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Office of
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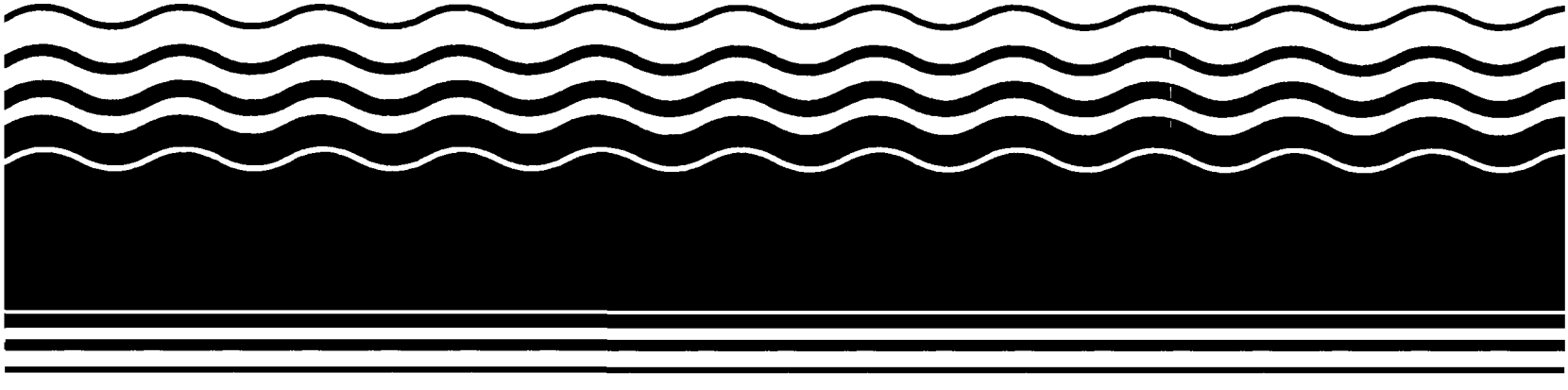
Remedial Response

EPA/ROD/R09-93/087
March 1993

EPA

Superfund Record of Decision:

Sacramento Army Depot, CA



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Sacramento Army Depot, CA
Fourth Remedial Action

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16. Abstract (Limit: 200 words)

The Sacramento Army Depot site is part of a 485-acre military facility, located in the Sacramento, California. Onsite operations include electro-optics equipment repair, the emergency manufacture of parts, shelter repair, metal plating and treatment, and painting operations. Approximately 3,000 people are employed at the site; however, there are no longer any residents at the Sacramento Army Depot (SAAD) facility. Land use is the area is predominantly commercial and light industrial, with some residential areas located two to three miles west of the site. Morrison Creek originally flowed from east to west through the land now occupied by the SAAD facility, but was later re-routed to flow outside the southern boundary of the site. The creek discharges into two overflow basins of the Sacramento and American Rivers, and ultimately empties into the Sacramento River. Ground water contamination at the site appears to extend approximately 1,000 feet southwest of the site; however, most industries and residences in the area use Sacramento City water from municipal wells located at least three quarters of a mile from the SAAD. In 1981, as part of the Army's Installation Restoration Program (IRP), the U.S. Army initiated an onsite investigation that revealed VOC-contaminated ground water in the southwest corner of the site. Based on the location of the VOCs in the ground water, two burn pits appeared to be the main

(See Attached Page)

17. Document Analysis a. Descriptors
Record of Decision - Sacramento Army Depot, CA
Fourth Remedial Action
Contaminated Media: soil, debris
Key Contaminants: VOCs (PCE, TCE, toluene, xylenes), metals (arsenic, chromium, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 90
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Fourth Remedial Action

Abstract (Continued)

sources of this contamination. Constructed in the late 1950s, the Burn Pits served intermittently as incineration pits until 1966. Materials that reportedly were buried and/or burned in the Burn Pits include plating shop wastes, oil and grease, batteries, and uncontaminated construction debris. The 21-foot deep Burn Pits occupy approximately 2 acres in the southwest corner of the SAAD, and are currently filled to the ground surface with soil and debris. The extent of soil contamination has been determined to extend as far as sixty feet laterally from the pits, to varying depths of 0 to 86 feet outside the Pits. Three RODs signed in 1989, 1991, and 1992 addressed the VOC-contaminated ground water, the VOC-contaminated soil in the Tank 2 area, and the heavy metal-contaminated soil in the oxidation lagoons at the SAAD, respectively. This ROD addresses a final remedy for the contaminated soil and debris in the Burn Pits, as OU5. Future RODs will address four other OUs at the SAAD. The primary contaminants of concern affecting the soil and debris are VOCs, including PCE, TCE, toluene, and xylenes; and metals, including arsenic, chromium, and lead.

The selected remedial action for this site includes ventilating all soil to remove VOCs, and applying a soil sealant annually to control dust; treating 247,900 yd^3 of soil using a soil vapor extraction (SVE) treatment system to remove VOCs from the soil, and extracting vapor through an air/water separator and routing the water to the existing onsite ground water treatment plant; transporting the spent carbon adsorption canisters offsite for disposal or recycling; conducting air sampling at the wellheads to evaluate the effectiveness of the SVE system and identify vadose zone hot spots; using particulate air filters on extraction wells located in the area of the Burn Pits, and disposing of any spent filters at an offsite hazardous waste facility; excavating the soil that contains non-volatile contaminants from the Burn Pits; removing containers and other debris from the Burn Pits, crushing some of the onsite debris for use as an aggregate in the solidification/fixation process, and transporting the remaining debris offsite for treatment, recycling, or disposal; treating the excavated soil onsite using cement-based stabilization; backfilling the excavated areas with solidified soil and debris, and covering the backfill with a layer of clean soil; and implementing institutional controls, including deed and land use restrictions. The estimated present worth cost for this remedial action is $2,811,000.

PERFORMANCE STANDARDS OR GOALS:

Chemical-specific soil cleanup goals are based on RCRA TCLP levels, and include arsenic 5 mg/l; cadmium 1 mg/l; chromium 5 mg/l; and lead 5 mg/l. Additionally, the SVE system will reduce TCE, PCE, and 1,2-DCE soil concentrations to 5 ug/kg or less; and soil gas concentrations will be reduced to 5 ug/kg or less.

SUPERFUND

RECORD OF DECISION:

Sacramento Army Depot
Burn Pits
Operable Unit

Sacramento, California

February 26, 1993

RECORD OF DECISION
I. DECLARATION

SITE NAME AND LOCATION

Burn Pits Operable Unit
Sacramento Army Depot (SAAD)
8350 Fruitridge Road
Sacramento, California

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Burn Pits Operable Unit at the SAAD facility in Sacramento, California, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is documented in the administrative record for this site, which contains, among other documents:

- The Burn Pits Operable Unit Feasibility Study (OUFS) which contains site investigation data, the Public Health Evaluation, and an analysis of remedial alternatives;
- The Proposed Plan (PP), dated August 1992, which summarizes the preferred cleanup alternative, compares the preferred alternative with several other alternatives, and invites public participation; and
- Summaries of public comments on the OUFS and the PP, including the Army's response to comments (as Part III of this ROD).

The purpose of this Record of Decision (ROD) is to set forth the remedial action to be conducted at SAAD to remedy soil contamination associated with the Burn Pits. This is the fourth of several remedial actions addressing soil and groundwater contamination that may be conducted, or are currently being conducted at SAAD. Subsequent RODs will address other potential threats posed by conditions at SAAD, both on and off site. A final comprehensive ROD will address the entire facility prior to SAAD's closure in 1997.

The U.S. Environmental Protection Agency, Region IX (EPA) and the State of California [California EPA: Department of Toxic Substances Control (DTSC) and the Central Valley Regional Water Quality Control Board (CVRWQCB)] concur with the selected remedy.

ASSESSMENT OF THE SITE

The Burn Pits Operable Unit consists of two pits containing soils and debris to a depth of 21 feet, and soils from depths of 0 to 86 feet outside the pits, extending as far as 60 feet laterally from the pits. The two pits have been designated "Unit 1". The remainder of the Burn Pits Operable Unit has been designated "Unit 2" through "Unit 5". The Burn Pits Operable Unit does not include groundwater. Although groundwater beneath a portion of SAAD has been impacted by volatile organic chemicals, it is currently being remediated as a separate Operable Unit.

An investigation by the Army showed that soils in the Burn Pits Operable Unit have been contaminated by semi-volatile and volatile organic chemicals, metals, polychlorinated biphenyls (PCBs), and dioxins and furans. Organic chemicals detected most often in site soils were ethylbenzene, di-n-butylphthalate, tetrachloroethene (PCE), toluene, 1,2-dichloroethene (1,2-DCE), trichloroethene (TCE), and xylenes. Two PCBs were detected, Arochlor 1254 and Arochlor 1260. Twelve metals were detected at concentrations exceeding background: antimony, arsenic, boron, cadmium, chromium (including chromium III and chromium VI), copper, lead, manganese, mercury, molybdenum, silver, and zinc.

Volatile organics contamination appears to extend vertically to the total depth of groundwater, and is a primary source of groundwater contamination. However, the vertical extent of semi-volatiles, metals, PCBs and dioxins/furans appears to be confined to Unit 1, no deeper than about 21 feet, and is limited laterally to the pits area. Volatile organic chemicals have been detected throughout the Burn Pits Operable Unit, in Units 1 through 5.

A baseline health risk assessment was conducted to evaluate the current and potential future risks posed by the contamination at the Burn Pits Operable Unit if no cleanup is performed. The health risk assessment found that arsenic, cadmium, chromium (chromium III and chromium VI), lead, TCE, PCE, and 1,2-DCE pose potential risks to human health, due to their toxicities and concentrations. For the purpose of reducing potential health risks and protecting groundwater, four Remedial Action Objectives (RAOs) were identified which target these contaminants. The RAOs were developed on the basis of Applicable or Relevant and Appropriate Requirements, and To-Be-Considered criteria.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action presented in this Record of Decision, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

In order to expedite the assessment and remediation processes at SAAD, the Army and participating regulatory agencies agreed to treat individual areas where hazardous materials have been used, stored, or disposed of as separate Operable Units. The Burn Pits Operable Unit is the fourth Operable Unit for which a ROD has been prepared.

The Army intends to clean up the Burn Pits Operable Unit so that the public is not exposed to toxic chemicals from the site. This ROD addresses the principal threat at the Burn Pits site by removing volatile contaminants and stabilizing non-volatile contaminants present in the soil. Removal and stabilization of contaminants in the soil will reduce the potential for:

- migration of contamination from soil to groundwater; and
- public exposure to contamination via inhalation of dust, direct contact with, or ingestion of, contaminated soil.

Each of these pathways represent primary potential future risks to public health.

The selected remedy for cleaning up the soil at the Burn Pits Operable Unit consists of:

- ventilating the entire Burn Pits Operable Unit soils to remove VOCs using extraction wells and a vacuum pump/rotary blower;
- treating extracted vapor using carbon adsorption;
- treating entrained water in the on-site water treatment plant;
- sampling air emissions to verify that volatile organic chemicals have been removed prior to venting to the atmosphere;
- sampling ventilated soils following treatment to assess whether treatment has been effective;
- excavating Unit 1 soils which contain non-volatile contaminants;
- sampling the excavation bottom and sidewalls to verify that contaminated soil has been removed;
- stabilizing the excavated soils using a cement-silica mixture;
- backfilling the excavation with stabilized soil; and

- implementing institutional controls in the form of a deed restriction and notice, to prohibit future disturbance of the stabilized soil mass.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces the toxicity, mobility or volume as a principal element. The remedial action will remove volatile contaminants from the site, will immobilize non-volatile contaminants through stabilization treatment, and will be completed within approximately 15 months. Since solidification of the non-volatile contaminants results in hazardous substances remaining at the Burn Pits above levels which allow for unlimited use and unrestricted exposure, the solidification component of this action shall be reviewed, pursuant to CERCLA 121(c) and the NCP 300.430 (f) (4) (ii), within five years after its initiation.

IT IS SO AGREED:
FOR THE U.S. DEPARTMENT OF THE ARMY:

Date

Lewis D. Walker
Deputy for Environmental, Safety, and Occupational Health
Office of the Assistant Secretary of the Army (IL&E)

Date

William Grundy
Colonel, OD
Commander, Sacramento Army Depot

FOR THE STATE OF CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY:

Date

David Wang
Chief, Base Closure Branch
Department of Toxic Substances Control
California Environmental Protection Agency

Date

William H. Crooks
Executive Officer
Central Valley Regional Water Quality Control Board

FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY:

Date

Regional Administrator
United States Environmental Protection Agency, Region IX

BURN PITS
RECORD OF DECISION

IT IS SO AGREED:
FOR THE U.S. DEPARTMENT OF THE ARMY:

24 MAR 1993 — Richard E. Newsome

Date — Lewis D. Walker
Deputy for Environmental, Safety, and Occupational Health
Office of the Assistant Secretary of the Army (IL&E)

3 MAR 1993 — William Grundy

Date — William Grundy
Colonel, OD
Commander, Sacramento Army Depot

FOR THE STATE OF CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY:

25 March 1993 — David Wang

Date — David Wang
Chief, Base Closure Branch
Department of Toxic Substances Control
California Environmental Protection Agency

25 March 93 — William H. Crooks

Date — William H. Crooks
Executive Officer
Central Valley Regional Water Quality Control Board

FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY:

3.29.93 — John Wise

Date — Regional Administrator
United States Environmental Protection Agency, Region IX

RECORD OF DECISION
SAAD – BURN PITS OPERABLE UNIT

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III. RESPONSIVENESS SUMMARY

I SITE NAME, LOCATION, AND DESCRIPTION

I.1 Location

The Burn Pits Operable Unit is part of the Sacramento Army Depot (SAAD) military facility owned by the U.S. Army. The SAAD facility is located at 8350 Fruitridge Road, in the City and County of Sacramento, California. SAAD lies approximately 7 mile southeast of downtown Sacramento (Figure 1), and is bound by Fruitridge Road on the north, Florin-Perkins Road on the east, Elder Creek Road on the south, and the Southern Pacific Railroad tracks on the west. The facility encompasses an area of 485 acres.

The Burn Pits Operable Unit occupies approximately two acres in the southwest portion of SAAD. The Operable Unit consists of two rectangular trenches (North and South Pits) containing soils and debris to a depth of 21 feet, and soils outside the trenches to a depth of 86 feet within about 60 feet of the Burn Pits. A site map of the SAAD facility, showing the location of the Burn Pits Operable Unit with respect to the other Operable Units and site features, is shown on Figure 2.

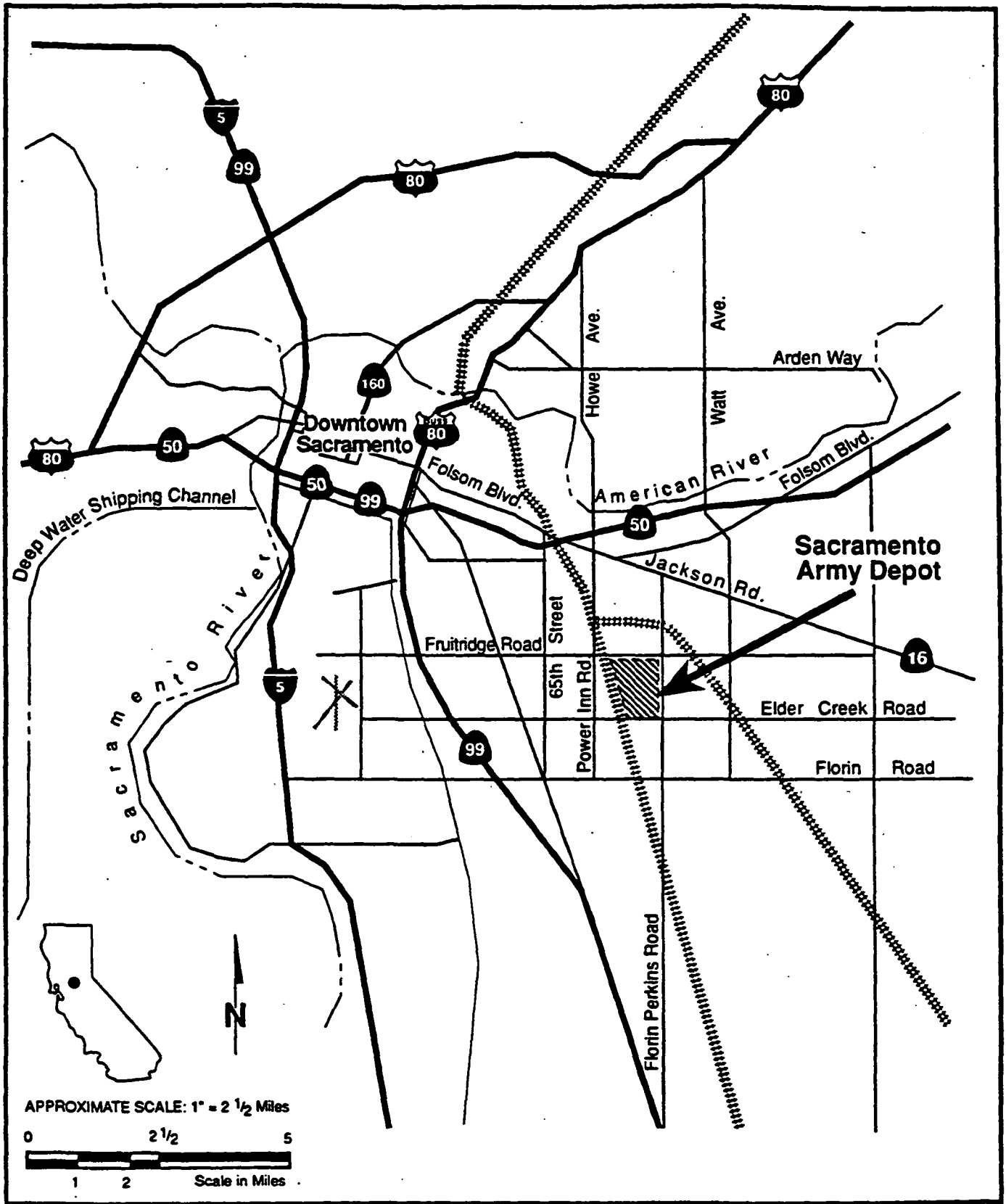
I.2 Site Description

Past and present activities conducted at SAAD include electro-optics equipment repair, the emergency manufacture of parts, shelter repair, metal plating and treatment, and painting. The metal plating and painting operations are likely the primary on-site waste generating activities.

In addition to the Burn Pits, past and present disposal and storage areas and structures at the site include: several underground and above-ground storage tanks; unlined wastewater lagoons; a battery disposal area; areas where pesticides were mixed or pesticide rinse water may have been discharged to the ground surface; and an area used for firefighter training, where flammable hydrocarbons were reportedly burned on the ground surface. Several of these areas have released contaminants into the soil and/or groundwater at SAAD, and are being investigated and cleaned up as separate Operable Units. Areas where contaminants have been found at SAAD are discussed in more detail in Section 2.

I.3 Demography

In 1987, 76 people were living on the SAAD facility; 56,398 people were living off site, within 2 to 3 miles of SAAD. Currently, there are no residents on the SAAD facility.



KLEINFELDER

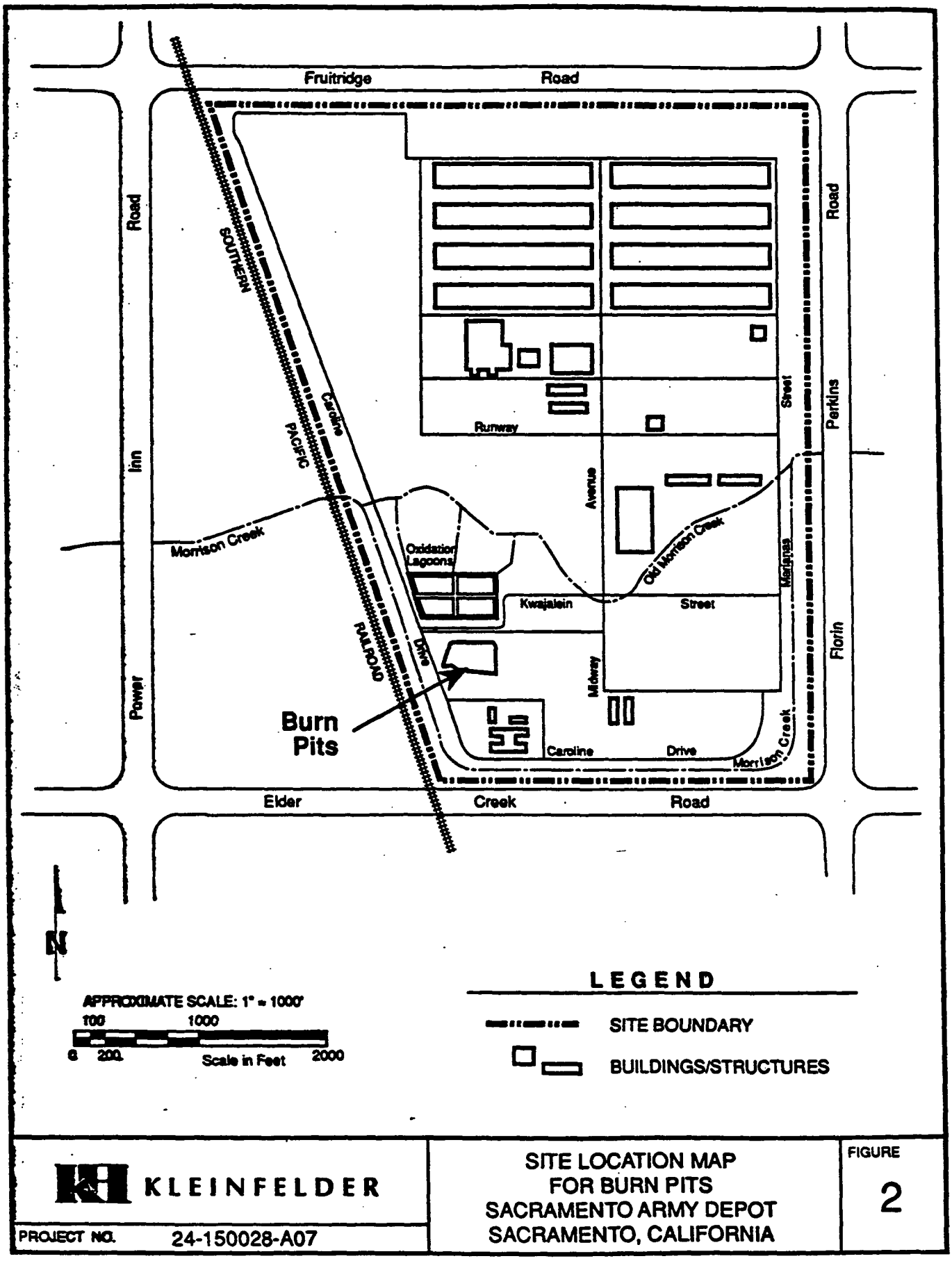
DATE PRODUCED: 5/12/92 | DATE REVISED: 2/8/93

PROJECT NO. 24-150028-A07

SITE VICINITY MAP
SACRAMENTO ARMY DEPOT
SACRAMENTO, CALIFORNIA

FIGURE
1

SD/30-150028-A07-01



KLEINFELDER

PROJECT NO. 24-150028-A07

SITE LOCATION MAP
FOR BURN PITS
SACRAMENTO ARMY DEPOT
SACRAMENTO, CALIFORNIA

FIGURE
2

In 1984, there were 20,710 people working off site, within 2 to 3 miles of SAAD. There are approximately 3,000 people currently working on the SAAD facility. Due to base closure, the number of employees is expected to decrease to approximately 100 by the end of 1994.

1.4 Land Use

SAAD is surrounded on all sides by land currently zoned as commercial/light industrial property. Within 2 to 3 miles of SAAD, the areas that are primarily low to medium density residential are northwest, west, and southwest of the site. The areas south, east, and north of the SAAD are primarily industrial.

1.5 Climatology

Climate at SAAD is classified as "Mediterranean", hot summer (Koppen system), with mean temperatures of 30 to 40 degrees Fahrenheit in January, and 90 to 100 degrees in July. Average relative humidity in January ranges from 80 to 90 percent, and from 50 to 60 percent in July. Generally, 85 to 95 percent of the annual precipitation occurs in winter, and the majority of the evaporation occurs in the summer. The estimated mean annual precipitation at the site is 17 inches, and the estimated mean evaporation is 73 inches.

1.6 Regional Topography

SAAD is located in the Central Valley of California, a broad, flat valley that lies between the Sierra Nevada to the east and the Coast Ranges to the west. The youngest sediments (as old as 5 million years) underlying SAAD were deposited by the American River as its course meandered across the valley floor, and, to a lesser extent, by Morrison Creek. Consequently, the topography at SAAD is relatively flat. The slope of the land surface is approximately 0.13 percent to the west, with ground surface elevations ranging from 36 to 42 feet above mean sea level.

1.7 Surface Water Hydrology

SAAD is situated within the Morrison Creek drainage basin. Morrison Creek originally flowed from east to west through the land now occupied by the SAAD facility. When SAAD was constructed, the Army re-routed Morrison Creek so that it flowed along the facility boundary around the south side of the facility, rather than through it. The floodplain for the re-routed Morrison Creek extended approximately half a mile north of the creek, onto the

SAAD facility. The creek discharges into two overflow basins of the Sacramento and American Rivers, and ultimately empties into the Sacramento River.

In 1958, 7,900 linear feet of flood-control dikes were constructed along the re-routed portion of Morrison Creek, and in 1986, the new channel was widened and deepened. The re-routed portion of Morrison Creek is currently capable of handling 100-year flood events, so the Burn Pits is not considered to be on the floodplain at this time. The old channel of Morrison Creek is currently dry during most of the year. This channel bisects the facility from east to west and is referred to as "Old Morrison Creek".

Drainage of the SAAD facility is mainly overland flow to Morrison Creek and man-made diversion structures. Morrison Creek also receives surface runoff from other industrial and agricultural sites which are located along its course, and permitted discharges from industries.

A study of the SAAD facility indicates that the only potential wetlands at the facility are located within the Oxidation Lagoons Operable Unit, along Old Morrison Creek, approximately 800 feet north of the Burn Pits. There are no wetlands in or adjacent to the Burn Pits that would be impacted by this ROD.

1.8 Geology

SAAD is located in the Great Valley of California, a broad asymmetric trough filled with a thick assemblage of flat-lying marine and non-marine sediments. The most recent formations deposited in the Great Valley are non-marine sediments derived from the Sierra Nevada foothills and mountains on the west side of the valley and from the Coast Ranges on the east side of the valley. The sediments are carried out of the mountains and deposited by a series of large and small rivers. Sediments under SAAD have been largely derived from the Sierra Nevada, and have been deposited by the American River as it has meandered across the valley floor.

The upper 250 feet of sediments under SAAD are comprised of interbedded sands, silts, and clays, with some coarse gravels underlying the north side of the facility at an approximate depth of 40 feet. The identification of horizontal and vertical boundaries of geologic formations is extremely difficult in alluvial deposits, such as those underlying SAAD. Older buried stream channels exist at various locations and depths in the area. These streams have deposited materials ranging in size from gravel to clay as they meandered across the area. Multiple discontinuous hardpans (cemented clays), representing ancient soil horizons, exist throughout the site.

1.9 Hydrogeology

SAAD is underlain by a series of alluvial aquifers which provide water to residences, industries, and agricultural properties in Sacramento County. The California Department of Water Resources has divided the water-bearing sediments in the area into two hydraulically isolated sections: the superjacent (upper) series, at depths of about 80 to 250 feet beneath the site; and, the subjacent (lower) series, at depths below about 250 feet. The primary water-producing aquifers are in the subjacent series, although many wells in the area surrounding the site draw water from the superjacent series.

Groundwater contamination extends off site to the southwest of the SAAD facility. The lateral extent of groundwater contamination is currently being investigated, but appears to extend approximately 1,000 feet southwest of SAAD. Industries and residences in this area use Sacramento City water from municipal wells located at least three quarters of a mile from SAAD. However, there may be some private wells in the area using groundwater.

1.10 Natural Resources

Except for groundwater, which is an extremely important resource throughout the Central Valley, no other natural resources on the site are used.

2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Remedial Investigations conducted at SAAD are a part of the U.S Army Installation Restoration Program (IRP). The Army owns the site and is the lead agency for implementing the environmental response actions.

In the late 1970's, the U.S. Army Depot Systems Command recommended that SAAD be included in the IRP. Consequently, in 1978 and 1979, the U.S. Army Toxic and Hazardous Materials Agency (USATHMA) conducted a review of historical data to assess SAAD with regard to the use, storage, treatment, and disposal of toxic and hazardous materials. USATHMA identified several areas of concern where further investigations were warranted.

In early 1981, the Army initiated an on-site investigation of soil and groundwater in the areas of concern identified by the USATHMA, including the Burn Pits, Oxidation Lagoons, Pesticide Mix Area, Morrison Creek, and Old Morrison Creek. Groundwater samples collected during this investigation indicated that volatile organic chemicals (VOCs) were present in groundwater under the southwest corner of SAAD. Based on the location of the

VOCs in groundwater, the Burn Pits appeared to be one of the main sources of groundwater contamination in this area.

In late 1981, the Central Valley Regional Water Quality Control Board (CVRWQCB) sampled off-site wells near the southwest corner of SAAD. VOCs were reported in some of the wells closest to SAAD, and the Army began working with the CVRWQCB to assess the source and extent of groundwater contamination. The EPA and the California Department of Health Services subsequently became involved in the investigation of contamination at SAAD, and SAAD was placed on the National Priorities List (NPL), effective August 21, 1987 (52 Fed. Reg. 27620; July 22, 1987).

In December 1988, the Army, the EPA, and the State of California signed a Federal Facility Agreement (FFA) under CERCLA Section 120, agreeing to address the entire facility, including the contaminated groundwater and seven areas of suspected contamination on the SAAD facility:

- Tank 2
- Oxidation Lagoons
- Burn Pits
- Building 320 Leach Field
- Pesticide Mix Area
- Firefighter Training Area
- Battery Disposal Well

The FFA also calls for a RCRA Facility Assessment to identify other specific Solid Waste Management Units that need further characterization and cleanup. To expedite investigation and cleanup of the individual sites, three areas listed above and the on-site/off-site groundwater are each being treated as individual Operable Units. The remaining areas are being addressed under the installation-wide RI/FS. These seven areas are shown on Figure 2. Groundwater and the saturated zone immediately above the water table was the first Operable Unit investigated, and is currently being cleaned up under a Record of Decision (ROD) which was signed in 1989. Contaminated soil at the Tank 2 Operable Unit is scheduled to be cleaned up next, under a ROD that was signed in December 1991. A ROD for the Oxidation Lagoons was signed in September 1992, and this area will be cleaned up in 1994.

Constructed in the late 1950's, the Burn Pits served intermittently as incineration pits until 1966. Materials that were reportedly buried and/or burned in the Burn Pits include plating shop wastes, oil and grease, batteries, and uncontaminated construction debris. Currently the Burn Pits are filled to the ground surface with soil and debris.

As part of the IRP, the U.S. Army conducted additional soil assessments at the Burn Pits in 1985 through 1987, and 1990 through 1992. In 1991, the Army prepared a Remedial Investigation/Feasibility Study (RI/FS) workplan in accordance with the FFA. The RI/FS evaluated the seven Operable Units. Based upon the RI/FS findings, four of these, including the Burn Pits were recommended for Operable Unit feasibility studies (OUFS).

The Burn Pits were recommended for an OUFS because heavy metals, VOCs and semi-volatile organic chemicals are present in the near surface, and pose a potential threat via direct contact, airborne migration, or migration through soil to groundwater.

An OUFS for the Burn Pits was prepared in May 1992. As part of the OUFS, the Army prepared a baseline Public Health Evaluation (PHE) to estimate potential health and environmental risks that could result if no action was taken at the site. The PHE indicated potential cancer and non-cancer health effects to a future on-site business, an off-site resident, and a future on-site recreation user from metals, VOCs, polychlorinated biphenyls (PCBs), and dioxins/furans in Burn Pits soil. Details of the PHE are summarized in Section 6.

3 HIGHLIGHTS OF COMMUNITY INVOLVEMENT

In May, 1992, the Army prepared a new Community Relations Plan. In August, 1992, the Army issued a Proposed Plan (PP) for the Burn Pits Operable Unit. The plan consists of a 12-page fact sheet that was mailed to residents in the surrounding community. The plan describes the site background, presents a summary of site contamination, and discusses health risks, remedial action objectives, and remediation alternatives. The plan also includes a list of individuals who may be contacted for additional information, lists the addresses of the information repositories, and announces the public comment period. The Army also placed a notice in a local daily newspaper, the Sacramento Bee, for five days prior to the public comment period to outline the preferred remediation alternative and to announce the availability of the OUFS and PP, as part of the Administrative Record, for review and comment. The SAAD Administrative Record was located at the following local repositories: SAAD Visitor Center, the California State University, Sacramento, Library, and the George Sim Community Center. The OUFS and PP were also available for public review at the Sacramento office of the DTSC and at EPA headquarters in San Francisco.

A public comment period was held from August 3 through September 1, 1992. A public meeting was held on August 13, 1992. Thirty-four people, including community members and representatives from the Army, EPA, DTSC, and CVRWQCB attended the public meeting.

Eleven oral questions/comments were received at the meeting. No written comments were received during the public comment period.

Details of community involvement activities and responses to official public comments on the PP are presented in the Responsiveness Summary, which is Part III of this ROD.

4 SCOPE AND ROLE OF OPERABLE UNIT WITHIN SITE STRATEGY

Since the Army began investigating possible contamination at SAAD, eight Operable Units have been identified that may require remediation (see Section 2, preceding). Four of the units, the Burn Pits, the Oxidation Lagoons, Tank 2, and On-site Groundwater, were recommended for OUFS'.

The Groundwater OUFS was completed in May 1989, and an operable unit ROD addressing volatile organic compounds (VOCs) in groundwater was signed in September 1989. The OUFS for Tank 2 was finalized in October 1991, and an operable unit ROD addressing VOCs in soil was signed in December 1991. The OUFS for the Oxidation Lagoons was finalized in March 1992, and an operable unit ROD addressing heavy metals in soil was signed in September 1992. The additional four OUs will be addressed in a comprehensive site Feasibility Study and ROD, after important site characterization information becomes available.

The existing southwest corner groundwater VOC plume is currently being "captured" (i.e., it is being refrained from further migration) by the on-site groundwater extraction and treatment system selected in the 1989 groundwater ROD. The groundwater cleanup standards are federal and State drinking water standards, called maximum contaminant levels (MCLs).

The Burn Pits cleanup will address two different types of soil contamination: (1) VOCs, which are considered the primary source of groundwater contamination, and (2) heavy metals which based on the remedial investigation, are not considered a threat to groundwater.

Following completion of the Burn Pits soil cleanup, the pump and treatment system will continue to operate until the remaining VOC contamination in the aquifer has been cleaned up to MCLs.

5 SUMMARY OF SITE CHARACTERISTICS

5.1 Contamination Sources

In order to better define contaminant concentrations and distribution for the purpose of evaluating health risks and developing remediation plans, the Army divided the Burn Pits Operable Unit into five units. VOC concentrations and distribution were used as the bases for assigning the unit divisions. The units are:

- Unit 1: North and South Pits; depths of 0 to 21 feet
- Unit 2: Outside Burn Pits; depths of 0 to 21 feet
- Unit 3: Outside Burn Pits; depths of 21 to 41 feet
- Unit 4: Outside Burn Pits; depths of 41 to 61 feet
- Unit 5: Outside Burn Pits; depths of 61 to 86 feet.

Soils in each of the units contain volatile and semi-volatile organic chemicals. Soils in Unit 1 also contain 12 metals at concentrations exceeding background, PCBs, and dioxins/furans. Additionally, groundwater beneath the site contains VOCs. However, as described in preceding sections of this ROD, groundwater, including the saturated zone, is being remediated as a unique Operable Unit. Under the existing Groundwater Treatment ROD, the affected groundwater is being extracted and treated using ultraviolet/chemical oxidation. The extraction wells were located to treat the contaminant plume as well as to act as a barrier to contain offsite flow of contaminated groundwater. The medium targeted for remediation of the Burn Pits is soil. This will remove the primary source of groundwater contamination, which is critical to the overall remediation of groundwater.

The source of the contaminants at the Burn Pits Operable Unit appears to be disposal and incineration of materials containing metals, volatile and semi-volatile organic chemicals, and PCBs.

5.2 Evaluation of Primary Contaminants

The organic compounds detected most often were ethylbenzene, di-n-butylphthalate, tetrachloroethene (PCE), toluene, 1,2-dichloroethene (1,2-DCE), trichloroethene (TCE), and xylenes. Twelve metals have been detected at concentrations exceeding background: antimony, arsenic, boron, cadmium, chromium (including chromium VI and chromium III), copper, lead, manganese, mercury, molybdenum, silver, and zinc. Metals appear to be confined to Unit 1 soils. A summary of contaminants detected at the Burn Pits Operable Unit

is presented on Table 1. All RI data have been validated and the quality is acceptable to support the recommendations made in this ROD.

The total volume of soil in the Burn Pits Operable Unit is approximately 247,900 cubic yards. Of this volume, 16,900 cubic yards of material are located within the two Burn Pits and primarily are contaminated with volatile chemicals and metals. Approximately 231,000 cubic yards of soil are located outside of the two Burn Pits, and are contaminated primarily with volatile organic chemicals. PCBs and dioxins/furans have been detected in Unit 1 soils but are not considered primary contaminants of concern because of the low levels found.

5.3 Location of Contaminants and Potential Routes of Migration

The estimated lateral extents of contamination for each of the five investigation Units are shown on Figures 3 through 6. Cross sections showing the extent of contamination in each Unit are presented on Figures 7 through 9. The vertical extent of VOC contamination appears to extend to the total depth of groundwater, about 86 feet. The vertical extent of metals, PCBs, and dioxins/furans appears to be no deeper than about 21 feet.

The presence of metals, PCBs, and dioxins/furans in soils is limited laterally to the area of Unit 1, i.e., within the two Burn Pits. VOCs have been detected in soils throughout the Burn Pits Operable Unit, as far as about 120 feet north and 20 feet west of the North Pit, and 60 feet south and west of the South Pit. Contamination does not appear to extend eastward beyond the Burn Pits.

Since contaminants are present in surface soils, airborne migration off site could occur in windblown dust. Individuals on site could be exposed via inhalation of dust, or by direct contact or ingestion of soils.

6 SUMMARY OF SITE RISKS

6.1 Human Health Risks

As part of the OUFS, the Army prepared a baseline Public Health Evaluation (PHE). This PHE was prepared to estimate, in the absence of remedial action (i.e., the "No Action" alternative), the potential future risks to human health if contaminants remained in soil or leached through soil, migrated to groundwater, or entered the atmosphere. Table 2 presents definitions of key risk terms from the PHE that are used in this section of the ROD.

TABLE 1
SUMMARY OF PRIMARY CONTAMINANTS

CHEMICAL	FREQUENCY OF DETECTS No. detected/No. analyzed		RANGE OF DETECTED CONCENTRATIONS		RANGE OF SAMPLE QUANTITATION LIMITS		BURN PITS OPERABLE UNIT						BACK-GROUND	BURN PITS OPERABLE UNIT						BACK-GROUND
	Burn Pits OU	Background	Burn Pits OU	Background	Burn Pits OU	Background	Surface Soil	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5		Surface Soil	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	
ORGANICS			in ug/kg		in ug/kg		AVERAGE CONCENTRATION* (ug/kg)							95% UCL OF CONCENTRATION* (ug/kg)						
Toluene	19/297	2/60	ND – 8,000	1.4 – ND	5 – 12,000	5 – 6.6	0.4	0.2	2.0	2.1	2.0	2.0	NC	172	613.6	2.2	5.6	2.6	2.0	NC
Ethylbenzene	7/297	0/60	ND – 30,000	ND	5 – 12,000	5 – 6.6	2.0	0.1	3.0	2.1	2.0	2.0	NC	4	253.4	4.2	5.1	2.6	2.0	NC
Xylene	11/290	0/60	1.2 – 200,000	ND	5 – 12,000	5 – 6.6	2.6	7.2	2.0	2.0	2.0	2.0	NC	8	652.0	2.2	11.6	2.6	2.0	NC
Trichloroethene	45/297	0/60	1 – 1,120	ND	5 – 12,000	5 – 6.6	2.1	0.9	3.0	2.0	2.0	2.0	NC	8	230.2	4.2	7.0	15.0	20.0	NC
1,2 – Dichloroethene	53/297	0/60	1.1 – 12,000	ND	5 – 12,000	5 – 6.6	2.6	5.2	2.6	4.5	5.6	4.7	NC	8	110.4	16.6	27.6	62.0	23.0	NC
Tetrachloroethene	22/297	0/60	1.4 – 804	ND	5 – 12,000	5 – 6.6	2.0	7.0	2.0	2.0	2.1	2.1	NC	10	277.0	2.2	7.0	4.2	4.0	NC
Di – N – Butylphthalate	6/104	5/57	33 – 626	43 – 58	330 – 3,000	330 – 450	154	186.6	190.2	172.1	188.1	214.7	NC	366	666.2	206.6	266.2	220.6	226.7	NC
Arochlor 1254	6/14	0/0	ND – 660	No Data	190 – 190	No Data	No Data	140.0	NC	NC	No Data	No Data	No Data	No Data	430.0	NC	NC	No Data	No Data	No Data
Arochlor 1260	2/14	0/0	ND – 176	No Data	190 – 190	No Data	No Data	60.0	NC	NC	No Data	No Data	No Data	No Data	136.6	NC	NC	No Data	No Data	No Data
2,3,7,8 – TCDD equiv.#	6/10	No Data	ND – 0.561	No Data	Not Applic.#	No Data	No Data	0.069	No Data	No Data	No Data	No Data	No Data	No Data	0.365	No Data	No Data	No Data	No Data	No Data
METALS			in mg/kg		in mg/kg		AVERAGE CONCENTRATION* (mg/kg)							95% UCL OF CONCENTRATION* (mg/kg)						
Antimony	29/210	0/43	ND – 1,810	ND – 6.9	2.9 – 60	2.9 – 6	4.6	6.0	NC	NC	NC	NC	2.7	116.9	66.6	NC	NC	NC	NC	4.9
Arsenic	230/230	40/43	ND – 76	0.6 – 9.2	0.24 – 40	0.24 – 2.5	3.2	6.9	NC	NC	NC	NC	2.6	4.6	20.1	NC	NC	NC	NC	7.9
Boron	119/180	12/16	ND – 164	ND – 7	2.64 – 20	2.64 – 3.6	4.2	6.6	NC	NC	NC	NC	3.6	15.1	41.6	NC	NC	NC	NC	9.6
Cadmium	69/230	0/43	ND – 670	ND – 6.6	0.1 – 1	0.5 – 0.62	2.0	4.9	NC	NC	NC	NC	0.35	169	251.7	NC	NC	NC	NC	1.7
Chromium (III + VI)	237/238	43/43	ND – 300	11.9 – 60.6	0.29 – 6	0.41 – 1.64	49.1	51.6	NC	NC	NC	NC	20.6	122.6	266.0	NC	NC	NC	NC	64.6
Chromium VI	1/41	0/26	ND – 19.6	ND	0.1 – 10	0.06 – 1	No Data	2.0+	NC	NC	NC	NC	0.10	No Data	47.6+	NC	NC	NC	NC	0.73
Copper	236/238	43/43	11.6 – 2,210	10.6 – 42.7	0.23 – 5	0.26 – 2	35.7	66.4	NC	NC	NC	NC	27.1	166.7	661.6	NC	NC	NC	NC	43.6
Lead	234/238	43/43	ND – 26,400	8.7 – 63.6	0.24 – 10.6	0.24 – 1	34.6	64.6	NC	NC	NC	NC	7.4	606.6	2084.7	NC	NC	NC	NC	21.1
Manganese	10/10	2/2	66 – 1,240	386 – 461	0.1 – 3	0.1	535	360	NC	NC	NC	NC	376	660.7	1074	NC	NC	NC	NC	NC
Mercury	22/234	0/43	ND – 3.6	ND – 0.1	0.02 – 0.6	0.02 – 0.1	0.1	0.1	NC	NC	NC	NC	0.06	1.97	0.9	NC	NC	NC	NC	0.07
Molybdenum	29/213	0/41	ND – 9.7	ND	0.6 – 10	1.2 – 2	0.93	1.1	NC	NC	NC	NC	0.9	2.6	5.0	NC	NC	NC	NC	1.6
Silver	35/230	0/43	ND – 24.7	ND	0.21 – 23.6	0.22 – 1	0.17	0.23	NC	NC	NC	NC	0.30	2.1	3.1	NC	NC	NC	NC	1.6
Zinc	236/236	43/43	16.6 – 4,070	16.6 – 97.6	0.26 – 4	0.26 – 2	66.3	156.6	NC	NC	NC	NC	53.6	622.6	4466.6	NC	NC	NC	NC	153.7

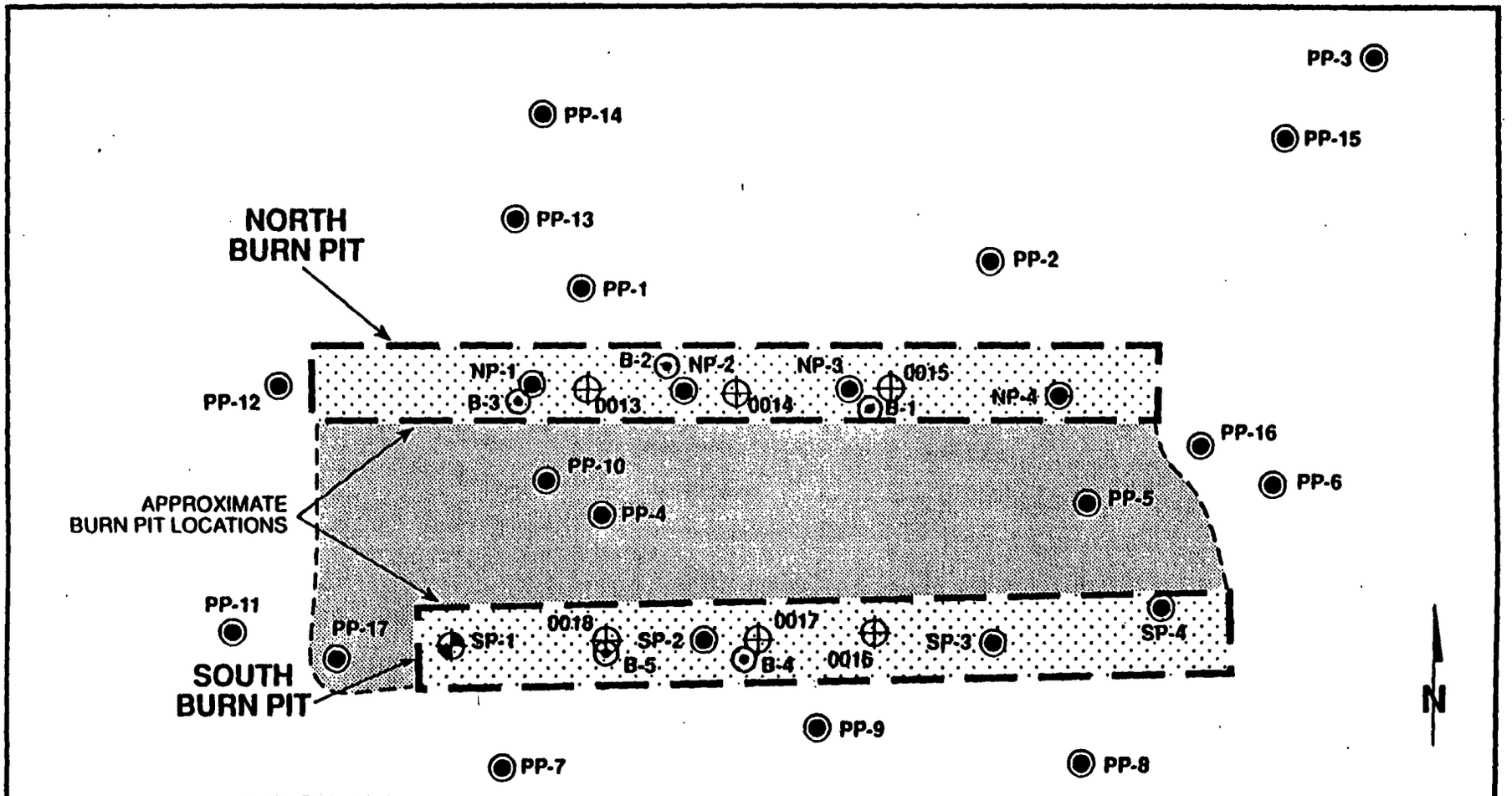
NC: Not Calculated
ND: Not Detected

* Average and 95% UCL concentrations are based on logarithmically transformed data, except Arochlors and 2,3,7,8 – TCDD which are arithmetic.

+ Avg. and 95% UCL for CrO_4 in Unit 1 were derived by finding the avg. and 95% UCLs for both total Cr and CrO_4 in the 8 samples analyzed from Unit 1. The avg and 95% UCL for total Cr (based on 60 samples) were then used to estimate the theoretical avg. and 95% UCL for CrO_4 in the population of 60 samples, as follows:

$$\frac{(Cr^{+3})\ 8\ \text{samples}}{(Cr^{+3})\ 8\ \text{samples}} = \frac{(Cr^{+3})\ 60\ \text{samples}}{(Cr^{+3})\ 60\ \text{samples}}$$

2,3,7,8 – TCDD (dioxin) equivalent concentrations were calculated based on the reported 2,3,7,8 – isomer concentrations for each congener for each sample analyzed, multiplied by their respective International Toxicity Equivalence Factors. Due to the calculations involved, the "Range of Sample Quantitation Limits" is not applicable for the 2,3,7,8 – TCDD equivalent. See Appendix C of the Burn Pits OUFS for calculations. See Appendix A, Table A – 7 of the Burn Pits OUFS for laboratory data.



MW-5 Monitoring Well Shown for Location Reference Rectangular Coordinates for MW-5 are: 308,912.32 feet north 2,171,611.73 feet east

KLEINFELDER

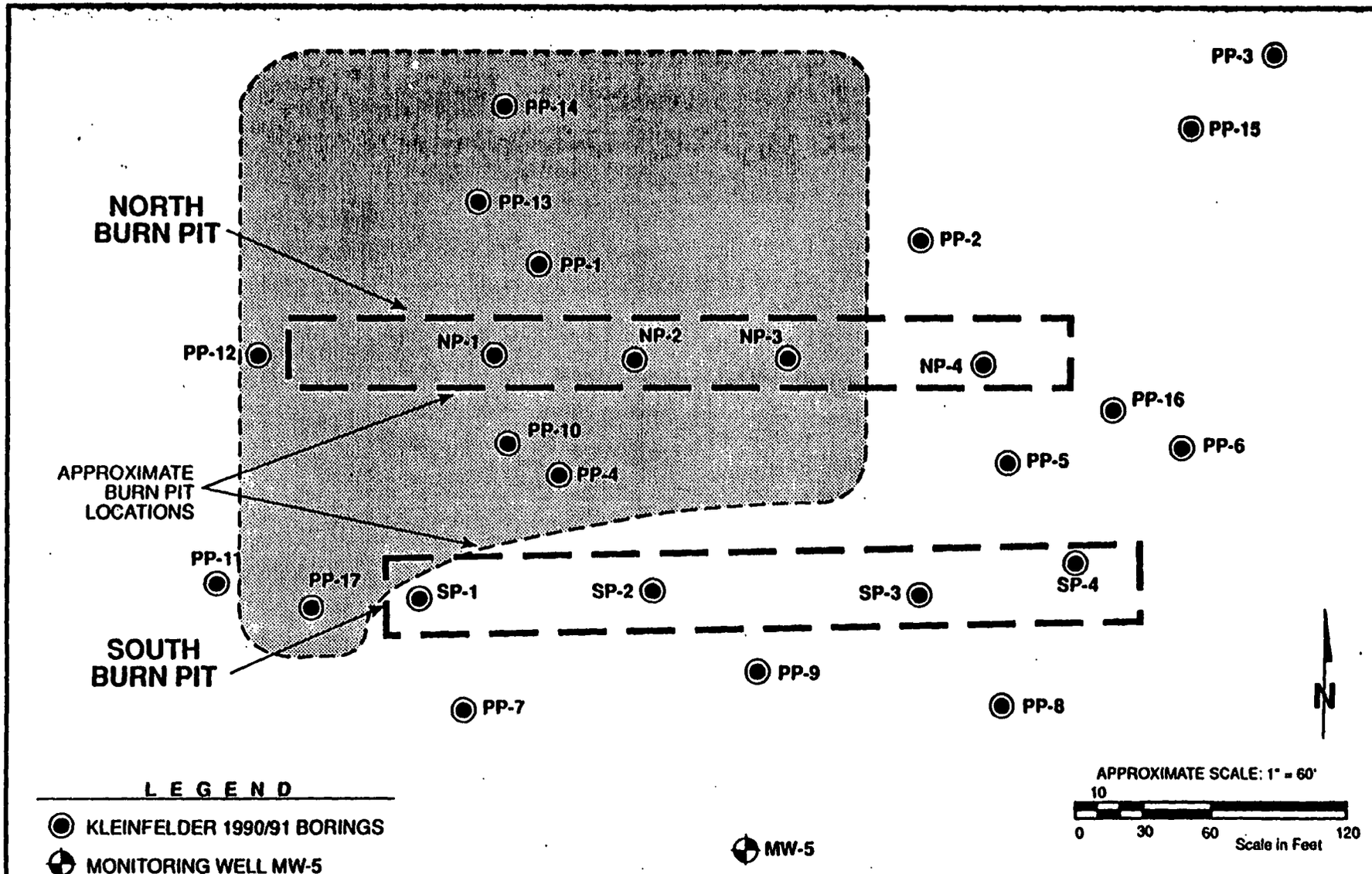
DATE PRODUCED: 6/15/92 | DATE REVISED: 2/8/93

PROJECT NO. 24-150028-A07

APPROXIMATE EXTENT OF ORGANIC COMPOUNDS, UNITS 1 & 2; 0-21 FEET
BURN PITS OPERABLE UNIT
SACRAMENTO ARMY DEPOT
SACRAMENTO, CALIFORNIA

FIGURE 3

SAAD/30-150028-A07-03



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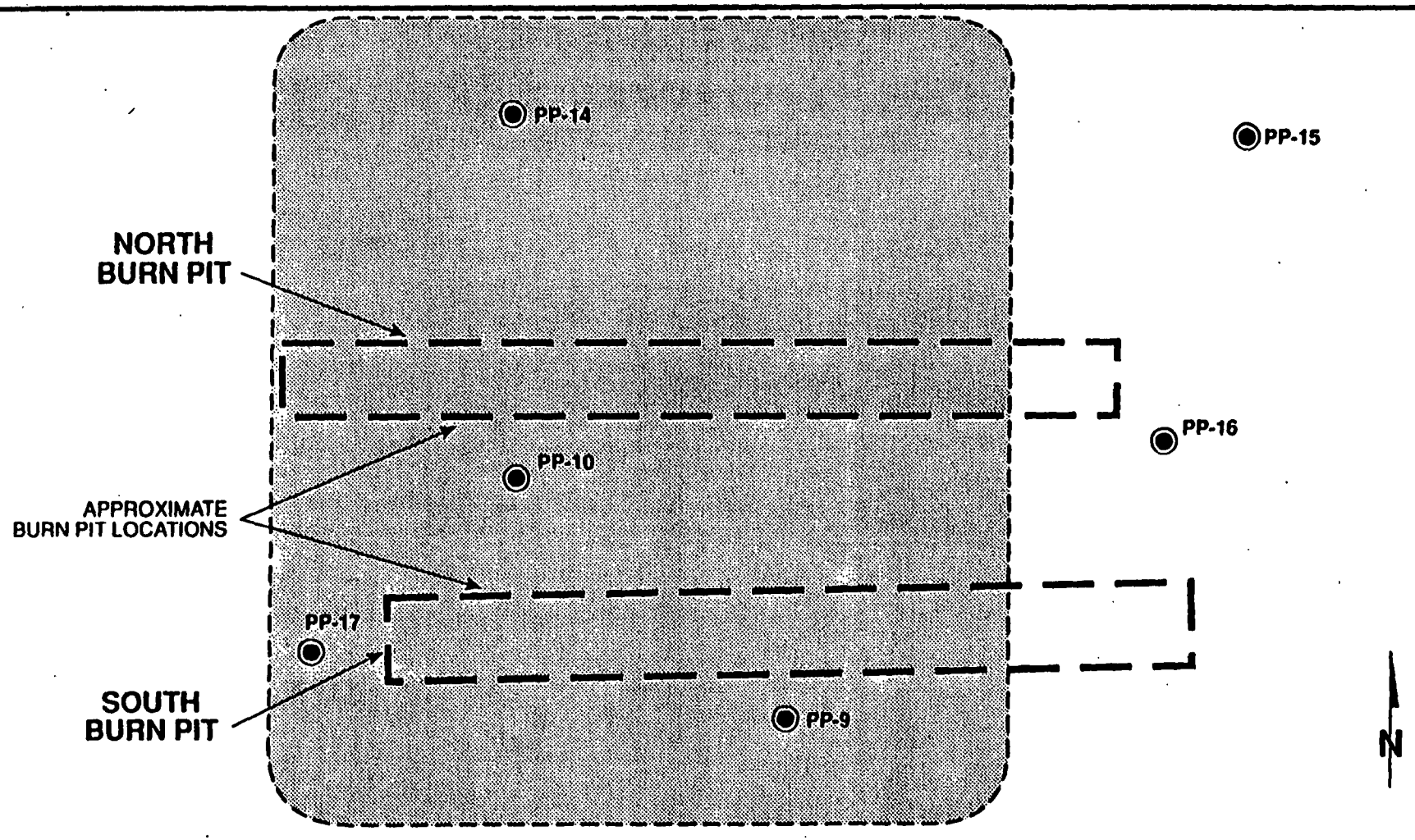


L E G E N D

- KLEINFELDER 1991 BORINGS
- MONITORING WELL MW-5
- EXTENT OF ORGANIC COMPOUNDS

PP = PERIMETER PIT BORING

MW-5

APPROXIMATE SCALE: 1" = 60'

10

0 30 60 120

Scale in Feet

MW-5 Monitoring Well Shown for Location Reference Rectangular Coordinates for MW-5 are: 308,912.32 feet north 2,171,611.73 feet east

KLEINFELDER

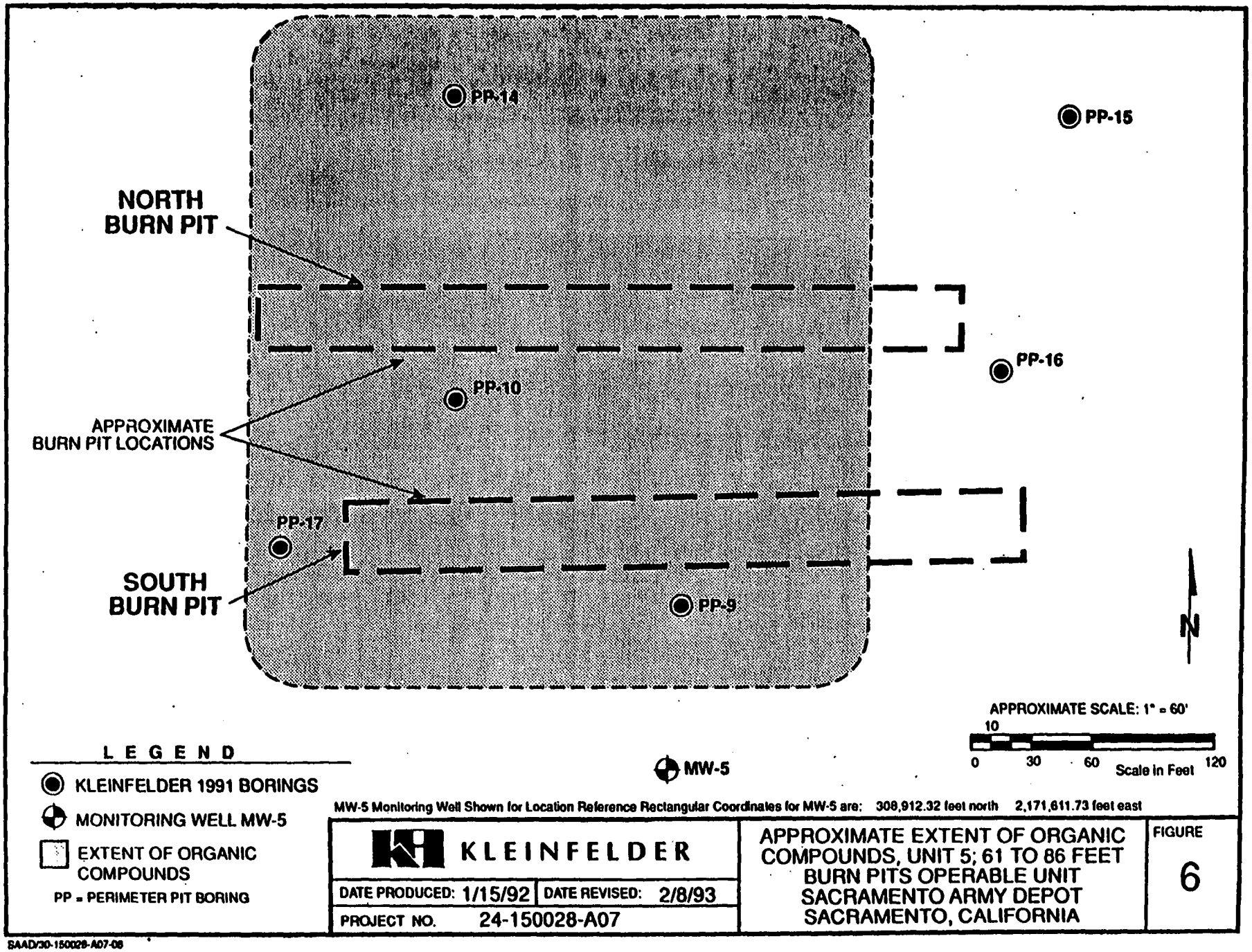
DATE PRODUCED: 1/15/92 DATE REVISED: 2/8/93

PROJECT NO. 24-150028-A07

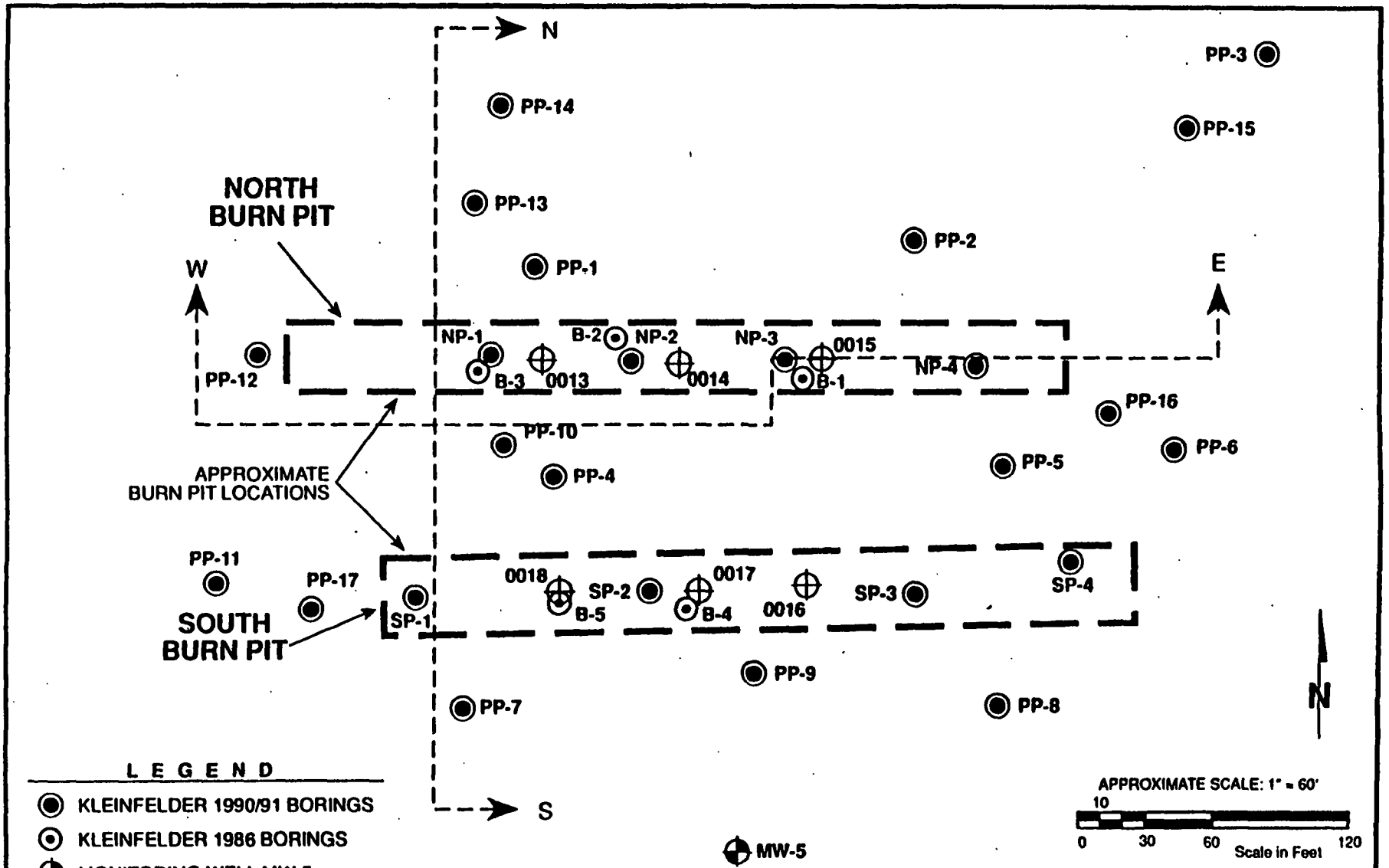
APPROXIMATE EXTENT OF ORGANIC COMPOUNDS, UNIT 4; 41 TO 61 FEET
BURN PITS OPERABLE UNIT
SACRAMENTO ARMY DEPOT
SACRAMENTO, CALIFORNIA

FIGURE 5

SAAD/30-150028-A07-05



SAAD/30-150028-A07-06



MW-5 Monitoring Well Shown for Location Reference Rectangular Coordinates for MW-5 are: 308,912.32 feet north 2,171,611.73 feet east

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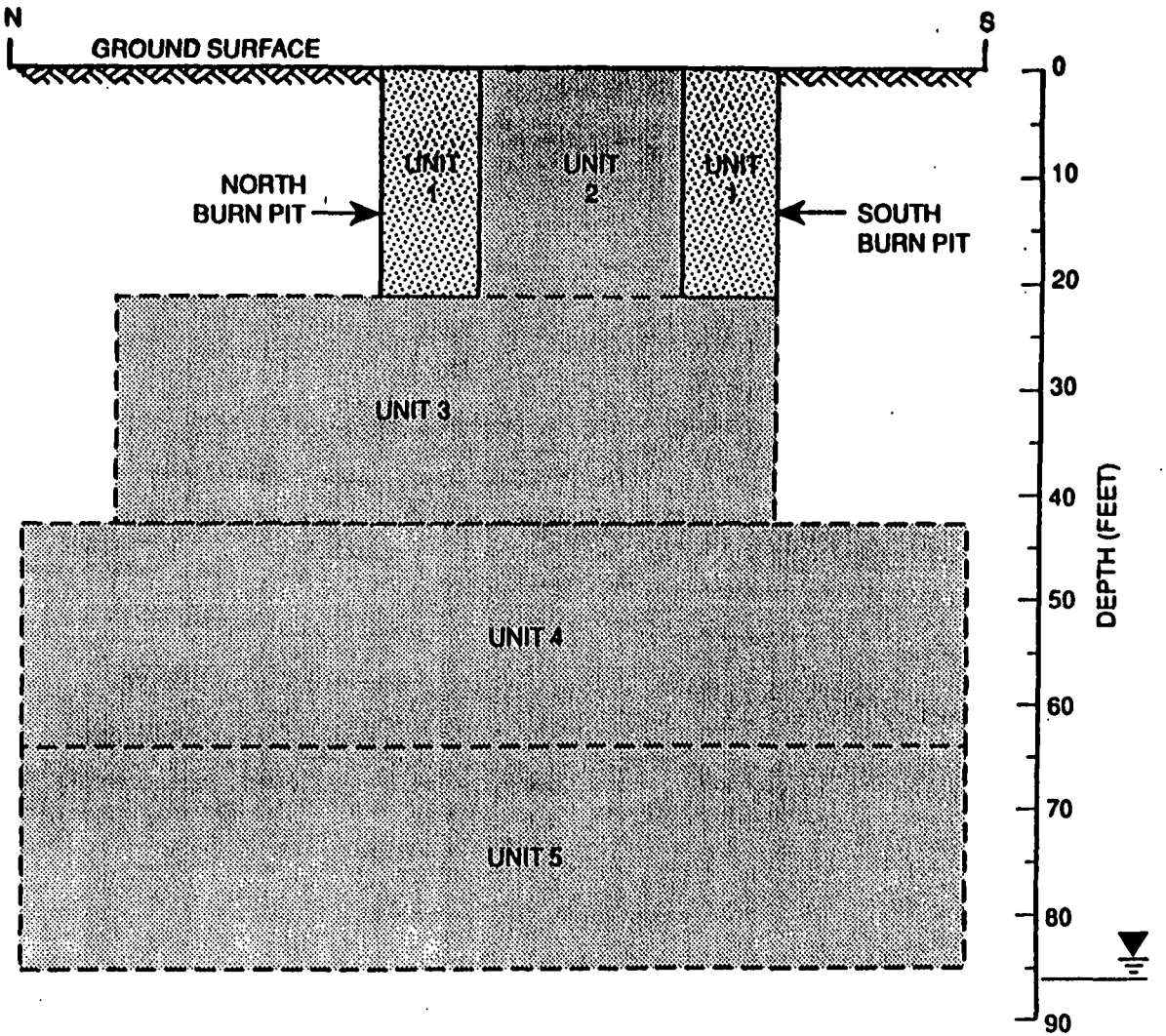
DATE PRODUCED: 1/15/92 DATE REVISED: 2/8/93

PROJECT NO. 24-150028-A07

CROSS SECTION LOCATION MAP
BURN PITS OPERABLE UNIT
SACRAMENTO ARMY DEPOT
SACRAMENTO, CALIFORNIA

FIGURE 7

SAAD/29-150006-C13-05



LEGEND

APPROXIMATE AREA OF CONTAMINATION

GROUND WATER

APPROXIMATE HORIZONTAL SCALE: 1" = 60'

10

0 30 60 120

Scale in Feet

KLEINFELDER

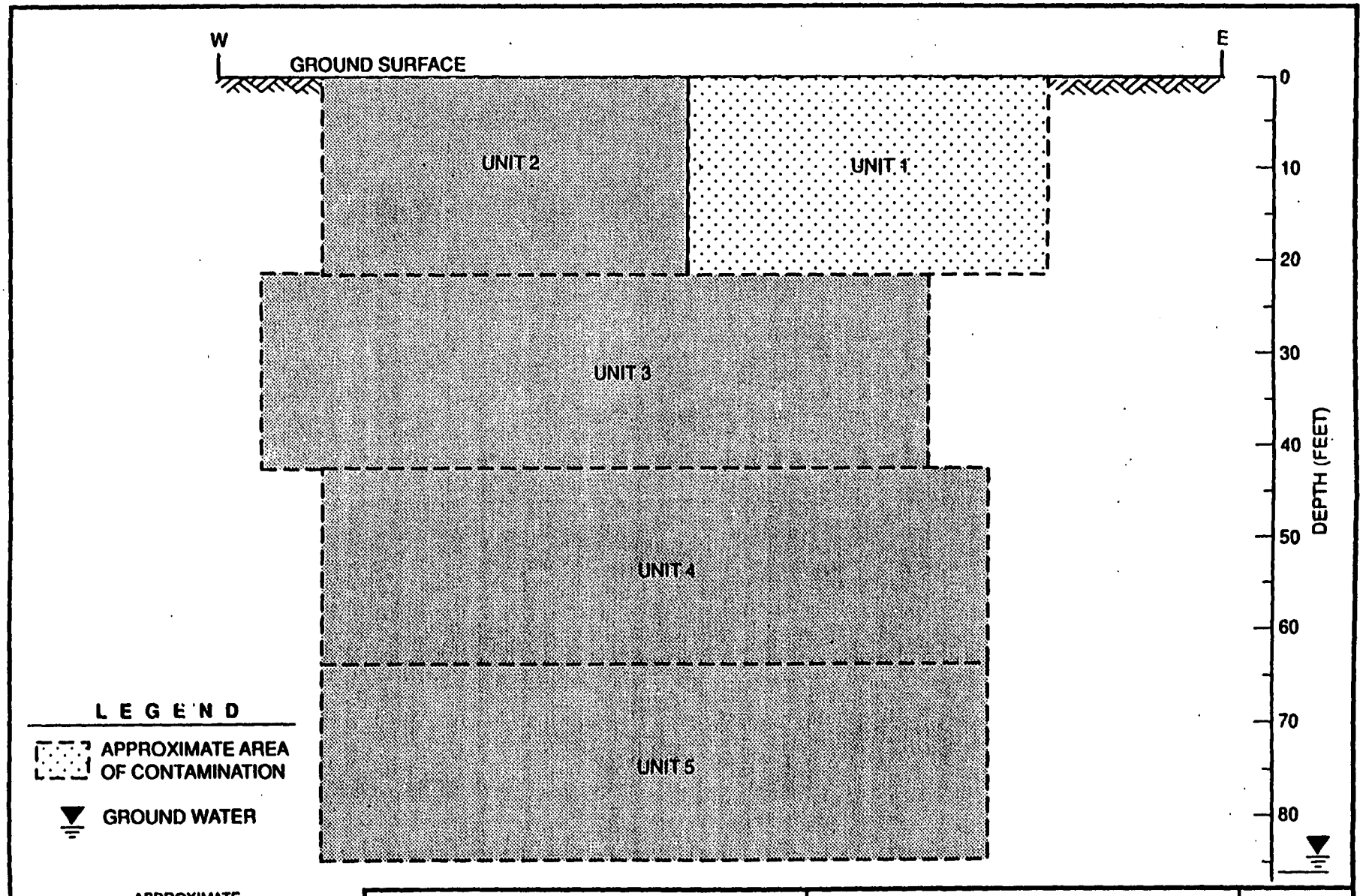
DATE PRODUCED: 1/7/92 | DATE REVISED: 2/8/93

PROJECT NO. 24-150028-A07

NORTH-SOUTH CONTAMINANT DISTRIBUTION CROSS SECTION
BURN PITS OPERABLE UNIT
SACRAMENTO ARMY DEPOT
SACRAMENTO, CALIFORNIA

FIGURE 8

SAAD/30-150028-A07-07



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DATE PRODUCED: 1/15/92	DATE REVISED: 2/8/93
PROJECT NO. 24-150028-A07	

WEST-EAST CONTAMINANT DISTRIBUTION CROSS SECTION
BURN PITS OPERABLE UNIT
SACRAMENTO ARMY DEPOT
SACRAMENTO, CALIFORNIA

FIGURE 9

SAAD/30-150028-A07-08

TABLE 2
DEFINITIONS OF RISK TERMS

Carcinogen: A substance that, with long term exposure, may increase the incidence of cancer.

Chronic Daily Intake (CDI): The average amount of chemical in contact with an individual on a daily basis over a substantial portion of a lifetime.

Chronic Exposure: A persistent, recurring, or long-term exposure. Chronic exposure may result in health effects (such as cancer) that are delayed in onset, occurring long after exposure ceased.

Exposure: The opportunity to receive a dose through direct contact with a chemical or medium containing a chemical.

Exposure Assessment: The process of describing, for a population at risk, the amounts of chemicals to which individuals are exposed, or the distribution of exposures within a population, or the average exposure of an entire population.

Health Hazard Index (HHI): An EPA method used to assess the potential noncarcinogenic risk. The ratio of the CDI to the chronic RfD (or other suitable toxicity value for noncarcinogens) is calculated. If it is less than one, then the exposure represented by the CDI is judged unlikely to produce an adverse noncarcinogenic effect. A cumulative, endpoint-specific HHI can also be calculated to evaluate the risks posed by exposure to more than one chemical by summing the CDI/RfD ratios for all the chemicals of interest that exert a similar effect on a particular organ. This approach assumes that multiple subthreshold exposures could result in an adverse effect on a particular organ and that the magnitude of the adverse effect will be proportional to the sum of the ratios of the subthreshold exposures. If the cumulative HHI is greater than one, then there may be concern for public health risk.

Reference Dose (RfD): An estimate, with uncertainty spanning an order of magnitude, of a daily exposure level for human population that is likely to be without an appreciable risk of deleterious effects.

Risk: The nature and probability of occurrence of an unwanted, adverse effect on human life, health, or on the environment.

Risk Assessment or Health Evaluation: The characterization of the potential adverse effect on human life, health, or on the environment. According to the National Research Council's Committee on the Institutional Means for Assessment of Health Risk, human health risk assessment includes: (1) description on the potential adverse health effects based on an evaluation of results of epidemiologic, clinical, toxicologic, and environmental research; (2) extrapolation from those results to predict the types and estimate the extent of health effect in humans under given conditions of exposure; (3) judgments as to the number of characteristics of persons exposed at various intensities and durations; (4) summary judgments on the existence and overall magnitude of the public-health program; and (5) characterization of the uncertainties inherent in the process of inferring risk.

Slope Factor: A plausible upper-bound estimate (set at 95%) of the probability of a response per unit intake of a chemical over a lifetime.

6.1.1 Contaminants of Concern

The risk assessment provides a list of contaminants based on the results of the RI that were found above detection limits or above natural background levels. Twelve metals above background levels, seven semi-volatile and volatile organic chemicals, two PCBs, and dioxins/furans were identified in Burn Pits soils. The PHE estimated the risk posed by each of these metals or chemicals. Based upon the estimated health risks, and detection frequencies, the following metals and chemicals were identified as targets for remedial action:

METALS

Arsenic: Classified as a Group A carcinogen by ingestion and inhalation (known human carcinogen).

Cadmium: Classified as a Group B1 carcinogen by inhalation (probable human carcinogen, limited human data).

Chromium III: Non-carcinogenic; inhalation is associated with nasal mucosa atrophy.

Chromium VI: Classified as a Group A carcinogen by inhalation.

Lead: Classified as a Group B2 carcinogen (probable human carcinogen, no human data) The most notable effect of lead exposure is decreased neurological development in children.

VOLATILE ORGANIC CHEMICALS

1,2-Dichloroethene: Non-carcinogenic; inhalation is associated with CNS depression.

Tetrachloroethene: Classified as a Group B2 carcinogen (probable human carcinogen, combination of sufficient evidence in animals and inadequate or no evidence in humans).

Trichloroethene: Classified as a Group B2 carcinogen.

6.1.2 Exposure Assessment

Seven exposure points were considered for the PHE:

- The current depot resident: a residence for the base Commander is located 600 feet east-southeast of the Burn Pits. In the past, occupants have been assigned on 2- to 3-year rotations, so no one family lives at the residence for more than 3 years. Currently no one lives at the residence.
- Current depot employees: depot employees work at several locations in the vicinity. For the PHE, the nearest depot employees were considered to be those about 600 feet northeast of the Burn Pits, since this location is more often downwind than other worker areas.

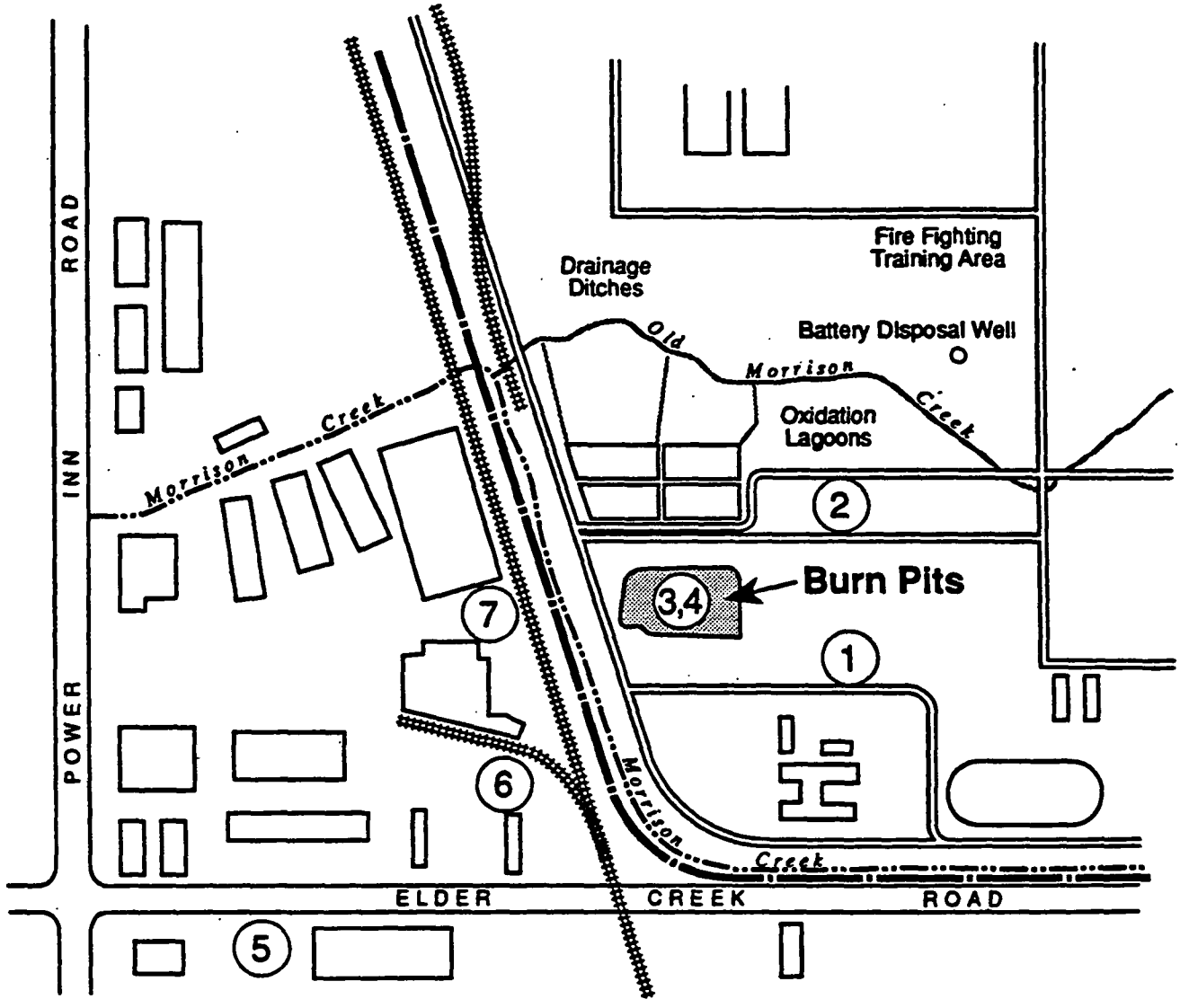
- Future on-site recreational user: a portion of SAAD is being evaluated for Natural Resources Restoration. Future users could include hikers, picnickers, and people playing.
- Future on-site workers: the area is zoned light industrial, and potential new business built on the Burn Pits could include indoor and outdoor workers.
- Current and future off-site residents: the nearest off-site resident is located about 1,800 feet southwest of the Burn Pits, and does not have a well. No future residents, other than this one, are expected due to the industrial zoning.
- Current and future off-site business with a well: the nearest off-site business with a well is located about 1,100 feet southwest of the Burn Pits. Since city water is provided to the area, future businesses with wells are not anticipated.
- Current and future off-site business without a well: the nearest current off-site business is located about 600 feet west of the burn pits. This business is as close to the Burn Pits as an off-site business can be.

Additionally, one worst-case exposure point was requested by the EPA for inclusion as a point of comparison: future on-site resident with a well. This exposure point is highly unlikely, since the area is zoned industrial, is surrounded by industries, and has access to municipal water. Locations of potential exposure points are shown on Figure 10.

Since site groundwater has been impacted by VOCs from the Burn Pits, the assumption was made that, in the absence of remediation, contaminants presently in the Burn Pits soil will continue to migrate to groundwater. Other assumptions for the PHE were: contaminants in site soils may enter the atmosphere as windblown dust, and individuals on site may contact or ingest soil. Thus, the following exposure pathways were considered:

For on-site individuals:

- dust inhalation;
- soil vapor inhalation;
- groundwater vapor inhalation;
- dermal absorption from soil;
- soil ingestion;
- groundwater ingestion; and
- dermal absorption from groundwater;



LEGEND

- Site Boundary
- Buildings / Structures
- (1) On-Depot Resident (currently vacant)
- (2) Depot Worker
- (3) Future On-Site Recreational User
- (4) Future On-Site Business
- (5) Off-Site Residential
- (6) Off-Site Business with a Well
- (7) Off-Site Business without a Well

N

APPROXIMATE SCALE in FEET: 1" = 600'

0 100 300 600 1200

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SITE VICINITY MAP
SHOWING POTENTIAL EXPOSURE POINTS
SACRAMENTO ARMY DEPOT
SACRAMENTO, CALIFORNIA

FIGURE 10

For off-site individuals:

- dust inhalation;
- groundwater vapor inhalation;
- groundwater ingestion; and
- dermal absorption from groundwater.

Soil sample analytical results were used to calculate average and upper-bound concentrations of chemicals found at the Burn Pits Operable Unit. The calculated upper-bound concentration for each chemical is the 95 percent upper confidence limit (UCL) concentration, calculated by finding the mean and adding twice the standard deviation. The 95 percent UCL concentrations for chemicals found at the Burn Pits are presented on Table 1. Upper-bound chemical concentrations were used for calculating exposure point concentrations for each of the exposure pathways listed above.

Exposure point concentrations for each exposure pathway were based upon the following:

- Dust inhalation, dermal absorption from soil, and soil ingestion - For a current SAAD resident and employee, average concentrations of contaminants in surface soil (0 to 1 foot) covering the two Burn Pits were used as exposure point concentrations. Future on-site, and future and current off-site exposure concentrations were calculated based upon the 95 percent UCL concentrations in Unit 1 soils (0 to 20 feet within the two Burn Pits).
- Soil vapor inhalation - Potential soil vapor concentrations were calculated based upon the 95 percent UCL concentrations of VOCs in Unit 1 soil samples.
- Groundwater vapor inhalation, ingestion, and dermal absorption - The potential contribution of contaminants to groundwater from the vadose zone, and the maximum average exposure concentrations in groundwater were estimated using two computer models. The upper-bound chemical concentrations in the soil, which were assumed to remain constant over time, were input to a vadose zone model (SESOIL) to derive upper-bound leachate concentrations. These calculated leachate concentrations were then input to a transport model (AT123D) to estimate contaminant migration in groundwater to off-site exposure points. The modeling results were used to calculate the maximum average exposure point concentration for off-site receptors with wells, assuming a 30-year exposure for residents and a 25-year exposure for businesses. The on-site residential exposure-point concentrations for groundwater were estimated by using 30-year leachate concentrations as input to AT123D. Groundwater vapor concentrations were calculated using Henry's Law Constant.

The equations used to estimate contaminant intake and the values chosen for various intake parameters were derived from standard intake equations presented in EPA's guidance documents for conducting health risk assessments. Chronic Daily Intake (CDI), the amount of each chemical that could be inhaled, ingested, or absorbed, was estimated for VOCs, metals, PCBs, and dioxins/furans.

The CDIs were then multiplied by chemical-specific slope factors (SF) to calculate carcinogenic risk. The SF represents the 95 percent UCL value of the probability of a carcinogenic response per unit intake of a contaminant over the exposure period (25 years and 30 years for the business and resident, respectively). Standard SF values approved by EPA were used for each of the chemicals, except lead, found at the Burn Pits. A SF has not been established for lead.

To calculate the Health Hazard Index (HHI) for non-carcinogenic risks, the CDIs were divided by chemical-specific Reference Dose (RfD) values. The RfD values for a substance represent a level of intake which is unlikely to result in adverse non-carcinogenic health effects in individuals exposed for an extended period of time (25 and 30 years for the business and resident, respectively). RfDs were available for each of the metals and chemicals, except lead. EPA Health Criteria are not available for lead at this time.

Several RfDs and SFs were derived by extrapolation, because the toxicity values were not available. This was done for chemicals that may have systemic effects which could occur if the chemical was absorbed at the point of exposure. In most cases, oral toxicity values were used to derive toxicity values for inhalation or dermal absorption. These extrapolations were performed by first expressing the oral toxicity value as an absorbed dose (i.e. by multiplying the oral toxicity value by the estimated fraction of the chemical that is absorbed orally). Dermal toxicity values were derived directly from the absorbed doses. Toxicity values for inhalation were derived by dividing the absorbed dose by the fraction of the chemical that is absorbed following inhalation.

6.1.3 Summary of PHE Results

The PHE estimated the potential non-carcinogenic and carcinogenic risks posed by each of the chemicals of concern at the Burn Pits Operable Unit to individuals at current and potential future exposure points. Dose-response criteria are not available for lead, so it was evaluated separately.

The primary carcinogenic chemicals of concern at the Burn Pits Operable Unit were identified based on the PHE as follows: TCE, PCE, arsenic, cadmium, chromium VI, and lead. The calculated carcinogenic risks from TCE, PCE, and metals at each exposure point are summarized in Table 3.

Neither the PCBs nor the dioxins/furans were identified as primary chemicals of concern because of the low levels detected, which were below regulated levels and within the acceptable risk range. PCBs were detected in the soil at concentrations less than 1 ppm, below levels requiring remedial action. See "Guidance on Remedial Actions for Superfund Sites with PCB Contamination", OSWER Directive No. 9355.4-01. Dioxins/furans were detected in the soil at concentrations less than 1 ppb. The EPA Dioxin Disposal Advisory Group had indicated that no remediation is warranted when dioxin/furan levels are less than 1 ppb for residential areas or less than 20 ppb for industrial or non-residential areas. See "General Approach Used By the Dioxin Disposal Advisory Group (DDAG) Regarding Pentachlorophenol Waste (also PCBs)", November 15 1988.

As a National goal, the EPA's target risk range is 10^{-4} to 10^{-6}, or one incidence of cancer per 10,000 people to one additional incidence of cancer per 1,000,000 people. The total estimated carcinogenic risks from each of the carcinogenic chemicals due to the combined effects of all pathways are approximately:

- less than one excess cancer per 1,000,000 people for Current Depot Employees;
- less than one excess cancer per 1,000,000 people for Current Depot (3-year) Resident;
- one excess cancer per 100,000 people for Future On-site Recreational Users;
- three excess cancers per 100,000 people for Future On-site Workers;
- one excess cancer per 100,000 people for Current and Future Off-site Residents;
- less than one excess cancer per 1,000,000 people for Current and Future Off-site Businesses with Wells;
- less than one excess cancer per 1,000,000 people for Current and Future Off-site Businesses without Wells; and
- one excess cancer per 10,000 people for Future On-site Residents.

Thus, the baseline risks estimated for Future On-site Recreational Users, Future On-site Workers, Current and Future Off-site Residents, and Future On-site Residents are within the target risk range, but greater than 10^{-6}.

TABLE 3
ESTIMATED TOTAL CARCINOGENIC RISKS FOR EACH OF THE PRIMARY CARCINOGENS
BURN PITS OPERABLE UNIT

CHEMICAL	TOTAL CARCINOGENIC RISK — PRIMARY EXPOSURE POINT							TOTAL CARC. RISK — WORST-CASE*
	Current Depot Resident (3-year)	Current Depot Employee	Future On-Site Recreational User	Future On-Site Worker	Current & Future Off-Site Resident	Current & Future Off-Site Business with well	Current & Future Off-Site Business without well	Future On-Site Resident With Well
Trichloroethene	3.1E-11	2.9E-10	2.9E-09	7.1E-09	7.1E-06	5.7E-08	6.2E-14	2.4E-05
Tetrachloroethene	3.2E-12	3.1E-11	3.5E-09	7.4E-09	2.6E-06	6.2E-08	4.0E-14	6.3E-06
Arochlor 1254	NC	NC	1.1E-06	2.6E-06	NC	NC	NC	7.6E-06
Arochlor 1260	NC	NC	3.4E-07	7.8E-07	NC	NC	NC	2.4E-06
Arsenic	2.3E-09	6.5E-09	9.0E-06	1.6E-05	1.4E-08	1.7E-08	8.6E-08	6.3E-05
Cadmium	1.1E-08	1.0E-07	8.5E-07	3.9E-06	1.5E-08	1.9E-08	9.4E-08	6.5E-06
Chromium VI	6.0E-09	5.7E-08	7.5E-07	3.4E-06	1.3E-09	1.7E-08	8.4E-08	5.6E-06
Lead	NC	NC	NC	NC	NC	NC	NC	NC
TOTAL	2E-08	2E-07	1E-05	3E-05	1E-05	2E-07	3E-07	1E-04

*: Worst-case exposure not considered likely, but is included as a point-of-reference at the request of EPA, Region IX
NC: Not calculated, slope factor not available for applicable exposure routes.

As discussed in Section 6.1.2 of this ROD, the Future On-site Residents scenario is highly unlikely. Therefore, the most exposed individual is likely to be the Future On-site Worker. The risks to this individual are attributable primarily to ingestion of arsenic, inhalation of dust containing arsenic, cadmium, and chromium VI, and absorption of Arochlor 1254 through direct contact with soil.

Other individuals potentially exposed to a risk greater than 10^{-6} would be the Future On-site Recreational User and the Current and Future Off-site Residents. Risks to the Recreational User are attributable primarily to ingestion of arsenic in soil. Risks to Off-site Residents are primarily from inhalation of TCE and PCE vapors from groundwater while showering.

For non-carcinogenic risks, an HHI greater than 1.0 indicates a potential health threat. The total estimated HHI's from each of the contaminants due to the combined effects of all the pathways are shown on Table 4. Total HHIs for the Future On-site Worker and the Future On-site Resident with a well exceed 1.0, with index values of 4.2 for the former and 9.5 for the latter.

An RfD value was not available for lead, and therefore lead was not included in the HHI calculation. However, for lead, which may cause decreased neurological development in children younger than 6 years, the EPA has developed a biokinetic model for evaluating lead exposures on a site-specific basis. Using the model, potential blood lead levels in children can be calculated. The results can then be evaluated by comparing them to the level which the EPA estimates will cause adverse affects in children [10 micrograms per deciliter (ug/dl) for 0- to 6-year-old children , U.S. EPA, 1990].

Potential non-carcinogenic health effects from exposure to lead in soil at the Burn Pits were estimated by EPA for the exposure points most likely to include 0- to- 6-year-old children: Current On-site Residents and Future On-site Recreational Users or Residents. As a conservative assumption, the model for children was used.

Under current conditions, the Current On-site Resident's exposure to lead in the Burn Pits would result in an average blood lead concentration in children of 4.1 μg/dl. Considering a range of blood lead levels, an estimated 99.5 percent of children at this exposure point would have blood lead concentrations less than the recommended 10 μg/dl limit.

The risk to the Future On-site Recreational User or Future On-site Resident from lead exposure was estimated using the 95 percent UCL lead concentration, which is 506.9 mg/kg. At this concentration, potential exposure to lead in the Burn Pits would result in an average

TABLE 4
ESTIMATED TOTAL HAZARD INDICES FOR EACH OF THE PRIMARY NON-CARCINOGENIC CONTAMINANTS
BURN PITS OPERABLE UNIT

CHEMICAL	TOTAL HAZARD INDEX PRIMARY EXPOSURE POINT							TOTAL HI MG/KG-DAY WORST CASE*	TOTAL HI FOR SEVEN PRIMARY EXPOSURE POINTS ONLY
	On-Depot Three-Year Resident	On-Depot Worker	Future On-Site Recreational User	Future On-Site Worker	Off-Site Resident	Off-Site Business with well	Off-Site Business without well	Future On-Site Resident With Well	
Toluene	5.4 E-06	2.6 E-07	1.8 E-06	8.6 E-06	1.5 E-11	2.3 E-11	1.1 E-10	1.3 E-05	0.0
Ethylbenzene	0.0 E+00	8.1 E-06	1.4 E-06	4.6 E-06	2.1 E-05	2.2 E-07	1.1 E-10	4.3 E-04	0.0
Xylenes	2.3 E-07	7.4 E-07	1.4 E-06	1.6 E-05	1.6 E-03	6.7 E-07	1.2 E-09	7.9 E-03	0.0
Trichloroethene	NC	NC	NC	NC	NC	NC	NC	NC	NC
1,2-Dichloroethene (cis)	0.0 E+00	1.3 E-05	5.6 E-05	3.8 E-04	8.6 E-01	1.8 E-03	6.8 E-10	2.8 E+00	0.0
Tetrachloroethene	1.1 E-05	2.4 E-06	1.9 E-05	8.5 E-05	8.2 E-02	3.4 E-04	1.7 E-09	2.1 E-01	0.1
Di-N-Butylphthalate	NC	NC	1.9 E-06	3.4 E-06	NC	NC	NC	1.3 E-05	0.0
Antimony	0.0 E+00	2.9 E-04	6.6 E-02	1.2 E-01	1.6 E-06	2.4 E-05	1.2 E-04	4.6 E-01	0.2
Arsenic	2.6 E-04	1.2 E-06	3.6 E-02	6.4 E-02	6.4 E-07	9.7 E-07	4.8 E-06	2.6 E-01	0.1
Boron	1.1 E-06	2.1 E-06	1.3 E-04	2.3 E-04	3.8 E-09	5.8 E-09	2.9 E-08	9.1 E-04	0.0
Cadmium	1.8 E-06	9.2 E-04	1.1 E-01	2.1 E-01	1.2 E-04	1.8 E-04	8.8 E-04	7.4 E-01	0.3
Chromium III	8.0 E-04	5.4 E-02	6.0 E-01	3.3 E+00	1.1 E-02	1.6 E-02	7.9 E-02	4.6 E+00	4.6
Chromium VI	4.8 E-02	6.8 E-03	7.8 E-02	4.2 E-01	1.3 E-03	2.0 E-03	1.0 E-02	6.0 E-01	0.6
Copper	6.0 E-03	1.8 E-07	4.9 E-03	8.6 E-03	8.8 E-06	8.9 E-06	4.4 E-07	3.4 E-02	0.02
Lead	NC	NC	NC	NC	NC	NC	NC	NC	NC
Manganese	0.0 E+00	2.1 E-03	2.2 E-02	1.0 E-01	2.6 E-04	4.5 E-04	2.2 E-03	1.7 E-01	0.1
Mercury	1.8 E-03	5.7 E-06	8.5 E-04	1.8 E-03	1.7 E-07	2.6 E-07	1.3 E-06	5.9 E-03	0.0
Molybdenum	5.0 E-06	1.2 E-07	8.8 E-04	9.7 E-04	1.6 E-06	2.5 E-06	1.2 E-07	3.8 E-03	0.0
Silver	1.1 E-07	2.6 E-06	1.9 E-04	3.9 E-04	2.6 E-07	3.9 E-07	1.9 E-06	1.3 E-03	0.0
Zinc	2.3 E-06	1.6 E-06	6.2 E-03	1.1 E-02	7.3 E-07	1.1 E-06	5.8 E-06	4.4 E-02	0.02
TOTAL	9 E-02	9 E-02	9 E-01	4 E+00	10 E-01	2 E-02	9 E-02	9 E+00	

NC: Not Calculated. Either exposure pathway does not apply to this exposure point, or RfD not available for chemical

blood lead concentration in children of 12.2 μg/dl. An estimated 32 percent of children at this exposure point would have blood lead concentrations less than the recommended limit.

In summary, the baseline risk assessment indicates a potential non-carcinogenic health threat to the Future On-site Worker, the Future On-site Recreational User, and the Future On-site Resident (an unlikely scenario) from contaminants at the site. The risk to a Future On-site Worker is primarily from inhalation of dust containing chromium III. The risk to a Future On-site Recreational User is from exposure to lead. Although a Future On-site Resident would be at risk for non-carcinogenic health effects, this scenario is unlikely to occur, and was not a factor in developing cleanup objectives.

Health risk assessment provides a means of quantifying potential risks posed by chemicals present in the environment. However, a great deal of uncertainty exists in the estimation process. In addition to uncertainties common to the risk assessment process, sources of uncertainty in the PHE conducted for the Burn Pits Operable Unit include:

- Site Characterization -- Chemicals may exist in localized "hot spots", where samples were not collected, or chemicals may exist at the site but may not have been detected by the selected analytical methods. This could result in an underestimation of risk.
- Estimation of Exposure Point Concentrations -- These may be overestimated, since: (1) chemicals reported as "not detected" are assigned a value of half the detection limit for the purpose of calculating site concentrations; and (2) the PHE assumes that chemical concentrations in soil and groundwater remain constant over the 25- and 30-year exposure periods, rather than decreasing, as expected, due to leaching. This could result in overestimating the risk.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

6.2 Environmental Evaluation

The SAAD is primarily a disturbed annual grassland ecosystem. No threatened plant or animal species inhabit the site. The Burn Pits are located in a grassland area, and a landscaped area is located east of the site. Several bird species have been observed at the site, and jackrabbits and gophers inhabit the grassland area. No wetlands or vernal pools have been identified in the Burn Pits area.

In summary, significant ecological resources have not been found in the Burn Pits Operable Unit. The area may be disrupted as a consequence of excavation activities during remediation, but significant habitat disruption is not anticipated.

6.3 Threat to Groundwater

Soil data from the remedial investigation indicates that the VOC contamination at the Burn Pits is the primary source of groundwater contamination at SAAD, but that the non-volatile constituents (heavy metals, PCBs, dioxins, and furans) are not a threat to groundwater.

Because the VOCs have impacted groundwater quality, the Burn Pits are subject to California Code of Regulations Title 23, Chapter 15, Section 2510(g), which provides for groundwater monitoring of discharges at closed waste managements units as for corrective action if water quality impairment is found. However, section 2511(d) exempts cleanup actions taken by public agencies from Chapter 15 requirements, provided that the VOCs removed by soil vapor extraction are disposed of at an appropriate off-site facility. The existing groundwater monitoring program and remediation under the Groundwater ROD, in conjunction with the implementation of VOC soil remediation under this ROD, will satisfy the monitoring and corrective action requirements of Chapter 15.

Remedial investigation data showed that total metals in the Burn Pits Unit 1 soils are above background soil concentrations. However, groundwater and soils outside Unit 1 have not been impacted, indicating that the metals are relatively immobile and do not pose a threat to groundwater quality. To further verify this conclusion, the Army conducted deionized water waste extraction tests (DI-WET) on soil samples from Unit 1, in accordance with the Central Valley Regional Water Quality Control Board's water quality site assessment (WQSA) procedures. The results confirmed that the potential leachate from Unit 1 would not pose a threat to groundwater.

6.4 Remedial Action Objectives

Based upon the results of the PHE and the objective of reducing the potential for migration of contaminants to groundwater, the Army, EPA and the State developed remedial action objectives (RAOs) for contaminants at the site. Specific RAOs were developed for those contaminants identified as being primarily responsible for the assessed health risks: arsenic, cadmium, chromium, lead, 1,2-DCE, TCE, and PCE. Specific RAOs were not developed for PCBs or dioxins/furans because the low levels found at the site do not warrant remediation (see Section 6.1.3). However, when remediation alternatives were evaluated, preference was

given to the alternatives which would reduce potential risks posed by these chemicals. The objective of the remedial action is to clean up the soil so that public health is protected and contaminants present above background levels are reduced so that there is no migration to groundwater. Any residual VOC contamination reaching groundwater will be cleaned up by the existing groundwater extraction and treatment system.

The four RAOs are:

- To reduce the potential for inhaling arsenic, cadmium, and chromium in dust to an acceptable risk level (1.0 E-6 for carcinogens or HI = 1.0 for noncarcinogens) by reducing either the metals concentrations in soil or the amount of potential dust by 75 percent. Maximum residual concentrations in soil would be: arsenic 7.3 mg/kg (background concentration), cadmium 88 mg/kg, total chromium 112 mg/kg, and chromium VI 16 mg/kg. These concentrations were estimated using the acceptable risk levels and chemical intake equations for industrial exposures.
- To reduce the potential for ingesting arsenic in soil so that risk is reduced to background level, by either reducing the concentration of arsenic to the background level (7.3 mg/kg) or reducing the amount of soil which can be ingested by 81 percent.
- To reduce migration of VOCs to groundwater above the groundwater cleanup levels (drinking water standards) established in the existing Groundwater ROD. TCE, 1,2-DCE, and PCE concentration must be reduced by 98 percent, 96 percent, and 92 percent respectively. These reductions correspond to soil concentrations of 5 ug/kg or less and soil gas concentrations of 5 ppb or less.
- To reduce lead concentrations in soil to 174 parts per million or less, which is the concentration that is recommended by DTSC of the Cal EPA for lead exposures to children, ages 1-6 years. This requires reducing lead concentrations in soil or reducing the potential for ingestion of soil containing lead by 92 percent.

7 DESCRIPTION OF ALTERNATIVES

An OUFS was conducted to develop remediation alternatives for the Burn Pits Operable Unit. Forty-seven remediation alternatives were assembled from applicable remediation technology options, and were initially evaluated for effectiveness, institutional implementability, and cost. Six alternatives for remediating soil at the Burn Pits passed the initial screening, and were then evaluated by comparing them to the nine criteria required by the National Oil and Hazardous substances Pollution Contingency Plan (NCP). The remediation alternatives emphasize the use of technologies which reduce toxicity, mobility, or volume (TMV) of contaminants, and which

provide a permanent solution. In addition to the remediation alternatives, the NCP and CERCLA require that a no-action alternative be considered at every site. The no-action alternative serves primarily as a point-of-comparison for other alternatives. The six alternatives evaluated are:

Alternative 1: No Action

Alternative 2: Capping of entire Burn Pits Operable Unit

Alternative 3: In-situ soil ventilation of the entire Burn Pits Operable Unit; controls to limit surface soils exposures

Alternative 4: In-situ soil ventilation of the Entire Burn Pits Operable Unit; capping of Unit 1

Alternative 5: In-situ soil ventilation of the entire Burn Pits Operable Unit; excavation of Unit 1; soil washing of excavated soil; backfilling with treated soil

Alternative 6: In-situ soil ventilation of the entire Burn Pits Operable Unit; excavation of Unit 1; Stabilization of excavated soil; backfilling with stabilized soil

Each alternative would be applied to remediate approximately 247,900 cubic yards (cy) of soil: 16,900 cy are located within the two Burn Pits and contain volatile and semi-volatile organic chemicals, metals, PCBs, and dioxins/furans; 231,000 cy are located outside the Burn Pits and contain volatile and semi-volatile organic chemicals.

The Burn Pits contain RCRA characteristic wastes, based on toxicity, including the metals arsenic, cadmium, chromium, lead, and the VOCs 1,2-DCE, TCE, and PCE. Although the Burn Pits would be considered a RCRA landfill if they were in use today, the pits have not been used for waste treatment and disposal since 1966, prior to the effective date of RCRA. Therefore, the only applicable RCRA requirements are those triggered by the action-specific components of the various alternatives, as described below. However, for alternatives which include a RCRA-type cap, RCRA closure requirements have been determined to be relevant and appropriate. Because the state of California's RCRA program has now been authorized to operate in lieu of the federal RCRA program, the RCRA ARARs for the Burn Pits ROD are state RCRA regulations.

7.1 Alternative 1: No Action

Under this alternative, the Army would take no further action to control the source of contamination. However, volatile organics would continue to contaminate the groundwater. Therefore, because the No Action alternative does not pass the threshold criterion of protectiveness, no further evaluation of ARARs or detailed assessment is required.

7.2 Alternative 2: Capping of the Entire Burn Pits Operable Unit

Alternative 2 consists of covering the entire Burn Pits Operable Unit to inhibit exposure to surface soils and to impede infiltration of rainfall or runoff into the contaminated soil. The cap would be designed as a surface water collection and removal system. From top to bottom, it would consist of a cover, a drainage zone, a flexible membrane liner (FML), and a secondary clay liner.

The cover would consist of a 2-foot thick soil layer with vegetation. Under the cover, the drainage zone would consist of a one-foot thick layer of granular material, such as gravel. This granular layer would allow water to drain from the soil/vegetation layer, and would also inhibit burrowing animals from damaging the FML. Water drained from this layer would be collected in perimeter ditches and transported via an underground culvert or PVC piping to Morrison Creek. Under the granular material, a 2-inch thick sand bed would help protect the underlying FML. The FML would be about 30 milliliters thick. Beneath the FML, a 2-foot thick, clay liner would further impede infiltration from the surface. The clay liner would be compacted to reduce its permeability to 1 X 10-7 centimeters per second or slower. The cap would be constructed with a slope of 3 to 5 percent to promote drainage away from it into perimeter ditches.

Overall protection of human health was evaluated based on the ability of the cap to prevent surface exposures to metals and reduce VOC concentrations in leachate. A cap would act as a thick barrier to nearly eliminate all contact with the surface soil. Exposures would occur only if the cap was inadvertently disturbed, for example, through excavation of the soil. Fate and transport modeling indicates that TCE and PCE concentrations will be reduced by 73% and 90%, respectively, by capping using a typical cap design. A cap is expected to meet the protectiveness of human health criterion by reducing risk to within the EPA's 10^{-4} to 10^{-6} target risk range.

Capping will reduce health risks to on-site and off-site receptors due to dermal contact, inhalation, and/or ingestion of metals, dioxins, furans, and PCBs in soil and fugitive dust. Periodic maintenance of the cap would be required to ensure its integrity. Following completion of the remedial action and prior to any sale or other transfer of the portion of SAAD property where the Burn Pits Operable Unit is located, the Army would record a land use restriction as an institutional control to prohibit future disturbance of the hazardous substances remaining in the soil, in accordance with California Health and Safety Code

§ 25230. In addition, the Army would provide notice of this restriction in any purchase, lease, or rental agreements relating to that portion of the property.

Since the contaminated soil and debris will be allowed to remain in-place under this alternative, capping does not provide long-term control of human exposure to volatile organic compounds in groundwater at levels that may be harmful. Vapor phase vadose zone monitoring, to detect leaching from the capped area would be required.

ARARs

ARARs for Alternative 2 are listed on Table A-1 in Appendix A. Capping can be performed in compliance with ARARs.

Under Alternative 2, the wastes would be left in place and covered with a cap that meets RCRA specifications. Long-term monitoring and maintenance would be conducted to ensure the effectiveness of the cap. Although not applicable, RCRA closure requirements for cap design specifications, long-term monitoring and maintenance would be relevant and appropriate.

Because the VOCs have impacted groundwater quality, the Burn Pits are subject to California Code of Regulations Title 23, Chapter 15, Section 2510(g) monitoring and corrective action requirements are applicable; see Section 6.3. Section 2581 final cover requirements for landfill closure would also be applicable for Alternative 2.

7.3 Alternative 3: In-situ Soil Ventilation of the Entire Burn Pits Operable Unit; Controls to Limit Surface Soils Exposures

Alternative 3 consists of using soil ventilation to extract volatile organic chemicals from the subsurface. A soil sealant would be applied annually to control dust, and site access would be limited to reduce the potential for soil ingestion, dermal absorption, and inhalation.

Soil Vapor Extraction (SVE) (Alternatives 3, 4, 5, and 6)

The SVE system consists of: a) air extraction wells, b) a vacuum pump/rotary blower, and c) a system of carbon adsorption canisters (CACs).

The pump/rotary blower pulls a vacuum at the extraction wells thus mobilizing the contaminated soil gas in the soil pore spaces. Air sampling at the well heads will be

performed periodically to evaluate the effectiveness of the SVE system and to identify vadose zone hot spots.

The extracted contaminated air will be routed through CACs to capture the VOC contaminants for treatment. The CAC exhaust will be monitored to assess compliance with air emission standards, and the treated air will be discharge to the atmosphere. Carbon treatment of vapors typically achieves an organic removal efficiency of 90 percent. Multiple CACs in series will be used, if necessary, to meet the Sacramento Metropolitan Air Quality Management District (SMAQMD) air discharge requirements. The spent CACs will be transported off-site for disposal or recycling.

All extracted vapor will be routed through an air/water separator to separate entrained water; and through a particulate air filter prior to routing through the CACs. The entrained water will be routed for treatment to the existing on-site groundwater treatment plant.

Because the Burn Pits (Unit 1) contain heavy metals, PCBs, dioxins and furans, particulate air filters capable of removing such contaminants adsorbed onto particulate matter from Unit 1 will be used on Unit 1 wells. Based on remedial investigation data, PCBs, dioxins or furans are not major contaminants of concern. However, the filters are included as a safety/contingency component so that these particulates and chemicals, if any, do not reach the pump and emissions control equipment (the CACs). The spent HEPA filters will be disposed of at an off-site facility as hazardous waste.

Also, because the mixture of soil and debris in Unit 1 is highly permeable, Unit 1 may be temporarily covered during ventilation to reduce the potential for air channeling.

For Unit 1, treatability study results indicate that a ventilation rate of 200 cubic feet per minute (cfm) could accomplish remediation. For Units 2 thru 5, higher ventilation rates, a minimum of 500 cfm, are required.

Implementation of soil venting at Units 1 through 5 will reduce risk to human health from TCE, PCE, and 1,2-DCE via ingestion, absorption, or inhalation of vapors from ground water to meet RAO No. 3.

Controls to Limit Surface Soil Exposures

A soil sealant will be applied to the surface of Unit 1 to control dust. The sealant would penetrate and stabilize the surface soil, and would resist natural erosion. The sealant would be re-applied annually.

Maintenance of dust control and use restrictions to Unit 1 will protect human health by preventing dermal exposure to soil, inhalation of fugitive dust, and ingestion of soil that contains metals, PCBs, and dioxins/furans. These controls are expected to achieve the exposure reductions required by RAO Nos. 1 and 2. RAO No. 4 would be achieved through dust control and limiting of site access. Following completion of the remedial action and prior to any sale or other transfer of the portion of SAAD property where the Burn Pits Operable Unit is located, the Army would record a land use restriction as an institutional control to prohibit future disturbance of the hazardous substances remaining in the soil, in accordance with California Health and Safety Code § 25230. In addition, the Army would provide notice of this restriction in any purchase, lease, or rental agreements relating to that portion of the property.

ARARs

ARARs for Alternative 3 are listed on Table A-2 in Appendix A. Soil ventilation with dust control can be performed in compliance with ARARs.

RCRA tank requirements are applicable to the activated carbon unit used for the treatment of vapors from the SVE system. The carbon units and HEPA filters will be disposed of at an appropriate off-site facility.

7.4 Alternative 4: In-situ Soil Ventilation of the Entire Burn Pits Operable Unit; Capping of Unit 1

Alternative 4 combines the cap component of Alternative 2 with the soil ventilation component of Alternative 3. The cap would be designed as a barrier to limit exposure to surface soils, but not to limit water infiltration, since mobile contaminants would have been removed by ventilation.

Cap

The cap would consist of a one- to two-foot thick layer of compacted soil. Vegetation would be planted on the cap to impede erosion and increase soil stability. The vegetative root zone

would increase the capacity of the cap to hold water, thereby decreasing infiltration. The cap would be constructed with a slope of about 3 to 5 percent to direct runoff away from it. On-going maintenance would be required, including visual inspections and repairs.

This alternative meets the RAOs. RAO Nos. 1, 2, and 4 are met by the protective barrier cap. RAO No. 3 is met by reducing the total mass of volatile contaminants in the subsurface to non-detectable levels.

The debris in the Burn Pits will remain under this alternative. However, the cap will reduce rain water infiltration and provide a measure of reduction in the threat of a chemical release and migration to groundwater. Vapor phase vadose zone monitoring will be used to monitor potential unknown releases from the debris.

Following completion of the remedial action and prior to any sale or other transfer of the portion of SAAD property where the Burn Pits Operable Unit is located, the Army would record a land use restriction as an institutional control to prohibit future disturbance of the hazardous substances remaining in the soil, in accordance with California Health and Safety Code § 25230. In addition, the Army would provide notice of this restriction in any purchase, lease, or rental agreements relating to that portion of the property.

ARARs

ARARs for Alternative No. 4 are listed in Table A-3. Soil ventilation with capping can be implemented in compliance with ARARs.

RCRA tank requirements are applicable to the activated carbon unit, as described for Alternative 3. RCRA landfill closure requirements are relevant and appropriate. Unlike Alternative 2, the Alternative 4 cap is designed to limit surface exposure but not water infiltration, since the VOCs would be removed by SVE. Only limited long-term maintenance and monitoring would be required. Therefore, RCRA closure requirements for a hybrid-landfill closure would be relevant and appropriate.

7.5 Alternative 5: In-situ Soil Ventilation of the Entire Burn Pits Operable Unit; Excavation of Unit 1; Soil Washing of Excavated Soil; and Backfilling with Treated Soil

Alternative 5 consists of using soil ventilation to remove VOCs from Units 1 through 5, excavating soil contaminated with metals from Unit 1, washing the soil to remove the metals,

and replacing the washed soil in the excavation. Soil ventilation would be conducted as previously described for Alternative 3.

Soil Washing

During soil excavation, dust would be controlled using water or foam sprays. At the time of excavation for soil washing, solid debris will be segregated from the soil. Hazardous debris will be separated from the general non-hazardous debris. Non-hazardous debris will be washed using physical abrasion, water, and/or pressurized water. The residues from the washing will be treated along with other water during the soil washing process.

Hazardous debris will be treated at the BDAT standards for hazardous debris, using physical extraction or chemical extraction technologies. Residuals will be managed according to requirements either by discharge to the sewer, by inclusion of the residual in the soil washing process, or by shipping the residual offsite to a facility that can apply BDAT treatment for the constituents in the residual. All debris after treatment will be disposed of offsite.

The soil washing unit would consist of a size segregation device, mix reactors, and a de-watering device. Oversized soil particles will be segregated, using wet screens to physically remove contaminants from the larger-sized fraction. The segregated, lower-sized fraction would be combined with a washing reagent in a mix reactor. Based upon treatability testing results, a dilute acid solution would likely be used. Composited samples of the washed soil would be chemically analyzed to assess whether cleanup has been successful. The clean soil would then be used as backfill in the excavation.

After washing, the wash liquid would be treated on site using a chemical precipitant, and the treated water would be disposed in a sanitary sewer. Dissolved metals would be converted to insoluble forms, and would be separated from the rinseate using a clarifier. The sludge containing precipitated metals would be de-watered on site, and disposed at an off-site facility permitted to accept hazardous waste. Stabilization of the de-watered sludge may be required to minimize its leaching potential. As an alternative, the precipitated metals may be recovered at an off-site metal reclamation unit. The decision to use reclamation will depend upon the concentration of metals in the sludge, the total amount of sludge, the cost, and the availability of a market for metals recycling.

Implementation of this alternative would protect both human health and the environment. Soil ventilation will reduce risk posed by volatile organics that could be inhaled, ingested, or absorbed from soil and groundwater. Estimated removal of these constituents meets RAO No.

3. Soil washing would be performed to reduce risk to human health by inhalation, dermal contact, or ingestion of metals found in Unit 1. To meet RAO Nos. 1 and 2 the soil washing will need to remove metals to the following residual concentrations:

Metal	Residual Concentration	
Cadmium	88 mg/kg	
Total Chromium	112 mg/kg	
Chromium (VI)	16 mg/kg	
Arsenic	7.3 mg/kg	(background)
Lead	174 mg/kg	

ARARs

ARARs for Alternative No. 5 are listed in Table A-4 in Appendix A. Soil ventilation and soil washing can be implemented in compliance with ARARs.

RCRA land disposal restrictions (LDRs) treatment standards are applicable for replacement of excavated soil containing RCRA characteristic waste. Testing indicates that the washed soil would achieve the LDR leachability limits.

RCRA tank requirements are applicable for the activated carbon vessel used for SVE vapor treatment. RCRA container requirements are applicable for the containers used to store and wash excavated soil.

7.6 Alternative 6: In-situ Soil Ventilation of the Entire Burn Pits Operable Unit; Excavation of Unit 1, Stabilization of Excavated Soil, and Backfilling with Stabilized Soil

Under this alternative, two technologies will be utilized.

The first part of the remedy utilizes soil vapor extraction (SVE) to extract VOCs from the burn pits and vadose zone soils in order to curtail VOC migration to groundwater, as discussed for Alternative 3.

The second part of the remedy consists of solidification of relatively immobile contaminants (heavy metals, PCBs, and dioxins/furans) within the burn pits (Unit 1) in order to reduce their bioavailability (reduce potential future exposure via direct dermal contact, ingestion or

inhalation of fugitive dust). Because of their relative immobility, these non-volatile contaminants are not considered a threat to groundwater. Although PCBs, and dioxins/furans are not considered primary contaminants of concern, solidification will also immobilize those contaminants.

Solidification

The objective of the burn pits soil solidification (stabilization) is to reduce potential future risk to human health by reducing exposure via dermal contact and/or ingestion of contaminated site soils, or inhalation of contaminated dust.

Stabilization will be accomplished by excavating contaminated soil from Unit 1 and mixing it with the appropriate pre-determined quantities of cement, silicates, and water. The stabilized soil will then be loaded into dump trucks, replaced in the excavation, and spread and compacted by bulldozers. A layer of clean soil will cover the solidified mass.

Excavation will also remove containers and other debris which may be buried in the Burn pits. Some of the debris may be crushed and used as aggregate in the stabilization. Other debris will be transported off-site for treatment, recycling, or disposal.

Testing has shown that the excavated soil meets the "inert waste" classification as defined by §2524 of Chapter 15, Title 23 CCR. No additional requirements (such as a cap, post-closure monitoring, or long-term maintenance) will be needed.

Following completion of the remedial action and prior to any sale or other transfer of the portion of SAAD property where the Burn Pits Operable Unit is located, the Army would record a land use restriction as an institutional control to prohibit future disturbance of the hazardous substances remaining in the soil, in accordance with California Health and Safety Code § 25230. In addition, the Army would provide notice of this restriction in any purchase, lease, or rental agreements relating to that portion of the property.

ARARs

The ARARs for Alternative #6 are listed in Table A-5. The major ARARs for the SVE portion of the remedy include:

a) 22 CCR 66264.192-199, RCRA tank standards for owners and operators of hazardous waste treatment, storage, and disposal facilities applicable to carbon adsorption canisters,

b) 22 CCR 66262.34 RCRA storage time restrictions. This requirement applies to spent HEPA filters and CACs,

c) SMAQMD Rule 202, Sec. 301 requires the use of best available control technology (BACT) when reactive organic emissions are greater than 0 lbs/day,

d) SMAQMD Rule 402, requires the use of risk assessment to set emissions standards (a 10^{-6} health risk criteria will be used) when BACT is not sufficiently protective.

The major ARARs for the solidification portion of this remedy include:

a) 22 CCR 66268.41 Land Disposal Restriction Treatment Standards (expressed as concentrations in waste extract) applicable for on-site land disposal of stabilized RCRA characteristic waste,

b) 22 CR 66264.192-199 RCRA tank requirements applicable for the cement mixing tanks,

c) SMAQMD Rule 403 Applicable requirement that regulates operations which periodically may cause fugitive dust emissions into the atmosphere.

8 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The six remediation alternatives were assessed using the nine evaluation criteria developed to address CERCLA requirements. The nine criteria are:

Threshold Criteria

1) Overall Protection of Human Health and the Environment
2) Compliance with ARARs

Primary Balancing Criteria

3) Long-term Effectiveness and Permanence
4) Reduction of Toxicity, Mobility, or Volume through treatment
5) Short-term Effectiveness
6) Implementability
7) Cost

Modifying Criteria

8) State Acceptance
9) Community Acceptance

The following sections compare the six remediation alternatives in terms of each of the nine criteria. The comparisons are summarized on Table 5.

8.1 Criterion 1: Overall Protection of Human Health and the Environment

This criterion assesses whether the alternative meets the statutory requirement for protection of public health and the environment, and describes how risks posed through each potential exposure pathway are eliminated, reduced, or controlled through treatment, or engineering or institutional controls.

Each of the alternatives except Alternative 1 (No-action) would provide protection of human health and the environment. Risks are expected to be reduced to acceptable levels.

8.2 Criterion 2: Compliance with ARARs

The ARARs evaluations are presented on Tables A-1 through A-5 in Appendix A.

Compliance with ARARs was not evaluated for Alternative No. 1 since this alternative did not meet the threshold criterion of protectiveness.

Alternative 2 capping would not eliminate the threat to groundwater because VOCs would be expected to continue migrating to groundwater.

Table 5

Summary Comparison of Remedial Alternatives, Burn Pits Operable Unit

ALTERNATIVE	SELECTION CRITERIA						
	OVERALL PROTECTIVENESS	COMPLIANCE WITH ARARs	LONG-TERM EFFECTIVENESS PERMANENCE	REDUCTION OF TMV	SHORT-TERM EFFECTIVENESS	IMPLEMENTABILITY	ESTIMATED COST
No Action 	Does not protect human health or environment.	Not Applicable, applies only to CERCLA actions.	Is not a long-term or permanent solution.	Does not reduce toxicity, mobility, or volume.	Effective, since no one is currently exposed to chemicals in soil of OU.	Easily implementable	$0
Capping Units 1 - 5 (entire Burn Pits OU). 	Protects human health and the environment.	Complies with ARARs.	Cap would need to be maintained. Containers of chemicals may exist in pits and could deteriorate and release contents in the future. VOCs expected to continue degrading groundwater.	Does not reduce toxicity or volume, but will reduce mobility.	Implementation will not greatly increase exposure to soil and/or dust	Easily implementable	$1,200,000
Soil Venting of Units 1 - 5 Dust/Access Controls. (Vapor Treatment by carbon adsorption). 	Protects human health and the environment.	Complies with ARARs if soil exposure is adequately controlled.	Venting provides permanent remedy for VOCs. Long-term maintenance of dust access controls needed. Land use restrictions needed. Containers of chemicals may exist within the pits and could deteriorate and release contents in the future.	Reduces toxicity, mobility and volume of volatile organics. Dust control reduces mobility of metals, but no reduction in the toxicity or volume of these contaminants is effected.	Currently effective due to limited current exposures. Implementation would not greatly increase potential exposures.	Easily implementable.	$304,000
Soil Venting of Units 1 - 5 (entire Burn Pits OU), Cap Unit 1. 	Protects human health and the environment.	Complies with ARARs.	Venting provides permanent remedy for VOCs. Cap would need to be maintained. Containers of chemicals may exist within the pits and could deteriorate and release contents in the future.	Reduces toxicity, mobility, and volume of VOCs. Does not reduce toxicity or volume of metals. The cap will further reduce mobility and the potential for exposures to occur.	Effective, will reduce potential exposures to soil and/or dust. Air monitoring of vapor emissions will be performed to confirm protectiveness.	Easily implementable.	$306,000
Soil Venting of Units 1 - 5 (entire Burn Pits OU), Excavate Unit 1, Soil Wash and Backfill. 	Protects human health and the environment.	Complies with ARARs.	Venting provides permanent remedy for VOCs. Soil Washing is expected to provide permanent remedy for metals.	Reduces toxicity, mobility, and volume of VOCs and metals.	Potential for dust exposures during excavation. Dust control and monitoring worker health & safety, and air emission monitoring will be performed.	Implementation may be difficult. Pilot test required. Excavated soil requires careful screening.	$13,203,000
Soil Venting of Units 1 - 5 (entire Burn Pits OU). Excavate Unit 1, Stabilize and Backfill. 	Protects human health and the environment.	Complies with ARARs.	Venting provides permanent remedy for VOCs. Stabilization is expected to provide permanent remedy for metals and dioxins/furans.	Reduces toxicity and mobility of VOCs and metals.	Potential for dust exposures during excavation of Unit 1. Dust control and monitoring, worker health & safety, and air emission monitoring will be performed.	Fairly easy to implement. Excavated soil requires screening.	$2,811.000

TMV = Toxicity, Mobility, Volume.

Alternative 3 will meet ARARs if soil exposure controls are implemented annually. The remaining alternatives, 4 through 6, would meet ARARs. Pilot testing will be conducted prior to soil washing (Alternative 5) to select a wash reagent capable of removing metals to levels required for compliance with ARARs.

8.3 Criterion 3: Long-term Effectiveness and Permanence

The analysis of long-term effectiveness and permanence addresses the expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment after completion of the remedial action.

Alternative 1, No Action, would not provide a long-term or permanent solution. The magnitude of health risks associated with this alternative are estimated in the baseline health risk assessment. The remaining alternatives would provide better long-term effectiveness and permanence than No-Action. The long-term effectiveness and permanence of Alternatives 5 and 6 would be better than those of Alternatives 2, 3, and 4 because they involve excavation of the material in the Burn Pits. Based on previous investigations, containers of unknown chemicals may be present in the Burn Pits. These containers could deteriorate with time and release their contents. Alternatives 5 and 6 would provide means for removing containerized waste, if any, and disposing of it at a permitted facility.

8.4 Criterion 4: Reduction of Toxicity, Mobility, or Volume through Treatment

The analysis of this criterion addresses the anticipated performance of the treatment technologies the remedy may employ. The analysis considers:

- treatment process;
- volume of hazardous material to be treated;
- effectiveness in reducing toxicity, mobility, or volume (TMV) of contaminants; and
- type and quantity of treatment residual.

Alternative 2, Capping of the Operable Unit, does not involve a treatment process. Mobility of the contaminants would be reduced, but the toxicity and volume would not be affected.

Alternative 3, Soil Ventilation with Surface Dust Control, involves removal of organics from the soil using soil ventilation, thus reducing the TMV of the volatile organics in soil. In addition, treatment of surface soils through the annual application of soil sealant will reduce

the mobility of metals. Treatment residual from the process includes entrained water from the soil ventilation process. The entrained water will be further treated in the existing on-site water treatment plant.

Alternative 4, In-situ Soil Ventilation and Capping, is similar to Alternative 3, with the exception that capping is used instead of applying a soil sealant. Mobility of metals is similarly reduced with capping; however, capping does not involve treatment and toxicity and volume would not be reduced.

Alternative 5 involves several treatment processes including soil ventilation for removal of volatile organics; debris decontamination to reduce the toxicity of the debris and volume of contaminants; and a soil washing to remove metals from the soil. The wash liquid will be further treated on-site using a chemical precipitant to remove metals from the wash liquid, thus reducing the volume of treatment residual to be disposed of. This will reduce the toxicity of the wash water and allow the treated wash water to be disposed of in the sanitary sewer.

Alternative 6, In-situ Soil Ventilation, Excavation, Stabilization, and Backfilling, involves treatment by soil ventilation to reduce the toxicity and volume of volatile compounds, stabilization of the soil to immobilize non-volatile contaminants, and treatment of the contaminated debris to reduce its toxicity.

8.5 Criterion 5: Short-term Effectiveness

The analysis of short-term effectiveness addresses public health and environmental impacts during the construction and implementation period. The period of time required to achieve remediation objectives is also considered. The time required to complete the six alternatives are as follows:

- Alternative 1 - None
- Alternative 2 - 6 months
- Alternative 3 - 10 months
- Alternative 4 - 15 months
- Alternative 5 - 24 months
- Alternative 6 - 15 months

Alternative 1 provides short-term effectiveness, since the Burn Pits are secure on SAAD, are located in an area not used by workers or the current on-site resident, and do not present a

current health risk. Alternative 2 would slightly increase short-term exposures due to dust formation during cap construction, but this could be controlled. Alternatives 3 through 6 would slightly increase short-term exposure by increasing the potential for dust and organic vapors during installation of extraction wells. A contingency plan would be developed to limit vapor emissions. Alternatives 5 and 6 have the greatest potentials for increased short-term exposures because soil would be excavated. However, these short-term risks and exposures will be monitored and controlled to acceptable levels through air monitoring and dust controls.

8.6 Criterion 6: Implementability

Implementability refers to the technical and administrative feasibility of performing the remediation alternative. The analysis also considers the availability of necessary materials and services. The following factors were considered:

- ability to construct the technology;
- reliability of the technology;
- ease of interfacing additional remediation technology;
- feasibility of monitoring;
- ability to obtain approvals from, and coordinate with, regulatory agencies; and
- availability of treatment, storage, and disposal services; equipment and specialists; and technologies.

Alternatives 1 through 4 and 6 could be readily implemented. The implementability of Alternative 5 is poor for several reasons. Experienced contractors with quality equipment are generally not available; prices can be high and scheduling contractors is difficult. Soil washing is being used at the Oxidation Lagoons, where contamination is restricted to the top few feet of soil. At the Oxidation Lagoons, there is no debris and metals are the only known contaminants. In contrast, the soils to be washed at Burn Pits extend to approximately a 20 foot depth, are more variable, and are filled with debris which would need to be removed prior to soil washing. Pilot testing would be required to select a reagent and washing time which would meet objectives. Pilot testing could indicate the washing process is not effective. Alternative 6 relies on a process (soil stabilization) which is proven at the bench-scale level, and has been implemented at other sites. However, handling the debris during excavation creates some uncertainties for both Alternatives 5 and 6, because the nature of the debris is not completely known and therefore, there are unknown potential hazards from the debris.

8.7 Criterion 7: Cost

This criterion evaluates the capital and operation and maintenance (O&M) costs, and present worth of each alternative. The estimated costs for each alternative are as follows:

Alternative	Present Worth	Capital Cost	O&M Cost
Alternative 1	$0	$0	$0
Alternative 2	$1,200,000	$296,000	$904,000
Alternative 3	$304,000	$289,000	$15,000
Alternative 4	$306,000	$298,000	$8,000
Alternative 5	$13,203,000	$13,203,000	$0
Alternative 6	$2,811,000	$2,811,000	$0

O&M costs for Alternative 2 are for cap maintenance and groundwater monitoring for 30 years. O&M costs for Alternatives 3 and 4 are for annual dust control and cover maintenance, respectively, for 30 years. These costs are estimates; actual contractor bids may differ from the estimate.

Alternative 1 would be the least expensive. The estimated costs for Alternatives 3 and 4 are similar, and are about one-eighth the estimated costs for Alternative 6. Alternative 5 would be the most expensive, exceeding Alternative 6 estimated costs by over 400 percent.

8.8 Criterion 8: State Acceptance

The State of California has concurred with the selected alternative for the cleanup of soil at the Burn Pits Operable Unit.

8.9 Criterion 9: Community Acceptance

This criterion indicates whether the public concurs with, opposes, or has no comment on the preferred alternative. The community expressed no opposition to the preferred alternative at the public meeting. No written comments on the alternatives were received during the public comment period. Part III of this ROD contains the Responsiveness Summary from the public comment period and the public meeting.

9 SELECTED REMEDY

Alternative 6 is the remedy selected for the cleanup of the soil at the Burn Pits Operable Unit. The selection of this remedy was based upon the comparative analysis of alternatives presented above, and provides the best balance of trade-offs with respect to the nine evaluation criteria.

9.1 Components of the Remedy

The selected remedy consists of the following components:

- ventilating the entire Burn Pits Operable Unit soils to remove VOCs;
- excavating Unit 1 soils which contain non-volatile contaminants;
- stabilizing the excavated soils;
- backfilling the excavation with stabilized soil; and
- implementing institutional controls in the form of a deed restriction and notices, to prohibit future disturbances of the stabilized soil mass.

9.2 Cleanup Standards

Volatile Organic Compounds

The soil vapor extraction (SVE) system will reduce the TCE, PCE, and 1,2-DCE soil concentrations to 5 micrograms/kg or less; further, soil gas concentrations will be reduced to 5 ppb or less.

This cleanup standard meets Remedial Action Objective No. 3 (see section 6.4).

Non-Volatile Compounds

The heavy metals will be solidified so that the waste extract does not exceed the following levels as set forth in 22 CCR §66261.24: arsenic, 5 mg/l; cadmium 1 mg/l; chromium, 5 mg/l; and lead, 5 mg/l. These levels will render the solidified mass a non-hazardous waste and acceptable for on-site land disposal.

This cleanup standard meets Remedial Action Objectives Nos. 1, 2, and 4 (see section 6.4).

9.3 Cost Information

The present worth cost of the selected remedy using activated carbon treatment of the extracted vapor is estimated to be $2,811,185. The capital cost is primarily for construction and

operation of the soil ventilation system, excavation of Unit 1, and stabilization of the excavated soil. As the remedial action should be completed within 15 months, no recurring annual O&M costs for the alternative are anticipated and no long-term monitoring will be required. A summary of cost information is presented in Table 6.

10 STATUTORY DETERMINATIONS

The Army's primary responsibility at this NPL site is to undertake remedial actions that achieve adequate protection of human health and the environment. Section 121 of CERCLA establishes several statutory requirements and preferences. These specify that, when complete, the selected remedy must comply with ARARs unless a statutory waiver is justified. The selected remedy must also be cost effective, and utilize permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. Finally, the statute expresses a preference for treatment as a principal element that reduces TMV of the hazardous waste.

10.1 Protection of Human Health and the Environment

The selected remedy would protect human health by removing VOCs from the soil, and by stabilizing non-volatile contaminants. Risks posed by inhalation, ingestion, or absorption of volatile organics, and by absorption or ingestion of soil or inhalation of dust containing non-volatile contaminants would be eliminated. Non-volatile contaminants would be bound into a concrete mix that would eliminate the potential for exposure.

10.2 Compliance with ARARs

Section 121 of the CERCLA provides that, unless waived, remedial actions shall comply with Federal and State laws that are applicable or relevant and appropriate to the contaminants and circumstances of the site.

The selected remedy would meet all ARARs. The list of ARARs for the selected alternative is presented on Table A-4 in Appendix A.

10.3 Cost Effectiveness

The selected remedy is cost-effective because it has been determined to provide overall effectiveness proportional to its costs. The estimated cost of the selected alternative is $2,811,000 using activated carbon treatment for emissions control, Estimated costs for Alternatives 2, 3 and 4 are less, but these alternatives do not meet remediation objectives as

TABLE 6

Selected Alternative Cost Summary:
Soil Ventilation, Excavation, Soil Stabilization, Backfill

Soil Ventilation System (SVS)		Cost ($)
SVS Extraction System		
#8 vertical wells,4" dia., 80' deep		$40,170.00
#27 – EPA 8240 @ $385 ea.		$10,395.00
#18 – EPA 8270 @ $700 ea.		$12,600.00
#1 horizontal extraction well, 4" dia., 330 feet long, 10 ft deep		$4,032.00
#3 – EPA 8240 @ $385 ea.		$1,155.00
#3 – EPA 8270 @ $700 ea.		$2,100.00
Above ground extraction system piping installation		
2 laborers for 2 days @ $35/hr		$1,120.00
1420 LF, 4" dia , sch 40 PVC pipe @ $4/LF		$5,680.00
#9 – 4" dia , sch 40 PVC Elbows @ $20/ea.		$180.00
#9 – 4" dia , sch 40 PVC Tees @ $20/ea.		$180.00
#11 – 4" dia , sch 40 PVC ball valves @ $120/ea.		$1,320.00
500 SCFM Vacuum Blower, Liquid/gas separator, and particulate filter, @ $3000/mo X 4 months		$12,000.00
Mobe/Demobe		$1,500.00
15' X 15' X 4" concrete pad (for activated carbon or unit)		$1,350.00
#8 vacuum gauges @ $200 ea.		$1,600.00
#8 Pitot Tubes installed @ $80 ea.		$640.00
#8 sample ports installed @ $50 ea.		$400.00
	Subtotal	**$96,422.00**
SVS Treatment System (Activated Carbon)		
Activated Carbon vapor treatment system (No change outs required)		
(#2– 1000 lb. canisters @ $5535 ea.)(Westates quote)		$11,070.00
Installation (wag)		$1,500.00
	Subtotal	**$12,570.00**
Security Fencing		
Permanent 110 LF cyclone fence, 6' high, and one 10' gate installed		$820.00
Electrical		
230v, 3–phase, 30 Amp service		$5,000.00
Electrical power consumption 20 Hp for 4 months		$3,550.00
	Subtotal	**$9,370.00**
Operation and Monitoring		
Vapor sampling, EPA TO14 analysis @ $350/ea X 38 samples		
(One influent sample and one stack sample per event)		$13,300.00
32 site visits @ $688/visit		$22,016.00
	Subtotal	**$35,316.00**
Verification Soil Sampling		
4 confirmation borings		$9,756.00
#14 – Epa 8240 @ $385 ea.		$5,390.00
#8 – EPA 8270 @ $700 ea.		$5,600.00
	Subtotal	**$20,746.00**
Total with Activated Carbon		**$174,424.00**
Contractor Markup (15%)		**$26,163.60**
Design and Permitting (20%)		**$34,884.80**
Engineering Oversight (20%)		**$34,884.80**
Reporting (5%)		**$8,721.20**
Total cost for SVS with Activated Carbon		**$279,078.40**

TABLE 6 (CONT.)

Selected Alternative Cost Summary: Soil Ventilation, Excavation, Soil Stabilization, Backfill

Alternative 6 Burn Pits Soil Stabilization	Cost
Site Preparation	
Dozer for 16 hrs @ $60/hr	$960.00
Excavation 22,900 C.Y. (includes benching, both pits)	
Excavator, 6 weeks @ $145/hr	$46,400.00
Dozer, 6 weeks @ $60/hr	$19,200.00
2 Dump trucks, 6 weeks @ $65/hr ea.	$41,600.00
Dust control	
1 water truck for 2 months @ $1500/mo	$3,000.00
Visqueen cover for untreated soil piles	
16 rolls @ $100 ea. (2500 ft^2 each)	$1,600.00
Excavation Verification Sampling (approx. 40 ft spacing)	
62 samples, EPA 8010 TTLC metals @ $501/sample	$31,062.00
31 samples, EPA 1613 (high res.) dioxins/furans @ $1600/ea	$49,600.00
62 samples, CLP package @ $50/sample	$3,100.00
Rush turn around time (100%)	$83,762.00
Soil Stabilization Pilot Testing	
1000 tons @ $80/ton	$80,000.00
Soil Stabilization Treatment	
Screen 20,000 tons soil @ $7.36/ton	$147,200.00
Stabilize 17,000 tons of soil @ $54.5/ton	$926,500.00
Mobe	$15,000.00
Demobe	$10,000.00
Treated Soil Confirmation Sampling (one sample/300 CY's)	
EPA 8010, 45 samples, @ $501/sample	$22,545.00
EPA 8010 STLC, 5 samples @ $425/sample	$2,125.00
EPA 1613 (high res.) TCLP, 45 samples @ $1750/sample	$78,750.00
CLP package, 45 samples @ 50/sample	$2,250.00
Backfill and Compact	
22,900 C.Y. @ $1.00/C.Y.	$22,900.00
Perimeter Air Monitoring	
Once day each week for 8 weeks @ $11,112/day	$88,896.00
– 3 PUF samplers, 3 high volume samplers @ $687/event/week	
– 3 TO–9 Analyses @ $7200/event/week	
– 3 glass fiber filter samples @ $780/event/week	
– Weather station @ $350/event/week	
– Mini–Ram @ $185/event/week	
– Mobe/Demobe @ $225/event/week	
– Calibration @ $450/event/week	
– Sampling/mini–ram measurements @ $600/event/week	
– QA/QC @ $450/event/week	
– Reporting @ $185/event/week	
Site Security Fencing (temporary)	
1400 L.F. of temporary fence @ $1.00/L.F.	$1,400.00
Site Restoration	
Dozer for 16 hrs 2 $60/hr	$960.00
Utilities	
Electrical power	
Installation	$3,906.00
Usage (40 – 8hr days @ 704 KWH/day X $0.08163/KWH)	$2,300.00
Water (installation)	$3,055.00
	Subtotal $1,688,071.00

Contractor Markup (15% construction cost)	$253,210.65
Design and Permitting (20% construction cost)	$337,614.20
Construction Oversight (10% construction cost)	$168,807.10
Reporting (5%)	$84,403.55
Total Cost for Stabilization	TOTAL $2,532,106.50
Total SVE Plus Stabilization	TOTAL $2,811,185.00

effectively as Alternative 6. Alternatives 2, 3, and 4 provide less long-term effectiveness and permanence than Alternative 6. Alternative 5 would meet the objectives of the remedial action, but would be difficult to implement, and would cost considerably more than Alternative 6. Estimated costs for Alternative 6 are summarized on Table 6.

10.4 Utilization of Permanent Solutions, and Alternative Treatment and Resource Recovery Technologies

The selected remedy represents the maximum extent to which permanent solutions and technologies can be used in a cost-effective manner at the Burn Pits Operable Unit. Of those alternatives that meet the threshold criteria of overall protection of human health and the environment and compliance with ARARs, the selected remedy provides the best balance of tradeoffs in terms of:

- Long-term Effectiveness and Permanence;
- Reduction of TMV;
- Short-term Effectiveness;
- Implementability; and
- Cost

10.5 Preference for Treatment as a Principal Element

The selected remedy satisfies the statutory preference for treatment as a principal element. The principal threats to human health and the environment are volatile organic chemicals, and metals in soil. The selected remedy would address these threats through treatment by removing VOCs from the soil using ventilation; metals in soil would be immobilized by adding stabilizers to the soil.

11 REFERENCES CITED

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U.S. EPA, 1990d, Policy Memorandum: "CERCLA Response Activities and the Land Disposal Restrictions Program's Applicability at Plattsburgh Air Force Base;" From Sylvia Lowrance, Director of Office of Solid Waste, April 6, 1990.

III. RESPONSIVENESS SUMMARY

1 BACKGROUND ON COMMUNITY INVOLVEMENT

At various times since 1979, formal news releases have been issued by the SAAD Public Affairs Office concerning contamination issues at SAAD. The releases have provided the local media and general public with information on the status of investigative and remedial efforts and continuing action to protect public health and safety.

To date, public concerns about the contamination at SAAD have mainly focused on (1) the potential for exposure to contaminated groundwater that currently exists under the southwest corner of SAAD and off site to the south and west of SAAD, and (2) the effects that contamination and remedial actions have on wildlife and wildlife habitat at the facility. The first concern is applicable to the Burn Pits Operable Unit since the unit appears to have affected groundwater at SAAD, based on the results of soil and groundwater sampling. The second concern is minor at the Burn Pits Operable Unit since few wildlife species have been observed in the vicinity. SAAD has studied the wildlife population in and around the Operable Unit and has determined that wildlife is more at risk due to the presence of contaminants in this area than due to temporary disruption of the area during remedial activities.

Contamination at the Burn Pits site is not expected to affect businesses in the vicinity of the site, residential property values, or traffic patterns during site cleanup since this Operable Unit is located entirely within the SAAD facility boundary and the selected remedy will not significantly change the number of vehicles going to or from the Depot each day. The public has expressed no concerns with these issues. If not remediated, contaminants at the Burn Pits Operable Unit could pose a long-term health risk to future on-site and off-site residents. No short-term or long-term human health or environmental risks should occur during or after remediation of this site by the selected alternative, providing that on-site workers follow standard OSHA guidelines for working with hazardous waste during remediation and dust control measures are implemented during construction. The public has expressed no concerns with short- or long-term health risks of remediation, but has expressed concern about contamination of drinking water wells.

2 OVERVIEW

Notice was placed in the local community daily newspaper announcing the availability of the Operable Unit Feasibility Study (OUFS) and Proposed Plan (PP) in the local information repositories at the California State University Library, the SAAD Visitor Center, the Department of Toxic Substance Control, and the George Sim Community Center. Public review and comment was invited for a period of 30 days, from August 3 to September 1, 1992. No written comments were received.

A public information and comment meeting on the PP was held on August 13, 1992 at the George Sim Community Center. The meeting was attended by 34 people, representing the public, the Army, EPA, DTSC and RWQCB. During the public comment period and the public meeting, the public made one comment asking about the relative advantages of the Army's preferred alternative for cleaning up the soil at the Burn Pits Operable Unit. The Army's preferred alternative for soil cleanup is composed of in-situ soil ventilation of the entire Burn Pits Operable Unit followed by excavation of the contaminated soil in the pits, stabilization of excavated soil, and backfilling the pits with stabilized soil.

The public asked for information on impacts to groundwater. The public also expressed a desire for increased communication between the depot and the community.

3 SUMMARY OF PUBLIC COMMENTS AND ARMY RESPONSES

The following questions were asked at the public meeting on August 13, 1992.

QUESTION #1:

Could you explain the figures showing parts per million of the inorganic and organic substances? They don't seem much cleaner than the average concentrations.

RESPONSE:

Those are the cleanup levels. They are based on the ARARs and on available technology. The soil will be cleaned up so that we would not contaminate groundwater any more than it is already.

QUESTION #2:

Is this site in a flood zone?

RESPONSE:

No. The water coming down from a break on the American River levee actually comes down in ponds behind the Southern Pacific railroad tracks. A few years back, the Morrison Creek channel was widened and deepened so that it will not flood.

QUESTION #3:

What about the channel that is south of here?

RESPONSE:

That could be Elder Creek. The creek near the depot is Morrison Creek. Elder Creek is the next one down. The Department of Public Works may be able to give you the status on Elder Creek.

QUESTION #4:

Aside from the cost, can you discuss the relative advantage of the selected alternative?

RESPONSE:

In the Burn Pits, we have low level dioxins, furans, and PCBs and there is no known technology to handle these. Also, because of the variability in the soil from surface to 20 feet and the debris present throughout the Burn Pits, soil washing is less attractive for cleanup of the Burn Pits than at the Oxidation Lagoons where metals contamination is present only in the upper 2 to 3 feet of soil and there is no debris. The Army cannot be guaranteed a cleanup with soil washing at the Burn Pits. The best option that preserves DOD's intent and obligation to monitor and take responsibility for its actions is to stabilize the soil and leave it at its present location.

QUESTION #5:

Is our water safe?

RESPONSE:

We are not contaminating any utility district water supplied to this area. We have sampled wells within the confines of the contaminant plume and the levels are below the MCL of 5 ppb.

COMMENT #6:

At the last public meeting, you said that you would take samples and get back to us.

RESPONSE:

We are currently investigating where to install the monitoring wells, and once that occurs, we will be sampling.

QUESTION #7:

When does the public comment period end?

RESPONSE:

September 1.

COMMENT #8:

There needs to be an ongoing communication between the depot, state agencies and community members as the cleanup proceeds. Formal lines of communication need to be set up.

RESPONSE:

We would be happy to set up informal community meetings, tours or whatever else is requested by concerned community members. A public relations plan has been set up to get the public involved and flyers have been sent out to people on the mailing list.

QUESTION #9:

Was this meeting announcement only sent to people on the mailing list?

RESPONSE:

No, a large public notice was also placed in the Sacramento Bee for 5 days.

COMMENT #10:

Flyers are better than the newspaper. The average person doesn't read the paper.

RESPONSE:

For future meetings, we will send out flyers.

QUESTION #11:

The base has to be closed by July or October of 1997, but the groundwater contamination won't be cleaned up until 2001. Can portions of the base be given to the public or other government agencies prior to 2001? Also, when will employees have to leave?

RESPONSE:

Portions of the base that are cleaned up can be transferred for other uses, but the final decision on reuse of the property has not been made. For employees, the maintenance work will most likely end by September of 1994. The work load is being transferred to other bases by competitive bid.

REMAINING CONCERNS

All public questions expressed during the public meeting were addressed by the Army. The Regional Water Quality Control Board offered to test the tap water of a citizen who had expressed concern about contamination of the drinking water. A major concern expressed was the need for additional communication to the public, which the Army is addressing through an expanded mailing list and additional public information meetings to be set up at the request of the community.

COMMENT:

The State of California, Department of Toxic Substances Control has stated that the California Environmental Quality Act (CEQA) should be included as an ARAR for the SAAD site. DTSC has adopted a Negative Declaration under CEQA.

RESPONSE:

EPA has determined that the requirements of CEQA are no more stringent than the requirements for environmental review under CERCLA. Pursuant to the provisions of CERCLA, the NCP and other federal requirements, EPA's prescribed procedures for evaluation of environmental impacts, selecting a remedial action with feasible mitigation measures, and providing for public review, are designed to ensure that the proposed action provides for the short-term and long-term protection of public health and the environment and hence perform the same function as and are substantially parallel to the state's requirements under CEQA.

Since EPA has found that CERCLA, the NCP, and other federal requirements are no less stringent than the requirements of CEQA, EPA has determined that CEQA is not an ARAR for this site.

4 RESPONSIVENESS SUMMARY

The Community Relations activities conducted at the Burn Pits Operable Unit on the SAAD facility to date have included the following:

- The Army placed notices in a local daily newspaper announcing the cleanup plan, the availability of documents in the Administrative Record and other information repositories, and an upcoming public meeting August 13, 1992. The notices invited public participation in the selection of a cleanup alternative.

- The Army issued a Proposed Plan (PP) describing the preferred alternative for soil cleanup at the Burn Pits Operable Unit and soliciting public involvement on August 3, 1992. The PP was mailed to contiguous property owners and numerous newspapers, radio, and television stations. In addition to the Administrative Record, the PP is available at the offices of Region IX EPA, the California EPA DTSC in Sacramento, California, and the George Sim Community Center.

- The Army held a public meeting on August 13, 1992 at the George Sim Community Center, 6207 Logan Street in Sacramento, California. The meeting was recorded by a court reporter and a written text of the meeting is available in the Administrative Record.

- The Army opened a public comment period from August 3 to September 1, 1992. No written or oral comments were received during that time, except at the public meeting on August 13 (see preceding item).

APPENDIX A
Analysis of ARARs

TABLE A-1
BURN PITS
ARARs FOR ALTERNATIVE No. 2
CAPPING

February 8, 1993

TYPE	SUBMITTING AGENCY	ARAR	DESCRIPTION	COMMENTS/IMPACTS
Action Specific	DTSC	22 CCR 66264.301	- Design and operating requirements for landfills.	- This regulation is relevant and appropriate to this closure. The capping will reduce the migration of hazardous constituents into the groundwater and limit exposure to surface soils. The factors to be considered, listed in section (j-5), are relevant and shall be considered when assessing this alternative.
Action Specific	DTSC	22 CCR 66264.310 (a)(1-6)	- Closure care requirements for landfills.	- This regulation is relevant and appropriate. The cap will be designed and constructed to meet requirements of (a) 1-6.
Action Specific	Regional Water Quality Control Board (RWQCB)	23 CCR 2510 (g)	- Provides for groundwater monitoring of discharges at closed waste management units and corrective action if water quality impairment is found.	- This regulation is applicable to VOC contamination. The existing groundwater monitoring program and groundwater remediation will satisfy these requirements.
Action Specific	RWQCB	23 CCR 2581	- Landfill closure requirements.	- This regulation is applicable for cover design, grading, groundwater monitoring, and post-closure maintenance.
Chemical Specific	Sacramento Metropolitan Air Quality Management District (SMAQMD)	Rule 403	- Fugitive Dust	- This rule is applicable. "Every reasonable precaution shall be taken not to cause or allow the emissions of fugitive dust from being airborne beyond the property line from which the emissions originate. Reasonable precautions shall include, but are not limited to applying water or suitable chemicals for the control of dust on surfaces which can give rise to airborne matter. Other measures may be taken as approved by the Air Pollution Control Officer".

TABLE A-2
BURN PITS
ARARs FOR ALTERNATIVE No. 3
SOIL VENTILATION SYSTEM WITH DUST CONTROL

February 8, 1993

TYPE	SUBMITTING AGENCY	ARAR	DESCRIPTION	COMMENTS/IMPACTS
Chemical Specific	Sacramento Metropolitan Air Quality Management District (SMAQMD)	Rule 403	- Fugitive Dust	- This rule is applicable. "Every reasonable precaution shall be taken not to cause or allow the emissions of fugitive dust from being airborne beyond the property line from which the emissions originate. Reasonable precautions shall include, but are not limited to applying asphalt, oil, water, or suitable chemicals for the control of dust on surfaces which can give rise to airborne matter. Other measures may be taken as approved by the Air Pollution Control Officer". The contractor will be required to comply with this rule.
Action Specific	DTSC	22 CCR 66264.192-197	- These sections address RCRA tank standards for owners/operators of hazardous waste TSD facilities including: - design and installation - containment and leak detection - operating requirements - inspection - spill response - closure and post closure	- This regulation is applicable to the activated carbon vessel.
Action Specific	DTSC	22 CCR 66262.34	- This section sets forth storage time requirements for generators of hazardous waste.	- This regulation is applicable to the spent filters and carbon from SVE treatment.
Chemical Specific	EPA	40 CFR 403	- General Pretreatment Regulations for existing and new sources of water pollution.	- This regulation is applicable. The contractor shall meet the requirements of the existing sewer use permit issued to SAAD, or the contractor shall obtain any permits from the POTW in accordance with the approved POTW Pretreatment Program.
Chemical Specific	Sacramento Metropolitan Air Quality Management District (SMAQMD)	Rule 202, Section 301	- New Source Review. The purpose of this rule is to provide for the review of new stationary air pollution sources and to provide mechanisms by which authorities to construct such sources may be granted without interfering with the attainment or maintenance of ambient air quality standards.	- The rule is applicable. The rule specifies that BACT shall be used when reactive organics emissions are greater than 0 lb/day. The contractor shall use BACT to attain air quality standards.
Chemical Specific	SMAQMD	Rule 402	- General guideline, if the operation causes release of contaminants to the atmosphere, then a case-by-case determination of public nuisance potential should be performed to verify compliance. This rule states that discharges to air causing injury, detriment, nuisance, annoyance; or endangering comfort, repose, health, safety, or causing damage to business or property is prohibited.	- This rule is applicable. Carcinogens emitted by SVS operation will require treatment prior to emission to the atmosphere. Emissions from treatment processes will be evaluated by the contractor with regards to public effects and monitored and abated. Analytical sampling will be done on a periodic basis to monitor emissions. A 1E-06 health risk criteria will be utilized.

TABLE A-3
BURN PITS
ARARs FOR ALTERNATIVE No. 4
SOIL VENTILATION SYSTEM AND CAPPING

February 8, 1993

TYPE	SUBMITTING AGENCY	ARAR	DESCRIPTION	COMMENTS/IMPACTS
Action Specific	DTSC	22 CCR 66264.310 (a)(1-6)	- Closure care requirements for landfills.	- This regulation is relevant and appropriate. The cap will be designed and constructed to meet requirements of (a) 1-6.
Chemical Specific	Sacramento Metropolitan Air Quality Management District (SMAQMD)	Rule 403	- Fugitive Dust	- This rule is applicable. "Every reasonable precaution shall be taken not to cause or allow the emissions of fugitive dust from being airborne beyond the property line from which the emissions originate. Reasonable precautions shall include, but are not limited to applying asphalt, oil, water, or suitable chemicals for the control of dust on surfaces which can give rise to airborne matter. Other measures may be taken as approved by the Air Pollution Control Officer". The contractor will be required to comply with this rule.
Chemical Specific	EPA	40 CFR 403	- General Pretreatment Regulations for existing and new sources of water pollution.	- This regulation is applicable. The contractor shall meet the requirements of the existing sewer use permit issued to SAAD, or the contractor shall obtain any permits from the POTW in accordance with the approved POTW Pretreatment Program.
Action Specific	DTSC	22 CCR 66264.192-197	- These sections address RCRA tank standards for owners/operators of hazardous waste TSD facilities including: - design and installation - containment and leak detection - operating requirements - inspection - spill response - closure and post closure	- This regulation is applicable to the activated carbon vessel.
Action Specific	DTSC	22 CCR 66262.34	- This section sets forth storage time requirements for generators of hazardous waste.	- This regulation is applicable to the spent filters and carbon from SVE treatment.
Chemical Specific	Sacramento Metropolitan Air Quality Management District (SMAQMD)	Rule 202, Section 301	- New Source Review. The purpose of this rule is to provide for the review of new stationary air pollution sources and to provide mechanisms by which authorities to construct such sources may be granted without interfering with the attainment or maintenance of ambient air quality standards.	- The rule is applicable. The rule specifies that BACT shall be used when reactive organics emissions are greater than 0 lb/day. The contractor shall use BACT to attain air quality standards.
Chemical Specific	SMAQMD	Rule 402	- General guideline, if the operation causes release of contaminants to the atmosphere, then a case-by-case determination of public nuisance potential should be performed to verify compliance. This rule states that discharges to air causing injury, detriment, nuisance, annoyance; or endangering comfort, repose, health, safety, or causing damage to business or property is prohibited.	- This rule is applicable. Carcinogens emitted by SVS operation will require treatment prior to emission to the atmosphere. Emissions from treatment processes will be evaluated by the contractor with regards to public effects and monitored and abated. Analytical sampling will be done on a periodic basis to monitor emissions. A 1E-06 health risk criteria will be utilized.

TABLE A–4
BURN PITS
ARARs FOR ALTERNATIVE No. 5
SOIL VENTILATION SYSTEM AND SOIL WASHING

February 8, 1993

TYPE	SUBMITTING AGENCY	ARAR	DESCRIPTION	COMMENTS/IMPACTS
Action Specific	DTSC	22 CCR 66264.171	– Containers must be in good condition or the waste must be managed in compliance with this.	– This regulation is applicable. The containers used will be in good condition.
Action Specific	DTSC	22 CCR 66264.172	– Containers should be used that are compatible with the contents.	– This regulation is applicable. The Chemical Management Plan/Residuals Management Plan will specify appropriate containers for hazardous waste residual from the soil washing process.
Action Specific	DTSC	22 CCR 66264.173	– This section requires proper management of containers including opening and handling so as not to cause a release.	– This regulation is applicable. Opening, handling, transferring and storage procedures will be outlined in the contractor's Residual Management Plan.
Action Specific	DTSC	22 CCR 66264.174	– Weekly inspections of containers is required.	– This regulation is applicable. The contractor will inspect containers weekly.
Action Specific	DTSC	22 CCR 66264.175(a)(b)	– The containers will have a containment system.	– This regulation is applicable. Stored drums and other containers will have a containment system as outlined in the Residuals Management Plan.
Action Specific	DTSC	22 CCR 66264.178	– Decontamination or removal of hazardous waste residues from the containment system must be complete at closure of the facility.	– This regulation is applicable. The contractor will remove and decontaminate all containers and waste residues from the containment system at the completion of treatment.
Action Specific	DTSC	22 CCR 66264.192	– New tank system design and installation requirements are outlined.	– This regulation is applicable to the carbon vessel used for SVE treatment and to tanks used in soil washing. The soil washing process will involve bringing tanks on site for treatment of the sludge and residual liquid. Any new tanks will meet the structural requirements of this section.
Action Specific	DTSC	22 CCR 66264.193	– Secondary containment and equipment for detection of releases are required for all new tank systems unless a variance is granted.	– This regulation is applicable. The tank systems will meet the secondary containment requirements as outlined in the Design Plan.
Action Specific	DTSC	22 CCR 66264.194	– This section described general operating requirements for tanks systems containing hazardous waste or other materials (treatment reagents).	– This regulation is applicable. The tanks will be designed to handle the hazardous wastes as described in the contractor's Operating Plan. Appropriate controls will be in place prior to beginning the soil washing treatment process.
Action Specific	DTSC	22 CCR 66264.195	– Tank inspection schedule and procedures are outlined.	– This regulation is applicable. The carbon vessels and soil washing tanks will be inspected following these requirements. They are also outlined in the contractor's Health and Safety/Operating Plan.
Action Specific	DTSC	22 CCR 66264.196	– Emergency response.	– This regulation is applicable. Emergency response provisions will be met.
Action Specific	DTSC	22 CCR 66262.34	– This section sets forth storage time requirements for generators of hazardous waste.	– This regulation is applicable to the spent filters and carbon from SVE treatment.
Action Specific	DTSC	22 CCR 66264.197	– This section describes closure and post–closure care requirements for tanks.	– This regulation is applicable. The contractor will remove and decontaminate all tanks, equipment, and waste residues at the completion of treatment.
Chemical Specific	DTSC	22 CCR 66268.41	– Treatment standards for disposal of waste to land. Sets treatment requirements for RCRA waste categories that are restricted from land disposal including contaminated soil and debris.	– This regulation is applicable. Treatment standards for constituents that have associated characteristic waste codes and treatment requirements will be met. These treatment standards are as follows:

Constituent	Waste Code	Treated Soil TCLP (mg/l)
Arsenic	D004	5.0
Cadmium	D006	1.0
Chromium (Total)	D007	5.0
Lead	D008	5.0

TABLE A–4
BURN PITS
ARARs FOR ALTERNATIVE No. 5
SOIL VENTILATION SYSTEM AND SOIL WASHING

February 8, 1993

TYPE	SUBMITTING AGENCY	ARAR	DESCRIPTION	COMMENTS/IMPACTS
Chemical Specific	EPA	40 CFR 403	– General Pretreatment Regulations for existing and new sources of water pollution.	– This regulation is applicable. The contractor shall meet the requirements of the existing sewer use permit issued to SAAD, or the contractor shall obtain any permits from the POTW in accordance with the approved POTW Pretreatment Program. Permits shall be obtained prior to discharge of pretreated soil wash liquids to the sewer. Constituent / Max. Conc. (mg/l) / Avg. Conc. (mg/l) Cadmium 0.11 0.07 Chromium (total) 2.77 1.71 Copper 3.38 2.07 Lead 0.69 0.43 Nickel 3.98 2.38 Silver 0.43 0.24 Zinc 2.61 1.48 TTO* 2.13 --- Wash liquid that cannot be treated to meet these requirements, and the sludge containing hazardous properties after treatment will be transported and disposed of in an off–site landfill. * Total Toxic Organics as listed in 40 CFR 403.
Chemical Specific	Sacramento Metropolitan Air Quality Management District (SMAQMD)	Rule 202, Section 301	– New Source Review. The purpose of this rule is to provide for the review of new stationary air pollution sources and to provide mechanisms by which authorities to construct such sources may be granted without interfering with the attainment or maintenance of ambient air quality standards.	– The rule is applicable. The rule specifies that BACT shall be used when reactive organics emissions are greater than 0 lb/day. The contractor shall use BACT to attain air quality standards.
Chemical Specific	SMAQMD	Rule 401	– Ringlemann Chart	– This rule is applicable. "Atmospheric discharges from the site from any source (other than uncombined water vapor) for a period of more than three minutes in any one hour shall not be as dark or darker in shade as designation No. 1 on the Ringlemann Chart published by the U.S. Bureau of Mines. Nor shall the emissions be of such opacity as to obscure a human observer's view, or register on a certified in–stack opacity monitoring system at a level equal to or greater than Ringlemann designation No. 1" The contractor will be required to comply with this rule.
Chemical Specific	SMAQMD	Rule 402	– General guideline, if the operation causes release of contaminants to the atmosphere, then a case–by–case determination of public nuisance potential should be performed to verify compliance. This rule states that discharges to air causing injury, detriment, nuisance, annoyance; or endangering comfort, repose, health, safety, or causing damage to business or property is prohibited.	– This rule is applicable. Carcinogens emitted by SVS operation will require treatment prior to emission to the atmosphere. Emissions from treatment processes will be evaluated by the contractor with regards to public effects and monitored and abated. Analytical sampling will be done on a periodic basis to monitor emissions. A 1E–06 health risk criteria will be utilized. The soil–washing contractor shall minimize the potential for emissions using BACT. A health risk assessment has been conducted to evaluate the effect of fugitive emissions on the receptors in the vicinity of the soil washing unit. The results are included in the "short–term effectiveness" criteria for this alternative. The contractor shall use perimeter monitoring to verify the successful dust control measures. If the following values are exceeded, the contractor shall stop dust–generated work and undertake all actions necessary to eliminate dust from travelling off site: Metal / ug/m^3 Arsenic 0.042 Cadmium 0.034 Copper 35 Nickel 0.8 Zinc 35 Lead 1.5

TABLE A-4
BURN PITS
ARARs FOR ALTERNATIVE No. 5
SOIL VENTILATION SYSTEM AND SOIL WASHING

TYPE	SUBMITTING AGENCY	ARAR	DESCRIPTION	COMMENTS/IMPACTS
Chemical Specific	SMAQMD	Rule 403	- Fugitive Dust	- This rule is applicable. "Every reasonable precaution shall be taken not to cause or allow the emissions of fugitive dust from being airborne beyond the property line from which the emissions originate. Reasonable precautions shall include, but are not limited to applying asphalt, oil, water, or suitable chemicals for the control of dust on surfaces which can give rise to airborne matter. Other measures may be taken as approved by the Air Pollution Control Officer". The contractor will be required to comply with this rule.
Chemical Specific	SMAQMD	Rule 404	- Particulate Matter	- This rule is applicable. "No discharges shall be made to the atmosphere from any sources with particulate matter in excess of 0.23 grams per dry standard cubic meter (0.1 grains per dry cubic foot)." The contractor will be required to comply with this rule.
Chemical Specific	EPA	40 CFR 268.45	- Treatment standards for hazardous debris.	- This regulation is applicable.
Chemical Specific	SMAQMD	Rule 406	- Dust and condensed fumes requirements.	- This rule is applicable. No discharges into the atmosphere shall be made from any source whatsoever of dust or condensed fumes in total quantities exceeding the following:

PROCESS WEIGHT AND ALLOWABLE DISCHARGE

Process Weight per hour		Maximum discharge rate allowed for solid particulate matter (aggregate discharged from all points of process)		Process Weight per hour		Maximum discharge rate allowed for solid particulate matter (aggregate discharged from all points of process)	
kg/hr	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr
114	250	0.45	1.00	3636	8000	3.95	8.70
136	300	0.51	1.12	3864	8500	4.11	9.04
159	350	0.56	1.23	4091	9000	4.25	9.36
182	400	0.61	1.34	4318	9500	4.40	10.00
205	450	0.65	1.44	4545	10000	4.55	10.0
227	500	0.70	1.54	6455	12000	4.73	10.4
273	600	0.79	1.73	6364	14000	4.91	10.8
318	700	0.86	1.90	7273	16000	5.09	11.2
364	800	0.94	2.07	8182	18000	5.23	11.5
409	900	1.01	2.22	9091	20000	5.36	11.8
455	1000	1.08	2.38	13636	30000	5.81	13.0
545	1200	1.21	2.66	18182	40000	6.32	13.9
636	1400	1.33	2.93	22727	50000	6.68	14.7
727	1600	1.45	3.19	27273	60000	6.96	15.3
818	1800	1.56	3.43	31818	70000	7.23	15.9
909	2000	1.66	3.66	36364	80000	7.45	16.4
1136	2500	1.91	4.21	40909	90000	7.68	16.9
1364	3000	2.15	4.72	45455	100000	7.86	17.3
1591	3500	2.36	5.19	90909	200000	9.27	20.4
1818	4000	2.56	5.64	136364	300000	10.23	22.5
2045	4500	2.76	6.07	181818	400000	10.96	24.1
2273	5000	2.96	6.49	227273	500000	11.55	25.4
2500	5500	3.13	6.89	272727	600000	12.09	26.6
2727	6000	3.30	7.27	318182	700000	12.55	27.6
2955	6500	3.47	7.64	363636	800000	12.91	28.4
3182	7000	3.64	8.00	409091	900000	13.32	29.3
3409	7500	3.80	8.36	454545 or more	1000000 or more	13.64	30.0

To use the table above, take the process weight per hour as such is defined below. Then find this figure on the table, opposite which is the maximum number of kilograms or pounds of contaminants which may be discharged into the atmosphere in any one hour. As an example, if "A" has a process which emits contaminants into the atmosphere and which process takes 3 hours to complete, he will divide the weight of all materials in the specific process, in this example, 7500, by 3, giving a process weight per hour of 2500 kg. The table shows that "A" may not discharge more than 3.13 kg in any hour during the process, where the process weight per hour falls between figures int he left hand column, the exact weight or permitted discharged may be interpolated. The contractor will be required to comply with this rule.

TABLE A–5
BURN PITS
ARARs FOR ALTERNATIVE 6
SOIL VENTILATION SYSTEM AND SOIL STABILIZATION

February 8, 1993

TYPE	SUBMITTING AGENCY	ARAR	DESCRIPTION	COMMENTS/IMPACTS
Action Specific	DTSC	22 CCR 66264.192	– New tank system design and installation requirements are outlined.	– This regulation is applicable. The soil washing process will involve bringing tanks on site for treatment of the excavated soil. This regulation is applicable to the activated carbon vessel. Any new tanks will meet the structural requirements of this section.
Action Specific	DTSC	22 CCR 66264.193	– Secondary containment and equipment for detection of releases are required for all new tank systems unless a variance is granted.	– This regulation is applicable. The tank systems will meet the secondary containment requirements as outlined in the Design Plan.
Action Specific	DTSC	22 CCR 66264.194	– This section describes general operating requirements for tank systems containing hazardous waste or other materials (treatment reagents).	– This regulation is applicable. The tanks will be designed to handle the hazardous wastes as described in the contractor's Operating Plan.
Action Specific	DTSC	22 CCR 66264.195	– Tank inspection schedules and procedures are outlined.	– This regulation is applicable. The stabilization tanks will be inspected following these requirements. They are also outlined in the contractor's Health and Safety/Operating Plan.
Action Specific	DTSC	22 CCR 66264.197	– This section describes closure and post–closure care requirements for tanks.	– This regulation is applicable. The contractor will remove and decontaminate all tanks, equipment, and waste residues at the completion of treatment of the soil.
Chemical Specific	DTSC	22 CCR 66268.41	– Treatment standards for land disposal of characteristic waste.	– This regulation is applicable. Prior to stabilization, some of the wastes are restricted from land disposal. Arsenic and mercury are present. Treatment standards for these characteristic wastes with the immobilization technologies are applicable. An inert waste will result from immobilization by soil stabilization. After stabilization, the stabilized material is expected to meet treatment standards and achieve leachability limits for constituents that fall into characteristic hazardous waste categories, as follows:
Chemical Specific	EPA	40 CFR 268.45	– Treatment standards for hazardous debris.	– This regulation is applicable. The mixtures of hazardous debris will be treated with the soil, using the immobilization technology of stabilization.
Chemical Specific	Sacramento Metropolitan Air Quality Management District (SMAQMD)	Rule 202, Section 301	– New Source Review. The purpose of this rule is to provide for the review of new stationary air pollution sources and to provide mechanisms by which authorities to construct such sources may be granted without interfering with the attainment or maintenance of ambient air quality standards.	– The rule is applicable. The rule specifies that BACT shall be used when reactive organics and PM10 emissions are greater than 0 lb/day. The contractor shall use BACT to attain air quality standards.
Chemical Specific	SMAQMD	Rule 401	– Ringlemann Chart	– This rule is applicable. "Atmospheric discharges from the site from any source (other than uncombined water vapor) for a period of more than three minutes in any one hour shall not be as dark or darker in shade as designation No. 1 on the Ringlemann Chart published by the U.S. Bureau of Mines. Nor shall the emissions be of such opacity as to obscure a human observer's view, or register on acertified in–stack opacity monitoring system at a level equal to or greater than Ringlemann designation No. 1" The contractor will be required to comply with this rule.

Constituent	Waste Code	Concentration (mg/l)
Arsenic	D004	5.0
Cadmium	D006	1.0
Chromium	D007	5.0
Lead	D008	5.0

TABLE A-5
BURN PITS
ARARs FOR ALTERNATIVE 6
SOIL VENTILATION SYSTEM AND SOIL STABILIZATION

February 8, 1993

<table>
<tr><th>TYPE</th><th>SUBMITTING AGENCY</th><th>ARAR</th><th>DESCRIPTION</th><th>COMMENTS/IMPACTS</th></tr>
<tr><td>Chemical Specific</td><td>SMAQMD</td><td>Rule 402</td><td>- General guideline, if the operation causes release of contaminants to the atmosphere, then a case-by-case determination of public nuisance potential should be performed to verify compliance. This rule states that discharges to air causing injury, detriment, nuisance, annoyance; or endangering comfort, repose, health, safety, or causing damage to business or property is prohibited.</td><td>- This rule is applicable. Carcinogens emitted by SVS operation will require treatment prior to emission to the atmosphere. Emissions from treatment processes will be evaluated by the contractor with regards to public effects and monitored and abated. Analytical sampling will be done on a periodic basis to monitor emissions. A 1E-06 health risk criteria will be utilized.

For the stabilization unit the contractor shall minimize the potential for emissions using BACT. A health risk assessment has been conducted to evaluate the effect of fugitive emissions on the receptors in the vicinity of the stabilization unit. The results are included in the "short-term effectiveness" criteria for this alternative. The contractor shall use perimeter monitoring to verify the successful dust control measures. If the following values are exceeded, the contractor shall stop dust-generated work and undertake all actions necessary to eliminate dust from travelling off-site:

<table>
<tr><th>Metal</th><th>$\mu g/m^3$</th></tr>
<tr><td>Arsenic</td><td>0.042</td></tr>
<tr><td>Cadmium</td><td>0.034</td></tr>
<tr><td>Copper</td><td>35</td></tr>
<tr><td>Nickel</td><td>0.6</td></tr>
<tr><td>Zinc</td><td>35</td></tr>
<tr><td>Lead</td><td>1.5</td></tr>
</table>
</td></tr>
<tr><td>Chemical Specific</td><td>SMAQMD</td><td>Rule 403</td><td>- Fugitive Dust</td><td>- This rule is applicable. "Every reasonable precaution shall be taken not to cause or allow the emissions of fugitive dust from being airborne beyond the property line from which the emissions originate. Reasonable precautions shall include, but are not limited to applying asphalt, oil, water, or suitable chemicals for the control of dust on surfaces which can give rise to airborne matter. Other measures may be taken as approved by the Air Pollution Control Officer". The contractor will be required to comply with this rule.</td></tr>
<tr><td>Chemical Specific</td><td>SMAQMD</td><td>Rule 404</td><td>- Particulate Matter</td><td>- This rule is applicable. "No discharges shall be made to the atmosphere from any sources with particulate matter in excess of 0.23 grams per dry standard cubic meter (0.1 grains per dry cubic foot)." The contractor will be required to comply with this rule.</td></tr>
<tr><td>Action Specific</td><td>DTSC</td><td>22 CCR 66262.34</td><td>- This section sets forth storage time requirements for generators of hazardous waste.</td><td>- This regulation is applicable to the spent filters and carbon from SVE treatment.</td></tr>
</table>

TABLE A-5
BURN PITS
ARARs FOR ALTERNATIVE 6
SOIL VENTILATION SYSTEM AND SOIL STABILIZATION

TYPE	SUBMITTING AGENCY	ARAR	DESCRIPTION	COMMENTS/IMPACTS
Chemical Specific	SMAQMD	Rule 405	- Dust and condensed fumes requirements.	- This rule is applicable. No discharges into the atmosphere shall be made from any source whatsoever of dust or condensed fumes in total quantities exceeding the following:

PROCESS WEIGHT AND ALLOWABLE DISCHARGE

Process Weight per hour		Maximum discharge rate allowed for solid particulate matter (aggregate discharged from all points of process)		Process Weight per hour		Maximum discharge rate allowed for solid particulate matter (aggregate discharged from all points of process)	
kg/hr	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr	kg/hr	lb/hr
114	250	0.46	1.00	3636	8000	3.95	8.70
136	300	0.51	1.12	3864	8500	4.11	9.04
159	350	0.56	1.23	4091	9000	4.25	9.36
182	400	0.61	1.34	4318	9500	4.40	10.00
205	450	0.65	1.44	4545	10000	4.55	10.0
227	500	0.70	1.54	5455	12000	4.73	10.4
273	600	0.79	1.73	6364	14000	4.91	10.8
318	700	0.86	1.90	7273	16000	5.09	11.2
364	800	0.94	2.07	8182	18000	5.23	11.5
409	900	1.01	2.22	9091	20000	5.36	11.8
455	1000	1.08	2.38	13636	30000	5.91	13.0
545	1200	1.21	2.66	18182	40000	6.32	13.9
636	1400	1.33	2.93	22727	50000	6.68	14.7
727	1600	1.45	3.19	27273	60000	6.95	15.3
818	1800	1.56	3.43	31818	70000	7.23	15.9
909	2000	1.66	3.66	36364	80000	7.45	16.4
1136	2500	1.91	4.21	40909	90000	7.68	16.9
1364	3000	2.15	4.72	45455	100000	7.86	17.3
1591	3500	2.36	5.19	90909	200000	9.27	20.4
1818	4000	2.56	5.64	136364	300000	10.23	22.5
2045	4500	2.76	6.07	181818	400000	10.95	24.1
2273	5000	2.95	6.49	227273	500000	11.55	25.4
2500	5500	3.13	6.89	272727	600000	12.09	26.6
2727	6000	3.30	7.27	318182	700000	12.55	27.6
2955	6500	3.47	7.64	363636	800000	12.91	28.4
3182	7000	3.64	8.00	409091	900000	13.32	29.3
3409	7500	3.80	8.36	454545 or more	1000000 or more	13.64	30.0

To use the table above, take the process weight per hour as such is defined below. Then find this figure on the table, opposite which is the maximum number of kilograms or pounds of contaminants which may be discharged into the atmosphere in any one hour. As an example, if 'A' has a process which emits contaminants into the atmosphere and which process takes 3 hours to complete, he will divide the weight of all materials in the specific process, in this example, 7500, by 3, giving a process weight per hour of 2500 kg. The table shows that 'A' may not discharge more than 3.13 kg in any hour during the process, where the process weight per hour falls between figures int he left hand column, the exact weight or permitted discharged may be interpolated. The contractor will be required to comply with this rule.

APPENDIX B

Administrative Record Documents

BURN PITS ADMINISTRATIVE RECORD

Administrative Record Documents		Submittal Date
1.	Burn Pits Operable Unit, Technical Memorandum on Field Activities, Appendix A-3 of the Remedial Investigation	October 28, 1991
2.	Burn Pits Operable Unit Feasibility Study (OUFS)	May 15, 1992
3.	Burn Pits Public Health Evaluation (Appendix C of OUFS)	May 15, 1992
4.	Burn Pits Treatability Study (Appendix G of OUFS)	May 15, 1992
5.	Health and Safety Plan Burn Pits	March 1, 1990
6.	Proposed Action Plan - Burn Pits	July 1992
7.	Letter from Michael Mosbacher of CVRWQCB to Dan Oburn of SAAD, dated November 24, 1992 re: ARARs	
8.	Letter from Marlon Mezquita of EPA Region 9 to Michael Mosbacher of CVRWQCB in response to above letter, March 1993	