Southwest Division
Naval Facilities Engineering Command
Contracts Department
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FINAL

RECORD OF DECISION

Revision 0
June 25, 2002

SITE 22 LANDFILL
MOFFETT FEDERAL AIRFIELD
MOFFETT FIELD, CALIFORNIA

DCN: FWSD-RACII-02-0197

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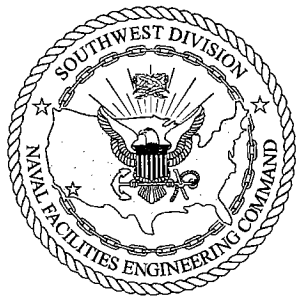

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SITE 22 LANDFILL
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DECLARATION STATEMENT FOR SITE 22 LANDFILL

SITE NAME AND LOCATION

Site 22 Landfill
Moffett Federal Airfield (MFA) [formerly Naval Air Station (NAS) Moffett Field]
Moffett Field, California 94041
National Superfund Electronic Database ID Number 0902734

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) document presents the selected remedy for the Site 22 Landfill at Moffett Federal Airfield (MFA). Site 22 is a former solid waste landfill currently overlain by part of the MFA golf course. The selected remedy 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 File for the Site 22 Landfill. The United States Environmental Protection Agency (EPA), and the State of California [through the California Environmental Protection Agency, San Francisco Bay Regional Water Quality Control Board (RWQCB)] concur with the selected remedy. This ROD also includes a Responsiveness Summary, which describes the public participation activities conducted and provides responses to comments received during the public comment period.

ASSESSMENT OF THE SITE

Results of investigations conducted at the Site 22 Landfill indicate a need to prevent human exposure to buried waste, which could be uncovered by the activities of burrowing animals. In addition, refuse contained within the Site 22 Landfill could potentially lead to future contaminant releases to groundwater or the atmosphere, although remedial investigations have shown this potential to be minimal. Therefore, actual or threatened releases of this nature from the Site 22 Landfill, if not addressed by implementation of the remedy selected in this ROD, may present a current or potential threat to public health or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy will address direct contact between waste and humans through the implementation of measures that will prevent animals from burrowing into the landfill and uncovering waste. Potential releases of contaminants to groundwater or the atmosphere are believed to be insignificant and will be addressed through monitoring. The remedy selected for the Site 22 Landfill is consistent with remedial investigation and feasibility study (RI/FS) activities performed at the site. The potential source of contamination will be addressed by isolating subsurface waste, thereby reducing the risk associated with migration of, and exposure to, contaminated materials.

The major components of the selected remedy include:

- A barrier will be installed to prevent burrowing animals from uncovering the subsurface contamination.
- Surface water flow across the site will be managed to prevent ponding of water on the Site 22 Landfill and to improve precipitation runoff in order to reduce water infiltration into the subsurface.
- Institutional controls will be enacted to maintain the integrity of the barrier and to prevent disturbance or excavation of waste materials.
- Groundwater and landfill gas will be monitored in the vicinity of the site.

Groundwater monitoring will be conducted in accordance with the applicable or relevant and appropriate requirements (ARARs) to ensure that groundwater at the Site 22 Landfill is not adversely affected. Landfill gas (primarily methane) concentrations at the site boundaries will also be monitored in accordance with a long-term landfill gas monitoring plan to be developed for approval by the regulatory agencies as part of the remedial design. If methane concentrations approach levels of concern, gas migration will be evaluated.

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 remedy, and is cost-effective. However, because treatment of the principal contaminants present at this site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. The EPA has developed a strategy to address landfills that is based on containment of contaminants. Containment is the presumptive remedy for landfills and does not require characterization of landfill contents or a quantified assessment of associated risks. The heterogeneity and volume of the buried wastes and the fact that there are not any known hot spots that represent major sources of contamination preclude a remedy in which contaminants could be excavated and treated effectively. Therefore, based on site conditions, a biotic barrier was selected.

Because this remedy will result in potentially hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within the next 5 years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment. Subsequent statutory reviews will be conducted on a 5-year basis until the site monitoring activities are ceased, or a No Further Action determination is made for the site.

ROD CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD:

- Chemicals of potential concern and their respective concentrations
- Baseline risk represented by the chemicals of concern
- How source materials constituting principal threats are addressed
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater considered in the baseline risk assessment and the ROD
- Potential land and groundwater use that will be available at the site as a result of the selected remedy
- Estimated capital, annual operation and maintenance, total present worth costs, discount rate, and the number of years over which the remedy costs are projected
- Key factors that led to selecting the remedy

Additional information can be found in the Administrative Record File for this site.

AUTHORIZING SIGNATURES

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MAY 01, 2002
Date

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Date

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ABBREVIATIONS AND ACRONYMS

ARAR	applicable or relevant and appropriate requirement
AWQC	ambient water quality criteria
Basin Plan	San Francisco Bay Water Quality Control Plan
bgs	below ground surface
BRAC	Base Realignment and Closure
Cal/EPA	California Environmental Protection Agency
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIWMB	California Integrated Waste Management Board
COC	constituent of concern
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
CRP	Community Relations Plan
DDT	dichlorodiphenyltrichloroethane
DoD	Department of Defense
DoN	Department of the Navy
DTSC	Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
FFA	Federal Facility Agreement
FS	Feasibility Study
FWENC	Foster Wheeler Environmental Corporation
GCL	geosynthetic clay liner
HELP	Hydraulic Evaluation of Landfill Performance
HI	hazard index
HHRA	human health risk assessment
HLA	Harding Lawson and Associates
IAS	initial assessment study
IRP	Installation Restoration Program
ISS	integrated surface sampling
IT	International Technology Corporation
IWMB	Integrated Waste Management Board

ABBREVIATIONS AND ACRONYMS
(Continued)

LDR	land disposal restriction
LEA	Local Enforcement Agency
LEL	lower explosive limit
MFA	Moffett Federal Airfield
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
msl	mean sea level
MW	Montgomery Watson
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
NFESC	Naval Facilities Engineering Service Center (formerly NEESA)
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NMOC	non-methane organic compounds
NPL	National Priorities List
O&M	operation and maintenance
OU	operable unit
PCB	polychlorinated biphenyl
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
RI	Remedial Investigation
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act
SVOC	semivolatile organic compound
SVTC	Silicon Valley Toxics Coalition

ABBREVIATIONS AND ACRONYMS
(Continued)

SWAT	solid waste assessment test
SWEA	Site-wide Ecological Assessment
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TPH	total petroleum hydrocarbons
TPH-extractable	total extractable petroleum hydrocarbons
TPH-purgeable	total purgeable petroleum hydrocarbons
TRC	technical review committee
TtEMI	Tetra Tech EM, Inc.
USC	United States Code
VOC	volatile organic compound
WQO	water quality objective

1.0 SITE NAME, LOCATION, AND DESCRIPTION

1.1 SITE NAME AND LOCATION

The site addressed in this Record of Decision (ROD) is the Site 22 Landfill, which is located at Moffett Federal Airfield (MFA) [formerly Naval Air Station (NAS) Moffett Field], Moffett Field, California. MFA is located near the southwestern edge of the San Francisco Bay in Santa Clara County, California (Figure 1). MFA is bounded by Cargill saltwater evaporation ponds to the north, Stevens Creek to the west, U.S. Highway 101 to the south, and the Lockheed Martin Aerospace Center to the east. The cities of Mountain View and Sunnyvale, California, also border MFA. The city of Sunnyvale is located southeast of Mountain View, and both are adjacent to the southern portion of MFA.

1.2 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY ID NUMBER

CA2170090078

1.3 LEAD AND SUPPORT AGENCIES

The lead agency for activities conducted at this site is the United States Department of the Navy (DoN). The lead regulatory agency is the United States Environmental Protection Agency (EPA), and the supporting agencies are the San Francisco Bay Regional Water Quality Control Board (RWQCB) and the California Department of Toxic Substances Control (DTSC). All environmental investigation and restoration activities at MFA and this site are conducted under the DoN's Installation Restoration Program (IRP). The IRP was developed in 1980 by the United States Department of Defense (DoD) to comply with federal guidelines to manage and control past waste disposal actions. IRP activities are performed under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), also known as the "Superfund" program.

1.4 SOURCE OF CLEANUP MONIES

Funding for environmental investigation and remediation activities conducted under the IRP is provided by the DoN.

1.5 SITE TYPE

Landfill

1.6 SITE DESCRIPTION

The Site 22 Landfill is located in the northeastern corner of MFA (Figure 2). The Site 22 Landfill covers approximately 9.4 acres and contains an estimated total refuse (waste) volume of 92,000 cubic yards. The site was used as an active landfill from 1950 through 1967. The refuse is believed to consist primarily of domestic waste, as confirmed through exploratory trenching. Results of environmental investigations indicate that in some places, the waste is located beneath the groundwater table, while in others, waste is located near the surface (above the groundwater table). The Site 22 Landfill now underlies holes 6 and 7 of a golf course, which is operated by the United States Air Force. The fairway and putting greens for these holes are located on top of the landfill as shown in Figure 3. The rough for holes 6 and 7, which contains trees, is on the sloped part of the landfill. Soil borings and trenching indicate that most of the landfill is covered with approximately 1.5 feet of soil; however, soil thickness in a few areas is less than 1 foot.

2.0 SITE HISTORY

Moffett Field was operated by either the DoN or the United States Army Air Corps (at various times) from 1933 to 1994. The facility initially supported the West Coast dirigibles (blimps) of the lighter-than-air program and later was used in a variety of aviation-related capacities, which included transport, training, and anti-submarine patrol activities. NAS Moffett Field was closed as an active military base in July 1994. The National Aeronautics and Space Administration (NASA) Ames Research Center, a research and development facility, now operates Moffett Field as MFA.

Environmental restoration activities began at MFA in 1984 as part of the DoN's IRP. The DoN conducted an initial assessment study (IAS) in 1984 to gather data on the past use and disposal of hazardous materials at MFA [Naval Energy and Environmental Support Activity (NEESA), 1984]. Nineteen sites were identified as potential sources of wastes, including nine sites identified in the IAS and ten sites added during subsequent investigations in 1986 and 1987. The EPA proposed MFA as a National Priorities List (NPL) site in June 1986 and placed it on the NPL in 1987. Placement on the NPL initiated the Remedial Investigation/Feasibility Study (RI/FS) process under CERCLA. Data collected during the initial studies were used to plan the RI/FS work. This work was coordinated through a Federal Facility Agreement (FFA) between the DoN, EPA, RWQCB, and DTSC, which was signed on September 14, 1990. The FFA is a cooperative agreement that:

- Ensures environmental impacts are investigated and appropriate response actions are taken to protect human health and the environment
- Establishes a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions
- Facilitates cooperation, exchange of information, and participation of the parties
- Ensures adequate assessment, prompt notification, and coordination between federal and state agencies

Sites included in the RI/FS at MFA were organized into operable units (OUs) in 1991. The DoN and NASA later signed a Memorandum of Understanding (MOU) on December 22, 1992, concerning environmental activities at MFA. Under the MOU, the DoN will continue with environmental restoration and remain responsible for remediating DoN contaminant sources. NASA is responsible for non-environmental operations and ongoing environmental compliance.

Investigations supporting various phases of the RI for MFA identified several potentially contaminated sites, including the Site 22 Landfill. The Site 22 Landfill was characterized in the *Final Station-wide RI Report* [PRC Environmental Management, Inc. (PRC), 1996a] and the

Additional Sites Investigation Phase II Draft Final Report (PRC, 1995a). Because operating records do not exist for the Site 22 Landfill, the history of the landfill was researched by studying aerial photographs and historical maps of the area and interviewing base personnel. This review indicated that the landfill was active from 1950 to 1967. Base personnel reported that Site 22 was used as a municipal landfill after the landfill at Site 2 was closed. Visual characterization of waste excavated at Site 2 confirmed that Site 2 contained primarily domestic waste; therefore, it was expected (and later confirmed) that the Site 22 Landfill also contained domestic waste. In 1973, the Site 22 Landfill was converted into holes 6 and 7 of the MFA golf course.

In April 1998, an additional investigation was initiated to provide supplemental information about the Site 22 Landfill and its surrounding area. As part of this additional investigation, exploratory trenches were dug to further evaluate the vertical and horizontal extent of refuse within the landfill. The exploratory trenching uncovered municipal waste such as old tires, newspapers, vacuum tubes, and shampoo bottles. Based on the results of the trenching, the extent of the landfill was estimated to be approximately 9.4 acres, and the volume of refuse was estimated at approximately 92,000 cubic yards.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

In May 1989, the DoN developed a Community Relations Plan (CRP) for MFA. The CRP outlined specific activities based on environmental concerns voiced by the community. Since 1993, the EPA has provided a technical assistance grant to the Silicon Valley Toxics Coalition (SVTC), a local environmental group. This grant allowed SVTC to hire a consultant to assist in reviewing MFA environmental documents. In addition, the DoN 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 the community and holds regular public meetings to discuss environmental progress at MFA.

The Site 22 Landfill was characterized in the *Final Station-wide RI Report* (PRC, 1996a) and the *Additional Sites Investigation Phase II Draft Final Report* (PRC, 1995a). A final FS Report and draft Proposed Plan for the Site 22 Landfill were released to the agencies in March 1999. A revised final FS was prepared in May 1999 to address concerns raised by local agencies. The revised final FS added an additional remedial alternative. However, after discussions with the regulatory agencies and the public, the DoN determined that the additional remedial alternative was not feasible, and therefore, the final March 1999 FS [Tetra Tech EM, Inc. (TtEMI), 1999] was retained as the FS of record for the Site 22 Landfill.

The final *Proposed Plan for Site 22* (DoN, 2001) was released to the public on April 2, 2001. The notice of availability for the *Proposed Plan for Site 22* (DoN, 2001) and related documents was published in the San Jose Mercury News on April 2, 2001. All documents related to the site can be found in the Administrative Record File located at Southwest Division Naval Facilities Engineering Command, 1220 Pacific Highway, San Diego, California, 92132, and in the information repository located at the Mountain View Public Library, 585 Franklin Street, Mountain View, California, 94041. An index of the Administrative Record File for this site is provided as Appendix A. A public comment period was held from April 2, 2001, to May 9, 2001, and a public meeting was held on April 26, 2001, to present the *Proposed Plan for Site 22* (DoN, 2001) to a broader community audience than had already been involved at the site and to solicit public input on the *Proposed Plan for Site 22* (DoN, 2001). At this meeting, representatives from the DoN provided an environmental description and history of the site, presented the remedial action objectives for the Site 22 Landfill, provided a description of the remedial action alternatives considered, answered questions about the Site 22 Landfill, solicited input on the reasonably expected future land use, and supplied the rationale for proposing the preferred remedial action for the Site 22 Landfill. In addition, the EPA and the RWQCB explained their involvement with the Site 22 Landfill remediation process. The DoN's response to comments received from the audience during the public meeting and during the public comment period is included in the Responsiveness Summary (Section 15 and Appendix B) of this ROD. These

community participation activities fulfill the requirements of Sections 11 3(k)(2)(B)(i-v) and 11 7(a)(2) of CERCLA.

4.0 SCOPE AND ROLE OF SITE 22 WITHIN THE BASE-WIDE STRATEGY

MFA is a large federal facility containing numerous contaminated sites and potential sources of contamination, which have been identified through various environmental assessments and investigations conducted over the last 15 years. The lead agency for these activities is the DoN, and regulatory oversight is conducted by the EPA and agencies of the California Environmental Protection Agency. The sites investigated under the CERCLA program have been organized into OUs or otherwise as follows:

OU1	Soils and groundwater at Sites 1 and 2 Landfills
OU2-East	Soils at Sites 3, 4, 6, 7, 10 (runways), 11, and 13
OU2-West	Soils at Sites 8, 10 (Chase Park), 14-North, 16, 17, and 18
OU5	Aquifers on the eastern side of MFA that are not part of the regional plume or OU1
OU6	Wetland areas
Petroleum Sites	Sites 5, 9, 12, 14-South, 15, 19, 20, and 24
Additional Sites	Sites 21, 22, 23, weapons storage bunkers, former industrial wastewater flux ponds, and the abandoned former agricultural well

Most of the sites identified to date are in some phase of the assessment or remediation process. This ROD pertains specifically to reducing the risk associated with exposure to contaminated materials at the Site 22 Landfill, which may be brought to the surface by burrowing animals. The selected remedial action described in this ROD will prevent existing and future exposure to buried refuse through adopting institutional controls, preventing burrowing of animals, and minimizing erosion. In addition to these activities, the selected remedy and the overall site management plan will also include instituting long-term groundwater and landfill gas monitoring and maintaining the integrity of the biotic barrier in the future. The selected remedy will be implemented upon regulatory agency approval of the remedial design and the remedial action implementation plan.

The base-wide management strategy is to accelerate actions at OUs while identifying and closing out sites not requiring action. This strategy, which uses no-action RODs, allows resources to be concentrated on the OUs that require action. Selection of the remedy for the Site 22 Landfill is consistent with overall RI/FS activities at MFA.

5.0 SUMMARY OF SITE CHARACTERISTICS

EPA guidance and the preamble to the NCP identify landfills as sites where treatment may be impracticable because of the size and heterogeneity of municipal waste (EPA, 1993). 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 makes accurate characterization of landfill refuse impractical and virtually impossible.

As a result, Site 22 RI/FS field investigations focused on hydrogeology, soil chemistry, groundwater chemistry, and landfill gas composition to evaluate whether contamination from the landfill was migrating past landfill boundaries. The following subsections discuss general geological and hydrogeological characteristics at the Site 22 Landfill and summarize the nature and extent of contamination. More detailed, site-specific information can be found in the *Final Station-wide RI Report* (PRC, 1996a), the *Additional Sites Investigation Phase II Draft Final Report* (PRC, 1995a), and the *Site 22 FS Report* (TtEMI, 1999).

5.1 GEOLOGY/HYDROGEOLOGY

5.1.1 Regional Setting

MFA is located at the northern end of the Santa Clara Valley Basin, approximately 1 mile south of the San Francisco Bay. Regionally, the Santa Clara Valley contains as much as 1,500 feet of interbedded alluvial, fluvial, and estuarine deposits (Iwamura, 1980). Locally, these sediments consist of varying combinations of clay, silt, sand, and gravel that represents the interfingering of estuarine and alluvial depositional environments during the late Pleistocene and Holocene epochs. The fluvial sediments were derived from the Santa Cruz highlands west of the basin and deposited on an alluvial plain bounded by alluvial fan deposits to the west and baylands to the northeast (Iwamura, 1980). The heterogeneous nature of channel and interchannel sediments deposited in the fluvial depositional environment is evident in the many subsurface explorations conducted at MFA. These sediments most likely were deposited during the Holocene period when the worldwide sea level was rising toward its present elevation.

The following paragraphs briefly describe the hydrogeologic system present at MFA. The subsurface sediments were initially divided into upper and lower aquifers by Iwamura (1980), based on hydrogeologic characteristics. An investigation conducted by Harding Lawson Associates (HLA) (1988) classified these aquifers as the A, B, and C aquifers. The A and B aquifers correspond to Iwamura's upper aquifer, and the C aquifer corresponds to Iwamura's lower aquifer. HLA further subdivided the B aquifer into three subunits (B1, B2, and B3 aquifer

zones). International Technology Corporation (IT) reclassified the B1 sediments as the A2 aquifer zone based on lithologic and sedimentologic similarities between the A and B1 materials (IT, 1991). Aquifer materials within this system range from clays and silts, to fine and medium sands, to coarse gravel.

Below the A, B, and C aquifers lie what has been identified as the deep aquifers. Continuous and semi-continuous aquitards divide the aquifers and aquifer zones. The aquifer and aquitard descriptions are based on existing data and lithologic interpretation of soil borings and cone penetrometer tests, as discussed in Foster Wheeler Environmental Corporation's (FWENC's) *Draft Annual Groundwater Report for 1999 and 2000* (FWENC, 2001a). The A and B aquifers are currently not used for production purposes, and neither active agricultural nor municipal supply wells are located at MFA. The C aquifer, however, has historically been used for agricultural purposes at MFA and as a drinking water source elsewhere in the Santa Clara Valley. There is a continuous confining layer separating the B and underling C aquifers beneath the site and a regional upward hydraulic gradient from the C to the B aquifer. A continuous clay layer has also been observed between the A and underlying B aquifers with regional upward hydraulic gradient from the B aquifer to the A aquifer (FWENC, 2001a).

The water table at MFA is not a static boundary, but fluctuates in response to changes in evaporation, precipitation, and groundwater pumping. The water table at MFA ranges from approximately 1 to 15 feet below ground surface (bgs). Tidal influence on the elevation of the water table is negligible. Except in the northernmost portion of MFA, which includes the Site 22 Landfill, the A and B aquifers meet both the State Water Resources Control Board (SWRCB) Resolution 88-63 criteria and EPA classification guideline criteria for a potential drinking water source.

The aquifer zones and their approximate depths are provided below, and detailed aquifer descriptions are provided in the *Draft Annual Groundwater Report for 1999 and 2000* (FWENC, 2001a).

Aquifer Zone Designation	Approximate Depth (feet bgs)
A1 (or A) aquifer zone	0 to 35
A2 (or B1) aquifer zone	35 to 55
B2 aquifer zone	55 to 130
B3 aquifer zone	130 to 160
C aquifer	160 to 240
Deep aquifer	Generally deeper than 240

5.1.2 Local Setting

On a local scale, alluvial processes have juxtaposed clay, silt, sand, and gravel in adjacent depositional environments. The stratigraphy beneath the Site 22 Landfill is thus a complex interfingering of fine- and coarse-grained deposits. Alluvial plain coarse channel deposits are surrounded both laterally and vertically by fine-grained, low-energy interchannel deposits. The vadose zone, between the saturated zone and the land surface, consists primarily of either landfill material or clay and clayey silt. A laterally discontinuous permeable zone is typically encountered between 11 and 16.5 feet below mean sea level (msl) (about 9 to 16.5 feet below the ground surface adjacent to the landfill which is at or slightly below msl), specifically within the A1 aquifer, and varies in thickness from 1 to 9 feet. The thickness of landfill material is as large as approximately 17.5 feet, with the depth of landfill material bgs as large as approximately 10 feet. The water table in the area of the site is encountered between 1 foot and 5 feet bgs so that landfill material extends below the local water table.

Aquifers beneath the site are hydraulically connected to portions of aquifers south of the site to which criteria for potential drinking water sources apply. However, the site is hydraulically downgradient of such southern portions of the aquifers. As previously stated, there is a continuous confining layer separating the B and underling C aquifers beneath the site and a continuous clay layer between the A and underlying B aquifers.

The *San Francisco Bay Water Quality Control Plan* (Basin Plan) of 1995 (RWQCB, 1995) identifies potential and beneficial uses of groundwater in the region. For the Santa Clara Valley Basin all four beneficial uses of groundwater (municipal/domestic, industrial process, industrial, and agricultural water supply) are listed in the Basin Plan as existing uses. However, at Site 22 none of these is an existing use, although industrial service supply may be a potential use. Municipal/domestic and agricultural supply are neither existing nor potential uses due to elevated total dissolved solids (TDS). Any threat to surface waters is limited by geologic conditions (tight silt/clay soils), and the biotic barrier will further decrease the potential threat. Groundwater in wells at the perimeter of the landfill will be monitored to ensure protection of the beneficial uses of surface water.

Groundwater in the area of the Site 22 Landfill is recharged by infiltration from many potential sources, including precipitation (approximately 14 inches annually), golf course irrigation (approximately 17 inches annually), the Northern Channel, and the Cargill saltwater evaporation ponds. A Hydraulic Evaluation of Landfill Performance (HELP) model [provided in Attachment H of the *Site 22 FS Report* (TtEMI, 1999)] estimates the accounting of approximately 28.1 inches of annual water availability to be as follows:

- Runoff: 2.3 inches
- Evapotranspiration: 19.7 inches

- Percolation through landfill surface: 6.2 inches
- Change in water storage: -0.1 inches (that is, net loss in water storage)

Annual water availability of 31 inches can be accounted for in the proportions indicated by the HELP evaluation, resulting in approximately 6.8 inches of percolation through the landfill surface. The estimated rate of percolation through the landfill surface is too small to support a water table mound of the size indicated by water elevations at wells within the landfill.

Information on regional groundwater movement in the site area is presented in the *Draft Annual Groundwater Report for 1999 and 2000* (FWENC, 2001a). In the area of the Site 22 Landfill, regional direction of groundwater in the A1 aquifer zone varies from north to northwest to west. Water level elevations in Table 1 of the *Site 22 FS Report* (TtEMI, 1999) indicate varying directions of local groundwater movement, a result of the small differences in water level elevations in wells at the site perimeter. For this reason, conclusive information concerning site-specific groundwater flow direction and discharge points may not be determinable until the groundwater monitoring program has been initiated.

Saltwater intrusion from the north into the Site 22 Landfill area is evident in the analytical results for groundwater samples collected in April 1998 (TtEMI, 1999). Because of saltwater intrusion, groundwater beneath the Site 22 Landfill exceeds both EPA and SWRCB TDS concentrations for a potential drinking water source. SWRCB Resolution 88-63 states that an aquifer is a potential drinking water source if it contains groundwater with a TDS concentration below 3,000 milligrams per liter (mg/L) and a single well can sustain a yield of 200 gallons per day. EPA guidelines state that an aquifer with a TDS concentration of less than 10,000 mg/L and a yield of 150 gallons per day may be considered a potential drinking water source. TDS concentrations in groundwater sampled from wells surrounding the Site 22 Landfill ranged from 9,500 to 45,000 mg/L. TDS concentrations in landfill leachate were lower (2,300 to 5,000 mg/L); however, these lower concentrations are due to the greater influence of irrigation on the composition of the landfill leachate. The TDS concentrations exceeded the 3,000 mg/L criteria in all of the five samples tested and exceeded the 10,000 mg/L criteria in four of the five samples tested. Therefore, groundwater at the Site 22 Landfill is not a potential drinking water source.

The Basin Plan (RWQCB, 1995) identifies potential and beneficial uses of groundwater in the region. For the Santa Clara Valley Basin, all four beneficial uses of groundwater (municipal/domestic, industrial process, industrial, and agricultural water supply) are listed in the Basin Plan as existing uses. However, at the Site 22 Landfill none of these is an existing use, although industrial service supply may be a potential use. Municipal/domestic and agricultural supply are neither existing nor potential uses due to elevated TDS. Any threat to surface waters is limited by geologic conditions (tight silt/clay soils), and the biotic barrier will further decrease the potential threat. Groundwater in wells at the perimeter of the landfill will be monitored to ensure protection of the beneficial uses of surface water.

There are six water zones within the vicinity of the Site 22 Landfill: four surface water (the Northern Channel, Cargill evaporation ponds, and North Patrol Road Ditch to the north, and the golf course water hazards to the south and east), perched landfill leachate, and groundwater. According to the RWQCB Basin Plan (1995), the beneficial uses for surface water near the site are freshwater/estuarine habitat and wildlife habitat. The hydraulic relationships between surface water and groundwater and landfill leachate and groundwater are discussed in the following paragraphs.

5.1.3 Surface Water and Groundwater

The stratigraphy in the area of the Site 22 Landfill consists predominantly of clay and silty clay with discontinuous sand and silt intervals. Because of the discontinuous sand and silt intervals, communication between groundwater and surface water is limited. Lithology of water bearing materials beneath the site is relatively impermeable clay and clayey silt, and hydraulic communication between groundwater and any surface water is impeded by the relatively low hydraulic conductivity of clay/silty clay unit in which the water table occurs. There does not appear to be a direct permeable flow pathway between the groundwater and nearby surface water. However, salinity in the Site 22 Landfill groundwater indicates limited communication between surface water and groundwater. As discussed in the *OU5 Final FS* (PRC, 1995b), the water below the evaporation pond and Northern Channel is high in salinity and, therefore, more dense than groundwater. The result of this density difference would either be zero flow or a very low gradient from north to south (TtEMI, 1999).

There appears to be only limited communication between groundwater and North Patrol Road Ditch. The North Patrol Road Ditch is a surface drainage feature that carries a portion of surface stormwater flow from the eastern side of MFA. During times of low stormwater runoff, there is not any water flowing in the ditch. The lack of base flow in the ditch in the absence of stormwater runoff indicates that little or no groundwater discharges to the ditch. Lithology of waterbearing materials penetrated by the ditch is the same relatively impermeable clay and clayey silt beneath the site. Hydraulic communication between groundwater and the ditch is impeded by the relatively low hydraulic conductivity of clay/silty clay.

There appears to be no communication between groundwater and water hazards in the golf course. According to the golf course superintendent, the water for the golf course ponds are pumped in from the Northern Channel and are not replenished by groundwater. The ponds would be dry if golf course personnel did not fill them. This indicates that the ponds are not hydraulically connected to the water table beneath the site.

5.1.4 Landfill Leachate and Groundwater

Physical and chemical data indicate that communication between the perched leachate and shallow groundwater is limited. Clay and clayey silt are predominate beneath and around the landfill. Differences in reported water elevations indicate that groundwater in the landfill may be above surrounding groundwater, suggesting the potential for restricted, limited flow between the landfill and surrounding groundwater (TtEMI, 1999). This elevation difference is emphasized in the seasonal variations in water elevations in landfill wells compared to wells located at the perimeter of the landfill. Water levels in perimeter wells fluctuate in response to seasonal changes in precipitation and irrigation; water levels in the leachate wells do not. Localized perched refuse and clay layers were identified as the cause for highly retarded flow during excavation of exploratory trenches in and around the landfill. During the trenching, pockets of water were found within the landfill, perched either on refuse or clay.

Chemical comparisons of water samples from the landfill leachate wells to water samples from the surrounding groundwater indicate that the perched landfill leachate has a lower overall cation concentration. The lower cation concentration results from the greater influence of irrigation on the composition of the leachate due to the location of the landfill leachate wells on the fairway and the restricted flow conditions. The differences in the composition of these two water zones indicate that the landfill leachate is not in "open" communication with the surrounding groundwater.

The higher water level elevations within the landfill are due to water that is perched within the landfill materials and separated from shallow groundwater by unsaturated materials. The lack of a saturated connection between perched leachate and shallow groundwater means that, while at a higher elevation, perched leachate does not create a hydraulic head that drives leachate out of pore spaces in the landfill material. This reduces the communication between landfill leachate and shallow groundwater. Results of water balance modeling and physical evidence, including the differences in water elevations and the presence of pockets of perched groundwater found during trenching, support the chemical data and indicate that hydraulic communication between the perched leachate and shallow groundwater is limited.

5.2 ECOLOGY

Vegetation in the Site 22 Landfill area consists of non-native species. During the additional investigation field work in April 1998, approximately 115 trees were surveyed and identified. Four types of trees were identified in the survey including willow *(Salix* species), eucalyptus *(Eucalyptus camaldulensis* and *Eucalyptus polyanthemos),* tamarack *(Tamarix),* and pine *(Pinus radiata).* Salt grass is the predominant turf in many areas of the golf course.

Landscaped areas support opportunistic animal species common to suburban and park settings. Representative species include mourning doves, northern mockingbirds, Brewer's blackbirds, house finches, house sparrows, and ground squirrels. Another animal identified within the area of the Site 22 Landfill is the western burrowing owl. The western burrowing owl is a California species of special concern that is most often found living in close proximity with colonial rodents such as the ground squirrel. The owl does not dig its own burrow, but appropriates abandoned burrows dug by other animals (Trulio, 1995). A western burrowing owl protection zone, recommended by Dr. Lynne Trulio, senior ecologist consultant to NASA, and designated as such by NASA, lies within the perimeter of Site 22 Golf Course Landfill 2 (Trulio, 1997a). As part of the additional investigation field work, ground squirrel and burrowing owl burrows were surveyed. In April 1998, five active owl and more than 47 ground squirrel burrows were identified.

5.3 NATURE AND EXTENT OF CONTAMINATION

Investigative activities conducted at the Site 22 Landfill include soil sampling, groundwater sampling, a landfill gas survey, exploratory trenching, and aquifer testing (slug tests) (TtEMI, 1999). Complete discussion of field activities, methods, and procedures are presented in the *Final Station-wide RI Report* (PRC, 1996a), the *Additional Sites Investigation Phase II Draft Final Report* (PRC, 1995a), quarterly monitoring reports from 1994 [PRC and Montgomery Watson (MW), 1995a; 1995b], 1995 (PRC and MW, 1995c; 1995d; 1996a; 1996b), 1996 (PRC, 1996b; 1996c; 1996d; 1997a) and 1997 (PRC, 1997b; 1997c), the *Final Air Quality Solid Waste Assessment Test* (SWAT), *Golf Course Landfill 2, Technical Memorandum* (PRC, 1994), and the *Additional Investigation Site 22 Final Field Work Plan* (TtEMI, 1998).

Soil and groundwater samples were collected from 17 boreholes, seven monitoring wells, and five HydroPunch locations (Figure 4). Soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH), metals, and radioactivity. Groundwater samples collected during four quarterly monitoring events and the Site 22 Landfill additional investigation field work were analyzed for VOCs, SVOCs, pesticides, PCBs, TPH, and total dissolved metals. HydroPunch samples were analyzed for VOCs and metals. Results for soil, groundwater, and landfill gas sampling are discussed in the following subsections.

5.3.1 Soil

Soil sampling was conducted as part of the *Final Station-wide RI Report* (PRC, 1996a) and the *Additional Sites Investigation Phase II Draft Final Report* (PRC, 1995a). Samples were taken in soil borings (identified in Figure 4) from the perimeter and in the landfill between 0 and 15 feet bgs. In many cases, the samples taken from the borings in the landfill included soil and refuse. The soil investigation revealed that the concentrations of contaminants detected in soil samples from boreholes within the landfill material were greater than concentrations detected in soil

samples collected outside the landfill material (Figures 5 and 6). VOCs, in particular 2-butanone and acetone, were widely distributed within the soil samples collected from the landfill. A range of SVOCs, TPH, and pesticides were consistently detected in soil samples collected from boreholes within the landfill. Three PCBs, Aroclor 1242, Aroclor 1254, and Aroclor 1260, were repeatedly detected at various depths within the landfill soil samples. Inorganic constituents within the landfill were frequently detected at higher concentrations than in perimeter soil boring samples. The generally higher chemical concentrations are not unexpected since the area was a disposal site.

Eight samples from two borings within the landfill were also analyzed for radioactivity (gross alpha and gross beta), and two of these samples were further analyzed for radium, thorium, uranium, and a suite of 17 gamma energy emitting radionuclides. These samples showed less than 17 picocuries per gram of gross alpha and beta and less than 1 picocurie per gram of other isotopes. Gamma spectrometry analysis indicated that most of the activity in the samples were due to the radioactive decay of naturally occurring potassium or uranium and its daughter elements (PRC, 1996a).

Soil samples collected from boreholes located outside the landfill contained only sporadic and low-level detections of VOCs, SVOCs, and total extractable petroleum hydrocarbons (TPH-extractable) and total purgeable petroleum hydrocarbons (TPH-purgeable). Acetone and 2-butanone and were detected in samples from only one soil boring. Carbon disulfide, a common laboratory contaminant, was the only other VOC detected more than once in the perimeter soil samples. One SVOC, pyrene, was detected more than once in soil samples from the perimeter boreholes. Fluoranthene and bis(2-ethylhexyl)phthalate were each detected once. Other SVOCs were not detected in perimeter soils. From TPH analysis, motor oil is the only fuel-related compound detected more than once in perimeter soils. All detections were measured in samples collected within the first 2 feet bgs. Pesticides were also detected in the shallow samples from the perimeter soil borings, and one PCB, Aroclor 1260, was detected in soil samples from only one perimeter soil boring. A complete set of results of soil analyses are presented in the *Site 22 FS Report* (TtEMI, 1999) and the *Final Station-wide RI Report* (PRC, 1996a). A tabulated summary of the soil investigation analytical results is included in Tables 1 through 7.

A majority of the contaminants were detected in the landfill at depths 2 feet bgs. However, some contaminants, including chlordane and dichlorodiphenyltrichloroethane (DDT) and its metabolites, have been detected in the shallow soil samples between 0 and 2 feet bgs. An explanation for the detections of some contaminants within the shallow soil samples from within the landfill and the perimeter is in order. First, the thickness of the soil covering the landfill material ranges from 0.5 to 2 feet thick in many places, and therefore, shallow soil samples may have been collected within the refuse. Secondly, when the landfill was covered with soil, it was not intended as the "cap" that is required by current regulations, but was placed to allow the area to be landscaped and converted to a golf course. Therefore, there could have been mixing

between the refuse and the shallow soil, resulting in the presence of contamination within the relatively shallow (1- to 2-foot interval) soil samples. Finally, examination of the data for the shallow soil samples suggests that some of the contaminants present in the shallow soil samples are not necessarily due to the refuse. For example, several pesticides (DDT and its metabolites and chlordane) were detected in the shallow soil samples from both the landfill and the perimeter. This can be explained by the fact that the area is a golf course, and therefore pesticides have been, and continue to be, used regularly in the area. In addition, Santa Clara County Vector Control also used pesticides to the north of the Site 22 Landfill for mosquito abatement.

5.3.2 Groundwater

Between September 1994 and November 1995, four rounds of groundwater samples were collected from four wells surrounding the landfill (Wells WGC2-4 through WGC2-7) and two leachate or perched groundwater wells within the landfill (Wells WGC2-2 and WGC2-3) (PRC and MW, 1995b; 1995c; 1996a; 1996b). Locations of the groundwater monitoring wells are shown on Figure 4. Groundwater samples from Well WGC2-1 were taken in September 1994. Another round of samples was obtained from all seven wells in April 1998 as part of the *Additional Investigation Site 22 Final Field Work Plan* (TtEMI, 1998). Concentrations of both organic and inorganic constituents were compared to ambient water quality criteria (AWQC) for the protection of aquatic life. As discussed in Section 5.1, the groundwater in the area of the Site 22 Landfill has TDS concentrations above both the 3,000 mg/L and the 10,000 mg/L thresholds for a potential drinking water source under SWRCB Resolution 88-63 and EPA guidelines, respectively. In addition, hydraulic communication between the landfill leachate and shallow groundwater is limited. Groundwater flow between the shallow groundwater and surface water is also restricted. Therefore, direct saturated-flow pathways from the landfill leachate at Site 22 to surface water have not been defined.

In addition to AWQC, inorganic constituent concentrations were statistically compared to generally high TDS background groundwater concentrations established in the *Site 22 FS Report* (TtEMI, 1999). Typically, wells located immediately upgradient of a site are used to establish background conditions. However, the landfill leachate potentiometric surface at the Site 22 Landfill is perched above the uppermost aquifer (the A aquifer). In addition (as mentioned in Section 5.3.2), water level elevations measured in landfill wells during quarterly monitoring have indicated that water in the landfill can be higher than the surrounding groundwater by as much as 7 feet (TtEMI, 1999). As noted in the preceding Section 5.1, relatively high water level elevations at Wells WGC2-2 and WGC2-3 within the landfill are interpreted as perched rather than mounded water. However, upgradient and downgradient locations at the site cannot be identified using information in the *Site 22 FS Report* (TtEMI, 1999) because water level elevations in Table 1 of the *Site 22 FS Report* (TtEMI, 1999) indicate varying directions of local groundwater movement, a result of the small differences in water level elevations in wells at the

site perimeter. For this reason, conclusive information concerning site-specific groundwater flow direction and discharge points may not be determinable until the groundwater monitoring program has been initiated.

Therefore, the statistical comparison was conducted to compare metals concentrations in samples from the groundwater in the Site 22 Landfill area and in leachate, to concentrations in high TDS background wells located in the northern portion of MFA. The approach used was included in the agency-approved *Site 22 FS Report* (TtEMI, 1999). The statistical analysis and comparison of the inorganic constituents are presented in the *Site 22 FS Report* (TtEMI, 1999). A summary of groundwater analytical results is presented in Tables 8 through 12.

Groundwater samples from the landfill leachate wells were analyzed for the following types of organic constituents: VOCs, SVOCs, TPH-extractable, TPH-purgeable, pesticides, and PCBs. VOCs that were regularly detected in the landfill leachate samples include: chlorobenzene, benzene, ethylbenzene, and xylene. Only chlorobenzene was detected at concentrations above AWQC. One SVOC, diethylphthalate, was detected above AWQC in the leachate samples. Other SVOCs detected frequently in the landfill leachate include 1,4-dichlorobenzene, 2-methylnaphthalene, and naphthalene. Only two pesticides were detected in the landfill leachate samples. Both were detected infrequently at low concentrations. Maximum detections and the number of detections for landfill leachate samples are presented in Figures 7 and 8.

In samples from the perimeter wells, neither PCBs nor pesticides were detected. Fuel-related compounds were not detected more than once, and neither VOCs nor SVOCs were detected at concentrations above AWQC. VOCs detected in the perimeter wells for which AWQC have not been established included 2-hexanone, carbon disulfide, and xylene. Of these, only carbon disulfide, a common laboratory contaminant, was detected more than once. SVOCs lacking AWQC, which were detected more than once in samples from perimeter wells, include bis(2-chloroethyl)ether and oxybis(1)-chloropropane. These compounds were detected in groundwater samples from only one perimeter well (WGC2-5). Maximum detections and the number of detections for groundwater samples from the perimeter wells are shown on Figures 7 and 8.

The statistical comparison of metal concentrations in landfill leachate samples and background samples suggest that several metals, including barium, cobalt, iron, lead, nickel, and zinc are present above background concentrations. These differences are not unexpected since the area was used for disposal of a variety of wastes. Analysis of the landfill leachate samples for inorganic constituents indicates that concentrations of copper, lead, and nickel are greater than AWQC.

Samples from all but two of the perimeter wells also indicated that nickel and lead concentrations were greater than AWQC. Dissolved metal concentrations in all samples from Well WGC2-1 were lower than AWQC. Samples from Well WGC2-7 were lower than AWQC for lead, but

greater for nickel and zinc. However, no trace metals (including zinc, lead, or nickel) were found to have concentrations significantly different than background levels.

5.3.3 Landfill Gas

Landfill gas was also investigated at the Site 22 Landfill. An air quality SWAT was conducted between February 23 and March 3, 1994, to evaluate whether action is required to address emissions from the landfill. The air SWAT tests included: 1) landfill gas characterization to evaluate the composition of the landfill gas, 2) integrated surface sampling (ISS) to assess whether landfill gases are escaping through the existing soil, and 3) off-site migration analysis. Tests were conducted in general accordance with the 1987 California Air Resources Board Hazardous Waste Site Testing Guidelines with site-specific variations as approved by the Bay Area Air Quality Management District. Sampling locations are shown in Figure 9. The conclusions from the 1994 *Final Air Quality SWAT, Golf Course Landfill 2, Technical Memorandum* (PRC, 1994) state that there were not any indications of off-site migration of landfill gases, that there were not any detectable concentrations of non-methane hydrocarbons migrating to the atmosphere from the landfill, and that there was not any significant subsurface gas migration beyond the perimeter of the landfill.

5.3.4 General Conclusions

General conclusions regarding the nature and extent of contaminants are as follows:

- Contaminant detections in soil samples from boreholes outside of the landfill were low level and sporadic.
- Chemical analyses of groundwater samples from wells surrounding the landfill indicate sporadic detections of organic constituents in perimeter wells; these may have originated from the landfill due to the presence of groundwater within the refuse. TPH constituents were not detected more than one time, and neither VOCs nor SVOCs were detected at concentrations significantly above AWQC. Results from the analysis of groundwater samples do not indicate significant or consistent chemical releases from the landfill.
- Nickel, lead, and zinc constituents were detected in both samples of landfill leachate and surrounding groundwater. The metals detected in some perimeter groundwater wells exceeded AWQC, but the results were not significantly different than background concentrations.
- Air SWAT results indicate that landfill gases are not escaping through surface soil or migrating away from the landfill.

6.0 CURRENT AND FUTURE LAND AND RESOURCE USE

In April 1991, the Base Realignment and Closure (BRAC) commission voted to: 1) decommission MFA, 2) transfer MFA's naval operations to other Naval facilities, and 3) transfer the majority of MFA property to the NASA Ames Research Center. In December 1992, an MOU was signed between the DoN and NASA. The MOU documented the major points of agreement regarding transfer of MFA property to NASA. The property transfer took place on July 1, 1994.

The Air Force operates and maintains the golf course located in the northeast corner of the facility, which encompasses the Site 22 Landfill. The golf course has been maintained and operated for over 30 years, and there are no plans to change the land use of this area. It is therefore, likely that the Site 22 Landfill will remain part of the golf course. The selection and screening of remedial alternatives was thus conducted based on the premise that continued use as a golf course is the most likely future land use scenario, which has been confirmed with NASA personnel.

As mentioned in Section 5.1, all four beneficial uses of groundwater (municipal/domestic, industrial process, industrial, and agricultural water supply) are listed in the Basin Plan (RWQCB, 1995) as existing uses. However, at the Site 22 Landfill, none of these is an existing use, although industrial service supply may be a potential use. Municipal/domestic and agricultural supply are neither existing nor potential uses due to elevated TDS. Any threat to surface waters is limited by geologic conditions (tight silt/clay soils), and the biotic barrier will further decrease the potential threat. Groundwater in wells at the perimeter of the landfill will be monitored to ensure protection of the beneficial uses of surface water. According to the RWQCB Basin Plan (1995), the beneficial uses for surface water near the site are freshwater/estuarine habitat and wildlife habitat.

7.0 SUMMARY OF SITE RISKS

The following sections discuss the human health risk assessment (HHRA) and the ecological risk assessment conducted for the Site 22 Landfill.

7.1 HUMAN HEALTH RISK ASSESSMENT

A quantitative HHRA is of limited use in evaluating whether landfill refuse requires remediation. The decision to remediate a landfill typically does not depend on risk assessment results. EPA guidance indicates that quantifying risks from landfill refuse has little practical use because an underlying assumption must be made that the landfill content is well characterized. The heterogeneity of contaminant distribution and concentrations makes characterization of landfill contents an impractical and virtually impossible task. Characterizing landfill content is also a health and safety hazard for field crews. As a result, the EPA has developed a strategy to address landfills that is based on containment of contaminants. Containment is the presumptive remedy for landfills and does not require accurate characterization of landfill contents or a quantified assessment of associated risks.

Nevertheless, an HHRA was conducted for the Site 22 Landfill to characterize potential human health risks from exposure pathways associated with constituents in surface and subsurface soils (PRC, 1996a). Potential risk from exposure to soil gas associated with the Site 22 Landfill was also evaluated in the station-wide HHRA. The HHRA evaluated risks for the occupational, recreational, and residential scenarios, and considered the following exposure pathways, which are associated with landfill sites:

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

In the HHRA, groundwater exposure pathways were considered incomplete because the groundwater is not a current drinking water supply and it is not reasonably expected to become a drinking water supply because of its high TDS level (greater than 10,000 mg/L). It is also noted that landfills are generally not evaluated as potential residential areas. As stated in EPA guidance *Presumptive Remedy for CERCLA Municipal Landfill Sites* (EPA, 1993), "EPA has [thus] determined that it is not appropriate or necessary to estimate the risk associated with the future residential use of the landfill source, as such use would be incompatible with the need to maintain the integrity of the containment system." Therefore, risk associated with the residential scenario is not considered relevant for the Site 22 Landfill.

The potential human health risk associated with the Site 22 Landfill was assessed by two different methods: 1) risk to potential residential, occupational, and recreational receptors was evaluated using an exposure area approach, and 2) risks associated with occupational and recreational receptors specifically for the Site 22 Landfill were characterized by a point risk approach. The exposure area approach identifies potential exposure receptors in a predetermined area over which exposure occurs (1/2-acre lot for residential and occupational exposure scenarios and the entire area of the golf course for the recreational exposure scenario). In the exposure area approach, the risk estimates are calculated from average concentrations of chemicals of potential concern (COPC) within the selected area. In the point risk approach, risk estimates are calculated from each data point.

The HHRA results for the Site 22 Landfill, including COPCs, exposure and toxicity assessment, and risk characterization, are presented in Tables 13 through 15. In summary, the HHRA indicated that total carcinogenic risks and noncarcinogenic hazard indices (HIs) for recreational and occupational exposures were within EPA target risk levels; carcinogenic risks were between 1E-04 and 1E-06, and noncarcinogenic HIs were less than 1. The risk assessment did indicate a slight noncarcinogenic risk (HI of 2.2) for the residential scenario; however as mentioned above, residential housing is not an intended future land use for the site. Risks due to soil gas exposure and methane were also investigated in the station-wide HHRA based on the results of the *Final Air Quality SWAT, Golf Course Landfill 2, Technical Memorandum* (PRC, 1994). Risks associated with soil gas exposure or methane hazards were not found.

In summary, there are not any significant human health risks at the Site 22 Landfill associated with surface and subsurface soils. However, as stated in the *Site 22 FS Report* (TtEMI, 1999), the only potential threat at Site 22 was identified as exposure to contaminants due to direct contact with refuse, which could be uncovered via disturbances to the subsurface, such as construction, significant erosion, or through the activities of burrowing animals.

7.2 ECOLOGICAL RISK ASSESSMENT SUMMARY

Ecological receptors could be exposed to Site 22 Landfill contaminants through the following mechanisms:

- Contact with surface refuse
- Contact with subsurface refuse/contaminants via burrowing
- Contact with landfill gas

The presumptive remedy for landfills includes measures to isolate or contain landfill waste (see Section 9.0). For the Site 22 Landfill, isolation/containment of the waste would deter animals from burrowing into the landfill, thereby reducing the potential for contact with refuse. Because the presumptive remedy addresses the above-mentioned pathways, a quantification of ecological

risks from refuse is not required. This information also is not necessary because containment, the most practical technology, does not require such information (EPA, 1991). Nevertheless, the Site 22 Landfill was included in the Site-wide Ecological Assessment (SWEA) conducted at MFA (PRC and MW, 1997).

The SWEA was conducted to assess potential risks associated with chemicals of potential ecological concern (COPECs) to flora and fauna at MFA. Within the area of the Site 22 Landfill, the burrowing owl was chosen as an indicator species, a representative measurement endpoint receptor. The burrowing owl was chosen for further evaluation due to concerns about risk to the owl resulting from inhalation of VOCs in burrows. The SWEA results indicate that, within all of the burrowing owl habitat areas, exposure to COPECs is through food chain transfer and, to a much lesser extent, soil ingestion and inhalation of VOCs. The COPECs at MFA, determined to be driving potential risks to the owls, are pesticides and metals including zinc and lead.

The SWEA indicated that the MFA owl population, including the Site 22 Landfill area, is healthy compared to other burrowing owl populations within the south San Francisco Bay area (Trulio, 1997b). Chemical concentrations at the Site 22 Landfill therefore do not appear to adversely affect the burrowing owl community, and risks to ecological receptors were not identified.

Finally, while it has been noted in previous sections that groundwater contaminants do not appear to be migrating from the site, a potential groundwater pathway to San Francisco Bay merits discussion. Stratigraphy in the area of the Site 22 Landfill, the salinity of the groundwater, and the distance between the Site 22 Landfill and the bay indicate that there is not an exposure pathway from the Site 22 Landfill to the bay. The stratigraphy in the area of the Site 22 Landfill consists predominately of clay and silty clay within discontinuous sand and silt intervals. Because of the discontinuous sand and silt intervals, communication between groundwater and surface water is limited (refer to Section 5.1.4). In addition, water below the Cargill evaporation ponds and Northern Channel is high in salinity and therefore more dense than groundwater, which may further contribute to a limited communication between surface water and groundwater (refer to Section 5.1.3). Very limited groundwater flow from the Site 22 Landfill to the bay is due to stratigraphy and to a lesser extent salinity. Contaminants in the groundwater would most likely be attenuated before reaching the bay.

7.3 BASIS FOR ACTION

Based on the characterization of risks at the site, the response action selected in this ROD is necessary to protect the public health from actual or threatened releases of hazardous substances into the environment via the activities of burrowing animals at the Site 22 Landfill.

8.0 REMEDIAL ACTION OBJECTIVE

The remedial action objective (RAO) of the response action described in this ROD is to protect human health by preventing contact with landfill refuse, which is the only relevant risk identified for the site. Since the Site 22 Landfill is expected to remain part of the golf course for the forseeable future (see Section 6.0), it is unlikely that erosion or construction activities would represent a significant mechanism for uncovering buried refuse. However, burrowing animals have been identified as having the potential for uncovering landfill refuse, and humans (for example, players, visitors, and workers at the golf course) could come in direct contact with the exposed refuse. Therefore, the RAO is to eliminate this risk by preventing animals from burrowing into the Site 22 Landfill and exposing the refuse. This will be accomplished through the use of physical barriers to permanently limit this exposure pathway to landfill refuse. Institutional controls, as described in Section 9.2, will also be adopted as part of the remedy to prevent disturbance of the biotic barrier through construction activities. In addition, an operation, maintenance, and monitoring plan will be adopted to maintain proper surface water flow and to minimize erosion. The RAO complies with the NCP and Superfund requirements.

9.0 DESCRIPTION OF REMEDIAL ALTERNATIVES

Based on experience, the EPA has developed presumptive remedies to accelerate cleanup for certain types of sites. Presumptive remedies are technologies that are preferred for specific types of contaminants, based on an evaluation of performance data from previous implementation. The 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 Code of Federal Regulations (CFR) 300.430(a)(I)(iii)(B)], as is the case at the Site 22 Landfill. The alternatives assembled in the *Site 22 FS Report* (TtEMI, 1999), therefore, focus largely on containment, and are listed below:

Medium	Designation	Description
Soil	Alternative 1	No action
Soil	Alternative 2	Installation of a biotic barrier, managing surface water flow, institutional controls, and groundwater and landfill gas monitoring
Soil	Alternative 3A	Multilayer cap with clay layer and biotic barrier, institutional controls, and groundwater and landfill gas monitoring
Soil	Alternative 3B	Multilayer cap with geosynthetic clay layer and biotic barrier, institutional controls, and groundwater and landfill gas monitoring
Soil	Alternative 4	Excavation and off-site disposal

The following sections provide detailed descriptions of the remedial alternatives.

9.1 ALTERNATIVE 1: NO ACTION

Under the no action alternative, no remedial actions would be implemented. The no action alternative is required by NCP [40 CFR 300.430(e)(6)] to provide a baseline condition if no remedial action is taken. Under this alternative, no remediation measures, monitoring, or access land-use controls would be initiated at Site 22.

Key elements identified for Alternative 1 are as follows:

Applicable or Relevant and Appropriate Requirements (ARARs): ARARs are identified in Table 16.

Estimated costs: Capital: $0

Expected outcome of alternative:	This alternative is not expected to result in achieving the RAO of eliminating risk of human contact with refuse by preventing animals from burrowing into the Site 22 Landfill and exposing the refuse.
Land use, water use, other impacts:	This remedy is not expected to result in approval of all recreational land uses, as the landfill materials will not be isolated or removed. Therefore, industrial and residential land uses are limited due to the inherent instability of landfills for supporting construction. Due to naturally high salt levels, groundwater beneath the site does not have beneficial uses for drinking water, and this would remain unchanged. Other beneficial uses of groundwater and surface water in the area would also remain unchanged.

9.2 ALTERNATIVE 2: BIOTIC BARRIER

Alternative 2 consists of a biotic barrier, surface water flow controls, institutional controls, and groundwater and gas monitoring. The following paragraphs describe these components.

9.2.1 Biotic Barrier

For this alternative, layers constructed of soil, gravel, cement, and cobblestone would be installed to prevent animals (mainly ground squirrels) from burrowing into the Site 22 Landfill and disturbing buried waste. Because ground squirrels usually burrow only into the low maintenance or low activity grassy areas where golf play does not occur, it was originally proposed in the *Site 22 FS Report* (TtEMI, 1999) and the *Proposed Plan for Site 22* (DoN, 2001) that the barrier would be installed on the 7 acres of the Site 22 Landfill not directly associated with the field of play (that is, excluding the fairways and greens). However, a number of public comments were received during the public comment period which questioned this approach and suggested that this issue be re-evaluated with respect to providing a more permanent remedy for the entire landfill area (see Section 15.0). Based on these comments, and due to the high population of ground squirrels in the area, the DoN intends to extend the coverage of the biotic barrier from the 7 acres originally proposed, to 9.4 acres to cover the entire footprint of the landfill.

Figure 10 shows a conceptual cover detail for the biotic barrier proposed in Alternative 2. The footprint of the proposed biotic barrier is provided in Figure 11. The areas to be addressed during construction would require recontouring to improve drainage and reduce infiltration of precipitation and irrigation water into the landfill. However, this recontouring is not expected to have significant impacts on golf course playability because drainage requirements for the biotic barrier are not as stringent as those required for a multilayer cap. Implementation of Alternative 2 would, therefore, allow the Site 22 Landfill to remain as part of the golf course with little change to current field of play conditions once the barrier is installed and the golf course greens and fairways are re-established.

Implementation of the biotic barrier would require removal of a number of existing trees. Alternative 2, as originally proposed in the *Site 22 FS Report* (TtEMI, 1999) and the *Proposed Plan for Site 22* (DoN, 2001) did not include tree replacement. However, a number of comments were received during the public comment period (Section 15.0) concerning the effects of this approach on the aesthetics of the area. As a result, Alternative 2 now includes one or more of the following options: 1) replanting trees currently located on the landfill area in areas outside the landfill boundary, if feasible 2) planting new trees outside the landfill boundary, and 3) planting new trees within the landfill boundary in tree wells, which would be engineered into the biotic barrier. The tree wells would prohibit ground squirrels that burrow around the tree roots from disturbing refuse and would provide deeper rooting depth (in soil versus refuse) and stability for the trees such that they would not be easily blown down, and there is thus little chance of refuse being exposed. A final decision as to where, and how many, trees would be planted and/or relocated, would be made during the remedial design phase.

Finally, portions of the Site 22 Landfill are considered habitat for a California species of special concern, the western burrowing owl. Burrowing owls live in burrows created by ground squirrels. Relocation methods for burrowing owls would be determined by surveys and guidance presented in "Passive Relocation: A Method to Preserve Burrowing Owls on Disturbed Land" (Trulio, 1995) and *Staff Report on Burrowing Owl Mitigation* (California Department of Fish and Game, 1995).

9.2.2 Surface Water Flow Controls

Surface water flow controls would be implemented as part of Alternative 2. Surface water drainage techniques would control site runoff and erosion and prevent off-site surface water from entering the site. Surface controls that would be used at the Site 22 Landfill include filling in topographic depressions to provide positive surface drainage to achieve reduction of ponding and infiltration.

9.2.3 Institutional Controls

Access restrictions would be developed to protect human health as part of this alternative in coordination with NASA. These restrictions would be included in NASA's land use planning documents and would be designed to maintain the integrity of the biotic barrier and to limit surface excavation that could disturb the refuse. The restrictions would be implemented by NASA per a MOA to be entered into between the DoN and NASA after review and concurrence by EPA. The MOA will be adopted within 1 year of the Final ROD, and will include the following elements:

- Protection of the structural aspects of the landfill cap (biotic barrier)
- Prohibition of alterations to the drainage patterns or modification of surface contours

- Establishment of specific boundaries for the extent of the landfill
- Prohibition of extraction of groundwater from the site
- Prohibition of residential land use
- Requirement of regulatory approval for consideration of alternative land uses
- Indication of the parties responsible for ongoing operations, maintenance, and monitoring activities for the site
- Requirement of annual reporting to EPA regarding the implementation, monitoring and efficacy of the institutional controls
- Reference to how the MOA will be enforced with NASA and with their site-specific tenants
- Requirement that transfer of the site to a non-federal entity includes a restrictive covenant conveying the property with institutional controls as provided in the MOA in place.

9.2.4 Groundwater Monitoring

A groundwater monitoring program would be developed in accordance with Title 27 CCR, Section 20385 (a)(1), (a)(2), (a)(3), (c), Section 20390 (a), Section 20395 (a), Section 20400 (a), (d), (g), Section 20415 (b)(1)(A-C), (e), Section 20420, and Section 20425 (b), (c), (d)(1), (d)(2), (e), (f), (g), (h), and (i). The groundwater monitoring program would consist of a sufficient number of wells installed at appropriate locations and depths to yield groundwater samples that represent background water quality and the quality of groundwater at the points of compliance. Groundwater monitoring would consist of a detection monitoring program. The detection monitoring program would be designed to detect the presence of waste constituents in groundwater outside of the landfill. The detection monitoring program evaluates whether there is a statistically significant increase over water quality protection standards for any constituent of concern (COC) at a monitoring point. Concentration limits for COCs will be determined using statistical analysis procedures in accordance with Title 27 CCR, Section 20415 (b)(1)(A-C), (e).

For costing purposes it was assumed that groundwater monitoring would be conducted for 30 years, as is common at landfill sites. However, it is noted that monitoring may not be necessary for the entire 30-year period, depending upon analytical results (see Section 12.2). Additional details and objectives of the groundwater monitoring program will be presented in a Groundwater Monitoring Plan to be developed during the remedial design and remedial action for submittal to, and approval by, the regulatory agencies.

9.2.5 Landfill Gas Monitoring

Landfill gas monitoring would also be conducted under Alternative 2. Regulations in Title 27 CCR, Section 20921(a) require that gas monitoring wells be placed around the landfill perimeter, and spaced no more than 1,000 feet apart. According to the regulations, wells should be screened through the vadose zone to a maximum depth set by the bottom of refuse or the maximum water table depth. However, at the Site 22 Landfill, the water table is between 1 and 5 feet bgs. Because groundwater is close to the ground surface, shallow monitoring points would be installed, just above the seasonal low water table. 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 to control any release.

Possible corrective actions would include installing gas vents or a collection trench. Corrective actions of this type are usually necessary only if gas emissions are considered a significant problem. Currently, significant gas problems have not been identified at the Site 22 Landfill. Monitoring points would be placed around the perimeter of the landfill. The exact number and placement of the monitoring units would depend on surrounding hydrogeology, land use, and lithology. Figure 12 shows the possible monitoring locations. It is noted that methane has not been detected beyond the perimeter of the Site 22 Landfill. As with groundwater monitoring, it was assumed for costing purposes that gas monitoring would be conducted for 30 years, as is common at landfill sites. However, it is noted that gas monitoring may not be necessary for the entire 30-year period, depending upon analytical results (see Section 12.2). Additional details concerning implementation of the landfill gas monitoring program will be provided in a long-term landfill gas monitoring plan to be developed during the remedial design and remedial action for submittal to, and approval by, the regulatory agencies.

Key elements are identified for Alternative 2 as follows:

O&M:	• Vegetation control • Cover soil loss replacement • Depression fill • Monitoring well maintenance • Drainage control maintenance • Institutional controls/maintenance
Long-term reliability:	Potential settlements may require grade adjustment for drainage control
Monitoring requirements:	Gas well monitoring; 4 events annually Groundwater monitoring; 4 events annually Vegetative and soil cover inspection; 2 events annually
ARARs:	ARARs are identified in Table 16.

Estimated time for design, construction, and implementation:	Remedial Design – 43 weeks Remedial Action – 32 weeks Maximum 30-year O&M
Estimated costs:	Capital: $2,422,000 Annual O&M: $21,000 Total present worth cost: $2,842,000 Discount rate: 7.25%, 4% annual escalation rate Time over which estimate is projected: 30 years
Expected outcome of alternative:	This alternative is expected to result in achieving the RAO of eliminating risk of human contact with refuse by preventing animals from burrowing into the Site 22 Landfill and exposing the refuse.
Land use, water use, other impacts:	While this remedy is expected to result in approval of all recreational land uses, the landfill materials would not be removed. Therefore, industrial and residential land uses are limited due to the inherent instability of landfills for supporting construction. Due to naturally high salt levels, groundwater beneath the site has no beneficial uses, and this would remain unchanged. Other beneficial uses of groundwater and surface water in the area would also remain unchanged.

9.3 ALTERNATIVE 3: MULTILAYER CAP

Alternative 3 consists of a multilayer, low-permeability cap over the entire 9.4 acres of the Site 22 Landfill and surface water flow controls. Institutional controls and groundwater and gas monitoring (as described for Alternative 2) would also be included. The cap would function as a barrier to infiltration as well as a biotic barrier and would eliminate the potential for direct contact with landfill refuse. Alternative 3 includes two options: clay (Alternative 3A), and a geosynthetic clay liner (GCL) (Alternative 3B), as the low permeability layer.

The following cap components, from top to bottom, are included in Alternative 3:

- Construction of a minimum 6-inch-thick erosion control layer that supports vegetation and, thus, protects the layer below from erosion, drying, and cracking. The vegetation would allow the surface of the Site 22 Landfill to continue to be used as a golf course (as would all other alternatives).
- A biotic barrier constructed of 6 inches of gravel and 12 inches of cobble would also be included to prevent burrowing animals from penetrating the low-permeability layer.

- A minimum 12-inch-thick soil barrier or low-permeability layer would reduce the infiltration of surface water into the Site 22 Landfill. This would be constructed as either a compacted clay layer (Alternative 3A) or by placing a GCL (Alternative 3B).
- A minimum 24-inch-thick foundation layer constructed of inert material to support the barrier layers.

Both Alternatives 3A and 3B would involve regrading of the surface of the Site 22 Landfill to prevent ponding and facilitate surface drainage. Implementation of Alternatives 3A and 3B would therefore cause major changes in landscaping and the aesthetics of the golf course. In addition, all trees and shrubs at the Site 22 Landfill would be removed and not replaced since these deep-rooted plants could damage the low-permeability layer and would interfere with operation of cap construction equipment. Further, engineered tree wells (as specified in Alternative 2) would be much more difficult to implement under Alternative 3. This is mainly due to the fact that, in order to maintain the impermeability of the cap, they would either have to be constructed through the entire thickness of the refuse, or would require an impermeable bottom layer. Constructing tree wells through the entire thickness of the refuse would require excavation of large amounts of refuse, part of which is presently below the water table. An impermeable bottom layer in the tree wells would prohibit drainage from the wells, which could easily lead to saturated soil conditions for extended periods of time as well as salt build up, which can kill or damage trees. Under Alternatives 3A and 3B, institutional controls, surface water flow controls, and groundwater and gas monitoring would be the same as described for Alternative 2 (above), and therefore, only the cap is discussed here.

It is noted that Alternatives 3A and 3B were not specifically designed to meet the landfill cap requirements of the Resource Conservation and Recovery Act (RCRA) Subtitle D; however, Alternatives 3A and 3B do contain specific elements thereof. It is also noted that the Site 22 Landfill is not subject to the RCRA Subtitle D closure requirements.

9.3.1 Alternative 3A: Clay

Alternative 3A includes a multilayer cap with a low-permeability layer of clay. Caps with low-permeability layers are designed specifically to reduce infiltration and associated leachate formation. The low-permeability layer minimizes water entering the refuse. Clay barriers are durable and resistant to mechanical failures, such as stress. However, clay layers have special compaction requirements (for example, placement at optimum moisture) that must be met during cap construction to ensure that excessive swelling or cracking would not occur. Figure 13 contains a conceptual cover detail of the multilayer cap proposed in Alternative 3A.

9.3.2 Alternative 3B: Geosynthetic Clay Liner

Alternative 3B employs a GCL as the low-permeability layer. A multilayer cap with a GCL is functionally the same as the multilayer cap with a clay layer discussed in Alternative 3A and is designed specifically to reduce infiltration and associated leachate formation. GCL components may be nearly twice as impermeable as clay materials. Therefore, they are often combined with a drainage layer to reduce the hydraulic head on the GCL. GCL materials may be less expensive than clay because they do not require the closely controlled construction processes or incur the large hauling costs of clays. Care must be taken, however, to ensure that adequate geosynthetic clay liner material is used in the seam overlap and that the GCL is not exposed to excessive moisture and high temperatures during installation. Strict field quality assurance and quality control (QA/QC) measures must be followed to confirm that the GCL is properly installed. If the GCL experiences stress from subsidence, it may tear; field repair of GCL material can be difficult once installed. A conceptual cover detail of the multilayer cap specified in Alternative 3B is included in Figure 13.

Key elements are identified for Alternatives 3A and 3B as follows:

O&M:	• Vegetation control • Cover soil loss replacement • Low-permeability barrier adjustment • Drainage layer adjustment • Depression fill • Monitoring well maintenance • Drainage control maintenance • Institutional controls/maintenance
Long-term reliability:	Potential settlements may require adjustment of low permeability barrier, drainage layer, and soil cover over top 2 acres to prevent ponding/potential replacement costs of $1.5 million
Monitoring requirements:	Gas well monitoring; 4 events annually Groundwater monitoring; 4 events annually Vegetative soil cover and barrier inspection; 2 events annually
ARARs:	ARARs are identified in Table 16.
Estimated time for design, construction, and implementation:	Remedial Design – 45 weeks Remedial Action – 34 weeks Maximum 30-year O&M and monitoring
Estimated costs:	Capital: 3A: $3, 490,000; 3B: $3,175,000. Annual O&M: $31,000 Total present worth cost: 3A: $4,105,000; 3B: $3,790,000 Discount rate: 7.25%, 4% annual escalation rate Time over which estimate is projected: 30 years

Expected outcome of alternative:	This alternative is expected to result in achieving the RAO of eliminating risk of human contact with refuse by preventing animals from burrowing into the Site 22 Landfill and exposing the refuse.
Land use, water use, other impacts:	While this remedy is expected to result in approval of all recreational land uses, the landfill materials would not be removed. Therefore, industrial and residential land uses are limited due to the inherent instability of landfills for supporting construction. Due to naturally high salt levels, groundwater beneath the site has no beneficial uses, and this would remain unchanged. Other beneficial uses of groundwater and surface water in the area would also remain unchanged.

9.4 ALTERNATIVE 4: EXCAVATION AND OFF-SITE DISPOSAL

Alternative 4 involves excavating the refuse located within the Site 22 Landfill and disposing of it off site at a permitted landfill facility. Clean (overburden) soil would be removed and stockpiled, and the refuse layer would be removed, as shown in the lithologic cross-section in Figures 14, 15, and 16. The refuse would be characterized, and hauled to an appropriate facility. Based on calculations presented in the *Site 22 FS Report* (TtEMI, 1999), approximately 92,000 cubic yards of waste material would require removal. Approximately 69,000 cubic yards of clean fill (from local sources) would be needed to replace the excavated soils and refuse materials (assuming a 30 percent compaction factor). This amount of soil would fill the depression left after the soil and refuse are removed, but it would not return the site to its current contours. With Alternative 4, only limited post-action monitoring would be required, and there would be no institutional controls to limit future land use because contaminants would be removed.

Excavation may be extremely costly depending on the location of the disposal facility and borrow source, and the possibility that hazardous waste could be encountered during the excavation process (requiring disposal at a Class I or II facility). In light of EPA's presumptive remedy approach, excavation is not a preferred technology for landfill sites.

Key elements are identified for Alternative 4 as follows:

O&M:	• Vegetation control • Cover soil loss replacement • Depression fill • Monitoring well maintenance • Drainage control maintenance
Long-term reliability:	Potential soil consolidation may require additional fill for drainage control
Monitoring requirements:	Groundwater monitoring; 4 events annually for 3 years Vegetative cover inspection; 2 events annually

ARARs:	ARARs are identified in Table 16.
Estimated time for design, construction, and implementation:	Remedial Design – 30 weeks Remedial Action – 55 weeks 3-year O&M and monitoring
Estimated costs:	Capital: $4,057,600 - $8,919,000 (depending on transportation and disposal, and fill source locations) Annual O&M: $10,000 for 3 years Total present worth cost: $6,550,000/average range Discount rate: 7.25%, 4% annual escalation rate Time over which estimate is projected: 5 years
Expected outcome of alternative:	This alternative is expected to result in achieving the RAO of eliminating risk of human contact with refuse by preventing animals from burrowing into the Site 22 Landfill and exposing the refuse.
Land use, water use, other impacts:	Since this remedy involves the removal of all landfill materials and restoration of the site, this remedy is expected to result in approval of all land uses. Due to naturally high salt levels, groundwater beneath the site has no beneficial uses, and this would remain unchanged. Other beneficial uses of groundwater and surface water in the area would also remain unchanged.

10.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

This section summarizes the comparative analysis of the four remedial alternatives, which was conducted as part of the *Site 22 FS Report* (TtEMI, 1999). The NCP requires that the relative performance of each alternative be evaluated against nine evaluation criteria. The nine evaluation criteria are briefly described below:

1) Overall Protection of Human Health and the Environment Determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
2) Compliance with ARARs Evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
3) Long-term Effectiveness and Permanence Considers the ability of an alternative to maintain protection of human health and the environment over time.
4) Short-term Effectiveness Considers the length of time needed to implement an alternative, and the risks the alternative poses to workers, residents, and the environment during implementation.
5) Reduction of Toxicity, Mobility, or Volume through Treatment Evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
6) Implementability Considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
7) Cost Includes estimated capital and annual operation and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate with a range of +50 to –30 percent.
8) State Acceptance Considers whether the State agrees with the DoN's analyses and recommendations, as described in the RI/FS and Proposed Plan.
9) Community Acceptance Considers whether the local community agrees with the DoN's analyses and selected alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

Note that the state and community acceptance criteria were evaluated at a later date, after receiving public comments on the Proposed Plan. The following sections discuss the results of the comparative analysis of the four remedial alternatives.

10.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternative 1 (no action) would not protect human health and the environment because landfill refuse would not be isolated. For this reason, Alternative 1 is not considered further in this analysis as an option for this site. Alternatives 2 and 3 would protect human health and the environment by providing a barrier to restrict burrowing animals from mobilizing contaminants to the surface and implementing institutional controls to maintain the integrity of the barrier. Alternative 4 would protect human health and the environment by removing the contaminated material completely.

From this aspect of the comparison, Alternatives 2 and 3 are considered acceptable because they adequately address the identified RAO for the site. Alternative 4 is regarded as most favorable because the contaminant mass is removed.

10.2 COMPLIANCE WITH ARARS

This section identifies and evaluates federal and state of California ARARs from the universe of regulations, requirements, and guidance and sets forth the DoN's determinations regarding those potential ARARs for the remedial alternatives.

10.2.1 Summary of CERCLA and NCP Requirements

Section 121(d) of the CERCLA of 1980 [42 United States Code (USC), Section 9621(d)], as amended, states that remedial actions on CERCLA sites must attain (or the decision document must justify the waiver of) any federal or more stringent state environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address the situation at a CERCLA site. The requirement is applicable if the jurisdictional prerequisites of the standard show a direct correspondence when objectively compared to the conditions at the site. An applicable federal requirement is an ARAR. An applicable state requirement is an ARAR only if it is more stringent than federal ARARs.

If the requirement is not legally applicable, then the requirement is evaluated to determine whether it is relevant and appropriate. 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 law that, while not applicable, address problems or situations similar to the circumstances of the proposed response action and are well suited to the conditions of the site. A requirement must be determined to be both relevant and appropriate in order to be considered an ARAR.

The criteria for determining relevance and appropriateness are listed in 40 CFR Part 300.400(g)(2) and include the following:

- Purpose of the requirement and the purpose of the CERCLA action
- Medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site
- Substances regulated by the requirement and the substances found at the CERCLA site
- Any variances, waivers, or exemptions of the requirement and their availability for the circumstances at the CERCLA site
- Type of place regulated and the type of place affected by the release or CERCLA action
- Type and size of structure or facility regulated and the type and size of structure or facility affected by the release or contemplated by the CERCLA action
- Consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resources at the CERCLA site

According to EPA CERCLA ARARs guidance, a requirement may be "applicable" or "relevant and appropriate," but not both. Identification of ARARs must be done on a site-specific basis and involve a two-part analysis: first, a determination whether a given requirement is applicable; then, if it is not applicable, a determination whether it is nevertheless both relevant and appropriate. It is important to explain that some regulations may be applicable or, if not applicable, may still be relevant and appropriate. When the analysis determines that a requirement is both relevant and appropriate, such a requirement must be complied with to the same degree as if it were applicable.

To qualify as a state ARAR under CERCLA and the NCP, a state requirement must be:

- A state law or regulation
- An environmental or facility siting law
- Promulgated (of general applicability and legally enforceable)
- Substantive (not procedural or administrative)
- More stringent than the federal requirement
- Identified in a timely manner
- Consistently applied

To constitute an ARAR, a requirement must be substantive. Therefore, only the substantive provisions of requirements identified as ARARs in this analysis are considered to be ARARs. Permits are considered to be procedural or administrative requirements. Provisions of generally

relevant federal and state statutes and regulations that were determined to be procedural or non-environmental, including permit requirements, are not considered to be ARARs. CERCLA 121(e)(1), 42 USC, Section 9621(e)(1), states that "No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely on-site, where such remedial action is selected and carried out in compliance with this section." The term *on-site* is defined for purposes of this ARARs discussion as "the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action" (40 CFR, Part 300.5).

Pursuant to EPA guidance, ARARs are generally divided into three categories: chemical-specific, location-specific, and action-specific requirements. This classification was developed to aid in the identification of ARARs; some ARARs do not fall precisely into one group or another. ARARs are identified on a site basis for remedial actions where CERCLA authority is the basis for cleanup.

10.2.2 Potential ARARs for the Remedial Alternatives Evaluated

The *Site 22 FS Report* (TtEMI, 1999) identified several potential federal and state ARARs for the remedial alternatives evaluated for the Site 22 Landfill at MFA. It was determined that chemical-specific ARARs do not exist for landfill refuse. For the surrounding groundwater and surface water, the only chemical-specific ARARs are the beneficial use provisions (Chapter 2), and the water quality objectives (WQOs) provisions for protecting those beneficial uses (Chapter 3) of the RWQCB Basin Plan (1995). In addition, all of the alternatives would meet the relevant and appropriate location-specific ARARs identified in the *Site 22 FS Report* (TtEMI, 1999). The ARARs identification and evaluation process conducted for preparation of the *Site 22 FS Report* (TtEMI, 1999) was preliminary and focused primarily on the groundwater and gas monitoring requirements. This evaluation was not intended to be comprehensive of all potential ARARs for the remedial alternatives. Therefore, a more complete evaluation of the ARARs, primarily the action-specific ARARs, was conducted. Certain action-specific ARARs, including landfill closure requirements, waste generation and disposal, landfill capping, and maintenance requirements were expanded from the original list in the *Site 22 FS Report* (TtEMI, 1999). These additional ARARs are discussed below.

Landfill closure and post-closure requirements are contained in 40 CFR, Part 258 and in CCR, Titles 22, 23, and 27. Because the Site 22 Landfill addressed in this ROD ceased operation prior to the effective date of any of these four sets of similar, but not identical regulations, they are not "applicable" ARARs. Therefore, the DoN reviewed them to determine whether any of the regulations were potentially "relevant and appropriate" ARARs. These similar regulations were provided in a table of potential ARARs in the *Site 22 FS Report* (TtEMI, 1999). The purpose of this table was to facilitate preliminary identification of ARARs for remedial design and remedial action. However, since the *Site 22 FS Report* (TtEMI, 1999) was finalized in 1999, the DoN has re-evaluated the various provisions of the potential ARARs listed in the *Site 22 FS Report*

(TtEMI, 1999). In some cases, the listed ARARs contained citations to duplicative requirements, and in other cases, the listed ARARs were not the most appropriate. For preparation of the ROD, when federal and state regulations were considered to be equally stringent, federal regulations were selected as controlling ARARs. Therefore, based on the DoN's re-evaluation of ARARs identified in the *Site 22 FS Report* (TtEMI, 1999), the ARARs have been revised and the final action-specific, location-specific, and chemical-specific ARARs are listed in Table 16.

Capping or covering the Site 22 Landfill is a component of several of the alternatives evaluated. Federal and state requirements for landfill closure are the primary sources of ARARs for this action. The Site 22 Landfill would not be classified as a hazardous waste landfill because there is no record of hazardous waste disposal. However, because some of the wastes in the landfill may contain hazardous constituents, certain provisions of RCRA may be relevant and appropriate for landfill closure.

The RCRA landfill closure requirements (22 CCR, Sections 66264.111 and 66264.310) are general performance standards that eliminate the need for further maintenance and control and eliminate post-closure escape of hazardous wastes, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products. The grading conducted for the capping/cover options at the Site 22 Landfill does not constitute placement or disposal under RCRA and, therefore, the generator requirements for hazardous waste determinations contained in 22 CCR, Sections 66262.10(a) and 66262.111 are not triggered.

Alternatives 2 and 3 may necessitate excavating a portion of the landfill for the purpose of consolidating waste within the site. The EPA has determined that disposal occurs when waste is placed in the land-based unit. However, movement within a unit does not constitute disposal or placement, and at CERCLA sites, an area of contamination can be considered comparable to a unit. Therefore, movement within the landfill boundary does not constitute placement and, therefore, RCRA waste generation and land disposal restrictions are not triggered. Similarly, hazardous waste regulations concerning waste characterization and disposal would only be applicable if hazardous waste requiring off-site disposal is discovered during reconfiguration and grading of the landfill prior to placement of the biotic barrier (Alternative 2) or biotic barrier and liner (Alternative 3). The appropriate regulatory requirements for management of hazardous waste would be followed should testing result in classification of these materials as RCRA or non-RCRA hazardous waste.

Landfill closure requirements for municipal waste landfills are set forth in 40 CFR Part 258, Subpart F. Because the Site 22 Landfill did not receive wastes after the effective date of these requirements (October 9, 1991), these requirements would not be applicable. However, the final cover system will be designed to minimize infiltration and erosion.

Part 258.61 requires post-closure maintenance for 30 years unless it can be demonstrated that a shorter or longer period of maintenance is required. If it can be demonstrated that the site poses no threat to public health and safety or to the environment, the post-closure maintenance period may be eliminated.

The groundwater and gas monitoring ARARs were also expanded from the potential ARARs identified in the *Site 22 FS Report* (TtEMI, 1999) and were revised specifically to address the selected remedy. This discussion is provided in Section 14.2, Compliance with ARARs, of this document.

10.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternatives 2, 3A, and 3B would provide long-term effectiveness, but would require long-term O&M activities. These would include landfill gas and groundwater monitoring and occasional repairs, such as regrading to ensure that the design thickness of the soil cover is maintained. Alternatives 3A and 3B provide increased protection over Alternative 2 in terms of limiting infiltration; however, this is not regarded as significant because: 1) leachate is not migrating and is not expected to migrate in the future; therefore, minimizing infiltration is not a requirement of the remedial action at the Site 22 Landfill; and 2) there will be landfill material located below the water table whether a multilayer cap is employed or not.

Alternative 4 provides a long-term, permanent solution by removing the refuse without further cleanup activity. From this aspect of the comparison of alternatives, Alternative 4 is regarded as the most favorable. Alternatives 2 and 3 are also regarded as acceptable.

10.4 SHORT-TERM EFFECTIVENESS

Alternative 2 would provide greater short-term effectiveness than Alternatives 3 and 4 because Alternatives 3 and 4 would require more time to implement, both due to the larger volumes of materials required and the more complex installation, construction, and excavation involved. Even with the extension of the biotic barrier (Alternative 2) to cover the entire 9.4 acres of the landfill, the materials required for the multilayer caps proposed under Alternative 3 would still be much greater due mainly to the foundation layer and to the thicker cover layer. The requirement for more materials for Alternatives 3 and 4 would also result in greater truck traffic and therefore, increase the potential for vehicle accidents, dust, and noise disturbances. In addition, since Alternative 4 involves excavation and removal of the waste material, the potential for short-term exposure to contaminants is greatest for this alternative.

In consideration of the above factors, from this aspect of the comparison, Alternative 2 is regarded as the most favorable.

10.5 REDUCTION IN TOXICITY, MOBILITY, AND VOLUME THROUGH TREATMENT

Based on EPA guidance *Conducting RIs/FSs for CERCLA Municipal Landfill Sites EPA/540/P-91-001* (EPA, 1991), this criterion is not considered relevant to municipal landfills. Treatment is not deemed to be practical or technically feasible for landfill sites. Therefore, none of the alternatives considered and evaluated for the Site 22 Landfill include a treatment component. Consequently, further evaluation of the alternatives under this criterion was not conducted. It is noted however, that Alternatives 2, 3A, and 3B are all effective in reducing contaminant mobility through isolation. Alternative 4 is also effective in reducing contaminant mobility and volume since all of the landfill materials would be removed from the site.

10.6 IMPLEMENTABILITY

Alternative 2 is easier to implement than Alternatives 3A, 3B, and 4. Alternatives 3A and 3B require significantly more construction materials including soil (cover), foundation material, and low-permeability clay material or a GCL.

Alternative 4 is more complicated to implement than Alternatives 2 and 3 for several reasons. Alternative 4 would require that equipment and workers come into contact with refuse, necessitating more complicated health and safety procedures than required for the other alternatives. Large volumes of refuse would be transported on public roads to an approved disposal facility. This alternative would also require a significantly greater volume of material to be placed at the Site 22 Landfill than the other alternatives and would consequently require significantly more truck traffic in the area.

From this aspect of the comparison of the alternatives, Alternative 2 can be implemented more readily than Alternatives 3A and 3B, and therefore, is regarded as the most favorable. Alternative 4 is regarded as the least favorable.

10.7 COSTS

Original total costs for Alternatives 2, 3 and 4 (construction plus lifetime O&M) were presented in the final *Site 22 FS Report* (TtEMI, 1999). A Technical Memorandum, dated May 30, 2001, was submitted to the regulatory agencies in which the DoN updated the cost estimates for these alternatives to reflect current practices and current costs for materials, equipment, and labor (FWENC, 2001b). Following the public comment period, the costs for Alternative 2 were further revised based on the extension of the biotic barrier to cover the entire 9.4-acre footprint of the landfill, and tree replacement/relocation. These revised costs are summarized below. A range of costs is provided for Alternative 4 due to differences in disposal and fill source locations. More detailed costs were provided for each alternative in Section 9.0, and only total costs are provided here for comparison.

- Alternative 2 $2,842,000
- Alternative 3A $4,105,000
- Alternative 3B $3,790,000
- Alternative 4 $4,057,600 - $8,919,000

Alternative 2 has the lowest construction costs. Costs for groundwater and landfill gas monitoring are identical for Alternatives 2, 3A, and 3B. Alternative 3B is less expensive than Alternative 3A because of the different materials used in the cap structure. Alternative 4 incurs a much higher capital cost than all the other alternatives because it involves hauling a large amount of material to and from the Site 22 Landfill. However, Alternative 4 would not need maintenance and only limited long-term groundwater monitoring would be necessary.

For cost comparison of alternatives, Alternative 2 is regarded as the most favorable, while Alternative 4 is regarded as the least favorable.

10.8 STATE AND SUPPORT AGENCY ACCEPTANCE

The EPA and the RWQCB stated in a joint concurrence letter to the DoN, dated October 27, 2000, that they agree with the DoN's decision to withdraw the May 1999 FS and proceed with the *Site 22 FS Report* (TtEMI, 1999), which recommends the biotic barrier as the preferred alternative. In addition, letters were received by the DoN from EPA (March 26, 2001) and RWQCB (April 24, 2001) concurring with the *Proposed Plan for Site 22* (DoN, 2001), which recommends the biotic barrier as presented in this ROD. Based on these letters, the regulatory agencies agree that Alternative 2 is acceptable as the selected alternative. Alternative 2 would be protective of human health and the environment, would comply with ARARs, and would utilize permanent solutions to achieve the RAO to the maximum extent practicable.

10.9 COMMUNITY ACCEPTANCE

The public comment period for the *Proposed Plan for Site 22* (DoN, 2001) was held from April 2, 2001, to May 9, 2001, and a public meeting was held April 26, 2001, at the Mountain View City Council Chambers located at 500 Castro Street, Mountain View, California, 94041, from 7 to 9 p.m. During the public comment period, input was received from members of the public, the local county and cities, an environmental group, League of Women Voters, Moffett Field Golf Course, and NASA. All comments were transcribed during the meeting. In general, Alternative 2, the biotic barrier, was acceptable with special considerations. The main recurring theme pertained to consideration and mitigation of impacts to wildlife (namely the burrowing owl) and habitat (trees).

The following summary provides concerns received during the public comment period regarding implementation of the remedial action.

- The DoN should consider alternative ways to conserve trees while installing the biotic barrier. Tree mitigation and replacement should occur very soon after construction completion in order to maintain habitat for raptors and golf course aesthetics.
- The DoN should maintain strict compliance with burrowing owl guidelines during installation of the biotic barrier. In addition, owl habitat should be restored upon construction completion. The DoN might consider relocating owls from the site altogether.
- The DoN should evaluate the impacts to golf course customers and staff, course playability, and lost time and revenue during construction of the biotic barrier.
- The DoN should consider extending the footprint of the biotic barrier from 7 acres to 9.4 acres to cover the entire area of the landfill to prevent current and future burrowing of animals into the refuse across the site.

Section 15.0 provides the Responsiveness Summary that was developed to document the community participation activities conducted and to provide details on the public comments received and the DoN's responses. The Responsiveness Summary also states how the public concerns were addressed within the ROD.

11.0 PRINCIPAL THREAT WASTE

Since highly toxic or highly mobile contaminants were not identified at the Site 22 Landfill, there is no discussion of principal threat wastes in this section.

12.0 SELECTED REMEDY

12.1 RATIONALE FOR SELECTION OF REMEDY

A table summarizing the comparative evaluation of the alternatives presented above is provided below:

Comparative Evaluation of the Remedial Alternatives

Evaluation Criteria	**Alternative 1** No Action	**Alternative 2** Biotic Barrier	**Alternative 3A** Multilayer Cap (clay layer) and Biotic Barrier	**Alternative 3B** Multilayer Cap (GCL) and Biotic Barrier	**Alternative 4** Excavation and Off-Site Disposal
Overall Protection of Human Health and the Environment	Not Protective	Acceptable	Acceptable	Acceptable	Most Favorable
Compliance with ARARs	Not Evaluated	Acceptable	Acceptable	Acceptable	Acceptable
Long-Term Effectiveness and Permanence	Not Evaluated	Acceptable	Acceptable	Acceptable	Most Favorable
Short-Term Effectiveness	Not Evaluated	Most Favorable	Acceptable	Acceptable	Least Favorable
Reduction of Toxicity, Mobility, or Volume through Treatment	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
Implementability	Not Evaluated	Most Favorable	Acceptable	Acceptable	Least Favorable
Cost	Not Evaluated	Most Favorable	Acceptable	Acceptable	Least Favorable

Note:

Alternatives 2, 3A, 3B, and 4 include groundwater and landfill gas monitoring. Alternatives 2, 3A, and 3B include institutional controls.

The biotic barrier proposed under Alternative 2 is preferred over the multilayer caps in Alternatives 3A and 3B and excavation in Alternative 4. The biotic barrier (Alternative 2) and the multilayer caps proposed under Alternative 3, would both meet the RAO for the site, which is to prevent animals from burrowing into the Site 22 Landfill and exposing the refuse. The multilayer caps would be more effective in terms of minimizing infiltration of water into the landfill, and thus would provide better control over mobilization of leachate. However, leachate is not migrating to groundwater beneath the Site 22 Landfill, and is not expected to migrate in the future. Because of this, and because a portion of the refuse is located below the water table,

minimizing infiltration is not a requirement of the remedial action for the Site 22 Landfill. The biotic barrier proposed in Alternative 2 is also the most favored remedy in terms of cost, and would therefore meet the RAO in a more cost effective manner. The biotic barrier is also more easily implemented than the remedy proposed in Alternative 3.

Excavation, as proposed in Alternative 4, is ranked highest in terms of eliminating direct exposure to refuse because refuse is removed and transported to an off-site location. Alternative 4 also has minimal O&M and lower monitoring requirements than Alternatives 2 and 3. However, Alternative 4 would be very difficult to implement and is less effective in the short term due to excessive disturbances that would result from the effort. Finally, Alternative 2 is much more cost-effective than Alternative 4.

Based on this evaluation, Alternative 2, installation of a biotic barrier, managing surface water flow, institutional controls, and groundwater and gas monitoring, is the selected alternative for the Site 22 Landfill. This is consistent with EPA's presumptive remedy approach, which specifies containment for landfill sites where wastes pose a relatively low, long-term threat, or where treatment is impractical.

12.2 DESCRIPTION OF SELECTED REMEDY

Alternative 2, the biotic barrier, is comprised of layers constructed of soil, gravel, concrete slurry, and cobblestone to prevent animals from burrowing into the Site 22 Landfill. It also includes institutional controls and groundwater and gas monitoring. The barrier will be constructed over the entire 9.4 acres of the Site 22 Landfill, and the disturbed areas will be restored to the extent practicable, given that recontouring may be necessary to maximize drainage, thereby reducing ponding of precipitation and irrigation water.

The selected response action addresses the RAO for the site by preventing animals from burrowing into the Site 22 Landfill and exposing the refuse, thereby limiting direct contact with the waste by humans. The major components of the selected response action are summarized below:

- Installing a barrier to prevent burrowing animals from disturbing the subsurface contamination
- Managing surface water flows across the site
- Enacting institutional controls to prevent excavation of waste materials
- Monitoring of groundwater and gas in the vicinity of the site

Institutional controls will be developed in coordination with NASA and will include access restrictions to maintain the integrity of the biotic barrier and to limit surface excavation that could disturb the refuse. As noted in Section 9.2, institutional controls would be implemented by NASA per an MOA to be signed by the DoN and NASA after review and concurrence by EPA.

A groundwater monitoring program will be developed and will incorporate the substantive provisions of the following requirements applicable to the development and implementation of a monitoring program:

- Required programs [27 CCR, Section 20385 (a)(1), (a)(2), (a)(3), (c)]
- Water quality protection standard [27 CCR, Section 20390 (a)]
- Constituents of concern [27 CCR, Section 20395 (a)]
- Concentration limits [27 CCR, Section 20400 (a), (d), (g)]
- Water quality monitoring and system requirements [27 CCR, Section 20415 (b)(1)(A-C), (e)]
- Detection monitoring program (27 CCR, Section 20420)
- Evaluation monitoring program [27 CCR, Section 20425 (b), (c), (d)(1), (d)(2), (e), (f), (g), (h), (i)]

The landfill gas monitoring requirements specified in 27 CCR, Section 20921(a) are relevant and appropriate. This regulation requires that landfill gases be monitored to ensure methane concentrations at the property boundary do not exceed 5 percent by volume in air.

Monitoring details will be provided in a long-term landfill gas monitoring plan that will be developed for approval by the regulatory agencies as part of the remedial design. It is expected that groundwater and landfill gas monitoring would initially be conducted on a quarterly basis for a minimum 5 years following implementation of the remedy, and if results show no evidence of significant impacts, monitoring intervals may later be less frequent, or monitoring may be deemed unnecessary. Additional details of the monitoring program would be developed during the remedial design and remedial action.

COCs for groundwater at the Site 22 Landfill are provided in Table 17. If COC concentrations in groundwater exceed levels established in accordance with Title 27 CCR, Section 20415 (b)(1)(A-C), (e) the DoN will immediately notify the regulatory agencies. The DoN also will evaluate the groundwater contamination in accordance with CERCLA and obtain concurrence from the regulatory agencies on appropriate actions.

Implementation of the biotic barrier will require removal of a number of existing trees. Where practical, trees currently located on the landfill area will be replanted in areas outside the landfill boundary; new trees will be planted outside the landfill boundary; and trees will be planted

within the landfill boundary in tree wells, which would be engineered into the biotic barrier. A final decision as to where, and how many trees would be planted and/or relocated will be made during the remedial design phase.

Finally, although burrowing owls are not expected to reside on the site based on previous surveys conducted, prior to commencing construction, additional surveys for burrowing owls would be conducted based on guidance presented in "Passive Relocation: A Method to Preserve Burrowing Owls on Disturbed Land" (Trulio, 1995) and *Staff Report on Burrowing Owl Mitigation* (California Department of Fish and Game, 1995). If burrowing owls are identified on the site, relocation of the owls will be conducted in accordance with the aforementioned guidance.

12.3 SUMMARY OF COSTS FOR SELECTED REMEDY

A summary of estimated cost for the selected remedy is provided below. The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the selected remedy. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to –30 percent of the actual project cost. Cost estimates for implementation of this alternative as proposed in the *Site 22 FS Report* (TtEMI, 1999) were re-evaluated based on current practices and actual costs for materials, equipment, and labor. The revised cost estimate for this alternative was presented in the *Cost Justification Technical Memorandum* (FWENC, 2001b). Following the public comment period, the costs for Alternative 2 were further revised based on the extension of the biotic barrier to cover the entire 9.4-acre footprint of the landfill and tree replacement/relocation.

Biotic Barrier	Estimated Costs
Total Cost (Capital + O&M)	$2,842,000
Capital	$2,422,000
Annual O&M	$21,000

The O&M costs for the selected remedy assume an annual escalation rate of 4 percent and the costs are discounted back to present value using a U.S. Treasury Rate of 7.25 percent in effect November 10, 2000. The O&M period is 30 years. A summary of the costs associated with implementation of the selected remedy is provided in Table 18.

12.4 EXPECTED OUTCOMES OF SELECTED REMEDY

It is expected that the selected remedy:

- Reduces risk within a reasonable timeframe
- Meets ARARs from federal and state laws and regulations

- Is the most cost-effective alternative
- Provides a remedy that is reliable over the long-term

A 5-year review of the site will be conducted in accordance with NCP Section 300.430(f)(4)(ii). This review will evaluate whether the current remedy is, or will be, protective of human health and the environment. This review is required pursuant to CERCLA Section 121(c) and NCP Section 300.430(f)(5)(iii)(C). Subsequent statutory reviews will be conducted on a 5-year basis until the site monitoring activities cease or a no-further-action determination is made for the site.

While the selected remedy meets the RAO identified for the site, the remedy also includes an institutional control component that is required to prevent certain access or limit certain future uses of the site including restrictions on uses of soil and groundwater from the site.

13.0 DOCUMENTATION OF SIGNIFICANT CHANGES

As indicated in the Responsiveness Summary (Section 15.0), a number of comments were received during the public comment period for the *Proposed Plan for Site 22* (DoN, 2001) and the public meeting during which the preferred remedial alternative was presented and explained. Based on these comments, the DoN has evaluated the effects of modifying two aspects of the proposed biotic barrier on the remedy selection process. The modifications under consideration included: 1) expanding the areal extent of the biotic barrier from 7 acres to 9.4 acres to cover the entire landfill footprint, thus providing a more permanent long-term remedy for the site and 2) replanting some of the existing trees or planting new trees outside the boundary of the site and/or adding trees in engineered tree wells within the landfill area.

The DoN agrees that expanding the biotic barrier from 7 to 9.4 acres is advisable in consideration of the following factors:

- As presented in the *Site 22 FS Report* (TtEMI, 1999), refuse has been detected as shallow as 6 inches beneath the surface of the site in fairway areas. This is minimal cover and is prone to the effects of erosion, which over time, could result in uncovering of refuse and subsequent human exposure.
- Squirrels are prolific throughout the golf course and have been observed by golf course personnel to be burrowing in the fairway areas. Burrowing activities in these areas may intensify if only the "rough" areas are covered by the biotic barrier, and during times when the golf course may be closed for maintenance (for example, during reseeding).

In considering these enhancements to the preferred alternative and documenting these enhancements in the ROD, the DoN consulted the EPA's Office of Solid Waste and Emergency Response Guidance document entitled *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (EPA, 1999). Section 4.0 of the guidance discusses pre-ROD changes and references Section 300.430(f)(3) of the NCP, which requires the DoN as lead agency to determine the following: 1) are the changes significant and 2) could the changes have been reasonably anticipated based on information presented to the public? Changes deemed significant and that could have been reasonably anticipated on the information available to the public are to be discussed in the Documentation of Significant Changes section of the ROD.

With respect to determining if the proposed modifications are significant, since adding trees and extending the limits of the biotic barrier to an additional 2.4 acres will add an additional $1 million (or 70 percent increase) in projected capital costs over the costs presented in the *Proposed Plan for Site 22* (DoN, 2001), the DoN believes the modifications are significant. A more detailed breakdown of the costs for construction of the biotic barrier is presented in

Table 18. Based on the EPA's guidance, for cost differentials, significant is defined as +50 to –30 percent accuracy from the cost estimates presented in the *Proposed Plan for Site 22* (DoN, 2001).

Since the proposed modifications are deemed to be significant, the second criterion for evaluation is determining if the proposed changes could have been reasonably anticipated based on information available to the public. Based on the following considerations, the DoN believes that these modifications could have been reasonably anticipated based on information available to the public.

- The boundaries of the Site 22 Landfill cover 9.4 acres and underlie portions of holes 3, 6, and 7 of the Moffett Field Golf Course.
- As presented in the *Site 22 FS Report* (TtEMI, 1999), refuse has been detected as shallow as 6 inches beneath the surface of the site in fairway areas. This is minimum cover and is prone to the effects of erosion, which overtime could result in human exposure to the refuse.
- Squirrels are prolific throughout the golf course and have been observed by golf course personnel burrowing in the fairway areas. Burrowing activities in these areas are likely to intensify if only "rough" areas are covered with the biotic barrier, and during times when the golf course may be closed for maintenance (that is, reseeding and so forth).
- The *Site 22 FS Report* (TtEMI, 1999) addressed covering 5 acres of the site with the biotic barrier and the proposed plan extended this to cover 7 acres of "low activity" where squirrels would be likely to burrow.
- Two containment and biotic barrier (cap) options along with a complete site refuse excavation and disposal alternative were considered for the site during the FS stage and within the Proposed Plan, and these options encompassed the entire 9.4-acre landfill footprint.
- Information was available to the public in the form of the FSs, proposed plans, and public meetings (including numerous RAB meetings) and based on the physical site characteristics that indicated that the entire 9.4-acre footprint of the landfill may need to be addressed to prevent exposure of humans to landfill refuse.

In conclusion, the modifications (including the addition of trees and expanding the biotic barrier to 9.4 acres) proposed to the preferred alternative due to public comments are significant and could reasonably have been anticipated based on information available to the public. As such, the DoN, in accordance with NCP Section 300.430(f)(3), has documented the proposed pre-ROD changes and the reasons for the changes in Sections 9, 10, 12, and 13 of this ROD.

14.0 STATUTORY DETERMINATIONS

The following statutory determinations are provided to describe how the selected remedy satisfies the statutory requirements of CERCLA Section 121, as required by NCP Section 300.430(f)(5)(ii) and to explain the 5-year review requirements for the selected remedy.

14.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The RAO of this response action is to protect human health by preventing contact with landfill refuse. The burrowing activity of ground squirrels has caused refuse to be uncovered at the landfill and has presented the potential for direct contact with visitors, golfers, and workers at the golf course. The selected remedy protects human health and the environment by ensuring the continued isolation of the waste at the site. Exposure to site refuse will be controlled using permanent, physical barriers which will eliminate the current exposure pathway. There are no short-term threats associated with the selected remedy that cannot be easily controlled. Cross-media impacts are not expected from the remedy.

14.2 COMPLIANCE WITH ARARS

The selected remedy must comply with ARARs established under federal and state laws unless a statutory waiver is granted. An ARAR may be either "applicable" or "relevant and appropriate", but not both. Applicable requirements are those which specifically address a contaminant, remedial action, or location present at a CERCLA site. Relevant and appropriate requirements are those, which although they are not "applicable" to a contaminant, remedial action, or location, their use is well suited to the particular site.

There are three categories of ARARs: chemical-specific requirements, action-specific requirements, and location-specific requirements. These categories are described in the following sections and are presented in Table 16.

14.2.1 Chemical-Specific ARARs

Chemical-specific ARARs are risk-based cleanup standards or methodologies which, when applied to site-specific conditions, result in the development of cleanup standards for COCs. COCs established for groundwater, based on prior groundwater monitoring activities at the Site 22 Landfill, include various VOCs, SVOCs, and pesticides as listed in Table 17.

The California Porter-Cologne Water Quality Control Act (Porter-Cologne Act) became Division 7 of the California Water Code in 1969. The Porter-Cologne Act requires each regional board to formulate and adopt a Basin Plan (RWQCB, 1995) for all areas within the region (California Water Code Section 13240). It also requires each regional board to establish WQOs

that will protect the beneficial uses of the water basin (California Water Code Section 13241) and to prescribe waste discharge requirements that would implement the Basin Plan (RWQCB, 1995) for any discharge of waste to the waters of the state [California Water Code, Section 13263(a)].

The San Francisco Bay RWQCB has adopted the Basin Plan (1995). The Basin Plan was prepared and is implemented by the San Francisco Bay RWQCB to protect and enhance the quality of the waters in the region. The Basin Plan establishes location-specific beneficial uses and WQOs for the surface water and groundwater of the region and is the basis of the San Francisco Bay RWQCB regulatory programs. The Basin Plan includes both numeric and narrative WQOs for specific groundwater sub-basins. The WQOs are intended to protect the beneficial uses of the waters of the region and to prevent nuisances.

Beneficial uses and reuses of water are key aspects of the Basin Plan (RWQCB, 1995) for the San Francisco Bay RWQCB. While groundwater at the Site 22 Landfill is not considered a beneficial use for municipal/domestic and agricultural water supply due to elevated TDS, groundwater beneath the site and surrounding surface waters are potentially beneficial for use as industrial service supply. Beneficial uses of adjacent surface waters (perimeter ditches and Northern Channel) are freshwater/estuarine and wildlife habitat. These uses could be impaired if groundwater with exceedances of interim concentration limits were to migrate from the site into surface waters.

The DoN accepts the substantive provisions in Chapter 2 and Chapter 3 of the Basin Plan (1995) for the San Francisco Bay RWQCB, which address beneficial uses and quantifiable WQOs for the selected remedy. The groundwater monitoring program to be conducted for the selected remedy will follow the substantive requirements of Title 27 CCR, Section 20385 (a)(1), (a)(2), (a)(3), (c), Section 20390 (a), Section 20395 (a), Section 20400 (a), (d), (g), Section 20415 (b)(1)(A-C), (e), Section 20420, and Section 20425 (b), (c), (d)(1), (d)(2), (e), (f), (g), (h), (i), which are the relevant and appropriate ARARs for groundwater monitoring for the site. WQOs for nearby surface water uses will be compared to the interim concentration limits at the projected point of exposure to surface water receptors (subject to any appropriate dilution attenuation factors) for any releases of chemicals of concern developed pursuant to Title 27 CCR, Sections 20395 (a), 20400 (a), (d), (g), and 20420.

Federal and state regulations exist that pertain to methane gas. The federal landfill regulations are adopted under Subtitle D of RCRA. Title 27 CCR also regulates the concentration of methane migrations. Since there is not any methane migration beyond the site boundaries, there are no ARARs. In addition, there are not ARARs for non-methane organic compounds (NMOCs).

14.2.2 Location-Specific ARARs

Location-specific ARARs are restrictions placed on concentrations of hazardous substances or the conduct of activities because of the special locations, which have important geographical, biological, or cultural features. Examples of special locations include wetlands, flood plains, sensitive ecosystems, and seismic areas. The Coastal Zone Management Act and Migratory Bird Treaty Act are ARARs. All of the alternatives would meet the location-specific ARARs. The location-specific ARARs are listed in Table 16.

14.2.3 Action-Specific ARARs

Action-specific ARARs are technology-based or activity-based requirements or limitations on actions to be taken to conduct a remedial action. They are triggered by the specific activities selected to complete a remedial action.

The Title 27 CCR landfill closure regulations and the RCRA Subtitle D landfill closure requirements are not applicable to any of the alternatives because the DoN discontinued operations in 1967. A closed site, for California Integrated Waste Management Board (CIWMB) purposes, is a "disposal site that has ceased accepting waste and was closed in accordance with applicable statutes, regulations, and local ordinances in effect at the time" (Title 27 CCR, Section 20164). Based on CIWMB's June 10, 1993, Local Enforcement Agency (LEA) Advisory, *Site Investigation Process for Investigating Closed, Illegal, and Abandoned Disposal Sites*, for a site that last received wastes prior to 1976, closure requirements did not exist at the state level at that time. Furthermore, under the SWRCB-promulgated regulations, units closed before November 27, 1984, are only required to develop and implement a detection-monitoring program. Because of this, the landfill closure requirements in Title 27 are not applicable, and the groundwater and landfill gas monitoring requirements are addressed under different ARARs as described below.

The selected remedy for the Site 22 Landfill includes a groundwater monitoring and a landfill gas-monitoring component. Federal and state requirements that pertain to groundwater and landfill gas monitoring for corrective action programs are described in the following sections.

14.2.3.1 Federal Action-Specific ARARs

The DoN has determined that since the Site 22 Landfill did not operate as a hazardous waste landfill, the Federal RCRA groundwater protection standards contained in 22 CCR, which apply to hazardous waste landfills, are not applicable nor relevant and appropriate for the groundwater potentially impacted by releases from the Site 22 Landfill. However, the California state groundwater protection standards of 27 CCR are relevant and appropriate. The specific provisions of these requirements are listed within the State Action-Specific ARARs discussion in Section 14.2.3.2 below.

14.2.3.2 State Action-Specific ARARS

The DoN has determined that portions of Title 27 CCR California state requirements for groundwater monitoring, which apply to domestic solid waste landfills, constitute state action-specific ARARs. Substantive provisions of the following requirements are relevant and appropriate to the development and implementation of a groundwater monitoring program:

- Required programs [27 CCR, Section 20385 (a)(1), (a)(2), (a)(3), (c)]
- Water quality protection standard [27 CCR, Section 20390 (a)]
- Constituents of concern [27 CCR, Section 20395 (a)]
- Concentration limits [27 CCR, Section 20400 (a), (d), (g)]
- Water quality monitoring and system requirements [27 CCR, Section 20415 (b)(1)(A-C), (e)]
- Detection monitoring program (27 CCR, Section 20420)
- Evaluation monitoring program [27 CCR, Section 20425 (b), (c), (d)(1), (d)(2), (e), (f), (g), (h), (i)]

The landfill gas monitoring requirements specified in 27 CCR, Section 20921(a) are relevant and appropriate. This regulation requires that landfill gases be monitored to ensure methane concentrations at the property boundary do not exceed 5 percent by volume in air. Details of the landfill gas monitoring program will be provided in a separate long-term landfill gas monitoring plan to be developed for approval by the regulatory agencies as part of the remedial design.

14.2.3.3 Conclusions

The substantive provisions of requirements for groundwater monitoring at 27 CCR, Section 20385 (a)(1), (a)(2), (a)(3), (c), Section 20390 (a), Section 20395 (a), Section 20400 (a), (d), (g), Section 20415 (b)(1)(A-C), (e), Section 20420, and Section 20425 (b), (c), (d)(1), (d)(2), (e), (f), (g), (h), and (i) have been determined to be state relevant and appropriate ARARs for this remedial action. The controlling ARAR for landfill gas monitoring is set forth in 27 CCR, Section 20921(a).

14.3 COST EFFECTIVENESS

Alternative 2, the selected remedy, has been determined to provide overall effectiveness proportional to its costs, therefore, making it cost-effective. It has the lowest construction costs, and provides both long and short-term effectiveness. Alternative 2 effectively provides the same level of protection to human health and the environment as Alternatives 3A, 3B, and 4. As a result, the additional costs associated with the other alternatives are unwarranted. From this aspect of cost comparison of alternatives, Alternative 2 is regarded as the most favorable, while Alternative 4 is regarded as the least favorable.

14.4 LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternative 4 is considered to have the most long-term effectiveness and permanence due to the excavation and disposal of the landfill refuse. Alternative 4 would not require maintenance and would require only limited long-term groundwater monitoring. Alternative 2, 3A, and 3B also provide long-term effectiveness and permanence due to the construction of a barrier or cap to prevent infiltration by ground squirrels.

14.5 REDUCTION IN TOXICITY, MOBILITY, AND VOLUME

Alternative 2 reduces mobility through isolation or containment by preventing burrowing animals from bringing waste to the surface. Because the landfill historically contains only municipal solid waste, as substantiated by analytical testing and trenching, groundwater contamination is not a serious concern. It is also noted that groundwater contaminants are not migrating off site and the groundwater does not have beneficial use for drinking water.

14.6 SHORT-TERM EFFECTIVENESS

Alternative 2 is the most effective in the short term. Alternatives 3A and 3B would require large amounts of materials to be brought on site, and Alternative 4 would require the complete excavation of the landfill, triggering additional health and safety concerns.

Alternative 2 effectively provides the same level of protection to human health and the environment as Alternatives 3A, 3B, and 4. As a result, the additional costs associated with the other alternatives are unwarranted. From this aspect of cost comparison of alternatives, Alternative 2 is regarded as the most favorable, while Alternative 4 is regarded as the least favorable.

14.7 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

EPA and the DoN have determined that the selected remedy represents the maximum extent practicable to which permanent solutions and alternative treatment technologies can be used in a cost-effective manner for the landfill. All of the alternatives (excepting Alternative 1 – No action) are protective of human health and the environment and comply with applicable ARARs. The EPA and DoN have determined that this selected remedy provides the best balance among the short-term effectiveness, long-term effectiveness and permanence, implementability, and cost criteria. The selected remedy is expected to be permanent and effective over the long term as long as routine maintenance of the cap is performed, monitoring of groundwater and methane is conducted, and institutional controls are enforced.

14.8 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

Based on EPA guidance *Conducting RIs/FSs for CERCLA Municipal Landfill Sites, EPA/540/P-91/001* (EPA, 1991), treatment is not deemed to be practical or technically feasible for landfill sites. In addition, the selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the extent practicable for this site. However, because treatment of the principal threats of the site were not found to be practicable, this remedy does not satisfy the statutory preference for treatment as the principle element of the remedy. The size of the landfill and the fact that there are not any on-site hot spots that represent the major sources of contamination preclude a remedy in which contaminants could be excavated and treated effectively.

14.9 FIVE-YEAR REVIEW REQUIREMENTS

A 5-year review of the site will be conducted in accordance with NCP Section 300.430(f)(4)(ii). This review will evaluate whether the current remedy is, or will be, protective of human health and the environment. This review is required pursuant to CERCLA Section 121(c) and NCP Section 300.430(f) (5)(iii)(C). Subsequent statutory reviews will be conducted on a 5-year basis until the site monitoring activities cease or a No Further Action determination is made for the site.

15.0 RESPONSIVENESS SUMMARY

The final *Proposed Plan for Site 22* (DoN, 2001) was released to the public on April 2, 2001. A public comment period was held from April 2, 2001, to May 9, 2001, and a public meeting was held on April 26, 2001, to present the *Proposed Plan for Site 22* (DoN, 2001) to a broader community audience than had already been involved at the site and to solicit public input on the Proposed Plan. At this meeting, representatives from the DoN provided an environmental description and history of the site, presented the RAOs for the Site 22 Landfill, provided a description of the remedial action alternatives considered, answered questions about the Site 22 Landfill, solicited input on the reasonably expected future land use, and supplied the rationale for proposing the preferred remedial action for the Site 22 Landfill. In addition, the EPA and the RWQCB explained their involvement with the Site 22 Landfill remediation process.

The DoN's response to comments received from the audience during the public meeting and during the public comment period is included in the Responsiveness Summary (Appendix B) of this ROD. The Responsiveness Summary serves the dual purpose of: 1) presenting stakeholder concerns about the site and preferences regarding the remedial alternatives and 2) explaining how those concerns were addressed and how the preferences were factored into the remedy selection process.

16.0 REFERENCES

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TABLES

TABLES

TABLE 1

RESULTS OF SOIL ANALYSIS FOR VOCs (µg/kg)

	Sample	Depth (feet)	Methylene Chloride	Toluene	2-Butanone	Acetone	Ethylbenzene	Xylene (total)	2-Hexanone	Styrene	Chlorobenzene	Benzene	Carbon Disulfide
Landfill Soils	SBGC-1	3.0-4.0	--	--	33J	86J	17X	33	--	--	--	--	--
	SBGC-2	1.0-2.0	6J	7J	--	--	--	--	--	--	--	--	--
		3.0-4.0	--	--	240J	530J	--	--	--	--	--	--	--
		5.0-6.0	--	--	120J	220J	48	480	--	--	--	--	--
	SBGC-3	3.0-4.0	--	7J	--	31J	--	6J	--	--	--	--	--
		5.0-6.0	--	--	51J	210J	--	--	--	--	--	--	--
	SBGC-4	1.0-2.0	--	--	54J	310J	--	--	--	--	--	--	--
		3.0-4.0	--	--	590J	1200J	200	890	73J	--	--	--	--
		5.0-6.0	--	--	150J	230J	190	900E	--	7J	--	--	--
	SBGC-7	10.0-10.5	--	--	--	--	4J	7J	--	--	11J	0.9J	--
		16.0-16.5	--	--	--	--	--	2J	--	--	--	--	--
	SBGC-8	1.0-1.5	--	--	--	--	--	--	--	--	--	--	0.6J
		5.0-5.5	--	--	--	--	16	39B	--	--	--	--	0.7J
		10.0-10.5	--	4J	--	360B	23	40	--	--	--	4J	--
Perimeter Soils	SBGC-5	1.0-2.0	--	--	32J	80J	--	--	--	--	--	--	--
		3.0-4.0	--	--	56J	140J	--	--	--	--	--	--	--
		5.0-6.0	--	--	63J	190J	--	--	--	--	--	--	--
	SBGC2-10	1.0-1.5	--	--	--	--	--	--	--	--	--	0.4J	0.4J
	SBGC2-12	15.0-15.5	--	--	--	--	--	--	--	--	--	--	1J

Notes:

Samples from SBGC-1 through SBGC-5 were taken in April 1992. Samples from SBGC2-6 through SBGC2-12 were taken in July 1994.
Samples SBGC2-6, -9 and -11 are not listed in this table because they had no detections of VOCs.

Laboratory Organic Qualifiers:

J Value is qualitatively identified, but is reported at an estimated quantity.
X Fuel mixture detected that did not exhibit a reasonable pattern match to any calibrated fuels.
B The reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
E Identifies compounds whose concentrations exceed the calibration range of the gas chromotography/mass spectrometery (GC/MS) for the specific analysis.

VOC - volatile organic compound
-- - not detected
µg/kg - micrograms per kilogram

Source: Tetra Tech EM, Inc. 1999. *Feasibility Study Site 22 Landfill.* March.

TABLE 2

RESULTS OF SOIL ANALYSIS FOR TPH (µg/kg)

	Sample	Depth (feet)	Motor Oil	Kerosene	Other Heavy Component	Other Light Component	Xylene (total)	JP-5	Diesel	Ethylbenzene
Landfill Soils	SBGC2-7	0.0-0.5	110000	--	--	--	--	--	--	--
		1.0-1.5	89000	--	--	--	--	--	--	--
		5.0-5.5	--	36000	840000Y	11000Y	--	--	--	--
		10.0-10.5	--	27000	750000Y	15000Y	20	--	--	--
		16.0-16.5	--	--	30000Y	--	--	--	--	--
	SBGC2-8	0.0-0.5	--	--	13000Y	--	--	--	--	--
		1.0-1.5	360000	--	--	--	--	--	--	--
		5.0-5.5	--	--	1100000Y	17000Y	56	--	230000J-K	26
		10.0-10.5	--	--	2000000J-S	--	--	720000J-S	--	--
		15.0-15.5	--	130000	520000Y	--	--	--	--	--
Perimeter Soils	SBGC2-6	0.0-0.5	--	--	14000Y	--	--	--	--	--
		1.5-2.0	150000	--	--	1400Y	--	--	--	--
		10.0-10.5	--	8600	--	--	--	--	--	--
	SBGC2-10	0.0-0.5	41000	--	2500Z	--	--	--	--	--
		1.0-1.5	100000	--	--	--	--	--	--	--
	SBGC2-11	0.0-0.5	240000	--	--	--	--	--	--	--
		1.5-2.0	140000	--	--	--	--	--	--	--
	SBGC2-12	0.0-0.5	51000	--	--	--	--	--	--	--
		1.0-1.5	70000	--	--	--	--	--	--	--
		10.0-10.5	--	--	4700Z	--	--	--	--	--

Notes:

Samples SBGC2-1, -2, -3, -4, -5, and -9 not listed in table because they had no detections of TPH.

Samples from SBGC2-6 through SBGC2-12 were taken in July 1994. Samples from SBGC-1 through SBGC-5 were not analyzed for TPH.

Laboratory Organic Qualifiers:

J Value is qualitatively identifed, but is reported as an estimated quantity.

Validation Organic Qualifiers:

S Value is estimated due to surrogate recovery being out of quality control (QC) limits.

K Value is estimated due to the calibration or gas chromotography/mass spectrometry tuning criteria being out of QC limits.

Y Petroleum-like chromatograph for TPH.

Z Unknown single peak or patterns were detected but did not resemble a typical fuel pattern.

-- - not detected

µg/kg - micrograms per kilogram

TPH - total petroleum hydrocarbons

Source: Tetra Tech EM, Inc. 1999. *Feasibility Study Site 22 Landfill.* March.

TABLE 3

RESULTS OF ANALYSIS FOR METALS IN THE LANDFILL SOIL (mg/kg)

	Minimum Detection at Site 22	Maximum Detection at Site 22	Moffett Area Background Concentrations	Station-wide Maximum Detections	Number of Samples Collected at Site 22	Number of Detections Reported at Site 22	Percentage of Samples for Which Detections Were Reported
Antimony	4.8	157	6	148	24	21	88
Arsenic	1.3	11.1	5.6	39.6	24	23	96
Barium	132	312	700	1470	24	24	100
Beryllium	0.13	0.75	0.7	6.5	24	15	63
Cadmium	0.59	59.3	0.7	218	24	12	50
Chromium	39.5	197	17	710	24	24	100
Cobalt	7.5	21.5	15	39	24	24	100
Copper	27.5	2640	15	21600	24	24	100
Iron	12300	109000	30000	298000	24	24	100
Lead	3.1	916	19	5240	24	24	100
Manganese	235	1240	500	6650	24	24	100
Mercury	0.1	3.4	0.1	6.2	24	19	79
Nickel	34.5	270	30	221	24	24	100
Selenium	3.1	3.1	0.3	10.9	24	1	4.2
Silver	0.53	62	0.2	360	24	12	50
Thallium	ND	ND	0.2	2.2	24	0	0
Vanadium	28.4	72.2	150	200	24	24	100
Zinc	67	1080	31	43000	24	24	100

Notes:

ND - not detected

mg/kg - milligrams per kilogram

Source: Tetra Tech EM, Inc. 1999. *Feasibility Study Site 22 Landfill.* March.

TABLE 4

RESULTS OF ANALYSIS FOR METALS IN THE LANDFILL PERIMETER SOIL (mg/kg)

	Minimum Detection at Site 22	Maximum Detection at Site 22	Moffett Area Background Concentrations	Station-wide Maximum Detections	Number of Samples Collected at Site 22	Number of Detections Reported at Site 22	Percentage of Samples for Which Detections were Reported
Antimony	5.7	73.9	6	148	29	29	100
Arsenic	1.1	18.2	5.6	39.6	29	25	86
Barium	43.9	376	700	1470	29	29	100
Beryllium	0.12	0.91	0.7	6.5	29	6	21
Cadmium	0.13	1.8	0.7	218	29	8	28
Chromium	48.7	88.8	17	710	29	29	100
Cobalt	11.4	34.8	15	39	29	29	100
Copper	24.8	552	15	21600	29	29	100
Iron	15400	37500	30000	298000	29	29	100
Lead	3.3	36.2	19	5240	29	29	100
Manganese	318	792	500	6650	29	29	100
Mercury	0.05	0.1	0.1	6.2	29	10	34
Nickel	46.9	91.9	30	221	29	29	100
Selenium	ND	ND	0.3	10.9	29	0	0
Silver	0.75	0.93	0.2	360	29	2	6.9
Thallium	ND	ND	0.2	2.2	29	0	0
Vanadium	47.4	122	150	200	29	29	100
Zinc	41.7	269	31	43000	29	29	100

Notes:

ND - not detected

mg/kg - milligrams per kilogram

Source: Tetra Tech EM, Inc. 1999. *Feasibility Study Site 22 Landfill.* March.

TABLE 5

RESULTS OF SOIL ANALYSIS FOR SVOCS (µg/kg)

Sample Number	Landfill Soils							Perimeter Soils			
	SBGC-1	SBGC-4	SBGC2-7		SBGC2-8			SBGC-5	SBGC2-9	SBGC2-11	SBGC2-12
Depth (feet)	1.0-2.0	1.0-2.0	5.0-5.5	10-10.5	0.0-0.5	1.0-1.5	5.0-5.5	1.0-2.0	1.5-2.0	0.0-0.5	0-0.5
Benzo(b)flouranthene	21J	--	--	--	--	--	--	--	--	--	--
Fluoranthene	10J	--	1100	2300		17J	59J	--	30J	--	--
Pyrene	10J	--	1100J-K	1800	21J	24J	190J	--	29J	26J	16J
n-Nitrosodiphenylamine (1)	--	100J	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	10000D	120J	--	--	--
1,4-Dichlorobenzene	--	--	1100	2400	--	--	86J	--	--	--	--
2-Methylnaphalene	--	--	58J	160J	--	--	55J	--	--	--	--
4-Chloro-3-Methylphenol	--	--	--	410J	--	--	--	--	--	--	--
Acenaphthene	--	--	--	160J	--	--	--	--	--	--	--
Anthracene	--	--	--	570	--	--	--	--	--	--	--
Benzo(a)anthracene	--	--	780	430J	--	23J	180J	--	--	--	--
Benzo(b)flouranthene	--	--	810	270J	--	--	--	--	--	--	--
Benzo(k)flouranthene	--	--	640	240J	--	--	--	--	--	--	--
Carbazole	--	--	--	670	--	--	--	--	--	--	--
Chrysene	--	--	800	360J	--	30J	270J	--	--	--	--
Dibenzofuran	--	--	--	120J	--	--	--	--	--	--	--
Fluorene	--	--	--	320J	--	--	--	--	--	--	--
Naphthalene	--	--	110J	140J	--	--	360J	--	--	--	--
Phenanthrene	--	--	280J	3000	--	--	58J	--	--	--	--
Benzo(g,h,i)perylene	--	--	--	--	--	--	460	--	--	--	--
Benzo(a)pyrene	--	--	730	--	--	--	360J	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	360J	--	--	--	--

Notes:

Samples SBGC2-2, -3, -6, and -10 not listed in table because they had no detections of SVOCs.

Samples from SBGC-1 through SBGC-5 were taken in April 1992. Samples from SBGC2-6 through SBGC2-12 were taken in July 1994.

Laboratory Organic Qualifiers:

J Value was qualitatively identified, but is reported at an estimated quantity.

D Identifies all compounds identified in an analysis at a secondary dilution factor.

Validation Organic Qualifiers:

K Value is estimated due to the calibration or gas chromotgraphy/mass spectrometry tuning criteria being out of QC limits.

-- - not detected

µg/kg - micrograms per kilogram

SVOC - semivolatile organic compound

Source: Tetra Tech EM, Inc. 1999. *Feasibility Study Site 22 Landfill.* March.

TABLE 6

RESULTS OF ANALYSIS FOR PESTICIDES/PCBs IN LANDFILL SOIL (µg/kg)

Sample Number	SBGC-1		SBGC-2			SBGC-3			SBGC-4			SBGC2-7				SBGC2-8			
Depth (feet)	1.0-2.0	3.0-4.0	1.0-2.0	3.0-4.0	5.0-6.0	1.0-2.0	3.0-4.0	5.0-6.0	1.0-2.0	3.0-4.0	5.0-6.0	0.0-0.5	1.0-1.5	5.0-5.5	10-10.5	1.0-1.5	5.0-5.5	10.0-10.5	15.0-15.5
4,4'-DDD	4.3	180	2.3J	40	--	31	71J	20	55J	120J	100J	8.4J-S	9J-S	12J-S	40J-S	25P	200D	17P	16J-S
4,4'-DDE	2.2JP	--	0.84J	17	--	5.2	11J	5.6	--	22J	18J	--	--	11J-S	17J-S	4.3	21P	8.7	--
4,4'-DDT	0.29J	--	1.7JP	2.1JP	--	--	--	0.94JP	--	5.8J	4.1J	--	--	--	--	--	--	--	--
Gamma-Chlordane	0.8J	160	0.55J	4.4	56P	4.3	--	1.6J	27J	10J	13J	--	2.2J-S	2.7J-S	3.6J-S	2.4P	3.9P	--	--
Alpha-Chlordane	--	210	0.57J	5.7P	--	8.2	--	--	41J	20J	18J	--	2.3J-S	--	8J-S	3.4P	14	--	--
Aroclor-1254	--	1800	--	180P	--	--	--	150P	390J	700J	--	--	--	170J-S	420J-S	--	710	240	280J-S
Delta-BHC	--	20JP	--	--	--	--	3.5J	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	--	29J	--	3.2J	20P	3.6J	--	--	76J	65J	12J	--	--	--	--	180D	23P	--	--
Gamma-BHC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.5P	--	--	--
Endosulfan Sulfate	--	--	0.44JP	--	3J	--	--	--	1.6J	--	--	--	--	--	--	--	--	--	11J-S
Endrin Ketone	--	--	0.16JP	0.21JP	2.3J	0.32JP	1.6J	0.67JP	1.2J	1.4J	--	--	--	--	--	--	--	--	--
Heptachlor	--	--	2.2	2.7P	--	--	--	--	7.6J	--	--	--	--	--	--	4.4	--	--	--
Endrin aldehyde	--	--	--	2.2J	--	--	--	--	--	--	--	--	--	--	--	--	--	9.2P	--
Aroclor-1242	--	--	--	--	12000D	--	--	--	--	--	--	--	--	170J-S	350J-S	--	--	260	250J-S
Aroclor-1260	--	--	--	--	--	110P	--	--	--	--	--	--	--	71J-S	170J-S	92	400	490P	260J-S
Aroclor-1232	--	--	--	--	--	--	--	--	--	--	1300J	--	--	--	--	--	--	--	--

Notes:

Samples from SBGC-1 through SBGC-5 were taken in April 1992. Samples from SBGC2-6 through SBGC2-12 were taken in July 1994.

Laboratory Organic Qualifiers:

J Indicates that the value is reported at an estimated value.

D Identifies all compounds in the analysis at a second dilution factor.

Validation Organic Qualifiers:

S Value is estimated due to surrogate recovery being out of quality control (QC) limits.

P Pesticide analysis by dual column. The column results differ by more than 25 percent.

DDD - Dichlorodiphenyldichloroethane
DDE - Dichlorodiphenyldichloroethylene
DDT - Dichlorodiphenyltrichloroethane
µg/kg - micrograms per kilogram
-- - not detected
PCB - polychlorinated biphenyls

Source: Tetra Tech EM, Inc. 1999. *Feasibility Study Site 22 Landfill.* March.

TABLE 7

RESULTS OF SOIL ANALYSIS FOR PESTICIDES/PCSs IN PERIMETER SOIL (µg/kg)

Sample Number	SBGC-5	SBGC2-9	SBGC2-10	SBGC2-11			SBGC2-12
Depth (feet)	1.0-2.0	1.5-2.0	1.0-1.5	0.0-0.5	1.5-2.0	5.0-5.5	1.0-1.5
4,4'-DDD	--	6.8	3.6J-S	--	--	--	--
4,4'-DDE	0.82J	--	--	--	--	--	--
4,4'-DDT	0.48JP	--	--	--	--	--	7.1J-S
Gamma-Chlordane	--	--	--	--	--	--	--
Alpha-Chlordane	--	--	--	--	--	--	--
Aroclor-1254	--	--	--	--	--	--	--
Delta-BHC	--	--	--	--	--	--	--
Dieldrin	--	--	--	--	--	--	--
Gamma-BHC	--	--	--	--	--	--	--
Endosulfan Sulfate	--	--	--	--	--	--	--
Endosulfan II	--	--	--	1300DP	260P	--	--
Endrin Ketone	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--
Endrin aldehyde	--	--	--	610P	140P	--	--
Aroclor-1242	--	--	--	--	--	--	--
Aroclor-1260	--	--	--	33000D	7700D	48J-S	--
Aroclor-1232	--	--	--	--	--	--	--

Notes:

Samples from SBGC-1 through SBGC-5 were taken in April 1992. Samples from SBGC2-6 through SBGC2-12 were taken in July 1994.

Laboratory Organic Qualifiers:

J Value is qualitatively identified, but is reported at an estimated value.

D Identifies all compounds in the analysis at a second dilution factor.

Validation Organic Qualifiers:

S Value is estimated due to surrogate recovery being out of quality control (QC) limits.

P Pesticide analysis by dual column. The column results differ by more than 25 percent. The lower value is reported.

DDD - Dichlorodiphenyldichloroethane

DDE - Dichlorodiphenyldichloroethylene

DDT - Dichlorodiphenyltrichloroethane

µg/kg - micrograms per kilogram

-- - not detected

PCB - polychlorinated biphenyls

Source: Tetra Tech EM, Inc. 1999. *Feasibility Study Site 22 Landfill.* March.

TABLE 8

RESULTS OF LANDFILL LEACHATE AND GROUNDWATER ANALYSIS FOR VOCs (µg/L)

	AWQC	Landfill Leachate						Groundwater														
			WGC2-2			WGC2-3		WGC2-1			WGC2-4			WGC2-5			WGC2-6			WGC2-7		
		Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect
VOCs																						
1,1-Dichloroethene	11300*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.06	0.06	1 of 5
1,2-Dichloroethene	11300*	2J	1.1	2 of 5	0.9J-S	0.5	4 of 5	0.2J	0.2	1 of 2	0.7J-K	0.5	2 of 5	---	---	---	0.2J	0.2	1 of 5	2J	1.3	3 of 5
2-Hexanone	^	---	---	---	---	---	---	---	---	---	0.8J-K	0.8	1 of 5	---	---	---	2J	2	1 of 5	---	---	---
Benzene	700	11	7.2	5 of 5	6	5.5	4 of 5	0.2J	0.20	1 of 2	---	---	---	0.08J	0.08	1 of 5	0.1J	0.1	1 of 5	---	---	---
Carbon Disulfide	^	0.2	0.2	1 of 5	0.09J-S	0.09	1 of 5	---	---	---	0.3J	0.2	2 of 5	0.06J	0.06	1 of 5	---	---	---	0.07J	0.07	1 of 5
Chlorobenzene	129	950	390	5 of 5	0.6J	0.6	1 of 5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Chloroform	^	5	5	1 of 5	---	---	---	---	---	---	0.5J	0.5	1 of 5	22	22	1 of 5	---	---	---	1J	1	1 of 5
Ethylbenzene	430*	1J	0.8	3 of 5	2J	1.0	4 of 5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methylene Chloride	^	---	---	---	0.2J-S	0.2	1 of 5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tetrachloroethene	450	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2J	1.5	4 of 5
Toluene	5000	0.6J	0.6	1 of 5	0.5J-S	0.4	3 of 5	0.2J	0.2	1 of 2	0.3J	0.3	1 of 5	2J	0.8	3 of 5	0.2J	0.2	1 of 5	---	---	---
Trichloroethene	2000	10J	10	1 of 5	---	---	---	---	---	---	0.4J	0.4	1 of 5	---	---	---	10J	5.3	2 of 5	3	2.3	4 of 5
Vinyl Chloride	^	---	---	---	0.2J-S	0.2	1 of 5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Xylene (Total)	^	5J-B	3.3	4 of 5	6J-BS	4	4 of 5	---	---	---	---	---	---	2J	2	1 of 5	---	---	---	---	---	---

Notes:

Samples were collected during four monitoring events between September 1994 and May 1995, and one event in April 1998.

Laboratory Organic Qualifiers:

J Value is qualitatively identified but is reported in an estimated quantity.

J-B Value is an estimated quantity because the given target compound was detected in the associated method blank.

Validation Organic Qualifiers:

S Value is estimated due to surrogate recovery being out of quality control (QC) limits.

K Value is estimated due to the calibration or gas chromotography/mass spectrometry tuning criteria being out of QC limits.

* Acute value used because there is no chronic AWQC listed

^ - No AWQC has been determined for this constituent

AWQC - Ambient water quality criteria

µg/L - micrograms per liter

--- - not detected

VOC - volatile organic compound

Source: Tetra Tech EM, Inc. 1999. *Feasibility Study Site 22 Landfill.* March.

TABLE 9

RESULTS OF LANDFILL LEACHATE AND GROUNDWATER ANALYSIS FOR SVOCs (µg/L)

	AWQC	Landfill Leachate						Groundwater								
		WGC2-2			WGC2-3			WGC2-5			WGC2-6			WGC2-7		
		Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect
SVOCs																
1,4-Dichlorobenzene	129	27	17.4	5 of 5	23	18.6	5 of 5	---	---	---	---	---	---	---	---	---
2,2'-Oxybis(1-Chloropropane)	^	---	---	---	---	---	---	2J-K	1.18	4 of 5	---	---	---	---	---	---
2-Methylnaphthalene	300*	2J	1.8	4 of 5	6J	4.6	5 of 5	---	---	---	---	---	---	---	---	---
4-Methylphenol	^	7J	7	1 of 5	---	---	---	---	---	---	---	---	---	---	---	---
Bis(2-Chloroethoxy)methane	6400	---	---	---	---	---	---	10J-K	10	1 of 5	---	---	---	---	---	---
Bis(2-chloroethyl)ether	^	---	---	---	---	---	---	1J	0.925	4 of 5	---	---	---	---	---	---
Bis(2-ethylhexyl)phthalate	^	4B	4	1 of 5	2J	2	1 of 5	15	15	1 of 5	---	---	---	58B	58	1 of 5
Carbazone	^	1J	1	1 of 5	3J	3	1 of 5	---	---	---	---	---	---	---	---	---
Dibenzofuran	^	---	---	---	0.7J	0.7	1 of 5	---	---	---	---	---	---	---	---	---
Diethylphthalate	3.4	14	9.5	2 of 5	3J	2.5	2 of 5	---	---	---	---	---	---	---	---	---
Fluorene	300*	---	---	---	0.9J	0.9	1 of 5	---	---	---	---	---	---	---	---	---
N-Nitrosodiphenylamine (1)	3300000*	25J-B	22.5	4 of 5	---	---	---	---	---	---	---	---	---	---	---	---
Naphthalene	2350*	17	13.2	5 of 5	35	31.6	5 of 5	---	---	---	---	---	---	---	---	---
Pyrene	300*	---	---	---	---	---	---	---	---	---	0.6J	0.6	1 of 5	---	---	---

Notes:

Samples were collected during four monitoring events between September 1994 and May 1995, and one event in April 1998.

Laboratory Organic Qualifiers:

J Value is qualitatively identified, but is reported in an estimated quantity.

J-B Value is an estimated quantity because the given target compound was detected in the associated method blank.

Validation Organic Qualifiers:

S Value is estimated due to surrogate recovery being out of quality control (QC) limits.

K Value is estimated due to the calibration or gas chromotography/mass spectrometry tuning criteria being out of QC limits.

* Acute value used because there is no chronic AWQC listed

^ - No AWQC has been determined for this constituent

AWQC - ambient water quality criteria

µg/L - micrograms per liter

--- - not detected

SVOC - semivolatile organic compound

Source: Tetra Tech EM, Inc. 1999. *Feasibility Study Site 22 Landfill.* March.

TABLE 10

RESULTS OF LANDFILL LEACHATE AND GROUNDWATER ANALYSIS FOR TPH (µg/L)

	AWQC	Landfill Leachate						Groundwater														
		WGC2-2			WGC2-3			WGC2-1			WGC2-4			WGC2-5			WGC2-6			WGC2-7		
		Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect
TPH-e																						
Diesel	^	220Y	220	1 of 5	360Y	360	1 of 5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Motor Oil	^	230Y	230	1 of 5	300Y	300	1 of 5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Other Components	^	10000Y	8150	4 of 5	10000Y	9425	4 of 5	67Z	67	1 of 2	67Z	67	1 of 5	59Z	59	1 of 5	59Z	59	1 of 5	36ZJ	36	1 of 5
TPH-p																						
Gasoline	^	270Y	270	1 of 5	270Y	270	1 of 5	---	---	---	35JZ	35	1 of 5	39JZ	39	1 of 5	---	---	---	28JZ	28	1 of 5
Benzene	700	13	7.7	3 of 5	13	7.7	3 of 5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Other Components	^	900Y	720	4 of 5	480YJ	357.5	4 of 5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Xylene (Total)	^	7	7	1 of 5	2	2	1 of 5	---	---	---	---	---	---	0.9	0.9	1 of 5	---	---	---	---	---	---
Ethylbenzene	430	---	---	---	0.7	0.7	1 of 5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Toluene	5000	---	---	---	---	---	---	---	---	---	---	---	---	1	1	1 of 5	---	---	---	---	---	---

Notes:

Samples were collected during four monitoring events between September 1994 and May 1995, and one event in April 1998.

Laboratory Organic Qualifiers:

J Value is qualitatively identified, but is reported in an estimated quantity.

Y Fuel mixture detected that did not exhibit a reasonable pattern match to any of the calibrated fuels.

Z Unknown single peak or patterns were detected, but did not resemble a typical fuel pattern.

^ - No AWQC has been determined for this constituent

AWQC - ambient water quality criteria

µg/L - micrograms per liter

--- - not detected

TPH - total petroleum hydrocarbons

TPH-e - total extractable petroleum hydrocarbons

TPH-p - total purgeable petroleum hydrocarbons

Source: Tetra Tech EM, Inc. 1999. *Feasibility Study Site 22 Landfill.* March.

TABLE 11

RESULTS OF LANDFILL LEACHATE AND GROUNDWATER ANALYSIS FOR DISSOLVED METALS (µg/L)

	AWQC	Landfill Leachate						Groundwater													
		WGC2-2			WGC2-3			WGC2-1			WGC2-4			WGC2-5			WGC2-6			WGC2-7		
		Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect	Max	Ave	Detect
Dissolved Metals																						
Aluminium	^	40.1B	40.1	1 of 5	48.6B	48.6	1 of 5	30.5B	30.5	1 of 2	63.9N	60.9	2 of 5	81.6N	71.6	2 of 5	133B	133	1 of 5	223	131.6	2 of 5
Antimony	500	1.5B	1.5	1 of 5	2.3B	2.3	1 of 5	---	---	---				---	---	---				---	---	---
Arsenic	36	13.4	9.4	4 of 5	9J-B	6.5	4 of 5	---	---	---	15.1	6.9	3 of 5	9B	9.0	1 of 5	7.8B	6.1	2 of 5	1.6B	1.6	1 of 5
Beryllium	5.3	---	---	---	---	---	---	---	---	---	3.3J-N	3.0	2 of 5	3.4J-N	2.8	3 of 5	4.1B	2.6	3 of 5	2B	1.4	2 of 5
Cadmium	9.3	4.9B	2.9	2 of 5	0.79B	0.8	1 of 5	---	---	---	0.51B	0.51	1 of 5	---	---	---	2.6B	2.6	1 of 5	0.64B	0.64	1 of 5
Chromium	50(+6)	8B	6.4	4 of 5	9.5B	8.1	4 of 5	---	---	---	4.8B	4.8	1 of 5	3.9B	3.9	1 of 5	6.7B	4.7	2 of 5	3.2B	3.2	1 of 5
Cobalt	^	38J-B	24.6	5 of 5	51.9J-N	44.0	5 of 5	3.4B	2.01	2 of 2	7.7B	5.0	4 of 5	12.9B	8.5	4 of 5	13.5B	7.7	4 of 5	8.1J-BN	5.7	5 of 5
Copper	2.9*	30.6	11.6	3 of 5	10B	4.7	3 of 5	---	---	---	---	---	---	---	---	---	---	---	---	2.5B	2.5	1 of 5
Lead	8.5	32.4	15.0	3 of 5	45.4	34.3	4 of 5	---	---	---	39.3B	20.3	2 of 5	50.5B	50.5	1 of 5	61	61.0	1 of 5	---	---	---
Mercury	0.025	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.12B	0.1	1 of 5
Molybdenum	^	---	---	---	0.98B	0.98	1 of 5	4.1B	4.1	1 of 2	---	---	---	---	---	---	2.5	2.5	1 of 5	5	5.0	1 of 5
Nickel	8.3	81.9	48.1	5 of 5	139	121.2	5 of 5	3.8B	2.7	2 of 2	10	6.7	4 of 5	30.4J-B	19.1	5 of 5	15.8B	9.1	5 of 5	19.5B	13.0	5 of 5
Selenium	71	3.3B	2.2	2 of 5	3 J-B	3	1 of 5	1.5B	1.5	1 of 2	---	---	---	---	---	---	4.2B	4.2	1 of 5	1.9B	1.9	1 of 5
Thallium	2130*	6.6B	6.6	1 of 5	4.1	4.1	1 of 5	---	---	---	56.5B	56.5	1 of 5	---	---	---	---	---	---	---	---	---
Vanadium	^	6.9B	5.8	4 of 5	9.3J-BN	5.7	5 of 5	---	---	---	---	---	---	2.6B	2.6	1 of 5	---	---	---	---	---	---
Zinc	86	61.3J-B	27.1	3 of 5	37.6	27.8	5 of 5	6.1B	6.1	1 of 2	10.6B	5.7	3 of 5	5.3B	4.3	3 of 5	22.6B	14.1	3 of 5	123	46.7	4 of 5

Notes:

Samples were collected during four monitoring events between September 1994 and May 1995, and one event in April 1998.

Laboratory Organic Qualifiers:

B The reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).

J Value is qualitatively identified, but is reported at an estimated quantity.

* Acute value used because there is no chronic AWQC listed

^ - No AWQC has been determined for this constituent

AWQC - ambient water quality criteria

µg/L - micrograms per liter

--- - not detected

(+6) - hexavalent chromium

Validation Inorganic Qualifiers:

N Value is estimated due to matrix spike recoveries being out of QC limits.

Source: Tetra Tech EM, Inc. 1999. *Feasibility Study Site 22 Landfill.* March.

TABLE 12

RESULTS OF LANDFILL LEACHATE AND GROUNDWATER ANALYSIS FOR PESTICIDES/PCBs (µg/L)

	AWQC	Landfill Leachate					
		WGC2-2			WGC2-3		
		Max	Ave	Detect	Max	Ave	Detect
Aldrin	^	0.11P	0.08	2 of 5	0.13J-S	0.13	1 of 5
Gamma-BHC (Lindane)	^	0.056P	0.1	1 of 5	---	---	---

Notes:

Samples were collected during four monitoring events between September 1994 and May 1995, and one event in April 1998.
Samples WGC2-1, -4, -5, -6, and -7 not listed in table because they had no detections of pesticides or PCBs.

Laboratory Organic Qualifiers:

J-S value is qualitatively identified, but is reported as an estimated quantity. Value is estimated due to surrogate recovery being out of QC limits.
P Analyte is greater than 25 percent different for detected concentrations between primary and confirmatory GC columns.

^ - No AWQC has been determined for this constituent
AWQC - Ambient water quality criteria
µg/L - micrograms per liter
--- - not detected
PCB - Polychlorinated biphenyl

Source: Tetra Tech EM, Inc. 1999. *Feasibility Study Site 22 Landfill.* March.

TABLE 13

RESIDENTIAL, OCCUPATIONAL, AND RECREATIONAL RISK AT SITE 22 USING THE EXPOSURE AREA APPROACH

Exposure Scenario	Range of Noncarcinogenic Risk	Range of Carcinogenic Risk
Residential	8.3E-2 to 2.2E+0	4.9E-7 to 3.1E-7
Occupational	8.2E-3 to 4.8E-1	6.1E-8 to 5.2E-6
Recreational (entire golf course)	<1	1E-7

Notes:

Reference: *Feasibility Study Site 22 Landfill*, Tetra Tech EM, Inc., 1999

TABLE 14

SUMMARY OF CARCINOGENIC AND NONCARCINOGENIC RISKS OCCUPATIONAL EXPOSURE SCENARIO, POINT RISK APPROACH

	Cal/EPA	EPA	COPCs Contributing Significantly to Risk or Hazard
Noncarcinogenic Hazards			
Soil Ingestion	1.6E-1	8.0E-2	Antimony
Dermal Contact with Soil	4.0E-1	4.0E-2	Antimony
Inhalation of Particulates	4.3E-8	9.5E-11	Carbon Disulfide
Inhalation of VOCs	1.2E-6	7.2E-8	Ethylbenzene
Total Hazard Index	5.6E-1	1.2E-2	
Carcinogenic Risks			
Soil Ingestion	6.8E-6	3.2E-6	Aroclor-1260, Aroclor-1254, and Benzo(a)pyrene
Dermal Contact with Soil	7.6E-5	2.1E-5	Aroclor-1260, Aroclor-1254, Aroclor-1242, and Benzo(a)pyrene
Inhalation of Particulates	5.7E-7	7.4E-10	Nickel and Cadmium
Inhalation of VOCs	1.4E-8	2.5E-10	Benzene
Total Cancer Risk	8.3E-5	2.4E-5	

Notes:

Reference: *Feasibility Study Site 22 Landfill*, Tetra Tech EM, Inc., 1999
Cal/EPA - California EPA
COPC - chemical of potential concern
EPA - U.S. Environmental Protection Agency
VOC - volatile organic compound

TABLE 15

SUMMARY OF NONCARCINOGENIC AND CARCINOGENIC RISKS RECREATIONAL EXPOSURE SCENARIO, POINT RISK APPROACH

	Cal/EPA	EPA	COPCs Contributing Significantly to Risk or Hazard
Noncarcinogenic Hazards			
Soil Ingestion	2.0E-2	1.3E-2	Antimony and Aroclor-1260
Dermal Contact with Soil	4.6E-1	5.4E-2	Antimony and Aroclor-1260
Inhalation of Particulates	3.2E-7	4.4E-10	Endrin Aldehyde
Inhalation of VOCs	1.4E-7	4.5E-8	Ethylbenzene
Total Hazard Index	4.8E-1	6.7E-2	
Carcinogenic Risks			
Soil Ingestion	7.9E-7	4.9E-7	Aroclor-1242, Aroclor-1254, Aroclor-1260, and Benzo(a)pyrene
Dermal Contact with Soil	6.5E-5	1.2E-5	Aroclor-1260
Inhalation of Particulates	7.1E-8	9.6E-11	Nickel and Cadmium
Inhalation of VOCs	1.8E-9	1.6E-10	Benzene
Total Cancer Risk	7.7E-5	1.3E-5	

Notes:

Reference: *Feasibility Study Site 22 Landfill*, Tetra Tech EM, Inc., 1999
Cal/EPA - California EPA
COPC - chemical of potential concern
EPA - U.S. Environmental Protection Agency
VOC - volatile organic compound

TABLE 16

FINAL FEDERAL AND STATE ARARs*

Citation	Requirement	ARAR Determination	Rationale
Location-Specific ARARs			
Coastal Zone Management Act San Francisco Bay Plan McAteer-Petris Act, California Government Code Sections 66600 et seq.	Activities within a coastal zone must be consistent with approved state management programs. The approved state management plan for San Francisco Bay consists of the McAteer-Petris Act and the San Francisco Bay Plan, developed pursuant to the act.	Relevant and appropriate	Site 22 is located within the coastal zone.
Migratory Bird Treaty Act 16 USC 701-715	This act prohibits the taking, killing, or possessing of migratory birds.	Relevant and appropriate	Site 22 is home to the burrowing owl, which is protected under this act. It is not applicable because the federal government is exempt from liability. However, the act is relevant and appropriate due to the presence of the burrowing owl.
Action- and Chemical-Specific ARARs			
Waste Characterization and Disposal from Landfill Reconfiguration			
22 CCR, Sections 66261.24(a)(2) and (3)	Requires the characterization (hazardous waste determination) of waste to determine appropriate off-site disposal options.	Relevant and appropriate	If drums or containers or other potentially hazardous waste items are discovered during reconfiguration or excavation of the landfill, or waste is generated (i.e., drill cuttings, used oil), the waste will be analyzed in accordance with these requirements.

TABLE 16

FINAL FEDERAL AND STATE ARARs*

Citation	Requirement	ARAR Determination	Rationale
22 CCR, Section 66268.7(a)	Requires generators to determine if hazardous waste is subject to land disposal restrictions (LDRs).	Relevant and appropriate	If waste materials requiring off site disposal are determined to be hazardous waste, the waste will be evaluated to determine the applicability of LDRs.
27 CCR, Sections 20200(c) and Section 20210	Requires generators to properly characterize waste and to dispose of designated waste at Class I or II units.	Relevant and appropriate	If drums or containers are discovered during reconfiguration of the landfill, or waste is produced (i.e., drill cuttings, used oil) the contents will be analyzed in accordance with these requirements to select the appropriate off-site disposal requirements.
Groundwater Monitoring			
27 CCR, Section 20385 (a)(1), (a)(2), (a)(3), (c); Section 20420; Section 20425 (b), (c), (d)(1), (d)(2), (e), (f), (g), (h), (i)	Establishes groundwater monitoring program requirements for waste management units.	Relevant and appropriate	Establishes a groundwater detection monitoring program to demonstrate effectiveness of the selected remedy, and an evaluation monitoring program to assess the nature and extent of a release, if discovered.
27 CCR, Section 20415 (b)(1)(A-C), (e)	Provides general water quality monitoring and system requirements for the post-remedial action groundwater monitoring program.	Relevant and appropriate	A sufficient number of background points and monitoring points will be used for the monitoring.
27 CCR, Section 20390 (a); Section 20395 (a); Section 20400 (a), (d), (g)	Discusses requirements for the development of a water quality protection standard and establishment of the constituents of concern and concentration limits.	Relevant and appropriate	Applies to the development and selection of interim concentration limits and to the establishment of concentration limits greater than the background for constituents of concern.

TABLE 16

FINAL FEDERAL AND STATE ARARs*

Citation	Requirement	ARAR Determination	Rationale
Chapter 2, Water Quality Control Plan[1] (San Francisco Bay Regional Water Quality Control Board)	Presents beneficial uses of groundwater and surface waters.	Applicable	Applies to groundwater beneath the site. Due to elevated salinity, the groundwater beneficial use is industrial service supply. The beneficial uses for surface water near the site are fresh-water/estuarine habitat and wildlife habitat.
Chapter 3, Water Quality Control Plan[1] (San Francisco Bay Regional Water Quality Control Board)	Establishes water quality objectives (WQOs) for protecting those beneficial uses.	Relevant and appropriate	Applies to surrounding surface waters near the site that come into hydrological contact with groundwater beneath the site. WQOs for nearby surface water uses will be compared to the interim concentration limits at the projected point of exposure to surface water receptors (subject to any appropriate dilution and attenuation factors) for any releases of chemicals of concern developed pursuant to Title 27 CCR, Section 20395 (a), Section 20400 (a), (d), (g), and Section 20420.
Gas Monitoring			
27 CCR, Section 20921 (a)(1)(2)(3)	Establishes requirements for gas monitoring and control for waste management units.	Relevant and appropriate	Gas monitoring will be implemented to ensure methane concentrations do not exceed 5 percent by volume at landfill boundaries.
Landfill Capping and Construction			
40 CFR, Parts 122, 123, and 124	Contains requirements to control stormwater discharges associated with construction activities exceeding 5 acres in size.	Relevant and appropriate	The DoN will undertake measures necessary to minimize stormwater discharges over the 7-acre area during construction of the biotic barrier.

TABLE 16

FINAL FEDERAL AND STATE ARARs*

Citation	Requirement	ARAR Determination	Rationale
Post-Remedial Action Monitoring			
40 CFR, Part 258.61(a)(3) and (4) and 27 CCR, Section 20385 (a)(1), (a)(2), (a)(3), (c)	Requires gas and groundwater monitoring.	Relevant and appropriate	Monitoring programs will be established for gas and groundwater.

Notes:

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

1 Denotes a chemical-specific ARAR

ARAR - applicable or relevant and appropriate requirement
CCR - California Code of Regulations
CFR - Code of Federal Regulations
DON - Department of the Navy
LDR - Land disposal restriction
RCRA - Resource Conservation and Recovery Act
USC - United States Code
WQO - water quality objective

TABLE 17

GROUNDWATER MONITORING CONSTITUENTS OF CONCERN

Volatile Organic Compounds	Semivolatile Organic Compounds	Pesticides
Chlorobenzene	Diethylphthalate	Aldrin
Benzene	1,4-Dichlorobenzene	Gamma BHC (Lindane)
Ethylbenzene	2-Methylnapthalene	--
Xylene	Napthalene	--
Toluene	4-Methylphenol	--
Vinyl Chloride	bis(2-Ethylhexyl)Phthalate	--
cis-1,2-Dichloroethene	Carbazole	--
Chloroform	Dibenzofuran	--
Trichloroethene (TCE)	Fluorene	--

TABLE 18

SELECTED REMEDY COST SUMMARY - BIOTIC BARRIER

	Quantity	Unit	Material	Labor & Equipment	Total
ABANDON GROUNDWATER WELL	2	EACH	$500.00	$1,500.00	$4,000.00
PLACE GAS WELL	4	EACH	$1,000.00	$2,000.00	$12,000.00
IRRIGATION SYSTEM REMOVAL	5500	LF	$1.00	$3.00	$22,000.00
TREE REMOVAL	115	EACH	$20.00	$120.00	$16,100.00
GRUBBING	7	ACRES	$500.00	$1,500.00	$14,000.00
EROSION CONTROL	9.4	ACRES	$500.00	$1,100.00	$15,040.00
DUST CONTROL	120	DAYS	$200.00	$500.00	$84,000.00
REMOVE TOPSOIL/STOCKPILE	10000	CY	$1.00	$4.00	$50,000.00
PLACE COBBLESTONE	23000	TON	$20.00	$5.00	$575,000.00
PLACE AGGREGATE STONE	12000	TON	$15.00	$3.00	$216,000.00
GUNNITE CEMENT	2200	CY	$54.00	$8.00	$136,400.00
IMPORT TOPSOIL	7000	TON	$18.00	$2.00	$140,000.00
PLACE TOPSOIL	15000	CY	$1.00	$4.00	$75,000.00
FINISH GRADING/SOIL AMENDMENT	9.4	ACRES	$1,200.00	$1,000.00	$20,680.00
FAIRWAY AND GREEN REPLACEMENT	2.4	ACRES	$25,000.00	$70,000.00	$228,000.00
HYDROSEEDING (ROUGH)	7	ACRES	$3,000.00	$1,000.00	$28,000.00
TREE REPLACEMENT(1)	50	EACH	$200.00	$1,500.00	$85,000.00
IRRIGATION	5000	LF	$8.00	$12.00	$100,000.00
SURVEY	3	EACH	$500.00	$4,500.00	$15,000.00
QUALITY CONTROL	120	DAYS	$100.00	$200.00	$36,000.00
SECURITY/TRAFFIC CONTROL	45	DAYS	$20.00	$150.00	$7,650.00
SMALL EQUIPMENT/HAND TOOLS	120	DAYS	$150.00	$75.00	$27,000.00
			SUBTOTAL		$1,906,870.00
			CONTINGENCY 27%		$2,421,724.90

Notes:

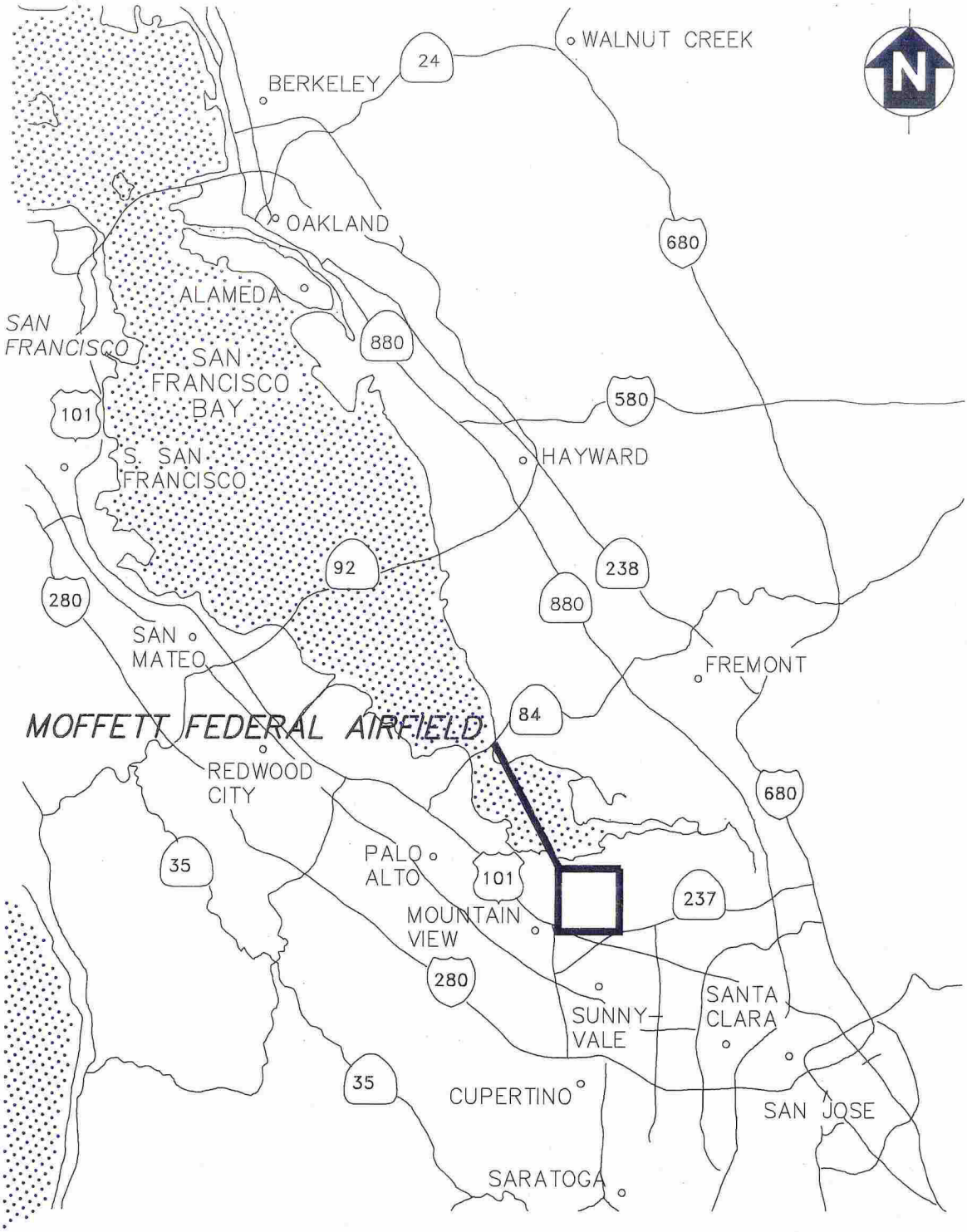
CY - cubic yard

LF - linear feet

(1) - Cost is based on an estimate of placing 50 trees; however, the actual number and location of trees and the exact costs associated with the design requirements for their placement will be determined during the remedial design phase.

FIGURES

FIGURES



NOT TO SCALE

REFERENCE: TETRA TECH EM INC., FEASIBILITY STUDY, 1999.

Figure 1
VICINITY MAP

MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL

FOSTER WHEELER ENVIRONMENTAL CORPORATION

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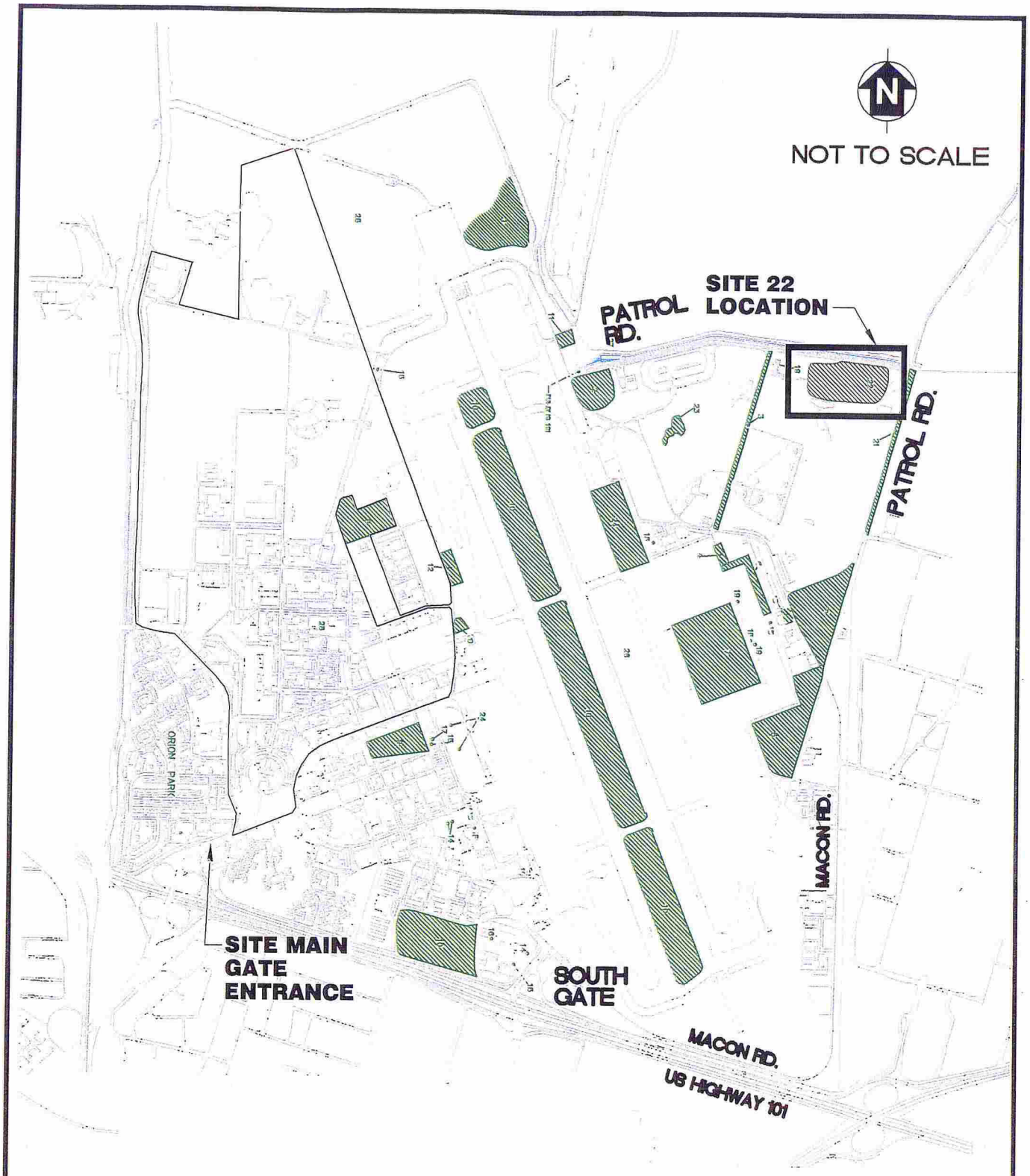

LEGEND

- INSTALLATION RESTORATION PROGRAM SITES
- SITE 22 LANDFILL

REFERENCE: TETRA TECH EM INC., FEASIBILITY STUDY, 1999.

Figure 2
LOCATION MAP

MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL

FOSTER WHEELER ENVIRONMENTAL CORPORATION

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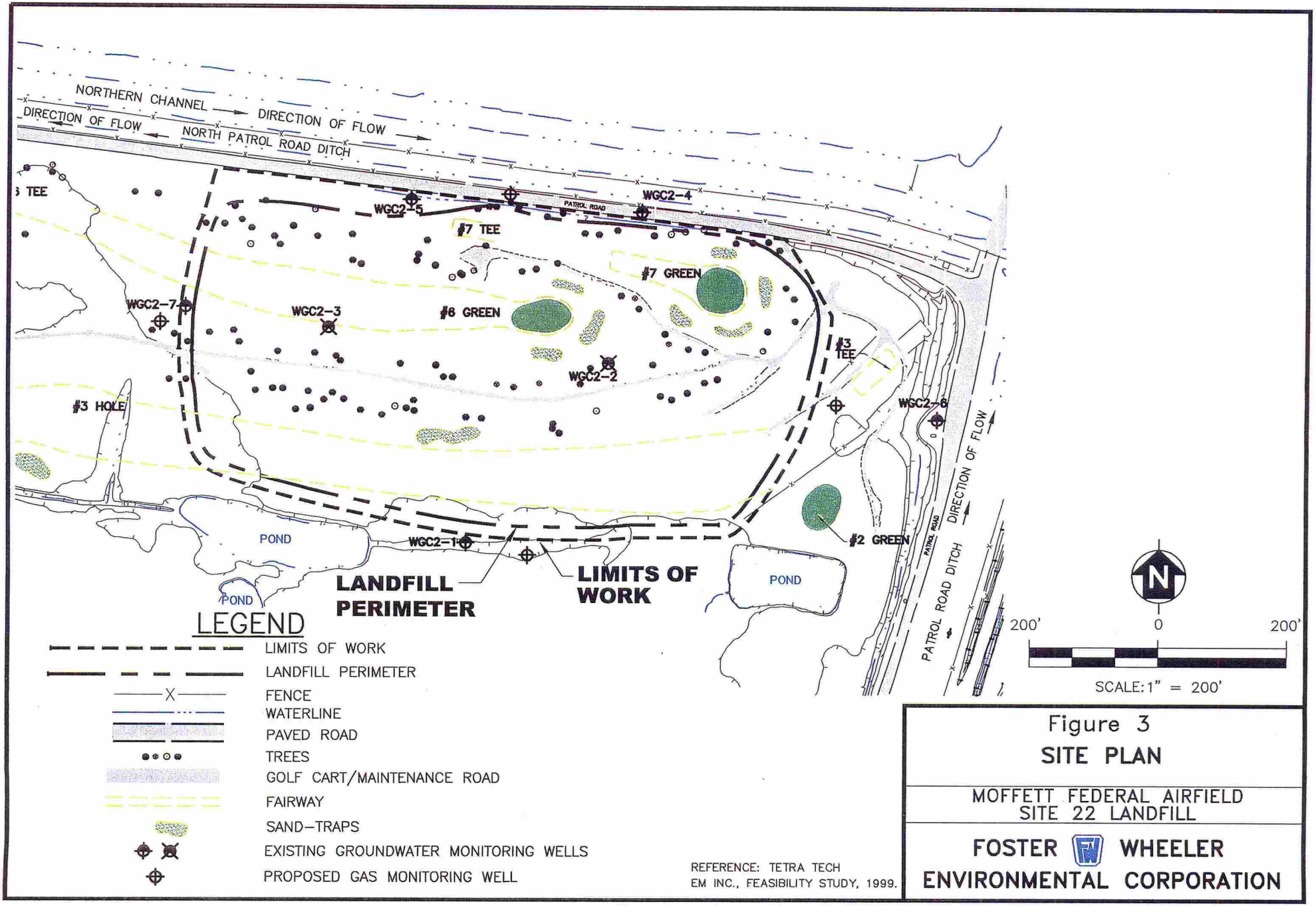

REFERENCE: TETRA TECH EM INC., FEASIBILITY STUDY, 1999.

Figure 3
SITE PLAN

MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL

FOSTER WHEELER ENVIRONMENTAL CORPORATION

SBGC2-5

Constituent	Conc.	Sample Depth (ft)
Semivolatile Organic Compounds (µg/kg)		
Bis(2-Ethylhexyl)phthalate	120 J	1-2
Volatile Organic Compounds (µg/kg)		
2-Butanone	32 J	1-2
	56 J	3-4
	63 J	5-6
Acetone	80 J	1-2
	140 J	3-4
	190 J	5-6

SBGC2-10

Constituent	Conc.	Sample Depth (ft)
Volatile Organic Compounds (µg/kg)		
Benzene	0.4 J	1-1.5
Carbon Disulfide	0.4 J	5-5.5

SBGC2-9

Constituent	Conc.	Sample Depth (ft)
Semivolatile Organic Compounds (µg/kg)		
Fluoranthene	30 J	1.5-2
Pyrene	29 J	1.5-2

SALTWATER EVAPORATION POND

SBGC2-1

Constituent	Conc.	Sample Depth (ft)
Semivolatile Organic Compounds (µg/L)		
Benzo(b)fluoranthene	21 J	1-2
Fluoranthene	10 J	1-2
Pyrene	10 J	1-2
Volatile Organic Compounds (µg/L)		
2-Butanone	33 J	3-4
Acetone	86 J	3-4
Ethylbenzene	17 X	3-4
Xylene (Total)	33	3-4

SBGC2-12

Constituent	Conc.	Sample Depth (ft)
Semivolatile Organic Compounds (µg/kg)		
Pyrene	16 J	0-0.5
Volatile Organic Compounds (µg/kg)		
Carbon Disulfide	1 J	15-15.5

SBGC2-2

Constituent	Conc.	Sample Depth (ft)
Volatile Organic Compounds (µg/kg)		
2-Butanone	240 J	3-4
	120 J	5-6
Acetone	530 J	3-4
	220 J	5-6
Ethylbezene	48	5-6
Methylene Chloride	6 J	1-2
Toluene	7 J	1-2
Xylene (Total)	480	5-6

SBGC2-11

Constituent	Conc.	Sample Depth (ft)
Semivolatile Organic Compounds (µg/kg)		
Pyrene	26 J	0-0.5
Volatile Organic Compounds (µg/kg)		
Carbon Disulfide (dup)	0.4 J	5-5.5

SBGC2-4

Constituent	CONC.	Sample Depth (ft)
Semivolatile Organic Compounds (µg/kg)		
N-Nitrosodiphenylamine	100 J	1-2
Volatile Organic Compounds (µg/kg)		
2-Butanone	54 J	1-2
	590 J	3-4
	150 J	5-6
2-Hexanone	73 J	3-4
Acetone	310 J	1-2
	1200 J	3-4
	230 J	5-6
Ethylbenzene	200	3-4
	190	5-6
Styrene	7 J	5-6
Xylene (Total)	890	3-4
1,1-Dichloroethene	900 E	5-6

SBGC2-3

Constituent	Conc.	Sample Depth (ft)
Semivolatile Organic Compounds (µg/kg)		
Di-N-Butylphthalate (Dup)	98 J	1-2
Volatile Organic Compound (µg/kg)		
2-Butanone	51 J	5-6
Acetone	31 J	3-4
	210 J	5-6
Toluene	7 J	3-4
Trichloroethene (Dup)	14	1-2
Xylene (Total) (Dup)	18	1-2
	6 J	3-4

SBGC2-7

Constituent	Conc.	Sample Depth (ft)
Semivolatile Organic Compounds (µg/kg)		
1,4-Dichlorobenzene	1100	5-5.5
(Dup)	880	5-5.5
	2400	10-10.5
2-Methylnaphthalene	58 J	5-5.5
(Dup)	63 J	5-5.5
	160 J	10-10.5
4-Chloro-3-Methylphenol	410 J	10-10.5
Acenaphthene	160 J	10-10.5
Anthracene	570	10-10.5
Benzo(a)anthracene	780	5-5.5
(Dup)	230 J	5-5.5
	430 J	10-10.5
Benzo(a)pyrene	730	5-5.5
(Dup)	250 J	5-5.5
Benzo(b)fluoranthene	810	5-5.5
	270 J	10-10.5
Benzo(k)fluoranthene	640	5-5.5
	240 J	10-10.5
Carbazole	670	10-10.5
Chrysene	800	5-5.5
(Dup)	330 J	5-5.5
	360 J	10-10.5
Dibenzofuran	120 J	10-10.5
Fluoranthene	1100	5-5.5
(Dup)	290 J	5-5.5
	2300	10-10.5
Fluorene	320 J	10-10.5
Naphthalene	110 J	5-5.5
(Dup)	120 J	5-5.5
	140 J	10-10.5
Phenanthrene	280 J	5-5.5
(Dup)	250 J	5-5.5
	3000	10-10.5
Pyrene	1100 J-K	5-5.5
(Dup)	310 J	5-5.5
	1800	10-10.5
Volatile Organic Compounds (µg/kg)		
Benzene	0.9 J	10-10.5
Chlorobenzene	11 J	10-10.5
Ethylbenzene	4 J	10-10.5
Xylene (Total)		
	7 J	10-10.5
	2 J	10-10.5

SBGC2-8

Constituent	Conc.	Sample Depth (ft)
Semivolatile Organic Compounds (µg/kg)		
1,4-Dichlorobenzene	86 J	5-5.5
2-Methylnaphthalene	55 J	5-5.5
Benzo(a)anthracene	23 J	1-1.5
	180 J	5-5.5
Benzo(a)pyrene	360 J	5-5.5
Benzo(g,h)perylene	460	5-5.5
Bis(2-Ethylhexyl)phthalate	10000 D	5-5.5
Chrysene	30 J	1-1.5
	270 J	5-5.5
Fluoranthene	17 J	1-1.5
	59 J	5-5.5
Naphthalene	360 J	5-5.5
Pentachlorophenol	360 J	5-5.5
Phenanthrene	58 J	5-5.5
Pyrene	21 J	0-0.5
(Dup)	25 J	0-0.5
	24 J	1-1.5
	190 J	5-5.5
Volatile Organic Compounds (µg/kg)		
Acetone	360 B	10-10.5
Benzene	4 J	10-10.5
Carbon Disufide	0.6 J	1-1.5
	0.7 J	5-5.5
Ethylbenzene	16	5-5.5
	23	10-10.5
Toluene	4 J	10-10.5
Xylene (Total)	39 B	5-5.5
	40	10-10.5

SBGC2-6

Constituent	Conc.	Sample Depth (ft)
Volatile Organic Compound (µg/kg)	ND	0.0-0.5,1.0-1.5,10.0-10.5
Semivolatile Organic Compounds (µg/kg)	ND	0.0-0.5,1.0-1.5,10.0-10.5

NORTH PATROL ROAD DITCH

PATROL ROAD

NORTHERN CHANNEL

PATROL ROAD

SITE 22 LANDFILL

POND

POND

SBGC2-1
SBGC2-2
SBGC2-3
SBGC2-4
SBGC2-5
SBGC2-6
SBGC2-7
SBGC2-8
SBGC2-9
SBGC2-10
SBGC2-11
SBGC2-12

PATROL ROAD

PATROL ROAD DITCH

N

50' 0 50' 100'

SCALE: 1" = 100'

LEGEND

- SOIL BORING
- AREA ABOVE 1 FT. MSL CONTOUR (APPROXIMATE BOUNDARY OF LANDFILL)
- µg/kg MICROGRAMS PER KILOGRAM

REFERENCE: TETRA TECH EM INC., FEASIBILITY STUDY, 1999.

Figure 5
SOIL SAMPLES, VOCs, AND SVOCs

MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL

FOSTER WHEELER ENVIRONMENTAL CORPORATION

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SBGC2-8

Constituent	Conc.	Sample Depth (ft)
Pesticides/PCBs (µg/kg)		
Alpha-Chlordane	3.4 P	1-1.5
	14	5-5.5
Aroclor 1242	260	10-10.5
	250 J-S	15-15.5
Aroclor 1254	710	5-5.5
	240	10-10.5
	280 J-S	15-15.5
Aroclor 1260	92	1-1.5
	400	5-5.5
	490 P	10-10.5
	260 J-S	15-15.5
Dieldrin	180 D	1-1.5
	23 P	5-5.5
Endosulfan Sulfate	11 JS	15-15.5
Endrin Aldehyde	4.4	1-1.5
	9.2 P	10-10.5
Gamma-BHC (Lindane)	2.5 P	1-1.5
Gamma-Chlordane	2.4 P	1-1.5
	3.9 P	5-5.5
P,P'-DDD	25 P	1-1.5
	200 D	5-5.5
	17 P	10-10.5
	16 J-S	15-15.5
P,P'-DDE (Dup)	4.3	0-0.5
	4.3	1-1.5
	21 P	5-5.5
	8.7	10-10.5

SBGC2-10

Constituent	Conc.	Sample Depth (ft)
Pesticides/PCBs (µg/kg)		
P,P'-DDT	3.6 J	1-1.5

SBGC2-9

Constituent	Conc.	Sample Depth (ft)
Pesticides/PCBs (µg/kg)		
P,P'-DDD	6.8	1.5-2

SBGC2-3

Constituent	Conc.	Sample Depth (ft)
Pesticides/PCBs (µg/kg)		
Alpha-Chlordane	8.2	1-2
Aroclor 1254 (Dup)	570 P	1-2
	150 P	5-6
Aroclor 1260	110 P	1-2
Delta-BHC	3.5 J	3-4
Dieldrin	3.6 J	1-2
Endosulfan Sulfate (Dup)	0.53 JP	1-2
Endrin Ketone	0.32 JP	1-2
	1.6 J	3-4
	0.67 JP	5-6
Gamma-Chlordane	4.3	1-2
(Dup)	8.8	1-2
	1.6 J	5-6
Heptachlor (Dup)	7.2	1-2
P,P'-DDD	31	1-2
	71 J	3-4
	20	5-6
P,P'-DDE	5.2	1-2
	11 J	3-4
	5.6	5-6
P,P'-DDT (Dup)	2 J	1-2
	0.94 JP	5-6

SBGC2-2

Constituent	Conc.	Sample Depth (ft)
Pesticides/PCBs (µg/kg)		
Alpha-Chlordane	0.57 J	1-2
	5.7 P	3-4
Aroclor 1248	12000 D	5-6
Aroclor 1254	180 P	3-4
Dieldrin	3.2 J	3-4
	20 P	5-6
Endosulfan Sulfate	0.44 JP	1-2
	3 J	5-6
Endrin Aldehyde	2.2 J	3-4
Endrin Ketone	0.16 JP	1-2
	0.21 JP	3-4
	2.3 J	5-6
Gamma-Chlordane	0.55 J	1-2
	4.4	3-4
	56 P	5-6
Heptachlor	2.2	1-2
	2.7 P	3-4
P,P'-DDD	2.3 J	1-2
	40	3-4
P,P'-DDE	0.84 J	1-2
	17	3-4
P,P'-DDT	1.7 JP	1-2
	2.1 JP	3-4

SBGC2-11

Constituent	Conc.	Sample Depth (ft)
Pesticides/PCBs (µg/kg)		
Aroclor 1260	33000 D	0-0.5
	7700 D	1.5-2
	48 J-S	5-5.5
Endosulfan II	1300 DP	0-0.5
	260 P	1.5-2
Endrin Aldehyde	610 P	0-0.5
	140 P	1.5-2

SBGC2-12

Constituent	Conc.	Sample Depth (ft)
Pesticides/PCBs (µg/kg)		
P,P'-DDT	7.1 J	1-1.5

SBGC2-5

Constituent	Conc.	Sample Depth (ft)
Pesticides/PCBs (µg/kg)		
P,P'-DDE	0.82 J	1-2
P,P'-DDT	0.48 JP	1-2

SBGC2-6

Constituent	Conc.	Sample Depth (ft)
Pesticides (µg/kg)	ND	0.0-0.5,1.0-1.5,10.0-10.5
PCBs	ND	0.0-0.5,1.0-1.5,10.0-10.5

SBGC2-7

Constituent	Conc.	Sample Depth (ft)
Pesticides/PCBs (µg/kg)		
Alpha-Chlordane	2.3 J-S	1-1.5
(Dup)	7.2 J	5-5.5
	8 J-S	10-10.5
Aroclor 1242	170 J-S	5-5.5
(Dup)	190 J-S	5-5.5
	350 J-S	10-10.5
Aroclor 1254	170 J-S	5-5.5
(Dup)	180 J-S	5-5.5
	420 J-S	10-10.5
Aroclor 1260	71 J-S	5-5.5
(Dup)	100 J-S	5-5.5
	170 J-S	10-10.5
Gamma-Chlordane	2.2 J-S	0-0.5
	2.7 J-S	5-5.5
(Dup)	5.9 J-S	5-5.5
	3.6 J-S	10-10.5
P,P'-DDD	8.4 J-S	0-0.5
	9 J-S	1-1.5
	12 J-S	5-5.5
(Dup)	14 J-S	5-5.5
	40 J-S	10-10.5
P,P'-DDE	11 J-S	5-5.5
(Dup)	12 J-S	5-5.5
	17 J-S	10-10.5

SBGC2-4

Constituent	Conc.	Sample Depth (ft)
Pesticides/PCBs (µg/kg)		
Alpha-Chlordane	4.1 J	1-2
	20 J	3-4
	18 J	5-6
Aroclor 1232	1300 J	5-6
Aroclor 1254	390 J	1-2
	700 J	3-4
Dieldrin	76 J	1-2
	65 J	3-4
	12 J	5-6
Endosulfan Sulfate	1.6 J	1-2
Endrin Ketone	1.2 J	1-2
	1.4 J	3-4
Gamma-Chlordane	27 J	1-2
	10 J	3-4
	13 J	5-6
Heptachlor	7.6 J	1-2
P,P'-DDD	55 J	1-2
	120 J	3-4
	100 J	5-6
P,P'-DDE	22 J	3-4
	18 J	5-6
P,P'-DDT	5.8 J	3-4
	4.1 J	5-6

NORTHERN CHANNEL

PATROL ROAD

SALTWATER EVAPORATION POND

SITE 22 LANDFILL

POND

POND

PATROL ROAD

PATROL ROAD DITCH

SBGC-5

SBGC2-12

SBGC2-8

SBGC2-4

SBGC2-10

SBGC2-9

SBGC2-3

SBGC2-2

SBGC2-7

SBGC2-1

SBGC2-11

SBGC2-6

N

50' 0 50' 100'

SCALE: 1" = 100'

LEGEND

- SOIL BORING
- AREA ABOVE 1 FT. MSL CONTOUR (APPROXIMATE BOUNDARY OF LANDFILL)
- ft FEET
- µg/kg MICROGRAMS PER KILOGRAM
- PCBs POLYCHLORINATED BIPHENYLS
- DDE DICHLORODIPHENYLDICHLOROETHENE
- DDD DICHLORODIPHENYLDICHLOROETHANE
- DDT DICHLORODIPHENYTRICHLOROETHANE

REFERENCE: TETRA TECH EM INC., FEASIBILITY STUDY, 1999.

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Figure 6
SOIL SAMPLES, PESTICIDES, AND PCBs

MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL

FOSTER WHEELER ENVIRONMENTAL CORPORATION

NORTHERN CHANNEL

PATROL ROAD

SALTWATER EVAPORATION POND

NORTHERN CHANNEL

PATROL ROAD

SITE 22 LANDFILL

POND

POND

PATROL ROAD

PATROL ROAD DITCH

N

50' 0 50' 100'

SCALE: 1" = 100'

HPGC2-5

Constituent	Max	Sample Depth (ft)
Volatile Organic Compounds (µg/L)		
Carbon Disulfide	0.1 J	38

WGC2-5

Constituent	Max	Detects
Semivolatile Organic Compounds (µg/L)		
2,2-Oxybis(1-chloropropane)	2J-K	4 of 5
Bis(2-chloroethoxy)methane	10J-K	1 of 5
Bis(2-chloroethyl)ether	1J	4 of 5
Bis (2-ethylhexyl) phthalate	15	4 of 5
Volatile Organic Compounds (µg/L)		
Benzene	0.08J	1 of 5
Carbon Disulfide	0.06J	1 of 5
Chloroform	22	1 of 5
Toluene	2J	3 of 5
Xylene (Total)	2J	1 of 5

WGC2-4

Constituent	Max	Detects
Volatile Organic Compounds (µg/L)		
1,2-Dichloroethene	0.7J-K	2 of 5
2-Hexanone	0.8J-K	1 of 5
Carbon Disulfide	0.3J	2 of 5
Chloroform	0.5J	1 of 5
Toluene	0.3J	1 of 5
Trichloroethene	0.4J	1 of 5

HPGC2-3

Constituent	Conc.	Sample Depth (ft)
Volatile Organic Compounds (µg/L)		
Carbon Disulfide	0.1 J	45

WGC2-7

Constituent	Max	Detects
Semivolatile Organic Compounds (µg/L)		
Bis (2-ethylhexyl) phthalate	58B	1 of 5
Volatile Organic Compounds (µg/L)		
1,1-Dichloroethene	0.06	1 of 5
1,2-Dichloroethene	2J	3 of 5
Carbon Disulfide	0.07J	1 of 5
Chloroform	1J	1 of 5
Tetrachloroethene	2J	4 of 5
Trichloroethene	3	4 of 5

HPGC2-4

Constituent	Conc.	Sample Depth (ft)
Volatile Organic Compounds (µg/L)		
2-Butanone	110 J	36
Carbon Disulfide (DUP)	0.1 J	36

HPGC2-2

Constituent	Conc.	Sample Depth (ft)
No VOCs Detected > MCLs		45

HPGC2-6

Constituent	Conc.	Sample Depth (ft)
No VOCs Detected > MCLs		38

HPGC2-1

Constituent	Conc.	Sample Depth (ft)
No VOCs Detected > MCLs		38

WGC2-3

Constituent	Max	Detects
Semivolatile Organic Compound (µg/L)		
1,4 Dichlorobenzene	23	5 of 5
2-Methylnaphthalene	6J	5 of 5
Bis (2-ethylhexyl) phthalate	2J	1 of 5
Carbazole	3J	1 of 5
Dibenzofuran	0.7J	1 of 5
Diethylphthalate	3J	2 of 5
Fluorene	0.9J	1 of 5
Naphthalene	35	5 of 5
Volatile Organic Compounds (µg/L)		
1,2-Dichloroethene	0.9J-S	4 of 5
Benzene	6	4 of 5
Carbon Disulfide	0.09J-S	1 of 5
Ethylbenzene	2J	4 of 5
Methylene Chloride	0.2J-S	1 of 5
Chlorobenzene	0.6 J	1 of 5
Toluene	0.5J-S	3 of 5
Vinyl Chloride	0.2J-S	1 of 5
Xylene (Total)	6J-BS	4 of 5

WGC2-2

Constituent	Max	Detects
Semivolatile Organic Compounds (µg/L)		
1,4-Dichlorobenzene	27	5 of 5
2-Methylnaphthalene	2 J	4 of 5
4-Methylphenol	7J	1 of 5
Bis (2-ethylhexyl) phthalate	4B	1 of 5
Carbazole	1J	1 of 5
Diethylphthalate	14	2 of 5
N-Nitrosodiphenylamine (1)	25J-B	4 of 5
Naphthalene	17	5 of 5
Volatile Organic Compounds (µg/L)		
1,2-Dichloroethene	2J	2 of 5
Benzene	11	5 of 5
Carbon Disulfide	0.2	1 of 5
Chlorobenzene	950	5 of 5
Chloroform	5	1 of 5
Ethylbenzene	1J	3 of 5
Toluene	0.6J	1 of 5
Trichloroethene	10J	1 of 5
Xylene (Total)	5J-B	4 of 5

WGC2-6

Constituent	Max	Detects
Semivolatile Organic Compounds (µg/L)		
Pyrene	0.6J	1 of 5
Volatile Organic Compounds (µg/L)		
1,2-Dichloroethene	0.2J	1 of 5
2-Hexanone	2J	1 of 5
Benzene	0.1J	1 of 5
Toluene	0.2J	1 of 5
Trichloroethene	10J	2 of 5

WGC2-1

Constituent	Max	Detects
Volatile Organic Compounds (µg/L)		
1,2-Dichloroethene	0.2J	1 of 2
Benzene	0.2J	1 of 2
Toluene	0.2J	1 of 2

LEGEND

- GROUNDWATER MONITORING WELL
- HYDROPUNCH SAMPLE
- AREA ABOVE 1 FT. MSL CONTOUR (APPROXIMATE BOUNDARY OF LANDFILL)
- ft FEET
- msl MEAN SEA LEVEL
- MCL MAXIMUM CONTAMINANT LEVEL
- µg/L MICROGRAMS PER LITER

REFERENCE: TETRA TECH EM INC., FEASIBILITY STUDY, 1999.

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Figure 7

GROUNDWATER SAMPLES, VOCs, AND SVOCs

MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL

FOSTER WHEELER ENVIRONMENTAL CORPORATION

NORTHERN CHANNEL

PATROL ROAD

NORTH PATROL ROAD DITCH

SALTWATER EVAPORATION POND

N

50' 0 50' 100'

SCALE: 1" = 100'

NORTHERN CHANNEL

PATROL ROAD

SITE 22 LANDFILL

POND

POND

PATROL ROAD

PATROL ROAD DITCH

WGC2-5

WGC2-5

Constituent	Max	Detects
TPHe (µg/L)		
Other Components	59Z	1 of 5
TPHp (µg/L)		
Gasoline	39JZ	1 of 5
Xylene (Total)	0.9	1 of 5
Toluene	1	1 of 5

WGC2-4

Constituent	Max	Detects
TPHe (µg/L)		
Other Components	67Z	1 of 5
TPHp (µg/L)		
Gasoline	35JZ	1 of 5

WGC2-4

WGC2-2

Constituent	Max	Detects
TPHe (µg/L)		
Diesel	220Y	1 of 5
Motor oil	230Y	1 of 5
Other Components	10000Y	4 of 5
TPHp (µg/L)		
Gasoline	270Y	1 of 5
Benzene	13	3 of 5
Other Components	900Y	4 of 5
Xylene (Total)	7	1 of 5
Pesticides/PCBs (µg/L)		
Aldrin	0.11P	2 of 5
Gamma-BHC (Lindane)	0.056P	1 of 5

WGC2-7

WGC2-7

Constituent	Max	Detects
TPHe (µg/L)		
Other Components	36JZ	1 of 5
TPHp (µg/L)		
Gasoline	28JZ	1 of 5

WGC2-3

WGC2-3

Constituent	Max	Detects
TPHe (µg/L)		
Diesel	360Y	1 of 5
Motor oil	300Y	1 of 5
Other Components	10000Y	4 of 5
TPHp (µg/L)		
Gasoline	170Y	1 of 5
Benzene	13	3 of 5
Other Components	480YJ	4 of 5
Xylene (Total)	2	1 of 5
Ethylbenzene	0.7	1 of 5
Pesticides/PCBs (µg/L)		
Aldrin	0.13J-S	1 of 5

WGC2-2

WGC2-6

WGC2-6

Constituent	Max	Detects
TPHe (µg/L)		
Other Components	59Z	1 of 5

WGC2-1

WGC2-1

Constituent	Max	Detects
TPHe (µg/L)		
Other Components	67Z	1 of 2

LEGEND

- GROUNDWATER MONITORING WELL
- AREA ABOVE 1 FT. MSL CONTOUR (APPROXIMATE BOUNDARY OF LANDFILL)
- TPHe TOTAL PETROLEUM HYDROCARBONS-EXTRACTABLE
- TPHp TOTAL PETROLEUM HYDROCARBONS-PURGEABLE
- ft FEET
- msl MEAN SEA LEVEL
- µg/L MICROGRAMS PER LITER

REFERENCE: TETRA TECH EM INC., FEASIBILITY STUDY, 1999.

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Figure 8
GROUNDWATER SAMPLES, TPH, AND PESTICIDES/PCBs
MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL
FOSTER WHEELER ENVIRONMENTAL CORPORATION

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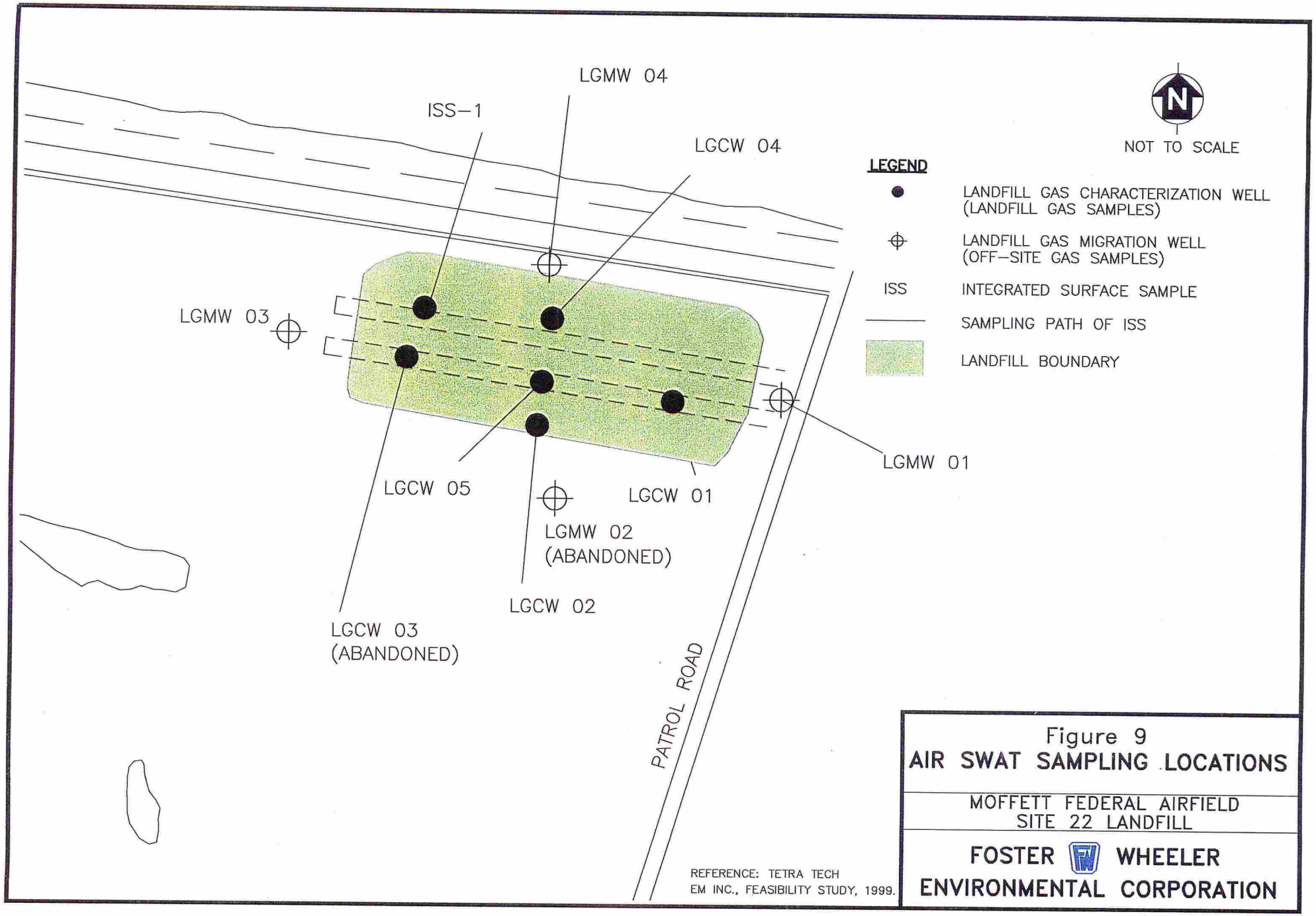
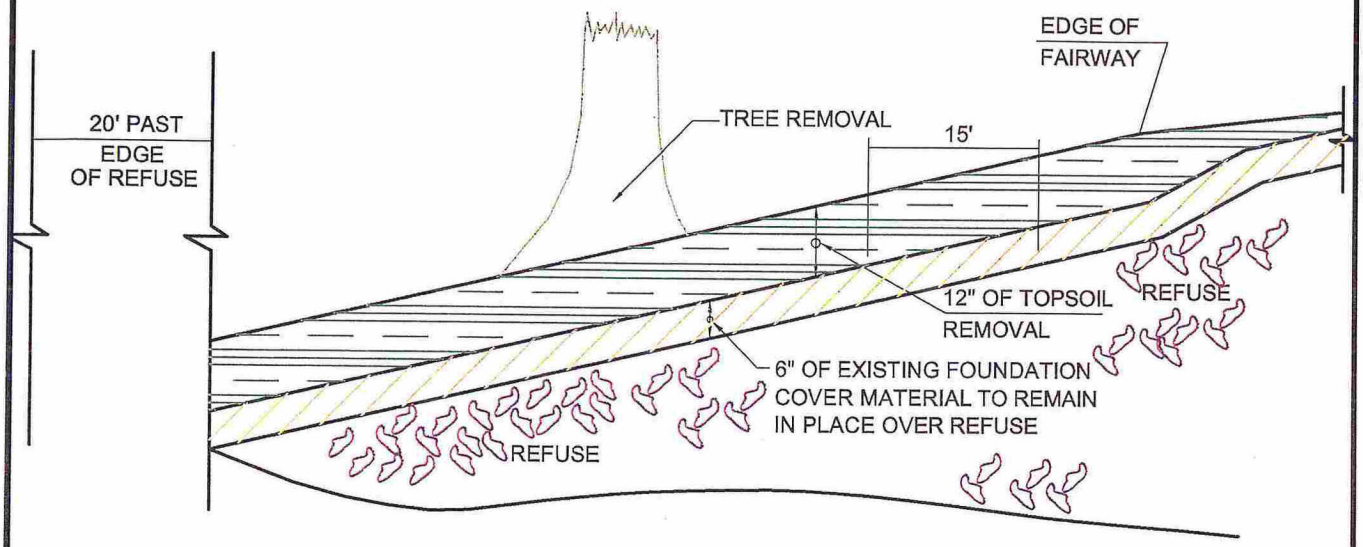


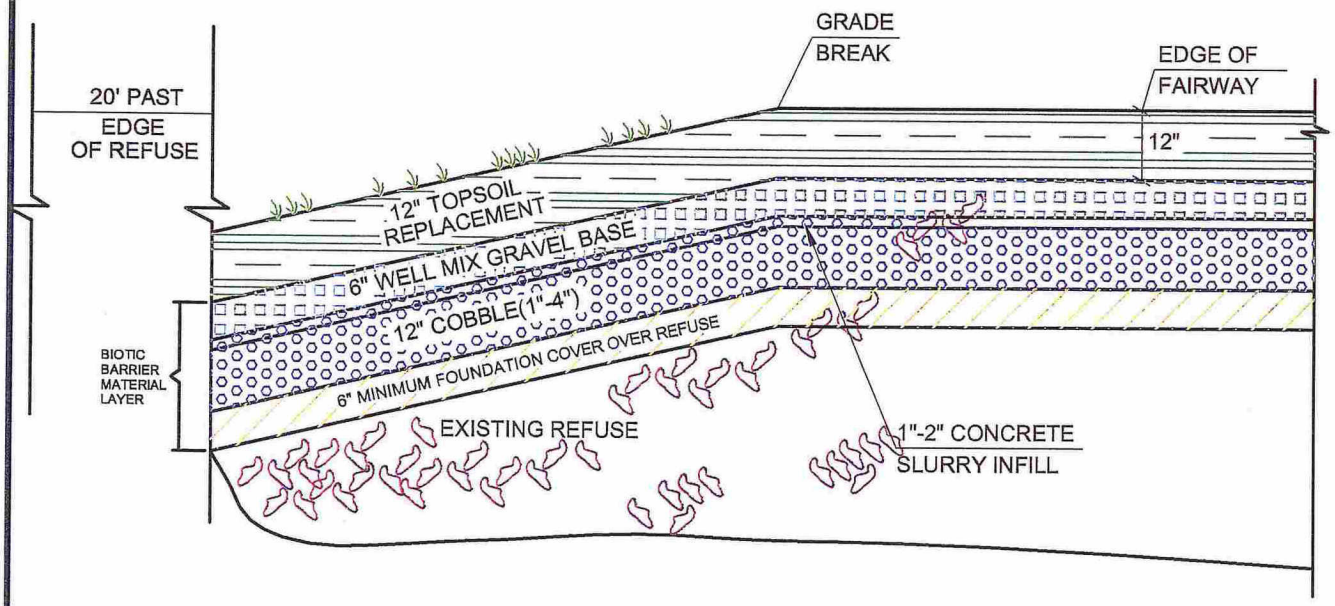
Figure 9
AIR SWAT SAMPLING LOCATIONS

MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL

FOSTER WHEELER ENVIRONMENTAL CORPORATION



TYPICAL SOIL REMOVAL



PROPOSED BIOTIC BARRIER COVER

Figure 10
ALTERNATIVE 2 CONCEPTUAL COVER DETAIL

MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

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REFERENCE: TETRA TECH EM INC., FEASIBILITY STUDY, 1999.

Figure 11
PROPOSED BIOTIC BARRIER LOCATION
MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL

FOSTER WHEELER ENVIRONMENTAL CORPORATION

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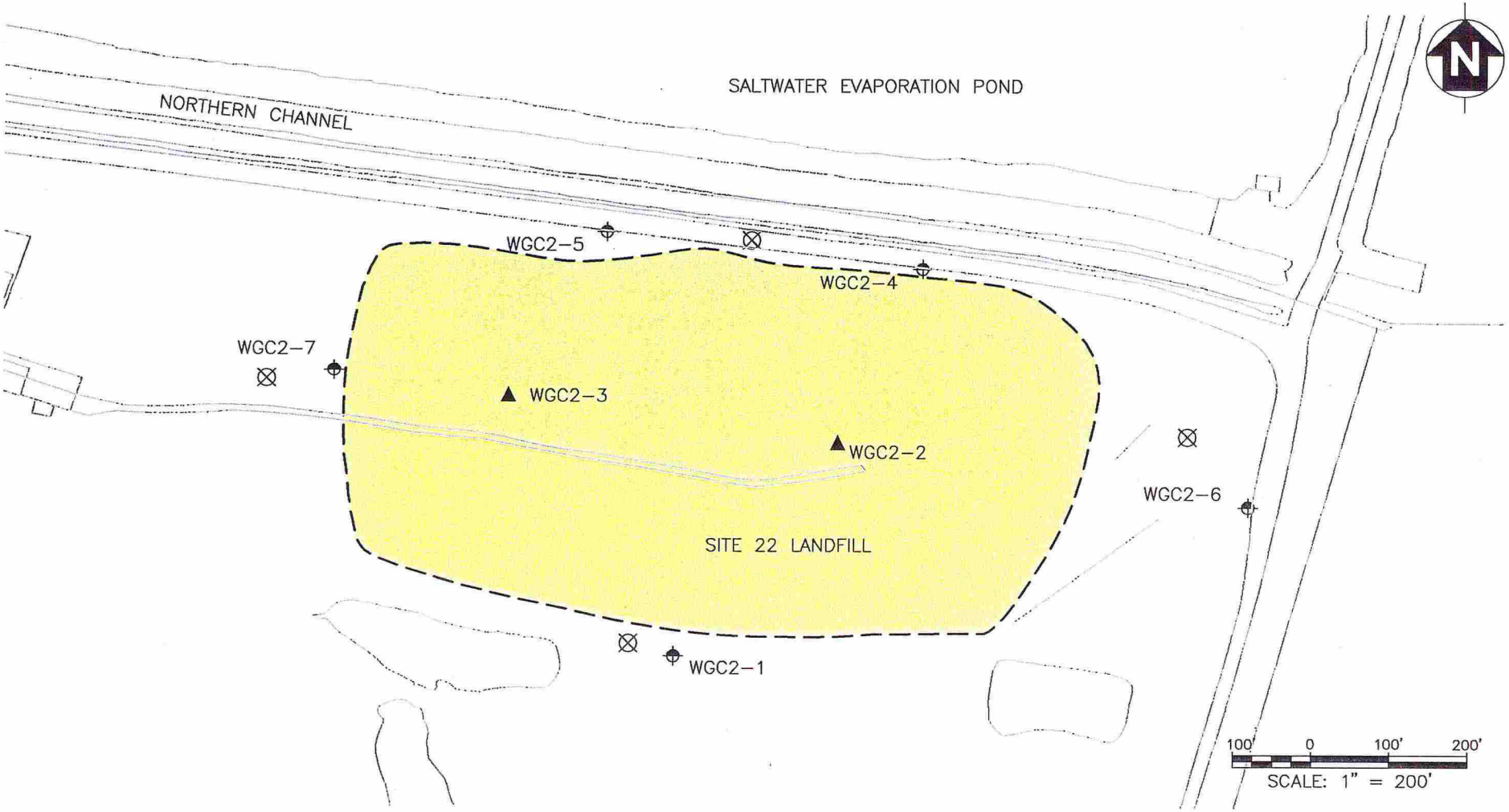

LEGEND

- ⊠ PROPOSED GAS MONITORING UNIT
- ⊕ PROPOSED GROUNDWATER MONITORING WELL (CURRENT MONITORING WELL)
- ▲ CURRENT GROUNDWATER MONITORING WELL (WILL BE DESTROYED)

REFERENCE: TETRA TECH EM INC., FEASIBILITY STUDY, 1999.

Figure 12
PROPOSED MONITORING WELL LOCATIONS
MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL

FOSTER WHEELER ENVIRONMENTAL CORPORATION

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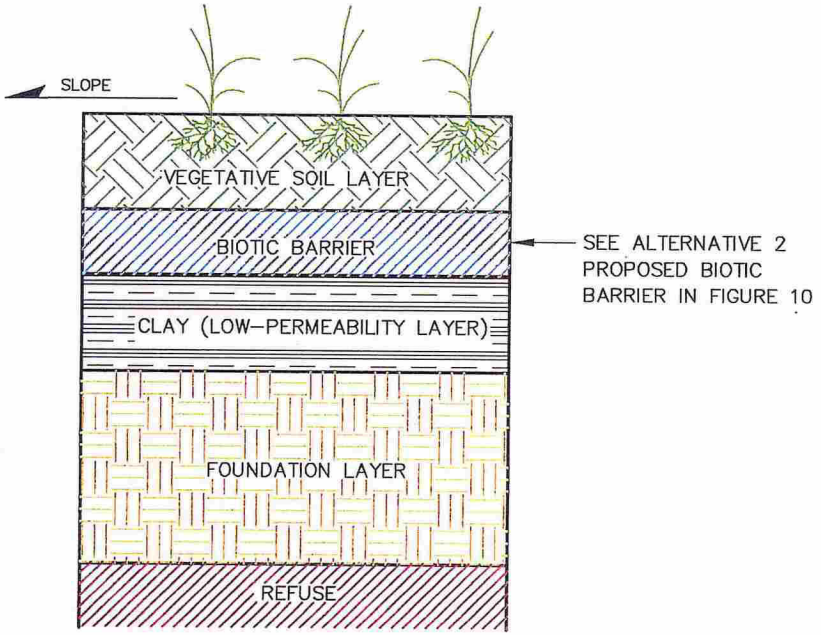
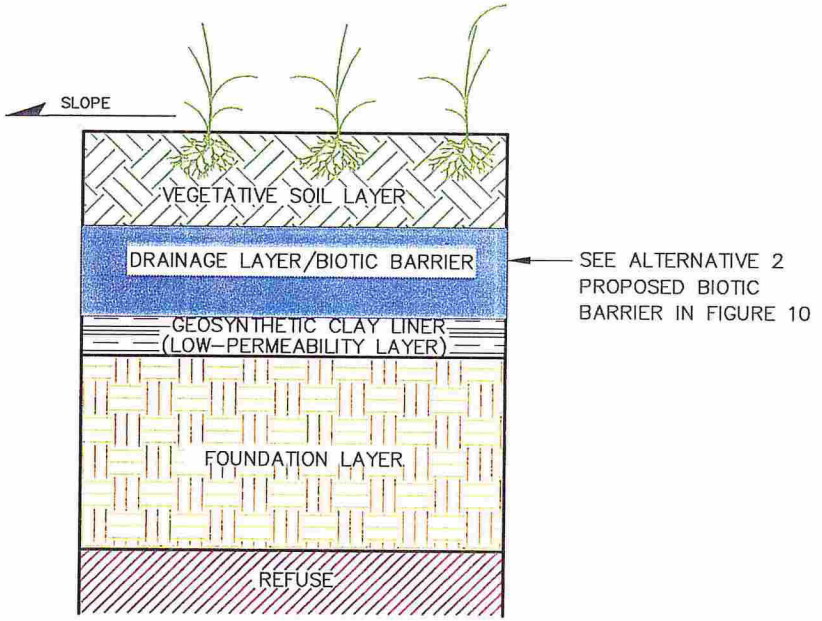


MULTILAYER CAP (CLAY BARRIER) SECTION
(ALTERNATIVE 3A)
NO SCALE



MULTILAYER CAP (GCL BARRIER) SECTION
(ALTERNATIVE 3B)
NO SCALE

REFERENCE: TETRA TECH
EM INC., FEASIBILITY STUDY, 1999.

Figure 13
ALTERNATIVE 3 CONCEPTUAL COVER DETAIL
MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL
FOSTER WHEELER ENVIRONMENTAL CORPORATION

A (WEST)

A' (EAST)

ELEVATION (MSL) (FEET)

10 5 0 −5 −10 −15 −20 −25 −30 −35 −40 −45 −50

CPTGC2-3

WGC2-7 (SBGC2-12)

WGC2-3 (SBGC2-8)

WGC2-2 (SBGC2-7)

WGC2-6 (SBGC2-11)

CPTGC2-10

PATROL ROAD

MSL

FILL

PATROL ROAD DITCH

LANDFILL MATERIAL

CLAY

CLAY/CLAYEY SILT

SILT

SAND

CLAY

TD=22'

TD=29'

TD=19'

TD=25'

TD=45'

HORIZONTAL SCALE

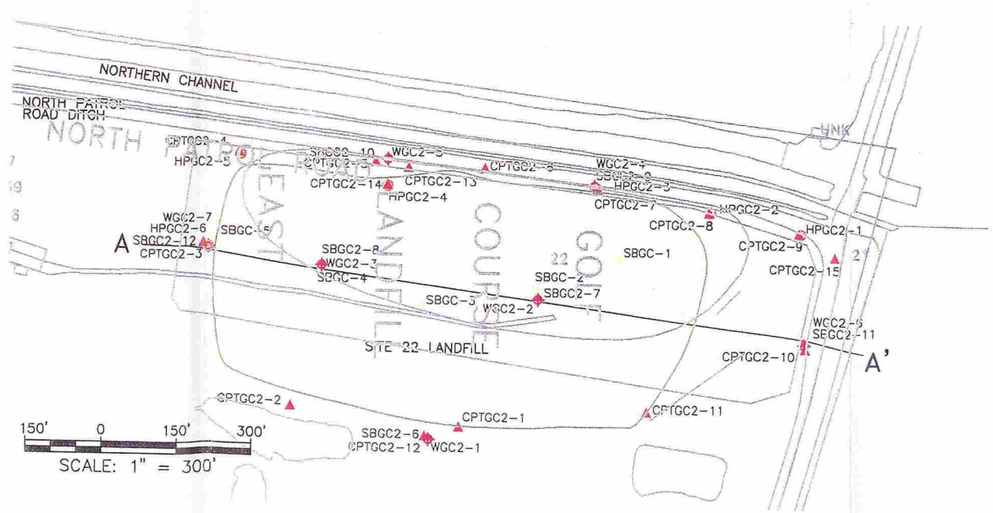
50' 0 50' 100'

SCALE: 1" = 100'

VERTICAL SCALE

5' 0 5' 10'

SCALE: 1" = 10'



PLAN VIEW

LEGEND

- CLAY/CLAYEY SILT
- SILT
- CLAYEY SAND
- SAND
- LANDFILL MATERIAL
- CLEAN FILL/TOPSOIL
- SURFACE WATER

- MONITORING WELL
- SCREEN INTERVAL
- BOREHOLE BACKFILL
- CONE PENETROMETER TEST
- GROUNDWATER
- PERCHED GROUNDWATER
- TD=45' TOTAL DEPTH
- MSL MEAN SEA LEVEL

REFERENCE: TETRA TECH EM INC., FEASIBILITY STUDY, 1999.

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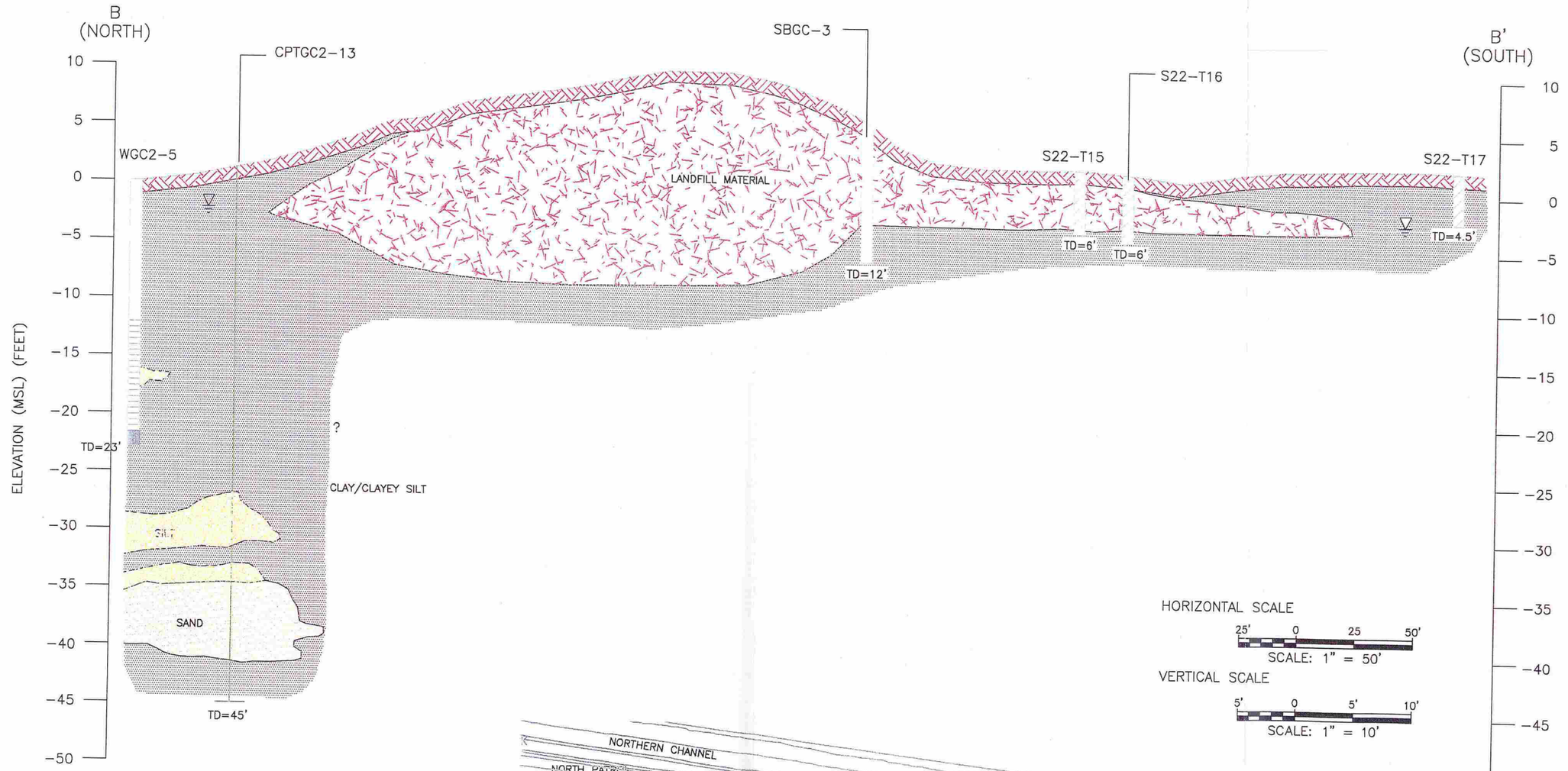
Figure 14

LITHOLOGIC CROSS-SECTION A-A'

MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL

FOSTER WHEELER ENVIRONMENTAL CORPORATION



HORIZONTAL SCALE

25' 0 25 50'

SCALE: 1" = 50'

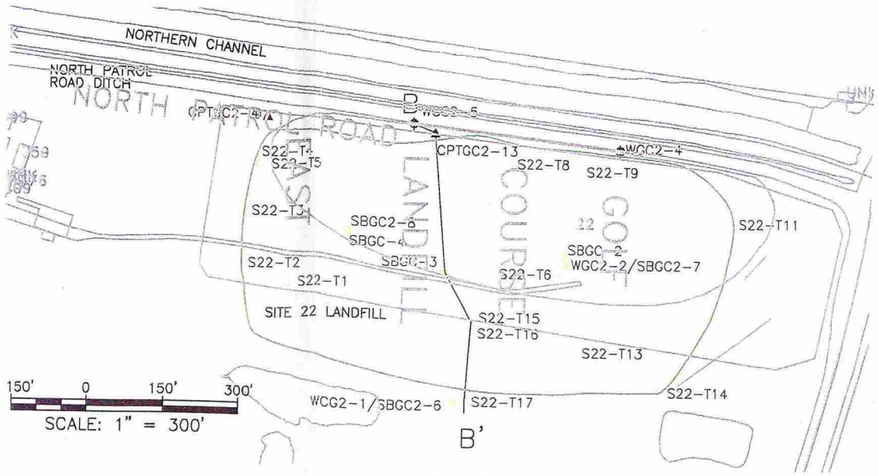
VERTICAL SCALE

5' 0 5' 10'

SCALE: 1" = 10'

LEGEND

- CLAY/CLAYEY SILT
- SILT
- SAND
- LANDFILL MATERIAL
- TOPSOIL
- GROUNDWATER
- TD=45' TOTAL DEPTH
- MSL MEAN SEA LEVEL
- MONITORING WELL
- SCREEN INTERVAL
- BOREHOLE BACKFILL
- CONE PENETROMETER TEST
- EXPLORATORY TRENCH
- SOIL BORING



PLAN VIEW

REFERENCE: TETRA TECH EM INC., FEASIBILITY STUDY, 1999.

Figure 15

LITHOLOGIC CROSS-SECTION B-B'

MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL

FOSTER WHEELER ENVIRONMENTAL CORPORATION

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PLAN VIEW

LEGEND

- CLAY/CLAYEY SILT
- SAND
- LANDFILL MATERIAL
- TOPSOIL
- GROUNDWATER
- PERCHED GROUNDWATER
- TD=45' TOTAL DEPTH
- MSL MEAN SEA LEVEL

EXPLORATORY TRENCH

SOIL BORING

HORIZONTAL SCALE

25' 0 25 50'

SCALE: 1" = 50'

VERTICAL SCALE

5' 0 5' 10'

SCALE: 1" = 10'

REFERENCE: TETRA TECH EM INC., FEASIBILITY STUDY, 1999.

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Figure 16
LITHOLOGIC CROSS-SECTION C-C'

MOFFETT FEDERAL AIRFIELD
SITE 22 LANDFILL

FOSTER WHEELER ENVIRONMENTAL CORPORATION

APPENDIX A

APPENDIX A

INDEX OF ADMINISTRATIVE RECORD FOR SITE 22 LANDFILL, MOFFETT FEDERAL AIRFIELD

MOFFETT FIELD

DRAFT ADMINISTRATIVE RECORD FILE INDEX - UPDATE (SORTED BY RECORD DATE / RECORD NUMBER)

INDEX OF RECORDS FOR IRP SITE 022

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 000417 NONE RPT N62474-88-D-5086 0075	04-19-2002 **08-12-1994** 00235	PRC ENVIRON. MANAGEMENT, INC. R. FOX NAVFAC - WESTERN DIVISION S. CHAO	DRAFT - AIR QUALITY SOLID WASTE ASSESSMENT TEST (SWAT) - GOLF COURSE LANDFILL 2, TECHNICAL MEMORANDUM - INLCUDES LETTER AND NEW DOCUMENT COVER SHEET WHICH REVISES THIS DRAFT TO A FINAL, DATED 28 SEP 1994	ADMIN RECORD	SWAT	022	SOUTHWEST DIVISION

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 002842 RPT N62474-88-D-5086 0500 0500	11-22-1999 **05-21-1996** 00236 00.0	PRC YOUNG, MICHAEL N N NAVY CHAO, STEPHEN G.	FINAL STATIONWIDE REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 1 OF 11: SECTIONS 1 THROUGH 4 - TEXT, TABLES, FIGURES, AND PLATES	ADMIN RECORD	RI	001 002 003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 023 024	IRON MOUNTAIN 37041313

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 002843 RPT N62474-88-D-5086 0500 0500	11-22-1999 **05-21-1996** 00236 00.0	PRC YOUNG, MICHAEL N N NAVY CHAO, STEPHEN G.	FINAL STATIONWIDE REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 2 OF 11: SECTIONS 5 AND 6 - TEXT, TABLES, FIGURES, AND PLATES	ADMIN RECORD	RI	001 002 003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 023 024	IRON MOUNTAIN 37041313

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 002844	11-22-1999 **05-21-1996**	PRC YOUNG, MICHAEL N	FINAL STATIONWIDE REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 3 OF 11: APPENDIX A	ADMIN RECORD	RI	001 002	IRON MOUNTAIN 37041313
RPT N62474-88-D-5086 0500 0500	00236 00.0	N NAVY CHAO, STEPHEN G.				003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 023 024	

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 002845 RPT N62474-88-D-5086 0500 0500	11-22-1999 **05-21-1996** 00236 00.0	PRC YOUNG, MICHAEL N N NAVY CHAO, STEPHEN G.	FINAL STATIONWIDE REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 4 OF 11: APPENDIX A (CONTINUED) AND B	ADMIN RECORD	RI	001 002 003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 023 024	IRON MOUNTAIN 37041314

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 002846	11-22-1999 **05-21-1996**	PRC YOUNG, MICHAEL N	FINAL STATIONWIDE REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 5 OF 11: APPENDIX C - SECTIONS C1 THROUGH C3	ADMIN RECORD	RI	001 002	IRON MOUNTAIN 37041314
RPT N62474-88-D-5086 0500 0500	00236 00.0	N NAVY CHAO, STEPHEN G.				003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 023 024	

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 002847	11-22-1999	PRC	FINAL STATIONWIDE REMEDIAL	ADMIN RECORD	RI	001	IRON MOUNTAIN
	05-21-1996	YOUNG, MICHAEL	INVESTIGATION (RI) REPORT, VOLUME 6 OF			002	37041314
		N	11: APPENDIX C - SECTIONS C4 THROUGH				
RPT	00236	N	C6			003	
N62474-88-D-5086	00.0	NAVY				004	
0500		CHAO, STEPHEN					
0500		G.				005	
						006	
						007	
						008	
						009	
						010	
						011	
						012	
						013	
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						023	
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N00296 / 002848 RPT N62474-88-D-5086 0500 0500	11-22-1999 **05-21-1996** 00236 00.0	PRC YOUNG, MICHAEL N N NAVY CHAO, STEPHEN G.	FINAL STATIONWIDE REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 7 OF 11: APPENDIX C - SECTION C6 (CONTINUED)	ADMIN RECORD	RI	001 002 003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 023 024	IRON MOUNTAIN 37041314

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 002849 RPT N62474-88-D-5086 0500 0500	11-22-1999 **05-21-1996** 00236 00.0	PRC YOUNG, MICHAEL N N NAVY CHAO, STEPHEN G.	FINAL STATIONWIDE REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 8 OF 11: APPENDIX C - SECTIONS C6 (CONTINUED) THROUGH C7	ADMIN RECORD	RI	001 002 003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 023 024	IRON MOUNTAIN 37041314

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 002850 RPT N62474-88-D-5086 0500 0500	11-22-1999 **05-21-1996** 00236 00.0	PRC YOUNG, MICHAEL N N NAVY CHAO, STEPHEN G.	FINAL STATIONWIDE REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 9 OF 11: APPENDIX C - SECTION C8	ADMIN RECORD	RI	001 002 003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 023 024	IRON MOUNTAIN 37041314

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 002851	11-22-1999 **05-21-1996**	PRC YOUNG, MICHAEL N	FINAL STATIONWIDE REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 10 OF 11: APPENDIX D	ADMIN RECORD	RI	001 002	IRON MOUNTAIN 37041315
RPT N62474-88-D-5086 0500 0500	00236 00.0	N NAVY CHAO, STEPHEN G.				003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 023 024	

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 002852 **05-21-1996** RPT N62474-88-D-5086 0500 0500	11-22-1999 00236 00.0	PRC YOUNG, MICHAEL N N NAVY CHAO, STEPHEN G.	FINAL STATIONWIDE REMEDIAL INVESTIGATION (RI) REPORT, VOLUME 11 OF 11: APPENDIX E, F, G, H, I, AND J	ADMIN RECORD	RI	001 002 003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020 021 022 023 024	IRON MOUNTAIN 37041315
N00296 / 003164 **02-23-1998** CMNT NONE 0008	11-22-1999 00000 00.0	USEPA GILL, MICHAEL D. NAVY CHAO, STEPHEN G.	COMMENTS ON THE DRAFT SITE 22 FEASIBILITY STUDY (FS) REPORT - 09 JANUARY 1998	ADMIN RECORD	FS	022	IRON MOUNTAIN 37041322

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 003231 CMNT NONE 0004	11-22-1999 **03-06-1998** 00000 00.0	RWQCB CHOU, C. JOSEPH NAVY CHAO, STEPHEN G.	COMMENTS ON THE SITE 22 DRAFT FEASIBILITY STUDY (FS) REPORT	ADMIN RECORD	FS	022	IRON MOUNTAIN 37041323
N00296 / 003150 RESP N62474-94-D-7609 0017	11-22-1999 **07-10-1998** 00153 00.0	NAVY	RESPONSE TO COMMENTS ON THE SITE 22 DRAFT FEASIBILITY STUDY (FS)	ADMIN RECORD	FS	022	IRON MOUNTAIN 37041321
N00296 / 003153 CMNT NONE 0002	11-22-1999 **08-25-1998** 00000 00.0	MOUNTAIN VIEW WOODHOUSE, KEVIN NAVY CHAO, STEPHEN G.	COMMENTS ON THE DRAFT FINAL SITE 22 FEASIBILITY STUDY (FS) REPORT	ADMIN RECORD	FS	022	IRON MOUNTAIN 37041321
N00296 / 003233 CMNT NONE 0005	11-22-1999 **11-13-1998** 00000 00.0	USEPA SUER, LYNN NAVY CHAO, STEPHEN G.	COMMENTS ON THE DRAFT FINAL SITE 22 FEASIBILITY STUDY (FS) REPORT - 10 JULY 1998	ADMIN RECORD	FS	022	IRON MOUNTAIN 37041323
N00296 / 003211 RESP N62474-94-D-7609 0029	11-22-1999 **01-08-1999** 00153 00.0	TETRA TECH MOWER, TIMOTHY E NAVY CHAO, STEPHEN G.	RESPONSE TO COMMENTS TO THE DRAFT FINAL SITE 22 FEASIBILITY STUDY (FS)	ADMIN RECORD	FS	022	IRON MOUNTAIN 37041323

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 003225 RPT N62474-94-D-7609 0200	11-22-1999 **03-17-1999** 00153 00.0	TETRA TECH MOWER, TIMOTHY E NAVY CHAN, HUBERT	FINAL FEASIBILITY STUDY (FS) REPORT FOR SITE 22	ADMIN RECORD	FS	022	IRON MOUNTAIN 37041323
N00296 / 003239 RPT N62474-94-D-7609 0250	11-22-1999 **05-28-1999** 00153 00.0	TETRA TECH MOWER, TIMOTHY E NAVY CHAO, STEPHEN G. L. SUER	SITE 22 REVISED FINAL FEASIBILITY STUDY (FS) REPORT	ADMIN RECORD	FS	022	IRON MOUNTAIN 37041324
N00296 / 000227 NONE LTR LTR NONE 0002	08-04-2001 **10-27-2000** NONE NONE	VARIOUS AGENCIES NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	EPA AND CRWQCB REVIEW AND CONCURRENCE OF THE FINAL FEASIBILITY STUDY {SEE AR #3225 - FINAL FEASIBILITY STUDY}	ADMIN RECORD INFO REPOSITORY	FS	022	IRON MOUNTAIN 80462406
N00296 / 000120 NONE XMTL XMTL NONE 0015	02-19-2001 **01-23-2001** NONE NONE	USEPA R. BLANK NAVFAC - NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	EPA COMMENTS ON DRAFT PROPOSED PLAN FOR LANDFILL CLOSURE, GOLF COURSE HOLES 6 AND 7, FEDERAL AIRFIELD (SEE AR #88 - PROPOSED PLAN AND AR #119 - RESPONSE TO COMMENTS)	ADMIN RECORD INFO REPOSITORY REPOSITORY	COMMENTS FS IR LF PCB ROD SVOC TPH VOC	022	IRON MOUNTAIN 80462404

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 000124 NONE XMTL XMTL NONE 0003	02-19-2001 **01-26-2001** NONE NONE	RWQCB, SF BAY REGION L. SUER L. SUER NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	RWQCB COMMENTS ON DRAFT PROPOSED PLAN FOR LANDFILL CLOSURE, GOLF COURSE HOLES 6 AND 7, FEDERAL AIRFIELD (SEE AR #88 - PROPOSED PLAN AND AR #119 - RESPONSE TO COMMENTS)	ADMIN RECORD INFO REPOSITORY REPOSITORY	ARAR COMMENTS FS LF	022	IRON MOUNTAIN 80462404
N00296 / 000125 NONE MISC MISC NONE 0001	02-19-2001 **02-05-2001** NONE NONE	USEPA, REGION 9 R. BLANK NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	ADDITIONAL COMMENTS FROM DAVID COOPER OF USEPA ON DRAFT PROPOSED PLAN FOR LANDFILL CLOSURE, GOLF COURSE HOLES 6 AND 7, FEDERAL AIRFIELD, FORWARDED BY ROBERTA BLANK (SEE AR #88 - PROPOSED PLAN AND AR #119 - RESPONSE TO COMMENTS)	ADMIN RECORD INFO REPOSITORY	COMMENTS LF	022	IRON MOUNTAIN 80462404
N00296 / 000119 FWSD-RACII-01-006 8DO 088 8DO 088 MISC N44255-95-D-6030 0012	02-12-2001 **02-09-2001** P. EVERDS P. EVERDS	FOSTER WHEELER NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	RESPONSE TO RWQCB, EPA AND NASA COMMENTS ON THE DRAFT PROPOSED PLAN FOR LANDFILL CLOSURE, GOLF COURSE HOLES 6 AND 7 {SEE AR #88 - PROPOSED PLAN AND AR #120, #124, #125 - COMMENTS FROM EPA, RWQCB & D. COOPER}	ADMIN RECORD INFO REPOSITORY REPOSITORY	COMMENTS LANDFILL PROPOSED PLAN	022	IRON MOUNTAIN 80462404
N00296 / 000127 SWDIV SER 06CH.AM/0180 06CH.AM/0180 LTR LTR NONE 0003	02-19-2001 **02-13-2001** NONE NONE	NAVFAC - SOUTHWEST DIVISION DIVISION A. MUCKERMAN VARIOUS AGENCIES	RESPONSE TO COMMENTS ON DRAFT PROPOSED PLAN FOR LANDFILL CLOSURE, AIRFIELD (SEE AR #119 - ENCLOSURE #1) GOLF COURSE HOLES 6 AND 7, FEDERAL	ADMIN RECORD INFO REPOSITORY REPOSITORY	COMMENTS FFA IR RESPONSE	022	IRON MOUNTAIN 80462404

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 000411 NONE LTR NONE 0001	04-17-2002 **03-05-2001** NONE	U.S. EPA A. LEE NAVFAC - SOUTHWEST DIVISION L. LANSDALE	ADDITIONAL COMMENTS ON THE DRAFT FINAL RECORD OF DECISION (ROD) REGARDING ADDITIONAL INSTITUTIONAL CONTROLS (IC) LANGUAGE	ADMIN RECORD	COMMENTS	022	SOUTHWEST DIVISION
N00296 / 000177 01-0124 & SWDIV SER 06CH.AM/0316 PLAN N44255-95-D-6030 0020	03-27-2001 **03-23-2001** DO088	FOSTER WHEELER VARIOUS AGENCIES	PROPOSED PLAN FOR GOLF COURSE LANDFILL - INCLUDES SWDIV TRANSMITTAL LETTER BY A. MUCKERMAN	ADMIN RECORD INFO REPOSITORY	LANDFILL PROPOSED PLAN	022	IRON MOUNTAIN 80462404
N00296 / 000194 NONE LTR LTR NONE 0001	05-02-2001 **03-26-2001** NONE	U.S. EPA, SAN FRANCISCO, CA R. BLANK R. BLANK NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	EPA'S REVIEW AND CONCURRENCE OF THE DRAFT FINAL PROPOSED PLAN FOR THE GOLF COURSE LANDFILL {SEE AR #163 - DRAFT FINAL PROPOSED PLAN}			022	IRON MOUNTAIN 80462404
N00296 / 000189 NONE PLAN PLAN	04-09-2001 **04-01-2001** NONE NONE	NAVFAC - SOUTHWEST DIVISION DIVISION	PROPOSED PLAN - U.S. NAVY ANNOUNCES PREFERRED CLEANUP REMEDY FOR THE LANDFILL KNOWN AS SITE 22	ADMIN RECORD INFO REPOSITORY REPOSITORY	FS GW LANDFILL	022	IRON MOUNTAIN 80462404
NONE 0016		NAVFAC - SOUTHWEST DIVISION			PCB PROPOSED PLAN RI SVOC TPH VOC		

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N00296 / 000228 NONE LTR LTR NONE 0001	08-04-2001 **04-24-2001** NONE NONE	CRWQCB, OAKLAND, CA D. MISHEK D. MISHEK NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	CRWQCB REVIEW AND CONCURRENCE OF THE DRAFT FINAL PROPOSED PLAN FOR THE GOLF COURSE LANDFILL {SEE AR #163 - DRAFT FINAL PROPOSED PLAN}	ADMIN RECORD INFO REPOSITORY	LANDFILL PROPOSED PLAN	022	IRON MOUNTAIN 80462406
N00296 / 000246 FWSD-RACII-01-023 9DO 090 MM N44255-95-D-6030 0048	08-04-2001 **04-26-2001**	FOSTER WHEELER NAVFAC - SOUTHWEST DIVISION	MEETING TRANSCRIPT FROM THE SITE 22 GOLF COURSE LANDFILL PROPOSED PLAN PUBLIC MEETING HELD ON 26 APRIL 2001	ADMIN RECORD INFO REPOSITORY	LANDFILL PROPOSED PLAN	022	IRON MOUNTAIN 80462406
N00296 / 000234 NONE LTR LTR NONE 0001	08-04-2001 **05-17-2001** NONE NONE	U.S. EPA, SAN FRANCISCO, CA J. HAMILL J. HAMILL NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	EPA REVIEW AND CONCURRENCE OF THE TECHNICAL MEMORANDUM/COST JUSTIFICATION FOR SITE 22 {SEE AR #188 - TECH MEMO/COST JUSTIFICATION}	ADMIN RECORD INFO REPOSITORY	TECH MEMO	022	IRON MOUNTAIN 80462406
N00296 / 000267 FWSD-RACII-01-020 4-01 & SWDIV SER 4-01 & SWDIV SER 06CH.AM/0527 MISC N44255-95-D-6030 0100	08-04-2001 **05-21-2001** DO 088 DO 088	FOSTER WHEELER NAVFAC - SOUTHWEST DIVISION	DRAFT RECORD OF DECISION (ROD) FOR THE SITE 22 LANDFILL, REVISION 1 - INCLUDES SWDIV TRANSMITTAL LETTERS BY A. MUCKERMAN (SEE ADDITIONAL INFORMATION IN COMMENTS SECTION BELOW). ***COMMENTS: [INCLUDES REPLACEMENT PAGES FOR SECTIONS 9, 10, 12, 13, TABLE 19, FIGURES 10 & 11, & SWDIV TRANSMITTAL LETTER BY A. MUCKERMAN (SER 06CH.AM/0658), WHICH HAVE BEEN INSERTED INTO THE DOCUMENT]***	ADMIN RECORD INFO REPOSITORY	LANDFILL ROD	022	IRON MOUNTAIN 80462407

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 000224 NONE LTR LTR NONE 0001	08-04-2001 **05-29-2001** NONE NONE	DEPT. OF FISH & GAME K. MAYER K. MAYER NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	DEPARTMENT OF FISH AND GAME REVIEW AND CONCURRENCE OF THE DRAFT FINAL PROPOSED PLAN FOR THE GOLF COURSE LANDFILL {SEE AR #163 - DRAFT FINAL PROPOSED PLAN}	ADMIN RECORD INFO REPOSITORY	LANDFILL PROPOSED PLAN	022	IRON MOUNTAIN 80462406
N00296 / 000245 FWSD-RACII-01-022 8 & SWDIV SER 8 & SWDIV SER 06CH.AM/0567 MISC N44255-95-D-6030 0018	08-04-2001 **05-30-2001** DO 088 DO 088	FOSTER WHEELER P. EVERDS P. EVERDS NAVFAC - SOUTHWEST DIVISION	FINAL TECHNICAL MEMORANDUM/COST JUSTIFICATION FOR REMEDIAL ALTERNATIVES AT THE GOLF COURSE, REVISION 0 - INCLUDES SWDIV TRANSMITTAL LETTER BY A. MUCKERMAN	ADMIN RECORD INFO REPOSITORY REPOSITORY	LANDFILL REMEDIAL TECH MEMO	022	IRON MOUNTAIN 80462406
N00296 / 000254 NONE LTR LTR NONE 0001	08-04-2001 **06-18-2001** NONE NONE	U.S. EPA, SAN FRANCISCO, CA C. WHITE C. WHITE NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	EPA CONCURRENCE ON THE DRAFT RESPONSIVENESS SUMMARY FOR THE SITE 22 LANDFILL PROPOSED PLAN {SEE AR #250 - SUMMARY}	ADMIN RECORD INFO REPOSITORY	LF PROPOSED PLAN	022	IRON MOUNTAIN 80462406
N00296 / 000425 NONE MISC NONE 0001	04-30-2002 **06-18-2001** NONE	SWRCB L. SUER NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	WATER BOARD CONCURRENCE ON THE DRAFT RESPONSIVENESS SUMMARY FOR THE SITE 22 LANDFILL PROPOSED PLAN, DATED 8 JUNE, 2001 {SEE AR #250 - SUMMARY}	ADMIN RECORD	LF PROPOSED PLAN	022	SOUTHWEST DIVISION

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 000256 FWSD-RACII-01-025 1 & SWDIV SER 1 & SWDIV SER 06CH.AM/0660 PLAN N44255-95-D-6030 0045	08-04-2001 **06-20-2001** DO 088	FOSTER WHEELER NAVFAC - SOUTHWEST DIVISION	FINAL RESPONSIVENESS SUMMARY FOR THE SITE 22 LANDFILL PROPOSED PLAN - INCLUDES SWDIV TRANSMITTAL LETTER BY A. MUCKERMAN	ADMIN RECORD CONFIDENTIAL INFO REPOSITORY	LANDFILL PROPOSED PLAN	022	IRON MOUNTAIN 80462406
N00296 / 000407 NONE LTR NONE 0006	04-17-2002 **07-12-2001** NONE	CRWQCB, OAKLAND, CA A. CONSTANTINESC U NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	COMMENTS ON DRAFT RECORD OF DECISION (ROD)	ADMIN RECORD	COMMENTS	022	SOUTHWEST DIVISION
N00296 / 000404 NONE LTR NONE 0010	04-17-2002 **07-13-2001** NONE	U.S. EPA, SAN FRANCISCO, CA C. WHITE NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	COMMENTS ON DRAFT RECORD OF DECISION (ROD)	ADMIN RECORD	COMMENTS	022	SOUTHWEST DIVISION
N00296 / 000295 FWSD-RACII-01-030 2 & SWDIV SER 2 & SWDIV SER 06CH.AM/0826 MISC N44255-95-D-6030 0026	08-14-2001 **08-08-2001** DO 088 DO 088	FOSTER WHEELER NAVFAC - SOUTHWEST DIVISION	NAVY'S RESPONSE TO EPA COMMENTS ON THE DRAFT RECORD OF DECISION (ROD) FOR THE SITE 22 LANDFILL - INCLUDES SWDIV TRANSMITTAL LETTER BY A. MUCKERMAN {SEE AR #267 - DRAFT ROD; AR #339 - COMMENTS ON RESPONSE TO COMMENTS)	ADMIN RECORD INFO REPOSITORY REPOSITORY	COMMENTS LANDFILL ROD	022	IRON MOUNTAIN 136772570

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 000339 NONE LTR LTR NONE 0001	10-19-2001 **08-27-2001** NONE NONE	CRWQCB, SF REGION A. A. CONSTANTINESC U NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	CRWQCB COMMENTS ON SITE 22 DRAFT RECORD OF DECISION (ROD) RESPONSE TO COMMENTS (SEE AR #295 - RESPONSE TO COMMENTS; AR #306 - SITE 22 LANDFILL SCHEDULE)	ADMIN RECORD INFO REPOSITORY REPOSITORY	COMMENTS LF RESPONSE ROD	022	IRON MOUNTAIN 136772571
N00296 / 000340 NONE LTR LTR NONE 0002	10-19-2001 **08-27-2001** NONE NONE	USEPA, SF REGION C. WHITE C. WHITE NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	RESPONSE TO A. MUCKERMAN'S E-MAIL OF 24 AUGUST 2001 REQUESTING A FORMAL RESPONSE TO THE NAVY'S RESPONSE TO COMMENTS ON THE SITE 22 LANDFILL DRAFT RECORD OF DECISION (ROD)	ADMIN RECORD INFO REPOSITORY	LF ROD	022	IRON MOUNTAIN 136772571
N00296 / 000409 NONE LTR LTR NONE 0008	04-17-2002 **10-19-2001** NONE	CRWQCB, OAKLAND, CA A. A. CONSTANTINESC U NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN	COMMENTS ON DRAFT RECORD OF DECISION (ROD) REGARDING THE BASIN PLAN AND TITLE 27 CCR FOR GOUNDWATER MONITORING REGULATIONS	ADMIN RECORD	COMMENTS	022	SOUTHWEST DIVISION

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 000410 NONE LTR LTR NONE 0003 0003	04-17-2002 **11-28-2001** NONE	CRWQCB, OAKLAND, CA A. A. CONSTANTINESC U NAVFAC - SOUTHWEST DIVISION L. LANSDALE	COMMENTS ON DRAFT RECORD OF DECISION (ROD) REGARDING STATE ARAR'S (PER RPM'S ATTACHED E-MAIL DATED 12 FEB 02, CRWQCB DID NOT PROVIDE A SIGNED HARD COPY - SENT LETTER VIA E-MAIL ONLY)	ADMIN RECORD	COMMENTS	022	SOUTHWEST DIVISION
N00296 / 000422 FWSD-RACII-01-034 8DO 088 RPT N44255-95-D-6030 0200	04-19-2002 **02-08-2002**	FOSTER WHEELER NAVFAC - SOUTHWEST DIVISION	DRAFT FINAL - RECORD OF DECISION (ROD)	ADMIN RECORD	ROD	022	SOUTHWEST DIVISION
N00296 / 000423 SWDIV SER 06CH.AM/0121 & 06CH.AM/0121 & FWSD-RACII-01-030 2ON DRAFT ROD DATED 21 MAY 2001) - SEE 2VARIOUS LTR N44255-95-D-6030 0004	04-19-2002 **02-08-2002** DO 088	NAVFAC - SOUTHWEST DIVISION A. MUCKERMAN AR #422 FOR ENCLOSURE 1 - DRAFT FINAL AGENCIES	TRANSMITTAL OF THE DRAFT FINAL RECORD OF DECISION FOR REVIEW AND COMMENT (INCLUDES ENCLOSURE 2 - REVISED RESPONSE TO EPA COMMENTS ROD DATED 2 FEB 2002	ADMIN RECORD	RESPONSE ROD	022	SOUTHWEST DIVISION
N00296 / 000426 NONE MISC MISC NONE 0001	04-30-2002 **03-05-2002** NONE	US EPA - SAN FRANCISCO A. LEE A. LEE NAVFAC - SOUTHWEST DIVISION L. LANSDALE	EPA COMMENTS ON THE DRAFT FINAL - RECORD OF DECISION (ROD), DATED 8 FEBRUARY, 2002 (SEE AR #422 - ROD)	ADMIN RECORD	COMMENTS MOA MONITORING ROD	022	SOUTHWEST DIVISION

UIC No. / Rec. No. Doc. Control No. Record Type Contr./Guid. No. Approx. # Pages	Prc. Date Record Date CTO No. EPA Cat. #	Author Affil. Author Recipient Affil. Recipient	Subject/Comments	Classification	Keywords	Sites	Location Box No.
N00296 / 000412 NONE LTR NONE 0009	04-17-2002 **03-28-2002** NONE	NAVFAC - SOUTHWEST DIVISION L. LANSDALE VARIOUS AGENCIES	RESPONSE TO EPA AND CRWQCB COMMENTS ON THE DRAFT FINAL RECORD OF DECISION (ROD) REGARDING TITLE 27 AND INSTITUTIONAL CONTROLS (IC)	ADMIN RECORD	RESPONSE	022	SOUTHWEST DIVISION
N00296 / 000413 NONE LTR NONE 0002	04-17-2002 **04-01-2002** NONE	U.S. EPA A. LEE NAVFAC - SOUTHWEST DIVISION L. LANSDALE	RESPONSE TO NAVY'S 28 MAR 2002 E-MAIL - WRITTEN MODIFICATION TO THE DRAFT FINAL RECORD OF DECISION (ROD) - MODIFICATIONS ACCEPTABLE TO EPA	ADMIN RECORD	RESPONSE	022	SOUTHWEST DIVISION
N00296 / 000414 NONE LTR LTR NONE 0001	04-17-2002 **04-01-2002** NONE	CRWQCB, OAKLAND, CA A. A. CONSTANTINESCU NAVFAC - SOUTHWEST DIVISION L. LANSDALE	RESPONSE TO NAVY'S 28 MAR 2002 E-MAIL - WRITTEN MODIFICATION TO THE DRAFT FINAL RECORD OF DECISION (ROD) - MODIFICATIONS ACCEPTABLE TO CRWQCB	ADMIN RECORD	RESPONSE	022	SOUTHWEST DIVISION

UIC=N00296
No Keywords
Sites=022
No Classification

APPENDIX B

APPENDIX B

RESPONSIVENESS SUMMARY, PARTS I AND II

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Building 127, Room 112
San Diego, California 92132-5190

RESPONSIVENESS SUMMARY FOR PROPOSED PLAN
June 20, 2001

SITE 22 LANDFILL
MOFFETT FEDERAL AIRFIELD
MOFFETT FIELD, CALIFORNIA

Responsiveness Summary
for Proposed Plan
Site 22 Landfill
Moffett Federal Airfield
Moffett Field, California

PART I
Summary Report

Introduction

This Responsiveness Summary was prepared to address comments received from the community and other interested parties regarding the proposed remedial action and alternatives for the Site 22 Landfill at Moffett Federal Airfield, Moffett Field, California. Part II of this Responsiveness Summary provides a matrix documenting how the Navy considered public comments received during the Site 22 Proposed Plan public comment period and provides answers to those comments. The Navy's responses to the comments also document how public comments were integrated into the decision-making process.

Section 1 Overview

Alternative 2, Biotic Barrier, was selected as the preferred alternative to achieve the overall remedial action objective of preventing human exposure to contaminants by impeding burrowing of animals and disruption of landfill refuse. The biotic barrier as originally proposed would be installed on seven acres of the Site 22 Landfill not directly associated with the golf course activities as ground squirrels typically burrow only into low activity grassy areas (where golf play does not occur). The preferred remedy would include constructing the biotic barrier using layers of soil, gravel, cement, and cobblestone to prevent animals from burrowing into the landfill refuse. The preferred remedy also includes institutional controls, and long-term groundwater and gas monitoring.

Section 2 Public Participation

The public comment period for the Site 22 Proposed Plan was originally scheduled to take place from April 2, 2001 to May 2, 2001 and a public meeting was originally scheduled for the week of April 16, 2001. However, at the request of community, the end date of the public comment period was extended from May 2, 2001 to May 9, 2001. In addition, the public meeting was rescheduled to April 26, 2001 and was held at the Mountain View City Council Chambers located at 500 Castro Street, Mountain View, CA 94041, from 7-9 p.m. During the public comment period, input was received from public members, the local county and cities, an environmental group, League of Women Voters, Moffett Field Golf Course, and the National Aeronautics and Space Administration (NASA; see Section 4 and Part II below). All comments were transcribed during the meeting. In general, Alternative 2, Biotic Barrier, was acceptable

with special considerations. The main recurring theme pertained to consideration and mitigation of impacts to wildlife (namely the burrowing owl) and habitat (trees).

Two commentators were supportive of Alternative 2, but favored the Alternative 3, Multilayer Cap, designs for more long-term effectiveness, and Alternative 4, Excavation and Off-site Disposal, to allow for reintroduction of trees and provide unrestricted land use. One commentator did not support the preferred alternative, stating that Alternative 2 did not meet state and federal standards for landfill closure.

Due to its relation to the San Francisco Bay, the Don Edwards National Wildlife Refuge, working salt ponds, and historic marshes and wetlands, general interest in environmental issues at Moffett Field relate to water quality and wildlife protection. In addition, potential impacts that remediation efforts may have on future land use is another concern. The public is broadly concerned that selected remedies will not preclude a full range of land reuse options. Similarly, a common concern relates to the need for, and long-term implementation of, institutional controls that would be required by the remedies. However, the bulk of issues that are of public concern at Moffett Field relate to groundwater.

The following sections provide a look at community involvement in the environmental process at Moffett Field, a summary of comments received during the public comment period and Navy responses to them, and concerns regarding implementation of the remedial action. The responses were approved by the EPA and the RWQCB. Part II presents an in-depth technical response to all comments received.

The Navy has had active community outreach in the environmental process at Moffett Field since the conversion of the Technical Review Committee to a Restoration Advisory Board (RAB) in 1994. The RAB is a volunteer committee that reflects the diverse interests of the local community. The RAB is chaired by the Navy and is co-chaired by a member of the community elected by the RAB. The Moffett Field RAB includes members representing the following agencies and organizations:

- Bay Area Air Quality Management District
- California Department of Fish & Game
- California Regional Water Quality Control Board
- Center for Public Environmental Oversight
- City of Mountain View
- City of Sunnyvale
- Environmental professionals
- Media (various)
- Middlefield, Ellis, Whisman (MEW) consultants
- NASA
- Private citizens

- Santa Clara Valley Water District
- Silicon Valley Toxics Coalition
- Stanford University
- The League of Women Voters
- U.S. Environmental Protection Agency (EPA)
- U.S. Fish and Wildlife Service

Members serve as a liaison with the community and are available to meet with community members and groups. The RAB meets quarterly, and reviews and comments on plans and activities related to the ongoing environmental studies and restoration activities at Moffett Federal Airfield. RAB members are savvy and informed about the environmental activities on Moffett Field and in the surrounding area (i.e., Silicon Valley).

In addition to an active RAB and other avenues for public involvement in the environmental process, local media have followed the progress of environmental activities and provide a conduit for information to the community. Also, the Moffett Field environmental program team maintains a mailing list of over 500 individuals. This list is used regularly to mail notices at all environmental milestones and to disseminate information about major activities, project updates, and RAB meetings.

Section 3 Summary of Comments Received

As stated in Section 1, Alternative 2, Biotic Barrier, was generally acceptable with special considerations. Comments received in support of the Biotic Barrier, but requesting either additional detail or consideration, pertained to the following issues:

1. Effective mitigation and replacement of trees.
2. Compliance with state guidance for burrowing owls and their habitat.
3. Comprehensive long-term monitoring (groundwater and gas).
4. Consideration of the effects of earthquakes on the biotic barrier.
5. A contingency plan should contaminant migration occur in the future.
6. A plan for implementing institutional controls.
7. Delineation of actions and alternatives to be implemented in the event that institutional controls are not followed.
8. A contingency plan should land use change on site or at adjacent properties.
9. Consideration to the interface of Moffett Field with the adjacent wetlands, northern channel, and drainage ditches and potential impacts to wildlife and habitat.
10. Consideration to funding issues and whether choosing Alternative 2 compromises funding for addressing other environmental sites at Moffett Field.

Comments supporting a biotic barrier, but with suggestions or minor changes included the following points:

1. Installation of a biotic barrier across the entire 9.4 acres of the landfill would better control the site over the long term.
2. Consideration to other acceptable barriers that would cost less and be less destructive to trees and burrowing owl habitat.
3. While the biotic barrier is marginally acceptable, installation of a multilayer cap would better reduce the likelihood of the future migration of contaminants.

The one commentator not in support of Alternative 2 preferred Alternative 4, Excavation and Off-site Disposal, or Alternative 3b, Multilayer cap with geosynthetic clay layer. The basis for this input was that Alternative 2 does not meet state and federal requirements for landfill closure.

Section 4 Remedial Design/Remedial Action Concerns

This section provides a summary of concerns received during the public comment period regarding implementation of the remedial action.

Trees

The Navy should seriously consider alternative ways to conserve trees while installing the biotic barrier. Tree mitigation and replacement should occur very soon after construction completion in order to maintain habitat for raptors and golf course aesthetics.

Burrowing Owls

The Navy should maintain strict compliance with burrowing owl guidelines during installation of the biotic barrier. In addition, owl habitat should be restored upon construction completion. The Navy might consider relocating owls from the site altogether.

Golf Course

The Navy should evaluate the impacts to golf course customers and staff, course playability, and lost time and revenue during construction of the biotic barrier.

Areal Extent of the Biotic Barrier

The Navy should consider extending the footprint of the biotic barrier from 7 acres to 9.4 acres to cover the entire area of the landfill to prevent current and future burrowing of animals into the refuse across the site.

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PART II
Response to Comments Matrix

Responsiveness Summary
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Written on: NA	**Received on**: 26 April 2001
From: Joseph Chou, Hillsborough, California	**Submitted Via**: Public Meeting
Affiliation/Agency: Restoration Advisory Board Member	

GENERAL COMMENTS

Comment 1: In general, we are happy to see the Navy take the lead on this particular landfill, Site 22, and move this project forward. And I think we all concur on the approach of doing biotic barrier.	**Response 1:** Thank you for your concurrence.

SPECIFIC COMMENTS

Comment 2: I wondered if the current biotic barrier proposed plan by the Navy is really the most cost-effective way. I don't have the real documents in front of me, but I remember probably this maybe a little bit different from the biotic barrier we talked about a year or two years ago. So it looks like we're much more comprehensive or even doing different things. So, I just wondered, if we have put the cost factor in there to really play the best way to do the biotic barrier because, no matter how, the whole purpose of doing this remedial action is trying to prevent human exposure and we really don't gain anything by protecting the environment because of this. So what's the best way to do the biotic barrier to prevent the burrowing activity from the squirrels? And I think that's my comment, and I leave that to the Navy.	**Response 2:** The EPA and Navy believe that an appropriate range of alternatives were considered, and the proposed biotic barrier provides the most reliable and cost-effective long term solution for inhibiting squirrels from burrowing into the refuse. Native rock, which will be used to construct the barrier, will out perform and out last man-made materials and will also require less routine maintenance. A detailed technical justification and cost evaluation of the rock-based biotic barrier versus the man-made fabric-based biotic barrier initially proposed was conducted and is documented in the *Technical Memorandum – Cost Justification for Remedial Alternatives*, Site 22, MFA. The draft memorandum was submitted to the agencies in April 2001 and was approved in draft form by the EPA on May 18, 2001. A final version was submitted to the regulatory agencies on June 1, 2001, and is part of the Administrative Record for the Site.

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Comment 3: Secondly, I'm not very fully convinced that we have to remove the trees. I think if we're going to do the biotic barrier, we still can have the creative way in concert with ARARs. Well, I know why we will have to remove the trees because if we put the biotic barrier on the roots of the trees they will die. So that's why I think we need to think through if there are any other alternatives. We don't have to put all those, the cement, all the different thick topsoil for trying to prevent that happening. In my opinion, we can put some barrier or cobblestone or even the decorative finishes as a combination to still save the trees without moving them. And according to the Proposed Plan at the RAB, one of the major costs is removing the trees. So I know from an engineering and construction standpoint, by eliminating the trees it'd be easier to do the work, but even it's still very precious to have all those trees in Moffett. If I remember correctly probably a number of those trees are somewhere between 150. So I really would urge the Navy to reconsider or evaluate if there is any way to still conserve the trees but still have the biotic barrier over there. So that's my second comment.	**Response 3:** The Navy recognized the value of the trees at Moffett. However, the current trees on the landfill are rooted in soil that is only 1-2 feet deep, and the majority of roots are in the refuse. As these trees age, there is an increased potential for them to blow over and expose large amounts of refuse, thus becoming a larger concern than the burrowing animals. In response to this comment and others, the Navy is currently planning to relocate the existing trees, plant new trees outside the landfill boundary, and plant new trees within the landfill boundary in tree wells, which would be engineered into the biotic barrier. The tree wells would provide deeper rooting depth and stability such that the trees will not be as easily blown down, and there is thus less chance of refuse being exposed. A final decision as to where, and how many, trees will be planted and/or relocated will be made during the remedial design phase.
Comment 4: And the third comment is basically a question because I looked at the different alternatives proposed here and like anyone of them we all include groundwater monitoring and gas monitoring. But I just look at those dollar numbers. No. 1, the capital cost for No. 1 is $2,000, so I wonder if that already includes doing the groundwater monitoring well over there, because I don't have all the documents. Maybe you mentioned it somewhere else. But I think if we include the groundwater monitoring as part of the alternative, then we should reflect those numbers, because I think we need to do additional monitoring, especially in Site 22. So this is just a question, and I want to know to about those numbers. And something related to that is related to my first comment. It's also a question. I wonder if the Navy has evaluated after we're going to do this kind of biotic barrier and if the drainage pattern or infiltration situation or even do we consider about any landfill gas problem because we're doing all these changes?	**Response 4:** The $2,000 capital cost for Alternative 1 is for installation of gas monitoring wells. Seven groundwater monitoring wells already exist at Site 22, which will continue to be monitored and maintained. Additional wells were not specified under Alternative 1. The costs of the actual monitoring are included in operation and maintenance costs, which are $10,000 per year. With regards to drainage, implementation of the biotic barrier alternative includes management of surface water flow across the site to prevent ponding of water on the Landfill, and to improve precipitation runoff in order to reduce water infiltration into the subsurface. It is also notable that the remedial investigation showed that contaminants were not migrating off-site (via groundwater or gas) to a significant extent.

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Written on: NA	**Received on**: 26 April 2001
From: Captain Don Yeager, retired Navy, Sunnyvale, California	**Submitted Via**: Public Meeting
Affiliation/Agency: Public Member	

GENERAL COMMENTS

Comment 1: Moffett is a place dear to my heart not solely because I'm retired Navy, but I do enjoy it a great deal. In 1963, -4, -5, along in that time frame, I was the facilities officer for the 12th Naval District, and along that time we sort of oversaw the realignment of the bases here on the west coast. And when we went to, what they call, "base loading," we took all of the carrier forces and put them in Miramar and Lemoore, which was a brand new airfield, and that allowed us to take jet facilities out of Moffett Field and bring in the newer Patrol P-3 operations into Moffett as a new base solely for that airplane. And then we were able to get rid of the P-2 and seaplanes from Alameda and up in Woodland Island and southern California. So it was a time that was rather dynamic for the U.S. Navy. And there was a lot of reconstruction going on. And Moffett has been a naval air station ever since 1933 when it was dedicated as an airfield. And the Navy has been in charge of Moffett throughout that entire period, with the exception when the Army took it over, I guess, about 1936, something like that, and kept it until '42 when the blitz came back during the II World War. So the Navy really has been the operator of all the air facilities around here. I don't want to go through the whole history pitch, but it's interesting to know where it came from back there.	**Response 1:** Thank you for the information. The Navy appreciates your participation in the remedy selection process.

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SPECIFIC COMMENTS	
Comment 2: The one thing that is fairly obvious, I think, is the fact that Moffett is on a liquefication (sic) zone where if we had an earthquake -- and I didn't hear anyone mention what's going to happen to this biotic barrier in the case of when an earthquake strikes. And it strikes me, if, in fact, that place is rigid where you pour a slurry in there, then that's going to break during an earthquake. And if it breaks you got the situation that you have right now. So I think that needs to be addressed. The same thing is true for storm trees. If, in fact, any of these storm trees are left in place and they break up after, that barrier, that's going to provide an entry into the hazard fill area also.	**Response 2:** The biotic barrier is actually flexible, and is not intended to perform like a rigid, impervious cap. The function of the slurry is twofold: (1) to fill in voids in the cobbles to minimize surface soil loss, (2) to mortar 2-3 cobbles into a larger mass to minimize squirrel burrowing. The slurry has no structural bearing on the barrier, and thus cracking is anticipated, and will not compromise the function of the barrier. Minimal displacement of the barrier following a seismic event is not expected to allow squirrels access to the refuse. However, it is true that aquifer conditions could change as a result of an earthquake, and alter contaminant migration. This will be addressed through the monitoring plan, which will detect contaminant migration, and allow for proper actions (please see response to Mr. Woodhouse's Comment 2 below). Regarding the trees, the Navy currently plans to remove some of the trees, and relocate others. In addition, new trees may be planted (see response to Joseph Chou's Comment 3) in tree wells, which would be engineered into the biotic barrier, and would provide deeper rooting depth and stability such that the trees will not be as easily blown down. A final decision as to where, and how many, trees will be planted and/or relocated will be made during the remedial design phase.
Comment 3: The question is, "What's wrong with doing nothing?" What would happen if you did nothing, other than violate the law, but practically speaking? Maybe as an amelioration of the do-nothing choice might be squirrel retraining or something of that sort. There are people who can affect the behavior of animals, and maybe there is something that can be done to make them want to burrow somewhere else. And if that's the only real problem, why spend all this money if you don't really need to?	**Response 3:** The results of the human health risk assessment suggested that something needed to be done to prevent human contact with waste material brought to the surface by burrowing animals (squirrels). Following careful analysis using EPA criteria, the Navy, the Regional Water Quality Control Board, and the EPA have concluded that the biotic barrier is the best long-term solution. Modifying the behavior of the squirrels is potentially possible, but would be very difficult to accomplish and maintain over the long term.

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Written on: NA	**Received on**: 26 April 2001
From: Kevin Woodhouse, Environmental Coordinator	**Submitted Via**: Public Meeting
Affiliation/Agency: City of Mountain View and the staff representative for the Restoration Advisory Board	
GENERAL COMMENTS	
Comment 1: The City has submitted recent comments that were passed on city council this last Tuesday, April 24. I'd like to briefly go through those comments here and add them as additional comments. The City concurs with the Navy and U.S. EPA and the Regional Water Quality Control Board that this preferred biotic barrier will achieve the remedial action objective designated for preventing contact with the landfill refuse.	**Response 1:** Thank you for your concurrence.
SPECIFIC COMMENTS	
Comment 2: However, beyond that, to assure the effectiveness of this preferred alternative, the City would like to encourage the Navy to consider additional points during the remedial design and the remedial action phase. And the City as well will be participating in those phases through participating on the advisory board. First, when as part of the alternative, institutional controls are critical and gas monitoring plans, when designing these features, it's very critical to clearly delineate critical actions and remedy alternatives that will be implemented if the institutional controls are not followed.	**Response 2:** The ROD will specify that a comprehensive monitoring plan will be developed in accordance with 22 CCR, § 66264 (groundwater) and 27 CCR § 20921 (gas) to detect any releases from the site. It is further specified that if contaminant concentrations in groundwater exceed levels established in accordance with Title 22 CCR, § 66264.97, the Navy will immediately notify the regulatory agencies. The Navy also will evaluate the groundwater or gas contamination in accordance with CERCLA, and obtain concurrence from EPA, RWQCB, and DTSC on remediation decisions. Appropriate institutional controls have not been agreed upon yet. The ROD will state that institutional controls will be developed in coordination with

	NASA and will include access restrictions to maintain the integrity of the biotic barrier and to limit surface excavation that could disturb the refuse. Once they are established, NASA, per an MOU with the Navy, will be responsible for enforcing the institutional controls. It is noted that the golf course has been maintained and operated for over 30 years, there are currently no plans to change the land use of this area, and it is likely that Site 22 will remain part of the golf course. It is therefore unlikely that the institutional controls would be violated. However, if violations were to occur, it is expected that they would be reviewed on a case-by-case basis.
Comment 3: And a second comment would be, as mentioned, this proposal as it stands now would remove a significant number of trees, and to request that the Navy evaluate mitigating tree removal by planting new trees somewhere on other locations on the base. And I know that is being considered, which is the first I heard, which is great.	**Response 3:** Please refer to response to Mr. Chou's Comment 3.
Comment 4: Additionally, when constructing the biotic barrier and working in that area, the City would like to encourage strict compliance with burrowing owl guidelines as enforced by the Fish and Game on state and local agencies. The City has significant experience with that at Shoreline, so if questions arise, please let me know.	**Response 4:** It is the intent of the Navy to incorporate an owl mitigation element (passive relocation) into the remedial action plan in accordance with Department of Fish and Game guidelines. In addition, it is noted that the biotic barrier includes a 1-foot cover layer consisting of soil, which will support the vegetative cover. It is expected that in some cases, squirrels may successfully establish themselves in the cover layer, and burrows may subsequently be available for owl nesting. Thus the biotic barrier will not completely preclude use of the site by squirrels or burrowing owls, but will prevent the uncovering of refuse.

Comment 5: We appreciate the opportunity to participate. And the additional comment I'd like to make is this public hearing tonight was not noticed in the Mountain View *Voice*, and I just want to emphasize that for future public meetings to ensure that Mountain View *Voice* is included in the future.	**Response 5:** The public meeting was announced in the San Jose Mercury News, which has the largest circulation of newspapers in the area. However, it is noted that the Navy is willing to work with the City of Mountain View in the future to explore ways to make better use of local media.

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Written on: NA	**Received on**: 26 April 2001
From: Jim McClure, Fremont, California	**Submitted Via**: Public Meeting
Affiliation/Agency: Restoration Advisory Board (RAB) member and chair of the RAB technical subcommittee	

SPECIFIC COMMENTS

Comment 1: I have one comment-question which I'd like to see addressed in the responsiveness summary. We understand that we may be entering a period in which individual bases may be competing with each other for funds, which in total may not be sufficient to achieve all of the necessary environmental cleanups. And within given bases, it's possible that individual sites may be competing for the limited dollars available to their host base. In light of the fact that the alternative that's been proposed is not the least capital cost alternative, and without having seen, or at least not having a chance to digest the overall capital cost and O&M cost analysis, I'd like to see an analysis of the effect of choosing this biotic barrier on overall funding of all remedial actions that are anticipated at Moffett and some commentary on whether or not choosing this may compromise the availability of necessary funds to perform future actions in other areas of the base.	**Response 1:** Funding for the biotic barrier has already been secured, and therefore, funding for other Navy remedial actions at Moffett Field is unaffected. The effects that funding for this remedial action may have on other environmental restoration projects is not considered during the remedy selection process. However, cost effectiveness is required to be evaluated as one of the five balancing criteria under CERCLA for remedy selection.

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Written on: NA	**Received on**: 26 April 2001
From: Lenny Siegel	**Submitted Via**: Public Meeting
Affiliation/Agency: Restoration Advisory Board and The Center for Public Environmental Oversight	

GENERAL COMMENTS

Comment 1: When we first started looking at this site it was definitely a low priority for us who have been following it. But there are some changes happening that could bring people into close proximity. That doesn't necessarily mean that there's a pathway, but the bay trail will pass along its northern edge someplace on the other side of the channel.

There's talk about unlikely restoration of the salt ponds across the channel. And even a proposal which is more remote, but possibly that a ferry terminal will be available in that area. Contamination there, it wasn't a high priority.

The essential question and my position basically is that this remedy is marginally acceptable. It's not the most preferred remedy. And looking back to what we did in Operable Unit 1 with the landfill ... initially we were going with a rather limited cap and then some of the members of the Restoration Advisory Board said how come the Navy doesn't have to use the same kind of cap that we have in the municipal landfill as in Mountain View. And that's essentially where we ended up with OU 1.

I actually think that in terms of criterion of long-term effectiveness that will be a better solution here. The contaminants there are persistent. The argument is that the landfill was closed a long time ago and we aren't seeing migration. But

Response 1: It is true that a multi-layer cap is the best technology for preventing percolation of surface water into the refuse. However, the biotic barrier includes a gravel layer, which will act as a capillary break and drainage layer over the cobble slurry layer. This, in conjunction with management of surface flow, will significantly decrease percolation into the landfill relative to current conditions. In addition, institutional controls will be enacted to prevent excavation of waste materials, and groundwater monitoring will be conducted for a period of up to 30 years to detect migration of contaminants from landfill, and if detected, appropriate response and mitigation will be considered (please see response to Mr. Woodhouse's Comment 2). Hence, the biotic barrier would provide long-term effectiveness, especially in light of the fact that significant migration of contaminants to off-site groundwater has not been observed under current conditions (despite the fact that refuse has been in place for over 30 years, and is present below the water table). Therefore, low permeability capping of the site may not provide additional protection commensurate with the increased costs and effort.

With regard to potential future development of adjacent areas, the remedial investigations found that contaminant migration is not significant, and is not

with persistent contaminants you have to look ahead in the long run. And by limiting going to the low cost now we eliminate having contaminants migrating in the long run and multi-layer cap would reduce that likelihood. I've never been convinced that we know the reason why we don't have the migration, to know that we can count on the biotic barrier to do the job. Again, the investigation shows there's contamination on the site. It's persistent because it wasn't buried yesterday. And, again, there's no guarantee that it's going to sit there forever and not cause anybody any harm. So, I think you should look seriously at that multi-layer cap as a way of developing a more permanent solution. The matrix that's been presented, it's just called acceptable. I think that long-term effectiveness is a preferable solution.	expected to affect the bay or surrounding area (including the area of the bay trail). The Navy and support agencies have evaluated these investigations, and based the Preferred Alternative, on the most likely future use scenario of the site, which is that it will remain a golf course. Based on the site investigations and risk assessments, and on implementation of the biotic barrier (which prevents contact with refuse, and limits infiltration of water), concerns regarding future development are expected to be minimal. However, larger-scale development can not be forecasted in any meaningful way, and any potential effects of the development on the hydrogeological regime are speculative. In the unlikely event that future changes are proposed for the site or nearby areas, planning permits would be required. The planning and approval process for future development beyond the site would likely trigger the environmental planning process under the California Environmental Quality Act (CEQA) or a similar environmental planning evaluation. Ultimately, the developers will have to consider how their project impacts the surrounding area and what impacts the surrounding environs have on their project. Based on all of the information collected, The regulatory agencies and Navy believe that the biotic barrier provides the best balance among the long-term effectiveness and permanence, short-term effectiveness, implementability, and cost criteria. The selected remedy is expected to be permanent and effective over the long term as long as routine maintenance of the cover is performed, monitoring of groundwater and methane is conducted, and institutional controls are enforced.

SPECIFIC COMMENTS	
Comment 2: Realizing that most of the agencies agree that they don't want to go that route, I think it's important with the long-term monitoring, as we did with some of the other sites here at Moffett, to have criteria for when we do something else. We don't just want to monitor, we want to know if we find leaking contaminants at the level where there's serious problems, which, should we start to find if the contaminants is leaking that we do something about it and I don't know, the fact sheet doesn't provide in sufficient detail, documents to provide a contingency plan so if we find that PCBs or contaminants are moving into what would be the bay, hopefully, at some point, that we have a way to deal with that before it's unstoppable.	**Response 2:** Please refer to response to Mr. Woodhouse's Comment 2.
Comment 3: Also, the mention of institutional controls, it's important to have them. But it's also important to explain how they'll be implemented. We don't have a deed for the federal property here. It's managed by Moffett, it's owned by NASA. What would be the documents that ensure that in 10 or 20 years that no one will go out to dig a trench out there, put in a pipeline, or whatever? And also the thing that concerns me with the continued restoration of the salt ponds, what would we do if that alters the property and causes migration to happen? The Navy doesn't have the authority to limit the use of the salt ponds, so how will we deal with that kind of problem with respect to institutional controls? I'm just not convinced that all we need do is keep the squirrels from digging holes. There's contamination down there. It's not the worst problem in the world, but maybe it's something we need to take a little more seriously.	**Response 3:** Institutional controls have yet to be agreed upon. However, a framework for determining appropriate institutional controls will be presented in the ROD, and details will be identified and agreed upon by the Navy and NASA during the remedial design phase (please refer to response to Mr. Woodhouse's Comment 2). Regarding continued restoration of the salt ponds, it is not possible to evaluate or consider potential future hydrological conditions at this time. However, the remedial investigations have shown that leachate communication with groundwater is minimal. As noted above (response to Mr. Seigel's Comment 1), the planning and approval process for future use beyond the site would likely trigger the environmental planning process under the California Environmental Quality Act (CEQA) or a similar environmental planning evaluation. This would ultimately include an evaluation of the effects of any proposed activities on local groundwater regimes.

	At the present stage of this landfill, the only concern that has been identified is preventing animals from burrowing into the Site 22 Landfill and exposing the refuse. Future concerns, if any, would be identified through monitoring program and would be addressed appropriately through the CERCLA process, or through other applicable land use planning regulations as described above.

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Written on: NA	**Received on**: 26 April 2001
From: Barbara Healy, Mountain View	**Submitted Via**: Public Meeting
Affiliation/Agency: Public	
GENERAL COMMENTS	
Comment 1: According to the January 9, document 14, when they did an environmental search assessment, done by Daniel Johnson Mendenheim (phonetic), in paragraph 4.2, Ames is overlaid part of the largest groundwater basin in Santa Clara. And there are several studies that indicate that there are a series of water fills by clay aqueducts, and I'm just wondering about migration of any contaminants into that area.	**Response 1:** Remedial investigations have shown that impact to surrounding groundwater from the landfill leachate is very minimal, even though the refuse is present under the water table, and has been in place for many years. In addition, groundwater beneath the site is not a current drinking water supply and it is not reasonably expected to be a drinking water supply in the future due to its high salt levels. Finally, the Preferred Alternative will include a comprehensive monitoring plan so that if contaminant migration is observed, appropriate actions can be taken (please refer to response to Mr. Woodhouse's Comment 2).
Comment 2: Also, it stated there is an inactive earthquake fault under Ames. And 9 miles northwest of that is the San Andrea Fault, and 13 miles southwest of that is the Hayward Fault.	**Response 2:** Please see response to Captain Yeager's Comment 2.

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Written on: 07 May 2001	**Received on**: 07 May 2001
From: Vanya Sloan, President	**Submitted Via**: Fax to Andrea Muckerman
Affiliation/Agency: Los Altos League of Women Voters	
GENERAL COMMENTS	
Comment 1: The League of Women Voters has long been concerned about the landfills at Moffett Field, believing that the U.S. Navy should be subject to the same environmental standards as those used for closing the Mountain View municipal landfill.	**Response 1:** The Title 27 CCR landfill closure regulations and the RCRA Subtitle D landfill closure requirements are not applicable to any of the alternatives because the Navy discontinued operation of the landfill in 1967. A closed site, for California Integrated Waste Management Board (CIWMB) purposes, is a "disposal site that has ceased accepting waste and was closed in accordance with applicable statutes, regulations, and local ordinances in effect at the time" (Title 27 CCR, Section 20164). Based on CIWMB's June 10, 1993 Local Enforcement Agency (LEA) Advisory "Site Investigation Process for Investigating Closed, Illegal and Abandoned Disposal Sites," for a site that last received wastes prior to 1976, closure requirements were met at the state level at that time. Furthermore, under the SWRCB-promulgated regulations, units closed before November 27, 1984, are only required to develop and implement a detection-monitoring program. Because of this, the landfill closure requirements in Title 27 are not applicable to the Site 22 Landfill, but the groundwater and landfill gas monitoring requirements are considered relevant and appropriate.

SPECIFIC COMMENTS	
Comment 2: Since part of the Site 22 landfill is already below groundwater levels and leachate is not a problem, it may be that installation of a biotic barrier and monitoring will be adequate to protect human health and the environment. However, putting the biotic barrier only outside of the greens and fairways is very shortsighted. There is no guarantee that the land will always be used as a golf course or that ground squirrels will not move into the fairways. Alternative 2 calls for installation of a biotic barrier on 7 acres of the site. Our recommendation would be to do all 9.4 acres at once. We would support placing a biotic barrier over the entire landfill area with groundwater and gas monitoring, and a contingency plan for what will be done if the monitoring detects leakage.	**Response 2:** Based on this comment and others received, the Navy agrees that placement of the biotic barrier over the entire 9.4 acre footprint of the landfill would provide a more permanent and effective remedial solution and would provide greater fulfillment of the Site's remedial action objective of preventing human contact with landfill refuse brought to the surface by burrowing animals. This justification is further supported by the observance of squirrel burrows in the "active" (fairway) areas of the golf course where the soil cover over the refuse has been measured to be as little as 6 inches thick. Therefore, the Navy currently plans to extend the proposed biotic barrier from 7 acres to 9.4 acres to cover the entire landfill footprint. This change will be documented in the *Documentation of Significant Changes* Section of the ROD. Design, implementation and effects on playability of extending the biotic barrier from 7 to 9.4 acres will be determined in the remedial design phase. Regarding monitoring, please see response to Mr. Woodhouse's Comment 2.
Comment 3: In your April 2001 Public Notice it is stated on page 6 that no burrowing owls were recently observed in the area of proposed construction. This has not been the observation of burrowing owl specialists. Therefore, the lack of mitigation plan for impacts to the burrowing owl by this project makes it seriously deficient. Mounds of earth can be established around the project site that will provide the necessary refugia for the ground squirrels and burrowing owls. This has been done successfully at the nearby Sunnyvale dump and in the Sunnyvale Shoreline Park, by specialists that have been funded by a NASA grant. Please incorporate such a mitigation element in this plan. It is an ideal time and location for burrowing owls.	**Response 3:** As part of the additional investigation field work, ground squirrel and burrowing owl burrows were surveyed in the vicinity of the site. In April 1998, five active owl and more than 47 ground squirrel burrows were identified. According to Chris Alderete, the NASA on-site biologist (personal communication, May 17, 2001), a much more recent survey identified no owls, and 7 or 8 active squirrel burrows. Mr. Alderete also indicated that a new survey would be completed very soon. Prior to implementation, a survey will be conducted, and it is the intent of the Navy to incorporate an owl mitigation element (passive relocation) into the remedial action plan in accordance with Department of Fish and Game and NASA protocols.

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Comment 4: The project site interfaces with wetlands and the historic San Francisco Bay, so it is not entirely accurate to place the project one mile south of San Francisco Bay. The Crittenden Marsh and any number of adjacent wildlife oriented land uses encourage a high degree of Pacific Flyway migratory use as well as resident birds and water fowl foraging uplands. It would be commendable if this superfund site recovery plan would include interface with the northern channel and the patrol road ditch. What is the water quality and circulation in these two water bodies? Are there high quality or degraded wetlands adjacent to them and the dump site? Is there a capability for increased and improved wetlands to be created here? This site will not be revisited by any other recreation or regulatory agency so this would be a window of opportunity to improve a degraded wetlands and San Francisco Bay interface. To not address this element of the project site would be a deficiency in the plan. Thank you for considering our input into this important matter.	**Response 4:** The site is located close to the bay. However, information collected for the RI suggested that surface and subsurface impacts of the site to the surrounding area are insignificant. This includes minimal contaminant detections in surface soil, very little evidence of contaminant migration in gas or groundwater after many years of the refuse being in place. In addition, subsurface investigations suggest that there is little if any communication between landfill leachate, and surrounding groundwater. Adjacent wildlife-oriented land is not part of the site, and is not effected by the landfill. Therefore, assessment and potential improvement of this land is not addressed by the preferred alternative for the Site 22 Landfill. It is noted, however, that the preferred alternative does include a comprehensive monitoring plan to detect future contaminant migration (if any) into adjacent areas (please see response to Mr. Woodhouse's Comment 2). Finally, the Northern Channel and the Patrol Road Ditch are being addressed separately as Sites 27 and 21, respectively.

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Written on: 22 March 2001	**Received on**: 22 March 2001
From: Mike Hill, Superintendent	**Submitted Via**: Fax to Andrea Muckerman
Affiliation/Agency: Moffett Field Golf Course	

GENERAL COMMENTS

Comment 1: We (Moffett Field GC) feel that alternative 2 is best suited for us in terms of not disturbing existing playability. Although, I am concerned that current squirrel population(s) could jeopardize results (if allowed to keep multiplying). A plan of containment must be in place, for desired results on Plan 2, burrowing owls should be moved off golf course to insure better results of this large scale ($) project.	**Response 1:** It should be noted that, while the initial plan was to exclude the fairway from the coverage of the biotic barrier, the Navy is now planning to extend the barrier to encompass the entire 9.4 acres of the landfill footprint. This is due to public comments received, and to the fact that squirrels have been observed on the fairways, necessitating expansion of the barrier in order to meet the remedial action objective (protecting human health by preventing contact with landfill refuse). Design, implementation and effects on playability will be determined in the remedial design phase. It is also noted that the Preferred Alternative does not address squirrel population control. It only seeks to provide a physical barrier to prevent them from burrowing into the refuse. The Navy intends to relocate the owls (please see response to Mr. Woodhouse's Comment 4).

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SPECIFIC COMMENTS	
Comment 2: Also, we need to talk about how paying customers will be impacted and time/revenue lost while project is in progress? (sic)	**Response 2:** The Navy is responsible for mitigating environmental concerns at MFA through the Installation Restoration Program. The Navy expects that any issues that arise regarding tenants of the facility would be discussed and resolved in cooperation with NASA, who serves as the landlord.
Comment 3: If alternative 3 or 4 is approved. The tree issue will become a big concern of myself and all of our patrons. I agree that non-native trees are not needed, but some replacement will be needed.	**Response 3:** Please see response to Mr. Chou's Comment 3.

Responsiveness Summary
for Proposed Plan
Site 22 Landfill
Moffett Federal Airfield
Moffett Field, California

Written on: 24 April 2001	**Received on**:
From: Mario Ambra, Mayor	**Submitted Via**: Mail to Andrea Muckerman
Affiliation/Agency: City of Mountain View	

GENERAL COMMENTS

Comment 1: Thank you for the opportunity to comment on the Moffett Federal Airfield (MFA) Site 22 Proposed Plan. The City of Mountain View is vitally interested in the clean-up efforts at MFA and holds the position that all contaminated sites at MFA be remediated to a level that will allow for the maximum flexibility for future land use while protecting health and safety and the environment. The City concurs with the Navy, the United States Environmental Protection Agency and the Regional Water Quality Control Board that the preferred alternative, the biotic barrier, will achieve the Remedial Action objective of protecting human health by preventing contact with landfill refuse. To ensure the effectiveness of the preferred alternative, the City would like to encourage the Navy to consider the following points during the Remedial Design and Remedial Action phases of the project.	**Response 1:** Thank you for your concurrence. Please see responses to specific comments below.

Responsiveness Summary
for Proposed Plan
Site 22 Landfill
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SPECIFIC COMMENTS	
Comment 2: 1. When designing the institutional controls and groundwater and gas monitoring plans, clearly delineate corrective actions and remedy alternatives that will be implemented if institutional controls are not followed or site monitoring detects new or additional contamination.	**Response 2:** Please refer to response to Mr. Woodhouse's Comment 2.
Comment 3: 2. Because the biotic barrier will require the removal of many trees, evaluate the feasibility of mitigating tree removal with the planting of new trees elsewhere on the golf course or at other locations at Moffett Federal Airfield.	**Response 3:** Please refer to response to Mr. Chou's Comment 3.
Comment 4: 3. When constructing the biotic barrier, comply with burrowing owl guidelines as enforced by the California Department of Fish and Game on State and local agencies.	**Response 4:** Please refer to response to Mr. Woodhouse's Comment 4.

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Written on: 10 April 2001	**Received on**: 17 April 2001
From: Sandy Olliges, Division Chief	**Submitted Via**: Fax to Andrea Muckerman
Affiliation/Agency: Environmental Services Office, National Aeronautics and Space Administration	

SPECIFIC COMMENTS

Comment 1: NASA Ames Research Center has received the proposed plan for the Navy's Site 22 Landfill located at the golf course. After review of the four alternatives listed, NASA prefers Option 4 as the best alternative for the site. Option four, which involves the excavation and removal of the waste in the landfill provides NASA with unrestricted use of the site. Alternative four also allows for the replacement of trees at the site.	**Response 1:** As stated in the Proposed Plan, the proposed alternatives were evaluated in the feasibility study in accordance with the CERCLA process using nine evaluation criteria. The golf course, which currently overlies the site, has been maintained and operated for over 30 years, and there are currently no plans to change the land use of this area. It was therefore assumed for the evaluation that Site 22 will remain part of the golf course for the foreseeable future. Alternative 4 (excavation and off-site disposal) was evaluated and was considered less favorable than the biotic barrier. This was mainly because the ability of Alternative 4 to meet the remedial action objective for the site (preventing human exposure to waste uncovered by burrowing animals) was not substantially increased over Alternative 2 and could not be justified, given difficulties regarding implementation, health hazards and nuisance associated with the effort, and the relatively high costs. Finally, this site has been characterized, and appears to contain mainly domestic waste.

	The selected alternative, the biotic barrier, is consistent with the National Contingency Plan (NCP), which states that containment technologies are likely to be appropriate for sites with relatively low-level threats and where treatment is impractical. Containment has been identified as the most likely response action at municipal landfill sites because CERCLA municipal landfills are primarily composed of municipal wastes and lesser amounts of hazardous waste, and often pose a low-level threat rather than a principal threat. In addition, the volume and heterogeneity of waste within CERCLA municipal landfills often make treatment impractical. Regarding tree replacement, please see response to Mr. Chou's Comment 3.
Comment 2: NASA is opposed to alternatives two and three because they involve the removal of all the trees at the site. Removal of the trees will greatly affect the aesthetic character of the golf course. NASA would be willing to support a modified version of Alternative 2, construction of a biotic barrier, that would allow some of the trees at the site or replacement of trees with native vegetation.	**Response 2:** Based on this comment and others received, the Navy is currently evaluating replacement of trees as part of Alternative 2. Please see response to Mr. Chou's Comment 3.
Comment 3: NASA would also support a plan that would involve the Navy maintaining the site as is. Thank you for the opportunity to comment on your proposed plan.	**Response 3:** The No Action alternative was evaluated as described in the Proposed Plan, and was not selected because it did not meet the RAO, which was established based on human health risks identified at the site.

Responsiveness Summary
for Proposed Plan
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Written on: 7 May 2001	**Received on**: 7 May 2001
From: Robert S. Lasala, City Manager	**Submitted Via**: Mail to Andrea Muckerman
Affiliation/Agency: City of Sunnyvale	

GENERAL COMMENTS

Comment 1: The City of Sunnyvale appreciates the opportunity to comment on the Proposed Plan for Moffett Field Site 22. The main concern of the City of Sunnyvale is that the Navy's Preferred Alternative (Alternative 2, Biotic Barrier) does not meet the State or Federal standards for landfill closure. The City of Sunnyvale's preferred alternative is Alternative 4, which would entail the excavation, removal and proper disposal of the subject waste. Alternative 3b, which entails use of a multi-layer cap containing a geosynthetic clay liner, would be considered an acceptable alternative if it meets State requirements for landfill cover.	**Response 1:** Regarding standards for landfill closure, please refer to response to Ms. Sloan's Comment 1. Regarding Alternative 4, please see response to Ms. Olliges' Comment 4. There are no regulations requiring a multi-layer cap at this site, and significant migration of contaminants to groundwater has not been observed under current conditions. The main advantage of a multilayer cap would be that it would prevent infiltration. The cap in Alternative 3b, which includes an infiltration barrier layer, would only be necessary if the groundwater was a major concern. The additional cost for the cap in 3b is not warranted because: (1) groundwater contamination has been shown to be minimal, and contaminants are not migrating off-site (despite the fact that the refuse has been in place for over 30 years, and is present below the water table), and (2) groundwater beneath the site is considered non-beneficial use (due to salinity).

	The biotic barrier includes a gravel layer, which will act as a capillary break and drainage layer over the cobble slurry layer. This, in conjunction with management of surface flow, will significantly decrease percolation into the landfill over the current conditions. In addition, groundwater monitoring will be conducted for a period of up to 30 years to detect contamination from landfill, and if detected, appropriate response and mitigation will be considered (please see response to Woodhouse Comment 2). Hence, the biotic barrier would provide long-term effectiveness, and under the CERCLA evaluation process, has been determined to be the most acceptable remedial alternative.
SPECIFIC COMMENTS	
Comment 2: In a February 18, 1995 letter the California Integrated Waste Management Board (CIWMB) stated that Sites #1, #2 and #22 meet the definition of a solid waste disposal site pursuant to PRC 40122, have not been closed pursuant 14 CCR 18011, and therefore must comply with 14 CFR. They cited their goal of assuring application of their requirements throughout California.	**Response 2:** Regarding standards for landfill closure, please refer to response to Ms. Sloan's Comment 1. Also, please note, the Proposed Plan was sent to the CIWMB, and no comments were received. However, Mr. Chris Rummel of the County of Santa Clara, Department of Environmental Health, Solid Waste Enforcement Program, the lead enforcement agency for the CIWMB, did provide comments, which are addressed within this Responsiveness Summary. In addition, since this is a Superfund site with an enforceable Federal Facility Agreement, the Regional Water Quality Control Board (RWQCB) is the lead agency for the State of California. The RWQCB (and USEPA) concurred with the selection of this remedy and the selection of the applicable or relevant and appropriate requirements.
Comment 3: According to the Navy's *Draft Site 22 Post-Remedial Action Plan,* dated January 31, 2000, "The landfill received wastes generated from domestic aircraft maintenance and other military operations, such as scrap equipment, construction debris, paint and paint thinners, solvents, lacquer, asbestos waste oil and transformer oil, jet fuel, fuel and transformer filters and sawdust containing polychlorinated biphenyls (PCBs)". Some of the constituents reported in the	**Response 3:** As with many former landfill sites operated and closed prior to 1970s, the site may have received some of these wastes, however, the landfill is believed to contain mainly domestic waste which is consistent with exploratory trenching conducted at the site as well as with remedial investigations, which did not reveal significant impacts from these compounds.

landfill (e.g., PCBs, volatile organic compounds, semi-volatile organic compounds, heavy metals) are potentially hazardous, and at certain concentrations require isolation from the environment via disposal at hazardous waste landfills. As some migration of these constituents to perimeter soil and groundwater has already occurred, Class III landfill closure requirements, at a minimum, are warranted.	Regarding standards for landfill closure, please refer to response to response to Ms. Sloan's Comment 1. Finally, if this was an active landfill, Class III landfill closure requirements would be applied. However, this action is being conducted specifically as a mitigation measure to prevent squirrels from uncovering buried refuse, and thus, current Class III landfill closure requirements are not applicable.
Comment 4: The Biotic Barrier layer proposed in Alternative 2 does not meet State-prescribed criteria for a landfill cap. Use of a two-inch concrete slurry within the barrier will likely serve no useful long term purpose, as it is expected that it will crack relatively quickly due to landfill settlement related to waste degradation. A cover that minimizes infiltration of water through the waste is necessary. In addition to the average annual rainfall of 14-inches, the Navy's preferred alternative 2 would add an additional 17 inches of additional water per year. This localized increase in infiltrating water could form a groundwater mound, potentially distributing contaminants over 360-degrees, and increasing the rate of contaminant migration.	**Response 4:** Regarding standards for landfill closure, please refer to response to Ms. Sloan's Comment 1. The current plan specifies 1- to 2-inches of concrete slurry within the cobble layer. The function of the slurry is twofold: (1) to fill in the upper voids in the cobbles to minimize surface soil loss, (2) to mortar 2-3 cobbles into a larger mass to minimize squirrel burrowing. The slurry has no structural bearing on the barrier, and thus cracking is anticipated, and will not compromise the function of the barrier. Physical and chemical data indicate that communication between the perched leachate and shallow groundwater is limited. Clay and clayey silt predominate beneath and around the landfill. Moreover, migration of contaminants in both groundwater and air has been minimal, despite the fact that the refuse has been in place for over 30 years, and it is partially present below the water table. The biotic barrier will minimize (although not prevent) infiltration relative to current conditions. Finally, a monitoring plan is included in the Preferred Alternative, which allows for detection of off-site contaminant migration, if it occurs (please see response to Mr. Woodhouse's Comment 2)
Comment 5: While reported contaminant concentrations outside the landfill's perimeter have not been very high to date, preferential pathways of sand and gravel incised into matrices of clays and silts result in transport at velocities several orders of magnitude higher than within the clay/silt matrix. With the sparse amount of sampling locations, it is possible that undetected significant	**Response 5:** Remedial investigations were completed and documented in accordance within the CERCLA process, which included oversight and approval by EPA and state agencies (RWQCB). While additional information can always be useful (no matter how well a site is characterized), the information collected for this site has been deemed adequate to delineate the

releases have occurred. The five existing groundwater wells are judged insufficient to monitor groundwater. Discrete sampling of thin beds/lenses of more permeable strata may yield higher concentrations of contaminants than well samples of 10-foot screened intervals. The wells' screens cross multiple thin beds/lenses, which if not equally impacted, result in dilution. Comprehensive assessment should be performed. Additionally, analysis of groundwater samples at 5-year intervals, as proposed for Pesticides/PCBs and metals, is judged to be inadequate.	concerns and to evaluate site risks. Monitoring is expected to be conducted quarterly for up to 30 years, if necessary (please see response to Mr. Woodhouse's Comment 2). In addition, under the CERCLA process, an evaluation of the effectiveness of the remedial alternative is required 5 years after implementation.
Comment 6: Considering the above, the City of Sunnyvale strongly supports selection of Alternative 4-Excavation and off-Site Disposal. Besides being the most environmentally friendly sound of the alternatives, this alternative would result in a site that is essentially free of future land use restrictions. At a minimum, a landfill cap meeting State requirements should be required if the waste remains in place. The City of Sunnyvale sees no compelling reason to allow Moffett Airfield to close the subject landfill to a lesser standard than the one that applies to landfills throughout the State of California.	**Comment 6:** Alternative 4 was evaluated in accordance with the CERCLA process and was considered less favorable than the biotic barrier, mainly because the level of effort, health/nuisance, traffic controls, and costs were not commensurate with the benefits (please see response to Ms. Olliges Comment 1). The landfill is a closed landfill, and at the time of closure met state requirements. Preventing animals from burrowing into the Site 22 Landfill and exposing the refuse is the only issue being addressed by this action. Institutional controls will be established to prevent actions that would compromise the biotic barrier, and monitoring is included to ensure that future impacts, if any, are detected and can be appropriately addressed.
Comment 7: Regardless of the remedial alternative that is chosen, there will likely be potential impacts to the burrowing owl and its habitat, although impacts would be temporary if the City of Sunnyvale's preferred alternative (Alternative 4) were implemented. The burrowing owl is a "Species of Special Concern", and as such warrants State and Federal protection. Note that approval of the preferred Alternative 2 (the "biotic barrier") would preclude the subsequent use of the site by the burrowing owls, due to the presence of the two-inch concrete slurry layer. The burrowing owls are continuing to lose habitat at an alarming rate, and selection of preferred Alternative 2 would permanently remove another seven	**Response 7:** According to Chris Alderete, the NASA on-site biologist (personal communication, May 17, 2001), a recent survey identified no owls, and 7 or 8 active squirrel burrows at the site. It is noted that Mr. Alderete indicated that he was performing another survey very soon, and the new findings will be used to incorporate a mitigation element for the current owl population into the remedial action plan (please refer to response to Mr. Woodhouse's Comment 4).

acres of habitat.	In addition, it is noted that the biotic barrier includes a 1-foot cover layer consisting of soil, which will support the vegetative cover. It is expected that in some cases, squirrels may successfully establish themselves in the cover layer, and burrows may subsequently be available for owl nesting. Thus the biotic barrier will not completely preclude use of the site by squirrels or burrowing owls, but will prevent the uncovering of refuse.
Comment 8: We appreciate your consideration of our comments, and hope that you will consider Alternative 4, Excavation and Off-Site Disposal, which the City of Sunnyvale has identified as our preferred alternative for remediation of Moffett Field Site 22. Disposal of municipal, industrial, "maintenance" and "military"-type refuse, judged by the DTSC as being worthy of treatment as hazardous waste/substances, should be in a properly sited, constructed, and maintained landfill that meets all State requirements for disposal of such materials.	**Response 8:** As noted in the responses to your prior comments, the risk assessments for this site identified prevention of burrowing animals from exposing the refuse as the only issue requiring remedial action for this closed landfill, and this will be accomplished through installation of the biotic barrier. It is noted that the Navy currently plans to extend the biotic barrier to encompass the fairways, which would completely cover the 9.4-acre landfill footprint. This is due to public comments received, and to the fact that squirrels have been observed on the fairways, necessitating expansion of the barrier in order to meet the remedial action objective (prevention of burrowing animals from exposing the refuse). Design, implementation and effects on playability of extending the biotic barrier over the landfill footprint will be determined in the remedial design phase.

Responsiveness Summary
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Moffett Field, California

Written on: 5 April 2001	**Received on**: 5 April 2001
From: Chris Rummel, Sr., R.E.H.S.	**Submitted Via**: E-mail to Andrea Muckerman
Affiliation/Agency: Santa Clara County, Dept. of Environmental Health, Solid Waste LEA	

GENERAL COMMENTS

Comment 1: I would like to take this opportunity to express my views on this subject, as the designated Local Enforcement Agency (LEA) of this closed landfill. I have recently inspected this site and observed the extent of the exposed waste uncovered at limited spots around the site. The only evidence of waste debris and potential "exposure" to humans is where ground squirrels have brought the old waste material to the surface from their burrows. It only occurs at a few small areas where the soil cover over the buried waste is too thin. The potential hazard of waste exposure is essentially insignificant.	**Response 1:** Health risks were evaluated at this site in accordance with CERCLA protocols, and a potential threat at Site 22 was identified as exposure to contaminants due to direct contact with refuse, which could be uncovered via disturbances to the subsurface, such as construction, significant erosion, or through the activities of burrowing animals. Since the Site 22 Landfill is expected to remain part of the golf course for the foreseeable future, it is unlikely that erosion or construction activities would represent a significant mechanism for uncovering buried refuse. However burrowing animals have been identified as having the potential for uncovering landfill refuse, and humans (e.g., players, visitors, and workers at the golf course) could come in direct contact with the exposed refuse. Therefore, a remedial action objective was established for the site as follows: to eliminate this risk by preventing animals from burrowing into the Site 22 Landfill and exposing the refuse. This will be accomplished through the use of physical barriers to permanently limit this exposure pathway to landfill refuse. Monitoring and institutional controls will also be used to maintain the integrity of the barrier, and to detect potential future contaminant migration from the site.

SPECIFIC COMMENTS	
Comment 2: The typical method of closure for such old sites is to add appropriate cover materials, such as 1 to 3 feet of low-permeability soils and establish vegetation and drainage. The gas and groundwater monitoring systems are also installed. We have recently seen that a ground squirrel had dug and chewed through the biotic barrier at the Site 1 closed landfill. However, I believe that an improvement could be made to the barrier that is less expensive and less destructive than the proposed alternative. Other barriers should be considered instead of tons of rock and concrete and complete removal of shade trees for bird perching. I would suggest a heavier ½ inch mesh hardware cloth with plastic coating, or some of the sturdy base liners used to line landfills. Also, consideration should be given to applying the liner or hardware cloth to the existing soil cover after minimal scraping. Then, new cover material could be added to build-up the site 1 to 3 feet. In this way the job could be done without the removal of trees. After all, we are just trying to prevent vector rodents from bringing up small pieces of inert material.	**Response 2:** The proposed biotic barrier includes 2-3 feet of appropriate earthen cover material that will provide for vegetation, and drainage control, in addition to preventing squirrels from burrowing into the refuse. Man-made material (metal wire mesh) has a limited service life compared to earthen materials, especially in salty environments such as is present at Site 22. The biotic barrier is expected to provide protection over a longer term than man-made material. The addition of 1-3 feet buildup materials may kill the existing trees. The current trees are rooted in soil that is only 1-2 feet deep, and the majority of roots are in the refuse. As these trees mature and are exposed to wind, they could blow over and expose large amounts of refuse, thus becoming a larger concern than the burrowing animals. The Navy currently plans to remove some of the trees in areas where the biotic barrier will be installed and these trees may be relocated off the refuse area. The Navy also plans to install tree wells for new trees to be engineered into the biotic barrier. This will provide deeper rooting depth and stability such that the trees will not be as easily blown down (please see response to Mr. Chou's Comment 3). A final decision will be made as to how many trees will be moved or planted during the remedial design phase.
Comment 3: The ground squirrel fleas are a bubonic plague vectors in California and the County Ag Department provides effective poisons. Alternatively, good populations of raptor birds are found on the site and serve as very good controls when perching sites, such as trees, are available. This is probably why currently no active burrows can be found on this tree-lined golf course site where debris has been spotted. In fact, on a recent inspection, owl droppings containing rodent fur was found under a tree surrounded by a virtual "ghost town" of squirrel burrows. This was the main site where some	**Response 3:** The May 1999 revised-final FS originally considered squirrel abatement, but it was rejected due to concerns regarding long term management, and in preference of more passive, humane, and publicly acceptable approaches. The Navy agrees raptor birds can help control the squirrel population, but numerous active burrows are still observable throughout the Site 22 area of the golf course. Finally, it is not the intent of the remedial action to control the squirrel population, but to prevent squirrels from burrowing into the refuse. Eradication of squirrels may not be desirable,

of the old landfilled material was strewn about the surface. As you know, these animals are also very destructive as engineering pests. These animals are being safely eradicated in all of the surrounding environs of the County. The scope of the problem does not justify the means of the preferred alternative. Thank you for the consideration of these ideas and observations.	in light of the dependency of burrowing owls on squirrel burrows (please see response to Mr. Lasala's Comment 7).

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Moffett Field, California

Written on: 7 May 2001 **From**: Libby Lucas, Los Altos, CA **Affiliation/Agency**: Public Member	**Received on**: 7 May 2001 **Submitted Via**: E-mail to Andrea Muckerman
GENERAL COMMENTS	
Comment 1: The science of the capping process, and the biotic barrier, appear to be sound procedure but I urge you to implement a habitat restoration and management plan for the site in view of the wealth of sensitive species that find resting and nesting refugia at Moffett Field. The report that would be most beneficial is Sensitive Species Surveys at Moffett Field, 1994 that was prepared by the San Francisco Bird Observatory for the National Aeronautics and Space Administration/ Ames Research Center at Moffett Field. The report also cites most research data that has been done on this region of the South Bay.	**Response 1:** While this comment is appreciated, the golf course at Site 22 is expected to remain as such, and a habitat restoration and management plan for this site, and the surrounding areas, is outside the scope of the current Proposed Plan for Site 22. It is noted, however, the Navy currently plans to remove some of the trees in areas where the biotic barrier will be installed and these trees may be relocated off the refuse area. The Navy also plans to install tree wells for new trees to be engineered into the biotic barrier. This will provide deeper rooting depth and stability such that the trees will not be as easily blown down (please see response to Mr. Chou's Comment 3). A final decision will be made as to how many trees will be moved or planted during the remedial design phase. Also, burrowing owls will be relocated appropriately in accordance with protocols set forth by NASA and the Department of Fish and Game.
SPECIFIC COMMENTS	
Comment 2: On page 2 of your project summary, Site History is not entirely accurate at placing the site 1 mile south of San Francisco Bay. The northern channel connects to the Bay and the intervening salt ponds are	**Response 2:** The site is located close to the bay. However, information collected for the remedial investigation suggested that surface and subsurface impacts of the site to the surrounding area are very minimal. This includes

historic bay marshes and wetlands, so please consider Site 22 contiguous to the Bay. Also, the San Francisco Bay Don Edwards National Wildlife Refuge extends to the tip of the airfield so the refuge interface is very important. I urge you to work with the Refuge Manager Clyde Morris in development of a management plan, which probably should include predator control. The red fox has had a den in this interface area and does serious depredation to the nests of the western snowy plover, and California least tern.	minimal contaminant detections in surface soil, and very little evidence of contaminant migration in gas or groundwater after many years of the refuse being in place. Groundwater investigations suggest that there is little if any communication between landfill leachate, and surrounding groundwater. Because of this, the only potential hazard associated with the site was determined to be through contact with solid waste brought to the surface by burrowing animals. In summary, information collected for the RI suggests that the potential for Site 22 to impact the bay is insignificant. Finally, the Proposed Plan for the site requires monitoring of groundwater and gas to alert the Navy and the regulatory agencies to any potential contaminant migration, so appropriate protective actions can be taken (please see response to Mr. Woodhouse's Comment 2). Regarding the development of a wide-ranging management plan, please see response to Ms. Lucas' Comment 1.
Comment 3: The Moffett Field landfill remedial capping project is a concern in that it does not really address the environmental constraints of the site in regards these sensitive species of waterfowl and wildlife, nor does it evaluate the seasonal wetlands for the salt marsh yellowthroat, red-legged frog or tiger salamander.	**Response 3:** The Proposed Plan of placing the biotic barrier over the Site 22 Landfill is intended only to address the concerns at that particular "site", which includes only the area encompassed by the landfill, and not the adjacent areas, which investigations have shown to be unaffected. The site is currently overlain by the Moffett Golf Course, and will remain as such for the foreseeable future. Seasonal wetlands, and related sensitive species are not present at the site. Please see also responses to Ms. Lucas' Comments 1 and 2.
Comment 4: In June 1999 a Stanford report noted 16 burrowing owls in the area, 2 at Shoreline Park, 2 at Lockheed, and the rest on Moffett Field including 3 small juveniles at a nest site near the Moffett Golf Course. This Super Fund Site report claiming, on page 6, that burrowing owls have not recently been observed in the project area appears inaccurate.	**Response 4:** The number of owls present at the site at any particular time varies, based on a number of factors (including time of year, preditorial activity, etc.). According to Chris Alderete, the NASA on-site biologist (personal communication, May 17, 2001), a more recent survey of the Site 22 Landfill identified no owls (and 7 or 8 active squirrel burrows). Mr. Alderete is planning to re-survey the site in the near future, and new information will

Responsiveness Summary
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Comment 7: Please note that a great deal of expertise in the scientific community is available to assure that the interface with San Francisco Bay is preserved in all its integrity. Inboard levees, seasonal wetlands and uplands are vital for the both resident birds and migratory waterfowl of the Pacific Flyway. As the coast becomes impacted by recreation use the wildlife cannot safely nest and rear their young, so have retreated to the salt ponds of the South Bay. The reduced presence of humans on the Moffett (sic) site is highly beneficial, so it is an especially valuable interface of uplands, wetlands and the Bay's Northern Channel.	**Response 7:** Please see response to Ms. Lucas' Comment 3.
Comment 8: The use of chemicals in and around the golf course and in the ditches and channel should be limited in order to give the best opportunity for survival of tiger salamanders and red-legged frogs; and no vector control poisons or practices (except for red fox) considered.	**Response 8:** The remedial action described in the Proposed Plan of placing the biotic barrier over the Site 22 Landfill is intended to address the concerns identified for the site through the remedial investigations, i.e. preventing contact with refuse. The action also includes monitoring and institutional controls to ensure that the remedy will be protective of human health and the environment. For purposes of carrying out the remedial action, no pesticide use is planned.

The mitigation measures of creating special mounds of dirt for burrowing owls and ground squirrels have been successful at the Sunnyvale dump and at Shoreline Park. This too was inspired by the NASA grant, I believe, and should be easy to accommodate around this golf course site. The protected lands at Moffett and its proximity to San Francisco Bay prove to be exceptional habitat and should not be lost to the burrowing owls. They have lost over half of their historical terrain in the last decade in our area. The removal of the trees on site will be a major impact, and it should be noted what birds use them. The Stanford report noted red-tailed and red-shouldered hawks. Is it firmly a part of the mitigation plan that replacement trees will be introduced as soon as practical?	thus be available shortly. If present, burrowing owls will be relocated in accordance with guidelines enforced by the Department of Fish and Game, which is the standard procedure to ensure that these animals are protected. Regarding the trees, the Navy currently plans to remove some of the trees in areas where the biotic barrier will be installed and these trees may be relocated off the refuse area. The Navy also plans to install tree wells for new trees to be engineered into the biotic barrier. This will provide deeper rooting depth and stability such that the trees will not be as easily blown down (please see response to Mr. Chou's Comment 3). A final decision will be made as to how many trees will be moved or planted during the remedial design phase.
Comment 5: In the ponds just north of the golf course, eared grebe, western grebe and Clark's Grebe were observed along with "lots of nesting activity by Forster's Terns (60 + sitting), avocets and California Gulls, and Double-breasted Cormorants had 4 occupied nests. This is an impressive diversity of waterfowl and the need of a management plan is strongly indicated here.	**Response 5:** Activities at Site 22 are not expected to impact the ponds north of the golf course, since they're several hundred feet away. Please also see response to Ms. Lucas' Comment 3.
Comment 6: The wetlands of the northern channel, Marriage Road Drainage Ditch, Patrol Road Ditch and ponds, and golf course ponds and seasonal wetlands in general need to be evaluated as to their water quality, vegetation and possible presence of frogs, tree and/or red-legged and for Tiger Salamander. The salt marsh yellowthroat is especially suited to the habitat of Moffett Field and in 1994 at least 6 pairs were noted. The wetlands and vegetation of the drainage ditches and standing water in summer is excellent for their needs and a management plan should be incorporated into this super fund site project.	**Response 6:** Please see response to Ms. Lucas' Comment 3. It is also noted that the Northern Channel, Marriage Road Ditch, and Patrol Road Ditch are being addressed separately as Sites 27, 3, and 21, respectively.

DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132-5190

5090
Ser 06CH.LL/0689
July 18, 2002

Ms. Adriana Constantinescu (3 copies)
Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

RECEIVED
JUL 23 2002
BY: Dme

Ms. Alana Lee (5 copies)
U.S. Environmental Protection Agency
Region IX
75 Hawthorne St., SFD-73
San Francisco, CA 94105

Dear Ms. Constantinescu and Ms. Lee:

Enclosed is the Final Record of Decision (ROD) for the Moffett Federal Airfield Site 22 Landfill dated June 25, 2002. The Site 22 ROD identifies a biotic barrier, institutional controls, groundwater monitoring, and landfill gas monitoring as the selected landfill remedy.

Thank you for your assistance in finalizing the ROD. Please contact Mr. Wilson Doctor or me if you have any questions.

Mr. Wilson Doctor
Remedial Project Manager
Southwest Division
Naval Facilities Engineering Command
BRAC Operations Office
1230 Columbia Street, Suite 1100
San Diego, CA 92101-8517

Telephone: (619) 532-0928
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Mr. Lawrence Lansdale
BRAC Environmental Coordinator
Southwest Division
Naval Facilities Engineering Command
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lansdalell@efdsw.navfac.navy.mil

Sincerely,

Lawrence Lansdale

LAWRENCE LANSDALE, P.E.
BRAC Environmental Coordinator
By direction of the Commander

Encl: Final Site 22 Record of Decision

5090
Ser 06CH.LL/0689
July 18, 2002

Copy to:

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