NAVAL AIR FACILITY
EL CENTRO
IMPERIAL COUNTY, CALIFORNIA 92243

FINAL
ACTION MEMORANDUM/REMEDIAL ACTION WORK PLAN FOR NON-TIME-CRITICAL REMOVAL ACTION SITE 1, MAGAZINE ROAD LANDFILL NAVAL AIR FACILITY, EL CENTRO

SITE STATUS:	NON-NPL
CATEGORY:	NON-TIME-CRITICAL REMOVAL ACTION
CERCLIS ID	CA6170090017
SITE ID:	SITE 1, MAGAZINE ROAD LANDFILL
DATE:	FEBRUARY 1997

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ACRONYMS/ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
Ca-HSC	California Health and Safety Code
Cal-EPA	California Environmental Protection Agency
CCR	*California Code of Regulations*
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CLEAN	Comprehensive Long-Term Environmental Action Navy
cm/s	centimeters per second
COC	chemical of concern
COPC	chemical of potential concern
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DON	Department of the Navy
DTSC	(Cal-EPA) Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
°F	degrees Fahrenheit
HELP	Hydrologic Evaluation of Landfill Performance
ICAPCD	Imperial County Air Pollution Control District
IRP	Installation Restoration Program
mg/kg	milligrams per kilogram
NAF	Naval Air Facility
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NPL	National Priorities List
NTCRA	non-time-critical removal action
PCB	polychlorinated biphenyl
POC	Point of Contact
ppm	parts per million
PRG	(U.S. EPA Region IX) preliminary remediation goal
RAB	Restoration Advisory Board
RAP	Remedial Action Plan

ACRONYMS/ABBREVIATIONS (continued)

RAWP	Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act
RWQCB	(California) Regional Water Quality Control Board
SI	Site Investigation
SVOC	semivolatile organic compound
SWAT	Solid Waste Water Quality Assessment Test
TFH	total fuel hydrocarbons
TRPH	total recoverable petroleum hydrocarbons
UL	upper limit
USC	*United States Code*
U.S. EPA	United States Environmental Protection Agency
VOC	volatile organic compound

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Section 1
PURPOSE

The purpose of this Action Memorandum is to document, for the Administrative Record, the Department of the Navy (DON) decision to undertake a non-time-critical removal action (NTCRA) for Installation Restoration Program (IRP) Site 1, Magazine Road Landfill, Naval Air Facility (NAF) El Centro, California. The Department of Defense (DoD) has the authority to undertake Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response actions, including removal actions, under 42 *United States Code* (USC) §9604, 10 USC §2705, and Federal Executive Order 12580. This document is prepared in accordance with the U.S. Environmental Protection Agency (U.S. EPA) guidelines described in the "Superfund Removal Procedures: Action Memorandum Guidance" (U.S. EPA 1990). In addition, this section is intended to meet the Removal Action Work Plan (RAWP) requirements, as defined in 25323.1, California Health and Safety Code (Ca-HSC).

The objective of the proposed removal action for Site 1 is to reduce the potential for human and ecological exposure to the landfill wastes, and to limit the migration of the contaminants to groundwater by reducing the generation of leachate. The proposed removal action for Site 1 is an interim action. The DON will submit a separate document that describes the final remedy for the site. The final remedy will address groundwater contamination, if present, and institutional controls of hazardous substances which will be left in place. The landfill gas survey will be conducted to assess the potential for landfill gas generation prior to the removal action field activities. If the survey identifies landfill gas at concentrations requiring further assessment, then the appropriate steps will be taken to comply with Title 14, *California Code of Regulations* (CCR).

The proposed removal action for Site 1 is deemed consistent with the guidelines set forth within the National Oil and Hazardous Substances Pollution Control Contingency Plan (NCP) (40 *Code of Federal Regulations* [CFR] Part 300) based on the findings of "actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations, animals, or food chains" (40 CFR 1990).

Site 1 received a Relative Risk Site Evaluation Model ranking of "Y4 high." There are no nationally significant or precedent-setting issues for this site.

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Section 2
SITE CONDITIONS AND BACKGROUND

This section is intended to meet the RAWP requirements, as defined in 25323.1 Ca-HSC, specifically meeting the description of on-site contamination. NAF El Centro is located approximately 7 miles northwest of El Centro, California, 7 miles north of the Mexican border, and 100 miles east of San Diego, California (Figure 2-1). Site 1 is located southeast of the intersection of Magazine Road and Patrol Road in the north portion of NAF El Centro (Figure 2-2). The site is rectangular and extends approximately 600 feet along Magazine Road and 400 feet along Patrol Road (Figure 2-3). The total landfill area is approximately 5.5 acres.

2.1 REMOVAL SITE EVALUATION

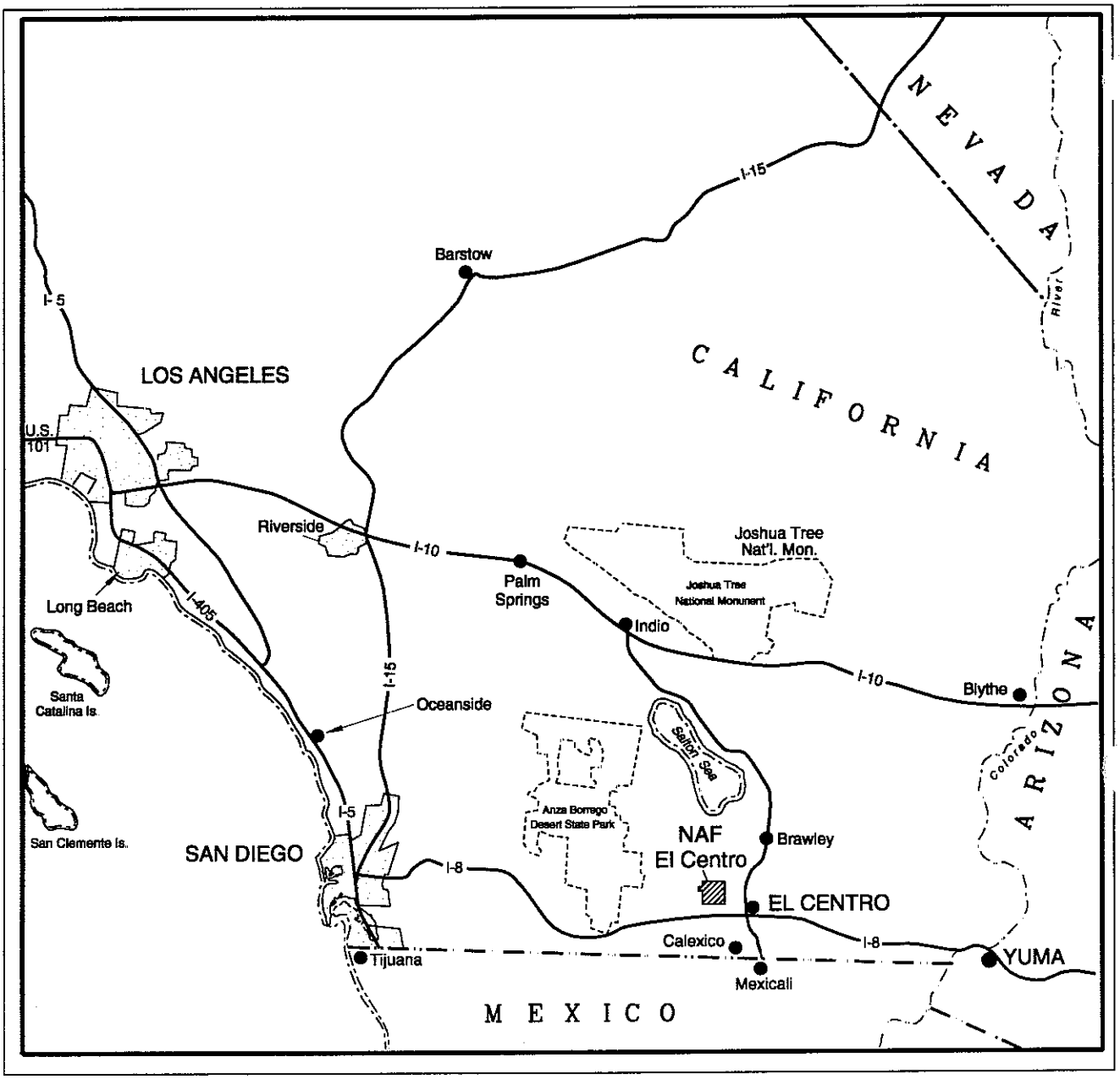
In 1987, the Naval Energy and Environmental Support Activity (NEESA) conducted a Preliminary Assessment/Site Inspection (NEESA 1987) in which 16 sites at NAF El Centro were evaluated for potential contamination. During the Preliminary Assessment/Site Inspection, information from sources such as historical records, aerial photographs, on-site surveys, and personnel interviews was used to evaluate 16 potentially contaminated sites. The evaluation consisted of assessing possible discharge of hazardous waste; the potential for contaminants in the waste to migrate via surface water, groundwater, and air; and the potential for the waste to affect human and ecological receptors. Based on the evaluation, 14 of the 16 sites, including Site 1, were selected for further investigations under the IRP.

In May 1993 a Solid Waste Water Quality Assessment Test (SWAT) and Site Investigation (SI) was completed (Ogden 1993a) for Site 1. The objectives of the SWAT/SI were to assess the potential for the release of hazardous substances and to evaluate the nature of contamination in the event that a release had occurred. The investigation was not intended to characterize the extent of contamination but to assess if further investigation or remediation were necessary (Ogden 1993a).

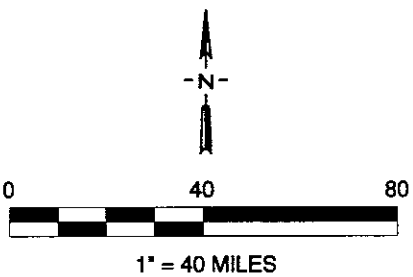
During the SWAT/SI, eight soil borings were drilled and sampled to depths ranging from 11.5 to 51.5 feet below the ground surface within and adjacent to the landfill. A ninth soil boring (B-9) was drilled approximately 100 feet southeast of the landfill as a background boring (Figure 2-3). Five borings, B-3/MW1, B-4/MW2, B-5/MW3, B-8/MW4, and B-9/MW5, were converted into groundwater monitoring wells.

Thirty soil samples were collected and analyzed for chemicals of potential concern (COPCs) using the following analytical procedures:

- aromatic halogenated and volatile organic compounds (VOCs) (U.S. EPA Method 8010/8020);
- chlorinated herbicides (U.S. EPA Method 8150);
- ethylene dibromide (U.S. EPA Method 504);
- pesticides (U.S. EPA Method 8140);

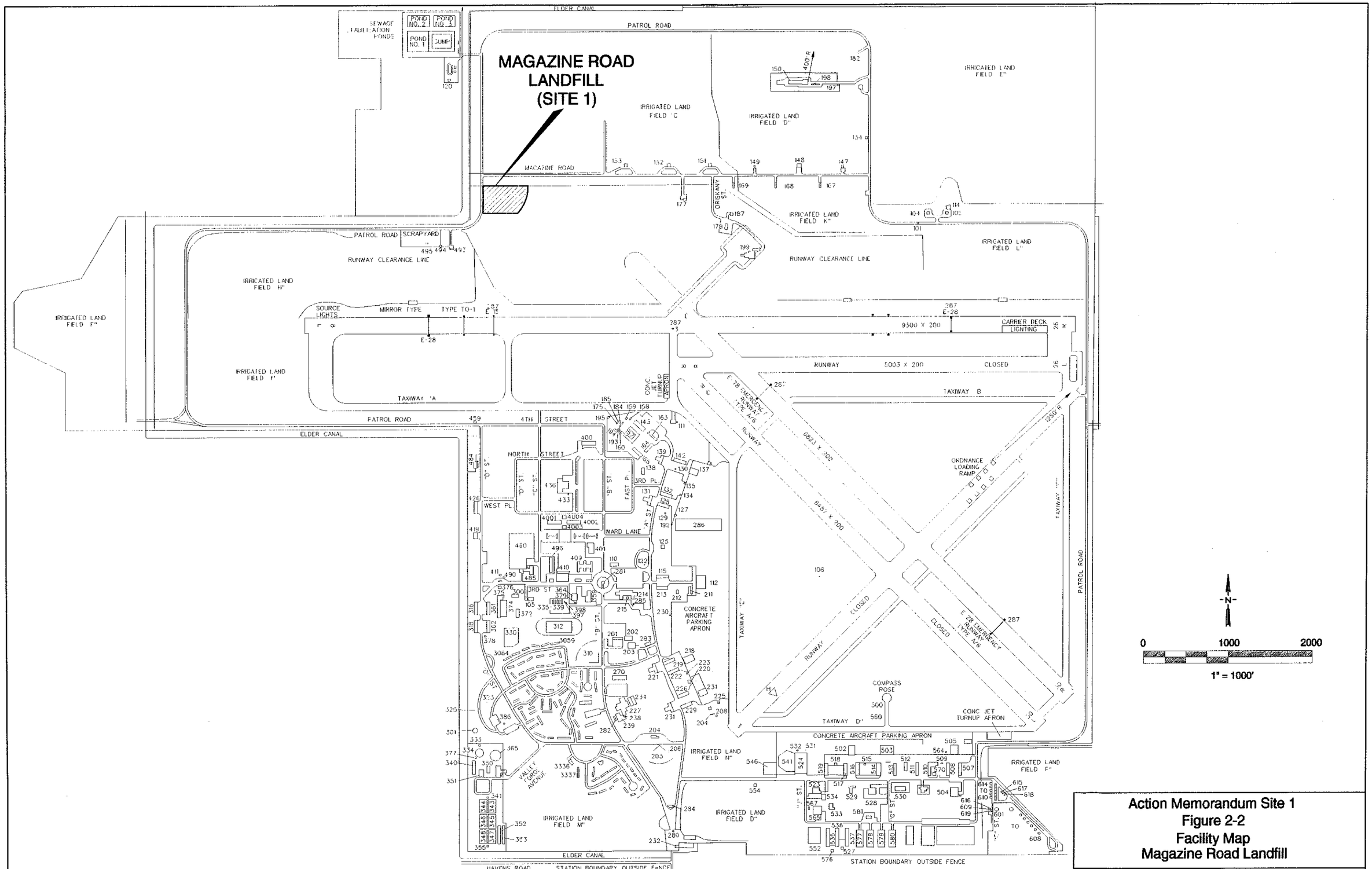


SOURCE: Master Plan - NAF El Centro, 1988



Action Memorandum
Figure 2-1
Regional Location Map
Magazine Road Landfill

NAF El Centro, Imperial County, California



Action Memorandum Site 1
Figure 2-2
Facility Map
Magazine Road Landfill

NAF El Centro, Imperial County, California

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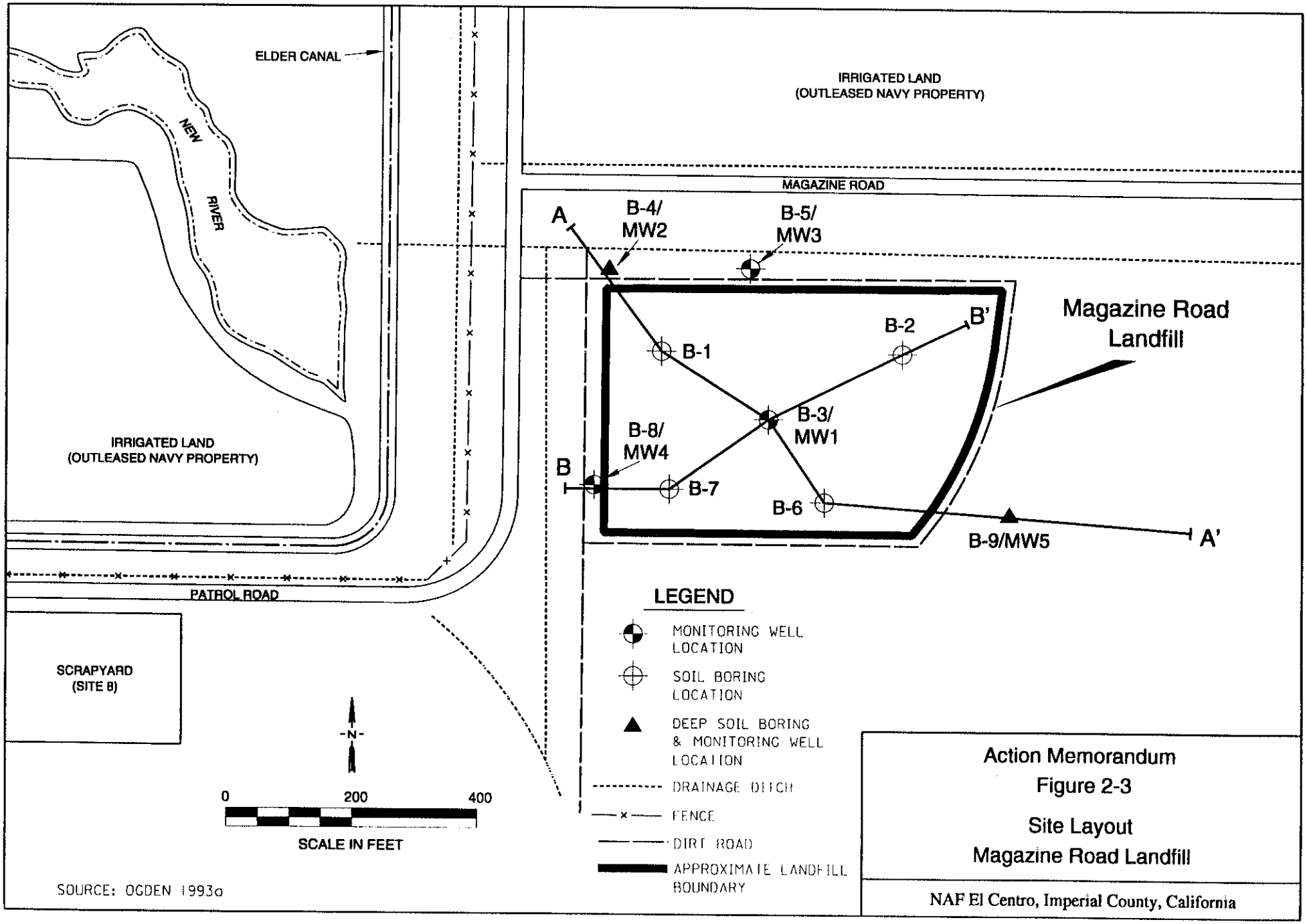

Action Memorandum
Figure 2-3
Site Layout
Magazine Road Landfill

NAF El Centro, Imperial County, California

- polychlorinated biphenyls (PCBs) and organochlorine pesticides (U.S. EPA Method 8080);
- priority pollutant metals (various methods);
- semivolatile organic compounds (SVOCs) (U.S. EPA Method 8270);
- total recoverable petroleum hydrocarbons (TRPH) (U.S. EPA Method 418.1);
- total fuel hydrocarbons (TFH) (modified U.S. EPA Method 8015);
- total phenols (U.S. EPA Method 9066);
- total cyanide (U.S. EPA Method 9012);
- VOCs (U.S. EPA Method 8240); and
- general chemistry.

The results of these analyses are included in Attachment A.

TRPH was detected in eight of the samples at concentrations ranging between 1 and 2,400 milligrams per kilogram (mg/kg); however, in six samples, concentrations were less than or equal to 10 mg/kg. TFH were detected in only three samples at concentrations of 7.2, 69, and 480 mg/kg. Although sample EC1-B9-S2-D3.5 was collected from B9, intended as a background soil boring, it contained TRPH and TFH at concentrations of 2,400 and 69 mg/kg, respectively. It is suspected that this contamination is associated with an off-site source that is not associated with the landfill.

All samples analyzed for priority pollutant metals contained concentrations of beryllium, chromium, copper, nickel, total lead, and zinc above the laboratory detection limits. Antimony, arsenic, cadmium, mercury, selenium, silver, and thallium were reported above the laboratory detection limits in some of the samples.

2.2 PHYSICAL LOCATION

The New River and Elder Canal are located within 1 mile of Site 1. The New River, along with the Alamo River, form the two main drainages for Imperial Valley. The New River originates primarily as agricultural return from the Imperial and Mexicali Valleys, and flows north to the Salton Sea. The Elder Canal provides water from the Colorado River for agricultural purposes in the Imperial Valley. It flows north along the western perimeter of NAF El Centro.

The climate in the NAF El Centro area is arid, with hot, dry summers and mild winters. The summer temperatures average 92 degrees Fahrenheit (°F), with highs often reaching 115°F. During winter, the low temperatures are near 30°F, and the highs are over 80°F. Rainfall in the area occurs as gentle winter rains or intense summer thunderstorms. The mean annual rainfall is 2.4 inches. During winter and spring, the prevailing winds are from the west; in summer months, winds are generally from the southwest.

NAF El Centro has an average winter population of 1,500 and an annual summer population of 1,000. The closest community is Seeley, which is approximately 1 mile

southwest of the base. The mid-1991 population of Seeley, as estimated by the County of Imperial Community Economic Development, was 1,228.

NAF El Centro is surrounded by unincorporated portions of Imperial County, and the land is primarily agricultural. Approximately 18 percent of the county is irrigated agricultural land. The developed areas, including the incorporated cities, unincorporated communities, and supporting facilities, comprise less than 1 percent of the total county area. Approximately 74 percent of the county is desert/mountains owned by the federal government, Native American nations, or private parties. The Salton Sea occupies approximately 7 percent of the county area.

The Imperial County Ultimate Use Plan, cited in the Ogden report (1993a), states that agriculture is the dominant economic sector of the county. The plan discourages new urban development within or adjacent to existing urban areas and agricultural margin lands. The plan encourages the preservation of prime agricultural land and also emphasizes the preservation of unique natural areas.

2.3 SITE CHARACTERISTICS

NAF El Centro is an operational facility owned and operated by the DON. Land use within the base is generally classified as a current and future "military operating area." Between 1965 and 1983, Magazine Road Landfill was operated as a municipal landfill. The landfill was converted from a former borrow pit. Neither a liner nor a leachate collection system was installed during construction. The dimensions of the landfill are approximately 400 by 600 feet, and the ground surface within the landfill is approximately 4 feet lower than the surrounding ground surface. The waste management practices at the site reportedly included occasional burning of the waste materials. Approximately 60 percent of the Site 1 landfill waste material reportedly consisted of household rubbish (i.e., municipal waste). The remainder comprised industrial wastes, including plating wastes, asbestos, water-bearing fuels, used lubricating oil and hydraulic fluids, paint, solvents, photographic chemicals, sandblasting grit, pesticides, batteries, and spent cartridges (NEESA 1987). The fill materials were reportedly covered with approximately 24 inches of locally derived silty sands when landfill use was discontinued in 1983 (Ogden 1993a). The total volume of fill materials placed in the landfill, including the soil cover, is estimated to be approximately 90,000 cubic yards.

Site 1 is currently vacant and unused.

2.4 RELEASE OR THREATENED RELEASE INTO THE ENVIRONMENT OF A HAZARDOUS SUBSTANCE, POLLUTANT, OR CONTAMINANT

The results of the soil sample analyses performed during the SWAT/SI (Ogden 1993a) indicated that hydrocarbons and several priority pollutant metals were COPCs at Site 1. As part of the Engineering Evaluation/Cost Analysis (EE/CA) prepared for the site, background concentrations of metals were estimated and risk screening was performed to identify chemicals of concern (COCs) from the list of COPCs. Background

concentrations of metals were estimated using a California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC) recommended procedure. This procedure consisted of the following steps:

- combine data from background and site samples for each analyte;
- prepare a cumulative frequency probability plot;
- check normality of data;
- graphically identify the upper limit (UL) of the background population as an inflection point on the highest part of the probability plot;
- extract the background data points from the combined population;
- evaluate the extracted data for anomalies (e.g., data points below the inflection point but an obvious deviation from the linear plot, a coefficient of variation greater than 100 percent, or a range greater than two orders of magnitude); and
- use 95th percentile of the background population as the UL for background concentration.

A summary of the background metals concentrations is shown in Table 2-1.

Due to the uncertainties in direct comparison with the UL values, additional factors were considered in discriminating between background and nonbackground concentrations as an indication of potential contamination at the site. The factors considered in evaluating whether sample results were indicative of potential contamination include the following:

- similar or greater background sample concentrations that also exceed the UL values;
- the magnitude of sample concentration relative to the UL values;
- constituents likely associated with the suspected contaminant source;
- comparison of sample concentrations with laboratory method detection limits in instances where there are no UL values (i.e., where nondetectable concentrations of particular analytes in most background and nonbackground samples precluded calculating a UL value); and
- comparison of sample concentrations with typical concentrations of metals occurring in the western United States (Shacklette et al. 1984) (Table 2-1)

The NCP considers an acceptable lifetime cancer risk as the result of exposure to a carcinogen to be between 1×10^{-6} and 1×10^{-4}. Risk screening was performed by comparing the highest measured concentration of the COPCs in soil to the U.S. EPA Region IX or Cal-EPA-modified preliminary remediation goals (PRGs) for a residential exposure scenario (U.S. EPA 1995). The residential soil PRGs are concentrations corresponding to a lifetime cancer risk of one in a million (1×10^{-6}) for carcinogenic effects and a hazard index of 1.0 for noncarcinogenic effects. Therefore, if the concentration of a chemical exceeds its PRG, the concentration may result in a level of exposure corresponding to an upper-bound cancer risk exceeding 1×10^{-6} if the chemical

Table 2-1
Upper Limit of Background Concentration
Using 95th Percentile of the Background Population

Analyte	Upper Limit of Background Concentration as 95th Percentile (mg/kg)[b]	Typical Metal Concentrations in Soil, Western U.S.[a] (mg/kg)
Arsenic	6.3	< 0.1-97
Beryllium	1.1	< 1-15
Cadmium	4.6	np[c]
Chromium	17	3-2000
Copper	25	2-300
Lead	17	< 10-700
Nickel	20	< 5-700
Silver	0.6	np
Zinc	70	10-2100

Notes:
[a] United States Geological Society Professional Paper 1270 (Shacklette et al. 1984)
[b] mg/kg – milligrams per kilogram
[c] np – not published

is a carcinogen, or it may result in an illness of another type if the chemical is not a carcinogen. The exposure scenario for the residential soil PRGs is unlikely to occur at the site because the site is located in a secured area and residential personnel do not have access to the site. Thus, the results of the risk screening represent a risk greater than is likely to be present at the site.

Cancer risk factors were developed for each carcinogenic COPC, and a hazard index was developed for each noncarcinogenic COPC. Summaries of the risk-screening calculations are provided in Tables 2-2 and 2-3. A discussion of the risk-screening process and the method used to develop background concentrations for COPCs at NAF El Centro are provided in Attachment A.

Those carcinogenic COPCs having a cancer risk factor greater than 1×10^{-6} and those noncarcinogenic COPCs having a hazard index greater than 1.0 were identified as COCs for Site 1. The COCs identified for Site 1 included:

- arsenic,
- chromium (as hexavalent chromium), and
- lead.

Chromium was included as a COC based on the assumption that the chromium observed in the soil sample was hexavalent chromium. This assumption was made as a conservative measure because there are no chromium speciation data available. Due to the unstable nature of hexavalent chromium, this assumption is not likely to be valid.

Table 2-2
Estimated Total Cancer Risk for Chemicals of Potential Concern at Site 1

Chemical	Residential PRG[a] (mg/kg)[b]	Highest Measured Concentration (mg/kg)	Risk
Arsenic	0.32	11.3	3.53×10^{-5}
Beryllium	0.14	1.1	7.86×10^{-6}
Cadmium	9.0[c]	1.1	1.22×10^{-7}
Chromium, total	210	20.6	9.81×10^{-8}
Chromium, hexavalent	(0.2)[c]	(20.6)	(1.03×10^{-4})
Methylene chloride	11	0.06	5.45×10^{-9}
Total Assuming Cr as Total Chromium[d]			**4.34×10^{-5}**
Total Assuming Cr as Cr^{+6}[e]			**(1.46×10^{-4})**

Notes:
[a] PRG – United States Environmental Protection Agency (U.S. EPA) Region IX preliminary remediation goal (PRG) for residential soil (carcinogenic effects), February 1995
[b] mg/kg – milligrams per kilogram
[c] California-modified PRG
[d] assumes trivalent (Cr^{+3}) and hexavalent (Cr^{+6}) chromium in the same proportions as the U.S. EPA Region IX PRG for total chromium
[e] assumes total chromium is hexavalent chromium (Cr^{+6}), California-modified PRG (i.e., 0.2 mg/kg) used in risk calculation

The waste management practices at Magazine Road Landfill included occasional burning. This practice likely resulted in the reduction of organic chemicals in the waste through combustion. The results of the soil sample analyses from the SWAT/SI tend to support this conclusion. Only two of the 30 samples analyzed contained greater than 10 mg/kg of TRPH and TFH. One of these samples (B9-S2-D3.5) was collected from boring B9, which is located approximately 100 feet southeast of the landfill, and it was intended to be a background soil boring. It is suspected that the petroleum hydrocarbon contamination observed in the soil samples collected from B9 is probably related to an off-site source not associated with Site 1.

The COCs identified at Site 1 are the result of past activities at the site. Because these activities are no longer conducted on-site, there is no potential for future additional releases. However, the existing COCs may migrate by several routes.

Table 2-3
Estimated Total Hazard Indices for Chemicals of Potential Concern at Site 1

Chemical	Residential PRG[a] (mg/kg)[b]	Highest Measured Concentration (mg/kg)	Hazard Index
Antimony	31	5.9	0.190
Arsenic	22	11.3	0.514
Beryllium	380	1.1	0.003
Cadmium	38	1.1	0.029
Chromium, hexavalent[c]	380	20.6	0.054
Chromium, total[d]	1×10^5M[e]	20.6	0.006
Copper	2,800	538	0.192
di-n-butyl phthalates	6,500	0.22	0.000
Lead	130	157	1.208
Methylene chloride	1,700	0.06	0.000
Nickel	150	20.2	0.135
Nitrate as N	100,000	67.7	0.001
Silver	380	1.1 J[f]	0.003
Thallium	5.4	1.8	0.333
Toluene	1,900	0.02	0.000
1,1,1-trichloroethane	3,200	0.02	0.000
Xylenes	980	0.01	0.000
Zinc	23,000	418	0.018
Total Hazard Index Assuming Cr as Total Chromium[d]			**2.626**
Total Hazard Index Assuming Cr as Cr^{+6}			**2.680**

Notes:
[a] PRG – United States Environmental Protection Agency (U.S. EPA) preliminary remediation goals (PRG) for residential soil (noncarcinogenic effects), February 1995
[b] mg/kg – milligrams per kilogram
[c] assumes all chromium is hexavalent
[d] assumes trivalent and hexavalent chromium in the same proportions as U.S. EPA Region IX PRG
[e] maximum value (saturated), not included in hazard sum
[f] J – data validation qualifier indicating that the value has been estimated

Groundwater below the site is shallow (i.e., approximately 10 to 12 feet below the ground surface). Vertical migration of the COCs to the groundwater may occur as the result of rainwater percolation through the contaminated soil. Therefore, the potential for groundwater contamination exists.

Humans and ecological receptors may be exposed to near-surface COCs through:

- direct uptake by plants;
- dermal absorption by humans or wildlife;
- ingestion of contaminated food, water, or soil; and

- inhalation of airborne contaminants.

The available data are not adequate to assess the lateral extent of potential soil contamination, or to identify and characterize the extent of potential hot spot contamination within the fill materials. This information is not necessary for selection and design of the removal action alternatives because of the selection of a presumptive remedy.

The COCs identified for the site are considered hazardous substances (as defined by §101[14] of CERCLA), pollutants or contaminants (as defined by §101[33] of CERCLA), and hazardous substances (as defined by Table 302.4 of 40 CFR). Accordingly, the provisions of the NCP apply to Site 1 and to this NTCRA.

2.5 NATIONAL PRIORITIES LIST STATUS

Site 1 is part of the DoD IRP. The IRP is the basis for assessments and response actions on DoD installations. The IRP is designed to identify, confirm, quantify, and remediate problems with past and present management of hazardous wastes. Site 1 is not listed, nor has it been proposed for inclusion, on the National Priorities List (NPL).

2.6 PREVIOUS ACTIONS

Previous environmental investigations conducted at Site 1 included the Preliminary Assessment/Site Inspection (NEESA 1987) and the SWAT/SI (Ogden 1993a). These investigations were described in Section 2.1 (Removal Site Evaluation).

2.7 CURRENT ACTIONS

The DON has initiated a basewide study to characterize groundwater at NAF El Centro in an effort to address groundwater issues at Site 1 as well as at other IRP sites. These efforts are currently underway. The EE/CA (Attachment A) summarizes the previous studies.

As the lead federal agency, the DON has also initiated community relations at NAF El Centro. The attached EE/CA (Attachment A) summarizes the previous studies. These activities have consisted of establishing an information repository that contains the Administrative Record Index (Attachment B). This includes responses to regulatory and public comments (Attachment C) and three public meetings since March 1995, including one open house at NAF El Centro; solicitations to interested parties for participation in a Restoration Advisory Board (RAB); development of fact sheets and brochures describing the IRP and the legal background (Attachment D); and establishment of information repositories. This Action Memorandum, which is available to the public for review and comment at the information repositories, will be included in the Administrative Record. The Administrative Record is located at the Environmental Technical Library, Southwest Division Naval Facilities Engineering Command, 1220 Pacific Highway, Building 129, San Diego, CA 92132-5190. The Point of Contact (POC) is Chris Potter at (619) 532-1144. An index to the Administrative Record is included in Attachment B.

Pertinent documents from the Administrative Record will be available at the following information repositories:

NAF El Centro
Public Works Department
El Centro, CA 92243-5001
POC: Fred Rivera (619) 339-2226

City of El Centro Public Library
539 State Street
El Centro, CA 92243
POC: Librarian (619) 337-4565

City of Brawley Public Library
400 Main Street
Brawley, CA 92227
POC: Librarian (619) 344-1891

Due to limited community interest in the activities at NAF El Centro, a RAB has not yet been established. Future community relations planned for the facility include continued efforts to establish a RAB and updating of the information in the information repositories.

2.8 STATE AND LOCAL ACTIONS TO DATE

Federal Executive Order 12580 delegates to the DoD the President's authority to undertake CERCLA response actions. Congress further outlined this authority in its Defense Environmental Restoration Program (DERP) Amendments, which can be found at 10 USC §2701-2705. Both CERCLA §120(f) and 10 USC §2705 require DON facilities to assure that state and local officials be given the timely opportunity to review and comment on DON response actions. CERCLA §120 further requires the DON to apply state removal and remedial action law requirements at its facilities.

Accordingly, the following agencies have provided technical advice, oversight, and approval during previous activities conducted for Site 1:

- Cal-EPA, DTSC (formerly known as the California Department of Health Services); and
- California Regional Water Quality Control Board (RWQCB), Colorado River Basin Region.

2.9 POTENTIAL FOR CONTINUED STATE AND LOCAL RESPONSE

Cal-EPA DTSC and RWQCB will continue to provide technical advice, oversight, and assistance throughout the IRP process. Because the removal action may generate particulate emissions and fuel-related emissions from the operation of heavy equipment, it is anticipated that the Imperial County Air Pollution Control District (ICAPCD) will also be involved. It is expected that the DON DERP account will continue to fund this program.

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Section 3
THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT

In accordance with the 1990 NCP, the following threats must be considered in determining the appropriateness of a removal action (40 CFR § 300.415[b][2]):

(i) actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations, animals, or food chains;

(ii) actual or potential contamination of drinking water supplies or sensitive ecosystems;

(iii) hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release;

(iv) high levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate;

(v) weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;

(vi) threat of fire or explosion;

(vii) the availability of other appropriate federal or state response mechanisms to respond to the release; and

(viii) other situations or factors that may pose threats to public health or welfare or the environment.

Items (i) and (ii) have been identified as the primary threats for both public health or welfare and the environment at Site 1. The following sections describe the threats to humans and the environment posed by the wastes at Site 1.

3.1 THREATS TO PUBLIC HEALTH OR WELFARE

Based on the available data, the COCs identified for Site 1 are present in near-surface soil. Human exposure to the COCs in near-surface soil may occur through several routes. These include:

- dermal absorption;
- ingestion of contaminated food, water, or soil; and
- inhalation of airborne contaminants.

In addition, vertical migration of the COCs to the groundwater may occur through rainwater percolation through the waste material and contaminated soil. This transport mechanism may result in the contamination of groundwater.

Descriptions of the human-health effects for the three COCs identified for Site 1 are presented below.

- Arsenic is a known human carcinogen, as well as a classic poison. The fatal oral dose for arsenic trioxide is about 120 milligrams in an adult human. For a person weighing 70 kilograms, that amount is equivalent to a dose of 1.7 mg/kg. The toxicity of arsenic is due to its ability to interfere with cellular metabolism by enzyme inhibition. Chronic exposure to arsenic can cause liver and kidney damage, heart failure, anemia, and weight loss.
- Chromium is most commonly found in the forms of trivalent and hexavalent chromium. Trivalent chromium compounds are less soluble in water than hexavalent chromium compounds and are also less toxic. Chromium has been reported to cause contact dermatitis, liver and kidney damage, lung congestion, and lung cancer in humans. Hexavalent chromium also appears to be a cause of lung cancer.
- Lead affects the central and peripheral nervous system, the blood system, the cardiovascular system, and the male reproductive tract. Its effects on the central nervous system are of particular concern. Lead is particularly toxic to children, and exposure to very low levels can result in mental and developmental retardation. U.S. EPA classifies lead as a probable human carcinogen.

3.2 THREATS TO THE ENVIRONMENT

The Ecological Scoping Assessment (included in Attachment A) performed as part of the EE/CA identified potential floral and faunal receptors to the COCs at Site 1. These include the following.

- mammals: Colorado valley wood rat (a California species of special concern), coyote, mice/kangaroo rats, and desert cottontail and black-tailed jack rabbit;
- birds: burrowing owl (a California species of special concern), road runner, and red-tailed hawk;
- reptiles: flat-tailed horned lizard (a California species of special concern); and
- plants: four-wing saltbush and Torrey's sea-blight.

The potential exposure routes include the following:

- direct uptake of the COCs by plants,
- dermal absorption of COCs by wildlife,
- ingestion of the COCs in contaminated food or water sources, and
- inhalation of airborne COCs.

Although potentially complete exposure pathways were identified by the Ecological Scoping Assessment, it was concluded that significant exposure to wildlife was unlikely to occur. The supporting evidence for this conclusion was the limited availability of food sources at the site (i.e., sparse vegetation) and no physical evidence (e.g., burrows or nests) of wildlife activity at the site.

Section 4
ENDANGERMENT DETERMINATION

The risk screening, which was performed for Site 1 by comparing the highest detected concentrations of the COCs to the U.S. EPA Region IX PRGs for a residential exposure scenario, indicates that current conditions at Site 1 pose potential threats to human health and the environment for a future land use such as residential. Actual or potential releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Action Memorandum, may present future endangerment to public health, welfare, or the environment.

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Section 5
PROPOSED ACTIONS AND ESTIMATED COSTS

The U.S. EPA guidance on conducting NTCRAs under CERCLA recommends the use of presumptive remedy guidance, where available and appropriate, to focus the selection of removal action alternatives during the EE/CA process (U.S. EPA 1993a). U.S. EPA has developed presumptive remedy guidance for CERCLA municipal landfill sites (U.S. EPA 1993b). This guidance defines a municipal landfill as "a heterogeneous mixture of municipal waste frequently co-disposed with industrial and/or hazardous waste." Approximately 60 percent of the Site 1 landfill waste material reportedly consisted of household rubbish (i.e., municipal waste); the remainder consists of industrial wastes (e.g., plating wastes, asbestos, water-bearing fuels, used lubricating oil and hydraulic fluids, paint, solvents, photographic chemicals, sandblasting grit, pesticides, batteries, and spent cartridges) (Ogden 1993a). Excavation followed by either treatment or off-site disposal were considered. However, because of the large volume and heterogeneity of the waste materials in landfills, treatment is usually impractical. U.S. EPA generally considers containment to be the appropriate response action, or presumptive remedy, for such sites. Institutional controls may also be necessary to maintain the integrity of the containment system. Controls that restrict access or limit use of the site are considered institutional controls.

The removal action alternatives considered in the EE/CA were consistent with the general response action of containment, the presumptive remedy for landfills. These alternatives included:

- Alternative 1, construction of a multiple-layer cap in general accordance with the technical requirements of Title 23 CCR, Chapter 15, Sections 2580 and 2581;
- Alternative 2, construction of a monolithic cap having a level of performance comparable to the multiple-layer cap; and
- Alternative 3, no action.

The three removal action alternatives were evaluated with respect to effectiveness, implementability, and cost. Effectiveness was evaluated using the Hydrologic Evaluation of Landfill Performance (HELP) model (U.S. EPA 1994). The HELP model estimates landfill performance (i.e., leachate generation) by estimating infiltration, evaporation, and variations in landfill moisture content using characteristics of the landfill cap, and local environmental and meteorological data. A summary of the HELP model performance estimates for each alternative is provided in Table 5-1. Details of the HELP modeling are provided in Attachment A.

Both Alternatives 1 and 2 include provisions for filling of the existing depression at the site to prevent ponding of runoff within the landfill boundaries. Ponding of runoff was identified as the key contributor to the generation of leachate at the site (Table 5-1). The HELP model estimates indicated that the annual average leachate could be reduced by 99 percent by eliminating ponding (see Table 5-1, Alternative 3a versus 3b).

Based on the results of the removal action alternative evaluation, Alternative 2 was selected as the recommended removal action.

Table 5-1
Summary of HELP* Model Calculations

	Alternative	Average Annual Leachate (cubic feet per year)
1.	Multiple-layer cap	0.001
2.	Monolithic cap	0.01
3a	No action (excluding infiltration due to ponding)	8.0
3b.	No action (including infiltration due to ponding)	1,100

Note:
*HELP – Hydrologic Evaluation of Landfill Performance

5.1 PROPOSED ACTION

Alternative 2, construction of monolithic cap having a level of performance comparable to the multiple-layer cap, is the recommended removal action because it is considered to have greater long-term effectiveness and is less expensive than Alternative 1, the multiple-layer cap. Alternative 3, no action, is not recommended because it does not achieve the removal action objectives.

5.1.1 Proposed Action Description

Both Alternatives 1 and 2 include the reuse of an estimated 3,000 cubic yards of soil excavated during removal actions proposed at Site 3 (Sludge Burial Area) and Site 8 (Scrapyard). As described in the EE/CAs for Sites 3 and 8 (BNI 1995a,b), the soils classified as inert will be reused at Site 1. In accordance with CCR Title 23, Chapter 15, Section 2581, the soils generated during the Site 3 and 8 removal actions will be combined with imported soils to construct the foundation layer for the monolithic cap at Site 1.

A monolithic cap consists of a layer of clayey to silty soil with no barrier layer. In arid environments, deep percolation is principally controlled by the ability of the cap to store water within the evaporative zone (e.g., 18 inches or deeper). Therefore, the larger storage capacity (relative to the multiple-layer cap) provided by the monolithic cap is appropriate for the arid environment at NAF El Centro. Recent research has also called into question the adequacy of compacted clay barriers in arid locations such as the site. There is evidence that the clay barriers crack due to desiccation under arid conditions, limiting the effectiveness of these layers in reducing leachate generation (Daniels 1993). The use of monolithic caps as alternatives to standard CCR Title 23 multiple-layer caps for landfills in arid environments has been gaining acceptance in recent years. The RWQCB Santa Ana Region is currently monitoring the performance of a monolithic cap at the Coyote Canyon Landfill.

A conceptual design for the monolithic cap is shown in Figure 5-1. The cap consists of a minimum 48-inch-thick cover consisting of silty to clayey sand with a permeability of 1×10^{-4} to 1×10^{-5} centimeters per second (cm/s) overlain by a 6-inch-thick gravel layer for erosion control. The cap is designed to fill the existing depression and provide a minimum grade of 3 percent away from the center to prevent ponding of runoff. A lined drainage channel will be constructed around the base of the cap to direct runoff from the landfill into the adjacent drainage ditches.

In addition to the above engineering controls, the following institutional controls will be included as part of the removal action. An 8-foot-high, chain-link security fence with a locked gate will be installed around the perimeter of the site to limit site access. Warning signs will be posted on the fence. Two permanent survey monuments will also be constructed to monitor settlement of the landfill.

5.2 POTENTIAL IMPACTS ON SENSITIVE POPULATIONS AND HABITATS

Site 1 is characterized by exposed soil with sparse vegetation. A few four-wing saltbush and Torrey's sea-blight shrubs were observed on the site during the Ecological Scoping Assessment that was performed as part of the EE/CA. It will be necessary to remove this vegetation to perform the proposed removal action. Several kinds of birds, mammals, and possibly reptiles may cross or forage at the site. These animals may include the burrowing owl, Colorado valley wood rat, Yuma clapper rail, and flat-tailed horned lizard, which are California species of special concern. The proposed removal action may have an impact on these species.

Prior to beginning the removal activities, a biologist will inspect the site for the presence of the burrowing owl and the flat-tailed horned lizard (a California species of special concern). If active owl burrows are identified and it is not mating season (i.e., March through June), the burrowing owl residents will be moved to an off-site burrow. Removal action activities will not be performed during the mating season if active burrows are observed on-site. Any Colorado valley wood rat, Yuma clapper rail, and flat-tailed horned lizards observed on the site will be relocated prior to the removal action. Once the site has been inspected by a biologist, the site will be cleared of vegetation.

5.3 POSTREMOVAL SITE CONTROL

The postremoval site-control activities will include periodic inspection and repair of the perimeter fence and signs. The monolithic cap will not require regular maintenance. However, following rainfall events, some erosion of the cap may occur and repairs may be necessary.

5.4 CONTRIBUTION TO REMEDIAL PERFORMANCE

The proposed removal action will eliminate immediate and potential exposure risks to human health and the environment by containing the landfill wastes and associated

contaminated soil in place. The monolithic cap will reduce infiltration of rainfall though the landfill by reducing runoff ponding within the existing depression and by creating a barrier that will retain rainfall within the evaporative zone (see Attachment A). The security fence will limit access to the site and will reduce the potential for humans or animals to enter the site and compromise the cap.

5.5 DESCRIPTION OF ALTERNATIVE TECHNOLOGIES

Construction of a multiple-layer cap (in general accordance with the technical requirements of Title 23 CCR, Chapter 15, Sections 2580 and 2581) and no action were also considered as removal action alternatives for Site 1. Descriptions and estimated total costs of these alternatives are provided below.

5.5.1 Description of Alternative 1, Multiple-Layer Cap

The multiple-layer cap was designed in general accordance with the technical landfill closure requirements of CCR Title 23, Chapter 15, Sections 2580 and 2581. A conceptual design for the multiple-layer cap is shown in Figure 5-1. The cap includes the following components:

- a minimum 24-inch-thick foundation layer;
- a 12-inch-thick clay barrier layer with a permeability of 1×10^{-6} cm/s or less;
- a 24-inch-thick topsoil cover layer; and
- a 6-inch-thick gravel layer for erosion control.

The cap is designed to fill the existing depression and provide a minimum grade of 3 percent away from the center to prevent ponding of runoff. A lined drainage channel will be constructed around the base of the cap to direct runoff from the landfill into the adjacent drainage ditches.

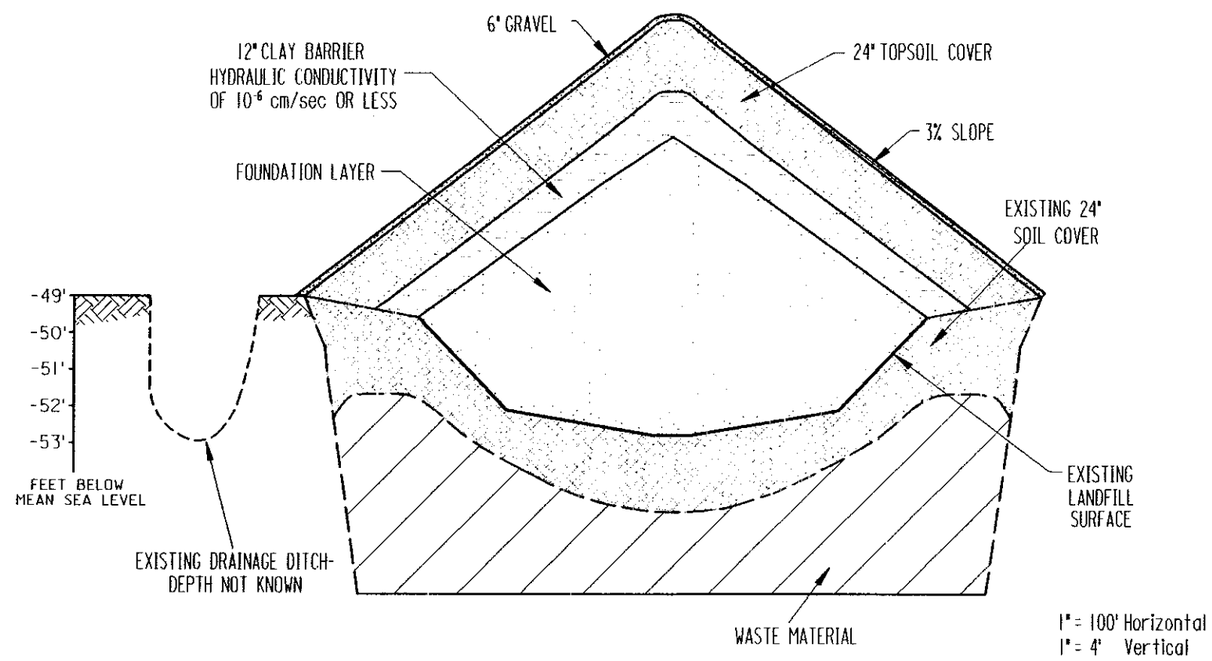
In addition to the above engineering controls, institutional controls were also included as part of this alternative. These included an 8-foot-high, chain-link security fence with a locked gate, warning signs, and two permanent survey monuments.

The estimated cost for Alternative 1 is approximately $1,842,000 (Attachment A). The cost estimates developed for the removal action alternatives are intended for comparative purposes. They are not detailed engineering estimates. The actual cost to implement the removal action may vary from the estimates.

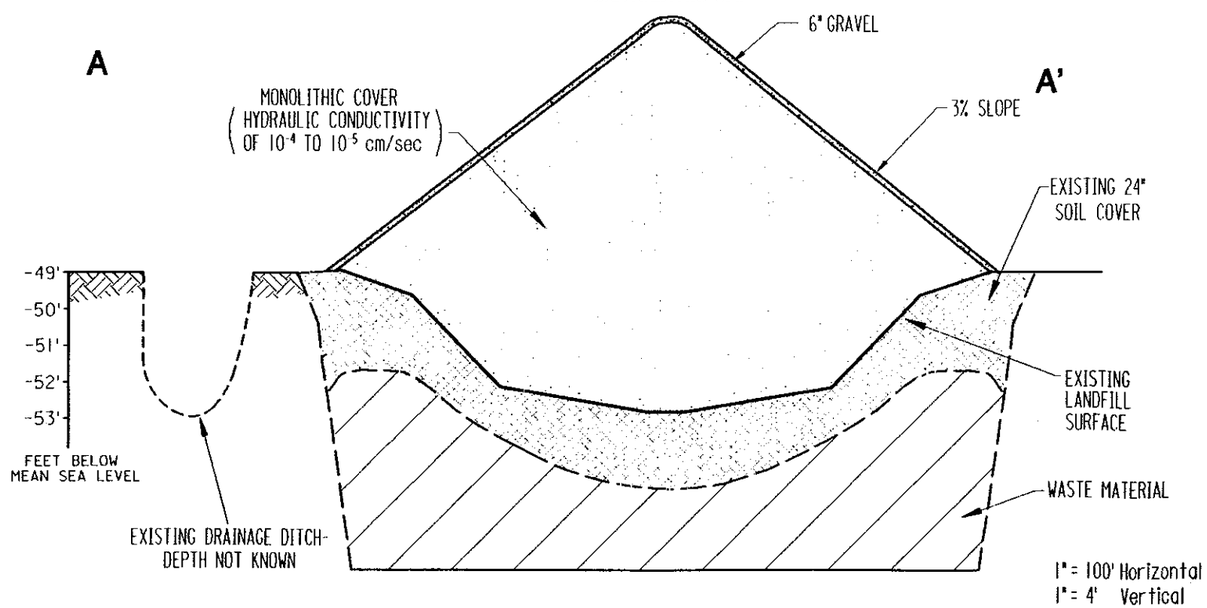
5.5.2 Description of Alternative 3, No Action

Alternative 3 includes no action (i.e., leaving the site as it is). This alternative would not reduce the risk of exposure to the contaminated soil at the site and would not meet removal action objectives. The toxicity, mobility, and volume of COCs would not be reduced. There are no costs associated with this alternative.

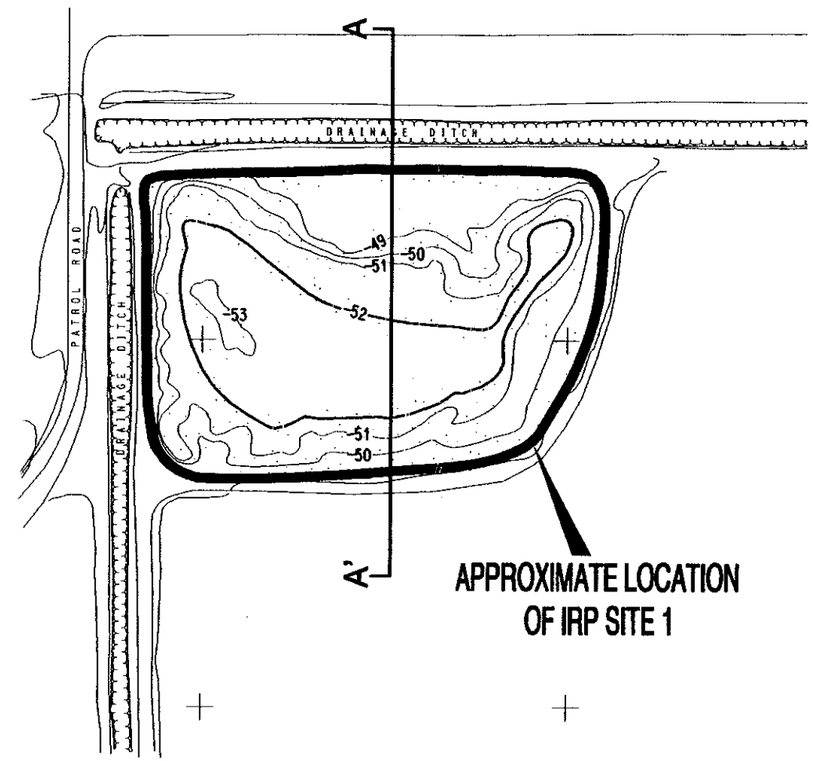
ALTERNATIVE 1
MULTIPLE-LAYER CAP

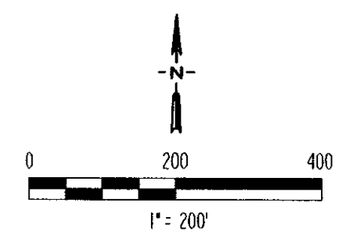


ALTERNATIVE 2
MONOLITHIC CAP



EXISTING TOPOGRAPHY OF SITE 1





A A' APPROXIMATE LOCATION OF CROSS SECTION

CONTOUR INTERVAL IN FEET
BELOW MEAN SEA LEVEL

Action Memorandum

Figure 5-1

Conceptual Design For Removal Action Alternatives 1 and 2 Magazine Road Landfill

NAF El Centro, Imperial County, California

5.6 ENGINEERING EVALUATION/COST ANALYSIS

An EE/CA has been developed for this NTCRA (Attachment A). Several removal action alternatives for the contaminated soil at Site 1 were identified and compared in the EE/CA. The EE/CA was released for public review and comment. An Administrative Record has been developed and is available for public review. The public comment period on the EE/CA and draft Action Memorandum occurred from 04 November to 04 December 1996. Responses to regulatory comments to the EE/CA are provided in Attachment C; no public comments were received.

5.7 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Section 300.415(i) of the NCP provides that removal actions must meet applicable or relevant and appropriate requirements (ARARs) to the extent practicable, considering the exigencies of the situation.

Section 300.5 of the NCP defines applicable requirements as cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state environmental or facility-siting laws that specifically address a hazardous substance, pollutant, or contaminant; remedial action; location; or other circumstances at a CERCLA site.

Section 300.5 of the NCP defines relevant and appropriate requirements as cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental or facility-siting laws that, while not "applicable" to a hazardous substance, pollutant, or contaminant; remedial action; location; or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site and are well-suited to the particular site.

Since CERCLA on-site response actions do not require permitting, only substantive requirements are considered as possible ARARs. Administrative requirements such as approval of or consultation with administrative bodies, issuance of permits, documentation, reporting, record keeping, and enforcement, are not ARARs for CERCLA actions confined to the site. Only those state standards that are identified by a state in a timely manner and are more stringent than federal requirements may be applicable or relevant and appropriate. ARARs must be identified on a site-specific basis from information about specific chemicals at the site, specific features of the site location, and actions that are being considered as removal actions.

As the lead federal agency, the DON is primarily responsible for identifying federal ARARs at Site 1. As the lead state agency, Cal-EPA has the responsibility for identifying state ARARs. In a letter dated 13 April 1995, the DON requested that Cal-EPA identify ARARs for the NAF El Centro IRP sites, including Site 1. On 21 June 1995, Cal-EPA submitted a letter to the DON listing a wide variety of state ARARs for the NAF El Centro IRP sites (Cal-EPA 1995). Many of the ARARs identified by the state

agencies were not relevant to the activities planned for Site 1 and are not discussed in this document. The ARARs analysis presented in this Action Memorandum represents a summary of the information provided by Cal-EPA. A detailed evaluation of ARARs is provided in the EE/CA (Attachment A).

There are three types of ARARs. The first type includes "chemical-specific" requirements. These ARARs set limits on concentrations of specific hazardous substances, contaminants, and pollutants in the environment. Examples of this type of ARAR are ambient water-quality criteria and drinking water standards. The second type of ARAR includes "location-specific" requirements that set restrictions on certain types of activities, based on site characteristics. These include restrictions on activities in wetlands, floodplains, and historic sites. The third type of ARAR includes "action-specific" requirements. These are technology-based restrictions that are triggered by the type of action under consideration. Examples of action-specific ARARs are Resource Conservation and Recovery Act (RCRA) regulations for waste treatment, storage, and disposal.

The principal controlling ARARs for the proposed activities at Site 1 are the requirements for landfill closure contained in Title 23, CCR, Chapter 15, Sections 2510, 2546, 2550, 2580, and 2581. Other ARARs related to landfill closure and postclosure care are provided in Title 14 CCR, Chapter 3, Article 7.8. Although not an ARAR, the U.S. EPA presumptive remedy guidance for municipal landfills (U.S. EPA 1993) has been identified as a "to be considered" requirement. Additionally, various rules and regulations of the ICAPCD promulgated pursuant to the Clean Air Act will be ARARs for construction activities associated with the removal at Site 1.

5.7.1 CHEMICAL-SPECIFIC ARARs

The proposed removal action does not involve groundwater, surface water, or air. Therefore, there were no chemical-specific ARARs for these media. Summaries of the federal and state chemical-specific ARARs for soil are provided in Tables 5-2 and 5-3 and are discussed below.

5.7.1.1 FEDERAL SOIL ARARs

Soil classified as inert from proposed removal actions at IRP Sites 3 and 8 will be incorporated into the foundation layer for the final landfill cap at Site 1. Because this soil will require characterization and classification prior to use at Site 1, the RCRA hazardous waste regulations are the controlling chemical-specific ARARs for soil reused at Site 1. The requirements that determine whether a waste is a RCRA hazardous waste are described in Title 22 CCR 66261.100. The applicable chemical-specific standards of RCRA include the maximum concentrations of contaminants for toxicity characteristics (Title 22 CCR 66261.24a[1]). Other RCRA Subtitle C technical requirements do not apply and are not relevant and appropriate to this removal action because hazardous waste will not be generated, transported, treated, stored, or disposed at Site 1. A summary of the federal chemical-specific ARARs for soil is provided in Table 5-2.

Table 5-2
Federal Chemical-Specific ARARs[a]

Requirement	Prerequisite	Citation	ARAR[b] Determination	Comments
SOIL				
Resource Conservation and Recovery Act				
Definition of RCRA[c] hazardous waste.	Waste soil	Title 22 CCR[d] Sections 66261.21, 66261.22(a)(1) and (2) 66261.23, 66261.24(a)(1), and 66261.100	Applicable	Applicable for determining whether excavated soil imported to Site 1 from Sites 3 and 8 is hazardous waste.

Notes:

[a] Statutes and policies, and their citations, are provided as headings to identify general categories of applicable or relevant and appropriate requirements (ARARs) for the convenience of the reader. Listing the statutes and policies does not indicate that the Department of the Navy accepts the entire statutes or policies as ARARs. Specific ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered ARARs.

[b] Chemical-specific concentrations used for removal action alternative evaluation may not be ARARs indicated in this table, but may be based upon other factors. Such factors may include the following:

- human health risk-based concentrations (preliminary remediation goals 40 CFR 300.430[e][A][1] and [2]),
- ecological risk-based concentrations (40 CFR 300.430[e][G]), and
- practical quantitation limits of contaminants (40 CFR 300.430[e][A][3]).

Many action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables.

[c] RCRA – Resource Conservation and Recovery Act

[d] CCR – *California Code of Regulations*

Table 5-3
State Chemical-Specific ARARs[a]

Requirement	Prerequisites	Citation	ARAR Determination[b]	Comments
GROUNDWATER, SURFACE WATER, AND SOIL				
California Environmental Protection Agency Department of Toxic Substances Control (DTSC)				
Definition of non-RCRA[c] hazardous waste.	Waste soil	22 CCR[d] 66261.22(a)(3) and (4), 66261.24(a)(2) to (a)(8), 66261.101, 66261.3(a)(2)(C), or 66261.3(a)(2)(F)	Applicable	Applicable for determining whether excavated soil imported to Site 1 from Sites 3 and 8 is a non-RCRA hazardous waste.
State MCL[e] list.	Public water system	22 CCR 64435 and 64444.5	Not an ARAR	
State SMCL[f] list.	Public water system	22 CCR 64473	Not an ARAR	
State and Regional Water Quality Control Board[g]				
Authorizes the state and regional water boards to establish in Water Quality Control Plans beneficial uses and numerical and narrative standards to protect both surface and groundwater quality; authorizes regional water boards to issue permits for discharges to land or surface or groundwater that could affect water quality, including National Pollutant Discharge Elimination System (NPDES) permits, and to take enforcement action to protect water quality.	Existence of surface water or groundwater	California Water Code, Division 7, Sections 13241, 13243, 13263(a), and 13360 (Porter-Cologne Water Quality Control Act)	Not an ARAR	Removal action will not affect surface water quality or address groundwater.
		Other provisions of Porter-Cologne Water Quality Control Act	Not an ARAR	

(table continues)

Table 5-3 (continued)

Requirement	Prerequisites	Citation	ARAR Determination	Comments
Describes the water basins in Colorado River Basin region, establishes beneficial uses of groundwater and surface water, establishes water quality objectives, including narrative and numerical standards, establishes implementation plans to meet water quality objectives and protect beneficial uses, and incorporates statewide water quality control plans and policies.	Existence of surface water or groundwater	Comprehensive Water Quality Control Plan for the Colorado River (Water Code 13240)	Not an ARAR	Substantive provisions would be ARARs for removal actions affecting water quality. The removal action at Site 1 will not affect surface water quality or address groundwater.
Incorporated into all regional Board Basin Plans; designates all groundwater and surface water of the state as drinking water except where the total dissolved solids are greater than 3,000 ppm[h], the well yield is less than 200 gallons per day from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonably be treated for domestic use using either best management practices or best economically achievable treatment practices.	Existence of surface water or groundwater	State Water Resources Control Board Resolution No. 88-63 (Sources of Drinking Water Policy)	Not an ARAR	Not applicable because the removal action at Site 1 will not affect surface water quality or address groundwater.

Notes:

[a] Statutes and policies, and their citations, are provided as headings to identify general categories of applicable or relevant and appropriate requirements (ARARs) for the convenience of the reader. Listing the statutes and policies does not indicate that the Department of the Navy accepts the entire statutes or policies as ARARs. Specific ARARs are addressed in the table below each general heading; only substantive requirements of specific citations are considered ARARs.

[b] Chemical-specific concentrations used for the removal action alternative evaluation may not be ARARs indicated in this table, but may be concentrations based upon other factors. Such factors may include the following:

- human-health risk-based concentrations (preliminary remediation goals 40 CFR 300.430[e][A][1] and [2]),
- ecological risk-based concentrations (40 CFR 300.430[e][G]), and
- practical quantitation limits of contaminants (40 CFR 300.430[e][A][3]).

Many action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables.

[c] RCRA – Resource Conservation and Recovery Act

[d] CCR – *California Code of Regulations*

[e] MCL – maximum contaminant level

[f] SMCL – secondary maximum contaminant level

[g] California Regional Water Quality Control Board, Colorado River Basin Region

[h] ppm – parts per million

5.7.1.2 STATE SOIL ARARs

Title 22 CCR is applicable, and its chemical-specific requirements for characterization of the excavated soil transported from Sites 3 and 8 to Site 1 include the list of inorganic persistent and bioaccumulative toxic substances (Title 22 CCR 66261.24[a][2][A]) as well as the list of organic persistent and bioaccumulative toxic substances (Title 22 CCR 66261.24[a][2][B]). A summary of the state chemical-specific ARARs for soil is provided in Table 5-3.

5.7.2 Location-Specific ARARs

The Ecological Scoping Assessment performed as part of this EE/CA identified the potential for California species of special concern to use the site. These species include the burrowing owl, Colorado valley wood rat, Yuma clapper rail, and flat-tailed horned lizard. The flat-tailed horned lizard has also been proposed for inclusion on the federal threatened and endangered species list. Based on this assessment, the Endangered Species Act of 1973 is identified as a federal location-specific ARAR because the removal actions will involve disruption of potential habitats.

Because Site 1 is proximate to the New River but outside the 100-year floodplain, Executive Order 11988, Protection of Floodplains, is also identified as a relevant and appropriate federal location-specific ARAR.

Because the ESA identified the potential for California species of special concern to use the site and because the removal action will disturb the site and potential habitats, provisions of the California Fish and Game Code pertaining to actions that may jeopardize the survival and reproduction of these species are identified as state location-specific ARARs. No other state location-specific ARARs were identified. Summaries of the federal and state location-specific ARARs are provided in Tables 5-4 and 5-5.

5.7.3 Action-Specific ARARs

Action-specific ARARs are addressed according to anticipated activities at Site 1. With the exception of the no action alternative, the removal action alternatives considered in this EE/CA involve construction of a landfill cap, control of surface drainage, and supplemental institutional controls. Federal and state action-specific ARARs are summarized in Tables 5-6 and 5-7 and discussed below.

5.7.3.1 LANDFILL CLOSURE

The substantive portions of Title 22 CCR 66264.111, which involve closure of hazardous waste management facilities, are identified as relevant and appropriate ARARs for the removal action objective of closure. This regulation establishes the general performance standard for closure of landfills in which hazardous waste was placed after 19 November 1980, the effective date of the RCRA regulations.

Table 5-4
Federal Location-Specific ARARs[a]

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Executive Order 11988, Protection of Floodplains					
Within floodplain	Actions taken should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.	Action that will occur in a floodplain (i.e., lowlands) and relatively flat areas adjoining inland and coastal waters and other flood-prone areas	40 CFR[b] 6, Appendix A, excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Relevant and appropriate	Site 1 is not located within the 100-year floodplain of the New River but is in a flat area proximate to the river.
Endangered Species Act of 1973					
Critical habitat upon which endangered species or threatened species depend	Action to conserve endangered species or threatened species, including consultation with the Department of the Interior.	Determination of effect upon endangered or threatened species or its habitat	16 USC[c] 1536(a)	Relevant and appropriate	Relevant and appropriate because the ecological scoping assessment conducted for Site 1 indicates that proposed endangered species have the potential to use the site.

Notes:

[a] Statutes and policies, and their citations, are provided as headings to identify general categories of applicable or relevant and appropriate requirements (ARARs) for the convenience of the reader. Listing the statutes and policies does not indicate that the Department of the Navy accepts the statutes or policies in their entirety as ARARs. Specific ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered ARARs.

[b] CFR – *Code of Federal Regulations*

[c] USC – *United States Code*

Table 5-5
State Location-Specific ARARs*

Location	Requirement	Prerequisites	Citation	ARAR Determination	Comments
Fish and Game Code*					
Endangered species habitat	No person shall import, export, take, possess, or sell any endangered or threatened species or part or product thereof.	Threatened or endangered species determination on or before 1 January 1985 or a candidate species with proper notification	Fish and Game Code Section 2080	Relevant and appropriate	Ecological scoping assessment identified potential for two California species of special concern to use the site. One of these species (the flat-tailed horned lizard) has been proposed as a threatened species for inclusion on the federal threatened and endangered species list.
Endangered species habitat	Department policy and legislative findings and definitions for significant natural areas.		Fish and Game Code Sections 2050-2068	Not an ARAR	Procedural; not a "cleanup standard, standard or control," or "other substantive requirement, criteria, or limitation."
Endangered species habitat	Assures that action taken will not jeopardize the survival and reproduction of any threatened or endangered species.		Fish and Game Code Sections 2090-2096	Not an ARAR	Not effective after 1 January 1994.

Notes:
*Statutes and policies, and their citations, are provided as headings to identify general categories of applicable or relevant and appropriate requirements (ARARs) for the convenience of the reader. Listing the statutes and policies does not indicate that the Department of the Navy accepts the statutes or policies in their entirety as ARARs. Specific potential ARARs follow each general heading; only substantive requirements of the specific citations are considered ARARs.

Table 5-6
Federal Action-Specific ARARs[a]

Action	Requirement	Prerequisites	Citation	ARAR Determination A[b]	RA[c]	TBC[d]	Comments
Resource Conservation and Recovery Act 42 USC[e] 6901 et seq.							
Closure	General performance standard requires minimization of need for further maintenance and to the extent necessary to protect human health and the environment, postclosure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products.	Land-based unit containing hazardous waste. Hazardous waste placed at site after the effective date of the requirements. Not applicable to material treated, stored, or disposed only before the effective date of the requirements, or if treated *in situ*, or if consolidated within area of contamination.	22 CCR[f] 264.111 and 22 CCR 264.114 except for cross-references to procedural requirements such as preparation and submittal of closure plans and other notifications		x		Requirement relevant and appropriate for sites where hazardous waste is placed after 19 November 1980 and closure is a removal action objective. This is potentially the case at Site 1.
Hazardous waste landfill final cover	Technical requirements for closure of hazardous waste landfill. Final cover must prevent downward entry into closed landfill for minimum of 100 years, function with minimum maintenance, promote drainage and minimize erosion and abrasion of the cover, accommodate earthquake shear forces, have a permeability less than any bottom liner or native subsoils, and comply with prescribed design standards. Variances are permitted if public health and the environment are protected.	Landfill that received hazardous waste after 19 November 1980.	22 CCR 66264.310 (a)	x			Applicable because Site 1 may have received hazardous waste after 19 November 1980.
Postclosure maintenance of hazardous waste landfill	Maintain integrity of final cover, continue to operate leachate collection system until leachate is no longer produced, maintain and operate groundwater monitoring system, prevent run-on and runoff from damaging final cover, protect and maintain surveyed benchmarks.	Closed landfill that received hazardous waste after 19 November 1980.	22 CCR 66264.310 (b)	x			Applicable because Site 1 may have received hazardous waste after 19 November 1980.

(table continues)

Table 5-6 (continued)

Action	Requirement	Prerequisites	Citation	ARAR Determination A[b]	RA[c]	TBC[d]	Comments
CERCLA[g] response action at municipal landfill	Containment is presumptive remedy for CERCLA response actions at municipal landfills. Elements of remedy include, as appropriate, a landfill cap, monitoring and mitigation of groundwater impact at the landfill perimeter, landfill gas collection and treatment, leachate collection and treatment, and supplemental institutional controls.	CERCLA removal or remedial action at a municipal landfill site.	OSWER[h] Directive No. 9355.0-49FS			x	Not a law or promulgated regulation but to be considered because it addresses situations similar to Site 1.
Clean Air Act 40 USC 7401 et seq.							
Discharge to air	Provisions of State Implementation Plan approved by U.S. EPA[i] under Section 110 of CAA[j].	Major sources of air pollutants.	40 USC Section 7410; portions of 40 CFR[k] Section 52.220 applicable to ICAPCD[l]	x			Specific pertinent rules are listed below.
Fugitive dust emissions	Persons engaging in the handling, transport, or disposition of bulk materials shall apply reasonably available control measures to prevent fugitive dust emissions.	Engaging in nonexempt handling, transport, or disposition of bulk materials.	ICAPCD Regulation VIII	x			Removal action will involve nonexempt handling, transport, and disposition of bulk materials
Opaque emissions	Release or discharge to the atmosphere from a single source of emission of an air contaminant darker than No. 1 on the Ringleman chart for a period or periods of more than 3 minutes in any hour.	Discharge of opaque emissions.	ICAPCD Rule 401	x			May be applicable to emissions from fuel-burning equipment.

(table continues)

Table 5-6 (continued)

Notes:

[a] Statutes and policies, and their citations, are provided as headings to identify general categories of applicable or relevant and appropriate requirements (ARARs). Specific ARARs are addressed in the table below each general heading.

[b] A – applicable

[c] RA – relevant and appropriate

[d] TBC – to be considered

[e] USC – *United States Code*

[f] CCR – *California Code of Regulations*

[g] CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act (1980)

[h] OSWER – (U.S. EPA) Office of Solid Waste Emergency Response

[i] U.S. EPA – United States Environmental Protection Agency

[j] CAA – Clean Air Act

[k] CFR – *Code of Federal Regulations*

[l] ICAPCD – Imperial County Air Pollution Control District

Table 5-7
State Action-Specific ARARs[a]

Action	Requirement	Prerequisites	Citation	ARAR Determination A[b]	RA[c]	TBC[d]	Comments
California Code of Regulations, Title 23, Chapter 15							
Landfill closure	Technical requirements for final cover and grading of landfills during closure, placement of survey monuments, and selection of vegetative cover. Variances are permitted for alternatives to prescribed regulatory design standards if equivalent protection against water quality impairment is achieved.	Disposal of waste in landfill	23 CCR[e] 2580, 2581(a), 2581(b) and 2510(b)	X			Applicable to closure of landfill at Site 1.
Postclosure maintenance of landfill	Maintain structural integrity of final cover against settlement and other factors, prevent erosion-related damage to final cover, protect and maintain survey monuments, operate leachate collection system until leachate is no longer produced, maintain and operate groundwater monitoring system.	Closed landfill	23 CCR 2581(c)	X			Applicable to postclosure care of Site 1.
California Code of Regulations, Title 14, Chapter 3, Article 7.8							
Landfill closure	Technical requirements for the construction of final landfill cover, grading slope stability, drainage and erosion control, and construction quality assurance.	Disposal of waste in landfill	14 CCR 17773, 17774, 17776, 17777, 17778, and 17779	X			Applicable to closure of landfill at Site 1. Requirements are essentially equivalent to Title 23 Chapter 15 requirements.
Postclosure maintenance of landfill	Postclosure maintenance requirements, including maintenance of final cover and slope, landfill gas and leachate mitigation as necessary, groundwater monitoring, and site security, for minimum of 30 years. Restriction on postclosure land use.	Closed landfill	14 CCR 17767, 17781, 17782, 17783, 17788, and 17796	X			Applicable to postclosure care of Site 1.

(table continues)

Table 5-7 (continued)

Action	Requirement	Prerequisites	Citation	ARAR Determination A[b]	RA[c]	TBC[d]	Comments
California Health and Safety Code, Chapter 6.8							
Removal action	Except as provided in subdivision (h), the department or, if appropriate, the regional board shall prepare or approve remedial action plans for all sites listed pursuant to Section 25356.	Removal action is planned	Section 25356.1(b)	X			Applicable because a removal action is planned.
Removal action	A remedial action plan is not required if conditions present at a site present an imminent or substantial endangerment to the public health and safety or to the environment, or if the estimated cost of the removal action is less than $1 million.	Removal action is planned	Section 25356.1(h)(1)	X			Applicable because the removal action is projected to cost less than $1 million.
Removal action	The department or a regional board shall prepare or approve a removal action work plan for all sites where a nonemergency removal action is proposed and where a remedial action plan is not required.	Nonemergency removal action is planned	Section 25356.1(h)(1)	X			Applicable because a nonemergency removal action is planned and a remedial action plan is not required.

(table continues)

Table 5-7 (continued)

Action	Requirement	Prerequisites	Citation	ARAR Determination A[b]	RA[c]	TBC[d]	Comments
California Health and Safety Code, Chapter 6.8							
Removal action	"Removal action work plan" means a work plan prepared or approved by the department or a California regional water quality control board which is developed to carry out a removal action, in an effective manner, which is protective of the public health and safety and the environment. The removal action work plan shall include a detailed engineering plan for conducting the removal action, a description of the on-site contamination, the goals to be achieved by the removal action, and any alternative removal options that were considered and rejected and the basis for that rejection.	Removal action planned for which a removal action work plan is required	Section 25323.1		X		Relevant and appropriate content requirements for the Engineering Evaluation/Cost Analysis.

Notes:

[a] Statutes and policies, and their citations, are provided as headings to identify general categories of potential applicable or relevant and appropriate requirements (ARARs). Specific ARARs are addressed in the table below each general heading.

[b] A – applicable

[c] RA – relevant and appropriate

[d] TBC – to be considered

[e] CCR – *California Code of Regulations*

The technical requirements for design of a hazardous waste landfill final cover are provided in Title 22 CCR 66264.310. Variances from the technical requirements are permitted for alternative landfill cover designs that protect public health and the environment (Title 22 CCR 66264.310[a][7]). These requirements are applicable ARARs for the removal action at Site 1. U.S. EPA has issued guidance (U.S. EPA 1993b) on presumptive remedies for CERCLA response actions at municipal landfill sites. Although this guidance is not a law or promulgated regulation, and therefore not an ARAR, it is identified as a "to be considered" requirement for Site 1 because it addresses situations similar to Site 1.

The technical requirements of Title 23 CCR, Chapter 15, which address landfill closure, are identified as applicable ARARs for the removal action at Site 1. Variances from landfill cover and grading requirements are permitted (see Title 23 CCR 2510[b]) if an alternative design is consistent with the performance goal of the regulatory design standard and achieves equivalent protection against water quality impairment. Per Title 23 CCR 2581(a)(1), the use of waste materials, including contaminated soil, is allowed in the foundation layer of the final cap under certain circumstances.

Title 14 CCR, Chapter 3, Article 7.8 contains additional requirements for the closure and postclosure care of solid waste disposal sites, including landfills. Portions of these regulations are also identified as applicable ARARs for the removal action at Site 1.

5.7.3.2 REMOVAL ACTION

Ca-HSC Section 253561.1(b) states that except as provided in subdivision (h), a Remedial Action Plan (RAP) shall be prepared for a site where a removal action is planned. Ca-HSC Section 25356.1(h)(1) states that an RAP is not required if the conditions present at a site present an imminent or substantial endangerment to the public health and safety or to the environment, or if the estimated cost of the removal action is less than $1 million. However, an RAWP must be prepared if a nonemergency removal action is proposed and an RAP is not required. The planned removal action is estimated to cost less than $1 million; therefore, the EE/CA is intended to meet the requirements of the RAWP. The RAWP as defined in Ca-HSC Section 25323.1 includes a detailed engineering plan for conducting the removal action, a description of the on-site contamination, the goals to be achieved by the removal action, and discussion of any alternative removal options that were considered and rejected, and the basis for that rejection.

5.7.3.3 EMISSIONS

Fugitive dust may be generated during construction of the landfill cap. The provisions of the ICAPCD Regulation VIII are considered applicable ARARs for these activities. ICAPCD Regulation VIII requires that reasonably available control measures be applied to prevent fugitive dust emissions.

ICAPCD Rule 401 is applicable to mobile fuel-burning equipment. The requirements of Rule 401 prohibit the emission of air contaminants darker than No. 1 on the Ringleman chart for more than 3 minutes in any hour.

5.8 PROJECT SCHEDULE

The removal action at Site 1 is scheduled for funding in late 1997 or early 1998. Because the soil from Sites 3 and 8 will be used in the foundation of the cap planned for Site 1, the removal action schedule for Site 1 will be coordinated with the removal action schedules for Sites 3 and 8. The schedule for the removal action at Site 1 is subject to change, depending on the work schedules at the other sites and funding constraints.

The anticipated removal action schedule for Site 1 is as follows:

Draft EE/CA and Action Memorandum	October 1996
Issued for Public Comment	November 1996
Response to Public Comments	December 1996
Final EE/CA and Action Memorandum	February 1997
Design and Work Plan Preparation	May 1997 - August 1997
NTCRA Implementation	October 1997 - January 1998

5.9 ESTIMATED COSTS

The estimated costs for the proposed removal action (Alternative 2) are summarized in Table 5-8. Details of the cost estimating procedure are provided in the EE/CA (Attachment A). The cost estimates developed for the recommended removal action alternative were intended for comparative purposes. They are not detailed engineering estimates. The actual cost to implement the recommended removal action may vary from these estimates.

Table 5-8
Cost Estimate[a]
Alternative 2 - Monolithic Cap

Cost Category	Estimated Cost
Direct Costs[b]	
Capping	$335,000
Professional labor (project oversight)	6,000
Fencing and signs	64,000
Total Direct Costs	**$405,000**
Indirect Costs[c]	190,000
Remedial Design	27,000
Escalation[d]	72,000
Contingency[e]	139,000
TOTAL	**$833,000**

Notes:
[a] these estimated costs are conceptual and should be used for comparative purposes only
[b] costs of materials and labor directly associated with construction (e.g., fill materials, grading operations)
[c] general conditions costs associated with project support (e.g., supervision, consumable materials and supplies, mobilization)
[d] escalation modifies the costs in the Remedial Action Cost Engineering and Requirements database from January 1992 to the assumed project start date
[e] a 20-percent contingency has been added to cover cost increases that may occur as a result of unforeseen conditions and changes that typically occur on remediation projects

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Section 6
EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Because Site 1 is currently not used by NAF El Centro personnel, the COCs identified at the site do not pose an immediate threat to human health. In addition, there is no evidence that ecological receptors are currently impacted by the COCs at the site. If action should be delayed or not taken, future use of the site by humans and ecological receptors may result in exposures through several exposure pathways, including inadvertent ingestion of soil, dermal contact with soil, and inhalation of airborne particulates. Contamination could also potentially spread to groundwater by rainwater percolation through waste materials and associated contaminated soil. This spread of contamination may result in increased risk to the exposed populations.

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Section 7
OUTSTANDING POLICY ISSUES

There are no outstanding policy issues with regard to the proposed removal action.

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Section 7
OUTSTANDING POLICY ISSUES

There are no outstanding policy issues with regard to the proposed removal action.

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Section 8
RECOMMENDATION

This decision document represents the selected removal action for Site 1 (Magazine Road Landfill), NAF El Centro, El Centro, California, that was developed in accordance with CERCLA, as amended, and is consistent with the NCP. This decision is based on the administrative record for the site.

Signature: _____ Date: 12 Feb 97

P. T. MADISON
Captain, U.S. Navy
Commanding Officer

Section 9
REFERENCES

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BNI. *See* Bechtel National, Inc.

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Ogden Environmental and Energy Services. 1993a. Final Solid Waste Water Quality Assessment (SWAT), Site Investigation Report (SI), Site 1 Magazine Road Landfill, Site 2 Patrol Road Landfill, Site 3 Sludge Disposal Area. May.

———. 1993b. Final Site Investigation Report (SI), Site 4 – Fourth Street Fire Fighting Training Area, Site 5 – Fire Fighting Training Area East of Hangar Number Three, Site 6 – Northwest Fire Fighting Training Area, Site 7 – Abandoned Fuel Farm, Site 8 – Scrap Yard, Site 9 – Transformer Storage Area, and Site 11– Runway Burn Area. May.

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ATTACHMENT A

ENGINEERING EVALUATION/COST ANALYSIS

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Room 135
San Diego, California 92132-5187

Contract No. N68711-92-D-4670

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN II

FINAL ENGINEERING EVALUATION/ COST ANALYSIS SITE 1, MAGAZINE ROAD LANDFILL NAVAL AIR FACILITY EI CENTRO, CALIFORNIA

CTO-0090/0277

February 1997

Prepared by:

BECHTEL NATIONAL, INC.
401 West A Street, Suite 1000
San Diego, California 92101

Signature: _____ Date: 10-Feb-97
Gregory A. Cagle, R.G., CTO Leader

SUMMARY

This Engineering Evaluation/Cost Analysis (EE/CA) was performed in accordance with current United States Environmental Protection Agency (U.S. EPA) and U.S. Navy guidance documents for a non-time-critical removal action under the Comprehensive Environmental Response, Compensation, and Liability Act and Chapter 6.8 results of the California Health and Safety Code. This document characterizes the site, identifies removal action objectives, describes removal action alternatives, contains analysis of these alternatives, and describes the recommended removal action alternative.

This EE/CA was performed as part of National Oil and Hazardous Substances Pollution Contingency Plan requirements to evaluate potential removal actions for the Magazine Road Landfill, Installation Restoration Program Site 1, at Naval Air Facility El Centro.

The Magazine Road Landfill was operated as a municipal landfill between 1965 and 1983. The landfill was converted from a former borrow pit, and neither a liner nor a leachate collection system was installed during construction. The dimensions of the landfill are approximately 400 by 600 feet; the ground surface within the landfill is approximately 4 feet lower than the surrounding ground surface. The waste management practices at Site 1 reportedly included monthly burning to reduce the waste volume. The fill materials were reported to be covered with approximately 24 inches of locally derived soils when landfill use was discontinued in 1983.

Limited data collected during a Solid Waste Water Quality Assessment Test/Site Investigation (SWAT/SI) (Ogden 1993a) suggest that metals are the primary contaminants of concern at the site. These data suggest that the occurrence of elevated metals concentrations is principally limited to the fill materials. Lead and arsenic were the only metals detected at concentrations likely to cause significant risk to human health. The available data are not adequate to assess the lateral extent of potential soil contamination, or to identify and characterize the extent of potential hot spot contamination within the fill materials. However, the existing information is sufficient to select and develop a conceptual design for a U.S. EPA presumptive remedy.

The scope of this removal action is to reduce the potential for human and ecological exposure to the landfill wastes and potentially contaminated soils, as well as to reduce the potential for the generation and migration of leachate. The practice of burning wastes at a landfill typically reduces the volume of organic wastes that may decay and produce landfill gases. Since limited organic wastes were reported during the SWAT/SI, it is concluded that the Site 1 fill materials are unlikely to produce landfill gases, and mitigation of landfill gases is not included in the scope of the proposed removal action. Available data are not sufficient to assess if groundwater at the site is impacted by the landfill. Evaluation of potential groundwater impacts at the site is beyond the scope of this EE/CA. Installation and monitoring of additional groundwater monitoring wells is recommended to further assess the potential impact of the landfill on groundwater.

Based on U.S. EPA presumptive remedy guidance for municipal landfill sites, the removal action alternatives evaluated included construction of a cap. Three removal action alternatives, including the no action alternative, were evaluated:

- Alternative 1 - construction of a multiple-layer cap designed in general accordance with the technical requirements of *California Code of Regulations* (CCR) Title 23, Chapter 15, Sections 2580 and 2581;
- Alternative 2 - construction of a monolithic (single-layer) cap, which is proposed as a suitable substitute for the prescriptive landfill closure requirements of CCR Title 23 (i.e., the multiple-layer cap design proposed as Alternative 1); and
- Alternative 3 - no action.

Both Alternatives 1 and 2 include the reuse of an estimated 3,000 cubic yards of soil excavated during removal actions proposed at NAF El Centro Installation Restoration Program Sites 3 (Sludge Burial Area) and 8 (Scrapyard). The soils generated during the Site 3 and 8 removal actions will be combined with imported soils to construct the foundation layer for the cap at Site 1. As described in the EE/CA documents for Sites 3 and 8, only the soils classified as inert during these removal actions will be reused at Site 1.

The effectiveness of each proposed alternative at reducing the potential for the generation and migration of leachate was evaluated using the U.S. EPA Hydrologic Evaluation of Landfill Performance (HELP) model. Modeling results indicate that the monolithic cap (Alternative 2) and multiple-layer cap (Alternative 1) designs are equally effective at reducing contaminant mobility by limiting leachate generation due to percolation of rainwater through the wastes. However, recent research indicates that compacted clay barriers may tend to crack due to desiccation under arid conditions at the site. Cracking of the clay barrier layer (Alternative 1) included in the multiple-layer cap design would significantly increase leachate generation and migration through the cap. Because the monolithic cap (Alternative 2) does not include a compacted clay barrier, it is judged to be superior in long-term effectiveness, compared to the multiple-layer cap.

Alternative 2, construction of a monolithic cap, is the recommended removal action alternative. This alternative is considered to be more effective and about 50 percent less expensive than the multiple-layer cap proposed as Alternative 1. Alternative 3 is not recommended because it does not achieve the removal action objectives.

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ACRONYMS/ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
BNI	Bechtel National, Inc.
Ca-HSC	California Health and Safety Code
Cal-EPA	California Environmental Protection Agency
CCR	*California Code of Regulations*
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CLEAN	Comprehensive Long-Term Environmental Action Navy
cm/s	centimeters per second
COPC	chemical of potential concern
CTO	Contract Task Order
DERP	Defense Environmental Restoration Program
DON	Department of the Navy
DTSC	Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
ESA	Ecological Scoping Assessment
°F	degrees Fahrenheit
HELP	(U.S. EPA) Hydrologic Evaluation of Landfill Performance (model)
ICAPCD	Imperial County Air Pollution Control District
IRP	(Navy) Installation Restoration Program
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MSL	mean sea level
NAF	Naval Air Facility
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
Ogden	Ogden Environmental and Energy Services, Inc.

ACRONYMS/ABBREVIATIONS (continued)

PCB	polychlorinated biphenyl
PRG	preliminary remediation goal
RACER	Remedial Action Cost Engineering Requirements
RAGS	Risk Assessment Guidance for Superfund
RAP	Removal Action Plan
RAWP	Removal ActionWork Plan
RCRA	Resource Conservation and Recovery Act
RWQCB	(California) Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
SWAT	Solid Waste Water Quality Assessment Test
SVOC	semivolatile organic compound
TBC	to be considered
TFH	total fuel hydrocarbons
TRPH	total recoverable petroleum hydrocarbons
UL	upper limit
USC	*United States Code*
U.S. EPA	United States Environmental Protection Agency
VOC	volatile organic compound

Section 1
INTRODUCTION

Bechtel National, Inc. (BNI), has prepared this Engineering Evaluation/Cost Analysis (EE/CA) for Site 1, Magazine Road Landfill, located at the Naval Air Facility (NAF) El Centro in Imperial County, California, on behalf of the U.S. Department of the Navy (DON), Southwest Division Naval Facilities Engineering Command, under Contract Task Order (CTO)-0090, issued under the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract No. N68711-92-D-4670.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) define removal actions to include "the cleanup or removal of released hazardous substances from the environment, such actions as may necessarily be taken in the event of the threat of release of hazardous substances into the environment, such actions as may be necessary to monitor, assess, and evaluate the release or threat of release of hazardous substances, the disposal or removal of material, or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of release." The United States Environmental Protection Agency (U.S. EPA) has classified removal actions into three types based on the circumstances surrounding the release or threat of release: emergency, time-critical, and non-time-critical. The removal action at Site 1 will be a non-time-critical removal action because on-site action will be conducted more than 6 months after commencement of the planning period.

Additionally, the California Health and Safety Code (Ca-HSC) specifies the preparation of necessary documentation, which depends upon the costs of the removal action. The Ca-HSC requires development of either: a Remedial Action Plan (RAP) for removal actions that cost $1 million or greater; or a Removal Action Work Plan (RAWP) for removal actions that cost less than $1 million. The Ca-HSC authorizes the California Environmental Protection Agency (Cal-EPA) DTSC to waive the RAP requirements, in favor of a RAWP or a RAP-equivalent document, for removal actions if an imminent and/or substantial endangerment determination exists. DTSC may also waive the RAP requirements if a RAP-equivalent document that meets the requirements of Ca-HSC 25356.1(h)(3) is prepared. The removal action for Site 1 is expected to cost less than $1 million, and therefore, the requirements for a RAWP apply. This EE/CA is intended to satisfy these requirements.

Under 40 *Code of Federal Regulations* (CFR) 300.415 of the NCP, the lead agency (i.e., DON) is required to conduct an EE/CA for non-time-critical removal actions (CFR 1990). This EE/CA is being prepared based on the U.S. EPA guidelines described in the Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA (U.S. EPA 1993a).

The removal action objective for Site 1 is to reduce the potential for human and ecological exposure to the potentially contaminated landfill wastes, and to limit the migration of contaminants to groundwater by reducing the generation of leachate. The proposed removal action for Site 1 is an interim action. DON will submit a separate document that describes the final remedy for Site 1. The final remedy will address groundwater contamination, if present, and institutional controls, if hazardous wastes or substances are left in place. A landfill gas

survey will be conducted to assess the potential for landfill gas generation prior to the removal action field activities. If the survey identifies landfill gas at concentrations requiring further assessment, then the appropriate steps will be taken to comply with Title 14, *California Code of Regulations* (CCR).

The development and evaluation of removal actions in this EE/CA are based on the available data regarding the nature and extent of soil contamination at Site 1 and U.S. EPA guidance (U.S. EPA 1993a,c). Previous investigations performed at the site (NEESA 1987 and Ogden 1993a) were focused on evaluating the presence and potential impacts of contamination due to historic activities at the site. A complete site characterization, which defines the nature, extent, and background concentrations of contaminants at the site, has not been performed.

The public is encouraged to review and comment on the proposed removal activities described in this EE/CA. To gain a more thorough understanding of the activities associated with this removal action the public is encouraged to review the administrative record for this activity available at the following locations.

Southwest Division Naval Facilities
Engineering Command
Environmental Technical Library
1220 Pacific Highway, Building 129
San Diego, CA 92132-5190
(619) 532-1144

NAF El Centro
Public Works Department
El Centro, CA 92243-5001
(619) 339-2201

City of El Centro Public Library
539 State Street
El Centro, CA 92243
(619) 337-4565

City of Brawley Public Library
400 Main Street
Brawley, CA 92227
(619) 344-1891

Section 2
SITE CHARACTERIZATION

In 1987, the Naval Energy and Environmental Support Activity (NEESA) conducted a Preliminary Assessment/Site Inspection (NEESA 1987) in which 16 sites at NAF El Centro were evaluated for potential contamination. Fourteen of the 16 sites, including Site 1, were selected for further investigation under the U.S. Navy Installation Restoration Program (IRP). Investigation findings for Site 1 are documented in a Solid Waste Water Quality Assessment Test (SWAT)/Site Investigation report (Ogden 1993a) prepared for Sites 1, 2, and 3. The information presented in this section was obtained primarily from this source.

2.1 SITE LOCATION

NAF El Centro is an operational naval facility located approximately 7 miles northwest of El Centro, California, 7 miles north of the Mexican border, and 100 miles east of San Diego, California (Figure 2-1).

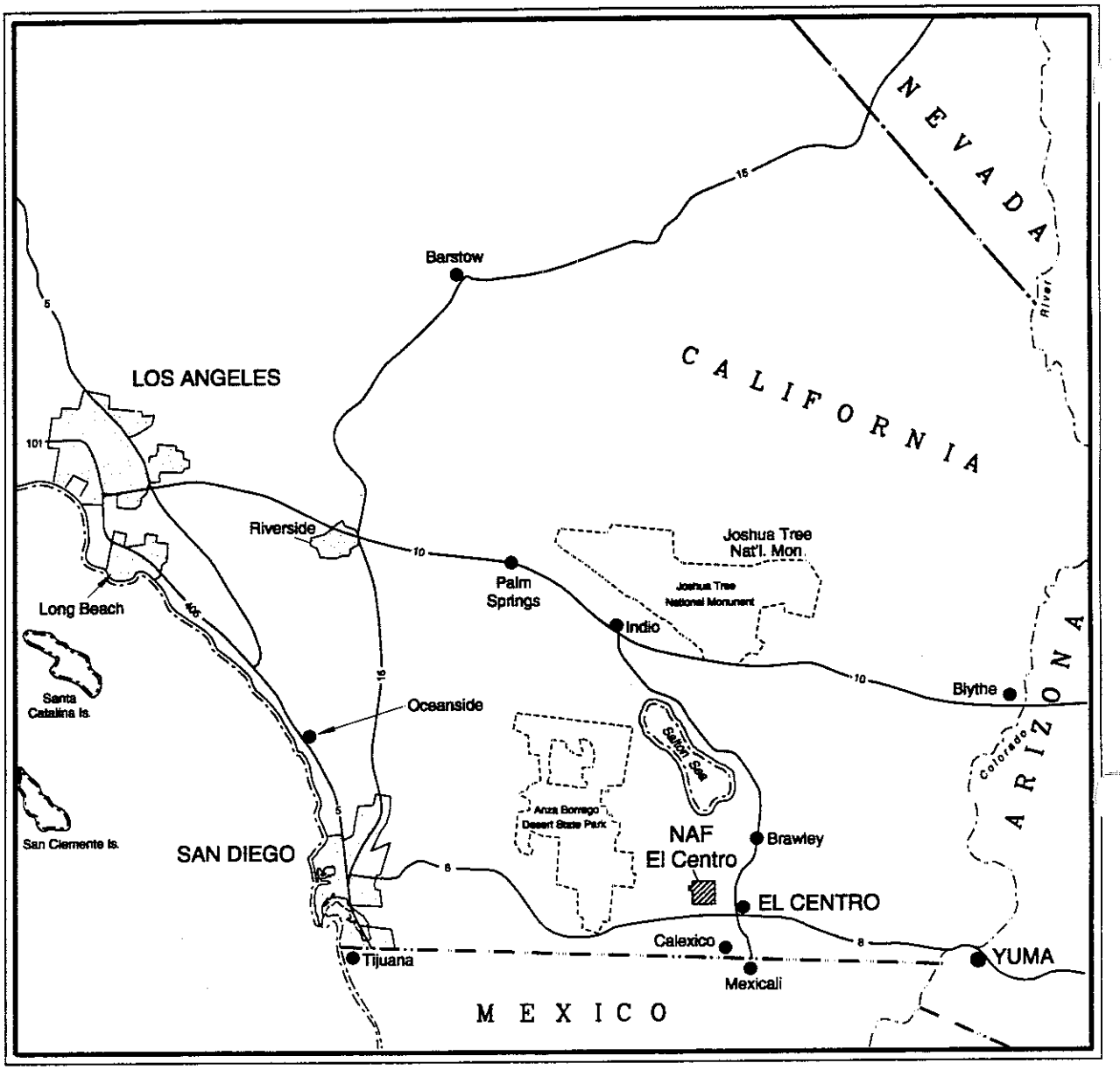
Site 1 is located southeast of the intersection of Magazine Road and Patrol Road in the north portion of NAF El Centro (Figure 2-2). The site is rectangular and extends approximately 600 feet along Magazine Road and 400 feet along Patrol Road (Figure 2-2). The total landfill area is approximately 5.5 acres (NEESA 1987).

2.2 TYPE OF FACILITY AND OPERATIONAL STATUS

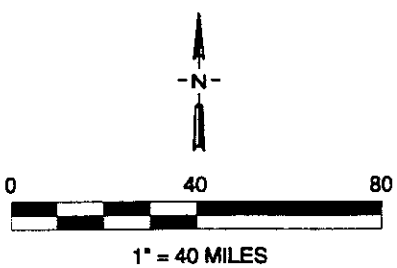
The Magazine Road Landfill was operated as a municipal landfill between 1965 and 1983. The landfill was converted from a former borrow pit. Neither a liner nor a leachate collection system was installed during construction. The dimensions of the landfill are approximately 400 by 600 feet, and the ground surface within the landfill is approximately 4 feet lower than the surrounding ground surface. The waste management practices at the site reportedly included monthly burning to reduce the waste volume. Approximately 60 percent of the Site 1 landfill waste stream reportedly comprised household rubbish (i.e., municipal waste), with the remainder comprising industrial wastes including plating wastes, asbestos, water-bearing fuels, used lubricating oil and hydraulic fluids, paint, solvents, photographic chemicals, sandblasting grit, pesticides, batteries, and spent cartridges (NEESA 1987). The fill materials were reportedly covered with approximately 24 inches of locally derived silty sands when landfill use was discontinued in 1983 (Ogden 1993a). The total volume of fill materials placed in the landfill, including the soil cover, is estimated to be approximately 90,000 cubic yards.

2.3 REGIONAL GEOLOGY AND HYDROGEOLOGY

NAF El Centro is located in Imperial Valley, which is within the Colorado Desert geomorphic province of California (Norris and Webb 1990). The Imperial Valley occupies the north-central part of the Salton Trough, a large topographic and structural depression that extends from near Palm Springs about 180 miles south to the head of the Gulf of California. The Salton Trough is separated from the Gulf of California by the broad, fan-shaped delta of the Colorado River. The lowest part of the trough is occupied



SOURCE: Master Plan - NAF El Centro, 1988



EE/CA Site 1

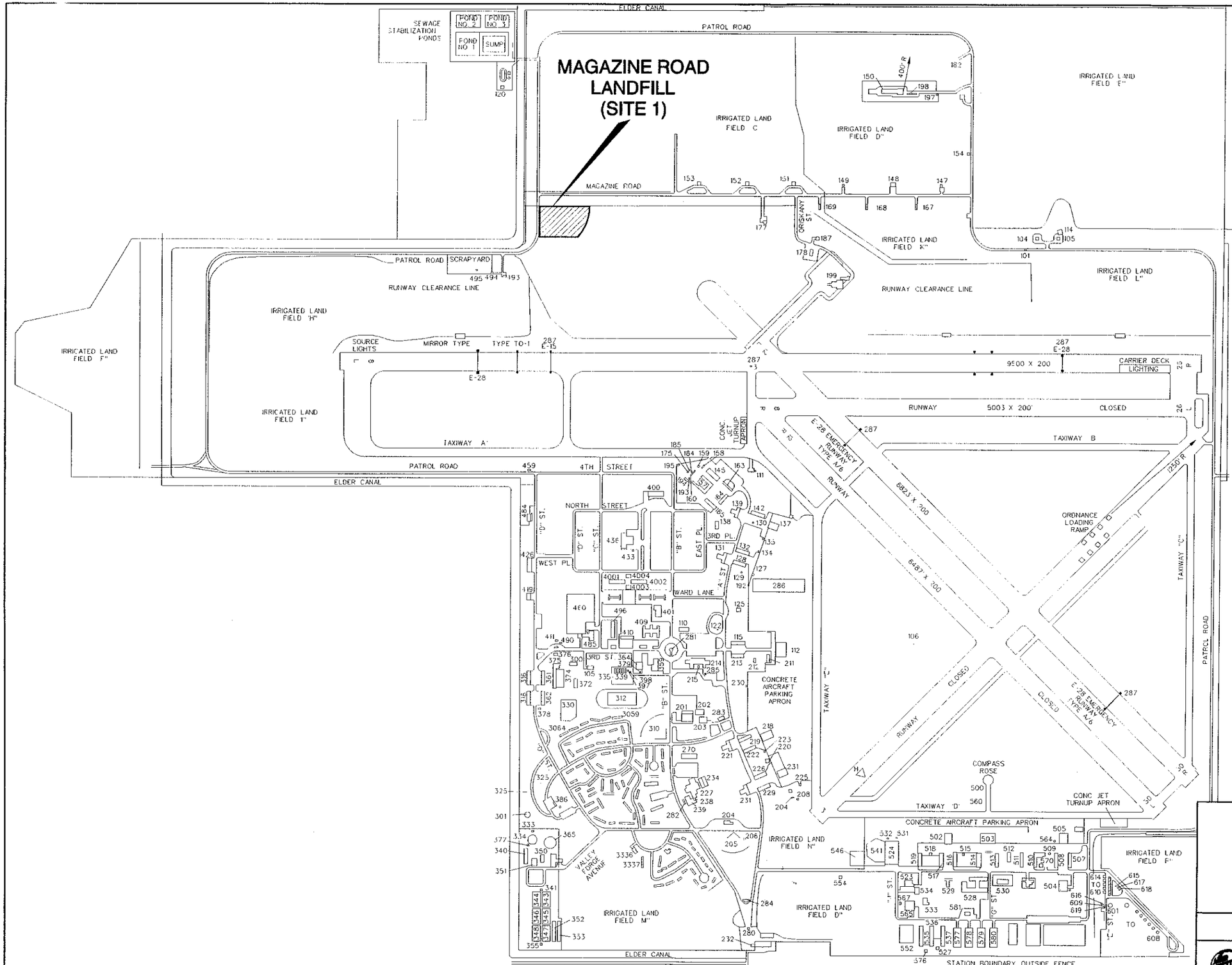
Figure 2-1

Regional Location Map
Magazine Road Landfill

NAF El Centro, Imperial County, California

Bechtel National, Inc.
CLEAN II Program

Date: 8/8/95
File No. regmap
Job No. 22214-090



EE/CA Site 1

Figure 2-2

Facility Map

Magazine Road Landfill

NAF El Centro, Imperial County, California

Bechtel National, Inc.
CLEAN II Program

Date: 2/6/97
File No. 090R2023
Job No. 22214-090

by the Salton Sea, a saline lake fed primarily by irrigation water imported from the Colorado River. Much of the land surface in the Salton Trough is below sea level. The Imperial Valley drains north into the Salton Sea, which is currently 226 feet below mean sea level (MSL).

The Imperial Valley is bordered on the northwest by the Salton Sea. On the southeast, the valley is contiguous with the Mexicali Valley in Mexico. The Imperial Valley is flanked by the Chocolate Mountains on the northeast, and by the Peninsular Ranges of southern California and Baja California on the southwest. The Imperial Valley is divided into three regions: eastern, central, and western. NAF El Centro is located within the lowlands of the central Imperial Valley, which is a broad, flat, northwest-sloping lowland that represents the bed of ancient Lake Cahuilla (Loeltz et al. 1975).

The Imperial Valley is a seismically active area that historically has experienced numerous strong earthquakes. The faults in the Imperial Valley (Figure 2-3) are considered to be part of the San Andreas Fault System. Nearly all of the recognized faults are considered active.

The California Department of Water Resources has divided the state into nine Hydrologic Study Areas. The Imperial Valley is located in the Colorado Desert Hydrologic Study Area. Most of the Imperial Valley is underlain by the Imperial Valley Groundwater Basin, which encompasses 1,870 square miles of the Imperial Valley and drains into the Salton Sea via the Alamo and New Rivers. The Chocolate Mountains piedmont slope area of the eastern Imperial Valley includes parts of the East Salton Sea, Amos Valley, and Ogilby Valley Groundwater Basins. The western Imperial Valley includes part of the Coyote Wells Groundwater Basin. These mountain-margin basins are small alluvial basins with limited well yields and generally poor water quality, particularly in the east (California Department of Water Resources 1975). The groundwater reservoir in the Imperial Valley Basin consists of Cenozoic valley-fill deposits. Although the valley fill is probably more than 20,000 feet thick, the usable part of the reservoir consists of heterogeneous, nonmarine deposits in the upper few thousand feet.

The general direction of groundwater flow in the Imperial Valley is toward the axial part of the valley and then northwestward toward the Salton Sea (Loeltz et al. 1975). The principal area of recharge is the heavily cultivated central Imperial Valley.

2.4 LOCAL GEOLOGY AND HYDROGEOLOGY

The following sections include discussion of the local geology and hydrogeology of the central Imperial Valley.

2.4.1 Geology

The central Imperial Valley is a broad, flat lowland that slopes northwestward from about mean sea level at the international border to approximately 226 feet below MSL at the shore of the Salton Sea (Figure 2-3). The elevation at NAF El Centro is approximately 50 feet below MSL. The central Imperial Valley is drained by the Alamo and New Rivers, and by a network of drains installed to remove irrigation water.

The central Imperial Valley lies entirely within the paleoshoreline of ancient Lake Cahuilla (Loeltz et al. 1975). Surface conditions throughout the central Imperial Valley are similar, unlike those in the more diverse eastern and western parts of the valley. Recent deposits, formed during the presence of Lake Cahuilla, contain a large proportion of clay and silt, in contrast with the generally sandy soils of the eastern and western parts of the valley. In general, Lake Cahuilla deposits are believed to be less than 100 feet thick (Loeltz et al. 1975); however, in some areas, deposits have been reported up to 300 feet thick (Elders 1979).

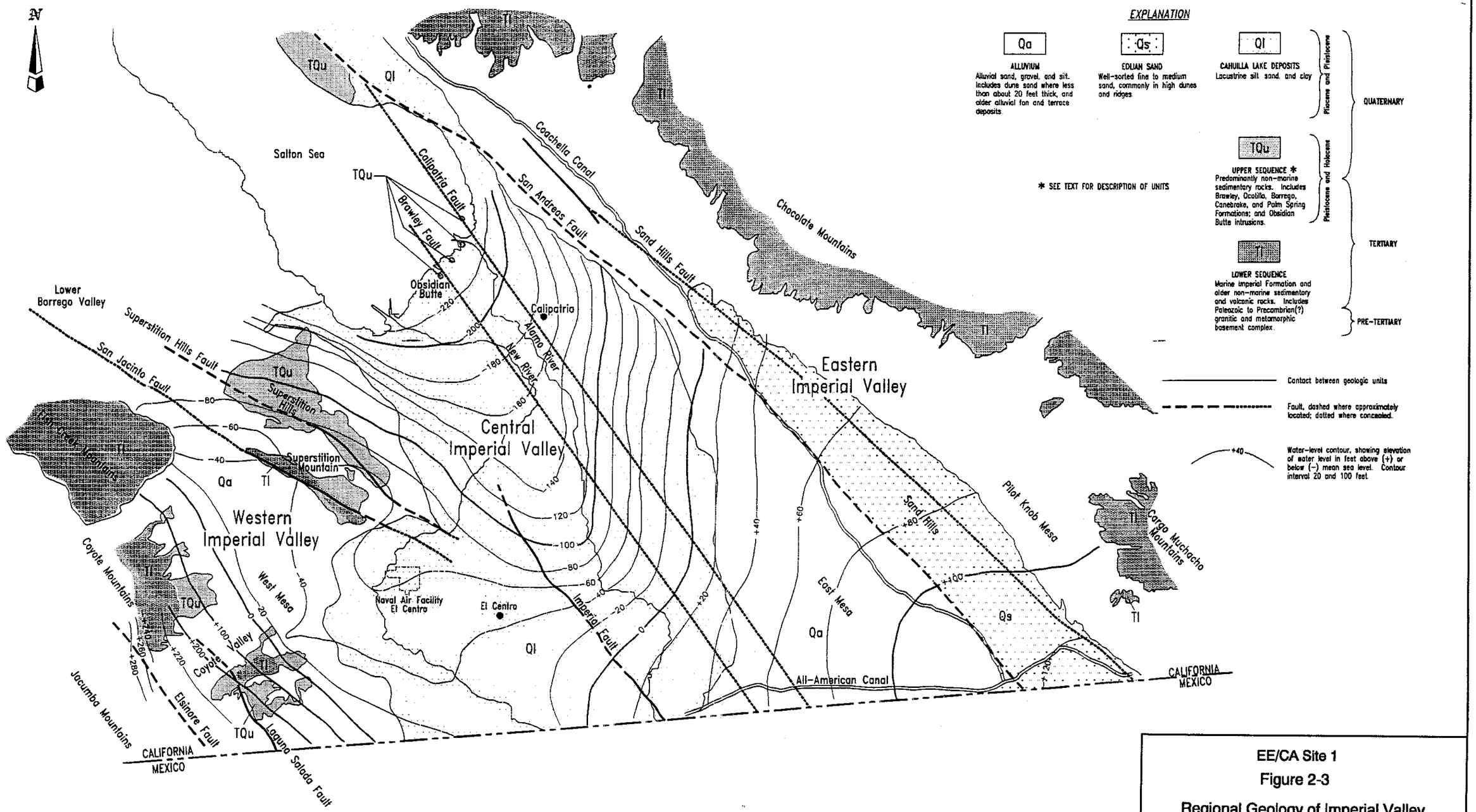
During the site investigations performed at Sites 1 through 11, 56 soil borings up to 51.5 feet deep and 20 trenches up to 5 feet deep were excavated and logged according to the Unified Soil Classification System. The soils logged in these soil borings and trenches were described as unconsolidated interbedded layers of fine sand, silt, and clay up to the maximum depth investigated (Ogden 1993a,b).

2.4.2 Groundwater

The main source of groundwater recharge in the Imperial Valley comes from the Colorado River and leakage from canals (Loeltz et al. 1975). Where there is substantial recharge due to leakage from canals, the chemical quality of the water resembles that of the Colorado River, which is characterized by sulfate as the predominant ion. Where canal leakage does not contribute to groundwater recharge, either sodium or bicarbonate is the principal ion (Loeltz et al. 1975). The groundwater recharge from the application of irrigation water is difficult to estimate because most of the applied water is removed to the Salton Sea by the network of subsurface drains. The recharge contribution from precipitation, runoff, and underflow is assumed to be minimal due to the arid environment.

The water table in the central Imperial Valley is generally close to the ground surface due to intensive irrigation in the area. This shallow occurrence of groundwater is reported to be a discontinuous perched system recharged by local irrigation practices. In the vicinity of NAF El Centro, groundwater levels have been reported as shallow as 3 to 5 feet below ground surface (bgs) (U.S. Department of Agriculture 1981). Records from previous geotechnical investigations in the area indicate groundwater levels from 8 to 15 feet bgs (NEESA 1987). During previous investigations of IRP Sites 1 through 11, groundwater was encountered in the soil borings at depths ranging between approximately 8 and 13 feet bgs (Ogden 1993a,b). Data regarding the occurrence of a deeper, regional aquifer are not available for NAF El Centro; however, soil samples collected at depths up to 51.5 feet during the site investigations were described as saturated (Ogden 1993a,b).

Based on the data collected during the previous investigations, groundwater flow direction varies throughout NAF El Centro. It appears to be influenced complexly by irrigation and the network of drains that underlie the agricultural fields in the area. Groundwater flow direction in the vicinity of Site 1 is estimated to be northwest (Ogden 1993a).



NOTE: MODIFIED AFTER LOELTZ AND OTHERS, 1975; AND MORTON, 1977

EE/CA Site 1

Figure 2-3

Regional Geology of Imperial Valley
Magazine Road Landfill

NAF El Centro, Imperial County, California

Bechtel National, Inc.
CLEAN II Program

Date: 8/8/95
File No.
Job No. 22214-090

The groundwater in the Imperial County basin is designated as beneficial for municipal and industrial uses. Usable water is found along the margins of the basin (alluvial fan aquifers) near the mountains and in deeper aquifers underlying the larger irrigation canals such as the All American Canal.

The water quality of the shallow aquifer in the vicinity of NAF El Centro is poor and is characterized by high concentrations of total dissolved solids. Groundwater samples collected in 1991 and 1992 contained concentrations of total dissolved solids generally between 2,000 and 15,000 milligrams per liter (mg/L), although concentrations as high as 30,000 mg/L were observed in a number of samples (Ogden 1993a,b). These concentrations exceed the California Department of Health Services and U.S. EPA secondary maximum contaminant level of 500 mg/L and the California agricultural water quality goal of 450 mg/L (RWQCB 1993).

2.4.3 Surface Water

The New River and Elder Canal are located within 1 mile of the site. The New River is one of two main drainages for Imperial Valley; the other is the Alamo River. The New River originates primarily from agricultural return in the Imperial and Mexicali Valleys, and flows north to the Salton Sea. The water quality of the New River is generally poor. The Elder Canal is a lined canal that provides raw water from the Colorado River for domestic and agricultural purposes in the Imperial Valley. It flows north along the western perimeter of NAF El Centro.

During the SWAT/SI (Ogden 1993a), surface water samples collected from the New River and Elder Canal upstream and downstream of NAF El Centro showed contamination at various concentrations. Chemicals detected include total recoverable petroleum hydrocarbons (TRPH), 1,1,1-trichloroethane, methylene chloride, and several metals. Concentrations of these chemicals were similar in the upstream and downstream samples.

2.5 SURROUNDING LAND USE AND POPULATIONS

The land use within NAF El Centro is generally classified as "military operating area" for both current and future use. The base is surrounded by unincorporated portions of Imperial County, and land use is primarily agricultural. Approximately 18 percent of the county is irrigated agricultural land. The developed areas, including the incorporated cities, unincorporated communities, and supporting facilities, compose less than 1 percent of the total county area. Approximately 74 percent of the county is desert/mountains owned either by the federal government, Native American nations, or private parties. The Salton Sea occupies approximately 7 percent of the county area.

The Imperial County Ultimate Use Plan, cited in Ogden (1993a), states that agriculture is the dominant economic sector of the county. The plan discourages new urban development within or adjacent to existing urban areas and agricultural margin lands. The plan encourages the preservation of prime agricultural land and also emphasizes the preservation of unique natural areas.

NAF El Centro has an average winter population of 1,500 and an annual summer population of 1,000. The closest community is Seeley, approximately 1 mile southwest of the base. The mid-1991 population of Seeley, as estimated by the County of Imperial Community Economic Development, was 1,228.

2.6 SENSITIVE ECOSYSTEMS

The site is characterized by exposed soil with sparse vegetation. Four-wing saltbush up to 5 feet tall, and smaller shrubs, such as Torrey's sea-blight and tamarisk, occupy the site. There is also a sparse understory of annual grass and seedling saltbush. A windrow of athel trees, up to 40 feet tall, line the west side of Patrol Road adjacent to the site. The land to the north, south, and east of the site is occupied by alfalfa fields.

Several animal species may occupy or use the site and adjacent land. These species are coyote, mice/kangaroo rats, desert cottontail, black-tailed jackrabbit, round-tail ground squirrel, burrowing owl, rail, roadrunner, red-tailed hawk, dragonfly, red ant, and flat-tailed horned lizard. Of these, the burrowing owl, Colorado valley wood rat, Yuma clapper rail, and flat-tailed horned lizard are considered California species of special concern. The flat-tailed horned lizard has also been proposed as a federal threatened and endangered species. The site and adjacent land support a wide variety of birds, including raptors and owls. The open ditch running along the northern edge of the site contains dragonflies and freshwater clam shells.

2.7 METEOROLOGY

The climate in the NAF El Centro area is arid, with hot, dry summers and mild winters. The summer temperatures average 92 degrees Fahrenheit (°F) with highs often reaching 115°F. During winter, the low temperatures are near 30°F, and the highs are over 80°F.

Rainfall in the area occurs as gentle winter rains or intense summer thunderstorms. The mean annual rainfall is 2.4 inches. Evapotranspiration exceeds 6 feet per year.

During the winter and spring, the prevailing winds are westerly; in hot summer months, winds are generally from the southwest. Wind speeds are calm to 10 knots 78 percent of the time; 11 to 16 knots 12 percent of the time; and 16 to 27 knots about 8 percent of the time (NEESA 1987).

2.8 PREVIOUS INVESTIGATIONS

A Preliminary Assessment/Site Inspection (NEESA 1987) and a SWAT/SI (Ogden 1993a) have been performed at Site 1. No removal actions have been conducted at the site. This section summarizes the findings from previous investigations.

2.8.1 Preliminary Assessment/Site Inspection

During the Preliminary Assessment/Site Inspection (NEESA 1987), information from sources, such as historical records, aerial photographs, on-site surveys, and personnel interviews, was used to evaluate 16 potentially contaminated sites. The evaluation

consisted of assessing possible discharge of hazardous waste; the potential for contamination in the disposed waste to migrate via surface water, groundwater, and air; and the potential for the waste to affect humans and the ecology.

The following conclusions were stated for Site 1 (NEESA 1987).

- Because Site 1 is located at the lowest elevation point on the base, the potential for contaminants to migrate through the groundwater to adjacent cultivated fields or off-base runoff to irrigation ditches is high.
- Surface asbestos contamination may potentially migrate by wind.

Based on the above conclusions, NEESA recommended further investigation under the Navy IRP program.

2.8.2 Solid Waste Water Quality Assessment Test and Site Investigation

The SI was completed in May 1993 by Ogden Environmental and Energy Services, Inc. (Ogden). Because the site was used for disposal of solid waste, Ogden also conducted a SWAT for submission to the California Regional Water Quality Control Board (RWQCB) in accordance with Section 13273 of the California Water Code.

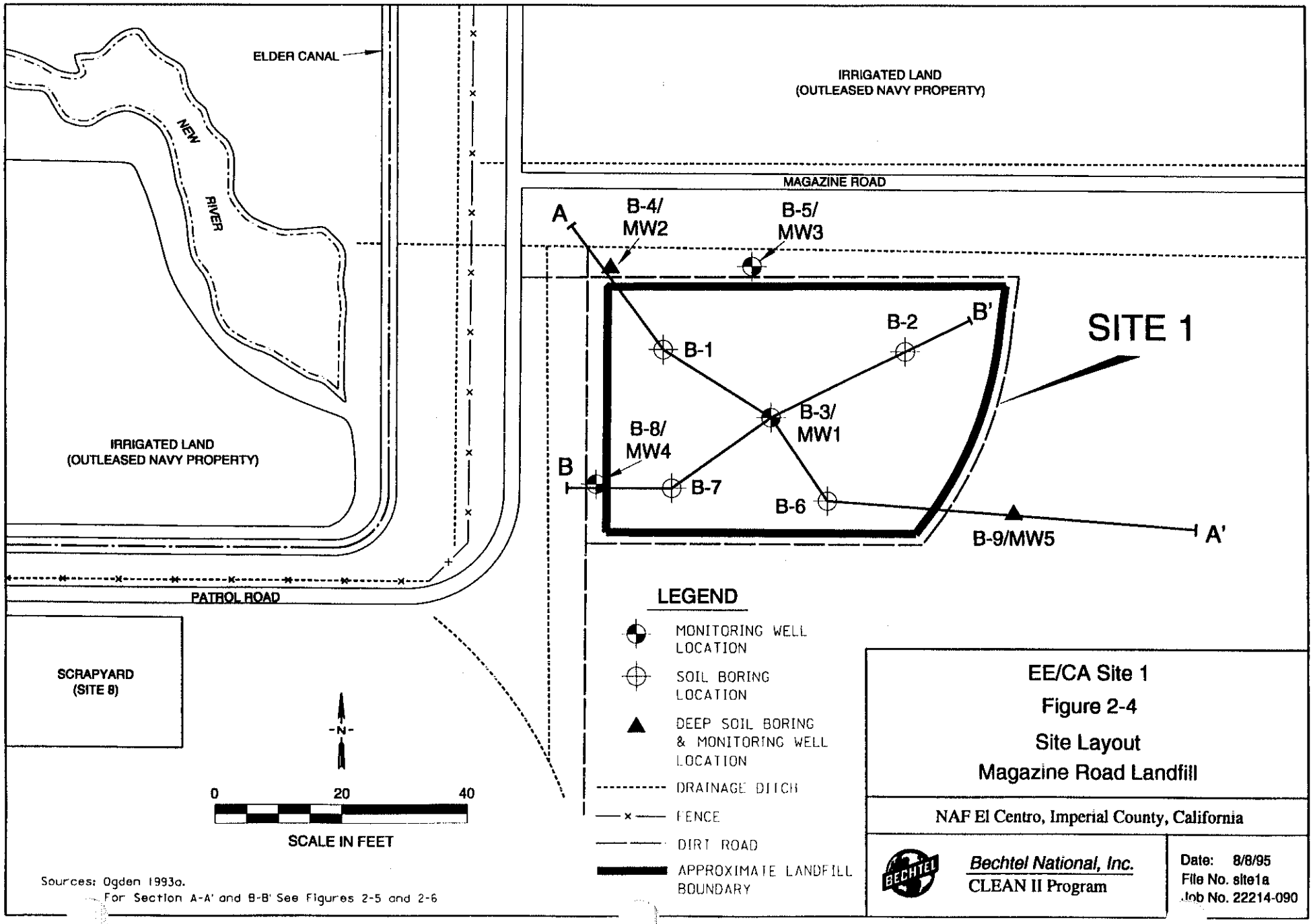
The general objective of the SWAT/SI investigation was to assess the potential for the release of hazardous substances and to perform an assessment of the nature of contamination in the event that a release had occurred. As stated in the Ogden (1993a) report, the investigation was not intended to characterize the extent of contamination but would allow for assessment of whether further investigation or remediation was necessary.

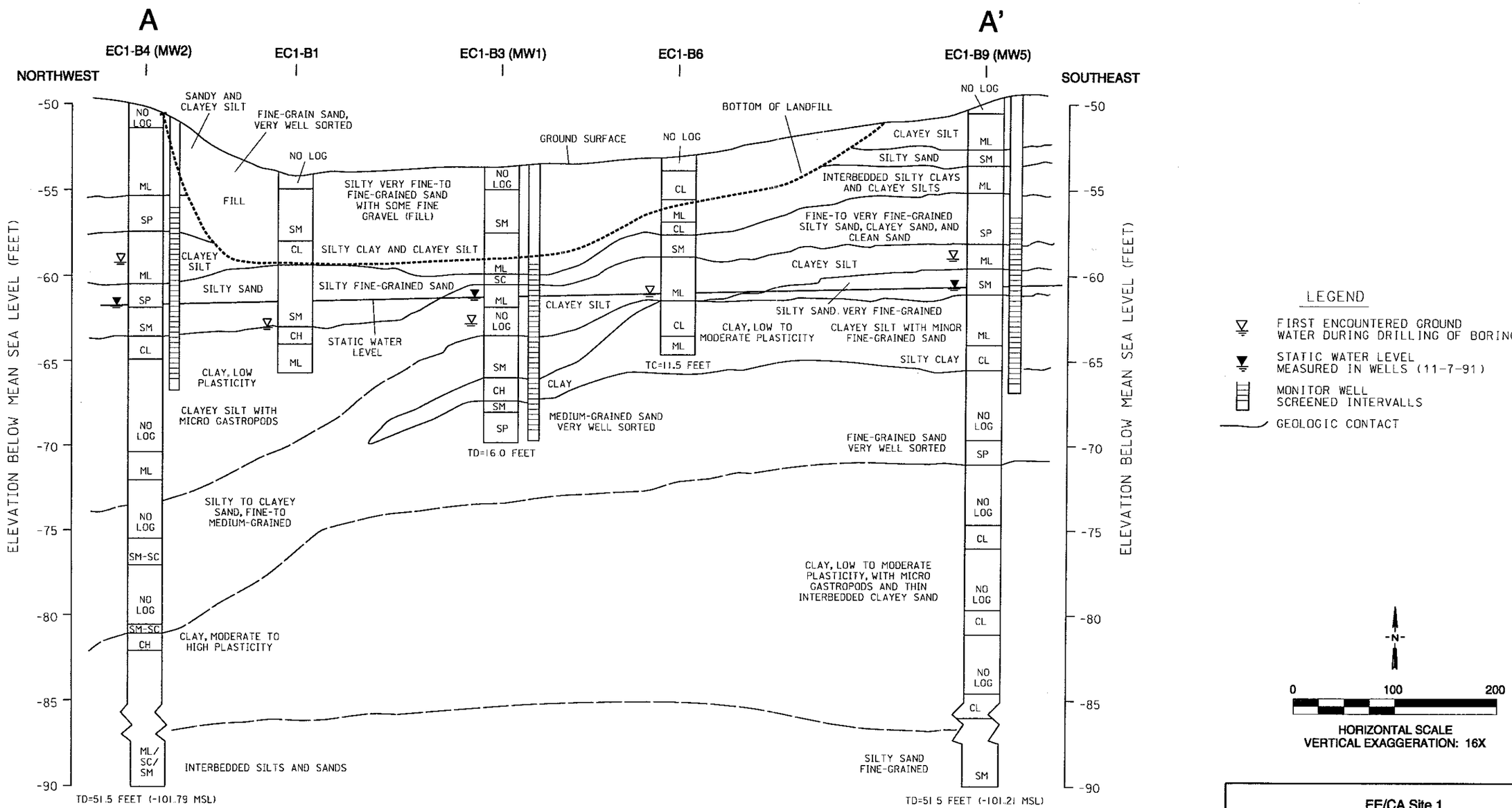
2.8.2.1 SCOPE AND RESULTS

The SWAT/SI included the drilling and sampling of eight soil borings to depths ranging from 11.5 to 51.5 feet bgs within and adjacent to the former landfill. A ninth soil boring, B-9, located 100 feet southeast of the landfill, was intended as a background boring. Locations of the borings are shown in Figure 2-4. Five borings, B-3/MW1, B-4/MW2, B-5/MW3, B-8/MW4, and B-9/MW5, were converted into groundwater monitoring wells. Based on the data collected during the investigation, Ogden developed two subsurface sections of the site. These sections are shown in Figures 2-5 and 2-6.

Thirty soil samples were collected and analyzed for chemicals of potential concern (COPCs) using the following analytical procedures:

- aromatic halogenated and volatile organic compounds (VOCs) (U.S. EPA Method 8010/8020);
- chlorinated herbicides (U.S. EPA Method 8150);
- ethylene dibromide (U.S. EPA Method 504);
- pesticides (U.S. EPA Method 8140);


ELDER CANAL
NEW RIVER
IRRIGATED LAND
(OUTLEASED NAVY PROPERTY)
IRRIGATED LAND
(OUTLEASED NAVY PROPERTY)
MAGAZINE ROAD
A
B-4/
MW2
B-5/
MW3
B-2
B'
SITE 1
B-1
B-3/
MW1
B-8/
MW4
B
B-7
B-6
B-9/MW5
A'
PATROL ROAD
SCRAPYARD
(SITE 8)
N
0
20
40
SCALE IN FEET
LEGEND
MONITORING WELL LOCATION
SOIL BORING LOCATION
DEEP SOIL BORING & MONITORING WELL LOCATION
DRAINAGE DITCH
FENCE
DIRT ROAD
APPROXIMATE LANDFILL BOUNDARY
Sources: Ogden 1993a.
For Section A-A' and B-B' See Figures 2-5 and 2-6
EE/CA Site 1
Figure 2-4
Site Layout
Magazine Road Landfill
NAF El Centro, Imperial County, California
Bechtel National, Inc.
CLEAN II Program
Date: 8/8/95
File No. site1a
Job No. 22214-090



Source: Ogden 1993a
See Figure 2-4 for Location of A-A'

EE/CA Site 1

Figure 2-5

Cross Section A-A' Through Magazine Road Landfill

NAF El Centro, Imperial County, California

Bechtel National, Inc.
CLEAN II Program

Date: 8/8/95
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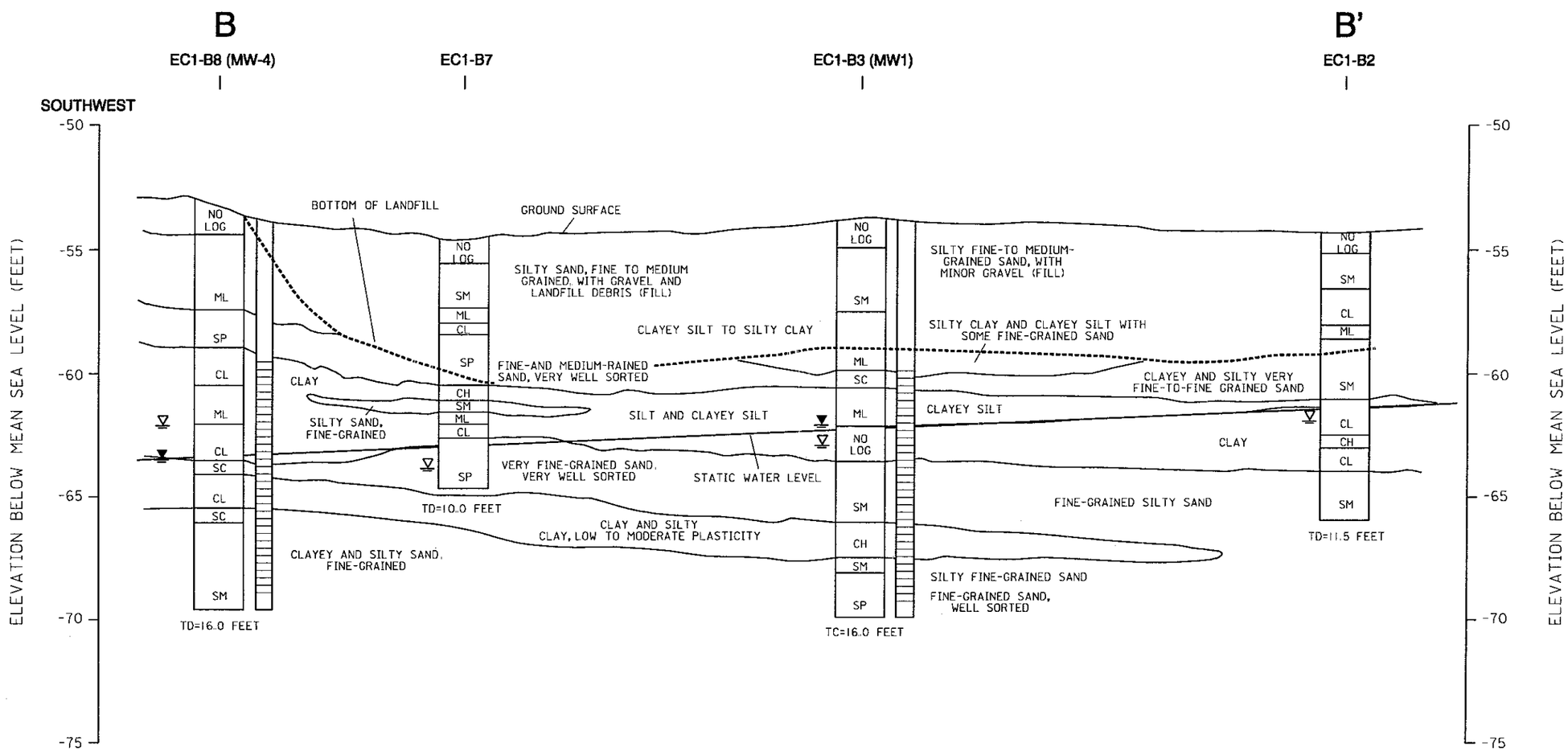
Job No. 22214-090



LEGEND

- FIRST ENCOUNTERED GROUND WATER DURING DRILLING OF BORING
- STATIC WATER LEVEL MEASURED IN WELLS (11-7-91)
- MONITOR WELL SCREENED INTERVALLS
- GEOLOGIC CONTACT

Source: Ogden 1993a
See Figure 2-4 for Location of B-B'

EE/CA Site 1

Figure 2-6

Cross Section B-B' Through Magazine Road Landfill

NAF El Centro, Imperial County, California

Bechtel National, Inc.
CLEAN II Program

Date: 8/8/95
File No. x2
Job No. 22214-090

- polychlorinated biphenyls (PCBs) and organochlorine pesticides (U.S. EPA Method 8080);
- priority pollutant metals (various methods);
- semivolatile organic compounds (SVOCs) (U.S. EPA Method 8270);
- total recoverable petroleum hydrocarbons (TRPH) (U.S. EPA Method 418.1);
- total fuel hydrocarbons (TFH) (modified U.S. EPA Method 8015);
- total phenols (U.S. EPA Method 9066);
- total cyanide (U.S. EPA Method 9012);
- VOCs (U.S. EPA Method 8240); and
- general chemistry.

The results of these analyses are presented in Table 2-1.

TRPH constituents were reported in eight of the samples at concentrations ranging between 1 and 2,400 milligrams per kilogram (mg/kg); however, in six samples, concentrations were less than or equal to 10 mg/kg. TFH was detected in only three samples at concentrations of 7.2, 69, and 480 mg/kg. Although sample EC1-B9-S2-D3.5 was collected from B9, intended as a background soil boring, it contained TRPH and TFH at concentrations of 2,400 and 69 mg/kg, respectively. It is suspected that this contamination is from an off-site source that is not associated with the landfill.

All samples analyzed for priority pollutant metals contained concentrations of beryllium, chromium, copper, nickel, total lead, and zinc above the laboratory detection limits. Antimony, arsenic, cadmium, mercury, selenium, silver, and thallium were reported above the detection limits in some of the samples.

2.8.2.2 BACKGROUND METALS CHARACTERIZATION

Metals occur commonly in nature. Therefore, it is necessary to discriminate between background (i.e., naturally occurring) concentrations of these analytes and concentrations indicative of potential contamination related to past operations at NAF El Centro. In general, samples collected from representative background locations are used to evaluate upper limits for the background concentrations in order to differentiate contamination from naturally occurring concentrations.

In addition to the SWAT/SI conducted for Sites 1, 2, and 3, Ogden also conducted an SI for Sites 4 through 9 and 11 (Ogden 1993b). Data from these two reports were used for evaluating background metals concentrations.

As part of the SWAT/SI, 14 soil samples from eight background locations were collected and analyzed (Ogden 1993a,b). These locations within the facility were believed to be unaffected by past base operations. To increase the sample size and to develop statistically significant background levels for metals, a data set consisting of metal concentrations in soil samples collected from ten NAF El Centro IRP sites and the eight

background sample locations were used (Ogden 1993a,b). Background concentrations for metals using the combined data set were estimated based on Cal-EPA DTSC recommendations (DTSC 1995). This procedure is discussed in Appendix A.

The combined data set was used only when at least half of the samples analyzed had detectable concentrations of the analyte. A review of laboratory data in the Ogden reports (1993a,b) indicates that concentrations of four metals (mercury, antimony, selenium, and thallium) in a majority of soil samples collected from the sites and background locations were below the detection limits. Therefore, background concentrations were not calculated for these metals.

The procedure described in the DTSC recommendations consists of the following steps:

- combine data from background and site samples for each analyte;
- prepare a cumulative-frequency probability plot;
- check normality of data;
- graphically identify the upper limit (UL) of the background population as an inflection point on the highest part of the probability plot;
- extract the background data points from the combined population;
- evaluate the extracted data for anomalies (e.g., a data point below the inflection point but an obvious deviation from the linear plot, a coefficient of variation greater than 100 percent, or a range greater than two orders of magnitude); and
- use 95th percentile of the background population as the UL for background concentration.

Based on Cal-EPA DTSC recommendations, the 95th percentile of normal distribution of the background population is selected as the UL for background concentration. The mean and the standard deviation of the background distributions were used to calculate the 95th percentile using the following equation:

$$X_{95} = m + Z\,S$$

where:

X_{95} = 95th percentile value of the background population,
m = mean,
Z = factor for the 95th percentile, which is equal to 1.646 for normal distribution (obtained from Table A1, Gilbert 1987), and
S = standard deviation.

The UL of background concentrations as the 95th percentile of the population for each analyte is summarized in Table 2-2. These values are also compared in the table with metal concentrations typically occurring in the western United States (Shacklette et al. 1984).

Analyses of the data sets indicated that the background population for cadmium is lognormally distributed (i.e., logarithm of concentration is normally distributed).

Table 2-1
Analytical Results[a] for Soil Samples Collected at Magazine Road Landfill (Site 1) (mg/kg)[b]

Analyte	EC1-B1-S2-D3.5	EC1-B1-S4-D6.5	EC1-B1-S5-D8	EC1-B2-S1-D2	EC1-B2-S3-D5	EC1-B2-S5-D8	EC1-B3-S2-D3.5	EC1-B3-S4-D5	EC1-B3-S4-D6.5	EC1-B5-S1-D2	EC1-B5-S2-D3.5	EC1-B5-S4-D6.5	EC1-B6-S1-D2	EC1-B6-S3-D5	EC1-B6-S4-D6.5	EC1-B6-D4-D6.5	EC1-B7-S1-D2	EC1-B7-S2-D3.5	EC1-B7-S3-D5.0	EC1-B7-S4-D6.5	EC1-B7-S5-D8.0	EC1-B7-D5-D8.0
Total petroleum hydrocarbons (TPH) - 418.1	NA[c]	NA	NA	260	NA	NA	NA	10	NA	NA	NA	<1	NA	1	NA	NA	NA	NA	1	NA	NA	4
Total fuel hydrocarbons (TPH) - 8015	7 2 J	< 5.9	< 6.6	480 J	< 6.7	< 6.5	< 5.4	< 6.5	< 6.0	< 5.1	< 6 1	< 5.8	< 5.8	< 6.4	< 6.2	< 6.4	NA	< 5.2	< 5.5	< 5.8	< 6.2	< 6.4
Hydrocarbon range	C21-C23	--	--	C14-C24+ N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aromatic volatile organic compounds - 8010/8020																						
1,1,1-Trichloroethane	< DL[d] J	< DL	< DL	NA	< DL	< DL	< DL	NA	< DL		< DL	NA	< DL	NA	< DL	< DL	NA	NA	NA	< DL	< DL	< DL
Total phenols - 9066	NA	NA	NA	< 0.2	NA	NA	NA	< 0.3	NA	NA	NA	< 0.2	NA	< 0.3	NA	NA	NA	NA	< 0.2	NA	NA	NA
Total cyanide - 9012	NA	NA	NA	< 0.1	NA	NA	NA	< 0.6	NA	NA	NA	< 0.6	NA	< 0.3	NA	NA	NA	NA	< 0.2	NA	NA	NA
Ethylene dibromide -504	NA	NA	NA	< 1.0	NA	NA	NA	<1.0	NA	NA	NA	< 1.0	NA	< 1	NA	NA	NA	NA	< 1.0	NA	NA	NA
Volatile organic compounds - 8240	NA	NA	NA		NA	NA	NA	< DL	NA	NA	NA	< DL	NA	< DL	NA	NA	NA	NA	< DL	NA	NA	NA
Methylene chloride				0.06																		
Toluene				0.02																		
Xylenes				0.01																		
Semivolatile organics - 8270	NA	NA	NA		NA	NA	NA		NA	NA	NA		NA	< DL	NA	NA	NA	NA		NA	NA	NA
Chrysene																						
Di-n-butylthalate								< 0.22				< 0 25										
Fluoranthene																						
Bis (2-ethylhexyl) phthalate				0 33 R																		
2-methyl-4,6-dinitrophenol																						
Phenanthrene																						
Pyrene																						
Benzo(a)anthracene																						
Benzo(b)fluoranthene																						
Benzo(a) pyrene																						
Benzo(g,h,i) perylene																						
Pesticides and PCBs - 8080	NA	NA	NA	< DL	NA	NA	NA	< DL	NA	NA	NA	< DL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides - 8140	NA	NA	NA	< DL	NA	NA	NA	< DL	NA	NA	NA	< DL	NA	< DL	NA	NA	NA	NA	< DL	NA	NA	NA
Chlorinated herbicides - 8150	NA	NA	NA	< DL	NA	NA	NA	< DL	NA	NA	NA	< DL	NA	< DL	NA	NA	NA	NA	< DL	NA	NA	NA
2,4,5-T																						
Priority pollutant metals																				NA	NA	NA
Antimony	< 0.64 R	< 0.69 R	< 0.78 R	< 0.62 R	< 0.79 R	< 0.75 R	< 0.62 J	< 0.77 J	< 0.70 J	< 0.61 J	< 0 70 J	< 0.68 J	< 0.70 J	< 0.76 J	< 0.71 J	< 0.75 J	5.9	< 0.62	< 0.64 J			
Arsenic	2.7	1.7	5	2.7	2	3.5	3.5	3.5	< 0.58	2.5	5	3.1	5 9	2.7	2.5	3.7	11.3	6.7	3.2			
Beryllium	0 77	0.44	0.85	0.52	0.65	0.82	0.84	0.83 J	0 15 J	0.52 J	1.1 J	0.39 J	1 1	0.45	0.42	0.69	0.78	0.61	0.79			
Cadmium	0.45	0.23	0.38	0.29	0.38	0.37	0.43	0.43	< 0.12	0.19	0.47	0.24	1 1	< 0.13	0.15	0.17	0.91	0.15	0.22			
Chromium	13 1	10 3	15	8.4	12.6	15	11 8	11 8	4.5	8 3	13.6	5.8	20.6	6.4	7 3	9 3	15.5	8 1	13 1			
Copper	38.9	145	286	19 1	525	538	14.6	13.8	3.4	8.3	21	4	37.4	5 8	5 5	8 9	30	8.5	12 8			
Mercury	< 0.09	< 0.10	< 0.11	< 0.10	< 0.12	< 0.10	< 0.09	< 0.09	< 0 10	< 0.09	< 0.12	< 0.09	< 0.10	< 0.11	< 0.12	< 0.13	< 0.10	< 0.10	< 0.10			
Nickel	11.6	7.4	14.9	7.5	11 3	14	12 5	12.6	4 2	9 1	15 1	5.4	16.8	6.4	6 7	9.4	20.2	9 1	10.4			
Organolead				< 0.24				< 0.30				< 0.26		< 0.29					< 0.25			
Lead	15.6	4.3	7 7	7 2	8 1	8.6	8 8	9 3	1.8	5 5	10 3	3 2	68.8	5 5	4 5	7 2	157	6	9 1			
Selenium	< 1.1	< 1.2	< 1.3	< 1.0	< 1.3	< 1.3	< 1.1	< 1.3	< 1.2	< 1.0	< 1.2	< 1.1	< 1 1	< 1.3	< 1.2	< 1.2	< 1.0	< 1.0	< 1.1			
Silver	0.47	< 0.29	0.37	< 0.33	< 0.33	0.35	0.32	< 0.32	< 0.29	< 0.25	< 0.29	< 0.29	1 1 J	0.36 J	0.43	0.46	0.83 J	0.36 J	0.36 J			
Thallium	< 1 1	< 1.2	< 1.3	< 1.0	< 1 3	< 1.3	< 1 1	< 1 3	< 1.2	< 1.0	< 1.2	< 1.1	< 1.1	1 5	1 8	< 1.2	< 1.0	< 1.0	1 1			
Zinc	58.4	174	170	34.6	418	266	42.2 J	36.2 J	11.6 J	23.1 J	46.2 J	14.9 J	95.5	18.3	20.3	29.7	36.2	27	37.2			
General chemistry																				NA	NA	NA
Carbonate as $CaCO_3$	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	120	< 5	144	< 5	92	< 5	110	< 5			
Bicarbonate as $CaCO_3$	20	27	34	28	41	25	319	360	300	270	636	310	300	936	293	292	375	190	237			
Hydroxide as $CaCO_3$	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5			
Total alkalinity as $CaCO_3$	20	27	34	28	41	25	319	360	300	270	636	430	300	1080	293	384	375	300	237			
Chloride	700	925	905	310	410	570	10200	10100	5640	7500	600	360	1080	< 5.0	195	520	4300	100	1100			
Electric conductivity	8080	6060	5260	4060	2800	5620	38400	42600	28400	10100	10000	3200	2690	1570	926	1060	4820	710	1690			
Fluoride	< 5.4	< 5 9	1 3	< 5 3	< 6.7	< 6.5	< 5.4	< 6.5	< 6	< 5.1	< 6.1	< 5.8	< 5.0	< 5.0	< 5.0	< 5.0	5	< 5 0	< 5.0			
% Moisture	6.7	14.6	24.4	4.8	25.2	22.8	6.9	23	16.1	2.4	18 2	13 7	14.5	21 8	18 7	21 9	4.4	4.6	8.8			
Nitrate as Nitrogen	54 7	0.6	1 3	< 0.6 R	< 0.5	< 0.7	67 7	< 0.6	< 0.6	4 8	< 0.6	< 0.6	60.7	2 9	5.4	6.1	31 3	< 0.5	0.5			
pH	7.1	7.9	7.8	7.7	8.1	8	7.6	8	7 9	8.4	7.9	9.1	8.1	9	8.6	8.9	8.1	8.9	8.3			
Sulfate	1640	2000	1860	1420 R	1990	1400	753	4660	4490	1880	3370	406 R	12800	615	1340	905	15500	1090	3840			
Calcium	28 500	15 300	43,400	20,800	38 700	41 300	30 700	42 700	10,900	29 700	46,800	22 300	43,400	23 300	32,000	41 100	41 500	29,800	25,600			
Iron	13,600	8,080	14,400	7 710	11 500	13 200	12 300	12 700 J	3 980 J	8,900 J	15 100 J	6,190 J	16,900	7 300	7.580	11 000	19 500	9 240	11,800			
Potassium	2 980	1 960	2.910	1.670	2,050	2 260	2,880	2 220 J	748 J	1 270 J	2 510 J	841 J	3,920	943	1.140	1.590	2,440	1 280	2,250			
Magnesium	8,540	4,740	12,400	5 220	10,600	11,600	8 590	11 900	2,620	7,800	13 300	5,620	11 500	6,030	8,440	10,300	8 760	8 300	7 550			
Manganese	298	182	358	188 J	314	335	334	352	96.2	268	487	197	396 J	227 J	253 J	311 J	282	277	247 J			
Sodium	2230 R	3930 R	4950 R	1510 R	3090 R	4160 R	5070	6290	2770	1910	2440	438	4710	622	984	1600	2660	889	2360			
Formaldehyde	NA	NA	NA	< 1.0	NA	NA	NA	< 1.0	NA	NA	NA	< 1.0	NA	< 1	NA	NA	NA	NA	< 1.0	NA	NA	NA

(table continues)

Table 2-1 (continued)

Analyte	EC1-B8-S1-D2	EC1-B8-S3-D5	EC1-B8-D3-D5	EC1-B8-S4-D6.5	EC1-B9-S1-D2	EC1-B9-S2-D3.5	EC1-B9-S3-D5	EC1-B9-S4-D6.5
Total petroleum hydrocarbons (TPH) - 418.1	2	NA	NA	NA	4	2400	NA	< 1
Total fuel hydrocarbons (TPH) - 8015	< 5.2	< 5.1	< 5.1	< 6.3	< 5.7	69 J	NA	< 5.3
Hydrocarbon range	--	--	--	--	--	C13-C24+ N		--
Aromatic volatile organic compounds - 8010/8020								
1,1,1-Trichloroethane	NA	< DL	< DL	< DL	NA	NA	NA	NA
Total phenols - 9066	< 0.2	NA	NA	NA	NA	< 0.2	NA	< 0.2
Total cyanide - 9012	< 0.2	NA	NA	NA	< 0.2	< 0.2	NA	< 0.2
Ethylene dibromide -504	< 1.0	NA	NA	NA	< 1.0	< 1.0	NA	< 1.0
Volatile organic compounds - 8240	< DL	NA	NA	NA	< DL	< DL	NA	< DL
Methylene chloride								
Toluene								
Xylenes								
Semivolatile organics - 8270	< DL	NA	NA	NA	< DL		NA	< DL
Chrysene						46 J		
Di-n-butylthalate								
Fluoranthene						29 J		
Bis (2-ethylhexyl) phthalate								
2-methyl-4,6-dinitrophenol								
Phenanthrene						44 J		
Pyrene						80 J		
Benzo(a)anthracene						16 R		
Benzo(b)fluoranthene						22 J		
Benzo(a) pyrene						12 J		
Benzo(g,h,i) perylene						9.6 J		
Pesticides and PCBs - 8080	< DL	NA	NA	NA	< DL	< DL	NA	< DL
Pesticides - 8140	< DL	NA	NA	NA	< DL	< DL	NA	< DL
Chlorinated herbicides - 8150	< DL	NA	NA	NA	NA	< DL		< DL
2,4,5-T							0.0052 *B	
Priority pollutant metals							NA	
Antimony	< 0.62 J	< 0.60 J	< 0.58 J	< 0.72 J	< 0.67	< 0.61 J		< 0.61 J
Arsenic	5.7	2.4	2.1	6.4	5.6	10.6 J		1.7
Beryllium	0.85	0.23	0.34	1.1	1.2	0.6		0.32
Cadmium	0.29	< 0.10	< 0.10	0.28	0.31	0.85		< 0.1
Chromium	11.6	4.2	3.7	13.6	14.7	44.1		4.5
Copper	17.3	3.2	2.7	20.3	21	215		3.2
Mercury	< 0.09	< 0.09	< 0.09	< 0.12		0.43		< 0.10
Nickel	14	4.4	3.2	15.6	15.8	60.2		4.2
Organolead	< 0.24				< 0.76	< 0.25		< 0.24
Lead	10	3.6	2.7	13.3	15.2	45.5		4.4
Selenium	< 1.0	< 1.0	< 1.0	< 1.2	< 1.1	< 1.0		< 1
Silver	0.43 J	0.33	< 0.24	0.46 J	0.49 J	0.83 J		< 0.25
Thallium	1.2	1.1	< 1.0	< 1.2	< 1.1	< 1.0		< 1
Zinc	42.5	12.9	9.8	49.7	56.5	11600		17.3
General chemistry							NA	
Carbonate as $CaCO_3$	< 5	100	180	< 5	60	< 5		< 5
Bicarbonate as $CaCO_3$	295	175	180	540	1060	1100		245
Hydroxide as $CaCO_3$	< 5	< 5	< 5	< 5	< 5	< 5		< 5
Total alkalinity as $CaCO_3$	295	275	360	540	1120	1100		245
Chloride	200	< 5.0	< 5.0	1200	< 5.0	3410		100
Electric conductivity	932	945	472	289	686	5800		717
Fluoride	< 5.0	< 5.0	< 5.0	< 5.0	14	6.6		< 5.0
% Moisture	3.9	2.3	2.5	20.1	11.7	9.7		4.8
Nitrate as Nitrogen	0.7	< 0.5	< 0.5	< 0.6	3.6	< 4.6		< 1.5
pH	8.7	9.4	8.4	8.6	8.6	7.8		1370 R
Sulfate	4880	117	< 100	1980	471	11000 R		1370
Calcium	43,800	16,300	13,700	45,900	37,400	22,800		15,300
Iron	13,300	4,670	3,820	15,600	16,300	84,700		4,630
Potassium	2,260	647	468	2,550	2,800	1,470		575
Magnesium	10,900	3,840	3,560	12,200	11,200	6,100		4,080
Manganese	382 J	155 J	125 J	436 J	417	469 J		140 J
Sodium	2520	395	266	2820	942	2510		554
Formaldehyde	< 1.0	NA	NA	NA	NA	< 1.0	NA	< 1.0

Notes:
[a] analytical data are for detected compounds only from Ogden 1993a
[b] units of all analyses are in mg/kg, except for pH (unitless), moisture content (%), and electric conductivity (µmhos)
[c] DL – detection limit; NA – not analyzed
[d] J, R, and N are data qualifiers (see Section 2.9.2 for discussion)

Table 2-2
Upper Limit of Background Concentration
Using 95th Percentile of the Background Population

Analyte	Concentration at the Inflection Point (mg/kg)[a]	Mean (mg/kg)	Standard Deviation (mg/kg)	Upper Limit of Background Concentration as 95th Percentile (mg/kg)	Typical Metal Concentrations in Soil, Western U.S.[b] (mg/kg)
Arsenic	7.2	3.84	1.49	6.3	< 0.1 - 97
Beryllium	1.3	0.67	0.28	1.1	< 1 - 15
Cadmium	5.2	(-0.28)[c]	(1.1)[c]	4.6	NP[d]
Chromium	17	11.12	3.42	17	3 - 2000
Copper	22.7	14.57	6.29	25	2 - 300
Lead	24	9.86	4.37	17	< 10 - 700
Nickel	22	12.89	4.5	20	< 5 - 700
Silver	0.7	0.3	0.16	0.6	NP
Zinc	96	41.64	17.10	70	10 - 2100

Notes:
[a] mg/kg – milligram per kilogram
[b] Shacklette et al. 1984
[c] mean and standard deviation of log (concentration), unitless
[d] NP – not published

Therefore, the mean and standard deviation of the logarithm of concentrations were used to calculate the 95th percentile of the lognormal distribution that was then converted to the actual concentration as the UL value for cadmium.

The UL of the background concentration was estimated as the 95th percentile of the background population. As such, it is expected that approximately 5 percent of the soil samples that represent background (i.e., naturally occurring) conditions will contain concentrations of metals exceeding the UL. Therefore, a simple comparison of sample results to the UL is not sufficient to discriminate between naturally occurring concentrations of analytes and concentrations indicative of potential contamination. A metal concentration in a sample that exceeds the UL does not necessarily mean that the concentration is related to contamination.

Due to the uncertainties in direct comparison with the UL values, additional factors are considered in discriminating between background and nonbackground concentrations as an indication of potential contamination at the site. The factors considered in evaluating whether analytical results are indicative of potential contamination include the following:

- similar or greater background sample concentrations that also exceed the UL values;
- the magnitude of sample concentration relative to the UL values;

- constituents likely associated with the suspected contaminant source;
- comparison of sample concentrations with laboratory method detection limits in instances where there are no UL values (i.e., if nondetectable concentrations of particular analytes in most background and nonbackground samples precluded calculating a UL value); and
- comparison of sample concentrations with typical concentrations of metals occurring in the western United States (Shacklette et al. 1984) (Table 2-2).

2.8.2.3 ASSESSMENT OF ANALYTICAL DATA QUALITY

The analytical results presented in Table 2-1 were subject to data validation, and if necessary, specific results were qualified with respect to usability (Ogden 1993a). Validation qualifiers attached to the data are also shown in Table 2-1.

Three types of qualifiers ("J," "R," and "N") were applied to the Site 1 analytical data. The "J" qualifier indicates that the quantification of the result is somewhat uncertain, and the reported value is estimated. The Risk Assessment Guidance for Superfund (RAGS), Volume 1, Human Health Evaluation Manual (U.S. EPA 1989) suggests that the value be used as reported.

An "R" qualifier is attached to data that have not met one or more specific quality assurance standards (defined in RAGS). A value with an "R" qualifier is inadequate for risk assessment or risk screening. Six of the 26 antimony analyses, the bis(2-ethylhexyl) phthalate analyses for sample EC1-B2-S1-D2, the benz(a)anthracene analysis for sample EC1-B9-S2-D3.5, and a variety of the general chemistry analyses, were qualified with an "R" (Table 2-1). The characteristic of antimony concentrations at Site 1 were deficient due to poor spike recovery. The benz(a)anthracene analysis belonged to a sample collected from boring B9, located outside of the landfill. Because the removal actions evaluated in this EE/CA are focused primarily on in-place containment of the landfill waste (Section 4), the analyses qualified with an "R" have no affect on this evaluation.

An "N" qualifier indicates presumptive evidence of the presence of a compound. The hydrocarbon range in the TFH analysis of sample EC1-B2-S1-D2 was labeled as "N." Results with this validation qualifier do not affect the risk screening conclusions or the removal action alternatives.

2.8.2.4 EVALUATION OF DETECTION LIMITS

Analytical detection limits for analyses performed on soil samples collected from borings B1 through B8 were reviewed and compared to the U.S. EPA (1995) Region IX preliminary remediation goals (PRGs). Analytical results from soil samples collected from boring B9 were not reviewed because it was located outside of the landfill area and was intended as a background boring. The review was conducted to determine if the data collected for the SWAT/SI were sufficient to perform a risk screening. Table 2-3 lists analytes with detection limits higher than PRGs.

Analytical methods used for the SWAT/SI, excluding the analysis for boring B-9, have detection limits greater than PRGs for:

- N-nitrosodimethylamine,
- vinyl chloride,
- bis(2-chloroethyl)ether,
- benzo(a)pyrene,
- dibenz(a,h)anthracene, and
- organolead.

N-nitrosodimethylamine is a compound most commonly associated with rocket fuel production and lubricant manufacturing. These processes are not known to have occurred at NAF El Centro.

Vinyl chloride is normally associated with plastic manufacturing or is a degradation product of some chlorinated solvents. Plastic manufacturing was not conducted at NAF El Centro, nor do the analytical data presented in Table 2-1 indicate the presence of any chlorinated solvents in the landfill except for a trace amount of 1,1,1-trichloroethane. Therefore, vinyl chloride is not likely to be present at Site 1.

Bis(2-chloroethyl)ether is a fumigant, solvent, and reagent in organic synthesis. There is no evidence of use of this compound at El Centro. Benzo(a)pyrene and dibenz(a,h)anthracene) are polyaromatic hydrocarbons and components of coal tar. Based on the operational history of NAF El Centro, there is no reason to believe that the compounds would be present in concentrations greater than those at any industrial facility. Organolead was not detected in any samples, and where fuel hydrocarbons were detected, the characterization was diesel rather than gasoline (i.e., leaded gasoline).

Chemicals analyzed using U.S. EPA Method 8010/8020 are not listed in Table 2-3. Laboratory reports for the analyses of these compounds were not available during the preparation of this EE/CA. However, laboratory reports were available for analyses performed on soil samples collected at Sites 3, 4, and 8. These results indicate that the standard laboratory detection limits for Method 8010/8020 are below the PRGs for all analytes except vinyl chloride. Because there was no dilution required in the analyses of samples collected from Site 1, the laboratory detection limits are likely to be the same as those for the Site 3, 4, and 8 analyses.

One sample, EC1-B9-S2-D3.5, had elevated detection limits reported for analytes in U.S. EPA Methods 8080 and 8270. The sample was diluted to correct for a complex hydrocarbon matrix that interfered with the location of target compounds at levels below the PRG. The elevated detection limits do not change the findings.

Table 2-3
Summary of Laboratory Detection Limits Greater Than
U.S. EPA Region IX Preliminary Remediation Goals for Residential Soils
(units reported in milligrams per kilogram)

Sample/Analyte	Detection Limit[a]	PRG[b]
EC1-B2-S1-D2		
Method 8270		
N-nitrosodimethylamine	0.17	0.0087
bis (2-chloroethyl)ether	0.17	0.074
benzo(a)pyrene	0.17	0.061
dibenz(a,h)anthracene	0.17	0.061
Metals		
organolead	0.24	0.0065
EC1-B3-S3-D5		
Method 8240		
vinyl chloride	0.006	0.0052
Method 8270		
N-nitrosodimethylamine	0.17	0.0087
bis (2-chloroethyl)ether	0.17	0.074
benzo(a)pyrene	0.17	0.061
dibenz(a,h)anthracene	0.17	0.061
Metals		
organolead	0.30	0.0065
EC1-B5-S4-D6.5		
Method 8240		
vinyl chloride	0.006	0.0052
Method 8270		
N-nitrosodimethylamine	0.17	0.0087
bis (2-chloroethyl)ether	0.17	0.074
benzo(a)pyrene	0.17	0.061
dibenz(a,h)anthracene	0.17	0.061
Metals		
organolead	0.26	0.0065
EC1-B6-S3-D5		
Metals		
organolead	0.29	0.0065
EC1-B7-S3-D5		
Metals		
organolead	0.25	0.0065
EC1-B8-S1-D2		
Metals		
organolead	0.24	0.0065

Notes:
[a] detection limits reported in Ogden 1993a
[b] PRG – United States Environmental Protection Agency preliminary remediation goals for residential soils, February 1995

2.8.2.5 HUMAN HEALTH RISK SCREENING CALCULATIONS

Risk screening was conducted to determine whether the highest measured concentration of each COPC exceeded its respective U.S. EPA or Cal-EPA-modified residential soil PRG (U.S. EPA 1995). The residential soil PRGs are concentrations corresponding to a lifetime cancer risk of one in a million (1×10^{-6}) for carcinogenic effects and a hazard index of 1.0 for noncarcinogenic effects. Therefore, if the concentration of a chemical exceeds its PRG, the concentration may result in a level of exposure corresponding to an upper-bound cancer risk exceeding 1×10^{-6} if the chemical is a carcinogen, or it may result in an illness of another type if the chemical is not a carcinogen.

The total risk for each carcinogen, based on the U.S. EPA Region IX, Cal-EPA, or modified PRGs (U.S. EPA 1995) for carcinogens, is summarized in Table 2-4. The incremental cancer risk (i.e., the risk above that of background conditions) is also presented in Table 2-4.

Incremental risk was not calculated for noncarcinogenic effects (Table 2-5). Unlike carcinogenic effects, noncarcinogenic effects are based on threshold concentrations. Below the threshold concentrations, there are no health effects associated with the presence of the compound. Above the threshold concentrations, health hazards become apparent. A release of a chemical to the environment may cause the total concentration of the compound (background plus the added amount) to exceed the threshold concentration. The threshold concentrations (i.e., noncarcinogenic PRGs) are typically several orders of magnitude greater than the carcinogenic PRGs for compounds that have both carcinogenic and noncarcinogenic effects (e.g., arsenic).

2.8.2.6 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

Based on the available data (Ogden 1993a,b), metals are the primary contaminants of concern at the site. Arsenic, antimony, copper, chromium, lead, nickel, silver, and zinc occur at concentrations exceeding the UL of background in the soil samples collected at a depth of 2 feet in soil borings B6 and B7, but not in samples collected at greater depths.

As summarized previously, lead and arsenic were the only metals detected at concentrations likely to cause significant risk to human health. With the exception of zinc, the occurrence of metals concentrations exceeding the ULs for background is limited to the fill materials. Zinc was present at concentrations exceeding the UL of background at 8 feet in B1 and B2, although the concentrations detected in these samples are less than the PRG for residential soil. These data suggest that the occurrence of elevated metals concentrations is principally limited to the fill materials.

The waste management practices at Magazine Road Landfill included monthly burning to reduce the volume of wastes. This practice likely resulted in the reduction of organic chemicals in the waste through volatilization and combustion. The results of the soil sample analyses from the SWAT/SI tend to support this conclusion. Only two of the 30 samples analyzed contained greater than 10 mg/kg of TRPH and TFH. Of these samples,

Table 2-4
Estimated Total Cancer Risk for Chemicals of Potential Concern at Site 1

Chemical	Residential PRG[a] (mg/kg)[b]	Highest Measured Concentration (mg/kg)	Risk	UL[c] of Background Concentration (mg/kg)	Net Concentration[d] (mg/kg)	Incremental Risk
Arsenic	0.32	11.3	3.53×10^{-5}	6.3	5.0	1.56×10^{-5}
Beryllium	0.14	1.1	7.86×10^{-6}	1.1	—[e]	0
Cadmium	9.0[f]	1.1	1.22×10^{-7}	4.6	—	0
Chromium, hexavalent	(0.2)	(20.6)	(1.03×10^{-4})	(0)	20.6	1.03×10^{-4}
Chromium, total[g]	210	20.6	9.81×10^{-8}	17	3.6	1.71×10^{-8}
Methylene chloride	11	0.06	5.45×10^{-9}	None	—	5.45×10^{-9}
Total Assuming Cr as total chromium[g]			$\mathbf{4.34 \times 10^{-5}}$			$\mathbf{1.56 \times 10^{-5}}$
Total Assuming Cr as Cr^{+6}[h]			$\mathbf{(1.46 \times 10^{-4})}$			$\mathbf{(1.19 \times 10^{-4})}$

Notes:
[a] PRG – preliminary remediation goal (U.S. EPA 1995)
[b] mg/kg – milligrams per kilogram
[c] UL – upper limit
[d] net concentration above background UL
[e] — – not applicable
[f] for cadmium, Cal-EPA-modified PRG was used
[g] assumes trivalent (Cr^{+3}) and hexavalent (Cr^{+6}) chromium in the same proportions as the U.S. EPA Region IX PRG for total chromium
[h] assumes total chromium is hexavalent chromium (Cr^{+6}), Cal-modified PRG (i.e., 0.2 mg/kg) used in risk calculation

Table 2-5
Estimated Total Hazard Indices for Chemicals of Potential Concern at Site 1

Chemical	Residential PRG[a] (mg/kg)[b]	Highest Measured Concentration (mg/kg)	UL[c] of the Background Concentration (mg/kg)	Hazard Index
Antimony	31	5.9	None	0.190
Arsenic	22	11.3	6.3	0.514
Beryllium	380	1.1	1.1	0.003
Cadmium	38	1.1	4.6	0.029
Chromium, hexavalent[d]	380	20.6	None	0.054
Chromium, total[e]	1×10^5M[f]	20.6	17	0.000
Copper	2,800	538	25	0.192
di-n-butyl phthalates	6,500	0.22	None	0.000
Lead	130	157	17	1.208
Methylene chloride	1,700	0.06	None	0.000
Nickel	150	20.2	20	0.135
Nitrate as N	100,000	67.7	None	0.001
Silver	380	1.1 J[g]	0.6	0.003
Thallium	5.4	1.8	None	0.333
Toluene	1,900	0.02	None	0.000
1,1,1-trichloroethane	3,200	0.02	None	0.000
Xylenes	980	0.01	None	0.000
Zinc	23,000	418	70	0.018
Total Hazard Index Assuming Cr as Cr^{+6}				**2.680**
Total Hazard Index Assuming Cr as Total Chromium[e]				**2.626**

Notes:
[a] PRG – preliminary remediation goal (U.S. EPA 1995)
[b] mg/kg – milligrams per kilogram
[c] UL – upper limit
[d] assumes total chromium is all hexavalent chromium
[e] assumes trivalent and hexavalent chromium in the same proportions as U.S. EPA Region IX PRG for total chromium
[f] maximum concentration (saturated) not included in hazard sum
[g] J – data validation qualifier indicating that the value has been estimated

one sample, EC1-B9-S2-D3.5, was collected from B9. Boring B9 is located approximately 100 feet southeast of the landfill and was intended to be a background soil boring. It is suspected that the petroleum hydrocarbon contamination observed in the soil samples collected from B9 is probably related to an off-site source not associated with Site 1.

The available data are not adequate to assess the lateral extent of potential soil contamination or to identify and characterize the extent of potential hot spot contamination within the fill materials. However, as described in the following sections, this information is not necessary for selection and design of the removal action alternatives because of the selection of a presumptive remedy.

2.9 STREAMLINED RISK EVALUATION

The eight factors described in the NCP (40 CFR 1990) Section 300.415(b)(2) for determining the appropriateness of a removal action were reviewed. The following factors were identified as being applicable: actual or potential exposure to nearby human populations, animals, or the food chain may result from hazardous substances or pollutants or contaminants present at the site; and actual or potential contamination of drinking water supplies or sensitive ecosystems.

In this evaluation, analytical data for samples collected from boring B9 were not included. As discussed in Section 2.8.2, soil boring B9 was intended as a background boring. Contaminants detected in samples from this boring are suspected to be related to an off-site source not associated with Site 1.

Summaries of carcinogenic risk and the noncarcinogenic hazard index are presented in Tables 2-4 and 2-5. The total and incremental cancer risk presented by all of the carcinogens is approximately 1.46×10^{-4} and 1.19×10^{-4}, respectively (assuming total chromium as hexavalent chromium). Arsenic is the only element or contaminant for which the net concentration exceeds the corresponding residential PRG.

The total hazard index for noncarcinogenic effects is 2.6. Lead and arsenic have the highest risk factors, with a total hazard index of 1.71.

Total chromium was not observed at concentrations exceeding the U.S. EPA Region IX residential PRG (i.e., 210 mg/kg) for total chromium. If it is assumed that total chromium is 100 percent hexavalent chromium, then the highest measured concentration of chromium (i.e., as hexavalent chromium) exceeds the Cal-EPA-modified PRG (i.e., 0.2 mg/kg) for hexavalent chromium (Table 2-4).

Although in the above analysis lead is evaluated only as a noncarcinogenic chemical, it is also considered to be a carcinogen. However, a cancer potency factor for lead is yet to be developed (U.S. EPA 1993b). Arsenic and cadmium were evaluated both for carcinogenic and noncarcinogenic effects because there are PRGs for both types of effects.

Based on the risk screening, the COPCs at Site 1 are lead, arsenic, and chromium, if total chromium is assumed to be hexavalent chromium.

2.9.1 Health Effects Produced by Chemicals That May Present a Significant Risk

Brief descriptions of the toxicity of the three chemicals that contribute significantly to the total estimated risk are presented below.

- Arsenic is a known human carcinogen. The fatal oral dose for arsenic trioxide is about 120 milligrams in an adult human. For a 70-kilogram person, that amount is equivalent to a dose of 1.7 mg/kg. The toxicity of arsenic is due to its ability to interfere with cellular metabolism by enzyme inhibition. Chronic exposure to arsenic can cause anemia, weight loss, liver and kidney damage, and heart failure.
- Chromium is most commonly found in the forms of trivalent and hexavalent chromium. Trivalent chromium compounds are less soluble in water than hexavalent chromium compounds and are also less toxic. Chromium has been reported to cause contact dermatitis, liver and kidney damage, lung congestion, and lung cancer in humans. Hexavalent chromium also appears to be a cause of lung cancer.
- Lead affects the central and peripheral nervous system, the blood system, the cardiovascular system, and the male reproductive tract. Its effects on the central nervous system are of particular concern. Lead is particularly toxic to children; exposure to very low levels can result in mental and developmental retardation. U.S. EPA classifies lead as a probable human carcinogen.

2.9.2 Potential Exposure Pathways

Human contact with the chemicals could occur through incidental ingestion of the soil, direct contact of the soil with the skin, inhalation of windblown soil particles, and other mechanisms if the site is used in a way that would allow such exposure to occur. These exposure mechanisms are possible for individuals who might live, work, play, or otherwise use the site. Because the depth to groundwater at Site 1 is shallow, approximately 10 feet bgs, the potential exists for groundwater contamination from leachate generation.

2.9.3 Sensitive Populations

Site 1 is located approximately 1.5 miles from the main area of operation in the north portion of NAF El Centro. The site is in a restricted area and not frequently used by NAF El Centro personnel. Property to the north, south, and east of the site is used for agricultural purposes. The agricultural activities do not involve Site 1. Property to the west of the site is open, undeveloped land. Given the current usage of the site, there does not appear to be any human populations sensitive to the COPCs at this time. If the site

usage is changed in the future, or if the site soil is disturbed, human exposure to the COPCs may result.

2.9.4 Ecological Scoping Assessment

An Ecological Scoping Assessment (ESA) of Site 1 was performed as part of this EE/CA (Appendix B). Unlike human health risk assessments, ESAs focus on communities of plants and animals that are actually present on a site and/or in the surrounding area. Ecological communities can consist of several to many species of plants and animals.

The ESA was performed to evaluate the need for additional risk evaluation or site remediation. The assessment was performed according to the guidance issued by the Cal-EPA DTSC (1994).

A biologist and a toxicologist visited the site on 20 April 1995 to inspect the site and identify habitats that are most likely to occur on site. Potential exposure routes were identified during the site visit. The data collected during the site visit, and existing chemical data, were evaluated to identify if potentially complete exposure pathways exist at the site. It was concluded that potentially complete exposure pathways are likely to exist at Site 1.

Section 3
IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

This section identifies the scope and objectives of the proposed removal action at Site 1. The removal action objectives are based on CERCLA, NCP, the streamlined risk screening presented in Section 2.8, the ESA presented in Attachment B, and applicable or relevant and appropriate requirements (ARARs) (Appendix C). These objectives are used to develop removal action alternatives (Section 4).

3.1 STATUTORY FRAMEWORK

This removal action is taken pursuant to CERCLA and NCP under the delegated authority of the Office of the President of the United States by Executive Order 12580. These orders authorize the DON to conduct and finance removal actions. This removal action is non-time-critical because a 6-month planning period was available from the time a removal action was determined to be necessary before the initiation of removal actions. The mandated public comments on the EE/CA provide opportunity for public input to the cleanup process. The DON is the lead agency for the removal action. As such, DON is responsible for the removal action and all public participation activities.

This EE/CA complies with the requirements of CERCLA, Superfund Amendments and Reauthorization Act (SARA), NCP at 40 CFR Part 300, Defense Environmental Restoration Program (DERP) at 10 *United States Code* (USC) §2701, et seq., and Executive Order 12580. This EE/CA is being pursued under 40 CFR Part 300.415 (b)(2)(iv) (CFR 1990).

Additionally, the Ca-HSC specifies the preparation of necessary documentation which depends upon the costs of the removal action. The Ca-HSC requires development of either an RAP for removal actions that cost $1 million or greater, or an RAWP for removal actions that cost less than $1 million. Further, the Ca-HSC authorizes DTSC to waive the RAP requirements, in favor of an RAWP or an RAP-equivalent document, for removal actions when an imminent and/or substantial endangerment determination exists. DTSC may also waive the RAP requirements if an RAP-equivalent document that meets the requirements of Ca-HSC 25356.1(h)(3) is prepared. The removal action for Site 1 is expected to cost less than $1 million; therefore, this EE/CA has been prepared to comply with the requirements of an RAWP.

3.2 DETERMINATION OF REMOVAL SCOPE

The scope of this removal action is to reduce the potential for human and ecological exposure to the potentially contaminated landfill wastes, and to reduce the potential for the generation and migration of leachate due to percolation of precipitation. As described later in this section, the proposed removal action, which was selected following U.S. EPA Guidance for Presumptive Remedies (U.S. EPA 1993c), involves containment of Site 1 landfill wastes through the construction of a cap and through implementation of institutional controls. The dimensions of the landfill are approximately 400 by 600 feet (approximately 5.5 acres) (Ogden 1993a). Limited data collected during the SWAT/SI

suggest that several metals and organic chemicals are present in the fill materials at concentrations greater than background.

Available data are not sufficient to assess if groundwater at the site is impacted by the landfill. As described in Section 2.4.2, data collected during the previous investigations suggest that groundwater elevations and flow direction vary throughout NAF El Centro. Groundwater flow appears to be influenced complexly by irrigation and the network of subsurface drains that underlie the agricultural fields in the area. These variations may cause groundwater to come into contact with the fill materials, increasing the potential for migration of contaminants to the groundwater. Evaluation of potential groundwater impacts at the site is beyond the scope of the proposed removal action, although it is recommended that evaluation of potential groundwater impacts be addressed further as part of separate activities.

The previous investigations performed at Site 1 (NEESA 1987; Ogden 1993a) did not address the potential for the production and migration of landfill gases at the site. Landfill gases are typically produced as a by-product of the natural degradation of organic wastes (e.g., vegetation, paper). The waste management practices at Site 1 reportedly included monthly burning to reduce the waste volume (Ogden 1993a). This practice typically reduces the volume of organic wastes, and probably also served to volatilize VOCs (e.g., fuels) present in the waste. In addition, review of the geologic logs presented in the SWAT/SI (Ogden 1993a) indicates that the occurrence of organic wastes in the fill material is limited. Therefore, it is concluded that the Site 1 fill materials are unlikely to produce landfill gases. Mitigation of landfill gases is not included in the scope of the proposed removal action.

3.3 DETERMINATION OF REMOVAL SCHEDULE

Factors that may affect the removal action schedule include availability of services and weather. As part of the EE/CA removal action evaluation process, the availability of services is considered. Due to the extreme summer temperatures in the Imperial Valley, removal actions executed during the summer may require additional time or nighttime work. Rain is not expected to be a major consideration in the execution of any removal action.

Other removal actions at NAF El Centro must be coordinated with activities at Site 1. Specifically, inert soil generated during removal actions at Sites 3 and 8 is proposed for reuse as part of the foundation for the cap for Site 1. For this reason, the implementation schedule for the Site 1 removal action will depend on work schedules at the other two IRP sites.

This EE/CA will be available for public review and comment for 30 days. The DON will review and prepare written responses to the comments and will direct the incorporation of public comment in the final EE/CA. The DON will also prepare an Action Memorandum providing a written record of decision to select an appropriate removal action. Once the DON awards the removal contract, the removal action is expected to be completed within 12 months.

3.4 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The NCP states, "Removal actions . . . shall to the extent practicable considering the exigencies of the situation, attain applicable or relevant and appropriate requirements under federal environmental or state environmental or facility siting laws" [40 CFR 300.415(I)]. The evaluation of ARARs for this EE/CA is presented in Appendix C. The following sections provide an overview of the ARARs process and a summary of those potential ARARs that most significantly affect the development of removal action objectives.

3.4.1 Applicable or Relevant and Appropriate Requirements Overview

Identification of ARARs is a site-specific determination that involves a two-part analysis. First, it must be determined if a given requirement is applicable. Second, if a requirement is not applicable, it must be determined if the requirement is relevant and appropriate. A requirement is deemed applicable if the specific terms of the law or regulation directly address the COPCs, remedial action, or place involved at the site. If the jurisdictional prerequisites of the law or regulation are not met, a legal requirement still may be relevant and appropriate if the site circumstances are sufficiently similar to circumstances in which the law otherwise applies, and if it is well suited to the conditions of the site.

A requirement must be substantive to constitute an ARAR for activities conducted on-site. Procedural or administrative requirements, such as permits and reporting requirements, are not ARARs for on-site activities.

In addition to ARARs, the NCP provides that where ARARs do not exist, agency advisories, criteria, or guidance are to be considered (TBC) useful "in helping to determine what is protective at a site or how to carry out certain actions or requirements" (55 *Federal Register* 8745). The NCP preamble states, however, that provisions in the TBC category "should not be required as cleanup standards because they are, by definition, generally neither promulgated nor enforceable, so they do not have the same status under CERCLA as do ARARs."

As the lead federal agency, the DON is primarily responsible for the identification of federal ARARs at Site 1. As the lead state agency, Cal-EPA is responsible for identifying state ARARs. In a letter dated 13 April 1995, the DON requested that Cal-EPA identify potential ARARs for the NAF El Centro IRP sites, including Site 1. A response was received by the DON from Cal-EPA on 21 June 1995. The ARARs analysis presented in this EE/CA incorporates the information provided by Cal-EPA to the extent it applies to the removal action alternatives considered at Site 1.

3.4.2 Applicable or Relevant and Appropriate Requirements Affecting Removal Action Objectives

ARARs and TBCs are generally divided into three categories: chemical-specific, location-specific, and action-specific. A detailed discussion of the potential ARARs considered for this EE/CA is presented in Appendix C.

In addition to the statutory framework for CERCLA removal actions (Section 3.1), the principal controlling ARARs for the proposed activities at Site 1 are the requirements for landfill closure contained in CCR Title 23, Chapter 15, Sections 2510, 2546, 2550, 2580 and 2581. Other potential ARARs related to landfill closure and postclosure care are provided in CCR Title 14, Chapter 3, Article 7.8. Although not an ARAR, the U.S. EPA presumptive remedy guidance for municipal landfills (U.S. EPA 1993c) has been identified as a principal controlling TBC requirement. Additionally, various rules and regulations of the Imperial County Air Pollution Control District (ICAPCD) promulgated pursuant to the Clean Air Act will be potential ARARs for construction activities associated with the removal at Site 1.

3.4.2.1 U.S. EPA PRESUMPTIVE REMEDY

The proposed removal action alternatives identified in Section 4 address two components of the presumptive remedy prescribed by the U.S. EPA under CERCLA guidance for municipal landfill sites: construction of a landfill cap and institutional controls to supplement engineering controls.

The U.S. EPA guidance on conducting non-time-critical removal actions under CERCLA recommends the use of presumptive remedy guidance, if available and appropriate, to focus the selection of removal action alternatives in EE/CAs (U.S. EPA 1993a). Presumptive remedies involve the use of remedial technologies that have been selected in the past at similar sites or for similar contaminants.

The U.S. EPA presumptive remedy guidance for municipal landfill sites (U.S. EPA 1993c) is appropriate for Site 1. The guidance defines a municipal landfill as "a heterogeneous mixture of municipal waste frequently codisposed with industrial and/or hazardous waste." Approximately 60 percent of the Site 1 landfill waste stream reportedly consisted of household rubbish (i.e., municipal waste), with the remainder consisting of industrial wastes (e.g., plating wastes, asbestos, water-bearing fuels, used lubricating oil and hydraulic fluids, paint, solvents, photographic chemicals, sandblasting grit, pesticides, batteries, and spent cartridges) (Ogden 1993a). Because of the large volume and heterogeneity of the waste materials in a landfill, treatment is usually impractical, and U.S. EPA generally considers containment to be the appropriate response action, or presumptive remedy, for such sites. Institutional controls may also be necessary to maintain the integrity of the containment system. Controls which restrict access or limit use of the site are considered institutional controls.

The U.S. EPA guidance (U.S. EPA 1993c) identifies the primary components of the presumptive remedy as:

- landfill cap;
- monitoring and mitigation of groundwater impacts at the perimeter of the landfill source area;
- landfill gas collection and treatment;
- leachate collection and treatment; and/or
- institutional controls to supplement engineering controls.

Response actions developed for individual landfills should include only those components of the presumptive remedy that are necessary based on site-specific conditions.

As described in Section 3.2, evaluation and mitigation of potential groundwater impacts at Site 1 is beyond the scope of the proposed removal action, although it is recommended that evaluation of potential groundwater impacts be addressed separately from this removal action.

The Site 1 fill materials are considered unlikely to produce landfill gases (Section 3.2). The landfill cap proposed for Site 1 will be designed to limit the generation of leachate. In addition, because of the arid environment, volumes of leachate requiring collection and treatment are not anticipated. Therefore, engineering controls related to the mitigation of landfill gas and/or collection and treatment of leachate are not considered necessary and are not included in the proposed removal action alternatives.

3.4.2.2 CCR TITLE 23, CHAPTER 15

The proposed removal action alternatives identified in Section 4, construction of a landfill cap, and institutional controls to supplement engineering controls, have been developed following the guidelines presented in CCR Title 23, Chapter 15.

Sections 2580 and 2581 of the Chapter 15 regulations include the technical requirements for landfill closure, addressing the following issues:

- construction of survey monuments;
- construction of the final cover (i.e., cap);
- grading requirements for construction of the final cap;
- selection of vegetation to be planted on the cap; and
- postclosure maintenance requirements, which include groundwater monitoring, landfill gas and leachate mitigation, as necessary, and maintenance of the cap and survey monuments.

Section 2581 (a)(1) allows use of waste materials, including contaminated and previously contaminated soil, in the foundation layer of the cap provided that such materials have

appropriate engineering properties. Therefore, the proposed reuse of inert soils generated during the Site 3 and 8 removal actions as foundation materials for the cap at Site 1 is consistent with ARARs.

Section 2550 contains detailed groundwater monitoring requirements for detecting, evaluating, and responding to the release of waste constituents from landfills. These requirements apply during the postclosure maintenance period. However, assessment of potential groundwater impacts at Site 1 is beyond the scope of the proposed removal action (Section 3.2). It is recommended that evaluation of potential groundwater impacts at Site 1 be addressed separately from this removal action.

Section 2510(b) allows consideration of alternatives to the prescriptive technical requirements of CCR Title 23, Chapter 15, including the landfill cover and grading requirements of Section 2581. For an alternative to be considered, it must be demonstrated that:

- the regulatory construction standard is not feasible considering the cost and burden imposed on the landfill facility; and
- the proposed engineered alternative is consistent with the performance goal addressed by the particular construction or prescriptive standard and affords equivalent protection against water quality impairment.

3.4.2.3 CCR TITLE 14, CHAPTER 3, ARTICLE 7.8

CCR Title 14, Chapter 3, Article 7.8 contains additional requirements for the closure and postclosure care of solid waste disposal sites, including landfills. Substantive portions of these regulations addressing the following issues are considered potential ARARs for purposes of this EE/CA:

- security at closed sites (Section 17767);
- construction of the landfill cap (Section 17773);
- construction quality assurance (Section 17774);
- grading and slope stability requirements for the final cover (Section 17776 and 17777);
- drainage slope protection, and erosion control requirements for the final cover (Section 17778 and 17779);
- postclosure maintenance requirements, including groundwater monitoring, site security, landfill gas and leachate mitigation as necessary, and maintenance of the cap and survey monuments (Sections 17781 through 17783, and 17788); and
- restrictions on postclosure land use (Section 17796).

The proposed removal action alternatives for Site 1 identified in Section 4 have been developed to be consistent with the CCR Title 14, Chapter 3, Article 7.8 requirements cited above.

As noted in Section 3.2, the evaluation and mitigation of potential groundwater impacts is beyond the scope of this removal action. CCR Title 14, Chapter 3, Article 7.8, Section 17778 requires implementation of a groundwater monitoring program at landfills during the closure and postclosure periods. It is recommended that these monitoring requirements be addressed separately from this removal action.

Materials disposed at Site 1 are considered unlikely to produce landfill gases (Section 3.2) and the proposed landfill cap will be designed to limit the generation of leachate. Therefore, engineering controls for landfill gas and collection and treatment of leachate are not considered necessary at Site 1 (see CCR Title 14, Chapter 3, Article 7.8, Sections 17781 and 17783). These features are not incorporated in the proposed removal action alternatives.

3.5 REMOVAL ACTION OBJECTIVES

This section is intended to meet portions of the RAWP, as defined in Section 25323.1, Ca-HSC, specifically, goals of the removal action.

The purpose of this removal action is to reduce the potential for human and ecological exposure to the landfill wastes and potentially contaminated soils, as well as to reduce the potential for the generation and migration of leachate. The streamlined risk evaluation performed as part of this EE/CA (Section 2.8) indicated that potential human exposure pathways for the COPCs included incidental ingestion, direct skin contact with soil, and inhalation of windblown soil particles. The ESA performed as part of this EE/CA (Appendix B) indicated that potential ecological exposure routes include direct uptake of COPCs in soil or groundwater by plants, dermal absorption of COPCs in soil by wildlife receptors, ingestion of COPCs in contaminated food or water sources by wildlife receptors, and inhalation of COPCs in air. Based on these potential exposure pathways, the primary removal action objectives are as follows:

- reduce the potential for human and ecological exposure to landfill waste and associated contaminated soil;
- reduce the potential for contaminant leaching and subsequent migration of waste constituents to groundwater and surface water; and
- control surface water runoff and reduce the potential for erosion of the landfill surface.

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Section 4
IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Three removal action alternatives have been identified for evaluation. The three removal action alternatives are:

- Alternative 1 - multiple-layer cap;
- Alternative 2 - monolithic cap; and
- Alternative 3 - no action.

Alternative 1 includes a multiple-layer cap designed in general accordance with the technical requirements of CCR Title 23, Chapter 15, Sections 2580 and 2581 (see Section 3.4.2.2).

Alternative 2 includes a monolithic (single-layer) cap, which is proposed as a suitable substitute for the prescriptive landfill closure requirements of CCR Title 23 (i.e., the multiple-layer cap design proposed as Alternative 1). As described in Section 4.4, the monolithic cap is "consistent with the performance goal addressed by the particular construction or prescriptive standard, and affords equivalent protection against water quality impairment," as required by CCR Title 23, Chapter 15, Section 2510.

4.1 HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE MODEL CALCULATIONS

The effectiveness at reducing the potential for the generation and migration of leachate was evaluated using the Hydrologic Evaluation of Landfill Performance (HELP) model (U.S. EPA 1994) for each of the three alternatives evaluated as part of this EE/CA. The HELP model was designed by U.S. EPA to evaluate landfill leachate production. The HELP model simulates of landfill performance by estimating infiltration, evaporation, leachate, and moisture content of the landfill on a daily basis. Input to the program included meteorological data (i.e., precipitation, temperature, evaporation) for 1960 through 1990, and the physical characteristics and thicknesses of the proposed cap materials and existing landfill. Because the data did not include a 100-year storm event, an estimated 100-year, 24-hour storm event of 3.3 inches was included in the meteorological data set (National Weather Service 1973).

The HELP model calculations were performed using the cap designs proposed for each of the three proposed removal action alternatives described in the following sections. The conceptual designs of the first two alternatives are shown in Figure 4-1. The estimated total average annual leachate generated at the landfill based on HELP model results for each alternative is summarized in Table 4-1. The HELP model program output for Alternatives 1 through 3 are presented in Appendix D.

Table 4-1
Summary of HELP* Model Calculations

Alternative	Average Annual Leachate (cubic feet per year)
1. Multiple-layer cap	0.001
2. Monolithic cap	0.01
3a. No action	8.0
3b. No action (including infiltration due to ponding)	1,100

Note:
*HELP – Hydrologic Evaluation of Landfill Performance

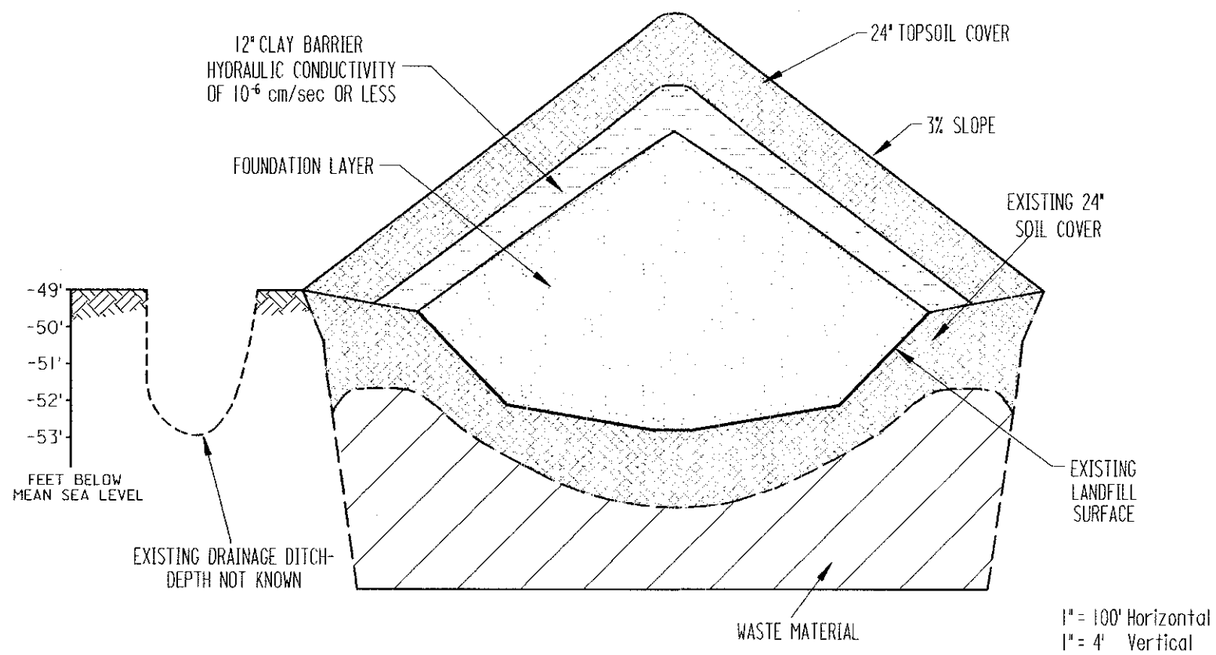
Because the surface of the existing landfill is depressed with respect to the surrounding grade, a supplemental calculation was performed for the no-action alternative (Alternative 3) to estimate the volume of deep infiltration (and subsequent leachate generation) due to ponding of runoff. This calculation was not performed for Alternatives 1 and 2 because the proposed landfill caps would fill the existing depression and promote runoff away from the site. Stormwater runoff from the landfill (i.e., 5.5 acres) was estimated using the Soil Conservation Service Curve Number Method. This same method is used in the HELP model to estimate runoff; however, it is assumed that the runoff leaves the site. The area of the landfill covered by the ponded water was estimated using a volume-depth area curve for the lowest portion of the landfill (Appendix D). It was assumed that the runoff would pond in the lowest portion of the landfill. The volume of runoff deeply infiltrating was estimated to be the volume of the ponded runoff minus the storage capacity of the evaporative zone in the lowest portion of the landfill. Evaporation from the surface of the ponded runoff was neglected because it was estimated to be less than 5 percent of the deep infiltration.

The total deep infiltration due to ponding for the 31-year period evaluated was estimated to be 33,200 cubic feet. This is equivalent to an average annual volume of approximately 1,100 cubic feet (Table 4-1). However, this average annual value is not likely to occur each year. Because storm events are infrequent in desert environments, deep infiltration only occurs during the most intense storms. Thirty percent of the deep infiltration occurred during the 100-year storm event, and 86 percent occurred during the 12 largest storm events. During 9 of the 31 years evaluated, there was no deep infiltration (Appendix D).

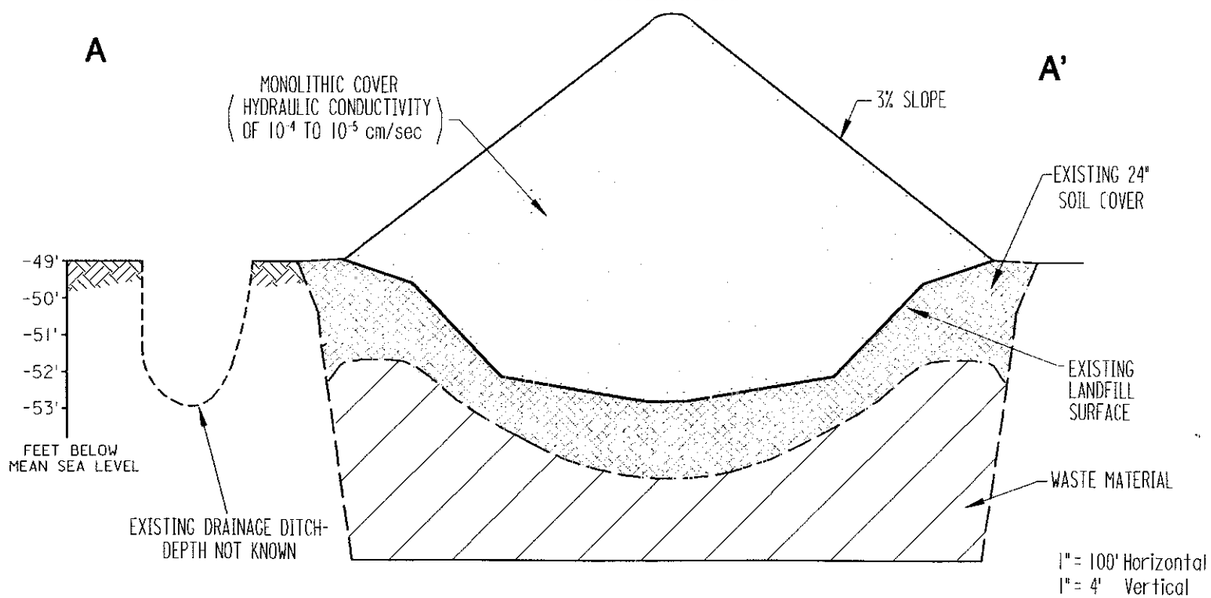
The HELP model output (Appendix D) for the multiple-layer cap indicated that the average annual leachate generation was 0.000 cubic feet. This value was thought to be unrealistic so a nominal value of 0.001 cubic feet was used in Table 4-1. The HELP model output for the monolithic cap indicated that the average annual leachate generation was 0.006 cubic feet. This was rounded to 0.01 cubic feet in Table 4-1.

Based on the calculated average amount of annual leachate generation (i.e., less than 0.01 cubic feet over the entire 5.5-acre landfill), both Alternatives 1 and 2 reduce the estimated amount of leachate generated, and are equally effective at limiting the generation and migration of leachate.

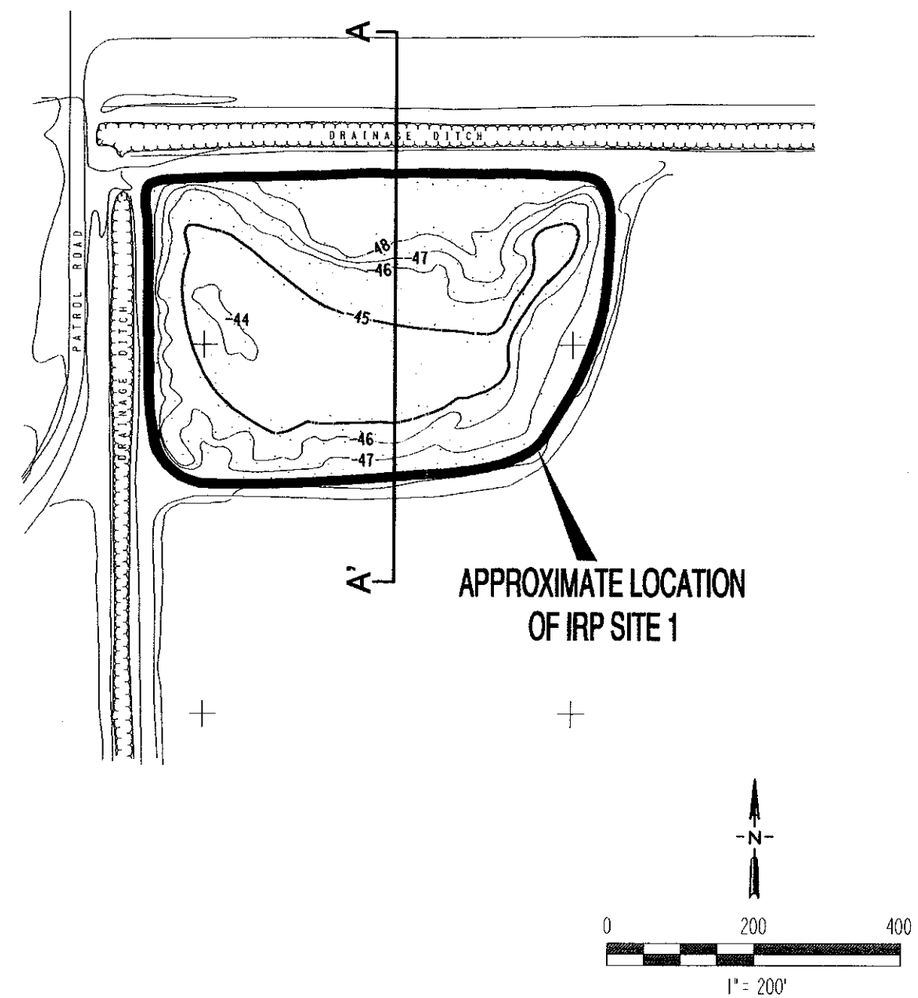
ALTERNATIVE 1
MULTIPLE-LAYER CAP



ALTERNATIVE 2
MONOLITHIC CAP



EXISTING TOPOGRAPHY OF SITE 1



A A' APPROXIMATE LOCATION OF CROSS SECTION

CONTOUR INTERVAL IN FEET
BELOW MEAN SEA LEVEL

EE/CA Site 1

Figure 4-1

Conceptual Design For Removal Action Alternatives 1 and 2 Magazine Road Landfill

Salton Sea Test Base, Imperial County, California

Bechtel National, Inc.
CLEAN II Program

Date: 10/21/95
File No. fig4-1
Job No. 22214-090

4.2 REUSE OF SOILS GENERATED DURING REMOVAL ACTIONS AT SITES 3 AND 8

Both Alternatives 1 and 2 include the reuse of an estimated 3,000 cubic yards of soil excavated during removal actions proposed at Sites 3 (Sludge Burial Area) and 8 (Scrapyard). As described in the EE/CAs for Sites 3 and 8, only the soils generated during these removal actions that are classified as inert will be reused at Site 1. In accordance with CCR Title 23, Chapter 15, Section 2581 (see Section 3.4.2.2), the soils generated during the Site 3 and 8 removal actions will be combined with imported soils to construct of the foundation layer for the cap at Site 1.

4.3 ALTERNATIVE 1, MULTIPLE-LAYER CAP

This section is intended to meet portions of RAWP, as defined in Section 25323.1, Ca-HSC, specifically, removal alternatives.

The multiple-layer cap was designed in general accordance with the technical landfill closure requirements of CCR Title 23, Chapter 15, Sections 2580 and 2581 (see Section 3.4.2.2). Conceptual design for the multiple-layer cap is shown in Figure 4-1. The cap includes the following components:

- a minimum 24-inch-thick foundation layer;
- a 12-inch-thick clay barrier layer with a permeability of 1×10^{-6} centimeter per second (cm/s) or less;
- a 24-inch-thick topsoil cover layer; and
- a 6-inch-thick gravel layer for erosion control.

The technical landfill closure requirements of CCR Title 23, Chapter 15, Section 2580, specify a minimum 12-inch-thick topsoil cover layer, rather than the 24-inch-thick layer considered for this EE/CA. Assuming a 12-inch thickness for this layer caused the leachate generation for the landfill estimated using the HELP model (1,600 average cubic feet per year) to be significantly greater than any other alternative investigated, including the no action alternative (Table 4-1).

The reason for these results is associated with the arid environment of the site. The evaporative zone (i.e., the zone in which moisture is lost from the soil due to evapotranspiration) in arid environments may extend to a depth of 18 inches or more. Below the evaporative zone is a deep percolation zone in which moisture is not lost through evapotranspiration and may deeply percolate resulting in leachate generation. In arid environments, the moisture-storage capacity of the evaporative zone is usually greater than the rainfall during the short-duration events that typify these environments. Very little moisture passes beyond the evaporative zone into the deep percolation zone. Placement of a clay barrier layer 12 inches bgs has the effect of reducing the thickness (and storage capacity) of the evaporative zone because clay has a greater tendency to retain moisture against evapotranspiration. Thus, the clay layer would retain the moisture

that would have otherwise been lost through evapotranspiration. With successive rainfall events and repeated wetting of the clay, the moisture in the clay would tend to deeply percolate, resulting in leachate generation. Increasing the topsoil layer to 24 inches effectively increases the thickness (and storage capacity) of the evaporative zone such that rainfall does not pass to the clay barrier layer.

The cap is designed to provide a minimum grade of 3 percent away from the center to prevent ponding. A lined drainage channel will be constructed around the base of the cap to direct runoff from the landfill into the adjacent drainage ditches. Because the existing landfill surface is approximately 4 feet lower than the surrounding ground surface, it will be necessary to add additional foundation materials to raise the surface of the cap to achieve design grade.

In addition to the above engineering controls, institutional controls will be included as part of the removal action. An 8-foot-high, chain-link security fence with a locked gate will be installed around the site perimeter to limit site access. Warning signs will be posted on the fence. Two permanent survey monuments will also be constructed to monitor settlement of the landfill.

Prior to beginning the removal action activities, a biologist will inspect the site for the presence of the burrowing owl, Colorado valley wood rat, Yuma clapper rail, and the flat-tailed horned lizard (California species of special concern). If active owl burrows are identified and it is not mating season (i.e., March through June), the burrowing owl residents will be moved to an off-site burrow. Removal action activities will not be performed during the mating season if active burrows are observed on-site. Any flat-tailed horned lizards or wood rats observed on the site will be relocated prior to the removal action.

Once the site has been inspected by a biologist, the site will be cleared of vegetation. After cutting, the vegetation will be removed from the site and disposed at a construction debris landfill or similar facility.

4.3.1 Effectiveness

Based on evaluation of the criteria described in the following sections, Alternative 1 is considered to be effective at achieving the goals of reducing the potential for direct human and ecological exposure to the landfill wastes and potentially contaminated soils, as well as reducing the potential for the generation and migration of leachate.

4.3.1.1 COMPLIANCE WITH ARARs

Alternative 1 complies with the ARARs summarized in Section 3.4.2 and Appendix C. The multiple-layer cap has been designed following U.S. EPA guidance for presumptive remedies, and in general accordance with CCR Title 23, Chapter 15, Sections 2580 and 2581, landfill closure requirements (see Section 3.4.2.2).

4.3.1.2 REDUCTION OF TOXICITY, MOBILITY, AND VOLUME

Contaminant mobility will be reduced by limiting leachate generation due to percolation of rainwater through the wastes. This alternative does not reduce the toxicity and volume of the contaminants. As described in Section 4.1, the calculated average annual amount of leachate generated, assuming construction of the multiple-layer cap, is negligible (i.e., less than 0.001 cubic feet over the entire 5.5-acre landfill). Therefore, this alternative is effective at limiting the generation and migration of leachate. However, as described in Section 3.2, variations in groundwater elevations and flow direction related to local agricultural practices may cause groundwater to come into contact with the fill materials, increasing the potential for migration of contaminants to the groundwater. Evaluation of potential groundwater impacts at the site is beyond the scope of the proposed removal action, although it is recommended that evaluation of potential groundwater impacts be addressed further as part of separate activities.

4.3.1.3 SHORT-TERM EFFECTIVENESS

According to U.S. EPA guidance, the short-term effectiveness criterion addresses the effects of the alternative during implementation before the removal objectives have been met (U.S. EPA 1993a). The primary considerations of this criterion are protection of the community, protection of workers, and environmental impacts during the implementation and time until the removal objectives are met.

During the grading activities associated with construction of the cap, measures will be taken to reduce fugitive dust emissions and the associated impacts on workers and the surrounding community. The COPCs are nonvolatile; thus, volatile emissions from the site are not expected. Workers will not be required to directly handle contaminated soil; therefore, hazards associated with worker contact with contaminated soil are not anticipated.

4.3.1.4 LONG-TERM EFFECTIVENESS

Alternative 1 is consistent with the U.S. EPA presumptive remedy guidance for long-term reduction of the potential for human and ecological exposure to municipal landfill wastes and potentially contaminated soils, and for reduction of the potential for the generation and migration of leachate (U.S. EPA 1993c). As indicated in Section 4.1, the multiple-layer cap is effective at reducing the potential for leachate generation and migration. However, recent research has called into question the adequacy of compacted clay barriers in arid locations such as the site. Under arid conditions, clay barrier layers may crack due to desiccation (Daniels 1993). This cracking creates pathways for percolating rainwater to rapidly flow through the barrier. The HELP model does not consider the additional leachate that may be generated as the result of percolation through desiccation cracks. Therefore, the HELP model calculations for this alternative may underestimate the amount of leachate generated in the field.

4.3.2 Implementability

The implementability of Alternative 1 is evaluated in the following sections with respect to technical feasibility, administrative feasibility, availability of services and material, and state and community acceptance.

4.3.2.1 TECHNICAL FEASIBILITY

Alternative 1 is technically feasible. Conventional earth-moving equipment can be used to construct the cap. The site is open and accessible. Thus, there are no apparent site characteristics that impact the performance of the work.

Due to the low precipitation in the Imperial Valley, there is no restriction on the time of year when the work can be performed. Due to the extreme summer temperatures in the Imperial Valley, it may be preferable to avoid work in the summer. The materials, equipment, and services needed to construct the cap and perimeter fence can be provided by local construction contractors.

4.3.2.2 ADMINISTRATIVE FEASIBILITY

There are no known administrative restrictions affecting implementation of this alternative. Therefore, Alternative 1 is considered administratively feasible.

4.3.2.3 AVAILABILITY OF SERVICES AND MATERIALS

Local construction contractors with experience working at hazardous waste sites can be used to construct the cap. Materials required to construct the cap are locally available.

4.3.2.4 STATE AND COMMUNITY ACCEPTANCE

Responses to Cal-EPA DTSC and RWQCB Colorado River Basin Region comments on this EE/CA are provided in Appendix E. No public comments were received during the public comment period.

4.3.3 COST

A total cost of $1,842,000 is estimated to construct the multiple-layer cap proposed under Alternative 1 (Table 4-2). These estimated costs are conceptual and should be used for comparative purposes only. The following assumptions were made in developing the cost estimate for Alternative 1.

- The landfill covers an area of 240,000 square feet.
- The current landfill surface averages 4 feet below the surrounding ground surface.
- The cap will comprise a foundation layer, a 12-inch-thick clay barrier layer, a 24-inch-thick topsoil cover, and a 6-inch gravel layer.

POTENTIAL ARAR's

Source[1]	Standard, Requirement, Criterion, or Limitation	ARAR Status	Description	Comment
66264.14(a)	security requirement	relevant	prevent the unauthorized entry of persons or livestock	
66264.18 (a) (b)	 seismicity standard floodplain requirement	 relevant relevant	location specific	
66264.19(a,c)	landfill construction standards	relevant	ensures the proper construction of landfills	
66264.25	Design standards to meet seismic and precipitation requirements	relevant	landfill standard to function during 24 hour maximum precipitation storm; and withstand maximum credible earthquake.	
66264.51 66264.52(b)	action specific	TBC	requirement that proper action be taken in event of landfill failure	FS or Proposed Plan should discuss who and what action will be taken if the landfill fails e.g. washout of sites 2 or 17
66264.97 to 66264.100	general water quality standard, and detection monitoring, evaluation monitoring and corrective action for maintaining water quality standard	relevant	establish a groundwater monitoring program to protect and remediate groundwater contamination from landfills	Sites 2 and 17 have "hits" in soil and vapor which may produce leachate contaminating groundwater. Site 2 has "hits" of contamination in groundwater
66264.117 (a-d), (f)	requirements for the care and use of property	relevant	specifies the care and/or use of the landfills.	
66264.301 (a-i), (k,l)	requirements for landfill extensions	relevant	specifies for leachate collection, liner, run-on and -off, and particulate matter control	relevant if planning to extend the landfills boundaries.
66264.302, 66264.303 (a,b) 66264.304	requirement for having a liner with leak detection and response plan for excessive leachate	relevant	monitoring for generated leachate	relevant if extend the landfills boundaries.
66264.309	requirement	relevant	maintain records about the landfills	as much information collated on the landfills should be part of the record
66264.310	closure and post closure care requirements	relevant	cap requirements, maintenance requirements	

Table 4-2
Cost Estimate[a] for Alternative 1 - Multiple-Layer Cap

Cost Category	Estimated Cost
Direct Costs[b]	
Capping	$871,000
Professional Labor (project oversight)	14,000
Fencing and Signs	64,000
Total Direct Costs	**$949,000**
Indirect Costs[c]	364,000
Remedial Design	62,000
Escalation[d]	160,000
Contingency[e]	307,000
TOTAL	**$1,842,000**

Notes:
[a] these estimated costs are conceptual and should be used for comparative purposes only
[b] costs of materials and labor directly associated with construction (e.g., fill materials, grading operations)
[c] general conditions costs associated with project support (e.g., supervision, consumable materials and supplies, mobilization)
[d] escalation modifies the costs in the RACER database from January 1992 to the assumed project start date
[e] a 20 percent contingency has been added to cover cost increases that may occur as a result of unforeseen conditions and changes that typically occur on remediation projects

- The cap surface will have a minimum slope of 3 percent.
- The construction activities will include installation of two permanent survey monuments, an 8-foot-high, chain-link security perimeter fence, and a lined drainage channel to direct runoff from the landfill into the adjacent drainage ditches.
- All fill materials required to construct the cap will be obtained from off-base sources.

If fill materials suitable to construct the cap can be obtained from an on-base source, the estimated costs will be reduced. To simplify the assumptions and calculations, the use of fill materials generated during the Site 3 and 8 removal actions, which would reduce the estimates slightly, was not considered in developing the cost estimates.

The cost estimate was performed using the Remedial Action Cost Engineering Requirements (RACER) system developed by the U.S. Air Force. RACER cost models are based on generic engineering solutions for environmental projects, technologies, and processes. These solutions are derived from historical project information, government laboratories, construction management agencies, vendors, contractors, and engineering analysis. RACER cost estimates are made site-specific through the modification of

geographic and project-specific factors. The estimated project costs are summarized in Table 4-2.

4.4 ALTERNATIVE 2, MONOLITHIC CAP

This section is intended to meet portions of RAWP, as defined in section 25323.1, Ca-HSC, specifically, removal alternatives.

A monolithic (single-layer) cap is proposed as a suitable substitute for the prescriptive landfill closure requirements of CCR Title 23 (i.e., the multiple-layer cap design proposed as Alternative 1).

The use of monolithic caps as alternatives to standard CCR Title 23 caps for landfills in arid environments has been gaining acceptance in recent years. The RWQCB Santa Ana Region is currently monitoring the performance of a monolithic cap at the Coyote Canyon Landfill. A monolithic cap comprises a layer of clayey to silty soil with no barrier layer. As described in Section 4.1, in arid environments such as the site, deep percolation is principally controlled by the ability of the cap to store water within the evaporative zone (e.g., 18 inches or deeper). Therefore, the larger storage capacity (relative to the multiple-layer CCR Title 23 cap) provided by the monolithic cap is appropriate for the arid environment at NAF El Centro. Additionally, as described in Section 4.3.1.4, recent research has called into question the adequacy of compacted clay barriers in arid locations such as the site. There is evidence that the clay barriers crack due to desiccation under arid conditions, limiting the effectiveness of these layers in reducing leachate generation (Daniels 1993).

Conceptual design for the monolithic cap is shown in Figure 4-1. The cap comprises a minimum 48-inch-thick cover comprising silty to clayey sand with a permeability of 1×10^{-4} to 1×10^{-5} cm/s overlain by a 6-inch-thick gravel layer for erosion control. The cap is designed to provide a minimum grade of 3 percent away from the center to prevent ponding. A lined drainage channel will be constructed around the base of the cap to direct runoff from the landfill into the adjacent drainage ditches. Because the landfill surface averages approximately 4 feet lower than the surrounding ground surface, the cap thickness will be slightly greater than 48 inches to achieve design slope.

In addition to the above engineering controls, the following institutional controls will be included as part of the removal action. An 8-foot-high, chain-link security fence with a locked gate will be installed around the perimeter of the site to limit site access. Warning signs will be posted on the fence. Two permanent survey monuments will also be constructed to monitor settlement of the landfill.

Prior to beginning the removal action activities, a biologist will inspect the site for the presence of the burrowing owl, Colorado valley wood rat, Yuma clapper rail, and the flat-tailed horned lizard (California species of special concern). If active owl burrows are identified and it is not mating season (i.e., March through June), the burrowing owl residents will be moved to an off-site burrow. Removal action activities will not be performed during the mating season if active burrows are observed on-site. Any flat-

tailed horned lizards or wood rats observed on the site will be relocated prior to the removal action.

Once the site has been inspected by a biologist, the site will be cleared of vegetation. After cutting, the vegetation will be removed from the site and disposed at a construction debris landfill or similar facility.

4.4.1 Effectiveness

Based on the criteria detailed below, Alternative 2 is considered equivalent to Alternative 1 in reducing the potential for human and ecological exposure to the landfill wastes and potentially contaminated soils, as well as reducing the potential for the generation and migration of leachate.

4.4.1.1 COMPLIANCE WITH ARARs

Alternative 2 complies with the ARARs summarized in Section 3.4.2 and Appendix C. The monolithic cap has been designed to satisfy U.S. EPA guidance for presumptive remedies and, in general accordance with Title 23, CCR, Chapter 15, Sections 2580 and 2581, landfill closure requirements (Section 3.4.2.2). As described in Section 4.1, calculations performed using the HELP model (U.S. EPA 1994) indicate that the monolithic cap is equally effective at limiting leachate generation compared to the multiple-layer cap considered under Alternative 1. Therefore, Alternative 2 satisfies the criteria to serve as a suitable substitute for Alternative 1, because it is "consistent with the performance goal addressed by the particular construction or prescriptive standard, and affords equivalent protection against water quality impairment," as required in CCR Title 23, Chapter 15, Section 2510.

4.4.1.2 REDUCTION OF TOXICITY, MOBILITY, AND VOLUME

Contaminant mobility will be reduced by limiting leachate generation due to percolation of rainwater through the wastes. This alternative does not reduce the toxicity and volume of the contaminants. As described in Section 4.1, the calculated average annual amount of leachate generated, assuming construction of the monolithic cap, is negligible (i.e., less than 0.01 cubic feet over the entire 5.5-acre landfill). Therefore, this alternative is effective at limiting the generation and migration of leachate. However, as described in Section 3.2, variations in groundwater elevations and flow direction related to local agricultural practices may cause groundwater to come into contact with the fill materials, increasing the potential for contaminant migration to the groundwater. Evaluation of potential groundwater impacts at the site is beyond the scope of the proposed removal action, although it is recommended that evaluation of potential groundwater impacts be addressed further as part of separate activities.

4.4.1.3 SHORT-TERM EFFECTIVENESS

According to U.S. EPA guidance (U.S. EPA 1993a), the short-term effectiveness criterion addresses the effects of the alternative during implementation before the removal

objectives have been met. Protection of the community, protection of workers, and environmental impacts during the implementation and time until the removal objectives are met are the primary considerations of this criterion.

During the grading activities associated with cap construction, measures will be taken to reduce fugitive dust emissions and the associated impacts on workers and the surrounding community. The COPCs are nonvolatile; thus, volatile emissions from the site are not expected. Workers will not be required to directly handle contaminated soil; therefore, hazards associated with worker contact with contaminated soil are not anticipated.

4.4.1.4 LONG-TERM EFFECTIVENESS

Alternative 2 is consistent with the U.S. EPA presumptive remedy guidance (U.S. EPA 1993c) for long-term reduction of the potential for human and ecological exposure to municipal landfill wastes and potentially contaminated soils, and for reduction of the potential for the generation and migration of leachate. As indicated in Section 4.1, the monolithic cap is effective at reducing the potential for leachate generation and migration. Recent research comparing the field performance of a traditional clay barrier cap to a capillary barrier cap (similar to a monolithic cap) (Khire et al. 1994) indicates that in arid environments, the capillary barrier cap may be more effective at restricting percolation than the traditional clay barrier cap. In addition, the monolithic cap does not include a compacted clay barrier, which according to recent research, may tend to crack due to desiccation under arid conditions at the site (Section 4.3.1.4).

4.4.2 Implementability

The implementability of Alternative 2 is evaluated in the following sections with respect to technical feasibility, administrative feasibility, availability of services and material, and state and community acceptance.

4.4.2.1 TECHNICAL FEASIBILITY

Alternative 2 is technically feasible. Conventional earth-moving equipment can be used to construct the cap. The site is open and accessible. Thus, there are no apparent site characteristics that impact the performance of the work.

Due to the low precipitation in the Imperial Valley, there is no restriction on the time of year when the work can be performed. Due to the extreme summer temperatures in the Imperial Valley, it may be preferable to avoid work in the summer. The materials, equipment, and services needed to construct the cap and perimeter fence can be provided by local construction contractors.

4.4.2.2 ADMINISTRATIVE FEASIBILITY

There are no known administrative restrictions affecting implementation of this alternative. Therefore, Alternative 2 is considered administratively feasible.

4.4.2.3 AVAILABILITY OF SERVICES AND MATERIALS

Local construction contractors with experience working at hazardous waste sites can be used to construct the cap. Materials required to construct the cap are locally available.

4.4.2.4 STATE AND COMMUNITY ACCEPTANCE

This EE/CA has been reviewed and accepted by Cal-EPA DTSC and the California RWQCB, Colorado River Basin Region, and it was open for public review. Comments from these agencies have been incorporated into this document. No public comments were received during the review period.

4.4.3 Cost

A total cost of $833,000 is estimated to construct the monolithic cap proposed under Alternative 2 (Table 4-3). These estimated costs are conceptual and should be used for comparative purposes only. The cost estimate for Alternative 2 was developed using the following assumptions.

- The landfill covers an area of 240,000 square feet.
- The current landfill surface averages 4 feet below the surrounding ground surface.
- The cap will comprise a minimum 48-inch-thick layer of silty to clayey sand with a permeability of 1×10^{-4} to 1×10^{-5} cm/s and a 6-inch-thick gravel layer.
- The cap surface will have a minimum slope of 3 percent.
- The construction activities will include installation of two permanent survey monuments, an 8-foot-high, chain-link security perimeter fence, and a lined drainage channel to direct runoff from the landfill into the adjacent drainage ditches.
- All fill materials required to construct the cap will be obtained from off-base sources.

If fill materials suitable to construct the cap can be obtained from an on-base source, the estimated costs will be reduced. To simplify the assumptions and calculations, the use of fill materials generated during the Site 3 and 8 removal actions, which would reduce the estimates slightly, was not considered in developing the cost estimates. The cost estimate was performed using the RACER system as described in Section 4.3.3. The estimated project costs are summarized in Table 4-3.

4.5 ALTERNATIVE 3, NO ACTION

This section is intended to meet portions of RAWP, as defined in Section 25323.1, Ca-HSC, specifically, removal alternatives.

This alternative includes no changes to the existing conditions at the landfill.

Table 4-3
Cost Estimate[a] for Alternative 2 – Monolithic Cap

Cost Category	Estimated Cost
Direct Costs[b]	
Capping	$335,000
Professional Labor (project oversight)	6,000
Fencing and Signs	64,000
Total Direct Costs	**$405,000**
Indirect Costs[c]	190,000
Remedial Design	27,000
Escalation[d]	72,000
Contingency[e]	139,000
TOTAL	**$833,000**

Notes:
[a] these estimated costs are conceptual and should be used for comparative purposes only
[b] costs of materials and labor directly associated with construction (e.g., fill materials, grading operations)
[c] general conditions costs associated with project support (e.g., supervision, consumable materials and supplies, mobilization)
[d] escalation modifies the costs in the RACER database from January 1992 to the assumed project start date
[e] a 20-percent contingency has been added to cover cost increases that may occur as a result of unforeseen conditions and changes that typically occur on remediation projects

4.5.1 Effectiveness

This alternative would not reduce either the potential for human and ecological exposure to the landfill wastes and potentially contaminated soils, or the potential for the generation and migration of leachate. The toxicity, mobility, and volume of potential contaminants would not be reduced. Therefore, this alternative is not effective at meeting the removal action objectives. As indicated in Section 4.1 (Table 4-1), the calculated average amount of leachate generated assuming no action (Alternative 3) is greater than that for either Alternative 1 or 2.

4.5.2 Implementability

Evaluation of implementability for this alternative primarily regards state and community acceptance. It is anticipated that this alternative would be unacceptable to both the community and state regulators (i.e., Cal-EPA DTSC and RWQCB).

4.5.3 Cost

There is no cost associated with this alternative.

Section 5
COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

This section is intended to meet portions of RAWP, as defined in Section 25323.1, Ca-HSC, specifically removal action alternatives.

In this section, the removal action alternatives described and evaluated in Section 4 are compared with respect to effectiveness, implementability, and cost.

5.1 EFFECTIVENESS OF ALTERNATIVES

Alternative 2, construction of a monolithic cap, is considered to be the most effective alternative at achieving the removal action objectives (i.e., reducing either the potential for human and ecological exposure to the landfill wastes and potentially contaminated soils, or the potential for the generation and migration of leachate).

Calculations conducted using the HELP model (U.S. EPA 1994) indicate that the multiple-layer cap (Alternative 1) and monolithic cap (Alternative 2) designs are equally effective at reducing contaminant mobility by limiting leachate generation due to percolation of rainwater through the wastes. However, recent research indicates that compacted clay barriers may tend to crack due to desiccation under arid conditions at the site (Section 4.3.1.4). Cracking of the clay barrier layer included in the multiple-layer cap design would significantly increase leachate generation and migration through the cap. Because the monolithic cap does not include a compacted clay barrier, it is judged to have a greater long-term effectiveness compared to the multiple-layer cap.

Alternative 3, no action, would neither reduce the potential for human and ecological exposure to the landfill wastes and potentially contaminated soils, nor the potential for the generation and migration of leachate. Therefore, this alternative is not effective at meeting the removal action objectives.

5.2 IMPLEMENTABILITY OF ALTERNATIVES

Based on the criteria reviewed, there do not appear to be any restrictions to the implementability of Alternatives 1 and 2. Therefore, these alternatives have an equivalent level of implementability. However, it is anticipated that Alternative 3 (no action) would be unacceptable to the community and state regulators.

5.3 COST OF ALTERNATIVES

The estimated costs for the proposed removal action alternatives are shown in Table 5-1. These estimated costs are conceptual and should be used for comparative purposes only.

Table 5-1
Estimated Costs of Removal Action Alternatives

Alternative	Cost
Alternative 1 - Multiple Layer Cap	$1,842,000
Alternative 2 - Monolithic Cap	$833,000
Alternative 3 - No Action	$0

Section 6
RECOMMENDED REMOVAL ACTION ALTERNATIVE

The EE/CA was performed in accordance with current U.S. EPA and U.S. Navy guidance documents for a non-time-critical removal action under CERCLA. The purpose of this EE/CA was to identify and analyze alternative removal actions to address contaminated soil at Site 1. Three alternatives were identified and evaluated: Alternative 1, multiple-layer cap; Alternative 2, monolithic cap; and Alternative 3, no action.

Based on the comparative analysis of the removal action alternatives completed in Section 5, Alternative 2, monolithic cap, is the recommended removal action because it is considered to have greater long-term effectiveness and is less expensive than Alternative 1, multiple-layer cap. Alternative 3 is not recommended because it does not achieve the removal action objectives.

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Section 7
REFERENCES

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Bechtel Job 22214
Contract No. N68711-92-D-4670
File Code: 0306

IN REPLY REFERENCE: CTO-0090/0033

5 May 1995

Southwest Division
Naval Facilities Engineering Command
1220 Pacific Highway
San Diego, CA 92132-5187

Attention: Dave Dawson (Code 1821.DD)
Remedial Project Manager

Subject: CTO-090: *EE/CAs and Action Memoranda at NAF El Centro*
Estimation of Background Metals Concentrations

Dear Mr. Dawson:

Bechtel National Inc. (BNI) had earlier proposed and documented two methods (BNI 1995a and b) for determination of background metal concentrations at Naval Air Facility (NAF) El Centro. These methods were discussed in the meeting held on 13 April 1995 with California Department of Toxic Substance Control (DTSC) and the Regional Water Quality Control Board (RWQCB), Colorado River Basin Region. Subsequent to the meeting, DTSC provided additional guidance and recommendations in a draft memorandum from Babara Renzi of the Office of Scientific Affairs (OSA) to Tizita Bekele of the Site Mitigation Branch. In summary, OSA recommended the following procedure for estimating background concentrations for metals in soils at NAF El Centro:

1. Combine data from background and site samples for each analyte;
2. Prepare a cumulative frequency probability plot;
3. Check normality of data;
4. Graphically identify the upper limit of the background populations as an inflection point on the highest part of the probability plot;
5. Extract the background data points from the combined population;
6. Evaluate the extracted data for anomalies (e.g., data points below the inflection point but an obvious deviation from the linear plot, a coefficient of variation greater than 100%, or a range greater than two orders of magnitude); and
7. Use the 95th percentile of the acceptable, extracted background data points to estimate the background concentration for each analyte.

It was also indicated that if anomalies are present in the data set, OSA may recommend a different or more conservative approach for estimating the background concentration such as 80 percent lower confidence limit on the 95th percentile of the background samples.

Based on the OSA recommendations, BNI evaluated the available data from NAF El Centro sites. The procedure and the results of our evaluation are documented in the following sections of this letter report.

Analytical Data

The metal concentrations in soil samples collected from ten sites and eight background locations at NAF El Centro during Site Investigation/Solid Waste Water Assessment Tests (SI/SWAT) (Ogden 1993a, 1993b) were used to form a combined data set for evaluation. The analytical data considered in the evaluation were collected from the sites listed below:

- Site 1- Magazine Road Landfill
- Site 2 - Patrol Road Landfill
- Site 3 - Sludge Disposal Area
- Site 4 - Fourth Street Fire Fighting Training Area
- Site 5 - Fire Fighting Training Area East of Hangar Number Three
- Site 6 - Northwest Fire Fighting Training Area
- Site 7 - Abandoned Fuel Farm
- Site 8 - Scrapyard
- Site 9 - Transformer Storage Yard
- Site 11 - Runway Burn Area

The eight background locations were reportedly selected in areas at the base that were considered to be unaffected by past base operations. These locations are described in the SI/SWAT reports (Ogden 1993a and b).

The combined data sets were used for evaluation only when at least half of the samples analyzed have detectable concentrations of the analyte. When a result is reported by the laboratory as less than the detection limit, a value of one half of the detection limit is substituted for the concentration. This is a common assumption and is based on United States Environmental Protection Agency (U.S.EPA) risk assessment guidance (U.S. EPA 1989).

A review of laboratory data in Ogden reports indicates that chemical concentrations of four metals (Mercury, Antimony, Selenium, and Thallium) in a majority of soil samples collected from the sites and background locations were below the detection limits. Therefore, background concentrations for these metals were not determined.

The combined data sets (sites and background) are included in Attachment 1.

Frequency Probability Plot

The combined data set was used to prepare a cumulative frequency probability plot for each analyte. The plots were generated using the computer program GEO-EAS 1.2.1, an U.S. EPA program for geostatistical environmental assessment (U.S. EPA 1991). The plots are included in Attachment 2 (Figures 2-1 through 2-9).

The frequency probability plot for each analyte was used to visually identify an inflection point in the upper part of the plot which is the upper limit of the background population. The background population was then extracted from the combined data set and a cumulative frequency probability plot of the background population was prepared for each analyte. These plots are included in Attachment 3 (Figures 3-1 through 3-9).

Coefficient of Variation

The frequency probability plots contain information on coefficient of variation of the data sets. The coefficient of variations for background populations of the analytes range from approximately 30 to 95 percent. These variations are less than the acceptable limit of 100 percent recommended in the DTSC draft memorandum (DTSC, 1995). A summary of the coefficient of variation for each analyte is included in Table 1.

Check for Normality

A majority of the frequency probability plots for background populations are linear indicating normal distribution. The plots for Cadmium, Copper and Silver appear to be nonlinear indicating potentially non-normal distribution. In order to accept or reject the hypothesis that the given data set is normally distributed, the test developed by D'Agostino (Gilbert 1987) was used. This test can be used to test the null hypothesis of normality or lognormality when the sample population is greater than 50 (Gilbert 1987). For all data sets except Cadmium, hypothesis of a normal distribution cannot be rejected. Therefore, for those metals except Cadmium, background data are judged to be normally distributed.

The Cadmium data set was tested also for lognormal distribution using the D'Agostino test. The logarithm of the concentration is used in place of actual concentration to check for lognormality of the data distribution. The test indicated that Cadmium data are lognormally distributed. Cadmium data were plotted on a log-probability plot included in Figure 3-3b in Attachment 3. The log-probability plot for Cadmium is linear supporting the results of the D'Agostino test.

Background Concentration

The background concentration for each analyte, except Cadmium, was calculated as the 95th percentile of normal distribution of the background population. The mean and the standard deviation of the background distribution were used to calculate the 95th percentile using the following equation:

$$X_{95} = m + Z\,S$$

where:

X_{95} = 95th percentile value of the background population

m = arithmetic mean

Z = factor for the 95th percentile which is equal to 1.646 for normal distribution (obtained from Table A1, Gilbert 1987).

S = standard deviation

The values of the mean, the standard deviation and the background concentration as the 95th percentile of the population for each analyte are summarized in Table 2. The background concentration for Cadmium is calculated as the 95th percentile of the lognormal distribution for the data population.

In an earlier letter (BNI 1995b), BNI proposed an alternative background concentration based on an Upper Tolerance Limit (UTL). The UTL with a 95 percent confidence limit for 95th percentile ($UTL_{95,95}$) was selected as the upper threshold for background concentration. The $UTL_{95,95}$ values for three metals (Arsenic, Beryllium and Chromium) were determined using combined data sets and documented in the letter. Those $UTL_{95,95}$ values are also included in Table 2 for comparison.

Conclusions

Background metals concentration data collected from locations at NAF El Centro are normally distributed, except for Cadmium. The 95th percentile of the normal distribution of the background population of each analyte was calculated as the background concentration. Background data for Cadmium can be approximated by a lognormal distribution. The background concentration for Cadmium was based on the 95th percentile of the lognormal distribution of the population.

The background concentrations determined using the current procedure closely agree with the earlier reported $UTL_{95,95}$ values. The $UTL_{95,95}$ values are only slightly higher. Therefore, we conclude that either method can be used to estimate background metals concentrations at NAF El Centro.

We hope this letter satisfies your current project needs. Please contact Mahi Galagoda at (619) 687-8860 if you have any questions regarding this letter.

Very truly yours,

David Umstot, P.E., C.E.G.
Project Manager

Attachments
DU/MG/mj

cc: J. Rogers (Code 18C2)
P. Kennedy (Code 0233)
W. Kitchin (Code 1852.WK)
M Galagoda
C. Barr
DCC File

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Table 1

Coefficient of Variation of the extracted data sets

Analyte	Coefficient of Variation, %
Arsenic	39
Beryllium	43
Cadmium	95
Chromium	31
Copper	43
Lead	44
Nickel	35
Silver	55
Zinc	41

Table 2. Background Concentration using 95th Percentile of the Normal Distribution

Analyte	Mean (mg/kg)	Standard Deviation (mg/kg)	Background Concentration as 95th percentile (mg/kg)**	$UTL_{95,95}$ from previous work (mg/kg)***
Arsenic	3.84	1.49	6.3	6.6
Beryllium	0.67	0.28	1.1	1.2
Cadmium	(-0.28)*	(1.1)*	4.6	nc
Chromium	11.12	3.42	17	18
Copper	14.57	6.29	25	nc
Lead	9.86	4.37	17	nc
Nickel	12.89	4.5	20	nc
Silver	0.3	0.16	0.6	nc
Zinc	41.64	17.10	70	nc

Notes:
- * Mean and Standard deviation of log (concentration)
- ** Values rounded off to two significant digits
- *** $UTL_{95,95}$ values reported in BNI letter dated 12 April 1995
- nc not calculated

Table 1
Combined Data Set Used for Statistical Evaluation
NAF El Centro (Units in mg/Kg)

Sample	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Nickel	Silver	Zinc
EC1-B1-S2-D3.5	2.7	0.77	0.5	13.1	38.9	15.6	11.6	0.47	58.4
EC1-B1-S4-D6.5	1.7	0.44	0.2	10.3	145	4.3	7.4	< 0.29	174
EC1-B1-S5-D8	5	0.85	0.4	15	286	7.7	14.9	0.37	170
EC1-B2-S2-D2	2.7	0.52	0.3	8.4	19.1	7.2	7.5	< 0.33	34.6
EC1-B2-S3-D5	2	0.65	0.4	12.6	525	8.1	11.3	< 0.33	418
EC1-B2-S5-D8	3.5	0.82	0.4	15	538	8.6	14	0.35	266
EC1-B3-S2-D3.5	3.5	0.84	0.4	11.8	14.6	8.8	12.5	0.32	42.2 J
EC1-B3-S3-D5	3.5	0.83 J	0.4	11.8	13.8	9.3	12.6	< 0.32	36.2 J
EC1-B3-S4-D6.5	< 0.6	0.15 J	< 0.1	4.5	3.4	1.8	4.2	< 0.29	11.6 J
EC1-B5-S1-D2	2.5	0.52 J	0.2	8.3	8.3	5.5	9.1	< 0.25	23.1 J
EC1-B5-S2-D3.5	5	1.1 J	0.5	13.6	21	10.3	15.1	< 0.29	46.2 J
EC1-B5-S4-D6.5	3.1	0.39 J	0.2	5.8	4	3.2	5.4	< 0.29	14.9 J
EC1-B6-S1-D2	5.9	1.1	1.1	20.6	37.4	68.8	16.8	1.1 J	95.5
EC1-B6-S3-D5	2.7	0.45	< 0.1	6.4	5.8	5.5	6.4	0.36 J	18.3
EC1-B6-S4-D6.5	2.5	0.42	0.2	7.3	5.5	4.5	20.3	0.43	20.3
EC1-B6-D4-D6.5	3.7	0.69	0.2	9.3	8.9	7.2	29.7	0.46	29.7
EC1-B7-S1-D2	11	0.78	0.9	15.5	30	157	36.2	0.83 J	36.2
EC1-B7-S2-D3.5	6.7	0.61	0.2	8.1	8.5	6	27	0.36 J	27
EC1-B7-S3-D5.0	3.2	0.79	0.2	13.1	12.8	9.1	37.2	0.36 J	37.2
EC1-B8-S1-D2	5.7	0.85	0.3	11.6	17.3	10	14	0.43 J	42.5
EC1-B8-S3-D5	2.4	0.23	< 0.1	4.2	3.2	3.6	4.4	< 0.24	12.9
EC1-B8-S3-D5	2.1	0.34	< 0.1	3.7	2.7	2.7	3.2	0.33	9.8
EC1-B8-S4-D6.5	6.4	1.1	0.3	13.6	20.3	13.3	15.6	0.46 J	49.7
EC1-B9-S1-D2	5.6	1.2	0.3	14.7	21	15.2	15.8	0.49 J	56.5
EC1-B9-S2-D3.5	11 J	0.6	0.9	44.1	215	45.5	60.2	0.83 J	11600
EC1-B9-S4-D6.5	1.7	0.32	< 0.1	4.5	3.2	4.4	4.2	< 0.25	17.3
EC2-B1-S1-D2.0	4.5 J	1.1	1	13.6	21.1	11.6	17.5	< 0.25	51.4
EC2-B1-S3-D5.0	2.6 J	0.61	2	8.8	7.4	4.4	6.5	4	19.5
EC2-B1-S7-D10.5	3.2 J	0.7	1.7	13.3	20.5	9.9	15.1	0.37	44.7
EC2-B2-S2-D3.5	2.9 J	0.36	0.7	7.3	7.5	4.7	7.7	< 0.25	22
EC2-B2-S4-D6.5	2.4 J	0.57	1.2	9	12.8	7.7	11.1	< 0.26	35.2
EC2-B2-S5-D8.0	2.2 J	0.25	1.3	7.8	5.4	4.7	5.8	< 0.26	18.8
EC2-B3-S1-D2.0	6.9 J	1.3	2	15.6	22.7	13.6	18	< 0.27	59.4
EC2-B3-S7-D11.0	5.2	< 0.06	1.4	11.5	16.8	9.3	12.8	< 0.3	42.7
EC2-B3-S9-D14.0	1.9	0.65	0.5	5	5.3	1.7	4.9	< 0.3	15.6
EC2-B4-S3-D5.0	1.9	0.15 J	0.3 J	5.3	3.5	3.7	5.5	< 0.24	15.6
EC2-B4-S6-D9.5	2.1	0.16 J	< 0.5 J	6.3 J	5	5	6.8	< 0.26 R	20.7
EC2-B4-S8-D12.5	4	0.84 J	0.8 J	12	17.3	9.8	14.5	0.68	47.7
EC2-B5-S2-D3.0	9.1	0.57 J	3.7 J	17	66.8	194	17.3	7.2	321
EC2-B5-S4-D6.0	2.7	0.49 J	0.7 J	9.6	12.4	16.3	11.8	0.35 R	46
EC2-B5-S5-D7.5	2	0.16 J	0.4 J	4	3	4.2	4.3	< 0.26	14
EC2-B6-S1-D5.0	6	0.81	4.4	14.9 J	18.8	56.2	16.7	< 0.29 R	58.5
EC2-B6-S11-D20.0	7 J	0.88	1.6	13.9	20.1	9.8	16.3	< 0.31	47.4
EC2-B6-S7-D14.0	6.5	0.61	1.5	11.5	15.6	9	13	< 0.3	37.7
EC2-B6-D7-D14.0	5.5	0.92	1.6	13.1	20	10.6	16.5	< 0.28	47.2
EC2-B7-S2-D3.0	3.5	0.8	1.4	12.1	18.1	9.1	14.8	< 0.28	42.2
EC2-B7-S3-D4.5	4.7	0.94	4.5	13.9 J	21.3	16.8	17	0.36 J	53.7
EC2-B7-D3-D4.5	3.7	1.2	4.7	14.1 J	21.8	19.8	18.3	0.38 J	56.6
EC2-B7-S5-D7.5	1.6	1.2	1.7	13.1	22.3	13.1	17.5	< 0.31	57.5
EC2-B8-S2-D3.0	3.4	0.57	352	37.9	1390	476	131	17.7	768
EC2-B8-S3-D4.5	1	< 0.06	3.2	110000 J	41.1	84.5	8.4	4.7 J	123
EC2-B8-D3-D4.5	4.4	0.68	5.1	406 J	17.9	42.9	12.4	0.69 J	78.1
EC2-B8-S5-D7.5	1.4	0.64	1.3	13.6	17.1	10.3	12.5	< 0.29	37.9
EC2-B9-S1-D2.0	7.2	0.97	1.1	20.8	22.6	14.8	19.3	0.33	68.9
EC2-B9-S3-D5.0	4	0.56	0.7	12.8	15.6	9.6	14.5	0.36	42.7
EC2-B9-D3-D5.0	3.5	0.36	0.6	9.6	9.9	7.4	10.5	0.42	31.1
EC2-B9-S10-D17.0	1.2	0.05	0.1	2.5	1.6	< 1.2	2.5	0.34	7.3

Table 1
Combined Data Set Used for Statistical Evaluation
NAF El Centro (Units in mg/Kg)

Sample	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Nickel	Silver	Zinc
EC2-B10-S1-D2.0	5.5	0.75	0.8	12.8	17.7	10.1	15.6	0.49	48.1
EC2-B10-S13-D20.0	6.5	0.98	1	16.6	20.3	13.1	17.8	0.44	63
EC2-B10-S14-D24.5	2.4	0.25	0.3	7.2	7.4	4.8	6.9	0.47	21.7
EC2-B11-S1-D2.0	4.4	1	1.7	14.1	19.2	12.6	15.8	< 0.26	51.5
EC2-B11-S5-D7.5	2.4	0.58	0.9	8.6	16	7.2	11.8	< 0.27	32
EC2-B11-S6-D9.5	2.2	0.44	0.9	7.7	10	6.5	8.8	< 0.26	26.8
EC3-B1-S3-D5.0	3.2	0.79	0.5	11	14.6	9.3	13	< 0.3	41.4
EC3-B2-S2-D3.0	4.3	0.57	1.2	9	12.8	7.7	11.1	< 0.26	35.2
EC3-B3-S4-D6.0	11	0.63	12	127	985	209	20.8	86.5	772
EC3-B3-D4-D6.0	5.2	0.71	0.6	11.6	15.6	10.6	13.6	0.34	42.7
EC3-B4-S2-D3.0	13	0.51	13	114	929	197	28.2	111	735
EC3-B5-S3-D4.5	4.3	0.53	0.4	7.5	8.4	7.2	9.5	< 0.28	29.5
EC3-B6-S1-D1.5	5	1.2	2	15.3	22.2	14.1	17.6	< 0.28	54.7
EC4-B2A-S1-D2.5	3.4	0.47	0.7	9.3	10.2	8.1	10.6	0.37	28.5
EC4-B2-S1-D2.5	3.4	0.71	1.1	13.6	14.6	11.1	14.1	0.32	44
EC4-B2-S2-D3.5	4	0.45	0.9	9.5	11.9	8.5	11.8	0.28	32.2
EC5-B1-S1-D2.0	4.5	1.1	1.3	14.8	21.3	16	17	0.46	59.2
EC5-B2-S1-D2.0	4	0.91	1.3	14.8	22.7	19.5	15.6	0.55	71
EC5-B3-S3-D5.0	4.8	0.83	1	13.9	18.8	10	16.5	0.46	45.6
EC5-B3-D3-D5.0	3.4	0.55	1	12	14.6	9.3	14.5	0.34	38.2
EC5-B4-S1-D2.0	4.3	1.1	1.3	15.1	22.5	14.3	18.5	0.49	64
EC6-B1-S4-D6.0	3.4	0.69	1.3	11.1	17.3	11.1	15	< 0.32	41.4
EC6-B4-S1-D2.0	5.7	1.1	1.6	13.9	20.8	14.3	17.8	< 0.3	57.1
EC6-B5-S2-D3.5	6	1	1.6	12.8	19.5	9.1	16	< 0.3	45.4
EC7-B1-S7-D11.0	2.9	0.48	0.2	6	7	7.4	6.7	< 0.42	20.8
EC7-B2-S6-D9.5	5	0.98	0.4	10.1	17.6	81.4	13.1	< 0.59	45
EC7-B2-D6-D9.5	3.9	0.74	0.3	10.3	15.4	90.8	12.4	0.37	40.2
EC7-B3-S5-D8.0	5.7	0.88	0.3	11	18.3	10.5	14	< 0.58 J	44.5
EC7-B3-D5-D8.0	5	0.73	0.2	9.4	14.4	8.6	11.4	0.66 J	34.4
EC7-B4-S7-D11.0	3.4	0.56	0.2	8.4	9.4	465	9.1	< 0.54 J	26.7
EC7-B6-S6-D11.0	5.2	0.75	0.4	10.6	14.5	15.1	12.4	< 0.3	43.3
EC7-B7-S6-D9.5	3	0.55	0.4	7.5	7.5	6.3	8.4	< 0.3	25
EC7-B9-S7-D11.0	3.2	0.6	0.5	8.3	9.9	7.2	10.4	< 0.3	30.6
EC8-T1-S2-D1.0	5.5	1.1 J	2.4	14.5	20.2	9.2	19.1	< 0.37	54.4
EC8-T2-S1-D0.3	4	0.75	2.7	13.3	21.2	15	15.6	0.63	58.2
EC8-T3-S2-D0.5	5.2	0.73	3.7	11.8	22.1	13.5	15.6	0.78	58.2
EC8-T4-S2-D0.2	3.9	0.84	62	16	239	33.4	16.8	0.7	217
EC8-T5-S2-D0.3	4	0.67	2.7	24.5	28.3	24	16.3	0.38	74.9
EC8-T6-S1-D0.2	323	0.48	14	16.5	204	371	16.5	4	204
EC8-T7-S2-D1.5	2.6	0.42 J	1.4	9	10.9	7.4	11.3	< 0.25	33.2
EC8-T8-S2-D0.6	4.5	0.74 J	2.2	12.5	20	15	15.9	0.37	66.8
EC8-T9-S2-D0.2	3.7	0.75 J	5.2	13.3	22.7	14.6	15.9	0.51	62.5
EC8-T9-D2-D0.2	14	0.61	2.2	12.4	18	11.5	15.6	0.57	55.6
EC8-T10-S1-D0.4	4	0.72 J	2.4	23.7	19.6	11.1	21.6	0.25	55
EC9-T2-S1-D0.5	3.2	0.8 J	2.2	12.8	19.7	18	15.4	0.3	56.7
EC9-T5-S1-D0.2	3.3	< 0.74 J	2.9	14.5	19.9	15.2	16.4	0.56 J	58.5
EC9-T5-D1-D0.2	2.7	0.73 J	2.7	13.9	20.3	15.8	16.8	0.63 J	58.2
EC9-T9-S1-D0.2	1.8 J	< 0.23 J	< 1.1 J	6.5	5.5	10.9	5.7	0.56 J	19.8
EC10-B4-S1-D1.5	3.5	0.64	2.7	9.1	11.1	12.1	10.9	0.33	32.2
EC10-B4-S3-D4.5	3.2	0.6	2.2	9.1	9.9	11.3	10.1	0.45	30.3
EC11-B1-S2-D2.5	4.4	0.61	2.7	15 J	20.8	12.1	17.3	0.46 J	56.2
EC11-B2-S4-D4.5	4.4	0.56	2.2	12.6 J	15.5	10.6	13.9	0.29 J	46.2
EC11-B4-S1-D0.5	4.4	0.26	1.4	11.9 J	5.6	9.2	6.4	0.27 J	35.8
EC11-B5-D2-D3.5	5.2	0.85	2.1	13.5 J	20	11.9	16.8	< 0.31	52.7
EC11-B5-S2-D3.5	5.4	0.62	2.2	14.4	18.6	12.6	15.3	0.42 J	54.2
EC15-B6-S2-D3.0	4.4	1.1	2.2	44.1	20.3	11.3	40.6	0.32	51.2

Note:
Qualifier R indicates that the result was rejected in data validation process (not used in background concentration evaluation).
Qualifier J indicates that the result was estimated.

Dave Dawson
5 May 1995
Attachment 2

Figure 2-1

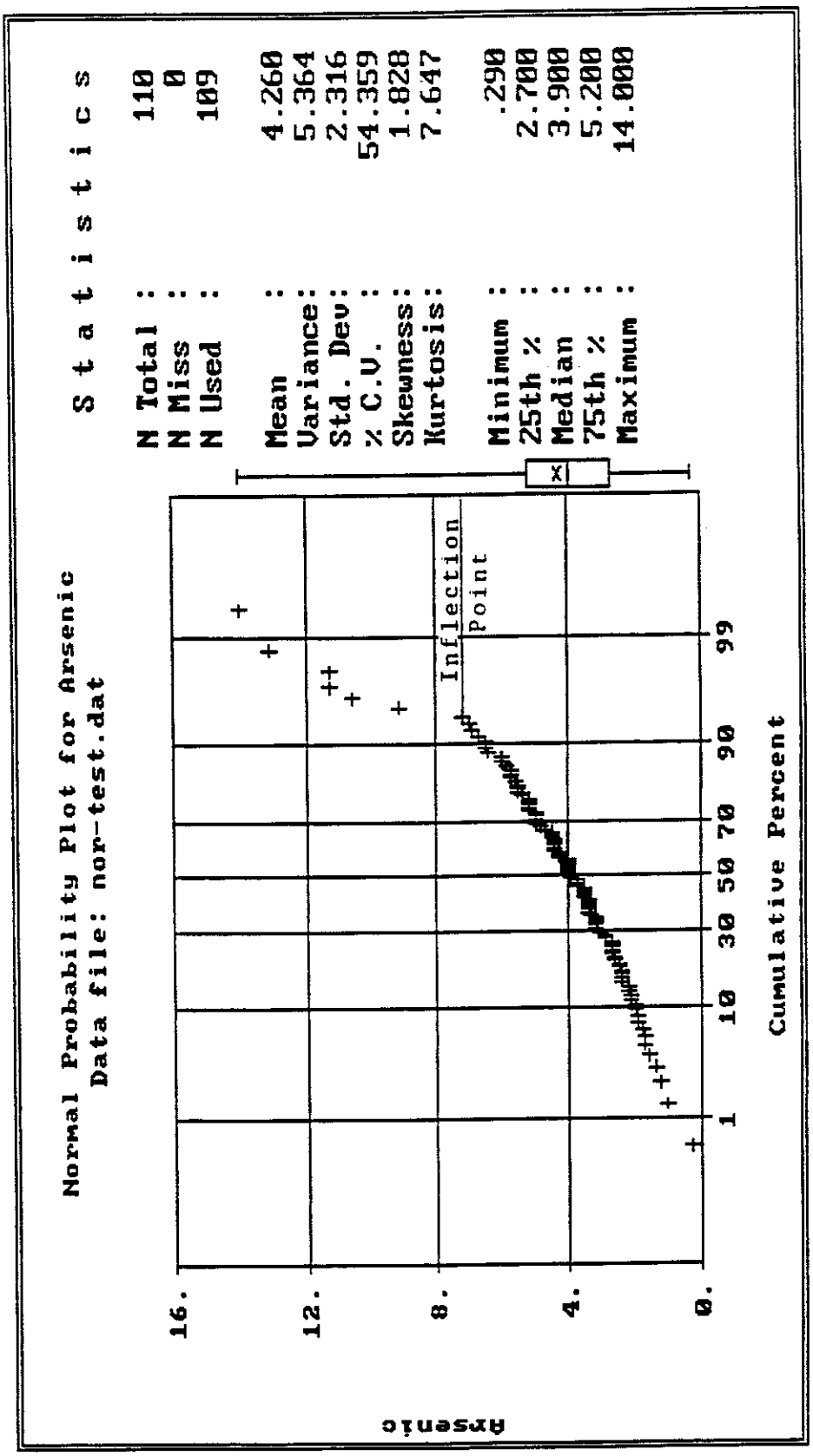

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Figure 2-2

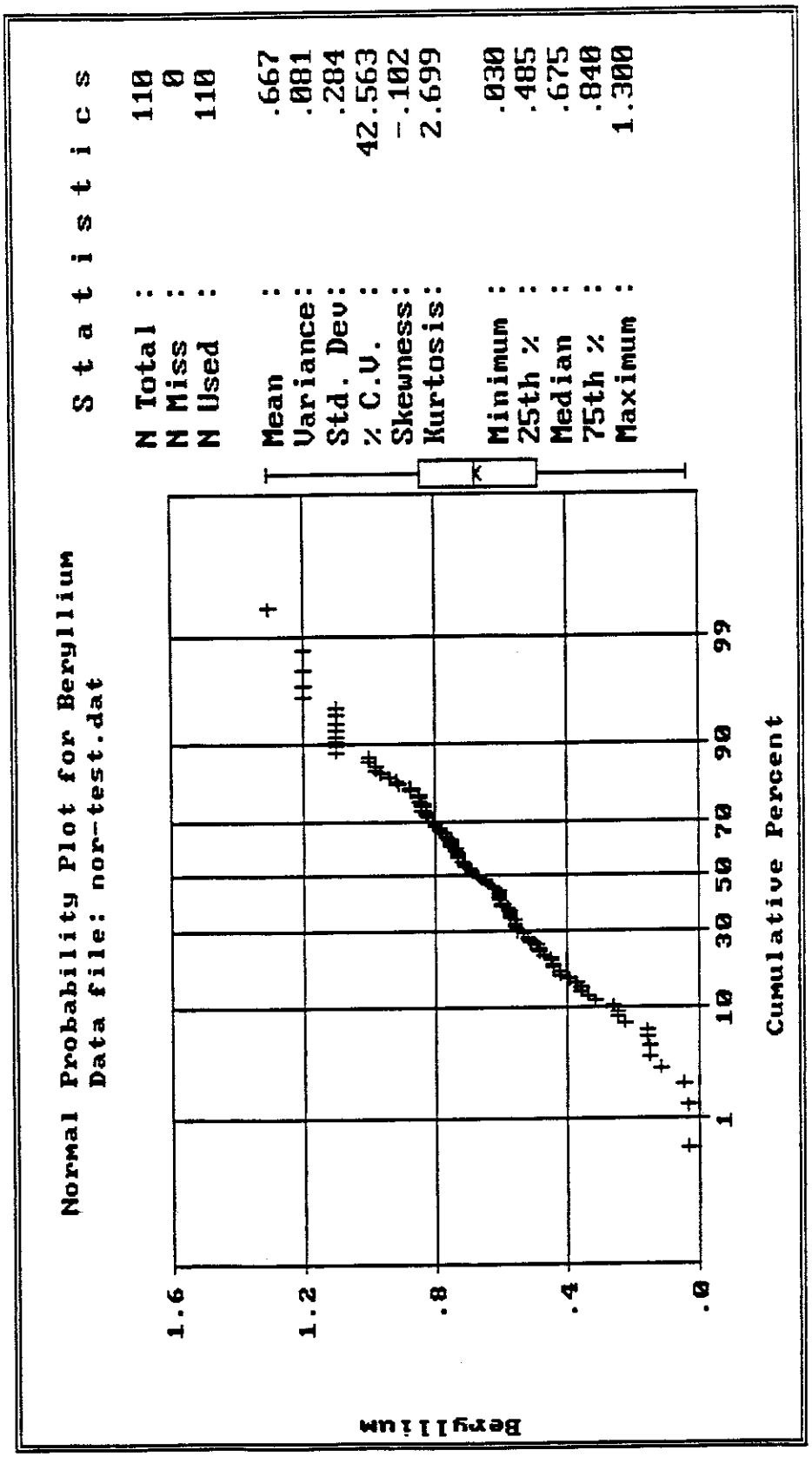
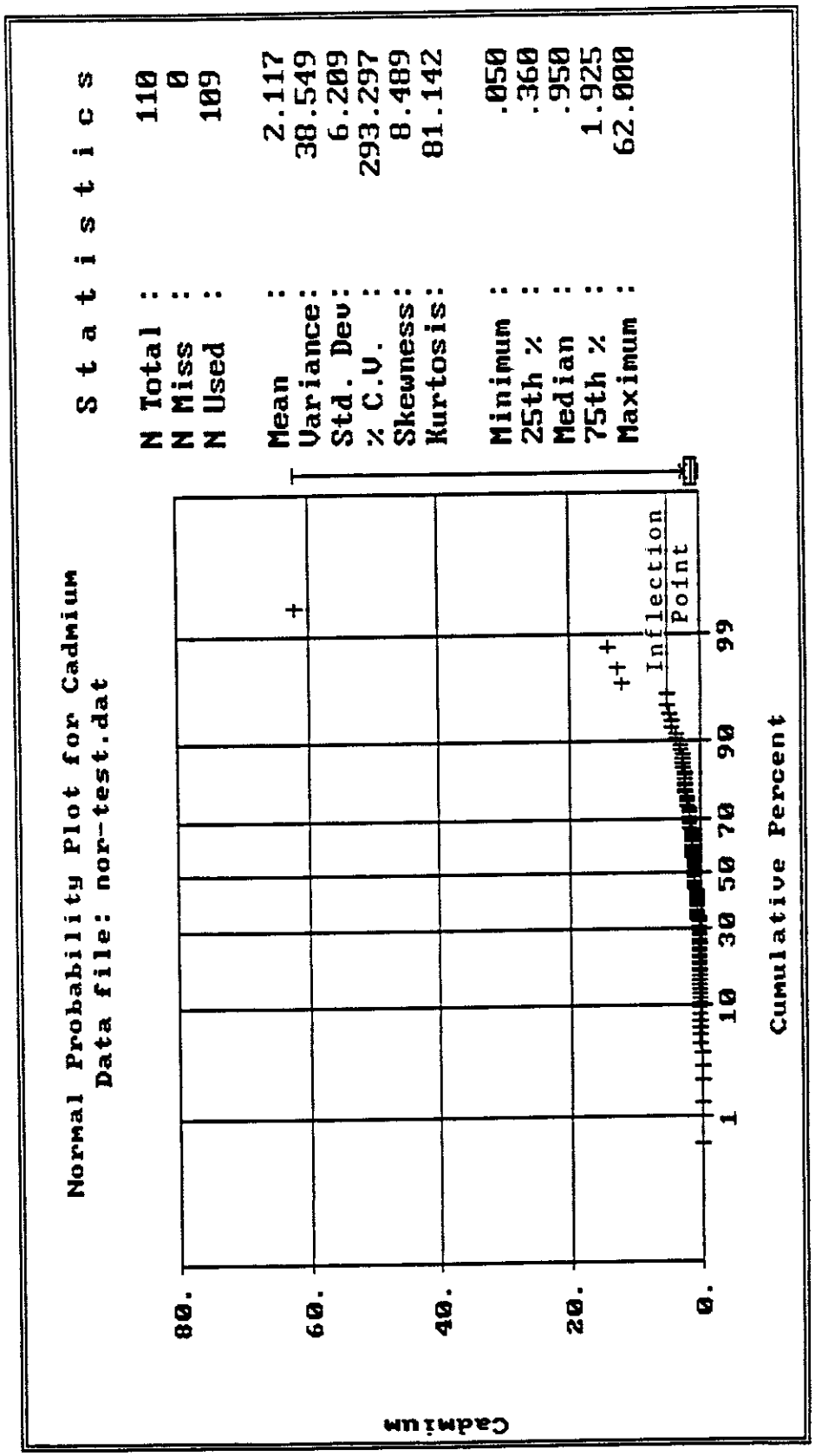


Figure 2-3


Normal Probability Plot for Cadmium
Data file: nor-test.dat
Statistics
N Total : 110
N Miss : 0
N Used : 109
Mean : 2.117
Variance : 38.549
Std. Dev : 6.209
% C.V. : 293.297
Skewness : 8.489
Kurtosis : 81.142
Minimum : .050
25th % : .360
Median : .950
75th % : 1.925
Maximum : 62.000
Inflection Point
80.
60.
40.
20.
0.
Cadmium
1
10
30
50
70
90
99
Cumulative Percent

Dave Dawson
5 May 1995
Attachment 2

Figure 2-4

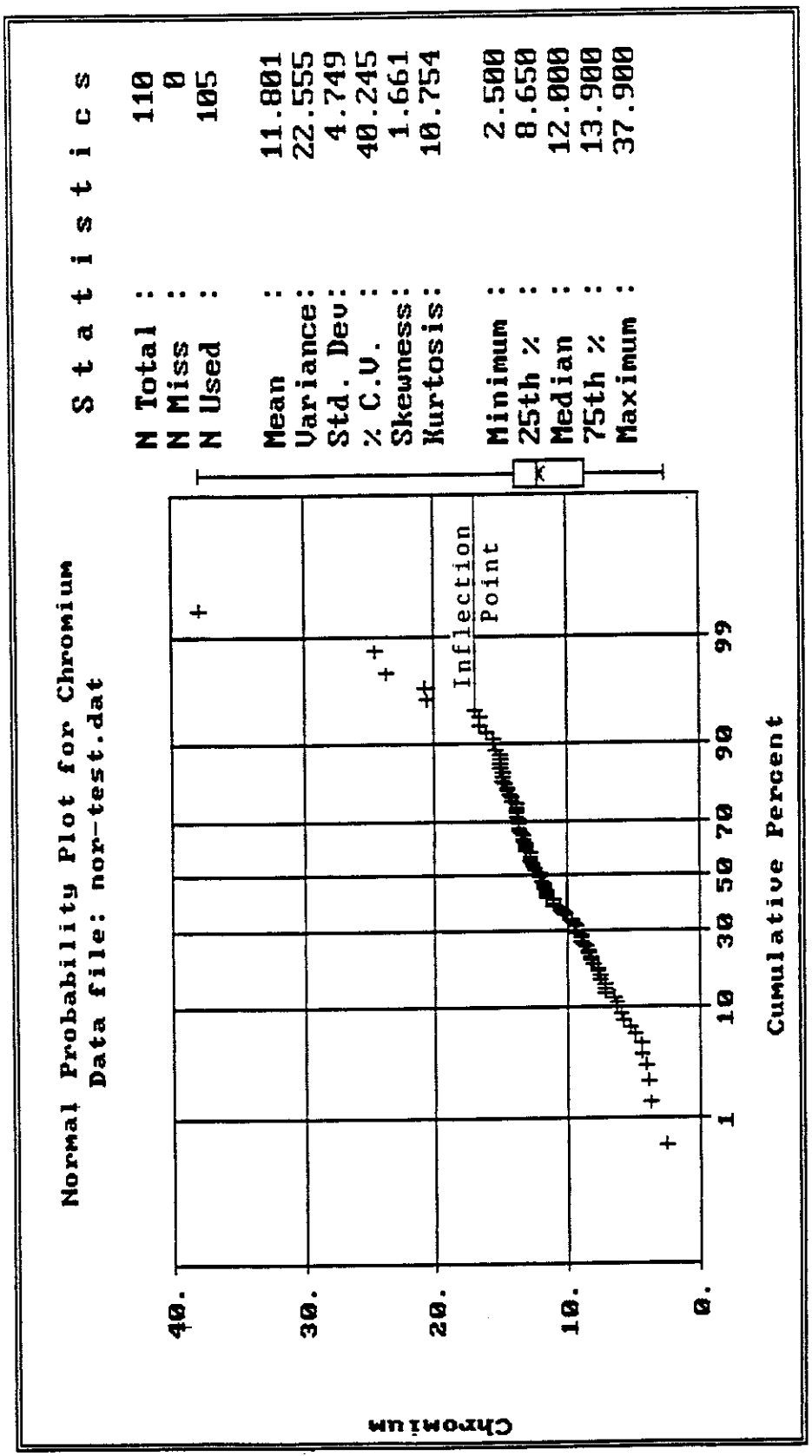


Figure 2-5

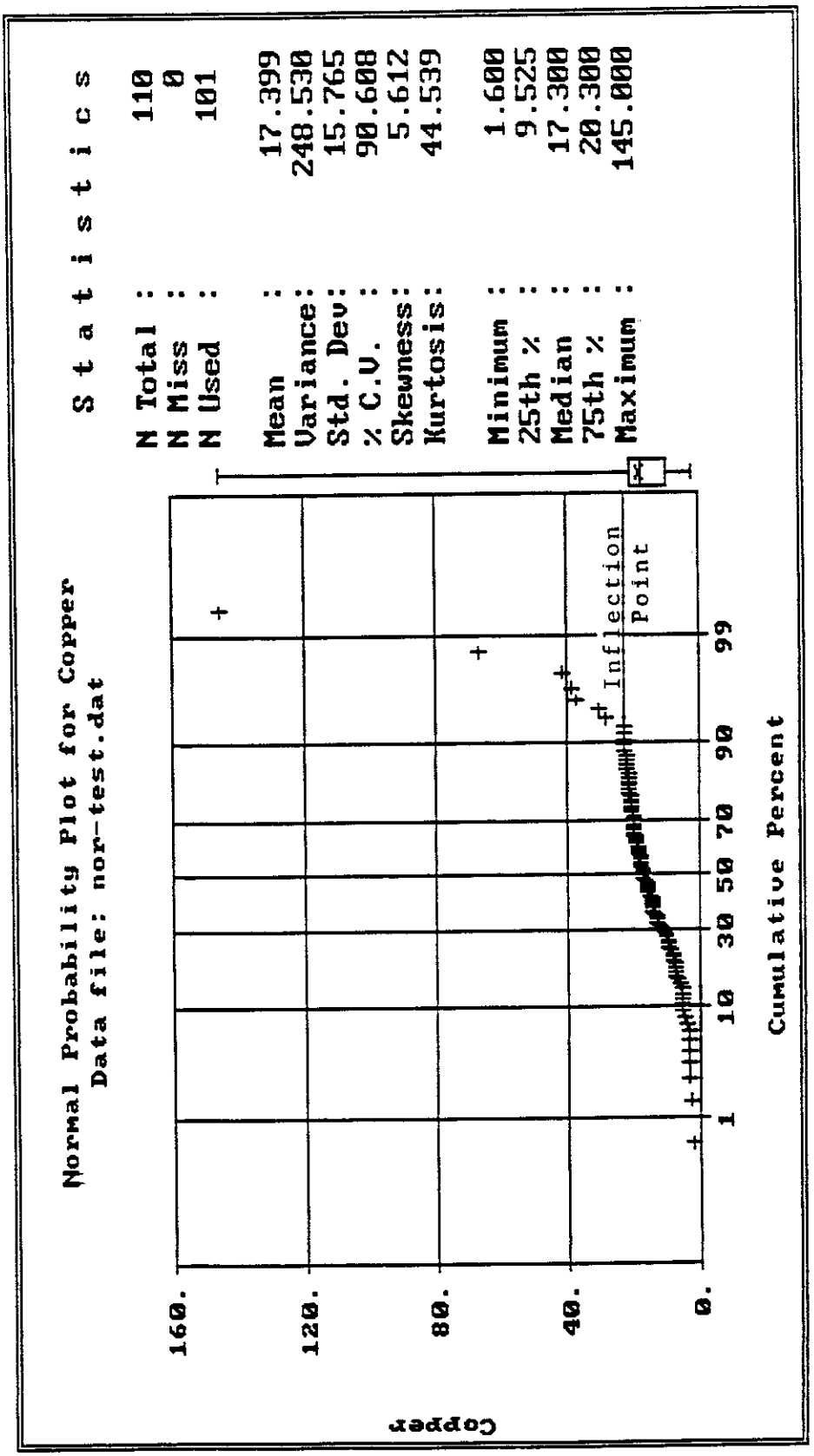

Normal Probability Plot for Copper
Data file: nor-test.dat
Statistics
N Total : 110
N Miss : 0
N Used : 101
Mean : 17.399
Variance : 248.530
Std. Dev : 15.765
% C.V. : 90.608
Skewness : 5.612
Kurtosis : 44.539
Minimum : 1.600
25th % : 9.525
Median : 17.300
75th % : 20.300
Maximum : 145.000
Inflection Point
Copper
160.
120.
80.
40.
0.
1
10
30
50
70
90
99
Cumulative Percent

Figure 2-6

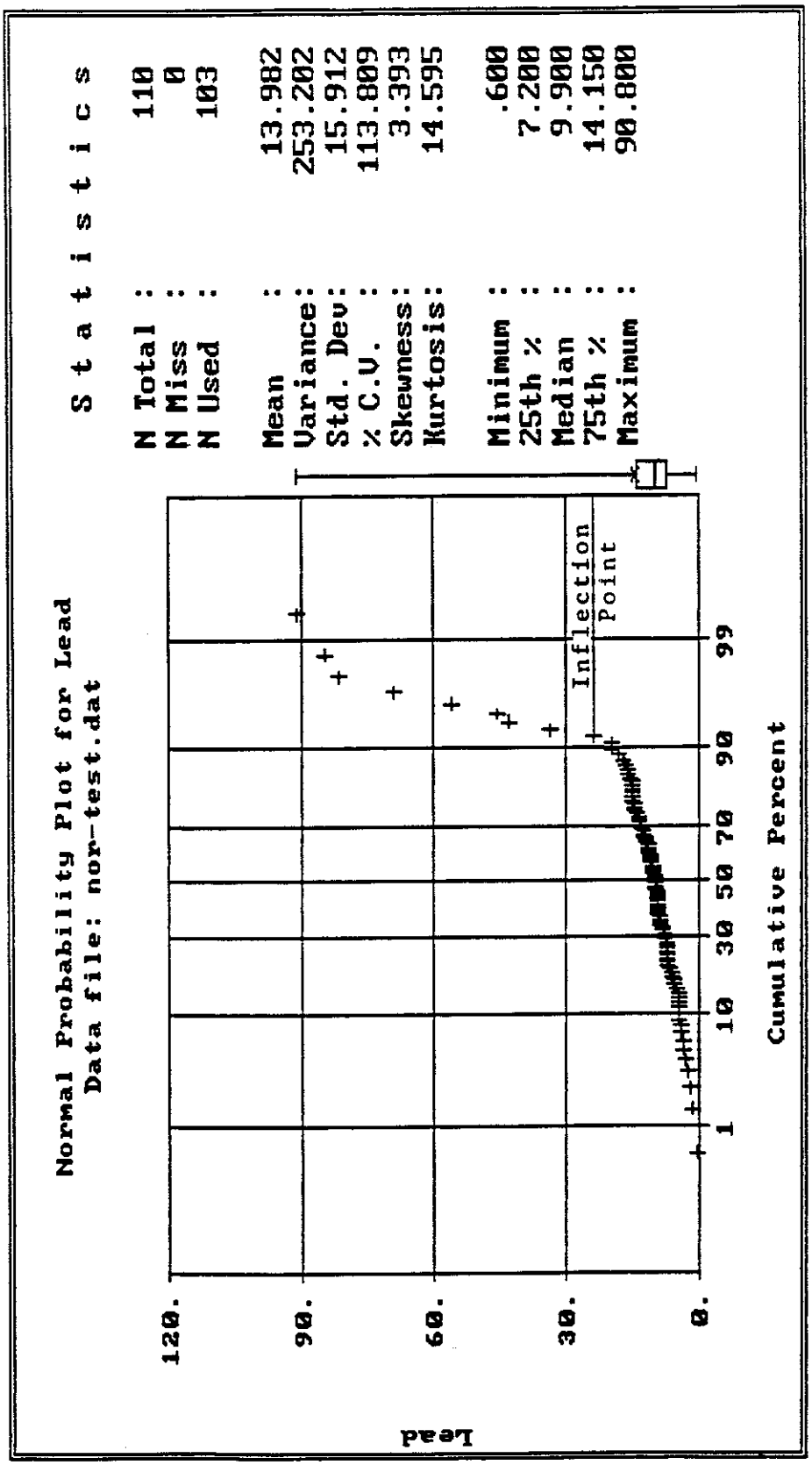
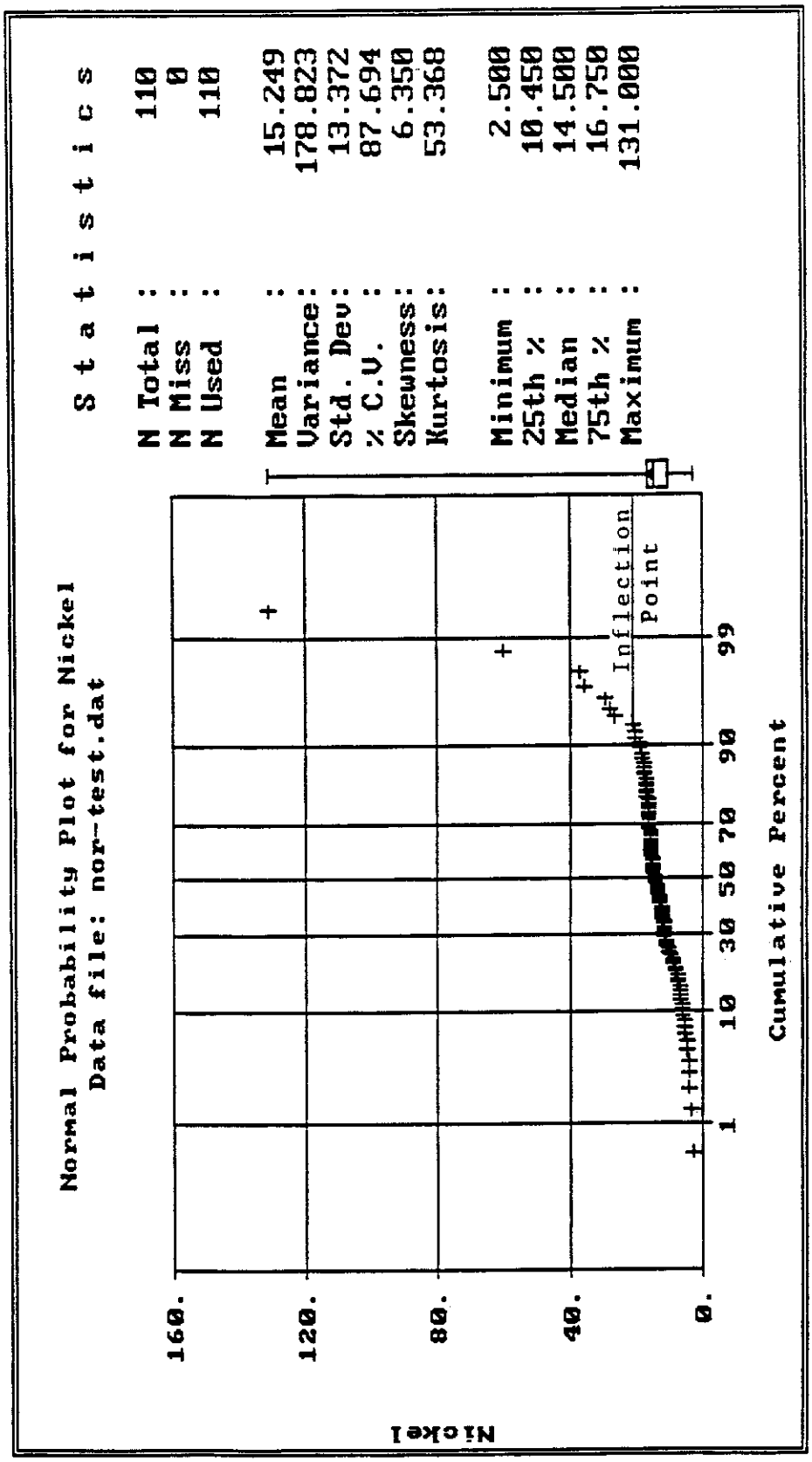
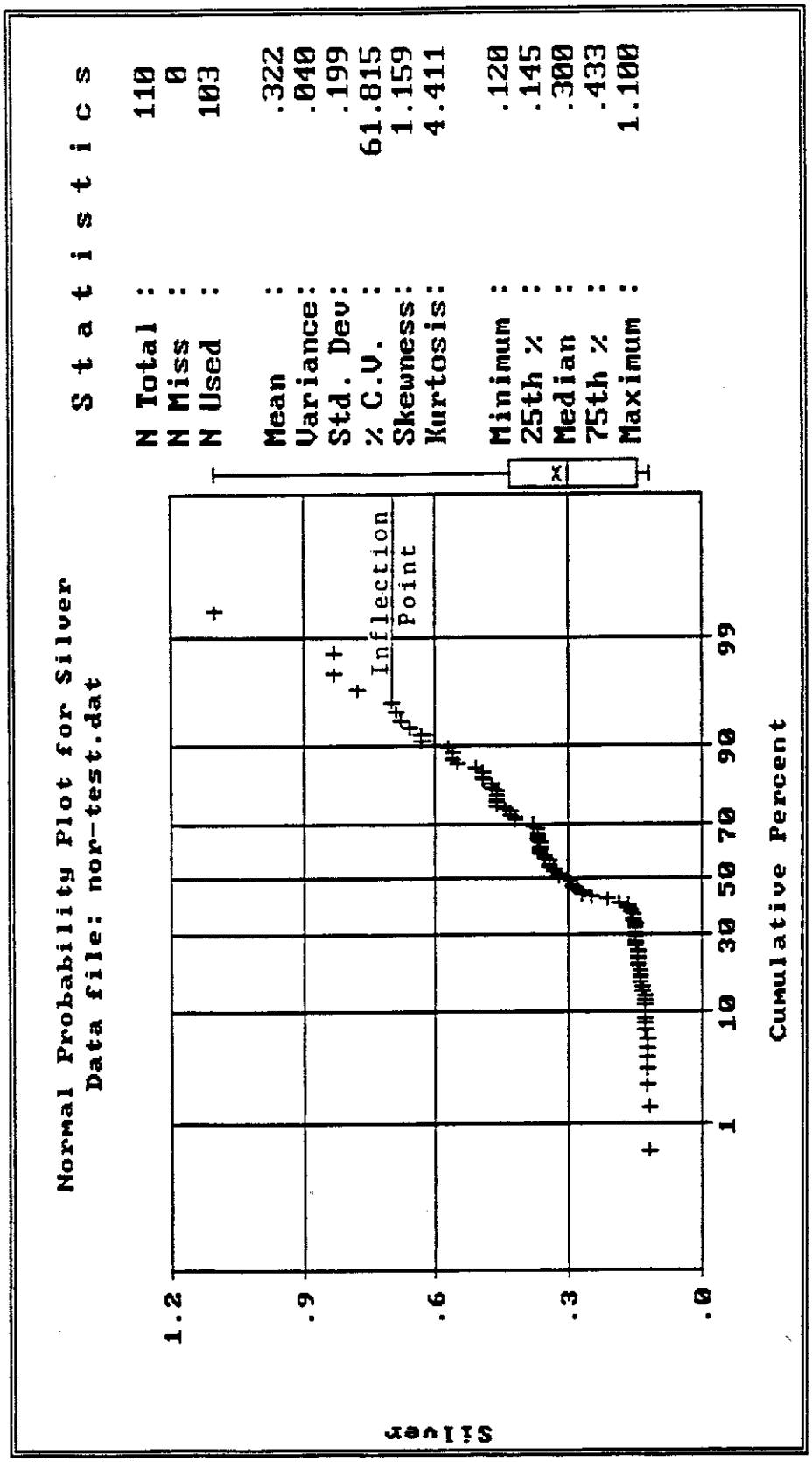

Normal Probability Plot for Lead
Data file: nor-test.dat
Statistics
N Total : 110
N Miss : 0
N Used : 103
Mean : 13.982
Variance : 253.202
Std. Dev : 15.912
% C.V. : 113.809
Skewness : 3.393
Kurtosis : 14.595
Minimum : .600
25th % : 7.200
Median : 9.900
75th % : 14.150
Maximum : 90.800
Inflection Point
Lead
120.
90.
60.
30.
0.
1
10
30
50
70
90
99
Cumulative Percent

Figure 2-7


Normal Probability Plot for Nickel
Data file: nor-test.dat
Statistics
N Total : 110
N Miss : 0
N Used : 110
Mean : 15.249
Variance : 178.823
Std. Dev : 13.372
% C.V. : 87.694
Skewness : 6.350
Kurtosis : 53.368
Minimum : 2.500
25th % : 10.450
Median : 14.500
75th % : 16.750
Maximum : 131.000
Inflection Point
Nickel
160.
120.
80.
40.
0.
1
10
30
50
70
90
99
Cumulative Percent

Dave Dawson
5 May 1995
Attachment 2

Figure 2-8



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Attachment 2

Figure 2-9

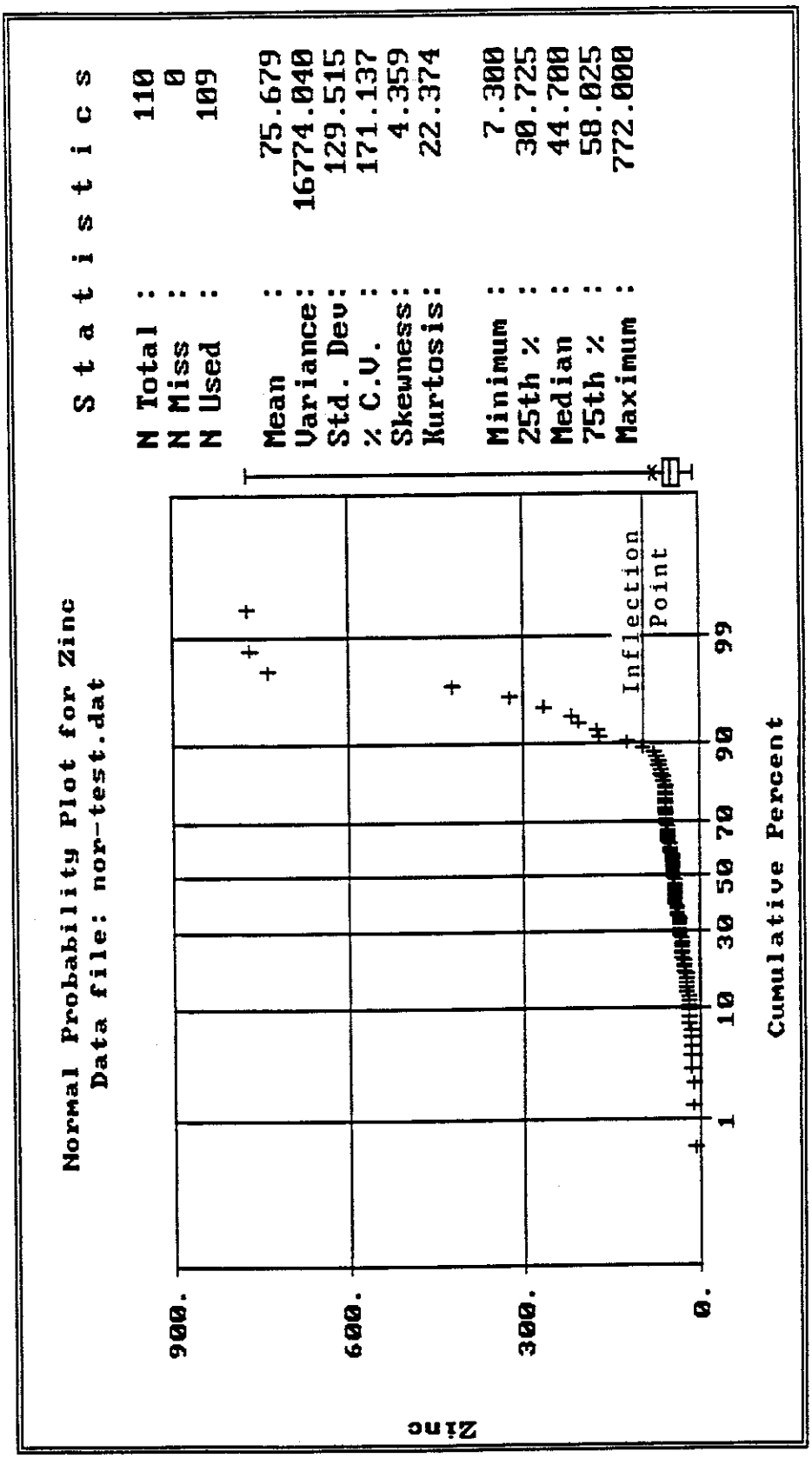


Figure 3-1

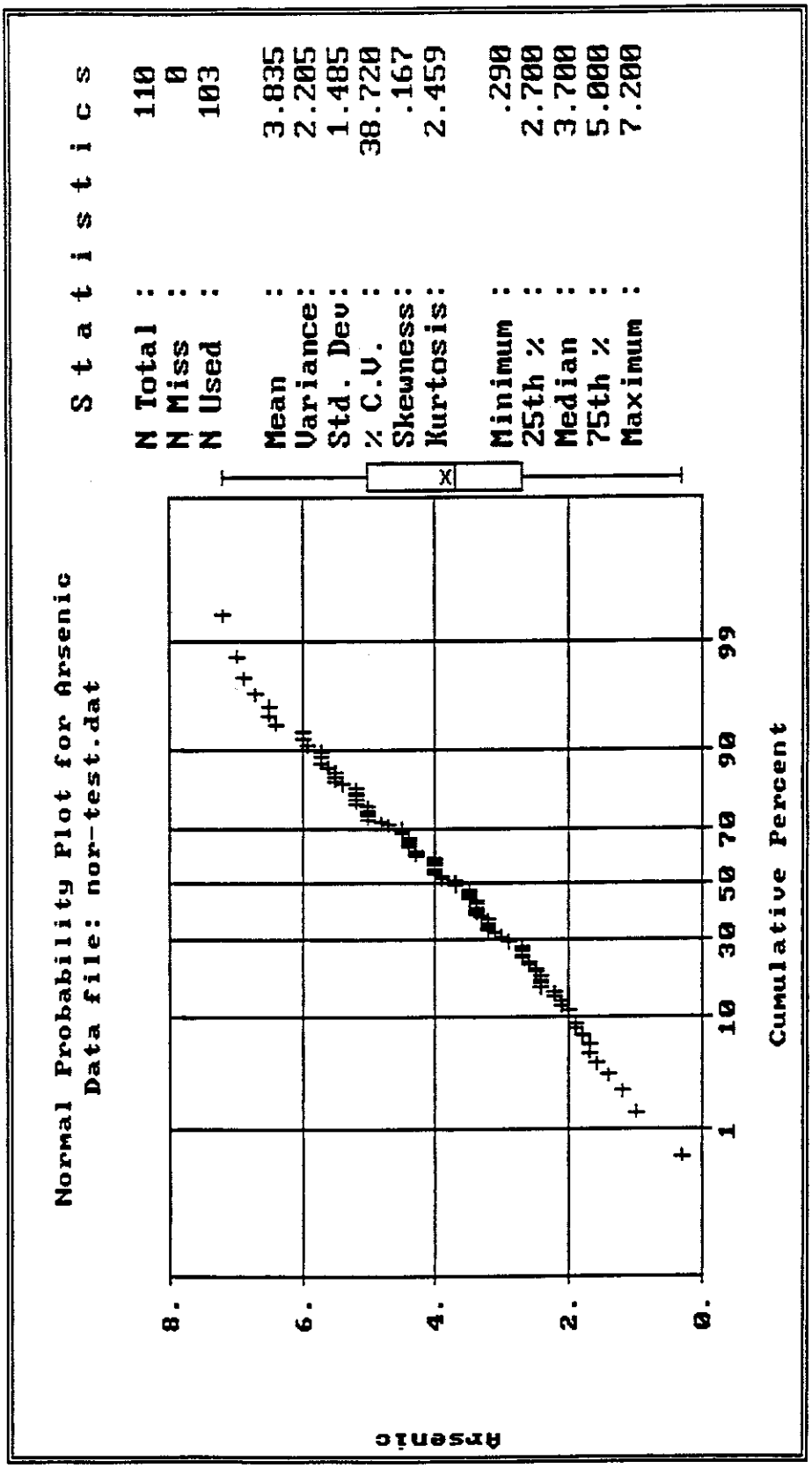
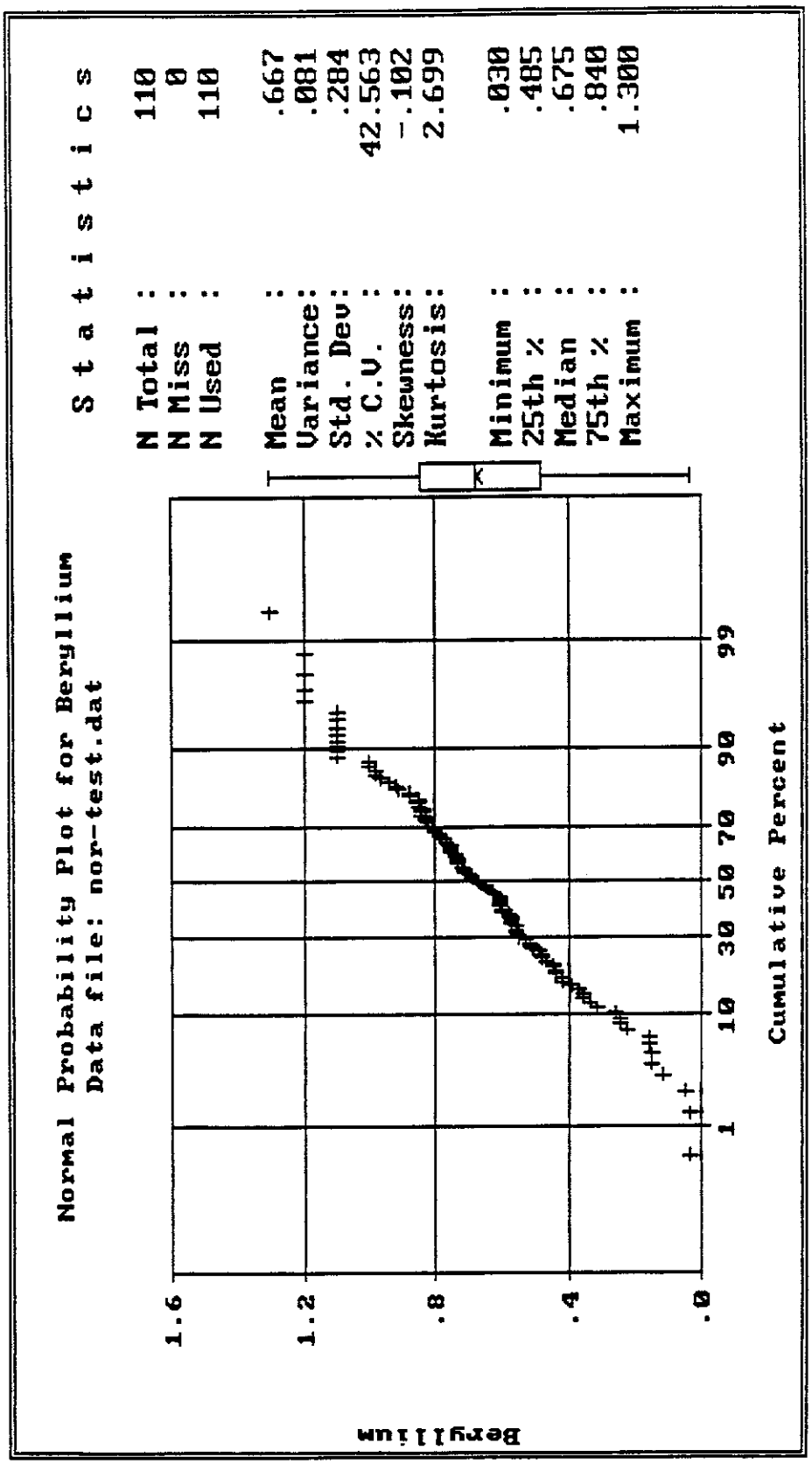

Normal Probability Plot for Arsenic
Data file: nor-test.dat
Statistics
N Total : 110
N Miss : 0
N Used : 103
Mean : 3.835
Variance : 2.205
Std. Dev : 1.485
% C.V. : 38.720
Skewness : .167
Kurtosis : 2.459
Minimum : .290
25th % : 2.700
Median : 3.700
75th % : 5.000
Maximum : 7.200
Arsenic
8.
6.
4.
2.
0.
1
10
30
50
70
90
99
Cumulative Percent

Figure 3-2


Normal Probability Plot for Beryllium
Data file: nor-test.dat
Statistics
N Total : 110
N Miss : 0
N Used : 110
Mean : .667
Variance : .081
Std. Dev : .284
% C.V. : 42.563
Skewness : -.102
Kurtosis : 2.699
Minimum : .030
25th % : .485
Median : .675
75th % : .840
Maximum : 1.300
1.6
1.2
.8
.4
.0
Beryllium
1
10
30
50
70
90
99
Cumulative Percent

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5 May 1995
Attachment 3

Figure 3-3a

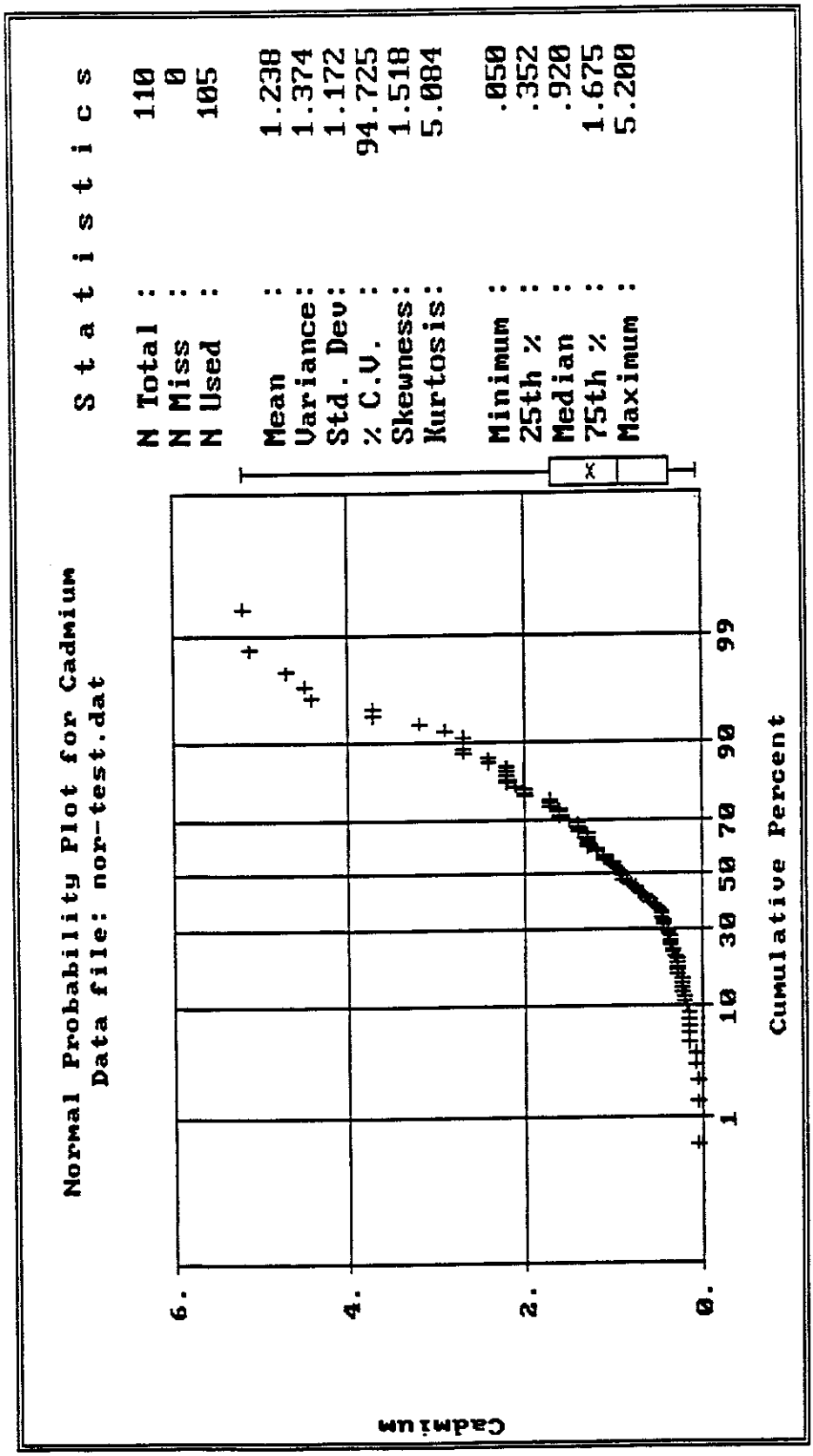
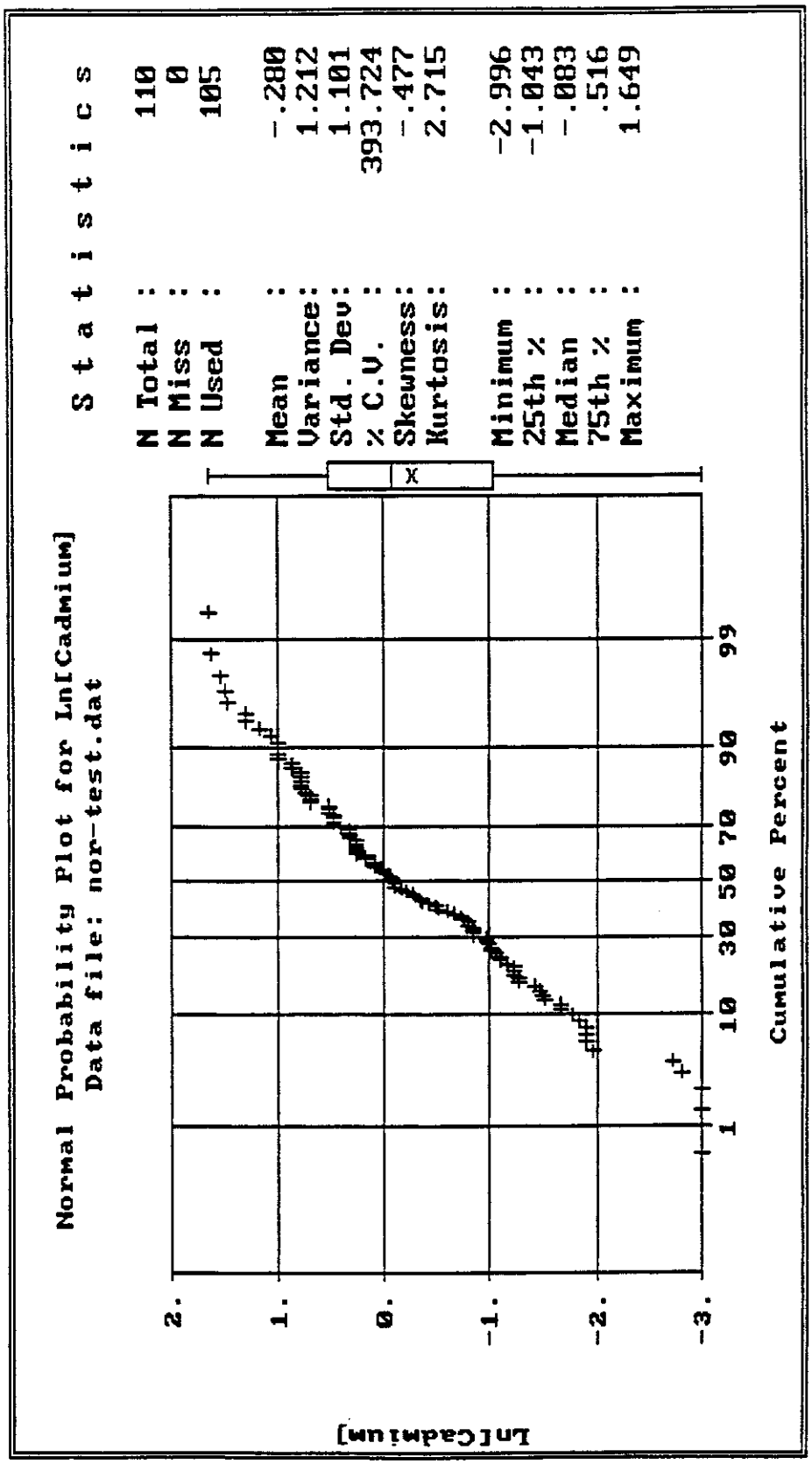


Figure 3-3b


Normal Probability Plot for Ln[Cadmium]
Data file: nor-test.dat
Statistics
N Total : 110
N Miss : 0
N Used : 105
Mean : -.280
Variance: 1.212
Std. Dev: 1.101
% C.V. : 393.724
Skewness: -.477
Kurtosis: 2.715
Minimum : -2.996
25th % : -1.043
Median : -.083
75th % : .516
Maximum : 1.649
2.
1.
0.
-1.
-2.
-3.
Ln[Cadmium]
1
10
30
50
70
90
99
Cumulative Percent

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Attachment 3

Figure 3-4

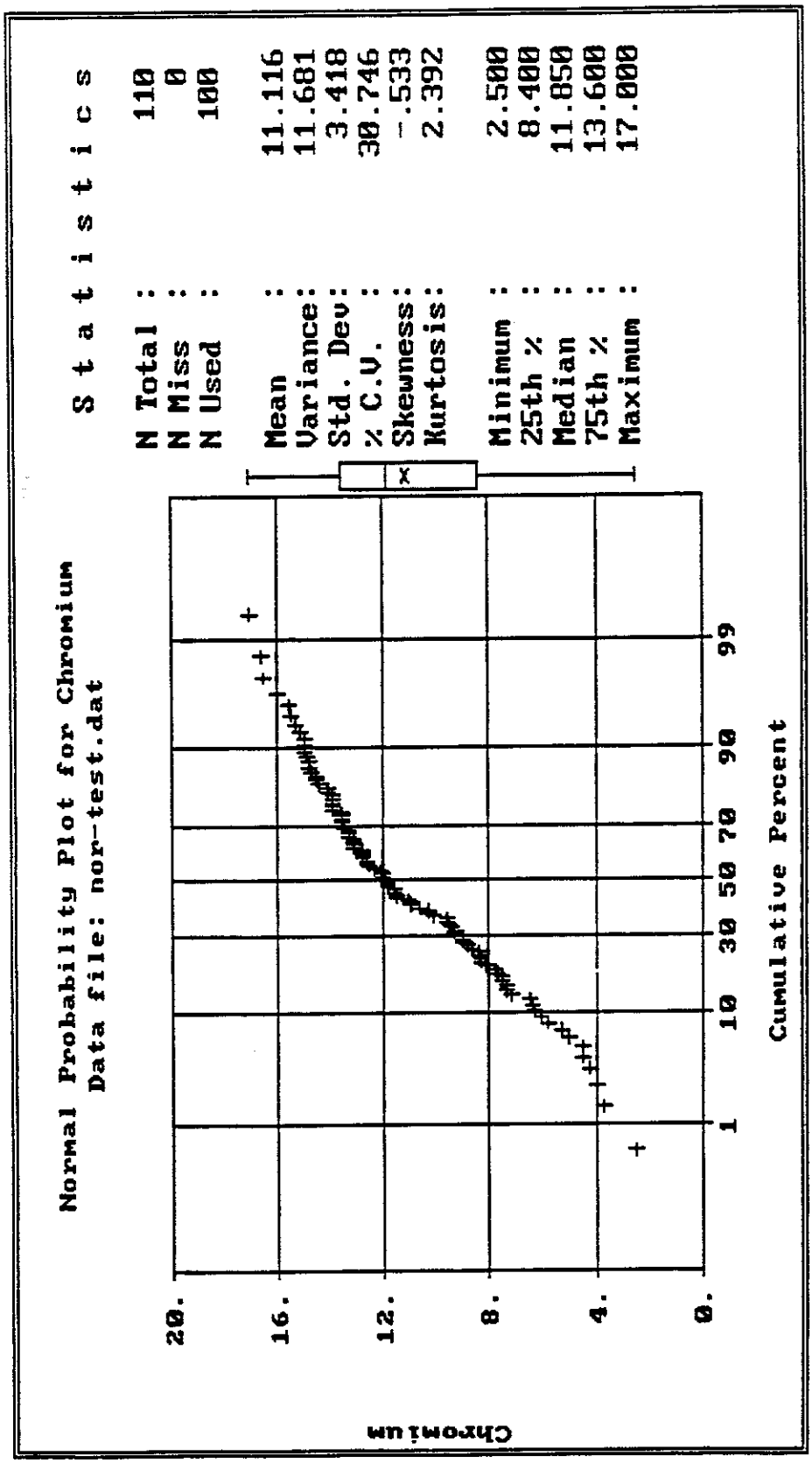

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Figure 3-5

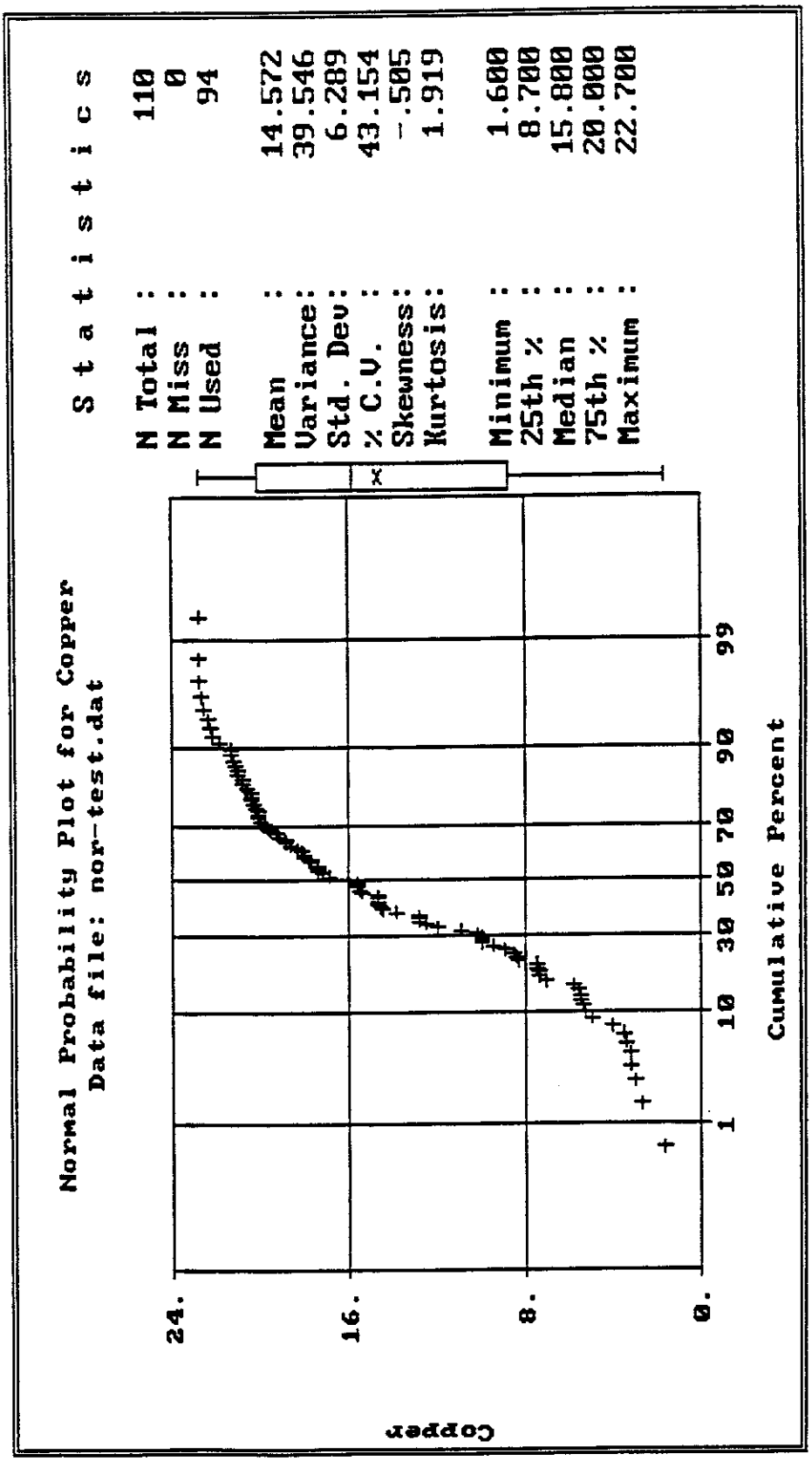

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Figure 3-6

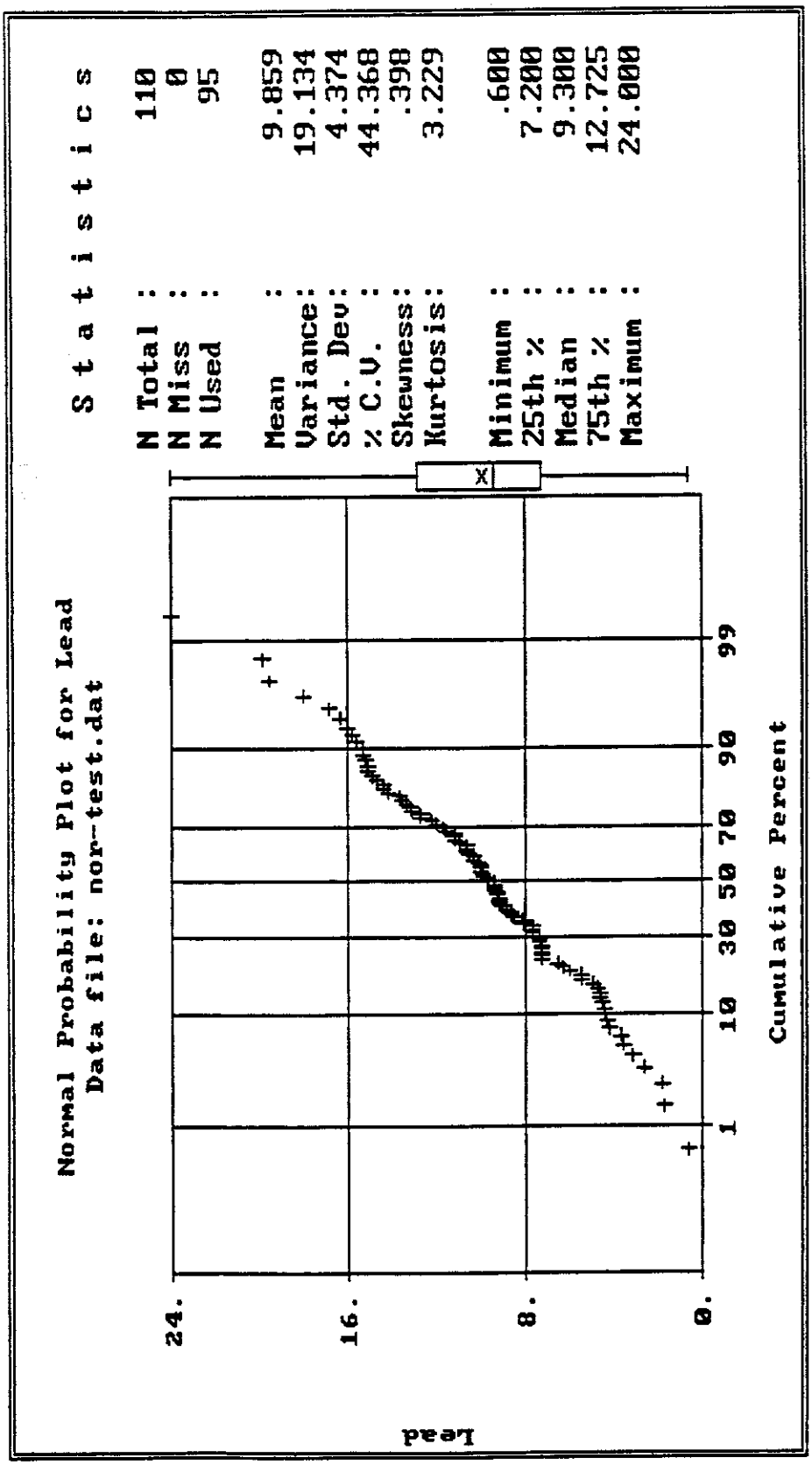
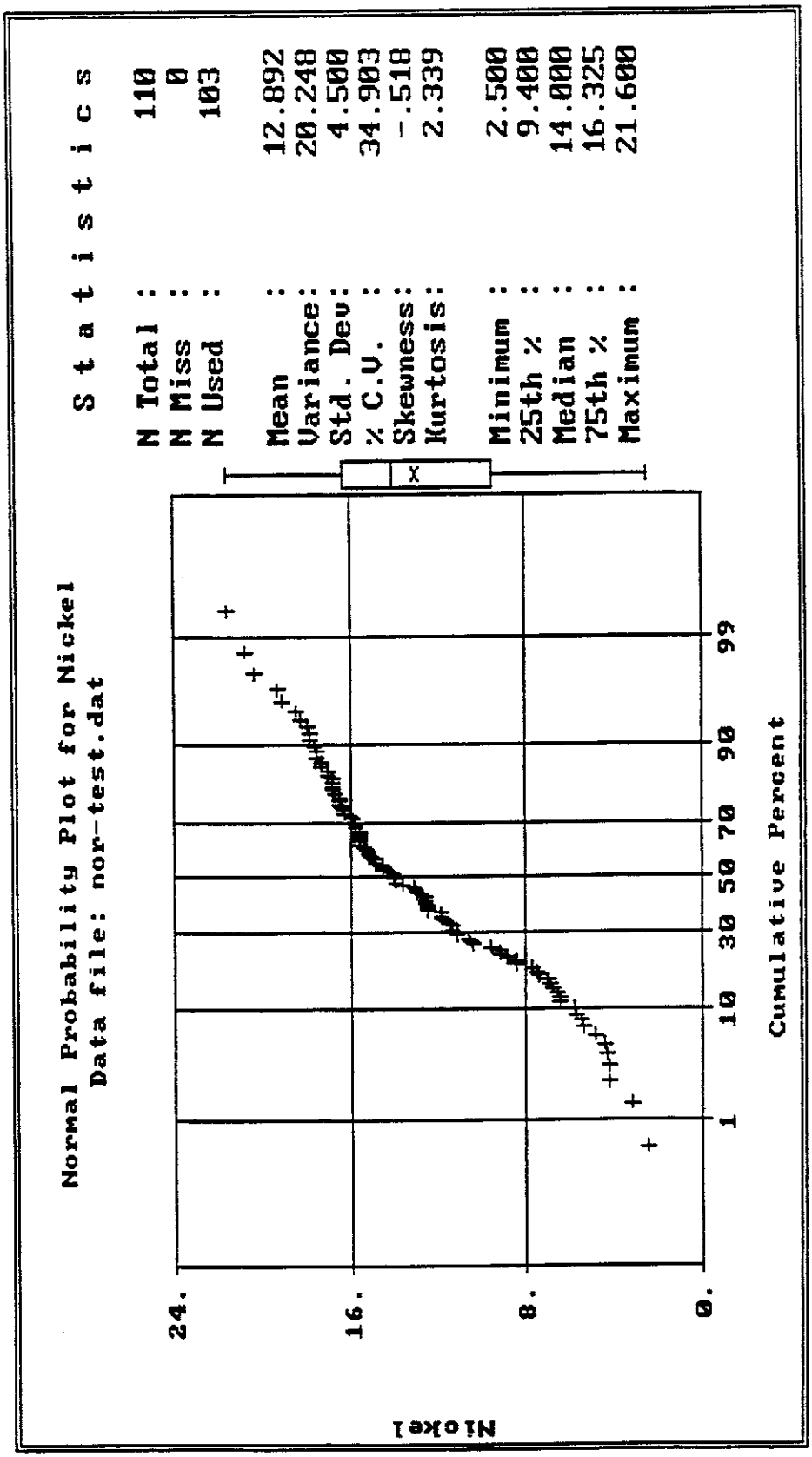


Figure 3-7


Normal Probability Plot for Nickel
Data file: nor-test.dat
Statistics
N Total : 110
N Miss : 0
N Used : 103
Mean : 12.892
Variance : 20.248
Std. Dev : 4.500
% C.V. : 34.903
Skewness : -.518
Kurtosis : 2.339
Minimum : 2.500
25th % : 9.400
Median : 14.000
75th % : 16.325
Maximum : 21.600
Nickel
24.
16.
8.
0.
1
10
30
50
70
90
99
Cumulative Percent

Dave Dawson
5 May 1995
Attachment 3

Figure 3-8

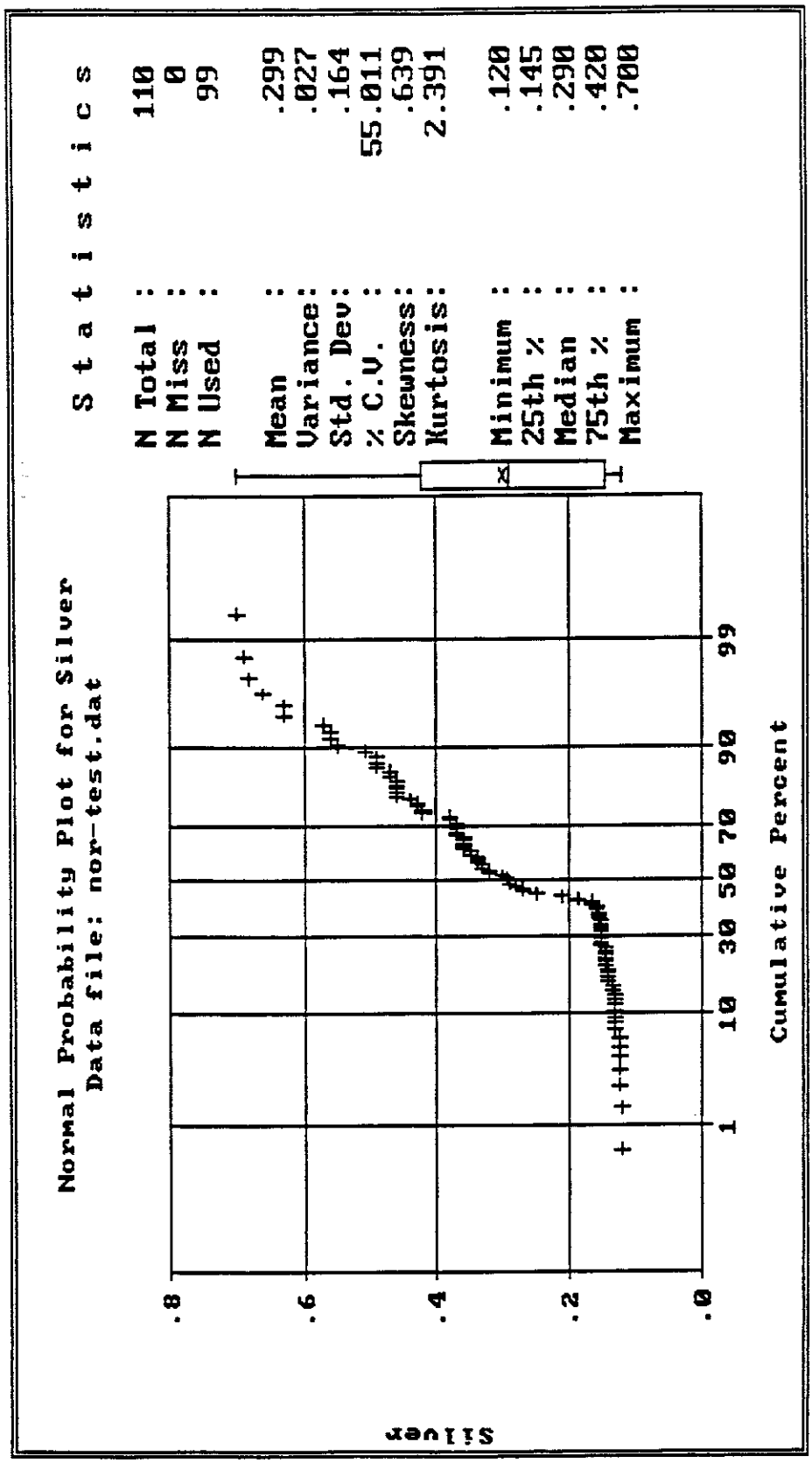
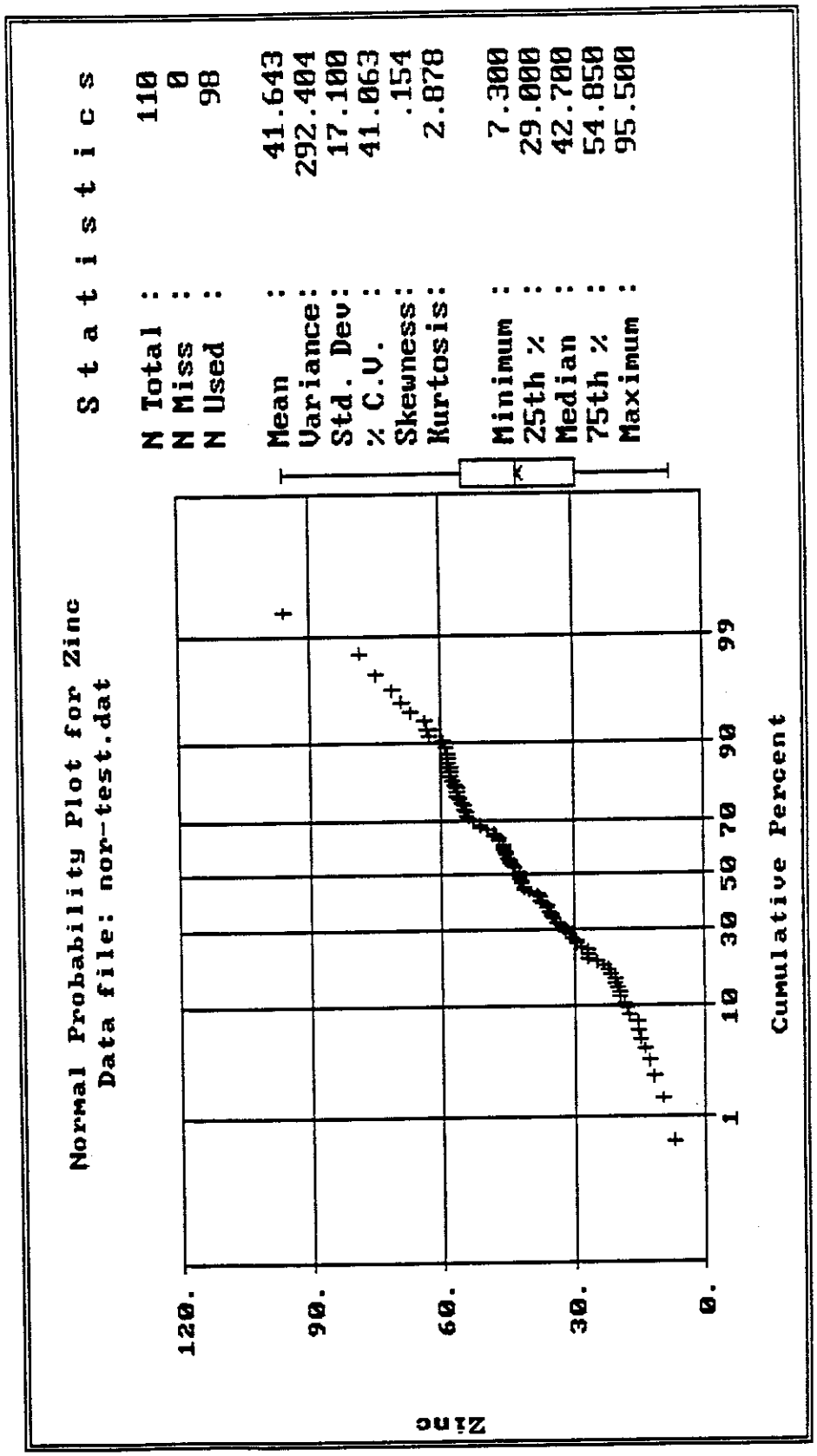


Figure 3-9


Normal Probability Plot for Zinc
Data file: nor-test.dat
Statistics
N Total : 110
N Miss : 0
N Used : 98
Mean : 41.643
Variance : 292.404
Std. Dev : 17.100
% C.V. : 41.063
Skewness : .154
Kurtosis : 2.878
Minimum : 7.300
25th % : 29.000
Median : 42.700
75th % : 54.850
Maximum : 95.500
Zinc
120.
90.
60.
30.
0.
1
10
30
50
70
90
99
Cumulative Percent

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Room 135
San Diego, California 92132-5187

Contract No. N68711-92-D-4670

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN II

APPENDIX B
FINAL
ECOLOGICAL SCOPING ASSESSMENT
SITE 1 MAGAZINE ROAD LANDFILL
NAVAL AIR FACILITY
EL CENTRO, CALIFORNIA

CTO-0090/0277
February 1997

Prepared by:

BECHTEL NATIONAL, INC.
401 West A Street, Suite 1000
San Diego, California 92101

Signature: _____ Date: 10-Feb-97
Gregory A. Cagle, R.G., CTO Leader

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ACRONYMS/ABBREVIATIONS

Cal-EPA	California Environmental Protection Agency
CLEAN	Comprehensive Long-Term Environmental Action Navy
COPC	chemical of potential concern
CTO	Contract Task Order
DTSC	(Cal-EPA) Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
ESA	Ecological Scoping Assessment
°F	degrees Fahrenheit
IRP	(Navy) Installation Restoration Program
mg/kg	milligrams per kilogram
mph	miles per hour
MSL	mean sea level
NAF	Naval Air Facility
NEESA	Naval Energy and Environmental Support Activity
PCB	polychlorinated biphenyl
SI	Site Investigation
SWAT	Solid Waste Water Quality Assessment Test
TFH	total fuel hydrocarbons
TRPH	total recoverable petroleum hydrocarbons
VOC	volatile organic compound

ACRONYMS/ABBREVIATIONS (continued)

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Section B1
INTRODUCTION

This Ecological Scoping Assessment (ESA) has been prepared under the Comprehensive Long-Term Environmental Action Navy (CLEAN) II Program, Contract Task Order (CTO)-0090, in support of an Engineering Evaluation/Cost Analysis (EE/CA) performed for Site 1, the Magazine Road Landfill, located at Naval Air Facility (NAF), El Centro. The EE/CA is being prepared to evaluate removal action alternatives to address soil contaminated with metals and chlordane. This ESA characterizes potential ecological receptors and complete exposure pathways at the site. The results of this ESA are used in the EE/CA to evaluate the need for removal actions or additional ecological risk screening. Much of the information used in this scoping assessment was obtained from the reports of previous investigations performed at the site. The reports include:

- Preliminary Assessment/Site Inspection of Naval Air Facility El Centro, California, (NEESA 1987);
- Final Solid Waste Water Quality Assessment Test (SWAT)/Site Investigation (SI) Report - Site 1-Magazine Road Landfill, Site 2-Patella Road Landfill, and Site 3-Sludge Disposal Area; Engineering Services for Installation Restoration Studies for the Naval Air Facility, El Centro, California (Ogden 1993); and
- Letter Report on Quarterly Ground-water Sampling Results at the Magazine Road Landfill, Patrol Road Landfill, Sludge Disposal Area, Fourth Street Fire Fighting Training Area, Fire Fighting Training Area East of Hangar Number Three, Northwest Fire Fighting Training Area, Abandoned Fuel Farm, and Runway Burn Area (Ogden 1992).

The general outline of this report is consistent with the California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC) publication, Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities, Part B: Scoping Assessment (DTSC 1994).

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Section B2
SITE BACKGROUND

This section includes a brief site description and a summary of climate, topography, and hydrology at NAF El Centro. Specific information on Site 1 is included as necessary.

B2.1 SITE DESCRIPTION

The NAF El Centro is a fully operational facility located approximately 7 miles northwest of El Centro, California, in Imperial County (Figure B2-1). The mission of NAF El Centro is to maintain and operate facilities and to provide services and materials to support naval operations (e.g., aviation activities and other activities designated by the Chief of Naval Operations). Tasks and functions conducted at NAF El Centro include:

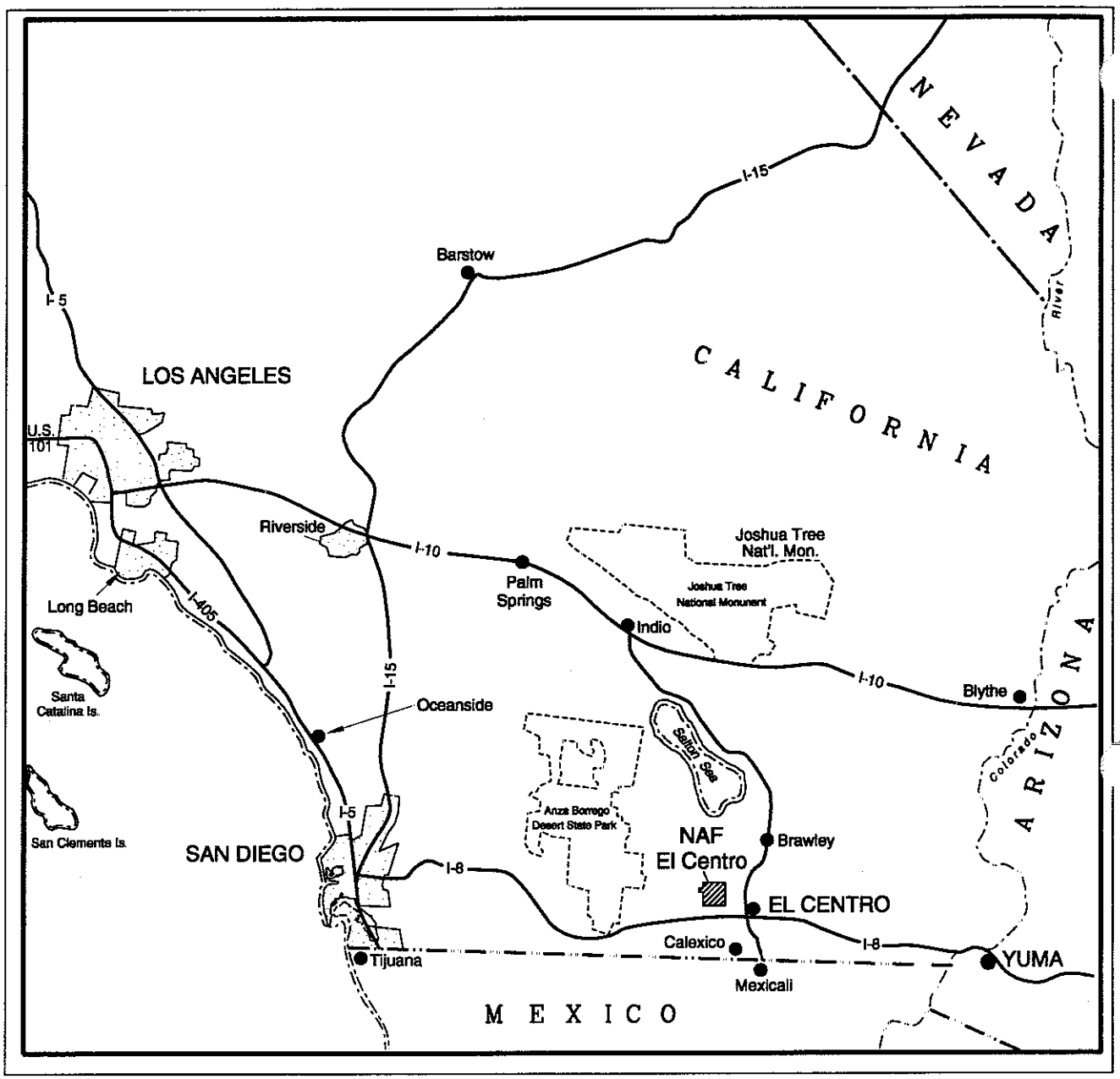
- operations and training,
- administration,
- general engineering support and mission operations,
- personnel support,
- medical and dental support,
- maintenance of material,
- maintenance of real property and utility operations, and
- supply operations.

The NAF El Centro was first commissioned in 1942 as a Marine Corps Air Station (NEESA 1987). Since 1942, NAF El Centro has served various functions and has been known variously as NAF, Naval Auxiliary Landing Field, Naval Air Station, Naval Auxiliary Air Station, and National Parachute Test Range. The facility has been used as a Naval Air Facility since July 1979.

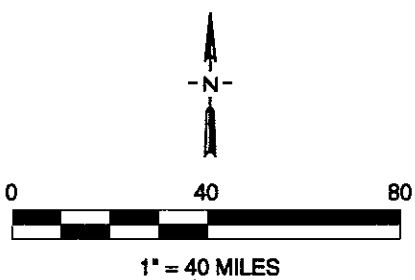
Site 1 is located inside NAF El Centro at the intersection of Magazine and Patrol Roads in the northwest portion of NAF El Centro (Figure B2-2). This site operated as a landfill from 1965 through 1983 and was the only landfill on the base during this time (NEESA 1987). Waste in the landfill was burned approximately once per month throughout the operation of the site. The total landfill area is approximately 5.5 acres (NEESA 1987). Vegetation is currently growing on top of the landfill site, although some of the surface area remains barren. An unlined drainage ditch runs along the northern edge of the site and drains into a location west of the NAF El Centro perimeter fence.

Wastes reportedly disposed in the Magazine Road Landfill include (NEESA 1987):

- household waste;
- metal plating waste;
- asbestos;
- fuel, motor oil, and various solvents;



SOURCE: Master Plan - NAF El Centro, 1988



Attachment B-ESA

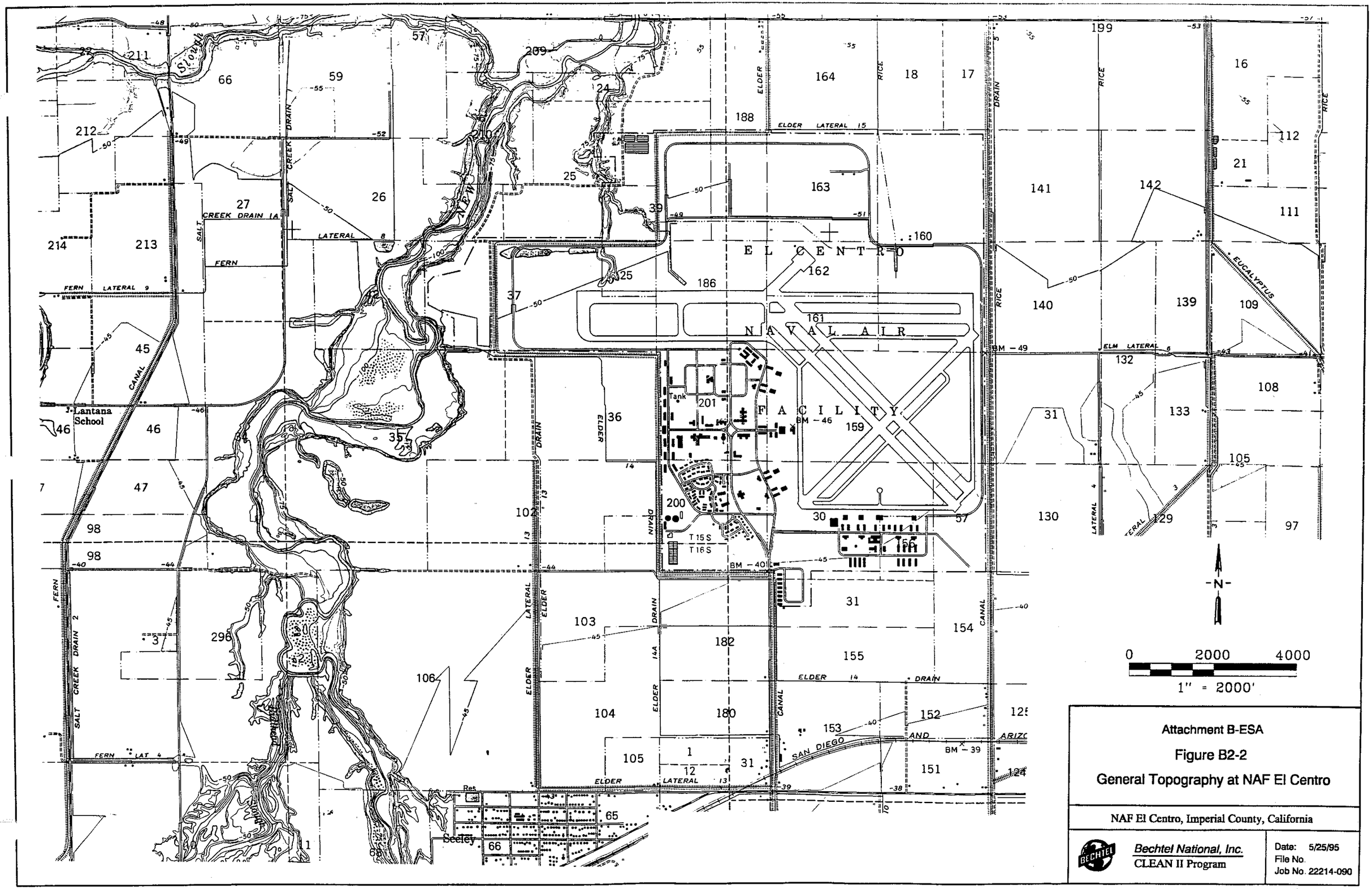
Figure B2-1

Regional Location Map

NAF El Centro, Imperial County, California

Bechtel National, Inc.
CLEAN II Program

Date: 6/15/95
File No. regmap
Job No. 22214-100



Attachment B-ESA

Figure B2-2

General Topography at NAF El Centro

NAF El Centro, Imperial County, California

Bechtel National, Inc.
CLEAN II Program

Date: 5/25/95
File No.
Job No. 22214-090

- paint;
- spent 40-millimeter cartridges;
- photographic chemicals and film;
- sandblast grit;
- demolition debris;
- parachutes;
- pesticide containers; and
- batteries.

B2.2 CLIMATE

The climate at NAF El Centro and the surrounding area is arid. Daily summer temperatures average 92 degrees Fahrenheit (°F) with high temperatures often reaching 115°F (NEESA 1987). Daily winter temperatures average approximately 55°F. Mean annual rainfall in the area is approximately 2.4 inches. Prevailing winds are westerly in the winter and spring, and are from the southeast in the summer. Wind speeds at NAF El Centro range from approximately 1 to 17 miles per hour (mph) with an average annual wind speed of 10 mph.

B2.3 TOPOGRAPHY

The ground surface at NAF El Centro is relatively flat, with surface elevations ranging from 45 feet below mean sea level (MSL) to 50 feet below MSL (NEESA 1987). The area surrounding NAF El Centro is also relatively flat, with the exception of bluffs adjacent to the New River located west of NAF El Centro (Figure B2-2).

B2.4 HYDROLOGY

The NAF El Centro is located near the center of Imperial Valley. The Colorado River is the primary water source within Imperial Valley, and it is used for agricultural, industrial, and domestic purposes (Ogden 1993). The Alamo and New Rivers are the two main drainage basins within the valley. There are several artificial drains and irrigation canals running through and around NAF El Centro that flow into the New River west of the facility. Water quality in the New River is considered poor due to discharges of contaminated water from Mexico as well as various agricultural sources (NEESA 1987). New River flows generally northward and discharges into Salton Sea, which is located in the northern part of Imperial Valley. Salton Sea is the largest lake in California; it is an artificial saline lake that formed in the early 1900s as a result of flooding of the Colorado River into the Salton Sea Basin.

Groundwater monitoring data indicate that groundwater elevations range from 50 to 70 feet below MSL at NAF El Centro (Ogden 1993). The groundwater flow direction at NAF El Centro is to the northwest, toward the New River. Due to high concentrations of

total dissolved solids, groundwater quality in the vicinity of El Centro is generally poor and is not considered useable for domestic or agricultural purposes (NEESA 1987).

Section B3
PREVIOUS SITE INVESTIGATIONS

A Preliminary Assessment/Site Inspection of 16 sites at NAF El Centro, including Site 1, was conducted (NEESA 1987) under the Navy Installation Restoration Program (IRP). Based on NEESA recommendations, an SI/SWAT was performed at Site 1 (Ogden 1993). Soil, groundwater, and surface water samples collected during the SWAT/SI were analyzed for a variety of organic and inorganic chemicals. A summary of the analysis performed on these samples and the results of the analyses are provided in Tables B3-1 and B3-2.

Eleven metals, three volatile organic chemicals (VOCs), total recoverable petroleum hydrocarbons (TRPH), total fuel hydrocarbons (TFH), and bis(2-ethylhexyl)phthalate were detected at least once in soil samples collected at Site 1 during the SI conducted by Ogden (1993). As shown in Table B3-1, the maximum concentrations of arsenic, beryllium, chromium, copper, lead, and zinc at Site 1 exceeded their background concentrations, indicating that these metals may be present at concentrations exceeding their background (naturally occurring) concentrations at NAF El Centro. Two of the organic chemicals detected in soil at Site 1, methylene chloride and bis(2-ethylhexyl)phthalate, are common laboratory contaminants and may not be site contaminants.

As indicated in Table B3-2, 15 metals and 5 organic chemicals were detected at least once in groundwater samples collected at Site 1 during four groundwater monitoring events performed by Ogden (1992).

Sample water samples were collected upstream and downstream of Site 1 in the New River and Elder Canal. Surface water quality was found to be similar at upstream and downstream locations in both water bodies (Ogden 1993), indicating that surface water quality has not been impacted by contaminants detected at Site 1.

Table B3-1
Summary of Soil Analytical Data at Site 1
(results reported in milligrams per kilogram)

Analysis (U.S. EPA[a] Method)	Number of Analyses	Number Detected	Minimum Concentration	Maximum Concentration	Background[b] Concentration
Total recoverable petroleum hydrocarbons (418.1)	7	6	1	260	—[c]
Total fuel hydrocarbons (8015)	25	2	2	480	—
Total phenols (9066)	6	0	—	—	—
Total cyanide (9012)	6	0	—	—	—
Ethylene dibromide (504)	6	0	—	—	—
Volatile organic compounds (8240)	6	1	—	—	—
Methylene chloride			0.06	0.06	—
Toluene			0.02	0.02	—
Xylenes (total)			0.01	0.01	—
Semivolatile organic compounds (8270)	5	4	—	—	—
Bis-(2-ethylhexyl)phthalate			0.33	0.33	—
Pesticides and PCBs[d] (8080)	4	0	—	—	—
Pesticides (8140)	6	0	—	—	—
Chlorinated herbicides (8150)	4	0	—	—	—
Priority Pollutant Metals					
Antimony	24	1	5.9	5.9	—
Arsenic	24	23	1.7	11.3	6.3
Beryllium	24	24	0.15	1.1	1.1
Cadmium	24	20	0.15	1.1	4.6
Chromium	24	24	3.7	20.6	17
Copper	24	24	2.7	538	25
Lead	24	1	1.8	157	17
Mercury	24	0			—
Nickel	24	24	3.2	20.2	20
Organolead	6	0	—	—	—
Selenium	24	0	—	—	—
Silver	24	14	0.32	1.1	0.6
Thallium	24	5	1.1	1.8	—
Zinc	24	4	11.1	418	70

Source: Ogden 1993

Notes:
[a] U.S. EPA – United States Environmental Protection Agency
[b] background concentration represents 95th percentile of the entire background population
[c] — – means not calculated or not applicable
[d] PCB – polychlorinated biphenyl

Table B3-2
Summary of Groundwater Analytical Data[a] at Site 1
NAF El Centro

Analysis/EPA Method	Units	MW1				MW2				MW3				MW4			
		# of Analysis	# Detected	Minimum Concentration	Maximum Concentration	# of Analysis	# Detected	Minimum Concentration	Maximum Concentration	# of Analysis	# Detected	Minimum Concentration	Maximum Concentration	# of Analysis	# Detected	Minimum Concentration	Maximum Concentration
Total fuel hydrocarbons (TFH) - 8015	mg/L	4	0			4	0			4	0			4	0		
Total phenols - 9066	mg/L	1	0			1	0			1	0			1	0		
Total cyanide - 9012	mg/L	1	0			1	0			1	0			1	0		
Ehtylene dibromide -504	µg/L	1	0			1	0			1	0			1	0		
Volatile organics - 8240		1	0			1	0			1	0			1	0		
Semi-volatile organics - 8270		1	0			1	0			1	0			1	0		
Aromatic volatile orgaincs - 8010/8020		3	0			3	0			3	1						
Benzene												0.6	0.6				
Toluene	µg/L											0.63	0.63	3	1	0.62	0.62
1,2 Dichloroethane	µg/L													3	3	1.3	2.2
Polynuclear Aromatic Hydrocarbons (8310)		3	0			3	1			3	0			3	0		
Pyrene	µg/L							0.4	0.4								
Pestcides and PCBs - 8080		4	0			4	0			4	1			4	0		
Aroclor-1242	µg/L											1.5	1.5				
Pesticides - 8140	µg/L	1	0			1	0			1	0			1	0		
Chlorinated herbocides - 8150		1	0			1	0			1	0			1	0		
Hexavalent Chromium Unfiltered	mg/L	3	0			3	0			3	0			3	0		
Metals (unfiltered)																	
Antimony	µg/L	3	0			3	0			3	0			3	0		
Arsenic	µg/L	3	0			3	1	1.6	1.6	3	3	1.4	5.3	3	1	5	5
Berylium	µg/L	3	1	2.3	2.3	3	0			3	0			3	1	2.3	2.3
Cadmium	µg/L	3	1	3.1	3.1	3	0			3	0			3	2	2.4	3.2
Chromium	µg/L	3	0			3	0			3	1	5.2	5.2	3	1	4.1	4.1
Cobalt	µg/L	3	0			3	0			3	0			3	0		
Chromium	µg/L	3	0			3	0			3	1	5.2	5.2	3	1	4.1	4.1
Copper	µg/L	3	2	5.8	33	3	2	5.1	30.3	3	2	10.9	26.7	3	2	13.6	37.4
Lead	µg/L	3	0			3	2	1.9	3.5	3	2	2	3.1	3	1	8.6	8.6
Mercury	µg/L	3	0			3	0			3	0			3	0		
Molybdenum	µg/L	3	3	184	259	3	3	13.8	23.9	3	3	105	332	3	3	81.6	107
Nickel	µg/L	3	0			3	1	5.6	5.6	3	1	5.6	5.6	3	0		
Selenium	µg/L	3	3	2.5	45.9	3	2	1.8	2.9	3	2	2	2.4	3	3	17.2	38
Silver	µg/L	3	3	7.4	11.3	3	0			3	1	7.8	7.8	3	1	10.4	10.4
Thallium	µg/L	3	0			3	0			3	0			3	0		
Vanadium	µg/L	3	2	4.3	4.4	3	2	4.3	5.2	3	2	4.4	6	3	3	4.3	6.7
Zinc	µg/L	3	3	13.4	40.7	3	3	5.8	30.6	3	3	17	27.1	3	3	8	64.4

Notes:

[a] The analytical data were collected by Ogden. October 1992

Section B4
BIOLOGICAL CHARACTERIZATION

This section describes the habitats at NAF El Centro and potential receptors. Specific flora (plant) and fauna (wildlife) species observed in Site 1 are discussed in following sections. Information presented in this section is based on observations made during a site visit by CLEAN II personnel on 20 April 1995. The approximate sizes of various areas are based on field observations only. These sizes are estimates rather than actual measurements.

B4.1 IDENTIFICATION OF HABITATS AT NAF EL CENTRO

The undeveloped portions of NAF El Centro consist almost entirely of graded, cleared land. The developed areas of the base are landscaped with lawns and nonnative shrubs and trees. There are a few large, flood-irrigated fields of alfalfa, which are fallowed during some years. Site 1 is not associated with landscaped or agricultural areas. There are a few small open areas that were previously disturbed, but have now been invaded by a mixture of native and exotic shrubs. These open areas along with the few short sections of windrow athel trees, provide the only significant upland habitat for birds, mammals, reptiles, and amphibians at NAF El Centro. Open agricultural drainage and irrigation ditches provide limited aquatic habitat. The berms/levees of the ditches, roads, and agricultural fields are commonly used by round-tail ground squirrels and burrowing owls.

B4.2 IDENTIFICATION OF POTENTIAL RECEPTORS

Potential receptors at NAF El Centro, and more specifically at Site 1, are identified in this section. Potential receptors are defined as flora or fauna species, including special-status species, that are known or expected to occur in the areas of potential concern. Special-status species include the following:

- California species of special concern;
- state or federal listed rare, threatened, or endangered species; and
- species that are proposed or recommended for state or federal listing.

The identification of potential receptors at NAF El Centro was based on observations made during the 20 April 1995 site visit. Potential receptors at Site 3 are discussed in the following sections.

B4.2.1 Flora

The flora described for NAF El Centro includes only terrestrial vascular plants. Native shrubs, such as four-wing saltbush (*Atriplex canescens*) and Torrey's sea-blight (*Suaeda moquinii*) with exotic tamarisk (*Tamarix ramosissimum*), are the most prevalent species on NAF El Centro. Understory herbaceous species are mostly nonexistent, even in the small shrubland parcels. When present, the understory contains annual grasses, salt heliotrope (*Heliotropium curassavicum* ssp. *oculatum*), alkali mallow (*Sida hederacea*), and goosefoot (*Chenopodium* sp.). There is an active vegetation-control program for most of the open areas of NAF El Centro by which tractors scrape away the vegetation

and maintain cleared, flat fields. There are some alfalfa fields on the facility, but none are associated with Site 1. Rows of athel (*Tamarax atheli*) trees were previously planted as windbreaks at some locations in NAF El Centro.

Site 1 contains more than 1 acre of shrubland that has not been disturbed for several years. Four-wing saltbush up to 5 feet tall dominate the site with a lesser shrub component of Torrey's sea-blight and tamarisk. There is a very sparse understory of annual grass and seedling saltbush. There is a windrow of athel trees, many up to 40 feet tall, across the road to the west of the site.

An unlined drainage ditch, for storm water and agricultural water runoff, approximately 15 feet across and 8 feet deep, runs along one side of the site. The ditch contained water about 8 inches deep during the 20 April 1995 site visit. The ditch has recently been mechanically cleared of large shrubs (mostly four-wing saltbush and tamarisk). The brush was piled next to the ditch during the 20 April 1995 site visit. The drainage ditch runs westward under the NAF El Centro perimeter fence into a deep gully and eventually to the New River. The deep gully contains a dense stand of tamarisk, four-wing saltbush, and a few mesquite trees (*Prosopis* sp.), some as high as 20 feet tall.

B4.2.2 Fauna

The fauna at NAF El Centro considered in this assessment include mammal, bird, amphibian, reptile, and invertebrate taxa common to the desert in Imperial County. A thorough survey of the fauna was not conducted on 20 April 1995, but the site was inspected for evidence of faunal use (e.g., scat, burrows, tracks, bones, shells, or positive sightings). All areas of NAF El Centro could be visited at any time by the bird species present in the El Centro area as well as some wide-ranging mammals such as coyote. This assessment generally discusses observations made at NAF El Centro and any specific information related to Site 1. The assessment considers those species that are most likely to occupy or consistently use Site 1 and does not attempt to record every occasional or incidental wildlife occurrence.

Most of the wildlife species that occur at NAF El Centro are native, but a few bird species (e.g., European starling and house sparrow) are introduced. There are also a few feral house cats on the base. It is unknown if shells from clams found near the Site 1 irrigation canal are native or exotic.

Bird species observed on NAF El Centro during the 20 April 1995 site visit include Western kingbird, red-wing blackbird, European starling, white-winged dove, turkey vulture, black phoebe, Gambel's quail, yellow warbler, bittern, red-tailed hawk, roadrunner, raven, cliff swallow, house sparrow, and burrowing owls. Species not observed by CLEAN II personnel but reported by others include ring-necked pheasant, white-crowned sparrow, western meadowlark, American crow, American kestrel, great horned owl, and northern harrier. Several other common bird species might be expected to occur at NAF El Centro. There is a sizable population of burrowing owls (a California species of special concern) resident on NAF El Centro. At least five different areas containing active burrows or burrow complexes were observed during the 20 April 1995

site visit. Base personnel reported that burrowing owls also occur at other areas on NAF El Centro that were not inspected. The burrowing owls commonly inhabit abandoned ground squirrel holes in levees or open areas and forage in open areas, including adjacent agricultural fields. No burrowing owl burrows were discovered in Site 1.

Mammal species observed or expected to occur at NAF El Centro include coyote, desert cottontails, black-tailed jackrabbits, round-tail ground squirrels, and Colorado Valley wood rats (a California species of special concern). There was also evidence of small burrows of kangaroo rats, deer mice, or harvest mice.

Reptiles and amphibians possibly present include western whiptail lizard, side-blotched lizard, and flat-tailed horn lizard (a California species of special concern). Two unidentified lizards were briefly observed at Site 1 during the 20 April 1995 site visit. One toad carcass, species unknown, was observed at the mouth of a burrowing owl burrow.

Invertebrate species that were common at some sites include dragonflies and large red ants. Shells of an unidentified species of freshwater clam were observed next to the drainage ditch near Site 1; however, these shells may have come from a nearby irrigation ditch.

Desert cottontail and black-tailed jackrabbits were observed at Site 1, and there was a considerable amount of rabbit scat on the ground. A relatively high density of rodent holes were observed between and under the shrubs, and one large burrow (probably a rabbit) was found. Coyote scat was common. The shrub community probably contains bird nests, and bird activity was fairly high in and around this site. The nearby row of athel trees (across the road to the west of the site) provides habitat for several bird species, including raptors and owls.

Two unidentified lizards were observed at this Site 1. There were also active colonies of large red ants.

The open ditch running along the northern edge of the site contained dragonflies, and there were opened freshwater clam shells on the banks of the ditch. The clam shells had possibly been harvested by some bird or mammal. No animals were observed in the water, but the inspection was cursory. There is an area of the drainage ditch outside the NAF El Centro perimeter fence that contains a dense stand of four-wing saltbush, tamarisk, and mesquite trees, which are relatively good habitat for many bird and mammal species.

B4.2.3 Summary of Potential Receptors

Based on the observations made during the site visit, following is a list of flora and fauna species expected to be present at Site 1:

- mammals: coyote, mice/kangaroo rats, desert cottontail, black-tailed jackrabbit, and round-tail ground squirrel;

- birds: burrowing owl (a California species of special concern), road runner, and red-tailed hawk;
- invertebrates: dragonfly and red ant;
- reptiles: flat-tailed horn lizard (a California species of special concern); and
- plants: four-wing saltbush, Torrey's sea-blight, tamarisk, and mesquite.

Section B5
CHEMICALS OF POTENTIAL CONCERN

Chemicals of potential concern (COPCs) include metals reported above their background concentrations or organic chemicals detected at least once in soil or groundwater samples collected from Site 1. If background data for specific metals detected in soil or groundwater were not available, the detected metals were included as COPCs in this assessment. The analytical data for unfiltered groundwater samples (Ogden 1992) were used to identify metals as COPCs in this assessment. This is a conservative approach because most metals adsorb readily to total dissolved solids, which are known to be present at high levels in the groundwater at NAF El Centro. Therefore, metals are generally detected more frequently and at higher concentrations in unfiltered samples than filtered samples.

Based on the analytical information (Ogden 1993) summarized in Tables B3-1 and B3-2, the COPCs identified at Site 1 are metals, VOCs, TRPH, and TFH in soil; and metals and organic compounds in groundwater.

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Section B6
POTENTIALLY COMPLETE EXPOSURE PATHWAYS

Potentially complete exposure pathways at Site 1 are discussed in this section. An exposure pathway may be defined as the course that a chemical or physical agent takes from the source of contamination to potentially exposed receptors. Exposure pathways generally include the following components:

- primary source of contamination,
- chemical release mechanisms,
- secondary source of contamination,
- potential receptors, and
- exposure routes.

General description of these components are discussed in the following sections. Based on the conditions observed at Site 1, potentially complete exposure pathways are summarized in Table B6-1.

B6.1 PRIMARY SOURCES OF CONTAMINATION

The primary sources of contamination at Site 1 are the soil media in which COPCs have been detected.

B6.2 POTENTIAL RELEASE MECHANISMS

Release mechanisms refer to the fate and transport of chemicals in the environment that result in the contamination of secondary sources. Release mechanisms depend on the chemical and physical characteristics of the COPCs as well as the characteristics of the environmental media in which COPCs are detected. Potential release mechanisms identified for COPCs in soil at Site 1 are:

- windblown dust and vapors,
- surface water runoff into the drainage ditch,
- leaching of chemicals into groundwater, and
- lateral migration of surface water bodies.

The only potential release mechanism identified for COPCs in groundwater is lateral migration of contaminants to surface water bodies.

To be conservative, the release mechanisms discussed below do not consider the attenuation or natural degradation of COPCs in the environment, which generally results in lower concentrations of COPCs in both primary and secondary sources.

COPCs may be released from their primary sources at Site 1 through various means. Metals and other chemicals that adsorb readily to soil (e.g., the organochlorine chemicals) may be released into the air through windblown dust or during activities that disturb the soil (e.g., soil scraping). VOCs may also be released to air as vapors. Because

groundwater at Site 1 is relatively shallow, some of the COPCs in soil, particularly water-soluble COPCs, such as VOCs, may leach downward through soil to groundwater. COPCs in soil may also be released into drainage ditches as sediments and eventually discharged into the New River in areas where surface water runoff into the ditches may occur.

COPCs in groundwater may be released by lateral migration into unlined drainage ditches in areas where groundwater is shallow (e.g., the same depth as the drainage ditches). This release mechanism may occur at Site 1. Surface water in the drainage ditches flows to the New River. COPCs in groundwater may also migrate within groundwater to the New River, because groundwater is known to flow toward the New River. As stated previously, water quality in the New River is poor, and it is unlikely that COPCs from Site 1 contribute significantly to the contamination of the river. Surface water in the New River eventually flows into the Salton Sea.

B6.3 SECONDARY SOURCES OF CONTAMINATION

Secondary sources of contamination include those media into which COPCs may be released, specifically, air and surface water in the drainage ditches in New River.

B6.4 POTENTIAL RECEPTORS

Potential receptors at Site 1 were discussed in Section 4.2.

B6.5 EXPOSURE ROUTES

Exposure routes are the means by which plant or animal receptors absorb chemicals from environmental media. Potential exposure routes for receptors may include:

- direct uptake of COPCs from primary or secondary sources of contamination by plants;
- dermal absorption of COPCs in primary or secondary sources of contamination by wildlife receptors;
- ingestion of COPCs in contaminated food or water sources; and
- inhalation of COPCs in air (secondary exposure route).

Direct uptake of COPCs by plants may occur as a result of root or leaf uptake of COPCs in soil, groundwater, or air (e.g., from fugitive dust). Dermal absorption of COPCs may occur in wildlife receptors who contact contaminated media directly with their skin, such as burrowing animals (e.g., rodents, birds, reptiles). Ingestion of COPCs in contaminated food sources may occur as a result of plant or wildlife uptake of COPCs followed by the consumption of these plants or wildlife by other receptors. Although inhalation of COPCs in air is listed as a potential exposure route, this route is considered a secondary route of exposure for receptors. Potentially complete exposure pathways that exist at Site 1 are summarized in Table B6-1.

Table B6-1
Summary of Potentially Complete Exposure Pathways at Site 1, NAF El Centro

Primary Sources of Contamination[a]	Potential Release Mechanisms	Secondary Sources of Contamination	Plant Receptors[b]	Wildlife Receptors[b]	Do Potential Complete Exposure Pathways Exist?
Soil: metals, VOCs[c], TRPH[d], and TFH[e]	Windblown, dust, vapors	Air	Yes	Yes	Yes
	Surface water runoff into drainage ditch	Surface water in drainage ditches, New River			
	Leaching of chemicals to groundwater	Groundwater			

Notes:
[a] primary sources of contamination are the environmental media in which chemicals of potential concern were detected
[b] receptors include plants or animals observed in or around the site or for which evidence of their occurrence was noted
[c] VOC – volatile organic compound
[d] TRPH – total recoverable petroleum hydrocarbons
[e] TFH – total fuel hydrocarbons

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Section B7
SUMMARY AND CONCLUSIONS

Potential ecological receptors, COPCs, and potentially complete exposure pathways were evaluated for Site 1 at NAF El Centro in this assessment. Potential ecological receptors include plants or animals observed during the site inspection conducted by CLEAN II personnel on 20 April 1995 or those expected to occur in the habitats at NAF El Centro. Much of the land at NAF El Centro has been developed for various uses, including NAF activities, landscaping, and agricultural use. Therefore, the habitats at NAF El Centro have been disturbed. Metals and various types of organic chemicals were identified as COPCs in soil and groundwater at Site 1. Potential exposure routes include direct uptake of COPCs in soil or groundwater by plants, dermal absorption of COPCs in soil by wildlife receptors, ingestion of COPCs in contaminated food or water sources by wildlife receptors, and inhalation of COPCs in air (secondary exposure route). Potentially complete exposure pathways were identified for Site 1. Due to potentially complete exposure pathways, further evaluation of Site 1 or site remediation to prevent occurrence of complete exposure pathways is recommended.

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Section B8
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Contracts Department
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San Diego, California 92132-5187

Contract No. N68711-92-D-4670

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN II

APPENDIX C
FINAL
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
SITE 1, MAGAZINE ROAD LANDFILL
NAF EL CENTRO, CALIFORNIA

CTO-0090/0277
February 1997

Prepared by:

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Signature: _____ Date: 10-Feb-97
Gregory A. Cagle, R.G., CTO Leader

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ACRONYMS/ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
ACL	alternate concentration limit
CAA	Clean Air Act
Ca-HSC	California Health and Safety Code
Cal-EPA	California Environmental Protection Agency
CCR	*California Code of Regulations*
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CWA	Clean Water Act
DON	Department of the Navy
DTSC	(Cal/EPA) Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
ESA	Ecological Scoping Assessment
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
HWCA	Hazardous Waste Control Act
ICAPCD	Imperial County Air Pollution Control District
IRP	Installation Restoration Program
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
NAAQS	National Ambient Air Quality Standards
NAF	Naval Air Facility
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
OSWER	(U.S. EPA) Office of Solid Waste Emergency Response
PCB	polychlorinated biphenyl
ppm	parts per million
RAP	Remedial Action
RAWP	Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act

ACRONYMS/ABBREVIATIONS (continued)

RWQCB	(California) Regional Water Quality Control Board
SARA	Superfund Amendments Reauthorization Act
SDWA	Safe Drinking Water Act
SIP	State Implementation Plan
SMCL	secondary maximum contaminant level
SWDIV	Southwest Division Naval Facilities Engineering Command
TBC	to be considered
TSCA	Toxic Substances Control Act
TSD	treatment, storage, and disposal
USC	*United States Code*
U.S. EPA	United States Environmental Protection Agency
VOC	volatile organic compound

Section C1
INTRODUCTION

This document was prepared as an attachment to the Engineering Evaluation/Cost Analysis (EE/CA) prepared for Site 1 at Naval Air Facility (NAF) El Centro by the Southwest Division Naval Facilities Engineering Command (SWDIV) to evaluate applicable or relevant and appropriate requirements (ARARs).

C1.1 PURPOSE

The purpose of this document is to identify and evaluate potential federal and state ARARs and set forth the Department of the Navy (DON) determinations regarding those potential ARARs for removal alternatives addressed in the EE/CA.

This evaluation is the first step in identifying potential ARARs from the universe of regulations, requirements, and guidance that may be pertinent to this site as identified by the DON or state agencies. It includes an initial determination of whether the potential ARARs actually qualify as ARARs for the site and a comparison for stringency to identify the controlling ARARs. The identification of ARARs is an iterative process. After public review, final determination of ARARs will be presented by the DON in the Action Memorandum as part of the selection of the response action.

C1.2 SUMMARY OF CERCLA AND NCP REQUIREMENTS

Section 121(d) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) states that remedial actions at 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 determined to be legally applicable or relevant and appropriate. Although Section 121 of CERCLA does not itself expressly require that CERCLA removal actions comply with ARARs, the United States Environmental Protection Agency (U.S. EPA) has promulgated a requirement in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) mandating that CERCLA removal actions "... shall, to the extent practicable considering the exigencies of the situation, attain applicable or relevant and appropriate requirements under federal environmental or state environmental or facility siting laws" (40 *Code of Federal Regulations* [CFR] Section 300.415[j]). It is DON policy to follow this requirement. Certain specified waivers may be used for removal actions, as is the case with remedial actions.

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. If the requirement is not legally applicable, 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, although not applicable, address problems or situations sufficiently similar to the circumstances of the proposed response action and are well suited to the conditions of the site (U.S. EPA 1988). The criteria for determining relevance and appropriateness are listed in 40 CFR 300.400(g)(2) and include the following:

- the purpose of the requirement and the purpose of the CERCLA action;
- the medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site;
- the 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;
- the type of place regulated and the type of place affected by the release or CERCLA action;
- the 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; and
- any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resource at the CERCLA site.

Tables included in this attachment present each potential ARAR with a determination of its status (i.e., applicable or relevant and appropriate). For the determination of relevance and appropriateness, the pertinent criteria were examined to determine whether the requirements addressed problems or situations sufficiently similar to the circumstances of the release or remedial action contemplated, and whether the requirement was well suited to the site. A negative determination of relevance and appropriateness indicates that the requirement did not meet the pertinent criteria. Negative determinations are documented in the tables of this attachment and will only be discussed in the text for specific cases.

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

- state law,
- 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, and
- consistently applied.

To constitute an ARAR, a requirement must be substantive. Therefore, only substantive provisions of requirements identified as ARARs in this analysis shall be considered ARARs. Section 121(e)(1) of CERCLA 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." Permits are considered procedural or administrative requirements. Provisions of generally relevant federal and state statutes and regulations that are determined to be procedural or nonenvironmental, including permit requirements, are not considered to be ARARs.

Nonpromulgated guidance or advisories issued by federal or state government are not legally binding and do not have the status of ARARs. Such requirements may, however, be useful and are to be considered. To be considered (TBC) requirements complement ARARs but do not override them. They are useful for guiding decisions regarding cleanup levels or methodologies when regulatory standards are not available.

Pursuant to U.S. 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; however, some potential ARARs do not fall precisely into one category or another.

Site-specific ARARs are identified for remedial actions where CERCLA authority is the basis for cleanup. As the lead federal agency, the DON is primarily responsible for identifying federal ARARs at NAF El Centro. As described in Section 1.4, the DON also requested that the California Environmental Protection Agency (Cal-EPA), Department of Toxic Substances Control (DTSC), identify potential state ARARs for Navy Installation Restoration Program (IRP) sites at NAF El Centro. Potential federal and state ARARs identified for Site 1 are discussed below.

C1.3 DESCRIPTION OF METHODOLOGY

In preparing this ARARs analysis, the DON undertook ARAR-evaluation measures consistent with CERCLA and the NCP. These measures included:

- identifying federal ARARs for the site and for each removal action alternative addressed in the EE/CA;
- requesting that Cal-EPA DTSC identify potential state ARARs;
- evaluating and comparing federal ARARs and their state counterparts to determine which state ARARs are more stringent or are in addition to the federal ARARs; and
- determining which federal and state ARARs were the most stringent and/or "controlling" ARARs for each alternative.

Site 1 was used as a landfill at NAF El Centro from 1965 to 1983 for the disposal of household rubbish (i.e., municipal waste) and industrial waste, including plating wastes, asbestos, water-bearing fuels, used lubricating oil and hydraulic fluids, paints, solvents, photographic chemicals, sandblasting grit, pesticides, batteries, and spent cartridges. Available analytical data suggest that the site may contain elevated concentrations of several metals. The objectives of the proposed removal action at Site 1 are as follows:

- reduce the potential for human and ecological exposure to the landfill waste and associated contaminated soils;
- reduce the potential for contaminant leaching and subsequent migration of waste constituents to groundwater and surface water; and
- control surface water runoff and reduce the potential for erosion of the landfill surface.

In view of these objectives, Site 1 will be provided with a landfill cap, runoff control, and supplemental institutional controls.

C1.4 IDENTIFICATION AND EVALUATION OF STATE ARARS

In a letter dated 13 April 1995, the DON requested that Cal-EPA DTSC identify potential state ARARs for NAF El Centro IRP sites, including Site 1. A reply was received on 21 June 1995. State ARARs listed in the Cal-EPA DTSC letter were considered for their applicability or relevance to the site conditions and objectives of the removal action at Site 1 (DTSC 1995). Those that met the evaluation criteria are identified in this document as potential state ARARs.

C1.5 GENERAL APPROACH TO REQUIREMENTS OF FEDERAL RESOURCE CONSERVATION AND RECOVERY ACT

The Resource Conservation and Recovery Act (RCRA) was enacted in 1976 as a federal statute to meet three goals:

- protection of human health and the environment;
- reduction of waste and the conservation of energy and natural resources; and
- elimination of the generation of hazardous waste as expeditiously as possible.

The Hazardous and Solid Waste Amendments of 1984 significantly expanded the scope of RCRA by adding new corrective action requirements, land-disposal restrictions, and technical requirements. RCRA, as amended, contains several provisions that are potential ARARs for CERCLA sites. Substantive RCRA requirements are applicable to response actions on CERCLA sites if the waste is a RCRA hazardous waste, and if:

- the waste was initially treated, stored, or disposed after the effective date of the particular RCRA requirement; or
- the activity at the CERCLA site constitutes treatment, storage, or disposal, as defined by RCRA (U.S. EPA 1988).

State regulations that are a component of a federally authorized or delegated state program are generally considered federal requirements and potential federal ARARs for the purposes of ARARs analysis (55 *Federal Register* 8742). The state of California received approval for its base RCRA hazardous waste management program on 23 July 1992 (57 *Federal Register* 8742). The Environmental Health Standards for the

Management of Hazardous Waste set forth in Division 4.5 of Title 22 of the *California Code of Regulations* (CCR) were approved by U.S. EPA as a component of the federally authorized California RCRA program.

Therefore, the regulations at Division 4.5, CCR Title 22, are a source of potential federal ARARs for CERCLA response actions. The exception is when a state regulation is "broader in scope" than the corresponding federal RCRA regulations. In that case, such regulations are not considered part of the federally authorized program or potential federal ARARs. Instead, they are state law requirements and potential state ARARs.

As noted in Section 4, inert soil from NAF El Centro IRP Sites 3 and 8 will be incorporated into the foundation layer of the final cover proposed for Site 1. Before reuse in the foundation layer, excavated soil at Sites 3 and 8 will be tested for the characteristics of RCRA and non-RCRA hazardous waste specified at 22 CCR 66261.24 (a)(1) and (a)(2). Only material that does <u>not</u> exhibit a characteristic of hazardous waste and is determined to be inert by the California Regional Water Quality Control Board (RWQCB) will be transported to Site 1. Therefore, the removal action proposed at Site 1 will not involve the treatment, storage, or disposal of RCRA or non-RCRA hazardous waste.

A second important issue for this ARARs analysis concerns the applicability or relevance and appropriateness of the hazardous waste landfill cover design requirements (CCR 66264.310) for the proposed removal action. These technical requirements are arguably potential ARARs because RCRA hazardous waste may have been disposed at Site 1 after 19 November 1980, the effective date of the RCRA regulations. Variances from the hazardous waste landfill cover design requirements are permitted as long as the final closure protects public health and the environment (22 CCR 66264.310 [a][7]).

A RCRA hazardous waste landfill cap is not proposed for this removal action. Given the arid climate of the Imperial Valley, the proposed monolithic landfill cap affords equal protection in terms of preventing contaminant leaching and subsequent migration of waste constituents to groundwater. The NCP mandates that CERCLA removal actions attain ARARs "to the extent practicable considering the exigencies of the situation" (40 CFR 300.415[j]). The DON has determined that the design requirements of a RCRA-equivalent hazardous waste landfill cap at Site 1 are not practicable in this situation. The proposed monolithic cap protects public health and environment at NAF El Centro in a manner equivalent to the prescribed hazardous waste landfill cover design.

C1.6 CALIFORNIA CANCER POTENCY FACTORS

In a letter dated 28 June 1993, Dr. John Christopher of DTSC indicated that "... Cal-EPA interprets its published cancer potency factors to meet the criteria for designation as <u>potential</u> chemical-specific ARAR criteria ... [emphasis added]" (DTSC 1993). In a letter dated 24 September 1993, from James R. Pawlisch of the DON to John Scandura of the DTSC, the DON posed a number of questions to the DTSC concerning its position on the ARARs status of state cancer potency factors (SWDIV 1993).

The DON has conducted independent research and concluded that the state cancer potency factors do not constitute ARARs because they were not "promulgated" as required under 40 CFR Section 300.400(g)(4). This conclusion is based upon the following findings.

- The cancer potency factors have not been promulgated under the provisions of the State of California Administrative Procedures Act. The cancer potency factors have not been adopted as a regulation as required for a rule or policy as regulation as provided in Government Code Section 11342. The cancer potency factors themselves are not published in the CCR as regulations (Government Code Section 11344).
- The State of California Administrative Procedures Act provides that no state agency may enforce any "guideline, criterion, bulletin, manual, instruction, order, standard of general application, or other rule" unless it has been adopted as a regulation (Government Code Section 11342).
- Because the state cancer potency factors were not promulgated as regulations, they are not enforceable by the state.
- Section 300.400(g)(4) of the NCP requires that state standards must be "promulgated" to constitute state ARARs. To be "promulgated" they must be of "general applicability" and "legally enforceable." Because the state cancer potency factors were not promulgated and are not legally enforceable under state law, they are not ARARs.

On 31 March 1994, the DTSC responded to a letter from the DON concerning California cancer potency factors and concurred that these factors are not ARARs; however, DTSC maintained that they are TBCs (DTSC 1994). As lead federal agency, the DON will consider using the state cancer potency factors that are more "stringent" than or in addition to U.S. EPA cancer potency factors as TBCs in risk assessments on a site-by-site, chemical-by-chemical basis, as appropriate (40 CFR Section 300.400[g][3]).

C1.7 CALIFORNIA ENVIRONMENTAL QUALITY ACT

The U.S. EPA and the DON have determined that the requirements of the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) are no more stringent than the requirements for environmental review under CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA). Pursuant to the provisions of CERCLA and NCP, selecting an action with feasible mitigation measures and providing for public review are designed to assure that the proposed action provides for the short-term and long-term protection of the environment and public health and, hence, perform the same function as (and are substantially parallel to) state requirements under CEQA and NEPA. Therefore, NEPA and CEQA are not ARARs for this site.

Section C2

CHEMICAL-SPECIFIC ARARS

Chemical-specific ARARs are generally regulatory-, health-, or risk-based numerical values or methodologies applied to site-specific conditions that result in the establishment of numerical values. Conclusions for ARARs determinations that address numerical values for chemical constituents are presented by medium: groundwater, surface water, soil, and air. A more detailed discussion of potential chemical-specific ARARs is presented in Tables C2-1 and C2-2.

C2.1 GROUNDWATER ARARS

The objective of the removal action is to reduce the immediate human-health and ecological risk posed by landfill waste and the associated contaminated soil present at Site 1. Groundwater at the site has not been characterized to determine if it is currently impacted by the landfill waste. Future consideration of groundwater at Site 1 will include characterization, monitoring, and remedial action as appropriate. Additional chemical-specific ARARs for groundwater may be identified at that time.

C2.2 SURFACE WATER ARARS

The objective of the removal action is to reduce immediate human-health and ecological risk posed by the landfill waste and the associated contaminated soil at Site 1. Discharges to surface water are not anticipated by any of the proposed removal action alternatives. No chemical-specific ARARs are identified for surface water at this time.

C2.3 SOIL ARARS

Inert soil generated during the proposed removal actions at IRP Sites 3 and 8 will be incorporated into the foundation layer for the final landfill cover at Site 1. Analytical results of soil samples collected at IRP Sites 3 and 8 indicate the presence of several metals and polychlorinated biphenyls (PCBs). Chemical-specific ARARs establish requirements for classifying the excavated material from these areas based on specific concentration levels of these contaminants. Only material that does not exhibit the characteristics of hazardous waste and is determined to be inert by the RWQCB will be used as part of the landfill cover foundation layer at Site 1.

C2.3.1 Federal ARARs

The requirements that determine whether a waste is a RCRA hazardous waste are described in 22 CCR 66261.100. The applicable chemical-specific standards of RCRA include the maximum concentrations of contaminants for toxicity characteristics (22 CCR 66261.24a[1]). Other RCRA Subtitle C technical requirements do not apply and are not relevant and appropriate to this removal action because hazardous waste will not be generated, transported, treated, stored, or disposed at Site 1.

Table C2-1
Potential Federal Chemical-Specific ARARs[a] by Media

Requirement	Prerequisite	Citation	ARAR Determination	Comments
GROUNDWATER				
Resource Conservation and Recovery Act				
Groundwater protection standards: owners/operators of RCRA[b] treatment, storage, or disposal facilities must comply with conditions in this section that are designed to assure that hazardous constituents entering groundwater from a regulated unit do not exceed the concentration limits for contaminants of concern set forth under Section 66264.94 in the uppermost aquifer underlying the waste management area beyond the point of compliance.	Uppermost aquifer underlying a waste management unit beyond the point of compliance; hazardous waste, treatment, storage, or disposal	22 CCR[c] 66264.94, except 66264.94(a)(2), and 94(b)	Not an ARAR	Groundwater is not being addressed in this removal action; potentially relevant and appropriate in the future after characterization of groundwater at Site 1 is complete.
Comprehensive Environmental Response, Compensation, and Liability Act				
Alternate concentration limits	Known and projected points of entry of groundwater to surface water; no statistically significant increase of hazardous constituents from groundwater in surface water at point of entry; and enforceable institutional controls to preclude human exposure at any point between the facility boundary and the point of entry to surface water	CERCLA[d] Section 121(d)(2)(B)(ii)	Not an ARAR	The removal action at Site 1 will not address groundwater.

(table continues)

Table C2-1 (continued)

Requirement	Prerequisite	Citation	ARAR Determination	Comments
SURFACE WATER				
Safe Drinking Water Act, 42 USC[e] 300				
National primary drinking water standards are health-based standards for public water systems; includes MCLs[f] and MCLGs[g].	Public water system	40 CFR[h] 141.11 - 141.16, excluding 141.11(d)(3); 40 CFR 141.60-141.63	Not an ARAR	MCLGs that have nonzero values are relevant and appropriate for surface water determined to be a current or potential source of drinking water (NCP[i] Section 300.430[e][2][i][B] through [D]). The NCP also defines MCLs as relevant and appropriate for surface water determined to be a current or potential source of drinking water in cases where MCLGs are not ARARs. The proposed removal action does not involve nearby surface water bodies (New River and Elder Canal).
National secondary drinking water regulations are standards for the aesthetic qualities of public water systems SMCLs[j].	Public water system	40 CFR 143	Not an ARAR	SMCLs are nonenforceable federal contaminant levels intended as guidelines for the states. Because federal SMCLs are nonenforceable, they are not ARARs. The proposed removal action does not involve nearby surface water bodies (New River and Elder Canal).
Clean Water Act, 33 USC 1251 et seq.				
Water quality standards.	Discharges to U.S. waters	33 USC 1313 and 57 *Federal Register* 60920-60921	Not an ARAR	No discharges to surface waters are anticipated as part of the Site 1 removal action.
SOIL				
Resource Conservation and Recovery Act				
Definition of RCRA hazardous waste.	Waste soil	Title 22 CCR Sections 66261.21, 66261,.22(a)(1) and (2) 66261.23, 66261.24(a)(1), and 66261.100	Applicable	Applicable for determining whether excavated soil from Sites 3 and 8 is hazardous waste.

(table continues)

Table C2-1 (continued)

Requirement	Prerequisite	Citation	ARAR Determination	Comments
Toxic Substances Control Act				
Regulates use and manufacture of toxic substances and storage and disposal of PCBs[k].	Soils, debris, sludge, or dredged materials contaminated with PCBs at concentrations greater than 50 ppm[l]	40 CFR 761.60, excluding 761.60(a)(B and D), 761.60(a)(3)(iii)(3), 761.60(e), 761.60(f); 761.65(a and b); 761.65(c), except 761.65(c)(9); 761.65(e)(6)(ii and iii); 761.65(e)(7 and 8); 761.79 (15 USC 2601, et seq.)	Not an ARAR	Because PCB concentration is well below 50 ppm at Sites 3 and 8, TSCA[m] requirements are neither applicable nor relevant and appropriate for reuse of this material as part of the landfill cover foundation layer at Site 1.
Federal Insecticide, Fungicide, and Rodenticide Act				
Procedures recommended for all pesticide storage and disposal activities.	Recommendations for the disposal of organic pesticides, metal-organic pesticides, organic mercury, lead, cadmium, arsenic, and all inorganic pesticides	40 CFR 165.8	Not an ARAR	Not applicable because FIFRA[n] contains nonbinding recommendations for storage and disposal of excess pesticides and pesticide containers at non-U.S. EPA[o] sites. At this time, these procedures are not potential ARARs for CERCLA cleanup actions, but they should be considered when developing a protective remedy that involves disposal of pesticide waste or soils and debris highly contaminated with pesticides.
AIR				
Clean Air Act, 40 USC 7401 et seq.				
National Ambient Air Quality Standards: Primary and secondary standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead).	Contamination of air affecting public health and welfare	40 CFR 50.4 - 50.12	Not an ARAR	Not directly enforceable and therefore not an ARAR.

(table continues)

Table C2-1 (continued)

Requirement	Prerequisite	Citation	ARAR Determination	Comments
Provisions of State Implementation Plan approved by U.S. EPA under Section 110 of the Clean Air Act.	Major sources of air pollutants	40 USC 7410; portions of 40 CFR 52.220 applicable to Imperial County Air Pollution Control District.	Not an ARAR	Point source emission of air pollutants regulated by State Implementation Plan is not relevant or appropriate to current conditions at Site 1. Emissions that would be part of the removal action should be evaluated under the action-specific requirements.

Notes:

[a] Statutes and policies, and their citations, are provided as headings to identify general categories of potential applicable or relevant and appropriate requirements (ARARs) for the convenience of the reader. Listing the statutes and policies does not indicate that the Department of the Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

Chemical-specific concentrations used for removal action alternative evaluation may not be ARARs indicated in this table, but may be based upon other factors. Such factors may include the following:

- human health risk-based concentrations (preliminary remediation goals 40 CFR 300.430[e][A][1] and [2]),
- ecological risk-based concentrations (40 CFR 300.430[e][G]), and
- practical quantitation limits of contaminants (40 CFR 300.430[e][A][3]).

Many potential action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables.

[b] RCRA – Resource Conservation and Recovery Act
[c] CCR – *California Code of Regulations*
[d] CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
[e] USC – United States Code
[f] MCL – maximum contaminant level
[g] MCLG – maximum contaminant level goal
[h] CFR – *Code of Federal Regulations*
[i] NCP – National Oil and Hazardous Substances Pollution Contingency Plan
[j] SMCL – secondary maximum contaminant level
[k] PCB – polychlorinated biphenyl
[l] ppm – parts per million
[m] TSCA – Toxic Substances Control Act
[n] FIFRA – Federal Insecticide, Fungicide, and Rodenticide Act
[o] U.S. EPA – United States Environmental Protection Agency

Table C2-2
Potential State Chemical-Specific ARARs[a]

Requirement	Prerequisites	Citation	ARAR Determination	Comments
GROUNDWATER, SURFACE WATER AND SOIL				
California Environmental Protection Agency Department of Toxic Substances Control				
Definition of non-RCRA[b] hazardous waste.	Waste soil	22 CCR[c] 66261.22(a)(3) and (4), 66261.24(a)(2) to (a)(8), 66261.101, 66261.3(a)(2)(C), or 66261.3(a)(2)(F)	Applicable	Applicable for determining whether excavated soil from Sites 3 and 8 is a non-RCRA hazardous waste.
State maximum contaminant level list.	Public water system	22 CCR 64435 and 64444.5	Not an ARAR	See comment under Federal Safe Drinking Water Act, Table C2-1.
State secondary maximum contaminant level list.	Public water system	22 CCR 64473	Not an ARAR	See comment under Federal Safe Drinking Water Act, Table C2-1.
State and Regional Water Quality Control Board				
Authorizes the state and regional water boards to establish in Water Quality Control Plans beneficial uses and numerical and narrative standards to protect both surface and groundwater quality; authorizes regional water boards to issue permits for discharges to land or surface or groundwater that could affect water quality, including National Pollutant Discharge Elimination System permits, and to take enforcement action to protect water quality.	Existence of surface water or groundwater	California Water Code, Division 7, Section 13241, 13243, 13263(a), and 13360 (Porter-Cologne Water Quality Control Act)	Not an ARAR	Removal action will not affect surface water quality or address groundwater.
		Other provisions of Porter-Cologne Water Quality Control Act	Not an ARAR	

(table continues)

Table C2-2 (continued)

Requirement	Prerequisites	Citation	ARAR Determination	Comments
Describes the water basins in Colorado River Basin region, establishes beneficial uses of groundwater and surface water, establishes water quality objectives, including narrative and numerical standards, establishes implementation plans to meet water quality objectives and protect beneficial uses, and incorporates statewide water quality control plans and policies.	Existence of surface water or groundwater	Comprehensive Water Quality Control Plan for the Colorado River (Water Code 13240)	Not an ARAR	Substantive provisions would be ARARs for removal actions affecting water quality. The removal action at Site 1 will not affect surface water quality or address groundwater.
Incorporated into all regional Board Basin Plans; designates all groundwater and surface water of the state as drinking water except where the total dissolved solids are greater than 3,000 parts per million, the well yield is less than 200 gallons per day from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonably be treated for domestic use using either best management practices or best economically achievable treatment practices.	Existence of surface water or groundwater	State Water Resources Control Board Resolution No. 88-63 (Sources of Drinking Water Policy)	Not an ARAR	Not applicable because the removal action at Site 1 will not affect surface water quality or address groundwater.

Notes:

[a] Statutes and policies, and their citations, are provided as headings to identify general categories of potential applicable or relevant and appropriate requirements (ARARs) for the convenience of the reader. Listing the statutes and policies does not indicate that the Department of the Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of specific citations are considered potential ARARs.

Chemical-specific concentrations used for the removal action alternative evaluation may not be ARARs indicated in this table, but may be concentrations based upon other factors. Such factors may include the following:

- human health risk-based concentrations (preliminary remediation goals 40 CFR 300.430[e][A][1] and [2]),
- ecological risk-based concentrations (40 CFR 300.430[e][G]), and
- practical quantitation limits of contaminants (40 CFR 300.430[e][A][3]).

Many potential action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables.

[b] RCRA – Resource Conservation and Recovery Act

[c] CCR – *California Code of Regulations*

C2.3.2 State ARARs

CCR Title 22 is applicable, and its chemical-specific requirements for characterization of the excavated soil transported from Sites 3 and 8 to Site 1 include the list of inorganic persistent and bioaccumulative toxic substances (22 CCR 66261.24[a][2][A]) as well as the list of organic persistent and bioaccumulative toxic substances (22 CCR 66261.24[a][2][B]).

C2.4 AIR ARARS

Site 1 is not a source of emissions of any regulated pollutants or volatile organic compounds (VOCs). Thus, no federal or state chemical-specific ARARs have been identified for this removal action.

C2.4.1 Federal ARARs

The Clean Air Act establishes the National Ambient Air Quality Standards (NAAQS). NAAQS are not enforceable in and of themselves. NAAQS are translated into source-specific emissions limitations by the state. Site 1 does not appear to contain VOCs or other criteria pollutants. Possible particulate emissions in the form of fugitive dust resulting from construction activity are addressed in Section 4.1.1, because they do not have a chemical-specific standard of control.

C2.4.2 State ARARs

There are no requirements of the Imperial County Air Pollution Control District (ICAPCD) that present chemical-specific standards applicable or relevant to Site 1.

Section C3
LOCATION-SPECIFIC ARARS

Location-specific ARARs place restrictions on proposed removal activities at Site 1 based upon various attributes of the site location and conditions. Potential federal and state location-specific ARARs are summarized in Tables C3-1 and C3-2.

C3.1 FEDERAL LOCATION-SPECIFIC ARARS

Pertinent and substantive provisions of the following environmental laws and regulations were reviewed to determine whether they were potential federal ARARs for Site 1.

- 22 CCR 66264.18 (a), (b), and (c) (Hazardous Waste Control Act)
- CFR Part 6, 6.302 and Appendix A (excluding Sections 6(a)(2), 6(a)(4), and 6(a)(6) (Executive Order 11988 Protection of Floodplains and Executive Order 11990 Protection of Wetlands)
- CFR Part 65 (National Archaeological and Historical Preservation Act)
- CFR Part 800 (National Historic Preservation Act, Section 106)
- *United States Code* (USC) Section 1536(a) (Endangered Species Act of 1973)
- CFR 230.10, 231, 231.1, 231.2, 231.7, and 231.8 (Clean Water Act Section 404)
- CFR Section 35.1 et seq. (Wilderness Act)
- USC Section 662 (Fish and Wildlife Coordination Act)
- USC 1271 et seq. and Section 7(a) (Wild and Scenic Rivers Act)
- USC 461-467 (Historic Site, Buildings, and Antiquities Act)
- USC 403 (Rivers and Harbors Act of 1890)
- USC Section 703 (Migratory Bird Treaty Act of 1972)

Site 1 is not an identified wetland or historic area. In addition, there are no endangered fish, or wild and scenic rivers. A basewide archeological survey performed as part of a Historical and Archeological Resources Plan for NAF El Centro (KEA 1994) did not identify archeological sites proximate to Site 1.

The Ecological Scoping Assessment (ESA) performed as part of this EE/CA identified the potential for California species of special concern to use the site. These species include the burrowing owl and flat-tailed horned lizard. The flat-tailed horned lizard has also been proposed for inclusion on the federal threatened and endangered species list. Based on this assessment, the Endangered Species Act of 1973 is identified as a potential ARAR because the removal actions will involve excavation of potential habitats.

Because Site 1 is proximate to the New River but outside the 100-year floodplain, Executive Order 11988, Protection of Floodplains, is also identified as relevant and appropriate. The requirements of 40 CFR 6, Appendix A, indicate that action taken should avoid adverse effects, minimize potential harm, and restore and preserve natural

Table C3-1
Potential Federal Location-Specific ARARs[a]

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Hazardous Waste Control Act					
Within 61 meters (200 feet) of a fault displaced in Holocene time	New treatment, storage, or disposal of hazardous waste prohibited	Treatment, storage, or disposal of hazardous waste	22 CCR[b] 66264.18(a)	Not an ARAR	Removal action does not involve construction of a new hazardous waste TSD[c] facility.
Within 100-year floodplain	Facility must be designed, constructed, operated, and maintained to avoid washout of hazardous waste	Treatment, storage, or disposal of hazardous waste	22 CCR 66264.18(b)	Not an ARAR	Removal action alternatives do not involve construction of a new hazardous waste TSD facility. Site 1 is not located within the 100-year floodplain.
Within salt dome formation, underground mine, or cave	Placement of noncontainerized or bulk liquid hazardous waste prohibited	Hazardous waste placement	22 CCR 66264.18(c)	Not an ARAR	Site 1 does not contain any known salt domes, mines, or caves. Also, the removal action does not involve placement of noncontainerized or bulk liquid hazardous waste in salt domes, mines, and caves.
Executive Order 11988, Protection of Floodplains					
Within floodplain	Actions taken should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values	Action that will occur in a floodplain (i.e., lowlands) and relatively flat areas adjoining inland and coastal waters and other flood-prone areas	40 CFR[d] 6, Appendix A, excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Relevant and appropriate	Site 1 is not located within the 100-year floodplain of the New River, but is in a flat area proximate to the river.

(table continues)

Table C3-1 (continued)

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
National Archaeological and Historical Preservation Act					
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts	Construction on previously undisturbed land would require an archaeological survey of the area	Alteration of terrain that threatens significant scientific, prehistoric, historic, or archaeological data	Substantive requirements of 36 CFR 60	Not an ARAR	An archeological survey previously performed in the vicinity of Site 1 did not identify any archeological sites proximate to the site.
National Historic Preservation Act 1992, as amended, Section 106					
Historic project owned or controlled by federal agency	Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing on the National Register of Historic Places	Property included in or eligible for the National Register of Historic Places	Substantive requirements of 36 CFR 800	Not an ARAR	The area to be disturbed during the response action at Site 1 is not known to be eligible for the National Register of Historic Places No buildings exist at the site.
Endangered Species Act of 1973					
Critical habitat upon which endangered species or threatened species depend	Action to conserve endangered species or threatened species, including consultation with the Department of the Interior	Determination of effect upon endangered or threatened species or its habitat	16 USC[e] 1536(a)	Relevant and appropriate	Relevant and appropriate because the ecological scoping assessment conducted for Site 1 indicates that proposed endangered species have the potential to use the site.
Executive Order 11990, Protection of Wetlands					
Wetland	Action to minimize the destruction, loss, or degradation of wetlands	Wetland as defined by Executive Order 11990 Section 7	40 CFR 6, Appendix A, excluding Sections 6(a)(2). 6(a)(4), 6(a)(6); 40 CFR 6.302	Not an ARAR	There are no wetlands in the immediate vicinity of Site 1, and there will be no discharges to surface water.
Clean Water Act, Section 404					
Wetland	Prohibits discharge of dredged or fill material into wetland without permit	Wetland as defined by Executive Order 11990 Section 7	40 CFR 230.10; 40 CFR 231 (231.1, 231.2, 231.7, 231.8)	Not an ARAR	No discharge of dredged or fill material to a wetland is planned as part of the removal action at Site 1.

(table continues)

Table C3-1 (continued)

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Wilderness Act					
Wilderness area	Area must be administered in such a manner as will leave it unimpaired as wilderness and preserve its wilderness character	Federally owned area designated as wilderness area	50 CFR 35.1 et seq.	Not an ARAR	Site 1 is not located in a federally owned wilderness area.
National Wildlife Refuge System					
Wildlife refuge	Only actions allowed under the provisions of 16 USC Section 668 dd(c) may be undertaken in areas that are part of the National Wildlife Refuge System	Area designated as part of National Wildlife Refuge System	50 CFR 27	Not an ARAR	Site 1 is not part of the National Wildlife Refuge System.
Fish and Wildlife Coordination Act, Section 662					
Area affecting stream or other water body	Action taken should protect fish or wildlife	Diversion, channeling, or other activity that modifies a stream or other water body and affects fish or wildlife	16 USC 662	Not an ARAR	This removal action does not modify a stream or other water body and does not affect fish or wildlife.
Wild and Scenic Rivers Act					
Within area affecting national wild, scenic, or recreational river	Avoid taking or assisting in action that will have direct adverse effect on scenic river	Activities that affect or may affect any of the rivers specified in Section 1276(a)	16 USC 1271 et seq. and Section 7(a)	Not an ARAR	This removal action does not impact wild, scenic, or recreational rivers. There are no such rivers in the vicinity of Site 1.

(table continues)

Table C3-1 (continued)

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Coastal Zone Management Act					
Within coastal zone	Conduct activities in a manner consistent with approved state management programs	Activities affecting the coastal zone, including lands thereunder and adjacent shore land	Section 307(c) of 16 USC 1456(c); also see 15 CFR 930 and 923.45	Not an ARAR	Site i is not near a coastal area.
Coastal Barrier Resources Act, Section 3504					
Within designated coastal barrier	Prohibits any new federal expenditure within the Coastal Barrier Resource System	Activity within the Coastal Barrier Resource System	16 USC 3504	Not an ARAR	Site i is not near a coastal area.
Historic Sites, Buildings, and Antiquities Act					
Historic sites	Avoid undesirable impacts on landmarks	Areas designated as historic sites	16 USC 461-467	Not an ARAR	The areas to be disturbed during the removal action are not known to be eligible for designation as an historic site.
Rivers and Harbors Act of 1890					
Navigable waters	Permits required for structures or work in or affecting navigable waters	Activities affecting navigable waters	33 USC 403	Not an ARAR	Removal action at Site i will not affect navigable waters.
Migratory Bird Treaty Act of 1972					
Migratory bird area	Protects almost all species of native birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites	Presence of migratory birds	16 USC Section 703	Not an ARAR	The ecological scoping assessment did not indicate the presence of migratory birds at Site i.

(table continues)

Table C3-1 (continued)

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Marine Mammal Protection Act					
Marine mammal area	Protects any marine mammal in the U.S. except as provided by international treaties from unregulated "take"	Presence of marine mammals	16 USC 1372(2)	Not an ARAR	Site 1 is located inland; therefore, marine mammals are not present.
Magnuson Fishery Conservation and Management Act					
Fishery under management	Provides for conservation and management of specified fisheries within specified fishery conservation zones	Presence of managed fisheries	16 USC 1801, et seq.	Not an ARAR	Site 1 is located inland and, therefore, is not within a specified fishery conservation zone.

Notes:

[a] Statutes and policies, and their citations, are provided as headings to identify general categories of potential applicable or relevant and appropriate requirements (ARARs) for the convenience of the reader. Listing the statutes and policies does not indicate that the Department of the Navy accepts the statutes or policies in their entirety as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

[b] CCR – *California Code of Regulations*

[c] TSD – treatment, storage, and disposal

[d] CFR – *Code of Federal Regulations*

[e] USC – *United States Code*

Table C3-2
Potential State Location-Specific ARARs*

Location	Requirement	Prerequisites	Citation	ARAR Determination	Comments
Fish and Game Code					
Endangered species habitat	No person shall import, export, take, possess, or sell any endangered or threatened species or part or product thereof	Threatened or endangered species determination on or before 01 January 1985 or a candidate species with proper notification	Fish and Game Code Section 2080	Relevant and appropriate	Ecological scoping assessment identified potential for two California species of special concern to use the site. One of these species (the flat-tailed horned lizard) has been proposed as a threatened species for inclusion on the federal threatened and endangered species list.
Endangered species habitat	Department policy and legislative findings and definitions for significant natural areas		Fish and Game Code Sections 2050-2068	Not an ARAR	Procedural; not a "cleanup standard, standard or control," or "other substantive requirement, criteria, or limitation."
Endangered species habitat	Assures that action taken will not jeopardize the survival and reproduction of any threatened or endangered species		Fish and Game Code Sections 2090-2096	Not an ARAR	Not effective after 1 January 1994.

Note:
* Statutes and policies, and their citations, are provided as headings to identify general categories of potential applicable or relevant and appropriate requirements (ARARs) for the convenience of the reader. Listing the statutes and policies does not indicate that the Department of the Navy accepts the statutes or policies in their entirety as potential ARARs. Specific potential ARARs follow each general heading; only substantive requirements of the specific citations are considered potential ARARs.

and beneficial values of floodplains. No other federal location-specific ARARs were identified.

C3.2 STATE LOCATION-SPECIFIC ARARS

Because the ESA identified the potential for California species of special concern to use the site, and because the removal action will disturb the site and potential habitats, provisions of the California Fish and Game Code pertaining to actions that may jeopardize the survival and reproduction of these species are identified as potential state location-specific ARARs. No other state location-specific ARARs were identified.

Section C4

ACTION-SPECIFIC ARARS

Potential action-specific ARARs are addressed according to anticipated activities at Site 1. With the exception of the no action alternative, the removal action alternatives considered in this EE/CA involve construction of a landfill cap, control of surface drainage, and supplemental institutional controls. Potential action-specific ARARs are listed in Tables C4-1 and C4-2.

C4.1 REMOVAL ACTION

California Health and Safety Code (Ca-HSC) Section 253561.1.(b) states that except as provided in subdivision (h), a Remedial Action Plan (RAP) shall be prepared for a site where a removal action is planned. Ca-HSC Section 25356.1.(h)(1) states that a RAP is not required if the conditions present at a site present an imminent or substantial endangerment to the public health and safety or to the environment, or if the estimated cost of the removal action is less that $1 million. However, a Removal Action Work Plan (RAWP) must be prepared if a nonemergency removal action is proposed and a remedial action plan is not required. The planned removal action is estimated to cost less than $1 million; therefore, this EE/CA is intended to meet the requirements of the RAWP. The RAWP as defined in Ca-HSC Section 25323.1 includes a detailed engineering plan for conducting the removal action, a description of the on-site contamination, the goals to be achieved by the removal action, and discussion of any alternative removal options that were considered and rejected and the basis for that rejection.

C4.2 LANDFILL CLOSURE

The ultimate objective of the removal action at Site 1 is closure to reduce the potential exposure of human and ecological receptors to landfill waste and associated contaminated soil. Placement of an engineered cap over the landfill will also reduce potential leaching and subsequent migration of waste constituents to groundwater and surface water.

The substantive portions of 22 CCR 66264.111, which involve closure of hazardous waste management facilities, are identified as potential ARARs for the removal action objective. This regulation establishes the general performance standard for closure of landfills in which hazardous waste was placed after 19 November 1980, the effective date of the RCRA regulations.

The technical requirements for design of a hazardous waste landfill final cover are provided in 22 CCR 66264.310. Variances from the technical requirements are permitted for alternative landfill cover designs that protect public health and the environment (22 CCR 66264.310[a][7]). These requirements are potential ARARs for the removal action at Site 1.

As described in Section 4 of the EE/CA, the proposed monolithic cap satisfies the variance requirements of 22 CCR 66264.310(a)(7). It will achieve protection of human health and the environment equivalent to the prescribed landfill cover design given climatic conditions at NAF El Centro. The monolithic cap will also satisfy the general

Table C4-1
Potential Federal Action-Specific ARARs[a]

Action	Requirement	Prerequisites	Citation	ARAR Determination A[b]	RA[c]	TBC[d]	Comments
Alternatives 1 (multiple-layer cap) and 2 (monolithic cap)							
Resource Conservation and Recovery Act 42 USC[e] 6901 et seq.							
Closure	General performance standard requires minimization of need for further maintenance and to the extent necessary to protect human health and the environment, postclosure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products.	Land-based unit containing hazardous waste. Hazardous waste placed at site after the effective date of the requirements. Not applicable to material treated, stored, or disposed only before the effective date of the requirements, or if treated *in situ*, or if consolidated within area of contamination.	22 CCR[f] 264.111 and 22CCR 264.114 except for cross-references to procedural requirements such as preparation and submittal of closure plans and other notifications		1,2		Requirement relevant and appropriate for sites where hazardous waste is placed after 19 November 1980 and closure is a removal action objective. This is potentially the case at Site 1.
Hazardous waste landfill final cover	Technical requirements for closure of hazardous waste landfill. Final cover must prevent downward entry into closed landfill for minimum of 100 years, function with minimum maintenance, promote drainage and minimize erosion and abrasion of the cover, accommodate earthquake shear forces, have a permeability less than any bottom liner or native subsoils, and comply with prescribed design standards. Variances are permitted if public health and the environment are protected.	Landfill that received hazardous waste after 19 November 1980.	22 CCR 66264.310 (a)	1,2			Applicable because Site 1 may have received hazardous waste after 19 November 1980.

(table continues)

Table C4-1 (continued)

Alternatives 1 (multiple-layer cap) and 2 (monolithic cap)							
				ARAR Determination			
Action	**Requirement**	**Prerequisites**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Postclosure maintenance of hazardous waste landfill	Maintain integrity of final cover, continue to operate leachate collection system until leachate is no longer produced, maintain and operate groundwater monitoring system, prevent run-on and runoff from damaging final cover, protect and maintain surveyed benchmarks.	Closed landfill which received hazardous waste after 19 November 1980.	22 CCR 66264.310 (b)	1,2			Applicable because Site 1 may have received hazardous waste after 19 November 1980.
CERCLA[g] response action at municipal landfill	Containment is presumptive remedy for CERCLA response actions at municipal landfills. Elements of remedy include, as appropriate, a landfill cap, monitoring and mitigation of groundwater impact at the landfill perimeter, landfill gas collection and treatment, leachate collection and treatment, and supplemental institutional controls.	CERCLA removal or remedial action at a municipal landfill site.	OSWER[h] Directive No. 9355.0-49FS			1,2	Not a law or promulgated regulation but to be considered because it addresses situations similar to Site 1.
Discharge to groundwater from regulated unit	Owners/operators of hazardous waste treatment, storage, or disposal facilities must comply with groundwater protection standards designed to assure that hazardous constituents entering the groundwater from a regulated unit do not exceed the concentration limits for chemicals of potential concern in the uppermost aquifer underlying the waste management area beyond the point of compliance.	Uppermost aquifer underlying a waste management unit beyond the point of compliance; hazardous waste, treatment, storage, or disposal.	22 CCR 66264.94(a),(b), (c), (d), (e), (f), and (g)				Not an ARAR. There will not be any discharges to groundwater from the removal action. This removal action will not be addressing existing groundwater conditions at Site 1.

(table continues)

Table C4-1 (continued)

Alternatives 1 (multiple-layer cap) and 2 (monolithic cap)							
				ARAR Determination			
Action	**Requirement**	**Prerequisites**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Toxic Substances Control Act 15 USC 2601 et seq.							
On-site disposal of PCB[i]-contaminated soil or debris	Nonliquid PCBs at concentrations of 50 ppm[j] or greater in the form of contaminated soil, rags, or other debris shall be disposed in a TSCA[k]-approved incinerator or in a TSCA-approved chemical waste landfill or by a TSCA-approved alternative disposal method.	Soil containing greater than 50 ppm PCBs.	40 CFR[l] 761(a)(4), 761.60(e)				Not an ARAR. Maximum PCB contamination in soil from Sites 3 and 8 to be reused at Site 1 is less than 50 ppm.
Federal Insecticide, Fungicide, and Rodenticide Act							
Disposal of pesticides	Unacceptable disposal methods include: • those inconsistent with the label, • open dumping, • open burning, and • disposal into any body of water. Chemically deactivate pesticide and recover heavy metals. If chemical deactivation facilities are not available, encapsulate the pesticide and bury it. Store pesticide if neither deactivation nor burial are available.	Treatment recommended for organic mercury, lead, cadmium, arsenic, and all inorganic pesticides.	40 CFR 165.7 and 165.8				Not an ARAR. Not an enforceable requirement. Removal action does not involve open dumping, open burning, or discharge to water of regulated pesticides.
Clean Air Act 40 USC 7401 et seq.							
Discharge to air	Provisions of State Implementation Plan approved by U.S. EPA[m] under Section 110 of CAA[n].	Major sources of air pollutants.	40 USC Section 7410; portions of 40 CFR Section 52.220 applicable to Imperial County Air Quality Management District	1,2			Specific pertinent rules are listed below.

(table continues)

Table C4-1 (continued)

Action	Requirement	Prerequisites	Citation	ARAR Determination A	ARAR Determination RA	ARAR Determination TBC	Comments
Alternatives 1 (multiple-layer cap) and 2 (monolithic cap)							
Fugitive dust emissions	Persons engaging in the handling, transport, or disposition of bulk materials shall apply reasonably available control measures to prevent fugitive dust emissions.	Engaging in nonexempt handling transport or disposition of bulk materials.	ICAPCD[o] Regulation VIII	1,2			Removal action will involve nonexempt handling, transport, and disposition of bulk materials
Opaque emissions	Release or discharge to the atmosphere from a single source of emission air contaminant darker than No. 1 on the Ringleman chart for a period or periods of more than 3 minutes in any hour.	Discharge of opaque emissions.	ICAPCD Rule 401	1,2			May be applicable to emissions from fuel-burning equipment.
Criteria for Classification of Solid Waste Disposal Facilities and Practices, 40 CFR Part 257							
Solid waste disposal	A facility or practice shall not contaminate an underground drinking water source beyond the solid waste boundary or a court- or state-established alternative.	Solid waste disposal facility and practices except agricultural wastes, overburden resulting from mining operations, land application of domestic sewage, location and operations of septic tanks, solid or dissolved materials in irrigation return flows, industrial discharges that are point sources subject to permits under CWA[p], source special nuclear or by-product material as defined by the Atomic Energy Act, hazardous waste disposal facilities that are subject to regulation under RCRA[q] subtitle C, disposal of solid waste by underground well injection, and municipal solid waste landfill units	40 CFR 257.3-4 and Appendix I				Not an ARAR. Solid waste will not be disposed a Site 1 during this removal action. Inert soils generated during proposed removal actions at Sites 3 and 8 will be placed as foundation layer for cap, not as waste.

(table continues)

Table C4-1 (continued)

Notes:

[a] Statutes and policies, and their citations, are provided as headings to identify general categories of potential applicable or relevant and appropriate requirements (ARARs). Specific potential ARARs are addressed in the table below each general heading.

[b] A – applicable

[c] RA – relevant and appropriate

[d] TBC – to be considered

[e] USC – *United States Code*

[i] CCR – *California Code of Regulations*

[g] CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act (1980)

[h] OSWER – (U.S. EPA) Office of Solid Waste Emergency Response

[i] PCB – polychlorinated biphenyl

[j] ppm – parts per million

[k] TSCA – Toxic Substances Control Act

[l] CFR – *Code of Federal Regulations*

[m] U.S. EPA – United States Environmental Protection Agency

[n] CAA – Clean Air Act

[o] ICAPCD – Imperial County Air Pollution Control District

[p] CWA – Clean Water Act

[q] RCRA – Resource Conservation and Recovery Act

Table C4-2
Potential State Action-Specific ARARs[a]

Action	Requirement	Prerequisites	Citation	ARAR Determination A[b]	RA[c]	TBC[d]	Comments
Alternatives 1 (multiple-layer cap) and 2 (monolithic cap)							
California Code of Regulations, Title 23, Chapter 15*							
Landfill closure	Technical requirements for final cover and grading of landfills during closure, placement of survey monuments, and selection of vegetative cover. Variances are permitted for alternatives to prescribed regulatory design standards if equivalent protection against water quality impairment is achieved.	Disposal of waste in landfill	23 CCR[e] 2580, 2581(a), 2581(b) and 2510(b)	1,2			Applicable to closure of landfill at Site 1.
Postclosure maintenance of landfill	Maintain structural integrity of final cover against settlement and other factors, prevent erosion-related damage to final cover, protect and maintain survey monuments, operate leachate collection system until leachate is no longer produced, maintain and operate groundwater monitoring system.	Closed landfill	23 CCR 2581(c)	1,2			Applicable to postclosure care of Site 1.
California Code of Regulations, Title 14, Chapter 3, Article 7.8*							
Landfill Closure	Technical requirements for the construction of final landfill cover, grading slope stability, drainage and erosion control, and construction quality assurance.	Disposal of waste in landfill	14 CCR 17773, 17774, 17776, 17777, 17778, and 17779	1,2			Applicable to closure of landfill at Site 1. Requirements are essentially equivalent to Title 23 Chapter 15 requirements.

(table continues)

Table C4-2 (continued)

Action	Requirement	Prerequisites	Citation	ARAR Determination A	ARAR Determination RA	ARAR Determination TBC	Comments
Alternatives 1 (multiple-layer cap) and 2 (monolithic cap)							
Postclosure maintenance of landfill	Postclosure maintenance requirements, including maintenance of final cover and slope, landfill gas and leachate mitigation (as necessary), groundwater monitoring, and site security, for minimum of 30 years. Restriction on postclosure and land use.	Closed landfill	14 CCR 17767, 17781, 17782, 17783, 17788, and 17796.	1,2			Applicable to postclosure care of Site 1.
California Health and Safety Code, Chapter 6.8							
Removal action	Except as provided in subdivision (h), the department, or, if appropriate, the regional board shall prepare or approve remedial action plans for all sites listed pursuant to Section 25356.	Removal action is planned	Section 25356.1.(b)	1			Applicable because a removal action is planned
Removal action	A remedial action plan is not required if conditions present at a site present an imminent or substantial endangerment to the public health and safety or to the environment, or if the estimated cost of the removal action is less than $1 million.	Removal action is planned	Section 25356.1.(h)(1)	1			Applicable because the removal action is projected to cost less than $1 million.
Removal action	The department or a regional board shall prepare or approve a removal action work plan for all sites where a nonemergency removal action is proposed and where a remedial action plan is not required.	Nonemergency Removal action is planned	Section 25356.1.(h)(1)	1			Applicable because a nonemergency removal action is planned and a remedial action plan is not required.

Table C4-2 (continued)

Alternatives 1 (multiple-layer cap) and 2 (monolithic cap)							
				ARAR Determination			
Action	**Requirement**	**Prerequisites**	**Citation**	**A**	**RA**	**TBC**	**Comments**
California Health and Safety Code, Chapter 6.8							
Removal action	"Removal action work plan" means a work plan prepared or approved by the department or a California regional water quality control board which is developed to carry out a removal action, in an effective manner, which is protective of the public health and safety and the environment. The removal action work plan shall include a detailed engineering plan for conducting the removal action, a description of the onsite contamination, the goals to be achieved by the removal action, and any alternative removal options that were considered and rejected and the basis for that rejection.	Removal action planned for which a removal action work plan is required	Section 25323.1.		i		Relevant and appropriate content requirements for the Engineering Evaluation/Cost Analysis

Notes:

[a] Statutes and policies, and their citations, are provided as headings to identify general categories of potential applicable or relevant and appropriate requirements (ARARs). Specific potential ARARs are addressed in the table below each general heading.

[b] A – applicable

[c] RA – relevant and appropriate

[d] TBC – to be considered

[e] CCR – *California Code of Regulations*

performance standard for closure of hazardous waste landfills provided in 22 CCR 66264.111.

The U.S. EPA has issued guidance (U.S. EPA 1993) on presumptive remedies for CERCLA response actions at municipal landfill sites. Although this guidance is not a law or promulgated regulation, and therefore is not a potential ARAR, it is identified as a potential TBC requirement for this EE/CA because it addresses situations similar to Site 1. U.S. EPA has concluded that treatment of the large and heterogeneous volume of waste materials in municipal landfills is usually impracticable and that containment is the appropriate response action for such sites. The primary components of the U.S. EPA presumptive remedy are a landfill cap, monitoring and mitigation of groundwater impacts at the perimeter of the landfill source area, collection and treatment of leachate and landfill gas, and/or institutional controls to supplement engineering controls. The U.S. EPA guidance emphasizes that response actions at individual landfills should include only those components of the presumptive remedy that are necessary based on site-specific conditions.

The technical requirements of CCR Title 23, Chapter 15, which address landfill closure, are identified as potential ARARs for the proposed removal action at Site 1. Variances from landfill cover and grading requirements are permitted (see 23 CCR 2510[b]) if an alternative design is consistent with the performance goal of the regulatory design standard and achieves equivalent protection against water quality impairment. Per 23 CCR 2581(a)(1), the use of waste materials, including contaminated soil, is allowed in the foundation layer of the final cap under certain circumstances.

CCR Title 14, Chapter 3, Article 7.8 contains additional requirements for the closure and postclosure care of solid waste disposal sites, including landfills. Portions of these regulations are also identified as potential ARARs for the proposed removal action at Site 1.

C4.3 EMISSIONS

During execution of the removal action, fugitive dust emissions may occur and fuel burning equipment may be used. These activities may be subject to the potential ARARs discussed below.

Fugitive dust may be generated during construction of the landfill cap. The applicable provisions of the ICAPCD Regulation VIII are considered potential ARARs for these activities. ICAPCD Regulation VIII requires that reasonably available control measures be applied to prevent fugitive dust emissions.

ICAPCD Rule 401 may be applicable to mobile fuel-burning equipment. The requirements of Rule 401 prohibit the emissions of air contaminants darker than No. 1 on the Ringleman chart for more than 3 minutes in any hour.

Section C5
SUMMARY

The purpose of the proposed removal action at Site 1 is to reduce the potential exposure of human and ecological receptors to landfill wastes and associated contaminated soils, as well as to reduce the potential for the generation and migration of leachate. Potential ARARs and TBCs consistent with this objective have been identified in the text and tables of this attachment for each response alternative considered. In general, the controlling ARARs and TBCs for the Site 1 removal action are the performance standards, technical requirements, and variance provisions of federal and state regulations governing landfill closure and postclosure care. These controlling ARARs are discussed in Section 3 of the EE/CA report.

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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**               HELP MODEL VERSION 3.03  (31 DECEMBER 1994)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
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PRECIPITATION DATA FILE:      H:\TOM\ELCENTRO\CEN100.D4
TEMPERATURE DATA FILE:        H:\TOM\ELCENTRO\YUMA.D7
SOLAR RADIATION DATA FILE:    H:\TOM\ELCENTRO\YUMA.D13
EVAPOTRANSPIRATION DATA:      H:\TOM\ELCENTRO\CENTRO.D11
SOIL AND DESIGN DATA FILE:    H:\TOM\ELCENTRO\RWQCB24.D10
OUTPUT DATA FILE:             H:\TOM\ELCENTRO\rwqcb24.OUT


TIME:  12:10     DATE:   7/ 7/1995


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     TITLE:  Magazine Rd Landfill, RWQCB Cap with 24" Veg. Cover

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                   TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER   9
         THICKNESS                    =     24.00   INCHES
         POROSITY                     =      0.5010 VOL/VOL
         FIELD CAPACITY               =      0.2840 VOL/VOL
         WILTING POINT                =      0.1350 VOL/VOL
         INITIAL SOIL WATER CONTENT   =      0.1390 VOL/VOL
         EFFECTIVE SAT. HYD. COND.    =  0.190000006000E-03 CM/SEC
       NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
                FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 26

THICKNESS	=	12.00	INCHES
POROSITY	=	0.4450	VOL/VOL
FIELD CAPACITY	=	0.3930	VOL/VOL
WILTING POINT	=	0.2770	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4450	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000003000E-05	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 21

THICKNESS	=	60.00	INCHES
POROSITY	=	0.3970	VOL/VOL
FIELD CAPACITY	=	0.0320	VOL/VOL
WILTING POINT	=	0.0130	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0130	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000012000	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 4

THICKNESS	=	72.00	INCHES
POROSITY	=	0.4370	VOL/VOL
FIELD CAPACITY	=	0.1050	VOL/VOL
WILTING POINT	=	0.0470	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0470	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.170000002000E-02	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 9 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 3.% AND A SLOPE LENGTH OF 200. FEET.

SCS RUNOFF CURVE NUMBER	=	92.00	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	5.500	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.502	INCHES

UPPER LIMIT OF EVAPORAIIVE SIORAGE	=	9.018	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.430	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	12.840	INCHES
TOTAL INITIAL WATER	=	12.840	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
YUMA ARIZONA

MAXIMUM LEAF AREA INDEX	=	1.00
START OF GROWING SEASON (JULIAN DATE)	=	0
END OF GROWING SEASON (JULIAN DATE)	=	367
AVERAGE ANNUAL WIND SPEED	=	7.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	45.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	32.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	36.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	40.00 %

NOTE: PRECIPITATION DATA FOR El Centro California
WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR YUMA ARIZONA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
55.90	60.00	64.20	70.70	78.30	87.20
93.60	92.40	87.30	76.40	63.80	56.50

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR YUMA ARIZONA

STATION LATITUDE = 32.83 DEGREES

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ANNUAL TOTALS FOR YEAR 1960

	INCHES	CU. FEEI	PERCENI
PRECIPIIATION	0.87	17369.549	100.00

RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.928	18523.869	106.65
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.058	-1154.287	-6.65
SOIL WATER AT START OF YEAR	12.840	256350.047	
SOIL WATER AT END OF YEAR	12.782	255195.766	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.033	0.00

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ANNUAL TOTALS FOR YEAR 1961

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.78	35537.699	100.00
RUNOFF	0.022	445.424	1.25
EVAPOTRANSPIRATION	1.145	22859.127	64.32
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.613	12233.117	34.42
SOIL WATER AT START OF YEAR	12.782	255195.766	
SOIL WATER AT END OF YEAR	13.395	267428.875	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.031	0.00

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ANNUAL TOTALS FOR YEAR 1962

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.99	39730.352	100.00
RUNOFF	0.057	1141.843	2.87
EVAPOTRANSPIRATION	1.989	39713.629	99.96
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.056	-1125.118	-2.83
SOIL WATER AT START OF YEAR	13.395	267428.875	
SOIL WATER AT END OF YEAR	13.339	266303.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.005	0.00

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ANNUAL TOTALS FOR YEAR 1963

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.79	35737.348	100.00
RUNOFF	0.113	2252.198	6.30
EVAPOTRANSPIRATION	2.186	43651.172	122.14
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.509	-10166.009	-28.45
SOIL WAIER AT START OF YEAR	13.339	266303.750	
SOIL WATER AT END OF YEAR	12.829	256137.750	

SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.010	0.00

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ANNUAL TOTALS FOR YEAR 1964

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.69	13775.850	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.768	15331.671	111.29
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.078	-1555.805	-11.29
SOIL WATER AT START OF YEAR	12.829	256137.750	
SOIL WATER AT END OF YEAR	12.751	254581.953	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.015	0.00

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ANNUAL TOTALS FOR YEAR 1965

	INCHES	CU. FEET	PERCENT
PRECIPITATION	3.09	61691.844	100.00
RUNOFF	0.153	3046.277	4.94
EVAPOTRANSPIRATION	1.834	36613.043	59.35
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00

AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	1.104	22032.527	35.71
SOIL WATER AT START OF YEAR	12.751	254581.953	
SOIL WATER AT END OF YEAR	13.855	276614.469	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.003	0.00

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ANNUAL TOTALS FOR YEAR 1966

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.63	32542.949	100.00
RUNOFF	0.001	28.195	0.09
EVAPOTRANSPIRATION	2.727	54434.969	167.27
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-1.098	-21920.229	-67.36
SOIL WATER AT START OF YEAR	13.855	276614.469	
SOIL WATER AT END OF YEAR	12.757	254694.250	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.015	0.00

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ANNUAL TOTALS FOR YEAR 1967

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.39	87646.344	100.00
RUNOFF	0.652	13020.037	14.86
EVAPOTRANSPIRATION	2.795	55804.789	63.67
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.943	18821.527	21.47
SOIL WATER AT START OF YEAR	12.757	254694.250	
SOIL WATER AT END OF YEAR	13.700	273515.781	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.007	0.00

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ANNUAL TOTALS FOR YEAR 1968

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.55	30945.752	100.00
RUNOFF	0.087	1732.729	5.60
EVAPOTRANSPIRATION	2.484	49584.785	160.23
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-1.020	-20371.773	-65.83
SOIL WATER AT START OF YEAR	13.700	273515.781	
SOIL WATER AT END OF YEAR	12.679	253144.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE	0.0000	0.009	0.00

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ANNUAL TOTALS FOR YEAR 1969

	INCHES	CU. FEET	PERCENT
PRECIPITATION	3.33	66483.445	100.00
RUNOFF	0.411	8203.378	12.34
EVAPOTRANSPIRATION	2.813	56170.223	84.49
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.106	2109.834	3.17
SOIL WATER AT START OF YEAR	12.679	253144.000	
SOIL WATER AT END OF YEAR	12.785	255253.828	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.014	0.00

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ANNUAL TOTALS FOR YEAR 1970

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.06	21162.898	100.00
RUNOFF	0.013	266.834	1.26
EVAPOTRANSPIRATION	1.055	21063.164	99.53
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00

CHANGE IN WATER STORAGE	-0.008	-167.096	-0.79
SOIL WATER AT STARI OF YEAR	12.785	255253.828	
SOIL WATER AT END OF YEAR	12.777	255086.734	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.004	0.00

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ANNUAL TOTALS FOR YEAR 1971

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.44	8784.601	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.440	8778.321	99.93
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.000	6.283	0.07
SOIL WATER AT START OF YEAR	12.777	255086.734	
SOIL WATER AT END OF YEAR	12.777	255093.016	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.004	0.00

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ANNUAL TOTALS FOR YEAR 1972

	INCHES	CU. FEET	PERCENT
PRECIPITATION	2.32	46318.797	100.00

RUNOFF	0.405	8076.194	17.44
EVAPOTRANSPIRATION	1.820	36335.555	78.45
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.096	1907.057	4.12
SOIL WATER AT START OF YEAR	12.777	255093.016	
SOIL WATER AT END OF YEAR	12.873	257000.078	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.006	0.00

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ANNUAL TOTALS FOR YEAR 1973

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.29	5789.850	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.394	7858.069	135.72
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.104	-2068.213	-35.72
SOIL WATER AT START OF YEAR	12.873	257000.078	
SOIL WATER AT END OF YEAR	12.769	254931.875	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.007	0.00

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.42	28350.299	100.00
RUNOFF	0.106	2109.052	7.44
EVAPOTRANSPIRATION	1.292	25795.748	90.99
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.022	445.500	1.57
SOIL WATER AT START OF YEAR	12.769	254931.875	
SOIL WATER AT END OF YEAR	12.791	255377.375	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.001	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.97	19366.051	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.994	19837.795	102.44
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.024	-471.738	-2.44
SOIL WATER AT START OF YEAR	12.791	255377.375	
SOIL WATER AT END OF YEAR	12.768	254905.625	

SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.006	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.36	87047.406	100.00
RUNOFF	0.866	17286.736	19.86
EVAPOTRANSPIRATION	3.228	64449.457	74.04
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.266	5311.200	6.10
SOIL WATER AT START OF YEAR	12.768	254905.625	
SOIL WATER AT END OF YEAR	13.034	260216.828	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WAIER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.011	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPIIATION	4.54	90641.102	100.00
RUNOFF	0.832	16613.549	18.33
EVAPOTRANSPIRATION	3.190	63683.902	70.26
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00

AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.518	10343.652	11.41
SOIL WATER AT START OF YEAR	13.034	260216.828	
SOIL WATER AT END OF YEAR	13.552	270560.469	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.002	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEEI	PERCENT
PRECIPITATION	4.88	97429.203	100.00
RUNOFF	0.287	5733.261	5.88
EVAPOTRANSPIRATION	3.899	77847.500	79.90
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.694	13848.403	14.21
SOIL WATER AT START OF YEAR	13.552	270560.469	
SOIL WATER AT END OF YEAR	14.245	284408.875	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGEI BALANCE	0.0000	0.039	0.00

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ANNUAL TOTALS FOR YEAR 1979

	INCHES	CU. FEEI	PERCENI
PRECIPIIATION	3.07	61292.543	100.00
RUNOFF	0.026	519.761	0.85
EVAPOTRANSPIRAIION	4.538	90591.773	147.80
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-1.494	-29818.941	-48.65
SOIL WATER AT STARI OF YEAR	14.245	284408.875	
SOIL WATER AT END OF YEAR	12.752	254589.937	
SNOW WATER AI START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WAIER BUDGET BALANCE	0.0000	-0.051	0.00

ANNUAL TOTALS FOR YEAR 1980

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.06	81057.898	100.00
RUNOFF	0.177	3527.692	4.35
EVAPOTRANSPIRATION	3.907	78011.078	96.24
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.024	-480.915	-0.59
SOIL WATER AT START OF YEAR	12.752	254589.937	
SOIL WATER AT END OF YEAR	12.728	254109.031	
SNOW WATER AI START OF YEAR	0.000	0.000	0.00
SNOW WATER AI END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE	0.0000	0.040	0.00

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ANNUAL TOTALS FOR YEAR 1981

	INCHES	CU. FEET	PERCENT
PRECIPITATION	3.86	77064.906	100.00
RUNOFF	0.217	4329.946	5.62
EVAPOTRANSPIRATION	3.643	72734.687	94.38
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.000	0.267	0.00
SOIL WATER AT START OF YEAR	12.728	254109.031	
SOIL WATER AT END OF YEAR	12.728	254109.297	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.003	0.00

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ANNUAL TOTALS FOR YEAR 1982

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.92	98227.789	100.00
RUNOFF	1.060	21155.531	21.54
EVAPOTRANSPIRATION	2.954	58966.785	60.03
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00

CHANGE IN WAIER SIORAGE	0.907	18105.506	18.43
SOIL WATER AT START OF YEAR	12.728	254109.297	
SOIL WATER AT END OF YEAR	13.635	272214.812	
SNOW WATER AI START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.029	0.00

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ANNUAL TOTALS FOR YEAR 1983

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.63	152332.969	100.00
RUNOFF	1.752	34981.379	22.96
EVAPOTRANSPIRATION	6.606	131879.703	86.57
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.728	-14528.174	-9.54
SOIL WATER AT START OF YEAR	13.635	272214.812	
SOIL WATER AT END OF YEAR	12.907	257686.625	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.057	0.00

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ANNUAL TOTALS FOR YEAR 1984

	INCHES	CU. FEET	PERCENT
PRECIPITATION	2.33	46518.449	100.00

RUNOFF	0.031	623.259	1.34
EVAPOTRANSPIRATION	1.688	33693.551	72.43
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.611	12201.663	26.23
SOIL WATER AT START OF YEAR	12.907	257686.625	
SOIL WATER AT END OF YEAR	13.518	269888.281	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.024	0.00

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ANNUAL TOTALS FOR YEAR 1985

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.72	94234.805	100.00
RUNOFF	0.267	5331.270	5.66
EVAPOTRANSPIRATION	4.074	81333.289	86.31
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.379	7570.232	8.03
SOIL WATER AT START OF YEAR	13.518	269888.281	
SOIL WATER AT END OF YEAR	13.897	277458.531	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.017	0.00

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ANNUAL TOTALS FOR YEAR 1986

	INCHES	CU. FEET	PERCENT
PRECIPITATION	3.91	78063.148	100.00
RUNOFF	0.686	13687.943	17.53
EVAPOTRANSPIRATION	4.148	82814.437	106.09
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.924	-18439.240	-23.62
SOIL WATER AT START OF YEAR	13.897	277458.531	
SOIL WATER AT END OF YEAR	12.974	259019.281	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.010	0.00

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ANNUAL TOTALS FOR YEAR 1987

	INCHES	CU. FEET	PERCENT
PRECIPITATION	2.24	44721.602	100.00
RUNOFF	0.002	38.763	0.09
EVAPOTRANSPIRATION	1.583	31608.307	70.68
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.655	13074.537	29.24
SOIL WATER AT START OF YEAR	12.974	259019.281	
SOIL WATER AT END OF YEAR	13.629	272093.812	

SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.007	0.00

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ANNUAL TOTALS FOR YEAR 1988

	INCHES	CU. FEET	PERCENT
PRECIPITATION	2.43	48514.945	100.00
RUNOFF	0.240	4800.440	9.89
EVAPOTRANSPIRATION	2.952	58943.988	121.50
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.763	-15229.459	-31.39
SOIL WATER AT START OF YEAR	13.629	272093.812	
SOIL WATER AT END OF YEAR	12.866	256864.359	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.024	0.00

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ANNUAL TOTALS FOR YEAR 1989

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.92	18367.799	100.00
RUNOFF	0.027	541.332	2.95
EVAPOTRANSPIRATION	0.915	18274.541	99.49
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00

AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.022	-448.090	-2.44
SOIL WATER AT START OF YEAR	12.866	256864.359	
SOIL WATER AT END OF YEAR	12.843	256416.266	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.017	0.00

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ANNUAL TOTALS FOR YEAR 1990

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.97	39331.051	100.00
RUNOFF	0.038	758.703	1.93
EVAPOTRANSPIRATION	1.902	37980.711	96.57
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 2	0.0000		
PERC./LEAKAGE THROUGH LAYER 4	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.030	591.652	1.50
SOIL WATER AT START OF YEAR	12.843	256416.266	
SOIL WATER AT END OF YEAR	12.873	257007.922	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.015	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1960 THROUGH 1990

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCI	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.37	0.34	0.20	0.05	0.02	0.01
	0.09	0.36	0.30	0.29	0.26	0.41
STD. DEVIATIONS	0.45	0.72	0.35	0.14	0.05	0.02
	0.21	0.65	0.62	0.62	0.45	0.65
RUNOFF						
TOTALS	0.017	0.055	0.003	0.000	0.000	0.000
	0.003	0.039	0.055	0.037	0.029	0.038
STD. DEVIATIONS	0.048	0.289	0.012	0.002	0.000	0.000
	0.015	0.147	0.167	0.141	0.091	0.158
EVAPOTRANSPIRATION						
TOTALS	0.528	0.378	0.224	0.067	0.016	0.006
	0.085	0.293	0.109	0.110	0.204	0.396
STD. DEVIATIONS	0.495	0.509	0.379	0.154	0.050	0.024
	0.205	0.470	0.174	0.177	0.242	0.424
PERCOLATION/LEAKAGE IHROUGH LAYER 2						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ACROSS LAYER 2						
AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1960 THROUGH 1990

	INCHES		CU. FEET	PERCENT
PRECIPITATION	2.69	(1.702)	53744.5	100.00
RUNOFF	0.275	(0.4029)	5491.99	10.219
EVAPOTRANSPIRATION	2.416	(1.4180)	48231.28	89.742
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.00000	(0.00000)	0.000	0.00000
AVERAGE HEAD ACROSS TOP OF LAYER 2	0.000	(0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00000	(0.00000)	0.000	0.00000
CHANGE IN WATER STORAGE	0.001	(0.6277)	21.22	0.039

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PEAK DAILY VALUES FOR YEARS 1960 THROUGH 1990

	(INCHES)	(CU. FT.)
PRECIPITATION	3.30	65884.500
RUNOFF	1.613	32204.9687
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.000000	0.00000
AVERAGE HEAD ACROSS LAYER 2	0.000	
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000000	0.00000
SNOW WATER	0.00	0.0000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2452
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1287

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FINAL WATER STORAGE AT END OF YEAR 1990

LAYER	(INCHES)	(VOL/VOL)
1	3.3689	0.1404
2	5.3400	0.4450
3	0.7800	0.0130
4	3.3840	0.0470
SNOW WATER	0.000	

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**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**               HELP MODEL VERSION 3.03  (31 DECEMBER 1994)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:      C:\elcentro\CEN100.D4
TEMPERATURE DATA FILE:        C:\elcentro\YUMA.D7
SOLAR RADIATION DATA FILE:    C:\elcentro\YUMA.D13
EVAPOTRANSPIRATION DATA:      C:\elcentro\CENTRO.D11
SOIL AND DESIGN DATA FILE:    C:\elcentro\MONO.D10
OUTPUT DATA FILE:             C:\elcentro\MONO.OUT


TIME:  15:20     DATE:   6/30/1995


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     TITLE:  El Centro, Magazine Rd Landfill, Monolithic Cap

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                  LAYER  1
                                  --------

                    TYPE 1 - VERTICAL PERCOLATION LAYER
                        MATERIAL TEXTURE NUMBER   9
          IHICKNESS                    =     48.00   INCHES
          POROSITY                     =      0.5010 VOL/VOL
          FIELD CAPACITY               =      0.2840 VOL/VOL
          WILTING POINT                =      0.1350 VOL/VOL
          INIIIAL SOIL WATER CONTENT   =      0.1390 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.190000006000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 4

THICKNESS	=	72.00	INCHES
POROSITY	=	0.4370	VOL/VOL
FIELD CAPACITY	=	0.1050	VOL/VOL
WILTING POINT	=	0.0470	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0470	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.170000002000E-02	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 9 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 3.% AND A SLOPE LENGTH OF 200. FEET.

SCS RUNOFF CURVE NUMBER	=	92.00	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	5.500	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.502	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.018	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.430	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	10.056	INCHES
TOTAL INITIAL WATER	=	10.056	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
YUMA ARIZONA

MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	0	
END OF GROWING SEASON (JULIAN DATE)	=	367	
AVERAGE ANNUAL WIND SPEED	=	7.80	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	45.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	32.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	36.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	40.00	%

NOTE: PRECIPITATION DATA FOR El Centro California
WAS ENTERED FROM A EARIH INFO CLIMATEDATA.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR YUMA ARIZONA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
55.90	60.00	64.20	70.70	78.30	87.20
93.60	92.40	87.30	76.40	63.80	56.50

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR YUMA ARIZONA

STATION LATITUDE = 32.83 DEGREES

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ANNUAL TOTALS FOR YEAR 1960

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.87	17369.549	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.928	18523.869	106.65
PERC./LEAKAGE THROUGH LAYER 2	0.000005	0.092	0.00
CHANGE IN WATER STORAGE	-0.058	-1154.402	-6.65
SOIL WATER AT STARI OF YEAR	10.056	200767.484	
SOIL WATER AT END OF YEAR	9.998	199613.078	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.011	0.00

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ANNUAL TOTALS FOR YEAR 1961

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.78	35537.699	100.00

RUNOFF	0.022	445.424	1.25
EVAPOTRANSPIRATION	1.145	22859.127	64.32
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.613	12233.155	34.42
SOIL WATER AT START OF YEAR	9.998	199613.078	
SOIL WATER AT END OF YEAR	10.611	211846.234	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.007	0.00

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ANNUAL TOTALS FOR YEAR 1962

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.99	39730.352	100.00
RUNOFF	0.057	1141.843	2.87
EVAPOTRANSPIRATION	1.989	39713.629	99.96
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.003	0.00
CHANGE IN WATER STORAGE	-0.056	-1125.118	-2.83
SOIL WATER AT START OF YEAR	10.611	211846.234	
SOIL WATER AT END OF YEAR	10.555	210721.125	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.008	0.00

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ANNUAL TOTALS FOR YEAR 1963

	INCHES	CU. FEEI	PERCENT

PRECIPITATION	1.79	35737.348	100.00
RUNOFF	0.113	2252.198	6.30
EVAPOTRANSPIRATION	2.186	43651.172	122.14
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.509	-10166.027	-28.45
SOIL WATER AT START OF YEAR	10.555	210721.125	
SOIL WATER AT END OF YEAR	10.045	200555.094	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGEI BALANCE	0.0000	0.009	0.00

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ANNUAL TOTALS FOR YEAR 1964

	INCHES	CU. FEET	PERCENI
PRECIPITATION	0.69	13775.850	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.768	15331.671	111.29
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.078	-1555.824	-11.29
SOIL WATER AT STARI OF YEAR	10.045	200555.094	
SOIL WATER AT END OF YEAR	9.967	198999.266	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AI END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.004	0.00

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ANNUAL TOTALS FOR YEAR 1965

	INCHES	CU. FEET	PERCENT
PRECIPITATION	3.09	61691.844	100.00
RUNOFF	0.153	3046.277	4.94
EVAPOTRANSPIRATION	1.834	36613.043	59.35
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	1.104	22032.527	35.71
SOIL WATER AT START OF YEAR	9.967	198999.266	
SOIL WATER AT END OF YEAR	11.071	221031.797	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.003	0.00

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ANNUAL TOTALS FOR YEAR 1966

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.63	32542.949	100.00
RUNOFF	0.001	28.195	0.09
EVAPOTRANSPIRATION	2.727	54434.969	167.27
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-1.098	-21920.191	-67.36
SOIL WATER AT START OF YEAR	11.071	221031.797	
SOIL WATER AT END OF YEAR	9.973	199111.609	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.023	0.00

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ANNUAL TOTALS FOR YEAR 1967

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.39	87646.344	100.00
RUNOFF	0.652	13020.037	14.86
EVAPOTRANSPIRATION	2.795	55804.789	63.67
PERC./LEAKAGE THROUGH LAYER 2	0.000001	0.020	0.00
CHANGE IN WATER STORAGE	0.943	18821.488	21.47
SOIL WATER AT START OF YEAR	9.973	199111.609	
SOIL WATER AT END OF YEAR	10.916	217933.094	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.011	0.00

ANNUAL TOTALS FOR YEAR 1968

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.55	30945.752	100.00
RUNOFF	0.087	1732.729	5.60
EVAPOTRANSPIRATION	2.484	49584.785	160.23
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-1.020	-20371.773	-65.83
SOIL WATER AT START OF YEAR	10.916	217933.094	
SOIL WATER AT END OF YEAR	9.895	197561.312	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.009	0.00

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ANNUAL TOTALS FOR YEAR 1969

	INCHES	CU. FEET	PERCENT
PRECIPITATION	3.33	66483.445	100.00
RUNOFF	0.411	8203.378	12.34
EVAPOTRANSPIRATION	2.813	56170.223	84.49
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.106	2109.834	3.17
SOIL WATER AT START OF YEAR	9.895	197561.312	
SOIL WATER AT END OF YEAR	10.001	199671.156	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.014	0.00

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ANNUAL TOTALS FOR YEAR 1970

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.06	21162.898	100.00
RUNOFF	0.013	266.834	1.26
EVAPOTRANSPIRATION	1.055	21063.164	99.53
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.008	-167.096	-0.79
SOIL WATER AT START OF YEAR	10.001	199671.156	
SOIL WATER AT END OF YEAR	9.993	199504.062	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.004	0.00

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ANNUAL TOTALS FOR YEAR 1971

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.44	8784.601	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.440	8778.321	99.93
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.000	6.283	0.07
SOIL WATER AT START OF YEAR	9.993	199504.062	
SOIL WATER AT END OF YEAR	9.993	199510.344	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.004	0.00

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ANNUAL TOTALS FOR YEAR 1972

	INCHES	CU. FEET	PERCENT
PRECIPITATION	2.32	46318.797	100.00
RUNOFF	0.405	8076.194	17.44
EVAPOTRANSPIRATION	1.820	36335.555	78.45
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.096	1907.057	4.12
SOIL WATER AT START OF YEAR	9.993	199510.344	
SOIL WATER AT END OF YEAR	10.089	201417.391	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.006	0.00

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ANNUAL TOTALS FOR YEAR 1973

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.29	5789.850	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.394	7858.069	135.72
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.104	-2068.213	-35.72
SOIL WATER AT START OF YEAR	10.089	201417.391	
SOIL WATER AT END OF YEAR	9.985	199349.187	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.007	0.00

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.42	28350.299	100.00
RUNOFF	0.106	2109.052	7.44
EVAPOTRANSPIRATION	1.292	25795.748	90.99
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.022	445.500	1.57
SOIL WATER AT START OF YEAR	9.985	199349.187	
SOIL WATER AT END OF YEAR	10.007	199794.687	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE	0.0000	-0.001	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.97	19366.051	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.994	19837.795	102.44
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.024	-471.738	-2.44
SOIL WATER AT START OF YEAR	10.007	199794.687	
SOIL WATER AT END OF YEAR	9.984	199322.953	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.006	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.36	87047.406	100.00
RUNOFF	0.866	17286.736	19.86
EVAPOTRANSPIRATION	3.228	64449.457	74.04
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.266	5311.181	6.10
SOIL WATER AT START OF YEAR	9.984	199322.953	
SOIL WATER AT END OF YEAR	10.250	204634.125	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.030	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.54	90641.102	100.00
RUNOFF	0.832	16613.549	18.33
EVAPOTRANSPIRATION	3.190	63683.902	70.26
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.518	10343.652	11.41
SOIL WATER AT START OF YEAR	10.250	204634.125	
SOIL WATER AT END OF YEAR	10.768	214977.781	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.002	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.88	97429.203	100.00
RUNOFF	0.287	5733.261	5.88
EVAPOTRANSPIRATION	3.899	77847.500	79.90
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.005	0.00
CHANGE IN WATER STORAGE	0.694	13848.423	14.21
SOIL WATER AT START OF YEAR	10.768	214977.781	
SOIL WATER AT END OF YEAR	11.461	228826.203	

SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.015	0.00

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ANNUAL TOTALS FOR YEAR 1979

	INCHES	CU. FEET	PERCENT
PRECIPITATION	3.07	61292.543	100.00
RUNOFF	0.026	519.761	0.85
EVAPOTRANSPIRATION	4.538	90591.773	147.80
PERC./LEAKAGE THROUGH LAYER 2	0.000001	0.017	0.00
CHANGE IN WATER STORAGE	-1.494	-29818.979	-48.65
SOIL WATER AT START OF YEAR	11.461	228826.203	
SOIL WATER AT END OF YEAR	9.968	199007.219	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.030	0.00

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ANNUAL TOTALS FOR YEAR 1980

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.06	81057.898	100.00
RUNOFF	0.177	3527.692	4.35
EVAPOTRANSPIRATION	3.907	78011.078	96.24
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.003	0.00
CHANGE IN WATER STORAGE	-0.024	-480.896	-0.59
SOIL WATER AT START OF YEAR	9.968	199007.219	

SOIL WATER AT END OF YEAR	9.944	198526.328	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.018	0.00

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ANNUAL TOTALS FOR YEAR 1981

	INCHES	CU. FEET	PERCENT
PRECIPITATION	3.86	77064.906	100.00
RUNOFF	0.217	4329.946	5.62
EVAPOTRANSPIRATION	3.643	72734.687	94.38
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.000	0.267	0.00
SOIL WATER AT START OF YEAR	9.944	198526.328	
SOIL WATER AT END OF YEAR	9.944	198526.594	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.003	0.00

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ANNUAL TOTALS FOR YEAR 1982

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.92	98227.789	100.00
RUNOFF	1.060	21155.531	21.54
EVAPOTRANSPIRATION	2.954	58966.785	60.03
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.005	0.00
CHANGE IN WATER STORAGE	0.907	18105.447	18.43

SOIL WATER AT START OF YEAR	9.944	198526.594	
SOIL WATER AT END OF YEAR	10.851	216632.047	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.023	0.00

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ANNUAL TOTALS FOR YEAR 1983

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.63	152332.969	100.00
RUNOFF	1.752	34981.379	22.96
EVAPOTRANSPIRATION	6.606	131879.703	86.57
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.005	0.00
CHANGE IN WATER STORAGE	-0.728	-14528.136	-9.54
SOIL WATER AT START OF YEAR	10.851	216632.047	
SOIL WATER AT END OF YEAR	10.123	202103.906	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.014	0.00

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ANNUAL TOTALS FOR YEAR 1984

	INCHES	CU. FEET	PERCENT
PRECIPITATION	2.33	46518.449	100.00
RUNOFF	0.031	623.259	1.34
EVAPOTRANSPIRATION	1.688	33693.551	72.43
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00

CHANGE IN WATER STORAGE	0.611	12201.663	26.23
SOIL WATER AT START OF YEAR	10.123	202103.906	
SOIL WATER AT END OF YEAR	10.734	214305.578	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.024	0.00

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ANNUAL TOTALS FOR YEAR 1985

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.72	94234.805	100.00
RUNOFF	0.267	5331.270	5.66
EVAPOTRANSPIRATION	4.074	81333.289	86.31
PERC./LEAKAGE THROUGH LAYER 2	0.000001	0.029	0.00
CHANGE IN WATER STORAGE	0.379	7570.194	8.03
SOIL WATER AT START OF YEAR	10.734	214305.578	
SOIL WATER AT END OF YEAR	11.113	221875.766	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.027	0.00

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ANNUAL TOTALS FOR YEAR 1986

	INCHES	CU. FEET	PERCENT
PRECIPITATION	3.91	78063.148	100.00
RUNOFF	0.686	13687.943	17.53
EVAPOTRANSPIRATION	4.148	82814.437	106.09

PERC./LEAKAGE THROUGH LAYER 2	0.000001	0.010	0.00
CHANGE IN WATER STORAGE	-0.924	-18439.240	-23.62
SOIL WATER AT START OF YEAR	11.113	221875.766	
SOIL WATER AT END OF YEAR	10.190	203436.531	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.001	0.00

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ANNUAL TOTALS FOR YEAR 1987

	INCHES	CU. FEET	PERCENT
PRECIPITATION	2.24	44721.602	100.00
RUNOFF	0.002	38.763	0.09
EVAPOTRANSPIRATION	1.583	31608.307	70.68
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.005	0.00
CHANGE IN WATER STORAGE	0.655	13074.537	29.24
SOIL WATER AT START OF YEAR	10.190	203436.531	
SOIL WATER AT END OF YEAR	10.845	216511.062	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.012	0.00

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ANNUAL TOTALS FOR YEAR 1988

	INCHES	CU. FEET	PERCENT
PRECIPITATION	2.43	48514.945	100.00
RUNOFF	0.240	4800.440	9.89

EVAPOTRANSPIRATION	2.952	58943.988	121.50
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.763	-15229.497	-31.39
SOIL WATER AT START OF YEAR	10.845	216511.062	
SOIL WATER AT END OF YEAR	10.082	201281.562	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.014	0.00

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ANNUAL TOTALS FOR YEAR 1989

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.92	18367.799	100.00
RUNOFF	0.027	541.332	2.95
EVAPOTRANSPIRATION	0.915	18274.541	99.49
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-0.022	-448.052	-2.44
SOIL WATER AT START OF YEAR	10.082	201281.562	
SOIL WATER AT END OF YEAR	10.059	200833.516	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.022	0.00

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ANNUAL TOTALS FOR YEAR 1990

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.97	39331.051	100.00

RUNOFF	0.038	758.703	1.93
EVAPOTRANSPIRATION	1.902	37980.711	96.57
PERC./LEAKAGE THROUGH LAYER 2	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.030	591.633	1.50
SOIL WATER AT START OF YEAR	10.059	200833.516	
SOIL WATER AT END OF YEAR	10.089	201425.141	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.004	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1960 THROUGH 1990

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.37	0.34	0.20	0.05	0.02	0.01
	0.09	0.36	0.30	0.29	0.26	0.41
STD. DEVIATIONS	0.45	0.72	0.35	0.14	0.05	0.02
	0.21	0.65	0.62	0.62	0.45	0.65
RUNOFF						
TOTALS	0.017	0.055	0.003	0.000	0.000	0.000
	0.003	0.039	0.055	0.037	0.029	0.038
STD. DEVIATIONS	0.048	0.289	0.012	0.002	0.000	0.000
	0.015	0.147	0.167	0.141	0.091	0.158
EVAPOTRANSPIRATION						
TOTALS	0.528	0.378	0.224	0.067	0.016	0.006
	0.085	0.293	0.109	0.110	0.204	0.396
STD. DEVIATIONS	0.495	0.509	0.379	0.154	0.050	0.024
	0.205	0.470	0.174	0.177	0.242	0.424
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1960 THROUGH 1990

	INCHES		CU. FEET	PERCENT
PRECIPITATION	2.69	(1.702)	53744.5	100.00
RUNOFF	0.275	(0.4029)	5491.99	10.219
EVAPOTRANSPIRATION	2.416	(1.4180)	48231.28	89.742
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.00000	(0.00000)	0.006	0.00001
CHANGE IN WATER STORAGE	0.001	(0.6277)	21.21	0.039

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PEAK DAILY VALUES FOR YEARS 1960 THROUGH 1990

	(INCHES)	(CU. FT.)
PRECIPITATION	3.30	65884.500
RUNOFF	1.613	32204.9687
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.000001	0.01043
SNOW WATER	0.00	0.0000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2452
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1287

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FINAL WATER STORAGE AT END OF YEAR 1990

LAYER	(INCHES)	(VOL/VOL)
1	6.7049	0.1397
2	3.3840	0.0470
SNOW WATER	0.000	

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Calculation Sheet

Calc No. .

Originator:	Tom Hodge	Job No.:	22214-090	Rev. No.	
Project:	El Centro	Date:	17-Nov-95	Checked:	
Subject:	Infiltration due to ponding			Date Checked:	

SCS TR-55 Runoff Calculation Parameters

Curve Numbe 85 Based on Dry Antecedent

S 1.76 Conditions, AMC=1

Precipitation Histogram Evaporative Storage 6.5 inches

El Centro, CA 1960-90

Rainfall, In	No. of Days	Runoff in Inches	Volume of Runoff over 5.5 acre Feet Cubed	Runoff times Number of Da	Depth Ponde ft	Depth Minus Evap Storage	Evaporative Storage Cubic Ft	Ponded Water Infiltrating	Number of Days Times Water Infiltrating
0.0	11143	0.00	0				0	0	0
0.1	103	0.00	0				0	0	0
0.2	29	0.00	0				0	0	0
0.4	15	0.00	24	366	0.05	0.00	24	0	0
0.6	11	0.03	606	6663	0.70	0.16	532	74	810
0.8	5	0.09	1804	9020	1.07	0.52	1522	282	1408
1.0	4	0.17	3466	13864	1.24	0.70	2858	608	2432
1.2	5	0.27	5485	27424	1.45	0.91	4480	1005	5023
1.4	3	0.39	7785	23354	1.55	i.00	6577	1208	3624
1.6	0	0.52	10309	0	1.61	1.07	8510	1800	0
1.8	1	0.65	13017	13017	1.67	1.13	10583	2434	2434
2.0	0	0.80	15875	0	1.74	1.20	12771	3104	0
2.2	2	0.94	18859	37717	1.82	1.28	15056	3803	7606
2.4	0	1.10	21948	0	1.89	1.35	17421	4527	0
2.6	0	1.26	25128	0	1.97	1.43	19856	5272	0
2.8	0	1.42	28385	0	2.03	1.49	22584	5801	0
3.3	1	1.84	36801	36801	2.14	1.60	26939	9863	9863

31 Years Total Runoff 168,227 cubic ft

Average Annual Runoff 5427 cubic ft

31 Year Total Infiltrating 33200 cubic ft

Average Annual Infiltration 1071 cubic ft

Table of Depth, Area and Volume of Ponding

Volume ft cube	Depth, ft	Area, sq ft
0	0.0	0
235	0.5	940
1170	i.0	2800
5930	1.5	16250
26242	2.0	65000
64370	2.5	87500

In the 31 years from 1960 to 1990, only in 46 days was there sufficient rainfall to cause runoff.
In this calculation, the days with runoff are grouped into bins, the runoff and infiltration for each bin is estimated useing the SCS, TR55 method.
The storage in the evaporative zone, (the top 18 inches), is estimated as 6.5 inches. The ponded depth for each storm size is estimated from the depth-storage curve.
After the ponded depth is reduced by the evaporative storage depth, 6.5 inches, the remaining ponded water is assumed to infiltrate and form leachate.
Direct evaporation from the ponded surface is neglected since the evaoporation rate is less than 5% of the infiltration rate.

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**               HELP MODEL VERSION 3.03  (31 DECEMBER 1994)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:      C:\elcentro\CEN100.D4
TEMPERATURE DATA FILE:        C:\elcentro\YUMA.D7
SOLAR RADIATION DATA FILE:    C:\elcentro\YUMA.D13
EVAPOTRANSPIRATION DATA:      C:\elcentro\CENTRO.D11
SOIL AND DESIGN DATA FILE:    C:\elcentro\EX_SMRO.D10
OUTPUT DATA FILE:             C:\elcentro\exsmro.OUT


TIME:  14:13     DATE:   6/30/1995


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     TITLE:  El Centro, Magazine Rd Landfill, Existing Cover

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER


                                   LAYER  1
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TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9

THICKNESS	=	24.00	INCHES
POROSITY	=	0.5010	VOL/VOL
FIELD CAPACITY	=	0.2840	VOL/VOL
WILTING POINT	=	0.1350	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1390	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.190000006000E-03	CM/SEC

NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.80
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 4

THICKNESS	=	72.00	INCHES
POROSITY	=	0.4370	VOL/VOL
FIELD CAPACITY	=	0.1050	VOL/VOL
WILTING POINT	=	0.0470	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0470	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.170000002000E-02	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
SOIL DATA BASE USING SOIL TEXTURE # 9 WITH BARE
GROUND CONDITIONS, A SURFACE SLOPE OF 3.% AND
A SLOPE LENGTH OF 200. FEET.

SCS RUNOFF CURVE NUMBER	=	92.00	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	5.500	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.502	INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.018	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.430	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	6.720	INCHES
TOTAL INITIAL WATER	=	6.720	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
YUMA ARIZONA

MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	0	
END OF GROWING SEASON (JULIAN DATE)	=	367	
AVERAGE ANNUAL WIND SPEED	=	7.80	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	45.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	32.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	36.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	40.00	%

NOTE: PRECIPITATION DATA FOR El Centro California
WAS ENTERED FROM A EARTH INFO CLIMATEDATA.

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR YUMA ARIZONA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
55.90	60.00	64.20	70.70	78.30	87.20
93.60	92.40	87.30	76.40	63.80	56.50

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR YUMA ARIZONA

STATION LATITUDE = 32.83 DEGREES

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ANNUAL TOTALS FOR YEAR 1960

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.87	17369.549	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.928	18523.869	106.65
PERC./LEAKAGE THROUGH LAYER 2	0.000216	4.309	0.02
CHANGE IN WATER STORAGE	-0.058	-1158.638	-6.67
SOIL WATER AT START OF YEAR	6.720	134164.250	
SOIL WATER AT END OF YEAR	6.662	133005.609	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.009	0.00

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ANNUAL TOTALS FOR YEAR 1961

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.78	35537.699	100.00

RUNOFF	0.022	445.424	1.25
EVAPOTRANSPIRATION	1.145	22859.127	64.32
PERC./LEAKAGE THROUGH LAYER 2	0.000216	4.321	0.01
CHANGE IN WATER STORAGE	0.613	12228.833	34.41
SOIL WATER AT START OF YEAR	6.662	133005.609	
SOIL WATER AT END OF YEAR	7.274	145234.453	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.006	0.00

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ANNUAL TOTALS FOR YEAR 1962

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.99	39730.352	100.00
RUNOFF	0.057	1141.843	2.87
EVAPOTRANSPIRATION	1.989	39713.629	99.96
PERC /LEAKAGE THROUGH LAYER 2	0.000215	4.300	0.01
CHANGE IN WATER STORAGE	-0.057	-1129.421	-2.84
SOIL WATER AT START OF YEAR	7.274	145234.453	
SOIL WATER AT END OF YEAR	7.218	144105.031	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.002	0.00

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ANNUAL TOTALS FOR YEAR 1963

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.79	35737.348	100.00
RUNOFF	0.113	2252.198	6.30
EVAPOTRANSPIRATION	2.186	43651.172	122.14
PERC /LEAKAGE THROUGH LAYER 2	0.000215	4.286	0.01
CHANGE IN WATER STORAGE	-0.509	-10170.302	-28.46
SOIL WATER AT START OF YEAR	7.218	144105.031	
SOIL WATER AT END OF YEAR	6.708	133934.719	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.002	0.00

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ANNUAL TOTALS FOR YEAR 1964

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.69	13775.850	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.768	15331.671	111.29
PERC./LEAKAGE THROUGH LAYER 2	0.000214	4.280	0.03
CHANGE IN WATER STORAGE	-0.078	-1560.099	-11.32
SOIL WATER AT START OF YEAR	6.708	133934.719	
SOIL WATER AT END OF YEAR	6.630	132374.625	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.002	0.00

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ANNUAL TOTALS FOR YEAR 1965

	INCHES	CU. FEET	PERCENT
PRECIPITATION	3.09	61691.844	100.00
RUNOFF	0.153	3046.277	4.94
EVAPOTRANSPIRATION	1.834	36613.043	59.35
PERC./LEAKAGE THROUGH LAYER 2	0.000213	4.251	0.01
CHANGE IN WATER STORAGE	1.103	22028.281	35.71
SOIL WATER AT START OF YEAR	6.630	132374.625	

SOIL WATER AT END OF YEAR	7.734	154402.906	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.008	0.00

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ANNUAL TOTALS FOR YEAR 1966

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.63	32542.949	100.00
RUNOFF	0.001	28.195	0.09
EVAPOTRANSPIRATION	2.727	54434.969	167.27
PERC./LEAKAGE THROUGH LAYER 2	0.000212	4.233	0.01
CHANGE IN WATER STORAGE	-1.098	-21924.445	-67.37
SOIL WATER AT START OF YEAR	7.734	154402.906	
SOIL WATER AT END OF YEAR	6.636	132478.469	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.001	0.00

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ANNUAL TOTALS FOR YEAR 1967

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.39	87646.344	100.00
RUNOFF	0.652	13020.037	14.86
EVAPOTRANSPIRATION	2.795	55804.789	63.67
PERC./LEAKAGE THROUGH LAYER 2	0.000215	4.296	0.00
CHANGE IN WATER STORAGE	0.943	18817.225	21.47
SOIL WATER AT START OF YEAR	6.636	132478.469	
SOIL WATER AT END OF YEAR	7.578	151295.687	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.000	0.00

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ANNUAL TOTALS FOR YEAR 1968

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.55	30945.752	100.00
RUNOFF	0.087	1732.729	5.60
EVAPOTRANSPIRATION	2.484	49584.785	160.23
PERC./LEAKAGE THROUGH LAYER 2	0.000261	5.219	0.02
CHANGE IN WATER STORAGE	-1.021	-20376.990	-65.85

SOIL WATER AT START OF YEAR	7.578	151295.687	
SOIL WATER AT END OF YEAR	6.557	130918.695	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.007	0.00

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ANNUAL TOTALS FOR YEAR 1969

	INCHES	CU FEET	PERCENT
PRECIPITATION	3.33	66483.445	100.00
RUNOFF	0.411	8203.378	12.34
EVAPOTRANSPIRATION	2.813	56170.223	84.49
PERC./LEAKAGE THROUGH LAYER 2	0.000259	5.179	0.01
CHANGE IN WATER STORAGE	0.105	2104.665	3.17
SOIL WATER AT START OF YEAR	6.557	130918.695	
SOIL WATER AT END OF YEAR	6.663	133023.359	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.004	0.00

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PERC./LEAKAGE THROUGH LAYER 2	0.000257	5.129	0.06
CHANGE IN WATER STORAGE	0.000	1.152	0.01
SOIL WATER AT START OF YEAR	6.654	132851.109	
SOIL WATER AT END OF YEAR	6.654	132852.266	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.002	0.00

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ANNUAL TOTALS FOR YEAR 1972

	INCHES	CU. FEET	PERCENT
PRECIPITATION	2.32	46318.797	100.00
RUNOFF	0.405	8076.194	17.44
EVAPOTRANSPIRATION	1.820	36335.555	78.45
PERC./LEAKAGE THROUGH LAYER 2	0.000256	5.118	0.01
CHANGE IN WATER STORAGE	0.095	1901.935	4.11
SOIL WATER AT START OF YEAR	6.654	132852.266	
SOIL WATER AT END OF YEAR	6.750	134754.203	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.003	0.00

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ANNUAL TOTALS FOR YEAR 1973

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.29	5789.850	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.394	7858.069	135.72
PERC./LEAKAGE THROUGH LAYER 2	0.000254	5.080	0.09
CHANGE IN WATER STORAGE	-0.104	-2073.296	-35.81
SOIL WATER AT START OF YEAR	6.750	134754.203	
SOIL WATER AT END OF YEAR	6.646	132680.906	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.003	0.00

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ANNUAL TOTALS FOR YEAR 1974

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.42	28350.299	100.00
RUNOFF	0.106	2109.052	7.44

EVAPOTRANSPIRATION	1.292	25795.748	90.99
PERC./LEAKAGE THROUGH LAYER 2	0.000253	5.056	0.02
CHANGE IN WATER STORAGE	0.022	440.436	1.55
SOIL WATER AT START OF YEAR	6.646	132680.906	
SOIL WATER AT END OF YEAR	6.668	133121.344	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.008	0.00

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ANNUAL TOTALS FOR YEAR 1975

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.97	19366.051	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.994	19837.795	102.44
PERC./LEAKAGE THROUGH LAYER 2	0.000252	5.031	0.03
CHANGE IN WATER STORAGE	-0.024	-476.774	-2.46
SOIL WATER AT START OF YEAR	6.668	133121.344	
SOIL WATER AT END OF YEAR	6.644	132644.562	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE	0.0000	-0.001	0.00

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ANNUAL TOTALS FOR YEAR 1976

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.36	87047.406	100.00
RUNOFF	0.866	17286.736	19.86
EVAPOTRANSPIRATION	3.228	64449.457	74.04
PERC./LEAKAGE THROUGH LAYER 2	0.000252	5.021	0.01
CHANGE IN WATER STORAGE	0.266	5306.183	6.10
SOIL WATER AT START OF YEAR	6.644	132644.562	
SOIL WATER AT END OF YEAR	6.910	137950.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.007	0.00

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ANNUAL TOTALS FOR YEAR 1977

	INCHES	CU. FEET	PERCENT

PRECIPITATION	4.54	90641.102	100.00
RUNOFF	0.832	16613.549	18.33
EVAPOTRANSPIRATION	3.190	63683.902	70.26
PERC./LEAKAGE THROUGH LAYER 2	0.000250	4.984	0.01
CHANGE IN WATER STORAGE	0.518	10338.664	11.41
SOIL WATER AT START OF YEAR	6.910	137950.750	
SOIL WATER AT END OF YEAR	7.427	148289.422	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.002	0.00

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ANNUAL TOTALS FOR YEAR 1978

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.88	97429.203	100.00
RUNOFF	0.287	5733.261	5.88
EVAPOTRANSPIRATION	3.899	77847.500	79.90
PERC./LEAKAGE THROUGH LAYER 2	0.000257	5.125	0.01
CHANGE IN WATER STORAGE	0.693	13843.311	14.21
SOIL WATER AT START OF YEAR	7.427	148289.422	
SOIL WATER AT END OF YEAR	8.121	162132.719	

SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.008	0.00

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ANNUAL TOTALS FOR YEAR 1979

	INCHES	CU. FEET	PERCENT
PRECIPITATION	3.07	61292.543	100.00
RUNOFF	0.026	519.761	0.85
EVAPOTRANSPIRATION	4.538	90591.773	147.80
PERC./LEAKAGE THROUGH LAYER 2	0.000265	5.290	0.01
CHANGE IN WATER STORAGE	-1.494	-29824.271	-48.66
SOIL WATER AT START OF YEAR	8.121	162132.719	
SOIL WATER AT END OF YEAR	6.627	132308.453	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.010	0.00

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ANNUAL TOTALS FOR YEAR 1980

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.06	81057.898	100.00
RUNOFF	0.177	3527.692	4.35
EVAPOTRANSPIRATION	3.907	78011.078	96.24
PERC./LEAKAGE THROUGH LAYER 2	0.000266	5.316	0.01
CHANGE IN WATER STORAGE	-0.024	-486.199	-0.60
SOIL WATER AT START OF YEAR	6.627	132308.453	
SOIL WATER AT END OF YEAR	6.603	131822.250	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.008	0.00

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ANNUAL TOTALS FOR YEAR 1981

	INCHES	CU. FEET	PERCENT
PRECIPITATION	3.86	77064.906	100.00
RUNOFF	0.217	4329.946	5.62
EVAPOTRANSPIRATION	3.643	72734.687	94.38
PERC./LEAKAGE THROUGH LAYER 2	0.000264	5.278	0.01
CHANGE IN WATER STORAGE	0.000	-5.017	-0.01
SOIL WATER AT START OF YEAR	6.603	131822.250	

SOIL WATER AT END OF YEAR	6.602	131817.234	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.009	0.00

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ANNUAL TOTALS FOR YEAR 1982

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.92	98227.789	100.00
RUNOFF	1.060	21155.531	21.54
EVAPOTRANSPIRATION	2.954	58966.785	60.03
PERC./LEAKAGE THROUGH LAYER 2	0.000264	5.270	0.01
CHANGE IN WATER STORAGE	0.907	18100.211	18.43
SOIL WATER AT START OF YEAR	6.602	131817.234	
SOIL WATER AT END OF YEAR	7.509	149917.453	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.006	0.00

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ANNUAL TOTALS FOR YEAR 1983

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.63	152332.969	100.00
RUNOFF	1.752	34981.379	22.96
EVAPOTRANSPIRATION	6.606	131879.703	86.57
PERC./LEAKAGE THROUGH LAYER 2	0.000345	6.896	0.00
CHANGE IN WATER STORAGE	-0.728	-14535.047	-9.54
SOIL WATER AT START OF YEAR	7.509	149917.453	
SOIL WATER AT END OF YEAR	6.781	135382.406	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.035	0.00

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ANNUAL TOTALS FOR YEAR 1984

	INCHES	CU. FEET	PERCENT
PRECIPITATION	2.33	46518.449	100.00
RUNOFF	0.031	623.259	1.34
EVAPOTRANSPIRATION	1.688	33693.551	72.43
PERC./LEAKAGE THROUGH LAYER 2	0.000357	7.128	0.02

CHANGE IN WATER STORAGE	0.611	12194.522	26.21
SOIL WATER AT START OF YEAR	6.781	135382.406	
SOIL WATER AT END OF YEAR	7.392	147576.922	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.012	0.00

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ANNUAL TOTALS FOR YEAR 1985

	INCHES	CU. FEET	PERCENT
PRECIPITATION	4.72	94234.805	100.00
RUNOFF	0.267	5331.270	5.66
EVAPOTRANSPIRATION	4.074	81333.289	86.31
PERC /LEAKAGE THROUGH LAYER 2	0.000352	7.020	0.01
CHANGE IN WATER STORAGE	0.379	7563.207	8.03
SOIL WATER AT START OF YEAR	7.392	147576.922	
SOIL WATER AT END OF YEAR	7.771	155140.125	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.023	0.00

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ANNUAL TOTALS FOR YEAR 1986

	INCHES	CU. FEET	PERCENT
PRECIPITATION	3.91	78063.148	100.00
RUNOFF	0.686	13687.943	17.53
EVAPOTRANSPIRATION	4.148	82814.437	106.09
PERC./LEAKAGE THROUGH LAYER 2	0.001044	20.846	0.03
CHANGE IN WATER STORAGE	-0.925	-18460.070	-23.65
SOIL WATER AT START OF YEAR	7.771	155140.125	
SOIL WATER AT END OF YEAR	6.846	136680.062	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.006	0.00

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ANNUAL TOTALS FOR YEAR 1987

	INCHES	CU. FEET	PERCENT
PRECIPITATION	2.24	44721.602	100.00
RUNOFF	0.002	38.763	0.09
EVAPOTRANSPIRATION	1.583	31608.307	70.68

PERC./LEAKAGE THROUGH LAYER 2	0.001217	24.299	0.05
CHANGE IN WATER STORAGE	0.654	13050.242	29.18
SOIL WATER AT START OF YEAR	6.846	136680.062	
SOIL WATER AT END OF YEAR	7.500	149730.297	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.011	0.00

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ANNUAL TOTALS FOR YEAR 1988

	INCHES	CU. FEET	PERCENT
PRECIPITATION	2.43	48514.945	100.00
RUNOFF	0.240	4800.440	9.89
EVAPOTRANSPIRATION	2.952	58943.988	121.50
PERC./LEAKAGE THROUGH LAYER 2	0.001200	23.949	0.05
CHANGE IN WATER STORAGE	-0.764	-15253.439	-31.44
SOIL WATER AT START OF YEAR	7.500	149730.297	
SOIL WATER AT END OF YEAR	6.736	134476.859	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.007	0.00

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ANNUAL TOTALS FOR YEAR 1989

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.92	18367.799	100.00
RUNOFF	0.027	541.332	2.95
EVAPOTRANSPIRATION	0.915	18274.541	99.49
PERC./LEAKAGE THROUGH LAYER 2	0.001173	23.425	0.13
CHANGE IN WATER STORAGE	-0.024	-471.490	-2.57
SOIL WATER AT START OF YEAR	6.736	134476.859	
SOIL WATER AT END OF YEAR	6.712	134005.375	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.008	0.00

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ANNUAL TOTALS FOR YEAR 1990

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.97	39331.051	100.00

RUNOFF	0.038	758.703	1.93
EVAPOTRANSPIRATION	1.902	37980.711	96.57
PERC./LEAKAGE THROUGH LAYER 2	0.001151	22.983	0.06
CHANGE IN WATER STORAGE	0.028	568.652	1.45
SOIL WATER AT START OF YEAR	6.712	134005.375	
SOIL WATER AT END OF YEAR	6.740	134574.031	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.002	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1960 THROUGH 1990

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.37	0.34	0.20	0.05	0.02	0.01
	0.09	0.36	0.30	0.29	0.26	0.41
STD. DEVIATIONS	0.45	0.72	0.35	0.14	0.05	0.02
	0.21	0.65	0.62	0.62	0.45	0.65
RUNOFF						
TOTALS	0.017	0.055	0.003	0.000	0.000	0.000
	0.003	0.039	0.055	0.037	0.029	0.038

STD. DEVIATIONS	0.048	0.289	0.012	0.002	0.000	0.000
	0.015	0.147	0.167	0.141	0.091	0.158
EVAPOTRANSPIRATION						
TOTALS	0.528	0.378	0.224	0.067	0.016	0.006
	0.085	0.293	0.109	0.110	0.204	0.396
STD. DEVIATIONS	0.495	0.509	0.379	0.154	0.050	0.024
	0.205	0.470	0.174	0.177	0.242	0.424
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1960 THROUGH 1990

	INCHES		CU. FEET	PERCENT
PRECIPITATION	2.69	(1.702)	53744.5	100.00
RUNOFF	0.275	(0.4029)	5491.99	10.219
EVAPOTRANSPIRATION	2.416	(1.4180)	48231.28	89.742
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.00040	(0.00034)	8.002	0.01489
CHANGE IN WATER STORAGE	0.001	(0.6277)	13.22	0.025

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PEAK DAILY VALUES FOR YEARS 1960 THROUGH 1990

	(INCHES)	(CU. FT.)
PRECIPITATION	3.30	65884.500
RUNOFF	1.613	32204.9687
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.000005	0.09103
SNOW WATER	0.00	0.0000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2452
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1287

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FINAL WATER STORAGE AT END OF YEAR 1990

LAYER	(INCHES)	(VOL/VOL)
1	3.3565	0.1399
2	3.3840	0.0470
SNOW WATER	0.000	

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ANNUAL TOTALS FOR YEAR 1970

	INCHES	CU. FEET	PERCENT
PRECIPITATION	1.06	21162.898	100.00
RUNOFF	0.013	266.834	1.26
EVAPOTRANSPIRATION	1.055	21063.164	99.53
PERC./LEAKAGE THROUGH LAYER 2	0.000258	5.154	0.02
CHANGE IN WATER STORAGE	-0.009	-172.246	-0.81
SOIL WATER AT START OF YEAR	6.663	133023.359	
SOIL WATER AT END OF YEAR	6.654	132851.109	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.008	0.00

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ANNUAL TOTALS FOR YEAR 1971

	INCHES	CU. FEET	PERCENT
PRECIPITATION	0.44	8784.601	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	0.440	8778.321	99.93

Responses to regulatory comments previously submitted follow. Some of the responses were subsequently modified based on discussions with the regulatory agencies, and do not necessarily reflect the actual changes made in the removal action documents.

Responses to
16 April 1996 DTSC Comments
on
December 1995 Draft Engineering Evaluation/Cost Analysis,
Site 1, Magazine Road Landfill
Naval Air Facility El Centro, California

Comment	Response
GENERAL COMMENTS	
The Engineering Evaluation/Cost Analysis (EE/CA) included evaluation of analytical data from previous investigations (Preliminary Assessment/Site Inspection (PA/SI, NEESA 1987) documented in SI report (Ogden 1993a)) to identify chemicals of concern (COCs). The scope of this removal action is to reduce the potential for human and ecological exposure to the landfill wastes and potentially contaminated soils, as well as to reduce the potential for the generation and migration of leachate by installing a monolithic cap. 1. This removal action is also subject to and must comply with all the requirements of the H&SC, Chapter 6.8. Under the California H&SC, a Removal Action Workplan (RAW) (or an equivalent document) is required for a removal action estimated to cost less than $1.0 million.	Comment noted.
SPECIFIC COMMENTS	
SECTION 2.4.2 GROUNDWATER 1. In the second paragraph, it is stated that "data regarding the occurrence of a deeper regional aquifer are not available...". Please explain why this data is not available. The groundwater samples collected in 1991 and 1992 contained concentrations that exceeded safety levels, yet not enough data is provided on the chemicals detected, the proximity of groundwater to the bottom of the landfill, and the chemical concentrations found in groundwater	Previous studies have had no reason to investigate the deeper regional aquifer The objective of the Solid Waste Water Quality Assessment Test/Site Investigation performed at the site was to assess the potential for the release of hazardous substances and to perform an assessment of the nature of the contamination in the event that release had occurred. The investigation was not intended to characterize the full extent of contamination The data generated by this investigation are the only data (groundwater and soil) available for the site
SECTION 2.8.2.1 SCOPE AND RESULTS 2. Total Recoverable Petroleum Hydrocarbons (TRPH) and Total Fuel Hydrocarbons (TFH) were detected in the samples at concentrations exceeding the Preliminary Remediation Goals (PRGs). It is stated that this contamination is associated with an off-site source that is not associated with the landfill Please provide additional information on the suspected sources and why the concentrations detected above PRGs were not considered to be chemicals of concern.	The last sentence of Section 2.8 2 1, paragraph 3 refers to the analytical results for soil samples collected from soil boring B9 Based on a review of aerial photographs and discussions with base personnel, the location of this boring is outside the landfill boundaries The source of the petroleum hydrocarbons observed at this location is unknown. Contamination at this location is being further investigated as part of the Data Gaps Study. Preliminary Remediation Goals do not exist for TRPH (total recoverable petroleum hydrocarbons) and TFH (total fuel hydrocarbons)

Comment	Response
SECTION 2.8.2.4 EVALUATION OF DETECTION LIMITS 3. N-nitrosodimenthylamine is a compound most commonly associated with rocket fuel production and lubricant manufacturing. The detected levels for this chemical exceeded the PRGs (see Table 2-3). This chemical and other chemicals exceeding safety levels should not be excluded since the landfill waste is not clearly defined. Military activities involve many types of rocket and jet fuel in their operations and it is possible that fuel was dumped in the landfill. Please provide additional information on this exclusion.	The intent of Section 2.8.2.4 is to identify and discuss analytes for which detection limits exceeded the U. S. EPA Region IX Preliminary Remediation Goals. Except for benzo(a)pyrene, none of the analytes discussed in this section were detected in any of the samples collected during the Site Investigation/Solid Waste Water Quality Assessment Test. Benzo(a)pyrene was only detected in samples collected from soil boring B9, which is not located within the landfill boundaries. Because these analytes were not detected in samples collected from the landfill and because there is no reason to believe that they were used at NAF El Centro, they were not included in the human health screening calculations. If these analytes were included in the human health risk screening calculations using half the detection limits per USEPA Risk Assessment Guidance for Superfund (RAGS), they would not have a significant impact on the results (see table below).

Analyte	Detection Limit (mg/kg)	Preliminary Remediation Goal (mg/kg)	Carcinogenic Risk
N-nitrosodimethylamine	0.17	0.0087	1.0×10^{-5}
vinyl chloride	0.006	0.0052	5.8×10^{-7}
bis(2-chloro-ethyl)ether	0.17	0.074	1.1×10^{-6}
benzo(a)pyrene	0.17	0.061	1.4×10^{-6}
dibenz(a,h)anthracene	0.17	0.061	1.4×10^{-6}
organolead	0.30	0.0065	2.3×10^{-5}
Total Added Risk			**3.7×10^{-5}**
Risk From EE/CA[a]			1.5×10^{-4}
Total Cumulative Risk			**1.9×10^{-4}**

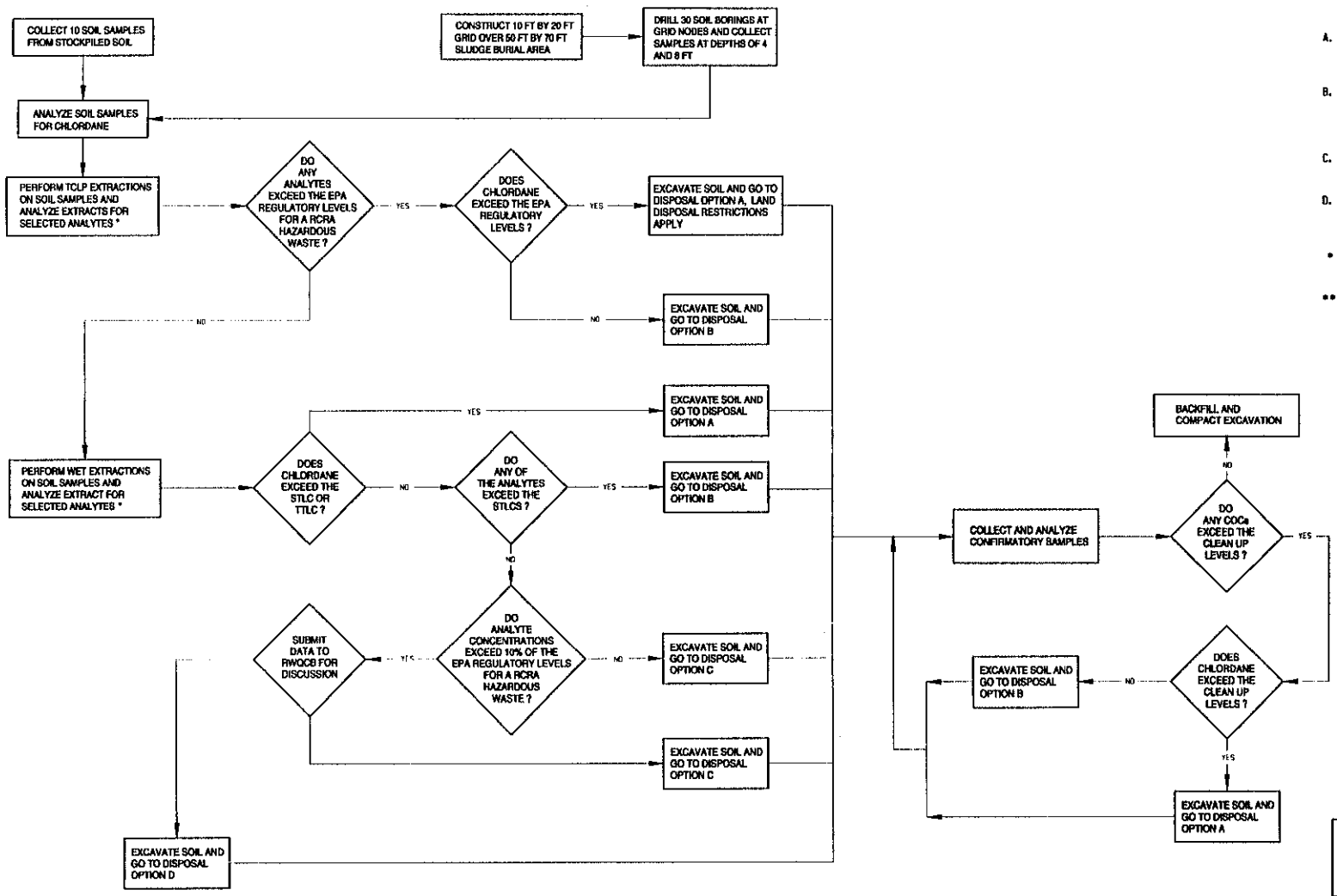
4. Chemicals analyzed using U.S. EPA Method 8010/8020 are not listed in Table 2-3. Laboratory reports for the analyses of these compounds were not available during the preparation of the EE/CA. However laboratory reports were available for analysis performed on soil samples collected at Sites 3, 4, and 8. This paragraph completely excludes data analysis for VOCs and is arriving at conclusions based on other sites. Please explain	Section 2.8.2.4, paragraph 5 is intended as a discussion of detection limits, not analytical results. At the time the evaluation of detection limits was performed, the laboratory reports for the U.S. EPA Method 8010/8020 analysis performed on samples collected from Site 1 were not available. Since the same laboratory that analyzed the samples from Site 1 also performed the U.S. EPA Method 8010/8020 analyses on samples from Sites 3, 4, and 8, it was assumed that the standard laboratory detection limits reported for the analyses of samples from Sites 3, 4, and 8 would also apply to the analysis of samples from Site 1. This assumption fits the available data in that concentrations reported are consistent with (at or near) the reported detection limit in other samples. Table 2-3 includes a list of analytes that had detection limits exceeding the U.S. EPA Region IX Preliminary Remediation Goals. Since none of the analytes included in U.S. EPA Method 8010/8020 had detection limits exceeding the U.S. EPA Region IX Preliminary Remediation Goals, it is not appropriate to include these analytes in Table 2-3.
SECTION 2.8.2.6 SOURCE, NATURE, AND EXTENT OF CONTAMINATION 5. The only background samples were taken from boring B9. It is located approximately 100 feet southeast of the landfill. It is suspected that the petroleum hydrocarbons and other contaminants observed in the soil samples collected from B9 are related to an off-site source not associated with Site 1. It seems that there is a great deal of assumptions made that most of the contamination at this site is coming from other sources. Could the landfill boundaries be more than originally estimated and that contamination from B9 is an extended area of the landfill where fuel products were dumped? Please explain the other potential sources of contamination and the reason why this background soil boring has such high hits. The Department recommends an alternate soil boring to be used for background confirmation.	During the preparation of the Engineering Evaluation/Cost Analysis document, historic aerial photographs of the site were reviewed and base personnel were interviewed. Based on the results of these activities it was concluded that soil boring B9 was outside of the landfill boundaries. The source of the contaminants reported at this location is unknown and is the subject of additional investigation as part of the Data Gaps Study to be conducted in the Spring of 1996.
SECTION 3.4.2.1 U.S. EPA PRESUMPTIVE REMEDY 6. Please provide information on how the institutional controls of restricting access or limiting use of the site will be documented. As a risk management measure, the proposed remedy should include risk management measures such as land use restriction and/or an amendment to the base master plan to restrict future use of this land parcel since hazardous wastes are left in place.	Discussion of land use restrictions or amendments to the base master plan are beyond the scope of this Engineering Evaluation/Cost Analysis. Discussion of documentation procedures for the proposed institutional controls is also beyond the scope of this Engineering Evaluation/Cost Analysis.
SECTION 4.3.1.3 SHORT-TERM EFFECTIVENESS 7. During the grading activities associated with construction of the cap, measures will be taken to reduce fugitive dust emissions and the associated impacts on workers and the surrounding community. It is stated that COPCs are non-volatile. Until the determination that volatile emissions from the site are not expected is clear, the workers should comply with all health and safety procedures.	Comment noted.

APPENDIX B: SECTION 2.1 SITE DESCRIPTION 8. It is previously stated in this EE/CA that the area of the landfill is approximately 5.5 acres. In this section the area is reduced to approximately 4 acres. It is important to know the exact area that is going to be capped prior to operations. Please make the corrections.	The area of Site 1 is approximately 5.5 acres. this will be corrected in Appendix B, Section 2.1.
ATTACHMENT B: ECOLOGICAL SCOPING ASSESSMENT 9. Flora or fauna species, including special-status species, are known or expected to occur in the installation restoration sites including the removal areas. According to the information presented in the initial ecological scoping assessment, there are potential exposure pathways identified. We have the following comments: Please clarify how the proposed removal actions will affect the habitats of these species. Specify what measures will be taken to ensure the identified flora and fauna species will not be harmed. Will a pre-removal biological survey be performed at these areas? Will a biologist be present at the proposed removal action locations during field activities to aid in providing safety measures for these species? Please discuss how the proposed removal actions affect the breeding season of potentially affected species.	The removal action at Site 1 may disturb plants, reducing cover and foraging opportunities for wildlife. In addition, the removal may destroy rodent or reptile burrows These disturbances are not likely to result in long-term effects on the ecological receptors. Two of the species identified in the Ecological Scoping Assessment are California Species of Special Concern, the burrowing owl and the flat-tailed horned lizard The flat-tailed horned lizard is also proposed as a threatened species under the federal Endangered Species Act. Although burrowing owls were observed in several areas at NAF El Centro during the 20 April 1995 site inspection, no active burrows were observed at Site 1. For the protection of burrowing owls, a biologist will inspect the site for the presence of burrows prior to the initiation of removal action activities. If active burrows are identified. and it is not mating season, (i.e. March through June), the burrowing owl residents will be moved to an off-site burrow. Removal action activities will not be performed during the mating season if active burrows are observed on-site. The site will also be inspected for flat-tailed horned lizards prior to initiation of the removal action activities. Any flat-tailed horned lizards observed on tl site will be relocated prior to the removal action. Section 4 will be modified to address the above considerations.
ATTACHMENT C: APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS-SECTION 1.7-CALIFORNIA ENVIRONMENTAL QUALITY ACT 10. DTSC has the responsibility to comply with CEQA when exercising its discretionary decision authority to approve removal actions. As such. CEQA compliance is a State action that should be identified. Please make the corrections to this paragraph to include CEQA as an ARAR. and delete reference to "CEQA" from the last sentence of the section which states that "Therefore, NEPA and CEQA are not ARARs for this site."	As the lead agency for the proposed actions at Site 1, the Department of the Navy has determined that the California Environmental Quality Act is not an Applicable Relevant or Appropriate Requirement. Attachment C, Section 1.7 will remain unchanged

Responses to
RWQCB Comments
on
Draft Engineering Evaluation/Cost Analysis Documents for
Sites 1, 3, and 8
Naval Air Facility El Centro, California

Comment	Response
GENERAL COMMENTS	
1. ARARs for these EE/CAs include Title 22, Chapter 15, regulating waste discharge to land Pursuant to Article 1 of Chapter 15, existing (abandoned, inactive) landfills at NAFEC are defined as "unclassified Waste Management Units (WMUs)". As such, the only waste they are allowed to receive must meet criteria required under Chapter 15 for an INERT designation. (See Article 2, Section 2524 of this Chapter) Contaminated soils may only be discharged to classified, permitted WMUs (under active Waste Discharge Requirements). This includes contaminated soils intended for use as part of a final cap. Soils contaminated to Hazardous Waste Concentrations that have been rendered INERT through solidification/stabilization processes and confirmed to be Non-Hazardous according to DTSC waste classification requirements may be considered for discharge to an unclassified WMU pursuant to Article 2, Section 2524 of Chapter 15.	Comment noted. Please see attached decision flow diagram for Sites 3 and 8 for waste classification and disposal criteria
2. These EE/CAs do not address groundwater contamination found at Sites 1 and 3 as well as further groundwater characterization needed at all three sites. These issues will be addressed in the Groundwater Monitoring Work Plan which was received April 2, 1996 and is currently under review by staff.	Comment noted
SPECIFIC COMMENTS	
SITE 1: MAGAZINE ROAD LANDFILL 1. The proposed monolithic cap is an acceptable removal action alternative for this site. Post closure maintenance and groundwater monitoring will be required pursuant to Chapter 15 regulations.	Comment noted.
SITE 3: FORMER SLUDGE BURIAL AREA 1. Contaminants of Concern (COCs) at this site include Arsenic, Cadmium, Chromium, Lead, and Chlordane. The EE/CA reports these COCs may be at Hazardous Waste concentrations. Extensive characterization and treatability studies will be necessary to obtain sufficient data to allow regulatory approval of the proposed removal action, to stabilize/solidify the waste to meet the criteria for confirmation as non-hazardous according to DTSC waste classification requirements and allow the disposal of the waste pursuant to Chapter 15 as part of the cap for Site 1.	The handling of soil classified as Resource Conservation and Recovery Act or California hazardous has been revised (please see attached decision flow diagram). Soil samples will be collected and submitted to a laboratory for classification prior to excavation. Soil in areas classified as hazardous will be excavated and transported to a Class I disposal facility or incinerated at a licensed facility if land disposal restrictions apply. On-site treatment of hazardous materials is no longer proposed.

Comment	Response
2 Figure 4-1; Removal Action Alternatives-This flow chart is not accurate. As stated above in the General Comments, nonhazardous contaminated soil cannot be discharged to the Site 1 Landfill. Only soils classified as INERT by the Regional Board may be placed on an unpermitted WMU such as Site 1	Please see attached decision flow diagram for revisions.
3 Section 4.1.1 EXCAVATION- Composite sampling for site characterization is not acceptable. Please revise this portion of the EE/CA to provide for discrete samples to be taken for both the construction waste sampling and for characterization of potentially hazardous waste.	The sampling plan will be revised to include discrete sampling of the stockpiled construction wastes and the sludge burial area prior to excavation. See attached decision flow diagram.
SITE 8: SCRAPYARD 1. The COCs at this site include Arsenic, Cadmium, Chromium, Lead, and PCBs all at potentially hazardous concentrations The proposed site characterization, soils removal, treatment, and disposal are the same as for Site 3 RWQCB staff comments for Site 3 therefore also apply to Site 8 regarding disposal of contaminated soil and discrete sampling for site characterization.	The handling of soil classified as Resource Conservation and Recovery Act of California hazardous has been revised (please see attached decision flow diagram). Discrete soil samples will be collected and submitted to a laboratory for classification prior to excavation. Soil in areas classified as hazardous will be excavated and transported to a Class I disposal facility. On-site treatment of hazardous materials is no longer proposed.
2 The sampling and excavation plan shown in Figure 4-2 appears acceptable, providing discrete samples are taken rather than composite samples.	Please see response to Specific Comment No. 1



DISPOSAL OPTIONS

A. SOIL CLASSIFIED AS A RCRA OR CALIFORNIA HAZARDOUS WASTE FOR CHLORDANE. EXCAVATE AND TRANSPORT OFF-SITE FOR INCINERATION **

B. SOIL CLASSIFIED AS A RCRA OR CALIFORNIA HAZARDOUS WASTE FOR ANALYTE OTHER THAN CHLORDANE. EXCAVATE SOIL AND TRANSPORT OFF-SITE FOR DISPOSAL AT A CLASS I FACILITY **

C. SOIL CLASSIFIED AS INERT. EXCAVATE AND TRANSPORT TO SITE I FOR DISPOSAL.

D. SOIL CLASSIFIED AS DESIGNATED OR NON-HAZARDOUS SOLID WASTE. EXCAVATE SOIL AND TRANSPORT OFF-SITE FOR DISPOSAL **

* ANALYTES INCLUDE: ARSENIC, CADMIUM, CHROMIUM (TOTAL), HEXAVALENT CHROMIUM, LEAD AND CHLORDANE

** ONLY SOIL FROM AREAS CLASSIFIED AS CONTAINING HAZARDOUS, DESIGNATED, OR NON-HAZARDOUS SOLID WASTE WILL BE TRANSPORTED OFF-SITE.

Engineering Evaluation/Cost Analysis

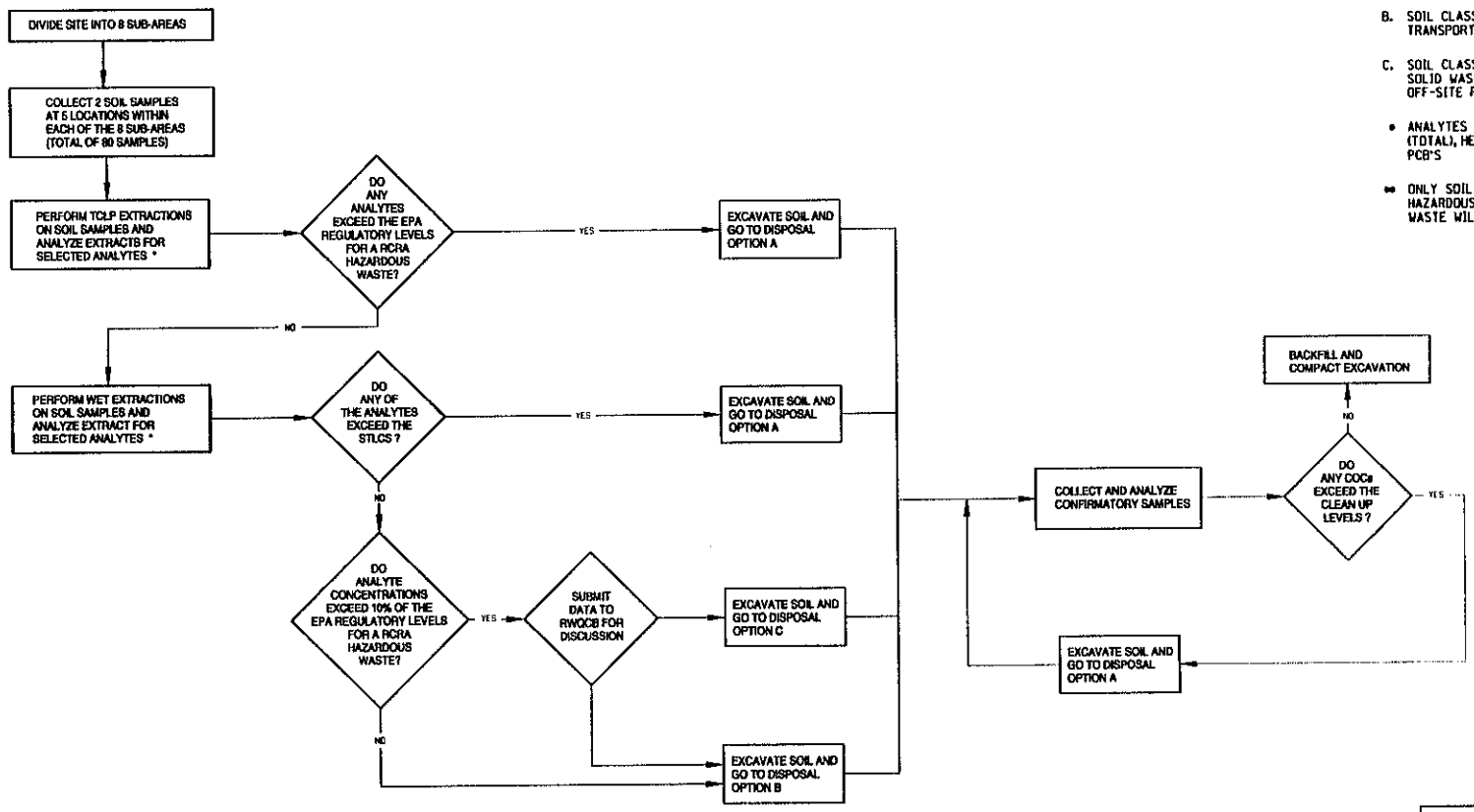
Figure 4-1

Characterization, Excavation, and Disposal Decision Flow Diagram Site 3

NAF El Centro, Imperial County, California

Bechtel National, Inc.
CLEAN II Program

Date: 6/26/96
File No: site3 f
Job No: 22214-090
Rev: A



DISPOSAL OPTIONS

A. SOIL CLASSIFIED AS A RCRA OR CALIFORNIA HAZARDOUS WASTE. EXCAVATE AND TRANSPORT OFF-SITE FOR DISPOSAL **

B. SOIL CLASSIFIED AS INERT. EXCAVATE AND TRANSPORT TO SITE 1 FOR DISPOSAL

C. SOIL CLASSIFIED AS DESIGNATED OR NON-HAZARDOUS SOLID WASTE. EXCAVATE SOIL AND TRANSPORT OFF-SITE FOR DISPOSAL **

* ANALYTES INCLUDE: ARSENIC, CADMIUM, CHROMIUM (TOTAL), HEXAVALENT CHROMIUM, LEAD AND PCB'S

** ONLY SOIL FROM AREAS CLASSIFIED AS CONTAINING HAZARDOUS, DESIGNATED, OR NON-HAZARDOUS SOLID WASTE WILL BE TRANSPORTED OFF-SITE

Engineering Evaluation/Cost Analysis

Figure 4-1

Characterization, Excavation, and Disposal Decision Flow Diagram Site 8

NAF El Centro, Imperial County, California

Bechtel National, Inc.
CLEAN II Program

Date: 6/26/96
File No: site8_f
Job No: 22214 090
Rev: A

Responses to
12 September 1996 California Integrated Waste Management Board Comments on Draft Engineering Evaluation/Cost Analysis Site 1, Magazine Road Landfill (June 1996) Naval Air Facility, El Centro, California

John P. Clinkenbeard; Associate Engineering Geologist	
Comment	**Response**
1. The second sentence of the third paragraph of page 1-1 appears to be incomplete. The same omission appears to have been made in paragraph 4 on page 3-1.	The referenced sentences are correct in the Draft for Public Review dated August 1996.
2. The first paragraph of page 2-9 indicates that the total dissolved solids in shallow ground water at the site are high and exceed the U.S. EPA secondary maximum contaminant level (MCL) of 500 mg/L and the California agricultural water quality goal of 450 mg/L. This paragraph also indicates that the ground water in the vicinity of Site 1 is currently designated for beneficial use. If the ground water does not meet either standard, what is the beneficial use for which it is designated? Does the designation for beneficial use apply to a deeper aquifer? The statements in this paragraph appear contradictory and should be clarified.	The 1994 Regional Water Quality Control Board, Water Quality Control Plan, Colorado River Basin designates the groundwater in the Imperial Valley Planning Area as beneficial for municipal and industrial uses. The Imperial Valley Planning Area is a large region that includes NAF El Centro. This designation is based on limited data and does not account for local variations in groundwater quality. The local groundwater at NAF El Centro is unsuitable for beneficial use due to high total dissolved solids concentrations. A sentence to clarify this will be put into the final documents.
3. Title 14, California Code of Regulations (CCR), Division 7, Chapter 3, Article 7.8, Section 17783.17 allows for exemption from the gas monitoring and control requirements of 14 CCR section 17783 if there is no potential for adverse impacts on public health and safety and the environment, based upon but not limited to: the size, nature, and age of refuse; projected gas generation: and remoteness of the facility. Section 3.2 concludes that the Site 1 fill materials are unlikely to produce landfill gases and indicates that mitigation of landfill gases is not included in the scope of the proposed removal action. It does not appear that any of the previous investigations at the site tested for the presence of landfill gas. While it is likely that, if the waste was periodically burned as indicated, landfill gas generation will not be a problem, a determination should be made that the landfill is not producing landfill gas to qualify for the exemption from landfill gas monitoring and control measures. Given the site conditions and history, a preliminary investigation could be made by penetrating the existing cover in several places with a bar-hole punch and monitoring with a combustible gas meter. If no methane is detected in the landfill in such sampling, this would support a request for an exemption.	Based on the results of previous investigations, correspondence with the Imperial County Air Pollution Control District, and land use in the vicinity of the site, DON (the Department of the Navy) does not believe that additional investigation at the site for landfill gas is warranted. Evidence of organic wastes or methane gas generation have not been observed during the previous investigations conducted at the site. Soil borings drilled during the Solid Waste Water Quality Assessment Test/Site Investigation did not encounter significant organic material. During the April 1994 groundwater sampling event, existing groundwater monitoring wells with screens extending above the groundwater surface were screened with an organic vapor analyzer capable of detecting methane. No organic vapors were detected in the wells. On August 7, 1996 a telephone conference was held between DTSC, the DON, and Mr. Fischer of the Imperial County Air Pollution Control District. Mr. Fischer indicated that burning of waste was common practice with most of the landfills in the area at the time Site 1 was operational. It was his experience that only landfills located near the water table (within the New River Valley) generated landfill gas. The water table is below the interpreted bottom of the Site 1 landfill. Site 1 is located in a limited access area on the northern portion of the base. There are no structures within one-half mile of the site where landfill gases could collect and there are no regular base activities conducted within one mile of the site that might result in personnel exposure.

John P. Clinkenbeard; Associate Engineering Geologist	
Comment	**Response**
4. The EE/CA indicates that in Alternative 1, the multi-layer cap, the cap surface will have a minimum slope of 3 percent but that in Alternative 2, the monolithic cap, the cap surface would have a minimum slope of only 1 percent. What is the reason for this variation? One of the goals of capping the landfill is to convey water off of the cap and to prevent ponding and a slope of 3 to 5 percent is generally used to accomplish this goal.	The monolithic cap uses soil to absorb rainfall and prevent deep percolation below the evaporative zone. Conveyance of water off the landfill surface is not an objective in this case. A slope of one percent was used for the monolithic cap to prevent ponding which might result in local over saturation of the cap.
5. The cost estimates for Alternatives 1 and 2 indicate that Alternative 2 (the monolithic cap) is approximately $1,000,000 less expensive that Alternative 1 (the multi-layer cap) The cost estimates provided lack of detail and seem to be high compared to cost estimates for similar closure activities at landfills in the region. A summary of closure cost estimates for landfills in the region is included as Attachment 1. These estimates were taken from closure plans submitted to the CIWMB by owner/operators for facilities in the region. Some of these plans are approved, and some are under review. A review of the data indicates that the cost ($27,188 to $81,690 per acre) for a clay cap similar to the multi-layer cap proposed in Alternative 1 appears to be significantly less than the proposed cost (approximately $334,909 per acre) for Alternative 1 or the proposed cost (approximately $151,454 per acre) of Alternative 2. If the relative costs of Alternatives 1 and 2 are to be considered in selecting the Alternative to be implemented, then a more realistic estimate of the costs for each alternative should be developed.	Site 1 is currently depressed approximately four feet below the surrounding grade. The removal action alternatives evaluated for the site include filling of this depression to the surrounding grade in addition to cap construction. Transport, placement, and compaction of this additional fill material may account for the greater cost of the Site 1 alternatives as compared to those listed in the referenced table provided by the California Integrated Waste Management Board (attached). In any case, the cost estimates provided in the Engineering Evaluation/Cost Analysis are intended to be used only for comparative purposes in evaluating the alternatives. With this purpose in mind, it is only necessary that the cost estimates for each alternative be developed using the same methodology. The cost estimates presented for the Site 1 landfill caps were developed using the Remedial Action Cost Engineering Requirements (RACER) model developed specifically for this purpose by the US Air Force.

Responses to
DTSC Comments on the
Draft for Public Review Action Memorandums for Non-Time-Critical Removal Actions at Site 1- Magazine Road Landfill, Site 3- Sludge Burial Area, and Site 8- Scrap Yard
Naval Air Facility
El Centro, California
CTO-0090

Barbara Renzi; Associate Toxicologist- DTSC	
Comment	**Response**
Scope of Risk Assessment and Review, Paragraph 1; The human health risk assessments presented for Sites 1, 3, and 8 are screening level evaluations which utilize the U.S. EPA Region IX Preliminary Remediation Goals (PRGs) for the residential exposure scenario. Ecological assessments, reportedly attached to the EE/CA reports, were not initially provided to HERD for review and will be reviewed in separate memorandum. Although space within the text was reserved, many figures and tables referenced were not provided with the working drafts, particularly in the Site 1 EE/CA report. Therefore, HERD referred to data presented in the 1993 Site investigation reports, and presumes no additional data were available.	The Action Memorandum and Engineering Evaluation Cost Analysis documents provided to DTSC in June 1996 were courtesy copies provided so that DTSC could review the changes made following their review of the draft documents submitted in November and December of 1995. Only those portions of these documents modified to address DTSC comments were submitted in June 1996. Complete versions of the Draft Action Memorandum and Engineering Evaluation/Cost Analysis for Public Review were submitted to DTSC on or about August 10 and September 4, 1996. These documents contained all referenced figures, tables and the Ecological Scoping Assessment.
Scope of Risk Assessment and Review, Paragraph 2; Risk assessments for Sites 1, 3, and 8 were limited to site soils; contaminated groundwater was excluded from the evaluation of risks associated with the sites. Therefore, the screening evaluation may underestimate total risk associated with each site. HERD recommends that risk associated with groundwater be evaluated and reported.	The removal action at Sites 1, 3, and 8 are intended to address soil contamination only. Groundwater at these sites has not yet been fully characterized. Therefore, the screening evaluations were only performed for the soil. Assessment of risk associated with potential groundwater contamination will be addressed by future actions. Currently, a basewide quarterly groundwater monitoring program intended to further characterize groundwater conditions at the base is in progress.
Scope of Risk Assessment and Review, Paragraph 3; The human health risk screening calculations are presented in Section 2.8.2.5 of the Site 1 EE/CA, Section 2.10.1 of the Site 3 EE/CA , and Section 2.10.1 of the Site 8 EE/CA. (continued on following page)	DON has decided to perform a non-time-critical removal action at Sites 1, 3, and 8 based on data collected during the Solid Wastewater Quality Assessment Tests and Site Investigations. Within this decision framework, the US EPA Region IX Preliminary Remediation Goals were

Barbara Renzi; Associate Toxicologist- DTSC	
Comment	**Response**
(continued from previous page) HERD does accept conditional use of the U.S. EPA Region IX PRGs for screening sites at open military facilities such as NAF EC. However, HERD continues to recommend that the Preliminary Endangerment Assessment Guidance Manual (PEA Manual; DTSC, January 1994) be used to screen sites for "no further action." Therefore, the statement in the EE/CA reports that "Cal/EPA has adopted the U.S. EPA Region IX PRGs as screening concentrations...." is not entirely correct and should not be applied to all contaminated sites. HERD did not receive a protocol specifying how the PRGs would be used prior to the submittal of the EE/CA reports.	used to identify chemicals of concern and to establish cleanup levels for the removal actions. They were not used to screen the sites for "no further action," since a removal action was already planned for the site. The referenced statement in the Engineering Evaluation/Cost Analyses was intended to indicate that The Preliminary Remediation Goals published by US EPA Region IX in September 1995 were used for screening assessments rather that the Preliminary Endangerment Assessment (PEA) screening levels included in PEA Guidance prior to 1994. The text within the Final Engineering Evaluation/Cost Analyses will be modified to more effectively convey this intent.
Scope of Risk Assessment and Review, Paragraph 4; HERD acceptance of human health risk assessments utilizing U.S. EPA Region IX PRGs is limited to screening sites for further action. Sites which fail this screening process require further investigation (e.g., refinement of risk estimates, further characterization, etc.) Furthermore, as stated by U.S. EPA Region IX in the disclaimer for the PRGs, "PRGs do not consider impact to groundwater or address ecological concerns. PRGs are specifically not intended as a stand-alone decision-making tool, (2) as a substitute for EPA guidance for preparing baseline risk assessments, or (3) a rule to determine if waste is hazardous under RCRA" (Region IX Preliminary Remediation Goals (PRGs) Second Half 1995), Stanford Smucker, Technical Support Section, U.S. EPA Region IX, September 1, 1995). Risk-based preliminary remediation goals are intended to be used as "long-term targets...during analysis and selection of remedial alternatives" (Risk Assessment Guidance for Superfund: Volume I. Part B; Development of Risk-Based Preliminary Remediation Goals, U.S. EPA, October 1991). Therefore, HERD does not endorse the use of PRGs as cleanup levels.	The recommended removal actions at Sites 3 and 8 involve excavation of soil at the site within the potentially impacted area. The residual risk of the chemicals of concern following the removal actions will not exceed the risk represented by the Preliminary Remediation Goals or background concentrations, which ever is greater. The recommended removal action for Site 1 involves containment of the wastes in place, the US EPA presumptive remedy for landfills. This remedy presumes that there are contaminants present which pose a risk; however, this risk is mitigated by isolating the contaminants from potential receptors. Therefore, complete assessment of risk is not necessary. Based on the anticipated future use of Sites 3 and 8 (i.e., active military facility), DON believes that the use of the US EPA Region IX Preliminary Remediation Goals for residential soils as cleanup goals is reasonable since the exposure scenario represented by these goals is likely more conservative than the anticipated exposure scenario. Thus, cleanup levels established using the anticipated exposure scenario would likely be higher than the US EPA Region IX Preliminary Remediation Goals for residential soils.

Barbara Renzi; Associate Toxicologist- DTSC	
Comment	**Response**
Site Characterization The EE/CA reports state that the evaluations were based on preliminary site investigation data [emphasis added]. Apparently, further investigation of these sites indicated by the Navy in its response to HERD comments (August 31, 1995, letter from David Dawson, to Tizta Bekle) was not conducted. The EE/CA reports for Sites 1, 3, and 8 state (p. 1-1, each report), "A complete site characterization, which defined the nature, extent and background concentrations of contaminants at the site, has not been performed." Therefore, because the sites have not been fully characterized, and because the sites fail the PRG screening human health risk assessment, HERD reiterates its recommendations (March 21, 1995 and November 1, 1995 memoranda) for further characterization of the sites.	Further site characterization of Sites 3 and 8 will be performed as part of the recommended removal actions. Please see Section 4.1.2 of each Engineering Evaluation/Cost Analysis. Further characterization of Site 1 is not necessary to implement the recommended removal action. The recommended removal action for Site 1 is containment of the landfill waste in place. This recommendation is consistent with the U.S. EPA Presumptive Remedy for CERCLA Municipal Landfills sites. This remedy presumes that the landfill contains contaminants that pose a threat to human health and the environment, and that mitigation of these risks is most appropriately achieved by isolating the landfill materials from potential receptors. To implement this remedy, it is not necessary to assess the nature of, and the risk posed by the contaminants within the landfill boundaries. It is only necessary to know the location of the landfill boundaries.
Background Concentration of Inorganics, Paragraph 1; Background concentrations of inorganic chemicals of concern (metals) are determined during site investigations for several purposes. One purpose is to determine whether the human health risks and/or ecological risks associated with a chemical at a site maybe be attributed to background levels of the chemical. The background concentration of a chemical also may be used in development of remediation goals and evaluation of remedial action alternatives. If background concentrations of a chemical pose a significant risk, the remedial project manager may consider the risk separately.	Comment noted.
Background Concentration of Inorganics, Paragraph 2; HERD previously discussed and reviewed the determination of background concentrations of inorganics for the NAF EC (memoranda dated April 25, 1995 and June 7, 1995). HERD indicated that the 95th percentile values of normally distributed data extracted from pooled data graphically identified as background concentrations appeared reasonable, based on a brief review of the concentration data. (continued on following page)	The methodology used to determine background concentrations at NAF El Centro were discussed with DTSC in a meeting held on April 13, 1995. Subsequent to this meeting, DTSC provided additional recommendations for estimating background concentrations at NAF El Centro in a Draft Memorandum dated April 21, 1995.

Barbara Renzi; Associate Toxicologist- DTSC	
Comment	**Response**
(continued from previous page) HERD has further examined the cumulative probability plots of the extracted data for this review, and recommends that data for cadmium, chromium, copper, and silver be re-evaluated for determination of background (see additional discussion below). Also, due to the high percentage of "nondetect" data for mercury, antimony, selenium, and thallium, background concentrations for these chemicals were not determined. Since the previous review, HERD has developed guidelines for determining background concentrations, including methods for data sets with a high percentage of nondetect data (see attachment). For the purpose of risk assessment, it is desirable to minimize Type II error--a false negative by which concentrations of a metal are identified as being within the range of background conditions, and therefore excluding the metal as a chemical of concern, when the concentrations of the metal actually represent contamination. A Type I error--a false negative by which concentrations of a metal are identified as contamination when the concentrations are actually with the range of background would simply result in the inclusion of the chemical in the risk assessment whereby associated risks may be found to be insignificant or only slightly greater than ambient, which may then be addressed by risk management.	The background concentrations presented in the Engineering Evaluation/Cost Analysis were calculated according to these recommendations, which were acceptable to DTSC at the time. Therefore, DON does not believe it is appropriate to re-evaluate this issue.
Detection Limits, **Paragraph 1;** To evaluate the adequacy of analytical detection limits for use in the human health risk assessments, the EE/CA reports present comparisons of analytical detection limits achieved for soil samples with U.S. EPA Region IX PRGs for residential exposures. HERD emphasizes the detection limits meeting the human health based PRGs may not be adequate for ecological risk assessment. Ecological assessment may require additional evaluation of detection limits	An Ecological Scoping Assessment was performed at Sites 1, 3, and 8, as part of the Engineering Evaluation Cost Analyses to evaluate potential ecological receptors and potentially complete exposure pathways. Several potential ecological receptors and potentially complete exposure pathways were identified at each site. The Ecological Scoping Assessment for Sites 1 and 3 recommended that either additional evaluation be conducted or that remediation be performed to prevent occurrence of complete exposure pathways. The Ecological Scoping Assessment for Site 8 concluded that although potentially complete exposure pathways were identified at the site, significant exposure was unlikely due to sparse food source at the site. Since removal actions are planned for Sites 1, 3, and 8, DON does not believe that further evaluation of ecological risk or detection limits is appropriate.

Barbara Renzi; Associate Toxicologist- DTSC	
Comment	**Response**
Detection Limits, Paragraph 2; At Site 1, analytical detection limits for benzo(a)pyrene and dibenz(a,h)anthracene in soil were greater than their respective residential PRGs. Benzo(a)pyrene and dibenz(a,h)anthracene, as well as other PAHs, reasonably may be expected to be present in the area due to burning of landfill materials, and therefore should be quantitatively evaluated in the risk assessment at one half their respective detection limits. (The sentence on p:2-25 regarding PAHs at NAF EC is not applicable to this site and should be deleted.) For Site 1, HERD recommends that the following chemicals be evaluated in the risk assessment at one-half their respective detection limits in site soils if they have been detected in site ground water or at other nearby NAF EC sites: vinyl chloride and N-nitrodimethylamine, possible transformation products of landfill contaminants; and bis(2-chloro-ethyl)ether, a fumigant possible associated with agricultural use in adjacent areas, and a possible landfill contaminant resulting from disposal.	The recommended removal action for Site 1 is containment of the landfill waste in place. This recommendation is consistent with the U.S. EPA Presumptive Remedy for CERCLA Municipal Landfill sites. This remedy presumes that the landfill contains contaminants that pose a threat to human health and the environment, and that mitigation of these risks is most appropriately achieved by isolating them from potential receptors. To implement this remedy, it is not necessary to assess the nature of, and the risk posed by the contaminants within the landfill boundaries. It is only necessary to know the location of the landfill boundaries. The concentration units for Table 2-3 of the Engineering Evaluation/Cost Analysis are milligrams per kilogram. These units will be added to the table in the final documents.
Detection Limits, Paragraph 3; Although the screening human health risk estimate for PCBs at Site 8 will not be affected, HERD recommends that PCBs be evaluated at one-half their respective detection limits for the ecological assessment.	An Ecological Scoping Assessment was performed at Site 8 as part of the Engineering Evaluation/Cost Analysis to evaluate potential ecological receptors and potentially complete exposure pathways. Several potential ecological receptors and potentially complete exposure pathways were identified for Site 8. However, the Ecological Scoping Assessment concluded that although potentially complete exposure pathways were identified, significant exposure was unlikely due to sparse food source at the site. Since a removal action is planned for Site 8, DON does note believe that further evaluation of either ecological risk or detection limits is appropriate.

Barbara Renzi; Associate Toxicologist- DTSC	
Comment	**Response**
Site 1, Magazine Road Landfill, Paragraph 1; The EE/CA for Site 1 states, (p.i): "The available data are not adequate to assess the lateral extent of potential soil contamination, or to identify and characterize the extent of potential hot spot contamination within the fill materials. However, the existing information is sufficient for selection and design of the removal action alternatives because a presumptive remedy has been selected." and, "Available data are not sufficient to assess if groundwater at the site is impacted by the landfill. Evaluation of potential groundwater impacts at the site is beyond the scope of the proposed removal action. Installation and monitoring of additional groundwater monitoring wells is recommended to further assess the potential impact of the landfill on groundwater." Therefore, the recommendation by the Site 1 EE/CA report for the presumptive remedy, construction of a cap on the landfill , is made in lieu of complete site characterization, and apparently without consideration of all available information. Due to the reported routine burning of wastes in the preparation of the landfill, HERD previously recommended (March 21, 1995 memorandum) that Site 1 also be evaluated for PAHs, PCDDs, and CDFs. HERD also has concerns regarding the presence of PCBs, and chlorinated pesticides/herbicides at the site. HERD emphasizes that burning of landfill wastes likely resulted in the emission and surface deposition of contaminants and particular material, to which contaminants were sorbed, in areas outside the landfill footprint. Also, contamination was reported in the one location selected for background sampling at Site 1 (B-9/MW5); the Navy apparently has not yet determined the source of the contamination at that location. HERD recommends that the source of contamination be further investigated	As noted above under Detection Limits, Paragraph 2, it is not necessary to fully characterize Site 1 to select and implement the presumptive remedy. Characterization of soil outside the boundaries of the landfill for particulate contamination deposited as the result of waste burning is beyond the scope of this removal action. Further characterization of the area in the vicinity of boring B-9/MW5 was performed in April 1996 as part of a data gaps study. Petroleum hydrocarbons exceeding the laboratory detection limits and concentrations of metals exceeding the US EPA Region IX Preliminary Remediation Goals for residential soils were not observed in soil samples collected within five feet of B-9/MW5 during this investigation. These results indicate that the extent of chemicals of potential concern observed in the soil samples collected from soil boring B-9/MW5 is limited. to the one sample from boring B-9 at 3.5 feet below grade.

Barbara Renzi; Associate Toxicologist- DTSC	
Comment	**Response**
Site 1, Magazine Road Landfill, Paragraph 2; Although the landfill contents reportedly are not being further investigated due to the presumptive remedy, the areas around the landfill and downwind should be investigated for contamination (including, but not limited to PAHs, PCDDs/PCDFs, organochlorine pesticides and chlorinated herbicides, and metals, including hexavalent chromium), and included in the risk assessment (human health and ecological). The EE/CE statement on p.2-27 par.3) regarding the sufficiency of the data should be removed, or revised to clarify that the conclusion refers only to the selection of the presumptive remedy for the landfill (i.e., not a complete assessment of the risk, or an assessment of the area around the landfill).	Characterization of soil outside the boundaries of the landfill for particulate contaminants deposited as the result of waste burning is beyond the scope of this removal action. The intended meaning of the referenced statement on page 2-27 was that the quality of the data collected during the SWAT/SI was sufficient to perform risk screening for the purpose of this removal action. It was not intended to imply that there was a sufficient quantity of data to perform a complete risk assessment. To avoid confusion, the last sentence of Section 2.8.2.4 will be deleted in the final documents.
Site 1, Magazine Road Landfill, Paragraph 3; Landfill contents may become saturated at times due to rising shallow ground water influenced by local agricultural irrigation. The Site 1 EE/CA states (p.2-11), "....the potential for contaminants to migrate through the groundwater to adjacent cultivated field or off-base to irrigation ditches is high." Due to the lack of adequate characterization of landfill contents and potential migration of contaminants in groundwater, HERD concurs with the recommendation for installation and monitoring of additional groundwater monitoring wells along the perimeter of the landfill and in the larger areas around the landfill, and recommends consultation with the DTSC Geologic Support Unit. Although the water quality of the shallow aquifer reportedly is generally poor and has high concentrations of dissolved solids, the EE/CA report also states that the ground water in the vicinity of Site 1 is designated for beneficial use. Therefore, HERD recommends that the risks associated with domestic use of groundwater be evaluated. Other uses of site ground water (agricultural, industrial) should be qualitatively addressed.	Considerations related to characterization of groundwater and the assessment of risks associated with contaminants in the groundwater are beyond the scope of this Engineering Evaluation/Cost Analysis. These considerations will be addressed by future activities. Currently, a basewide quarterly groundwater monitoring program intended to further characterize groundwater conditions at the base is in progress.

Barbara Renzi; Associate Toxicologist- DTSC	
Comment	**Response**
Site 1, Magazine Road Landfill, Paragraph 4; HERD recommends that the NAF EC provide supporting documentation (e.g., adequately conducted soil vapor survey, and/or soil sampling and analysis with sufficiently sensitive detection limits) that no landfill gases or vapors are migrating laterally or upward from the landfill, soil or groundwater at the site (Section 3.2, p. 3-2). Vapor migration may be an important potential exposure pathway that should be addressed by the selected remedy if risks are determined to be significant. HERD reiterates the previous recommendation that nearby surface waters be further characterized with respect to potential contamination associated with NAF EC. (This is particularly important for assessing potential impacts to ecological receptors.)	Based on the results of previous investigations, correspondence with the Imperial County Air Pollution Control District, and land use in the vicinity of the site, DON does not believe that additional investigation at the site for landfill gas is warranted. Evidence of organic wastes or methane gas generation have not been observed during the previous investigations conducted at the site. Soil borings drilled during the Solid Waste Water Quality Assessment Test/Site Investigation did not encounter significant organic material and methane has not been detected in groundwater monitoring wells screened above the groundwater surface at the site. On August 7, 1996 a telephone conference was held between DTSC, DON, and Mr. Fisher of the Imperial County Air Pollution Control District, Mr. Fischer indicated that burning of waste was common practice with most of the landfills in the area at the time Site 1 was operational. It was his experience that only landfills located within the water table (within the New River Valley) generated landfill gas. The water table is below the interpreted bottom of the landfill at Site 1. In the unlikely event that landfill gases were generated from the Site 1 waste material, the potential impacts are limited. Site 1 is located in a limited access area on the northern portion of the base. There are no structures within one-half mile of the site where landfill gases could collect and there are no regular base activities conducted within one mile of the site that might result in personnel exposure. Characterization of surface water is beyond the scope of this Engineering Evaluation/Cost Analysis.
Site 3, Sludge Burial Area, **Paragraph 1;** Preliminary investigation of the site included collection of seven soil samples from six borings from the approximately 20 feet by 10 feet by 5 feet deep disposal pit. Although all samples were analyzed for metals, only two locations (one sample from each of two borings plus a duplicate for one of the samples for a total of three samples) were evaluated for volatile organics, semivolatile organics, and organochlorine pesticides and PCBs (continued on following page)	The wastes disposed at Site 3 (sludge from the waste water treatment facility) were placed in a confined area with discrete boundaries. Because of the origin of this waste, it is expected that the contaminants are uniformly distributed throughout the waste material. Therefore, it is anticipated that; 1) samples collected within the waste material will have relatively consistent characteristics (i.e., similar types and concentrations of contaminants) and 2) the characteristics of the samples collected within the waste material will be significantly different from the those collected outside of the waste material.

Barbara Renzi; Associate Toxicologist- DTSC	
Comment	**Response**
(continued from previous page) The nature and extent of contamination have not been fully characterized, and further characterization, as previously recommended by HERD, is not planned for the site prior to the proposed removal action. Therefore, HERD recommends that confirmation soil samples (the number and location approved by the DTSC project manager as adequate) be analyzed for total concentrations of metals (including hexavalent chromium), PCBs, and chlorinated pesticides; analysis should not be limited to chemicals identified as major contributors to risk as determined by the screening analysis.	The samples collected from soil borings B3 (i.e., EC3-B3-S4-D6.0) and B4 (i.e., EC3-B4-S2-D3.0) exhibit significantly different characteristics than samples collected from other soil borings. For example, petroleum hydrocarbons were only detected in these samples and concentrations of cadmium, chromium, copper, lead, and zinc are more than and order of magnitude greater in these samples. In addition, other constituents typical of sludge such as nitrate were elevated in these samples. Thus, it appears that these samples were collected from within the waste material and are representative of the waste characteristics. Because PCBs, chlorinated pesticides (except chlordane) and metals other than arsenic, cadmium, chromium (total and hexavalent) and lead were not detected in samples collected from the waste material (i.e., samples EC3-B3-S4-D6.0 and EC3-B4-S2-D3.0) at concentrations that pose a significant risk, DON does not believe it is reasonable to expect that these constituents will be present in the soil following excavation of the waste material. The additional analyses of confirmation samples requested are not appropriate for this removal action.
Site 8, Scrap Yard, **Paragraph 1;** Fourteen soil samples were collected from 10 trenches at the 500-by-190-foot site and analyzed for PCBs and organochlorine pesticides. Additional analysis of subsets of the samples included priority pollutant metals, volatile organic compounds, semivolatile organic compounds, and petroleum hydrocarbons. PCBs, DDE, toluene, methylene chloride, metals, and fuel hydrocarbons were detected. HERD recommends that the EE/CA report clarify whether toluene and methylene chloride have been confirmed as laboratory contaminants for these samples (i.e., these chemicals were measured at concentrations less than ten times the concentrations measured in quality control samples-field and/or laboratory blanks--for that batch of samples). (continued on following page)	Methylene chloride and toluene have not been confirmed as laboratory contaminants based on the cited criteria. However, based on the volatility of these chemicals, the high ambient temperatures typical of the Imperial Valley, and the depth at which samples were collected (0.2 to 0.4 feet) it is unlikely that methylene chloride and toluene were present in the soil samples. Confirmation samples will be analyzed for the additional analytes (except asbestos) as requested. Because asbestos is not mobile in soil, the vertical extent of asbestos at the site, if present, is likely limited to within the upper few inches of soil. The recommended removal action will remove at least the upper six inches of soil and any associated asbestos.

Barbara Renzi; Associate Toxicologist- DTSC	
Comment	**Response**
(Continued from previous page) Further characterization, as previously recommended by HERD, is not planned for the site prior to the proposed removal action. Therefore, HERD recommends that confirmation soil samples (the number and location as approved by the DTSC project manager as adequate) be analyzed for total concentrations of metals (including hexavalent chromium), PCBs, and chlorinated pesticides; analysis should not be limited to chemicals identified as major contributors to risk as determined by the screening analysis. Also, HERD recommends that confirmation sampling include analysis for asbestos.	
Risk Calculations **Paragraph 1;** Using the Region IX PRGs, estimated cancer risk and non-cancer risk (hazard) appeared to be correctly calculated and total risks were reported. However, not all detected chemicals of potential concern (COCs) were included in the calculation of risk. The EE/CA reports do not provide reasons for the exclusions. PCBs and PAHs were not included for Site 1, and DDE was excluded for Site 8. Therefore, screening values for total risk were underestimated. Non-cancer risk was not evaluated for some carcinogenic COCs (e.g., chromium, PCBs, chlordane). HERD recommends that the EE/CA risk screening evaluations be revised to include all the chemicals of concern detected at the sites, and include non-cancer risk for all carcinogens. (HERD recognizes that the U.S. EPA Region IX PRG table may not include values based on non-cancer risk for some carcinogens. Future screening risk assessments for other NAF EC sites should include, as a minimum, evaluation of noncancer risk for carcinogens which have a ca* or ca** designation in the PRG table). The EE/CA appropriately used the DTSC screening value of 130 mg/kg for lead in soil for human health risk. As recommended above, all detected (and reasonably expected to be present) chemicals of concern should be included in the analysis of confirmation samples	PCB and PAHs were not included in the in the risk screening calculations for Site 1 for the following reasons. 1) PCBs were not detected in any samples collected and analyzed using EPA Method 8080. 2) PAHs were only detected in samples collected from soil boring B-9 located outside the boundaries of the landfill. DDE was not included in the risk screening calculations because the highest detected concentration of DDE was more than an order of magnitude less than the US EPA Region IX Preliminary Remediation Goal residential soil. Inclusion of DDE with a carcinogen risk of approximately $1x10^{-8}$ in the risk screening of approximately $1x10^{-3}$ would not significantly change the total site risk calculation. Table 2-5 in Engineering Evaluation/Cost Analysis for Sites 1, 3, and 8 will be revised to include carcinogens listed in Table 2-4 for which there is a noncarcinogenic US EPA Preliminary Remediation Goal for residential soil.

Barbara Renzi; Associate Toxicologist- DTSC	
Comment	**Response**
Risk Calculations, **Paragraph 2;** HERD commends the NAF EC for the clear tabular presentation and comparison of total risk and incremental risk--the above background risk attributed to site contamination. The Site 1 EE/CA concluded (Section 2.9) that soil concentrations of chromium (assumed to be hexavalent chromium), arsenic and lead exceed their respective screening values (beryllium was present at concentrations determined to be below background). The Site 3 EE/CA concluded that soil concentrations of chromium (assumed to be hexavalent chromium), arsenic, chlordane, and lead exceed their respective screening values (beryllium was present at concentrations determined to be below background). The Site 8 EE/CA concluded that soil concentrations of chromium (assumed to be hexavalent chromium), arsenic, cadmium, PCBs, and lead exceed their respective screening values (beryllium was present at concentrations determined to be below background). In addition to those COCs which exceeded their respective screening values, it is important to note that other COCs which did not exceed their respective screening values contribute significantly to total risk and/or hazard at the sites: arsenic and thallium (noncancer risk) at Sites 1 and 8; cadmium (cancer risk), and arsenic, copper and cadmium (noncancer risk) at Site 3.	Comment Noted
Proposed Remedial Action Alternatives, **Paragraph 1;** The landfill cap and institutional controls proposed for Site 1 will prevent direct contact by potential human receptors with landfill contents. However, the remedy does not address potential vapor migration, groundwater contamination, or contamination outside the landfill footprint. HERD strongly recommends that the Site 1 EE/CA clearly define and describe the "inert" soils from Sites 3 and 8 that are proposed to be used as cover at Site 1. If those translocated soils are placed within the top several feet of the final cover, then the risks associated with chemicals of concern in those soils should be reported. Asbestos which may become airborne is a particular concern which should be addressed. Excavated soils which are not classified as regulated hazardous waste may still present a significant risk.	Please see response to Site 1, Magazine Road Landfill, Paragraph 1. Section 4 of the Engineering Evaluation/Cost Analysis documents for Sites 3 and 8 contains a decision flow diagram for determining if soil excavated from each site is inert. This decision flow diagram was developed in cooperation with DTSC and the Regional Water Quality Control Board, Colorado River Region. The soil transported from Sites 3 and 8 will be used as base material in the landfill cap at Site 1.

Barbara Renzi; Associate Toxicologist- DTSC	
Comment	**Response**
Proposed Remedial Action Alternatives, **Paragraph 2;** Excavation of contaminated soils and backfilling of the excavated areas with imported clean fill is the remedial action alternative recommended by the EE/CA reports for Site 3 (excavation to a depth of approximately 8 feet) and Site 8 (excavation to a depth of approximately 6 inches). Cleanup levels for risk drivers, as identified by the human health screening assessment, are based on either background concentration or the U.S. EPA Region IX PRG for residential exposures (see discussion above regarding misapplication of PRGs). As recommended above, confirmation sampling should include all previously detected COCs, and those COCs which reasonably may be expected to be or to have been present at the site. HERD cautions that cleanup levels based solely on U.S. EPA Region IX PRGs for human health may not be adequately protective of ecological receptors. (The adequacy of the ecological assessments conducted for the sites will be reviewed by HERD separately from the human health risk assessment).	Comment noted.
Proposed Remedial Action Alternatives, **Paragraph 3;** <u>None of the remedial action alternatives recommended by the EE/CA reports address ground water and potential risks associated with exposures to groundwater or to volatile contaminants migrating from ground water.</u>	Comment noted.

Responses to
DTSC Comments on the
Draft for Public Review Action Memorandums for Non-Time-Critical Removal Actions at Site 1- Magazine Road Landfill, Site 3- Sludge Burial Area, and Site 8- Scrap Yard
Naval Air Facility
El Centro, California
CTO-0090

Issac Hirbawi; Remedial Project Manager- DTSC	
Comment	Response
Comment 1); The removal actions for Site 1 (Magazine Road Landfill) and Site 8 (Scrap Yard) are subject to and must comply with all requirements of the H&SC, Chapter 6 8, Sections 25323.1 and 25356.1(h)(1). Under the California H&SC, a Removal Action Workplan (RAW) (or an equivalent document) is required for a removal action estimated to cost less than $1.0 million. The removal action for Site 3 (Sludge Burial Area) is subject to and must comply with all the requirements of the H&SC, Chapter 6.8, Sections 25323.1. Under the California H&SC, a Removal Action Plan (RAP) is required for a removal action estimated to cost more than $1.0 million. In addition, these removal actions should be conducted in accordance with Title 40, Code of Federal Regulations (CFR), Section 300.415(b)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Please revise the Engineering Evaluation/Cost Analysis (EE/CAs) and Action Memorandum (AMs) accordingly.	The Engineering Evaluation/Cost Analyses and Action Memoranda were developed in accordance with guidance developed by the Department of Navy (DON) and the Department of Toxic Substances Control (DTSC). As stated in Section 1, Introduction, of both the Action Memorandum and Engineering Evaluation/Cost Analysis for each site, these documents have been prepared to meet the requirements of a Remedial Action Workplan or a Remedial Action Plan, as appropriate. DON believes that these documents contain the required information and that no modifications are necessary
Comment 2); On July 24, 1996, the Department faxed the Navy information regarding institutional controls. The Department requested information on how the institutional controls of restricting access or limiting use of Site 1 will be documented. The Navy's response was that "land use restrictions are beyond the scope of these EE/CAs." The Department is requesting to include the following language in the EE/CAs and AMs: "The proposed removal action for Site 1 is an interim action. The Navy will submit a separate document that describes the final remedy for Site 1. The final remedy will address groundwater contamination, verification of the lateral extent of contamination, and institutional controls if hazardous wastes or substances are left in place."	The requested language will be added to the final documents as modified below: "The proposed removal action for Site 1 is an interim action DON will submit a separate document that describes the final remedy for Site 1. The final remedy will address groundwater contamination (if present) and institutional controls if hazardous wastes or substances are left in place."

Issac Hirbawi; Remedial Project Manager- DTSC	
Comment	Response
Comment 3); APPLICABLE AND RELEVANT AND APPROPRIATE REQUIREMENTS-SECTION 1.7-CALIFORNIA ENVIRONMENTAL QUALITY ACT The Department submitted comments regarding "CEQA being a State ARAR" on April 16, 1996 (EE/CA comments) and on May 28, 1996 (AM comments). The Navy's response to our comments was received on July 31, 1996. The Navy is still insisting that CEQA is not an ARAR. If the Navy does not want to recognize CEQA as a State ARAR, then this paragraph should be revised as follows: "The Navy and DTSC have differences in opinion with respect to CEQA applicability to Navy response actions. DTSC has the responsibility to comply with CEQA when exercising discretionary decision authority to approve removal actions under H&SC, Chapter 6.8. As such, CEQA compliance is a State action that should be identified for these removal actions. The Navy chooses not to accept the CEQA as an ARAR" Please revise these documents accordingly.	DON does not believe the requested language is appropriate for inclusion in the Engineering Evaluation/Cost Analyses.
Comment 4); Implementation of field activities are contingent on the availability of funds for the removal actions. If funding problems occur (partial funding) during the removal actions period, please discuss how this would impact the other removal actions since they are scheduled within the same time frame.	Discussion of contingencies for conditions arising out of hypothetical funding scenarios is beyond the scope of an Engineering Evaluation/Cost Analysis.
Comment 5); The permanent population of NAF El Centro consists of approximately 600 officers, enlisted personnel, and civilians. For purposes of health and safety of base personnel, please clarify how many are civilian workers; if there are any base housing, schools or day care centers, and what is the transient population. Please include the approximate distance of these receptors to the removal action sites.	Sites 1, 3, and 8 are located in a restricted area approximately one mile from base residential areas, offices, and schools. A health and safety plan designed to protect base personnel and workers will be developed prior to removal action implementation. In addition, protection of the community and workers during implementation of the removal action are considerations discussed under short-term effectiveness in Section 4 of each Engineering Evaluation/Cost Analysis document.

Issac Hirbawi; Remedial Project Manager- DTSC	
Comment	Response
Comment 6); For Site 1 - Magazine Road Landfill, the EE/CA/Action Memorandum identifies the landfill waste as comprising of approximately 60 percent of household rubbish (i.e., municipal waste), with the remainder comprising industrial wastes. Spent cartridges were identified as being disposed at the landfill. For purposes of unexploded ordnance, please provide information on the types (grenades, bombs,.....) and quantities of any cartridges that were disposed of without actually being spent. Is there a procedure that eliminated the disposal of any live ammunition?	There are no available records which provide more explicit detail on ordnance disposal at Site 1. The waste disposal practices cited in the Engineering Evaluation/Cost Analysis were referenced from the Preliminary Assessment/Site Inspection performed at the site in 1987 (NEESA 1987). The information contained in these documents was obtained from available base documents and personnel interviews. The recommended removal action for Site 1 involves containment of the waste in place. This action will not require subsurface disruption of the landfill that would result in encounters with ordnance, if present.
Comment 7); Additional information is requested to support the Navy's decision that the Site 1 landfill is not producing landfill gas. Based on limited data collected during the Solid Waste Assessment Test/Site Investigation (SWAT/SI), the lateral extent, identification and characterization of potential soil contamination were not adequately assessed. The Navy concluded that Site 1 fill materials are unlikely to produce landfill gas without any real data. It is important to determine the level of methane being generated, because once the cap is installed any methane production will be trapped and can create an explosion. The department is recommending that a test be done for methane generation to support your decision.	Based on the results of previous investigations, correspondence with the Imperial County Air Pollution Control District, and land use in the vicinity of the site, DON does not believe that additional investigation at the site for landfill gas is warranted. Evidence of organic wastes or methane gas generation have not been observed during the previous investigations conducted at the site. Soil borings drilled during the Solid Waste Water Quality Assessment Test/Site Investigation did not encounter significant organic material. During the April 1996 groundwater sampling event, existing groundwater monitoring wells with screens extending above the groundwater surface were screened with an organic vapor analyzer capable of detecting methane. No organic vapors were detected in the wells. On August 7, 1996 a telephone conference was held between the Department of Toxic Substances Control (DTSC), DON, and Mr. Fisher of the Imperial County Air Pollution Control District. Mr. Fischer indicated that burning of waste was common practice with most of the landfills in the area at the time Site 1 was operational. It was his experience that only landfills located near the water table (within the New River Valley) generated landfill gas. The water table is below the interpreted bottom of the landfill at Site 1. (continued on following page)

Issac Hirbawi; Remedial Project Manager- DTSC	
Comment	Response
	(continued from previous page) In the unlikely event that landfill gases were generated from the Site 1 waste material, the potential impacts are limited. Site 1 is located in a limited access area on the northern portion of the base. There are no structures within one-half mile of the site where landfill gases could collect and there are no regular base activities conducted within one mile of the site that might result in personnel exposure. The recommended removal action for Site 1 is a permeable monolithic cap. Unlike multiple layer caps which include an impermeable layer, landfill gas will not build up beneath the monolithic cap. Concerning the lateral extent of the landfill, historic aerial photographs indicate that the landfill occupies a former borrow pit. The lateral extent of the landfill is limited by the boundaries of this pit which are currently manifested as a surface depression. Interviews with base personnel support this observation.
Comment 8); The Department previously requested information on the source of the backfill that will be used. The determination of where the imported fill will come from have not been made to this point. It is important to know which areas of the base will this soil be borrowed or if it will come from an outside source. Are there any procedures the base has in place to ensure that the source is clean? Please provide this information in the revised document.	With the exception of inert material from Sites 3 and 8, the source of the fill has not been identified. Identification and evaluation of borrow sources is beyond the scope of these Engineering Evaluation/Cost Analyses. This issue will be addressed in the pre-implementation workplan.
Comment 9); In addition to the technical requirements, removal actions, such as Site 3, that cost $1.0 million or greater must also meet public notification requirements. This includes but is not limited to the public meeting requirements of H&SC 25356.1(e)(3). Please specify the public notification activities for the removal actions in the appropriate sections of the EE/CA and AM.	As indicated in the Section 1 of both the Engineering Evaluation/Cost Analyses and the Action Memoranda, DON intends to comply with the requirements of Chapter 6.8, California Health and Safety Code. This includes placing the documents into an informantion repository, establishing a point of contact and notifying the public via the local newspaper. A public meting may be scheduled at the discretion of the DTSC.

ATTACHMENT B

ADMINISTRATIVE RECORD INDEX

NAF EL CENTRO ADMINISTRATIVE RECORD FILE INDEX

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N60042 000152 LTR 000000000000000 0005	12/08/94 00125 01.1	SOUTHWEST DIVISION S. TOWER CRWQCB PALM DESERT R. DIMENSTEIN	FUEL FARM CLEANUP PLAN IN ACCORDANCE WITH CLEANUP & ABATEMENT ORDER NO. 90-045 OF NOVEMBER 1, 1990 NAF EL CENTRO	ADMIN RECORD	C/A ORDER	FUEL FARM 14,15	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000298 MISC 00000000000000 0002	02/10/95 01/01/01 00000 10.6	NAF EL CENTRO DISTRIBUTION	FACT SHEET NO. 2 ON THE NAF EL CENTRO REMOVAL ACTION PROGRAM (WRITTEN IN ENGLISH ONLY)	ADMIN RECORD INFO REPOSITORY	REMOVAL	B-157 B-165 B-361 B-362 B-484 B-565	SOUTHWEST DIVISION BRAWLEY LIBRARY NAF EL CENTRO EL CENTRO LIBRARY
N60042 000299 MISC 00000000000000 0002	02/10/95 01/01/01 00000 10.6	NAF EL CENTRO DISTRIBUTION	FACT SHEET NO. 3 ON THE NAF EL CENTRO REMOVAL ACTION PROGRAM (WRITTEN IN ENGLISH AND SPANISH)	ADMIN RECORD INFO REPOSITORY	MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,10 11,14,15, 16,17	SOUTHWEST DIVISION BRAWLEY LIBRARY EL CENTRO LIBRARY NAF EL CENTRO
N60042 000300 MISC 00000000000000 0004	02/10/95 01/01/01 00000 10.6	NAF EL CENTRO DISTRIBUTION	BROCHURE ON THE NAF EL CENTRO INSTALLATION RESTORATION PROGRAM (WRITTEN IN ENGLISH ONLY)	ADMIN RECORD INFO REPOSITORY	MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5 6,7,8,9,10 11,12,13 14,15,16 17	SOUTHWEST DIVISION BRAWLEY LIBRARY NAF EL CENTRO EL CENTRO LIBRARY
N60042 000047 RPT NEESA 13-106 0300	12/06/94 09/01/87 00000 01.3	NEESA PORT HUENEME SOUTHWEST DIVISION	NAF EL CENTRO PRELIMINARY ASSESSMENT SITE INSPECTION	ADMIN RECORD	PA SI MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,10 11,12,13, 14,15,16	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000011 RPT N6871188D5053 0250	12/05/94 02/27/90 00000 01.1	ERC CO. SOUTHWEST DIVISION	NAF EL CENTRO FINAL DRAFT SOLID WASTE QUAILTY ASSESSMENT TEST (SWAT) PROPOSAL SITE 1, MAGAZINE ROAD LANDFILL INSTALLATION RESTORATION STUDIES	ADMIN RECORD	SWAT MAG RD LANDFILL	1	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000014 RPT N871188D5053 0125	12/06/94 02/27/90 00000 01.1	ERCE SOUTHWEST DIVISION	NAF EL CENTRO HYDROGEOLOGICAL ASSESSMENT REPORT (HAR) FINAL DRAFT SITE 10 SEWAGE STABILIZTION PONDS INSTALLATION RESTORATION STUDIES (FINAL)	ADMIN RECORD	HAR	10	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000015 RPT N871188D5053 0125	12/06/94 02/27/90 00000 01.1	ERCE SOUTHWEST DIVISION	NAF EL CENTRO SOLID WASTE WATER QUALITY ASSESSMENT TEST (SWAT) PROPOSAL SITE 3 SLUDGE DISPOSAL AREA INSTALLATION RESTORATION STUDIES (FINAL)	ADMIN RECORD	SWAT DISPOSAL SLUDGE WATER SLUDGE BUR AREA	3	SOUTHWEST DIVISION NAF EL CENTRO

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N60042 000037 RPT N6871188D5053 0175	12/06/94 02/27/90 00000 01.1	ERC ENVIRONMENTAL SOUTHWEST DIVISION	NAF EL CENTRO FINAL DRAFT SOLID WASTE WATER QUALITY ASSESSMENT TEST (SWAT) PROPOSAL SITE 2, PATROL ROAD LANDFILL INSTALLATION RESTORATION STUDIES	ADMIN RECORD	SWAT LF IRP WATER DISPOSAL MW GW	2	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000051 PLAN N871188D5053 0250	12/07/94 02/27/90 00000 01.2	ERC ENVIRONMENTAL SOUTHWEST DIVISION	NAF EL CENTRO FINAL DRAFT SITE INSPECTION (SI) WORK PLAN INSTALLATION RESTORATION STUDIES	ADMIN RECORD INFO REPOSITORY	SI MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD DISPOSAL MW MONITORING WELLS	1,2,3,4,5, 6,7,8,9, 10,11,14 15,16,17	SOUTHWEST DIVISION BRAWLEY LIBRARY NAF EL CENTRO EL CENTRO LIBRARY
N60042 000262 PLAN N871188D5053 0325	12/28/94 02/27/90 DO 01 01.2	ERC ENVIRONMENTAL SOUTHWEST DIVISION	FINAL HEALTH AND SAFETY PLAN ENGINEERING SERVICES FOR SI FOR NAF EL CENTRO	ADMIN RECORD	H&SP MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,10 11,14,15, 16,17	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000010 PLAN N6871188D5053 0150	12/05/94 03/12/90 00000 01.4	ERC CO. SOUTHWEST DIVISION	NAF EL CENTRO FINAL QUALITY CONTROL PLAN ENGINEERING SERVICES FOR THE SITE INVESTIGATION	ADMIN RECORD	QC SI MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,10 11,14,15 16,17	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000337 MEMO 000000000000000 0003	09/12/95 07/01/90 00000 01.6	SOUTHWEST DIVISION FILE	POINT PAPER ON EL CENTRO'S IRP FOR THE EVALUATION AND CLEAN UP OF SITES	ADMIN RECORD	IRP MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 7,8,9,10, 11,14,15, 16,17	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000154 LTR 000000000000000 0005	12/08/94 11/01/90 00125 07.0	CRWQCB PALM DESERT P. GRUENBERG NAF EL CENTRO C. GUDMUNSON	CLEANUP AND ABATEMENT ORDER NO. 90-045 REGARDING FUEL FARM AT NAF EL CENTRO CONCERNING CONTAMINATION OF SOIL AND GROUNDWATER BY DIESEL FUEL	ADMIN RECORD	C/A ORDER GW FUEL	FUEL FARM	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY
N60042 000175 LTR 000000000000000 0001	12/09/94 11/07/90 00024 06.0	CRWQCB PALM DESERT P. GRUENBERG EPA SAN FRANCISCO C.J. DOUGLAS	FEDERAL FACILITY PRELIMINARY ASSESSMENT REVIEW FOR NAF EL CENTRO COMMENTS (EPA ID #CA6170090017)	ADMIN RECORD	FFA COMMENTS	10	SOUTHWEST DIVISION NAF EL CENTRO

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N60042 000163 LTR 000000000000000 0001	12/09/94 12/20/90 00125 06.0	CRWQCB PALM DESERT P. GRUENBERG NAF EL CENTRO C. GUDMUNSON	EXTENSION REQUEST FOR CLEANUP & ABATEMENT ORDER NO. 90-045 (FUEL FARM) TANKS 605,606,607,608 AND FUEL TANK NEAR BLDG NO.533 NAF EL CENTRO	ADMIN RECORD	C/A ORDER	FUEL FARM B-533	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY
N60042 000054 RPT N871188D5053 0085	12/07/94 01/01/91 00000 03.3	ERC ENVIRONMENTAL SOUTHWEST DIVISION	NAF EL CENTRO FINAL HYDROGEOLOGICAL ASSESSMENT REPORT (HAR) WORKPLAN SITE 17 FIRE FIGHTING TRAINING AREA INSTALLATION RESTORATION STUDIES	ADMIN RECORD	HAR WATER GW	17	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000157 LTR 000000000000000 0001	12/08/94 01/28/91 00125 01.6	CRWQCB PALM DESERT P. GRUENBERG NAF EL CENTRO C. GUDMUNSON	EXTENSION REQUESTED IN LTR OF DEC. 14, 1990 FOR WORK TO BE PERFORMED UNDER CLEANUP AND ABATEMENT ORDER NO. 90-045	ADMIN RECORD	C/A ORDER		SOUTHWEST DIVISION NAF EL CENTRO
N60042 000258 RPT N871188D5053 0275	12/28/94 03/07/91 DO 02 01.4	ERCE J.C. HERWIG SOUTHWEST DIVISION	FINAL REPORT SITE INVESTIGATION MILCON P-205 TANK FARM SOIL TESTING NAF EL CENTRO	ADMIN RECORD	SI	TANK FARM	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000033 RPT N6871188D5053 0150	12/06/94 03/27/91 00000 01.1	ERC ENVIRONMENTAL SOUTHWEST DIVISION	NAF EL CENTRO FINAL DRAFT SOLID WASTE WASTE QUALITY ASSESSMENT TEXT (SWAT) PROPOSAL SITE 3, SLUDGE DISPOSAL AREA INSTALLATION RESTORATION STUDIES	ADMIN RECORD INFO REPOSITORY	SWAT DISPOSAL SLUDGE SLUDGE BUR AREA MW MONITORING WELLS WATER	3	SOUTHWEST DIVISION BRAWLEY LIBRARY EL CENTRO LIBRARY NAF EL CENTRO
N60042 000036 RPT N6871188D5053 0250	12/06/94 03/27/91 00000 01.1	ERC ENVIRONMENTAL SOUTHWEST DIVISION	NAF EL CENTRO FINAL SOLID WASTE WATER QUALITY ASSESSMENT TEST (SWAT) PROPOSAL SITE 1, MAGAZINE ROAD LANDFILL INSTALLATION RESTORATION STUDIES	ADMIN RECORD	SWAT MAG RD LANDFILL LF WATER DISPOSAL GW	1	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000166 LTR 000000000000000 0004	12/09/94 05/02/91 00125 01.1	JACOBS ENGINEERING G. DOYLE SOUTHWEST DIVISION R. PARDY	SITE ASSESSMENT AT NAF EL CENTRO EXPLORATORY BORINGS AND MONITORING WELLS OBTAIN ADDITIONAL GROUND WATER LEVEL AND PRODUCT THICKNESS DATA	ADMIN RECORD	MONITORING WELLS GW		SOUTHWEST DIVISION NAF EL CENTRO
N60042 000009 PLAN N6871189D9296 0080	12/05/94 05/08/91 00125 03.1	JACOBS ENGINEERING G.N. DOYLE SOUTHWEST DIVISION	NAF EL CENTRO SITE ASSESSMENT STUDY SAMPLING AND ANALYSIS PLAN FINAL	ADMIN RECORD	SAP		SOUTHWEST DIVISION NAF EL CENTRO

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N60042 000303 PLAN N6872289D9296 0075	03/02/95 05/08/91 00125 02.2	JACOBS ENGINEERING W. CRONE SOUTHWEST DIVISION	SITE ASSESSMENT STUDY SAMPLING AND ANALYSIS PLAN NAF EL CENTRO	ADMIN RECORD	SA SAP		SOUTHWEST DIVISION NAF EL CENTRO
N60042 000153 LTR 000000000000000 0001	12/08/94 07/11/91 00125 01.4	NAF EL CENTRO D.L. HESS SOUTHWEST DIVISION CODE 18	CRWQCB CLEANUP AND ABATEMENT ORDER 90-045 FUEL FARM SITE INVESTIGATION	ADMIN RECORD	C/A ORDER SI	FUEL FARM	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000003 RPT N6871189D9296 0150	12/05/94 07/26/91 00125 00.0	JACOBS ENGINEERING G.N. DOYLE SOUTHWEST DIVISION	SITE ASSESSMENT STUDY SITE ASSESSMENT REPORT	ADMIN RECORD	MONITORING WELLS GW		SOUTHWEST DIVISION NAF EL CENTRO
N60042 000179 LTR 000000000000000 0005	12/09/94 08/09/91 00125 01.6	NAF EL CENTRO D.L. HESS SOUTHWEST DIVISION CODE 18	CALIFORNIA REGIONAL WAATER QUALITY CONTROL BOARD (CRWQCB) CLEANUP AND ABATEMENT ORDER 90-045 FUEL FARM ENCL: SITE ASSESSMENT STUDY\REPORT NAF EL CENTRO	ADMIN RECORD	C/A ORDER	FUEL FARM	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000012 RPT 000000000000000 0450	12/05/94 10/30/91 00000 01.2	ERC CO. SOUTHWEST DIVISION	NAF EL CENTRO FINAL SITE INSPECTION (SI) FOR SITES 14, 15, AND 16 INSTALLATION RESTORATION STUDIES	ADMIN RECORD	SI	14,15,16	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000013 RPT 000000000000000 0250	12/06/94 10/30/91 00000 03.2	ERCE SOUTHWEST DIVISION	NAF EL CENTRO HYDROGEOLOGICAL ASSESSMENT REPORT (HAR) FINAL SITE 17 FIRE FIGHTING TRAINING AREA INSTALLATION RESTORATION STUDIES VOLUME II: ANALYTICAL LAB REPORTS	ADMIN RECORD	HAR	17	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000050 RPT 000000000000000 0350	12/07/94 10/30/91 00000 03.2	ERC ENVIRONMENTAL K. WAHL SOUTHWEST DIVISION	NAF EL CENTRO HYDROGEOLOGICAL ASSESSMENT REPORT (HAR) SITE 10, SEWAGE STABILIZATION PONDS INSTALLATION RESTORATION STUDIES VOLUME II ANALYTICAL LAB REPORTS	ADMIN RECORD	HAR DATA	10	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000071 RPT 000000000000000 0250	12/07/94 10/30/91 00000 01.2	ERC ENVIRONMENTAL SOUTHWEST DIVISION	NAF EL CENTRO PRELIMINARY DRAFT SITE INSPECTION (SI) REPORT FOR SITES 14, 15, AND 16 INSTALLATION RESTORATION STUDIES VOLUME II APPENDICES	ADMIN RECORD	SI TPH METALS MW	14,15,16	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000397 LTR 000000000000000 0008	08/13/96 01/03/92 00000 01.6	SOUTHWEST DIVISION J. PAWLISCH NAF EL CENTRO	NOTIFICATION THAT THE FOLLOWING REGULATORY & NAVY REPS MET TO DISCUSS WHAT CRITERIA SHOULD BE USED TO PRIORITIZE DERA PROJECTS. (ENCL. MTG.AGDA DTD 1/9/92	ADMIN RECORD	DERA FUEL MTG MINS RI	FUELING FA	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000253 RPT 000000000000000 0450	12/28/94 01/24/92 00000 01.2	OGDEN ENVIRONMENTAL T.J. FITZPATRICK SOUTHWEST DIVISION	FINAL SITE INSPECTION (SI) REPORT FOR SITES 14,15 & 16 VOLUME III ANALYTICAL LAB REPORTS NAF EL CENTRO	ADMIN RECORD	SI	14,15,16	SOUTHWEST DIVISION NAF EL CNETRO

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N60042 000304 RPT 000000000000000 0250	03/27/95 01/24/92 00000 01.1	OGDEN SOUTHWEST DIVISION	FINAL HYDORGEOLOGICAL ASSESSMENT REPORT (HAR) SITE 10 SEWAGE STABILIZATION PONDS VOLUME I TECHNICAL REPORT AND APPENDICES	ADMIN RECORD	HAR	10	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000318 RPT 000000000000000 1000	07/27/95 01/24/92 00000 01.2	OGDEN J. HENRY SOUTHWEST DIVISION	FINAL SITE INSPECTION (SI) REPORT FOR SITES 14, 15 & 16 VOLUME I: TECHNICAL REPORT, VOLUME II: APPENDICES VOLUME III: ANALYTICAL LABORATORY REPORTS	ADMIN RECORD INFO REPOSITORY	SI	14,15,16	SOUTHWEST DIVISION NAF EL CENTRO BRAWLEY LIBRARY EL CENTRO LIBRARY
N60042 000319 RPT N71188D5053 1000	07/27/95 04/01/92 DO 01 01.2	OGDEN SOUTHWEST DIVISION	DRAFT SOLID WASTE WATER QUALITY ASSESSMENT TEST (SWAT) SITE INVESTIGATION (SI) SITES 1,2,3	ADMIN RECORD INFO REPOSITORY	SWAT SI MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3	SOUTHWEST DIVISION NAF EL CENTRO BRAWLEY LIBRARY EL CENTRO LIBRARY
N60042 000271 RPT 000000000000000 0030	12/28/94 05/29/92 00000 02.2	CES, INC. R.C. ORLANDO SOUTHWEST DIVISION	STATUS REPORT ON SOIL MITIGATION BY BIOREMEDIATION, FUEL FARM STOCKPILE, NAF EL CENTRO	ADMIN RECORD	BIOREMEDIATION	FUEL FARM	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000052 RPT 000000000000000 0100	12/07/94 07/24/92 00000 02.2	OGDEN ENVIRONMENTAL J.C. HERWIG SOUTHWEST DIVISION M. RADECKI	NAF EL CENTRO LETTER REPORT QUARTERLY GROUND WATER SAMPLING RESULTS AT SITES 10,14,15,16 & 17	ADMIN RECORD	GW DATA BTX&E SWAT MW MONITORING WELLS VOC TPH TFH	10,14,15 16,17	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000371 RPT 000000000000000 0450	05/23/96 08/07/92 00000 02.1	OGDEN ENVIRONMENTAL T.J. FITZPATRICK SOUTHWEST DIVISION	FINAL QUARTERLY SAMPLING ANALYTICAL LABORATORY REPORTS SITE INVESTIGATION (SI) AND HYDROGEOLOGICAL ASSESSMENT REPORT SITES 10, 14, 15, & 17 VOLUME I	ADMIN RECORD	DATA SI HAR	10,14,15, 17	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000023 PLAN 000000000000000 0065	12/06/94 08/15/92 00000 03.3	GEOSERVICES SOUTHWEST DIVISION	NAF EL CENTRO FINAL HEALTH AND SAFETY PLAN (H&SP) PRECISION TANK TESTING	ADMIN RECORD	H&SP TANK HAZMAT MONITORING		SOUTHWEST DIVISION NAF EL CENTRO
N60042 000267 PLAN N6871189D9296 0050	12/28/94 09/29/92 00218 01.1	JACOBS ENGINEERING G.P. JENNETT SOUTHWEST DIVISION	HEALTH AND SAFETY PLAN FOR NAF EL CENTRO	ADMIN RECORD	H&SP		SOUTHWEST DIVISION NAF EL CENTRO

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N60042 000369 RPT 000000000000000 1500	05/23/96 10/01/92 00000 02.1	OGDEN ENIRONMENTAL K. WHAL SOUTHWEST DIVISION	FINAL QUARTERLY SMAPLING ANALYTICAL LABROATORY REPORTS SITE INVESTIGATION AND SOLID WATE ASSESSMENT TEST (SWAT) SITES 1,2,3,4,5,6,7, & 11 VOLUMES I & II	ADMIN RECORD	SI SWAT MAG RD LANDFILL SLUDGE BUR AREA	1,2,3,4,5, 6,7,11	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000034 RPT 000000000000000 0175	12/06/94 10/06/92 00000 02.2	OGDEN ENVIRONMENTAL J.C. HERWIG SOUTHWEST DIVISION M. RADECKI	LETTER REPORT OF QUARTERLY GROUND WATER SAMPLING RESULTS FOR SITES 1,2,3,4,5,6,7,,8,9 AND 11	ADMIN RECORD	GW DISPOSAL SLUDGE MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD MW BTX&E GC/MS LF PCB	1,2,3,4,5 6,7,8,9,11	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000070 RPT N6871191D0250 0150	12/07/94 02/04/93 00000 01.4	DAMES & MOORE J.C. WILSON SOUTHWEST DIVISION	NAF EL CENTRO FINAL REPORT SITE INVESTIGATION (SI) BUILDING 157 PAINT RINSE AREA	ADMIN RECORD	SI PESTICIDES PCB METALS VOC	B-157	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000041 RPT N6871189D9296 0350	12/06/94 03/12/93 00202 01.1	JACOBS ENGINEERING C. JOHNSON SOUTHWEST DIVISION	NAF EL CENTRO FINAL REPORT TREATABILITY STUDY OF FUEL FARM FREE PRODUCT PLUME	ADMIN RECORD	FUEL MONITORING WELLS MW GW	FUEL FARM	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000039 RPT N71188D5053 0450	12/06/94 05/01/93 00000 01.4	OGDEN ENVIRONMENTAL SOUTHWEST DIVISION CODE 0223	FINAL SITE INVESTIGATION (SI) REPORT SITE 4,5,6,7,8,9, AND 11 ENGINEERING SERVICES FOR RI/FS	ADMIN RECORD INFO REPOSITORY	SI RI SCRAPYARD FUEL GW DATA QA QC	4,5,6,7,8 9, 11	SOUTHWEST DIVISION BRAWLEY LIBRARY EL CENTRO LIBRARY NAF EL CENTRO
N60042 000040 RPT N71188D5053 0450	12/06/94 05/01/93 00000 01.4	OGDEN ENVIRONMENTAL SOUTHWEST DIVISION CODE 0223	NAF EL CENTRO FINAL SOLID WASTE WATER QUALITY ASSESSMENT TEST (SWAT) SITE INVESTIGATION REPORT (SI) SITE 1, 2, AND 3 VOLUME I	ADMIN RECORD	SWAT SI MAG RD LANDFILL SLUDGE BUR AREA WATER LF DISPOSAL SLUDGE	1,2,3	SOUTHWEST DIVISION NAF EL CENTRO BRAWLEY LIBRARY EL CENTRO LIBRARY

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N60042 000302 PLAN N6871191D0252 0100	02/10/95 05/01/93 DO 14 10.2	BROWN AND CALDWELL SOUTHWEST DIVISION	REVISED COMMUNITY RELATIONS PLAN FOR NAF EL CENTRO	ADMIN RECORD	CRP MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,10 11,14,15, 16,17	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000370 RPT N71188D5053 0450	05/23/96 05/01/93 00000 01.4	OGDEN ENVIRONMENTAL SOUTHWEST DIVISION CODE 0223	FINAL SOLID WASTE WATER QUALITY ASSESSMENT TEST (SWAT) SITE INVESTIGATION REPORT (SI) FINA DATA VALAIDATION REPORT APPENDIX VOLUME II	ADMIN RECORD	SWAT SI MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,11	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000029 PLAN N6871189D9296 0050	12/06/94 08/31/93 00268 03.3	JACOBS ENGINEERING D. TURNER SOUTHWEST DIVISION	NAF EL CENTRO FINAL WORK PLAN DELINEATION OF FUEL FARM FREE PRODUCT PLUME	ADMIN RECORD	FUEL GW QA QC	FUEL FARM	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000284 PLAN N6871189D9296 0030	01/30/95 08/31/93 00268 03.3	JACOBS ENGINEERING D. TURNER SOUTHWEST DIVISION	WORK PLAN OF DELINEATION FUEL FARM FREE PRODUCT PLUME NAF EL CENTRO (COMMENTS WRITTEN ON DOCUMENT)	ADMIN RECORD		FUEL FARM	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000279 RPT N6871192D4670 0040	01/27/95 09/24/93 00005 01.1	BECHTEL NATIONAL D. UMSTOT SOUTHWEST DIVISION	DRAFT SOLID WASTE WATER QUALITY ASSESSEMNT TEST (SWAT) PROPOSAL SITE 2A, WEST PARTROL ROAD LANDFILL NAF EL CENTRO (NO LONGER BEING DONE) (SENT TO RWQCB)	ADMIN RECORD	SWAT	2A	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000354 PLAN N6871192D4670 0050	02/01/96 10/05/93 00005 03.3	BECHTEL NATIONAL INC G.R. HASKINS SOUTHWEST DIVISION	DRAFT INVESTIGATION DERIVED WASTE MANAGEMENT PLAN SITE 2A, WEST PATROL ROAD LAND FILL SWAT/SI	ADMIN RECORD	IDWMP	2A	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000355 PLAN N6871192D4670 0025	02/01/96 10/05/93 00005 01.2	BECHTEL NATIONAL INC D.B. MCCULLAR SOUTHWEST DIVISION	DRAFT SITE INSPECTION WORK PLAN ADDENDUM FOR SITE 2A WEST PATROL ROAD LANDFILL	ADMIN RECORD	SI	2A	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000356 PLAN N6871192D4670 0250	02/01/96 10/05/93 00005 03.3	BECHTEL NATIONAL INC SOUTHWEST DIVISION	DRAFT SITE SPECIFIC HEALTH AND SAFETY PLAN SITE 2A WEST PATROL ROAD LANDFILL	ADMIN RECORD	H&SP	2A	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000016 PLAN N6871193D1457 0250	12/06/94 11/30/93 00000 03.3	GEOSERVICES L. MICHAELIAN SOUTHWEST DIVISION	NAF EL CENTRO FINAL HEALTH AND SAFETY PLAN	ADMIN RECORD INFO REPOSITORY	H&SP		SOUTHWEST DIVISION BRAWLEY LIBRARY EL CENTRO LIBRARY NAF EL CENTRO

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N60042 000285 RPT N6871189D9296 0250	01/30/95 12/15/93 00268 01.1	JACOBS ENGINEERING D. TURNER SOUTHWEST DIVISION	DRAFT SITE ASSESSMENT REMEDIAL ALTERNATIVES FUEL FARM TECHNICAL REPORT FOR NAF EL CENTRO	ADMIN RECORD	SA	FUEL FARM	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000196 LTR N6871192D4673 0008	12/13/94 01/19/94 00000 10.2	BROWN & CALDWELL B. SCHMUCKER SOUTHWEST DIVISION D. DUNBAR	COMMUNITY RELATIONS MAILING LIST FOR NAF EL CENTRO (MADE DISCLOSABLE)	ADMIN RECORD CONFIDENTIAL DOC INFO REPOSITORY	CRP MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,10 11,14,15, 16,17	SOUTHWEST DIVISION NAF EL CENTRO BRAWLEY LIBRARY EL CENTRO LIBRARY
N60042 000296 LTR N6871192D4673 0006	02/10/95 01/19/94 DO 22 10.2	BROWN & CALDWELL B. SCHMUCKER SOUTHWEST DIVISION D. DUNBAR	REVISED UPDATED MAILING LIST FOR THE COMMUNITY RELATIONS PROGRAM (PRIVIATE CITIZENS NAMES AND ADDRESSES HAVE BEEN BLANK OUT TO MAKE DISCLOSEABLE)	ADMIN RECORD CONFIDENTIAL DOC INFO REPOSITORY	MAILING LST MAG RD LANDFILL SLUDGE BUR AREA	1,2,3,4,5, 6,7,8,9,10 11,14,15, 16,17	SOUTHWEST DIVISION BRAWLEY LIBRARY NAF EL CENTRO EL CENTRO LIBRAY
N60042 000019 RPT N6871192D4670 0095	12/06/94 02/04/94 00005 01.1	BECHTEL NATIONAL,INC J.S. HOYLE SOUTHWEST DIVISION	NAF EL CENTRO FINAL SOLID WASTE WATER QUALITY ASSESSMENT TEST (SWAT) PROPOSAL SITE 2A WEST PATROL ROAD LANDFILL (NO LONGER BEING DONE)	ADMIN RECORD	SWAT LF WATER GW DISPOSAL WELLS MONITORING MW	2A	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000021 PLAN N6871192D4670 0075	12/06/94 02/04/94 00005 03.3	BECHTEL NATIONAL,INC A.L. FRANKS SOUTHWEST DIVISION	NAF EL CENTRO FINAL INVESTIGATION DERIVED WASTE MANAGEMENT PLAN SITE 2A, WEST PATROL ROAD LANDFILL SWAT/SI (NO LONGER BEING DONE)	ADMIN RECORD	WMP LF HAZ WASTE	2A	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000251 PLAN N6871192D4670 0017	12/28/94 02/04/94 00005 03.3	BECHTEL NATIONAL INC D. UMSTOT SOUTHWEST DIVISION	SITE INSPECTION (SI) WORK PLAN ADDENDUM SITE 2A WEST PATROL ROAD LANDFILL NAF EL CENTRO FINAL (NO LONGER BEING DONE)	ADMIN RECORD	SI	2A	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000283 RPT N6871192D4670 0044	01/30/95 02/04/94 00005 01.1	BECHTEL NATIONAL INC J.S. HOYLE SOUTHWEST DIVISION	SOLID WASTE WATER QUALITY ASSESSMENT TEST (SWAT) PROPOSAL SITE 2A, WEST PATROL ROAD LANDFILL NAF EL CENTRO (NO LONGER BEING DONE)	ADMIN RECORD	SWAT	2A	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000020 PLAN N6871192D4670 0175	12/06/94 02/07/94 00005 03.3	BECHTEL NATIONAL,INC C.I. SHERMAN SOUTHWEST DIVISION	NAF EL CENTRO FINAL SITE SPECIFIC HEALTH AND SAFETY PLAN SITE 2A, WEST PATROL ROAD LANDFILL SWAT/SI (NO LONGER BEING DONE)	ADMIN RECORD	H&SP LF SWAT SI PCB PESTICIDES HAZ WASTE	2A	SOUTHWEST DIVISION NAF EL CENTRO

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N60042 000215 LTR 000000000000000 0003	12/13/94 03/21/94 00000 01.6	CRWQCB PALM DESERT S. CHAKLADAR SOUTHWEST DIVISION D. DUNBAR	COMMENTS ON DRAFTS OF SI FOR SITES 4, 5, 6, 11 AT NAF EL CENTRO	ADMIN RECORD	SI COMMENTS	4,5,6,11	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000216 LTR 000000000000000 0001	12/13/94 03/21/94 00000 01.6	CRWQCB PALM DESERT S. CHAKLADAR SOUTHWEST DIVISION D. DUNBAR	COMMENTS ON DRAFTS OF SI FOR SITES 7,8 & 9 AT NAF EL CENTRO	ADMIN RECORD	COMMENTS SI SCRAPYARD	7,8,9	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000219 LTR 000000000000000 0002	12/13/94 03/28/94 00000 01.6	CRWQCB PALM DESERT R. LUKENS SOUTHWEST DIVISION D. DUNBAR	NAF EL CENTRO FUEL FARM REMEDIATION REGIONAL BOARD CLEANUP & ABATEMENT ORDER NO. 90-045	ADMIN RECORD	C/A ORDER GW BTX&E WATER TPH	FUEL FARM	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000297 MISC 00000000000000 0004	02/10/95 04/01/94 00000 10.6	NAF EL CENTRO DISTRIBUTION	FACT SHEET NO. 1 ON THE NAF EL CENTRO INSTALLATION RESTORATION PROGRAM (WRITTEN IN ENGLISH AND SPANISH)	ADMIN RECORD INFO REPOSITORY	MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2A,2,3,4 5,6,7,8,9 10,11,12, 13,14,15 16,17	SOUTHWEST DIVISION BRAWLEY LIBRARY NAF EL CENTRO EL CENTRO LIBRARY
N60042 000030 RPT N6871189D9296 0450	12/06/94 04/22/94 00268 01.1	JACOBS ENGINEERING D. TURNER SOUTHWEST DIVISION	NAF EL CENTRO FINAL SITE ASSESSMENT REMEDIAL ALTERNATIVES FUEL FARM TECHNICAL REPORT REVISION 0	ADMIN RECORD	FUEL MW MONITORING WELLS GW DATA PA LUFT	FUEL FARM	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000229 LTR 000000000000000 0002	12/13/94 05/10/94 00000 01.6	CRWQCB PALM DESERT S. CHAKLADAR SOUTHWEST DIVISION D. DUNBAR	COMMENTS ON THE FINAL REPORT FOR PIPING AND UST PRECISION TESTING AT NAF EL CENTRO	ADMIN RECORD	COMMENTS UST	FUEL FARM	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000236 LTR 000000000000000 0001	12/13/94 05/24/94 00000 01.6	CRWQCB PALM DESERT S. CHAKLADAR NAF EL CENTRO D. HESS	COMMENTS ON THE FINAL SITE ASSESSMENT REMEDIAL ALTERNATIVES FOR THE FUEL FARM AT NAF EL CENTRO	ADMIN RECORD	COMMENTS	FUEL FARM	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000239 LTR 000000000000000 0002	12/13/94 06/02/94 00000 01.6	DTSC LONG BEACH M.C. GASLAN NAF EL CENTRO J.L. CROW	SITE 2 LANDFILL NAF EL CENTRO REMOVAL OF AND TREATMENT OF CONTAMINATED SOIL FOR USE	ADMIN RECORD	REMOVAL LF	2,15	SOUTHWEST DIVISION NAF EL CENTRO

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N60042 LTR 000000000000000 0002	000072	12/08/94 06/15/94 00000 01.4	CRWCB PALM DESERT S. GHAKLADAR NAF EL CENTRO D. HESS	NAF EL CENTRO COMMENTS ON PROPOSED INTERIM COVER TO BE PROVIDED ON SWAT SITE #2 AS PART OF CONTINUED REMEDIATION REVIEW OF THE FINAL SI SWAT OF APRIL 1992	ADMIN RECORD	COMMENTS SI SWAT ARAR LF	2	SOUTHWEST DIVISION NAF EL CENTRO
N60042 LTR 000000000000000 0002	000092	12/08/94 07/14/94 00000 01.1	CRWQCB PALM DESERT S. CHAKLADAR NAF EL CENTRO E. GONZALEZ	NAF EL CENTRO COMMENTS ON DRAFT SOLID WASTE WATER QUALITY ASSESSMENT TEST (SWAT) PROPOSAL SITE 2A, WEST PATROL ROAD LANDFILL	ADMIN RECORD	COMMENTS SWAT LF	2A	SOUTHWEST DIVISION NAF EL CENTRO
N60042 LTR 000000000000000 0001	000094	12/08/94 07/15/94 00000 01.4	CRWQCB PALM DESERT S. CHAKLADAR NAF EL CENTRO E. GONZALEZ	NAF EL CENTRO COMMENTS ON INVESTIGATION DERIVED WASTE MANAGEMENT PLAN SITE 2A WEST PATROL ROAD LANDFILL SWAT/SI	ADMIN RECORD	SWAT WMP LF SI	2A	SOUTHWEST DIVISION NAF EL CENTRO
N60042 LTR 000000000000000 0026	000112	12/08/94 08/25/94 00000 01.1	ERM WEST INC. F. ALLISON SOUTHWEST DIVISION D. DUNBAR	PROJECT UPDATE RESULTS OF THIRD SAMPLING OF SLUDGE DRYING BEDS AT NAF EL CENTRO SEWAGE TREATMENT PLANT	ADMIN RECORD	SLUDGE DATA		SOUTHWEST DIVISION NAF EL CENTRO
N60042 LTR 000000000000000 0001	000124	12/08/94 09/13/94 00000 01.3	SOUTHWEST DIVISION D. DUNBAR DTSC LONG BEACH T. BEKELE	REPORT PROVIDED FOR REFERENCE FINAL PRELIMINARY ASSESSMENT SITE INSPECTION OF THE NAF EL CENTRO NEESA 13-106 9/87	ADMIN RECORD	PA SI		SOUTHWEST DIVISION NAF EL CENTRO
N60042 LTR 000000000000000 0001	000125	12/08/94 09/14/94 00000 03.3	CRWQCB PALM DESERT S. CHAKLADAR NAF EL CENTRO E. GONZALEZ	DRAFT PROJECT WORK PLAN BUILDING DECONTAMINATION, NAF EL CENTRO (CRWQCB WILL NOT BE REVIEWING THIS PLAN)	ADMIN RECORD	COMMENTS		SOUTHWEST DIVISION NAF EL CENTRO
N60042 LTR 000000000000000 0001	000374	07/31/96 12/21/94 00000 03.6	SOUTHWEST DIVISION D. DUNBAR EPA PALM DESERT L. CHAVEZ	ENCLOSURES AS REQUESTED FORWARDED. REF.DOC# 000034, 000052,& 000047.	ADMIN RECORD	SI GW MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5 6,7,8,9,10 11,12,13, 14,15,16, 17	SOUTHWEST DIVISION NAF EL CENTRO
N60042 LTR 000000000000000 0002	000312	05/18/95 02/09/95 00000 01.1	SOUTHWEST DIVISION D. DAWSON NAF EL CENTRO	REGINAL WATER QUALITY CONTROL BOARD AND DEPARTMENT OF TOXIC SUBSTANCES CONTROL SITE VISIT	ADMIN RECORD	MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,10 11,14,15, 16,17	SOUTHWEST DIVISION NAF EL CENTRO
N60042 LTR 000000000000000 0002	000332	09/12/95 02/15/95 00000 01.6	NAF EL CENTRO P.T. MADISON EPA SAN FRANCISCO	OPA 90 FACILITY RESPONSE PLAN AND EMERGENCY RESPONSE ACTION PLAN FOR NAF EL CENTRO	ADMIN RECORD			SOUTHWEST DIVISION NAF EL CENTRO

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N60042 000316 MISC 000000000000000 0001	06/23/95 03/01/95 00000 10.3	THE SANDPAPER	NOTICE OF PUBLIC MEETING TO DISCUSS THE ENVIRONMENTAL IR PROGRAM AND FORMATION OF A RAB	ADMIN RECORD INFO REPOSITORY	PUBNOT RAB MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,10 11,14,15, 16,17	SOUTHWEST DIVISION NAF EL CENTRO BRAWLEY LIBRARY EL CENTRO LIBRARY
N60042 000310 LTR 000000000000000 0028	05/18/95 03/24/95 00000 01.6	DTSC LONG BEACH M.C. GASLAN SOUTHWEST DIVISION D. DAWSON	COMMENT ON FINAL SITE INVESTIGATION REPORT FOR SITES 1,2,3,4,5,6,7,8,9 & 11	ADMIN RECORD	COMMENTS SI MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,11	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000375 LTR 000000000000000 0003	03/31/95 03/31/95 00000 01.6	SOUTHWEST DIVISION D. DAWSON NAF EL CENTRO TEAM	NAF EL CENTRO TEAM MEETING DRAFT AGENDA	ADMIN RECORD	ARAR MAG RD LANDFILL EE/CA(*) SLUDGE BUR AREA SCRAPYARD	1,2,3,4,8	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000376 MM 000000000000000 0001	07/31/96 04/05/95 00000 01.6	NAF EL CENTRO NAF EL CENTRO TEAM	AGENDA FOR PROGRESS MEETING EE/CA AM AND NFRAP SITES 1 ,3,4,5,8,12 AND 13 NAF EL CENTRO (NEED MTG MINS)	ADMIN RECORD	ACTMEMO EE/CA(*) MTG MINS MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,3,4,5,8, 12,13	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000309 LTR 000000000000000 0002	05/18/95 04/06/95 00000 01.6	DTSC LONG BEACH M.C. GASLAN SOUTHWEST DIVISION D. DAWSON	COMMENTS ON THE FINAL SITE INSPECTION REPORT FOR SITES 14, 15 & 16 (SEE COMMENTS ON SITES 1,2,3,4,5,6,7 8, 9, & 11 LTR OF MARCH 24, 1995	ADMIN RECORD	COMMENTS SI	14,15,16	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY
N60042 000377 MM 000000000000000 0001	07/31/96 04/13/95 00000 01.6	NAF EL CENTRO NAF EL CENTRO TEAM	SIGN IN SHEET FOR MEETING OF 13 APRIL 1995 NAF EL CENTRO (REF DOC #000375)	ADMIN RECORD	MTG MINS MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,8 5,6,7,9,11	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000341 MM 000000000000000 0003	10/19/95 04/17/95 00000 01.6	SOUTHWEST DIVISION D. DAWSON ATTENDEES	NAF EL CENTRO TEAM MEETING MINUTES	ADMIN RECORD	MTG MINS SI SWAT MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,11	SOUTHWEST DIVISION NAF EL CENTRO

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N60042 000308 LTR 000000000000000 0002	05/18/95 04/18/95 00000 04.5	SOUTHWEST DIVISION D. DAWSON DTSC LONG BEACH T. BEKELE	REQUEST FOR INDENTIFICATION OF POTENTIAL STATE CHEMICAL SPECIFIC ACTION SPECIFIC AND LOCATION SPECIFIC ARARs FOR AN INTERIM REMOVAL ACTION	ADMIN RECORD	ARAR MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,8	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000306 LTR 000000000000000 0002	05/18/95 04/24/95 00000 01.6	CRWQCB PLAM DESERT L. CHAVEZ NAF EL CENTRO E. GONZALEZ	COMMENTS ON IR SITES 1,2, AND 3 NAF EL CENTRO FINAL SITE INVESTIGATION REPORT	ADMIN RECORD	COMMENTS SI MAG RD LANDFILL SLUDGE BUR AREA	1,2,3,	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY
N60042 000325 LTR 000000000000000 0032	07/31/95 05/09/95 00090 02.7	SOUTHWEST DIVISION D. DAWSON DTSC LONG BEACH T. BEKELE	EE/CA AND ACTION MEMORANDA AT NAF EL CENTRO ESTIMATION OF BACKGROUND METALS CONCENTRATIONS	ADMIN RECORD	METALS MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,11	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000326 LTR 000000000000000 0003	07/31/95 05/09/95 00000 01.6	SOUTHWEST DIVISION M. GONZALES DTSC LONG BEACH T. BEKELE	WRITTEN RESPONSE TO LETTER OF APRIL 16, 1995 ON THE FINAL SITE INSPECTION REPORT FOR SITES 14,15, & 16 COMMENTS WILL ADDRESS SITE 16	ADMIN RECORD	COMMENTS	16	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000324 LTR 000000000000000 0003	07/31/95 05/23/95 00000 01.6	CRWQCB PALM DESERT L. CHAVEZ SOUTHWEST DIVISION D. DAWSON	COMMENTS ON THE DRAFT FINAL SITE 15 FUEL FARM REMOVAL ACTION GENERAL SITE WORK PLAN AND DRAFT FINAL SITE 15 FULE FARM SAMPLING AND ANALYSIS PLAN	ADMIN RECORD	COMMENTS RA SAP	15	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000345 MM 000000000000000 0003	10/19/95 05/31/95 00000 01.6	SOUTHWEST DIVISION D. DAWSON ATTENDEES	SITE 15 (FUEL FARM) STRATEGY MEETING MINUTES	ADMIN RECORD	MTG MINS	15	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000327 LTR 000000000000000 0002	07/31/95 06/08/95 00000 01.6	DTSC LONG BEACH M.C. GASLAN SOUTHWEST DIVISION D. DAWSON	REVIEW COMMENTS ON THE COMMUNITY RELATIONS PLAN FOR NAF EL CENTRO CONCURRED	ADMIN RECORD	COMMENTS MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,10 11,14,15, 16,17	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000342 MM 000000000000000 0003	10/19/95 06/14/95 00000 01.6	SOUTHWEST DIVISION D. DAWSON ATTENDEES	NAF EL CENTRO TEAM MEETING MINUTES	ADMIN RECORD	PRG MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,3,4,8	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000393 LTR 000000000000000 0004	07/31/96 06/14/95 0000 01.6	SOUTHWEST DIVISION D.DAWSON DTSC LONG BEACH T. BEKELE	REGARDING CERCLA STATUS OF SITE 14, 15, AT NAF EL CENTRO. NAVY REQUESTS THAT IR SITE 14 AND SITE 15 BE REMOVED FROM NAF EL CENTRO & PLACED UST.	ADMIN RECORD	CERCLA UST METALS	14,15	SOUTHWEST DIVISION NAF EL CENTRO

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N60042 000396 LTR 000000000000000 0004	08/13/96 06/14/95 00000 01.6	SOUTHWEST DIVISION D. DAWSON DTSC LONG BEACH T. BEKELE	CERCLA STATUS OF SITE 14 & SITE 15 AT NAF, EL CENTRO. REQUEST THAT THE SITES BE REMOVED FROM IRP AND PLACED INTO THE UST PROGRAM.(ENCLS. NOT INCLUDED)	ADMIN RECORD	CERCLA IRA UST BACKGROUND	14 15	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000317 LTR 000000000000000 0079	07/24/95 06/21/95 00000 04.1	DTSC LONG BEACH M.C. GASLAN SOUTHWEST DIVISION D. DAWSON	RESPONSE TO ARAR's REQUEST FOR SITES 1,2,3,4, & 8	ADMIN RECORD	ARAR MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,8	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY
N60042 000322 LTR 000000000000000 0002	07/31/95 06/28/95 00099 02.7	DTSC LONG BEACH M.C. GASLAN SOUTHWEST DIVISION D. DAWSON	COMMENTS ON THE EE/CA AND ACTION MEMORANDA AT NAF EL CENTRO ESTIMATION OF BACKGROUND METALS CONCENTRATIONS	ADMIN RECORD	COMMENTS MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5 6,7,8,9,11	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000321 LTR 000000000000000 0002	07/31/95 07/12/95 00099 02.7	DTSC LONG BEACH M.C. GASLAN SOUTHWEST DIVISION D. DAWSON	COMMENTS ON THE EE/CA AND ACTION MEMORANDA AT NAF EL CENTRO OCCURENCE OF VOLATILE ORGANIC COMPOUNDS AT SITES 1 AND 4	ADMIN RECORD	VOC EE\CA ACTMEMO MAG RD LANDFILL	1,4	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000320 LTR 000000000000000 0035	07/31/95 07/17/95 00000 01.1	SOUTHWEST DIVISION J.R. PAWLISCH DTSC LONG BEACH T. BEKELE	REQUEST FOR CONCURRENCE TO REMOVE THE IR SITE #14 AND #15 FROM THE NAF EL CENTRO IRP AND PLACE IN THE UST PROGRAM	ADMIN RECORD	UST IRP	14,15	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000340 LTR 000000000000000 0001	09/12/95 07/17/95 00000 01.6	NAF EL CENTRO P.T. MADISON SOUTHWEST DIVISION CODE 1822.MD	CORRECT LOCATION OR IR SITE 3 IS SHOWN IN REFERENCE(B)	ADMIN RECORD	SLUDGE BUR AREA	3	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000343 MM 000000000000000 0003	10/19/95 07/31/95 00000 01.6	SOUTHWEST DIVISION D. DAWSON ATTENDEES	NAF EL CENTRO TEAM MEETING MINUTES	ADMIN RECORD	VOC EE\CA MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,4,9,2,3, 8,12,13,15 16,14	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000378 MM 000000000000000 0003	07/31/96 07/31/95 00000 01.6	NAF EL CENTRO NAF EL CENTRO TEAM	31 JULY 1995 NAF EL CENTRO TEAM MEETING MINUTES	ADMIN RECORD	MTG MINS EE\CA UST RAB MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,4,3,8,9, 12,13,15,2	SOUTHWEST DIVISION NAF EL CENTRO

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N60042 000336 LTR 000000000000000 0002	09/12/95 08/17/95 00000 01.6	DTSC LONG BEACH M.C. GASLAN SOUTHWEST DIVISION D. DAWSON	CONCURRENCE TO MOVE SITES 14 & 15 FROM THE IRP TO THE UST PROGRAM	ADMIN RECORD	IRP UST	14,15,16	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY
N60042 000339 LTR 000000000000000 0011	09/12/95 08/31/95 00000 01.6	SOUTHWEST DIVISION D. DAWSON DTSC LONG BEACH T. BEKELE	GOVERNMENT RESPONSE TO DTSC GEOLOGIST AND TOXICOLOGIST COMMENTS ON FINAL SITE INVESTIGATION REPORTS FOR SITE 1-9 & 11 OF MARCH 24, 1995	ADMIN RECORD	COMMENTS MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5 6,7,8,9,11	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY
N60042 000379 MM 000000000000000 0002	07/31/96 09/06/95 00000 01.6	NAF EL CENTRO NAF EL CENTRO TEAM	6 SEPTERMER 1995 NAF EL CENTRO TEAM MEETING AGENDA	ADMIN RECORD	PCB REMOVAL CLOSURE GW MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5 6,7,8,9,11 12,13	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000344 MM 000000000000000 0003	10/19/95 09/18/95 00000 01.6	SOUTHWEST DIVISION D. DAWSON ATTENDEES	NAF EL CENTRO TEAM MEETING MINUTES	ADMIN RECORD	MTG MINS MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000380 MM 000000000000000 0004	07/31/96 09/18/95 01.6	SOUTHWEST DIVISION NAF EL CENTRO TEAM	15 SEPTEMBER 1995 NAF EL CENTRO TEAM MEETING MINUTES	ADMIN RECORD	PCB MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD GW ORDNANCE	1,2,3,4,5, 6,7,8,9,10 11,12,13, 14,15	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000381 MM 000000000000000 0005	07/31/96 09/18/95 00000 01.6	SOUTHWEST DIVISION NAF EL CENTRO TEAM	30 NOVEMBER 1995 NAF EL CENTRO TEAM MEETING MINUTES	ADMIN RECORD	UST MAG RD LANDFILL GW SI EE\CA CLOSURE	10,11,12,1	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000348 RPT N6871192D4670 0200	11/28/95 11/01/95 00090 02.4	BECHTEL NATIONAL INC M. GALAGODA SOUTHWEST DIVISION D. DAWSON	DRAFT ENGINEERING EVALUATION COST ANALYSIS (EE/CA) SITE 3 SLUDGE BURIAL AREA	ADMIN RECORD	EE\CA SLUDGE BUR AREA	3	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000349 LTR N6871192D4670 0200	11/28/95 11/01/95 00090 02.4	BECHTEL NATIONAL INC M. GALAGODA SOUTHWEST DIVISION D. DAWSON	DRAFT ENGINEERING EVALUATION COST ANALYSIS SITE 8 SCRAP YARD	ADMIN RECORD	EE\CA SCRAPYARD	8	SOUTHWEST DIVISION NAF EL CENTRO

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N60042 000350 LTR 000000000000000 0003	12/06/95 11/15/95 00000 01.6	DTSC LONG BEACH M.C. GASLAN SOUTHWEST DIVISION D. DAWSON	COMMENTS ON THE PRELIMINARY ASSESSMENT DOCUMENT FOR SITE 12 AND 13 (SEE DOC. NO N60042.000047)	ADMIN RECORD	PA	12,13	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000351 PLAN N68711924673 0042	12/06/95 11/20/95 DO 22 10.2	BROWN & CALDWELL B. SCHMUCKER SOUTHWEST DIVISION D. DAWSON	FINAL COMMUNITY RELATIONS PLAN (MADE DISCLOSABLE)	ADMIN RECORD CONFIDENTIAL DOC INFO REPOSITORY	CRP MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	4,5,6,7,8, 9,11,1,2,3 10,14,15, 16,17	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY
N60042 000352 LTR 000000000000000 0002	01/10/96 11/20/95 00000 01.6	DTSC LONG BEACH M.C. GASLAN SOUTHWEST DIVISION D. DAWSON	RESPONSE TO COMMENTS ON THE FINAL SITE INVESTIGATION FOR SITES 1-9 AND 11	ADMIN RECORD	COMMENTS MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,11	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000382 MM 000000000000000 0001	07/31/96 11/21/95 00000 01.6	SOUTHWEST DIVISION NAF EL CENTRO TEAM	30 NOVEMBER 1995 NAF EL CENTRO TEAM MEETING MINUTES	ADMIN RECORD	CLOSURE EE\CA ACTMEMO SCRAPYARD WELLS WORK PLAN	12,13,8,10	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000347 PLAN N6871193D1459 0075	11/28/95 11/25/95 DO 09 03.3	OHM REMEDIATION B. LEFEVER SOUTHWEST DIVISION D. DAWSON	FLUID INJECTION WITH VACUUM EXTRACTION PILOT STUDY WORK PLAN SITE 15 - FUEL FARM REMEIDATION	ADMIN RECORD	FUEL	15	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000353 RPT N6871193D1459 0450	01/31/96 12/01/95 DO 09 03.3	OHM REMEDIATION J. PEPIN SOUTHWEST DIVISION	DRAFT ENGINEERING EVALUATION FOR CONSTRUCTION SITE 2	ADMIN RECORD		2	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000386 LTR 000000000000000 0001	07/31/96 01/04/96 00000 01.6	SOUTHWEST DIVISION D. DAWSON CAL EPA PALM DESERT L. CHAVEZ	TRANSMITTAL OF "DRAFT FUEL FARM PILOT TEST REPORT" NAF EL CENTRO, DATED 12/95.	ADMIN RECORD	FUEL		SOUTHWEST DIVISION NAF EL CENTRO
N60042 000360 PLAN N6871192D4670 0250	03/08/96 01/17/96 00100 03.3	BECHTEL NATIONAL INC M. GALAGODA SOUTHWEST DIVISION	DRAFT DATA GAP STUDY WORK PLAN SITES 4,10,12,13,17	ADMIN RECORD	DATA	4,10,12,13 17	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000384 LTR 000000000000000 0002	07/31/96 01/23/96 00000 01.6	SOUTHWEST DIVISION D. DAWSON DTSC LONG BEACH I. HIRBAWI	TRANSMITTAL OF DRAFT DOCUMENT "DATA GAPS STUDY WORK PL N FOR NAF EL CENTRO"	ADMIN RECORD	WORK PLAN		SOUTHWEST DIVISION NAF EL CENTRO

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N60042 MM 000000000000000 0001	000383 07/31/96 01/24/96 00000 01.6	SOUTHWEST DIVISION NAF EL CENTRO TEAM	6 FEBRUARY 1996 NAF EL CENTRO TEAM MEETING AGENDA	ADMIN RECORD	UST MAG RD LANDFILL SLUDGE BUR AREA EE\CA FUEL AAL	1,3,8	SOUTHWEST DIVISION NAF EL CENTRO
N60042 MEMO N6871192D4670 0100	000359 03/05/96 02/01/96 00090 02.5	SOUTHWEST DIVISION NAF EL CENTRO	DRAFT ACTION MEMORANDUM FOR NON TIME CRITICAL REMOVAL ACTION AT NAF EL CENTRO SITE 1 MAGAZINE ROAD LANDFILL	ADMIN RECORD	ACTMEMO MAG RD LANDFILL	1	SOUTHWEST DIVISION NAF EL CENTRO
N60042 MM 000000000000000 0003	000385 07/31/96 02/09/96 00000 01.6	SOUTHWEST DIVISION NAF EL CENTRO TEAM	6 FEBRUARY MEETING MINUTES FOR NAF EL CENTRO TEAM	ADMIN RECORD	MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD GW EE\CA SI CLOSURE	1,3,8,7,9	SOUTHWEST DIVISION NAF EL CENTRO
N60042 LTR 000000000000000 0004	000365 05/23/96 02/14/96 00000 01.6	DTSC LONG BEACH M.C. GASLAN SOUTHWEST DIVISION D. DAWSON	COMMENTS ON THE PRELIMINARY DRAFT TECHNICAL MEMORANDUM BASEWIDE HYDROLOGY REPORT OF OCTOBER 25, 1995	ADMIN RECORD	COMMENTS TECH MEMO		SOUTHWEST DIVISION NAF EL CENTRO
N60042 MEMO N6871192D4670 0090	000357 03/04/96 02/21/96 00090 02.5	SOUTHWEST DIVISION NAF EL CENTRO	DRAFT ACTION MEMORANDUM FOR NON TIME CRITICAL REMOVAL ACTION AT NAF EL CENTRO SITE 8	ADMIN RECORD	ACTMEMO SCRAPYARD	8	SOUTHWEST DIVISION NAF EL CENTRO
N60042 MEMO N6871192D4670 0090	000358 03/04/96 02/21/96 00090 02.5	SOUTHWEST DIVISION NAF EL CENTRO	DRAFT ACTION MEMORANDUM FOR NON TIME CRITICAL REMOVAL ACTION AT NAF EL CENTRO SITE 3	ADMIN RECORD	ACTMEMO SLUDGE BUR AREA	3	SOUTHWEST DIVISION NAF EL CENTRO
N60042 RPT N6871192D4670 0350	000362 04/01/96 03/01/96 00090 01.1	BECHTEL NATIONAL INC M. GALAGODA SOUTHWEST DIVISION	FINAL TECHNICAL MEMORANDUM BASEWIDE HYDROGEOLOGY (SIGNED 3/14/96)	ADMIN RECORD	TECH MEMO MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,10 11,12,13, 14,15,16, 17	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO BRAWLEY LIBRARY
N60042 PLAN N6871192D4670 0450	000361 03/11/96 03/06/96 00100 01.6	BECHTEL NATIONAL INC M. GALAGODA SOUTHWEST DIVISION	DRAFT GROUNDWATER MONITORING WORK PLAN	ADMIN RECORD INFO REPOSITORY	GW MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,8,10,11, 17	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY

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N60042 000387 LTR 000000000000000 0001	07/31/96 03/13/96 0000 01.6	SOUTHWEST DIVISION M. GONZALES DTSC LONG BEACH I. HIRBAWI	SUBMITTAL OF THE "DRAFT GROUNDWATER MONITORING WORKPLAN FOR NAF, EL CENTRO FOR REVIEW. PROVIDE COMMENTS BY 3/29/96.	ADMIN RECORD	WORK PLAN GW		SOUTHWEST DIVISION NAF EL CENTRO
N60042 000368 LTR 000000000000000 0012	05/23/96 03/14/96 00000 01.6	CRWQCB COLORADO N. KRULL VARIOUS AGENCIES	NOTICE PROPOSED NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT AND WASTE DISCHARGE REQUIREMENTS RICE DRAIN AND FUEL FARM	ADMIN RECORD	PUBNOT	16	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000388 LTR 000000000000000 0001	07/31/96 03/14/96 0000 01.6	SOUTHWEST DIVISION M. GONZALES DTSC LONG BEACH I. HIRBAWI	REQUEST FOR COMMENTS ON THE SITE 1, 3, AND 8 DRAFT ACTION MEMOS	ADMIN RECORD	ACTMEMO MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,3,8	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000363 LTR 000000000000000 0002	05/23/96 03/18/96 00000 01.6	DTSC LONG BEACH M.C. GASLAN SOUTHWEST DIVISION D. DAWSON	CONCURRENCE WITH PROPOSED SUPPLEMENTAL INVESTIGATIONS TO THE FINAL SITE INVESTIGATION REPORT SITES 1-9 & 11 AND RWQCB's VERBAL CONCURRENCE DRAFT DATA GAP WORKPLAN	ADMIN RECORD	COMMENTS MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000367 LTR 000000000000000 0005	05/23/96 03/27/96 00000 01.6	DTSC LONG BEACH M.C. GASLAN SOUTHWEST DIVISION M. GONZALES	COMMENTS ON THE DRAFT DATA GAP STUDY WORK PLAN CAL/EPA AND DTSC COMMENTS	ADMIN RECORD	COMMENTS MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,7,8,9,11	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000366 LTR 000000000000000 0002	05/23/96 04/01/96 00000 01.6	NAF EL CENTRO P.T. MADISON IMPERIAL ITTIGATION J. KELLY	GRANT AUTHORIZATED TO THE IMPERIAL IRRIGATION DISTRICT A RIGHT-OF-WAY FOR OPERATING AND MAINTAINING AN OVERHEAD POWER LINE ADJACENT TO THE FUEL FARM	ADMIN RECORD	AAL	16	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000389 LTR 000000000000000 0006	07/31/96 04/16/96 0000 01.6	DTSC LONG BEACH I. HIRBAWI SOUTHWEST DIVISION M. GONZALES	COMMENTS ON THE DRAFT GROUNDWATER MONITORING PLAN OF MARCH 6, 1996 (CAL/EPA, DTSC, RWQCB COMMENTS)	ADMIN RECORD	COMMENTS		SOUTHWEST DIVISION NAF EL CENTRO
N60042 000390 LTR 000000000000000 0012	07/31/96 04/16/96 0000 01.6	DTSC LONG BEACH M. GASLAN SOUTHWEST DIVISION M. GONZALES	COMMENTS ON THE DRAFT EE/CA FOR SITES 1,3, AND 8 (CAL/EPA, DTSC, RWQCB COMMENTS)	ADMIN RECORD	EE\CA COMMENTS MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,3,8	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000372 PLAN N6871192D4670 0350	05/30/96 05/01/96 00100 03.3	BECHTEL NATIONAL INC M. GALAGODA SOUTHWEST DIVISION	FINAL GROUNDWATER MONITORING WORK PLAN (SIGNED MAY 15, 1996)	ADMIN RECORD	GW MONITORING MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,2,3,4,5, 6,8,10,11, 17	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO BRAWLEY LIBRARY

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N60042 000364 RPT N6871192D4670 0300	05/23/96 05/07/96 00100 01.1	BECHTEL NATIONAL INC D. UMSTOT SOUTHWEST DIVISION	TECHNICAL SPECIFICATION SECTIONS FOR NAF EL CENTRO IR SITES 11	ADMIN RECORD	FUEL	11	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000373 MM N6871192D4670 0003	05/30/96 05/15/96 00090 01.6	BECHTEL NATIONAL INC REGULATORY AGENCIES	MAY 5, 1996 CONFERENCE CALL MINUTES REGARDING CLARIFICATION REQUIREMENTS NECESSARY TO USE SOIL MATERIAL FROM SITES 3 & 8 TO COVER SITE 1	ADMIN RECORD	MTG MINS MAG RD LANDFILL SLUDGE BUR AREA SCRAPYARD	1,3,8	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000391 LTR 000000000000000 0005	07/31/96 05/28/96 0000 01.6	DTSC LONG BEACH M. GASLAN SOUTHWEST DIVISION M. GONZALES	COMMENTS ON THE DRAFT ACTION MEMORANDUM FOR NON-TIME CRITICAL REMOVAL ACTIONS AT SITE 1,3 AND 8	ADMIN RECORD	ACTMEMO MAG RD LANDFILL COMMENTS SLUDGE BUR AREA SCRAPYARD	1,3,8	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000392 LTR 000000000000000 0001	07/31/96 05/31/96 0000 01.6	NAF EL CENTRO P.T. MADISON APCD EL CENTRO B. FISHER	REGARDING LETTER DTD APRIL 12, 1996, NAF EL CENTRO, ENCLOSED REVISION TO THE HEALTH RISK ASSESSMENT. ENCL: REV. TO HRA, HRA APPENDIX E, & DISKETTES.	ADMIN RECORD	RA HRA		SOUTHWEST DIVISION NAF EL CENTRO
N60042 000394 LTR 000000000000000 0004	07/31/96 07/03/96 0000 01.6	DTSC LONG BEACH I. HIRBAWI SOUTHWEST DIVISION M. GONZALES	COMMENTS ON THE THE FINAL GROUNDWATER MONITORING PLAN OF MAY 1996 (CAL/EPA, DTSC, RWQCB COMMENTS)	ADMIN RECORD	GW COMMENTS SCRAPYARD	8	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000395 LTR N6871192D4670 0023	08/12/96 07/31/96 0090 02.7	BECHTEL, SAN DIEGO D. UMSTOT SOUTHWEST DIVISION R. SELBY	RESPONSES TO REGULATORY COMMENTS ON DRAFT REMOVAL ACTION DOCUMENTS FOR SITES, 1,3, AND 8. (ENCLOSURES)	ADMIN RECORD	RESPONSE REMOVAL	1,3,8	SOUTHWEST DIVISION NAF EL CENTRO
N60042 000398 MEMO N6871192D4670 2000	08/19/96 08/01/96 00090 02.5	BECHTEL SAN DIEGO D. UMSTOT SOUTHWEST DIVISION R. SELBY	DRAFT ACTION MEMORANDUM FOR PUBLIC REVIEW NTCRA SITE 1 (W/REVISED PAGES)	ADMIN RECORD INFO REPOSITORY	ACTMEMO REMOVAL	1	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY
N60042 000401 MEMO N6871192D4670 0700	09/26/96 08/01/96 00090 02.5	BNI SAN DIEGO D. UMSTOT SOUTHWEST DIVISION R. SELBY	DRAFT FOR PUBLIC REVIEW ACTION MEMORANDUM FOR NTCRA, SITE 3 (W/REVISED PAGES)	ADMIN RECORD INFO REPOSITORY	ACTMEMO NTCRA	3	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY
N60042 000399 LTR 000000000000000 0006	09/16/96 08/27/96 00000 10.0	DTSC LONG BEACH J. RICH NAF EL CENTRO F. RIVERA	PUBLIC PARTICIPATION REQUIREMENTS FOR THE UPCOMING REMOVAL ACTIONS AT SITES 1,3, AND 8	ADMIN RECORD INFO REPOSITORY	REMOVAL MAG RD LANDFILL SLUDGE SCRAPYARD	1 3 8	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY

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N60042 000400 MEMO N6871192D4670 0700	09/26/96 09/04/96 00090 02.5	BNI SAN DIEGO D. UMSTOT SOUTHWEST DIVISION R. SELBY	DRAFT FOR PUBLIC REVIEW ACTION MEMORANDUM FOR NTCRA SITE 8 (W/REVISED PAGES)	ADMIN RECORD INFO REPOSITORY	ACTMEMO NTCRA	8	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY
N60042 000402 RPT N6871192D4670 1050	09/26/96 09/10/96 00100 03.4	BNI SAN DIEGO G. CAGLE SOUTHWEST DIVISION	DRAFT GROUNDWATER MONITORING REPORT SECOND QUARTER 1996	ADMIN RECORD INFO REPOSITORY	GW MAG RD LANDFILL SCRAPYARD	1 2 3 4 5 6 8 10 11 17	SOUTHWEST DIVISION NAF EL CENTRO EL CENTRO LIBRARY BRAWLEY LIBRARY
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NAF EL CENTRO ADMINISTRATIVE RECORD FILE INDEX

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N60042 000407 XMTL N6871192D4670 0004	10/31/96 10/31/96 00090 10.5	BNI SAN DIEGO W. CLEMENTS SOUTHWEST DIVISION R. SELBY	OCTOBER 17, 1996 CONFERENCE CALL MINUTES REGARDING NAVY RESPONSE TO REGULATORY COMMENTS ON NAF REMOVAL ACTION DOCUMENTS FOR SITES, 1,3, & 8	ADMIN RECORD	MTG MINS RESPONSE COMMENTS REMOVAL	1 3 8	SOUTHWEST DIVISIS=
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ATTACHMENT C

RESPONSE TO SIGNIFICANT COMMENTS TO THE ENGINEERING EVALUATION/COST ANALYSIS AND ACTION MEMORANDUM

(See Appendix E in Engineering Evaluation/Cost Analysis Document)

ATTACHMENT D

NAF EL CENTRO INSTALLATION RESTORATION PROGRAM FACT SHEETS

NAVAL AIR FACILITY EL CENTRO
INSTALLATION RESTORATION PROGRAM

FACT SHEET NO. 1 **APRIL, 1994**

INTRODUCTION

The Naval Air Facility El Centro (NAFEC) is located about 9 miles west of the City of El Centro, California. Like most military installations, activities at NAFEC require the use of substances defined as hazardous substances. As a branch of the federal government, the U. S. Navy is subject to the federal laws and regulations, such as **CERCLA** and **SARA**, covering the generation and disposal of **hazardous substances** at its facilities. Past hazardous waste disposal practices, although acceptable at the time, have frequently resulted in unexpected and long-term problems through the release of **contaminants** into soil and **groundwater**.

This fact sheet is the first in a series providing information about the environmental **cleanup** activities at the NAFEC. This fact sheet discusses past and proposed activities and identifies sources of additional information.

BACKGROUND

NAFEC has been established in its present location since 1942, when it was commissioned as a Marine Corps Air Station. Although its name and activities have varied since then, it has been in continuous use since World War II. Presently, NAFEC is the Navy's support facility for fleet air squadrons performing tactical air training, and is also the winter home of the Navy's elite Blue Angels precision flying team. Other tasks and functions include operations and training, administration, general engineering support, personnel support, medical and dental support, maintenance of material, maintenance of property and utility operations, and supply operations.

Installation Restoration Program

The **Department of Defense (DOD)**, of which the Navy is a part, developed the **Installation Restoration (IR) Program** to identify and investigate potentially hazardous disposal sites created by former hazardous material handling, storage, and disposal practices -- procedures once accepted and approved, but subsequently found to be improper and unsafe. The IR Program was modeled after the "**Superfund**" program established by **CERCLA**. As part of the IR Program, soil and groundwater investigations are underway at NAFEC.

The IR Program involves these five steps, which are defined in the glossary:

- **Preliminary Assessment (PA)**
- **Site Investigation (SI)**
- **Remedial Investigation (RI)**
- **Feasibility Study (FS)**; and
- **Remedial Action (RA)**

Past Site Activities

Years of activities at NAFEC involving hazardous substances and hazardous wastes have resulted in sites of potential contamination on the facility. In September 1987, a **Preliminary Assessment** (NEESA 13-106) was completed at NAFEC which identified areas of potential contamination (see figure, inside). Sixteen sites were originally identified. Two sites were later added to the IR Program, Sites 2A and 17, for a total of 18 sites.

As part of **Site Investigation**, studies have been conducted and others are underway to determine the nature and extent of possible contamination to soil, surface water, and groundwater at NAFEC. However, early results suggest that surface water quality does not appear to be affected by contamination by NAFEC IR sites.

(Words shown in bold type are defined in the glossary)

The kinds of substances or materials used and identified through studies at NAFEC include **petroleum hydrocarbons** (fuels, hydraulic fluids, motor oils), **solvents**, paints and thinners, photo chemicals, **heavy metals**, battery acids, **chlorinated pesticides**, asbestos, **polychlorinated biphenyls (PCBs)**, construction and demolition debris, household rubbish, and sewage sludge.

A number of SI studies, including groundwater and solid waste testing resulting in at least 20 reports, have been conducted for the IR Program sites at NAFEC. Additional investigative site work is on-going at the facility.

Other Activities

The IR Program focuses on past problems. Compliance with current laws and regulations in effect ensures that NAFEC handles its hazardous wastes properly and that no future problems will arise. Plans have been developed and implemented to establish proper waste identification, handling, and disposal procedures:

- Oil and Hazardous Substance Spill Contingency Plan
- Hazardous Waste Management Plan
- Oil Spill Prevention, Control and Counter-measures Plan
- Hazardous/Extremely Hazardous Materials Management Plan
- AB2588 "Hot Spots" Emission Inventory Plan

In addition, underground storage tanks containing fuel and other petroleum products, often a source of groundwater contamination, are being replaced at NAFEC with above-ground storage tanks. Having tanks above the ground allows better monitoring and prevention of potential leaks, which might otherwise go undetected for long periods of time.

Future Activities

The community will continue to be informed about and involved in cleanup activities at NAFEC. Future fact sheets, public meetings, and opportunities for public review and comment on proposed cleanup methods are a part of the IR Program's community relations activities.

A mailing list has been developed and will be continuously updated. Please add your name and address, and those of others interested in the NAFEC IR Program cleanup, by filling out the mail-in coupon on the back of this fact sheet.

COMMUNITY INFORMATION

A number of potentially interested parties were contacted and interviewed about this program. Interviewees also had the opportunity to ask questions. Their concerns and questions, as well as the cleanup program background, were incorporated into the **Community Relations Plan**. This is a formal document, meeting Environmental Protection Agency (EPA) and State of California community relations guidelines, which describes community involvement activities at a hazardous waste remediation site. The Community Relations Plan is a public document and is on file at the Information Repositories.

Information Repositories

In order to ensure that relevant cleanup-related reports and findings are available for public access, two information repositories have been established. These locations were selected for public convenience and accessibility, based upon comments received during the community interviews:

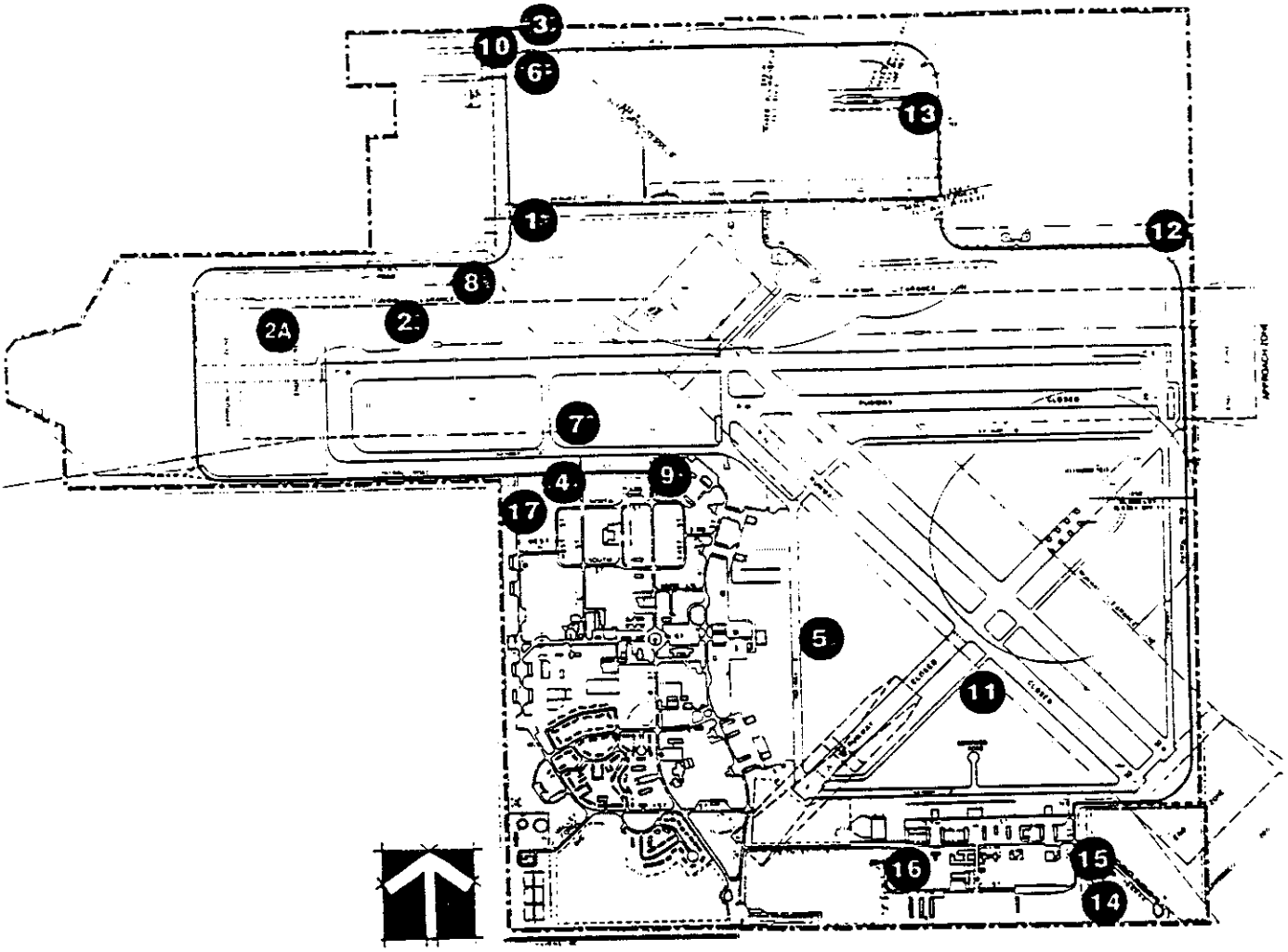
El Centro Public Library	M-Th	10 a.m.-8 p.m.
529 State Street	Fri	10 a.m.-5 p.m.
El Centro, CA 92243	Sat	10 a.m.-1 p.m.
Brawley Public Library	M-Th	12 p.m.-8 p.m.
400 Main Street	Sat	9 a.m.-5 p.m.

FOR MORE INFORMATION, PLEASE CONTACT:

Public Affairs Officer
Naval Air Facility El Centro
El Centro, CA 92243-5001
(619) 339-2519

Mr. John Crow
Naval Air Facility El Centro
El Centro, CA 92243-5001
(619) 339-2264

(Words shown in bold type are defined in the glossary)



Site	Location	Potential Contaminants
1	Magazine Road Landfill	Asbestos, fuel, paint, solvents, photo chemicals, acid
2	Patrol Road Landfill	Asbestos, fuel, paint, solvents, photo chemicals, acid
2A	West Patrol Road Landfill	Asbestos, fuel, paint, solvents, photo chemicals, acid
3	Sludge Burial Area	Silver, cyanide
4	4th Street Fire Fighting Training Area	Burned leaded fuel, hydraulic fluid, confiscated drugs
5	Fire Fighting Training Area	Burned leaded fuel
6	Northwest Fire Fighting Training Area	Burned leaded fuel
7	Abandoned Fuel Farm	Leaded and diesel fuel
8	Scrapyard	Empty drums, tanks, paint cans, transformers with PCBs
9	Transformer Storage Area	Transformers containing PCBs
10	Sewage Stabilization Ponds	Sewage, leaded fuel, motor fluids, photo solutions
11	Runway Burn Area	Burned fuel
12	Open Burn Pit	Burned confiscated drugs, ceramic, tin cans, wood
13	Old Incinerator	Burned paper
14	Fuel Farm Tank Rinseate Disposal	Leaded and diesel fuel
15	Fuel Farm Filter Cleaning Area	Leaded and diesel fuel
16	Potassium Ferricyanide Spill Area	Potassium ferricyanide
17	Fire Fighting Training Area	Burned leaded and diesel fuel

Installation Restoration Program Site Locations
Naval Air Facility El Centro
El Centro, California

ADAPTED FROM MAP PREPARED BY NAFEC

GLOSSARY OF TERMS

CERCLA - The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (also known as "Superfund") which implements EPA emergency and long-term hazardous waste cleanup activities. This Federal legislation covers the identification, investigation and remediation of hazardous waste sites.

Chlorinated pesticides - A class of pesticides which contain chlorinated hydrocarbon compounds. DDT and chlordane are examples of chlorinated pesticides.

Cleanup - Actions taken to deal with a release or threatened release of hazardous substances that could affect public health and/or the environment.

Community Relations Plan (CRP) - Formal plan for EPA community relations activities at a Superfund site. The CRP is designed to ensure citizen opportunities for public involvement at a site, determine activities that will provide for such involvement, and allow citizens the opportunity to learn about the site.

Contaminant - Any physical, chemical, biological, or radiological substance or matter that has an adverse affect on air, water, or soil.

Department of Defense (DOD) - The department of the federal government which oversees national defense, including all branches of the military

Feasibility Study (FS) - The description and analysis of the potential cleanup alternatives for a hazardous waste site and recommendation of a cost-effective alternative.

Groundwater - Water found beneath the earth's surface that fills pores between materials such as sand, gravel, or soil. In aquifers, groundwater occurs in sufficient quantities that it can be used for drinking water, irrigation, and other purposes.

Hazardous substance - Any material that poses a threat to public health and/or the environment.

Heavy metals - A class of metals categorized by their high molecular weight. A partial list of heavy metals includes: mercury, arsenic, lead, chromium, zinc, cadmium, copper, barium, silver, and nickel.

Installation Restoration Program - A program developed by the DOD and modeled after EPA's "Superfund" (see below) program, to identify and investigate potentially hazardous disposal sites created by former hazardous substance handling, storage, and disposal practices.

Petroleum hydrocarbons - The class of hydrocarbons (organic compounds) derived from petroleum. Typical petroleum hydrocarbons include: gasoline, kerosene, diesel, and oils.

Polychlorinated Biphenyls (PCBs) - A class of chemicals typically used to cool electrical devices such as transformers.

Preliminary Assessment (PA) - The process of collecting and reviewing available information about a known or suspected hazardous waste site or release. EPA or states use this information to determine if a site requires further study.

Remedial Action - The phase of actual implementation or construction that follows remedial investigation, feasibility study, and development of remedial design.

Remedial Investigation (RI) - An in-depth study designed to gather the data necessary to determine the nature and extent of contamination. The data are used to establish criteria for site cleanup and identify preliminary alternatives for remedial action.

SARA - The Superfund Amendments and Reauthorization Act (SARA) is a modification to CERCLA and was enacted on October 17, 1986.

Site Investigation (SI) - The step following Preliminary Assessment (PA). It is designed to collect more extensive information on a hazardous waste site.

Solvent - (Usually liquid) substance capable of dissolving or dispersing other substances.

Superfund - The common name for the federal Comprehensive Environmental Response, Compensation, and Liability Act (see CERCLA, above).

PLEASE KEEP ME INFORMED

YES, I would like to receive information on the progress of environmental cleanup activities at NAF El Centro.

PLEASE RETURN COMPLETED COUPON TO:

Public Affairs Officer
Naval Air Facility El Centro
El Centro, CA 92243-5001

_____
Name

_____
Address

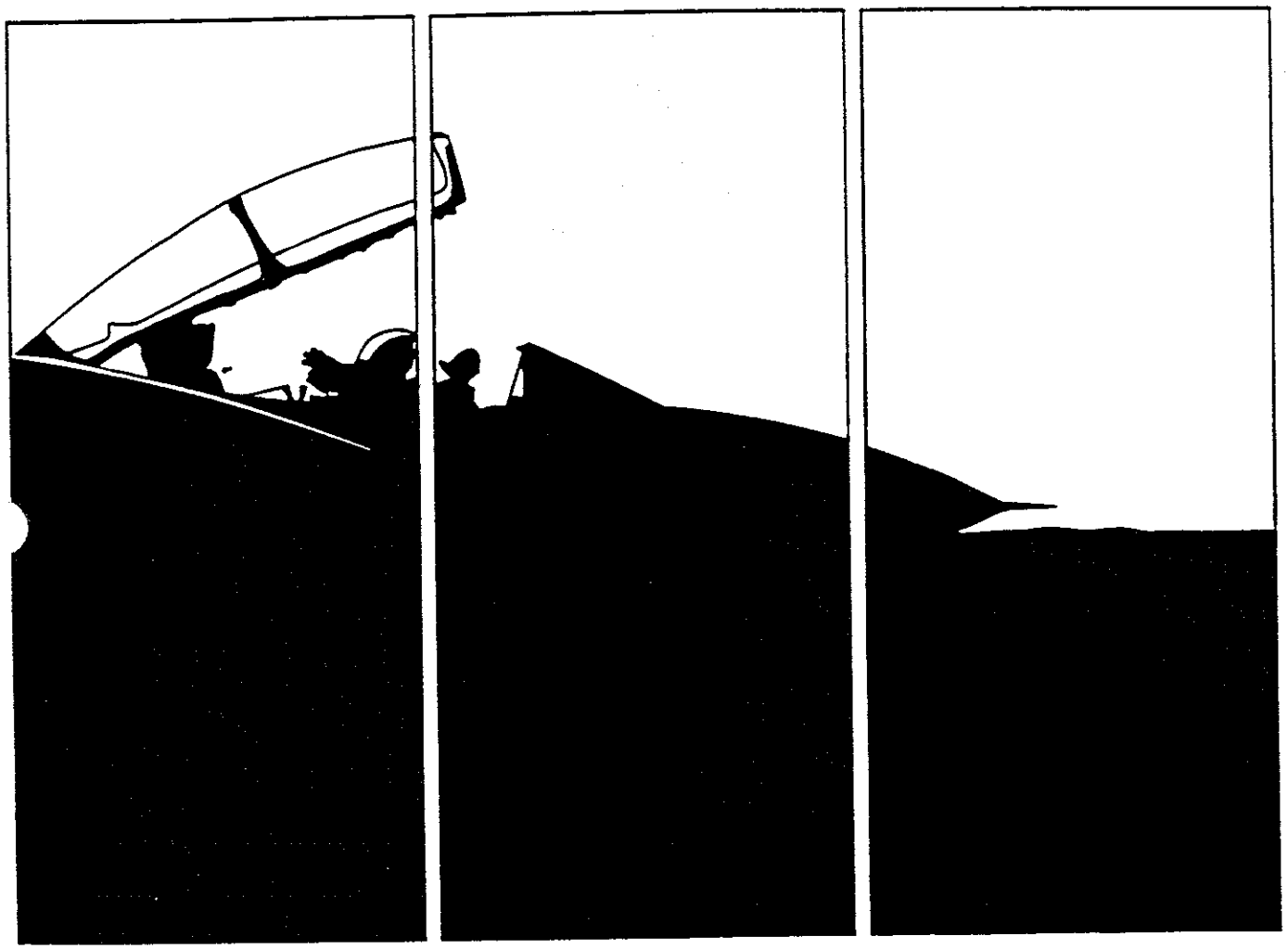
_____
City, State, Zip

_____
(Area Code) Telephone

Southwest Division, Naval Facilities
Environmental Division
1220 Pacific Highway, Building 130
San Diego, CA 92132

INSIDE

Update on Naval Air Facility, El Centro Installation Restoration Program



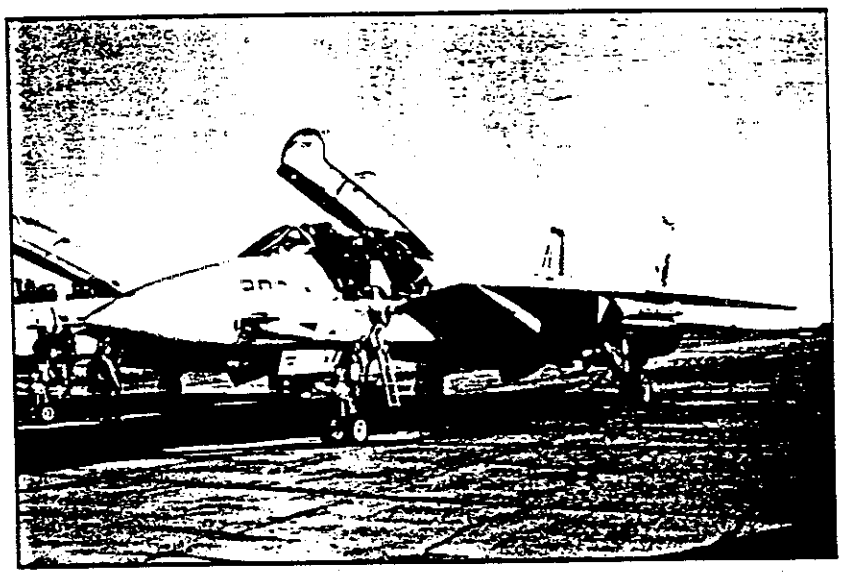
Naval Air Facility, El Centro

Installation Restoration Program

INSTALLATION RESTORATION PROGRAM

NAF EL CENTRO

NAF El Centro is the Navy's support facility for fleet air squadrons performing tactical air training such as field carrier landing practice, air-to-air and air-to-ground weapons training and fleet fighter air combat maneuvers. Fleet utilization has increased dramatically over the past few years, maximizing the area's excellent training facilities.



The base is the winter home of the Navy's elite Blue Angels precision flying team. NAF El Centro was first used by the Marine Corps during World War II and is now the second largest employer in the Imperial Valley.

PROGRAM OVERVIEW

The Installation Restoration (IR) Program, developed by the Department of Defense (DOD), was modeled after the "Superfund" program established by the Environmental Protection Agency (EPA). The EPA, California Regional Water Quality Control Board and other agencies are involved in reviewing the program as it develops.

The Navy is a leader in hazardous waste management and restoring hazardous waste sites. In the past, accepted and approved procedures, since found to be improper and unsafe, were employed in handling hazardous wastes. This resulted in the improper disposal of hazardous waste across the country.

The Navy has implemented this comprehensive program to identify and investigate potentially hazardous disposal sites created by former hazardous substance handling, storage and disposal practices. Several remedial action alternatives are reviewed, including "no action." Selection of the appropriate remedial action is based on an assessment of the potential health risks, desired level of cleanup, available technology, cost effectiveness and other factors

The IR Program consists of three phases: remedial investigation; feasibility study; and remedial action. A technical review committee, composed of representatives from the Navy, EPA, state and local agencies, environmental groups and the community, will review the program as it applies to specific installations and individual sites.

REMEDIAL INVESTIGATION

The remedial investigation involves a preliminary assessment and site investigation to identify potentially contaminated sites, characterize the nature of the contamination and recommend sites for further study. Once identified, further information is gathered on the extent of contamination and the potential threat to public health and safety and the environment.

A preliminary assessment and site investigation have identified 17 potential hazardous waste sites at NAF El Centro. These sites were evaluated using the EPA hazard ranking system which assesses a site's potential to affect human health, welfare and the environment. High scoring waste sites are placed on the National Priorities List (NPL). NAF El Centro scored well below the threshold and is not listed on the NPL.

The EPA is currently reevaluating previously scored hazardous waste sites under a revised hazard ranking system. It is expected that many sites not now listed on the NPL will be included with the revised scoring.

FEASIBILITY STUDY

Developed concurrently with the remedial investigation is the feasibility study, which proposes and evaluates various cleanup measures based on data gathered in the remedial investigation. The remedial investigation and feasibility study are then summarized in a report. The report, along with a plan for remedial action, is submitted to regulatory agencies for review. After receiving public and agency comments on these documents, a record of decision is developed which establishes cleanup measures to be implemented.

REMEDIAL ACTION

Cleanup planning begins after the record of decision is published. The plan is implemented in the remedial action phase in which contaminants are removed from the sites.

OPERATIONAL CHANGES

To ensure NAF El Centro remains clean of hazardous wastes, three local plans to establish proper procedures for the identification, handling and disposal of hazardous wastes have been developed and implemented. These are the Hazardous Substance Spill Contingency Plan, the Hazardous Materials/Waste Management Plan and the Oil Spill Prevention, Control and Countermeasures Plan.

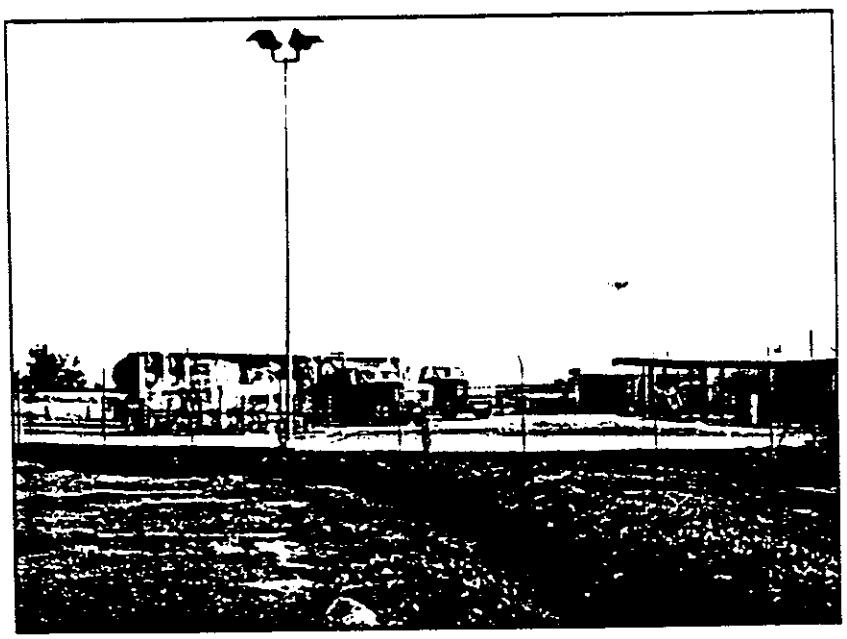
Additionally, the Navy has developed the Underground Storage Tank (UST) program. This continuing program is designed to prevent contamination from the storage of petroleum products underground. NAF El Centro recently completed testing all its underground storage tanks and has drained or adjusted all tanks requiring attention.

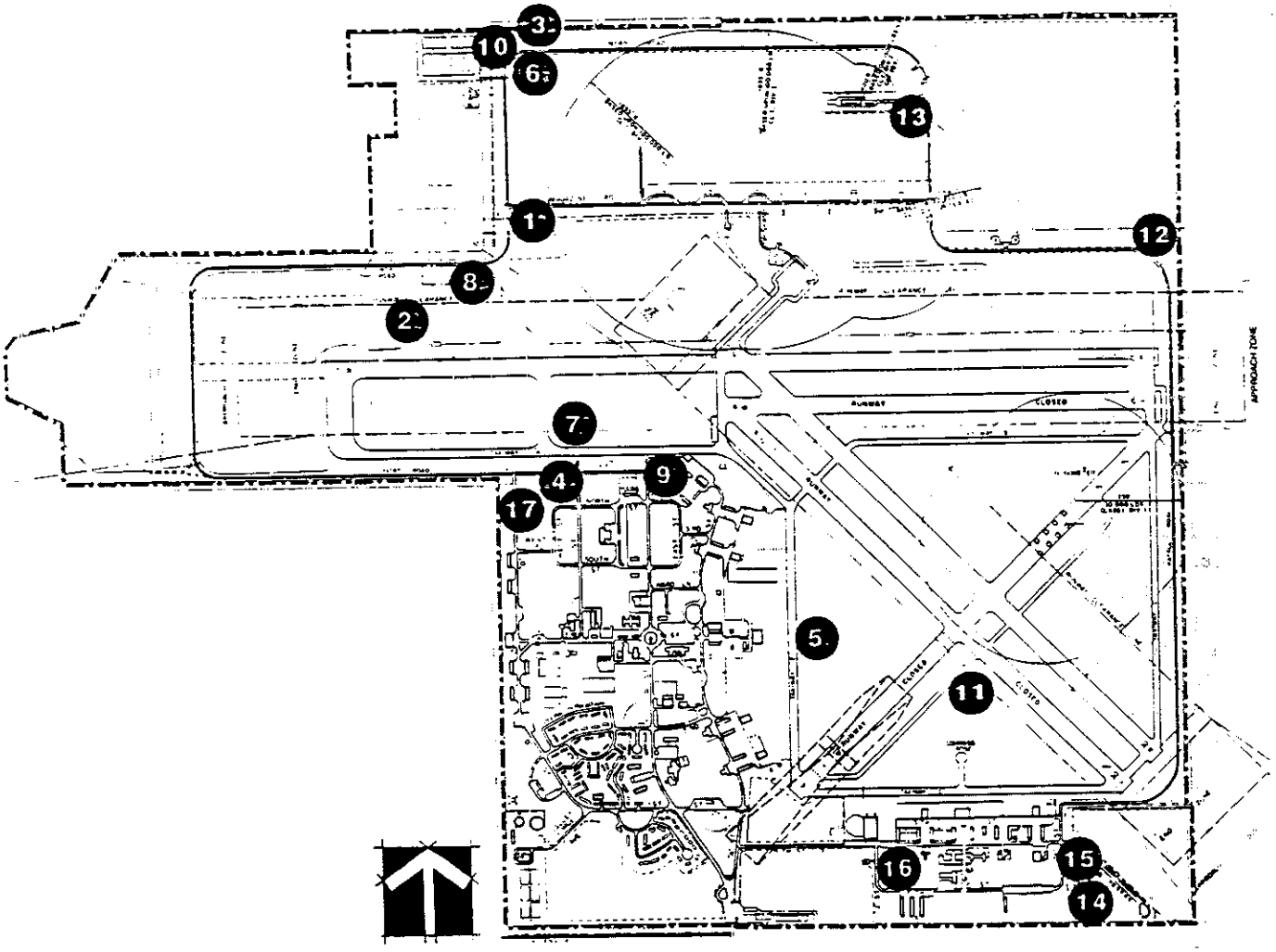
COMMUNITY RELATIONS

The Navy, recognizing the importance of community involvement in the IR process to identify and address community concerns, will coordinate with interested community members, provide information to libraries and make community presentations. Exhibits and information bulletins are available by calling:

for general information:
Public Affairs Office,
(619) 339-2519.

for technical information:
Public Works Department,
(619) 339-2201.





Installation Restoration

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NAVAL AIR FACILITY EL CENTRO
INSTALLATION RESTORATION PROGRAM

FACT SHEET NO. 1 **DECEMBER 1994**

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