CCR, Chapter 15, Article 2 are applicable for wastes excavated at Site 2. The Navy, with the concurrence of the regulatory agencies, will use visual screening methods to meet these requirements. However, because some characteristic hazardous wastes may be associated with the solid wastes at Site 2, the Navy proposes that Site 1 be designated a CAMU, which allows on-site handling of remediation wastes without triggering RCRA land disposal restrictions (LDRs) and minimum technology requirements (MTRs). Designation of Site 1 as a CAMU will not exempt the Navy from taking the steps described above for handling mobile, liquid wastes. The cap planned for Site 1 contains the same components as the cap originally envisioned for Site 2 so waste from Site 2 will be equally protected by the Site 1 cap. In addition, formerly saturated wastes from Site 2 will be placed above the water table at Site 1, reducing the potential for leachate formation.

Active groundwater remediation is not part of the consolidation alternative. However, excavation activities at Site 2 will likely require dewatering to allow removal of saturated wastes. This groundwater will be used for dust control at the site if sampling indicates that the water does not contain substances exceeding federal AWQC for aquatic life or RWQCB water quality objectives. Water will be applied at Site 1 only within a bermed area 10 feet interior to the foot print of the landfill cap and in accordance with pertinent occupational health and safety requirements. Groundwater data indicate that the Site 2 wastes are not affecting surrounding groundwater quality and removal of the wastes is expected to further reduce this potential effect. However, the Navy will monitor downgradient groundwater quality for a minimum of 3 years to confirm that groundwater quality is not affected. Groundwater monitoring at Site 2 will follow the substantive regulations in 23 CCR, Chapter 15, Article 5. The groundwater monitoring program will be contained in an appropriate remedial design document.

2.8 SUMMARY OF COMPARATIVE ANALYSIS

This section presents a comparative analysis of the alternatives against the nine evaluation criteria set forth in the NCP (40 CFR Part 300.430(e)(9)(iii)). Section 2.8.1 describes the evaluation criteria. Section 2.8.2 presents the comparative analysis of Site 1 alternatives as described in the OU1 FS. Section 2.8.3 presents the comparative analysis for the Site 2 alternatives described in the FS and for the consolidation alternative.

2.8.1 Remedial Alternatives Evaluation Criteria

The NCP requires that each alternative that undergo a detailed analysis be evaluated against nine evaluation criteria. The nine evaluation criteria fall into three categories, threshold criteria, balancing criteria, and modifying criteria. Sections 2.8.1.1 through 2.8.1.3 below describe the individual criteria evaluated under each of the three categories.

2.8.1.1 Threshold Criteria

For any alternative to be eligible for selection, it must meet certain threshold criteria. The two threshold criteria are overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs).

2.8.1.2 Balancing Criteria

After the comparison with threshold criteria, five additional criteria are used to analyze differences among alternatives. The following five criteria are used for comparative analysis:

- Long-term Effectiveness and Permanence
- Reduction in Toxicity, Mobility, and Volume
- Short-Term Effectiveness
- Implementability
- Cost

2.8.1.3 Modifying Criteria

Modifying criteria include state agency and community acceptance. These assessments evaluate issues and concerns of both the state agencies and the public and are evaluated following the release of the proposed plan.

2.8.2 Comparative Analysis of Site 1 Alternatives

This section presents the comparative analysis of the Site 1 alternatives for the three categories of evaluation criteria. Section 2.8.2.1 through 2.8.2.3 present the comparative analysis of the alternatives for the threshold, balancing, and modifying criteria. Section 2.8.4 presents the results of the Site 1 comparative analysis.

2.8.2.1 Site 1 Alternatives and the Threshold Criteria

Alternative 1 does not meet the threshold criteria of overall protection of human health and the environment and compliance with ARARs for Site 1. If no action is taken, site conditions would be unpredictable and uncontrolled, which could result in future erosion and exposure to human and ecological receptors. Leaving Site 1 uncontrolled would not likely provide continual overall protectiveness from hazards.

Since Alternative 1 does not meet the threshold criteria for Site 1, this alternative is not eligible for selection. However, Alternative 1 provides a basis for comparison for Alternatives 2 and 3.

Alternatives 2 and 3 meet the threshold criteria for Site 1. Both alternatives provide protection to human health and the environment by isolating the contamination with a cap and protecting the integrity of the cap with supporting technologies. Both alternatives monitor groundwater. Gas migration control and monitoring would be conducted to promote control of hazards associated with methane migration. In addition, the FS evaluation indicated that both alternatives would meet ARARs.

2.8.2.2 Site 1 Alternatives and the Balancing Criteria

The OU1 FS evaluated each of the Site 1 alternatives against the five balancing criteria and then compared the alternatives to one another in relation to the balancing criteria. Sections 2.8.2.2.1 through Sections 2.8.2.2.5 summarize the comparative analysis of the Site 1 alternatives.

2.8.2.2.1 Site 1 Alternatives and Long-term Effectiveness and Permanence

Alternatives 2 and 3 both provide long-term effectiveness and permanence for Site 1 but would require occasional O&M to promote long-term effectiveness and permanence. The only difference between Alternative 2 and Alternative 3 is that Alternative 3 employs a multilayer cap instead of a single layer soil cap. The function of the multilayer cap is the same as the native soil cap's function, which is to isolate landfill refuse, eliminate exposure to surface soils, reduce erosion, and limit infiltration. The functional difference between the alternatives is that Alternative 3 employs a low-permeability layer and drainage layer that specifically function to reduce infiltration. These layers may reduce the amount of leachate generated, which should reduce leachate migration. For the soil cap in Alternative 2, evapotranspiration, soil storage capacity, and runoff processes act to limit infiltration.

The comparative alternative evaluation in the FS proposed that the native soil cap would have similar effectiveness compared to the multilayer, clay (or clay equivalent) cap for Site 1. This analysis was based on (1) cap performance, (2) site conditions, (3) the ability to maintain cap integrity, and (4) the potential for increased gas migration. The analysis of these factors is discussed in detail in the FS report (PRC 1995).

Alternatives 2 and 3 provide greater long-term effectiveness and permanence than Alternative 1. Over the long-term, Site 1 conditions under Alternative 1 would be unpredictable and uncontrolled which could result in future erosion and exposure to human and ecological receptors. Although implementing Alternative 2 or 3 would destroy any current habitats at Site 1, these are expected to be short-term impacts. The area is expected to recover in less than 5 years (see Section 2.8.2.3) (PRC 1994).

2.8.2.2.2 Site 1 Alternatives and the Reduction in Toxicity, Mobility, and Volume

None of the Site 1 alternatives reduce the toxicity, mobility, or volume of contaminants through the use of treatment because treatment is not a component of any of the Site 1 alternatives. The objective of the Site 1 alternatives is to reduce mobility of contamination by isolation. In accordance with EPA presumptive remedy guidance (EPA 1993), reductions in toxicity, mobility, and volume are not addressed by any alternatives considered because such treatment is impractical for landfill sites.

Alternatives 2 and 3 are more effective in reducing the mobility of contamination than Alternative 1. Alternatives 2 and 3 reduce mobility of refuse by containment, whereas Alternative 1 does not reduce contaminant mobility.

2.8.2.2.3 Site 1 Alternatives and Short-term Effectiveness

Alternative 1 provides greater short-term effectiveness than Alternatives 2 and 3 because no remedial action would be implemented. No workers would be exposed and no increase in truck traffic would occur. Alternative 1 also provides greater short-term effectiveness because it minimizes impacts to the current habitat and associated residents.

Site 1 consists of disturbed, low-value habitat that supports predominantly non-native plant and animal species. Under Alternatives 2 and 3, heavy machinery and soil used to cap the Site 1 landfill would destroy the existing vegetative community and would kill or displace species inhabiting the site. Animals that would be displaced during cap implementation include the red fox, black-tailed hare, vagrant shrew, California vole, harvest mice, birds, and lizards. However, the detrimental impacts to the habitat are expected to be short term. Based on the OU1 ecological assessment, the landfill habitat is expected to recover rapidly as a result of the following site-specific conditions (PRC 1994):

- The ability of the animal species to emigrate from the site during cap construction and then re-establish territories in the following season
- The abundance of similar species in surrounding habitats (PRC 1994)
- The overall high reproductive rate of commonly occurring species such as shrews, voles, and ground squirrels due to short gestation and large litter size (PRC 1994)

- Revegetation

Aerial photographs of Site 1 taken in 1987 show a general lack of vegetative cover. Much of the landfill surface is bare, burned, matted, or covered with stockpiled drums and scrap equipment. However, photos of the same area taken in 1992 indicate vegetative recolonization with approximately 75 percent vegetative cover. Areas not sustaining vegetation are hard-packed, gravelly areas to the west and south of the pistol range area.

Due to the past recovery rate of the area, it is reasonable to assume that the area would again recover in less than 5 years after the landfill has been capped. The recovered habitat would not likely be identical to the current habitat, but it would be similar. Revegetation using regionally native plants may enhance the recovery rate.

Alternative 2 would be more effective than Alternative 3 in the short term. Although both alternatives are expected to be constructed relatively quickly (6 to 12 months), Alternative 3 would require more time to implement due to larger volumes of material required and more complex installation. Over three times more material would be required for Alternative 3. Truck traffic would be greater and increase the potential for vehicle accidents and disturbances and exposure to workers could be prolonged. In addition, for Alternative 3, refuse may need to be disturbed to achieve more stringent grades required due to the multiple layers and to minimize material requirements. Disturbing refuse would increase exposure and risk to workers.

2.8.2.2.4 Site 1 Alternatives and Implementability

Alternative 1 would be easier to implement than Alternatives 2 and 3. Except for the monitoring wells, no construction is required for Alternative 1. Monitoring is readily implementable. For Alternatives 2 and 3, greater technical and administrative effort would be required to construct the caps, collection trenches, and institutional controls at Site 1.

Alternative 2 would be simpler to implement than Alternative 3 due to the addition of multiple layers in Alternative 3. For the additional layers, additional construction materials include gravel from borrow sources, sand, and clay. In addition, slopes needed to maintain layer stability may require more precontouring and therefore increase the possibility of disturbing landfill contents. Also, construction

of the low-permeability layer would require specialized quality assurance and quality control (QA/QC) testing.

2.8.2.2.5 Site 1 Alternatives and Cost

The following is a list of the capital and present worth O&M (based on 30 years and an 8 percent discount rate) costs for Alternatives 1 through 3 at Site 1:

- Alternative 1: $1,068,000
- Alternative 2: $2,306,900
- Alternative 3: $5,091,400

Alternative 2 does not include multiple layers and consequently has lower capital and construction costs. O&M costs are similar. Estimated costs for monitoring, institutional controls, and collection trenches are identical for Alternatives 2 and 3. Alternative 1 has a lower cost than Alternatives 2 and 3 since no remedial action would be implemented under Alternative 1.

2.8.2.3 Site 1 and the Modifying Criteria

The state and community acceptance of the Site 1 alternatives are compared below.

2.8.2.3.1 Site 1 Alternatives and State Acceptance

DTSC, RWQCB, and EPA agreed on Alternative 2 as the preferred alternative for landfill containment for Site 1. DTSC and RWQCB participated in the development of the FS and the initial proposed plan. However, following the June 1995 public comment period, CIWMB noted several deficiencies with Alternative 2 and did not recommend selecting Alternative 2 for Site 1.

2.8.2.3.2 Site 1 Alternatives and Community Acceptance

A public comment period was held from May 30, 1995 to July 31, 1995 on the three alternatives presented in the FS and the June 1995 proposed plan. In addition, a public meeting was held on June 15, 1995. During this meeting, the Navy presented the proposed plan for OU1 and answered

questions. The community had concerns regarding regulatory compliance, overall protection to human health and the environment, and site characterization. Responses to community comments are presented in Section 3.1 and 3.2 of the responsiveness summary (Section 3.0).

2.8.2.4 Results of Site 1 Comparative Analysis

The results from the comparative analysis indicated Alternative 2 (monitoring, soil cap, and trench vent) was the most feasible for Site 1. Alternative 2 was easier to implement, had greater short-term effectiveness, and was believed to have equal long-term effectiveness with lower costs as compared to Alternative 3. Alternative 3 incorporated additional layers to directly address infiltration. The increased layers reduce implementability and increase costs. In addition, for Site 1, Alternative 3 did not offer greater effectiveness, as described in the FS report (PRC 1995). Alternative 2 was initially recommended as more feasible also when compared to Alternative 1 because it meets the threshold criteria and is more attractive based on several factors. Although Alternative 1 is easiest to implement, has the lowest cost, and minimizes impacts to the current habitat and current receptors, it is not recommended over Alternative 2. The short-term impacts from habitat destruction are not significant (PRC 1994). Alternative 2 eliminates the exposures to human and ecological receptors by (1) minimizing direct contact with landfill contents, (2) minimizing infiltration, (3) preventing inhalation of contaminated dust, and (4) minimizing erosion and runoff through revegetation and grading. In addition, in-place containment of landfill contents minimizes the potential spread of contaminants off site into the nearby wetlands. Alternative 1 achieves none of these results. Neither capping nor limited capping of the landfill would leave these potential pathways intact, and would provide no protection against off-site contaminant migration. Erosion and runoff would continue to occur, potentially spreading contaminants off site.

In summary, Alternative 2 was recommended in the initial proposed plan because the Navy believed it met ARARs and provided a cost-effective means to achieve long-term protectiveness. However, based on comments received during the public comment period, the Navy issued a new proposed plan in December 1995 that proposed implementation of a modified Alternative 2. This modifications to Alternative 2 are discussed in more detail in Sections 2.9 and 2.10.

2.8.3 Comparative Analysis of Site 2 Alternatives

The comparative analysis of Site 2 Alternatives is presented below. The analysis is presented for each of the three categories of criteria in Sections 2.8.3.1 through 2.8.3.3 and the results of the analysis are summarized in Section 2.8.3.4.

2.8.3.1 Site 2 Alternatives and the Threshold Criteria

Alternative 1 does not meet the threshold criteria of overall protection of human health and the environment and compliance with ARARs for Site 2. If no action is taken, site conditions would be unpredictable and uncontrolled which could result in future erosion and exposure to human and ecological receptors. Leaving Site 2 uncontrolled would not likely provide continual overall protectiveness from hazards.

Since Alternative 1 does not meet the threshold criteria for Site 2, this alternative is not eligible for selection. However, Alternative 1 provides a basis for comparison for Alternatives 2 and 3 and the consolidation alternative.

Alternatives 2 and 3 and the consolidation alternative meet the threshold criteria for Site 2. Alternatives 2 and 3 provide protection to human health and the environment by isolating the contamination with a cap and protecting the integrity of the cap with supporting technologies. The consolidation alternative would provide overall protectiveness at Site 2 by removing the waste from Site 2 and consolidating it at Site 1. Under the consolidation alternative, wastes from the saturated zone at Site 2 would be placed above the water table at Site 1 and provide an extra measure of protectiveness for groundwater at Site 2.

In addition, the FS evaluation and the April 1997 alternatives analysis technical memorandum indicated that Alternatives 2 and 3 and the consolidation alternative would meet ARARs.

2.8.3.2 Site 2 Alternatives and the Balancing Criteria

Sections 2.8.3.2.1 though 2.8.3.2.5 below present the comparative analysis of Site 2 alternatives for the five balancing criteria.

2.8.3.2.1 Site 2 Alternatives and Long-Term Effectiveness and Permanence

The consolidation alternative would provide the greatest degree of long-term effectiveness and permanence. Removing wastes from Site 2 would remove potential exposures to wastes at the site. Placement of previously saturated wastes from Site 2 above the water table at Site 1 would further reduce the potential for contaminant migration and enhance the long-term effectiveness of this alternative. The consolidation alternative would require less O&M than Alternatives 2 and 3 because Site 2 would not need to be capped.

Alternatives 2 and 3 both provide long-term effectiveness and permanence for Site 2 but would require occasional O&M to promote long-term effectiveness and permanence. The only difference between Alternative 2 and Alternative 3 is that Alternative 3 employs a multilayer cap instead of a single layer soil cap. The function of the multilayer cap is the same as the native soil cap's function, which is to isolate landfill refuse, eliminate exposure to surface soils, reduce erosion, and limit infiltration. The functional difference between Alternatives 2 and 3 is that Alternative 3 employs a low-permeability layer and an optional drainage layer that specifically function to reduce infiltration. These layers may reduce the amount of leachate generated, which should reduce leachate migration. For the soil cap in Alternative 2, evapotranspiration, soil storage capacity, and runoff processes act to limit infiltration.

The comparative alternative evaluation in the FS proposed that the native soil cap would have similar effectiveness compared to the multilayer, clay (or clay equivalent) cap for the OU1 landfills. This analysis was based on (1) cap performance, (2) site conditions, (3) the ability to maintain cap integrity, and (4) the potential for increased gas migration. The analysis of these factors is discussed in detail in the FS report (PRC 1995).

Alternatives 2 and 3 provide greater long-term effectiveness and permanence than Alternative 1 but less long-term effectiveness and permanence than the consolidation alternative. Over the long-term, site conditions under Alternative 1 would be unpredictable and uncontrolled which could result in future erosion and exposure to human and ecological receptors. Although implementing Alternative 2 or 3 or the consolidation alternative would destroy any current habitats at Site 2, these are expected to be short-term impacts. The area is expected to recover in less than 5 years (see Section 2.8.2.3) (PRC 1994).

2.8.3.2.2 Site 2 Alternatives and the Reduction in Toxicity, Mobility, and Volume

None of the Site 2 alternatives reduce the toxicity, mobility, or volume of contaminants through the use of treatment because treatment is not a component of any of the Site 2 alternatives. The objective of the Site 2 alternatives is to reduce mobility of contamination by isolation. In accordance with EPA presumptive remedy guidance, reductions in toxicity, mobility, and volume are not addressed by any alternatives considered because such treatment is impractical for landfill sites. However, consolidation will result in the placement of previously saturated wastes in the unsaturated zone at Site 1 and potential contaminant migration will be reduced.

2.8.3.2.3 Site 2 Alternatives and Short-term Effectiveness

Alternative 1 provides greater short-term effectiveness than Alternatives 2 and 3 and the consolidation alternative because no remedial action would be implemented. No workers would be exposed and no increase in truck traffic would occur. Alternative 1 also provides greater short-term effectiveness because it minimizes impacts to the current habitat and associated residents.

Site 2 consists of disturbed, low-value habitat that supports predominantly non-native plant and animal species. Heavy machinery and soil used to cap Site 2 (Alternatives 2 and 3) and to excavate waste from Site 2 (consolidation alternative) would destroy the existing vegetative community and would kill or displace species inhabiting the site. Animals that would be displaced during waste excavation and cap implementation include the red fox, black-tailed hare, vagrant shrew, California vole, harvest mice, birds, and lizards. However, the detrimental impacts to the habitat are expected to be short term. Based on the OU1 ecological assessment, the landfill habitat is expected to recover rapidly as a result of the following site-specific conditions (PRC 1994):

- The ability of the animal species to emigrate from the site during cap construction and then reestablish territories in the following season
- The abundance of similar species in surrounding habitats (PRC 1994)
- The overall high reproductive rate of commonly occurring species such as shrews, voles, and ground squirrels due to short gestation and large litter size (PRC 1994)
- Revegetation

The following discussion is pertinent to Site 2 because ecological conditions at Site 2 and Site 1 are very similar. Aerial photographs of Site 1 taken in 1987 show a general lack of vegetative cover.

Much of the landfill surface is bare, burned, matted, or covered with stockpiled drums and scrap equipment. However, photos of the same area taken in 1992 indicate vegetative recolonization with approximately 75 percent vegetative cover. Areas not sustaining vegetation are hard-packed, gravelly areas to the west and south of the pistol range area.

Due to the past recovery rate of the Site 1 area, it is reasonable to assume that the Site 2 area would recover in less than 5 years after Site 2 has been capped (Alternatives 2 and 3) or excavated (consolidation alternative). The recovered habitat would not likely be identical to the current habitat, but it would be similar. Revegetation using regionally native plants may enhance the recovery rate.

Alternative 2 would be more effective than Alternative 3 and the consolidation alternative in the short term. Alternatives 2 and 3 are expected to be constructed relatively quickly (6 to 12 months), although Alternative 3 would require more time to implement due to larger volumes of material required and more complex installation. Over three times more material would be required for Alternative 3. Truck traffic would be greater and increase the potential for vehicle accidents and disturbances and exposure to workers could be prolonged. In addition, for Alternative 3, refuse may need to be disturbed to achieve more stringent grades required due to the multiple layers and to minimize material requirements. Disturbing refuse would increase exposure and risk to workers. The consolidation alternative would be the least effective in the short-term because short-term risks to workers would be potentially increased during the excavation and consolidation of wastes from Site 2 to Site 1. Worker risks associated with excavation and consolidation of wastes could be minimized through implementation of appropriate health and safety precautions. The consolidation alternative would take less time to implement (3 months) than Alternatives 2 and 3 (6 to 12 months).

2.8.3.2.4 Site 2 Alternatives and Implementability

Alternative 1 would be easier to implement than Alternatives 2 and 3 and the consolidation alternative. Except for the monitoring wells, no construction is required for Alternative 1. Monitoring is readily implementable. For Alternatives 2 and 3 and the consolidation alternative, greater technical and administrative effort would be required to excavate and consolidate wastes and construct the caps, collection trenches, and institutional controls at Site 2.

The consolidation alternative would be simpler to implement than Alternatives 2 and 3 because it involves excavation of waste from Site 2 and does not require construction of a cap at Site 2. Alternatives 2 and 3 would both require construction of caps at Site 2. Alternative 2 would be simpler to implement than Alternative 3 due to the addition of multiple layers in Alternative 3. For the additional layers, additional construction materials include gravel from borrow sources, sand, and clay. In addition, slopes needed to maintain layer stability may require more precontouring and therefore increase the possibility of disturbing landfill contents. Also, construction of the low-permeability layer would require specialized QA/QC testing.

2.8.3.2.5 Site 2 Alternatives and Cost

The following is a list of the capital and present worth O&M (based on 30 years and an 8 percent discount rate) costs for Alternatives 1 through 3 and the consolidation alternative at Site 2:

- Alternative 1: $ 366,200
- Alternative 2: $ 850,700
- Alternative 3: $1,372,700
- Consolidation Alternative: $1,091,700

Alternative 2 is less costly than the consolidation alternative and Alternative 3 because it does not include excavation and consolidation of waste or multiple cap layers and consequently has lower capital and construction costs. The consolidation alternative costs less than Alternative 3 because capital costs of excavation and consolidation are less than those of capping with a multiple layer cap and because of the reduced O&M requirements. O&M costs are similar for Alternatives 2 and 3 but less for the consolidation alternative. Estimated costs for monitoring, institutional controls, and collection trenches are identical for Alternatives 2 and 3. Alternative 1 has a lower cost than Alternatives 2 and 3 and the consolidation alternative since no remedial action would be implemented under Alternative 1.

2.8.3.3 Site 2 Alternatives and the Modifying Criteria

The state and community acceptance of the Site 2 alternatives are presented below.

2.8.3.3.1 Site 2 Alternatives and State Acceptance

DTSC, RWQCB, and EPA, agreed on Alternative 2 as the preferred alternative for landfill containment for Site 2. All three agencies participated in the development of the FS and the initial proposed plan. However, following the June 1995 public comment period, CIWMB noted several deficiencies with Alternative 2 and did not recommend selecting Alternative 2 for Site 2. In March 1997, the Navy proposed a new plan for the remedial action at Site 2, the consolidation alternative. DTSC, RWQCB, and CIWMB agreed with the development, evaluation, and recommendation of the consolidation alternative at Site 2.

2.8.3.3.2 Site 2 Alternatives and Community Acceptance

A public comment period was held from May 30, 1995 to July 31, 1995 on the three alternatives presented in the FS and the June 1995 proposed plan. In addition, a public meeting was held on June 15, 1995. During this meeting, the Navy presented the proposed plan for OU1 and answered questions. The community had concerns regarding regulatory compliance, overall protection to human health and the environment, and site characterization. Responses to community comments are presented in Section 3.1 and 3.2 of the responsiveness summary (Section 3.0). The community also submitted comments on the proposal to consolidate wastes from Site 2 to Site 1 as presented in the March 1997 proposed plan. In general, the community accepts the consolidation alternative for Site 2. Responses to community comments received on the March 1997 proposed plan to consolidate Site 2 wastes at Site 1 are presented in Sections 3.5 and 3.6 of the responsiveness summary (Section 3.0).

2.8.3.4 Site 2 Comparative Analysis Results

The results of the comparative analysis presented in the OU1 FS for Alternatives 1 through 3 at Site 2 is the same as the analysis discussed above in Section 2.8.2.4. However, the results of the comparative analysis for Site 2 are now changed by the evaluation of the proposed consolidation alternative. The consolidation alternative compares more favorably than Alternatives 1 through 3 because it would: (1) provide greater long-term effectiveness and permanence by reducing the mobility of the Site 2 waste, (2) be easier to implement, and (3) take less time to implement. Excavation of wastes from Site 2 and consolidation with the wastes at Site 1 offers several additional advantages over capping wastes at Site 2. One advantage would be the gain of the Site 2 area for a wider range of land

uses in the future than would be allowed if Site 2 was capped. Another advantage would be the significant reduction in long-term O&M costs associated with a cap at Site 2. If groundwater monitoring is not required beyond 3 years, no further O&M expenditures would be needed for Site 2. Finally, placing the formerly saturated wastes from Site 2 above the water table at Site 1 would increase the protection of groundwater and the surrounding environment by reducing the potential for leachate formation in those wastes.

In summary, Alternative 2 was recommended in the initial proposed plan because the Navy believed it met ARARs and provided a cost-effective means to achieve long-term protectiveness. However, based on the new information regarding the volume of waste at Site 2 and the development and analysis of the consolidation alternative, the Navy believes that the consolidation alternative provides the best balance among the alternatives analyzed for Site 2.

2.9 DOCUMENTATION OF SIGNIFICANT CHANGES

Two significant changes to the OU1 preferred alternative have been proposed since the initial proposed plan dated June 1995. Section 2.9.1 below discusses the proposed modification of Alternative 2 (the preferred alternative identified in the June 1995 proposed plan) for Sites 1 and 2. Section 2.9.2 below discusses the proposed change from preference of Alternative 2 to preference of the consolidation alternative for Site 2.

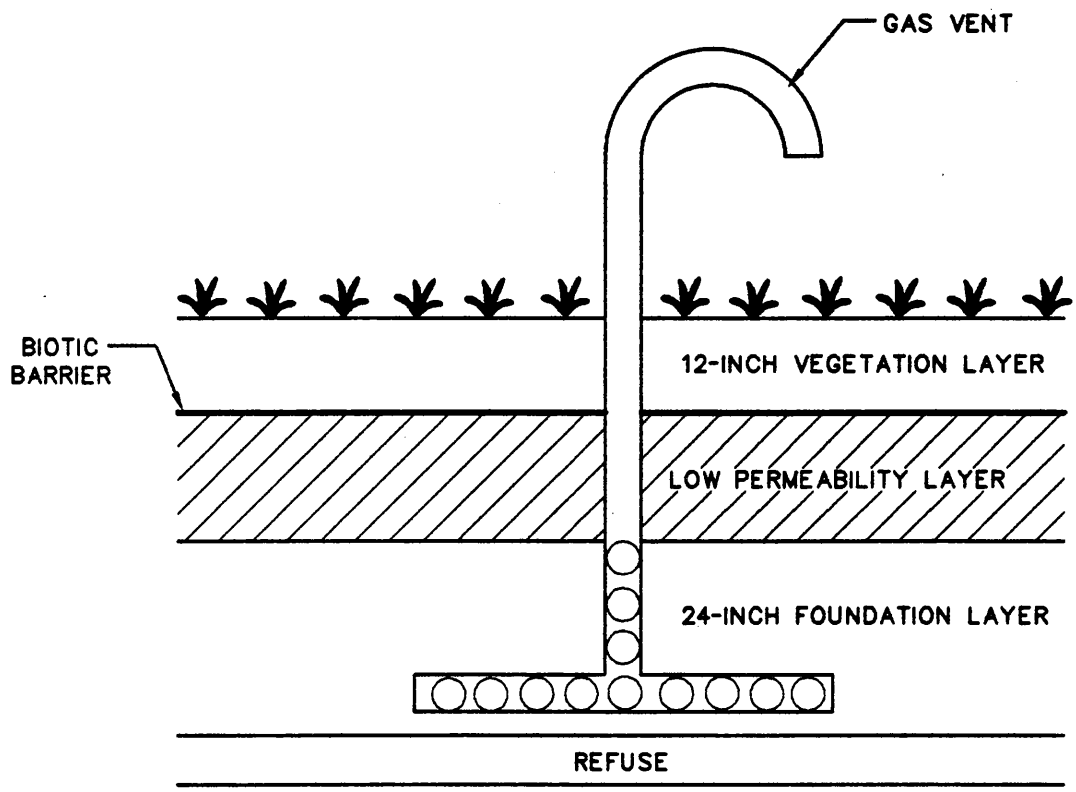
2.9.1 Significant Changes to Alternative 2 Cap Design

The initial proposed plan dated June 1995 recommended Alternative 2 (soil cap, groundwater and gas collection trenches at Site 1, monitoring, and maintenance) as the preferred alternative for Sites 1 and 2 based on the analysis presented in the RI/FS reports and summarized in Section 2.8. A proposed plan was presented to solicit public comments and facilitate the evaluation of the two modifying criteria: state acceptance and community acceptance.

During the June 1995 public comment period, state, county, and local regulatory agencies indicated that it is unlikely that the original proposal (Alternative 2) would meet performance standards contained in the landfill closure regulations. As a result, the Navy agreed to revise the proposed plan based on a prescribed, state pre-approved configuration for the two landfill caps at OU1. The responsiveness summary contains specific comments and responses regarding this issue. The revised cap

configuration uses design concepts from both Alternatives 2 and 3 and is somewhat of a hybrid of the two FS alternatives. Instead of 3-foot thick soil caps, the landfill caps will, at a minimum, contain 1 foot of topsoil overlying a low-permeability layer. These layers will be built on a 2-foot foundation layer. In addition to this minimum requirement, the Navy will include a biotic barrier and possibly a drainage layer between the low-permeability layer and topsoil to protect the integrity of the low-permeability layer and drain percolated water off the cap. The biotic barrier will prevent burrowing animals and deep plant roots from puncturing this layer. The drainage layer may be added to provide a pathway for percolation to flow from the cap. Several factors will be considered when evaluating the need for a drainage layer. These include slope stability, standard accepted practices in the area, and experience at other landfills. Inclusion of the drainage layer will be evaluated further during the design. Lastly, the Site 1 cap will include gas venting beneath the impermeable layer to prevent gas pressure buildup and horizontal subsurface gas migration. The revised cap configuration is very similar to Alternative 3 except for layer thicknesses and construction materials. Figure 7 depicts the revised cap configuration. Construction materials and cap dimensions will be specified during the remedial design.

The Navy held a second public comment period and public meeting to disseminate information regarding the revised proposal and to allow any interested parties to voice additional concerns. Although this second public meeting and public comment period were held, the modifications are not major changes from the originally proposed strategy. The original strategy included landfill caps, a groundwater collection trench, gas venting, monitoring, and postclosure maintenance and these features remain as part of the proposed remedy. The second proposed plan was made available to the public in December 1995. No significant comments were received during the second public comment period, and no significant changes have been made to the proposed changes to Alternative 2 as a result of public comments. The December 1995 proposed plan contained an error concerning the hydraulic conductivity of the low-permeability layer. The proposed plan stated that the conductivity of this layer would be 10^{-8} cm/sec but should have stated that the conductivity would be less than 10^{-6} cm/sec. A conductivity of 10^{-6} cm/sec is in accordance with the substantive landfill cap regulations. Section 2.10 describes the landfill cap and contains the correct hydraulic conductivity value (10^{-6} cm/sec) for the low-permeability layer.



MINIMUM DIMENSIONS SHOWN
NOT TO SCALE

FIGURE 7
MOFFETT FEDERAL AIRFIELD
OU1 ROD
REVISED CAP CONFIGURATION

DATE: 07/08/97 DDJ DN FILE NAME: 044\0236\IRU\1FS\F6.DWG

2.9.2 Significant Change from Capping to Consolidation for Site 2

As of January 1996, the preferred alternative was a modified version of Alternative 2 as described in Section 2.9.1 above. However, based on new information collected as part of OU1 design activities, the volume of wastes at Site 2 is much less than estimated in the OU1 FS report. Consequently, the Navy developed and evaluated an additional alternative for Site 2, the consolidation alternative. The consolidation alternative was developed and analyzed in an April 1997 technical memorandum. Because the consolidation alternative is considered a major change in the remediation strategy for Site 2, the Navy issued a proposed plan in March 1997 recommending the selection of the consolidation alternative for Site 2 instead of the modified Alternative 2.

2.10 SELECTED REMEDY

The initial proposed plan dated June 1995 recommended Alternative 2 (soil cap, groundwater collection trench at Site 1, trench vent at Site 1, monitoring, and maintenance) as the preferred alternative based on the analysis presented in the RI/FS reports. After the June 1995 public comment period ended, the Navy re-evaluated the proposal, modified the preferred alternative based on comments received, issued a revised proposed plan, and held a second public comment period and public meeting. Based on new information that indicates that the volume of waste in Site 2 is much less than that estimated in the OU1 FS, the Navy developed and analyzed the consolidation alternative for Site 2. The Navy issued a proposed plan in March 1997 that recommended selection of the consolidation alternative for Site 2. A public comment period and public meeting were held to discuss the recommendation of the consolidation alternative for Site 2. Based on the comments received on the three proposed plans for OU1, the final remedial action has been selected.

The final remedial action for OU1 consists of:

Site 1

- Landfill cap, including:
  - 12-inch minimum vegetation layer (potentially using recycled soils) and revegetation using regionally native plants
  - Biotic barrier
  - Drainage layer (optional)
  - Low-permeability layer (10^{-6} cm/sec minimum)
  - Gas vents
  - 24-inch minimum foundation layer

- Gas venting trench
- Subsurface groundwater collection trench
- Groundwater and gas monitoring
- Institutional controls - Fencing, signs, O&M of Building 191 pump station and drain/subdrain system, and restrictions on cap disturbances. The Navy will resolve any issues with NASA regarding the process to develop appropriate restrictive provisions to ensure continued O&M of the Building 191 pump station and to maintain the integrity of the Site 1 cap. The Navy will enter into an agreement with NASA or develop another appropriate vehicle to accomplish this task. The Navy will resolve any issues concerning the necessary restrictive provisions within 1 year of the date of this ROD.
- Postclosure maintenance

The selected remedial action for Site 1 is identical to the originally proposed alternative (Alternative 2 in the FS) except that it includes a modified cap configuration. The cap configuration was modified to address regulatory concerns.

Site 2

- Excavation of municipal-type wastes from Site 2
- Transport to and consolidation of Site 2 wastes at Site 1
- Backfilling and restoration of excavated area at Site 2 and revegetation using regionally native plants
- Groundwater monitoring for a minimum of 3 years
- Designation of Site 1 as CAMU through issuance of this ROD

Because of the proximity of surface water to the northern boundary of the Site 1 landfill, the selected remedy includes construction of a groundwater collection trench as a contingency measure to provide immediate protection to this adjacent surface water. This in-place collection trench can be activated in the future if groundwater becomes contaminated by the Site 1 landfill and migrates toward this surface water to the north.

Groundwater within the subsurface collection trench would be monitored at the same frequency as at the Site 1 groundwater monitoring wells. If chemical concentrations exceeding concentration limits set pursuant to 23 CCR Chapter 15 Article 5 are observed, the Navy will immediately notify the regulatory agencies and will obtain concurrence from EPA and the State regarding appropriate actions.

Potential actions may include additional or more frequent sampling or groundwater extraction and treatment, depending on the nature and levels of the chemicals detected.

The remedy, however, does not include active leachate extraction or active groundwater remediation at this time. Groundwater monitoring at Site 1 will continue throughout the postclosure period and, should groundwater become contaminated by Site 1 in the future and require remediation, the collection trench can be activated as an initial, immediate response. Implementing the collection trench at Site 1 will protect surface water while allowing time to implement a more permanent remedy, if necessary. Groundwater monitoring at Site 2 will continue for a minimum of 3 years to confirm that groundwater quality is not adversely affected. Groundwater monitoring at Sites 1 and 2 will comply with the substantive regulations in 23 CCR, Chapter 15, Article 5. The Navy will evaluate the groundwater contamination in accordance with CERCLA, and will obtain concurrence from EPA and the State on remediation decisions. The cost estimate for the selected remedial alternative is provided in Section 2.8.3.2.5.

The OU1 remedy also includes institutional controls. These controls include restrictions on cap disturbances and O&M of the Building 191 pump station and drain/subdrain system. O&M of the pump station was included as a component of the remedy to prevent potential flooding of OU1. The necessity of these restrictions and actions will be noted in the land use planning documents and real property records. The Navy will resolve any issues with NASA regarding the process to develop appropriate restrictive provisions to ensure continued O&M of the Building 191 pump station and to maintain the integrity of the Site 1 cap. The Navy will enter into an agreement with NASA or develop another appropriate vehicle to accomplish this task. The Navy will resolve any issues concerning the necessary restrictive provisions within 1 year of the date of this ROD. In the event of a future conveyance of the property, the necessity of pump station O&M and use restrictions at Site 1, will be addressed by appropriate notices and land use covenants; however, subsequent landowners may propose remedy modifications to the Navy and, if appropriate, the remedy may be modified in accordance with CERCLA Section 120 and the NCP.

2.11 STATUTORY DETERMINATIONS

Because of the proximity of surface water to the northern boundary of the Site 1 landfill, the selected remedy includes construction of a groundwater collection trench as a contingency measure to provide immediate protection to this adjacent surface water. This in-place collection trench can be activated in

the future if groundwater becomes contaminated by the Site 1 landfill and migrates toward this surface water to the north. Groundwater within the subsurface collection trench would be monitored at the same frequency as at the Site 1 groundwater monitoring wells. If chemical concentrations exceeding concentration limits set pursuant to 23 CCR Chapter 15 Article 5 are observed, the Navy will immediately notify the regulatory agencies and will obtain concurrence from EPA and the State regarding appropriate actions. Potential actions may include additional or more frequent sampling or groundwater extraction, depending on the nature and levels of the chemicals detected. The remedy, however, does not include active leachate extraction or active groundwater remediation at this time. Groundwater monitoring at Site 1 will continue throughout the postclosure period and, should groundwater become contaminated by Site 1 in the future and require remediation, the collection trench can be activated as an initial, immediate response. Implementing the collection trench at Site 1 will protect surface water while allowing time to implement a more permanent remedy, if necessary. Groundwater monitoring at Site 2 will continue for a minimum of 3 years to confirm that groundwater quality is not adversely affected. The Navy will evaluate the groundwater contamination in accordance with CERCLA, and will obtain concurrence from EPA and the State on remediation decisions. The cost estimate for the selected remedial alternative is provided in Section 2.8.3.2.5.

The OU1 remedy also includes institutional controls. These controls include restrictions on cap disturbances and O&M of the Building 191 pump station and drain/subdrain system. O&M of the pump station was included as a component of the remedy to prevent potential flooding of OU1. The necessity of these restrictions and actions will be noted in the land use planning documents and real property records. In the event of a future conveyance of the property, the necessity of pump station O&M and use restrictions at Site 1, will be addressed by appropriate notices and land use covenants; however, subsequent landowners may propose remedy modifications to the Navy and, if appropriate, the remedy may be modified in accordance with CERCLA Section 120 and the NCP.

The selected remedy meets the statutory requirements of Section 121 of CERCLA. The statute requires that remedial actions undertaken at Superfund sites:

- Be protective of human health and the environment
- Comply with ARARs unless a statutory waiver is justified
- Be cost effective
- Utilize permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practical

- Satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or provide an explanation as to why this preference is not satisfied

A brief description of how the selected remedy satisfies each of the statutory requirements is provided in the following subsections.

2.11.1 Protection of Human Health and the Environment

The selected remedial alternative provides protection to human health and the environment by consolidating Site 2 wastes at Site 1 and by encapsulating the contamination in the Site 1 landfill with a cap. Site 2 municipal-type wastes will be removed and transported to Site 1 for consolidation. Site 2 wastes will be consolidated at Site 1 in accordance with federal and State of California regulations regarding sanitary landfill operations, including waste compaction standards and interim cover requirements. Liquid waste and containerized waste will be disposed of off site at an appropriate facility.

Inert materials, such as construction debris, will remain at Site 2. The excavated areas at Site 2 will be backfilled with clean material and restored with vegetation. Groundwater monitoring will be conducted for at least 3 years to ensure Site 2 is not adversely impacting groundwater quality. This ROD designates Site 1 as a CAMU. Additional information on the CAMU designation is provided in this section.

The Site 1 cap will isolate landfill refuse, eliminate direct contact with surface refuse, reduce erosion, and minimize infiltration and surface contamination migration. A biotic barrier will be installed to minimize burrowing animal exposure and plant root uptake of chemicals. In addition, gas vents will be installed at Site 1 to prevent gas pressure from building up beneath the cap and increasing horizontal migration. The gas vents will also provide controlled venting of landfill gases. Riser pipes will be installed to vent the gases to the atmosphere. The riser pipe outlets will be positioned so that any potential gas inhalation hazards are mitigated.

The cap will be sloped so rainwater will drain off the landfill to a perimeter ditch or the SWRP. The cap will be designed to minimize erosion, thereby reducing the potential for surface contaminant migration. The cap will also limit infiltration into the landfills and reduce the formation of leachate by incorporating a low-permeability layer.

The selected remedial alternative also includes groundwater monitoring at both sites and a corrective action contingency measure at Site 1 to protect aquatic receptors at the SWRP, if necessary. The contingency measure will be implemented at Site 1 due to the proximity and potential impact of landfill contamination to ecological receptors and habitats in the adjacent northern area.

Gas migration will be controlled at Site 1 with a collection trench, gas vents, and gas monitoring will be conducted at Site 1 to promote control of hazards associated with methane migration. Methane concentrations will be monitored and if the LEL (concentration of 5 percent by volume in air) is exceeded at site boundaries, a corrective action program will be implemented according to 14 CCR requirements. At Site 2, methane has not been detected inside or at the perimeter of the landfill.

2.11.2 Compliance with ARARs

The selected remedial alternative complies with ARARs. Section 121 (d) of CERCLA, as amended by the SARA, states that remedial actions must attain or exceed ARARs. ARARs may include regulations, standards, criteria, or limitations promulgated under federal or state laws. ARARs apply to on-site response actions; response actions which take place off-site must comply with all laws, including both administrative and substantive requirements. An ARAR may be either "applicable," or "relevant and appropriate," but not both. The NCP (40 Code of Federal Regulations [CFR] Part 300) defines "applicable," "relevant and appropriate," and "to be considered" as follows:

- "Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state environmental or facility siting law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable."

- "Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state environmental or facility siting law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be relevant and appropriate."

The preliminary identification of ARARs involves considering a number of site-specific factors including potential remedial actions, compounds at the site, physical characteristics of the site, and site location. A requirement is applicable if it specifically addresses or regulates the hazardous substance, pollutant, contaminant, action being taken, or other circumstances at the site. To determine whether a particular requirement would be legally applicable, it is necessary to evaluate specific jurisdictional prerequisites of the statute or regulation. All jurisdictional prerequisites must be met for the requirement to be applicable. Jurisdictional prerequisites include:

- Who, as specified by the regulation, is subject to its authority
- The types of substances and activities listed as falling under the authority of the regulation
- The time period for which the regulation is in effect
- The types of activities the regulation requires, limits, or prohibits

If jurisdictional requirements are met, the requirement is applicable. If not, the next step is to consider whether the requirement is relevant and appropriate (EPA 1988).

The basic considerations when determining whether a requirement is relevant and appropriate include evaluating whether the requirement (1) regulates or addresses problems sufficiently similar to those encountered at the CERCLA site (that is, relevance) and (2) is appropriate to the circumstances of the release, such that its use is well suited to the particular site. Determining whether a requirement is relevant and appropriate is site specific and must be based on best professional judgment (EPA 1988). A requirement may be relevant but not appropriate for the specific site. Only those requirements that are determined to be both relevant and appropriate must be complied with. Portions of a requirement may be relevant and appropriate even if a requirement in its entirety is not (EPA 1988).

ARARs identified for remedial actions are based on anticipated chemicals present, the location of the site, and possible remedial actions for the site. The following sections discuss how the final alternative complies with the major chemical-specific, location-specific, and action-specific ARARs. Table 1 lists ARARs for the selected alternative.

TABLE 1

MOFFETT FEDERAL AIRFIELD OU1 ROD
ARARS FOR SELECTED ALTERNATIVE*

Citation	Description	ARAR Classification	Comments
40 CFR 258.11	A facility in a 100-year flood plain must be designed, constructed, operated, and maintained to avoid washout.	Location specific Relevant and appropriate	Northern MFA may experience tidal flooding.
Endangered Species Act of 1973 (16 USC 1536(a)(2) 50 CFR Part 200	Requires federal agencies to ensure actions will not jeopardize threatened and endangered (T&E) species or cause destruction or adverse modification to habitat. Action must conserve T&E species because a critical habitat is present or T&E species exist.	Location specific Applicable	A T&E species potentially resides near OU1.
California Fish and Game Code Section 2080	Actions should be taken to conserve T&E species.	Location specific Applicable	A T&E species potentially resides near OU1.
Executive Order 11990, Protection of Wetlands (40 CFR 6, Appendix A) CWA Section 404; 40 CFR 6.302 San Francisco Bay Basin Plan, 1995, Sec. 4 (Implementation Plan) Water Code §13142.5 and CA Executive Order W-59-93	Because wetlands exist, actions must minimize the degradation of wetlands.	Location specific Applicable Water Code 13142.5 and Executive Order W-59-93 are to be considered criteria	Parts of northern MFA are considered wetlands.
Coastal Zone Management Act (16 USC §1456(c); 40 CFR 6.302) California Coastal Act of 1976 (14 CCR §13001 - 13600) San Francisco Bay Plan (McAteer-Petris Act of 1965)	If within a coastal zone, activities must be consistent with approved state management programs.	Location specific Applicable	OU1 is in a coastal zone.

TABLE 1 (Continued)

MOFFETT FEDERAL AIRFIELD OU1 ROD
ARARS FOR SELECTED ALTERNATIVE*

Citation	Description	ARAR Classification	Comments
14 CCR 17767; 17772; 17773(b)/40 CFR 258.60(a)/ 17774(a),(c),(e)(1),(f),(h)(2)(A); 17776; 17777(a)(b); 17778(a) (c)-(j); 40 CFR 258.26 17779 (a)-(c) (e)-(h)	These are requirements for landfill cap design and closure.	Action specific (capping) Applicable	Subtitle D of RCRA and Title 14 are both identified as ARARs for Site 1. Subtitle D requirements will be followed unless state requirements are more stringent.
23 CCR 2580(d)(e); 23 CCR2581(a)(b)/ 40 CFR 258.60(a)	These are requirements for waste management units and cap requirements for units that may affect water quality.	Action specific (capping) Applicable	Title 23 CCR requirements are applicable for landfill closure as the regulations complement 14 CCR Article 7.8.
23 CCR 2596 and 2597	These are requirements regarding operations plan and closure and postclosure maintenance plans.	Action specific (closure and postclosure) Applicable	The substantive portions of these provisions are applicable to the selected remedy for Site 1. The Navy will provide the required information in an appropriate RD document.
14 CCR 17788(a)(1)(2)(3)(5); 40 CFR 258.61(a)(1) ; 17796(a)(c)(d); 23 CCR 2581(c)(1)(3)(4)(5)	These are general and landfill-specific requirements for postclosure at solid waste landfills.	Action specific (postclosure maintenance) Applicable	Postclosure requirements in 14 CCR and 23 CCR are applicable for Site 1 for the reasons discussed under capping.
14 CCR 17782(a)(b); 40 CFR 258.61(a)(3); 23 CCR 2550.1(a)(1)(2)(3); .2(a); .3; .4(a)(d); .5(a); .6(a); .7(a), (b)(1)(A)(B)(C), (b)(2), (b)(4-7), (c)(1)(2)(A)(B)(C), (e)(4 - 15); .8(a-i), .9 40 CFR 258.51(a)(c)(d); 40 CFR 258.53(a)-(f); 40 CFR 258.54(a)(b) San Francisco Bay Basin Plan, 1995, Sec.2 (Beneficial Uses) and 3 (Water Quality Objectives)	These are groundwater monitoring program requirements following closure.	Action specific (groundwater monitoring) Applicable	The substantive portions of the groundwater monitoring requirements in 14 CCR and 23 CCR are applicable for Sites 1 and 2 for the reasons discussed under capping. The Navy will provide the required information in an appropriate RD document.

TABLE 1 (Continued)

MOFFETT FEDERAL AIRFIELD OU1 ROD
ARARS FOR SELECTED ALTERNATIVE*

Citation	Description	ARAR Classification	Comments
14 CCR 17783(a)(2), (a)(3), (d); .3; .5(a)(1), (b), (c), (d)(1)(2); .9; .11; 40 CFR 258.61(a)(4) BAAQMD Regulation 8, Rule 34	These are requirements for gas monitoring and control during closure and postclosure.	Action specific (methane gas monitoring and emissions) Applicable	Requirements in 14 CCR are applicable for the reasons discussed under capping and closure. The landfills are exempt from Regulation 8 requirements based on the size of the landfills.
14 CCR 17766(a)	This requirement concerns the emergency response plan	Action specific Relevant and appropriate	Information about potential hazards and procedures to minimize them will be included in an appropriate RD document.
14 CCR 17677	Spreading and Compacting: Requires spreading and compacting refuse in layers.	Action specific Relevant and appropriate	This requirement affects placement of Site 2 refuse.
14 CCR 17678	Slopes and Cuts: Slope of working face to be maintained to allow effective compaction.	Action specific Relevant and appropriate	This requirement affects placement of Site 2 refuse.
14 CCR 17680	Stockpiling: Requires that stockpiles of cover material not interfere with unloading, spreading, or compacting waste or other pertinent safety and drainage factors.	Action specific Relevant and appropriate	This requirement affects the placement and use of cover material during the construction of the Site 1 cap.
14 CCR 17684	Intermediate Cover: Requires cover on fill where no additional refuse will be placed within 180 days.	Action specific Relevant and appropriate	This regulation sets requirement for interim cover of Site 2 refuse prior to Site 1 cap construction.
14 CCR 17706	Dust Control: Operator shall take adequate steps to minimize creation of dust.	Action specific Relevant and appropriate	This requirement affects operating practices for consolidation of Site 2 materials.
14 CCR 17707 40 CFR 258.22	Vector and Bird Control: Operator shall take adequate steps to control flies, rodents, and other vectors and to minimize bird problems.	Action specific Relevant and appropriate	This requirement affects operating practices for consolidation of Site 2 materials.
14 CCR 17708	Drainage and Erosion Control: Adequate drainage shall be provided. Effects of erosion shall be promptly repaired and steps taken to prevent further occurrence.	Action specific Relevant and appropriate	This requirement affects operating practices for consolidation of Site 2 materials.
14 CCR 17709	Contact with Water: Waste shall not be placed in direct contact with surface water or groundwater.	Action specific Relevant and appropriate	This requirement may affect placement of wastes at Site 1.

TABLE 1 (Continued)

MOFFETT FEDERAL AIRFIELD OU1 ROD
ARARS FOR SELECTED ALTERNATIVE*

Citation	Description	ARAR Classification	Comments
14 CCR 17710	Grading of Fill Surface: Covered surfaces shall be graded to promote runoff of precipitation.	Action specific Relevant and appropriate	This regulation sets requirements for slope of interim cover.
14 CCR 17713	Odor Control: The disposal site shall not be a source of odor nuisances.	Action specific Relevant and appropriate	This requirement affects operating practices for consolidation of Site 2 materials.
14 CCR 17743 40 CFR 258.28	Requirements prohibit placement of bulk or containerized liquid wastes.	Action specific Relevant and appropriate	Liquid wastes from Site 2 will not be placed at Site 1.
23 CCR, Chapter 15, Article 2	These are requirements for waste classification and management.	Action specific Applicable	This requirement affects consolidation of Site 2 materials.
23 CCR 2547(a) (Class III portion only)	These are requirements for seismic considerations for landfill design.	Action specific Relevant and appropriate	Landfill components will be designed to withstand the maximum probable earthquake without damage.
22 CCR 66261.1-.4; .10; .20 - .24 22 CCR 66261.30, .100, .101	These are requirements for identification and characterization of hazardous waste.	Action specific Applicable	Liquid, containerized (such as drums) waste excavated from Site 2 and any such materials encountered during capping of Site 1 will be analyzed to determine if they must be managed as hazardous wastes.
22 CCR 66262.10 - .12 22 CCR 66262.30 - .34	These are requirements for generators of hazardous waste.	Actions specific Applicable	The substantive generator requirements apply to the on-site handling of hazardous waste excavated from Site 2 and shipped off site.
22 CCR 66264.552	This concerns corrective action management units.	Location specific Relevant and appropriate	This requirement allows placement of remediation waste excavated from Site 2 at Site 1.
22 CCR 66268.1-.9, .30, .32, .40-.50	These sections include requirements for evaluating whether land disposal restrictions (LDRs) are applicable.	Action specific Applicable	These requirements are applicable for waste destined for off-site disposal.

* To the extent that the cited provisions contain administrative requirements, those requirements are not ARARs; only the substantive provisions within the requirements are ARARs.

BAAQMD	Bay Area Air Quality Management District	LDR	Land disposal restriction
CCR	California Code of Regulations	RD	Remedial design
CFR	Code of Federal Regulations	T&E	Threatened and endangered
		USC	United States Code

2.11.2.1 Chemical-Specific ARARs

Chemical-specific ARARs are health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. If a chemical has more that one cleanup level, the most stringent level will be identified as an ARAR for this remedial action.

Chemical-specific ARARs do not exist for landfill refuse or soils. Site 2 municipal-type waste will be removed from Site 2 using visual identification. Waste classification requirements in Title 23 CCR, Chapter 15, Article 2 are ARARs for wastes excavated at Site 2. The Navy, with the concurrence of the regulatory agencies, will use visual screening methods to meet these requirements. Based on the trenching conducted in Site 2 during 1996, it is easy to visually discern between the municipal-type waste, construction debris, and native soil material at Site 2. Sampling of soil from the excavation area after excavation of the wastes will be conducted. The soil sampling analytical results will aid in assessing groundwater quality at Site 2 after the 3 years of groundwater monitoring are concluded. Chemical-specific ARARs will be met for landfill gas at Site 1 through implementing the trench vent, installing gas vents in the cap, and through a gas monitoring program.

Because this action does not include active groundwater remediation, no chemical-specific ARARs are identified. Rather, chemical-specific ARARs will be identified in accordance with CERCLA if, through the monitoring program, remediation is found to be necessary. As part of the groundwater monitoring program, analytical results will be compared to federal AWQC. The Basin Plan water quality objectives and beneficial use designations will be considered, as appropriate, in developing the groundwater monitoring program. Moreover, if additional response actions are necessary, potential chemical-specific ARARs could include the Basin Plan and AWQC. Groundwater monitoring at Sites 1 and 2 will comply with the substantive regulations in 23 CCR, Chapter 15, Article 5.

2.11.2.2 Location-Specific ARARs

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities due to characteristics of the site or its immediate environment. For example, location of the site or proposed RA in a flood plain, wetlands, historic place, or sensitive ecosystem may trigger location-specific ARARs. Any RA that would affect special locations must comply with

the regulations. The following paragraphs discuss how the selected remedial alternative complies with the location-specific ARARs identified in Table 1.

Flood Plains (Location Standards) 40 CFR 258.11

This regulation is relevant and appropriate because northern Moffett Field may experience tidal flooding. This regulation states that any facility must be designed, constructed, and operated to avoid washout. The landfill cap will be designed to avoid washout from tidal flooding. The northern boundary of Site 1 will include a perimeter road with a shoulder protected with riprap. The road and riprap will extend to a height to accommodate seasonal water level fluctuations. In addition, if washout does occur at Site 1, it will be repaired during post-closure O&M.

Endangered Species Act/California Fish and Game Code

This act is an ARAR because a T&E species are found near OU1. The statutory interpretation of the term "jeopardize the continued existence of ..." language contained in Section 7 of the Endangered Species Act of 1973 means " . . . to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (Littell 1992). California Department of Fish and Game (DFG) Code Section 2080, which prohibits the taking of threatened or endangered species, is also an ARAR.

Based on the OU1 ecological assessment, capping of Site 1 and excavation of waste at Site 2 are not reasonably expected to appreciably reduce the likelihood of the survival and the recovery of any T&E species (PRC 1994). The Site 1 and Site 2 surfaces are not a critical habitat upon which any T&E species depend (PRC 1994). However, stands of pickleweed have been observed adjacent to Site 1. This pickleweed represents potential habitat for the SMHM, which is a federal T&E species. A band of pickleweed about 7 feet wide borders the northern perimeter of Site 1 along the SWRP basin. The eastern border along Jagel Slough has a narrow border of pickleweed about 3 feet wide. Another stand of pickleweed is found along the southern border next to the fence line. This area is approximately 10 feet by 12 feet with a vehicle path dividing it in half. These stands of pickleweed are isolated. Corridors do not exist between these stands and nearby wetland areas. Therefore, it is unlikely that the SMHM inhabits Site 1.

Because results are often inconclusive, extensive trapping has not been done in these areas to confirm or deny the presence of the SMHM at Site 1. According to the FWS, there is reasonable chance that the SMHM may exist at Site 1. Therefore, FWS recommended that the Navy prepare a replacement plan, which would address each acre of lost habitat. The replacement plan will provide the specific procedures and details of the restoration.

Also, Section 7 of the Endangered Species Act of 1973 forbids agency action that is likely to "result in the destruction or adverse modification of habitat." The regulations define the term "destruction or adverse modification" as meaning "... a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical" (Littell 1992).

Although potential habitat exists for the SMHM near Site 1, the habitat is not believed to be critical and lost habitat will be addressed. The stands of pickleweed are small and isolated. Corridors between these stands and nearby wetland areas do not exist. Therefore, it is unlikely that the habitat is critical for species survival.

In addition, actions taken under the selected remedial alternative will conserve T&E species that may use the SWRP as a habitat, including future pickleweed habitat. The landfill cap will protect the SWRP habitat by reducing erosion and wash out that could accelerate contaminant migration into the pond. The design of the cap will also include a perimeter road and shoulder with associated drainage to minimize sediment loading generated from hillside runoff. Capping the landfill will eliminate exposure pathways resulting from erosion of the landfill surface. The groundwater monitoring and corrective action contingency measures will protect the SWRP habitat from contaminants resulting from potential leachate migration from the landfill.

Executive Order 11990, Protection of Wetlands, 40 CFR 6.302

This executive order requires federal agencies to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands, if a practicable alternative exists. Wetlands are defined in Executive Order 11990 as those areas inundated by surface or groundwater with a frequency sufficient to support under normal

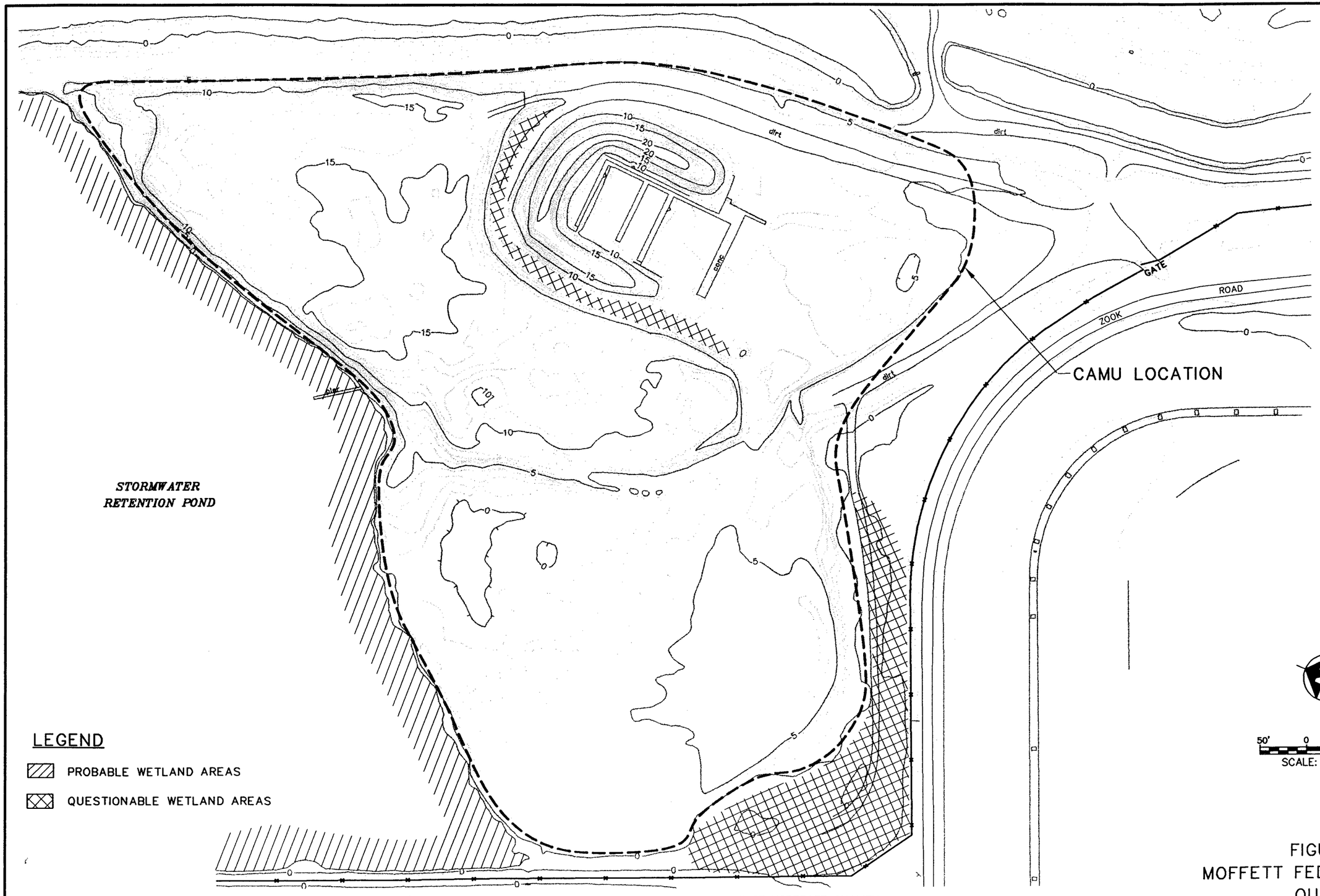
circumstances a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated conditions for growth or reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds.

The Navy delineated three potential wetland areas near OU1 based on the delineation criteria found in the 1987 COE wetlands delineation manual (see Figure 8). The first area (Area 1) is approximately 1.25 acres and is southwest of the Site 1 landfill. This area is within the Site 1 fenced area, but is not located on the landfill surface. This area was found to be a wetland with hydrophytic vegetation, appropriate hydrology, and hydric soils. Since the outer edge of this area abuts the landfill, the edge will require fill during capping.

The second area is the SWRP. The majority of this site is not vegetated, except for the fringe of vegetation along the pond edges (Area 2). The southern fringe of the SWRP adjacent to the landfill (approximately 0.4 acres) will require filling to construct the subsurface collection trench and cap shoulder. The rest of the fringe will not be affected. The vegetated SWRP fringe may qualify under the technical criteria as a wetland. A third area of approximately 0.1 acres exists in the central portion of Site 1 near the former pistol range berm.

The landfill capping will affect the two wetlands in the vicinity of Site 1. However, the Navy and regulatory agencies have determined that a landfill cap is necessary to protect the environment. Because filling small segments of wetlands will be required to cap the Site 1 landfill, the substantive requirements of NWP 38 will be met as part of the remedial design. This permit allows for fill to be placed in wetlands if filling is associated with the remediation of hazardous and toxic waste. The Navy has determined that NWP 38 and CWA Section 404 are applicable to the action at Site 1. The Navy has further determined that the planned activities at OU1 will meet all the substantive requirements of NWP 38 and CWA Section 404 except the requirement concerning mitigation. Mitigation of wetlands destroyed during activities at OU1 will be addressed in the stationwide ROD. The Navy will consult with RWQCB to review the wetland areas affected by Site 1 activities and reach concurrence to determine potential mitigation requirements.

Proposed actions under the selected alternative will minimize the degradation of OU1 wetlands. The landfill cap will protect the adjacent wetlands by reducing erosion and wash out that could accelerate contaminant migration into these wetlands. The design of the cap will also include a perimeter road and shoulder with associated drainage to minimize sediment loading generated from hillside runoff.



NOTE: "PROBABLE" WETLAND AREAS (STORMWATER RETENTION POND) PROVIDE DRY SEASON BRACKISH SURFACE WATER HABITAT OF MODERATE QUALITY.
"QUESTIONABLE" WETLAND AREAS OFFER LIMITED FEEDING AND FORAGING OPPORTUNITIES, POOR COVER VALUE, AND GENERALLY POOR HABITAT QUALITY.

SOURCE: FINAL PHASE 1 SITE-WIDE ECOLOGICAL ASSESSMENT REPORT (PRC AND MW 1995).

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FIGURE 8
MOFFETT FEDERAL AIRFIELD
OUI ROD
CAMU LOCATION

Coastal Zone Management Act, California Coastal Act of 1976

The Coastal Barriers Resources Act (16 United States Code [USC] Section 1456(c)) requires that all activities must be conducted in a manner consistent with approved state management programs. This statute is potentially applicable to OU1 because the OU1 sites are located in a coastal zone. The California Coastal Act of 1976 governs the state management program for coastal areas including the northern portion of Moffett Field. The California Coastal Act states that the basic goals of the state for the coastal zone are to protect, maintain, and where feasible, enhance and restore the overall quality of the coastal zone environment and its natural and artificial resources. Implementing the OU1 remedial alternative will be consistent with this goal. Within the San Francisco Bay area, the local coastal zone management program is described in the San Francisco Bay Plan, enacted pursuant to the McAteer-Petris Act of 1965. The San Francisco Bay Conservation and Development Commission (BCDC) implements this plan. The San Francisco Bay Plan contains requirements that are applicable to the actions at OU1.

2.11.2.3 Action-Specific ARARs

Action-specific ARARs are technology- or activity-based requirements or limitations for remedial activities. These requirements are triggered by the particular remedial activities conducted at the site and indicate how a selected remedial alternative should be achieved. For OU1, waste consolidation, landfill capping, groundwater and gas monitoring, and postclosure O&M are the remedial activities for which action-specific ARARs have been selected. State and federal hazardous and solid waste regulations were evaluated as potential activity based requirements for OU1. Federal and California solid waste regulations, whichever are more stringent, were selected as ARARs for the Site 1 cap. The rationale for this selection is provided below.

Landfill ARARs

State and federal hazardous waste regulations (Subtitle C of RCRA [40 CFR Part 264.310] and Title 22 CCR Section 66264.310) for capping landfills are not applicable since documentation does not exist to confirm that hazardous waste disposal occurred at either landfill. Some of the wastes disposed of at the OU1 landfills may have been hazardous constituents; however, this circumstance is common to all solid waste and CERCLA landfills. Further, low contaminant concentrations in leachate show that a

minimal threat from hazardous substances exists at OU1. In addition, documentation received from CIWMB indicates that Site 1 was operated as a solid waste facility. The Navy was issued a Solid Waste Facilities Permit for Site 1 by Santa Clara County. The permit states that the types of waste received at the site included cardboard, lawn cuttings, prunings, wood waste, and asbestos insulation wrapped in double plastic bags. The permit also states that disposal of hazardous waste was to be prohibited at the facility. This further supports the assumption that OU1 landfills were operated as solid waste landfills and received similar types of wastes (solid waste with small amounts of hazardous waste). Also, visible surface debris includes obvious construction and demolition debris, such as concrete rubble with reinforcing steel, asphalt chunks, wire, wood chips, glass, and mounds of dirt overgrown with weeds (possibly street sweepings), which are similar to solid waste landfill waste. For these reasons, the Navy identified solid waste closure regulations as most appropriate for Site 1. CIWMB concurred with these conclusions and determined that California landfill closure and monitoring requirements contained in 14 CCR and 23 CCR are applicable for OU1 remedial actions (CIWMB 1995). However, federal regulations adopted pursuant to Subtitle D of RCRA and found in 40 CFR Part 258 are also applicable to this action. The Navy will follow whichever regulation is more stringent.

The Site 2 selected remedy requires designation of Site 1 as a CAMU, which is accomplished with this ROD. Site 1 is designated a CAMU in accordance with the designation criteria established in Title 22 CCR 66264.552(c). The way in which Site 1 meets the CAMU designation criteria is discussed in Section 2.11.2.4 below. The description of the selected remedial action for Site 1 provides specific information about the CAMU, including its areal configuration; remediation waste management design and operation; groundwater monitoring and reporting requirements; and closure and post-closure requirements. This specific information is summarized in Section 2.11.2.4.

Waste classification requirements in Title 23 CCR, Chapter 15, Article 2 are ARARs for wastes excavated at Site 2. The Navy, with the concurrence of the regulatory agencies, will use visual screening methods to meet these requirements. The Navy does not intend to consolidate any wastes at Site 1 other than wastes excavated from Site 2. Soils currently stockpiled at the bioremediation pad will, however, be used as fill in the foundation layer beneath the Site 1 cap. Surplus soils from the light rail project under construction along the southern boundary of the facility may also be used at OU1 after review and approval by the regulatory agencies. Construction of the permanent landfill cap at Site 1 is scheduled to follow immediately after completion of excavation and consolidation. The

Navy will not place containers of hazardous waste excavated from Site 2 at Site 1. Furthermore, free liquids observed in the Site 2 excavation that are clearly not groundwater (for example, free-phase paints, oils, or solvents) will be removed and not placed at Site 1. Similarly, containers of hazardous waste encountered during activities at Site 1 will be removed. These containers will be tested and disposed of appropriately off site. Freely mobile waste will not be placed or allowed to remain at Site 1 but will be shipped off site to an appropriate disposal facility.

The act of consolidating remediation waste from Site 2 to the CAMU (Site 1) does not constitute land disposal of hazardous waste and, therefore, does not trigger Title 22 CCR, Division 4.5, Chapter 14 regulations regarding minimum technology requirements for transfer, treatment, storage, and disposal facilities or Chapter 18 regulations regarding land disposal restrictions, in accordance with the CAMU regulation. Therefore, these regulations are not ARARs for consolidation of the Site 2 remediation wastes to Site 1. However, certain requirements in 40 CFR Part 258 and Title 14 CCR Article 7.5, whichever are more stringent, are ARARs for the consolidation component of the remedy. These requirements include dust control, grading, and vector control. The relevant requirements are listed on Table 1.

The specific provisions of Title 14 CCR Article 7.8 and 40 CFR 258.60, whichever are more stringent, listed in Table 1 are ARARs for the closure of Site 1. Title 14 CCR 17760 (scope and applicability of Article 7.8) states that Article 7.8 applies to "solid waste disposal sites that did not commence complete closure prior to August 18, 1989, which is fully implemented by November 18, 1990, in accordance with all applicable requirements." Through Article 7.8 regulations, prescriptive standards for capping contained in 23 CCR 2546, 2581, and 2595 are referenced. The components that make up the selected remedial alternative have been included so that landfill closure regulations specified in 14 CCR Article 7.8 and 40 CFR 258.60, whichever are more stringent, listed on Table 1, will be met. The Site 1 landfill cap configuration is based on a prescribed, state pre-approved arrangement for landfill caps. The cap design standards in 14 CCR Article 7.8 for closure of a nonhazardous solid waste landfill consist of (from top to bottom): a 12-inch topsoil layer, a 12-inch low-permeability (clay or synthetic membrane liner) layer, and a 24-inch minimum foundation layer. Information required by these regulations will be contained in an appropriate remedial design document.

Groundwater monitoring regulations in 23 CCR, Chapter 15, Article 5 or 40 CFR 258 Subpart E that are listed in Table 1 are applicable to Sites 1 and 2. Pursuant to 23 CCR, Chapter 15, Article 5, Section 2550.4, the Navy will derive and propose concentration limits for each constituent of concern. Federal AWQC and RWQCB Basin Plan water quality objectives will be considered in deriving the concentration limits.

The unsaturated zone monitoring provisions in 23 CCR 2550.7(d) cannot be conducted in accordance with 23 CCR 2550.7(d)(5), which states that unsaturated zone monitoring is required unless it can be demonstrated that there is not unsaturated zone monitoring device or method designed to operate under the subsurface conditions existent at the waste management unit. Such is the case at Site 1. The Site 1 wastes are located within the saturated zone; no unsaturated zone exists between the bottom of the Site 1 wastes and the saturated zone.

The groundwater and gas monitoring program will be designed in accordance with the substantive provisions of 23 CCR or 40 CFR 258.61(a)(3) regulations and 14 CCR or 40 CFR 258.61(a)(4) regulations, respectively, whichever are more stringent, as listed on Table 1. Any groundwater response actions needed in the future will be carried out in accordance with CERCLA after concurrence is obtained from EPA and the State, and after modification of this ROD where necessary. At Site 1, the gas vents and gas venting trench will be installed to control gas concentrations at the landfill boundary to below the lower explosive limit in accordance with 14 CCR or 40 CFR 258.61(a)(4). To further meet the requirements of 14 CCR or 40 CFR 258.61(a)(4), the combination of the low-permeability layer, the gas vents, and riser pipes will function to provide controlled venting at Site 1 to mitigate any potential inhalation hazards associated with trace gases.

Because leachate collection, treatment, and discharge is not part of the selected remedy, ARARs for leachate collection, treatment, and discharge are not identified in this ROD. However, leachate collection and treatment may be required in the future if monitoring indicates that it is necessary. Groundwater within the subsurface collection trench will be monitored at the same frequency as at the Site 1 groundwater monitoring wells. If chemical concentrations exceeding concentration limits set pursuant to 23 CCR Chapter 15 Article 5 are observed, the Navy will immediately notify the regulatory agencies and will evaluate the groundwater contamination in accordance with CERCLA, and will obtain concurrence from EPA and the State on remediation decisions. Potential actions may include additional or more frequent sampling or groundwater extraction and treatment, depending on the nature and levels of the chemicals detected.

An in-place leachate collection trench is being installed as part of the Site 1 capping system. If it becomes necessary to collect, treat, and discharge leachate, any means of discharge must comply with substantive requirements of ARARs if the discharge is on site (such as to Marriage Road Ditch, North Patrol Road Ditch, or the stormwater retention pond), or be subject to a permit if the discharge is off site (such as to a POTW). An explanation of significant differences (ESD) or ROD amendment will be prepared, as appropriate, for the collection, treatment, and discharge of leachate. Prior to adoption of the ESD or ROD amendment, the Navy will solicit federal and state ARARs and will comply with CERCLA public participation requirements. The Navy will obtain concurrence from EPA and the State on remediation decisions.

The substantive provision of certain reports under Title 14 and 40 CFR 258 are considered ARARs for the landfill cap. Specifically, the requirements for operations plans in 23 CCR 2596, for closure and postclosure maintenance plans in 23 CCR 2597, and for emergency response plans in 14 CCR 17766 are relevant and appropriate. The substantive requirements of these provisions will be included in an appropriate remedial design document.

Hazardous Waste ARARs

Only nonhazardous solid waste is intended for consolidation at Site 1. The substantive hazardous waste identification regulations in Title 22 CCR Division 4.5, Chapter 11, Articles 1, 2, 3, and 5 and Title 23 CCR Division 3 Chapter 15 Article 2 are applicable to the characterization of liquid waste and containerized wastes excavated from Site 2 and any such materials encountered during the capping of Site 1. Hazardous wastes excavated from Site 2 and encountered at Site 1 will be characterized in accordance with these applicable regulations, and if they are hazardous, they will be disposed of off site at appropriate facilities in accordance with all applicable laws and regulations.

2.11.2.4 CAMU Designation Criteria and Specific Information

This section discusses the definition of a CAMU, how Site 1 satisfies the CAMU designation criteria, and specific information for the Site 1 CAMU. Even though Site 1 has been designated a CAMU, the Navy does not intend to consolidate any wastes at Site 1 other than wastes excavated from Site 2. Soils currently stockpiled at the bioremediation pad will, however, be used as fill in the foundation layer beneath the Site 1 cap. Surplus soils from the light rail project under construction along the southern

boundary of the facility may also be used at OU1 after review and approval by the regulatory agencies. Waste classification requirements in Title 23 CCR, Chapter 15, Article 2 are ARARs for wastes excavated at Site 2. The Navy, with the concurrence of the regulatory agencies, will use visual screening methods to meet these requirements. Construction of the permanent landfill cap at Site 1 is scheduled to follow immediately after completion of excavation and consolidation. The Navy will not place containers of hazardous waste excavated from Site 2 at Site 1. Furthermore, free liquids observed in the Site 2 excavation that are clearly not groundwater (for example, free-phase paints, oils, or solvents) will be removed and not placed at Site 1. Similarly, containers of hazardous wastes encountered during activities at Site 1 will be removed. These containers will be tested and disposed of appropriately off site. Freely mobile waste materials will not be placed or allowed to remain at Site 1 but will be shipped off site to an appropriate disposal facility.

2.11.2.4.1 Definition of a CAMU

As defined in 22 CCR 66260.10, a CAMU is a facility or area within a facility designated for the purpose of implementing corrective action requirements under 22 CCR 66264.101 and RCRA Section 3008(h). Wastes placed at a CAMU must be remediation wastes. Title 22 CCR 66260.10 defines remediation waste as all solid and hazardous wastes and all media (including groundwater, surface water, soils, and sediments) and debris, that contain listed hazardous wastes or that themselves exhibit a hazardous waste characteristic. The substantive requirements for CAMUs under RCRA are ARARs for CERCLA actions.

Placement of remediation waste in a CAMU does not constitute land disposal. Seven criteria are included in the regulations for evaluating the appropriateness of a CAMU:

- The CAMU facilitates the implementation of reliable, effective, protective, and cost-effective remedial actions.
- Waste management activities associated with the CAMU do not create unacceptable risks to human health and the environment.
- The CAMU incorporates uncontaminated areas only if the inclusion of such areas is more protective than using contaminated areas at a facility.
- Areas within the CAMU, where wastes remain in place after closure of the CAMU, are managed and contained to minimize the potential for future releases, to the extent practicable.

- The CAMU expedites the implementation of the remedial activity, when appropriate and practicable.

- The CAMU enables the use of treatment technologies, when appropriate, to enhance the long-term effectiveness of remedial actions by reducing the toxicity, mobility, or volume of wastes that will remain in place after closure of the CAMU.

- The CAMU minimizes the land area where wastes will remain in place after closure of the CAMU, to the extent practicable.

The following section discusses how Site 1 satisfies the CAMU designation criteria.

2.11.2.4.2 CAMU Criteria Evaluation

Designation of Site 1 as a CAMU satisfies the CAMU designation criteria in 22 CCR 66264.552(c) as explained below.

Facilitate Reliable, Effective, Protective and Cost-Effective Remedies. As shown in this ROD, consolidation of wastes from the Site 2 landfill into Site 1 will provide a reliable remedy that is effective, protective, and cost-effective. Excavation and surface grading are well developed and reliable technologies. Standard construction techniques and earthmoving equipment will be used. Costs for consolidation are anticipated to be less than for construction of a cap at Site 2. Consolidation of Site 2 wastes to Site 1 will be more effective than capping the Site 2 wastes in place. Site 2 wastes now in the saturated zone at Site 2 will be moved and consolidated above the water table at Site 1, reducing the likelihood that these wastes will contaminate groundwater.

Do Not Create Unacceptable Risks. Exposures to construction workers could occur during the excavation and consolidation activities. Excavation of landfill wastes is a potentially hazardous activity. Effective implementation of a health and safety plan, however, will minimize the risk of exposure during excavation and consolidation activities. The Navy will test liquid waste and containerized hazardous waste found during excavation and dispose of such waste at an appropriate disposal facility in compliance with the offsite policy rule.

Use Uncontaminated Areas Only if More Protective. The Site 1 landfill is a contaminated area. Uncontaminated areas will not be needed for the CAMU.

Minimize Potential for Future Releases. Consolidation of wastes from Site 2 to Site 1 will reduce the overall area occupied by landfill wastes at Moffett Field and so reduce the subsequent potential for exposure. In addition, saturated wastes from Site 2 will be placed in the unsaturated zone at Site 1 to further reduce the potential for leachate formation. Engineering controls, such as capping, to isolate the wastes at Site 1 will minimize the potential for exposure to landfill contaminants. Consolidation of wastes to one location allows monitoring efforts to be concentrated at a single site.

Expedite Remedy Implementation. Excavation and consolidations of wastes into a CAMU will require less time than cap construction. The construction techniques involved in consolidation also are simpler and easier to implement than those needed for cap construction. Liquid waste and containerized hazardous waste will be tested to determine if they are hazardous and will be disposed of off site in compliance with the off site policy rule.

Enhance Long-Term Effectiveness. Consolidation of wastes from Site 2 to a CAMU at Site 1 will reduce the overall area occupied by landfill wastes at Moffett Field, reduce the subsequent potential for exposure, and enhance the long-term effectiveness of the remedial action. Neither consolidation nor capping involves treatment; therefore, neither could substantially reduce the toxicity or volume of wastes. However, consolidation will result in the placement of previously saturated wastes in the unsaturated zone at Site 1 and contaminant mobility will be reduced. Consolidation has the potential to slightly reduce waste toxicity and volume to the extent that liquid waste and containerized hazardous wastes uncovered during excavation will be disposed of off site.

Minimize Land Areas Where Wastes Remain After Closure. Consolidation of wastes from Site 2 to a CAMU at Site 1 will reduce the land area where wastes remain in place and will allow future reuse of the Site 2 area that would not be possible if Site 2 wastes were capped in place.

Summary of Designation Criteria. Designation of Site 1 as a CAMU satisfies the CAMU designation criteria. Key aspects of the evaluation include (1) the increased reliability of containing the waste at the Site 1 area rather than at the Site 2 area, (2) the increase in long-term effectiveness gained by placing formerly saturated wastes in the unsaturated zone, (3) the reduction in total contaminated land area at Moffett Field, and (4) the decrease in remediation cost.

2.11.2.4.3 Specific Information for the Site 1 CAMU

The CAMU regulations require that specific information about the CAMU be provided. This specific information includes:

- The areal configuration of the CAMU
- Requirements for remediation waste management including design and operation
- Groundwater monitoring and reporting requirements
- Closure and postclosure requirements

The following discussion addresses these requirements.

Areal Configuration. Figure 8 indicates the location of the Site 1 CAMU. This area is the same general area proposed to be covered by the Site 1 cap. Minor modifications to the area may be necessary during remedial design of the Site 1 cap depending on various engineering design factors, airfield height restrictions, and property boundary constraints. Any modifications to wetland areas at Site 1 will be coordinated with the natural resource trustees.

Remediation Waste Management Requirements. Remediation waste management requirements include specification of the appropriate design and operation methods. Design of the Site 1 cap will meet the prescriptive solid waste landfill closure standards in the applicable substantive portions of CCR Title 14 and 40 CFR 258.60, whichever are more stringent. The cap design standards specified by 14 CCR Article 7.8 (listed in 23 CCR 2581) include, from top to bottom: 12-inch topsoil layer, 12-inch low-permeability clay layer, and 24-inch foundation layer. CIWMB has indicated that an appropriate synthetic geomembrane may be an acceptable substitute for the clay low-permeability layer. Additions to the above minimum requirements, such as thicker layers or addition of a drainage layer, may be necessary based on engineering design considerations to meet the applicable substantive portions of the 14 CCR regulations.

In addition to the cap requirements, two other waste management features will be incorporated at Site 1. An underground groundwater collection trench will be installed below grade along the northern border of Site 1 to intercept potential future leachate migration before it reaches the surface water. This measure will provide immediate protection of the adjacent surface water. The second feature is a

passive gas venting trench that will be installed along the western boundary of Site 1 to prevent off-site, subsurface migration of landfill gases.

Operations at Site 1 during consolidation activities would be in accordance with requirements that are relevant and appropriate for solid waste landfill operations. These requirements are listed in Table 1 of this ROD and include items such as requirements for spreading and compacting waste, drainage and erosion control, surface grading, and intermediate cover.

Groundwater Monitoring Requirements. According to 22 CCR 66264.552(e)(3), groundwater monitoring at a CAMU must be sufficient to "(a) continue to detect and characterize the nature, extent, concentration, direction, and movement of existing releases of hazardous constituents in groundwater from sources located within the CAMU and (B) detect and subsequently characterize releases of hazardous constituents to groundwater that may occur from areas of the CAMU in which wastes will remain in place after closure of the CAMU." Groundwater monitoring is already required for closure of the Site 1 landfill and these regulations would satisfy the requirements listed for use and closure of a CAMU. Groundwater monitoring requirements are specified in substantive portions of 14 CCR and 23 CCR and 40 CFR 258.61(a)(3) and include detailed requirements for evaluating the items described in 22 CCR 66264.552(e)(3). Specific ARARs for groundwater monitoring at Site 1 are contained in Table 1.

Closure and Postclosure Requirements. Closure of a CAMU must be conducted to (1) minimize the need for maintenance, and (2) minimize the potential for off-site migration of contaminants, to the extent necessary to protect human health and the environment. For the Site 1 CAMU, these requirements focus on capping requirements (closure) and operation and maintenance requirements (postclosure). Title 22 66264.552(e)(4)(C) directs the state to consider the following factors in establishing closure requirements: (1) CAMU characteristics, (2) volume of waste in place after closure, (3) physical and chemical characteristics of the waste, (4) hydrogeological and relevant environmental conditions that may influence the migration of potential releases, and (5) potential risks to human health and environmental receptors if a release were to occur. Similarly, postclosure requirements must be established to protect human health and the environment. For example, monitoring and maintenance activities must be conducted to ensure the integrity of the cap.

The design of the Site 1 cap will follow the solid waste landfill closure standards listed in CCR Title 14 and 40 CFR 258.60, whichever are more stringent. The objectives of the Title 14 and RCRA Subtitle D requirements are the same as those for closure of a CAMU: protection of human health and the environment by minimizing the potential for off-site migration of contaminants and minimization of ongoing maintenance needs. The landfill closure standards of Title 14 and RCRA Subtitle D consider similar factors in establishing the closure requirements as are required for CAMU closure. Factors considered for CAMU closure including waste volume, waste characteristics, hydrogeological conditions, and potential risks from a release are all addressed by the Title 14 and 40 CFR 258.60 requirements. Likewise, postclosure requirements for CAMUs such as monitoring and maintenance are contained within the Title 14 and RCRA Subtitle D standards. In addition to the protection provided by the cap, the northern border groundwater interceptor trench and the western boundary passive gas venting trench will provide controls for potential future releases at Site 1. Specific ARARs for landfill closure and postclosure activities at Site 1 are contained Table 1. By satisfying the Title 14 and 40 CFR 258.60 standards, whichever are more stringent, CAMU closure and postclosure requirements will be addressed. Satisfying Title 22 requirements will also address CAMU closure requirements.

Summary of Specific Information. Requirements for design, operation, closure, and postclosure already incorporated into the landfill cap remedial action at Site 1 will meet the requirements for design, operation, closure, and postclosure of a CAMU at Site 1. Table 1 lists the ARARs for these activities. In achieving the substantive standards of CCR Title 14 and 40 CFR 258.60, whichever are more stringent, the requirements for a CAMU will be met. Designating Site 1 as a CAMU will be protective of human health and the environment by minimizing the potential for off-site migration of contaminants and will comply with ARARs. Therefore, Site 1 satisfies the criteria and requirements for CAMU designation.

Designation. By concurring on the ROD, EPA and the state designate as a CAMU the area designated for a landfill under the selected remedial alternative as shown on Figure 8. The CAMU regulation is an ARAR as discussed in Section 2.11 of this ROD. This ROD documents the CAMU designation pursuant to 40 CFR 264.552(f) as implemented through the California EPA, Department of Toxic Substances Control, Hazardous Waste Regulations, Title 22, Chapter 14, 66264.552. The proposed plan for this ROD shall satisfy public notice requirements under the CAMU regulations. In designating the CAMU, EPA and the state have considered the criteria set forth in Section 66264.552 and determined that the CAMU satisfies each of these criteria.

2.11.3 Cost-Effectiveness

Research has shown that the most cost-effective solutions to landfills are based on containing wastes and monitoring at the landfill perimeter for any migration from the landfill. If contaminant migration is detected, it can be addressed through corrective actions such as subsurface collection trenches. EPA has developed the presumptive remedy strategy of containment for landfills in the 1993 Presumptive Remedy For CERCLA Municipal Landfill Sites and the OU1 RI/FS employed this strategy. The specific remedy for Site 1 was selected based on the presumptive remedy strategy and ARARs. The remedy for Site 2 balanced the considerations of removal of the waste with health and safety concerns and long-term operation and maintenance requirements. Because of the relatively small volume of waste at Site 2, excavation of the Site 2 wastes and consolidation of the wastes at Site 1 is a cost-effective action.

2.11.4 Utilization of Permanent Solutions

The statutory requirements of Section 121 of CERCLA require that remedial actions undertaken at Superfund sites use permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practical. The OU1 remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practical. The selected alternative is a permanent means to mitigate hazards associated with the OU1 landfills and complies with ARARs. Consolidation of Site 2 wastes at Site 1 will permanently remove the threats associated with Site 2. The Site 1 landfill cap will isolate landfill refuse, eliminate exposure to refuse, reduce erosion, and limit infiltration. The cap layers may reduce the amount of leachate generated, which should reduce the potential for leachate migration. The subsurface collection trench and gas vents will mitigate hazards associated with contaminant migration from the landfills.

2.11.5 Preference for Treatment

The statutory requirements of Section 121 of CERCLA require that remedial actions undertaken at Superfund sites satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or provide an explanation as to why this preference is not satisfied. This preference is not satisfied at OU1 because treatment of the principal threat was not found to be practical. Research has shown that treatment of refuse is generally not practical. The heterogeneity of contaminant distribution and concentrations typically associated with landfills makes treatment of

landfill refuse costly and difficult to implement. In addition, because landfills are heterogeneous, excavation followed by treatment or in-place treatment can create hazardous working conditions for field crews. A remedy in which contaminants could be treated effectively is also precluded because of the large size of Site 1 and because there are no known homogeneous hot spots that represent the major sources of contamination and that would be amenable to treatment at Sites 1 and 2. Typically, treatment is only considered for landfills less that 1 acre in size or have documented, homogeneous areas.

3.0 RESPONSIVENESS SUMMARY

This responsiveness summary has been prepared by the Navy to document public comments and questions regarding the proposed plan for OU1 at Moffett Field. The responsiveness summary contains comments received during the public comment period (May 30, 1995, through August 30, 1995) for the original OU1 proposed plan dated June 1995. Comments were also received on the proposed plan during the OU1 public meeting held on June 15, 1995.

Following the first public comment period, the Navy modified the preferred alternative based on public and regulatory agency comments. As a result, a revised proposed plan was released to the public in January 1996. A second public comment period was held from January 4, 1996, through February 5, 1996. A second public meeting was held on January 16, 1995.

Following the second public comment period, the Navy modified the preferred alternative based on regulatory agency comments. As a result, a revised proposed plan was released to the public in March 1997. A third public comment period was held from March 7, 1997, through April 11, 1997. A third public meeting was held on March 20, 1997.

This section provides responses to comment received during all three public comment periods and from all three public meetings.

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Comments were provided by many different entities, including the following:

- Members of the general public
- Moffett Field RAB
- SVTC
- CIWMB
- City of Sunnyvale
- City of Mountain View
- SCVWD
- League of Women Voters (LWV)
- NASA
- Santa Clara County Environmental Resources Agency

In addition to the written comments, a written transcript of the public meetings was used to identify additional comments and concerns. The Navy has provided written responses to all comments (oral and written) received. However, the Navy has summarized and edited the comments or questions when it was necessary to provide a better understanding of each specific issue. The complete written transcript for the OU1 public meetings can be found in the information repository.

3.1 JUNE 1995 PUBLIC MEETING COMMENTS AND RESPONSES

Comment 1: *A member of the public did not understand why the implementability of Alternative 2 and Alternative 3 was not the same. In addition, the justification for short-term effectiveness ranking was not clear.*

Response: Alternative 3 was considered more difficult to implement because more stringent specifications would be required and more materials would be handled during construction. Alternative 2 was considered to have greater short-term effectiveness because it would not take as long to build as Alternative 3. In addition, fewer truckloads of materials would require shipment. Consequently, risks to workers and the public during construction would be less.

Comment 2: *A member of the public asked whether landfill excavation and removal had been considered.*

Response: Excavation and removal were considered but were not presented in the FS report. Extreme costs and hazardous working conditions make landfill excavation and redisposal impractical.

Comment 3: *A member of the public asked whether dioxins had been tested for in the landfills and about detection levels.*

Response: Dioxins have not been tested for in landfill refuse. Dioxin contamination inside either landfill has not been characterized because this information is not needed to implement capping at the landfills. During cap construction, heavy equipment could generate fugitive dust emissions. Construction workers will mitigate any potential hazards by using personal protective equipment (PPE) such as respirators. In addition, dust suppression strategies such as wind speed alarms can be implemented to reduce fugitive dust emissions during capping.

Dioxins have not been tested for in groundwater surrounding the landfills. The occurrence of dioxin in groundwater is expected to be minimal based on strong sorption to soils. In addition, dioxins have not been a concern since they have very low water solubility and vapor pressure. Dioxins could dissolve into organic compounds in leachate and potentially migrate with leachate; however, leachate does not appear to be migrating from the landfills based on current monitoring data. The Navy will conduct field work to further investigate contaminant migration at Site 1.

Comment 4: *Mr. Paul Fisher from the City of Sunnyvale raised several concerns.*

Response: The City of Sunnyvale submitted written comments to reiterate concerns expressed during the public meeting. Please see Section 3.2.1 for specific written comments and responses.

Comment 5: *A member of the public asked what happens after the 30-year postclosure maintenance period ends.*

Response: If, after 30 years, the site still poses a threat to human health and the environment, the Navy will continue to conduct postclosure O&M.

Comment 6: *A member of the public asked whether Alternative 2 complies with the law and has been approved by the RWQCB.*

Response: Following submittal of the FS report, Alternative 2 was approved by EPA, DTSC, and RWQCB. During the public comment period, CIWMB stated that Alternative 2 does not meet performance standards. Therefore, the Navy is revising the proposed plan and soliciting additional public comments.

Comment 7: *A member of the public asked when the cleanup will be sufficient to allow development on the landfill.*

Response: Placing structures on the landfill may be limited by deed restrictions. However, the capped landfills could be used for outdoor recreation.

Comment 8: *A member of the public asked whether the Navy would retain jurisdiction over the landfills and monitoring systems for 30 years or more.*

Response: The Navy will retain responsibility for meeting environmental requirements for at least 30 years. If, at the end of 30 years of postclosure maintenance, the Navy demonstrates to the satisfaction of the local enforcement agency (LEA) and RWQCB that, based on site geology, design characteristics, and collected field data, the site poses no threat to public health or the environment, then the postclosure maintenance period may be terminated.

Comment 9: *A member of the public asked for clarification regarding the purpose of the groundwater collection trench.*

Response: The purpose of the groundwater collection trench is to intercept potentially migrating contamination from the landfill before it reaches the SWRP. It will be constructed as a contingency in the unlikely event leachate contamination migrates towards the pond.

Comment 10: *A member of the public asked what the biotic barrier would be made of and asked about its thickness.*

Response: The biotic barrier will be constructed out of a material that a burrowing animal could not penetrate. Materials such as compacted gravel or cobbles have been used. The type of material and layer thickness will be specified during the detailed design phase.

Comment 11: A member of the public asked whether the biotic barrier would be a barrier to infiltration.

Response: The biotic barrier will not be designed to limit infiltration.

Comment 12: A member of the public asked for a discussion about the anecdotal evidence found during the site investigations.

Response: During the initial stages of the investigation, information regarding types and quantities of waste disposed of at the landfills was obtained by personal communications with current or former staff at Moffett Field. These initial estimates indicated that large amounts of solvents, paints thinners, and oils could have been disposed of in the landfill. Confirming the accuracy of this anecdotal information is extremely difficult at OU1. No documentation or disposal records were kept for the landfills and it is impossible to verify much of the information obtained from the interviews. Leachate data do not indicate that the anecdotal information was accurate.

Comment 13: Jim McClure of Harding Lawson Associates (HLA) asked about previous discussions that indicated construction debris had been disposed of at the site as recently as the last year or two.

Response: The RAB submitted written comments that included this concern. Please see Section 3.2.4 for specific written comments and responses.

Comment 14: A member of the public asked for clarification regarding the type of liner beneath the landfill.

Response: Existing physical evidence shows that there are native bay muds beneath the landfill and that man-made liners do not exist.

Comment 15: *A member of the public asked for clarification regarding the depth of the groundwater collection trench.*

Response: The collection trench will be installed to extend to below the basin of the SWRP.

Comment 16: *A member of the public asked about groundwater monitoring system gaps, specifically, the gap between monitoring wells W1-14 and W1-15.*

Response: This issue has been raised in numerous written comments. Please see the comments and responses in Section 3.2.

Comment 17: *A member of the public requested clarification regarding the applicability of 14 CCR.*

Response: Title 14 CCR has been identified as applicable for OU1 landfill closure.

Comment 18: *A member of the public asked about the permeability of the bay muds at Site 1 and how it compares to the permeability of landfill liners.*

Response: The permeability of bay muds has been measured at about 10^{-8} cm/sec at the locations sampled. However, only limited areas have been sampled. Permeability requirements for landfill liners typically range from $1x10^{-5}$ cm/sec to $1x10^{-7}$ cm/sec.

Comment 19: *A member of the public asked whether sand layers have been found in the bay muds at Site 1.*

Response: An aquifer consisting of silty sands is located approximately 12 to 15 feet below sea level at Site 1. Other small sand lenses may exist within shallow bay muds above the aquifer.

Comment 20: *A member of the public asked how many wells were placed in the sand layer at Site 1.*

Response: There are ten aquifer monitoring wells at Site 1.

Comment 21: *Ms. Leslie Byster of SVTC asked whether the Navy had investigated the remedies implemented at similar sites surrounding the bay.*

Response: Information was received about Oyster Point, Third Avenue Landfill, and the old Stinson Beach Landfill. The following paragraphs summarize information obtained and discuss its applicability to OU1.

CIWMB was contacted for information regarding Oyster Point. The remedy was selected to prevent leachate migration and included a single-layer, low-permeability cap and a slurry wall. The cap was constructed solely with bay muds. The landfill was closed in the early 1970s and the area is now a marina. It is not known whether leachate migration was occurring, however, a slurry wall was constructed. Since it is not known whether leachate migration was occurring, it is difficult to compare these circumstances and associated remedy to OU1.

CIWMB was also contacted for information regarding the Third Avenue Landfill. The remedy was a multilayer clay cap and shoreline reconstruction. Waste is located below the water table, however, leachate migration was not occurring. No remedy was implemented to restrict potential leachate migration. This circumstance is similar to Site 1, but, at Site 1 a groundwater interceptor trench is proposed to protect surface water from potential future leachate migration.

The California Department of Transportation (Caltrans) was contacted for information regarding the Stinson Beach Landfill. The remedy was excavation, dewatering, segregation of hazardous and nonhazardous wastes, disposal, and restoration. Leachate migration was a concern at the Stinson site, but it was not occurring. This remedy was completed as a mitigation project to restore intertidal mudflat habitat destroyed during reconstruction of Route 1. The remedy was apparently not pursued to control leachate migration.

CIWMB stated that apparently several old landfills around the bay have waste below the water table. However, leachate migration is generally not a problem.

Comment 22: *Ms. Leslie Byster of SVTC was concerned about dioxins dissolving into leachate and migrating outside landfill boundaries.*

Response: Dioxins have not been tested for in groundwater surrounding the landfills and specific dioxin tests are not planned in the future. The occurrence of dioxin in groundwater is expected to be minimal based on strong sorption to soils. In addition, dioxins have not been a concern since they have very low water solubility and vapor pressure. Dioxins could dissolve into organic compounds in leachate and potentially migrate with leachate; however, leachate does not appear to be migrating from the landfills based on current monitoring data. The Navy will conduct field work to further investigate contaminant migration at Site 1.

Comment 23: *Ms. Leslie Byster of the SVTC raised concerns about the accuracy of the anecdotal information that described what has been disposed at OU1.*

Response: This issue has been raised in numerous written comments. Please see the comments and responses in Section 3.2.

Comment 24: *Mr. Peter Strauss of the SVTC raised concerns about corrective action triggering levels, Building 191's role in the OU1 cleanup, and wetlands protection and enhancement.*

Response: Mr. Strauss submitted written comments expressing SVTC concerns. Please see the comments and responses in Section 3.2.8.

Comment 25: *Ms. Cynthia Sievers expressed concern that the Navy was taking a minimal approach to cleanup at OU1 and was not following the same standards as local entities.*

Response: The Navy must comply with the same landfill closure regulations as local landfills. CIWMB has identified 14 CCR solid waste landfill closure regulations as applicable for OU1. During the public comment period, CIWMB stated that the Navy's proposed alternative would not meet specified performance standards in 14 CCR. As a result, the Navy has agreed to revise the proposed plan based on a prescribed, state pre-approved configuration for the two landfill caps at OU1. Additional public comments

were solicited from December 8, 1995 to January 22, 1996 on the revised proposal. In addition, a public meeting was held January 11, 1996 regarding the revised proposal.

Comment 26: *RAB Technical, Historical, and Educational (THE) committee chairperson Jim McClure raised several concerns.*

Response: The THE committee reiterated and expanded oral comments by also submitting written comments. Please see Section 3.2.4 for specific written comments and responses.

Comment 27: *NASA raised concerns regarding consistency with the Bay plan.*

Response: NASA submitted written comments expressing their concerns. Please see the comments and responses in Section 3.2.10.

Comment 28: *Ms. Mary Vrabel read a statement on behalf of the LWV.*

Response: The LWV submitted written comments. Please see Section 3.2.7 for specific written comments and responses.

Comment 29: *RAB member Mr. David Glick expressed several concerns, similar to THE committee concerns.*

Response: Mr. Glick submitted written comments. Please see Section 3.2.6 for specific written comments and responses.

3.2 JUNE 1995 WRITTEN COMMENTS AND RESPONSES

3.2.1 Comments from the City of Sunnyvale

Comment 1: *Section 1.3.2, Site 1 Hydrogeology. The report states that landfill liners typically have a conductivity of $1x10^{-6}$ cm/sec and that native soils under the site have an average conductivity of $1x10^{-8}$ cm/sec. There are also areas under the site with very high permeabilities (that is, sand lenses). From the limited data on hand the report presumes that an uninterrupted layer of low-permeability soil underlies the site. However, it is common in the south bay for high-permeability sand lenses to disrupt the*

continuity of such a layer. These sand lenses are found only after exhaustive study or actual excavation of the site. The report implies that the natural soils beneath the site exceed standards for landfill liners. To use the conductivity for naturally occurring soils is unreliable, and it is unreasonable to assume that native unengineered soils are superior to properly engineered and constructed liners.

Response: The Navy agrees that exhaustive sampling or excavation would be required if it was necessary to completely characterize the soil beneath the landfill. However, this information is not necessary and it is not assumed that the clay layers beneath the landfills are continuous and superior to an engineered liner. Information from the limited soil investigations offered a possible explanation for the lack of evidence of any contaminant migration. Additional field work will be conducted to further investigate whether contaminant migration is occurring. In addition, groundwater will continue to be monitored.

Comment 2: *Section 1.3.2, Site 1 Hydrogeology. Perched leachate in the landfill is said to be caused by placing refuse in lifts. Common landfill practice is to build landfills in lifts and most landfills do not develop perched groundwater or leachate. Those that do, do not generally attribute the perched leachate to placing the waste in lifts. Thus, your conclusion regarding the cause of the perched leachate at these sites does not appear to be well supported.*

Response: Perched moisture (above the saturated waste [leachate] zone) was reportedly observed during the OU1 RI. Placing waste in lifts was identified as a possible cause. However, the reasons for these perched areas of moisture have very little bearing on landfill remedial alternatives.

Comment 3: *Section 1.3.2, Site 1 Hydrogeology. The description of groundwater "barriers" is misleading and not consistent with previous groundwater work in the south San Francisco Bay. Generally in the south bay there are a number of transmissive zones and naturally occurring "groundwater barriers" are not believed to exist close to the surface.*

Response: As stated in the response to Comment 1, it would be difficult to prove conclusively that naturally occurring barriers to contaminant movement exist. However, groundwater

analytical data and groundwater elevations presented in the FS indicate that they exist. Continual groundwater monitoring is proposed because their existence cannot be proven conclusively. Additional field work will be conducted to further investigate potential contaminant migration.

Comment 4: *Section 1.3.3.1, Summary of Data Collected. The report states that W1-04 was damaged and will be abandoned properly during the RA. It is generally accepted practice that damaged wells are abandoned as soon as practical to avoid groundwater contamination.*

Response: The W1-4 location is currently inaccessible as a result of dredging. The roads to be constructed during the RA will remedy this situation.

Comment 5: *Section 1.3.3.1, Summary of Data Collected. While a limited amount of data on detections is provided in the appendices it would be helpful to identify what tests were done and will be done and at what frequency.*

Response: All detections were included in the appendices. In addition, Tables 2 and 6 summarized the groundwater sampling and analyses. Also, Tables 16 and 17 described a proposed groundwater monitoring program for OU1. A detailed long-term monitoring program will be developed during the RD.

Comment 6: *Section 1.3.3.5, Groundwater Surrounding the Landfill. "as a conservative approach, all perimeter A1-aquifer wells at Site 1 . . . are considered downgradient." This assumption may not be conservative, has a very high likelihood of leading to incorrect conclusions, and may allow a plan that will do more harm than good. It is possible that the site is being affected by other sources or that the site has a single hot spot that is contaminating all other areas of the site. Applying this simple assumption to a possibly complex situation will not allow proper analysis of these and other possibilities.*

Response: The approach that considers all perimeter monitoring wells as downgradient from the landfill will not be harmful. It was adopted on the basis of the leachate mounding observed at Site 1. The leachate mound results in a radially outward potential for flow.

Therefore, it was sensible to consider perimeter monitoring wells as downgradient. If groundwater monitoring wells indicate that perimeter groundwater is being impacted, a verification monitoring phase would be implemented. Under verification phase monitoring, the Navy would further delineate any groundwater contamination plume and attempt to uncover any potential, unforeseen complex circumstances. For example, if delineation efforts discovered that groundwater concentrations increased with distance from the landfill, it would be evident that the landfill was not the source of contamination and appropriate action would be taken.

Comment 7: *Section 1.3.3.5, Groundwater Surrounding the Landfill. In addition, the assumption that all groundwater monitoring wells are downgradient has led to lumping all "downgradient wells" together and has artificially made the number of detections of contaminates seem small. Upon review of individual wells for organic contaminates it is very likely that some wells will show consistent contamination while others are consistently "clean."*

Response: The Navy has carefully reviewed organic detections in each well to determine whether any patterns or consistent detections are evident. Tables 2 and 6 in the FS report (PRC 1995) list the number of consecutive detections and addresses them in accompanying text. For example, at Site 1 the Navy found that only three chemicals were detected during consecutive quarters in the same well. In May and August 1989, acetone was detected in monitoring well W1-5 at concentrations of 10 micrograms per liter (µg/L) and 6 µg/L, respectively. Since then, acetone has not been detected in the six samples collected from W1-5. In September and December 1993, carbon disulfide was detected in W1-14 at a concentration of 0.2 µg/L. Carbon disulfide has not been detected since in W1-14. Also in September and December of 1993, an unknown, light total petroleum hydrocarbons (TPH) component was detected in W1-17 at concentrations of 110 µg/L and 7 µg/L, respectively. Since then, light TPH components have not been detected in W1-17.

Comment 8: *Section 1.3.3.5, Groundwater Surrounding the Landfill. From the limited information present it appears that groundwater is flowing beneath the site and that contamination is occurring, but there is insufficient information presented in an acceptable manner to reach the same conclusions as in the report. It is also alarming to see the number of*

references to laboratory error and inaccurate data analysis in the report. The report does not speak well of the reliability of the groundwater data, while on the other hand it uses the same data to draw broad conclusions and to gamble on a skimpy closure method.

Response: Approximately 613 groundwater samples were collected and analyzed to support the OU1 RI/FS. All organic and inorganic detections in groundwater since 1988 have been provided either in FS report tables or in appendices in the FS report (PRC 1995). The data have been sorted by monitoring well and by compound so that any patterns or trends could be identified. All the data were presented objectively and the data were reviewed. The conclusion presented in the report and substantiated by data is that groundwater remediation is not necessary at OU1. Evidence has not been presented that indicates otherwise.

Groundwater has been sampled and analyzed in accordance with rigorous QA/QC protocol and it is reliable. The FS report indicates that acetone and bis(2-ethylhexyl)phthalate results are questionable since they are known to be common lab contaminants and detections were ubiquitous during the RI. However, these problems have not been evident during the nine groundwater sampling rounds conducted since the RI.

Comment 9: *Section 1.3.3.5, Groundwater Surrounding the Landfill. The conclusion section does not consider seasonal variability of groundwater and leachate elevations. Groundwater and leachate levels generally play a role when considering "consecutive" detections. Without accounting for seasonal variations, the analysis is incomplete and fails to justify the stated conclusions.*

Response: Seasonal variability is accounted for in the analysis. As of March 1995 at Site 1, 12 organic compounds had been detected more than once. Of these 12 organic compounds, four compounds had been detected more than once in the same well. Of these four spatially consistent detections, one well (W1-5) had detections occur during the same season. A light, unknown TPH component was detected in December 1992 and December 1993 at extremely low levels (1 µg/L and 5 µg/L). No light TPH compound was detected in December 1994. There are no apparent patterns or trends that indicate contaminant plumes are migrating either continuously or seasonally.

Comment 10: *Section 1.3.3.5, Groundwater Surrounding the Landfill. Analysis of groundwater required by 23 CCR should be reviewed. The statement "requires that two consecutive detections above a WQPS (typically background concentrations)" is not necessarily true. The selection of WQPS requires a scientific analysis of existing conditions as well as potential long term goals and uses of water at the site. There must be a justification for the WQPS that is identified. There is no justification presented. Until WQPS are established the conclusion drawn is not appropriate.*

Response: The selection of background concentrations as WQPS is justified by 23 CCR 2550.4, Concentration Limits, which states that the concentration limit should not exceed the background value of that constituent. This section also states that concentration limits greater than background can be proposed for a corrective action phase. However, the Navy is currently in the detection monitoring phase.

Comment 11: *Section 1.3.3.5, Groundwater Surrounding the Landfill. The statement that "however, the landfill is the likely source of organic leachate chemicals that have been infrequently detected in groundwater samples" argues that the landfill is a source of groundwater contamination. If the site is a source of groundwater contamination the site should have a corrective action plan to mitigate any adverse environmental impacts.*

Response: The landfill is probably the source of the detections; however, corrective action is not necessary. Corrective action would not be considered until chemicals were consistently detected in groundwater above water quality objectives developed for the protection of aquatic life. Tables 2 and 6 show that only very low, infrequent detections have occurred.

There are three phases of activities associated with groundwater monitoring under 23 CCR: detection monitoring, evaluation monitoring, and corrective action programs. As part of detection monitoring, groundwater constituent concentrations would be monitored, and, if a concentration level statistically exceeded its background concentration, evaluation monitoring would begin. The evaluation monitoring phase is used to assess the nature and extent of the violation (exceedance in WQPS). During evaluation monitoring, additional wells may be installed and sampled to verify leakage from the landfill as indicated by detection monitoring. The groundwater monitoring system, monitoring frequency, and sampling and analysis may be altered. In addition,

data needed to complete a corrective action program would be developed during evaluation monitoring.

Corrective action programs require activities to achieve compliance with standards, initiating and completing corrective actions within a reasonable period of time considering extent of pollution, and establishing and implementing a monitoring program to demonstrate effectiveness of the corrective action program (may be based on the evaluation monitoring program). Corrective action would likely include hydraulic control of the groundwater and leachate through pump and treat methods. A contingency measure is proposed for Site 1 and would be in place if corrective action is required along the northern boundary. A contingency measure is proposed at the Site 1 northern boundary because of the proximity and potential impact of landfill contamination on ecological receptors and habitats in the adjacent SWRP. The contingency measure includes enhancing the containment provided by the bay muds at Site 1 with a vertical subsurface barrier and collection trench along the northern boundary of Site 1. The subsurface collection trench will be designed to intercept any contaminants that may migrate into shallow groundwater and protect the SWRP receptors. The collected leachate can then be pumped to a treatment system designed to address the contaminant that has migrated. In addition to pumping the trench, leachate can also be extracted from within the landfill through the leachate monitoring wells as part of corrective action.

Leachate migration requiring corrective action is not necessary at this time or expected to be in the future. However, the contingency measure will protect against the possibility of any buried, drummed waste mobilizing and migrating off site in the future. Only the northern boundary of Site 1 is presently selected for additional containment because it is upgradient to surface water and associated receptors. Additional field work will be conducted to investigate contaminant migration at the southwestern border. Releases along the other borders can also be addressed by containment and hydraulic control, if needed. Site 2 is not considered for the additional containment since hydraulic control can be easily maintained near the site as demonstrated by the Building 191 lift station and associated runway drainage system.

Comment 12: *Section 1.3.3.5, Groundwater Surrounding the Landfill. Based on the landfill cross sections provided (Figures 5, 6, and 7), well W1-6 is the only well shown with a screened interval that is in a high-permeability lens. Other wells are generally screened in bay muds. This greatly limits these wells' ability to be used as monitoring wells. New wells should be constructed in highly permeable layers to that accurate data can be obtained and analyzed. All boring logs should be made part of the report.*

Response: With the exception of W1-16, all of the groundwater monitoring wells at Site 1 are screened across the most permeable sediments observed while drilling. Many of the wells are also partially screened in bay muds; however, they will still function as intended and do not need to be replaced. Additional field work will be conducted that will enhance the current monitoring network.

Comment 13: *Section 1.3.3.5, Groundwater Surrounding the Landfill. Under the inorganic constituent discussion it is stated that there is a potential for flow from the leachate zone to the aquifer zone. The immediately preceding paragraph implies that it is highly unlikely that there is a potential for flow from the landfill to groundwater. These statements are highly contradictory and should be reviewed for consistency.*

Response: The paragraphs are not contradictory. Potential for flow (or a gradient) does exist between leachate and groundwater; however, low hydraulic conductivity soils, high organic content associated with the clays, and low source contaminant concentrations are likely to combine to restrict flow and limit contaminant migration. This conclusion is supported by the analytical data collected during the investigations.

Comment 14: *Section 1.3.3.5, Groundwater Surrounding the Landfill. The next paragraph describes that wells with high TDS are used for comparison to determine groundwater contamination. The reason for using the high TDS wells is clear; these wells are most obviously from the area around the site. The wells are typed, either up or down gradient, and then the well's results are compared to determine the extent of contamination. Earlier in the report discussion was centered on samples with high matrix interference that could likely lead to erroneous results. Matrix interference is often caused by high TDS in the samples. These statements therefore also seem contradictory and should be reviewed for consistency.*

Response: High TDS concentrations often cause matrix interference. Samples having matrix interference may result in elevated detection limits and qualified data. The laboratory attempts to minimize the effects of matrix interference while maintaining the integrity of the sample with accepted and proven procedures. A sample's integrity is protected by QC procedures such as the use of matrix spikes. If QC procedures indicate that matrix interference is present, additional procedures may be used to eliminate the interference. However, it may be impossible to eliminate some matrix interference and the resulting data are qualified accordingly.

In addition to the laboratory procedures, all of the analytical data for Moffett Field undergo external, third-party validation which verifies that the laboratories performed the testing with an acceptable amount of QC. Third party data validation procedures may result in additional data qualification and possibly the elimination of some results. Data that are qualified with an "R" are not acceptable for any purpose and are considered erroneous, data qualified with a "J" qualifier are usable and estimate the true value.

Comment 15: *Section 1.3.3.5, Groundwater Surrounding the Landfill. The North Base Wells that were chosen for background comparison are not identified. Their locations and boring logs should be provided.*

Response: The Navy will send the City of Sunnyvale a map showing these well locations and borehole logs.

Comment 16: *Section 1.3.3.5, Groundwater Surrounding the Landfill. The conclusion that the source of TPH in Jagel Slough is not a result of Site 1 may be in error. It is true that wells W1-1 and W1-16 are between Jagel Sough and Site 1, but both are screened through clay. Clay is not a very permeable material and contamination from Site 1 may be reaching the slough through a sand lens that is not currently being monitored.*

Response: Monitoring well W1-16 is mainly screened through clay; however, W1-1, W1-8, and W1-5 are screened through permeable sediments and are located between the Jagel Slough and the Site 1 landfill. TPH migration into Jagel Slough has not been indicated by samples collected from these wells. In addition, hydrographs show that Jagel

Slough is upgradient from surrounding groundwater. Therefore, it is unlikely that Jagel Slough has been impacted by TPH from the landfill.

Comment 17: *Section 1.3.5, Site 2 Hydrogeology. Figure 20 shows that the site is being dewatered by the drainage pumping house Building 191. The pump discharge should be analyzed for contamination.*

Response: The pump discharge has been analyzed for contamination and low levels of chlorinated solvents have been detected in the past. However, recent samples have not indicated contamination. Building 191 receives drainage from many areas at Moffett Field and it is difficult to identify the source of the detections at the pump discharge. However, there are two monitoring wells located between Building 191 and Site 2. Sampling results from these wells indicate that the chlorinated solvents detected at Building 191 did not originate from Site 2.

Comment 18: *Section 1.3.6.1, Summary of Data Collected. Monitoring well W2-12 is not considered an upgradient well, but it seems that it should be based on its location and screened interval.*

Response: Monitoring well W2-12 was installed as an upgradient well and has been analyzed as upgradient.

Comment 19: *Section 1.3.6.3, Groundwater Surrounding the Landfill. The conclusions drawn for Site 2 are the same as for Site 1. The conclusions are drawn partly from a peculiar analysis of 23 CCR and the conclusions are based on monitoring data that are not presented in the report. As with Site 1, the conclusions are based on monitoring data that have been obtained from groundwater wells that appear to be screened primarily in clay.*

Response: All inorganic and organic detections in groundwater since 1988 have been provided either in FS report tables or in appendices in the FS report. The conclusions in the report are based solely on groundwater monitoring data presented in the report. All the perimeter groundwater monitoring wells at Site 2 are screened across the most

permeable sediments observed while drilling. Many of the wells are also partially screened in silts and clays; however, they still have functioned as intended.

Comment 20: *Section 1.3.6.3, Inorganic Constituents. The conclusions drawn for Site 2 are nearly identical to Site 1 and are subject to the same potential flaws as discussed for Site 1.*

Response: Please see the response to previous comments.

Comment 21: *Section 1.3.6.6, Surface Water. Samples were collected, but there is no description of how many samples were taken, how often the samples were taken, and what tests were done on each sample.*

Response: The information requested is beyond the scope of an FS report. The information listed can be found in RI reports (IT 1993a, IT 1993b), the field investigation technical memorandum (PRC 1993), and the site-wide ecological assessment report (PRC and MW 1995) which are located at the information repository.

Comment 22: *Section 1.3.6.6, Surface Water. The conclusion that Site 2 is not leaking into surface water because contaminants should be consistently detected should be reviewed. Leakage from a landfill can be based on many variables but, in general, landfills are most likely to leak after major storm events. The data on leakage should be reviewed to determine if detections of surface water contaminants are occurring at some regular interval or if leakage is related to some physical phenomenon.*

Response: It would be extremely difficult to correlate groundwater and, consequently, surface water chemistry with storm events. However, the landfills will be capped and infiltration will be minimized to reduce any effects storm events have on groundwater or surface water chemistry.

Comment 23: *Section 1.3.6.7, Landfill Gas. The frequency of testing should be discussed and should conform to 14 CCR. Physical structures within 1,000 feet of a landfill should be monitored.*

Response: The proposed gas monitoring program was developed according to 14 CCR. At Sites 1 and 2, gas concentrations are monitored quarterly. At Site 1, no physical structures

are located within 1,000 feet. At Site 2, landfill gas is not being generated. Gas has not been detected inside or outside landfill boundaries and gas monitoring at Site 2 will likely be discontinued.

Comment 24: *Section 1.3.7.3, Leachate Migration into Surrounding Groundwater. Areas around the margin of South San Francisco Bay exhibit highly variable permeability, with areas of bay mud (low permeability) containing lenses of other materials such as sand (high permeability) in a highly unpredictable fashion. These sand lenses often act as conduits for movement of leachate and landfill gas. Therefore, using the average K values for bay mud beneath the site is questionable. By using the K values presented the higher permeability of portions of the strata beneath the sites is ignored. Further, the sample preparation that was used to find the stated K values in the laboratory probably does not replicate the condition of the clay beneath the sites when the sites were first used.*

Response: The information in this section was provided to offer a possible explanation for the lack of evidence of contaminant migration. No sand lenses have been discovered that provide a conduit for migration. The Navy will conduct additional field work to further investigate whether contaminant migration is occurring at the southern end of Site 1 (between monitoring wells W1-14 and W1-15).

The landfill closure strategy accounts for the possibility that the bay muds are not continuous. The groundwater interceptor trench will protect the SWRP from any contamination migrating through smaller sand lenses. Continual A1-aquifer monitoring results will monitor landfill impacts on surrounding groundwater and will monitor whether sand lenses are transporting contamination into more permeable sediments.

Comment 25: *Section 1.5, Applicable or Relevant and Appropriate Requirements. This report does not appear to take into account the requirements of 14 CCR for closure of a landfill. Most of the discussion seems to be ignorant of 14 CCR. The report should also consider 23 CCR requirements for groundwater monitoring and leachate management. Specifically the report does not address the "five foot separation criteria" for waste and groundwater and does not adequately address 23 CCR Chapter 15, Article 5 monitoring requirements.*

Response: The FS report identifies 14 CCR and 23 CCR as the two major applicable regulations that will guide OU1 remedial actions. The report identifies these regulations in detail in Appendix J, which lists all applicable requirements from both 14 CCR and 23 CCR.

Comment 26: *Section 1.5, Applicable or Relevant and Appropriate Requirements. It is true that these regulations apply to nonhazardous municipal landfills and that Sites 1 and 2 are hazardous waste sites, but it seems logical that Sites 1 and 2 should not be held to a lesser standard than sites that have never knowingly received hazardous waste.*

Response: Some of the wastes at the OU1 landfills are potentially hazardous constituents; however, this circumstance is common to all solid waste and CERCLA landfills. Compliance with solid waste monitoring and closure regulations will provide protection for human health and the environment. Further, low contaminant concentrations in leachate show that a minimal threat from hazardous substances exists at OU1. Maximum detected concentrations are below maximum concentrations given for the toxicity characteristic in 40 CFR 261.24. In addition, documentation received from CIWMB indicates that Site 1 was operated as a solid waste facility. The Navy was issued a Solid Waste Facilities Permit for Site 1 by Santa Clara County Environmental Agency. The permit states that the types of waste received at the site include cardboard, lawn cuttings, prunings, wood waste, and asbestos insulation wrapped in double plastic bags. The permit also states that the disposal of hazardous waste was to be prohibited at the facility. This further supports the assumption that OU1 landfills were operated as solid waste landfills and received similar types of wastes (solid waste with small amounts of hazardous waste). Also, visible surface debris includes obvious construction and demolition debris, such as concrete rubble with reinforcing steel, asphalt chunks, wire, wood chips, glass, and mounds of dirt overgrown with weeds (possibly street sweepings), which are similar to solid waste landfill waste. For these reasons, the Navy identified 23 CCR groundwater monitoring requirements and 14 CCR closure regulations as most appropriate for OU1. CIWMB concurs with these conclusions.

Comment 27: *Section 1.5, Applicable or Relevant and Appropriate Requirements. Table 9 states that 14 CCR closure requirements are applicable. Title 14 CCR requires that a landfill be closed according to 23 CCR, Chapter 15. This chapter specifically requires a*

minimum of 12 inches of low permeability clay as well as two feet of foundation soil beneath the clay and one foot of vegetative cover to protect the clay layer.

Response: The Navy has agreed to revise the cap design and base the design on the aforementioned prescriptive standard at a cost increase of $1,772,000. The Navy's revised cap design includes the same layers that are specified as minimum requirements in 23 CCR. Three components have been added to the standard configuration in 23 CCR.

As stated in the comment, the 23 CCR cap standard consists of a 2-foot-thick foundation layer beneath a 1-foot low-permeability clay layer, which is under a 1-foot layer of cover soil. In addition, the Navy has included a gas venting layer at Site 1. This layer will prevent gas pressure from building up beneath the low-permeability layer and causing horizontal gas migration. The Navy has added a biotic barrier and may also add a drainage layer above the low-permeability layer. The drainage layer would be installed above the barrier layer to (1) prevent hydraulic head build-up, (2) prevent associated seepage through the layer, and (3) prevent plant-root saturation. Inclusion of a drainage layer will be further evaluated during the RD. The biotic barrier will protect the low-permeability layer from burrowing animals. The cap described above is similar to Alternative 3 in the FS report.

Comment 28: *Section 6.2. The Hydrologic Evaluation of Landfill Performance (HELP) Model results seem flawed. Intuitively, a site within 3 feet of loamy soil should allow much greater storm water infiltration than a site with 3 feet of loamy soil over 2 feet of clay. To assist in explaining this concept the following sketch (see attachment) illustrating the report's comparison of Alternatives 2 and 3 is provided.*

It is likely that one or more of the assumptions fed into the HELP model, such as soil characteristics, plant characteristics or evaporative zone/climatological data are flawed. These should be reviewed.

Response: Alternatives 2 and 3 have roughly equivalent performance because the upper 3-foot layers on both caps equally reduce the already low annual precipitation observed at Moffett Field. Approximately 90 percent of the 13 inches of annual rainfall is lost

through evapotranspiration. The remaining 1 inch of precipitation is inconsequential, especially when contaminant migration is not currently evident.

Comment 29: *Section 4.0. The report seems flawed in its consideration of closure by Alternatives 1 and 2. Alternatives 1 and 2 would not even be considered by regulatory agencies under ordinary circumstances (that is, if the site were not on the Superfund list and subject to CERCLA).*

Response: OU1 activities are regulated under CERCLA and the report was prepared accordingly. Alternative 1 was included as a baseline for comparison and Alternative 2 received significant consideration from regulatory agencies.

Comment 30: *Section 1.5, Applicable or Relevant and Appropriate Requirements. The report does not address leachate management as required by 23 CCR. It seems appropriate to at least review the concept of pumping and treating existing leachate. The report indicates that the waste mass is hydraulically separated from groundwater by a very low-permeability natural clay liner. If this is truly the case, it seems that pumping the leachate from the waste mound should be a very easy and effective procedure. Combining pumping with the very low intrusion of surface water that is predicted by the HELP model (if it has been correctly applied in this report) after the site is closed should result in very little leachate being generated in the future.*

Response: Appendix J addressed leachate management as required by 14 CCR and 23 CCR. Title 14 CCR states that leachate control shall cease after the landfill operator demonstrates to the local enforcement agency that leachate is no longer produced or the discharge of leachate will have no effect on water quality. At Site 1, refuse is below the water table and, as a result, leachate will always be produced. The FS has demonstrated to enforcement agencies that the leachate produced has no effect on water quality. The Navy will, however, conduct additional field work to investigate contaminant migration. Therefore, the conclusion reached in the FS may change based on results of this investigation.

Comment 31: *Section 1.5, Applicable or Relevant and Appropriate Requirements. All current regulations for municipal solid waste landfills have requirements for postclosure maintenance funds and for long-term monitoring. The OU1 report may not be the*

proper forum to address these issues, but these issues should be discussed before any final closure method is chosen. A postclosure maintenance plan should be prepared prior to closure of the sites.

Response: The Navy will prepare a postclosure maintenance plan during the RD.

Comment 32: The location of the two sites, adjacent to the bay and possibly upgradient of the Sunnyvale Landfill, is a concern because, if the Moffett Field sites are not closed properly, contaminant plumes could cause environmental degradation to a large area. In addition, by not properly closing these sites today, future problems that could have been reduced or prevented may occur. I urge you to re-evaluate the report and existing regulations to confirm that your plan is both feasible and proper given the existing conditions.

Response: OU1 landfills are not upgradient of the Sunnyvale Landfill. With proper and continual groundwater monitoring and corrective action contingency plans, the Navy can address any environmental degradation in a timely manner.

The basic strategy of (1) capping the landfills, (2) installing a gas interceptor trench, (3) installing a groundwater collection trench, and (4) continuing groundwater and gas monitoring (with corrective action contingencies) is an adequate, cost-effective solution. During the public comment period, the Navy learned that state, county, and local regulatory agencies do not believe that the original proposed alternative is in compliance with applicable landfill closure regulations. As a result, the Navy has agreed to revise the proposed plan based on a prescribed, state pre-approved configuration for the two landfill caps at OU1 at an additional cost of $1,772,000. Therefore, instead of 3-foot, single-layer soil caps, the landfill caps will, at a minimum, contain 1 foot of topsoil overlying an impermeable layer. These layers will be built on a 2-foot foundation layer. In addition to this minimum requirement, the Navy will include a biotic barrier and possibly a drainage layer between the impermeable layer and topsoil to protect the integrity of the impermeable layer and drain percolated water from the cap. The biotic barrier will prevent burrowing animals and deep plant roots from puncturing this layer. The drainage layer provides a pathway for percolation to flow off the cap. Inclusion of the drainage layer will be

evaluated during the RD. The Navy will include gas venting beneath the impermeable layer to prevent gas pressure build-up and horizontal subsurface gas migration.

3.2.2 Comments from the City of Mountain View

Comment 1: *As the host city to Moffett Field, we wish to bring out concerns regarding the closure of OU1 to your attention. We have discussed the proposed closure methodology with CIWMB, RWQCB, and the Santa Clara County Health Department, Toxic Substances Division. These agencies have all indicated the proposed closure method, Alternative 2, either does not meet their approval or is inferior to the prescriptive closure methods stipulated in state and federal regulations. We find this disappointing, and encourage you to re-evaluate your proposed closure method to comply with the recommendations of these agencies and the regulations which they enforce.*

Response: During the public comment period, the Navy learned that state, county, and local regulatory agencies do not believe that the original proposed alternative is in compliance with applicable landfill closure regulations. As a result, the Navy has agreed to revise the proposed plan based on a prescribed, state pre-approved configuration for the two landfill caps at OU1 at a cost increase of $1,772,000.

3.2.3 Comments from the RAB Cost Committee, compiled by Christina Scott, Committee Chairperson

Comment 1: *Will the soil cap in Alternative 2 be constructed to meet the specifications in 23 CCR, Section 2581?*

Response: A revised proposal includes landfill caps that will be constructed to meet the specifications in 23 CCR Section 2581. Originally, Alternative 2 was proposed as an engineered alternative to the cap design specified in 23 CCR 2581. However, during the public comment period, the Navy learned that state, county, and local regulatory agencies do not believe that Alternative 2 is in compliance with applicable landfill closure regulations. As a result, the Navy has agreed to revise the proposed plan based on a prescribed, state pre-approved configuration for the two landfill caps at OU1 at a cost increase of $1,772,000. Therefore, instead of 3-foot, single-layer soil caps, the landfill caps will, at a minimum, contain 1 foot of topsoil overlying an impermeable

layer. These layers will be built on a 2-foot foundation layer. In addition to this minimum requirement, the Navy will include a biotic barrier and possibly a drainage layer between the impermeable layer and topsoil to protect the integrity of the impermeable layer and drain percolated water off the cap. The biotic barrier will prevent burrowing animals and deep plant roots from puncturing this layer. The drainage layer would provide a pathway for percolation to flow from the cap. Inclusion of the drainage layer will be evaluated further during the RD. Lastly, the Navy will include gas venting beneath the impermeable layer to prevent gas pressure build-up and horizontal subsurface gas migration.

Comment 2: *How will the quality of the borrow material be assured?*

Response: The specific construction QA/QC procedures have not been formally compiled. However, in general, a civil or geological engineer will specify the type of soil required for each layer of the cap. At the borrow source, soil tests will be conducted to evaluate whether the soil meets specifications. In addition, during layer construction, periodic tests will be conducted to ensure that the final configuration is in accordance with specifications.

Comment 3: *What degree of compaction will be required for the cap?*

Response: The low-permeability layer is required to have a hydraulic conductivity less than $1x10^{-6}$ cm/sec or at least as low as underlying soil. The vegetation layer will not be compacted.

Comment 4: *Do the O&M cost estimates for the postclosure period include any provisions for future corrective actions?*

Response: Cost opinions have not been prepared for any future corrective actions. It is difficult to predict the extent of any future corrective action that may be needed.

Comment 5: *How will future major O&M or corrective actions be funded?*

Response: These activities will be funded through annual DoD environmental restoration budgets. These budgets are proposed by Naval Facilities Engineering Command (NAVFAC) headquarters in Washington D.C. and are approved as part of a total budget package each year by Congress and the President. While congressional actions cannot be anticipated, it is NAVFAC's responsibility to request the necessary money for the upcoming fiscal year's environmental restoration.

Comment 6: *Will a bond be posted or an insurance policy enstated?*

Response: These activities are not anticipated at this time.

Comment 7: *The FS does not contain any provision for the continued operation of the pumping system at Building 191. It appears that this pumping is critical to maintaining year-round access to the sites. O&M costs should be included in the estimates for the alternatives.*

Response: Operation of the Building 191 pump station and drain/subdrain system will be part of the Navy's OU1 remedy as an institutional control. Detailed provisions for system O&M are not included in the OU1 FS or the ROD because the pump station must be operated and maintained by NASA as part of their current land use. A review of the remedy and lift station operation will be conducted periodically to ensure that the remedy continues to provide adequate protection of human health and the environment.

Comment 8: *What happens to the OU1 landfills after the 30-year postclosure period? Who will maintain the sites? If your assumption is that at that time the landfills will become part of the natural landscape of the area, do you anticipate initiating wetlands restoration? Whether the postclosure status needs to be considered and funding set aside by the U.S. Navy.*

Response: The federal government will be obligated to provide for postclosure maintenance for at least 30 years. The federal government is not released from its responsibilities after 30 years if data indicate that the landfills still pose a threat to human health or the environment. Funding is based on annual budgets (please see the response to Comment 5).

3.2.4 **Comments from the RAB Technical, Historical, and Educational Committee,** compiled by Jim McClure, Committee Chairperson

Introduction

The THE Committee of the RAB for Moffett Field has reviewed the May 15, 1995, Final FS for OU1 at Moffett Field. OU1 consists of two landfills, called Sites 1 and 2 by the Navy.

During the THE Committee review of the OU1 FS, several questions and concerns have been identified. This presentation summarizes concerns previously documented in the THE Committee's July 19, 1995, report. That report was distributed to RAB members with the Navy's July 26, 1995, minutes of the July 13, 1995, RAB meeting. This presentation has been modified from the July 19 report, to better classify concerns and to present some additional concerns identified by the THE Committee members.

Recommendation

On the basis of the identified concerns, it is recommended that the May 15, 1995, OU1 FS either be rejected or withdrawn, and that it be revised to adequately address these concerns.

The Committee Concerns

OU1 FS concerns identified by the THE Committee can be grouped into the following five general areas:

- *Adequacy of Site Investigation*
- *Assumptions About Current Conditions*
- *Assumptions About Future Conditions*
- *Design Assumptions*
- *Regulatory Compliance and Financial Security*

Adequacy of Site Investigation

Comment 1: Lead contamination associated with the operation of the pistol firing range at Site 1 has not been investigated.

Response: Lead contamination at the landfill surface has not been characterized because this information is not needed to implement capping at the landfills. During cap construction, heavy equipment could generate fugitive dust emissions. Construction workers will mitigate any potential hazards by using PPE such as respirators. In addition, dust suppression strategies such as wind speed alarms can be implemented to reduce fugitive dust emissions during capping.

Comment 2: *The OU1 FS descriptions of hazardous wastes disposed in the landfills differ from those presented in relevant sections of the RI report. The result is that the possible extent of hazardous waste disposal in OU1 is obscured in the OU1 FS.*

Response: The hazardous waste descriptions in the RI report were originally presented in the IAS. All of the information regarding types and quantities of waste disposed at the landfills were obtained by personal communications with current or previous staff at Moffett Field. Confirming the accuracy of this anecdotal information is extremely difficult at OU1. No documentation or disposal records were kept for the landfills and it is impossible to verify any information obtained from interviews without actively excavating the landfills. A fate and transport analysis would have little value since the waste could have been disposed of in drums.

To address this concern, the Navy has (1) reviewed the IAS (NEESA 1984) and examined the basis for the assumptions regarding disposal, (2) identified approaches in EPA presumptive remedy guidance documents (EPA 1991, 1993) regarding similar circumstances since these circumstances are common to many landfills, and (3) considered additional remediation strategies that regard anecdotal information as potentially accurate.

One explanation for the differing information in the IAS and collected data is that the IAS is not accurate. To evaluate this further, the following paragraphs contain a summary of the IAS and places emphasis on the basis for assumptions made.

The IAS contains a cursory, qualitative survey of waste generation rates and disposal practices at Moffett Field from the 1930s to the early 1980s. The information is based on record searches, on-site surveys, and civilian and military personnel interviews.

The IAS presents waste generation rates from different groups that have resided at Moffett Field, most notably Public Works, P-3 Orion patrol squadrons and jet squadrons, aircraft intermediate maintenance departments, and general operations (such as the fire department, photography lab, and naval exchange [NEX] gas station). Of these groups, Public Works and the squadrons reportedly used the landfills for waste disposal. Waste disposal at the landfills from Public Works and the squadrons are summarized below from the IAS (NEESA 1984).

Public Works operated, maintained, and repaired buildings, structures, and other facilities at Moffett Field. Public Works is comprised of metal and welding shops, paint shops, utilities shops, electrical shops, pipe shops, the steam plant, the building trades shop, the transportation division, and the pesticide shop. Of these shops and divisions, the paint shop, the electrical shop, the pipe shop, and utilities shop disposed of waste at the landfills.

According to the IAS, the paint shop had an area of Site 2 reserved for paint shop waste. Paints and thinners were disposed in cans, as it was easier to dispose of wastes in barrels at the shop rather than on the ground. The paint shop staff never observed pools of liquid or chemical smells at the landfills.

The electrical shop reportedly used paper elements to filter oil from transformers. The crews used about seven to eight filters in a filter press and filtered about two to three 20- to 30-gallon capacity transformers per month in the summer. The shop generated a few dozen filters per year, as well as small amounts of sawdust used to soak up spilled transformer oil. The filtering was done on site and the filters were dried in an oven. The electrical shop reportedly used the landfills only for disposal of paper transformer oil filters.

Jet squadrons operated at Moffett Field from 1950 until 1962. According to personnel interviewed, most oily and solvent wastes were collected in 55-gallon barrels and stored beside hangars. The outside corners of the hangars reportedly were used to store barrels of waste materials. According to the IAS, the barrels were either hauled to the runway landfill (Site 1) by station personnel or disposed of down storm sewers around the hangars, or off the edge of the aprons. The amount of liquid wastes taken

to Site 1 is not known; however, the IAS estimates that a total of 1.5 million gallons were generated and assumes 5 to 10 percent of the 1.5 million gallons generated were disposed at the landfills. The basis for this assumption is unknown.

Seven P-3 Orion squadrons have been stationed at Moffett Field since 1962, which was near the time that Site 1 began operations and Site 2 ceased operations. Disposal methods reportedly varied. In the early 1960s, much of the solvents were poured down deck drains, around the hangars, and around the aprons, or placed in barrels and stored around the hangars. Personnel interviews indicated that some of the waste containerized in 55-gallon drums was hauled to Site 1 in the early 1960s. The amounts are not known.

The IAS reports of disposal practices contain several inconsistencies. The IAS indicates that barrels were disposed of at Site 1 from 1950 to 1962, however, the Site 1 landfill did not exist before 1962. In addition, the IAS states that 1.5 million gallons of liquid waste were generated by the Orion squadrons from 1962 to 1978 (that is, during the operating period of Site 1). However, the report tables indicate that 687,000 gallons of liquid waste were generated. The IAS then assumes that 5 to 10 percent of the 1.5 million gallons was disposed at Site 1. Both the 5 to 10 percent estimate and the 1.5-million-gallon estimate are arbitrary. The IAS also states that 1.5 million gallons of liquid waste were generated during the jet era at Moffett Field, however, report tables indicate that 528,000 gallons were generated. The report again arbitrarily assumes that 5 to 10 percent of the 1.5 million gallons (1,363 to 2,727 55-gallon drums) were disposed at Site 2. The estimates appear to be arbitrary and speculative, and are inconsistent with other estimates in the IAS report.

Another explanation for the differing information in the IAS and collected data is that the collected data do not adequately depict landfill content. There is no question that the landfill content is not characterized and it is not known what was disposed in the landfills. Notably, this circumstance is not unique to Moffett Field. Many Superfund landfills have the potential to contain a wide variety of wastes, including drums of waste. EPA guidance (EPA 1991, 1993) is very clear on how to address these sites. Landfill characterization is not recommended and containment is the best remedy unless (1) the location of the drums is known, (2) the location is easily accessible, and

(3) removal will reduce the principal threat. At Moffett Field, geophysical surveys do not show any drum disposal within Site 1. Leachate and groundwater data show low concentrations. Lastly, information presented in the IAS regarding waste disposal is questionable. The stated assumptions appear to have very little basis and are difficult to verify.

The Navy's strategy has been to evaluate containing the refuse through capping and, most importantly, to recognize that if any previously drummed waste begins to migrate from the landfill, the monitoring program will detect the release and corrective action will be implemented.

An additional strategy to protect against the possibility of buried, drummed waste mobilizing and migrating off-site was also evaluated. This strategy includes enhancing containment with a subsurface interceptor trench with a vertical barrier along the northern boundary of Site 1. This trench has been added as a corrective action contingency measure and will be in place if contamination migrates. The interceptor trench, in conjunction with capping and monitoring, will protect adjacent surface water. Only the northern boundary of Site 1 is presently selected for the possible additional containment because this area is upgradient to the SWRP ecosystem. Releases along other borders will not affect sensitive ecosystems and additional containment is not warranted. Additional field work will be conducted to investigate contaminant migration along the southwestern border. Any releases along these borders could be addressed by containment or hydraulic control if needed. Site 2 is not considered for the additional containment since hydraulic control can be easily maintained near the site as demonstrated by the Building 191 lift station and associated runway drainage system.

The reason for omitting the RI (actually IAS) estimates of the quantities of waste from the FS is that evidence collected during field investigations does not support the estimates. The Navy did not intend to misrepresent or suppress information. Chemical data from leachate wells do not support the estimates that hundreds of thousands of gallons of liquid waste were dumped in the landfill.

Comment 3: *The existing groundwater monitoring network does not adequately characterize leachate or groundwater flow.*

Response: A field investigation will be conducted to further characterize contaminant migration and groundwater flow.

Comment 4: *The OU1 FS does not appear to have reliably established the lateral and vertical extent of the landfills. In particular, available information indicates that at Site 1, refuse may have been placed into underlying aquifer material, but this is not indicated on the cross sections.*

Response: To establish the lateral extent of the landfills, the Navy will dig trenches. Trenching data will further refine and confirm initial estimates of landfill boundary locations. To depict the vertical extent of refuse, cross-sections were constructed based on borehole logs. Borehole logs did not indicate that refuse had been placed into the aquifer.

No records were kept regarding the initial depth of any excavations at Site 1. The information included in the text was obtained from interviewing base personnel during the IAS. The physical evidence collected during the OU1 RI/FS does not confirm that refuse extends into the aquifer at Site 1. The physical evidence regarding landfill depth is summarized below.

- Nine borings have been extended through Site 1 landfill refuse. The maximum refuse depth has been measured at 12.9 feet below msl at boring W1-11(F).
- In addition to borings through the landfill, the Navy conducted an electrical resistivity survey to locate the base of the landfill. The survey did not support the more reliable borehole logs. Survey results indicated that the landfill base is approximately 5 to 10 feet shallower than found in borings. The electrical resistivity information was not mentioned in the FS report since it did not accurately depict boundaries relative to soil boring information. However, the RI report discusses the results in detail (IT 1993a).
- If refuse extended 21 feet below msl, data indicate that the leachate zone would be in direct contact and communication with the A1-aquifer zone. If these two water bodies were in direct communication, sustained leachate mounding would not be observed. Water elevation data indicate that leachate elevations are above groundwater elevations and that leachate is "mounded." If the leachate zone was in direct contact with the A1-aquifer, mounding would not likely occur.

- Perimeter groundwater data collected to date do not indicate that contamination is migrating into the A1-aquifer at the landfill boundary. If the aquitard between the A1-aquifer zone and leachate zone was significantly breached, contaminant migration may be more likely. However, the Navy has agreed that additional field work is needed to support or disprove this point.

The physical evidence indicates that the information obtained from interviews may not be completely accurate. However, there is no practical or reliable method that can be used to verify or disprove anecdotal information. Therefore, the Navy will continue to monitor perimeter groundwater for releases of contamination from the landfills.

Assumptions About Current Conditions

Comment 5: *The OU1 FS understates soil hydraulic conductivity measurements from the RI report by factors of up to approximately 10. Therefore, leakage out of the landfills could be 10 times greater than assumed.*

Response: Leakage out of the landfill has been evaluated by analyzing groundwater chemistry data collected from monitoring wells. The information presented regarding measured hydraulic conductivity of surrounding soils was presented as a possible explanation for the lack of contaminant migration.

The underlying soil hydraulic conductivity has not been accurately characterized and the selected remedy accounts for this uncertainty. The groundwater interceptor trench will be designed to protect the SWRP from any migrating contamination. Continual A1-aquifer monitoring data will measure landfill impacts on surrounding groundwater and will monitor whether contamination is being transported into saturated permeable sediments.

The claim that the OU1 FS "*understates soil hydraulic conductivity measurements from the RI report by factors of up to approximately 10*" is unsubstantiated. Pages 14 and 18 of the FS state:

> "The cross sections indicate that silty clays exist between the lower boundary of the landfill refuse and the first water bearing unit (A1-aquifer zone). Twenty-three samples from the landfill borings

were collected and logged from native clays below and surrounding the landfill. Twelve of these samples were tested for porosity and hydraulic conductivity in the laboratory using geotechnical tests.

These data are presented in the OU1 RI report (IT 1993a). Seven locations exhibited conductivities in the $1x10^{-8}$ cm/sec range. Three locations measured $1x10^{-6}$ cm/sec, one location was $1x10^{-9}$ cm/sec at 21 feet below ground surface (bgs) and another taken at 50 feet bgs (from the A2-aquifer zone) was measured at $1x10^{-5}$ cm/sec. The conductivity of soil underneath and surrounding the landfill was also evaluated through soil classification during borehole drilling using the Unified Soil Classification System (USCS).

The soil and groundwater data show that significant clays exists around the landfill. The results indicate that clays below the landfill and above the A1-aquifer zone generally have hydraulic conductivity values in the $1x10^{-8}$ cm/sec range (IT 1993a)."

A review of Table 3.4-1 and paragraph two on page 3-7 in the OU1 RI report (IT 1993a) that summarizes Site 1 geotechnical test results shows that the FS report accurately provides the laboratory data and does not distort RI information.

Comment 6: *Available data, presented in the OU1 FS, indicate that both the Site 1 and Site 2 landfills are leaking. Despite these data, the OU1 FS proposes remedial alternatives that are based on the assumption that the landfills are not leaking.*

Response: Field work will be conducted to further investigate the possibility that contamination is migrating between monitoring wells W1-14 and W1-15 at Site 1.

Chemical data from surrounding perimeter groundwater monitoring wells at Sites 1 and 2 do not indicate remedial alternatives are needed for groundwater. The landfill is most likely the source of infrequent and low detections in perimeter groundwater; however, corrective action is not necessary. Corrective action would not be considered until chemicals were consistently detected in groundwater above water quality objectives developed for the protection of aquatic life. Tables 2 and 6 show that only very low, infrequent detections have occurred.

Assumptions About Future Conditions

Comment 7: *The OU1 FS essentially ignores the importance of the continued operation of the aging Moffett Field subdrain and storm drain system, including the active pumping required at the Building 191 pump station. The proposed remedial alternatives appear to depend on continued operation of the drainage system, but no provision for system operation and maintenance is included in the alternatives.*

Response: Please see the response to Comment 7 in Section 3.2.3.

Design Assumptions

Comment 8: *The OU1 FS does not consider the probable lower cost and better performance that might be obtained by constructing landfill caps that incorporate synthetic "impermeable" membrane layers. Such caps are routinely constructed for landfill closures. Omission of such caps from consideration may result in an unrealistic assessment of the cost-effectiveness of a single-layer soil cap.*

Response: The FS report evaluates the need for low-permeability caps, with the understanding that there are several configurations of layer type and design available. Single-layer caps were found to be more feasible for OU1 than low-permeability caps, regardless of their materials of construction. Rationale for selecting a single layer cap rather than the cap depicted in 23 CCR Chapter 15 (or equivalent) included:

1. A native, single-layer cap reduces infiltration to rates similar to rates achieved by a low-permeability layer due to Moffett Field's climate.

2. Contaminant plumes do not exist and, based on modeling, are not expected to occur in the future. Therefore, minimizing infiltration is not a controlling factor.

3. Employing a low-permeability cap has the potential for increasing horizontal subsurface gas migration.

4. A multilayer, low-permeability cap would be more difficult to construct.

5. A multilayer, low-permeability cap would be more costly.

6. At Site 1, leachate will exist regardless of cap type because refuse is below the water table. In addition, since waste is saturated below the water table, other technologies would be required to mitigate contaminant migration. If contaminant plumes migrate, a multilayer cap would not enhance the effectiveness of hydraulic control or significantly decrease the amount of water requiring extraction and treatment.

7. If hydraulic control is implemented, leachate extraction would increase refuse decomposition, gas generation, and settlement since waste is saturated. Settlement can compromise the integrity of the barrier layer.

However, as a result of regulatory agency review during the public comment period, the Navy has agreed to revise the proposed plan to incorporate landfill caps that more clearly meet established state standards and are more consistent with local landfill caps.

Comment 9: *The OU1 FS appears to understate typical minimum requirements for landfill cap hydraulic conductivities by a factor of 10 to 100, depending on which criteria are used to determine the appropriate cap characteristics. Therefore, the proposed caps may leak more than some minimum standard caps.*

Response: The Navy has agreed to include low-permeability caps constructed with a hydraulic conductivity at least as low as native soils beneath the landfills.

Comment 10: *The OU1 FS indicates that there is little difference between the performance of a single-layer soil cap and a multilayer cap designed to meet hazardous waste site closure requirements. However, review of the specifications of the multilayer cap used in the comparison modeling reveals that the proposed multilayer cap incorporates unrealistic design assumptions, such as an inadequate internal drainage layer, and does not meet typical minimum requirements for such caps.*

Response: Regulatory agency review during the public comment period has resulted in the Navy revising the proposed plan to incorporate landfill caps that more clearly meet established state standards, at a cost increase of $1,772,000.

Regulatory Compliance and Financial Security Assumptions

Comment 11: *The OU1 FS does not appear to provide expressly for the continued funding of remedial activities such as Moffett Field drainage system operation and maintenance. This is important in light of recent Navy statements implying limits on the Navy's ability or willingness to ensure future funding.*

Response: The Navy does not have direct control over long-term funding for environmental restoration at Moffett Field. Budgets are proposed by NAVFAC headquarters in Washington D.C. and are approved as part of a total budget package each year by Congress and the President. While congressional actions cannot be anticipated, NAVFAC will uphold their responsibility to request the necessary money for the upcoming fiscal year's environmental restoration work.

Comment 12: *The proposed landfill caps do not meet typical minimum requirements for hazardous waste landfills. The FS proposes to treat the landfills as nonhazardous, despite information indicating substantial hazardous waste disposal in the landfills, and with only a minimal field sampling program to verify refuse, leachate, and groundwater quality.*

Response: Hazardous waste landfill closure regulations are not applicable to OU1. Title 14 CCR solid waste landfill closure regulations have been identified as applicable by CIWMB. Documentation received from CIWMB indicates that Site 1 was operated as a solid waste facility. The Navy was issued a Solid Waste Facilities Permit for Site 1 by Santa Clara County Environmental Agency. The permit states that the types of waste received at the site include cardboard, lawn cuttings, prunings, wood waste, and asbestos insulation wrapped in double plastic bags. The permit also states that the disposal of hazardous waste was to be prohibited at the facility.

Some of the wastes at the OU1 landfills may contain hazardous constituents; however, this circumstance is common to all solid waste and CERCLA landfills. Compliance with solid waste monitoring and closure regulations will protect human health and the environment. Further, low contaminant concentrations in leachate show that a minimal threat from hazardous substances exists at OU1. Maximum detected concentrations are

below maximum concentrations given for the toxicity characteristic in 40 CFR Part 261.24. This further supports the assumption that OU1 landfills were operated like solid waste landfills and received similar types of wastes (solid waste with small amounts of hazardous constituents). Also, visible surface debris includes obvious construction and demolition debris, such as concrete rubble with reinforcing steel, asphalt chunks, wire, wood chips, glass, and mounds of dirt overgrown with weeds (possibly street sweepings), which are similar to solid waste landfill waste. For these reasons, the Navy identified 23 CCR groundwater monitoring requirements and 14 CCR closure regulations as most appropriate for OU1. CIWMB concurred that these regulations are applicable for OU1 closure.

Comment 13: *Evidence presented at the OU1 FS public meeting indicated that Site 2 still may be receiving waste.*

Response: In July 1995, the Navy investigated recent waste disposal at Site 2 and found that soil piles (presumably from dredging activity) and landscaping debris (such as tree limbs) have been recently dumped at Site 2 by the current landowner. The Navy has undertaken administrative action to prevent this from occurring in the future.

Summary

The THE Committee supports Navy and regulatory agency efforts to close the OU1 landfills expeditiously, cost-effectively, and in an environmentally protective manner. However, to achieve these goals, the concerns described above should be addressed.

3.2.5 **Comments from the Santa Clara Valley Water District,** compiled by Thomas I. Iwamura, Engineering Geologist

Comment 1: *Site Characterization of Site 1. On page 14 under Site 1 Hydrogeology, the statement that water level elevations within the landfill indicate that refuse is saturated is contradicted by the following sentence which says approximately the bottom one-third of Site 1 is saturated.*

Response: The sentence about the bottom one-third of Site 1 is saturated is correct.

Comment 2: *Site Characterization of Site 1: The discussion under Hydrogeology, page 18, and under Leachate Migration, page 74, indicate soil and groundwater data show that significant clays exist around the landfill. This combined with laboratory permeability tests on "undisturbed" soil samples, differences in potential piezometric heads within the different components of the groundwater bodies delineated by restrictive flow, and finding limited evidence of lateral migration of leachates lead to the conclusion that there appears to be no leachate migration from the Site 1 landfill. This conclusion has not been substantiated, as:*

Comment 2a: *The cross section presented as Figures 5, 6, and 7 show aquifers within the clay deposits have separations through clay beds at the site as little as 4 feet to the A1 aquifer. The occurrence of the next deeper aquifer layer (A2 aquifer) was not explored as borings depth was terminated a few feet below the A1 aquifer.*

Response: The 4-foot thickness could act as an aquitard and effectively separate the leachate zone from the A1-aquifer. This separation may not be complete, but based on information obtained from the current groundwater monitoring network, the existence of these clays may partially explain the lack of contaminant migration observed at Site 1. The existence of these clays, the low source concentrations, and contaminant retardation may be responsible for the lack of contaminant migration. The Navy will conduct additional field work to further investigate potential contaminant migration at Site 1.

An extensive investigation into the groundwater quality of the A2-aquifer beneath Site 1 has not been conducted because of information obtained from the A1-aquifer. Groundwater quality data from the A1-aquifer do not indicate that the A1-aquifer requires remediation. Therefore, it is assumed that the A2-aquifer, B-aquifer, and C-aquifer also do not require remediation as a result of Site 1. However, should future monitoring data or future field investigations indicate the A1-aquifer requires remediation, then potential impacts to the A2-aquifer will be investigated.

Comment 2b: *Laboratory permeability determinations of clay samples usually understate the true permeability as the samples become compacted during the sampling process. Furthermore, they represent very small sampling within a vast system, often overlooking potential natural "defects" within a block of soil.*

Response: The permeability of underlying soils has not been fully characterized. Extensive sampling or excavation would be required if it was necessary to completely characterize the soil beneath the landfill. However, this information is not necessary and the Navy does not assume that clay layers beneath the landfills are continuous. The information from the limited soil investigations offered a possible explanation for the lack of evidence of contaminant migration. However, it would be difficult to prove conclusively that naturally occurring barriers to groundwater movement exist. Therefore, because it is not known conclusively, continual groundwater monitoring is proposed. In addition, the Navy will conduct more field work to further investigate potential contaminant migration.

Comment 2c: *The delineation of two separate groundwater bodies as depicted on Figures 12, leachate potentiometric surface, and 13, A1 aquifer potentiometric surface, has not been substantiated. The leachate potentiometric surface map was interpreted by using wells constructed within the landfill and the A1 aquifer potentiometric map was interpreted by using wells only along the edges of the landfill. The distinction of the two groundwater bodies cannot be made without constructing a monitoring well within the A1 aquifer beneath the landfill to determine if a common groundwater body exists with a groundwater mound occurring within the landfill, as an alternative scenario. Such an alternative common aquifer scenario is depicted in Figures 5, 6, 7, and 11, showing a common connected groundwater body with a mound within the landfill. This would imply the clay deposits are leaky.*

Aquifer tests conducted for the OU5 RI indicated this clay cap overlying the A1 aquifer in the general site area to be leaky. The Santa Clara Valley Water District (District) had also performed aquifer tests in the Palo Alto flood basin area (a similar Bay estuarine area) and also found the clay cap and the next lower aquitard to be leaky. Studies of contaminant discharges in Silicon Valley and in areas bordering the baylands have also indicated the clay cap and the next intervening aquitard to be leaky.

Response: Conclusions regarding the integrity of the aquitard between the leachate zone and the A1-aquifer have not been substantiated and the aquitard may leak. However, groundwater analytical data and groundwater elevations presented in the FS indicate that the aquitard does not significantly leak and contaminant migration is retarded.

However, because aquitard integrity is not fully characterized, continual groundwater monitoring is proposed. In addition, the Navy will conduct additional field work to further investigate whether contaminant migration is occurring.

Comment 2d: *Hydrographs of groundwater levels in monitoring wells along the edges of the Site 1 landfill in the A1 aquifer shown as Figure 8A and the monitoring wells completed in the landfill refuse shown as Figure 8C show a close tracking of fluctuations indicating that the two bodies of groundwater to be connected. They both show highest levels in the spring of the year the lowest in the fall of the year. They also indicate that the groundwater mound that accumulated in the landfill (as leachate) culminating in highest levels in the spring leaks out of the landfill reaching their lowest levels in fall.*

Response: The Navy agrees that the hydrographs from wells inside the landfill fluctuate similarly as compared to A1-aquifer zone wells and that this indicates that the leachate zone and A1-aquifer zone may be hydraulically connected. Other information indicates that the connection is not significant and that there is little contaminant movement. For example, A1-aquifer monitoring well W1-12 was installed through the SWRP basin. Groundwater elevations from W1-12 and surface water elevations from the pond staff gauge indicate the A1-aquifer is at a higher pressure and is confined. In addition, hydrographs show that leachate elevations are consistently above groundwater elevations, indicating that the two water bodies are responding similarly to precipitation, and that there is a sustained gradient. This information, and more importantly, the lack of chemical data showing contaminant migration, has led the Navy to believe that the two water bodies are not significantly in communication. However, because it is not known conclusively, continual groundwater monitoring is proposed. In addition, the Navy will conduct additional field work to further evaluate whether contaminant migration is occurring.

Comment 3: *<u>Site Characterization of Site 1</u>: We believe that further studies should have been conducted at Site 1, in particularly to the testing of the clay cap and the A1 aquifer beneath the landfill, and, if required, of the A2 aquifer beneath the landfill.*

In addition, further exploration should be performed along the south side of the Site 1 landfill between monitoring wells W1-14 and W1-15, a downgradient area lacking

characterization. This is to check possible southward leachate migration (refer to Figure 13). A permanent monitoring well in the A1 aquifer is required and possibly another separate well sensing the A2 aquifer may be required.

Although it could be concluded that the A1 aquifer is contaminated by saltwater intrusion at Site 1, certain contamination in the leachate still has the potential to affect the baylands ecosystem. Furthermore, the condition of the A2-aquifer beneath the site area is yet unknown.

Response: Although additional information regarding the aquitard beneath the landfill would be helpful, it is not necessary. The Navy's approach to investigating landfills has been to focus on evaluating whether contamination is migrating from the landfill. The Navy will conduct additional field work to investigate whether contamination is leaving the landfill and migrating in groundwater between monitoring wells W1-14 and W1-15. A phased approach will be used for this investigation. If impacts to the A1-aquifer are discovered, the A2-aquifer will then be investigated as well. In addition, a subsurface groundwater collection trench has been proposed to protect potential ecological receptors in the SWRP.

Comment 4: *Site Characterization of Site 2. On page 50 under Site 2 Hydrogeology, the text indicates that similar conditions as Site 1 exist in that nearly impermeable clay beds occur beneath the landfill. However, there appear to be no mounding of groundwater within the landfill as at Site 1. Groundwater levels occur at the bottom of the landfill as Site 2 is located adjacent to the drainage pumping station at Building 191. Again, as at Site 1, the integrity of the clay beds to be nearly impermeable has not been substantiated. As at Site 1, the hydrographs in the A1 aquifer (Figure 21) and leachate levels (Figure 22) appear to fluctuate coincidentally, indicating a common groundwater body. Leachate (and also groundwater) fluctuating from a yearly highest level in the spring to lowest levels in the fall indicate leachate is migrating from the landfill. Any plume migration in the A1 aquifer would be controlled by drainage pumping at Building 191.*

Response: At Site 2, there is no mounding, it does not appear that there is a separate leachate zone, and most refuse is not saturated. Contaminant migration at Site 2 can be

controlled by pumping at Building 191. Please see the response to Comment 2 regarding the integrity of underlying soils.

Comment 5: Site Characterization of Site 2. *The report states on page 55 that borehole logs and associated cross sections also show that there is inert fill soil (sand and gravel) devoid of refuse located below the water table within landfill boundaries. However, on Figure 18, borehole W2-10 shows refuse below the water table atop a silty sand aquifer bed (A1 aquifer). Refuse characterized in boring W2-10 indicated metal inclusions, tar, petroleum odor, and polychlorinated biphenyls at 28,000 parts per billion (ppb). Arsenic was noted to be 1,830 ppb in the leachate. Nearby monitoring well W2-8 indicates a relatively high vinyl chloride content of 120 ppb in the leachate (Appendix B).*

Response: Borehole W2-10 does show refuse located below the water table, as indicated on page 50 of the FS report. Monitoring well W2-10 is considered a leachate monitoring well and detections from this well do not require remediation for groundwater.

Comment 6: Site Characterization of Site 2. *The A2-aquifer was not explored beneath the landfill. Monitoring well W2-7, located on the eastern edge of the landfill, is completed in the A2 aquifer but we were unable to find any analytical datum for this well in Appendix C. This well may be located on the upgradient side of the landfill.*

Response: Monitoring data show that well W2-7 is upgradient from the landfill. A2-aquifer monitoring data was not presented in the FS because A1-aquifer impacts have not been evident. However, the OU5 RI report (IT 1993b) contains A2-aquifer data. Should future impacts occur, the A2-aquifer will be investigated accordingly.

Comment 7: Site Characterization of Site 2. *Lateral plume migration away from the site through the A1 aquifer generally has not been apparent. The A1 and A2 aquifer beneath the landfill are yet to be tested.*

Response: Investigations have focused on lateral migration in the A1-aquifer. This is the most likely aquifer to be impacted by the OU1 landfills since it is the closest aquifer to the landfill refuse. The horizontal gradient at Site 2 is relatively large as a result of

Building 191's strong influence. Also, the hydraulic conductivity is typically an order of magnitude larger in the lateral direction. Therefore, the horizontal groundwater flow is likely much larger than the vertical flow. The Navy believes that lateral migration will occur in the A1-aquifer before contamination (1) migrates vertically down to the A2-aquifer and then (2) migrates laterally to the landfill perimeter through the A2-aquifer.

Comment 8: *Remedial Plan for Sites 1 and 2. We believe capping of the sites along with attendant gas interceptor trench, groundwater collection trench, and a monitoring program would serve as an appropriate remedy for Sites 1 and 2. In as much as there appear to be uncertainties in possible inclusions of hazardous materials in the landfill and incomplete characterization of the sites, we believe a cap with the greatest optimal performance be installed. In addition, the monitoring gap at Site 1 between wells W1-14 and W1-14 and W1-15 would have to be remedied.*

Response: The Navy has agreed to revise the cap design to include an impermeable layer that may further limit infiltration into the landfills. The Navy will also investigate the monitoring gap at Site 1 between wells W1-14 and W1-15.

Comment 9: *Long-term Pumping at Building 191. We believe the Navy should provide assurances that the drainage pumping at Building 191 be sustained in order to provide long-term effectiveness of the remedy. Long-term pumping would also be required for the effectiveness of mitigation proposed for other OUs on the base.*

Response: Pumping at Building 191 will be continued as necessary to provide for long-term effectiveness of the remedy. A review of the remedy and lift station operation will be conducted periodically to ensure that the remedy continues to provide adequate protection of human health and the environment.

Comment 10: *Although it is the District's desire that implementation of the final remedy be initiated as soon as possible, we believe our concerns should be appropriately addressed or the FS be appropriately amended first.*

Response: Please see the response to Comment 8.

Comment 11: *We are also represented on the RAB and on the THE Committee of the RAB. We substantially concur with the comments brought forth by the THE Committee for the OU1 FS.*

Response: Please see the response to the RAB and RAB THE committee comments.

3.2.6 Comments from RAB Members

Mr. David C. Glick

Comment 1: *The FS directly conflicts with historic evidence and with the findings of previous investigations regarding the base of the Site 1 landfill and, as presented, is misleading at best regarding the communication of the landfill and the underlying aquifer:*

Comment 1A: *First paragraph on page 13 states that the excavation for the landfill reportedly extended in depth from 2- to 21-feet below msl; however, the cross-sections (Figures 5-7) which appear to be based solely on the monitoring well logs only characterize the landfill to 11- to 13-feet below msl.*

Response: No records were kept regarding the initial depth of any excavations at Site 1. The information included in the text was obtained from interviewing base personnel during IAS activities. The physical evidence collected during the OU1 RI/FS does not confirm that the depth of refuse extends 21 feet below msl at Site 1. The physical evidence regarding landfill depth is summarized below.

- Nine borings have been extended through Site 1 landfill refuse. The maximum refuse depth has been measured at 12.9 feet below msl at boring W1-11(F).
- In addition to borings through the landfill, the Navy conducted an electrical resistivity survey to locate the base of the landfill. The survey did not support the more reliable borehole logs. Survey results indicated that the landfill base is approximately 5 to 10 feet shallower than found in borings. The electrical resistivity information was not mentioned in the FS report since it did not accurately depict boundaries relative to soil boring information. However, the RI report discusses the results in detail (IT 1993a).
- If refuse extended 21 feet below msl, data indicate that the leachate zone would be in direct contact and communication with the A1-aquifer zone. If these two water bodies were in direct communication, sustained leachate mounding would not be observed. Water elevation data indicate that leachate elevations are

above groundwater elevations and that leachate is "mounded." If the leachate zone was in direct contact with the A1-aquifer, mounding would not likely occur.

- Perimeter groundwater data collected to date do not indicate that contamination is migrating into the A1-aquifer at the landfill boundary. If the aquitard between the A1-aquifer zone and leachate zone was significantly breached, contaminant migration may be more likely. However, the Navy will conduct additional field work to address data gaps.

The physical evidence indicates that the information obtained from interviews may not be completely accurate. However, there is no practical or reliable method that can be used to verify or disprove anecdotal information. Therefore, the Navy will continue to monitor perimeter groundwater for releases of contamination from the landfills.

Comment 1B: *The cross-section on Figures 5-7 indicate the base of the landfill to be a 11- to 13-feet below msl with a clay layer underlying the fill material and overlying the A-1 aquifer which is depicted to be at 14- to 20-feet below msl. If the original reported depth of the landfill is up to 21-feet than based on this data the landfill does in fact intercept to A-1 aquifer and there very likely is direct communication between the leachate and the ground water. Figure 11, although only a concept model, provides and exaggerated thickness of clay beneath the landfill.*

Response: Please see the response to Comment 1A. Even if portions of the refuse zone extended 21 feet below msl, groundwater monitoring data collected to date indicate that this characteristic is not resulting in contaminant migration. Again, the Navy has agreed to conduct additional field work before this conclusion can be supported. If contaminant migration is found during the additional investigation, the Navy will address the contaminated groundwater plume. If additional field investigation results confirm previous conclusions regarding migration, continual groundwater monitoring is the appropriate action, regardless of whether anecdotal information is true and refuse extends 21 feet below msl.

Comment 1C: *The third paragraph on page 25 suggests that Monitoring Well W1-11 characterize the groundwater conditions with respect to the landfill, leachate, and the former surface water channel; however, the data provided in Figures 6 and 7 suggest that the well is screened entirely within the landfill material and does not depict the channel at all.*

Response: The text is incorrect. The cross section is based on information from borelog W1-11. The borelog indicates that W1-11 is screened in refuse and that W1-11 characterizes leachate.

Comment 1D: The second paragraph on page 27 indicates that borings were advanced along the former drainage channel where the channel intersects the boundaries of the landfill; however, this is not depicted on Figure 4 which suggests an absence of perimeter channel borings.

Response: Unfortunately, these two monitoring points were inadvertently omitted from Figure 4. The perimeter channel borings do, however, exist.

Comment 2: Since actual and/or potential communication of the Site 1 landfill leachate with the underlying shallow A1-aquifer groundwater is significant to characterization of the landfill, in the assumptions and results of the health risk analysis, and in the closure design, it is imperative that the issue of the vertical and lateral extent of the landfill be resolved prior to proceeding with closure design.

Response: The actual or potential communication of the leachate and A1-aquifer will continue to be evaluated through additional field investigation and continual groundwater monitoring. Please see the response to Comment 1 regarding vertical extent of refuse. Regarding the horizontal extent, the Navy will dig trenches to confirm landfill boundaries.

Comment 3: There appears to be a significant difference in the hydraulic data presented in the FS for the Site 1 landfill and the text of the FS and previously presented reports:

(A) Figure 12 clearly illustrates that the hydraulic conditions of the leachate have not been fully characterized with a significant absence of data along the entire southern extent of the landfill. In fact, the data suggests direct capture of the leachate with flow of the leachate/groundwater to the south beneath the landfill.

(B) *Figure 13 depicts the direction of groundwater flow within the A-1 aquifer beneath the landfill and adjacent areas and supports the argument that the site hydrology is directly influenced by the existing airfield drainage system. The flow path for groundwater beneath the landfill is southerly between Monitoring Well W1-14 and Monitoring Well W1-15 where there is a complete absence of leachate and groundwater monitoring. These conditions contradict the claim of assurance by PRC that there is no off-site migration of leachate and that groundwater has not been impacted.*

(C) *The fourth paragraph on page 35 addresses the direct/potential migration of leachate from the landfill to the A1-aquifer groundwater supporting the argument that the landfill and A1-hydraulic characteristics have not been fully documented with direct attention to the southern boundary.*

Response: The Navy will conduct additional field work to investigate the presence of contamination migrating past the southern landfill boundary.

Comment 4: *The groundwater data presented in Figure 13 and in previous reports illustrate that the existing airfield drainage system is a primary hydraulic control for the A-1 aquifer and has a direct impact on the southerly migration of the landfill leachate. The significance of this man-made hydraulic control seems to have been discounted by PRC in consideration for closure and any change (either a decrease or increase in pumping of groundwater) will have a direct impact on the hydraulic conditions beneath (and possibly within) the Site 1 landfill. Since hydraulic control of the landfill leachate and protection of the underlying groundwater are primary functions of the closure, maintenance of the man-made hydraulic controls must be accounted for in the closure design and reflected in the cost allocations.*

Response: The ROD adequately states the necessary performance standards of the remedy. The operation of the pump station (as a man-made hydraulic control) will be accounted for in the closure design. Because the pump station is operated and maintained by NASA as an essential aspect of their current land use, the O&M cost need not be reflected in the cost allocations for the Navy's remedy selection.

Comment 5: *The analytical test data indicate that contaminated sediments exist beyond the currently identified boundaries of the Site 1 landfill. This would suggest that the lateral extent of the landfill has not been fully determined. It is recommended that some shallow exploratory trenches be advanced around the perimeter area to assure that the boundaries of the landfill have been confirmed and that the ensuing closure plan account for the revised landfill configuration.*

Response: The Navy will dig exploratory trenches along the landfill boundaries to confirm the boundary location.

Comment 6: *The last paragraph on page 44 indicates that "It can not be confirmed that TPH compounds have migrated from the landfill to the SWRP." Understanding the data presented, it is recommended that additional sampling points be established within and beyond the landfill boundary to further evaluate. In absence of such data it should be concluded that these compounds have migrated and that there is a mechanism and pathway for future leachate migration.*

Response: The Navy has proposed a groundwater collection trench to be located between the landfill and the SWRP. This trench will be sampled and, if contamination is migrating above AWQC, corrective action will ensue.

Comment 7: *The closure design includes a leachate interceptor trench along the northern boundaries of the landfill; however, based on the hydraulic data presented the groundwater and leachate migrate southerly beneath the landfill toward the airfield drainage system. Therefore, this interceptor trench is located "up-gradient" of the landfill and has no practical use for monitoring as designed with the exception of political/public perception.*

Response: The interceptor trench is not located upgradient of leachate and may have a practical use. The leachate is mounded above the A1-aquifer and the SWRP at Site 1 and there is a radially outward gradient from the leachate zone to the SWRP. The SWRP is downgradient from leachate. The A1-aquifer generally flows from north to south, however, the A1-aquifer is not located between the leachate zone and the pond. The comment suggests that if contamination migrates past landfill boundaries, it can only

migrate straight down through predominantly clayey soils into the aquifer and proceed south in the A1-aquifer. However, contamination may also migrate from the landfill to the pond through sand stringers that may be located in the clay. The interceptor trench was proposed because (1) the Navy realizes that the clay may not be completely continuous between the landfill and the pond, (2) there is a gradient from the landfill to the pond, and (3) the leachate-SWRP exposure pathway is the only viable exposure pathway associated with leachate contaminant migration at Site 1. The Navy will conduct additional field work to investigate contaminant migration to the southwest.

Comment 8: *Section 1.3.5 confirms that the northern perimeter drainage system connected to the pump lift station (Building 191) has direct influence on the groundwater conditions at Site 2 and as such any change or termination in pumping will result in direct impact to the groundwater and leachate conditions of the landfill. It is therefore restated that the groundwater control of Building 191 be a direct line item of the closure plan.*

Response: Please see the response to Comment 7 in Section 3.2.3.

Comment 9: *There appears to be conflicting arguments in the text regarding sporadic detection of leachate compounds in the Site 2 perimeter monitoring wells which is interpreted by PRC that there is direct connection of the leachate with the A-1 aquifer groundwater. The conclusions presented on page 64 indicate that contaminants are not emanating from the landfill. The documented contribution of barium to the groundwater from the leachate as presented on page 65 further supports hydraulic connections to the A1-aquifer. If the monitoring has detected leachate compounds in the perimeter wells in the past, although not at the frequency for regulatory controls to be enforced, then these migratory pathways must be considered for the future and not casually avoided in the closure design assumptions/parameters.*

Response: Migration pathways are being considered. Continual groundwater monitoring is proposed to identify any potential future impacts and to further evaluate inorganic concentrations in groundwater.

Comment 10: *The conclusion that "no contaminant plumes are emanating from either landfill" as stated at the end of the first paragraph on page 74 is not consistent with the data and*

discussions presented elsewhere in the report or in the following paragraph which states that leachate chemicals have been detected in surrounding groundwater monitoring wells. Although there may not be "significant hazardous waste streams" or "slugs" flowing from either landfill, there is strong evidence that the leachate at both sites is migrating and is in communication with the A1-aquifer groundwater.

Response: The landfill is probably the source of the infrequent and low detections; however, corrective action is not necessary. Corrective action would not be considered until chemicals were consistently detected in groundwater at concentrations exceeding water quality objectives developed for the protection of aquatic life. Tables 2 and 6 show that only very low, infrequent detections have occurred.

Comment 11: There is an absence of data for both sites in reference to potential impacts to the A2-aquifer. Continued consideration that the A1-aquifer has not been impacted, which has not been definitively proven, does not preclude investigation of the A2-aquifer. This issue is significant with respect to Site 1 which has demonstrated historic evidence of downward (vertical) gradients within the A1-aquifer and at Site 2 where leachate compounds have been detected in the A1-aquifer.

Response: A phased approach has been employed which focuses on investigating lateral migration into the A1 aquifer. This is the most likely aquifer to be impacted by the OU1 landfills since it is closest to the landfill refuse. The Navy's approach has been to investigate the A1-aquifer, and if contamination is found, then investigate the A2-aquifer. Regarding vertical gradients, the comment states that Site 1 has demonstrated historic evidence of downward (vertical) gradients within the A1-aquifer. This statement has not been supported. The Navy has compared data from W1-7 (an A2-aquifer well) to an extrapolated A1-aquifer potentiometric surface and found that upward gradients may exist.

Comment 12: In preliminary review, it appears that minor modifications to Alternative 2 (using a synthetic fabric liner) would provide greater assurance of closure with significant cost savings to the Navy. The cost estimates as presented appear to overestimate the construction cost for the closure earthwork activities and underestimates the availability of competent contractors for this type of construction.

Response: The Navy has agreed to modify Alternative 2 to include a low-permeability liner. The Navy anticipates that this modification will increase costs by $1,772,000.

Comment 13: *The construction cost data appears to be direct labor, material, or equipment charges and does not appear to include items as: indirect charges, benefits, overhead, or profit related to the construction, indirect charges for consulting activities, or projected inflation. Cost data should be reviewed/prepared with same considerations of other government cost estimates. If the Navy will be responsible for continued community involvement during the 30-year postclosure period (for example, public meetings, newsletters, etc.) than the cost involved for the Navy and the Navy's contractors should be considered as a line-item.*

Response: The purpose of the cost estimate is to compare alternatives. Items common to all alternatives have little impact on the analysis. The cost estimates were prepared in accordance with EPA guidance (1988) and is accurate to plus 50 percent-minus 30 percent.

Comment 14: *The cost estimates for monitoring reports appears low compared to the actual data analysis, discussions, modeling updates, communication/conferences, etc. which will likely be involved during the life of the project (excluding the reproduction charges).*

Response: Please see the response to Comment 13.

Comment 15: *It is recommended that the site closure designs be reviewed with the consideration that leachate migration has and will occur at both sites and that a leachate control system be included in the design.*

Response: An interceptor trench and continual groundwater monitoring have been included in the design to guard against impacts from potential future migration. However, based on current data, additional leachate control systems are not necessary at this time. To efficiently allocate limited resources, the Navy should not implement additional leachate control unless necessary.

Ms. Cynthia Sievers

Comment 1: *Closing the Moffett Field Landfills, A Suggested Logical Approach*

Step 1: Place OU1 FS "on hold"

Rationale:

- *Comments indicate additional data needed for remedy*
- *No pressing use for the land involved*
- *Current data doesn't seem to indicate any immediate threat to human health requiring immediate action related to closures.*

Step 2:

a. *Expand OU1 to incorporate other two landfills*
b. *Conduct additional investigation at Sites 1 and 2 including:*

i. *Add monitoring wells to cover "gap" at Site 1 Landfill*
ii. *Trench to better define perimeter of Sites 1 and 2*
iii. *Revisit analysis of depth and base material as per questions raised by draft FS*
iv. *Investigate ramifications of pistol range at Site 1*

c. *Initiate accelerated contracting process for work on other landfills*
d. *Define perimeters of other landfills*
e. *Further investigate materials disposed of in which landfill by:*

i. *Re-interviewing base personnel to determine which landfill they referred to calling disposal at "the" landfill*
ii. *Reviewing manifests of hazardous materials disposed from time Navy began manifesting used solvents, PCBs, etc. to off-base sites to better understand exactly what materials and quantities were being generated at a particular time*
iii. *Reviewing solid waste disposal contracts for similar data re: solid waste*
iv. *Reviewing golf course history as it relates to landfill usage*

f. *Incorporate risk data and ecological study data into designing remedies*

Rationale: Remedies can be developed regarding cap design(s), monitoring systems, need for cutoff walls, leachate management, methane management, and long-term general management based upon better understanding of:

- *Size and shape of landfills*
- *Groundwater flow as it relates to base material in landfills*
- *Integrity of landfills regarding leakage*
- *Actual location of landfills and materials to be managed*
- *Risk to human and ecological receptors*
- *Possible reduced costs due to economies of scale*

Response: The overall strategy of capping the landfills, installing a gas interceptor trench, installing a groundwater collection trench, and continuing groundwater and gas monitoring (with corrective action contingencies) is an adequate and cost-effective approach to address the OU1 landfills; placing OU1 activities on hold is not necessary. The Navy will conduct additional field work to further investigate the potential for contaminant migration at Site 1. The outcome of this investigation will not influence the cap selection since the Navy has also agreed to include low-permeability caps constructed with a hydraulic conductivity less than $1x10^{-6}$ cm/sec. Therefore, OU1 activities can proceed with only minor modifications to the current schedule.

3.2.7 Comments from the League of Women Voters

The LWV of Los Altos, Los Altos Hills and Mountain View and of Sunnyvale-Cupertino know that the Navy is committed to meeting community standards as you proceed with environmental cleanup activities at Moffett Field. Community standards are high here. For the following reasons, the Federal government, the State of California, and local regulatory agencies have held polluters to a high standard of cleanup and remediation in Santa Clara County:

- *Santa Clara County is the only urban county in California that relies upon groundwater for 50% of our drinking water. The Santa Clara Valley Water District is internationally known for its expertise in groundwater recharge, utilizing our vast underground aquifer system as a water bank.*

- *The southern end of San Francisco Bay south of Dumbarton Bridge is a unique ecological resource. Here the Bay is shallow with little flushing action either from tides or from heavy fresh water runoff, hence pollutants tend to build up in Bay sediments and wetlands. Since the South Bay is a major stop on the Pacific Flyway for migrating birds, the ecological health of the South Bay has far-ranging importance to not only the birds and the fish but to the food chain which supports them. While the San Francisco Bay is one of the world's great estuary systems, the South Bay may well be its most fragile component.*

In light of the above circumstances, local government and private industry in Santa Clara County lead the nation in investigating hazardous material spills, designing remediation and prevention strategies, studying aquifers, and in expending millions if not billions of dollars to cleanup past mistakes and to

prevent future ones. Most federal laws and regulations relating to leaking underground storage tanks, toxic gas management, and groundwater protection began here.

The LWV believes the OU1 FS is inadequate. Data gaps will not allow an appropriate design to be developed unless adequate answers to the following questions are incorporated.

Comment 1: *Site Investigation Questions. What additional steps will be taken in the design phase to better define the outer perimeter boundaries of Sites 1 and 2? What additional trenching and/or borings will be conducted in order to determine the lateral extent of the landfills prior to design of cap, leachate collection systems, and monitoring systems?*

Response: The Navy will dig trenches to confirm the boundaries of the OU1 landfills.

Comment 2: *Site Investigation Questions. What criteria will the Navy use to conclude that boundaries of the sites have been reached (for example, no longer finding PCBs in the soil)?*

Response: The Navy will excavate trenches parallel to the currently estimated boundary at locations where the boundary is questionable. The Navy will visually examine excavated soils to determine whether the trench is within the landfill boundary. If native soils are present, the Navy will conclude that the trench is outside the landfill.

Comment 3: *Site Investigation Questions. Does the pistol range on the site present lead contamination problems or the danger to cap construction personnel from either soil contaminated lead or from possible live ammunition?*

Response: Lead contamination at the landfill surface has not been characterized. This information is not needed to implement capping at the landfills. During cap construction, heavy equipment could generate fugitive dust emissions. Construction workers will mitigate any potential hazards by using PPE such as respirators. In addition, dust suppression strategies, such as wind speed alarms can be implemented to reduce fugitive dust emissions. Unexploded ordnance has not been found at Site 1 during site investigations.

Comment 4: *Site Investigation Questions. The OU1 RI cited specific amounts of various hazardous materials that were buried in the landfills. This detail is missing from the OU1 FS. How does the Navy explain what happened to the following hazardous wastes disposed of in the Site 1 Landfill according to the OU1 RI:*

- *110,000 gallons of TCE, toluene, MEK, and solvents*
- *368,000 pounds of ash*
- *16,000 pounds of asbestos*
- *24,000 gallons of paint, lacquer, and thinner*
- *51,000 gallons of jet fuels*
- *3,300 gallons of waste oil in 55-gallon drums*
- *12,000 gallons of used lubricant oil*
- *1,260 gallons of transformer oil*
- *580 transformer filters*
- *Sawdust contaminated with transformer oil?*

Similarly, what has happened at the Site 2 Landfill to hazardous wastes disposed of there according to the OU1 RI:

- *75,000 to 150,000 gallons of TCE, toluene, MEK, and solvents*
- *69,000 pounds of ash*
- *16,000 pounds of asbestos*
- *43,500 gallons of paints, lacquer, and thinners*
- *Unknown amount of waste oil buried in 55 gallon drums*
- *Unknown amounts of used lube oil*
- *1,440 filters with fuel sludge, lead compounds and rust*
- *870 gallons of transformer oil*
- *Unknown amounts of transformer oil filters*
- *Unknown amount of sawdust contaminated with transformer oils possibly contaminated with PCBs?*

Response: The above-listed estimates were originally presented in the IAS and transferred to the RI. All of the information regarding types and quantities of waste disposed at the landfills were obtained from personal communications with current or previous staff at Moffett Field. Confirming the accuracy of this anecdotal information is extremely difficult at OU1. No documentation or disposal records were kept for the landfills and it is impossible to verify any information obtained from interviews without actively excavating the landfills. A fate and transport analysis would have little value since the waste could have been disposed in drums.

To address this concern, the Navy has (1) reviewed the IAS (NEESA 1984) and examined the basis for the assumptions regarding disposal, (2) identified approaches in EPA guidance (EPA 1991, 1993) regarding similar circumstances since these circumstances are common to many landfills, and (3) considered additional remediation strategies that regard anecdotal information as potentially accurate.

One explanation for the differing information in the IAS and collected data is that the IAS is not accurate. To evaluate this further, the following paragraphs contain a summary of the IAS and places emphasis on the basis for assumptions made.

The IAS contains an extensive survey of waste generation rates and disposal practices at Moffett Field from the 1930s to the early 1980s. The information is based on record searches, on-site surveys, and civilian and military personnel interviews. The IAS presents waste generation rates from different groups that have resided at Moffett Field, most notably Public Works, P-3 Orion patrol squadrons and jet squadrons, aircraft intermediate maintenance departments, and general operations (such as the fire department, photography lab, and naval exchange gas station). Of these groups, Public Works and the squadrons reportedly used the landfills for waste disposal. Waste disposal at the landfills from Public Works and the squadrons are summarized below from the IAS.

Public Works operated, maintained, and repaired buildings, structures, and other facilities at Moffett Field. Public Works is comprised of metal and welding shops, paint shops, utilities shops, electrical shops, pipe shops, the steam plant, the building trades shop, the transportation division, and the pesticide shop. Of these shops and divisions, the paint shop, the electrical shop, the pipe shop, and utilities shop disposed of waste at the landfills.

According to the IAS, the paint shop had an area of Site 2 reserved for paint shop waste. Paints and thinners were disposed in cans, as it was easier to dispose of wastes in barrels at the shop rather than on the ground. The paint shop staff never observed pools of liquid or chemical smells at the landfills.

The electrical shop reportedly used paper elements to filter oil from transformers. The crews used about seven to eight filters in a filter press and filtered about two to three 20- to 30-gallon capacity transformers per month in the summer. The shop generated a few dozen filters per year, as well as small amounts of sawdust used to soak up spilled transformer oil. The filtering was done on site and the filters were dried in an oven. The electrical shop reportedly used the landfills only for disposal of paper transformer oil filters.

Jet squadrons operated at Moffett Field from 1950 until 1962. According to personnel interviewed, most oily and solvent wastes were collected in 55-gallon barrels and stored beside hangars. The outside corners of the hangars reportedly were used to store barrels of waste materials. According to the IAS, the barrels were either hauled to the runway landfill (Site 1) by station personnel or disposed of down storm sewers around the hangars, or off the edge of the aprons. The amount of liquid wastes taken to Site 1 is not known; however, the IAS estimates that a total of 1.5 million gallons were generated and assumes 5 to 10 percent of the 1.5 million gallons generated were disposed at the landfills. The basis for this assumption is unknown.

Seven P-3 Orion squadrons have been stationed at Moffett Field since 1962, which was near the time that Site 1 began operations and Site 2 ceased operations. Disposal methods reportedly varied. In the early 1960s, much of the solvents were poured down deck drains, around the hangars, and around the aprons, or placed in barrels and stored around the hangars. Personnel interviews indicated that some of the waste containerized in 55-gallon drums was hauled to Site 1 in the early 1960s. The amounts are not known.

The IAS reports of disposal practices contain several inconsistencies. The IAS indicates that barrels were disposed of at Site 1 from 1950 to 1962, however, the Site 1 landfill did not exist before 1962. In addition, the IAS states that 1.5 million gallons of liquid waste were generated by the Orion squadrons from 1962 to 1978 (that is, during the operating period of Site 1). However, the report tables indicate that 687,000 gallons of liquid waste were generated. The IAS then assumes that 5 to 10 percent of the 1.5 million gallons was disposed at Site 1. Both the 5 to 10 percent estimate and the 1.5-million-gallon estimate are arbitrary. The IAS also states that 1.5 million

gallons of liquid waste were generated during the jet era at Moffett Field, however, report tables indicate that 528,000 gallons were generated. The report again arbitrarily assumes that 5 to 10 percent of the 1.5 million gallons (1,363 to 2,727 55-gallon drums) were disposed at Site 2. The estimates appear to be arbitrary and speculative, and are inconsistent with other estimates in the IAS report.

Another explanation for the differing information in the IAS and collected data is that the collected data do not adequately depict landfill content. There is no question that the landfill content is not fully characterized and it is not known what was disposed in the landfills. Notably, this circumstance is not unique to Moffett Field. Many Superfund landfills have the potential to contain a wide variety of wastes, including drums of waste. EPA guidance (EPA 1991, 1993) is very clear on how to address these sites. Landfill characterization is not recommended and containment is the best remedy unless (1) the location of the drums is known, (2) the location is easily accessible, and (3) removal will reduce the principal threat. At Moffett Field, geophysical surveys do not show any drum disposal areas within Site 1. Leachate and groundwater data show low concentrations. Lastly, information presented in the IAS regarding waste disposal is questionable. The stated assumptions appear to have no basis and are difficult to verify.

The Navy's strategy has been to evaluate containing the refuse through capping and, most importantly, to recognize that if any previously drummed waste begins to migrate from the landfill, the monitoring program will detect the release and corrective action will be implemented.

An additional strategy to protect against the possibility of buried, drummed waste mobilizing and migrating off-site was evaluated. This strategy includes enhancing containment with a subsurface interceptor trench with a vertical barrier along the northern boundary of Site 1. This trench has been added as a corrective action contingency measure and will be in place in the event contamination migrates. The interceptor trench, in conjunction with capping and monitoring, will protect adjacent surface water. Only the northern boundary of Site 1 is presently selected for the possible additional containment because this area is upgradient to the SWRP ecosystem. Releases along other borders will not affect sensitive ecosystems and

additional containment is not warranted. Additional field work will be conducted to investigate contaminant migration along the southwestern border. Any releases along these borders could be addressed by containment or hydraulic control if needed. Site 2 is not considered for the additional containment since hydraulic control is easily maintained near the site by the Building 191 lift station.

The reason for omitting the RI (actually IAS) estimates of the quantities of waste were from the FS is that evidence collected during field investigations does not support the estimates. The Navy did not intend to misrepresent or suppress information. Chemical data from leachate wells do not support the estimates that hundreds of thousands of gallons of liquid waste were dumped in the landfill.

Comment 5: *Leachate Investigation and Management Questions. At Site 1 a significant gap (500+ feet) exists in the groundwater monitoring system. How many wells does the Navy intend to place in that "gap" in order to get a clearer picture of groundwater flow and possible leachate leakage? On what technical basis was the number of wells deemed adequate?*

Response: The number and location of monitoring wells will be based on cone penetrometer test (CPT) results and HydroPunch (HP) sampling results. CPTs will locate permeable sediments. HP groundwater samples will be collected at locations with saturated permeable sediments and groundwater samples will be sent to a laboratory. Monitoring wells will be placed based on these results. The field work plan will discuss these activities in more detail.

Comment 6: *Leachate Investigation and Management Questions. How will the Navy address possible vertical migration of leachate into lower level aquifers due to existence of porous material in the bases of the Site 1 and Site 2 landfills (sand lenses, peat layers, etc.)?*

Response: Current groundwater monitoring data and soil boring data do not indicate that porous material exists beneath refuse or that contamination is migrating past the landfill perimeters. The Navy has focused the groundwater investigations on the uppermost aquifer (the A1-aquifer). The A1-aquifer is closest to the landfill refuse. In addition,

horizontal gradients in the A1-aquifer are generally equal to or greater than horizontal gradients in the A2-aquifer. Therefore, groundwater contamination will migrate to landfill boundaries in the A1-aquifer before they (1) vertically migrate downward to the A2-aquifer and then (2) migrate horizontally to landfill boundaries. If A1-aquifer impacts are discovered, additional investigation will focus on the A2-aquifer.

Comment 7: *Is it accurate to say that part of the waste in the Site 1 Landfill is sitting in a combination of groundwater and leachate? If so, what are the environmental implications of this and what are the implications for design of an adequate leachate collection system?*

Response: Part of the waste in the Site 1 landfill is sitting in a combination of groundwater and leachate. The concentrations of chemicals in this leachate and groundwater combination are low. The existence of this contamination is not cause for corrective action because the point of compliance is the landfill perimeter and contamination is not migrating. Therefore, the Navy will continue to monitor groundwater at the landfill perimeter and implement corrective actions if necessary. If corrective actions are required, leachate and contaminated groundwater can be extracted by pumping wells and interceptor trenches and treating the contaminated water above ground.

Comment 8: *If the waste in the Site 1 Landfill is currently partially immersed in groundwater/leachate, what type of barrier can be designed to prevent leachate from migrating into the adjacent slough, the Cargill salt ponds, and the SWRP (for example, a slurry wall)?*

Response: The SWRP north of the landfill is downgradient from leachate, indicating a potential for contaminant migration into the pond. Groundwater chemistry data do not show that contamination is migrating past the northern landfill boundary. Field investigations have indicated that low-permeability bay mud (barriers to contaminant migration) exists between the refuse/leachate zone and the SWRP. The integrity of this barrier has not been completely characterized and it is not known whether this layer is completely continuous. Therefore, the Navy proposed to install a subsurface interceptor trench between leachate and the SWRP. The trench would contain perforated pipe and gravel to facilitate groundwater collection. In addition, an impermeable liner would be

installed on the downgradient side (pond side) of the trench to further contain contaminants.

Regarding the slough/Cargill Salt Ponds, groundwater chemistry data do not show that contamination is migrating past the eastern landfill boundary. Also, water elevation measurements show that the slough/Cargill Salt Ponds are upgradient from the groundwater surrounding the Site 1 landfill, indicating there is not a potential for flow from leachate to the slough/Cargill Salt Ponds. In addition, field investigations indicate that low-permeability barriers also exist between the leachate zone and the slough/Cargill Salt Ponds. Therefore, the Navy did not propose an interceptor trench for the eastern boundary. The Navy will continue to monitor water elevations and groundwater chemistry in surface water, groundwater, and the leachate zone. Further containment can be added in the future if needed.

Comment 9: *Is it feasible to pump out and treat the groundwater/leachate at Site 1? What type of system could be used? How much would construction as well as operation and maintenance costs be for such a system? How long would it need to operate?*

Response: Based on current data, it is not feasible to pump out leachate at this time because contamination plumes are not known to be migrating. In addition, the FS report discusses contaminant transport modeling to illustrate future potential for migration from the Site 1 landfill. Based on the modeling in Section 3.7 of the FS report, contaminant plumes are not expected to occur in the future. In the unlikely event contaminant migration occurs, leachate can be pumped from the landfill if necessary.

Comment 10: *<u>Financial Assurance Questions</u>. What financial assurance mechanism will the Navy be using to assure sufficient funds are in place for closure and for 30+ years post-closure maintenance program for Moffett's four landfills?*

Response: Postclosure maintenance activities will be funded through annual DoD environmental restoration budgets. These budgets are proposed by NAVFAC headquarters in Washington D.C. and are approved as part of a total budget package each year by Congress and the President. While congressional actions cannot be anticipated, it is

NAVFAC's responsibility to request the necessary money for the upcoming fiscal year's environmental restoration work.

Comment 11: *Financial Assurance Questions. If, over time, gas and groundwater monitoring programs reveal a need for corrective actions who will decide:*

a. When corrective action is necessary
b. What remedy is needed
c. How will the remedy be funded

Response: The first two questions will be decided by RWQCB, DTSC, EPA, and the Navy, with input from the community. NAVFAC, DoD, Congress, and the President will decide how corrective actions will be funded (please see the response to Comment 10).

Comment 12: *Financial Assurance Questions. Will the RWQCB have access to these funds for corrective action if the Navy fails to implement closure, postclosure maintenance or needed corrective actions (in a timely fashion)?*

Response: RWQCB does not have access to Navy funds.

Comment 13: *Financial Assurance Questions. How will maintenance of the subdrain system at Moffett be funded and, if necessary, upgraded to prevent inundation of the landfills? What is the estimated cost for maintaining the subdrain system?*

Note: We understand that the Moffett actions are governed by CERCLA but it makes no sense to us that a CERCLA site should be required to do less than a standard solid waste landfill since it is presumably a greater threat to public health, welfare, and the environment. Otherwise why would it be governed by CERCLA?

Response: Maintenance of the subdrain system will be funded by annual budgets. Costs have not been estimated at this time. The subdrain's maintenance needs will be incorporated in the station-wide ROD. OU1 landfill closure and postclosure are governed by the same regulations as a standard solid waste landfill and are not required to do less.

Comment 14: *The LWVs throughout California support comprehensive measures to provide maximum protection to human health and the environment from the adverse effects of hazardous materials, including pesticides. An integrated approach should be taken to prevent harmful exposures through soil, surface and groundwater contamination, bioaccumulation, air pollution, and direct contact. We believe all levels of government share responsibility for preventing exposures.*

Frankly, we are disappointed in the OU1 FS and in the inadequate data base upon which it is based. However, we are convinced that the Navy, EPA, and community have learned a great deal in the course of the Feasibility Study review. As a result, future Moffett Remedial Investigations will include more complete data upon which to base the FSs that follow. Finally, we believe that the public interest is best served by the Navy moving forward if the ROD fully incorporates improvements in the project suggested by California regulatory agencies, local governments, and the community.

Response: The Navy revised the cap design and will conduct additional field work as a result of comments received during the June 1995 public comment period.

3.2.8 Comments from the Silicon Valley Toxics Coalition

Note: SVTC submitted a written statement of which portions were presented at the June public meeting. In addition, SVTC submitted a set of written comments. The public meeting written statement and associated responses are listed first, followed by the full set of written comments and associated responses.

Written Statement:

My name is Peter Strauss. I am the Director of Environmental Management with MHB Technical Associates in San Jose. I am the Technical Advisor to SVTC, which has a Technical Assistance Grant from the EPA to help it participate in the decision making process regarding the Superfund sites at Moffett and the so-called MEW companies south of the Bayshore Freeway.

I first commented on a draft FS in 1993. Since then, two other drafts were completed. I wish to commend the Navy for being responsive to the concerns that I raised about the capping of the landfills. Briefly, the Navy has agreed to alter its proposed plan in several ways:

1) *Added minimization of infiltration as a remedial action objective (RAO), thereby adding an extra foot of material to the cap;*

2) *Integrated OU1, as originally defined as constituting soils only, with groundwater*

3) *Waiting to design and implement a remedy until information was developed on the ecological effects of alternatives;*

4) *Sampled in additional areas that our hydrologist identified;*

5) *Describing some details about the monitoring and sampling plan;*

6) *Adding a leachate collection trench to the northern boundary between the Site 1 landfill and the SWRP. Leachate will be transferred to one of the treatment facilities;*

7) *Developing a rudimentary contingency plan should leachate migrate outside the boundaries of the landfills.*

I think that these are major improvements to the original proposed remedy.

However, I believe that the plan has to be improved. Four general areas that will need improvement are: 1) the contingency plan involving detections of leachate outside of the landfills needs to be strengthened; 2) a contingency plan should be developed that deals with the event that the use of the facility changes, or the federal government no longer wants to operate and maintain the drainage system at Moffett; 3) to the degree possible, the remediation strategy should try to enhance the quality of surrounding wetlands; and, 4) that all measures should be taken to have the remedy conform to community standards.

1. *While I realize that little leachate has been detected in this area previously, it is important to establish guidelines or criteria for when the leachate system will be mechanically activated. The FS proposes that this be done when leachate exceeds the ambient water quality criteria. The FS states that hydraulic control or a packaged leachate system can be implemented if AWQC are exceeded. I propose that activation levels be set at percentage of the AWQC, in combination with an increase in the level detected at existing wells for two consecutive quarters. This seems quite reasonable to*

me, as it would allow time to plan the remediation and gain approvals from regulatory agencies.

Regarding Site 2, while I recognize that hydraulic control could be maintained by lift station 191, I am concerned that there is no contingency plan if monitoring wells detect leachate migration. The aeration nozzle at Building 191 can only effectively treat some VOCs, and will not treat PCBs and semivolatile organic compounds (SVOCs), and inorganics. Therefore, I recommend that the Navy develop a contingency plan to treat leachate from Site 2, if monitoring points outside the landfill detect contaminants at levels similar to Site 1.

Additionally, I am concerned that relatively few AWQC are established for organic compounds. It is important that action levels be established for all possible constituents.

Response: The collection trench will be activated when AWQC for the protection of aquatic life are exceeded in groundwater in the trench. This strategy is conservative and protective because contaminant levels in the trench will not be representative of surface water contaminant levels. Surface water is downgradient from the trench and contaminant levels will be reduced by processes such as adsorption and dilution between the trench and surface water. Therefore, if AWQCs are exceeded in the trench, corrective actions can be initiated before AWQCs are exceeded in surface water.

Using AWQC is conservative. The National Oceanic and Atmospheric Administration (NOAA), Coastal Resources Coordination (CRC) branch, provides guidelines to identify potential impacts to coastal resources and habitats that are likely to be affected by waste sites. For groundwater, NOAA recommends using a screening level of 10 times the AWQC. According to NOAA, this conservative screening provides a high degree of confidence that any sources eliminated from future consideration pose no potential threat to resources of concern (NOAA 1994).

At Site 2, a corrective action would consist of a groundwater extraction and treatment that addresses specific contaminants that are migrating. Groundwater can be extracted

prior to reaching the Building 191 lift station and treated for metals, SVOCs, PCBs, or VOCs, if necessary.

AWQC have been identified for over 100 organic compounds, including chlorinated solvents, benzene, toluene, ethylbenzene, polynuclear aromatic hydrocarbons (PAHs), SVOCs, PCBs, and pesticides. The Navy will continue to update triggering levels as information becomes available.

2. *The FS is incomplete in that the RAs evaluated assume that the facility will continue to be used at levels similar to current use. After thinking this through, I think that this issue poses the largest potential problem to the Navy and the Community.*

As you know, some community members are opposed to having Moffett Field continue to operate. With budget slashers going to work in Washington, I don't think we can assume that the Department of Defense or NASA is going to want to operate the airfield.

So the question arises of what would happen if the drain system and the pumps are turned off. Would elimination of pumping inundate some of the areas, and defeat the purpose of the remedy? Who would have responsibility for maintaining the drainage system, in the event that Moffett is not operated as an airfield? These are all questions that should be thought about, before a remedy is implemented. At the very least, there should be some institutional mechanism to pass along knowledge of the remedy and consequences of not maintaining the drainage and pumping system.

Response: While Moffett Federal Airfield remains federally-owned land, the necessity of continued O&M of the pump station shall be noted in the Master Plan for the government's land uses and, in the event of any future conveyance of the property, shall be addressed by appropriate notices and land use covenants binding on subsequent property owners. While the CERCLA deed covenant and notice requirements would be applicable to any property transfer, any change in land use (either before or in connection with a transfer) would also be subject to an evaluation pursuant to the National Environmental Policy Act (NEPA), which would require the Government to

solicit public comment and evaluate the environmental impacts, including any possible effect on the remedial activities at OU1.

3. *I believe that efforts should be made to protect, and wherever possible, enhance existing wetlands, including the SWRP to the north of Site 1. I think it is important to recognize that this is somewhat degraded wetland that is potentially habitat for endangered species (salt harvest mouse). By enhancing the wetland, possibly by removing or creasing the levees to allow for more tidal flushing, pickleweed communities which are essential for the salt harvest mouse may become established.*

Response: Efforts will be made to re-establish pickleweed destroyed during cap construction. A replacement plan will be submitted during the RD to outline re-establishment efforts.

4. *The Navy should be held to the same standards as private parties, including the Cities of Mountain View and Sunnyvale. In this context, an early comment on a draft FS requested that the Navy investigate and consider other remedies for old landfills that abut the San Francisco Bay. I provided a list of landfills that I knew about. It would seem prudent, if the Navy has not investigated these landfills, with the addition of Mountain View and Sunnyvale, that it does so before the remedy is implemented.*

Response: Information was received about Oyster Point, Third Avenue Landfill, and the old Stinson Beach Landfill. The following paragraphs summarize information obtained and discuss applicability to OU1.

CIWMB was contacted for information regarding Oyster Point. The remedy was selected to prevent leachate migration and included a single-layer, low-permeability cap and a slurry wall. The cap was constructed solely with bay muds. The landfill was closed in the early 1970s and the area is now a marina. It is not known whether leachate migration was occurring, however, a slurry wall was constructed. Since it is not known whether leachate migration was occurring, it is difficult to compare these circumstances and associated remedy to OU1.

CIWMB was also contacted for information regarding the Third Avenue Landfill. The remedy was a multilayer clay cap and shoreline reconstruction. Waste is located

below the water table, however, leachate migration was not occurring. No remedy was implemented to restrict potential leachate migration. This circumstance is similar to Site 1; however, at Site 1 a groundwater interceptor trench is proposed to protect surface water from potential future leachate migration.

Caltrans was contacted for information regarding the Stinson Beach Landfill. The remedy was excavation, dewatering, segregation of hazardous and nonhazardous wastes, disposal, and restoration. Leachate migration was a concern at the Stinson site, but it was not occurring. This remedy was completed as a mitigation project to restore intertidal mudflat habitat destroyed during reconstruction of Route 1. The remedy was apparently not pursued to control leachate migration.

CIWMB stated that apparently several old landfills around the bay have waste below the water table. However, leachate migration is generally not a problem.

The Navy must comply with the same landfill closure regulations as local landfills. CIWMB has identified 14 CCR solid waste landfill closure regulations as applicable for OU1. During the public comment period, CIWMB stated that the Navy's proposed alternative would not meet specified performance standards in 14 CCR. As a result, the Navy has agreed to revise the proposed plan based on a prescribed, state pre-approved configuration for the two landfill caps at OU1. Additional public comments will be solicited from December 20, 1995 to January 31, 1996 on this revised proposal. In addition, a public meeting will be held January 16, 1996 regarding the revised proposal.

Written Comments from Peter Strauss of SVTC:

As a result of concerns raised by the THE Committee of the RAB and regulatory agencies, I have reviewed previous SVTC comments, the Navy's response, and the Navy's commitments. Below I have elaborated on some of our earlier concerns, my understanding of the Navy's commitments, and issues that still need to be addressed. Additionally, following discussions with DTSC and the RAB on August 9 and 10, 1995 respectively, I have included a framework for developing a contingency plan should the Navy find that leachate is migrating from Site 1.

*The written comments contain some passages which are underlined, in **bold**, or **both**. Underlined passages are meant to highlight previous SVTC concerns. Bold passages are what we believe to be Navy commitments. Bold and underlined passages are SVTCs recommendations and action items.*

Comment 1: *"It is inappropriate to develop a remediation strategy which does not take full account of existing and potential communication between the leachate in landfill material and the groundwater under and around the landfills." (December 1993).*

The original remediation strategy articulated in the OU1 Draft FS did not take account of groundwater at all. After regulatory pressure, the Navy agreed to consider both soils and groundwater at the landfills, which makes common sense. In 1993, we requested that the Navy provide information on the "the radius [and] or depth of groundwater that is going to be considered."

Based on recent discussions at RAB meetings and meetings with regulators, it is unclear that the radius and depth of groundwater that was considered was adequate. *Refer to comments about potential groundwater flow on the southern boundary of the Runway Landfill, and anecdotal information that the waste was buried 21 feet below ground surface. If the depth of waste is in fact 21 feet, then existing monitoring wells within the landfill, and those surrounding the landfill would be sufficient to detect the migration of potentially contaminated groundwater.*

Response: The Navy has focused groundwater investigations on the uppermost aquifer at the landfill perimeter. If any groundwater impacts become evident, the radius and depth of subsequent groundwater investigations will be increased to encompass the plume of leachate that has migrated.

Comment 2: *Minimizing infiltration should be a remedial action objective. (December 1993). There is no reason to believe that leachate from the landfills will not eventually migrate. One may hypothesize that it may be minimal and retarded by surrounding clays, but there is little doubt that it will eventually migrate. Therefore, we have argued that a strategic objective of the remediation at the site should be to minimize infiltration, to slow migration of leachate.*

*On July 25, 1994, after a technical meeting with Dr. Oberdorfer and me, the Navy **committed** to add minimizing infiltration as an RAO presentations. First, in a response*

to DTSC Comment 105, dated April 10, 1995, the Navy stated that "minimizing infiltration is not a primary cap function." Second, this was re-iterated at the August 10 RAB meeting. Third, during the public hearing, the Navy's consultant failed to include minimizing infiltration as a RAO.

There is nothing in the Remedial Action Plan that would limit infiltration, but for the cap. ***Although minimizing infiltration is included in the final FS as an RAO, it is important that it be fully considered in the design of the remedy.*** *It is not clear from the response to DTSC's comments cited above whether this has been done, or whether the Navy intends to do this.*

Response: The Navy has agreed to revise the OU1 landfill cap configurations to include a low-permeability layer to minimize infiltration.

Comment 3: *There is a disconnect between the amounts of hazardous materials detected in the OU1 RI/draft FS and the tons of liquid and solid hazardous materials that were reported in the IAS. (December 1993).*

Although we recognize that the IAS was based on anecdotal information, we recommended that the Navy reconcile this disparate information in the FS. It is difficult to dismiss these anecdotal reports merely because a few borings and wells have not shown heavy contamination. Other explanations could exist, including that these contaminants are now in the Bay or groundwater, that they have degraded, that they weren't located by the borings, or that they were disposed of at another landfill on the base. In fact, there is a third landfill located within the Golf Course that was identified by IT in 1988. (December 1993). (Subsequently, it was discovered that there is actually a fourth landfill).

With respect to the Navy's first response to this comment, (i.e. "The Navy does not agree that reconciliation of the past fate of landfill refuse is needed. These data...would be based on speculation."), we responded that it is incumbent upon the Navy to prove that the IAS was incorrect. (April 14, 1994).

On July 20, 1994, the Navy described the reasons why it believes that IAS may be incorrect, and ***committed to a strategy of enhancing containment by evaluating a vertical barrier at the northern boundary of Site 1, and corrective action should drummed waste begin to be detected migrating from the site.*** *It is not clear that the Navy has followed through with this* ***commitment.*** *For example, although the Navy proposed that a vertical leachate collection trench be installed at the north side of Site 1, the plan does not offer any concrete remedy should drummed waste begin to migrate to the south.* ***In light of the A1-aquifer gradients traveling north to south, the location of additional vertical barriers needs to be re-evaluated.*** *(See Comment 6, below).*

Additionally, although many reasons were given by the Navy for not adopting the information from the IAS, it seems that enough questions have been raised by the RAB, that the issue of what is in the landfills requires some reevaluation and explanation, with public review before the RAB. ***We recommend that the Navy begin with the July 20, 1994 response to SVTC comments as a starting point, as we believe that this was a good first effort to attempt to address this issue.***

Response: The northern location selected for the groundwater interceptor trench is the most appropriate. A potential for flow (gradient) has been measured from the leachate zone to the SWRP. Therefore, the trench was positioned between the Site 1 landfill and the SWRP to protect ecological receptors at the SWRP. It is not necessary at this time to develop contingencies in the event leachate is migrating southward. Any releases along the southern border could be addressed by additional containment or hydraulic control systems, if needed. There are no receptors close to the southern boundary. There would not be any immediate threat to human health and the environment, and therefore, it is not cost-effective to construct contingencies at this time.

The issue regarding the content of the landfills will be revisited when the Navy conducts a radiation survey. This is the only remaining information that is needed to implement the remediation strategy. Any additional information regarding the content of the landfills will not change the proposed remedial strategy.

Comment 4: *The Solid Waste Assessment Test (SWAT) concluded that leachate contained elevated levels of organic compounds and metals, and that seepage could enter surface waters. It also concluded that the A-1 aquifer was contaminated at this location, (i.e. Site 1), but suggested that contamination may be from another source. (December 1993).*

The Navy responded that corrective action strategies appropriate for OU1 landfills include hydraulically controlling gradients through leachate extraction and treatment, or combining extraction with vertical barriers. Additionally, disparities between leachate contaminants and the A-aquifer contaminants suggest a source other than landfills. The Navy responded that the SWAT stated that "upgradient sources have not been fully evaluated, [and] the concentrations of metals found in the A-aquifer are not considered definitive of landfill leakage."

First, the final plan and the ROD should describe in detail the additional enhancements to the containment strategy that may include vertical barriers and hydraulic control through leachate extraction (See comment 9 below). Also, has further analysis of upgradient sources led to any change of opinion or shed new light on this subject? Please identify possible upgradient sources of heavy metals and organics.

Response: The only subsurface barriers needed at this time have been described in the FS report and proposed plan.

At Site 1, no upgradient sources have been identified. At Site 2, some of the plumes identified in the OU5 FS are upgradient. However, comparisons of upgradient and downgradient concentrations enable the Navy to determine whether Site 2 is contributing to groundwater contamination.

Comment 5: *The design [e.g. base materials of the old landfills] needs to be better understood before a remedy is proposed. (December 1993)*

Based on the data presented, it appears that the Navy does not know much about the initial design of these landfills. There is not an adequate description of the base material or the sides of the landfill to make a reasonable judgement pertaining to how

these may contain the fill materials for long durations. In order to contain the landfill contents, it is essential that design characteristics of the existing landfill be well understood. ***(December 1993)***

The Navy responded to this comment by stating that the conductivity of "surrounding" soils has been tested and evaluated. Since the remediation strategy is one of containment, it is crucial that the Navy be as certain as possible that base materials won't leak, and that waste is not deposited below a clay layer, as suggested at the July 13, 1995 RAB meeting. ***Based on the present knowledge of the lithology of the landfills, we recommend that this issue be re-evaluated.***

Additionally, it appears that groundwater flowing into the landfill, with a downward gradient from North to South. This exacerbates our concerns about the need to understand the containment (or lack thereof) of the fill before developing a remedial plan, and importantly, and raises the question of whether the remediation strategy of containment can be successful with only a cap. ***There may have to be several other elements to the remedial action plan before it can be designed to successfully contain leachate and groundwater. Therefore, the final plan should state that additional remedies may be needed if contamination outside the landfill is found. This statement should be as specific as possible.***

Response: The permeability of underlying soils has not been fully characterized. Extensive sampling or excavation would be required if it was necessary to completely characterize the soil beneath the landfill. However, this information is not necessary and the Navy does not assume that clay layers beneath the landfills are continuous. The information from the limited soil investigations offered a possible explanation for the lack of evidence of contaminant migration. However, it would be difficult to prove conclusively that naturally occurring barriers to groundwater movement exist. Therefore, because it is not known conclusively, continual groundwater monitoring and contingency plans to protect nearby vulnerable receptors are proposed. In addition, the Navy will conduct more field work to further investigate potential contaminant migration.

The corrective action requirements under 23 CCR discuss the necessity for additional remedies to address leachate migration.

Comment 6: *We noted (December 1993) that groundwater at Site 1 flows in the south-southeast direction, towards Building 191. It appeared, however, based on Figures 3, 4 and 5, that most soil sample points and groundwater wells located outside of Site 1 were found on the north side of the landfill. Plate 1 and page 18 (of Draft FS) indicated that no samples were collected or analyzed from the borings and wells to the south-southeast of Site 1. We also asked whether the Navy believed that there are enough monitoring points on the south-southeast side of Site 1? (December 1993)*

The Navy's response (dated February 4, 1994) to these two comments stated that the OU1 Technical Memorandum and the additional field work plan describe groundwater flow patterns in detail and the adequacy of the monitoring network. At that point in time, there were four monitoring wells south and southeast of Site 1. The OU1 Additional Field Investigation, Technical Memorandum of December 29, 1993, shows the locations of four new monitoring wells at Site 1: one at the west-southwest perimeter; one a the southeastern perimeter; and another on the southern perimeter (the fourth is located at the northern perimeter). The location of the new well on the southern perimeter was screened to monitor "shallow concentrations of contaminants" migrating towards the Building 191 pump house. At this point in time, it was not apparent to Navy consultants (although it was suspected) that mounding of groundwater was occurring in Site 1. There are a number of problems with this response which have been brought to our attention through the excellent work of the RAB.

First, there are very different potentiometric surfaces described in the Technical Memorandum (Figures 10 and 11) from those described in the Final FS (Figures 12 and 13). There is not an explanation of why the potentiometric surfaces changed from the Technical Memorandum, based on fourth quarter 1993 data, and the FS, based on February 1994 data. Assuming that there are perched water zones within the landfill, Figure 11 of the Technical Memorandum depicts yet another elevation and gradient. ***As a result, we believe that the Navy must explain and reconcile these differences. In addition, it must make clear any assumptions that went into the models used to map***

the elevations. With relatively few data points inside the perimeter of the landfill, it is difficult to realistically depict leachate or groundwater contour levels.

A second problem is that it has never been clear how the Navy has differentiated between leachate and the shallow groundwater in the A-1 aquifer. Since the wells inside the landfill are drilled to the base of the landfill, one cannot differentiate between leachate and groundwater within the aquifer. The Technical Memorandum treats leachate and groundwater as one in the same, and it would appear that this would be a rational explanation if the bathtub model of the landfill is correct, as implied in the Technical Memorandum. In contrast, the FS conceptual model, however, depicts a semi-confined A1-aquifer that is below the base of the landfill (see Figure 11 of the FS). However, the measured depth of this A1-aquifer is 0.7 to 1.0 feet below the leachate levels (at approximately W1-11, see Figures 12 and 13 of the FS). Since the elevation of leachate level at this monitoring point is approximately 8 feet above the base of the landfill (see Figure 7, then it must be concluded that A1-aquifer is flowing through the landfill. We do not believe that this fact is in dispute: however, we are concerned that there may have been conclusions drawn based on a reliance on models of groundwater movement as depicted by the FS conceptual model. I draw two conclusions from this.

a) *There appears to be an imaginary line between leachate and groundwater, for they both will mix in the landfill. Therefore, this conceptual model is incorrect.* ***Because of the apparent contradiction (conceptual model versus actual results), we ask whether the hydrogeology of the site is understood enough to develop a remediation strategy, and that the conceptual model be modified. Potentiometric surfaces are developed by relatively few number of data points for the size of the area, and we feel strongly that the Navy must gather more information before it develops a remedial design.***

b) ***Because of the concern that the Navy may have relied on an incorrect conceptual model, we recommend that past assumptions and conclusions related to the framework that a semi-confined A1-aquifer beneath the landfill (Site 1) be revisited, and adjusted if need be.***

c) ***The remedial investigations and strategies cannot and should not be locked in time as new techniques or new information is developed.*** *OU1 appears to be a case-in-point where the results of an investigation were frozen in time, without regard to changing information. Apparently there have been changes of assumptions between the Technical Memorandum and the OU1 draft-final FS, in which the potentiometric surfaces based on February 1994 data were first presented. Because of this apparent change, the monitoring well data gap to the south, as brought to your attention by the RAB, is very evident. Despite*

SVTC's early concerns raised in December 1993 about the sufficiency of the monitoring well system on the south side of Site 1, the Navy does not appear to have adjusted the monitoring well system to account for new information. ***We strongly believe that the remediation plan needs to be flexible as new information is developed.***

Response: The Navy's conceptual model of the hydrogeology has changed since the Technical Memorandum as new information has been received and evaluated. The current conceptual model is described in the May 15, 1995 submittal of the FS report. Additional data will be collected and incorporated into the conceptual model, as appropriate.

The Navy believes that the hydrogeology of the site is adequately understood such that a remedial strategy can be developed. The current hydrogeologic conceptual model may be updated as additional information becomes available; however, changes to the conceptual model do not significantly affect the remediation strategy.

Groundwater elevation data indicate that the water pressure in the A1-aquifer is above atmospheric pressure at some OU1 locations, indicating that the A1-aquifer is semi-confined. This conclusion does not affect the remedial strategy, as the remedial strategy is adequate regardless of whether the A1-aquifer is semi-confined.

The groundwater monitoring and corrective action requirements found under 23 CCR allow for flexibility as new information becomes available.

Comment 7: *The FS is incomplete in that the RAs evaluated assume that the facility will continue to be used at levels similar to current use. Some community members are opposed to having Moffett Field continue long-term operations under NASA, almost as if there had not been a change in stewardship. (April 14, 1994)*

"The remedial action (RA) should not foreclose future options, such as reducing or eliminating flights, and significantly scaling back industrial activity. The RA should account for, wherever possible, a reduced use scenario where pumping from Building 191 no longer occurs. Elimination of pumping would create a stronger horizontal force on landfill contents and may affect groundwater levels, and will likely

change groundwater flow patterns and direction in some areas." Consequently, migration of constituents via groundwater/leachate transport is more likely to occur. (April 14, 1994)

As federal commitments to the facility seem to be in flux, we think that there is a strong need to look ahead at the possibility of the drain system being turned off. We were pleased to hear that the Navy, based on the meeting at DTSC and the RAB in August 1995, also thinks that this is enough of a possibility that it will discuss potential remedies and contingencies as part of the response to the public hearing and comments. ***We believe that more investigation should take place, including: 1) an evaluation of expected environmental effects on the landfills should the drain system be turned off: and, 2) an investigation and description of low cost techniques that could be installed now which would mitigate some or all of the negative environmental effects identified in 1) above. We also ask that a very specific contingency plan be described which would alleviate the effects of turning off the drain, which cannot be avoided by low cost techniques described in 2) above.***

Response: Please see the response to Comment 7 in Section 3.2.3.

Comment 8: *"I believe that efforts should be made to protect, and wherever possible, enhance existing wetlands, including the storm water retention pond to the north of Site 1. In the context of the Ecological Assessment, I think it is important to recognize that this is a somewhat degraded wetland that is potentially habitat for endangered species (salt harvest mouse). By enhancing the wetland, possibly by removing or creasing the levees to allow for more tidal flushing, pickleweed communities which are essential for the salt harvest mouse may become established." (April 14, 1994)*

We are pleased that the Navy has agreed to install a leachate collection trench on the north side of Site 1 to protect this potentially fragile ecosystem. We also believe that prior to remedial design, it is important that the Navy take an independent look at possibilities for enhancing the existing wetlands. ***We therefore recommend that an independent evaluation of ways to enhance the wetlands be made a formal commitment.***

Response: Comment noted.

Comment 9: *The remedial proposal is based on the assumption that should leachate migrate from the landfills, it will be detected and appropriate remedies can be installed, as required. This concept is insufficient unless the FS contains a contingency plan that establishes action levels that will require action, and what those actions are likely to be. I propose that action levels be set at a fairly low percentage of the maximum contaminant level (MCL), in combination with an increase in the level detected at existing wells. For example, if the TCE MCL is 5 ppb, I would propose that remedial action (in this instance, likely to be leachate collection and treatment) be triggered when TCE is detected at 25 percent of the MCL, and concentrations have increased over two quarters. (The above is an example of how a triggering mechanism could work, not a proposed standard.) (April 14, 1994)*

We have since revised the proposed action levels. Our current proposal is that action levels be set at 25 percent of the Water Quality Criteria, triggered when concentrations of contaminants increase over two consecutive quarters. This would at the very least give the Navy time to plan a remedy and a treatment for contaminated leachate. ***We strongly recommend that the Navy adopt this criteria for the leachate collection trench north of Site 1.***

With regards to potential leachate migration south of Site 1, a detailed contingency plan should be developed and included as part of the ROD. ***Below, we have suggested the following framework on how to develop this plan.***

a) ***The plan should be detailed enough to provide the public and the regulators with sufficient information and criteria for action so that it will act as a verifiable commitment in the ROD;***

b) ***Because we don't know what will be found by additional wells on the southern edge of Site 1, several scenarios should be included in developing the plan. For example, the following presents a range of findings; 1) no detectable finding of leachate migration; 2) migration of heavy metals, VOCs and SVOCs, above the MCL but below the AWQC; and, 3) migration of heavy metals, VOCs and SVOCs, above the AWQC.***

c) ***For each scenario, a plan should be articulated. For example, if scenario 1 is found, the contingency may commit to further monitoring; if scenario 3 is***

found, the plan may commit to a leachate extraction and treatment system either within, or on the edge of the landfill.

Response: The collection trench will be activated when AWQC for the protection of aquatic life are exceeded in groundwater in the trench. This strategy is conservative and protective because contaminant levels in the trench will not be representative of surface water contaminant levels. Surface water is downgradient from the trench and contaminant levels will be reduced by processes such as adsorption and dilution. Therefore, if AWQCs are exceeded in the trench, corrective actions can be initiated before AWQCs are exceeded in surface water.

Using AWQC is conservative. The NOAA CRC branch provides guidelines to identify potential impacts to coastal resources and habitats that are likely to be affected by waste sites. For groundwater, NOAA recommends using a screening level of 10 times the AWQC. According to NOAA, this conservative screening provides a high degree of confidence that any sources eliminated from future consideration pose no potential threat to resources of concern (NOAA 1994).

It is not necessary at this time to develop contingencies in the event leachate is migrating southward. As discussed above, any releases along the southern border could be addressed by additional containment or hydraulic control if needed. There are no receptors close to the southern boundary. There would not be any immediate threat to human health and the environment, and therefore, it is not cost-effective to construct contingencies at this time.

Comment 10: *Because wells inside of the landfill are screened to the bottom of the landfill, leachate is not truly characterized. Rather, the leachate wells reveal a mixture of leachate and groundwater.* ***While we are not suggesting that you remedy this, this fact should be taken into consideration in future testing and modeling. For example, we are concerned that low detects found in areas outside the landfills are not discounted, and do not become a rationale for saying that no leachate is migrating. When low detects are found, we believe that it is the Navy's burden of proof to demonstrate that it is not due to a leak in the landfill.***

Response: The monitoring program will be conducted in accordance with 23 CCR. Title 23 CCR identifies statistical procedures to be used for evaluating monitoring data.

3.2.9 Comments from Santa Clara County Environmental Resources Agency

Comment 1: *14 CCR 17773 - Final Cover: An engineered alternative for final cover is submitted in lieu of the prescriptive standard for final cover. Engineered alternatives shall only be approved when the operator can demonstrate to the satisfaction of the California Integrated Waste Management Board (Board) and the local enforcement agency (LEA) that requirements for proposing an engineered alternative [California Code of Regulations, Title 14, Section 17773(c)] can be satisfied. The need for an engineered alternative to the prescriptive cover standard has not been demonstrated.*

Response: During the June 1995 public comment period, CIWMB stated that the Navy's proposed alternative would not meet specified performance standards in 14 CCR. As a result, the Navy has agreed to revise the proposed plan based on a prescribed, state pre-approved configuration for the two landfill caps at OU1.

Comment 2: *14 CCR 17781 - Leachate Control During Closure and Post Closure: Leachate must be monitored, collected, treated and disposed of in an appropriate manner. The OU1 FS does not address the requirement.*

Response: Regarding this matter, 14 CCR 17781 also states:

> "Leachate control and monitoring shall cease only after the operator demonstrates, to the satisfaction of the local enforcement agency, regional board and the Board, that leachate is no longer being produced, or the discharges of leachate will have no effect on water quality. This demonstration shall take the form of a written report submitted to the local enforcement agency, and the Board and the regional board. Factors the local enforcement agency and the Board shall consider when ending leachate control shall include monitoring results, nature of refuse, the presence and design of landfill

containment structures, local hydrology and geology, and local land and water use."

To address this requirement, the OU1 FS stated that refuse is below the water table and, as a result, leachate will always be produced. However, Section 1.3 and Section 2.1 of the FS demonstrate that the leachate produced has no effect on water quality and that leachate plumes have not migrated and are not expected to migrate in the future. Therefore, it has been the Navy's position that leachate collection and treatment is not necessary at this time. DTSC, EPA, and RWQCB concur with this approach, as it is fundamental to the development of the OU1 FS and subsequent recommendations.

Comment 3: *14 CCR 17783 - Gas Monitoring and Control During Closure and Post Closure: Landfill gases must be controlled and monitored during closure and post closure for a period of 30 years or until written authorization to discontinue is given by the Board or LEA. The OU1 FS does not adequately address the requirements of 14 CCR 17783 through 17783.15.*

Response: To provide for the protection of public health, safety, and the environment, 14 CCR 17783 states that the operator shall ensure that landfill gases generated at the facility are controlled during the periods of closure and postclosure maintenance, in accordance with the following requirements:

(1) The concentration of methane gas must not exceed 1.25 percent by volume in air within on-site structures.

(2) The concentration of methane gas migrating from the landfill must not exceed 5 percent by volume in air at the facility property boundary or an alternative boundary in accordance with Section 17783.5.

(3) Trace gases shall be controlled to prevent adverse acute and chronic exposure to toxic and/or carcinogenic compounds.

The revised cap configuration for the Site 1 landfill will include gas venting beneath the low-permeability layer. This combination of layers will facilitate controlled venting of gas to meet the requirements of 14 CCR 17783. In addition, a gas venting trench will be constructed around the western perimeter of Site 1 to further meet the requirements

of 14 CCR 17783. Landfill gases are not being generated at Site 2 and, as a result, gas venting is not included at Site 2.

Comment 4: *14 CCR 17796 - Post Closure Land Use: Post Closure land use must be compatible with protection of the final cover and post closure environmental systems. Changes in proposed land use must be approved by the appropriate agencies. The OU1 FS does not adequately address post closure land use.*

Response: Article 7.8 of 14 CCR has been identified as applicable for the OU1 remedial action. Therefore, the provisions of 14 CCR 17796 will be specified for compliance in the OU1 ROD.

3.2.10 Comments from the National Aeronautics and Space Administration

Comment 1: *Alternative 2 is acceptable to NASA only if the Bay Conservation and Development Commission (BCDC) concurs that it is consistent with the San Francisco Bay Plan. NASA would like assurance that the remedy selected is acceptable to the state and any tideland trust concerns they may have. Therefore, NASA requests that the Navy submit a Consistency Determination to BCDC for concurrence.*

Response: The Navy has discussed the selected remedy with the BCDC. The BCDC preliminarily indicated that the remedy will be acceptable; but also identified several concerns. The Navy will continue to consult with the BCDC throughout the RD to address concerns. In addition, the Navy is currently investigating the need to prepare a determination of consistency.

Comment 2: *Any wetland mitigation plans to increase or maintain wetlands should be closely coordinated with NASA.*

Response: The Navy will coordinate wetland replacement plans with NASA.

3.2.11 Comments from California Integrated Waste Management Board

Note: CIWMB comments were provided in letter format. Therefore, the letter received by the Navy is presented with responses interjected throughout the letter.

CIWMB staff has concerns that the vegetative soil cap that was presented as the selected remedy in the Proposed Plan did not meet the final cover standards of 14 CCR 17773. Since this standard was identified as an applicable requirement in the FS, the NCP threshold criteria for meeting ARARs was not met.

The FS proposed the soil cap as an engineered alternative to the prescriptive standards of 14 CCR 17773, then compared its feasibility and performance against a multilayered cap and concluded that the soil cap was more feasible and performed similarly to the multilayered cap, therefore it met the criteria for an engineered alternative pursuant to 14 CCR 17773. CIWMB staff can not concur with these findings because the multilayered cap exceeds the prescriptive standards, therefore a comparison of the vegetative cap to the prescriptive standards was not performed. To assist the Navy in making an appropriate determination regarding the type of soil cap to use on the landfills CIWMB staff is providing the following guidance.

Pursuant to an interpretation by CIWMB legal counsel, two criteria need to be met before an engineered alternative can be used in lieu of the prescriptive standards, (1) the prescriptive standard is not feasible, and (2) the specified engineered alternative performance is consistent with the performance of the prescriptive standards in limiting infiltration to the greatest extent possible, controlling landfill gas emissions and compatibility with future reuse of the site.

During the August 9, 1995 meeting, CIWMB provided a unit cost comparison (Table 1 [attached]) of the multilayered cap and prescriptive standard caps for landfills in the vicinity of Moffett Field. This comparison shows that the final cover cost per acre for the prescriptive standard cap ranged between $82,981 and $20,185 while the multilayer cap cost $200,051. The multilayer cap costs were much higher because the cap design included many layers that were not required by the prescriptive standard as shown on Table 2 (attached). Table 2 also provides a comparison of cost estimates for the soil and multilayered caps with the prescriptive standard cap. Unit costs provided in the FS were used to develop the costs. Table 2 shows that closure of Site 1 pursuant to the prescriptive standards would

save the Navy $1,000. Therefore, based on the information provided in FS, the prescriptive standards are more feasible than the proposed vegetative cover.

Response: Implementing the prescriptive standard will not save money or resources. CIWMB costs do not include a drainage layer, biotic barrier, or provisions for gas venting. These layers may be necessary for OU1 if a cap with a low permeability layer is implemented. If these three layers are added to the prescriptive standard, the resulting cap is similar to Alternative 3. The rationale for the additional layers to the prescriptive standard is described below.

Drainage Layer

The prescriptive landfill cap standard in 23 CCR calls for a 12-inch vegetation layer overlying a low-permeability layer. This design essentially places an aquitard 12-inches bgs. Without adequate drainage, water may build up on the low-permeability layer. This water build up could saturate the root zone of vegetation and weaken vegetation. In addition, this water build up may increase the water pressure on the low-permeability layer and increase percolation. Therefore, a drainage layer may be needed to carry this water off the low-permeability layer. Inclusion of the drainage layer will be further evaluated during the RD.

Biotic Barrier

A biotic barrier is needed to prevent burrowing animals and plant roots from penetrating through the barrier layer and into refuse. This penetration can significantly affect the integrity of the barrier layer. A biotic barrier was also included to prevent burrowing animals from being exposed to landfill refuse. Therefore, a biotic barrier was also included in Alternatives 2 and 3.

Gas Vents

The Site 1 landfill is generating gases. Placing a low-permeability cover over the landfill can cause gas pressure to build up under the cap. Increased gas pressure can cause an increase in horizontal subsurface migration. Horizontal migration off site is

undesirable because methane can accumulate in enclosures and create an explosive atmosphere. Therefore, gas venting is needed to alleviate pressure beneath a barrier layer. Gas venting was not included in Alternative 2 because the cap soil would be more permeable than surrounding soils, and gases would flow upward not horizontally.

Using the unit costs provided in the FS with a 1-foot thick vegetation layer and synthetic materials for the drainage layer, biotic barrier, and the low-permeability layer, the total cost is $4,929,700. This results in an increase of $1,772,100 above Alternative 2.

According to CIWMB legal counsel's interpretation the feasibility issue alone is enough to require the prescriptive standards, however, CIWMB staff is providing additional comments on the performance of the caps to assist the Navy in their decision making process. The HELP Model was used in the FS to evaluate the performance of the soil cap versus the multilayered cap. The FS concluded that the two caps were similar in their ability to limit infiltration. After evaluating the input parameters used in the HELP Model comparison, CIWMB staff cannot concur with these findings for the following reasons.

The HELP model is a useful tool in determining the amount of leachate that a landfill is likely to produce because it assumes that any head that builds up on a barrier layer will infiltrate. In addition if infiltration occurs in one location it is applied evenly over the entire site. This is a conservative estimate for determining the amounts of leachate produced at a site but not for a comparison of infiltration rates for landfill caps. State landfill design standards prohibit the buildup of hydraulic head on a liner system. Therefore, when using the HELP model for cap performance evaluation purposes a barrier layer cap should have an adequate drainage system.

The drainage design for the multilayer cap used a drainage path length of 450 feet at a 5 percent slope. Since the HELP model incorporates infiltration while the precipitation is flowing along the drainage path it is doubtful that any of the precipitation will run off. The model shows that only 0.02 percent of the precipitation runs off. Generally landfill slopes are constructed at a 3:1 ratio or 33 percent slope with benches that include collector drains every 50 feet. Therefore, the maximum drainage path that should be used is 50 feet with a slope of approximately 33 percent. The multilayer cap design could also be improved by lowering the permeability of the drainage layer to the $1x10^{-1}$ cm/sec range which would be appropriate for a gravel drainage layer and choosing a barrier layer soil. The model

considers barrier layer soils highly compacted, the soil that was used was considered moderately compacted.

Response: The design of a drainage layer could be optimized and the resulting performance could be increased as noted. However, the important conclusion from the HELP model was that the difference in infiltration rates is insignificant. For Sites 1 and 2, a 3-foot soil cap reduces infiltration into refuse to 1.13 inches per year. A multilayer cap only reduces infiltration to 1.06 inches per year. No significant difference in the amount of infiltration results, considering that the multilayer cap reduces infiltration an additional 0.07 inches per year as compared to a soil cap. The results show that most precipitation will be lost through evapotranspiration (91 percent). Therefore, even if an alternate (and more costly) drainage design was used and all of the remaining precipitation was removed, the reduction (1 inch annually) would not be warranted. Most of the already low annual precipitation does not percolate through to the barrier layer. The Navy conducted a sensitivity analysis using the HELP model to evaluate the impact of drainage layer slope on infiltration rates. The Navy plotted infiltration as a function of drainage layer slope. The resulting additional decrease in infiltration from a 5 percent slope to a 30 percent slope was 0.16 inch. The amount of infiltration is insensitive to lateral drain slope at these low percolation levels.

For the vegetative cap, a 32-inch evaporative zone depth was used for the grass on the vegetative cover. Table 3 (see attached) shows several types of grasses used for landfill covers in California. Their root zones ranged between 6 and 12 inches. An appropriate grass for the vegetative cover model might be the native Costal Range melic with a root zone of 10 inches. If capillary action of the grass roots is considered the total evaporative zone should be approximately 12 inches.

Response: The 36-inch vegetation layer thickness was selected to accommodate deeper root systems of nonwoody plants, allow for long-term erosional losses, and provide water holding capacity to sustain vegetation through dry periods. According to research documented in the HELP model, 32 inches is an achievable evapotranspiration zone for the region and the 36-inch soil thickness was selected to take full advantage of this zone.

CIWMB staff have conducted several runs of the HELP Model Version 3.03 using drought weather conditions from a San Francisco weather station with an average annual precipitation of 12.99 inches which is similar to the synthetically produced 12.5 inches used in the FS comparison. After making the adjustments stated above to the HELP Model input parameters, staff found that the performance of the barrier layer cap significantly exceeded the performance of the soil cap in limiting infiltration. The HELP evaluation in the FS should be adjusted to reflect the above comments.

Response: The Navy agrees that making the suggested adjustment of reducing the evaporative zone to 10 inches will result in increased flow through the lateral drainage layer. The Navy believes making the suggested adjustments ignores the benefits of the dry climate at Moffett Field and enhances the detriments of the dry climate at Moffett Field.

During the August 9, 1995 meeting PRC staff stated that it was not necessary to reduce infiltration because the waste is in groundwater and was not migrating from the site. Title 14 CCR 17709 prohibits the disposal of waste in groundwater, except as approved by the RWQCB. Pursuant to discussions with the Regional Board it is not a matter of the leachate migrating from the site but if groundwater impairment has occurred, see 23 CCR 2510. Since groundwater monitoring wells located in the waste show groundwater impairment and there is a significant amount of waste above the groundwater table, at a minimum a corrective action of source control (that is, capping) must be taken. Staff can not concur with the statement that leachate is not migrating from the site, because adequate down gradient groundwater monitoring has not been provided.

Response: The Navy has agreed to further investigate contaminant migration at identified downgradient locations.

The second performance goal considers the need to limit landfill gas emissions. Landfill gas characterization test results in the Air Quality Solid Waste Assessment Test (Air SWAT) (IT 1992) show that the landfill decomposition gasses consists of 52 percent menthane and carcinogenic trance gasses such as vinyl chloride at 210 ppb. The FS states that the landfill gas is not a potential health threat and calculations for nonmethane organic compounds (NMOC) show that landfill gas emissions do not need to be controlled. CIWMB staff can not concur with these findings because the Air SWAT was never approved by the Bay Area Air Quality Management District, and the potential health risk of the 210 ppb of vinyl chloride, a Class A carcinogen, were never evaluated.

The FS states that the Air SWAT data was used to determine a potential carcinogenic risks of less than $1x10^{-7}$ from landfill gas emissions. Staff found that the Air SWAT proposed integrated surface sampling to determine if methane or carcinogenic trace gasses were emitting from the site but only a surface emissions screening with a flame ionization detector was conducted at 39 degrees Fahrenheit and 3 to 4 mile per hour wind speed. It is not likely than much methane gas was being produced at 39 degrees and a flame ionization detector is not designed to detect trace gases such as vinyl chloride. The landfill gas characterization data that shows 210 ppb of vinyl chloride should be used to determine the potential health risks posed by the landfill gas.

Response: It is likely that 210 ppb of vinyl chloride in the subsurface would attenuate through the 3-foot soil cap and disperse once it reached the surface to undetectable levels. However, the Navy has agreed to revise the cap configuration to include a low-permeability layer and an associated gas collection and venting system to mitigate any potential threats.

The FS states that calculations for NMOC emissions show that landfill gas does not need to be controlled. CIWMB staff can not concur that landfill gas does not need to be controlled. CIWMB staff can not concur that landfill gas does not need to be controlled. Calculations for NMOC emissions are used to determine if the landfill is producing enough NMOCs to impact the ozone layer. These calculations do not consider the need to control landfill gas emissions to prevent a potential health or explosive threat as required by 14 CCR 17783.

Since the intended postclosure land use of the site is a firing range which provides potential receptors and ignition sources it is unlikely that landfill gas emissions will not require control. The landfill cap design should be evaluated with consideration of the performance goals of 14 CCR 17783, Landfill Gas Monitoring and Control and the prescriptive standards in 14 CCR 17796, Postclosure Land Use.

Response: The Navy has agreed to revise the cap configuration to include a low-permeability layer and an associated gas collection and venting system to mitigate any potential threats.

The above discussion has shown that adequate proof has not been provided to show that the vegetative cap is more feasible than the prescriptive standard. In addition, it does not show that the vegetative cap provides infiltration protection to the greatest extent possible, controls landfill gas surface

emissions, or is compatible with the intended postclosure land use. Additional monitoring, modeling and risk assessment will be necessary to justify the vegetative cover. Staff is concerned that additional time and money may be spent by the Navy and will not provide results that will justify the soil cap. Therefore, staff recommends Alternative 2, the vegetative cover, be modified by replacing the lower two feet of vegetative soil with a less expensive foundation and barrier layer material, and if necessary have a drainage layer installed.

Response: The Navy has agreed to include landfill caps that will more clearly meet the specifications in 23 CCR 2581 because regulatory agencies do not believe that Alternative 2 is in compliance with applicable landfill closure regulations. As a result, the proposed plan was revised based on the prescribed, state pre-approved configuration for the two landfill caps at OU1. Instead of 3-foot soil caps, the landfill caps will at a minimum contain 1 foot of topsoil overlying a low-permeability layer. These layers will be built on a 2-foot foundation layer. In addition to this minimum requirement, the Navy will include a biotic barrier and possibly a drainage layer between the impermeable layer and topsoil to protect the integrity of the impermeable layer and drain percolated water off the cap. The biotic barrier will prevent burrowing animals and deep plant roots from puncturing this layer. The drainage layer provides a pathway for percolation to flow off the cap. Inclusion of the drainage layer will be evaluated further during the RD. The Navy will also include gas venting beneath the impermeable layer to prevent gas pressure build-up and horizontal subsurface gas migration.

3.2.12 Other Written Comments

Mr. Walter E. Wallis, P.E.

There are some folks who speak of man's activities on earth as having raped that virgin earth. I have news for them - in terms of "contamination," the earth was a confirmed harlot long before man came on the scene. The La Brea Tarpits are hardly the result of any national defense program, yet their presence has not deterred the development of Los Angeles. Water is an excellent solvent and the prehistoric recipient of all the earth's debris, which included the whole gamut of organic and inorganic possibilities, specifically including radioactivities. If the standards being applied to military base cleanup were generally applied, then all asphalt paving and the underlying soil would have to be

excavated and removed to a hazardous waste dump, and all graveyards receptive of embalmed corpses would have to be encapsulated.

It is in this reality context, rather than in the Bambi Biology, Pinocchio Physiology and other Aquarian "Sciences" that drives the latter day Mother Earth religion, that contamination cleanup must be evaluated.

I would oppose a groundwater collection trench unless it can be demonstrated that the plume from any dump constitutes either a threat to an aquifer that is currently being pumped or that the affected aquifer is discharging contaminants into the bay waters in quantities and concentrations constituting a clear and present danger to the biosphere. Geology suggests that any drinking water source contamination is unlikely.

I oppose a soil cap, both because of the expense of establishing and maintaining such a cap, and because a cap would halt whatever natural remediation processes that vegetation and efflorescence might now be proceeding. If a cap is necessary for methane recovery, it should be paid for out of the profits, if any, from sale of that methane.

If water can be pumped from the contaminated plume and used to irrigate the golf course and other landscape features of Moffett without causing harmful concentrations of materials, while at the same time air scrubbing volatiles, this should be considered. This could perhaps be combined with use of treated effluent from the adjacent Palo Alto treatment facility.

Monitoring should continue, both to determine whether some as yet unknown phenomena might constitute a threat and to evaluate the progress of both natural bioremediation and to try any newly developed assisted bioremediation.

The process of base cleanup being demanded, the unreal standards of what shall constitute clean and the restriction on land reuse until remediation has been completed all have been structured not to solve any threat to public health and safety, but to serve as the stinking albatross around this nation's neck as punishment for policies that countered the demands of the aesthetically advantaged, I would far rather spend scarce defense dollars on active measures of defense than for the expiation of imagined sins.

Response: The groundwater collection trench is proposed as a contingency and will be activated only if contamination is found to be migrating towards surface water. This contingency plan was developed considering the uses of the aquifer. The landfill caps are necessary to contain and isolate the refuse, control hazards associated with landfill gas and leachate, and comply with state regulations. These benefits outweigh any potential benefits of leaving the landfills exposed to the surroundings.

Mr. Peter B. Newman

Thank you for inviting public comment on the proposed plans for OU1. First, my credentials: although I live in Mill Valley, my parent's home is in Los Altos Hills. I have relatives in Palo Alto and San Jose, and friends all over the South Bay. My father (deceased) was a naval engineer in the Pacific in World War II. I have enjoyed the annual summer air show from Moffett ever since I was a kid. I have nothing but positive feelings for the Navy and for Moffett Airfield, and by virtue of the above I consider myself a neighbor of Moffett, albeit a very concerned one.

Having said all that, I will tell you that I am not a raving environmentalist either, but I am less than impressed with the Navy's plan for the "cleanup". I have enclosed the ad from today's Chronicle inviting this comment because, by serendipitous accident, on its backside is a news item about the pollutions at McClellan Air Force Base. Also, I lived adjacent to the Presidio from 1984 to 1992, and I saw repeated disregard for the environment, including the storage of leaking transformers [dioxin] less than 500 feet from San Francisco Bay. My father's stories from his days in the Navy do not help my confidence.

I hope my grandchildren will someday live in the South Bay, drink its waters, maybe even recreate in a cleaned-up Bay. What you proposed is not a cleanup, but a burial. It's not even a decent internment — those solvents will be in the groundwater (if they aren't already) before my kids even have kids, and they'll have to dig up the soil cap to remove and disable the carcinogens and heavy metals if we are ever to have a healthy environment.

Although I support myself as a businessman, I have a strong streak of scientist in me; my favorite magazine is Science News, and I often consider returning to UC Berkeley for an advanced degree in a hard science. It may sound like science fiction to you, but there are emergent technologies (for example, ultrahighsound, plasma ovens, etc.) that offer the real possibility of reducing dangerous

molecules to their atomic components, and of reclaiming poisonous metals so they do not harm the ecological life web. I wish that the Navy would consider spending some research dollars on figuring out how to clean up the messes they (and the other armed forces) have left at bases all over America, perhaps instead of just one missile on another unnecessary nuclear sub.

Response: The remedy was developed based on criteria such as implementability and cost-effectiveness. Research has shown that the most cost-effective solution to landfill contamination are based on containing wastes and monitoring at the landfill perimeter for any migration from the landfill. If contaminant migration is detected, it can be addressed through corrective actions such as subsurface collection trenches. Because landfills are heterogeneous, excavation followed by treatment or in-place treatment are not cost-effective solutions and can create hazardous working conditions. In addition, landfill refuse treatment is difficult to implement because landfills are so heterogeneous.

Comments from Harding Lawson Associates

Comment 1: *We have concluded that the interpretations and conclusions presented in the OU1 FS and repeated in the Proposed Plan are inadequately supported and that these documents contain errors, omissions, and misrepresentations that must be corrected before the documents can fairly represent either the nature and extent of contamination at the two landfills, or appropriate and cost-effective site cleanup alternatives.*

On the basis of our review, we recommend that the May 15, 1995, OU1 FS and the May/June 1995 Proposed Plan be rejected or withdrawn, and that deficiencies in site characterization and remedial planning be remediated before those two documents are revised and reissued. In our opinion, this is the simplest and most straightforward way of addressing the many problems that have been identified and of creating an easily understood administrative record that fairly represents both the remedial RI/FS and the final remedial selection. There does not appear to be any technical reason why this approach would significantly delay the actual field implementation of remedial actions.

Contrary to this recommendation, we understand that EPA and California DTSC staff would prefer to accept the OU1 FS in its present form and attempt to remedy

deficiencies through an additional specially established review, comment, and revision process inserted between the end of the current formal FS/Proposed Plan public comment period and creation of the draft ROD. It is our understanding that this preference is motivated by a desire to maintain the current Moffett Field RI/FS schedule and allow listing of the OU1 FS as "complete." Unless this represents preferential treatment for the Navy, it appears that this approach will establish a new precedent for approval of significantly flawed Superfund deliverables that will be applicable to many similar public and private Superfund sites.

Successfully implementing such a deviation from established Superfund protocols will require establishing an enforceable framework for ongoing public review and comment and an enforceable mechanism for continued revision of the Proposed Plan as fundamental data gaps are filled and will result in some key data gaps, such as gaps in required groundwater characterization, not being filled until after the ROD is completed. This will require an enforceable and meaningful mechanism for community input even after the ROD is completed. At this time, we do not understand how this can be accomplished consistent with the basic Superfund principle that community input is cut off after completion of the ROD.

Response: The overall strategy of capping the landfills, installing a gas interceptor trench, installing a groundwater collection trench, and continuing groundwater and gas monitoring (with corrective action contingencies) is an adequate approach to address the OU1 landfills. None of the comments and questions received during the public comment period have indicated that this remedial strategy is "significantly flawed." The Navy will conduct additional field work to further investigate leachate migration at Site 1. The outcome of this investigation will not influence the cap selection since the Navy has also agreed to include low-permeability caps. Therefore, OU1 activities can proceed with only minor modifications to the current schedule.

Comment 2: *Concurrence with Comments of Others. HLA has reviewed comments, concerns, and issues submitted by other individuals and groups, including:*

- *August 28, 1995, comments of the THE RAB Committee for Moffett Field, a community input forum established for Moffett Field cleanups,*

- *June 14, 1995, comments from the City of Sunnyvale Department of Public Works,*
- *June 4, June 12, and August 7, 1995, comments of the Cost Committee of the RAB,*
- *August 10, 1995, outline of recommendations for closing Moffett Field Landfills, submitted by community member Cynthia Sievers at the August 10, 1995, RAB meeting.*

On the basis of our review of the listed documents, we have concluded that our comments and concerns are all raised in one or more of these documents. Copies of each of these documents are attached for reference. Rather than restate all of these previously submitted comments, we simply confirm here that we concur with the factual issues and questions raised by the earlier commentors. We believe that all of these issues and questions need to be adequately addressed before the OU1 FS and the Proposed Plan will be adequate, and we note that adequately addressing some of these issues and questions will require additional data collection, technical analyses, and/or document revision.

Response: To avoid redundancy, please see the response to comments from the above-mentioned commentors.

3.3 JANUARY 1996 PUBLIC MEETING COMMENTS AND RESPONSES

Comment 1: *Mr. Tom Iwamura from the SCVWD asked about the material of construction for the low-permeability layer.*

Response: The low-permeability layer will likely be prefabricated and partially constructed from synthetic materials. For example, the low-permeability layer may be a composite layer of bentonite and polyethylene membrane. These types of synthetic layers are typically more cost-effective than clay and are easier to construct. The specific construction materials will be identified during the remedial design.

Comment 2: *Mr. Stewart McGee from the City of Sunnyvale raised five concerns regarding the revised proposal for OU1. Each concern is followed by a response, below. First, Mr.*

McGee was concerned that the revised proposed plan lacked detail regarding the data gaps associated with groundwater surrounding Site 1.

Response: Concerns about the adequacy of the current groundwater monitoring network were raised during the June 1995 public comment period. The groundwater monitoring network is believed to be inadequate because, at a downgradient location along the southwestern boundary of Site 1, no groundwater monitoring wells are present. RAB members are concerned that leachate could be migrating from the landfill through this unmonitored, downgradient area.

To address this concern, the Navy will conduct an additional groundwater investigation in this southwestern area to evaluate leachate migration. The additional investigation will be conducted in two phases. The first phase will include techniques to identify underground sand layers that may serve as preferential migration pathways. This first phase will also include collecting groundwater screening samples. Data from these two activities (CPT and HydroPunch) will be used to locate permanent groundwater monitoring wells. Phase II of the groundwater investigation will include installing and sampling new groundwater monitoring wells. Data resulting from this field investigation could trigger corrective action and the groundwater monitoring wells will be incorporated into the long-term groundwater monitoring plan.

There is also concern that the station-wide ROD and remedial actions should be postponed until the results of the field investigation are obtained. The overall strategy of capping the landfills, installing a gas interceptor trench, installing a groundwater collection trench, and continuing groundwater and gas monitoring (with corrective action contingencies) is an adequate approach to address the OU1 landfills. This activities can proceed as planned. The outcome of the investigation will not influence the remediation strategy because the results can be incorporated into the groundwater monitoring plan, which includes procedures to implement corrective action plans. Therefore, any corrective actions identified as a result of the additional field investigation can be integrated into the groundwater monitoring plan. Cap construction is also independent of the results of the groundwater investigation because the Navy has agreed to include low-permeability caps. For these reasons, the groundwater investigation received little discussion in the revised proposed plan.

Comment 3: *Mr. McGee asked whether the Navy's financial responsibilities will be maintained even if control of Moffett Field is transferred to a municipal government or redevelopment agency.*

Response: Postclosure landfill maintenance and monitoring activities will be funded through annual DoD environmental restoration budgets. These budgets are proposed by NAVFAC headquarters in Washington D.C. and are approved as part of a total budget package each year by Congress and the President. While congressional actions cannot be anticipated, it is NAVFAC's responsibility to request the necessary money for the upcoming fiscal year's environmental restoration work.

Comment 4: *Mr. McGee raised concerns about the current and future O&M of the Moffett Field subdrain system and the associated Building 191 pump station.*

Response: Flooding of the northern portion of the base, which includes the northern end of the airfield runways and landfills, could occur during the rainy season without continued pump station operation. Therefore, appropriate institutional controls will be implemented by the federal government to assure continued O&M of the pump station and drain system. While Moffett Federal Airfield remains federally-owned land, the necessity of continued O&M of the pump station shall be noted in the Master Plan for the government's land uses and, if still necessary in the event of any conveyance of the property, the required pump station O&M will be addressed by appropriate notices and land use covenants binding on subsequent property owners.

Comment 5: *Mr. McGee stated that the City of Sunnyvale agrees that radiological information should be collected for the OU1 landfills.*

Response: The Navy has included a radiological survey in plans for future field work.

Comment 6: *Mr. McGee stated that community participation should be continued during cleanup activities at Moffett Field.*

Response: The Navy supports and encourages continued public participation during the RD/RA through the Moffett Field RAB, by individual citizens, or by interested groups. The

Navy will continue to inform the RAB of progress throughout the RD/RA in accordance with EPA guidance.

Comment 7: *Ms. Leslie Byster of SVTC stated that SVTC members were concerned about continued public participation. In addition, Ms. Byster indicated that SVTC believes that the Navy should be held to a cleanup standard that allows complete flexibility in the future land use. She pointed out that this concern was also shared by a former naval officer and the Sisters of Notre Dame.*

Response: To allow maximum flexibility regarding future land use, the refuse in the OU1 landfills would have to be excavated, transported, possibly treated, and redisposed into another landfill. This strategy is rarely pursued for landfill remediation because extreme costs and hazardous working conditions make landfill excavation and redisposal impractical. For landfills, research has shown that the most cost-effective solutions to landfill contamination are based on containing wastes and monitoring at the landfill perimeter for any migration from the landfill.

Comment 8: *Ms. Cynthia Sievers of the LWV expressed concerns regarding groundwater data gaps, Building 191 O&M, continued public participation, and adequacy of data.*

Response: Please see the responses to comments 2 through 7 in this section.

Comment 9: *Mr. Lenny Siegel from the Pacific Studies Center spoke about several issues. He first stated that he believed that Moffett Field serves as a model for public participation. He also indicated that OU1 raises important issues surrounding the relationship of cleanup and future use of property. He stated that the community should have full flexibility regarding reuse, even if the Building 191 pump station is turned off.*

Response: Please see the responses to comments 4 and 7 above.

3.4 JANUARY 1996 WRITTEN COMMENTS AND RESPONSES

3.4.1 Comments from the City of Mountain View

Comment 1: *The City of Mountain View continues to be vitally interested in the cleanup efforts currently underway at Moffett Federal Airfield. It is the City's position that OU1 and all contaminated sites at Moffett Federal Airfield be cleaned up to a level that will allow for the maximum flexibility for future land use and meet all health and safety standards.*

Response: The Navy's selected remedy meets all applicable regulations and standards. However, to allow maximum flexibility regarding future land use, the refuse in the OU1 landfills would have to be excavated, transported, possibly treated, and redisposed into another landfill. This strategy is rarely pursued for landfill remediation because extreme costs and hazardous working conditions make landfill excavation and redisposal impractical. For landfills, research has shown that the most cost-effective solutions to landfill contamination are based on containing wastes and monitoring at the landfill perimeter for any migration from the landfill.

Comment 2: *The City of Mountain View has concerns regarding the Navy's long-term commitment for the cleanup of OU1 and other contaminated sites at Moffett Federal Airfield. The City is interested in knowing the mechanism the Navy will use to provide adequate financial resources for the long-term cleanup of OU1 and other contaminated sites at Moffett Federal Airfield.*

Response: The cleanup of OU1 and other contaminated sites at Moffett Field will be funded through annual DoD environmental restoration budgets. These budgets are proposed by NAVFAC headquarters in Washington D.C. and are approved as part of a total budget package each year by Congress and the President. While congressional actions cannot be anticipated, it is NAVFAC's responsibility to request the necessary money for the upcoming fiscal year's environmental restoration work.

Comment 3: *The City also has concerns regarding the methodology for groundwater sampling contained in the draft field work plan for OU1. Groundwater samples should be taken*

at every HydroPunch. Groundwater sampling should not be limited to areas where only permeable layers exist.

Response: Groundwater sample collection is not proposed for impermeable layers because groundwater flow and contaminant migration are typically not significant through such layers. Groundwater sampling will be focused on permeable layers where contaminants are more likely to migrate significant distances. In addition, it is often difficult and time-consuming to collect enough groundwater for analysis from a subsurface location with low permeability.

3.4.2 Comments from California Integrated Waste Management Board

Comment 1: *The proposed capping configuration shown on Figure 4 contains multiple layers with no dimensions. Staff is concerned about the excessive loading of the landfill slopes with all this material. The vegetative, biotic, and drainage layer can be combined into one 12 inch layer that would meet state standards. Please justify the need for the additional layers that are in excess of the state standards and show that the additional load on the landfill slopes will not cause a stability or settlement problem.*

Response: The justification for the additional layers was provided in the first response to CIWMB earlier comments in Section 3.2.11. The Navy would be interested in any information regarding the combined 12-inch vegetative, biotic, and drainage layer and requested further information from CIWMB. Slope stability and settlement will be evaluated and a geotechnical report will be prepared. The cap will then be designed to mitigate any slope stability and settlement concerns identified in the report.

Comment 2: *No basis for the Cost Comparison, shown on Table 1 was provided. Please provide a cost estimate to justify the cost comparison on Table 1.*

Response: The cost estimate details will be sent to CIWMB.

Comment 3: *It has not been shown that the proposed control measure of landfill gas venting will not pose a potential health threat. Please provide modeling and risk assessment data to show that the vents will not pose a potential threat.*

Response: At Site 1, landfill gases will be collected in the gas venting layer and vented to the atmosphere by riser pipes extending from the gas venting layer, through the cap, and to the surface. Each riser pipe outlet can be positioned several feet above the breathing zone to mitigate any possible inhalation hazards.

3.5 MARCH 1997 PUBLIC MEETING COMMENTS AND RESPONSES

Mr. Kevin Woodhouse, Environmental Management Coordinator for the City of Mountain View, stated that the City of Mountain View would provide comments before the end of the comment period.

3.6 MARCH 1997 WRITTEN COMMENTS AND RESPONSES

3.6.1 Comments from the City of Mountain View

Comment 1: *The Draft OU1 Alternatives Analysis Technical Memorandum states that landfill Site 2 "reportedly received wastes from maintenance operations such as scrap equipment, paint and paint thinners, solvents, lacquer, ash, asbestos, jet fuels, waste oil, fuel filters, transformer oils and filters, and sawdust contaminated with polychlorinated biphenyls (PCBs)" (Page 6). Handling and treatment procedures of such hazardous wastes should be thoroughly addressed in a health and safety plan prior to excavation and should comply with all applicable state and federal regulations.*

Response: Appropriate health and safety precautions will be observed during construction. Pertinent regulations concerning procedures for handling hazardous wastes discovered at Sites 1 and 2 are incorporated in the ROD.

Comment 2: *Although PG&E's easement agreement with the Navy requires PG&E to be responsible for relocating, if necessary, the high-pressure gas main running through OU1, this possible turn of events could significantly impact the project. Has an evaluation of project scheduling and (indirect) cost impacts been done in the event the pipeline must be relocated?*

Response: This contingency, while possible, is not considered likely. Consequently, resources have not been expended to evaluate potential changes to the project schedule and budget to account for PG&E relocating the pipeline.

Comment 3: *If dewatering during excavation reveals contamination levels exceeding regulatory criteria, how will this contaminated water be handled and treated?*

Response: Handling and treatment of groundwater containing contaminant levels that exceed regulatory criteria will depend on the contaminant concentrations. Discharge to the Sunnyvale POTW may be possible if concentrations meet POTW discharge requirements. Other treatment methods such as treatment using granular activated carbon may be employed depending on the observed groundwater characteristics.

Comment 4: *The proposal indicates that the Navy will monitor groundwater for a minimum of 3 years to confirm that groundwater quality is not affected (Page 13). This monitoring period should be for as long as required by state and federal oversight regulatory agencies beyond the 3-year minimum.*

Response: The Navy will consult with EPA and the state before groundwater monitoring ceases at Site 2.

Comment 5: *The cost estimate for consolidation versus capping includes a margin of error from 50 percent above to 30 percent below. A more accurate cost comparison should be developed prior to making a final decision on the remedial action alternative to be used at the site. Does the existing estimate factor in increased capping cost at Site 1 to handle the additional volume from Site 2 wastes? Increased costs for operating a CAMU? Increased benefit from having more flexibility with the land use on Site 2?*

Response: The cost estimates for the alternatives were prepared to the accuracy specified by EPA guidance and are suitable for remedy selection. The small amount of waste expected to be added from Site 2 to Site 1 is not anticipated to have any effect on the Site 1 cap cost within the accuracy of the estimate. The CAMU does not result in additional costs. The monitoring, closure, and postclosure activities proposed for Site 1 will incur the same costs, regardless of the CAMU. No additional costs for CAMU operation are expected. The potential increased land value at Site 2 was not considered in the cost analysis for the consolidation alternative.

Comment 6: *Operation of a CAMU for remediation wastes at Site 1 should be done in compliance with all applicable state and federal regulations, as should closure and postclosure maintenance of the Site 1 landfill.*

Response: The Navy will follow pertinent regulations concerning procedures for creating a CAMU as well as for closure and postclosure activities as incorporated in the ROD.

3.6.2 Comments from Mr. Thomas Iwamura, SCVWD

We have reviewed the revised plan on the remedy for OU1 and we are in concurrence with your plan of consolidating the two landfills at the Site 1 landfill.

4.0 REFERENCES

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