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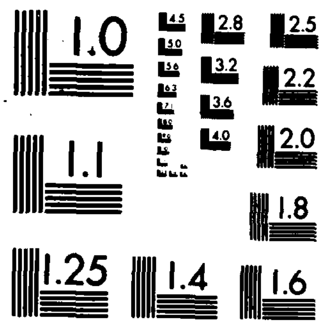
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AD-A173 737

INSTALLATION RESTORATION PROGRAM
PHASE II - CONFIRMATION/QUANTIFICATION
STAGE 1

DAVIS-MONTHAN AIR FORCE BASE
ARIZONA

DAMES & MOORE
1550 NORTHWEST HIGHWAY
PARK RIDGE, ILLINOIS 60068

AUGUST 18, 1986

FINAL REPORT (JANUARY 1983 TO NOVEMBER 1984)

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

PREPARED FOR
HEADQUARTERS TACTICAL AIR COMMAND
COMMAND SURGEON'S OFFICE (HQ TAC/SGPB)
BIOENVIRONMENTAL ENGINEERING DIVISION
LANGLEY AIR FORCE BASE, VIRGINIA 23665

UNITED STATES AIR FORCE
OCCUPATIONAL & ENVIRONMENTAL HEALTH LABORATORY (USAFOEHL)
TECHNICAL SERVICES DIVISION (TS)
BROOKS AIR FORCE BASE, TEXAS 78235-5501

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PREPARED BY

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1550 NORTHWEST HIGHWAY
PARK RIDGE, ILLINOIS 60068

USAF CONTRACT NO. F33615-83-D-4002, DELIVERY ORDER NO. 0003

USAFOEHL TECHNICAL PROGRAM MANAGER

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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The Davis-Monthan AFB Phase II, Stage 1 field evaluation of the IRP investigated 11 sites and consisted of (1) the installation and sampling of two ground water monitor wells, (2) ground water sampling of eight base wells, and (3) drilling and sampling soils from 47 borings. The ground water and soil samples were analyzed for up to 54 constituents, including purgeable halocarbons and aromatics, pesticides, heavy metals, oil and grease, phenol, TOC, and PCBs.

The ground water system beneath the base generally behaves as a single unconfined aquifer. Exact hydrostratigraphic and time stratigraphic units encountered during drilling were not determined. The regional ground water table is approximately 300 feet below ground surface with a regional ground water flow direction to the north-northwest. Perched ground water may have been encountered.

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19. Abstract (Continued)

Measurable amounts of contamination in the soil may have been found at all sites. Sites 3, 18, and 1 appear to be the most contaminated. Constituents found at or above the detection limits in the soil analyses were measured at the following sites:

Pesticides:	Site 1 (10)
VOCs:	Sites 1, 18, 19, 3, 25
Oil & Grease:	Sites 1, 18, 8, 25
Lead:	Sites 18, 19, 17, 4, 25
Phenol:	Site 18
Heavy Metals:	Sites 20, 21
PCBs:	Sites 25, 7

Background interference was so strong that the analytical procedures used in the testing were not able to identify and quantify the individual organic compounds for four samples. Heavy metals, including lead, were found at several sites. A background boring and analysis are needed to determine whether these concentrations are naturally occurring or the result of contamination. Questionable results indicated that contaminants in the ground water samples during the first sampling period were not confirmed in the resampling period, except for oil and grease in Base Well W-4.

Recommendations are to sample ground water twice over a 3-month period, install monitor wells at selected sites, install confirmation borings at selected sites, drill and analyze a background boring, perform a soil-gas survey, perform aquifer tests, and develop a private well inventory. Remedial action should be performed at Site 18 (Category 3). Sites 20, 21, 17, 8, and 4 were characterized as Category 1 (i.e., no further action required). The remaining sites are categorized as Category 2 and require additional investigations as recommended.

PREFACE

As part of the U.S. Air Force Installation Restoration Program (IRP), investigations were undertaken at 11 sites on Davis-Monthan Air Force Base, Arizona, to determine whether hazardous material contamination is present. This report, prepared by Dames & Moore under Contract No. F33615-83-D-4002, Order 0003, presents the results of the Phase II, Stage 1 (Confirmation Stage) IRP investigations. The period of work reported on herein was November 1983 through November 1984. The field investigations were directed by Mr. Lutz Kunze, Associate. Mr. Steve Johnson, Hydrogeologist, supervised installation of monitor wells; Mr. George Geiser, Water Resources Engineer, assisted in the collection of water samples; and Mr. Ron Anderson, Geotechnical Engineer, supervised the soil sampling activities. Dr. Kenneth J. Stimpfl served as Project Leader. Maj. Dennis D. Brownley, Technical Services Division, USAF Occupational and Environmental Health Laboratory (OEHL), was the Technical Monitor.

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SUMMARY

The Department of Defense (DOD) conceived the Installation Restoration Program (IRP) to investigate and mitigate any environmental contamination that may be present at DOD facilities as a result of handling or disposing of hazardous materials. The IRP was issued in 1981 as Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5. The U.S. Air Force (USAF) implemented DEQPPM 81-5 in 1982 as a four-phased program:

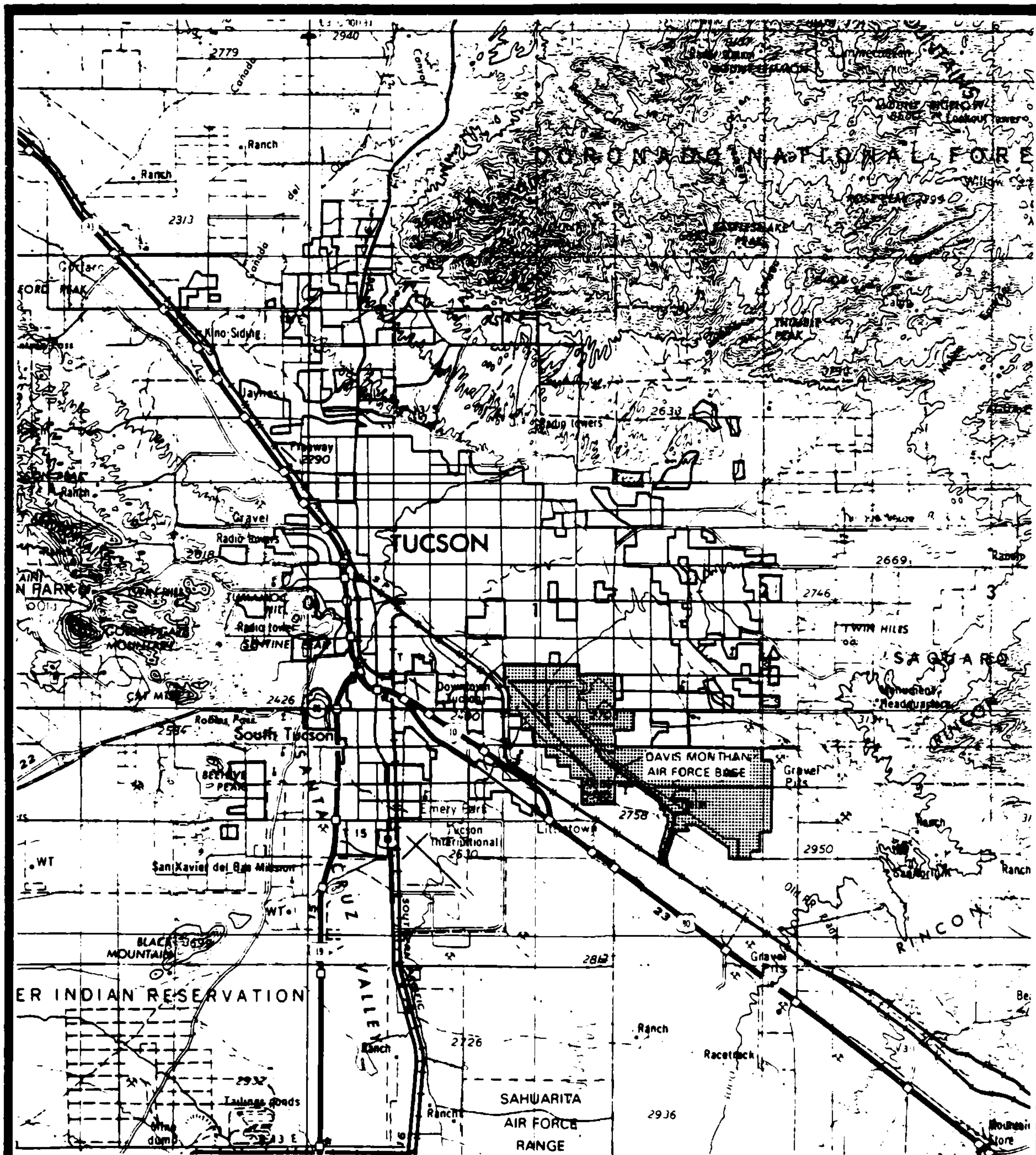
Phase I Program Identification/Records Search
Phase II Program Confirmation and Quantification
Phase III Technology Base Development
Phase IV Corrective Action

Phase II may consist of as many successive stages as are needed to define the extent and potential for migration of contamination.

Davis-Monthan Air Force Base (AFB) is located adjacent to the city of Tucson, Arizona (see Plate 1), and is presently a Tactical Air Command base. The base is situated in the Tucson basin, a basin, bordered by the Santa Catalina, Rincon, Santa Rita, Tucson, Sierrita, Tortolita, and Empire Mountains and Black Mountain, that typifies the physiography of the Basin and Range Province. Davis-Monthan AFB has been in operation since 1927, primarily as a training center, and today a large portion of the base is an aircraft storage, reclamation, and disposal center.

The basin fill sediments beneath Davis-Monthan AFB generally behave as a single, unconfined aquifer; however, locally confined conditions may occur due to the presence of discontinuous layers of low permeability materials. The aquifer consists of, in ascending order, the Pantano Formation, the Tinaja beds, the Fort Lowell Formation, and surficial deposits. Most of the base wells tap the Tinaja beds. This unit is a major source of ground water for the Tucson area. Ground water mining has caused ground water levels beneath Davis-Monthan AFB to decline from 70 to more than 100 feet in the northwest part of the base and to less than 20 feet in the southeast part of the base between 1953 and 1982. The rate of decline has ranged up to 4 feet per year. The decline in the ground water table is expected to continue until alternate sources of water such as the Central Arizona Project are available to the Tucson metropolitan area.

Phase II, Stage 1 of the IRP consisted of investigations of the following 11 sites, which are shown on Plate 2:



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REFERENCE:
USGS 1:250,000, TUCSON, AZ. 1977

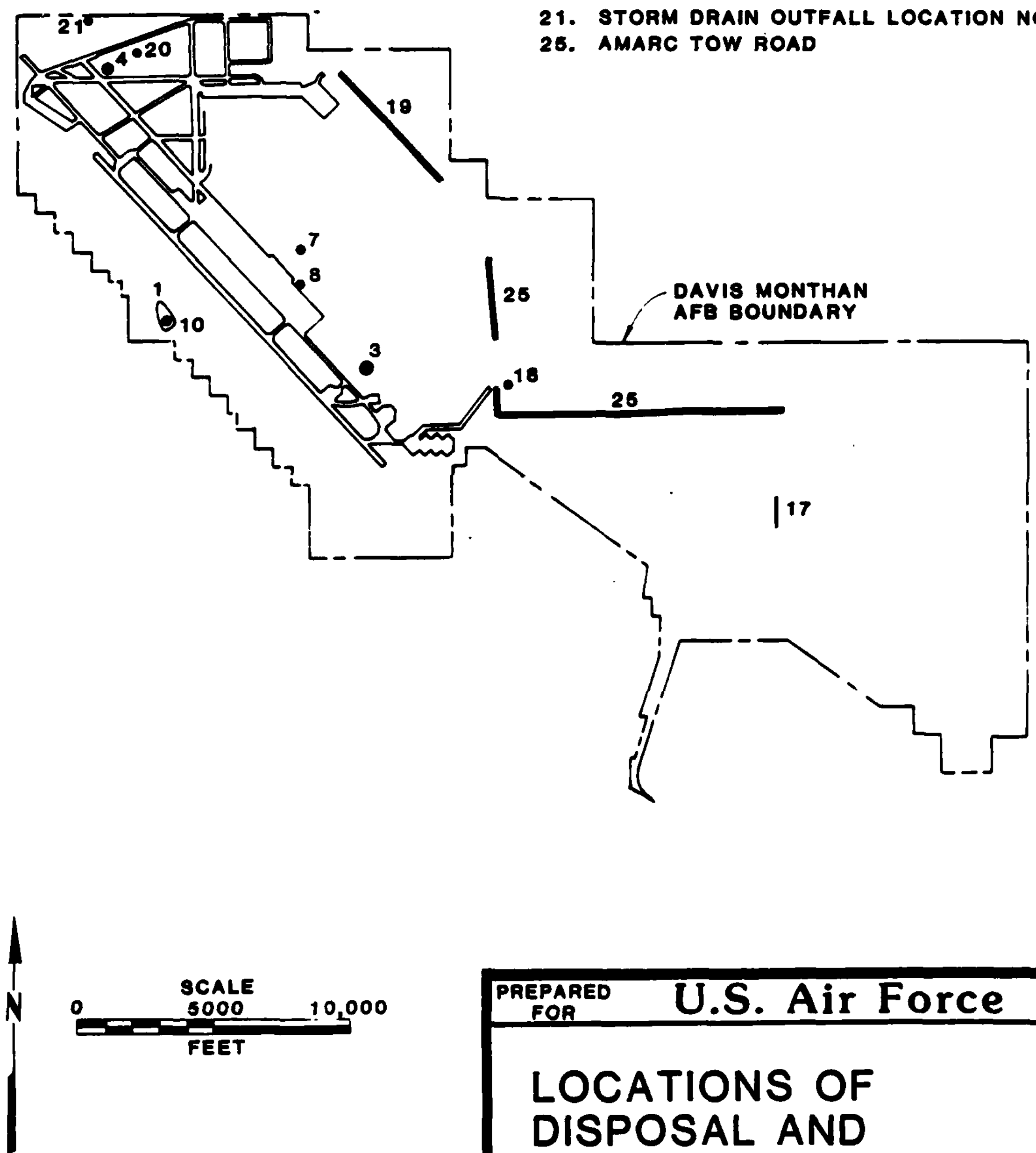
PREPARED FOR **U.S. Air Force**

VICINITY MAP

BY **Dames & Moore** Plate 1

LEGEND:

1. MAIN BASE LANDFILL
3. EXISTING FIRE DEPT. TRAINING AREA
4. NORTH RAMP FIRE DEPT. TRAINING AREA
7. OLD ELECTRICAL SUBSTATION SITE
8. TRANSFORMER OIL SPILL SITE
10. CHEMICAL SLUDGE BURIAL SITE *
17. AMARC/AMMO AREA DRAINAGE DITCH
18. AMARC FLUSH FARM DRAINAGE DITCH
19. RUNWAY NO. 4 DRAINAGE DITCH
20. STORM DRAIN OUTFALL LOCATION NO. 1
21. STORM DRAIN OUTFALL LOCATION NO. 2
25. AMARC TOW ROAD



* PRESUMED LOCATION, NOT CONFIRMED IN FIELD

REFERENCE: CH2M HILL (1982).

PREPARED FOR **U.S. Air Force**

LOCATIONS OF DISPOSAL AND SPILL SITES

BY **Dames & Moore** Plate 2

Site 1 - Main Base Landfill (includes Site 10);
Site 18 - AMARC (formerly MASDC) Flush Farm Drainage Ditch;
Site 7 - Old Electrical Substation Site;
Site 19 - Runway No. 4 Drainage Ditch;
Site 20 - Storm Drain Outfall No. 1;
Site 21 - Storm Drain Outfall No. 2;
Site 17 - AMARC (formerly MASDC)/AMMO Drainage Ditch;
Site 3 - Existing Fire Training Area;
Site 8 - Transformer Oil Spill Site;
Site 4 - North Ramp Fire Training Area; and
Site 25 - AMARC (formerly MASDC) Tow Road.

The field investigation consisted of the following activities:

- Installation and sampling of two monitor wells downgradient from Site 1;

- Sampling of base wells W-2, W-4, W-5, W-6, W-8, W-9, W-10, and W-11; and

- Drilling and sampling of 47 borings at 11 sites ranging from 6 to 50 feet in depth.

The ground water and soil samples were analyzed for up to 54 constituents, including purgeable halocarbons and aromatics, pesticides, heavy metals, oil and grease, phenol, total organic carbon (TOC), and polychlorinated biphenyls (PCBs).

Small amounts of contaminants may have been found in soils at all the sites. A background boring is needed to determine whether the low levels of metals found at many of the sites are typical of native soils. The sites with the largest apparent soil contamination are Sites 3, 18, and 1. At Site 3 (Existing Fire Training Area), samples had obvious hydrocarbon odors to depths of 20½ feet, but only low levels of chloroform and ethylbenzene were actually measured in the samples. Due to the large interferences from organics in the soils from Site 3, the analytical procedures were not able to measure purgeable organics in half of the samples submitted. Therefore, actual organic compounds that are suspected to be present in the soil at Site 3 and their concentrations have not been established. At Site 18 (AMARC (formerly MASDC) Flush Farm Drainage Ditch), low levels of methylene chloride and vinyl chloride were reported; however, levels of oil and grease, an indicator of total organic content, were low in these samples. The indications of methylene chloride and vinyl chloride are suspect because methylene chloride is a common laboratory contaminant and vinyl chloride is a gas usually associated with other halocarbons. Confirmation of these compounds by confirmatory borings or a secondary technique such as a second gas chromatograph (GC) column was not made but is needed. A single near-surface sample (18-2-1) had elevated oil and grease values, and suitable purgeable halocarbon and purgeable aromatic analyses could not be carried out due to the large interferences. The areal extent of the contamination appears small but needs confirmation. The threat posed to human health is considered low.

Contaminants were indicated in ground water samples from both monitor wells (DM-1 and DM-2) and base wells (W-4, W-9, W-10, and W-11) during the first round of sampling and analysis. The contaminants indicated included methylene chloride, chloroform, 1,2-dichloroethane, oil and grease, phenol, aldrin, and heptachlor. Analyses of samples taken during the November 1984 resampling did not detect these constituents except for oil and grease in W-4. Because the initial analyses were a nonconfirmatory type, and because the levels indicated were low, there is a potential for false positives to be reported. The few indications of low levels of organic contaminants, which have not been confirmed, indicate that the level of ground water pollution is low or nonexistent.

Sites 20, 21, 17, 8, and 4 were characterized as Category 1. The following summarizes our recommendations and rationale for Category 2 and Category 3 sites:

Sites	Recommended Action	Rationale
General	1) Four additional monitor wells.	Monitor ground water quality at northwest perimeter of base.
	2) Soil borings for the collection of samples for background chemistry.	To determine natural concentrations of inorganic constituents of the soil.
	CATEGORY 2 SITES	
1, 10	Installation of a monitor well downgradient of landfill. Monitor ground water quality twice over a 3-month period.	Pesticide, VOC, oil and grease contamination not defined; no confirmatory analyses. Spurious observations of pesticides in monitor wells.

Sites	Recommended Action	Rationale
	CATEGORY 2 SITES (cont'd)	
7	Analyze shallow soil boring samples with second column confirmation at 7-5.	No confirmatory analysis on PCB. Extent not well defined.
19	Compare lead levels to background boring analysis - additional sampling; deeper borings for VOC, second column confirmation: (NW and SE of 19-2), borings off centerline. Soil-gas investigation.	VOC and possible lead contamination not defined.
3	Installation of a monitor well downgradient of fire training area. Monitor ground water quality twice over a 3-month period.	No second column confirmation VOC analysis, VOC contamination extent not defined.
25	Compare lead levels to background boring analysis - additional sampling; soil-gas investigation to indicate lateral extent of VOC. Deeper borings as determined near 25-2 and 25-3. Off centerline boring also for Pb, VOC; confirmatory sampling and analysis for PCB at 25-2.	No confirmatory VOC/PCB analysis, extent of contamination not definable, potential lead contamination.
	CATEGORY 3 SITES	
18	Installation of a monitor well downgradient of the flush farm drainage ditch. Monitor well and sampling ground water quality twice over a 3-month period; aquifer tests. Remedial Actions: ground water quality monitoring; further characterize site and contamination type and extent; propose and implement remedial action alternatives that are applicable to Site 18.	VOC and phenol contamination, contamination indicated by a human carcinogen (vinyl chloride), probable perched water table.

I. INTRODUCTION

A. BACKGROUND

The Department of Defense (DOD) initiated the Installation Restoration Program (IRP) to investigate and mitigate any environmental contamination which may be present at DOD facilities as a result of handling or disposing hazardous wastes. The IRP was issued as the Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5. The Air Force initiated the IRP by implementing DEQPPM 81-5 in 1982 as a four-phased program:

Phase I	Problem Identification/Records Search
Phase II	Problem Confirmation and Quantification (Phase II consists of several stages as necessary)
Phase III	Technology Base Development
Phase IV	Corrective Action

Phase I for Davis-Monthan Air Force Base (AFB), Tucson, Arizona, was completed by CH2M Hill (1982), and the Phase II Presurvey was completed by Roy F. Weston, Inc. (1983). Dames & Moore has been retained by the Air Force under Contract Number F33615-83-D-4002, Order 0003, to conduct the Phase II, Stage 1 field evaluation at Davis-Monthan AFB.

The purpose of Phase I of the IRP was to identify any disposal or spill sites at the facilities and evaluate the potential for contaminant migration and impact to the environment. The methodologies used to achieve these objectives included a review of records of past and present industrial operations; storage, treatment, and disposal of waste materials; a ground tour of the site; interviews with site personnel; and numerical rating of identified sites. The site ratings were accomplished by use of the Hazard Assessment Rating Methodology (HARM). This site rating model considers four aspects of the site that could contribute to potential problems: possible receptors of the contamination, waste characteristics, potential pathways of contaminant migration, and efforts to contain the contamination. Each of these categories is assigned a numerical rank on the basis of a number of rating factors. The category scores are then added together and normalized to a maximum possible score of 100. Sites may be prioritized on the basis of these scores.

This report presents the results of Dames & Moore's field and laboratory investigations in the vicinity of hazardous waste disposal and handling areas at Davis-Monthan AFB. Chemical analyses were undertaken by UBTL, Inc. of Salt Lake City, Utah, as subcontractor to Dames & Moore. A summary of the analytical program is presented in Table 1.

TABLE 1

SUMMARY OF THE PHASE II, STAGE 1 ANALYTICAL PROGRAM

LOCATION	NUMBER OF SAMPLES 11/83	02/84	11/84	PARAMETERS
Monitor Wells				
DM-1 and DM-2	2			VOC, pesticides, heavy metals
DM-1 and DM-2			2	Pesticides
Base Wells				
W-9	1			VOC, O&G, phenol, lead
W-9, W-10, and W-11			3	VOC
W-10	1			VOC, O&G, phenol
W-11		2		VOC, O&G, phenol
W-2, W-5, W-6, W-8	4			VOC, O&G
W-4	1			VOC, O&G, TOC
W-4			1	O&G
Sites				
1	20			VOC, O&G, phenol
1	10			Pesticides
3	12		6	VOC
4	6			VOC, O&G, lead
7	20			PCBs
8	15			PCBs, O&G
17	4			VOC, O&G, phenol, lead
18	12			VOC, O&G, phenol, lead
18			1	VOC
19	12			VOC, O&G, phenol, lead
20	3			VOC, O&G, phenol, heavy metals
21	3			VOC, O&G, phenol, heavy metals, PCBs
25	27			VOC, O&G, lead, PCBs

Notes:
1. Volatile organic compounds (VOCs) include purgeable halocarbons and aromatics listed in Table 2.
2. Metals and pesticides are also listed in Table 2.
3. O&G = Oil and grease.
4. PCBs = Polychlorinated biphenyls.
5. TOC = Total organic carbon.

B. PURPOSE AND SCOPE

The purpose of Phase II, Stage 1 of the IRP was to:

1. Determine whether environmental contamination has resulted from waste handling and disposal practices at Davis-Monthan AFB;

2. Provide estimates of the magnitude and extent of contamination if contamination was found;

3. Identify any additional investigations and their attendant costs necessary to identify the magnitude, extent, and direction of movement of discovered contaminants; and

4. Make recommendations for additional investigations as necessary.

The scope of work, as outlined by USAFOEHL for Phase II, Stage 1 of the IRP, consisted of the following activities:

1. Drilling, sampling, and geologically logging two borings to the depth of the Tinaja beds at locations downgradient of Site 1 (Main Base Landfill).

2. Installing and developing a monitor well in each of the two borings above.

3. Sampling the two monitor wells and base wells W-2, W-4, W-5, W-6, W-8, W-9, W-10, and W-11.

4. Analyzing the ground water samples for 36 parameters including halocarbons, aromatics, pesticides, and others.

5. Drilling, sampling, and geologically logging soil borings at 11 of the 12 sites identified in the Phase II Presurvey report. The specific scope of drilling, sampling, and geologically logging soils at each site included:

   - **Site 1 - Main Base Landfill** -- Six 50-foot deep borings around the periphery of the landfill.

   - **Site 10 - Chemical Sludge Burial Site** -- Site 10 could not be located with certainty in the field and, since it appeared to fall within the confines of Site 1, a separate investigation was not considered warranted.

- **Site 18 - AMARC (formerly MASDC) Flush Farm Drainage Ditch** -- Three 20-foot deep borings in the ditch downstream of the oil/water separator.

- **Site 7 - Old Electrical Substation Site** -- Ten 6-foot deep borings in a general grid array encompassing both potential locations of the old substation.

- **Site 19 - Runway No. 4 Drainage Ditch** -- Four 20-foot deep borings along the axis of the ditch.

- **Site 20 - Storm Drain Outfall No. 1** -- One 20-foot deep boring adjacent to the outfall.

- **Site 21 - Storm Drain Outfall No. 2** -- One 20-foot deep boring adjacent to the outfall.

- **Site 17 - AMARC (formerly MASDC)/AMMO Drainage Ditch** -- One 20-foot deep boring within the ditch.

- **Site 3 - Existing Fire Training Area** -- Six 20-foot deep borings: three within the fire training areas and three in the vicinity of the waste fuel storage facilities.

- **Site 8 - Transformer Oil Spill Site** -- Four 10-foot deep borings around the spill site.

- **Site 4 - North Ramp Fire Training Area** -- Two 10-foot deep borings within the confines of the fire training area(s).

- **Site 25 - AMARC (formerly MASDC) Tow Road** -- Nine 10-foot deep borings spaced along the tow road.

6. Analyzing selected soil samples from the sites for specific constituents, including heavy metals, pesticides, phenol, PCBs, oil and grease, and volatile organic compounds (VOCs). Soil samples were selected for analysis on the basis of photoionization analyzer (HNU) readings, appearance, and odors. Parameters and detection limits are listed in Table 2.

7. Preparing this report, which presents our findings.

TABLE 2

PARAMETERS, LIMITS OF DETECTION FOR SOIL AND GROUND WATER ANALYSES, AND USEPA DRINKING WATER STANDARD

CONSTITUENT	LIMIT OF DETECTION, SOIL[a] (g/g)	LIMIT OF DETECTION, WATER[b] (g/L)	LIMIT OF DETECTION, WATER[c] (g/L)	USEPA DRINKING WATER STANDARD (g/L)
Purgeable Halocarbons and Aromatics				
Chloromethane	0.01 (0.05)	0.5	1.0	NS
Bromomethane	0.01 (0.05)	0.5	1.0	NS
Dichlorodifluoromethane	0.01 (0.1)	0.5	1.0	NS
Vinyl Chloride	0.01	0.5	1.0	1[g]
Chloroethane	0.01	0.5	1.0	NS
Methylene Chloride	0.01	0.5	1.0	NS
Trichlorofluoromethane	0.01	0.5	1.0	NS
1,1-Dichloroethene	0.01	0.1	1.0	7[f]
1,1-Dichloroethane	0.01	0.1	1.0	NS
Trans-1,2-Dichloroethene	0.01	0.1	1.0	70[g]
Chloroform	0.01	0.1	1.0	NS
1,2-Dichloroethane	0.01	0.1	1.0	5[f]
1,1,1-Trichloroethane	0.01	0.1	1.0	200[f]
Carbon Tetrachloride	0.01	0.1	1.0	5[f]
Bromodichloromethane	0.01	0.1	1.0	NS
1,2-Dichloropropane	0.01	0.1	1.0	6[g]
Trans-1,3-Dichloropropene	0.01	0.5	1.0	NS
Trichloroethene	0.01	0.1	1.0	5[f]
Dibromochloromethane	0.01	0.5	1.0	NS
1,1,2-Trichloroethane	0.01	0.1	1.0	NS
Cis-1,3-Dichloropropene	0.01	0.5	1.0	NS
2-Chloroethylvinyl Ether	0.01	1.0	1.0	NS
Bromoform	0.01	0.1	1.0	NS
1,1,2,2-Tetrachloroethane	0.01	0.5	1.0	NS
Tetrachloroethene	0.01	0.5	1.0	NS
Chlorobenzene	0.01	0.1	1.0	NS
1,2-Dichlorobenzene	0.01	0.5	1.0	620[g]
1,3-Dichlorobenzene	0.01	0.5	1.0	NS
1,4-Dichlorobenzene	0.01	0.5	1.0	750[f]
Ethylbenzene	0.01	0.5	1.0	680[g]
Benzene	0.01	0.5	1.0	5[f]
Toluene	0.01	0.5	1.0	2000[g]
Pesticides				
Aldrin	0.001	0.01	0.01	NS
Dieldrin	0.001	0.01	0.01	NS
Chlordane	0.02	0.2	0.2	NS
DDT isomers	0.001	0.01	0.05	NS
Endrin	0.001	0.01	0.02	0.2
Endrin Aldehyde	0.001	0.01	0.05	NS
Heptachlor	0.001	0.01	0.01	NS
Lindane	0.001	0.01	0.01	4.0

[a]Numbers in parentheses denote limits of detection for test samples from Sites 1 and 18.
[b]Samples taken in December 1983 and February 1984.
[c]Samples taken in November 1984.
[d]Primary drinking water standard.
[e]Secondary drinking water standard, non-enforceable.
[f]Proposed MCL.
[g]Proposed RMCL
[h]5 g/g when analyzed with the other heavy metals, 10 g/g when analyzed alone.
[i]20 g/g when analyzed with the other heavy metals, 10 g/g when analyzed alone.
[j]Number in parentheses denotes limit of detection for test sample from base well W-4.

NOTE: NS = no standard established; NA = not analyzed; ND = no detection limit established.

PARAMETERS, LIMITS OF DETECTION FOR SOIL AND GROUND WATER ANALYSES, AND USEPA DRINKING WATER STANDARD

CONSTITUENT	LIMIT OF DETECTION, SOIL[a] (g/g)	LIMIT OF DETECTION, WATER[b] (g/L)	LIMIT OF DETECTION, WATER[c] (g/L)	USEPA DRINKING WATER STANDARD (g/L)
Heavy Metals				
Arsenic	1	50	ND	50[d]
Cadmium	0.5	10	ND	10[d]
Chromium	5	50	ND	50[d]
Copper	0.5	50	ND	1000[e]
Lead	5, 10[h]	10, 20[i]	ND	50[d]
Mercury	0.05	2	ND	2[d]
Nickel	1	100	ND	NS
Selenium	1	10	ND	10[d]
Silver	0.5	10	ND	50[d]
Zinc	3	50	ND	5000[e]
Others				
Oil and Grease	0.06 (0.05) mg/g	400 (200)[j]	500	NS
Phenol	10 (5) g/g	10	ND	NS
Total Organic Carbon	NA	1000	ND	NS
PCB	0.05 g/g	NA	ND	NS

The field work was performed in three intervals. Interval 1 was started 28 November 1983 and was completed 7 December 1983. Interval 2 was started 6 February 1984 and was completed 11 February 1984. Water sampling of some base wells was performed on 24 February 1984 to replace samples broken in transit. Interval 3 consisted of resampling and analysis of base and monitoring wells in November 1984 to confirm questionable analytical results from Intervals 1 and 2.

C. HISTORY OF DAVIS-MONTHAN AFB AND WASTE DISPOSAL OPERATIONS

Davis-Monthan AFB, located adjacent to and southeast of the City of Tucson (Plate 1), is the outgrowth of the original municipal airport established in 1919. Initial construction of the base began in 1927; various construction programs continued through 1937. Shortly after the outbreak of World War II, the base was expanded into a heavy bombardment training center. In 1945, the base was designated an Air Technical Service Command Storage Area, and today a large portion of the base is an Air Force Logistics Command (AFLC) unit for aircraft storage, reclamation, and disposal operations.

In 1960, Davis-Monthan AFB became the home of the 390th Strategic Missile Wing with Titan II ICBM silos located in the area around the city of Tucson and Pima County. The wing was deactivated in July 1984. In 1976, the base was transferred from the Strategic Air Command to the Tactical Air Command with an accompanying mission change from deterrence to primarily tactical training.

In 1981, the 836th Air Division of the Tactical Air Command was established at Davis-Monthan AFB. The 836th Air Division commands the 355th Tactical Training Wing, the 836th Combat Support Group, Resource Management, and the Davis-Monthan Hospital. Currently, the major units assigned to Davis-Monthan AFB include the 836th Air Division, Aerospace Maintenance and Regeneration Center (AMARC) (formerly Military Aircraft Storage and Disposition Center (MASDC)), and the 41st Electronic Combat Squadron (ECS).

Potentially hazardous wastes have been generated at Davis-Monthan AFB from activities involving vehicle and aircraft maintenance, fuels storage, and a number of industrial operations. Although the initial construction of the base began in 1927, major industrial activities did not begin until the base expanded in 1941. Therefore, the industrial operations and related wastes were comparatively small prior to 1941 (CH2M Hill, 1982). Major industrial operations include the AMARC (formerly MASDC) maintenance shops, non-destructive inspection (NDI) labs, and corrosion control shops. These industrial operations generate varying quantities of waste oils, fuels, solvents, cleaners, and industrial wastes.

Practices from 1971 to 1976 consisted of the disposal of wastes into the base landfill, use in fire training exercises, and as road oil to suppress dust. Some waste oils were dumped into the drainage ditches or washed into the sanitary sewer system. In 1976, road oiling with waste oil, fire training exercises with contaminated fuels, and the landfill disposal of other wastes such as solvents and cleaners was stopped. Present practices are to either recycle or reuse contaminated fuels, waste oils, solvents and cleaners; these are separated, drummed, and either stored or sold to contractors. Oil/water separators were installed, starting in 1970, at several industrial facilities. The skimmings are collected and removed by a contractor. The water is discharged into the sanitary sewer system.

In addition to the aforementioned wastes, polychlorinated biphenyls (PCBs), pesticides, and wastewater are possible sources of contamination. PCBs are present in the oil of electrical transformers and capacitors. Most of the in-service transformers (752 of 839) have been tested and analyzed for PCBs. Nine transformers contain PCB concentrations greater than 500 parts per million (ppm), 87 are PCB-contaminated (less than 500 ppm but greater than 50 ppm), and 656 are non-PCB (less than 50 ppm). The remaining 87 in-service PCB transformers are currently being scheduled for PCB analysis.

Pesticides are in common use at Davis-Monthan AFB for weed and pest control. However, proper preparation and application procedures are followed and the records search (CH2M Hill, 1982) did not indicate any apparent contamination problems from past pesticide use.

Both sanitary and industrial wastewater from Davis-Monthan AFB are collected by two major collection systems that are tied into the Pima County Sanitary District system. The wastewater is being treated by Pima County.

No evidence has been found that biological and/or chemical warfare agents have been stored, handled, or disposed of at Davis-Monthan AFB. Small quantities of trichloroethylene (TCE) are reported to have been used on base, but the available reports and records do not quantify this usage. In 1975, 1,1,1-trichloroethane and trichlorofluoromethane were substituted for TCE.

D. DESCRIPTION OF SITES

CH2M Hill (1982) identified 34 sites within Davis-Monthan AFB at which potentially hazardous wastes were generated, disposed of, or used in some activity. Each site was rated on the basis of possible receptors, water characteristics, potential pathways, and waste management practices. Fifteen of the 34 sites received priority ranking, and the remaining sites were judged not to warrant further investigation. Weston (1983) further examined the sites during the Phase II Presurvey and developed a scope of work and cost estimate for Phase II, Stage 1 investigations at the following sites:

Site 1 - Main Base Landfill
Site 10 - Chemical Sludge Burial Site
Site 18 - AMARC (formerly MASDC) Flush Farm Drainage Ditch
Site 7 - Old Electrical Substation Site
Site 19 - Runway No. 4 Drainage Ditch
Site 20 - Storm Drain Outfall No. 1
Site 21 - Storm Drain Outfall No. 2
Site 17 - AMARC (formerly MASDC)/AMMO Drainage Ditch
Site 3 - Existing Fire Trairing Area
Site 8 - Transformer Oil Spill Site
Site 4 - North Ramp Fire Training Area
Site 25 - AMARC (formerly MASDC) Tow Road

The approximate locations of these sites are shown in Plate 2, and each is described below.

1. Site 1: Main Base Landfill

The Main Base Landfill is located approximately 2,000 feet west of the midpoint of the main runway at Davis-Monthan AFB. It served as the main sanitary landfill from the early 1940s until 1976, when a contractor began collecting general refuse for off-site disposal. Originally, the landfill was excavated as a source of gravel for runway and main base construction. Wastes were dumped into the landfill and covered daily. In addition to household garbage and miscellaneous refuse, the landfill is believed to have received hazardous materials such as paint residues, thinners, and solvents. Other wastes included transformer oil, fuel tank cleaning sludge, small quantities of pesticides, photo lab chemicals and discarded aircraft (CH2M Hill, 1982).

2. Site 10: Chemical Sludge Burial Site

Site 10 is approximately adjacent to and south of the Main Base Landfill (Site 1) where "a chemical sludge" material was reportedly disposed of in shallow trenches. The exact nature of the material is not known (CH2M Hill, 1982), nor are the disposal trenches distinguishable from the nearby landfill surface features. Because the trenches could not be located with certainty in the field and were probably enveloped by the growth of the landfill, investigation of this site was incorporated into the Site 1 investigation.

3. Site 18: AMARC (formerly MASDC) Flush Farm Drainage Ditch

Site 18 is a relatively shallow drainage ditch adjacent to and downstream of the AMARC (formerly MASDC) flush farm waste oil storage tank. Since 1970, it has received drainage from nearby washdown operations and shows evidence of waste oil spills that may have contained solvents (CH2M Hill, 1982). This site has potential for environmental impact due to the possible presence of hazardous solvents and because it provides a pathway for migration of potentially hazardous wastes.

4. Site 7: Old Electrical Substation Site

Site 7 is the approximate location of an old electrical substation that has since been razed and reconstructed on the property east of Craycroft Road. There appear to be two potential locations of the former substation in the general area between Building 4740 and Craycroft Road.

CH2M Hill's records search found that a lightning strike in 1964 resulted in the destruction of four large transformers, causing approximately 10,000 gallons of transformer oil to spill onto the ground. It is not known whether the transformer oil contained PCBs; however, the presence of PCBs must be considered (CH2M Hill, 1982).

5. Site 19: Runway No. 4 Drainage Ditch

Site 19 is a moderately shallow drainage ditch located between the abandoned Runway No. 4 and Wherry Housing. A portion of the ditch passes through a children's playground. The early AMARC (formerly MASDC) operations were conducted in the Runway No. 4 area, and it was reportedly common practice during the 1950s to drain waste oils and residual fuels from aircraft into the ditch prior to aircraft storage. Some waste solvents were probably also disposed of at this site (CH2M Hill, 1982).

6. Sites 20 and 21: Storm Drain Outfalls Nos. 1 and 2

Sites 20 and 21 are relatively deep outfall discharge points at the northwest corner of the base that receive storm drainage from the base industrial shop areas. The embankments surrounding the outfall ditches have also recently become the dumping grounds for various construction debris including asphalt and concrete rubble. The outfall discharge points would be likely locations for the accumulation of waste solvents, oils, and chemicals that may have been discharged to drainage ditches in the past (CH2M Hill, 1982).

7. Site 17: AMARC (formerly MASDC)/AMMO Drainage Ditch

Site 17 is the location of a major drainage ditch off Drexel Road near the southeast corner of the AMARC (formerly MASDC) property and the northeast corner of the AMMO storage area. Its banks are relatively steep and moderately vegetated. CH2M Hill (1982) found that the contents of approximately 1,000 portable fire extinguishers were emptied into this ditch in 1972. The contents probably included bromochloromethane, which was a common fire extinguishing agent in use at that time. Visual inspection of the ditch site indicated recent dumping of brush and scrap metal debris from aircraft. It is possible that this site was also used in the past for the disposal of other items, including various liquid wastes from stored or salvaged aircraft components.

8. Site 3: Existing Fire Training Area

Site 3 is the existing Base Fire Department training area, which has been in use since 1968. The site has four main features: three circular-shaped fire training areas and one waste fuel storage facility. Each of the circular-shaped areas is a relatively level, unvegetated surface surrounded by a small earthen berm. The southern fire training area has a grid of near-surface sprinkler heads for distribution of fuel that is supplied by the waste fuel storage facility. The storage facility consists of two side-by-side cylindrical tanks enclosed by a short concrete block wall.

Currently, Base Fire Department training exercises are conducted once each month using about 200 gallons of JP-4 fuel per exercise. Prior to 1972, the exercises were conducted once each week using contaminated fuels. CH2M Hill (1982) found that some dumping of waste oils and solvents in the fire department training area took place in the early 1970s. The majority of the petroleum, oil, and lubricant wastes would have been consumed in the fire training exercises; however, some percolation into the ground may have taken place.

9. <u>Site 8: Transformer Oil Spill Site</u>

Site 8 is a gravel parking lot, adjacent to Building 4852, where transformer oil was reportedly dumped onto the ground in 1978. This was a one-time occurrence. The exact quantity of transformer oil involved is not known but was probably in the range of 100 to 500 gallons (CH2M Hill, 1982). It is not known whether the transformer oil contained PCBs; however, the presence of PCBs must be considered.

10. <u>Site 4: North Ramp Fire Training Area</u>

Site 4 is the location of two former Base Fire Department training areas located in the north ramp area of the base. Each site has a circular shape with a small earthen berm around its circumference. The surface within the berm has a darkened appearance and contains numerous bits and pieces of metal scraps. The site was in use from approximately 1950 to 1968. Exercises were conducted about once each week using 200 gallons of petroleum, oil, and lubricant waste (mainly waste fuels) per exercise (CH2M Hill, 1982).

11. <u>Site 25: AMARC (formerly MASDC) Tow Road</u>

Site 25 includes the major AMARC (formerly MASDC) tow road where extensive road oiling was performed in the past for dust suppression. Waste oils, possibly including commingled waste oils and solvents, and some residual fuels were routinely collected in a waste oil storage tank located at the AMARC (formerly MASDC) flush farm. Until about 1976, it was common practice to dispose of the waste oil by spreading it on the dirt roads in the AMARC (formerly MASDC) area. The major tow road would have received most of the waste oil. It is estimated that 10,000 to 20,000 gallons per year of petroleum, oil, and lubricant waste were disposed of in this fashion (CH2M Hill, 1982). Most of the volatile components, including fuels and solvents, probably evaporated into the atmosphere; however, some of the waste solvents may also have penetrated into the ground.

E. IDENTIFICATION OF POLLUTANTS SAMPLED

Based on the wastes present or suspected at the identified sites, potential contaminants include VOCs (purgeable halocarbons and aromatics), pesticides, heavy metals, and other parameters listed in Table 1. Ground water samples from the two monitor wells and the various base wells were analyzed for VOCs, pesticides, and heavy metals. Ground water samples from the base wells were also analyzed for total organic carbon (TOC), phenol, and oil and grease. Soil samples were analyzed for one or more of the parameters given above, except TOC. Selected soil samples were also analyzed for PCBs.

F. IDENTIFICATION OF THE FIELD TEAM

The field work required for Phase II, Stage 1 was coordinated by Mr. Lutz Kunze, Associate. Mr. Steve Johnson, hydrogeologist, supervised the construction, sampling, and logging of the monitor wells. Mr. George Geiser, Water Resources Engineer, assisted in the collection of samples from the base wells. Mr. Ron Anderson, Geotechnical Engineer, supervised the soil sampling activities. Appendix F contains a description of the qualifications of these personnel.

II. ENVIRONMENTAL SETTING

A. GEOGRAPHIC LOCATION

Davis-Monthan AFB occupies 10,763 acres in Pima County, Arizona, immediately southeast of Tucson. The base is situated along with Tucson in the Tucson basin, a basin bordered by the Santa Catalina, Rincon, Santa Rita, Tucson, Sierrita, Tortolita, and Empire Mountains and Black Mountain. The Tucson basin typifies the physiography of the Basin and Range Province in which north to northwest-trending mountain ranges are separated by desert valleys. The elevation of the ground surface in the base vicinity is between 2,500 and 2,900 feet above mean sea level (MSL) and decreases toward the northwest.

The Tucson basin comprises 1,000 square miles in the upper Santa Cruz River drainage basin. The low surface relief of the basin was formed by stream erosion of the surrounding mountains and deposition of the sediments in the basin. The area is drained to the northwest by the Santa Cruz River and its tributaries, Rillito Creek and Canada del Oro.

The average annual precipitation at the base is about 10 inches, about half of which falls between July and September during thunderstorms. Mean monthly temperatures range from a low of 40°F in January to a high of 98°F in July. Annual average lake evaporation in the vicinity of the base is 65 inches (CH2M Hill, 1982).

B. REGIONAL GEOLOGY AND HYDROGEOLOGY

The mountains north, south, and east of the basin are composed of massive metamorphic and intrusive igneous rocks characterized by low porosity and permeability. Mountains to the west consist of igneous, sedimentary, and metamorphic rocks. The oldest rocks are Precambrian (more than 600 million years old), and the youngest are Tertiary (60 million years old). Ground water is transmitted mainly through fractures, which may yield enough water for small domestic wells. Large-scale ground water development is not possible.

The Tucson basin is a structural basin filled with alluvium eroded from the surrounding mountains and deposited by streams and wind in lacustrine and playa environs. The sediments consist of granite, granite-gneiss, schist, andesite, basalt, and limestone and are generally unconsolidated. Grain sizes range from clay to boulders. The deposits range in thickness from a thin veneer at the edge of the basin to more than

12,000 feet near the center of the basin. The basin fill sediments generally form a single aquifer, which is described in detail in the following section.

C. GENERAL HYDROGEOLOGY

The sediments beneath Davis-Monthan AFB generally behave as a single, unconfined aquifer. However, locally confined conditions may occur due to the presence of discontinuous layers of low permeability materials. The deepest unit is the Pantano Formation. The others, in ascending order, are the Tinaja beds, the Fort Lowell Formation, and surficial and stream channel deposits.

The Pantano Formation is generally a reddish brown silty sandstone to gravel. Drillers' logs indicate that the top of the Pantano Formation is approximately 1400 feet below ground surface in the vicinity of the base. In the central portion of the Tucson basin, over 1000 feet of Pantano Formation has been penetrated by wells. Large-diameter wells completed in the Pantano yield from a few hundred to as much as 5000 gallons per minute (gpm).

The Tinaja beds are composed of beds that range from gray to grayish brown sandy gravels to medium brown gypsiferous clayey silt and mudstone. The top of the Tinaja beds is estimated to be approximately 300 feet below ground surface in the vicinity of the base. The Tinaja beds range in thickness from up to several hundred feet near the basin edge to over 2000 feet near the center of the basin (Davidson, 1973). Yields of over 600 gpm have been reported for wells tapping these beds. Most of the base wells have been completed in this unit.

The Fort Lowell Formation consists of dark to light reddish brown unconsolidated to moderately consolidated sediments. The formation grades from silty gravel to sandy silt and clayey silt. The Fort Lowell Formation is between 300 and 400 feet thick near the center of the basin. Where still saturated, the Fort Lowell Formation may yield up to 1500 gpm.

Surficial deposits consist primarily of gravel and gravelly sand. These deposits generally range from a few feet to several tens of feet thick. Generally, these deposits are above the water table and are not considered as part of the regional aquifer.

The main sources of recharge to the basin aquifer are precipitation that infiltrates through ephemeral stream channels, inflow of ground water from the south and north (Canada Del Oro), and infiltration of runoff from the surrounding mountains. Lesser amounts of recharge are supplied by infiltration of excess irrigation water and sewage effluent discharged into the Santa Cruz River channel. Precipitation on the basin floor provides negligible recharge because most of it falls during the hottest part of the year and evaporates. Ground water is discharged from the basin primarily by pumping and outflow in the northwestern portion of the basin. The rate of discharge currently exceeds the recharge rate, resulting in continually declining ground water levels.

The depth to water in the Tucson basin ranges from less than 15 feet to greater than 550 feet. It is deepest beneath the eastern part of the basin and shallowest beneath the major stream channels. The ground water gradient slopes toward the north-northwest at 10 to 20 feet per mile in the center of the basin and 20 to 30 feet per mile in southern and northwestern regions of the basin.

The Tucson basin has been designated as part of the Tucson Active Management Area by the Arizona Department of Water Resources. This designation provides for specific ground water management in order to bring the basin into safe yield by 2025. The aquifer underlying the Tucson basin has also been designated as a sole source aquifer under the Safe Drinking Water Act (The Ground Water Newsletter, 1984). The designation gives USEPA the authority to veto projects involving federal funding that may contaminate or deplete ground water in the aquifer.

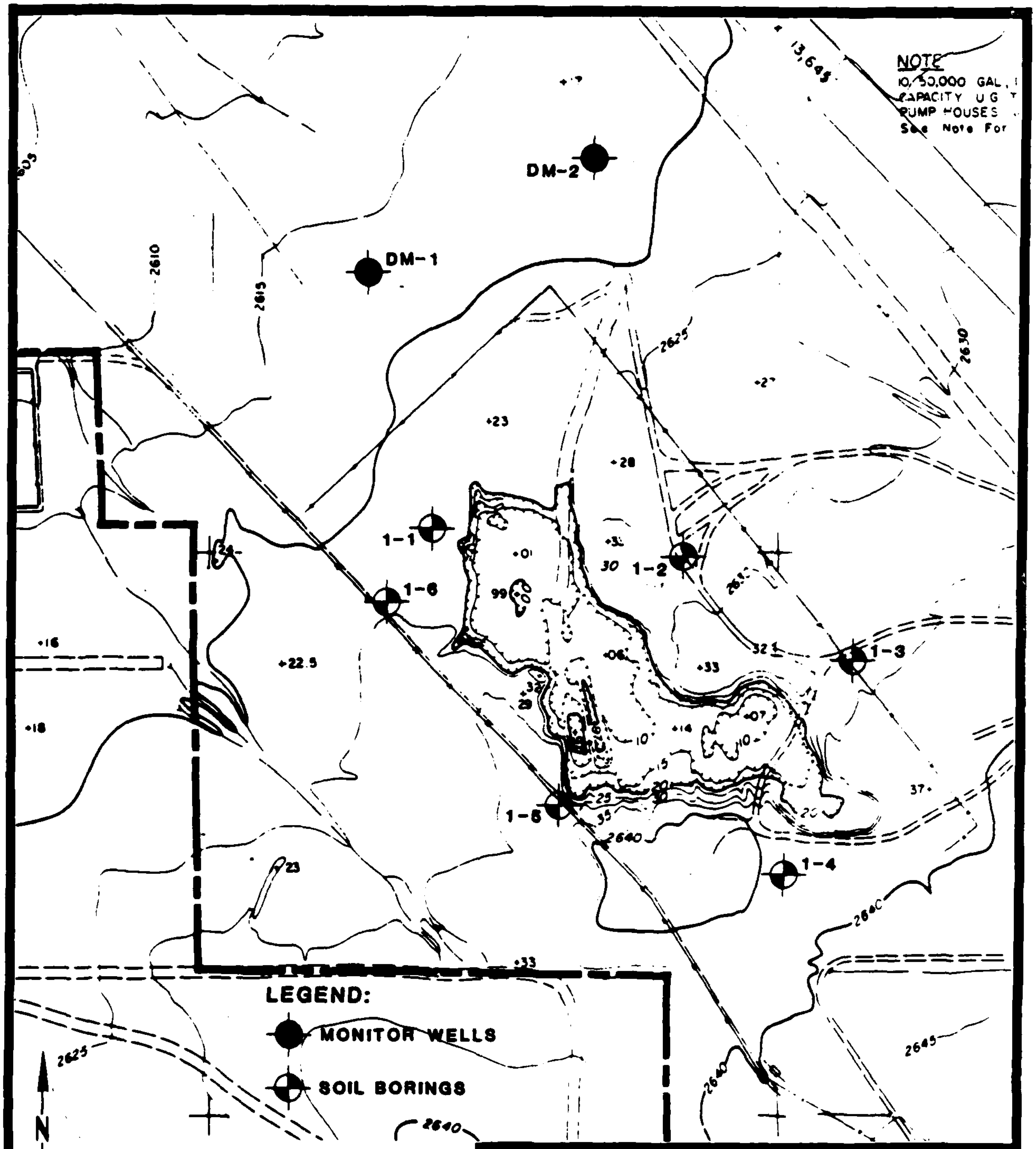
D. SITE-SPECIFIC GEOLOGY AND HYDROGEOLOGY

This section presents the results of surface and subsurface investigations conducted during Phase II, Stage 1 at Sites 1, 18, 7, 19, 20, 21, 17, 3, 8, 4, and 25 at Davis-Monthan AFB. The field program is described in Section III, and the results of the chemical analyses are presented in Section IV.

1. <u>Site 1</u>

The Main Base Landfill was designated as Site 1 (includes Site 10). Two monitor wells were installed north of the landfill, and six 50-foot deep soil borings were drilled around the landfill (see Plate 3).

Shallow subsurface soils conditions were explored by the soil borings. Boring logs are presented in Appendix A. Near-surface deposits consisted predominately of damp to slightly damp and variably cemented silty and



REFERENCES:
(a) DRAWING NO. S2-44R1 PREPARED BY DMAFB, CIVIL ENGINEERING OFFICE, ENTITLED, "TEST SOIL BORINGS - SITE 1", UNDATED.
(b) A DRAWING PREPARED BY THE DEPARTMENT OF THE AIR FORCE, DIRECTORATE OF CIVIL ENGINEERING, ENTITLED "TACTICAL AIR COMMAND - COMPREHENSIVE PLAN", LAST REVISED JANUARY 1, 1983.

PREPARED FOR **U.S. Air Force**

LOCATIONS OF MONITOR WELLS AND SOIL BORINGS AT SITE 1

BY **Dames & Moore** Plate 3

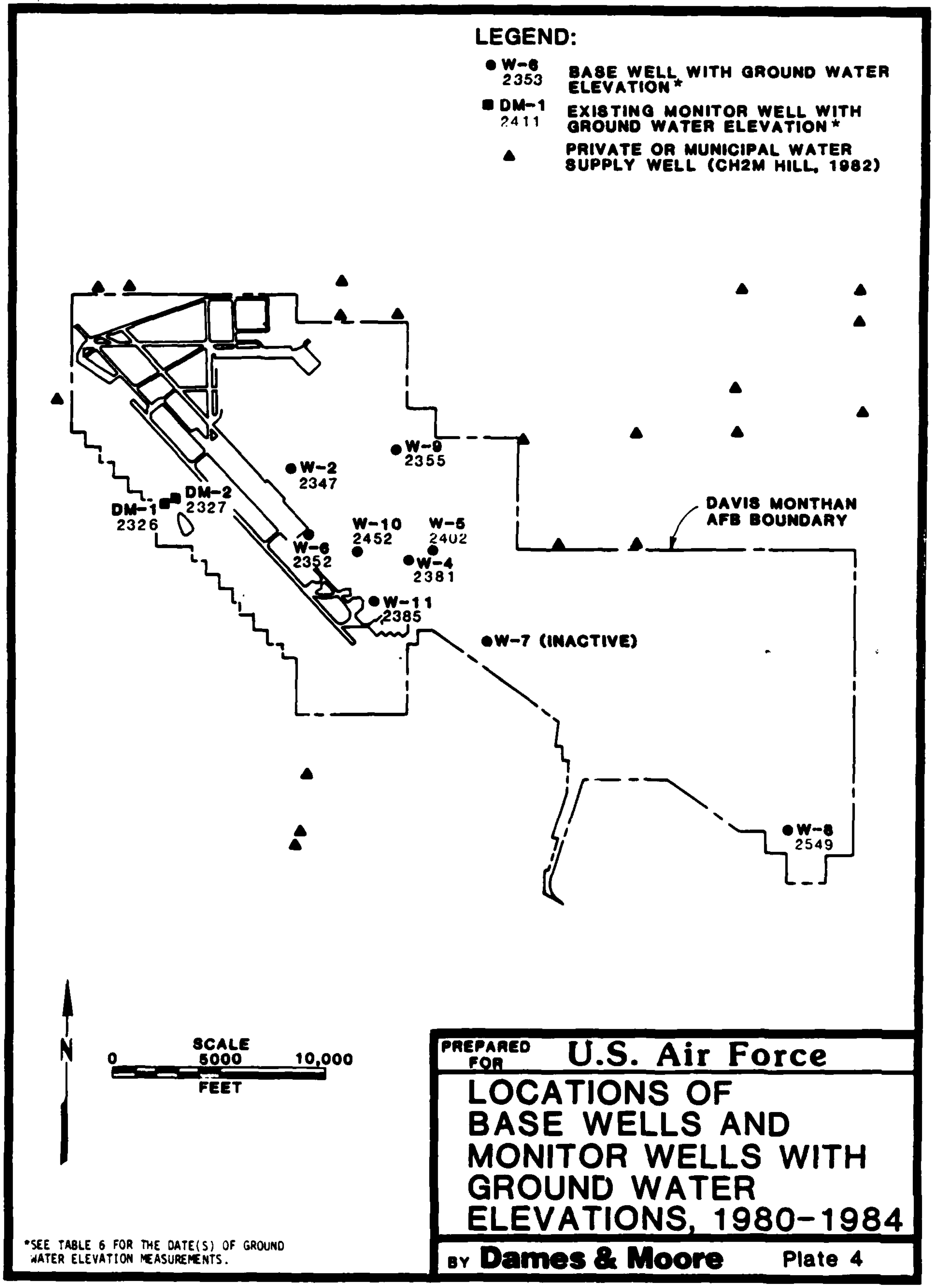
clayey sands containing trace to moderate amounts of gravel. These deposits were mixed and roughly stratified and only occasionally had any significant odor. No ground water was encountered in any of the soil borings. HNU readings were taken by extending the sensor probe a short distance into the open boring. All of these HNU readings were less than 1 ppm. All but four of the explosimeter readings were less than one unit, the other four readings being 4, 2, 6, and 50 percent of the lower flammability limit (lfl).

Deep subsurface soil conditions were explored in the two monitor wells. Boring logs are presented in Appendix A. In general, the logs indicate that the silty sand and gravel material extends to a depth of approximately 60 feet and is underlain by approximately 210 feet of stratified sandy silt with gravel. Below about 270 feet, the sediments are mostly sand and gravel with some silt and clay; but below about 300 feet, the silt and clay fraction predominates. The completed depths of the monitor wells were 330 and 367 feet. The depth to ground water was about 290 feet in each monitor well.

The ground wa'er regime beneath Site 1 and the base as a whole can be described in general using subsurface information from the monitor wells and water levels measured in base wells since 1980. It was not possible to collect static water levels from all the base wells during this study because of non-static conditions (pumpage) and malfunctioning of air lines in some of the wells.

Plate 4 shows the ground water elevation measurements made between 1980 and 1984. Comparison of the elevations suggests the possibility of anomalies, probably due to measurement of non-static water levels, measurement of water levels over the span of 4 years, and comparisons of wells with different perforation intervals. However, the general downward slope of the ground water surface is toward the northwest. Static water level elevations in base wells W-9 and W-10 and monitor wells DM-1 and DM-2 were most recently measured during the period of December 1983 to January 1984. The water level in base well W-4 was also measured in December 1983, but it represented a pumping level. Although the regional hydraulic gradient is toward the north-northwest, local gradients may be variable in the vicinity of several pumping wells.

Ground water samples were collected from the two monitor wells and eight base wells. Results of the analysis are discussed in Section IV.



*SEE TABLE 6 FOR THE DATE(S) OF GROUND WATER ELEVATION MEASUREMENTS.

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LOCATIONS OF BASE WELLS AND MONITOR WELLS WITH GROUND WATER ELEVATIONS, 1980–1984

BY Dames & Moore Plate 4

2. Site 18

The AMARC (formerly MASDC) Flush Farm drainage ditch, designated as Site 18, is located east of the approximate intersection of the AMARC (formerly MASDC) taxiway and tow road, as shown in Plates 2 and 5. The ditch is shallow and relatively narrow with sparsely vegetated gradual side slopes. The ditch drains toward the west. Most of the flow apparently is generated from the oil/water separator discharge point located on the south edge of the ditch approximately 520 feet upstream of the taxiway.

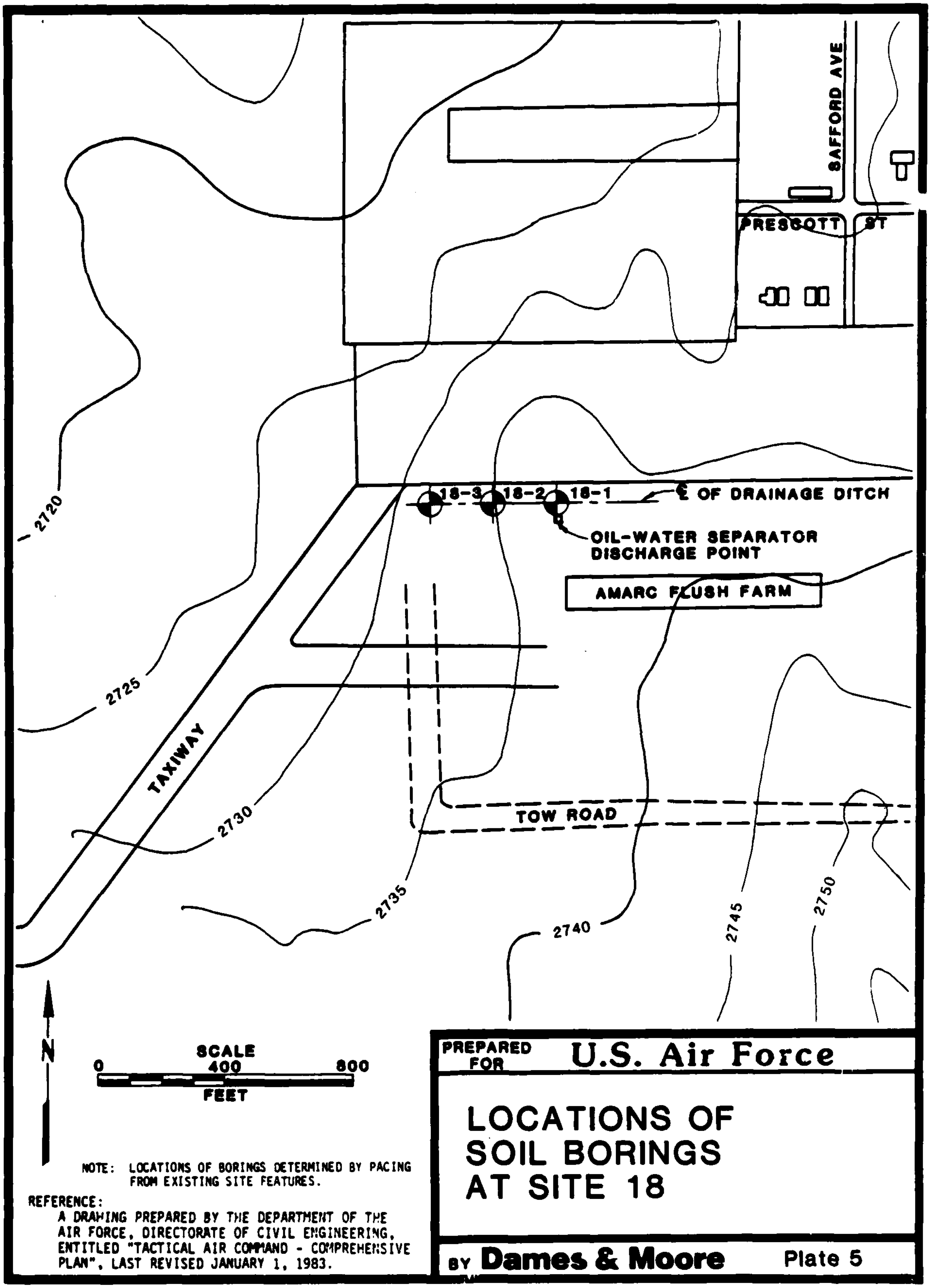
Subsurface soil conditions were investigated by drilling three 20-foot deep borings within the deepest portion of the channel at locations downstream of the oil/water separator discharge point, as shown in Plate 5. The logs of the borings are presented in Appendix A.

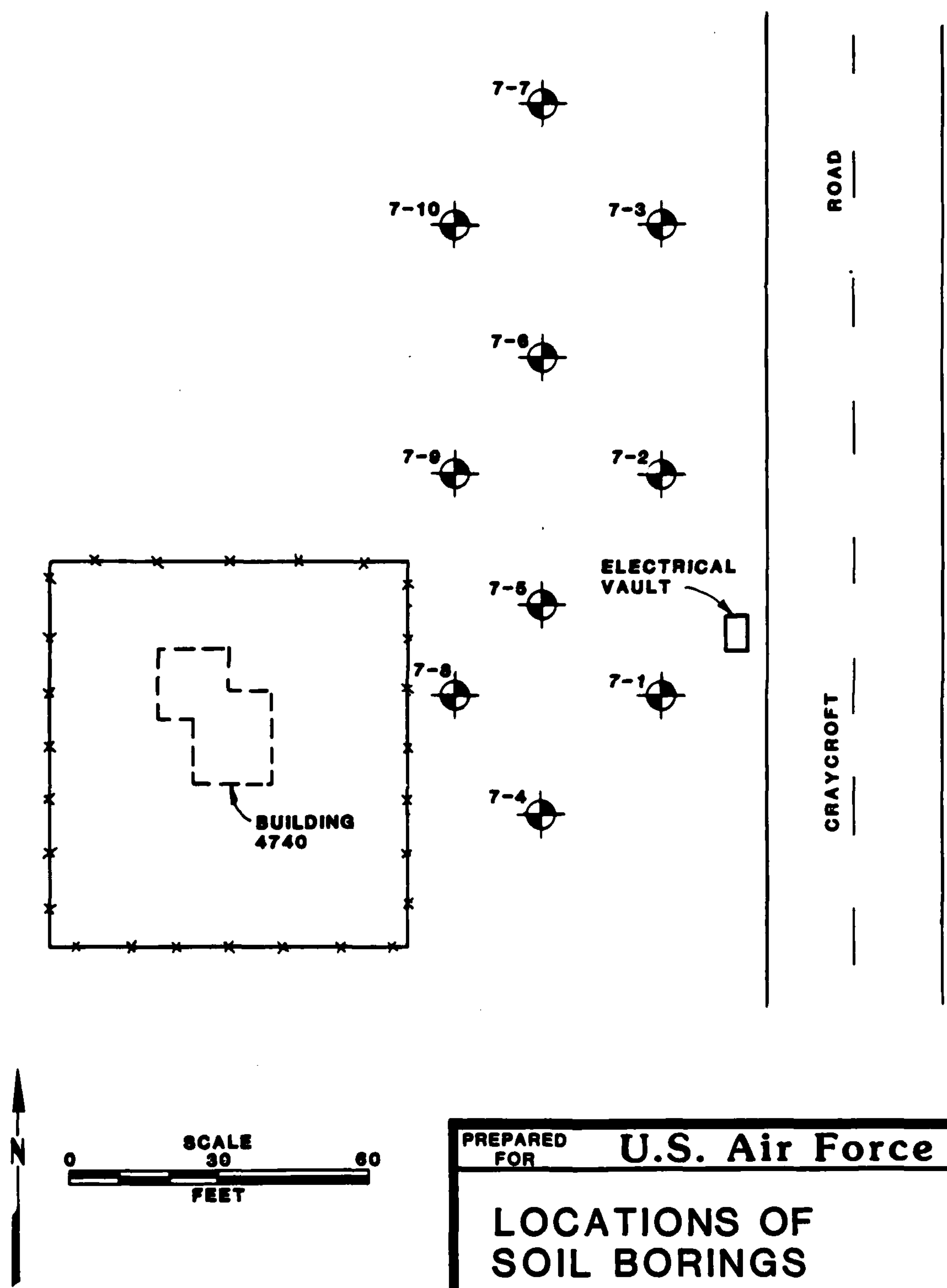
In general, subsurface soils in the drainage ditch consisted of a surficial deposit of wet to moist, black to grayish brown sand underlain by moist to damp, black to light brown clayey to silty sand at depth. Some of the near-surface materials smelled of solvents and contained soiled rags. Clayey subsoils occasionally had some odor, which was typically detected in the steam released during the augering operations. Water seepage was observed at approximately 0.3 foot during the drilling of Boring 18-1; no seepage was observed in the other two borings. However, water was observed in each boring prior to backfilling. All HNU readings were less than 1 ppm. All explosimeter readings were zero.

3. Site 7

The old electrical substation site, designated as Site 7, is located at the northwest corner of Yuma Street and Craycroft Road near the center of the base, as shown in Plates 2 and 6.

There appear to be two possible locations of the former substation, both of which are situated west of Craycroft Road and east of Building 4740. The northerly limit of the area is a row of oleanders forming the south boundary of an adjacent park. The southerly limit is approximately Building 4740. The site is relatively flat and lightly vegetated with grass and weeds, which are mowed periodically. Some of the area, particularly that northeast of Building 4740, has crushed gravel spread over its surface, presumably as a result of the razing of the old substation.


SAFFORD AVE
PRESCOTT ST
18-3
18-2
18-1
℄ OF DRAINAGE DITCH
OIL-WATER SEPARATOR DISCHARGE POINT
AMARC FLUSH FARM
2720
2725
2730
2735
2740
2745
2750
TAXIWAY
TOW ROAD
N
SCALE
0
400
800
FEET
NOTE: LOCATIONS OF BORINGS DETERMINED BY PACING FROM EXISTING SITE FEATURES.
REFERENCE:
A DRAWING PREPARED BY THE DEPARTMENT OF THE AIR FORCE, DIRECTORATE OF CIVIL ENGINEERING, ENTITLED "TACTICAL AIR COMMAND - COMPREHENSIVE PLAN", LAST REVISED JANUARY 1, 1983.
PREPARED FOR U.S. Air Force
LOCATIONS OF SOIL BORINGS AT SITE 18
BY Dames & Moore
Plate 5



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LOCATIONS OF SOIL BORINGS AT SITE 7

BY **Dames & Moore** Plate 6

NOTE: LOCATIONS OF BORINGS DETERMINED BY PACING FROM EXISTING SITE FEATURES.

Subsurface soil conditions were investigated by drilling 10 6½-foot deep borings within a general grid array as shown in Plate 6. The logs of the borings are presented in Appendix A.

One soil boring (Boring 7) was slightly relocated after encountering a buried piece of metal at a depth of about 18 inches.

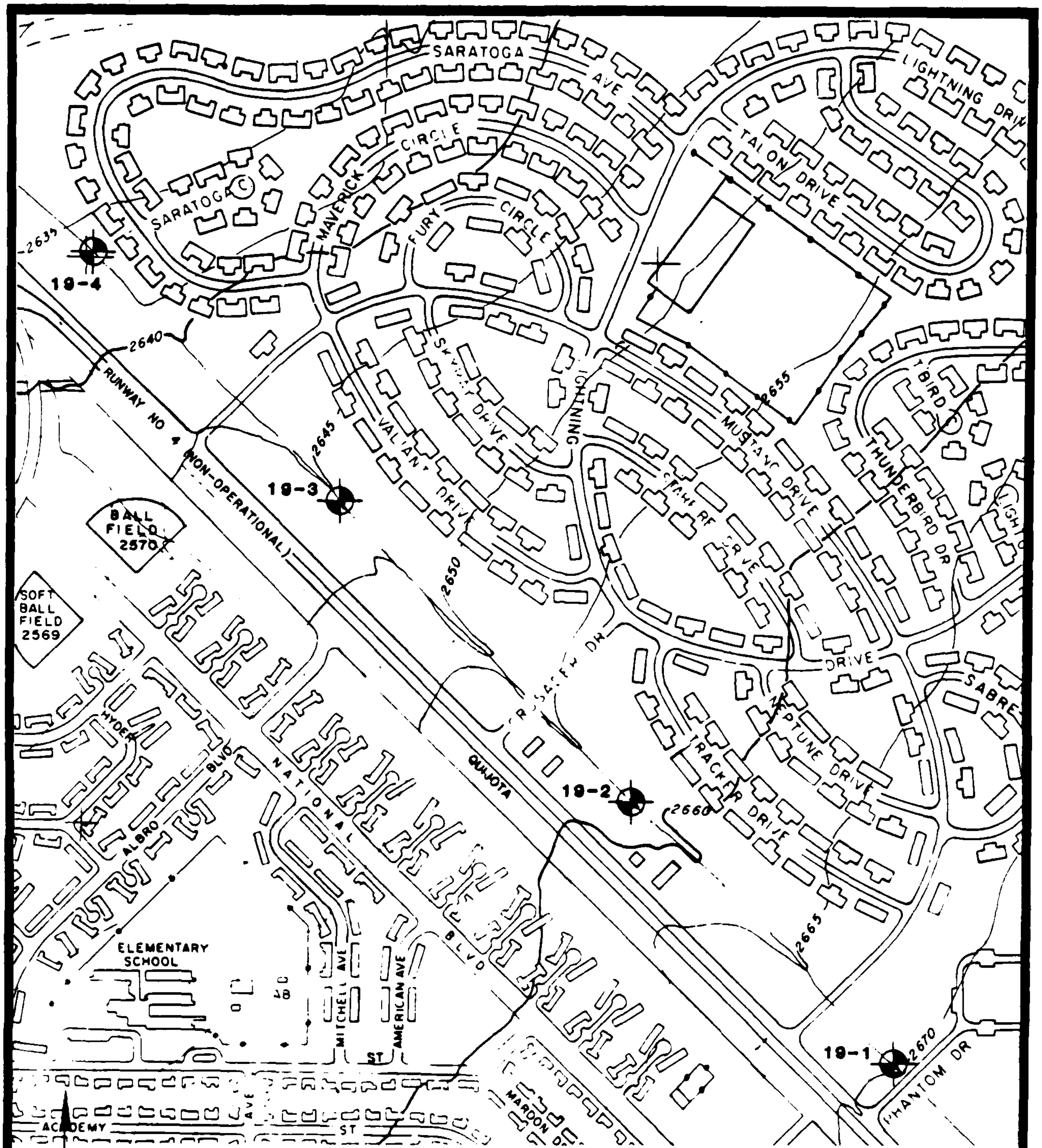
Subsurface soils at the old electrical station site were predominantly mixed and roughly stratified brown to off-white sandy clays and clayey sands. Lighter colored soils were generally associated with the presence of cementation, which varied in degree from light to moderate. Moistures ranged from damp to slightly damp. No ground water was encountered in any of the borings. Occasionally, some odor was detected from the auger cuttings. HNU readings ranged from less than 1 ppm to 9 ppm. No explosimeter readings were taken.

4. Site 19

The Runway No. 4 drainage ditch, designated as Site 19, parallels the non-operational runway near Wherry Housing in the north-central area of the base, as shown in Plates 2 and 7. The ditch is a long, linear depression located approximately 250 feet north of the old runway (now Quijota Boulevard). The ditch slopes gradually to the northwest with a uniform gradient of about 0.008 foot per foot. Side slopes are moderately steep to the south and relatively gradual to the north. Most of the surface is grass covered, although coverage is sparse in the vicinity of the playground area near Valiant Drive.

Subsurface soil conditions were investigated by drilling four 21-foot deep borings within the deepest portion of the ditch at the locations shown in Plate 7. The logs of the borings are presented in Appendix A.

Subsurface soil conditions in the drainage ditch consist predominantly of mixed and roughly stratified brown to tan sand with variable amounts of clay and silt fines. Degrees of cementation varied from slight to moderate. Moistures ranged from slightly damp to damp. No ground water was encountered in any of the borings. Some of the auger cuttings from Boring 19-1 had an odor, presumably as a result of the steam release created by auger friction. HNU readings varied from less than 1 ppm to 19 ppm. All explosimeter readings were zero.



N

SCALE
0 500 1000
FEET

REFERENCE:
A DRAWING PREPARED BY THE DEPARTMENT OF THE AIR FORCE, DIRECTORATE OF CIVIL ENGINEERING, ENTITLED "TACTICAL AIR COMMAND - COMPREHENSIVE PLAN", LAST REVISED JANUARY 1, 1983.

PREPARED FOR **U.S. Air Force**

LOCATIONS OF SOIL BORINGS AT SITE 19

BY **Dames & Moore** Plate 7

5. Sites 20 and 21

Two outfalls of a large storm drain, designated as Sites 20 and 21, are located near the northwest corner of the base as shown in Plate 2. The storm drain is a deep ditch that drains to the west and northwest. Numerous trees line each of the steep side slopes, and water stands in the deepest areas of the ditch; considerable amounts of asphalt and concrete rubble comprise most of the berms.

Because of access difficulties created by these surface conditions, borings were relocated downstream from the points of outfall. Borings 20-1 and 21-1 were situated approximately 500 feet upstream and 1,350 feet downstream of the (old) Taxiway No. 4 overpass, respectively, as shown in Plate 8. Each boring was drilled to a depth of 20 feet. The logs of the borings are presented in Appendix A.

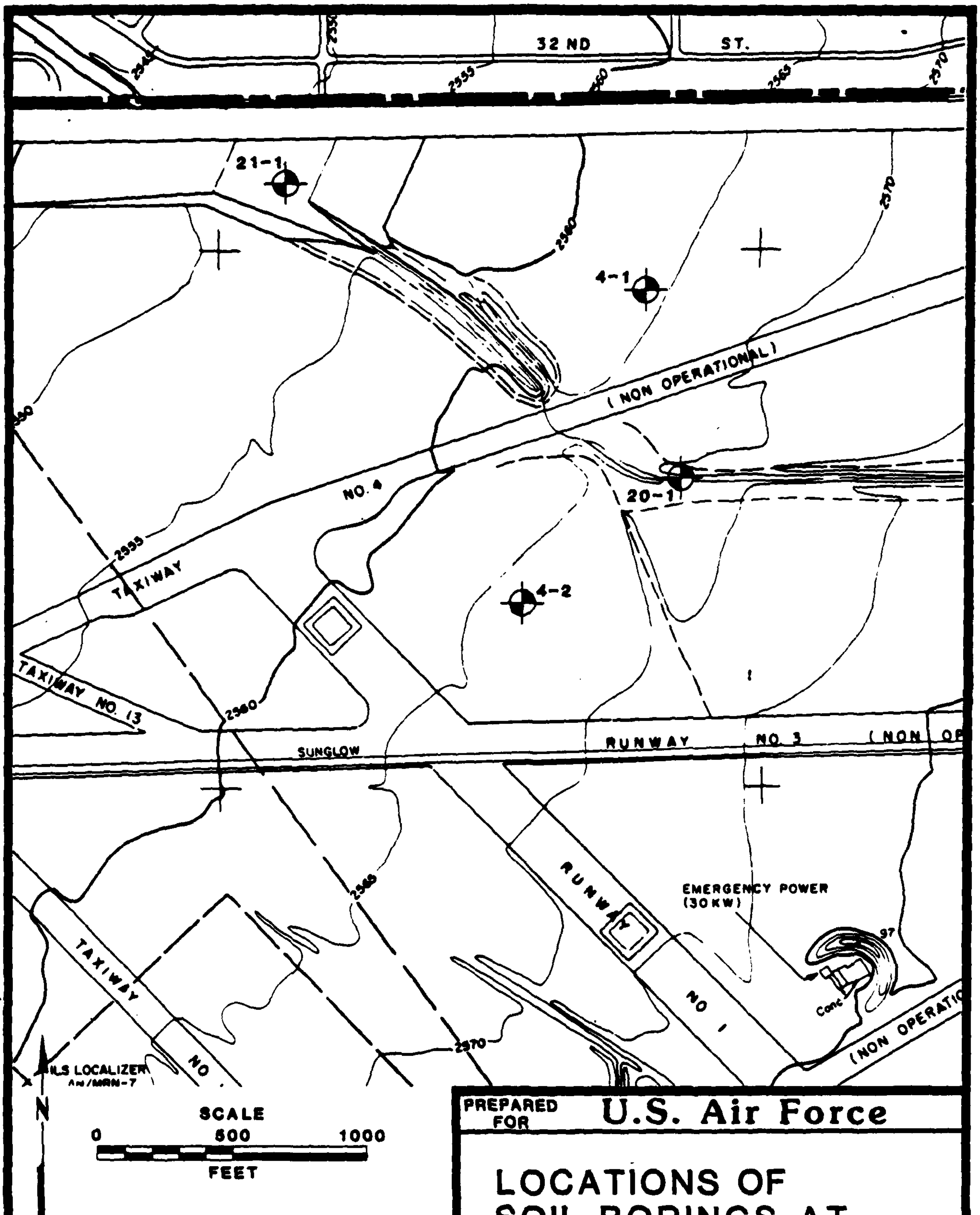
Subsurface soil conditions encountered in Boring 20-1 consisted of brown clayey sand and sand with some gravel overlying brown sandy clay. Moisture contents were damp, and no ground water was encountered. No odor was detected in any auger cuttings, although considerable steam was released from the soil by auger friction. HNU readings ranged from 1 to 3 ppm. No explosimeter readings were taken.

Subsurface soil conditions encountered in Boring 21-1 were fairly uniform throughout the depth explored. Soils consisted of brown clayey sand with light to moderate cementation. Moisture contents were damp, and no ground water was encountered. As in Boring 20-1, no odor was detected, although considerable steam was generated. HNU readings ranged from 1½ to 5½ ppm. Explosimeter readings were less than 1 percent of the lfl.

6. Site 17

The AMARC (formerly MASDC)/AMMO drainage ditch, designated as Site 17, is located in the southeastern portion of the base, as shown in Plates 2 and 9. The drainage ditch is a moderately deep and heavily vegetated depression that roughly parallels the gravel road along the east boundary of the AMARC (formerly MASDC) area. The ditch has relatively steep side slopes and contains some refuse and debris.

Subsurface soil conditions within the ditch were investigated by drilling one 21-foot deep boring in the center of the ditch approximately 100 feet south of the fork in the adjacent gravel road. The approximate location of Boring 17-1 is shown in Plate 9. The log is presented in Appendix A.



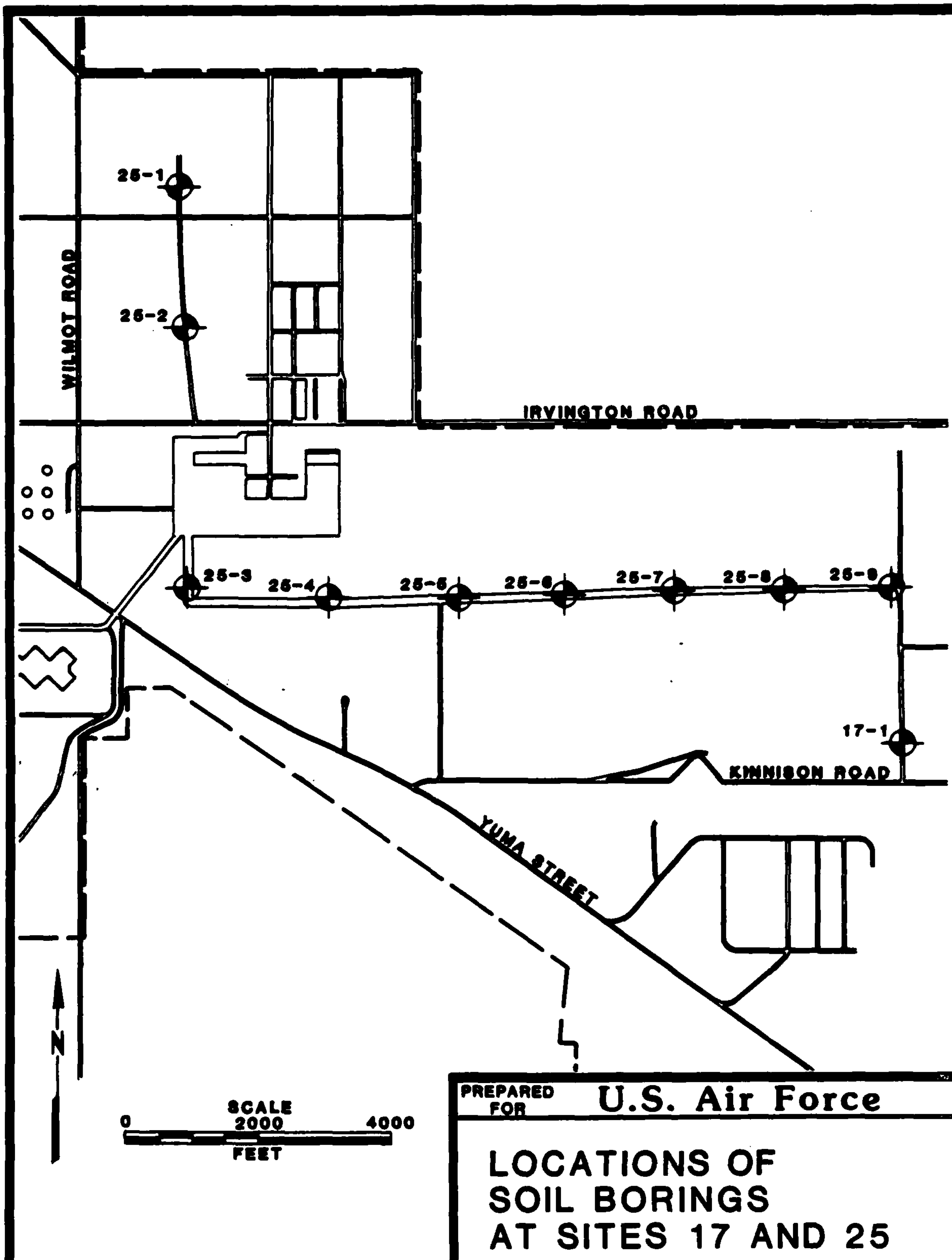
NOTE: LOCATIONS OF BORINGS DETERMINED BY TRANSFERRING DATA FROM A 1983 AERIAL PHOTO.

REFERENCE:
A DRAWING PREPARED BY THE DEPARTMENT OF THE AIR FORCE, DIRECTORATE OF CIVIL ENGINEERING, ENTITLED "TACTICAL AIR COMMAND - COMPREHENSIVE PLAN", LAST REVISED JANUARY 1, 1983.

PREPARED FOR **U.S. Air Force**

LOCATIONS OF SOIL BORINGS AT SITES 4, 20, AND 21

BY **Dames & Moore** Plate 8



PREPARED FOR U.S. Air Force

LOCATIONS OF SOIL BORINGS AT SITES 17 AND 25

BY Dames & Moore Plate 9

NOTE: LOCATIONS OF BORINGS DETERMINED BY USING VEHICLE ODOMETER.

REFERENCE:
AN UNTITLED AERIAL PHOTO DATED 1983.

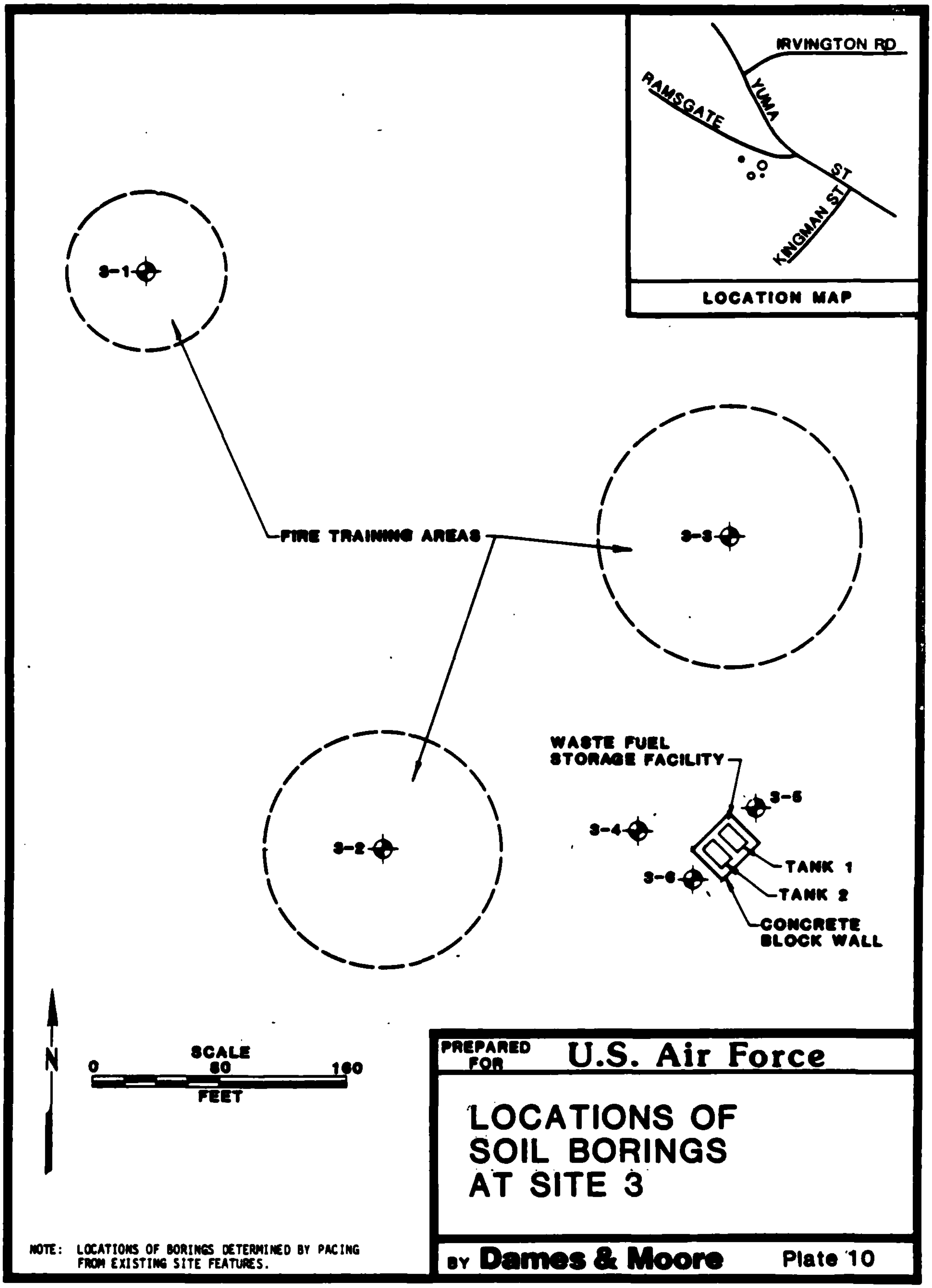
Subsurface soils in Boring 17-1 consist of mottled brown and off-white clayey sand to 5 feet, brown sand with some silt to 8½ feet, dark brown clay and sand to 19½ feet, and brown sand to 21 feet. Light to moderate degrees of cementation and traces of gravel were encountered in each layer. A slight odor was detected in the steam driven out of the soil. Moisture contents were damp, and no ground water was encountered. All HNU and explosimeter readings were zero.

7. Site 3

The existing fire training area, designated as Site 3, is located in the central area of the base, as shown in Plates 2 and 10. The site consists of three circular-shaped fire training areas situated west, southwest, and north of a waste fuel storage facility. Each fire training area consists of a relatively flat, unvegetated ground surface surrounded by a small earthen berm. The ground surface within the berm is darkened and contains occasional bits of scrap metal. The southwestern fire training area has a grid of sprinkler heads a couple inches above the ground surface for distribution of fuel supplied by the storage facility. The waste fuel storage facility has two cylindrical tanks surrounded by a short concrete block wall.

Subsurface soil conditions at the site were investigated by drilling six 21-foot deep borings, one near the center of each of the three circular-shaped fire training areas and three in the vicinity of the waste fuel storage facility, as shown in Plate 10. The logs of the borings are presented in Appendix A.

In general, subsurface soils at Site 3 consisted of mixed clayey sand and sandy clays overlying sand containing only trace amounts of silt and gravel. The top of the sand layer ranged from 14 to 19 feet below the ground surface. Except for some black within the upper foot or so of Borings 3-1 and 3-3, the color of the soils ranged from dark brown to off-white, the lighter shades being associated with cementation. With the notable exception of Boring 3-5, nearly all the auger cuttings exhibited some hydrocarbon odor. The odor was especially strong within the near-surface soils of Boring 3-1 and within the top 18 feet of Boring 3-6. Moisture range from damp to slightly damp. No ground water was encountered in any boring. HNU readings ranged from zero to 180 ppm and were significant in Borings 3-1, 3-2, 3-3, and 3-6. All explosimeter readings were zero.


IRVINGTON RD
YUMA
RAMSGATE
ST
KINGMAN ST
LOCATION MAP
3-1
FIRE TRAINING AREAS
3-3
WASTE FUEL
STORAGE FACILITY
3-5
3-4
3-2
3-6
TANK 1
TANK 2
CONCRETE
BLOCK WALL
N
SCALE
0
50
100
FEET
NOTE: LOCATIONS OF BORINGS DETERMINED BY PACING
FROM EXISTING SITE FEATURES.
PREPARED FOR U.S. Air Force
LOCATIONS OF
SOIL BORINGS
AT SITE 3
BY Dames & Moore
Plate 10

8. Site 8

The transformer oil spill site, designated as Site 8, is located northwest of Building 4852 near the center of the base, as shown in Plates 2 and 11. The site is a parking area with a graded, gravelly surface. Surface drainage is northwest across gradual and uniform gradients.

Surface soil conditions were investigated by drilling four 11-foot deep borings in the area and northwest of the transformer oil spill. The logs of the borings are presented in Appendix A.

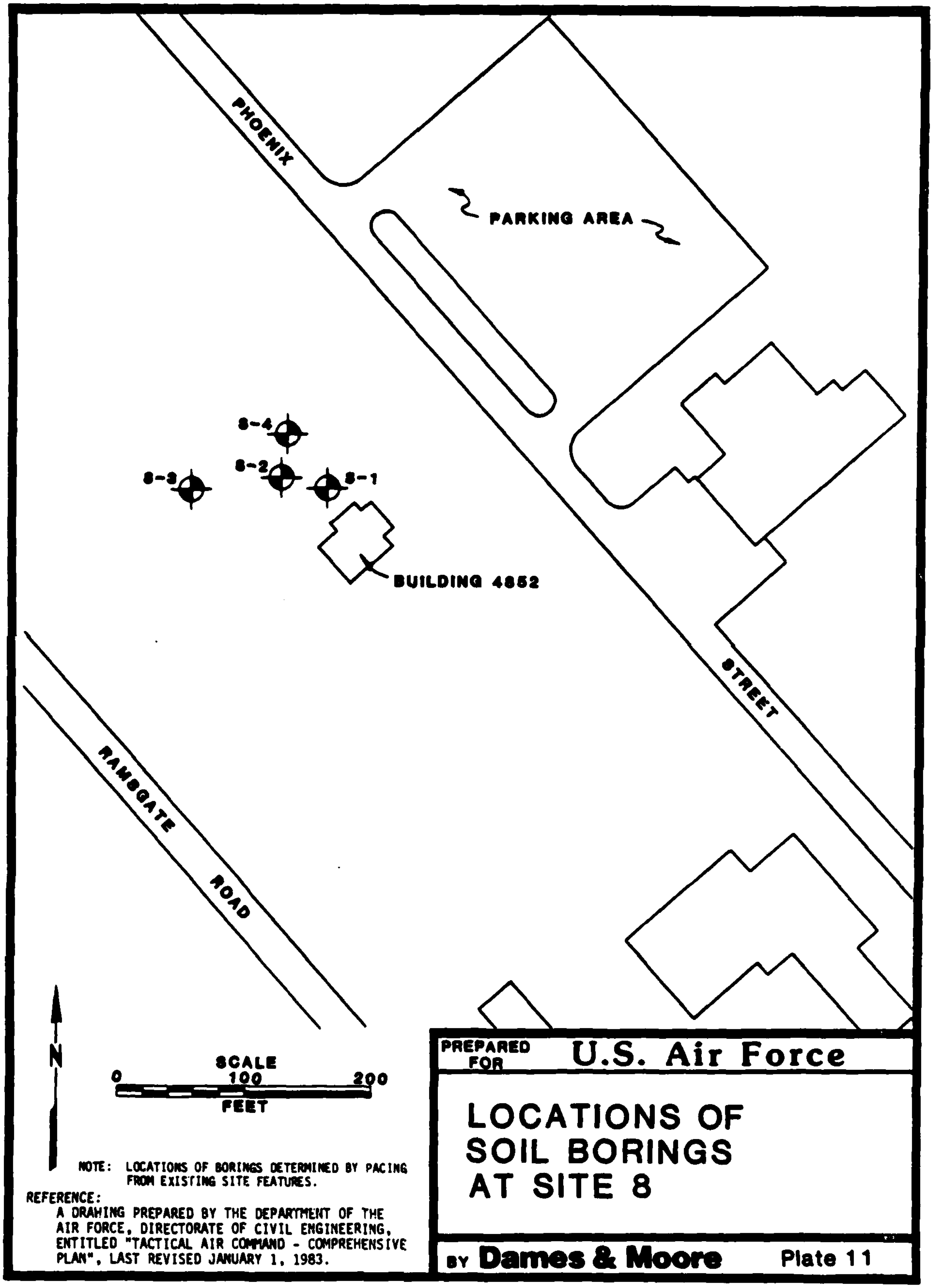
Subsurface soils consisted of brown to tan mixed clayey sands and sandy clays. Subsoils were often mottled in the presence of lightly to moderately cemented nodules. Moisture contents were damp. Ground water was not encountered in any boring. Nearly all auger cuttings had a significant odor. HNU readings ranged from less than 1 to 5 ppm, and all explosimeter readings were zero.

9. Site 4

The north ramp fire training area, designated as Site 4, is located near Taxiway No. 4, as shown in Plates 2 and 8. The site consists of two circular-shaped fire training areas similar to those at the existing fire training area (Site 3). Because of their inactivity since 1968, vegetation has somewhat disguised their appearance -- the northern area by native desert shrub brush, and the southern area by seeded grass. Within each area, however, portions of the surface are darkened and contained bits of scrap metal.

Subsurface soil conditions were investigated by drilling one 11-foot deep boring in the approximate center of each of the two circular-shaped fire training areas. Locations of the borings are shown in Plate 8. The logs of the borings are presented in Appendix A.

Subsurface soils consisted of mixed and mottled brown sandy clays and clayey sands. Soils in Boring 4-1 graded to sand with some fines at depth. Mottling was the result of light to occasionally heavy cementation. Moisture ranged from damp to slightly damp. No ground water was encountered in either boring. All HNU readings were 2 ppm or less, and all explosimeter readings were less than 1 percent of the lfl.



NOTE: LOCATIONS OF BORINGS DETERMINED BY PACING FROM EXISTING SITE FEATURES.

REFERENCE:
A DRAWING PREPARED BY THE DEPARTMENT OF THE AIR FORCE, DIRECTORATE OF CIVIL ENGINEERING, ENTITLED "TACTICAL AIR COMMAND - COMPREHENSIVE PLAN", LAST REVISED JANUARY 1, 1983.

PREPARED FOR **U.S. Air Force**

LOCATIONS OF SOIL BORINGS AT SITE 8

BY **Dames & Moore** Plate 11

10. Site 25

The AMARC (formerly MASDC) tow road, designated as Site 25, is located along the approximate centerline of the AMARC (formerly MASDC) area in the east-central area of the base, as shown in Plate 2. The road is a long, wide, linear, at-grade clearing, with or without gravel surface, extending both north-south and east-west through the AMARC (formerly MASDC) area. In some areas, especially along the eastern portion of the road, the surface contains a relatively thin layer of bituminous materials.

Subsurface soil conditions were investigated by drilling nine approximately 11-foot deep borings along the approximate centerline of the tow road, as shown in Plate 9. The logs of the borings are presented in Appendix A.

Subsurface soils along the alignment of the tow road consisted of mixed brown to off-white clayey sands. Cementation was light to occasionally heavy, and moisture usually ranged from damp to slightly damp. No ground water was encountered in any boring. Auger cuttings occasionally had some slight to very slight odor. All HNU and explosimeter readings were zero.

E. HISTORIC GROUND WATER PROBLEMS

Three ground water-related problems -- ground water mining, land subsidence due to ground water mining, and ground water contamination -- occur in the Tucson basin. At present, only ground water mining affects the base. All three problems are described below.

Mining of ground water occurs when ground water withdrawal exceeds the rate at which the aquifer is recharged. Ground water mining is causing water levels to decline throughout the Tucson basin. The rate of decline varies with the amounts of local recharge and pumpage. According to Davidson (1973), the greatest rates of decline have occurred along the Santa Cruz River northwest and southwest of Davis-Monthan AFB and in an area about 2 miles northeast of the base. Declines in these areas were as high as 130 feet between 1943 and 1983. Current data indicate decline rates have decreased in many areas within the Tucson basin. Water-level elevation rises have also been measured in some locations near major stream channels.

Ground water mining has caused ground water levels beneath Davis-Monthan AFB to decline from 70 to more than 100 feet in the northwest part of the base to less than 20 feet in the southeast part of the base between 1953 and 1982. The rate of decline ranges up to about 4 feet per year. The declines are due to pumpage by off-base wells rather than the relatively low ground water usage by the base (CH2M Hill, 1982).

Besides declining ground water levels, mining of ground water may cause land subsidence. The aquifer materials beneath the Tucson basin are generally unconsolidated, and the granular skeleton is partially stabilized by the buoyancy of the particles that comprise the aquifer. When ground water is removed, the aquifer consolidates, causing the ground surface to subside. Fissures due to subsidence normally occur near the edges of a basin, but may also occur within the interior of the basin at locations where underlying bedrock extends near to the surface.

Although fissures caused by land subsidence have not appeared at Davis-Monthan AFB (CH2M Hill, 1982), fracturing has occurred near Picacho, Arizona (Holzer et al., 1979) located about 40 miles northeast of Tucson, and in other areas of south-central Arizona. The significance of fractures is that they can create potential conduits to the water table for contaminants.

Ground water contamination has occurred in various portions of the Tucson basin. Contaminants to date include trichloroethylene (TCE), 1,1,1-trichloroethane (TCA), dichloroethylene (DCE), chromium, sulfates, nitrates, and total dissolved solids (TDS). These contaminants have been related to such operations as manufacturing, mining, agriculture, and effluent disposal. None of these known contaminants have been identified as emanating from the base.

F. LOCATIONS OF WELLS ON AND OFF BASE

Construction details for the base wells are listed in Table 3, and the base well locations are shown in Plate 4. CH2M Hill (1982) identified several municipal and private wells northwest, north, and northeast of the base. The locations of these wells are also shown in Plate 4.

TABLE 3

BASE WELL CONSTRUCTION DETAILS[a]

BASE WELL NUMBER	DATE INSTALLED	DIAMETER (in.)	MAXIMUM RATED FLOW (gpm)	WELL DEPTH (ft)	SURFACE ELEVATION (ft)[b]	PERFORATED INTERVALS (ft)[c]	ORIGINAL STATIC WATER LEVEL (ft)[c]	1982 STATIC WATER LEVEL (ft)[c]
W-2	1941	16	600	405	2650	235- 392	200	303
W-4	1951	16	750	492	2717	270- 489[d]	244	320
W-5	1952	16	750	424	2716	250- 420	238	315
W-6	1961	14	500	600	2663	240- 490	238	311
W-8	1951	10	6	526	2899	344- 424	324	350
W-9	1969	16	650	750	2684	340- 685 739- 744	283	321
W-10	1971	16	1400	1012	2792	215- 295 310- 630 785-1000	290	331
W-11	1971	16	1500	1010	2709	318- 492 530- 580 645- 705 740- 930 960-1002	291	337

NOTE: All well casings are 16-inch steel with machine-drilled screens.

[a]From CH2M Hill (1982).

[b]Above mean sea level (MSL).

[c]Below ground surface.

[d]Arizona Department of Water Resources, 1986.

III. FIELD PROGRAM

A. DEVELOPMENT

The field program was developed by previous phases of the IRP. During Phase I, all of the sites at which hazardous wastes were handled or disposed of were identified, and the sites with the highest potential environmental impact were selected. A field program to confirm the site selections was developed in Phase I and evaluated during the Phase II Presurvey. The Air Force chose portions of the Phase II Presurvey recommendations to comprise the Phase II, Stage 1 program based on the severity of the sites. Some changes, such as the incorporation of the Site 10 investigation into the Site 1 investigation, were suggested to and approved by the Air Force after field work had begun.

The field program consisted of the following activities:

1. Drilling, geologically logging, constructing, and developing two monitor wells at Site 1.

2. Sampling and measuring static water levels of the two monitor wells at Site 1.

3. Sampling and measuring static water levels of base wells W-2, W-4, W-5, W-6, W-8, W-9, W-10, and W-11.

4. Surveying of each monitor well location and elevation by Air Force personnel.

5. Drilling, geologically logging, and sampling of six 50-foot deep soil borings at Site 1; three 20-foot deep soil borings at Site 18; ten 6½-foot deep soil borings at Site 7; four 21-foot deep soil borings at Site 19; one 21-foot deep soil boring at each of Sites 20, 21, and 17; six 21-foot deep borings at Site 3; four 11-foot deep borings at Site 8; two 11-foot deep borings at Site 4; and nine 11-foot deep borings at Site 25.

6. Analyzing ground water and selected soil samples for selected parameters.

7. Backfilling the soil borings with concrete slurry.

B. IMPLEMENTATION

1. Monitor Well Installation

Two monitor wells were installed at locations north of the landfill (Site 1) between the landfill and off-base wells. The wells were drilled by B-J Drilling of Benson, Arizona using air-rotary techniques. Initially, a 14-inch boring was drilled to 19 feet, and 20 feet of 10-inch steel surface casing was cemented into the borehole with 1 foot of casing extending above the ground surface. A 10-inch borehole was then drilled to the completion depth. Cutting samples were collected at 10-foot intervals and logged in the field by a Dames & Moore geohydrologist. Hydrostratigraphic and time-stratigraphic units were not precisely determined; therefore, localized flow and transport mechanisms cannot be determined. Air exhausted from the borehole was monitored for organic and explosive vapors with a photoionization detector (HNU device) and an explosimeter. Bentonite drilling fluid was circulated in the borehole to stabilize the walls prior to installation of the well casing.

The well casing consisted of 6-inch-diameter Schedule 80 PVC pipe and well screen with 0.040-inch, machine-cut slots. Construction details are listed in Table 4. The casing and screen sections were connected with threaded joints to avoid using PVC solvent. Sand with grain size distribution between sieve sizes No. 6 and No. 10 was placed with a tremie pipe within the annulus of the borehole adjacent to the screen. A viscous, slurried bentonite seal was pumped onto the top of the sand pack. Cement-bentonite grout was pumped in two lifts from the top of the bentonite seal to the ground surface. Each monitor well was completed by constructing a concrete pad, placing a PVC slip cap on the well casing, and installing a lockable steel cap on the surface casing.

The wells were developed by airlift pumping until the discharge was clear of sand and the specific conductance was stable. Well No. 1 was pumped for about 4 hours and yielded 16 gallons per minute (gpm). Well No. 2 was also pumped for about 4 hours and yielded about 8 gpm.

2. Monitor Well Sampling

Prior to sampling, at least three casing volumes of water were pumped from each monitor well with a submersible pump. Water samples were taken using a Teflon bailer. All water samples were placed in an insulated cooler with ice and delivered to the analytical laboratory within 24 hours of sampling. Table 5 lists the chemical parameters and preservatives.

TABLE 4

MONITOR WELL CONSTRUCTION DETAILS

ITEM	DM-1	DM-2
Depth of borehole, feet below ground (fbg)	330	367
Boring diameter = 14 inches, fbg	0 to 19	0 to 19
Boring diameter = 10 inches, fbg	19 to 330	19 to 367
Screened interval, fbg	280 to 330	277 to 327*
Sand pack, fbg	257 to 330	245 to 367
Bentonite seal, fbg	240 to 257	230 to 245
Cement - bentonite grout, fbg	0 to 240	0 to 230
North state plane coordinate	426,540	426,850
East state plane coordinate	815,950	816,400
Ground surface elevation, ft (MSL)	2615.1	2618.1
Top of 6" PVC pipe elevation, ft (MSL)	2615.9	2619.0
Depth to water (12-8-83), fbg	290.0	292.1

*Non-slotted PVC pipe from 327 to 367 feet below ground.

TABLE 5

PARAMETERS AND PRESERVATIVES FOR GROUND WATER AND SOIL ANALYSES

PARAMETER	PRESERVATIVE	CONTAINER	MAXIMUM HOLDING TIME	SAMPLE VOLUME (ml)	ANALYTICAL METHOD[a]
		GROUND WATER SAMPLES			
Oil and Grease	Cool, 4°C H_2SO_4 or HCl to pH<2	Glass	24 hours	1,000	EPA 413.2
Heavy Metals (including Lead)	Filter on site HNO_3 or HCl to pH<2	Plastic, Glass	6 months	250	EPA 200 series[b,c]
Phenol	H_3PO_4 to pH<4 1.0 g $CuSO_4$ per liter	Glass	24 hours	1,000	EPA 420.2[b]
Pesticides	Cool, 4°C	Glass, Teflon Cap	24 hours	1,000	EPA 608[b]
Volatile Aromatics	Cool, 4°C	Glass, Teflon Cap	24 hours	40	EPA 601
Volatile Halocarbons	Cool, 4°C	Glass, Teflon Cap	24 hours	40	EPA 602
Total Organic Carbon	Cool, 4°C H_2SO_4 or HCl to pH<2	Glass	28 days	25	EPA 415.1
		SOIL SAMPLES			
Oil and Grease	Freeze	Glass	24 hours	500 g	EPA 413.2[b]
Volatile Aromatics	Freeze	Glass	24 hours	500 g	EPA 601[b]
Volatile Halocarbons	Freeze	Glass	24 hours	500 g	EPA 602[b]

[a]From "Methods for Chemical Analysis of Water and Wastes," USEPA (1978), and "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater," USEPA (1982).

[b]Method modifications and extraction procedures for soils are referenced in Appendix D.

[c]USEPA Methods 206.2, 213.1, 218.1, 220.1, 239.1, 245.1, 249.2, 270.2, 272.1, 289.1 for metals.

Table 6 lists field measurements of the depth to water, pH, conductivity, and temperature. The depth to water was measured with an electric tape. Measurements of pH were made with a Hach Model 19000 temperature-compensated, digital pH meter equipped with a combination electrode. The meter was calibrated using pH 4 and pH 7 buffers. Conductivity measurements were made with a Markson Science Model 10-B temperature-compensated conductivity meter, calibrated with a 716 micromhos per centimeter (μmhos/cm) standard solution. Conductivity measurements were reported at 25°C. Temperature was measured with a cibachrome dial thermometer. The portion of the sample to be analyzed for metals was filtered through a 0.45-micron membrane in the field with a barrel-shaped pressure filter.

3. Base Well Sampling

Base wells W-2, W-4, W-5, W-6, W-8, W-9, W-10, and W-11 were sampled during the Phase II, Stage 1 investigation. Prior to sampling, depth to water was measured where possible with the built-in air line and direct-reading gage. However, the air line was not functional for most of the base wells. The pump was then run for at least 10 minutes to remove one to four casing volumes, and the sample bottles were filled from a spigot on the discharge line. Removal of less than three casing volumes should not have affected sample quality because all of the wells, except base well W-5, are pumped intermittently during normal daily use. Base well W-5 had not been in use for some time, and at least three casing volumes were pumped prior to sampling. Measurements of pH, conductivity, and temperature were made as described above. These data are listed in Table 6. The sample bottles were placed in an insulated cooler with ice and delivered by air freight to the analytical laboratory within 24 hours of sampling.

4. Monitor Well Location and Elevation Survey

The location and elevation of each of the two monitor wells (and six soil borings) at Site 1 were surveyed after completion of the field work. The survey work was performed by personnel from the 836th Civil Engineering Squadron at Davis-Monthan AFB. Vertical and horizontal control were reported to the nearest 0.01 foot. Vertical control for each monitor well was established at ground level beside the steel surface casing. Horizontal control for all wells was established using State plane coordinates. The results of the survey work are presented in Appendix I.

TABLE 6

GROUND WATER QUALITY PARAMETERS MEASURED IN THE FIELD

WELL	SAMPLING DATE	pH	SPECIFIC CONDUCTIVITY (μmhos/cm)	TEMPERATURE (°C)	NUMBER OF CASING VOLUMES PUMPED	DEPTH TO WATER BELOW GROUND SURFACE	
						FEET	DATE
Monitor Well DM-1	8 Dec 83	7.55	480	26	10	290.0	8 Dec 83
Monitor Well DM-2	8 Dec 83	7.49	490	26	4	292.1	8 Dec 83
Base Well W-2	7 Feb 84	8.0	369	27	4	303	May 80
Base Well W-4	7 Dec 83	7.44	350	23	4	336	7 Dec 83
Base Well W-5	24 Feb 84	7.8	300	21	4	314.5	1980
Base Well W-6	8 Feb 84	7.9	400	23	3*	311.3	Mar 80
Base Well W-8	7 Feb 84	7.8	250	24	1*	350	Jul 82
Base Well W-9	8 Feb 84	7.9	251	22	1	329	Jan 84
Base Well W-10	7 Feb 84	8.0	381	25	1	339.5	Jan 84
Base Well W-11	24 Feb 84	7.8	391	24	2*	324.4	Jan 84

*Pump was running or had been in operation immediately prior to sampling.

5. Soil Sampling

The soil sampling program completed during this study consisted of drilling, sampling, and geologically logging six 50-foot deep borings at Site 1; three 20-foot deep borings at Site 18; ten 6½-foot deep borings at Site 7; four 21-foot deep borings at Site 19; one 21-foot deep boring at each of Sites 20, 21, and 17; six 21-foot deep borings at Site 3; four 11-foot deep borings at Site 8; two 11-foot deep borings at Site 4; and nine 11-foot deep borings at Site 25. The borings were advanced with either a CME 55 or CME 45 drill rig using hollow-stem or conventional auger techniques. Locations of the borings are shown in Plates 4 through 11.

The field explorations were continuously supervised by a Dames & Moore geotechnical engineer who classified the soils encountered and maintained a complete log for each boring. All soil samples were collected by using split spoon sampling techniques, which employed a ring sampler without rings. Each sample was driven with a standard 140-pound hammer falling a distance of approximately 30 inches with each blow. Vapor from possibly contaminated soil was periodically monitored. Samples of all soils were placed in sealed, labeled containers and shipped under refrigeration with instructions to the contractor laboratory for subsequent analysis and/or frozen storage.

The logs of borings are presented in Appendix A in Plates A-2 through A-56; the key to the log of borings is presented in Plate A-1A; the classification system is presented in summary form in Plate A-1B; and the ring sampler is shown in Plate A-1C.

6. Analytical Methods

The ground water and soil samples were analyzed according to USEPA methods (1978 and 1982). Specific methods of analyses are described in Appendix D.

IV. DISCUSSION OF RESULTS AND SIGNIFICANCE OF FINDINGS

This section presents a discussion of the chemical analyses of ground water and soil samples collected during field investigations at the sites shown in Plate 2. The second part of this section discusses the significance of the results.

A. DISCUSSION OF GROUND WATER ANALYSIS RESULTS

The standards to which the results of the chemical analyses are compared are USEPA drinking water standards. The water quality criterion for each parameter is listed in Table 2. There are no enforceable standards at present for the VOCs tested for in this investigation, however, Table 2 also lists proposed maximum contamination levels (MCL) and proposed recommended maximum contamination levels (RMCL).

1. Site 1

Field investigations included installing and sampling two monitor wells immediately northwest of the landfill, and drilling and sampling six 50-foot soil borings around the periphery of the landfill. Leachate tests were not performed, since leachate was not encountered in the borings. The field investigation is described in Section III, and the complete analyses are presented in Appendices B and D.

The detectable parameters from the first sampling interval, listed in Table 7, included heptachlor in the monitor well DM-1 sample and aldrin, heptachlor, and zinc in the monitor well DM-2 sample. Heptachlor was indicated in both monitor well samples, at a concentration of 0.12 micrograms per liter (µg/L) in monitor well DM-1 and 0.06 µg/L in monitor well DM-2. Aldrin was indicated in the monitor well DM-2 sample at 0.02 µg/L. No drinking water standards are established for heptachlor or aldrin. A non-enforceable recommended maximum contamination level (RMCL) of zero ppm has been proposed for heptachlor. Zinc was present in the monitor well DM-2 sample at 110 µg/L, well below the secondary drinking water standard of 5,000 µg/L.

A second sampling of DM-1 and DM-2 was undertaken in November 1984 to confirm the pesticide results (see Section IV.A.3). The presence of pesticides in the ground water at DM-1 and DM-2 was not confirmed by the sampling of November 1984.

TABLE 7

SUMMARY OF CONSTITUENTS ABOVE DETECTION LIMITS IN GROUND WATER ANALYSES

CONSTITUENT (μg/L)	11/83					2/7/84	2/24/84	11/15/84					
	DM-1	DM-2	W-4	W-9	W-10	W-11	W-11	DM-1	DM-2	W-4	W-9	W-10	W-11
Aldrin	ND	0.02	--	--	--	--	--	ND	ND	--	--	--	--
Heptachlor	0.12	0.06	--	--	--	--	--	ND	ND	--	--	--	--
Zinc	ND	110.	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	7.3	1.0	ND	6.3	--	--	--	ND	ND	ND
Chloroform	--	--	--	0.7	ND	ND	1.4	--	--	--	ND	ND	ND
1,2-Dichloroethane	--	--	--	ND	ND	ND	1.1	--	--	--	ND	ND	ND
Oil and Grease	--	--	200	ND	ND	--	ND	--	--	3800	--	--	--
Phenol	--	--	--	ND	ND	200	--	--	--	--	--	--	--

Notes: ND indicates parameter not detected (limits of detection given in Table 2).
-- indicates parameter not analyzed.

2. Results of Base Well Sampling

Ground water samples were collected and analyzed from eight base wells: W-2, W-4, W-5, W-6, W-8, W-9, W-10, and W-11. The base wells are located in the central and southeastern portions of the base (Plate 4). Sampling methods are given in Section 3.0, and the complete analyses are listed in Appendix D.

The base well samples were analyzed for volatile halocarbons, volatile aromatics, oil and grease, phenol, and lead (35 parameters). Five parameters were indicated in one or more samples from base wells W-4, W-9, W-10, or W-11, as shown in Table 7. The detectable parameters included methylene chloride, chloroform, 1,2-dichloroethane, oil and grease, and phenol. Base well W-11 VOC analysis resulted in quantification of 1,2-dichloroethane below the proposed maximum concentration level of 5 µg/L. None of the parameters were detected in the remaining base wells (W-2, W-5, W-6, and W-8).

Methylene chloride was indicated in samples from base well W-9 at 7.3 µg/L, base well W-10 at 1.0 µg/L, and base well W-11 at 6.3 µg/L. Chloroform was detected in samples from base well W-9 at 0.7 µg/L and base well W-11 at 1.4 µg/L. The base well W-11 sample contained 1.1 µg/L of 1,2-dichloroethane and 0.20 mg/L of phenol. The sample from base well W-4 contained 0.2 mg/L of oil and grease.

Analyses of samples taken from W-9, W-10, and W-11 on 15 November 1984 to confirm 24 February 1984 results (Section IV.A.3) showed no detectable VOC (see Table 7). An oil and grease analysis from W-4 showed a concentration of 3.8 mg/L when sampled in November 1984.

3. Reliability of the Ground Water Analyses

The ground water quality analyses are considered reliable by virtue of representative sampling and quality control procedures taken in the laboratory. Placement of monitor wells, well construction measures, and sampling procedures contributed to the collection of representative samples. Laboratory quality control procedures indicated the precision and accuracy of laboratory analyses. However, there is some evidence that casts doubt on the presence of aldrin, methylene chloride, and chloroform in the ground water samples.

The monitor wells were screened above and below the water table, where contaminants would be concentrated. After the monitor wells were installed, they were thoroughly developed by airlift pumping to remove traces of drilling fluid from the wells and to improve the flow of ground water into the wells. Pumping was continued until the specific conductance of the well water stabilized and the discharge was clear of sediment. At least three casing volumes of water were removed from the monitor wells and most of the base wells prior to sampling. The monitor well samples were collected with a Teflon bailer to minimize agitation and consequent aeration of the sample, which could volatilize organic chemicals. The Teflon bailer does not absorb any chemicals from the sample, and thereby prevents any adverse effects on sample chemistry and cross-contamination of subsequent samples.

The monitor wells were installed northwest of Site 1. The regional ground water gradient slopes toward the north-northwest, based on monitor well and base well water levels. Therefore, the monitor wells appear to be in the path of contaminants that may be migrating from the vicinity of Site 1. Similarly, the base wells in which contaminants were detected are in the vicinity of Site 3, where soil contamination was found. Although the wells are not downgradient from Site 3 with respect to the regional gradient, the local gradient may be reversed by pumping of the wells.

The laboratory quality control (QC) program is described in detail in Appendix B. In general, analyses of laboratory splits were satisfactory. Recovery of all the spikes ranged from 60 to 141 percent. The percentage of recovery was generally between 90 and 110 percent, and the average recovery was 100 percent. Recovery of pesticide spikes was generally less than 90 percent, although recovery of the aldrin and heptachlor spikes, the only two pesticides detected in ground water, was acceptable at 96 and 104 percent, respectively. Recoveries of spikes of the volatile aromatics were generally greater than 110 percent, although none of these chemicals were detected in ground water samples. Recoveries of spikes of metals and organics analyzed by USEPA Method 602 were satisfactory, especially for the constituents that were detected in the ground water samples. Analyses of method blanks did not result in detection of any analytes.

The presence of aldrin is difficult to explain. At the very low concentrations of aldrin detected (0.02 μg/L, just above the detection limit), ambiguities in the analytical results may erroneously indicate the presence or absence of this constituent. Although the results were rechecked, the analyst acknowledged that it is possible that the results may have been caused by a constituent other than aldrin. There are also physical reasons why aldrin would not be expected to be present. Aldrin is a relatively unstable compound and readily converts to dieldrin, which is one of the more persistent chlorinated pesticides (USEPA, 1979). It would be more likely that both aldrin and dieldrin, or dieldrin alone, would be detected rather than only aldrin. Analyses of samples of the wells where aldrin was detected, taken on 15 November 1984 to confirm the earlier results, showed no aldrin or dieldrin present. The results are inconclusive as to the presence of aldrin.

The presence of methylene chloride and chloroform may also be questionable. Laboratory method blank analysis did not result in detection of either methylene chloride or chloroform. However, methylene chloride is commonly used in analytical laboratories as a solvent, and its detection in water samples is often suspicious. A study by the American Petroleum Institute (API, 1981) rejected analyses of methylene chloride because it was found in 15 of 17 laboratory blanks at concentrations of up to 32 µg/L. Chloroform was detected in 5 of the 17 laboratory blanks. Although chloroform is not often used in the laboratory, it may be formed in the sample by a reaction between free chlorine or chlorinated compounds and organic material.

The laboratory blanks analyzed with the Phase II, Stage 1 ground water samples contained no detectable concentrations of either methylene chloride or chloroform. However, laboratory contamination is suspected because of questionable results of analyses of base well W-11 samples. Base well W-11 had to be resampled after a sample bottle containing part of the first sample broke in transit. Neither of the compounds was detected in the first sample, collected on 7 February 1984, but the reported concentrations (see Table 7) were detected in the second sample collected on 24 February 1984. Resampling and analysis on 15 November 1984 did not confirm the presence of these compounds.

4. Background Concentrations

Information exists for background concentrations of inorganic constituents in ground water. Total dissolved solids in ground water are less than 500 mg/L, and the dominant ions are calcium, sodium, and bicarbonate (Davidson, 1973). This description agrees with an analysis presented by CH2M Hill (1982) for base well W-8 (see Table 8). Base well W-8 is located upgradient (with regard to the regional gradient) of the base facilities and probably yields background ground water quality because no waste disposal sites were identified upgradient. Table 8 shows that water from base well W-8 contained no detectable levels of heavy metals

TABLE 8

ANALYSIS OF GROUND WATER FROM BASE WELL W-8

PARAMETER[a]	WELL NO. W-8[b]	EPA PRIMARY AND SECONDARY DRINKING WATER STANDARDS
Total Depth (ft)	426.5	
Perforated Section (ft)	344 to 424	
Arsenic	<0.01	0.05
Barium	<1.0	1.0
Cadmium	<0.01	0.01
Chromium	<0.05	0.05
Lead	<0.02	0.05
Mercury	<0.002	0.002
Selenium	<0.01	0.01
Silver	<0.01	0.05
Copper	0.451	1
Iron	5.020	0.3
Manganese	<0.05	0.05
Zinc	0.646	5
Calcium as Ca	22.7	—
Magnesium as Mg	4.3	—
Potassium	1.1	—
Sodium	17.6	—
Alkalinity, total as $CaCO_3$	106	—
Chloride	8	250
Hardness as $CaCO_3$	74	—
Residue, Filterable (TDS)	140	500
Residue, Non-filterable (SS)	1	—
Residue	141	—
Specific Conductance (μmhos/cm)	230	—
Sulfate as SO_4	9	250
Nitrate as N	1.4	10
Fluoride	0.2	1.4 to 2.4
Turbidity, JTU	3	—
Silica	28.0	—

Source: USAF OEHL, Brooks AFB, Texas in CH2M Hill (1983).
[a]Parameters are in mg/L unless otherwise noted.
[b]Sampled February 6, 1981.

except low concentrations of copper and zinc. The concentration of iron was quite high, and the water was moderately hard. CH2M Hill (1982) indicated the probable cause of elevated iron concentrations to be corrosion of steel well casing. According to Davidson (1973), ground water quality deteriorates at depths of 1,500 to 2,000 feet with increased concentrations of salts. In general, ground water above these depths is suitable for most uses, based on concentrations of inorganic constituents. Drinking water is routinely monitored weekly for chlorine residual, pH, and bacteria (CH2M Hill, 1982). Background concentrations of man-made organic parameters and pesticides in ground water beneath Davis-Monthan AFB are assumed to be zero. Periodic analyses have also been made for heavy metals, pesticides, radiation, and TCE.

B. SIGNIFICANCE OF FINDINGS

Based on the results described in the previous section, this section will estimate, to the degree possible, the extent of contamination at each site and the risk to human health, if determinable, that the contamination poses. Contamination is considered present when contaminants are measured at concentrations greater than background levels.

1. Extent of Contamination at Site 1 (Includes Site 10)

Contamination of ground water beneath Site 1 was initially suggested by the presence of aldrin and heptachlor in samples from the monitor wells, but this was not confirmed in a later ground water sampling. Identification of low concentrations of methylene chloride, toluene, oil and grease, aldrin, heptachlor, and DDT in soil samples indicates that contaminants may also be present in the soil. Since the solvent and pesticide results were not confirmed by second column analysis during the initial analyses, the results have to be considered questionable. According to CH2M Hill (1982), pesticides and fuel tank cleaning sludge were disposed of in the landfill (Site 1). These contaminants may be the source of oil and grease, toluene, aldrin, heptachlor, DDT, and methylene chloride in the soil. The results indicate that traces of the contaminants have migrated laterally at least 300 feet to where the six soil borings were drilled around the perimeter of the landfill. All the above soil contaminants were found at various depths to 50 feet except methylene chloride, which readily volatilizes, and DDT, which can sorb onto soil particles. All the borings were terminated at 50 feet. It is not possible to define a horizontal or vertical extent of contamination.

It is likely that the most highly contaminated soil is directly beneath the landfill. Contaminants not sorbed by soil particles or attenuated by bacterial action would migrate vertically downward to the water table and then be carried by ground water flow. The principal impetus for downward migration would be ponding of water in the landfill or disposal of liquid wastes. Site 1 is northwest (approximately downgradient based on the regional gradient) of the base wells. However, three water supply wells are located immediately northwest of the base (CH2M Hill, 1982) and in the path of ground water after passing beneath Site 1. The water supply wells are 8,000 to 12,000 feet from the landfill.

Observed soil pesticide contamination is judged to pose little or no threat to human health under minimal contact conditions. The pesticide contaminant concentrations were found at depths greater than 5 feet. Contamination of monitor wells was not substantiated in a second sampling.

A potential exists for contaminants from Site 1 to affect ground water quality. The regional water table gradient indicates that any contamination that may reach the water table will migrate off base to the northwest. Contaminants are carried by water infiltrating under unsaturated conditions. Infiltration rates were not measured at this site but are assumed to be as high as several feet per year. Based on available data contained in this report, it is not possible to predict when or if contaminants will reach the water table and the degree of health risk that could be created by ground water contamination.

2. Extent of Contamination at Site 18

Hazardous wastes present in the soils at this site are presumably derived primarily from waste fuels, lubricants, and solvents. Table 9 lists the contaminants that were detected in the soil samples at the site. The principal contaminants are the VOCs and oil and grease. The contaminants detected in samples from the base wells are listed in Table 7 and include methylene chloride, chloroform, 1,2-dichloroethane, oil and grease, and phenol.

Samples from Site 18 contained up to 12 mg/g of oil and grease in the upper ½ foot of soil and 8 μg/g of phenol at a depth of 10½ feet. Vinyl chloride and methylene chloride were detected in samples from ½ foot to the deepest sample analyzed at 10½ feet. Vinyl chloride is a human carcinogen and has proposed maximum contamination levels (MCLs) for drinking water of 1 μg/l. It appears that no horizontal or vertical extent of migration can be defined.

TABLE 9

SUMMARY OF CONSTITUENTS ABOVE DETECTION LIMITS IN SOIL ANALYSES

PARAMETER	CONSTITUENT	SITE AND BORING NUMBER[a]	SAMPLE NUMBER	SAMPLE DEPTH (ft)	CONCENTRATION (μg/g)[b]
Pesticides	Aldrin	1-5	9	40½	0.007
	o,p-DDT	1-5	2	5½	0.46
	Heptachlor	1-1	5	20½	0.004
	"	1-1	11	50½	0.004
	"	1-2	3	10½	0.004
	"	1-5	4	15½	0.002
	"	1-6	8	35½	0.002
Volatile Organic Compounds	Methylene Chloride	1-3	2	5½	0.04
	"	1-3	5	20½	0.03
	Toluene	1-1	2	5½	0.07
	"	1-1	4	15½	0.02
	"	1-3	2	5½	0.04
	"	1-3	9	40½	0.01
	"	1-4	1	½	0.01
	"	1-5	1	½	0.02
	"	1-6	5	20½	0.05
Oil & Grease	Oil & Grease	1-1	2	5½	0.07
	"	1-1	4	15½	0.05
	"	1-1	8	35½	0.07
	"	1-2	2	5½	0.07
	"	1-2	6	25½	0.09
	"	1-2	11	50½	0.08
	"	1-3	2	5½	0.06
	"	1-3	5	20½	0.12
	"	1-3	9	40½	0.06
	"	1-4	1	½	0.07
	"	1-4	3	10½	0.13
	"	1-4	4	15½	0.07
	"	1-4	6	25½	0.08
	"	1-5	1	½	0.17
	"	1-5	3	10½	0.19

[a]The first number in this column signifies the site number, and the second number indicates the boring number.

[b]Except for oil and grease in mg/g.

[c]Because of interfering peaks on the chromatogram, the sample was diluted 1:10, and the Limit of Detection (LOD) was adjusted accordingly. Confirmatory reanalyses by GC/MS (USEPA Method 624) in November 1984 using samples from frozen storage were unable to resolve the interference and achieve acceptable detection limits.

PARAMETER	CONSTITUENT	SITE AND BORING NUMBER[a]	SAMPLE NUMBER	SAMPLE DEPTH (ft)	CONCENTRATION (μg/g)[b]
Oil & Grease	Oil & Grease	1-5	7	30½	0.08
	"	1-5	10	43½	0.12
	"	1-6	1	½	0.06
	"	1-6	5	20½	0.09
	"	1-6	10	45½	0.06
Lead	Lead	18-1	1	½	17
	"	18-1	2	2½	17
	"	18-1	3	4½	19
	"	18-1	4	6½	13
	"	18-1	5	8½	12
	"	18-2	1	½	37
	"	18-2	6	10½	21
	"	18-3	1	½	26
	"	18-3	2	2½	14
	"	18-3	5	8½	12
Phenol	Phenol	18-2	6	10½	8
Oil & Grease	Oil & Grease	18-1	1	½	0.13
	"	18-1	2	2½	0.20
	"	18-1	3	4½	0.09
	"	18-1	4	6½	0.10
	"	18-1	5	8½	0.12
	"	18-2	1	½	12
	"	18-2	2	2½	0.15
	"	18-2	3	4½	0.17
	"	18-2	6	10½	0.06
	"	18-3	1	½	1.6
	"	18-3	2	2½	0.07
	"	18-3	5	8½	0.06
Volatile Organic Compounds	Methylene Chloride	18-1	3	4½	0.06
	"	18-2	2	2½	0.02
	Vinyl Chloride	18-2	2	2½	0.29
	"	18-2	3	4½	0.14
	"	18-2	6	10½	0.24
	"	18-3	1	½	0.14
	Purgeable Halocarbons	18-2	1	½	<500xLOD[c]
	Purgeable Aromatics	18-2	1	½	<5000xLOD[c]

TABLE 9 (continued)

PARAMETER	CONSTITUENT	SITE AND BORING NUMBER[a]	SAMPLE NUMBER	SAMPLE DEPTH (ft)	CONCENTRATION (μg/g)[b]
PCBs	Arochlor 1260	7-5	1	½	0.05
Lead	Lead	19-1	1	2½	22
	"	19-1	2	5½	28
	"	19-1	5	20½	27
	"	19-2	1	2½	19
	"	19-2	3	10½	30
	"	19-2	4	15½	21
	"	19-3	2	5½	17
	"	19-3	3	10½	27
	"	19-4	2	5½	17
	"	19-4	5	20½	23
Volatile Organic Compounds	Toluene	19-2	4	15½	0.03
Heavy Metals	Arsenic	20-1	1	2½	1.8
	"	20-1	4	15½	3.3
	"	20-1	5	20½	4.1
	"	21-1	2	5½	2.3
	Cadmium	20-1	1	2½	1.5
	"	20-1	4	15½	2.9
	"	20-1	5	20½	2.5
	"	21-1	2	5½	4.8
	"	21-1	3	10½	1.6
	"	21-1	4	15½	2.6
	Copper	20-1	1	2½	9.3
	"	20-1	4	15½	21
	"	20-1	5	20½	18
	"	21-1	2	5½	13
	"	21-1	3	10½	18
	"	21-1	4	15½	11
	Lead	20-1	1	2½	13
	"	20-1	4	15½	27
	"	20-1	5	20½	22
	"	21-1	2	5½	22
	"	21-1	3	10½	11
	"	21-1	4	15½	13
	Nickel	20-1	1	2½	9.9
	"	20-1	4	15½	26
	"	20-1	5	20½	22
	"	21-1	2	5½	28
	"	21-1	3	10½	11
	"	21-1	4	15½	18

TABLE 9 (continued)

PARAMETER	CONSTITUENT	SITE AND BORING NUMBER[a]	SAMPLE NUMBER	SAMPLE DEPTH (ft)	CONCENTRATION (μg/g)[b]
	Silver	20-1	4	15½	1.2
	"	20-1	5	20½	0.9
	"	21-1	2	5½	1.2
	"	21-1	4	15½	0.8
	Zinc	20-1	1	2½	22
	"	20-1	4	15½	56
	"	20-1	5	20½	46
	"	21-1	2	5½	37
	"	21-1	3	10½	27
	"	21-1	4	15½	28
Lead	Lead	17-1	1	1½	14
	"	17-1	4	10½	10
Volatile Organic Compounds	Chloroform	3-1	5	20½	0.02
	Purgeable Aromatics	3-1	2	5½	<200xLOD[c]
	"	3-2	2	5½	<50xLOD[c]
	"	3-2	3	10½	<200xLOD[c]
	"	3-6	2	5½	<100xLOD[c]
	"	3-6	3	10½	<200xLOD[c]
	"	3-6	5	20½	<100xLOD[c]
	Ethylbenzene	3-6	2	5½	5[c]
	"	3-6	5	20½	4[c]
Lead	Lead	4-1	1	2½	48
	"	4-1	2	5½	39
	"	4-1	3	10½	18
	"	4-2	1	2½	46
	"	4-2	2	5½	40
Oil & Grease	Oil & Grease	8-1	1	½	34
	"	8-2	1	½	1.7

PARAMETER	CONSTITUENT	SITE AND BORING NUMBER[a]	SAMPLE NUMBER	SAMPLE DEPTH (ft)	CONCENTRATION (μg/g)[b]
Lead	Lead	25-1	1	½	21
	"	25-1	2	2½	14
	"	25-1	4	10½	14
	"	25-2	1	½	24
	"	25-2	2	2½	15
	"	25-3	1	½	54
	"	25-4	1	½	13
	"	25-4	2	2½	15
	"	25-7	2	2½	15
	"	25-7	3	5½	14
	"	25-8	4	10½	15
	"	25-9	1	½	15
	"	25-9	2	2½	15
PCBs	Arochlor 1260	25-2	1	½	0.08
Oil & Grease	Oil & Grease	25-1	4	10½	0.07
	"	25-2	1	½	0.08
	"	25-3	1	½	10
	"	25-8	1	½	1.3
Volatile Organic Compounds	Methylene Chloride	25-3	1	½	0.19
	"	25-3	2	2½	0.46
	"	25-6	4	10½	0.07
	"	25-9	2	2½	0.01
	"	25-9	4	10½	0.07
	1,1,1-Trichloroethane	25-2	3	5½	0.05
	1,1 - Dichloroethene	25-2	3	5½	0.16
	Tetrachloroethene	25-6	1	½	0.01
	Toluene	25-5	2	2½	0.01

Due to the interferences reported in the initial analyses, the original sample 18-2:1 was taken from frozen storage and reanalyzed. As a part of the reanalysis, this soil sample was submitted for volatile analysis by gas chromatography/mass spectrometry (GC/MS) according to a modification of USEPA Method 624. The background contamination was so severe that the GC/MS procedure was not able to achieve more reasonable detection limits than the earlier 601/602 analyses; therefore, the results of reported concentrations of contaminants in 18-2:1 are considered unreliable, and further modified testing would be required to resolve this issue.

The minimal extent of ground water contamination can be estimated by the locations of the base wells in which contaminants were detected. Base wells W-4 and W-11 are within about 2,500 feet of each other and Site 18. Water was encountered in each boring at Site 18. Contaminants from Site 18 could be carried downgradient (with regard to the regional gradient) and captured in the cones of depression in the ground water surface created by pumping base wells W-4 and W-11. Ground water from base well W-4 is contaminated by oil and grease, and ground water from base well W-11 is contaminated by phenol.

The base wells in which no contaminants were found were W-2, W-5, W-6, and W-8. Initial indications of contamination in base wells W-9 and W-10 were not confirmed upon resampling. Base well W-8 is upgradient (with regard to the regional gradient) from all the waste sites. Base wells W-2 and W-6 may define the western extent of contamination, and base well W-5 may be at the eastern limit of contamination. The absence of contaminants in base well W-5 samples may also indicate that Site 18 is a minor contributor to ground water contamination, because the well appears to be in a position to intercept contaminants from this site.

The quantification of vinyl chloride, a human carcinogen, at Site 18 indicates a potential for human exposure. Potential exposure routes may include direct contact, inhalation, and contaminated ground water.

3. Extent of Contamination at Site 7

Transformer oil suspected of containing polychlorinated biphenyls (PCBs) was spilled at Site 7. Samples for testing were selected from surface and near-surface strata on the basis of appearance and odor, if possible. PCBs were quantified at the detection limit in a near-surface sample from Boring 7-5. Samples from nine other borings located at distances greater than 30 feet from Boring 7-5 had no detectable PCBs. If the potential spill site is less than 30 feet in diameter, it is possible that Boring 7-5 may have penetrated the edge of the contaminated soil, which would be between Boring 7-5 and the surrounding borings. No second column confirmation analyses were performed on the Boring 7-5 sample in which PCB was detected; however, method blanks resulted in no PCB detection. Horizontal extent of contamination may be limited to an area 30 feet in diameter and vertically limited to a depth of 5 feet or less.

4. Extent of Contamination at Site 19

Hazardous wastes present in the soils at this site are presumed to be derived primarily from waste fuels, lubricants, and solvents. Table 9 lists the contaminants that were detected in the soil samples at the site. The principal contaminants are toluene and lead.

Toluene was detected at the greatest sample depth analyzed from Boring 19-2. An extent of VOC contamination cannot be defined based on this one positive data point collected at depth. Lead concentrations greater than 10 µg/g contrasted with analyses where lead was not detected, indicating a background concentration of less than 10 µg/g. Possible lead contamination was noted for all Site 19 borings to termination depths, although concentrations are within the United States range (see Table 10).

5. Extent of Contamination at Site 20

Hazardous wastes at this site presumably would be derived from waste fuels, lubricants, and solvents. Table 9 lists the constituents that were detected in soil samples from the site.

Phenol, oil and grease, and volatile halocarbons measured by USEPA Method 601 were below detection limits in soil samples from this site. The concentrations of heavy metals were within the range that would be considered normal background levels (Table 10). However, on-site borings indicate that background concentrations of arsenic may be less than 1 µg/g and lead may be less than 10 µg/g. Therefore, the levels reported for arsenic and lead may be elevated somewhat above what may occur naturally in local soils.

6. Extent of Contamination at Site 21

Hazardous wastes at this site presumably would be derived from waste fuels, lubricants, and solvents. Table 9 lists the constituents that were detected in soil samples from the site.

TABLE 10

TYPICAL AND CONTAMINATED LEVELS OF METALS IN SOILS

METAL	U.S. RANGE[a] (ppm)	WESTERN U.S. MEAN[a] (ppm)	UNUSUALLY HEAVY CONTAMINATION[b] (ppm)
Antimony	<150-500[c]	—	500
Arsenic	<0.2-97	6.1	500
Barium	70-5,000	560	10,000
Beryllium	<1-7	0.6	50
Cadmium	<1-10	1	50
Chromium VI	—	—	—
Chromium III	38	3-1,500	2,500
Cobalt	8	3-50	—
Copper	21	2-300	2,500
Fluoride	250	<10-1,900	—
Lead	18	<7-700	10,000
Mercury	0.055	<0.01-4.6	50
Molybdenum	3	<3-7	—
Nickel	16	<3-700	1,000 (available)
Selenium	0.25	<0.1-4.3	50
Silver	<0.5	<0.5-5	—
Thallium	—	—	—
Vanadium	66	7-500	2,500
Zinc	51	10-2,000	5,000

[a]From Conner and Shacklette (1975).
[b]From DOE (1980).
[c]Eastern U.S. range.

Phenol, oil and grease, and volatile halocarbons measured by USEPA Method 601 were below detection limits in soil samples from this site. The concentrations of heavy metals were within the range that would be considered normal background levels (Table 10). However, arsenic was not detected in deeper samples, and lead concentrations are greater than 10 µg/g which suggests that the higher values reported may be above what may occur naturally in local soils.

7. Extent of Contamination at Site 17

No evidence of phenol, oil and grease, or VOC contamination was detected at Site 17. Although low levels of lead were measured in the soils, these levels are well within those expected in native soils (see Table 10).

8. Extent of Contamination at Site 3

Hazardous wastes present in the soils at this site are derived primarily from waste fuels, lubricants, and solvents. Table 9 lists the contaminants that were detected in the soil samples at the site. The principal contaminants are the VOCs and oil and grease. The contaminants detected in samples from the base wells W-4 and W-11 are listed in Table 7 and include methylene chloride, chloroform, 1,2-dichloroethane, oil and grease, and phenol.

The greatest suggestion of potential contamination was found at this site (Borings 3-1, 3-2, and 3-6), where jet fuel is currently burned for fire training exercises. The site exhibited strong interferences in the 601 and 602 analyses of samples to depths of 20½ feet. The Phase II, Stage 1 borings, however, were terminated at 21 feet, so it is not possible to estimate the vertical extent of the potential contamination. VOC contamination detected at termination depth at a boring near the waste fuel storage facility indicates that contamination is not limited to the fire training areas investigated by Borings 3-1 and 3-2.

Due to the interferences reported in the initial analyses, the original samples were taken from frozen storage and reanalyzed. As a part of the reanalysis, these soil samples were submitted for volatile analysis by gas chromatography/mass spectrometry (GC/MS) according to a modification of USEPA Method 624. The background contamination was so severe that the GC/MS procedure was not able to achieve more reasonable detection limits than the earlier 601/602 analyses; therefore, the results of reported concentrations of contaminants are considered unreliable, and further modified testing would be required to resolve this issue.

The extent of ground water contamination can be estimated by the locations of the base wells in which contaminants were detected sporadically. Base wells W-4 and W-11 are within about 2,500 feet of each other and Site 3. Contaminants from Site 3 could be carried downgradient and captured in the cones of depression in the ground water surface created by pumping base wells W-4 and W-11. However, no matches in contaminants were noted between Site 3 borings and base well ground water.

9. Extent of Contamination at Site 8

Transformer oil suspected of containing PCBs was dumped at Site 8. Samples for testing were selected from surface and near-surface strata (0 to 10 feet) on the basis of appearance and odor, if possible. At Site 8, up to 34 µg/g of oil and grease were found in two near-surface samples of four borings located about 40 feet apart. Although soils were collected for analysis from areas most suspect of being impacted by the transformer oil, no PCBs were detected.

10. Extent of Contamination at Site 4

Hazardous wastes at this site would be derived from waste fuels, lubricants, and solvents. Table 9 lists the constituents that were detected in soil samples from the site.

Phenol, oil and grease, and volatile halocarbons measured by USEPA Method 601 were below detection limits in soil samples from this site. The concentrations of lead were within the range that would be considered normal background levels for native soils (Table 10). Several soil samples taken from borings at other sites resulted in lead concentrations less than 10 µg/g. In comparison, Site 4 borings have elevated lead concentrations, indicating lead contamination that cannot be defined horizontally but may be defined vertically as less than 10½ feet in depth at Boring 4-2.

11. Extent of Contamination at Site 25

Hazardous wastes present in the soils at this site are derived primarily from waste fuels, lubricants, and solvents. Table 9 lists the contaminants that were detected in the soil samples at the site. The principal contaminants are the VOCs, PCB, lead, and oil and grease. The contaminants detected in samples from the base wells are listed in Table 7 and include methylene chloride, chloroform, 1,2-dichloroethane, oil and grease, and phenol.

PCB contamination appears to be limited to the area of Boring 25-2 and a depth less than 2½ feet. Contamination by VOCs and oil and grease cannot be defined horizontally or vertically based on available information. Elevated lead concentrations appear to be confined to the upper levels of the western borings of Site 25.

The extent of ground water contamination can be estimated by the locations of the base wells in which contaminants were detected. Base wells W-4 and W-11 are within about 2,500 feet of each other and Site 25. Contaminants from Site 25 could be carried downgradient and captured in the cones of depression in the ground water surface created by pumping base wells W-4 and W-11. Ground water samples from base well W-4 have oil and grease contamination. Base well W-4 has a turbine pump that is lubricated through the shaft (the well was constructed in 1951 and has the original pump). The pump may be the source of oil and grease in this well.

V. ALTERNATIVE MEASURES

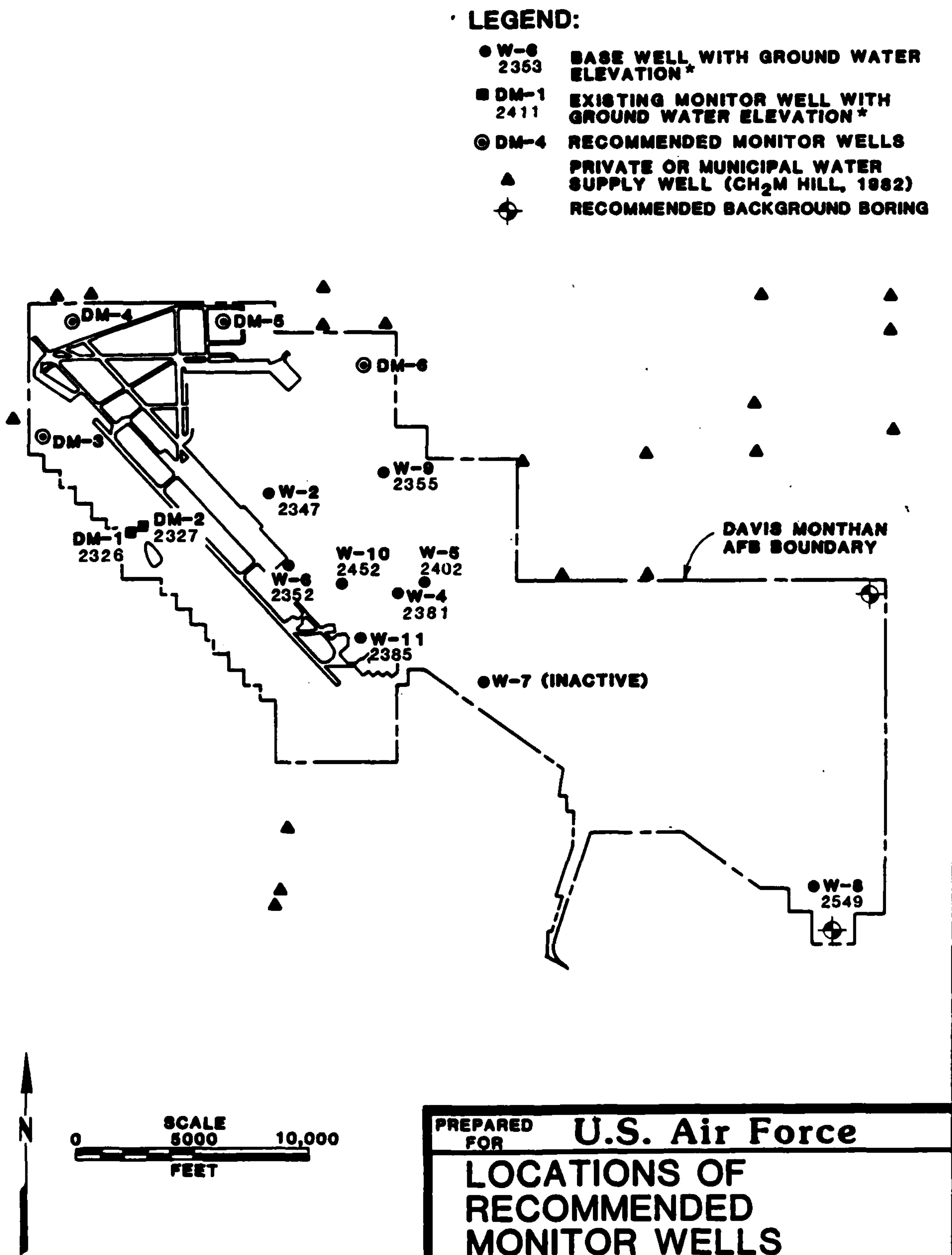
Phase II, Stage 1 of the Installation Restoration Program resulted in the indication of contamination at all sites investigated. The extent and significance of contamination could not be defined due to the limited investigative program. A list of alternative measures has been developed based upon the results of the analyses conducted during this investigation. These measures are not applicable to all sites but include:

- Soil-gas survey;
- Ground water quality monitoring;
- Additional wells and borings;
- Background boring;
- Aquifer tests; and
- Private well inventory.

A soil-gas survey can be conducted at those sites that have indicated VOC contamination. The soil-gas survey will allow a delineation of upper vadose zone VOC contamination and assist in siting additional as well as confirmation borings. Horizontal extent of soil contamination would be better defined; however, the soil-gas survey is not expected to reveal ground water contamination. The depth to the regional water table is too great for a soil-gas survey to yield accurate or strong detection of contamination emanating from the regional ground water.

Based on the Phase II, Stage 1 results, numerous sites where contamination was indicated will require confirmation boring. All confirmation borings should be drilled to 60 feet. Where conditions indicate, special construction measures should be taken in the course of boring to protect ground water quality. At sites where the extent of contamination indicates possible impact to ground water quality, additional ground water monitor wells may be needed.

Background data on inorganics for soil are needed. Background borings are necessary to determine the naturally occurring level of selected heavy metals. Suggested locations of proposed background borings are shown in Plate 12. Results of the background borings may confirm or eliminate various sites that appear to have higher than expected levels of lead and other heavy metals.



*SEE TABLE 6 FOR THE DATE(S) OF GROUND WATER ELEVATION MEASUREMENTS.

PREPARED FOR **U.S. Air Force**

LOCATIONS OF RECOMMENDED MONITOR WELLS AND BACKGROUND BORINGS

BY **Dames & Moore** Plate 12

Aquifer testing may be needed to determine in-situ aquifer properties. This testing will assist in the determination of potential rates and directions of contaminant movement in the ground water. These tests may also be useful in developing any needed remedial actions.

A private well inventory should be completed in order to identify wells that may be potential receptors of contamination emanating from the base. Selected wells may also provide additional off-site water quality and water-level elevation monitor points.

Variations in seasonal water-table elevations and pumping rates may affect observed ground water quality. Ground water quality monitoring can be implemented at all monitor and base wells and include selected perimeter and off-site wells to define the temporal variation of the concentrations. At a minimum, two samples should be collected from each well over a 3-month period. The analyses would help to prioritize the sites that require remedial action. The monitoring would include measurement of the water level and analysis for the expected contaminant groups plus pH and specific conductivity to indicate general water quality. Sample collection and analytical methods would be the same as those employed for Phase II, Stage 1 and are described in Section III. After samples have been collected and evaluated, the need for either continued monitoring or other actions should be evaluated as a Phase IV action.

Four additional monitor wells should be installed along the northwestern boundary of the base at locations shown in Plate 12 to detect contaminants before they leave the base. For ease of reference, these new wells have been numbered DM-3 to DM-6. The basis for each well is as follows:

- DM-3 -- Contaminants migrating from Sites 1 and 10 would be intercepted by DM-3 before leaving the base. Water levels from monitor wells DM-1, DM-2, and DM-3 would better define the attitude of the ground water surface and the rate at which contaminants may be migrating.

- DM-4 and DM-5 -- Contaminants originating from Sites 3, 17, 18, and 25, if present, would migrate from the center of the site towards the northwest. These contaminants could be intercepted by monitor wells DM-4 and DM-5 before they migrate off base. Water levels from these wells would also better define the ground water surface beneath the northern part of the base.

- DM-6 -- Monitor well DM-6 would intercept ground water that has passed beneath the base in general and specifically beneath Site 19.

Four additional wells would be completed at a depth of about 350 feet and would be constructed with PVC casing and well screen similar to the monitor wells installed for Phase II, Stage 1 (see Section III). The monitoring of these new wells, along with existing monitor and production wells, would detect ground water contamination within their cones of depression.

Table 11 sets out each site and the alternative measure applicable to it. The following were reviewed but not judged to be viable options for alternative measures:

- The use of a surface resistivity survey had been considered for detection of contaminant plumes but was rejected because the technique requires a significant resistivity contrast between the contaminated and uncontaminated ground water, which does not appear to be the case here.

- Borehole geophysical methods such as resistivity, self potential, density, and gamma radiation are often used to characterize geologic and hydrologic conditions. However, they would not yield significantly more subsurface information than that collected during the drilling and sampling program carried out for Phase II, Stage 1. Like surficial geophysical methods, borehole methods yield the most information from sediments with contrasting properties such as composition, grain size, moisture content, density, and degree of consolidation. The shallow sediments beneath the base consist primarily of clay and silt without sufficiently contrasting characteristics.

- Unsaturated zone monitoring is a method of investigation that is used to characterize the quality of water in the soil pores above the water table. The sample is collected in a lysimeter that is buried at some depth beneath the area of investigation. A lysimeter is a porous ceramic container with separate sampling and vacuum hose attachments. Soil water is collected by evacuating the lysimeter and then pressurizing it to retrieve the sample. If the soil moisture content is low, up to several days may be required for soil water to seep into the lysimeter. Lysimeters are useful because they provide samples of downward

TABLE 11

RECOMMENDED ALTERNATIVE MEASURES BY SITE

SITE	SOIL-GAS SURVEY	COMPARISON TO BACKGROUND BORING	GROUND WATER QUALITY MONITORING	CONFIRMATION BORING	ADDITIONAL BORINGS OR WELLS	AQUIFER TESTS	PRIVATE WELL INVENTORY
1 (includes 10)	NA*	NA*	Collect two samples from DM-1, DM-2, DM-3 over a period of 3 months; additional periods as indicated	None	Install one well downgradient of the landfill	As indicated by ground water quality monitoring	As indicated by ground water quality monitoring
18	NA*	NA*	Collect two samples from DM-4, DM-5, base wells over a period of 3 months; additional periods as indicated	None	Install one well downgradient of the flush farm drainage ditch	As indicated by ground water quality monitoring	As indicated by ground water quality monitoring
7	NA*	NA*	Collect two samples from base wells over a period of 3 months; additional periods as indicated	Additional soil borings to 60 feet	As indicated by confirmation boring	As indicated by confirmation boring	As indicated by confirmation boring
19	For VOC	Lead Concentration	Collect two samples from DM-6 over a period of 3 months; additional periods as indicated	Additional soil borings to 60 feet	As indicated by soil-gas-survey and confirmation boring	As indicated by soil-gas survey and confirmation boring	As indicated by soil-gas survey and confirmation boring
3	NA*	NA*	Collect two samples from DM-4, DM-5 over a period of 3 months; additional periods as indicated	None	Install one well downgradient of the fire training area	As indicated by ground water quality monitoring	As indicated by ground water quality monitoring
25	For VOC	Lead Concentration	Collect two samples from DM-4, DM-5, base wells over a period of 3 months; additional periods as indicated	Additional soil borings to 60 feet	As indicated by soil-gas survey and confirmation boring	As indicated by soil-gas survey and confirmation boring	As indicated by soil-gas survey and confirmation boring

*NA = Not Applicable

infiltrating water before it reaches the water table. They can be used to isolate sources of ground water contamination. The main disadvantages of lysimeters are that the porous ceramic filter may plug with soil and the hoses may break or collapse. Their usefulness at Davis-Monthan AFB would be limited by the lack of infiltrating water because of climatic conditions.

VI. RECOMMENDATIONS

Based on technial data collected during the Phase II, Stage 1 Installation Restoration Program, sites are divided into three categories as discussed below. Additional information for many of the sites will influence whether the site is ultimately characterized as requiring further study or remedial actions.

A. CATEGORY 1 - SITES REQUIRING NO FURTHER ACTION

The presence of contamination was suggested at all sites investigated in the Phase II, Stage 1 program. However, the concentration of contaminants at many of these sites were elevated only slightly above apparent background levels and the risk to the public health does not appear to be significant enough to warrent further action. Therefore, sites 20, 21, 17, 8, and 4 were characterized as Category 1.

B. CATEGORY 2 - SITES REQUIRING ADDITIONAL PHASE II EFFORT TO DETERMINE DIRECTION, MAGNITUDE, AND EXTENT OF CONTAMINATION

Five of the 11 sites are characterized as Category 2 on the basis of technical data collected in the Phase II, Stage 1 IRP. These five sites are 1 (including 10), 7, 19, 3, and 25.

Additional investigations, as detailed in Table 11, are required to evaluate the magnitude, extent, and direction of contamination migration. Sites may be downgraded from Category 2 to Category 1 upon completion of confirmatory borings and/or comparison with a background boring. Plate 12 shows two recommended locations at which one background boring should be made.

C. CATEGORY 3 - SITES REQUIRING REMEDIAL ACTIONS

Site 18 will require remedial action. Contamination by VOC and, in particular, vinyl chloride, is indicated. Prior to the enaction of remedial measures, information on the magnitude of contamination, horizontal and vertical extent of contamination, and local aquifer characteristics will be required to define whether remedial actions are needed for source control and/or migration control.

Although a list of remedial action alternatives for Site 18 is quite preliminary, the following technologies may be considered during the development of a technology applicability matrix:

- o Ground Water Extraction*
  - Vacuum recovery system
  - Pressure control system
  - Trenches and drains

- o Hydraulic Barriers*
  - Slurry trenches, walls
  - Sheet piles
  - Grout curtains
  - Pumping/injection wells

- o Containment/Removal
  - Excavation
  - Diversion (grading, dikes, diversion measures)
  - Capping (asphalt, concrete)

- o In-Situ Processes
  - Soil flushing/recovery
  - Immobilization - activated carbon permeable treatment beds
  - Polymerization
  - Biological degradation enhancement
  - Physical - compaction, cooling or heating, vitrification
  - Soil aeration and gas collection

- o Water Treatment Processes*
  - Air stripping
  - Carbon adsorption
  - Oxidation/reduction
  - Ozonation
  - UV photolysis
  - Ultrox (UV photolysis proprietary process)
  - Biological water treatments
    - + PACT (powdered activated carbon treatment)
    - + Activated sludge
    - + Rotating biological contactors
  - Chlorination
  - Media filtration

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*No water samples from Site 18 have been collected and analyzed; processes proposed on assumed contamination of water.

- On-Site Soil Treatment/Storage
  - Air stripping
  - Soil washing
  - Soil incineration
  - Wet air oxidation
  - Temporary or long-term storage
  - Scarification
  - Waste pile treatment
  - Soil-waste stabilization

- Off-Site Disposal
  - Contaminated soil
  - Contaminated water*

- Alternate Water Supply*
  - Long-term monitoring for adverse impact to water supplies
  - Alternate water supply
    + Relocation of wells
    + Cisterns or tanks
    + Municipal water supply

Additional investigation of Site 18 will provide information as to which of the above technologies will be most suitable for incorporation into remedial action alternatives. A suggested process by which technologies can be subjectively rated as to the applicability to site-specific conditions is described below. This technology ranking process hinges upon waste characteristics, site characteristics, and level of technology development. The technologies should be scored for the criteria using a subjective set of factors (High, Medium, Low) as defined below:

1. **Waste/Contamination Characteristics** -- Treatment applicability to waste/ contaminant with goal of removal, transformation, immobilization, or destruction of one or several of the site contaminants. Consider physical and chemical properties and toxicity of the waste/contaminant.

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*No water samples from Site 18 have been collected and analyzed; processes proposed on assumed contamination of water.

- High -- Contaminant Characteristics do not limit and may enhance the effectiveness of technology application.

- Medium -- Physical, chemical, or toxic characteristics of waste/ contaminant pose some problem with respect to implementation of the technology, but can be addressed through minor to moderate technology/operating modifications.

- Low -- Waste/contaminant characteristics will require major modification to technology operations. Physical/chemical properties preclude technology use.

- Fatal Flaw -- Technology not applicable due to waste/contaminant characteristics.

2. Site Characteristics -- Including surface conditions such as ground cover, land use and operations, overhead utilities, and traffic patterns; and subsurface conditions such as soils, ground water, bedrock, buried utilities, and less transmissive zones.

   - High -- Site characteristics do not limit constructability or effectiveness of the technology.

   - Medium -- Site characteristics limitations are slight to moderate and can be overcome by special but not extraordinary designs and construction measures, without significantly reducing the effectiveness of the technology.

   - Low -- Site characteristics severely limit or preclude construction and/or effectiveness of the technology; extraordinary design and construction measures will not fully restore the effectiveness or constructability of the technology.

   - Fatal Flaw -- Technology cannot be implemented due to site characteristics.

3. Level of Technology Development -- History of technology application with respect to contaminant groups, scale of application, reliability, and performance.

- High -- Record of successful full-scale application.

- Medium -- Technology is effective at pilot-scale development, or effective on related contaminants or performance record (full-scale or pilot-scale) is variable.

- Low -- Technology is at bench scale of development or performance at any scale is poor.

- Fatal Flaw -- Technology conceptual or theoretical.

At present, available technical data are lacking to rank technologies on the basis of applicability to Site 18 remedial action. At the minimum, information must be obtained concerning existence of water contamination, confirmation and extent of a perching layer, extent of soil contamination, and extent of ground water (and perched ground water) contamination. Thus, the procedures for remedial action alternative development and critique are described below but cannot be applied at present.

Remedial action alternatives are developed from technology components applicable (high to medium ranking) to the contaminated site. Technologies are combined to result in various degrees of cleanup. The following remedial action goals reflect the range of alternatives that should be developed:

- Treatment and disposal at an EPA-approved off-site facility;

- Alternatives that exceed applicable and relative public health and environmental standards;

- Alternatives that attain applicable and relative public health and environmental standards;

- Alternatives that do not attain public health or environmental standards but reduce the likelihood of present or future threat by the contamination; and

- No action taken on contamination problem. Long-term monitoring to assess imminent public health or environmental hazards.

Selection of the remedial action alternative to be implemented involves consideration of costs, technical feasibility, and institutional requirements. The proposed alternatives should be evaluated with regard to these three categories at a minimum. Appropriate information should be generated to provide a basis upon which an alternative can be selected.

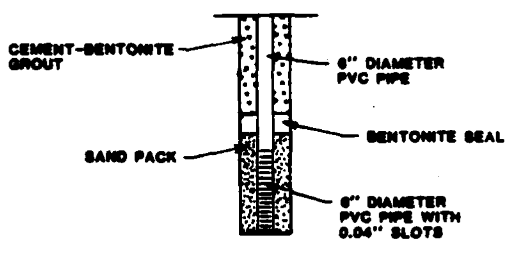
APPENDIX A

LOGS OF MONITOR WELLS AND SOIL BORINGS

MAJOR DIVISIONS			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL GRADED GRAVELS GRAVEL SAND MIXTURES LITTLE OR NO FINES
				GP	POORLY GRADED GRAVELS GRAVEL SAND MIXTURES LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS GRAVEL SAND SILT MIXTURES
				GC	CLAYEY GRAVELS GRAVEL SAND CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL GRADED SANDS GRAVELLY SANDS LITTLE OR NO FINES
				SP	POORLY GRADED SANDS GRAVELLY SANDS LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS SAND SILT MIXTURES
				SC	CLAYEY SANDS SAND CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY GRAVELLY CLAYS, SANDY CLAYS SILTY CLAYS LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT HUMUS SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

KEY TO WELL CONSTRUCTION

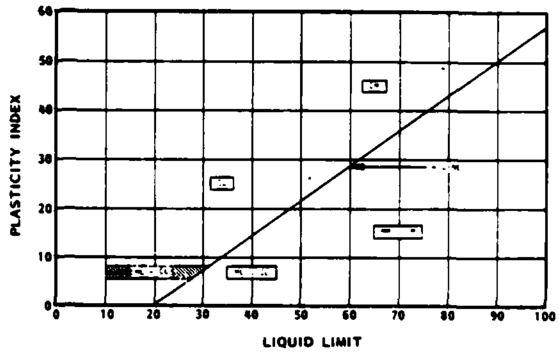


UNIFIED SOIL CLASSIFICATION SYSTEM

BY Dames & Moore Plate A1A

SYMBOL	TYPE OF TEST
M	MOISTURE
QD	QUICK MD TEST BASED ON ASSUMED SPECIFIC GRAVITY
MD	MOISTURE-DENSITY
CD	CHUNK DENSITY ON BULK SAMPLE
RD	RELATIVE DENSITY
COMP	COMPACTION CURVE
CI	CALIFORNIA IMPACT
CC	COMPACTED CORE
G	SPECIFIC GRAVITY
pH	HYDROGEN ION CONCENTRATION
MA	MECHANICAL ANALYSIS*
SA	SIEVE ANALYSIS (+200 ONLY)
HA	HYDROMETER ANALYSIS (-200 ONLY)
AL	ATTERBERG LIMITS (LL & PL)
SL	SHRINKAGE LIMIT
FS	FREE SWELL
SS	SHRINK-SWELL
EXP	EXPANSION
C (COL)	CONSOLIDATION (COLLAPSE)
VC	VIBRATING CONSOLIDATION
P	PERMEABILITY
FP	FIELD PERMEABILITY
UC	UNCONFINED COMPRESSION
	TRIAXIAL COMPRESSION TEST
TXUU	1. UNCONSOLIDATED-UNDRAINED
TXCU	2. CONSOLIDATED-UNDRAINED
TXCUM	3. CU/MULTIPHASE**
TXCUPP	4. CU/WITH PORE PRESSURE MEASUREMENTS
TXCD	5. CONSOLIDATED-DRAINED
	DIRECT SHEAR TEST
DS/UU	1. UNCONSOLIDATED-UNDRAINED
DS/CU	2. CONSOLIDATED-UNDRAINED
DS/CD	3. CONSOLIDATED-DRAINED
DS/CD/M*	4. CD/MULTIPHASE**
LV	TORVANE SHEAR (LAB VANE SHEAR)

* INCLUDES COMPLETE ANALYSIS, SIEVING AND HYDROMETER
** SERIES OF TESTS RUN ON SAMPLE



PLASTICITY CHART

X - INDICATES TEST PERFORMED

KEY TO LABORATORY TEST DATA

A - ACKER SOIL SAMPLER

D - DAMES & MOORE, TYPE D SAMPLER

P - DAMES & MOORE PISTON SAMPLER

U - DAMES & MOORE TYPE U SAMPLER

PT - PITCHER TUBE SAMPLER

NX - NX CORE SAMPLER

TW - DAMES & MOORE TYPE U SAMPLER WITH THIN WALL ATTACHMENT

SPT - STANDARD PENETRATION TEST SAMPLER

ST - SHELBY TUBE SAMPLER

KEY TO SAMPLERS

INDICATES DEPTH OF AUGER CUTTINGS SAMPLE

INDICATES DEPTH OF UNDISTURBED SAMPLE

INDICATES DEPTH OF DISTURBED SAMPLE

INDICATES DEPTH OF SAMPLING ATTEMPT WITH NO RECOVERY

INDICATES DEPTH OF STANDARD PENETRATION TEST

INDICATES DEPTH OF STANDARD PENETRATION TEST WITH NO RECOVERY

78% 5% INDICATES DEPTH AND LENGTH OF CORE RUN

RQD (ROCK QUALITY DETERMINATION) PERCENT OF THE TOTAL CORE RUN HAVING AN UNFRACTURED LENGTH OF 4" OR MORE

PERCENT OF CORE RUN RECOVERED

INDICATES DEPTH OF FIELD VANE SHEAR TEST

NOTE:
UNLESS OTHERWISE NOTED SAMPLING RESISTANCE IS MEASURED IN BLOWS PER FOOT REQUIRED TO DRIVE SAMPLER 12-INCHES AFTER SAMPLER HAS BEEN SEATED 6-INCHES. A 140-POUND HAMMER, FREE FALLING A DISTANCE OF 30 INCHES IS USED TO DRIVE THE SAMPLER.

KEY TO SAMPLES

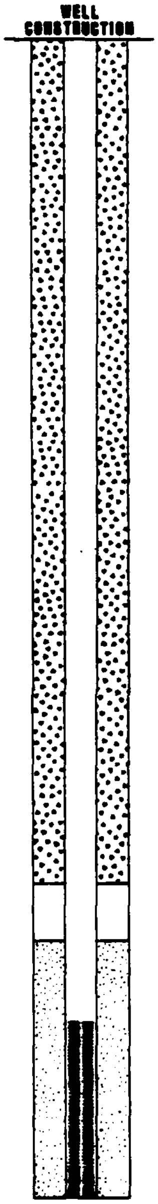
KEY TO LOG OF BORINGS

BY Dames & Moore Plate A1B

MONITORING WELL DM-1

SURFACE ELEVATION: 2615.06 FEET
STATE PLANE COORDINATES: N 426,540
E 815,950

WELL CONSTRUCTION



DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	PESTICIDES	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES
0							
25							
50				-	0		
75							
100							
125				-	0.8		
150							
175							
200				20-30	1-5		
225				0	5-10		
250				12	6		
275							
300				0	3		
325							
350							
375							
400							

SYMBOLS	DESCRIPTION
ML	REDDISH BROWN FINE SANDY SILT AND CLAY WITH TRACE OF MEDIUM TO COARSE SAND AND FINE GRAVEL
GM	REDDISH BROWN SILTY FINE TO COARSE SAND AND FINE GRAVEL
ML	REDDISH BROWN FINE SANDY SILT WITH TRACE OF MEDIUM TO COARSE SAND AND FINE GRAVEL AND OCCASIONAL 5 TO 10 FOOT THICK LAYERS OF COARSE SAND AND FINE GRAVEL
GM	REDDISH BROWN FINE TO COARSE SAND AND GRAVEL WITH SOME SILT AND CLAY
ML	REDDISH BROWN FINE SANDY SILT AND CLAY WITH TRACE OF MEDIUM TO COARSE SAND

BORING TERMINATED AT 330 FEET ON 12/06/83.
MONITORING WELL COMPLETED ON 12/07/83.
WATER LEVEL AT 290.0 FEET ON 12/08/83.

LOG OF BORINGS

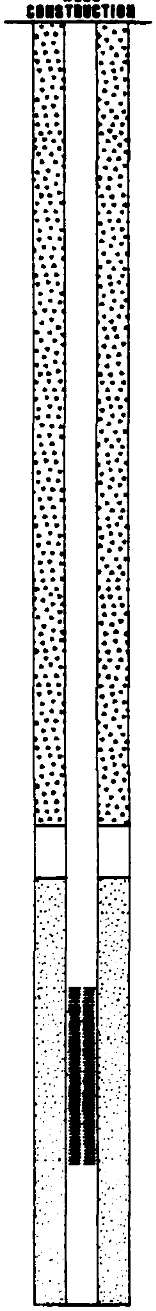
BY Dames & Moore

Plate A2

MONITORING WELL DM-2

SURFACE ELEVATION: 2618.14 FEET
STATE PLANE
COORDINATES: N 426,850
E 816,400

WELL CONSTRUCTION



LABORATORY TEST DATA REPORTED ELSEWHERE

DEPTH IN FEET	HEAVY METALS	PESTICIDES	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)
0					
25					
50					
75					
100					
125				0	-
150				0	0
175					
200				0	0
225					
250				0	0
275				0	-
300					
325				0	-
				0	0
350					
375					
400					

BLOWS/FT.

SAMPLES

SYMBOLS

SYMBOLS	DESCRIPTION
ML	REDDISH BROWN FINE SANDY SILT AND CLAY WITH TRACE OF MEDIUM TO COARSE SAND AND FINE GRAVEL
GM	REDDISH BROWN SILTY FINE TO COARSE SAND AND FINE GRAVEL
ML	REDDISH BROWN FINE SANDY SILT WITH TRACE OF MEDIUM TO COARSE SAND AND FINE GRAVEL AND OCCASIONAL 5 TO 10 FOOT THICK LAYERS OF COARSE SAND AND FINE GRAVEL
GM	REDDISH BROWN FINE TO COARSE SAND AND GRAVEL WITH SOME SILT AND CLAY
ML	REDDISH BROWN FINE SANDY SILT AND CLAY WITH TRACE OF MEDIUM TO COARSE SAND

BORING TERMINATED AT 367 FEET ON 12/01/83.
MONITORING WELL COMPLETED ON 12/03/83.
WATER LEVEL AT 292.1 FEET ON 12/08/83.

LOG OF BORINGS

BY **Dames & Moore** Plate A3

BORING 1-1

SURFACE ELEVATION: 2622.66 FEET

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.F.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0								-	-	7	☒	SC-SM	BROWN CLAYEY TO SILTY SAND WITH SOME GRAVEL, DAMP
5				X		X	X	<1	-	31	☒		TAN, SLIGHTLY DAMP
													DECREASED PLASTICITY
10								0	-	40	☒		
												SW-SM	TAN TO LIGHT BROWN GRAVELLY SAND WITH A TRACE TO SOME SILT, SLIGHTLY DAMP TO DAMP
15				X		X	X	0	0	57	☒		VERY SLIGHT ODOR
20			X					1	0	75	☒		A TRACE TO SOME SILT
25								0	0	116	☒		INCREASED GRAVEL
30								1	0	144	☒		DAMP
												SC-SM	ORANGISH BROWN CLAYEY/SILTY SAND WITH A TRACE TO SOME GRAVEL, DAMP
35				X		X	X	4	0	125	☒		
													DECREASED MOISTURE
40													

LOG OF BORINGS

BY **Dames & Moore** Plate A4

BORING 1-1 cont.

SURFACE ELEVATION:2622.66FEET

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
40								0	< 1	151			
												CL-SC	SANDY CLAY TO CLAYEY SAND WITH OCCASIONAL GRAVEL, DAMP
45								0	0	109			
50			X					0	0	98			
													BORING TERMINATED AT 51 FEET ON 11/28/83. NO GROUNDWATER ENCOUNTERED.
55													
60													
65													
70													
75													
80													

LOG OF BORINGS

BY Dames & Moore Plate A5

BORING 1-2

SURFACE ELEVATION: 2648.33 FEET

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.F.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0								-	-	24	☒	SC-SM	BROWN CLAYEY TO SILTY SAND WITH SOME GRAVEL, DAMP
5				X		X	X	0	<20	13	☒		
												CL	LIGHT BROWN AND OFF-WHITE MOTTLED AND ROUGHLY STRATIFIED SANDY CLAY WITH A TRACE OF GRAVEL-SIZED NODULES OF LIGHT TO MODERATE CEMENTATION, SLIGHTLY DAMP
10			X					0	0	42	☒		
												SP-SM	LIGHT BROWN SAND WITH A TRACE TO SOME SILT, SLIGHTLY DAMP
15								0	0	20	☒		
20								0	<1	152	☒		INCREASED GRAVEL
													INCREASED SILT AND GRAVEL
25				X		X	X	0	<1	122	☒		
30								0	<1	167	☒		
35								0	<1	102	☒		
													COLOR CHANGE TO ORANGISH BROWN, INCREASED MOISTURE
40													

LOG OF BORINGS

BY Dames & Moore — Plate A6

BORING 1-2 cont.

SURFACE ELEVATION: 2648.33 FEET

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
40								0	<1	194			
45								0	<1	168			SLIGHTLY CEMENTED
50				X		X	X	0	<1	150		CL-SC	LIGHT BROWN (WITH BLACK STRINGERS) SANDY CLAY/ CLAYEY SAND, SLIGHTLY DAMP TO DAMP, LIGHTLY CEMENTED
55													
60													
65													
70													
75													
80													

LABORATORY TEST DATA REPORTED ELSEWHERE

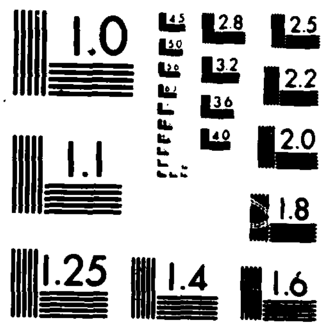
BORING TERMINATED AT 50 FEET ON 11/29/83.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore Plate A7

AD-A173 737 INSTALLATION RESTORATION PROGRAM PHASE II - CONFIRMATION/QUANTIFICATION S..(U) DAMES AND MOORE PARK RIDGE IL 18 AUG 86 F33615-83-D-4002 2/4

UNCLASSIFIED F/G 13/2 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

BORING 1-3

SURFACE ELEVATION: 2634.82 FEET

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0			X					-	-	9	■	CL	DARK BROWN TO BROWN SANDY CLAY, DAMP TO SLIGHTLY MOIST, SOME ODOR
5				X		X	X	0	<1	17	■	SM-SC	LIGHT BROWN SILTY/CLAYEY SAND, DAMP
												SP-SM	ORANGISH BROWN SAND WITH SOME SILT AND A TRACE OF GRAVEL, DAMP
10								0	<1	34	■		
15								0	<1	73	■		SLIGHTLY DAMP
20				X		X	X	0	<1	46	■	SW-SM	LIGHT BROWN SAND WITH SOME GRAVEL AND A TRACE OF SILT, SLIGHTLY DAMP
25			X					0	<1	75	■		
30								0	<1	107	■		INCREASED GRAVEL
35								0	<1	91	■		DECREASED GRAVEL INCREASED MOISTURE
40													

LOG OF BORINGS

BY Dames & Moore

Plate A8

BORING 1-3 cont.

SURFACE ELEVATION:2634.82 FEET

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
40				X		X	X	0	<1	90			
												CL	LIGHT BROWN SANDY CLAY, SLIGHTLY DAMP, HEAVY CEMENTATION
												SP-SM	LIGHT ORANGISH BROWN SAND WITH SOME SILT AND OCCASIONAL GRAVEL, DAMP TO SLIGHTLY DAMP
45								0	<1	69			
								0	<1	50			
50													
55													
60													
65													
70													
75													
80													

LABORATORY TEST DATA REPORTED ELSEWHERE (heavy metals through volatile organic compounds columns)

BORING TERMINATED AT 50 FEET ON 11/29/83.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore Plate A9

BORING 1-4

SURFACE ELEVATION: 2639.93 FEET

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES
0				X		X	X	-	-	3	■
5								0	<1	17	■
10				X		X	X	0	<1	35	■
15				X		X	X	0	<1	18	■
20								0	<1	62	■
25				X		X	X	0	<1	92	■
30			X					0	<1	80	■
35								0	<1	98	■
40											

SYMBOLS	DESCRIPTION
SC-SM	BROWN CLAYEY AND SILTY SAND WITH A TRACE OF GRAVEL, DAMP SLIGHT ODOR
	LIGHT BROWN, SLIGHTLY DAMP
	LIGHT BROWN TO TAN
SP-SM	LIGHT BROWN TO TAN GRAVELLY SAND WITH SOME SILT, SLIGHTLY DAMP
	INCREASED MOISTURE
	AUGER CHATTER AND RIG ACTION
SC-CL	BROWN TO LIGHT BROWN CLAYEY SAND AND SANDY CLAY WITH SOME GRAVEL, SLIGHTLY DAMP TO DAMP
	LIGHT CEMENTATION
SW	LIGHT BROWN TO MEDIUM BROWN SAND WITH GRAVEL AND A TRACE OF SILT, SLIGHTLY DAMP TO DAMP

LOG OF BORINGS

BY Dames & Moore Plate A10

BORING 1-4 cont.

SURFACE ELEVATION:2639.93FEET

	LABORATORY TEST DATA REPORTED ELSEWHERE												
DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
40								0	<1	125	⊠		DECREASED MOISTURE, INCREASED FINES
45								0	<1	156	⊠		INCREASED MOISTURE, INCREASED FINES
												SP-SM	LIGHT ORANGISH BROWN SAND WITH SOME GRAVEL, TRACE TO SOME SILT, SLIGHTLY DAMP TO DAMP
50								0	<1	150	⊠		
													BORING TERMINATED AT 50 FEET ON 11/30/83. NO GROUNDWATER ENCOUNTERED.
55													
60													
65													
70													
75													
80													

LOG OF BORINGS

BY **Dames & Moore** Plate A11

BORING 1-5

SURFACE ELEVATION: 2633.31 FEET

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES
0				X		X	X	-	-	12	▯
5			X					2	<1	18	▯
10				X		X	X	0	<1	40	▯
15			X					0	<1	32	▯
20								0	<1	46	▯
25								0	<1	-20	▯
30				X		X	X	1	<1	33	▯
35								0	<1	200	▯
40											

LABORATORY TEST DATA REPORTED ELSEWHERE

SYMBOLS	DESCRIPTION
SC-SM	MEDIUM BROWN CLAYEY/SILTY SAND WITH SOME GRAVEL, PROBABLY FILL, DAMP SOME ASPHALT CONCRETE DEBRIS A COUPLE OF INCHES BELOW SURFACE SOME AUGER CHATTER SOME ODOR TO ABOUT 7-1/2 FEET SOME CONCRETE FRAGMENTS AT 5-1/2 FEET
SC	LIGHT BROWN CLAYEY AND SILTY SAND, SOME OFF-WHITE GRAVEL-SIZED NODULES OF LIGHT TO MODERATE CEMENTATION, SLIGHTLY DAMP, SLIGHT ODOR
SP-SM	LIGHT BROWN SAND, SOME SILT AND GRAVEL, SLIGHTLY DAMP, SLIGHT ODOR
SW	LIGHT TO MEDIUM BROWN GRAVELLY SAND, SLIGHTLY DAMP TO DAMP INCREASED MOISTURE TO DAMP
SC-CL	BROWN CLAYEY SAND AND SANDY CLAY, DAMP
SP-SM/SC	ORANGISH BROWN SAND WITH SOME GRAVEL AND A TRACE OF FINES STEAM RISING FROM OPEN AUGER HAS ODOR

LOG OF BORINGS

BY Dames & Moore

Plate A12

BORING 1-5 cont.

SURFACE ELEVATION: 2633.31 FEET

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SYMBOLS
40			X					0	<1	105	SC-CL
				X		X	X	-	-	142	SC-CL
45											
								6	<1		SC-CL
50								50	<1	54	SP
55											
60											
65											
70											
75											
80											

SAMPLES / DESCRIPTION

SC-CL: BROWN CLAYEY SAND/SANDY CLAY WITH SOME BLACK STRINGERS AND CEMENTED NODULES, RELATIVELY DAMP

VERY STIFF TO HARD DRILLING BELOW 42 FEET
A SMALL AMOUNT OF WATER ADDED TO HOLE FOR DRILLING PURPOSES
ROCK OR SOME SIMILAR OBSTRUCTION IN HOLE IS INHIBITING PROGRESS BELOW 42 FEET. AFTER SEVERAL ATTEMPTS TO DISLODGE IT, ALL OF AUGER PULLED AND HOLE RE-ENTERED

SLIGHTLY DAMP TO DAMP
CONSIDERABLE AMOUNTS OF STEAM RELEASED FROM WARM CUTTINGS, STEAM HAS ODOR

SP: BROWN SAND, DAMP

BORING TERMINATED AT 50 FEET ON 11/30/83.
NO GROUNDWATER ENCOUNTERED.

NOTE: BOTTOM 20 FEET OF AUGER IS VERY WARM TO THE TOUCH. CUTTINGS ON THIS AUGER ARE DRY AND HOT.

LOG OF BORINGS

BORING 1-6

SURFACE ELEVATION: 2623.89 FEET

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.
0				X		X	X	-	-	14
5								0	<1	42
10								0	<1	31
15								-	-	65
20				X		X	X	-	-	64
25								-	-	105
30								-	-	156
35			X					-	-	144
40										

SYMBOLS	DESCRIPTION
SM-SC	BROWN SILTY AND CLAYEY SAND, DAMP
CL	BROWN TO TAN SANDY CLAY, DAMP TO SLIGHTLY DAMP, NODULES OF LIGHT TO MODERATELY HEAVY CEMENTATION
SW-SM	LIGHT BROWN SAND WITH SOME GRAVEL AND A TRACE TO SOME SILT, SLIGHTLY DAMP
	DECREASED SILT, INCREASED MOISTURE TO DAMP
CL/SC	BROWN SANDY CLAY/CLAYEY SAND, DAMP, LIGHT CEMENTATION
SW-GM	BROWN SAND AND GRAVEL WITH SOME SILT, SLIGHTLY DAMP TO DAMP
	AUGER ANNULUS HAS SLIGHT ODOR
SC	BROWN CLAYEY SAND WITH A TRACE OF GRAVEL, SLIGHTLY DAMP TO DAMP, MODERATE CEMENTATION, SOME BLACK STRINGERS, VERY SLIGHT ODOR

LOG OF BORINGS

BY **Dames & Moore** Plate A14

BORING 1-6 cont.

SURFACE ELEVATION: 2623.89 FEET

Depth in Feet	Heavy Metals	Lead	Pesticides	Phenol	PCB's	Oil and Grease	Volatile Organic Compounds	Explosimeter Reading (% L.E.L.)	HNU Reading (PPM)	Blows/Ft.	Description
40								-	-	77	
											DECREASED CEMENTATION AND PLASTICITY
45				X		X	X	-	-	55	
											VERY DIFFICULT DRILLING. WATER ADDED FOR DRILLING PURPOSES AT 47 FEET - CONSIDERABLE AUGER SQUEAKING AND VERY SLOW ADVANCEMENT
50								-	-	150	BORING TERMINATED AT 50 FEET ON 12/03/83. NO GROUNDWATER ENCOUNTERED.
55											
60											
65											
70											
75											
80											

LABORATORY TEST DATA REPORTED ELSEWHERE

SAMPLES — SYMBOLS

LOG OF BORINGS

BY Dames & Moore — Plate A15

BORING 18-1

Blows/ft.	Heavy Metals	Lead	Pesticides	Phenol	PCB's	Oil and Grease	Volatile Organic Compounds	Explosimeter Reading (% L.E.L.)	HNU Reading (PPM)
38		X		X		X	X	0	<1
25		X		X		X	X	0	<1
43		X		X		X	X	0	<1
40		X		X		X	X	0	<1
30		X		X		X	X	0	<1
23								0	<1
40								0	<1
11								0	<1

LABORATORY TEST DATA REPORTED ELSEWHERE

DEPTH IN FEET: 0, 5, 10, 15, 20, 25, 30, 35, 40

SAMPLES

SYMBOLS	DESCRIPTION
SP	BLACK SAND WITH SOME GRAVEL AND A TRACE OF SILT, WET
SC	BLACK TO ORANGISH BROWN CLAYEY SAND, MOIST TO DAMP
	LESS BLACK, MORE ORANGISH BROWN INCREASED CLAY AT 4 FEET
	DECREASED PLASTICITY
	DAMP AND SLIGHT ODOR
	ANNULUS OF HOLLOW STEM AUGER HAS SLIGHT ODOR AUGER FRICTION GENERATES CONSIDERABLE HEAT BELOW 12 FEET WHICH IS DRIVING OFF SOME MOISTURE FROM SOIL AS STEAM
SP	ORANGISH BROWN SAND WITH A TRACE TO SOME SILT, DAMP
SM	BROWN SILTY SAND, DAMP

BORING TERMINATED AT 20 FEET ON 12/01/83.
GROUNDWATER SEEPAGE OBSERVED AT APPROXIMATELY 0.3 FEET ON 12/01/83.
WATER LEVEL AT ABOUT 19.7 FEET ON 12/09/83

LOG OF BORINGS

BY Dames & Moore

BORING 18-2

Heavy Metals	Lead	Pesticides	Phenol	PCB's	Oil and Grease	Volatile Organic Compounds	Explosimeter Reading (% L.E.L.)	HNU Reading (PPM)	Blows/Ft.
	X		X		X	X	-	-	6
	X		X		X	X	0	<1	4
	X		X		X	X	0	<1	8
							0	<1	33
							0	<1	37
	X		X		X	X	0	<1	23
							-	<1	23
							0	<1	16

LABORATORY TEST DATA REPORTED ELSEWHERE

DEPTH IN FEET: 0, 5, 10, 15, 20, 25, 30, 35, 40

SAMPLES

SYMBOLS | DESCRIPTION

SP GRAYISH BLACK SAND WITH SOME GRAVEL AND A TRACE OF FINES, MOIST, CONTAINS SOME RAGS, SMELLS OF SOLVENTS

SC ORANGISH BROWN CLAYEY SAND WITH OCCASIONAL GRAVEL, DAMP TO SLIGHTLY DAMP

VERY SLIGHT ODOR

SAND IS MORE COARSE, INCREASED GRAVEL

SOME BLACK STRINGERS

SOME CEMENTED NODULES

AUGER ANNULUS HAS SLIGHT ODOR

AUGER GENERATES CONSIDERABLE FRICTION, HEAT AND STEAM

INCREASED CLAY BELOW 15 FEET

AUGER ANNULUS HAS NO ODOR, NO STEAM ESCAPE

BORING TERMINATED AT 20 FEET ON 12/01/83.
NO GROUNDWATER ENCOUNTERED ON 12/01/83.
WATER LEVEL AT ABOUT 10 FEET ON 12/09/83.

LOG OF BORINGS

BY Dames & Moore Plate A17

BORING 18-3

Heavy Metals	Lead	Pesticides	Phenol	PCB's	Oil and Grease	Volatile Organic Compounds	Explosimeter Reading (% L.F.L.)	HNU Reading (PPM)	Blows/Ft.	Samples
	X		X		X	X	-	-	14	⊠
							0	<1		
	X		X		X	X	0	<1	17	⊠
							0	<1	39	⊠
							0	<1	23	⊠
	X		X		X	X	0	<1	24	⊠
							0	<1	42	⊠
							0	<1	45	⊠
							0	<1	25	⊠

LABORATORY TEST DATA REPORTED ELSEWHERE

DEPTH IN FEET: 0, 5, 10, 15, 20, 25, 30, 35, 40

Symbols	Description
SP	GRAYISH BROWN SAND, MOIST
SC	LIGHT BROWN CLAYEY SAND, DAMP MOTTLED AND LIGHTLY CEMENTED
	SLIGHT DECREASE IN MOISTURE CONTENT
	OCCASIONAL TAN NODULES OF CEMENTATION AND SOME BLACK STRINGERS
	TRACE OF TAN CEMENTED NODULES DECREASED PLASTICITY BELOW 8 FEET
	INCREASED NODULES OF CEMENTATION
	AUGER DRILLING IS GENERATING FRICTION AND SOME STEAM RELEASE FROM CUTTINGS
	SAMPLER IS WARM FROM FRICTION CREATED IN DRIVING
SM	BROWN SILTY SAND, DAMP
	AUGER ANNULUS HAS SLIGHT ODOR
	SAMPLER IS WARM FROM FRICTION CREATED IN DRIVING

BORING TERMINATED AT 20 FEET ON 12/01/83.
NO GROUNDWATER ENCOUNTERED ON 12/01/83.
WATER LEVEL AT 5 FEET ON 12/09/83.

LOG OF BORINGS

BY **Dames & Moore** Plate A18

BORING 7-1

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.
0					X			-	-	24
					X			-	1-1/2	29
					X			-	1-1/2	37
5								-	-	42
10										
15										
20										
25										
30										
35										
40										

SYMBOLS	DESCRIPTION
CL	BROWN SANDY CLAY, DAMP BELOW THE PLASTIC LIMIT, VERY SLIGHT ODOR
SC	LIGHT BROWN TO OFF-WHITE CLAYEY SAND, DAMP TO SLIGHTLY DAMP, NODULES OF LIGHT TO MODERATE CEMENTATION

BORING TERMINATED AT 6-1/2 FEET ON 2/09/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY **Dames & Moore** Plate A19

BORING 7-2

Depth in Feet	Heavy Metals	Lead	Pesticides	Phenol	PCB's	Oil and Grease	Volatile Organic Compounds	Explosimeter Reading (% L.F.L.)	HNU Reading (PPM)	Blows/Ft.	Samples
0								-	-	21	☒
					X			-	9	22	☒
					X			-	2-1/2	25	☒
5								-	-	21	☒

LABORATORY TEST DATA REPORTED ELSEWHERE

Symbols	Description
SC-SM	BROWN CLAYEY/SILTY SAND, SLIGHTLY DAMP TO DAMP, SOME ODOR
SC	MOTTLED MEDIUM BROWN AND OFF-WHITE CLAYEY SAND, DAMP TO SLIGHTLY DAMP, NODULES OF LIGHT TO OCCASIONAL MODERATE CEMENTATION, VERY SLIGHT ODOR
	SLIGHTLY DAMP, VERY SLIGHT ODOR

BORING TERMINATED AT 6-1/2 FEET ON 2/09/84.
NO GROUNDWATER ENCOUNTERED.

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35, 40

LOG OF BORINGS

BY Dames & Moore

Plate A20

BORING 7-3

Depth in Feet	Heavy Metals	Lead	Pesticides	Phenol	PCB's	Oil and Grease	Volatile Organic Compounds	Explosimeter Reading (% L.F.L.)	HNU Reading (PPM)	Blows/Ft.	Samples	Symbols
0								-	-	19	⊠	SM-SC
					X			-	2-1/2	25	⊠	CL
								-	-	49	⊠	SC
5								-	1-1/2	75	⊠	SC
10												
15												
20												
25												
30												
35												
40												

LABORATORY TEST DATA REPORTED ELSEWHERE

DESCRIPTION

SM-SC: BROWN SILTY/CLAYEY SAND, SLIGHTLY DAMP
HIT BURIED PIECE OF METAL AT 18 INCHES-STOPPED AND MOVED HOLE ABOUT 1 FOOT NORTH

CL: BROWN SANDY CLAY, DAMP, SOME ODOR

SC: MOTTLED BROWN AND OFF-WHITE CLAYEY SAND, SLIGHTLY DAMP

BORING TERMINATED AT 6-1/2 FEET ON 2/09/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BORING 7-4

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0					X			-	-	26		CL	BROWN SANDY CLAY, DAMP TO SLIGHTLY DAMP
					X			-	3	30		CL-SC	BROWN SANDY CLAY/CLAYEY SAND, SLIGHTLY DAMP, SOME BLACK STRINGERS AND OFF-WHITE NODULES OF LIGHT CEMENTATION
								-	-	35		SM-SC	TAN TO OFF-WHITE SILTY/CLAYEY SAND, SLIGHTLY DAMP, LIGHT TO MODERATELY HEAVY CEMENTATION
5					X			-	2	61		SC	MOTTLED OFF-WHITE AND MEDIUM BROWN CLAYEY SAND, SLIGHTLY DAMP, LIGHT OT MODERATELY HEAVY CEMENTATION
10													
15													
20													
25													
30													
35													
40													

LABORATORY TEST DATA REPORTED ELSEWHERE (columns: HEAVY METALS, LEAD, PESTICIDES, PHENOL, PCB's, OIL AND GREASE, VOLATILE ORGANIC COMPOUNDS)

BORING TERMINATED AT 6-1/2 FEET ON 2/09/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore

Plate A22

BORING 7-5

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.F.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0					X			-	-	22	■	SC-CL	BROWN CLAYEY SAND/SANDY CLAY, DAMP
					X			-	-	28	■		SLIGHTLY STRONGER ODOR AND HIGHER PLASTICITY
								-	-	34	■	SC	BROWN ALTHOUGH SOMEWHAT MOTTLED CLAYEY SAND, SLIGHTLY DAMP
5								-	<1	41	■		LESS MOTTLED, SOME ODOR

BORING TERMINATED AT 6-1/2 FEET ON 2/09/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore

Plate A23

BORING 7-6

LABORATORY TEST DATA REPORTED ELSEWHERE

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS
0								-	-	23	☒	SC
					X			-	7-1/2	14	☒	SM-SC
5					X			-	-	35	☒	
								-	<1	50	☒	

DESCRIPTION

SC — LIGHT BROWN CLAYEY SAND, SLIGHTLY DAMP, SOME LIGHT CEMENTATION, SLIGHT ODOR

SM-SC — TAN AND SOMEWHAT MOTTLED SILTY /CLAYEY SAND, SLIGHTLY DAMP, LIGHT TO MODERATE CEMENTATION, SOME ODOR

MORE MOTTLING OF MEDIUM BROWN AND OFF-WHITE

BORING TERMINATED AT 6-1/2 FEET ON 2/09/84.
NO GROUNDWATER ENCOUNTERED.

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35, 40

LOG OF BORINGS

BY Dames & Moore — Plate A24

BORING 7-7

Depth in Feet	Heavy Metals	Lead	Pesticides	Phenol	PCB's	Oil and Grease	Volatile Organic Compounds	Explosimeter Reading (% L.E.L.)	HNU Reading (PPM)	Blows/Ft.	Samples
0					X			-	-	23	▣
								-	<1	19	▣
					X			-	-	29	▣
5					X			-	2	29	▣
10											
15											
20											
25											
30											
35											
40											

LABORATORY TEST DATA REPORTED ELSEWHERE

Symbols	Description
CL	BROWN SANDY CLAY, DAMP, SLIGHT ODOR
SC	MOTTLED BROWN AND OFF-WHITE CLAYEY SAND, SLIGHTLY DAMP
SC-SM	LIGHT BROWN ALTHOUGH SOMEWHAT MOTTLED CLAYEY/ SILTY SAND, SLIGHTLY DAMP

BORING TERMINATED AT 6-1/2 ON 2/09/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore

Plate A25

BORING 7-8

LABORATORY TEST DATA REPORTED ELSEWHERE

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0								-	-	23		SM-SC	BROWN SILTY CLAYEY SAND WITH GRAVEL, DAMP TO SLIGHTLY DAMP
												SC	BROWN CLAYEY SAND, DAMP, OCCASIONAL MODERATE CEMENTATION, VERY SLIGHT ODOR
					X			-	2	12			
								-	-	28			MOTTLED MEDIUM BROWN AND OFF-WHITE LIGHT TO MODERATE CEMENTATION IN NODULAR FORM SLIGHTLY DAMP SOME BLACK STRINGERS
5					X			-	2-1/2	23			
10													
15													
20													
25													
30													
35													
40													

BORING TERMINATED AT 6-1/2 FEET ON 2/10/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore Plate A26

BORING 7-9

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0								-	-	23	⊠	GM	SANDY GRAVEL WITH SOME SILT, SLIGHTLY DAMP
												SC	BROWN CLAYEY SAND, DAMP TO SLIGHTLY DAMP, SOME LIGHT CEMENTATION
								-	<1	28	⊠		
								-	<1	35	⊠		MOTTLED MEDIUM BROWN AND OFF-WHITE SLIGHTLY DAMP, LIGHT TO MODERATE CEMENTATION
5								-	-	56	⊠		DECREASED PLASTICITY

LABORATORY TEST DATA REPORTED ELSEWHERE

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35, 40

BORING TERMINATED AT 6-1/2 FEET ON 2/10/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore Plate A27

BORING 7-10

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE							EXPLOSIMETER READING (% L.F.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS						
0								-	-	23	⊠	CL	BROWN SANDY CLAY, DAMP
												SC	BROWN CLAYEY SAND, DAMP, SOME STRINGERS OF LIGHT CEMENTATION
								-	-	22	⊠		
													DECREASED PLASTICITY AT 4 FEET
					X			-	1-1/2	27	⊠		SLIGHTLY DAMP OCCASIONAL MODERATE CEMENTATION
5													
					X			-	2	19	⊠		INCREASED MOISTURE AND PLASTICITY
10													
15													
20													
25													
30													
35													
40													

BORING TERMINATED AT 6-1/2 FEET ON 2/10/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY **Dames & Moore** Plate A28

BORING 19-1

Laboratory Test Data Reported Elsewhere: Heavy Metals	Lead	Pesticides	Phenol	PCB's	Oil and Grease	Volatile Organic Compounds	Explosimeter Reading (% L.E.L.)	HNU Reading (PPM)	Blows/Ft.	Samples
	X		X		X	X	-	-	25	⊠
	X		X		X	X	0	15	65	⊠
	X		X		X	X	-	19	20	⊠
							-	1	69	⊠
	X		X		X	X	-	3	47	⊠

Depth in feet: 0, 5, 10, 15, 20, 25, 30, 35, 40

Symbols	Description
SC	BROWN CLAYEY SAND, DAMP, SOME TAN NODULES OF LIGHT CEMENTATION
	SOME BLACK STRINGERS, LIGHTLY TO MODERATELY CEMENTED
	STIFF TO VERY STIFF DRILLING
	CUTTINGS HAVE ODOR
SW	BROWN SAND, DAMP
SC	MEDIUM BROWN CLAYEY SAND, DAMP, LOW TO MEDIUM PLASTICITY, SOME BLACK STRINGERS AND OFF-WHITE NODULES OF LIGHT TO OCCASIONAL MODERATE CEMENTATION
	STEAM RELEASED FROM AUGER CUTTINGS
	AUGER CUTTINGS HAVE ODOR

BORING TERMINATED AT 21 FEET ON 2/10/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore

Plate A29

BORING 19-2

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0												SP-SM/SC	BROWN TO LIGHT BROWN SAND WITH SOME SILT AND CLAY, SLIGHT CEMENTATION, SLIGHTLY DAMP TO DAMP
		X		X		X	X	-	-	48	☒		
5								-	1-1/2	54	☒	SC	MOTTLED MEDIUM BROWN AND TAN CLAYEY SAND, DAMP, LIGHT CEMENTATION TO OCCASIONAL MODERATE CEMENTATION
													SOME STEAM RELEASED FROM AUGER CUTTINGS
10		X		X		X	X	-	3-1/2	69	☒		
													SOME WATER ADDED TO HOLE FOR DRILLING PURPOSES AT 12 FEET AND AGAIN AT 13-1/2 FEET
													SOME STEAM RELEASED FROM AUGER CUTTINGS
15		X		X		X	X	-	2-1/2	100/9"	☒		
20								-	-	62	☒		LESS MOTTLED
25													
30													
35													
40													

BORING TERMINATED AT 21 FEET ON 2/10/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore

Plate A30

BORING 19-3

Depth in feet	Heavy metals	Lead	Pesticides	Phenol	PCB's	Oil and grease	Volatile organic compounds	Explosimeter reading (% L.F.L.)	HNU reading (PPM)	Blows/ft.	Samples
0											
								-	-	57	▯
5		X		X		X	X	-	-	100	▯
10		X		X		X	X	-	3-1/2	100/9"	▯
15								-	2	60	▯*
20								-	-	81	▯*
25											
30											
35											
40											

LABORATORY TEST DATA REPORTED ELSEWHERE

SYMBOLS / **DESCRIPTION**

SC BROWN CLAYEY SAND, DAMP TO SLIGHTLY DAMP, SOME LIGHT CEMENTATION

DECREASE FINES, INCREASE SAND

CONSIDERABLE STEAM RELEASE FROM AUGER CUTTINGS

INCREASE FINES

MOTTLED BROWN AND TAN, LIGHT TO MODERATE CEMENTATION

WATER ADDED FOR DRILLING PURPOSES

INCREASE FINES

*SAMPLE IS RATHER WARM

WATER ADDED FOR DRILLING PURPOSES

CONSIDERABLE STEAM RELEASE FROM AUGER CUTTINGS

*SAMPLE IS RATHER WARM

BORING TERMINATED AT 21 FEET ON 2/10/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore Plate A31

BORING 19-4

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.F.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES
0											
								-	-	44	▯
5		X		X		X	X	-	4-1/2	37	▯
10		X		X		X	X	-	11-1/2	87	▯
15								-	<1	42	▯*
20		X		X		X	X	-	4-1/2	20	▯
25											
30											
35											
40											

SYMBOLS	DESCRIPTION
SM-SC	BROWN SILTY/CLAYEY SAND, SLIGHTLY DAMP TO DAMP, OCCASIONAL LIGHT CEMENTATION IN NODULAR FORM
SM-SC	BROWN SAND WITH SOME SILT/CLAY, DAMP, OCCASIONAL LIGHT CEMENTATION
SP	BROWN SAND, TRACE OF FINES, DAMP STEAM RELEASE FORM AUGER CUTTINGS
CL-SC	BROWN WITH BLACK STRINGERS SANDY CLAY/CLAYEY SAND, DAMP, OCCASIONAL LIGHT CEMENTATION STEAM RELEASE FROM AUGER CUTTINGS *SAMPLER IS WARM; SAMPLE IS STEAMING WATER ADDED FOR DRILLING PURPOSES CONSIDERABLE STEAM RELEASE FROM AUGER CUTTINGS
ML	BROWN SANDY SILT, AT THE PLASTIC LIMIT

BORING TERMINATED AT 21 FEET ON 2/11/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore

Plate A32

BORING 20-1

Depth in feet	Heavy metals	Lead	Pesticides	Phenol	PCB's	Oil and grease	Volatile organic compounds	Explosimeter reading (% L.E.L.)	HNU reading (PPM)	Blows/ft.	Samples
0											
	X			X		X	X	-	1	19	▣
5								-	1-1/2	53	▣*
10								-	1-1/2	63	▣*
15	X			X		X	X	-	2	100/ 7"	▣*
20	X			X		X	X	-	3	100/ 10"	▣*
25											
30											
35											
40											

LABORATORY TEST DATA REPORTED ELSEWHERE

Symbols	Description
SC	BROWN CLAYEY SAND WITH SOME GRAVEL, DAMP
SP	BROWN SAND WITH SOME GRAVEL AND TRACE OF FINES, DAMP *SAMPLE IS WARM
CL	BROWN SANDY CLAY WITH SOME BLACK STRINGERS, DAMP STEAM RELEASE FROM AUGER CUTTINGS *SAMPLE IS WARM WATER ADDED FOR DRILLING PURPOSES STEAM RELEASE FROM AUGER CUTTINGS INCREASE SAND *SAMPLE IS STEAMING, SAMPLER IS WARM TO HOT WATER ADDED SEVERAL TIMES FOR DRILLING PURPOSES CONSIDERABLE STEAM RELEASE FROM AUGER CUTTINGS INCREASE SAND *SAMPLE IS WARM

BORING TERMINATED AT 21 FEET ON 2/11/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore

Plate A33

BORING 21-1

Depth in Feet	Heavy Metals	Lead	Pesticides	Phenol	PCB's	Oil and Grease	Volatile Organic Compounds	Explosimeter Reading (% L.F.L.)	HNU Reading (PPM)	Blows/Ft.	Samples
0											
								-	-	26	⊠
5	X			X	X	X	X	-	3	40	⊠
10	X			X	X	X	X	0	5-1/2	90	⊠*
15	X			X	X	X	X	0	1-1/2	100/10"	⊠
20								<1	1-1/2	100/10"	⊠
25											
30											
35											
40											

LABORATORY TEST DATA REPORTED ELSEWHERE

SYMBOLS — SC

DESCRIPTION

BROWN ALTHOUGH SOMEWHAT MOTTLED WITH TAN CLAYEY SAND, DAMP, LIGHT TO OCCASIONAL MODERATE CEMENTATION

STEAM RELEASE FORM CUTTINGS

INCREASED MOISTURE AND FINES

WATER ADDED FOR DRILLING PURPOSES AT 7 FEET

WATER ADDED FOR DRILLING PURPOSES AT 8-1/2 FEET

INCREASED SAND
*SAMPLER AND SAMPLE ARE WARM TO ALMOST HOT FROM FRICTION CREATED IN DRIVING/AUGERING
WATER ADDED FOR DRILLING PURPOSES

CONSIDERABLE STEAM RELEASE FROM CUTTINGS AT 14 FEET

SOME NODULES OF RELATIVELY LIGHT CEMENTATION

SMALL QUANTITIES OF WATER ADDED TO THE BORE HOLE SEVERAL TIMES BETWEEN 18 AND 19 FEET FOR DRILLING PURPOSES

INCREASED CLAY - SOME BLACK STRINGERS

BORING TERMINATED AT 21 FEET ON 2/11/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY **Dames & Moore** Plate A34

BORING 17-1

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.
0										
		X		X		X	X	-	-	26
		X		X		X	X	-	-	24
5								0	0	49
10		X		X		X	X	0	-	62
15		X		X		X	X	-	-	100/ 11"
20								-	-	41
25										
30										
35										
40										

SYMBOLS	DESCRIPTION
SC	MOTTLED BROWN AND OFF-WHITE CLAYEY SAND, DAMP, LIGHT TO MODERATELY LIGHT NODULES OF CEMENTATION
	SLIGHTLY HIGHER MOISTURE
SM	BROWN SAND WITH SOME SILT AND A TRACE OF GRAVEL, DAMP
CL-SC	DARK BROWN (WITH BLACK STRINGERS) CLAY AND SAND, DAMP, LIGHT TO SLIGHT CEMENTATION
	LIGHTER BROWN NODULES OF MODERATE CEMENTATION
	AUGER ANNULUS HAS SLIGHT ODOR
	CONSIDERABLE STEAM DRIVEN OUT OF SOIL DURING AUGERING FROM 15 TO 20 FEET
SW	BROWN SAND WITH A TRACE OF SILT AND GRAVEL, DAMP

BORING TERMINATED AT 21 FEET ON 2/07/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore Plate A35

BORING 3-1

Depth in Feet	Laboratory Test Data Reported Elsewhere: Heavy Metals	Lead	Pesticides	Phenol	PCB's	Oil and Grease	Volatile Organic Compounds	Explorimeter Reading (% L.E.L.)	HNU Reading (PPM)	Blows/Ft.	Samples
0											
							X	-	-	12	
5											
							X	0	0	65	
10											
								-	-	45	
15											
								0	80	39	
20							X	-	150	34	
								0	0	46	
25											
30											
35											
40											

Symbols	Description
SC	BLACK TO BROWN CLAYEY SAND, DAMP, STRONG ODOR
CL	MOTTLED LIGHT BROWN AND OFF-WHITE SANDY CLAY, DAMP, LIGHTLY CEMENTED, SOME ODOR
	SOME BLACK STRINGERS
	CONSIDERABLE AUGER FRICTION RELEASES STEAM FROM SOIL
SW	MEDIUM BROWN SAND WITH TRACES OF SILT AND GRAVEL, SLIGHTLY DAMP, SOME ODOR

BORING TERMINATED AT 22 FEET ON 2/08/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BORING 3-2

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0												SC	DARK BROWN CLAYEY SAND, DAMP, SOME ODOR
								0	-	9	■		
5							X	0	70	25	■		INCREASED SAND
												CL	BROWN SANDY CLAY WITH BLACK STRINGERS, DAMP, SLIGHTLY CEMENTED, SOME ODOR
10							X	-	27	70	■		
												SC	BROWN CLAYEY SAND, DAMP, SOME ODOR
15								-	30	31	■		
												SW	MEDIUM BROWN SAND, TRACE OF GRAVEL, DAMP, SOME ODOR
20							X	-	70	23	■		
													BORING TERMINATED AT 21 FEET ON 2/08/84. NO GROUNDWATER ENCOUNTERED.
25													
30													
35													
40													

LABORATORY TEST DATA REPORTED ELSEWHERE

LOG OF BORINGS

BY Dames & Moore — Plate A37

BORING 3-3

Depth in Feet	Heavy Metals	Lead	Pesticides	Phenol	PCB's	Oil and Grease	Volatile Organic Compounds	Explosimeter Reading (% L.E.L.)	HNU Reading (PPM)	Blows/Ft.
0										
							X	-	-	22
5							X	0	30	21
10							X	-	30	59
15								-	10	29
20								-	<1	17
25										
30										
35										
40										

LABORATORY TEST DATA REPORTED ELSEWHERE

Symbols	Description
SC	BLACK TO ABOUT 15 INCHES, THEN BROWN TO LIGHT BROWN CLAYEY SAND, DAMP, SOME LIGHT CEMENTATION, SOME ODOR
CL-SC	BROWN SANDY CLAY AND CLAYEY SAND, DAMP, SLIGHT ODOR SOME STEAM DRIVEN OFF CUTTINGS BY AUGER OPERATIONS SOME BLACK STRINGERS, NO DETECTIBLE ODOR
SC	BROWN CLAYEY SAND, DAMP, SLIGHT CEMENTATION STEAM DRIVEN OUT OF CUTTINGS
SW	MEDIUM BROWN SAND WITH A TRACE OF GRAVEL, DAMP, SLIGHT ODOR

BORING TERMINATED AT 21 FEET ON 2/08/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BORING 3-4

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
	LABORATORY TEST DATA REPORTED ELSEWHERE												
								-	-	22		CL	MOTTLED BROWN AND TAN SANDY CLAY, DAMP, TAN SPOTS ARE LIGHTLY CEMENTED NODULES, SLIGHT ODOR
								-	0	36		SC-SM	LIGHT BROWN CLAYEY/SILTY SAND, SOME BLACK STRINGERS, SLIGHTLY DAMP, SOME TAN TO OFF-WHITE NODULES OF LIGHT TO MODERATE CEMENTATION
								-	0	40			DECREASE FINES, INCREASE MOISTURE TO DAMP
								-	-	30		SW	BROWN SAND, DAMP
								-	-	33			LESS MOISTURE AND VERY SLIGHT ODOR

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35, 40

BORING TERMINATED AT 21 FEET ON 2/08/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore Plate A39

BORING 3-5

Depth in feet	Heavy metals	Lead	Pesticides	Phenol	PCB's	Oil and grease	Volatile organic compounds	Explosimeter reading (% L.E.L.)	HNU reading (PPM)	Blows/ft.	Samples	Symbols	Description
0												SC-CL	BROWN CLAYEY SAND AND SANDY CLAY, DAMP BUT BELOW THE PLASTIC LIMIT
								-	-	24	▯		
												SC-SM	MEDIUM BROWN SAND WITH SILT AND CLAY, DAMP TO SLIGHTLY DAMP, SOME LIGHT CEMENTATION
5													
								-	0	47	▯		
10								-	0	100/8"	▪		SAND LENSE AT 10 FEET
15													
								-	0	53	▯		DECREASE FINES, INCREASE SAND
												SW	LIGHT BROWN SAND, SLIGHTLY DAMP
20								-	1-1/2	48	▯		
25													
30													
35													
40													

Laboratory test data reported elsewhere (Heavy metals, Lead, Pesticides, Phenol, PCB's, Oil and grease, Volatile organic compounds).

BORING TERMINATED AT 21 FEET ON 2/08/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore — Plate A40

BORING 3-6

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0								-	-	16	■	CL	DARK BROWN SANDY CLAY, DAMP TO SLIGHTLY MOIST, BELOW THE PLASTIC LIMIT, STRONG ODOR
												SC	LIGHT BROWN TO MEDIUM BROWN CLAYEY SAND, NODULES OF MODERATELY HEAVY CEMENTATION, DAMP, STRONG ODOR
5							X	0	180	22	■		
10							X	-	80	26	■		
												CL-SC	BROWN SANDY CLAY/CLAYEY SAND WITH A TRACE OF GRAVEL, SLIGHTLY DAMP TO DAMP, STRONG ODOR
15								-	20	27	■		
													SOME STEAM FROM AUGER CUTTINGS
												SW	BROWN SAND WITH A TRACE OF GRAVEL, SLIGHTLY DAMP TO DAMP, SOME ODOR
20							X	-	37	120	■		
25													
30													
35													
40													

BORING TERMINATED AT 21 FEET ON 2/08/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BORING 8-1

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES
0					X	X		-	-	26	
					X	X		0	2	32	
5					X	X		-	5	17	
10					X	X		-	2-1/2	34	
15											
20											
25											
30											
35											
40											

SYMBOLS	DESCRIPTION
SC	BROWN CLAYEY SAND, DAMP, SOME ODOR MOTTLED BROWN AND OFF-WHITE NODULES OF MODERATE CEMENTATION INCREASED ODOR
SC-CL	BROWN CLAYEY SAND/SANDY CLAY, DAMP, SOME TAN CEMENTED STRINGERS, SOME ODOR SLIGHT ODOR

BORING TERMINATED AT 11 FEET ON 2/09/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore Plate A42

BORING 8-2

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES
0					X	X		-	-	14	■
					X	X		-	1	15	■
5					X	X		-	1-1/2	21	■
10					X	X		-	2-1/2	36	■
15											
20											
25											
30											
35											
40											

LABORATORY TEST DATA REPORTED ELSEWHERE

SYMBOLS	DESCRIPTION
SC-CL	BROWN CLAYEY SAND/SANDY CLAY, DAMP, BELOW PLASTIC LIMIT, SLIGHT ODOR
SC-SM	MOTTLED TAN AND MEDIUM BROWN (MOSTLY TAN) CLAYEY/SILTY SAND, SOME MODERATELY HEAVILY CEMENTED NODULES, DAMP TO SLIGHTLY DAMP, SLIGHT ODOR
SC	BROWN CLAYEY SAND WITH BLACK STRINGERS, DAMP, SLIGHT ODOR
SC-CL	MEDIUM BROWN CLAYEY SAND/SANDY CLAY WITH BLACK STRINGERS, DAMP, SLIGHT ODOR SOME STEAM DRIVEN OUT OF SOIL BY AUGER DRILLING

BORING TERMINATED AT 11 FEET ON 2/09/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore Plate A43

BORING 8-3

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES
0					X	X		-	-	13	▣
					X	X		0	1-1/2	24	▣
5					X	X		0	1	25	▣
10					X	X		-	1-1/2	31	▣
15											
20											
25											
30											
35											
40											

LABORATORY TEST DATA REPORTED ELSEWHERE

SYMBOLS	DESCRIPTION
SC-CL	BROWN CLAYEY SAND AND SANDY CLAY, DAMP, VERY SLIGHT ODOR
SC	TAN (SOMEWHAT MOTTLED WITH MEDIUM BROWN) CLAYEY SAND, SLIGHTLY DAMP TO DAMP, NODULES OF MODERATELY HEAVY CEMENTATION
CL-SC	BROWN SANDY CLAY/CLAYEY SAND, DAMP, SOME LIGHT TO OCCASIONAL MODERATE CEMENTATION, SLIGHT ODOR
SC	BROWN CLAYEY SAND, DAMP, SOME ZONES OF LIGHT CEMENTATION, SLIGHT ODOR

BORING TERMINATED AT 11 FEET ON 2/09/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore

Plate A44

BORING 8-4

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SYMBOLS	DESCRIPTION
	LABORATORY TEST DATA REPORTED ELSEWHERE											
0					X	X		-	-	13	SC	BROWN CLAYEY SAND, DAMP, LIGHT CEMENTATION
					X	X		-	3-1/2	32		TAN, MODERATELY HEAVY CEMENTATION IN NODULAR FORM, SLIGHTLY DAMP TO DAMP, VERY SLIGHT ODOR
5								-	<1	27	SC-CL	BROWN CLAYEY SAND/SANDY CLAY, DAMP, SOME NODULES OF MODERATE TO LIGHT CEMENTATION, SLIGHT ODOR
											CL	BROWN SANDY CLAY, DAMP, BELOW PLASTIC LIMIT, OCCASIONAL LIGHT CEMENTATION, SLIGHT ODOR
10					X	X		0	2	25		

BORING TERMINATED AT 11 FEET ON 2/09/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BORING 4-1

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0												SC	LIGHT BROWN SOMEWHAT MOTTLED CLAYEY SAND, DAMP, SOME NODULES OF MODERATE TO OCCASIONAL HEAVY CEMENTATION
		X				X	X	<1	1	11	☒		
													INCREASED CLAY AND DECREASE MOISTURE TO SLIGHTLY DAMP
5		X				X	X	0	1	29	☒		
												SP-SM/SC	SAND WITH SOME FINES, DAMP
10		X				X	X	0	2	27	☒		
15													
20													
25													
30													
35													
40													

LABORATORY TEST DATA REPORTED ELSEWHERE

BORING TERMINATED AT 11 FEET ON 2/11/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore Plate A46

BORING 4-2

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.
0										
		X				X	X	0	<1	15
5		X				X	X	-	1	16
10		X				X	X	-	2	23
15										
20										
25										
30										
35										
40										

LABORATORY TEST DATA REPORTED ELSEWHERE

SAMPLES

SYMBOLS	DESCRIPTION
SM-SC	BROWN SILTY/CLAYEY SAND, SLIGHTLY DAMP, OCCASIONAL NODULES OF LIGHT TO MODERATE CEMENTATION
CL	BROWN SANDY CLAY, DAMP TO SLIGHTLY DAMP, SOME STRINGERS AND SMALL NODULES OF LIGHT CEMENTATION
	INCREASED SAND

BORING TERMINATED AT 11 FEET ON 2/11/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BORING 25-1

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0		X			X	X	X	-	-	8	▯	CL	BROWN SANDY CLAY, DAMP
		X			X	X	X	0	0	42	▯	SC	MOTTLED BROWN TO TAN CLAYEY SAND WITH A TRACE TO SOME GRAVEL, LIGHT TO OCCASIONAL MODERATE CEMENTATION, SLIGHTLY DAMP
5								0	0	28	▯		DECREASED CEMENTATION
10		X			X	X	X	0	0	100/ 10"	▯		INCREASED MOISTURE TO DAMP
15													
20													
25													
30													
35													
40													

LABORATORY TEST DATA REPORTED ELSEWHERE

BORING TERMINATED AT 10.9 FEET ON 2/07/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore Plate A48

BORING 25-2

Depth in feet	Heavy metals	Lead	Pesticides	Phenol	PCB's	Oil and grease	Volatile organic compounds	Explosimeter reading (% L.E.L.)	HNU reading (PPM)	Blows/ft.	Samples
0		X			X	X	X	0	-	30	▯
		X			X	X	X	0	-	34	▯
5		X			X	X	X	0	-	23	▯
10								0	-	94	▯

LABORATORY TEST DATA REPORTED ELSEWHERE

Symbols	Description
CL-SC	BROWN SANDY CLAY/CLAYEY SAND, DAMP
SW-SC	MOTTLED LIGHT BROWN AND OFF-WHITE SAND WITH SOME CLAY AND A TRACE OF GRAVEL, SLIGHTLY DAMP, LIGHT TO OCCASIONAL MODERATE CEMENTATION
SM-SC	TAN SILTY AND CLAYEY SAND WITH A TRACE OF GRAVEL, SLIGHTLY DAMP, LIGHT CEMENTATION
SC	MOTTLED BROWN AND TAN CLAYEY SAND, DAMP, SOME CEMENTATION

BORING TERMINATED AT 11 FEET ON 2/07/84.
NO GROUNDWATER ENCOUNTERED.

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35, 40

LOG OF BORINGS

BY Dames & Moore Plate A49

BORING 25-3

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0		X			X	X	X	0	-	53	▣	SC	GRAYISH BROWN CLAYEY SAND, DAMP, SLIGHT ODOR
		X			X	X	X	0	-	10	▣		LESS GRAY, MORE BROWN, DAMP TO MOIST
5		X			X	X	X	0	-	53	▣		SLIGHTLY DAMP, MODERATELY LIGHT CEMENTATION, TRACE OF GRAVEL
10								0	-	25	▣		NO ODOR
15													
20													
25													
30													
35													
40													

BORING TERMINATED AT 11 FEET ON 2/07/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BORING 25-4

DEPTH IN FEET	LABORATORY TEST DATA REPORTED ELSEWHERE: HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB'S	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.F.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0		X			X	X	X	-	-	24	⊠	SC	LIGHT BROWN CLAYEY SAND, SOME TAN NODULES OF LIGHT CEMENTATION, SLIGHTLY DAMP
		X			X	X	X	0	-	34	⊠		DARK BROWN, DAMP, VERY SLIGHT TO NO ODOR
5								0	-	28	⊠		LIGHT BROWN, SLIGHTLY DAMP, SOME CEMENTATION
10		X			X	X	X	0	-	38	⊠		LIGHT TO OCCASIONAL MODERATE CEMENTATION
15													
20													
25													
30													
35													
40													

BORING TERMINATED AT 11 FEET ON 2/07/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY **Dames & Moore** Plate A51

BORING 25-5

Depth in Feet	Heavy Metals	Lead	Pesticides	Phenol	PCB's	Oil and Grease	Volatile Organic Compounds	Explosimeter Reading (% L.E.L.)	HNU Reading (PPM)	Blows/Ft.	Samples	Symbols	Description
0		X			X	X	X	0	-	24	▣	SC	GRAYISH BROWN CLAYEY SAND, SOME LAYERS OF BLACKISH MATERIAL, DAMP, SLIGHT TO NO ODOR
		X			X	X	X	0	-	11	▣		DARK BROWN, DAMP TO SLIGHTLY MOIST
5								0	-	90	▣		LIGHTER COLOR, LESSER PLASTICITY, LESS MOISTURE, INCREASED CEMENTATION
10		X			X	X	X	0	-	36	▣		SLIGHT CEMENTATION, SOME DARK STRINGERS, DAMP

LABORATORY TEST DATA REPORTED ELSEWHERE (Heavy Metals through Volatile Organic Compounds)

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35, 40

BORING TERMINATED AT 11 FEET ON 2/07/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY **Dames & Moore** Plate A52

BORING 25-6

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0		X			X	X	X	-	-	27		SC	BROWN CLAYEY SAND, DAMP, SLIGHT ODOR
								0	-	71			LESS MOISTURE AND SLIGHTLY CEMENTED
5		X			X	X	X	0	-	63			MOTTLED MEDIUM BROWN TO OFF-WHITE, LIGHT TO MODERATELY HEAVY CEMENTATION, SLIGHTLY DAMP TO DAMP
10		X			X	X	X	-	-	88			DAMP, NO ODOR
15													
20													
25													
30													
35													
40													

LABORATORY TEST DATA REPORTED ELSEWHERE (columns HEAVY METALS through VOLATILE ORGANIC COMPOUNDS)

BORING TERMINATED AT 11 FEET ON 2/07/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BORING 25-7

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.	SAMPLES	SYMBOLS	DESCRIPTION
0		X			X	X	X	-	-	29	⊠	SC	BROWN TO GRAYISH BROWN CLAYEY SAND, DAMP, VERY SLIGHT ODOR
		X			X	X	X	-	-	20	⊠		MOTTLED LIGHT BROWN AND OFF-WHITE, SLIGHTLY DAMP TO DAMP LIGHT TO OCCASIONALLY MODERATE CEMENTATION
5		X			X	X	X	-	-	47	⊠		SLIGHTLY DAMP, LIGHT CEMENTATION
10								-	-	52	⊠		AUGER ANNULUS HAS SOME ODOR

LABORATORY TEST DATA REPORTED ELSEWHERE

BORING TERMINATED AT 11 FEET ON 2/07/84.
NO GROUNDWATER ENCOUNTERED.

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35, 40

LOG OF BORINGS

BY Dames & Moore   Plate A54

BORING 25-8

LABORATORY TEST DATA REPORTED ELSEWHERE

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT	SAMPLES
0		X			X	X	X	-	-	21	■
		X			X	X	X	-	-	10	■
5								-	-	74	■
10		X			X	X	X	-	-	52	■

SYMBOLS	DESCRIPTION
SM-SC	COMPACTED OIL AND SAND MIXTURE ON SURFACE TO A DEPTH OF APPROXIMATELY 2 INCHES BROWN SILTY AND CLAYEY SILTY SAND WITH A TRACE OF GRAVEL, DAMP TO SLIGHTLY MOIST AUGER ANNULUS HAS VERY SLIGHT ODOR
SW-SM/SC	LIGHT BROWN SAND WITH SOME FINES AND A TRACE OF GRAVEL, DAMP TO SLIGHTLY DAMP, SLIGHT CEMENTATION AUGER ANNULUS HAS VERY SLIGHT ODOR
SC	LIGHT BROWN CLAYEY SAND, SLIGHTLY DAMP TO DAMP, SOME BLACK STRINGERS OF LIGHT CEMENTATION AUGER ANNULUS HAS SLIGHT ODOR

BORING TERMINATED AT 11 FEET ON 2/07/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore

Plate A55

BORING 25-9

DEPTH IN FEET	HEAVY METALS	LEAD	PESTICIDES	PHENOL	PCB's	OIL AND GREASE	VOLATILE ORGANIC COMPOUNDS	EXPLOSIMETER READING (% L.E.L.)	HNU READING (PPM)	BLOWS/FT.
0		X			X	X	X	-	-	12
		X			X	X	X	-	-	73
5								-	-	100/8"
10		X			X	X	X	-	-	72
15										
20										
25										
30										
35										
40										

LABORATORY TEST DATA REPORTED ELSEWHERE

SYMBOLS	DESCRIPTION
CL-SC	COMPACTED OIL AND SAND MIXTURE ON SURFACE BROWN SANDY CLAY AND CLAYEY SAND, DAMP TO SLIGHTLY MOIST
SC-SM	MOTTLED BROWN AND OFF-WHITE CLAYEY/SILTY SAND, OFF-WHITE NODULES ARE MODERATELY LIGHT TO MODERATELY CEMENTED, SLIGHTLY DAMP AUGER ANNULUS HAS VERY SLIGHT ODOR LESS MOISTURE AND MORE CEMENTATION
SC	BROWN CLAYEY SAND, SLIGHTLY DAMP TO DAMP, BLACK STRINGERS OF LIGHT CEMENTATION AUGER ANNULUS HAS SLIGHT ODOR

BORING TERMINATED AT 11 FEET ON 2/07/84.
NO GROUNDWATER ENCOUNTERED.

LOG OF BORINGS

BY Dames & Moore Plate A56

APPENDIX B

FIELD AND LABORATORY QUALITY CONTROL PROGRAMS

FIELD AND LABORATORY QUALITY CONTROL PROGRAMS

FIELD INVESTIGATION QUALITY CONTROL PROGRAM

Quality control of field activities consists of following established procedures during the conduct of the work. In those cases that require the drilling of test borings, installation of piezometers or monitor wells, and taking of soil and water samples, the procedures include the preparation of records to document the compliance with these procedures. These field records include boring logs, monitor well installation records, daily field memoranda, sample shipment and test instruction forms for soil sample testing, and chain-of-custody records for all soil and water samples intended for chemical analyses. The nature of water sample tests was established in advance so that plans could be made to ship samples in an appropriate and timely manner.

The pH and specific conductivity meters used for field water quality measurements were calibrated with known standards immediately before the measurements were made. The HNU photoionization detector and explosimeter used to monitor vapors generated while drilling have internal calibration routines that were followed when the meters were turned on. A detailed description of sampling procedures is located in Section III.

LABORATORY QUALITY CONTROL PROGRAM

UBTL is an accredited laboratory of the American Industrial Hygiene (AIHA) Association (No. 17) and, as such, participates in an extensive interlaboratory proficiency analytical testing program sponsored by the National Institute for Occupational Safety and Health (NIOSH). In addition, UBTL is currently licensed by the Center for Disease Control (CDC) to perform chemical and clinical analyses of biological specimens and is State of Utah/USEPA approved for environmental analyses. The comprehensive internal quality control program at UBTL is detailed as follows.

Introduction

UBTL has implemented an effective system for Quality Control (QC). Procedures that are employed include:

1. Services of a full-time Quality Control/Quality Assurance Section;
2. Preparation of internal quality control samples;
3. Collection and evaluation of quality control data;
4. Generation of quality control charts; and
5. Instrument calibration and maintenance.

Sample Analyses

At least one blank sample and one reagent blank are included with each set of analyses and processed through the complete analytical procedure in order to detect any contamination in either collection media or reagents. In addition, duplicate analyses are accomplished on a minimum of 10 percent of all samples submitted from the field. Internal quality control samples, generated in the laboratory and containing known quantities of specified analyte(s), are run at the rate of 10 percent of the total field sample workload. At the completion of the analysis of a sample set, each chemist calculates his results and reports the results on the Analytical Report Form. Results for replicated samples and internal quality control samples are reported on the computer-generated Quality Control Data Sheet. Before the results are submitted to the Group Leader, another peer chemist analyst is assigned to check results for possible errors in the calculations. He must approve results reported on both the quality control sheet and the sample sheet. The Group Leader, after his evaluation of the data, gives the report sheets to the Quality Assurance Specialist (QAS) for his evaluation and implementation of any required action.

Specific steps are followed when any one QC sample result is determined to be out of control in connection with the analysis of a field sample set. QC charts with adjusted control limits of $\pm$ 3 standard deviations will generally be used to determine whether a result is out of control. If QC results are in control, the QAS signs off the report. It is then reviewed by the Section Head for accuracy of the results. Upon final approval of the reports by the QAS and the Section Head, the reports are sent to the sponsor.

The paperwork containing the raw data for a sample set (i.e., chart paper, computer readouts, paper tapes, calibration curves, tables of data, etc.) is collected and placed in an 8½-inch by 11-inch envelope that has been labeled with sample numbers, analyst, date, and other pertinent information. The envelopes are filed by laboratory number for possible future reference and data retrieval. Raw data for each sample analysis are therefore readily available, if needed.

Quality Control Sample Data Analysis

A record of the preparation of internal QC samples is detailed in the QC log book maintained by the QAS. As appropriate, a set of QC samples is distributed to the chemist along with each sample set at an average rate of at least 10 percent of the submitted samples. The analyses and data evaluations are performed for these QC samples, along with the submitted samples, and results are tabulated on the computer-generated Quality Control Data Sheet. At least duplicate results are reported for each internal QC sample.

QC charts are generated for each analyte through the analysis of QC sample results. Each result is divided by the theoretical value to standardize results so that data from all concentrations can be directly compared for accuracy and precision. When a control data set of N sample results has been accumulated, the following statistics are calculated: mean percent recovery, replicate standard deviation, and set standard deviation. These statistics are then used to determine accuracy and precision QC limits.

The control data set is updated after evaluation of 20 successive QC samples and includes data on the 50 most recent results. Any control sample analysis that is beyond accuracy or precision limits is not used in the subsequent determination of new limits.

External Quality Control Programs

In addition to internally generated QC data, other information concerning QC is provided by the participation of UBTL in four interlaboratory QC programs: NIOSH Proficiency Analytical Testing (PAT) Program; two CDC Blood Lead QC Programs; and State of Utah Environmental Quality Control Program. The PAT Program and the CDC Blood Lead Programs involve the participation of more than 100 laboratories on a nationwide basis. The PAT Program addresses the analysis of filter samples for lead, cadmium, zinc, free silica, and asbestos and the analysis of charcoal tubes for various organic solvents.

Laboratory Data Reduction

A significant fraction of the Chemistry Department's work involves data processing. Mathematical models, based upon analysis of standard solutions or samples, are generated in order to determine the quantity of analyte present in the samples. Considerable time and effort are saved by the utilization of automated data processing procedures. Data processing by the computer can include, for example, calculations, generation of standard calibration curves, mathematical modeling of standard curves, statistical analyses, and the generation of hard copy output. Advantages intrinsic to the use of an automated system include more accurate calculations, immediate and accurate generation of data plots, fewer transcription errors, and no calculation errors after programs have been verified and documented. In general, the types of data that are processed are those derived from the following techniques: atomic absorption and flame emission spectroscopy, gas and liquid chromatography, optical absorbance spectrophotometry, specific ion electrode, fluorescence spectroscopy, and wet chemistry determinations. Similar functions are employed for QC data. In addition, the data system is utilized to store QC data, provide statistical analyses, and generate and update QC charts.

The advantage of the provision for statistical analyses and the production of QC charts by automation is that the charts may be easily updated with minimal effort. QC data and any required action may, therefore, be provided on a daily basis.

Reporting Procedures

The analytical data are reported to the sponsor at the completion of each sample set. The report includes the following items:

1. A memorandum describing the sample set; the condition and appearance (i.e., homogeneity, integrity, etc.) of the samples upon receipt at UBTL; the method, equipment, and technique used in the determination; any interferences that were observed; and any unusual circumstances that may have occurred during the analysis. [The limit(s) of detection are also reported.]

2. UBTL Analytical Report Form, including field ID number, laboratory ID number, identification of the analytes, results of each determination, limit(s) of detection, and comments.

3. Other items, such as copies of strip chart recorder output, computer printout sheets, and other raw data (to be included as required).

Instrumentation

Each major equipment item at the UBTL Chemistry Department undergoes a routine preventive maintenance check on a regular schedule. This check is accomplished by a trained engineer. In addition, performance checks are made by the analyst prior to the analysis of each set of samples. This involves the analysis of one or more standards and a comparison of the values obtained with previous results and conditions. This information is recorded in an instrumentation log.

When an instrument or apparatus malfunctions and the problem is not readily corrected, the appropriate Section Head is notified. If it is determined that a visit by the service representative is required, a service call is scheduled and the QAS is notified. Action by the service representative is recorded by the QAS in the Instrument Maintenance Log, and the appropriate customer field and service order forms are filed, by instrument, in the Instrument Maintenance Log Supplement File. In an effort to monitor and maintain instrument specifications, logs for each of the AA spectrophotometers, the gas chromatographs (GC), the X-ray defractometer (X-ray), and the mass spectrometers (MS) have been provided for the analytical chemists' use each time an analysis is performed. The AA instrumentation logs contain entries for date, analyst, lamp number (if more than one lamp is available), standard concentration (recommended in manual), reading in milliabsorbence units, and a column for when instrumental parameters differ from the recommended conditions listed in the manual. The GC, X-ray, and MS logs contain entries for date, time, analyst, set identification number, and comments on parameters or performance.

Training

UBTL has established a continuing program of training of current personnel with respect to QC procedures. In addition, an intensive program for the training of recently recruited personnel in both analytical methods and techniques and QC policies has been implemented. It is the responsibility of the QAS and the Laboratory Director to train all laboratory personnel.

Results of the Laboratory QC Program

The results of the QC analysis for ground water and soil samples are presented on the following UBTL Quality Control Report Summaries, and further summarized in Tables B-1 through B-4.

Ground Water Analyses

The laboratory QC program for ground water included analyses of four spikes and five sets of splits. Tables B-1 and B-2 present results of spike recovery and duplicate concentrations in summary form. Percent spike recovery varied with spike concentration of the various constituents. Generally, low spike concentrations (near the detection limits) yielded relatively low spike recoveries. However, average spike recovery was greater than 80 percent for each parameter.

Duplicate analyses revealed that reported concentrations were quite accurate and, in most cases, were within the range of concentrations determined from the first and second splits.

Soil Analyses

The laboratory QC program for soil samples included analyses of 49 spikes and 75 sets of splits (including moisture contents). Tables B-3 and B-4 present results of spike recovery and duplicate concentrations in summary form. Percent spike recovery varied with spike concentration of the various constituents. Generally, low spike concentrations (near the detection limits) yielded relatively low spike recoveries. However, average spike recovery was greater than 80 percent for each parameter.

Duplicate analyses revealed that reported concentrations were quite accurate and, in most cases, were within the range of concentrations determined from the first and second splits.

[usaf20/dm5]

TABLE B-1

SUMMARY OF SPIKE RECOVERY FOR GROUND WATER SAMPLES

PARAMETER	SPIKE CONSTITUENT	SPIKE CONCENTRATION (µg/L)	% SPIKES RECOVERED MINIMUM	MAXIMUM	MEAN
Heavy Metals	Arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc	3 to 500	67	141	101
Pesticides	Aldrin, dieldrin, endrin, o,p-DDT, p,p-DDT, heptachlor, lindane, DDE	0.05	60	104	86
Oil & Grease	Oil & Grease	0.2*	-	-	131
TOC	TOC (total organic carbon)	1.6	-	-	99

*Oil and grease measured in milligrams per liter.

NOTE: Spike recovery of volatile organic compounds (VOC) analyzed with samples from Nellis AFB.

TABLE B-2

SUMMARY OF DUPLICATE ANALYSES FOR GROUND WATER SAMPLES[a]

PARAMETER	CONSTITUENT	WELL NUMBER	REPORTED CONCENTRATION (μg/L)	1st SPLIT CONCENTRATION (μg/L)	2nd SPLIT CONCENTRATION (μg/L)
Heavy Metals	Zinc	DM-2	110	123	98
Pesticides	Aldrin	DM-2	0.02	0.02	0.02
	Heptachlor	DM-2	0.06	0.04	0.04
Oil & Grease	Oil & Grease	W-4	0.2[b]	0.21[b]	0.24[b]

[a]Table does not include data in which 1st and 2nd split concentrations and reported concentrations were all undetectable.

[b]Oil and grease measured in milligrams per liter.

TABLE B-3

SUMMARY OF SPIKE RECOVERY FOR SOIL SAMPLES

PARAMETER	SPIKE CONSTITUENT	SPIKE CONCENTRATION (µg/g)	% SPIKES RECOVERED MINIMUM	MAXIMUM	MEAN
Heavy Metals	Arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc	0.2 to 23.8	14	128	95
Lead	Lead	11.9 to 48	86	118	100
Pesticides	Aldrin, dieldrin, endrin, o,p-DDT, p,p-DDT, heptachlor, lindane, DDE	0.05	60	100	81
Phenol	Phenol	2.4 to 10	62	100	86
PCBs	Arochlor 1260	0.2 to 3	70	89	83
Oil & Grease	Oil and grease	1.6 to 1.8*	70	114	94
Volatile Organic Compounds	Chloromethane, vinyl chloride, trichlorofluoromethane, trans-1,2-dichloroethene, 1,1,1-trichloroethane, bromodichloromethane, 1,2-dichloropropane, tetrachloroethene, and 1,2-dichlorobenzene.	0.075	86	142	119
	Methylene chloride, 1,1-dichlorethane, 1,2-dichloroethane, cis-1,3-dichloropropene, trichloroethene, dibromochloromethane, 1,1,2,2-tetrachloroethane, and 1,3-dichlorobenzene.	0.05	40	156	83
	Benzene, toluene, ethyl benzene, chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, and 1,4-dichlorobenzene	0.05	96	108	101
	Benzene, toluene, ethyl benzene, chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, and 1,4-dichlorobenzene	0.025	80	132	98

*Oil and grease measured in milligrams per gram.

TABLE B-4

SUMMARY OF DUPLICATE ANALYSES FOR SOIL SAMPLES[a]

PARAMETER	CONSTITUENT	BORING NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (ft)	REPORTED CONCENTRATION (μg/g)	1st SPLIT CONCENTRATION (μg/g)	2nd SPLIT CONCENTRATION (μg/g)
Heavy Metals	Arsenic	20-1	1	2½	1.8	1.4	2.3
	Cadmium	20-1	1	2½	1.5	1.5	1.4
	Copper	20-1	1	2½	9.3	9.6	8.9
	Lead	20-1	1	2½	13	12.2	13.1
	Nickel	20-1	1	2½	9.9	11.3	8.6
	Silver	20-1	1	2½	1.2	ND	ND
	Zinc	20-1	1	2½	22	23.9	20.9
Lead	Lead	18-1	1	½	17	14	19
		18-1	4	6½	13	14	12
		19-1	2	5½	28	30.2	25.9
		4-1	1	2½	48	45	51
		4-1	2	5½	39	48	30
		25-1	1	½	21	21	21
		25-1	2	2½	14	14	14
		25-1	4	10½	14	14	14
Pesticides	Heptachlor	1-1	5	20½	0.004	0.004	0.004
Oil & Grease	Oil & Grease	1-3	2	5½	0.06[b]	0.057[b]	0.042[b]
		1-5	1	½	0.17[b]	0.167[b]	0.148[b]
		18-1	1	½	0.14[b]	0.137[b]	0.126[b]
		18-2	2	2½	0.15[b]	0.155[b]	0.136[b]
		8-1	1	½	34[b]	43[b]	24[b]
		25-2	1	½	0.08[b]	0.08[b]	0.08[b]
Volatile Organic Compounds	Methylene Chloride	19-3	2	5½	0.03	ND	ND

[a]Table does not include data in which 1st and 2nd split concentrations and reported concentrations were all nondetectable (ND), nor moisture content data.

[b]Oil and grease measured in milligrams per gram.

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 18 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 18-3:5	% Recovered 18-3:5	First Split 18-2:2	Second Split 18-2:2			Method Blank
Benzene	μg/g	0.01	0.025	88	ND	ND			ND
Toluene	μg/g	0.01	0.025	88	ND	ND			ND
Ethylbenzene	μg/g	0.01	0.025	88	ND	ND			ND
Chlorobenzene (2)	μg/g	0.01	0.025	88	ND	ND			ND
1,2-Dichlorobenzene (2)	μg/g	0.01	0.025	84	ND	ND			ND
1,3-Dichlorobenzene (2)	μg/g	0.01	0.025	88	ND	ND			ND
1,4-Dichlorobenzene (2)	μg/g	0.01	0.025	88	ND	ND			ND
							First Split	Second Split	
					18-2:2	18-2:2	18-1:1	18-1:1	
Oil & Grease	mg/g	0.05	--	--	0.155	0.136	0.137	0.126	ND
					18-1:2	18-1:2	18-1:4	18-1:4	
Phenol	μg/g	5	(3)	(3)	ND	ND	ND	ND	--
					18-2:1	18-2:1	18-3:1	18-3:1	
					ND	ND	ND	ND	
			18-2:1	18-2:1	18-1:1	18-1:1	18-1:4	18-1:4	
Lead	μg/g	10	48	86	14	19	14	12	ND
					18-1:3	18-1:3	18-1:5	18-1:5	
Moisture	%	--	--	--	14.0	12.2	7.2	7.7	--
					18-2:3	18-2:3	18-3:2	18-3:2	
					10.3	9.6	10.5	10.9	

(2) Analyzed by EPA Method 602
(3) Spike values reported with data from Site 1

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 7 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 1-3:1	% Recovered 1-3:1	First Split 1-1:5	Second Split 1-1:5	Method Blank
Aroclor 1016	µg/g	0.5	(1)	(1)	(1)	(1)	ND
Aroclor 1221	µg/g	0.5	(1)	(1)	(1)	(1)	ND
Aroclor 1232	µg/g	0.5	(1)	(1)	(1)	(1)	ND
Aroclor 1242	µg/g	0.5	(1)	(1)	(1)	(1)	ND
Aroclor 1248	µg/g	0.5	(1)	(1)	(1)	(1)	ND
Aroclor 1254	µg/g	0.5	(1)	(1)	(1)	(1)	ND
Aroclor 1260	µg/g	0.5	(1)	(1)	(1)	(1)	ND
Moisture	%	--	--	--	(1)	(1)	--

(1) QC combined with QC for Site 8

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 18 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 18-2:2	% Recovered 18-2:2	First Split 18-1:5	Second Split 18-1:5	Method Blank
Methylene Chloride	μg/g	0.01	0	0	ND	ND	ND
1,1,1-Trichloroethane	μg/g	0.01	0.075	140	ND	ND	ND
Carbon Tetrachloride	μg/g	0.01	0	0	ND	ND	ND
Trichloroethene	μg/g	0.01	0	0	ND	ND	ND
1,1,2-Trichloroethane	μg/g	0.01	0	0	ND	ND	ND
1,1,2,2-Tetrachloroethane	μg/g	0.01	0	0	ND	ND	ND
Chloromethane	μg/g	0.05	0.075	140	ND	ND	ND
Bromomethane	μg/g	0.05	0	0	ND	ND	ND
Dichlorodifluoromethane	μg/g	0.1	0	0	ND	ND	ND
Vinyl Chloride	μg/g	0.01	0.075	104	ND	ND	ND
Chloroethane	μg/g	0.01	0	0	ND	ND	ND
Trichlorofluoromethane	μg/g	0.01	0.075	128	ND	ND	ND
1,1-Dichloroethene	μg/g	0.01	0	0	ND	ND	ND
1,1-Dichloroethane	μg/g	0.01	0	0	ND	ND	ND
trans-1,2-Dichloroethene	μg/g	0.01	0.075	133	ND	ND	ND
Chloroform	μg/g	0.01	0	0	ND	ND	ND
1,2-Dichloroethane	μg/g	0.01	0	0	ND	ND	ND
Bromodichloromethane	μg/g	0.01	0.075	134	ND	ND	ND
1,2-Dichloropropane	μg/g	0.01	0.075	132	ND	ND	ND
trans-1,3-Dichloropropene	μg/g	0.01	0	0	ND	ND	ND
Dibromochloromethane	μg/g	0.01	0	0	ND	ND	ND
cis-1,3-Dichloropropene	μg/g	0.01	0	0	ND	ND	ND
2-Chloroethylvinyl Ether	μg/g	0.01	0	0	ND	ND	ND
Bromoform	μg/g	0.01	0	0	ND	ND	ND
Tetrachloroethene	μg/g	0.01	0.075	132	ND	ND	ND
Chlorobenzene (1)	μg/g	0.01	0	0	ND	ND	ND
1,2-Dichlorobenzene (1)	μg/g	0.01	0.075	113	ND	ND	ND
1,3-Dichlorobenzene (1)	μg/g	0.01	0	0	ND	ND	ND
1,4-Dichlorobenzene (1)	μg/g	0.01	0	0	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 1 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 1-3:1	% Recovered 1-3:1	First Split 1-1:5	Second Split 1-1:5	Method Blank
Aldrin	μg/g	0.001	0.05	96	ND	ND	ND
Dieldrin	μg/g	0.001	0.05	64	ND	ND	ND
Chlordane	μg/g	0.02	0	0	ND	ND	* ND
Endrin	μg/g	0.001	0.05	60	ND	ND	ND
o,p-DDT	μg/g	0.001	0.05	62	ND	ND	ND
p,p'-DDT	μg/g	0.001	0.05	82	ND	ND	ND
Endrin Aldehyde	μg/g	0.001	0	0	ND	ND	ND
Heptachlor	μg/g	0.001	0.05	98	0.004	0.004	ND
Lindane	μg/g	0.001	0.05	100	ND	ND	ND
DDD	μg/g	0.001	0	0	ND	ND	ND
DDE	μg/g	0.001	0.05	88	ND	ND	ND
					1-1:11	1-1:11	
Moisture	%	--	0	0	3.4	4.1	--

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 1 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 1-4:1	% Recovery 1-4:1	Spike Concentration 1-5:3	% Recovery 1-5:3	First Split 1-2:6	Second Split 1-2:6	First Split 1-5:10	Second Split 1-5:10	Method Blank
Benzene	µg/g	0.01	0.025	104	0.025	100	ND	ND	ND	ND	ND
Toluene	µg/g	0.01	0.025	104	0.025	108	ND	ND	ND	ND	ND
Ethylbenzene	µg/g	0.01	0.025	108	0.025	100	ND	ND	ND	ND	ND
Chlorobenzene (2)	µg/g	0.01	0.025	104	0.025	104	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (2)	µg/g	0.01	0.025	120	0.025	92	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (2)	µg/g	0.01	0.025	116	0.025	92	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (2)	µg/g	0.01	0.025	132	0.025	92	ND	ND	ND	ND	ND
							1-3:2	1-3:2	1-5:1	1-5:1	
Oil & Grease	mg/g	0.05	--	--	--	--	0.057	0.042	0.167	0.148	ND
			1:4-6 (3)	1:4-6	1-5:7 (3)	1-5:7	1-2:2	1-2:2	1-2:11	1-2:11	
Phenol	µg/g	5	10	100	10	84	ND	ND	ND	ND	--
			1-6:5 (3)	1-6:5	1-6:10 (3)	1-6:10	1-5:10	1-5:10			
Phenol	µg/g	5	10	79	10	62	ND	ND			
							1-1:2	1-1:2	1-6:5	1-6:5	
Moisture	%	--	--	--	--	--	3.4	3.4	4.8	5.0	--

(2) Analyzed by EPA Method 602
(3) Spike was added to the distillate from the soil.

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 1 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 1-5:10	% Recovered 1-5:10	Spike Concentration 1-6:10	% Recovered 1-6:10	First Split 1-2:6	Second Split 1-2:6	First Split 1-6:1	Second Split 1-6:1	Method Blank
Methylene Chloride	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/g	0.01	0.075	99	0.075	140	ND	ND	ND	ND	ND
Carbon Tetrachloride	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Trichloroethene	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Chloromethane	µg/g	0.05	0.075	(2)	0.075	(2)	ND	ND	ND	ND	ND
Bromomethane	µg/g	0.05	0	0	0	0	ND	ND	ND	ND	ND
Dichlorodifluoromethane	µg/g	0.1	0	0	0	0	ND	ND	ND	ND	ND
Vinyl Chloride	µg/g	0.01	0.075	86	0.075	102	ND	ND	ND	ND	ND
Chloroethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/g	0.01	0.075	100	0.075	142	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/g	0.01	0.075	99	0.075	130	ND	ND	ND	ND	ND
Chloroform	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Bromodichloromethane	µg/g	0.01	0.075	95	0.075	139	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/g	0.01	0.075	104	0.075	137	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Dibromochloromethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Bromoform	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Tetrachloroethene	µg/g	0.01	0.075	117	0.075	125	ND	ND	ND	ND	ND
Chlorobenzene (1)	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (1)	µg/g	0.01	0.075	97	0.075	119	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND

(1) Analyzed by EPA Method 601

(2) It is surmised that the chloromethane may have been inadvertently omitted from the spiking mixture.

UBTL QUALITY CONTROL REPORT SUMMARY

David Monthan AFB Wells Water Analysis

Analyte	Units	Detection Limit	Spike (2) Concentration	% Recovered	First Split DM-2	Second Split DM-2	Method Blank
Methylene Chloride	µg/L	0.5	--	--	ND	ND	ND
1,1,1-Trichloroethane	µg/L	0.1	--	--	ND	ND	ND
Carbon Tetrachloride	µg/L	0.1	--	--	ND	ND	ND
Trichloroethene	µg/L	0.1	--	--	ND	ND	ND
1,1,2-Trichloroethane	µg/L	0.1	--	--	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	0.5	--	--	ND	ND	ND
Chloromethane	µg/L	0.5	--	--	ND	ND	ND
Bromomethane	µg/L	0.5	--	--	ND	ND	ND
Dichlorodifluoromethane	µg/L	0.5	--	--	ND	ND	ND
Vinyl Chloride	µg/L	0.5	--	--	ND	ND	ND
Chloroethane	µg/L	0.5	--	--	ND	ND	ND
Trichlorofluoromethane	µg/L	0.5	--	--	ND	ND	ND
1,1-Dichloroethene	µg/L	0.1	--	--	ND	ND	ND
1,1-Dichloroethane	µg/L	0.1	--	--	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	0.1	--	--	ND	ND	ND
Chloroform	µg/L	0.1	--	--	ND	ND	ND
1,2-Dichloroethane	µg/L	0.1	--	--	ND	ND	ND
Bromodichloromethane	µg/L	0.1	--	--	ND	ND	ND
1,2-Dichloropropane	µg/L	0.1	--	--	ND	ND	ND
trans-1,3-Dichloropropene	µg/L	0.5	--	--	ND	ND	ND
Dibromochloromethane	µg/L	0.1	--	--	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	0.1	--	--	ND	ND	ND
2-Chloroethylvinyl Ether	µg/L	1.0	--	--	ND	ND	ND
Bromoform	µg/L	0.1	--	--	ND	ND	ND
Tetrachloroethene	µg/L	0.5	--	--	ND	ND	ND
Chlorobenzene (1)	µg/L	0.1	--	--	ND	ND	ND
1,2-Dichlorobenzene (1)	µg/L	0.5	--	--	ND	ND	ND
1,3-Dichlorobenzene (1)	µg/L	0.5	--	--	ND	ND	ND
1,4-Dichlorobenzene (1)	µg/L	0.5	--	--	ND	ND	ND

(1) Analyzed by EPA Method 601
(2) The EPA 601 analyses were performed with samples from Nellis AFB. The QC was combined. The spike sample was from Nellis AFB, Sample W-6.

David Monthan AFB Wells Water Analysis

Analyte	Units	Detection Limit	Spike Concentration	% Recovered	First Split	Second Split	Method Blank
Benzene	µg/L	0.5	(5)	(5)	(5)	(5)	(5)
Toluene	µg/L	0.5	(5)	(5)	(5)	(5)	(5)
Ethylbenzene	µg/L	0.5	(5)	(5)	(5)	(5)	(5)
Chlorobenzene (3)	µg/L	0.5	(5)	(5)	(5)	(5)	(5)
1,2-Dichlorobenzene (3)	µg/L	0.5	(5)	(5)	(5)	(5)	(5)
1,3-Dichlorobenzene (3)	µg/L	0.5	(5)	(5)	(5)	(5)	(5)
1,4-Dichlorobenzene (3)	µg/L	0.5	(5)	(5)	(5)	(5)	(5)
			DM-1	DM-1	DM-2	DM-2	
Aldrin	µg/L	0.01	0.05	96	0.02	0.02	ND
Dieldrin	µg/L	0.01	0.05	76	ND	ND	ND
Chlordane	µg/L	0.2	0	0	ND	ND	ND
o,p-DDT	µg/L	0.01	0.05	60	ND	ND	ND
p,p'-DDT	µg/L	0.01	0.05	90	ND	ND	ND
Endrin	µg/L	0.01	0.05	80	ND	ND	ND
Endrin Aldehyde	µg/L	0.01	0	0	ND	ND	ND
Heptachlor	µg/L	0.01	0.05	104	0.04	0.07	ND
Lindane	µg/L	0.01	0.05	100	ND	ND	ND
DDD	µg/L	0.01	0	0	ND	ND	ND
DDE	µg/L	0.01	0.05	80	ND	ND	ND
			DM-1	DM-1	DM-2	DM-2	
Arsenic	µg/L	50	200	104	ND	ND	
Cadmium	µg/L	10	50	99	ND	ND	
Chromium	µg/L	50	50	105	ND	ND	
Copper	µg/L	50	200	102	ND	ND	
Lead	µg/L	20	100	100	ND	ND	
Mercury	µg/L	2	3(4)	141(4)	ND	ND	
Nickel	µg/L	100	500	113	ND	ND	
Selenium	µg/L	10	50	67	ND	ND	
Silver	µg/L	10	50	82	ND	ND	
Zinc	µg/L	50	200	97	123	98	
			W-4	W-4	W-4	W-4	
Oil & Grease	mg/L	0.2	0.37	131	0.21	0.24	
			W-4	W-4	W-4	W-4	
TOC	mg/L	1	1.6	99	ND	ND	

(3) Analyzed by EPA Method 602
(4) Spike data from sample W-2
(5) These [illegible] were analyzed with [illegible] samples from [illegible] AFB [illegible]. [illegible] QC data are reported [illegible]

UBTL QUALITY CONTROL REPORT SUMMARY
David Monthan AFB Wells Water Analyses

Analyte	Units	Detection Limit	Spike Concentration W-11(2)	% Recovered W-11(2)	First Split W-2	Second Split W-2	Method Blank
Methylene Chloride	μg/L	0.5	10	92	ND	ND	ND
1,1,1-Trichloroethane	μg/L	0.5	0	0	ND	ND	ND
Carbon Tetrachloride	μg/L	0.5	0	0	ND	ND	ND
Trichloroethene	μg/L	0.5	10	100	ND	ND	ND
1,1,2-Trichloroethane	μg/L	0.5	0	0	ND	ND	ND
1,1,2,2-Tetrachloroethane	μg/L	0.5	10	61	ND	ND	ND
Chloromethane	μg/L	1	0	0	ND	ND	ND
Bromomethane	μg/L	1	0	0	ND	ND	ND
Dichlorodifluoromethane	μg/L	1	0	0	ND	ND	ND
Vinyl Chloride	μg/L	1	0	0	ND	ND	ND
Chloroethane	μg/L	1	0	0	ND	ND	ND
Trichlorofluoromethane	μg/L	1	0	0	ND	ND	ND
1,1-Dichloroethene	μg/L	0.5	0	0	ND	ND	ND
1,1-Dichloroethane	μg/L	0.5	10	104	ND	ND	ND
trans-1,2-Dichloroethene	μg/L	0.5	0	0	ND	ND	ND
Chloroform	μg/L	0.5	0	0	ND	ND	ND
1,2-Dichloroethane	μg/L	0.5	10	95	ND	ND	ND
Bromodichloromethane	μg/L	0.5	0	0	ND	ND	ND
1,2-Dichloropropane	μg/L	0.5	0	0	ND	ND	ND
trans-1,3-Dichloropropene	μg/L	0.5	0	0	ND	ND	ND
Dibromochloromethane	μg/L	0.5	10	99	ND	ND	ND
cis-1,3-Dichloropropene	μg/L	0.5	10	91	ND	ND	ND
2-Chloroethylvinyl Ether	μg/L	1	0	0	ND	ND	ND
Bromoform	μg/L	0.5	0	0	ND	ND	ND
Tetrachloroethene	μg/L	0.5	0	0	ND	ND	ND
Chlorobenzene (1)	μg/L	0.5	0	0	ND	ND	ND
1,2-Dichlorobenzene (1)	μg/L	0.5	0	0	ND	ND	ND
1,3-Dichlorobenzene (1)	μg/L	0.5	10	103	ND	ND	ND
1,4-Dichlorobenzene (1)	μg/L	0.5	0	0	ND	ND	ND

(1) Analyzed by EPA Method 601.
(2) Sample collected 2-7-84.

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Wells Water Analyses

Analyte	Units	Detection Limit	Spike Concentration W-19	% Recovery W-19	Spike Concentration W-11[4]	% Recovery W-11[4]	First Split W-6	Second Split W-6	First Split W-11[4]	Second Split W-11[4]	Method Blank
Benzene	μg/L	0.01	5	111	5	109	ND	ND	ND	ND	ND
Toluene	μg/L	0.01	5	92	5	112	ND	ND	ND	ND	ND
Ethylbenzene	μg/L	0.01	5	117	5	114	ND	ND	ND	ND	ND
Chlorobenzene (2)	μg/L	0.01	5	109	5	108	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (2)	μg/L	0.01	5	99	5	105	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (2)	μg/L	0.01	5	111	5	106	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (2)	μg/L	0.01	5	108	5	107	ND	ND	ND	ND	ND
Oil & Grease	mg/L	0.4	(5)	(5)			(5)	(5)			(5)
Phenol	μg/L	10	(6)	(6)			(6)	(6)			(6)
						W-19	W-19				
Lead	μg/L					ND	ND				ND

(3) Analyzed by EPA Method 602.
(4) Sample collected 2-24-84.
(5) QC combined with Site 8 and Site 25.
(6) QC combined with Site 17 and Site 19.

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 19 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 19-3:3	% Recovered 19-3:3	Spike Concentration 19-4:2	% Recovered 19-4:2	First Split 19-2:3	Second Split 19-2:3	First Split 19-3:2	Second Split 19-3:2	Method Blank
Methylene Chloride	µg/g	0.01	0.05	94	0.05	74	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Carbon Tetrachloride	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Trichloroethene	µg/g	0.01	0.05	100	0.05	88	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/g	0.01	0.05	74	0.05	45	ND	ND	ND	ND	ND
Chloromethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Bromomethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Dichlorodifluoromethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Vinyl Chloride	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Chloroethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/g	0.01	0.05	98	0.05	95	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Chloroform	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Bromodichloromethane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Dibromochloromethane	µg/g	0.01	0.05	101	0.05	77	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/g	0.01	0.05	109	0.05	77	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Bromoform	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Tetrachloroethene	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
Chlorobenzene (1)	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1-2-Dichlorobenzene (1)	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	µg/g	0.01	0.05	98	0.05	85	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	µg/g	0.01	0	0	0	0	ND	ND	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 19 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 19-2:3	% Recovery 19-2:3	Spike Concentration	% Recovery	First Split 19-2:3	Second Split 19-2:3	First Split	Second Split	Method Blank
Benzene	μg/g	0.01	0.05	106			ND	ND			ND
Toluene	μg/g	0.01	0.05	104			ND	ND			ND
Ethylbenzene	μg/g	0.01	0.05	104			ND	ND			ND
Chlorobenzene (2)	μg/g	0.01	0.05	104			ND	ND			ND
1,2-Dichlorobenzene (2)	μg/g	0.01	0.05	100			ND	ND			ND
1,3-Dichlorobenzene (2)	μg/g	0.01	0.05	102			ND	ND			ND
1,4-Dichlorobenzene (2)	μg/g	0.01	0.05	100			ND	ND			ND
Oil & Grease	mg/g	0.06	(4)	(4)			(4)	(4)			--
			19-1:5(6)	19-1:5	19-2:1(6)	19-2:1	19-1:5	19-1:5	19-2:1	19-2:1	
Phenol	μ/g	10	2.4	85	4.8	98	ND	ND	ND	ND	
			19-1:1	10-1:1	19-1:2	19-1:2	19-1:3B	19-1:3B	19-1:2	19-1:2	
Lead	μg/g	10	19	118	43	99	ND	ND	30.2	25.9	ND
Moisture	%	--	--	--			(5)	(5)	--	--	--

(2) Analyzed by EPA Method 602.
(3) Spike was added to the distillate from the soil.
(4) QC combined with Site 8 and Site 25.
(5) QC combined with Site 8.
(6) Spikes below detection limit, of questionable value.

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 20/21 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration	% Recovered	First Split	Second Split	Method Blank
Methylene Chloride	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
1,1,1-Trichloroethane	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Carbon Tetrachloride	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Trichloroethene	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
1,1,2-Trichloroethane	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
1,1,2,2-Tetrachloroethane	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Chloromethane	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Bromomethane	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Dichlorodifluoromethane	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Vinyl Chloride	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Chloroethane	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Trichlorofluoromethane	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
1,1-Dichloroethene	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
1,1-Dichloroethane	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
trans-1,2-Dichloroethene	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Chloroform	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
1,2-Dichloroethane	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Bromodichloromethane	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
1,2-Dichloropropane	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
trans-1,3-Dichloropropene	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Dibromochloromethane	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
cis-1,3-Dichloropropene	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
2-Chloroethylvinyl Ether	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Bromoform	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Tetrachloroethene	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
Chlorobenzene (1)	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
1,2-Dichlorobenzene (1)	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
1,3-Dichlorobenzene (1)	µg/g	0.01	(2)	(2)	(2)	(2)	(2)
1,4-Dichlorobenzene (1)	µg/g	0.01	(2)	(2)	(2)	(2)	(2)

(1) Analyzed by EPA Method 601
(2) QC combined with Site 4 and Site 19

URTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 20/21 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 21-1:4	% Recovered 21-1:4	First Split 21-1:4	Second Split 21-1:4	Method Blank
Benzene	µg/g	0.01	0.05	108	ND	ND	ND
Toluene	µg/g	0.01	0.05	100	ND	ND	ND
Ethylbenzene	µg/g	0.01	0.05	102	ND	ND	ND
Chlorobenzene (2)	µg/g	0.01	0.05	100	ND	ND	ND
1,2-Dichlorobenzene (2)	µg/g	0.01	0.05	98	ND	ND	ND
1,3-Dichlorobenzene (2)	µg/g	0.01	0.05	100	ND	ND	ND
1,4-Dichlorobenzene (2)	µg/g	0.01	0.05	100	ND	ND	ND
			20-1:5	20-1:5	20-1:1	20-1:1	
Arsenic	µg/g	1	1.2	106	1.4	2.3	ND
Cadmium	µg/g	0.5	2.4	96	1.5	1.4	ND
Chromium	µg/g	5	11.9	122	ND	ND	ND
Copper	µg/g	0.5	11.9	108	9.6	8.9	ND
Lead	µg/g	5	23.8	74	12.2	13.1	ND
Mercury	µg/g	0.05	0.2	114	ND	ND	ND
Nickel	µg/g	1	11.9	88	11.3	8.6	ND
Selenium	µg/g	1	1.2	14	ND	ND	ND
Silver	µg/g	0.5	2.4	97	ND	ND	ND
Zinc	µg/g	3	11.9	128	23.9	20.9	ND
Phenol	µg/g	10	(4)	(4)	(4)	(4)	(4)
Oil & Grease	mg/g	10	(4)	(4)	(4)	(4)	(4)
Moisture	%	10	(4)	(4)	(4)	(4)	(4)
Aroclor 1016	µg/g	0.05	(7)	(7)	(7)	(7)	(7)
Aroclor 1221	µg/g	0.05	(7)	(7)	(7)	(7)	(7)
Aroclor 1232	µg/g	0.05	(7)	(7)	(7)	(7)	(7)
Aroclor 1242	µg/g	0.05	(7)	(7)	(7)	(7)	(7)
Aroclor 1248	µg/g	0.05	(7)	(7)	(7)	(7)	(7)
Aroclor 1254	µg/g	0.05	(7)	(7)	(7)	(7)	(7)
Aroclor 1260	µg/g	0.05	(7)	(7)	(7)	(7)	(7)

(3) Analyzed by EPA Method 602.
(4) QC combined with Site 17 and Site 19.
(5) QC combined with Site 8 and Site 25.
(6) QC combined with Site 8 and Site 8.

UBTL QUALITY CONTROL REPORT SUMMARY

David Monthan AFB   Site 17   Soil Analysis

Analyte	Units	Detection Limit	Spike Concentration	% Recovered	First Split	Second Split	Method Blank
Methylene Chloride	µg/g	0.10	(2)	(2)	(2)	(2)	ND
1,1,1-Trichloroethane	µg/g	0.01	(2)	(2)	(2)	(2)	ND
Carbon Tetrachloride	µg/g	0.01	(2)	(2)	(2)	(2)	ND
Trichloroethene	µg/g	0.01	(2)	(2)	(2)	(2)	ND
1,1,2-Trichloroethane	µg/g	0.01	(2)	(2)	(2)	(2)	ND
1,1,2,2-Tetrachloroethane	µg/g	0.01	(2)	(2)	(2)	(2)	ND
Chloromethane	µg/g	0.01	(2)	(2)	(2)	(2)	ND
Bromomethane	µg/g	0.01	(2)	(2)	(2)	(2)	ND
Dichlorodifluoromethane	µg/g	0.01	(2)	(2)	(2)	(2)	ND
Vinyl Chloride	µg/g	0.01	(2)	(2)	(2)	(2)	ND
Chloroethane	µg/g	0.01	(2)	(2)	(2)	(2)	ND
Trichlorofluoromethane	µg/g	0.01	(2)	(2)	(2)	(2)	ND
1,1-Dichloroethene	µg/g	0.01	(2)	(2)	(2)	(2)	ND
1,1-Dichloroethane	µg/g	0.01	(2)	(2)	(2)	(2)	ND
trans-1,2-Dichloroethene	µg/g	0.01	(2)	(2)	(2)	(2)	ND
Chloroform	µg/g	0.01	(2)	(2)	(2)	(2)	ND
1,2-Dichloroethane	µg/g	0.01	(2)	(2)	(2)	(2)	ND
Bromodichloromethane	µg/g	0.01	(2)	(2)	(2)	(2)	ND
1,2-Dichloropropane	µg/g	0.01	(2)	(2)	(2)	(2)	ND
trans-1,3-Dichloropropene	µg/g	0.01	(2)	(2)	(2)	(2)	ND
Dibromochloromethane	µg/g	0.01	(2)	(2)	(2)	(2)	ND
cis-1,3-Dichloropropene	µg/g	0.01	(2)	(2)	(2)	(2)	ND
2-Chloroethylvinyl Ether	µg/g	1.01	(2)	(2)	(2)	(2)	ND
Bromoform	µg/g	0.01	(2)	(2)	(2)	(2)	ND
Tetrachloroethene	µg/g	0.01	(2)	(2)	(2)	(2)	ND
Chlorobenzene (1)	µg/g	0.01	(2)	(2)	(2)	(2)	ND
1,2-Dichlorobenzene (1)	µg/g	0.01	(2)	(2)	(2)	(2)	ND
1,3-Dichlorobenzene (1)	µg/g	0.01	(2)	(2)	(2)	(2)	ND
1,4-Dichlorobenzene (1)	µg/g	0.01	(2)	(2)	(2)	(2)	ND

(1) Analyzed by EPA Method 601.
(2) QC combined with Site 25.

UBTL QUALITY CONTROL REPORT SUMMARY

David Monthan AFB   Site 17   Soil Analysis

Analyte	Units	Detection Limit	Spike Concentration	% Recovered	First Split	Second Split	Method Blank
Benzene	μg/g	0.01	(4)	(4)	(4)	(4)	ND
Toluene	μg/g	0.01	(4)	(4)	(4)	(4)	ND
Ethylbenzene	μg/g	0.01	(4)	(4)	(4)	(4)	ND
Chlorobenzene (2)	μg/g	0.01	(4)	(4)	(4)	(4)	ND
1,2-Dichlorobenzene (2)	μg/g	0.01	(4)	(4)	(4)	(4)	ND
1,3-Dichlorobenzene (2)	μg/g	0.01	(4)	(4)	(4)	(4)	ND
1,4-Dichlorobenzene (2)	μg/g	0.01	(4)	(4)	(4)	(4)	ND
Oil & Grease	mg/g	0.06	(4)	(4)	(4)	(4)	ND
			17-1:1 (3)	17-1:1	17-1:1	17-1:1	
Phenol	μg/g	10	7	91	ND	ND	ND
Lead	μg/g	10	(5)	(5)	(5)	(5)	(5)
Moisture	%	--	(5)	(5)	(5)	(5)	(5)

(2) Analyzed by EPA Method 602.
(3) Spike was added to the distillate from the soil.
(4) QC combined with Site 8 and Site 25.
(5) QC combined with Site 25.

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 3 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 3-1:1	% Recovered 3-1:1	First Split 3-1:1	Second Split 3-1:1	Method Blank
Methylene Chloride	µg/g	0.01	0.05	60	ND	ND	ND
1,1,1-Trichloroethane	µg/g	0.01	0	0	ND	ND	ND
Carbon Tetrachloride	µg/g	0.01	0	0	ND	ND	ND
Trichloroethene	µg/g	0.01	0.05	40	ND	ND	ND
1,1,2-Trichloroethane	µg/g	0.01	0	0	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/g	0.01	0.05	60	ND	ND	ND
Chloromethane	µg/g	0.01	0	0	ND	ND	ND
Bromomethane	µg/g	0.01	0	0	ND	ND	ND
Dichlorodifluoromethane	µg/g	0.01	0	0	ND	ND	ND
Vinyl Chloride	µg/g	0.01	0	0	ND	ND	ND
Chloroethane	µg/g	0.01	0	0	ND	ND	ND
Trichlorofluoromethane	µg/g	0.01	0	0	ND	ND	ND
1,1-Dichloroethene	µg/g	0.01	0	0	ND	ND	ND
1,1-Dichloroethane	µg/g	0.01	0.05	60	ND	ND	ND
trans-1,2-Dichloroethene	µg/g	0.01	0	0	ND	ND	ND
Chloroform	µg/g	0.01	0	0	ND	ND	ND
1,2-Dichloroethane	µg/g	0.01	0.05	60	ND	ND	ND
Bromodichloromethane	µg/g	0.01	0	0	ND	ND	ND
1,2-Dichloropropane	µg/g	0.01	0	0	ND	ND	ND
trans-1,3-Dichloropropene	µg/g	0.01	0	0	ND	ND	ND
Dibromochloromethane	µg/g	0.01	0.05	60	ND	ND	ND
cis-1,3-Dichloropropene	µg/g	0.01	0.05	60	ND	ND	ND
2-Chloroethylvinyl Ether	µg/g	0.01	0	0	ND	ND	ND
Bromoform	µg/g	0.01	0	0	ND	ND	ND
Tetrachloroethene	µg/g	0.01	0	0	ND	ND	ND
Chlorobenzene (1)	µg/g	0.01	0	0	ND	ND	ND
1,2-Dichlorobenzene (1)	µg/g	0.01	0	0	ND	ND	ND
1,3-Dichlorobenzene (1)	µg/g	0.01	0.05	40	ND	ND	ND
1,4-Dichlorobenzene (1)	µg/g	0.01	0	0	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 3 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 1-3:1	% Recovered 1-3:1	First Split 3-1:1	Second Split 3-1:1	Method Blank
Benzene	μg/g	0.01	0.025	84	ND	ND	ND
Toluene	μg/g	0.01	0.025	92	ND	ND	ND
Ethylbenzene	μg/g	0.01	0.025	84	ND	ND	ND
Chlorobenzene (2)	μg/g	0.01	0.025	88	ND	ND	ND
1,2-Dichlorobenzene (2)	μg/g	0.01	0.025	92	ND	ND	ND
1,3-Dichlorobenzene (2)	μg/g	0.01	0.025	88	ND	ND	ND
1,4-Dichlorobenzene (2)	μg/g	0.01	0.025	80	ND	ND	ND
					3-1:2	3-1:2	
Moisture	%	--	--	--	12.5	10.3	-
					3-1:2		
					10.6		

(2) Analyzed by EPA METHOD 602

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 8 Soil Analyses

Analyte	Units	Detection Limit	First Split 8-2:1	Second Split 8-2:1	First Split 8-3:2	Second Split 8-3:2	First Split 8-3:4	Second Split 8-3:4	First Split 8-4:1	Second Split 8-4:1
Aroclor 1016	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
			8-1:1	8-1:1	8-1:3	8-1:3	8-2:2	8-2:2	8-3:3	8-3:3
Oil & Grease	μg/g	0.06	43	24	ND	ND	ND	ND	ND	ND
			8-1:2	8-1:2	8-2:3	8-2:3	8-2:4	8-2:4	8-3:1	8-3:1
Moisture	%	—	14.3	12.8	8.6	9.9	5.1	4.9	5.2	5.6

"BTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 8 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 8-2:1	% Recovered 8-2:1	Spike Concentration 8-3:2	% Recovered 8-3:2	Spike Concentration 8-3:4	% Recovered 8-3:4	Spike Concentration 8-4:1	% Recovered 8-4:1
Aroclor 1016	µg/g	0.05	0	0	0	0	0	0	0	0
Aroclor 1221	µg/g	0.05	0	0	0	0	0	0	0	0
Aroclor 1232	µg/g	0.05	0	0	0	0	0	0	0	0
Aroclor 1242	µg/g	0.05	0	0	0	0	0	0	0	0
Aroclor 1248	µg/g	0.05	0	0	0	0	0	0	0	0
Aroclor 1254	µg/g	0.05	0	0	0	0	0	0	0	0
Aroclor 1260	µg/g	0.05	2.0	70	3.0	86	2.0	89	2.0	88
			8-1:1	8-1:1	8-1:3	8-1:3	8-2:2	8-2:2	8-3:3	8-3:3
Oil & Grease	µg/g	0.06	1.6	70	1.7	88	1.6	90	1.6	83
Moisture	%	--	--	--	--	--	--	--	--	--

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB   Site 4   Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 4-2:3	% Recovered 4-2:3	First Split 4-2:3	Second Split 4-2:3	Method Blank
Methylene Chloride	μg/g	0.01	0.05	100	ND	ND	ND
1,1,1-Trichloroethane	μg/g	0.01	0	0	ND	ND	ND
Carbon Tetrachloride	μg/g	0.01	0	0	ND	ND	ND
Trichloroethene	μg/g	0.01	0.05	107	ND	ND	ND
1,1,2-Trichloroethane	μg/g	0.01	0	0	ND	ND	ND
1,1,2,2-Tetrachloroethane	μg/g	0.01	0.05	100	ND	ND	ND
Chloromethane	μg/g	0.01	0	0	ND	ND	ND
Bromomethane	μg/g	0.01	0	0	ND	ND	ND
Dichlorodifluoromethane	μg/g	0.01	0	0	ND	ND	ND
Vinyl Chloride	μg/g	0.01	0	0	ND	ND	ND
Chloroethane	μg/g	0.01	0	0	ND	ND	ND
Trichlorofluoromethane	μg/g	0.01	0	0	ND	ND	ND
1,1-Dichloroethene	μg/g	0.01	0	0	ND	ND	ND
1,1-Dichloroethane	μg/g	0.01	0.05	96	ND	ND	ND
trans-1,2-Dichloroethene	μg/g	0.01	0	0	ND	ND	ND
Chloroform	μg/g	0.01	0	0	ND	ND	ND
1,2-Dichloroethane	μg/g	0.01	0	0	ND	ND	ND
Bromodichloromethane	μg/g	0.01	0	0	ND	ND	ND
1,2-Dichloropropane	μg/g	0.01	0	0	ND	ND	ND
trans-1,3-Dichloropropene	μg/g	0.01	0	0	ND	ND	ND
Dibromochloromethane	μg/g	0.01	0.05	118	ND	ND	ND
cis-1,3-Dichloropropene	μg/g	0.01	0.05	103	ND	ND	ND
2-Chloroethylvinyl Ether	μg/g	0.01	0	0	ND	ND	ND
Bromoform	μg/g	0.01	0	0	ND	ND	ND
Tetrachloroethene	μg/g	0.01	0	0	ND	ND	ND
Chlorobenzene (1)	μg/g	0.01	0	0	ND	ND	ND
1,2-Dichlorobenzene (1)	μg/g	0.01	0	0	ND	ND	ND
1,3-Dichlorobenzene (1)	μg/g	0.01	0.05	97	ND	ND	ND
1,4-Dichlorobenzene (1)	μg/g	0.01	0	0	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL QUALITY CONTROL REPORT SUMMARY
Davis Monthan AFB Site 4 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 4-2:2	% Recovered 4-2:2	First Split 4-1:1	Second Split 4-1:1			Method Blank
Benzene	μg/g	0.01	0.05	98	ND	ND			ND
Toluene	μg/g	0.01	0.05	100	ND	ND			ND
Ethylbenzene	μg/g	0.01	0.05	98	ND	ND			ND
Chlorobenzene (2)	μg/g	0.01	0.05	100	ND	ND			ND
1,2-Dichlorobenzene (2)	μg/g	0.01	0.05	96	ND	ND			ND
1,3-Dichlorobenzene (2)	μg/g	0.01	0.05	96	ND	ND			ND
1,4-Dichlorobenzene (2)	μg/g	0.01	0.05	96	ND	ND			ND
							First Split	Second Split	
Oil & Grease (3)	mg/g	0.06	--	--	--	--			--
			4-2:3	4-2:3	4-1:1	4-1:1	4-1:2	4-1:2	
Lead	μg/g	10	11.9	96	45	51	48	30	ND
					4-2:3	4-2:3			
Lead	μg/g	10			ND	ND			
Moisture (4)	%	--	--	--	--	--	--	--	--

(2) Analyzed by EPA Method 602
(3) QC combined with Site 8 and Site 25
(4) QC combined with Site 8 and Site B

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB   Site 25   Soil Analyses

Analyte	Units	Detection Limit	First Split 25-4:1	Second Split 25-4:1	First Split 25-4:2	Second Split 25-4:2	First Split 25-4:4	Second Split 25-4:4	Method Blank
Methylene Chloride	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Chloromethane	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Bromomethane	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Chloroethane	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Chloroform	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Bromoform	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (1)	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
1-2-Dichlorobenzene (1)	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	μg/L	0.01	ND	ND	ND	ND	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 25 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 25-4:1	% Recovered 25-4:1	Spike Concentration 25-4:2	% Recovered 25-4:2	Spike Concentration 25-4:4	% Recovered 25-4:4
Methylene Chloride	µg/L	0.01	0.05	97	0.05	102	0.05	104
1,1,1-Trichloroethane	µg/L	0.01	0	0	0	0	0	0
Carbon Tetrachloride	µg/L	0.01	0	0	0	0	0	0
Trichloroethene	µg	0.01	0.05	132	0.05	110	0.05	156
1,1,2-Trichloroethane	µg/L	0.01	0	0	0	0	0	0
1,1,2,2-Tetrachloroethane	µg/L	0.01	0.05	26	0.05	66	0.05	28
Chloromethane	µg/L	0.01	0	0	0	0	0	0
Bromomethane	µg/L	0.01	0	0	0	0	0	0
Dichlorodifluoromethane	µg/L	0.01	0	0	0	0	0	0
Vinyl Chloride	µg/L	0.01	0	0	0	0	0	0
Chloroethane	µg/L	0.01	0	0	0	0	0	0
Trichlorofluoromethane	µg/L	0.01	0	0	0	0	0	0
1,1-Dichloroethene	µg/L	0.01	0	0	0	0	0	0
1,1-Dichloroethane	µg/L	0.01	0.05	90	0.05	101	0.05	98
trans-1,2-Dichloroethene	µg/L	0.01	0	0	0	0	0	0
Chloroform	µg/L	0.01	0	0	0	0	0	0
1,2-Dichloroethane	µg/L	0.01	0.05	80	0.05	94	0.05	94
Bromodichloromethane	µg/L	0.01	0	0	0	0	0	0
1,2-Dichloropropane	µg/L	0.01	0	0	0	0	0	0
trans-1,3-Dichloropropene	µg/L	0.01	0	0	0	0	0	0
Dibromochloromethane	µg/L	0.01	0.05	48	0.05	48	0.05	54
cis-1,3-Dichloropropene	µg/L	0.01	0.05	86	0.05	100	0.05	92
2-Chloroethylvinyl Ether	µg/L	0.01	0	0	0	0	0	0
Bromoform	µg/L	0.01	0	0	0	0	0	0
Tetrachloroethene	µg/L	0.01	0	0	0	0	0	0
Chlorobenzene (1)	µg/L	0.01	0	0	0	0	0	0
1-2-Dichlorobenzene (1)	µg/L	0.01	0	0	0	0	0	0
1,3-Dichlorobenzene (1)	µg/L	0.01	0.05	70	0.05	88	0.05	76
1,4-Dichlorobenzene (1)	µg/L	0.01	0	0	0	0	0	0

(1) [illegible] EPA [illegible] 6C [illegible]

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 25 Soil Analyses

Analyte	Units	Detection Limit	Spike Concentration 25-4:1	% Recovered 25-4:1	Spike Concentration 25-4:2	% Recovered 25-4:2	Spike Concentration 25-4:4	% Recovered 25-4:4
Benzene	µg/g	0.01	0.025	112	0.025	108	0.025	280 (3)
Toluene	µg/g	0.01	0.025	100	0.025	84		
Ethylbenzene	µg/g	0.01	0.025	112	0.025	88		
Chlorobenzene (2)	µg/g	0.01	0.025	108	0.025	88		
1,2-Dichlorobenzene (2)	µg/g	0.01	0.025	124	0.025	108		
1,3-Dichlorobenzene (2)	µg/g	0.01	0.025	104	0.025	84		
1,4-Dichlorobenzene (2)	µg/g	0.01	0.025	104	0.025	88		
			25-5:1	25-5:1	25-5:2	25-5:2	25-5:4	25-5:4
Aroclor 1016	µg/g	0.05	0	0	0	0	0	0
Aroclor 1221	µg/g	0.05	0	0	0	0	0	0
Aroclor 1232	µg/g	0.05	0	0	0	0	0	0
Aroclor 1242	µg/g	0.05	0	0	0	0	0	0
Aroclor 1248	µg/g	0.05	0	0	0	0	0	0
Aroclor 1254	µg/g	0.05	0	0	0	0	0	0
Aroclor 1260	µg/g	0.05	2	82	2	88	0.2	76
			25-1:1	25-1:1	25-2:1	25-2:1	25-2:2	25-2:2
Oil & Grease	mg/g	0.06	1.7	107	1.6	109	1.6	92
			25-2:3	25-2:3	25-3:2	25-3:2		
	mg/g	0.06	1.6	92	1.8	114		
Lead	µg/g	10						
Moisture	%	--	--	--	--	--	--	--

(2) Analyzed by EPA Method 602
(3) Contaminant was present in the spiked sample.

UBTL QUALITY CONTROL REPORT SUMMARY

Davis Monthan AFB Site 25 Soil Analyses

Analyte	Units	Detection Limit	First Split 25-4:1	Second Split 25-4:1	First Split 25-4:2	Second Split 25-4:2	First Split 25-4:4	Second Split 25-4:4	Method Blank
Benzene	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND
Toluene	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND
			25-5:1	25-5:1	25-5:2	25-5:2	25-5:4	25-5:4	
Aroclor 1016	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
			25-2:1	25-2:1	25-2:2	25-2:2	25-2:3	25-2:3	
Oil & Grease	mg/g	0.06	0.08	0.08	ND	ND	ND	ND	ND
			25-1:1	25-1:1	25-1:2	25-1:2	25-1:4	25-1:4	
Lead	μg/g	10	21	21	14	14	14	14	ND
			First Split 25-3:1	Second Split 25-3:1	Third Split 25-3:1	First Split 25-3:2	Second Split 25-3:2	Third Split 25-3:2	
Moisture	%	--	2.4	3.7	2.3	3.7	5.5	5.2	--
			25-3:3	25-3:3	25-3:3				
	%	--	5.3	6.5	6.0				

(2) [illegible]zed by EPA Method 602

UBTL QUALITY CONTROL REPORT

Davis Monthan Resample - Water Analysis

(15 November 84)

Parameter	Method	Units	Detection Limit	Spiked Sample	Initial Value	Spike Conc.	Percent Recovered	Split Sample	First Value	Second Value	Method Blank
Aldrin	608 (2)	µg/L	1.0	D-M#1	*	2.	90	D-M#1	*	*	*
Dieldrin	608 (2)	µg/L	1.0	D-M#1	*	5.	114	D-M#1	*	*	*
p,p'-DDT	608 (2)	µg/L	1.0	D-M#1	*	5.	112	D-M#1	*	*	*
Endrin	608 (2)	µg/L	1.0	D-M#1	*	5.	102	D-M#1	*	*	*
Heptachlor	608 (2)	µg/L	1.0	D-M#1	*	2.	90	D-M#1	*	*	*
Lindane	608 (2)	µg/L	1.0	D-M#1	*	2.	115	d-M#1	*	*	*
Oil & Grease	413.2 (1)	mg/L	0.5	D-M#4	3.76	24.2	106	D-M#4	3.64	3.88	*
Methylene Chloride	601 (2)	µg/L	1.0	D-M#9	*	10	116	D-M#11	*	*	*
1,1,1-Trichloroethane	601 (2)	µg/L	1.0	D-M#9	*	10	117	D-M#11	*	*	*
Trichloroethylene	601 (2)	µg/L	1.0	D-M#9	*	10	111	D-M#11	*	*	*
Benzene	602 (2)	µg/L	1.0	D-M#11	*	10	108	D-M#11	*	*	*
Ethyl Benzene	602 (2)	µg/L	1.0	D-M#11	*	10	102	D-M#11	*	*	*
Chlorobenzene	602 (2)	µg/L	1.0	D-M#11	*	10	100	D-M#11	*	*	*
1,2-Dichlorobenzene	602 (2)	µg/L	1.0	D-M#11	*	10	96	D-M#11	*	*	*
1,3-Dichlorobenzene	602 (2)	µg/L	1.0	D-M#11	*	10	98	D-M#11	*	*	*
1,4-Dichlorobenzene	602 (2)	µg/L	1.0	D-M#11	*	10	98	D-M#11	*	*	*

(1) Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020 revised March 1983.

(2) Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA 600/4-82-057, July 1982.

* Not detected.

APPENDIX C

CHAIN-OF-CUSTODY FORMS

(14)

** aldrin, dieldrin, chlordane,
DDT isomers, endrin, endrin aldehyde
heptachlor, lindane (standard methods)

Sheet 1 of 2

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client DMAFB, TUCSON AZ / DMAFB (USAF)

Project Title INSTALLATION RESTORATION PROGRAM

Job No. 01016-179-22

Field Personnel (Signature) Ronald P. Anderson

Date 1983	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
						samples for analyses
1-20	1100	1	1QT. MASON JAR	ONE	1-1	
"		2	"	"	"	phenols group*
"		3	"	"	"	
"		4	"	"	"	phenols group*
"		5	"	"	"	pesticides**
"		6	"	"	"	
"		7	"	"	"	
"		8	"	"	"	phenols group*
"		9	"	"	"	
"		10	"	"	"	
"	1450	11	"	"	"	pesticides**
"	1550	1	"	"	1-2	
"		2	"	"	"	phenols, Oth. prio. poll*
"		3	"	"	"	pesticides**

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[illegible]	12-5-83	1300	[illegible]	12/8/83	10:30 am						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

(14)

sheet 2 of 5

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client DMAFB, TUCSON, AZ / DMAFB (USAF)						Field Personnel (Signature) Ronald P. Anderson
Project Title INSTALLATION RESTORATION PROGRAM					Job No. 0106-179-22	
Date '83	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks samples for analyses
11-28	1630	4	1QT. MASON JAR	ONE	1-2	phenols, O&G, priority pollut
11-29	0725	5	"	"	"	
"	↓	6	"	"	"	phenols O&G, priority pollutants *
"		7	"	"	"	
"		8	"	"	"	
"		9	"	"	"	
"		10	"	"	"	
"	0940	11	"	"	"	phenols group*
11-29	1010	1	"	"	1-3	pesticides* *
"	↓	2	"	"	"	phenols group*
"		3	"	"	"	
"		4	"	"	"	
"		5	"	"	"	phenols group*
"		6	"	"	"	pesticides * *

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[illegible]	12-5-83	1300	[illegible]	12/8/83	10:30 AM						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

(14)

sheet 3 of 4

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client DMAFB, TUCSON, AZ / DMAFB (USAF)

Project Title INSTALLATION RESTORATION PROGRAM

Job No. 0106-179-22

Field Personnel (Signature) Ronald D. Anderson

Date 83	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
						samples for analyses
11-29		7	1QT. MASON JAR	ONE	1-3	
"		8	"	"	"	
"		9	"	"	"	phenols, Other priority pollutants *
"		10	"	"	"	
"	1435	11	"	"	"	
11-29	1505	1	"	"	1-4	phenols group *
"		2	"	"	"	
"		3	"	"	"	phenols group*
"		4	"	"	"	phenols group*
"	1630	5	"	"	"	
11-30	0720	6	"	"	"	phenols group*
"		7	"	"	"	pesticides **
"		8	"	"	"	
"		9	"	"	"	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Steve B. Johnson	12-5-83	1300	[illegible]	12/8/83	1030 am						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

14)

sheet 4 of 7

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: DMAFB TUCSON AZ / DMAFB (USAF)

Project Title: INSTALLATION RESTORATION PROGRAM

Job No. 01016-179-22

Field Personnel (Signature): Ronald P. Anderson

Date 83	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
						samples for analyses
11-30	↓	10	1 QT. MASON JAR	ONE	1-4	
"	1000	11	"	"	"	
		~~12~~			~~~~	
11-30	1045	1	"	"	1-5	phenols, O+G, priority pollutants*
"		2	"	"	"	pesticides**
"		3	"	"	"	phenols group*
"		4	"	"	"	pesticides**
"		5	"	"	"	
"		6	"	"	"	
"		7	"	"	"	phenols group*
"		8	"	"	"	
"		9	"	"	"	pesticides**
"	↓	10	"	"	"	phenols group*
"	1540	11	"	"	"	
12-01	0915	1	"	"	18-1	phenols, O+G, priority poll., Pb

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Steve B. Johnson	12-5-83	1300	A B Jorgensen	12/8/83	10:30 A.M.						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

(14)

sheet 5 of 7

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client DMAFB, TUCSON AZ / DMAFB (USAF)

Project Title INSTALLATION RESTORATION PROGRAM

Job No. 01016-179-22

Field Personnel (Signature) Ronald P. Anderson

Date '83	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
12-01		2	1QT. MASON JAR	ONE	18-1	Samples for analyses phenols, O+G, priority polls. Pb
"		3	"	"	"	
"		4	"	"	"	
"		5	"	"	"	
"		6	"	"	"	
"		7	"	"	"	
"	1130	8	"	"	"	
"	1230	1	"	"	18-2	phenols, O+G priority poll. Pb
"		2	"	"	"	
"		3	"	"	"	
"		4	"	"	"	
"		5	"	"	"	
"		6	"	"	"	phenols, O+G, priority polls. Pb
"		7	"	"	"	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Steve B. Johnson	25-85	1300	A. B. Jorgensen	12/8/85	10:30 am						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

(14)

sheet 6 of ~~8~~ 7

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client DMAFB, TUCSON, AZ / DMAFB (USAF)

Project Title INSTALLATION RESTORATION PROGRAM

Job No. 01016-179-22

Field Personnel (Signature) Ronald P. Anderson

Date /83	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
12-01	1430	8	1 QT. MASON JAR	ONE	IB-2	samples for analyses
				~~4~~		
12-01	1440	1	"	"	IB-3	phenols, O+G, priority polls, Pb
"		2	"	"	"	"
"		3	"	"	"	
"		4	"	"	"	
"		5	"	"	"	phenols, O+G, priority polls, Pb
"		6	"	"	"	
"		7	"	"	"	
"	~~1645~~ 1625	8	"	"	"	
12-02	0800	1	"	"	~~IB-3~~ 1-6	phenols, O+G, priority polls
"	0830	2	"	"	"	
12-03	0730	3	"	"	"	
"		4	"	"	"	
"		5	"	"	"	phenols, O+G, priority polls,

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Steven B. Johnson	12-5-83	1300	A. B[illegible]	12/8/83	10:30 AM.						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

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sheet 7 of ~~8~~ 7

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: DMAFB, TUCSON, AZ / DMAFB (USAF)

Project Title: INSTALLATION RESTORATION PROGRAM

Job No. 01016-179-22

Field Personnel (Signature): Ronald P. Anderson

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks: Samples for analyses
12-3-83		6	1 QT. MASON JAR	ONE	1-6	
		7	"	"	"	
		8	"	"	"	pesticides X X
		9	"	"	"	
		10	"	"	"	phenols, O+G, priority polls
	0950	11	"	"	"	
		1	"	"	10-1	
		2	"	"	"	
		3	"	"	"	
		4	"	"	"	
		5	"	"	"	
		6	"	"	"	
		7	"	"	"	
		8	"	"	"	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[illegible]	12-5-83	1300	[illegible]	12/9/83	10:30 AM						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: Well #4 Davis Monthan AFB

Project Title: Davis Monthan AFB

Job No. 01010-179-22

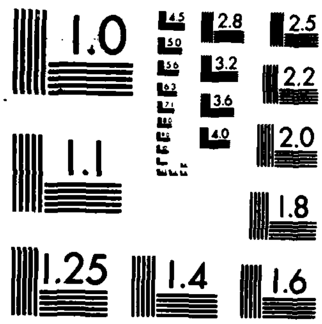
Field Personnel (Signature): Steve B. Johnson

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
12-7-83	1330	Well #4	Groundwater	18	Base well #4	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Steve B. Johnson	12-7-83	1530	[illegible]	12/8/83	1:00 p.m						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

AD-A173 737 INSTALLATION RESTORATION PROGRAM PHASE II - CONFIRMATION/QUANTIFICATION S..(U) DAMES AND MOORE PARK RIDGE IL 18 AUG 86 F33615-83-D-4002 3/4

UNCLASSIFIED F/G 13/2 NL



MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: Wells #1 + #2 Davis Monthan AFB						Field Personnel (Signature): [illegible] B. Johnson
Project Title: Davis Monthan Air Force Base				Job No. [illegible]-172-2		
Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
12-8-83	1230	well #1	Groundwater	8	Well #1	all metals bottles filtered
	1300	well #1	"	"	"	duplicate - all metal bottles filtered
	1445	well #2	"	10	well #2	smaller metals bottle has been filtered but not acidified (no [illegible] out)

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[illegible] B. Johnson	12-8-83	1600	AB Jorgensen	12/9/83	10:30 AM						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

1/42 [illegible]

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: DMAFB, TUCSON, AZ/DMAFB (USAF)

Project Title: INSTALLATION RESTORATION PROGRAM

Job No. 01016-179-22

Field Personnel (Signature): Ronald P. Anderson

Date '84	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
2-7	8:00 a	1	1 QT MASON JAR	ONE	25-1	Lead, Oil & Grease, EP, PPL VOC, PCB
"	8:15 a	2	"	"	"	"
"	8:30 a	3	"	"	"	
"	8:45 a	4	"	"	"	"
"	9:00 a	1	"	"	25-2	"
"	9:10 a	2	"	"	"	"
"	9:20 a	3	"	"	"	"
"	9:30 a	4	"	"	"	
"	10:15 a	1	"	"	25-3	"
"	10:25 a	2	"	"	"	"
"	10:35 a	3	"	"	"	"
"	10:45 a	4	"	"	"	
"	10:55 a	1	"	"	25-4	"
"	11:05 a	2	"	"	"	"
"	11:15 a	3	"	"	"	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Ronald P. Anderson	2-7-84	9:00 pm	KB Togawa	2/13/84	12:00 noon						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client DMAFB, TUCSON, AZ / DMAFB (USAF)

Project Title INSTALLATION RESTORATION PROGRAM

Job No. 0106-171-22

Field Personnel (Signature) Ronald R Anderson

Date 84	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
2-7	11:15 a	3	1QT. MASON JAR	ONE	25-4	
"	11:25 a	4	"	"	"	Lead, oil & Grease, EPA PRI.VOL, PCB
"	12:30 p	1	"	"	25-5	"
"	12:40 p	2	"	"	"	"
"	12:50 p	3	"	"	"	
"	1:00 p	4	"	"	"	"
"	1:15 p	1	"	"	25-6	"
"	1:20 p	2	"	"	"	
"	1:30 p	3	"	"	"	"
"	1:40 p	4	"	"	"	"
"	1:55 p	1	"	"	25-7	"
"	2:00 p	2	"	"	"	"
"	2:05 p	3	"	"	"	"
"	2:10 p	4	"	"	"	

Sample broken in transit

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Ronald P. Anderson	2-7-84	9:00 pm	AB Torgensen	2/17/84	12:00 noon						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

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DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: DMAFB, TUCSON, AZ / DMAFB (USAF)

Project Title: INSTALLATION RESTORATION PROGRAM

Job No. 01016-179-22

Field Personnel (Signature): Ronald P. Anderson

Date 84	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
2-7	2:25 pm	1	1 QT. MASON JAR	ONE	25-8	Lead, oil & grease, EPAPPLVOC, PCB
"	2:35 pm	2	"	"	"	"
"	2:45 pm	3	"	"	"	
"	2:55 pm	4	"	"	"	"
"	3:00 pm	1	"	"	25-9	"
"	3:05 pm	2	"	"	"	"
"	3:10 pm	3	"	"	"	
"	3:15 pm	4	"	"	"	"
"	3:45 pm	1	"	"	17-1	Phenol, Oil & Grease, Lead, & EPAPPLVO
"	3:50 pm	2	"	"	"	"
"	4:00 pm	3	"	"	"	
"	4:10 pm	4	"	"	"	"
"	4:20 pm	5	"	"	"	"
"	4:35 pm	6	"	"	"	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Ronald P. Anderson	2-7-84	9:00 pm	HB Torgensen	2/13/84	12:00 noon						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client Davis Montham AFB USAF

Project Title I R P

Job No 01016-179-022

Field Personnel (Signature) [signature]

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
1200	7 Feb 84	Well #2	O + G	2	Well #2	
		↓	VOC	4	↓	4 Bottles @ #601
			~~TOC~~	~~4~~		4 Bottles @ #602
1300	7 Feb 84	Well #10	O + G	2	Well #10	↑
			Phenol	2		Each Site
		↓	VOC	4	↓	
			~~TOC~~	~~4~~		delete
1400	7 Feb 84	Well #8	O + G	2	Well #8	
		↓	VOC	4	↓	
			~~TOC~~	~~4~~		
1500	7 Feb 84	Well #11	O + G	2	Well #11	
			Phenol	2		
		↓	VOC	4	↓	
			~~TOC~~	~~4~~		delete

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	8 Feb 84	1100	A. Lensley	2/9/84	9:00 AM						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client	Davis Monthan AFB			USAF	Field Personnel (Signature)
Project Title	IRP			Job No. 01016-179-22	[illegible]
Date	**Time**	**Sample I.D. No.**	**Sample Type**	**No. of Containers**	**Sampling Site**	**Remarks**
8Feb84	0745	Well #6	O+G	2	Well #6	
		↓	VOC	4	↓	4 Bottles @ #601
			~~TOC~~	~~1~~		4 Bottles @ #602
8Feb84	0830	Well #9	O+G	2	Well #9	↑
		↓	Phenol	2	↓	Each Site
			Lead	2		
			VOC	4		
			~~TOC~~	~~1~~		delete

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[illegible]	8Feb84	1100	[illegible]	2/9/84	9:00 AM						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: Davis Montham AFB — USAF

Project Title: I R P

Job No: 01016-179-022

Field Personnel (Signature):

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
1200	7 Feb 84	Well #2	O + G	2	Well #2	
		↓	VOC	4	↓	4 Bottles @ #601
			~~TOC~~	~~4~~		4 Bottles @ #602
1300	7 Feb 84	Well #10	O + G	2	Well #10	↑
		↓	Phenol	2	↓	Each Site
			VOC	4		
			~~TOC~~	~~4~~		delete
1400	7 Feb 84	Well #8	O + G	2	Well #8	
		↓	VOC	4	↓	
			~~TOC~~	~~4~~		
1500	7 Feb 84	Well #11	O + G	2	Well #11	
		↓	Phenol	2	↓	
			VOC	4		
			~~TOC~~	~~4~~		delete

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	8 Feb 84	1100									
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

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DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client DMAFB, TUCSON, AZ / DMAFB (USAF)

Project Title INSTALLATION RESTORATION PROGRAM

Job No. 0106-179-22

Field Personnel (Signature) Ronald R Anderson

Date '84	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
2-8	8:50 am	1	1 QT. MASON JAR	ONE	3-1	EPA PPL VOC
"	9:00 am	2	"	"	"	EPA PPL VOC
"	9:15 am	3	"	"	"	
"	9:30 am	4	"	"	"	
"	9:45 am	5	"	"	"	EPA PPL VOC
"	10:15 am	1	"	"	3-2	
"	10:30 am	2	"	"	"	EPA PPL VOC
"	10:45 am	3	"	"	"	EPA PPL VOC
"	11:00 am	4	"	"	"	
"	11:10 am	5	"	"	"	EPA PPL VOC
"	11:15 am	1	"	"	3-3	~~EPA PPL VOC~~ EPA PPL VOC
"	11:25 am	2	"	"	"	EPA PPL VOC
"	11:40 am	3	"	"	"	EPA PPL VOC
"	11:55 am	4	"	"	"	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Ronald R Anderson	2-9-84	1:00 pm	S. [illegible]	2/14/84	2:50 pm						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

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DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client DMAFB, TUCSON, AZ / DMAFB (USAF)

Project Title INSTALLATION RESTORATION PROGRAM

Job No.

Field Personnel (Signature) Ronald P. Anderson

Date 1984	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
2-8	12:10 pm	5	1 QT. MASON JAR	ONE	3-3	
"	1:15 pm	1	"	"	3-4	
"	1:20 pm	2	"	"	"	
"	1:25 pm	3	"	"	"	
"	1:35 pm	4	"	"	"	
"	1:45 pm	5	"	"	"	
"	2:55 pm	1	"	"	3-5	
"	3:05 pm	2	"	"	"	
"	3:15 pm	3	"	"	"	
"	3:30 pm	4	"	"	"	
"	3:45 pm	5	"	"	"	
"	3:55 pm	1	"	"	3-6	
"	4:05 pm	2	"	"	"	~~[illegible]~~ EPAPPLVOC
"	4:15 pm	3	"	"	"	EPAPPLVOC

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Ronald P. Anderson	2-9-84	10:00 pm	S. Rensley	2/14/84	2:50 pm						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

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DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: DMAFB, TUCSON, AZ / DMAFB (CAF)

Project Title: INSTALLATION RESTORATION PROGRAM

Job No. 0016-179-22

Field Personnel (Signature): Ronald P. Anderson

Date '84	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
2-8	4:25 pm	4	1 QT. MASON JAR	ONE	3-6	
"	4:35 pm	5	"	"	"	~~[illegible]~~ ETAPPLVOC
2-9	8:30 am	1	"	"	B-1	OIL, GREASE, & PCB's
"	8:45 am	2	"	"	"	"
"	9:00 am	3	"	"	"	"
"	9:20 am	4	"	"	"	"
"	9:30 am	1	"	"	B-2	"
"	9:40 am	2	"	"	"	"
"	9:50 am	3	"	"	"	"
"	10:00 am	4	"	"	"	"
"	10:15 am	1	"	"	B-3	"
"	10:20 am	2	"	"	"	"
"	10:30 am	3	"	"	"	"
"	10:45 am	4	"	"	"	"

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Ronald P. Anderson	2-11-84	10:00 pm	[illegible signature]	2/16/84	10:00 am						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

(14)

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client DMAFB, TUCSON, AZ / DMAFB (USAF)

Project Title INSTALLATION RESTORATION PROGRAM

Job No. 01016-179-22

Field Personnel (Signature) Ronald P. [signature]

Date '84	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
2-9	10:55 am	1	1 QT. MASON JAR	ONE	6-4	OIL, GREASE, & PCB'S
"	11:10 am	2	"	"	"	"
"	11:20 am	3	"	"	"	
"	11:35 am	4	"	"	"	"
"	12:45 pm	1	"	"	7-1	PCB's
"	12:55 pm	2	"	"	"	"
"	1:05 pm	3	"	"	"	"
"	1:15 pm	4	"	"	"	
"	1:25 pm	1	"	"	7-2	
"	1:35 pm	2	"	"	"	"
"	1:45 pm	3	"	"	"	"
"	1:55 pm	4	"	"	"	
"	2:05 pm	1	"	"	7-3	
"	2:15 pm	2	"	"	"	"

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Ronald P. [signature]	2-11-84	10:00 am	A B [signature]	2/16/84	10:00 am						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

(111)

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client DMAFB, TUCSON, AZ / DMAFB (USAF)

Project Title INSTALLATION / RESTORATION PROGRAM

Job No. 01016-174-22

Field Personnel (Signature) Donald P. Anderson

Date 84	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
2-9	2:30 pm	3	1 QT. MASON JAR	ONE	7-3	
"	2:47 pm	4	"	"	"	
"	2:55 pm	1	"	"	7-4	~~[illegible]~~ PCB's
"	3:05 pm	2	"	"	"	"
"	3:15 pm	3	"	"	"	
"	3:25 pm	4	"	"	"	"
"	3:35 pm	1	"	"	7-5	"
"	3:40 pm	2	"	"	"	"
"	3:50 pm	3	"	"	"	
"	4:00 pm	4	"	"	"	
"	4:05 pm	1	"	"	7-6	
"	4:10 pm	2	"	"	"	"
"	4:20 pm	3	"	"	"	"
"	4:30 pm	4	"	"	"	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Donald P. Anderson	2-11-84	10:00 pm	[illegible signature]	2/16/84	10:00 am						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

(10)

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client DMAFB TUCSON, AZ / DMAFB (USAF)

Field Personnel (Signature) Ronald P Anderson

Project Title INSTALLATION RESTORATION PROGRAM

Job No. 0186-174-22

Date 84	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
2-9	4:45 pm	1	1 QT. MASON JAR	ONE	7-7	~~Oil, grease,~~ PCBs
"	4:50 pm	2	"	"	"	
"	4:55 pm	3	"	"	"	"
"	5:05 pm	4	"	"	"	"
2-10	9:00 am	1	"	"	7-8	
"	9:10 am	2	"	"	"	"
"	9:20 am	3	"	"	"	
"	9:30 am	4	"	"	"	"
"	9:35 am	1	"	"	7-9	
"	9:40 am	2	"	"	"	
"	9:50 am	3	"	"	"	
"	10:00 am	4	"	"	"	
"	10:05 am	1	"	"	7-10	
"	10:10 am	2	"	"	"	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Ronald P Anderson	2-11-84	10:00	[illegible]	2/16/84	10:00 AM						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

(14)

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client DMAFB, TUCSON, AZ / DMAFB (USAF)						Field Personnel (Signature)
Project Title INSTALLATION RESTORATION PROGRAM					Job No. 01016-179-22	Ronald P. Anderson
Date '84	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
2-10	10:20 a	3	1 QT. MASON JAR	ONE	7-10	~~OIL & GREASE~~ → PCB's
"	10:30 a	4	"	"	"	"
"	11:00 a	1	"	"	19-1	PHENOL, OIL & GREASE, LEAD, [illegible] VOC
"	11:15 a	2	"	"	"	"
"	11:45 a	3A	"	"	"	
"	12:00 p	3B	"	"	"	"
"	12:35 p	4	"	"	"	
"	12:45 p	5	"	"	"	"
"	1:25 p	1	"	"	19-2	"
"	2:35 p	2	"	"	"	
"	2:55 p	3	"	"	"	"
"	3:15 p	4	"	"	"	"
"	3:40 p	5	"	"	"	
"	4:15 p	1	"	"	19-3	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Ronald P. Anderson	2-11-84	10:00 pm	A.B. Ferguson	2/16/84	10:00 a.m.						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

(14)

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client DMAFB, TUCSON, AZ /DMAFB (USAF)

Project Title INSTALLATION RESTORATION PROGRAM

Job No. 01016-179-22

Field Personnel (Signature) Donald P. Anderson

Date 84	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
2-10	4:25 pm	2	1 QT. MASON JAR	ONE	19-3	PHENOL, OIL & GREASE, LEAD, EPA PRI. VOC
"	4:45 pm	3	"	"	"	"
"	5:05 pm	4	"	"	"	
"	5:35 pm	5	"	"	"	
2-11	7:50 am	1	"	"	19-4	
"	8:05 am	2	"	"	"	"
"	8:20 am	3	"	"	"	"
"	8:40 am	4	"	"	"	
"	9:00 am	5	"	"	"	"
"	9:55 am	1	"	"	20-1	PHENOL, OIL & GREASE, EPA PRI. VOC, HEAVY METAL
"	10:10 am	2	"	"	"	
"	10:35 am	3	"	"	"	
"	11:00 am	4	"	"	"	"
"	11:25 am	5	"	"	"	"

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Donald P. Anderson	2-11-84	11:00 pm	A. D. [illegible]	2/16/84	10:00 am						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

(11)

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: DMAFB, TUCSON, AZ / DMAFB (USAF)

Project Title: INSTALLATION RESTORATION PROGRAM

Job No. 01016-179-22

Field Personnel (Signature): Donald P. Anderson

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
1984 2-11	1:15 pm	1	1QT. MASON JAR	ONE	21-1	
"	1:30 pm	2	"	"	"	PHENOL, OIL, GREASE, [illegible], HEAVY METALS
"	2:00 pm	3	"	"	"	"
"	2:30 pm	4	"	"	"	"
"	3:00 pm	5	"	"	"	
"	3:45 pm	1	"	"	4-1	OIL, GREASE, ~~PEEs~~, LEAD, EPA [illegible]
"	3:55 pm	2	"	"	"	"
"	4:05 pm	3	"	"	"	"
"	4:30 pm	1	"	"	4-2	"
"	4:30 pm	2	"	"	"	"
"	4:45 pm	3	"	"	"	"

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Donald P. Anderson	2-11-84	10:00 pm	JB Ferguson	2/16/84	10:00 A.M.						
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: Davis Monthan AFB - U.S.AF

Project Title: IRP

Job No. 1016-179-22

Field Personnel (Signature): [signature]

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
2/24/84	0900	Well # 11	O+G	2	Well # 11	
			TOC/VOC	3@601, 2@602		
2/24/84	0930	Well # 5	O+G	2	Well # 5	Goes with 1st [illegible]
			Phenol	2		
			TOC/VOC	2@601, 2@602		[initials] 3/1/84

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	2/24/84	2130	[signature]	2/24/84	2130	[signature]	2/29/84	0800	[signature]	3/1/84	8:50 AM
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client Davis-Monthan AFB USAF

Project Title IRP

Job No. 01016-179-22

Field Personnel (Signature) Jim Geiser, Lutz Kunze

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
15 Nov	1000	D-M #9	601	1	D-M #9	
	1000	D-M #9	602	1	D-M #9	
	1000	D-M #9	601	1	D-M #9	
	1000	D-M #9	602	1	D-M #9	
	1115	D-M #10	601	1	D-M #10	
	1115	D-M #10	602	1	D-M #10	
	1120	D-M #4	O+G	4	D-M #4	
	1200	D-M #11	601	1	D-M #11	
	1200	D-M #11	602	3	D+M #11	
	~~1530~~ 1313	D+M #1	Pesticides	3	D+M #1	pH
	1530	D+M #2	Pesticides	2	D+M #2	pH

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	11/15/84									11/16/84	9:30 AM.
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

APPENDIX D

METHODS OF ANALYSIS AND ANALYTICAL REPORT SUMMARIES

METHODS OF ANALYSES - WATER

HEAVY METALS (INCLUDING LEAD)

All test samples were analyzed according to EPA-600/4-79-020, "Methods for Chemical Analysis of Water and Wastes." The method numbers according to the above reference are as follows:

Analyte	Method No.
Arsenic	206.2
Cadmium	213.1
Chromium	218.2
Copper	220.1
Lead	239.2
Mercury	245.1
Nickel	249.2
Selenium	270.2
Silver	272.1
Zinc	289.1

PESTICIDES

All test samples were prepared for analysis by EPA Method 608. The samples were analyzed on a Tracor 222 gas chromatograph equipped with an electron capture detector. A 6-foot by 2-millimeter (i.d.) glass column packed with 3 percent OV-17 and 3 percent QF-1 on 100/120 mesh chromQ was used isothermally at 190°C and with a gas flow of 75 milliliters per minute.

PHENOL

All test samples were analyzed for phenol according to EPA-600/4-79-020, "Methods for Chemical Analysis of Water and Wastes." The method number for phenol according to this reference is 420.2.

TOTAL ORGANIC CARBON (TOC)

All test samples were analyzed for TOC according to EPA-600/4-79-020, "Methods for Chemical Analysis of Water and Wastes," using an O.I. Corp. Model 524-C carbon analyzer. The method number for TOC according to the above reference is 415.1.

OIL AND GREASE

All test samples were analyzed for oil and grease according to EPA-600/4-79-020, "Methods for Chemical Analysis of Water and Wastes." According to this reference, the method number for oil and grease by IR spectrophotometry is 413.2.

VOLATILE ORGANIC COMPOUNDS

All test samples were analyzed for purgeable halocarbons by EPA Test Method 601 and for purgeable aromatics by EPA Test Method 602.

All test samples of purgeable halocarbons were prepared in purging 5-milliliter aliquots of sample with helium. Any analytes present were collected on a trap consisting of activated charcoal, Tenax, and silica gel. The trap was then heated to 180°C, and any analytes were flushed onto an 8-foot by 2-milliliter glass chromatographic column packed with 1 percent SP-1000 on Carbopack B. A thermal program starting at 50°C and proceeding at 8°C per minute to 220°C was used to separate the analytes. A Hall 700A electroconductivity detector in the halogen mode was used for detection and quantification of the analytes.

All test samples for purgeable aromatics were prepared by purging a 5-milliliter sample of water with helium for 13 minutes. Any analytes were collected on a 10-inch Tenax trap. The trap was heated to 180°C, and the analytes were desorbed onto a 6-foot by 1/8-inch stainless steel column packed with 5 percent SP-1200 and 1.75 percent Bentone-34. The gas chromatograph was operated with thermal programming — 50°C for 2 minutes, increasing at a rate of 4°C per minute to 110°C, and held there for 16 minutes. The analytes were selectively detected by a photoionization device equipped with a 10.2 eV ultraviolet lamp.

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB   Wells   Water Analysis

Analyte	Units	Detection Limit	DM-1	DM-2	W-4
Methylene Chloride	μg/L	0.5	ND	ND	ND
1,1,1-Trichloroethane	μg/L	0.1	ND	ND	ND
Carbon Tetrachloride	μg/L	0.1	ND	ND	ND
Trichloroethene	μg/L	0.1	ND	ND	ND
1,1,2-Trichloroethane	μg/L	0.1	ND	ND	ND
1,1,2,2-Tetrachloroethane	μg/L	0.5	ND	ND	ND
Chloromethane	μg/L	0.5	ND	ND	ND
Bromomethane	μg/L	0.5	ND	ND	ND
Dichlorodifluoromethane	μg/L	0.5	ND	ND	ND
Vinyl Chloride	μg/L	0.5	ND	ND	ND
Chloroethane	μg/L	0.5	ND	ND	ND
Trichlorofluoromethane	μg/L	0.5	ND	ND	ND
1,1-Dichloroethene	μg/L	0.1	ND	ND	ND
1,1-Dichloroethane	μg/L	0.1	ND	ND	ND
trans-1,2-Dichloroethene	μg/L	0.1	ND	ND	ND
Chloroform	μg/L	0.1	ND	ND	ND
1,2-Dichloroethane	μg/L	0.1	ND	ND	ND
Bromodichloromethane	μg/L	0.1	ND	ND	ND
1,2-Dichloropropane	μg/L	0.1	ND	ND	ND
trans-1,3-Dichloropropene	μg/L	0.5	ND	ND	ND
Dibromochloromethane	μg/L	0.5	ND	ND	ND
cis-1,3-Dichloropropene	μg/L	0.5	ND	ND	ND
2-Chloroethylvinyl Ether	μg/L	1.0	ND	ND	ND
Bromoform	μg/L	0.1	ND	ND	ND
Tetrachloroethene	μg/L	0.5	ND	ND	ND
Chlorobenzene (1)	μg/L	0.1	ND	ND	ND
1,2-Dichlorobenzene (1)	μg/L	0.5	ND	ND	ND
1,3-Dichlorobenzene (1)	μg/L	0.5	ND	ND	ND
1,4-Dichlorobenzene (1)	μg/L	0.5	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Wells Water Analyses

Analyte	Units	Detection Limit	W-5	W-2	W-6	W-8	W-9	W-10	W-11(2)	W-11(3)
Methylene Chloride	μg/L	0.5	ND	ND	ND	ND	7.3	1	ND	6.3
1,1,1-Trichloroethane	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	μg/L	0.5	ND	ND	ND	ND	0.7	ND	ND	1.4
1,2-Dichloroethane	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	1.1
Bromodichloromethane	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (1)	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (1)	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND

(1) Analyzed by EPA Method 601
(2) First sample collected 2-7-84.
(3) Second sample collected 2-24-84.

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Wells Water Analyses

Analyte	Units	Detection Limit	W-5	W-2	W-6	W-8	W-9	W-10	W-11[2]	W-11[3]
Benzene	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (4)	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (4)	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (4)	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (4)	μg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Oil & Grease	mg/L	0.4	ND	ND	ND	ND	ND	ND	(5)	ND
Phenol	μg/L	10					ND	ND	200	
Lead	μg/L	10					ND			

(2) Sample collected 2-7-84.
(3) Sample collected 2-24-84.
(4) Analyzed by EPA Method 602.
(5) Sample broken in transit.

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Wells Water Analysis

Analyte	Units	Detection Limit	DM-1	DM-2	W-4
Benzene	µg/L	0.5	ND	ND	ND
Toluene	µg/L	0.5	ND	ND	ND
Ethylbenzene	µg/L	0.5	ND	ND	ND
Chlorobenzene (3)	µg/L	0.5	ND	ND	ND
1,2-Dichlorobenzene (3)	µg/L	0.5	ND	ND	ND
1,3-Dichlorobenzene (3)	µg/L	0.5	ND	ND	ND
1,4-Dichlorobenzene (3)	µg/L	0.5	ND	ND	ND
Aldrin	µg/L	0.01	ND	0.02	
Dieldrin	µg/L	0.01	ND	ND	
Chlordane	µg/L	0.2	ND	ND	
o,p-DDT	µg/L	0.01	ND	ND	
p,p'-DDT	µg/L	0.01	ND	ND	
Endrin	µg/L	0.01	ND	ND	
Endrin Aldehyde	µg/L	0.01	ND	ND	
Heptachlor	µg/L	0.01	0.12	0.06	
Lindane	µg/L	0.01	ND	ND	
DDD	µg/L	0.01	ND	ND	
DDE	µg/L	0.01	ND	ND	
Arsenic	µg/L	50	ND	ND	
Cadmium	µg/L	10	ND	ND	
Chromium	µg/L	50	ND	ND	
Copper	µg/L	50	ND	ND	
Lead	µg/L	20	ND	ND	
Mercury	µg/L	2	ND	ND	
Nickel	µg/L	100	ND	ND	
Selenium	µg/L	10	ND	ND	
Silver	µg/L	10	ND	ND	
Zinc	µg/L	50	ND	110	
Oil & Grease	mg/L	0.2			0.2
TOC	mg/L	1			ND

(3) Analyzed by EPA Method 602

METHODS OF ANALYSES - SOIL

HEAVY METALS (INCLUDING LEAD)

All test samples were made ready for analysis by weighing a portion, about ½ gram, and digesting for metals with nitric and perchloric acids. Except for test samples from Site 18, all digests were brought to a final volume of 25 milliliters with deionized water. All digests of test samples from Site 18 were brought to a final volume of 100 milliliters with deionized water.

All test samples were analyzed according to EPA-600/4-79-020, "Methods for Chemical Analysis of Water and Wastes" (modified for soil). The method numbers according to the above reference are as follows:

Analyte	Method No.
Arsenic	206.2
Cadmium	213.1
Chromium	218.2
Copper	220.1
Lead	239.2
Mercury	245.1
Nickel	249.2
Selenium	270.2
Silver	272.1
Zinc	289.1

PESTICIDES

All test samples were prepared for analysis by EPA sonication Method 8.85 for evaluating solid waste. A cleanup of the sample was then performed using a 10-gram fluorisil column.

The samples were analyzed on a Tracor 222 gas chromatograph equipped with an electron capture detector. A 6-foot by 2-millimeter (i.d.) glass column packed with 3 percent OV-17 and 3 percent QF-1 on 100/120 mesh Gas Chrom Q was used isothermally at 190°C and with a gas flow of 75 milliliters per minute.

PHENOL

All test samples were analyzed for phenol according to EPA-600/4-79-020, "Methods for Chemical Analysis of Water and Wastes" (modified for soil).

PCBs

All test samples were prepared for analysis by extracting a 5-gram sample with methylene chloride. The samples were extracted three times, and the combined extract was taken to dryness with a rotary evaporator. The samples were reconstituted to 5 milliliters with isooctane.

The gas chromatographic analysis was performed on a Hewlett-Packard Model 5711A gas chromatograph equipped with an electron capture detector and accessories for capillary column capabilities. A 25-meter by 0.31-millimeter fused silica WCOT capillary column coated internally with DB-5 was used with temperature programming from 210°C (held for 2 minutes) to 310°C at a rate of 8°C per minute. Five percent methane in argon was used as the carrier gas. The injector was operated in the splitless mode of operation.

The presence of Arochlors 1242, 1254, and 1260 was determined by comparison with standard samples of Arochlors 1016, 1221, 1232, 1242, 1248, 1254, and 1260 obtained from the EPA. Quantitation was performed by summing the peak heights of the five major peaks of the standards and comparing those sums to the sums of the same peaks in the sample.

OIL AND GREASE

All test samples were analyzed for oil and grease according to the methods published in EPA-600/4-79-020, "Methods for Chemical Analysis of Water and Wastes" (modified for soil). According to this reference, the method number for oil and grease by IR spectrophotometry is 413.2.

VOLATILE ORGANIC COMPOUNDS

All test samples were analyzed for purgeable halocarbons by EPA Test Method 601 and for purgeable aromatics by EPA Test Method 602.

Test samples of purgeable halocarbons were prepared by diluting 1 gram of soil with 5 milliliters of organic free water and purged with helium. Any analytes present were collected on a trap consisting of activated charcoal, Tenax, and silica gel. The trap was then heated to 180°C, and any analytes were flushed onto an 8-foot by 2-millimeter glass column packed with 1 percent SP-1000 on Carbopack B. A thermal program starting at 50°C and proceeding at 8°C per minute to 200°C was used to separate the analytes. A Hall 700A electroconductivity detector in the halogen mode was used for detection and quantification of the analytes.

All test samples for purgeable aromatics except 18-2:1 and 3-6:5 were prepared by diluting 1 gram of sample with 5 milliliters of organic free water and purging with helium. Because of the high level of contamination, test sample 3-6:5 was prepared by diluting 1 gram of sample with 5 milliliters of organic free water, shaking for 2 minutes, settling for 15 minutes, diluting 1 to 100 with organic free water, and purging 5 milliliters with helium for 12 minutes. Test sample 18-2:1 was prepared by extracting 1 gram of sample with 5 milliliters of water and diluting 1 microliter of this extract into 5 milliliters of water.

Any analytes present were collected on a trap consisting of Tenax and/or silica gel. The trap was heated to 180°C, and the analytes were desorbed onto a stainless steel column. A column consisting of 5 percent SP-1200 and 1.75 percent Bentone-34 was used for test samples 1-1:2 through 1-6:10, 18-1:1 through 18-3:5, and 25-1:1 through 25-6:1. A column consisting of 5 percent SP-2100 and 1.75 percent Bentone-34 was used for all other test samples. The gas chromatograph was operated with thermal programming — 45°C for 2 minutes, increasing at a rate of 4°C per minute to 90°C, and held there for 16 minutes.

MOISTURE

All test samples were analyzed for moisture according to the following procedure. A beaker was dried in an oven at 105°C for 1 hour, desiccated for 1 hour, and weighed. Approximately 10 grams of sample were added to the beaker, and the weight of the beaker plus the sample was recorded. The sample was then dried at 105°C for 16 hours, desiccated for 1 hour, and weighed. The moisture weight was then divided by the weight of the sample before drying to find the percent moisture.

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 1 Soil Analyses

Analyte	Units	Detection Limit	1-1:2	1-1:4	1-1:8	1-2:2	1-2:6	1-2:11	1-3:2	1-3:5	1-3:9	1-4:1	1-4:3	1-4:4
Methylene Chloride	µg/g	0.01	ND	ND	ND	ND	ND	ND	0.04	0.03	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	µg/g	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 1 Soil Analyses

Analyte	Units	Detection Limit	1-4:6	1-5:1	1-5:3	1-5:7	1-5:10	1-6:1	1-6:5	1-6:10
Methylene Chloride	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	µg/L	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	µg/L	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	µg/L	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (1)	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (1)	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	µg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 1 Soil Analyses

Analyte	Units	Detection Limit	1-1:2	1-1:4	1-1:8	1-2:2	1-2:6	1-2:11	1-3:2	1-3:5	1-3:9	1-4:1	1-4:3	1-4:4
Benzene	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	μg/g	0.01	0.07	0.02	ND	ND	ND	ND	0.04	ND	C.01	0.01	ND	ND
Ethylbenzene	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene. (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Oil & Grease	mg/g	0.05	0.07	0.05	0.07	0.07	0.09	0.08	0.06	0.12	0.06	0.07	0.13	0.07
Phenol	μg/g	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Moisture	%	-	3	2	5	3	2	6	9	2	2	5	4	1

(2) Analyzed by EPA Method 602

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 1 Soil Analyses

Analyte	Units	Detection Limit	1-4:6	1-5:1	1-5:3	1-5:7	1-5:10	1-6:1	1-6:5	1-6:10
Benzene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/g	0.01	ND	0.02	ND	ND	ND	ND	0.05	ND
Ethylbenzene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (2)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (2)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (2)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (2)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Oil & Grease	mg/g	0.05	0.08	0.17	0.19	0.08	0.12	0.06	0.09	0.06
Phenol	µg/g	5	ND	ND	ND	ND	ND	ND	ND	ND
Moisture	%	-	3	9	2	10	8	8	5	6

(2) Analyzed by EPA Method 602

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 1 Soil Analyses

Analyte	Units	Detection Limit	1-1:5	1-1:11	1-2:3	1-3:1	1-3:6	1-4:7	1-5:2*	1-5:4	1-5:9	1-6:8
Aldrin	μg/g	0.001	ND	ND	ND	ND	ND	ND	<0.01	ND	0.007	ND
Dieldrin	μg/g	0.001	ND	ND	ND	ND	ND	ND	<0.01	ND	ND	ND
Chlordane	μg/g	0.02	ND	ND	ND	ND	ND	ND	<0.2	ND	ND	ND
Endrin	μg/g	0.001	ND	ND	ND	ND	ND	ND	<0.01	ND	ND	ND
o,p-DDT	μg/g	0.001	ND	ND	ND	ND	ND	ND	0.46	ND	ND	ND
p,p'-DDT	μg/g	0.001	ND	ND	ND	ND	ND	ND	<0.01	ND	ND	ND
Endrin Aldehyde	μg/g	0.001	ND	ND	ND	ND	ND	ND	<0.01	ND	ND	ND
Heptachlor	μg/g	0.001	0.004	0.004	0.004	ND	ND	ND	<0.01	0.002	ND	0.002
Lindane	μg/g	0.001	ND	ND	ND	ND	ND	ND	<0.01	ND	ND	ND
DDD	μg/g	0.001	ND	ND	ND	ND	ND	ND	<0.01	ND	ND	ND
DDE	μg/g	0.001	ND	ND	ND	ND	ND	ND	<0.01	ND	ND	ND
Moisture	%	--	3	4	5	10	2	13	6	3	6	4

*This sample extract was diluted 1:10 for pesticide analysis.

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 18 Soil Analyses

Analyte	Units	Detection Limit	18-1:1	18-1:2	18-1:3	18-1:4	18-1:5	18-2:1(2)	18-2:2	18-2:3	18-2:6	18-3:1	18-3:2	18-3:5
Methylene Chloride	ug/g	0.01	ND	ND	0.06	ND	ND	< 5	0.02	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
Trichloroethene	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
Chloromethane	ug/g	0.05	ND	ND	ND	ND	ND	< 25	ND	ND	ND	ND	ND	ND
Bromomethane	ug/g	0.05	ND	ND	ND	ND	ND	< 25	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ug/g	0.1	ND	ND	ND	ND	ND	< 50	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ug/g	0.01	ND	ND	ND	ND	ND	< 5	0.29	0.14	0.24	0.14	ND	ND
Chloroethane	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
Chloroform	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
Bromoform	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
Chlorobenzene (1)	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (1)	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	ug/g	0.01	ND	ND	ND	ND	ND	< 5	ND	ND	ND	ND	ND	ND

(1) Analyzed by EPA Method 601.

(2) Severe contamination raised the detection limit by a factor of 500.

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 18 Soil Analyses

Analyte	Units	Detection Limit	18-1:1	18-1:2	18-1:3	18-1:4	18-1:5	18-2:1 (4)	18-2:2	18-2:3	18-2:6	18-3:1	18-3:2	18-3:5
Benzene	μg/g	0.01	ND	ND	ND	ND	ND	< 50	ND	ND	ND	ND	ND	ND
Toluene	μg/g	0.01	ND	ND	ND	ND	ND	< 50	ND	ND	ND	ND	ND	ND
Ethylbenzene	μg/g	0.01	ND	ND	ND	ND	ND	< 50	ND	ND	ND	ND	ND	ND
Chlorobenzene (3)	μg/g	0.01	ND	ND	ND	ND	ND	< 50	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (3)	μg/g	0.01	ND	ND	ND	ND	ND	< 50	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (3)	μg/g	0.01	ND	ND	ND	ND	ND	< 50	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (3)	μg/g	0.01	ND	ND	ND	ND	ND	< 50	ND	ND	ND	ND	ND	ND
Oil & Grease	mg/g	0.05	0.13	0.20	0.09	0.10	0.12	12	0.15	0.17	0.06	1.6	0.07	0.06
Phenol	μg/g	5	ND	ND	ND	ND	ND	ND	ND	ND	8	ND	ND	ND
Lead	μg/g	10	17	17	19	13	12	37	ND	ND	21	26	14	12
Moisture	%	-	11	10	13	10	8	13	10	10	12	9	11	8

(3) Analyzed by EPA Method 602

(4) Severe contamination raised the detection limit by a factor of 5000

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 7 Soil Analyses

Analyte	Units	Detection Limit	7-1:1	7-1:2	7-1:3	7-2:2	7-2:3	7-3:2	7-4:1	7-4:2	7-4:4	7-5:1	7-5:2	7-6:2
Aroclor 1016	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	ND	ND
Moisture	%	--	5.6	4.2	7.6	9.5	8.0	9.4	2.8	6.7	7.1	5.0	5.9	8.3

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 7 Soil Analyses

Analyte	Units	Detection Limit	7-6:3	7-7:1	7-7:3	7-7:4	7-8:2	7-8:4	7-10:3	7-10:4
Aroclor 1016	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	µg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Moisture	%	--	7.1	3.9	4.0	8.0	11	8.7	11	9.1

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 19 Soil Analyses

Analyte	Units	Detection Limit	19-1:1	19-1:2	19-1:3B	19-1:5	19-2:1	19-2:3	19-2:4	19-3:2	19-3:3	19-4:2	19-4:3	19-4:5
Methylene Chloride	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 19 Soil Analyses

Analyte	Units	Detection Limit	19-1:1	19-1:2	19-1:38	19-1:5	19-2:1	19-2:3	19-2:4	19-3:2	19-3:3	19-4:2	19-4:3	19-4:5
Benzene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/g	0.01	ND	ND	ND	ND	ND	ND	0.03	ND	ND	ND	ND	ND
Ethylbenzene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (2)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (2)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (2)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (2)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Oil & Grease	mg/g	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	µg/g	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	µg/g	10	22	28	ND	27	19	30	21	17	27	17	ND	23
Moisture	%	—	9.6	12	2.5	13	6.8	8.4	10	6.9	9.8	8.1	4.2	17

(2) Analyzed by EPA Method 602.

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 20/21 Soil Analyses

Analyte	Units	Detection Limit	20-1:1	20-1:4	20-1:5	21-1:2	21-1:3	21-1:4
Methylene Chloride	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	µg/g	0.01	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Chloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Bromomethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Vinyl Chloride	µg/g	0.01	ND	ND	ND	ND	ND	ND
Chloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND
Chloroform	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Bromodichloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/g	0.01	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND	ND	ND
Dibromochloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	µg/g	0.01	ND	ND	ND	ND	ND	ND
Bromoform	µg/g	0.01	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND
Chlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 20/21 Soil Analyses

Analyte	Units	Detection Limit	20-1:1	20-1:4	20-1:5	21-1:2	21-1:3	21-1:4
Benzene	µg/g	0.01	ND	ND	ND	ND	ND	ND
Toluene	µg/g	0.01	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/g	0.01	ND	ND	ND	ND	ND	ND
Chlorobenzene (2)	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (2)	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (2)	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (2)	µg/g	0.01	ND	ND	ND	ND	ND	ND
Arsenic	µg/g	1	1.8	3.3	4.1	2.3	ND	ND
Cadmium	µg/g	0.5	1.5	2.9	2.5	4.8	1.6	2.6
Chromium	µg/g	5	ND	ND	ND	ND	ND	ND
Copper	µg/g	0.5	9.3	21	18	13	18	11
Lead	µg/g	5	13	27	22	22	11	13
Mercury	µg/g	0.05	ND	ND	ND	ND	ND	ND
Nickel	µg/g	1	9.9	26	22	28	11	18
Selenium	µg/g	1	ND	ND	ND	ND	ND	ND
Silver	µg/g	0.5	ND	1.2	0.9	1.2	ND	0.8
Zinc	µg/g	3	22	56	46	37	27	28
Phenol	µg/g	10	ND	ND	ND	ND	ND	ND
Oil & Grease	mg/g	0.06	ND	ND	ND	ND	ND	ND
Moisture	%	--	8.9	12	14	13	8.7	10
Aroclor 1016	µg/g	0.05				ND	ND	ND
Aroclor 1221	µg/g	0.05				ND	ND	ND
Aroclor 1232	µg/g	0.05				ND	ND	ND
Aroclor 1242	µg/g	0.05				ND	ND	ND
Aroclor 1248	µg/g	0.05				ND	ND	ND
Aroclor 1254	µg/g	0.05				ND	ND	ND
Aroclor 1260	µg/g	0.05				ND	ND	ND

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 17 Soil Analysis

Analyte	Units	Detection Limit	17-1:1	17-1:2	17-1:4	17-1:5
Methylene Chloride	µg/g	0.01	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/g	0.01	ND	ND	ND	ND
Carbon Tetrachloride	µg/g	0.01	ND	ND	ND	ND
Trichloroethene	µg/g	0.01	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/g	0.01	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/g	0.01	ND	ND	ND	ND
Chloromethane	µg/g	0.01	ND	ND	ND	ND
Bromomethane	µg/g	0.01	ND	ND	ND	ND
Dichlorodifluoromethane	µg/g	0.01	ND	ND	ND	ND
Vinyl Chloride	µg/g	0.01	ND	ND	ND	ND
Chloroethane	µg/g	0.01	ND	ND	ND	ND
Trichlorofluoromethane	µg/g	0.01	ND	ND	ND	ND
1,1-Dichloroethene	µg/g	0.01	ND	ND	ND	ND
1,1-Dichloroethane	µg/g	0.01	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/g	0.01	ND	ND	ND	ND
Chloroform	µg/g	0.01	ND	ND	ND	ND
1,2-Dichloroethane	µg/g	0.01	ND	ND	ND	ND
Bromodichloromethane	µg/g	0.01	ND	ND	ND	ND
1,2-Dichloropropane	µg/g	0.01	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND
Dibromochloromethane	µg/g	0.01	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND
2-Chloroethylvinyl Ether	µg/g	0.01	ND	ND	ND	ND
Bromoform	µg/g	0.01	ND	ND	ND	ND
Tetrachloroethene	µg/g	0.01	ND	ND	ND	ND
Chlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND
1,2-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 17 Soil Analysis

Analyte	Units	Detection Limit	17-1:1	17-1:2	17-1:4	17-1:5
Benzene	μg/g	0.01	ND	ND	ND	ND
Toluene	μg/g	0.01	ND	ND	ND	ND
Ethylbenzene	μg/g	0.01	ND	ND	ND	ND
Chlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND
1,2-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND
1,3-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND
1,4-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND
Oil & Grease	μg/g	0.06	ND	ND	ND	ND
Phenol	μg/g	10	ND	ND	ND	ND
Lead	μg/g	10	14	ND	10	ND
Moisture	%	--	11	5.9	12	12

(2) Analyzed by EPA Method 602.

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 3 Soil Analyses

Analyte	Units	Detection Limit	3-1:1	3-1:2	3-1:5	3-2:2	3-2:3	3-2:5	3-3:1	3-3:2	3-3:3	3-6:2	3-6:3	3-6:5
Methylene Chloride	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/g	0.01	ND	ND	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 3 Soil Analyses

Analyte	Units	Detection Limit	3-1:1	3-1:2	3-1:5	3-2:2	3-2:3	3-2:5	3-3:1	3-3:2	3-3:3	3-6:2	3-6:3	3-6:5
Benzene	μg/g	0.01	ND	< 2	ND	< 0.5	< 2	ND	ND	ND	ND	< 1	< 2	< 1
Toluene	μg/g	0.01	ND	< 2	ND	< 0.5	< 2	ND	ND	ND	ND	< 1	< 2	< 1
Ethylbenzene	μg/g	0.01	ND	< 2	ND	< 0.5	< 2	ND	ND	ND	ND	5	< 2	4
Chlorobenzene (2)	μg/g	0.01	ND	< 2	ND	< 0.5	< 2	ND	ND	ND	ND	< 1	< 2	< 1
1,2-Dichlorobenzene (2)	μg/g	0.01	ND	< 2	ND	< 0.5	< 2	ND	ND	ND	ND	< 1	< 2	< 1
1,3-Dichlorobenzene (2)	μg/g	0.01	ND	< 2	ND	< 0.5	< 2	ND	ND	ND	ND	< 1	< 2	< 1
1,4-Dichlorobenzene (2)	μg/g	0.01	ND	< 2	ND	< 0.5	< 2	ND	ND	ND	ND	< 1	< 2	< 1
Moisture	%	-	9.2	11	1.9	6.7	12	1.2	11	13	9.6	8.4	7.2	1.5

(2) Analyzed by EPA Method 602

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 8 Soil Analyses

Analyte	Units	Detection Limit	8-1:1	8-1:2	8-1:3	8-1:4	8-2:1	8-2:2	8-2:3	8-2:4
Aroclor 1016	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Oil & Grease	μg/g	0.06	34	ND	ND	ND	1.7	ND	ND	ND
Moisture	%	—	2.9	14	4.8	3.8	4.3	13	9.3	5.0

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 8 Soil Analyses

Analyte	Units	Detection Limit	8-3:1	8-3:2	8-3:3	8-3:4	8-4:1	8-4:2	8-4:4
Aroclor 1016	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND
Oil & Grease	μg/g	0.06	ND	ND	ND	ND	ND	ND	ND
Moisture	%	--	5.4	13	6.7	6.2	5.2	16	6.1

UBTL ANALYTICAL REPORT SUMMARY
Davis Monthan AFB Site 4 Soil Analyses

Analyte	Units	Detection Limit	4-1:1	4-1:2	4-1:3	4-2:1	4-2:2	4-2:3
Methylene Chloride	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	µg/g	0.01	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Chloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Bromomethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Vinyl Chloride	µg/g	0.01	ND	ND	ND	ND	ND	ND
Chloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND
Chloroform	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
Bromodichloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/g	0.01	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND	ND	ND
Dibromochloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	µg/g	0.01	ND	ND	ND	ND	ND	ND
Bromoform	µg/g	0.01	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND
Chlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL ANALYTICAL REPORT SUMMARY
Davis Monthan AFB Site 4 Soil Analyses

Analyte	Units	Detection Limit	4-1:1	4-1:2	4-1:3	4-2:1	4-2:2	4-2:3
Benzene	μg/g	0.01	ND	ND	ND	ND	ND	ND
Toluene	μg/g	0.01	ND	ND	ND	ND	ND	ND
Ethylbenzene	μg/g	0.01	ND	ND	ND	ND	ND	ND
Chlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND
1-4-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND
Oil & Grease	mg/g	0.06	ND	ND	ND	ND	ND	ND
Lead	μg/g	10	48	39	18	46	40	ND
Moisture	%	--	11	11	5.7	5.0	10	6.3

(2) Analyzed by EPA Method 602

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB   Site 25   Soil Analyses

Analyte	Units	Detection Limit	25-1:1	25-1:2	25-1:4	25-2:1	25-2:2	25-2:3	25-3:1	25-3:2	25-3:3	25-4:1	25-4:2	25-4:4
Methylene Chloride	ug/g	0.01	ND	ND	ND	ND	ND	ND	0.19	0.46	ND	ND	ND	ND
1,1,1-Trichloroethane	ug/g	0.01	ND	ND	ND	ND	ND	0.05	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ug/g	0.01	ND	ND	ND	ND	ND	0.16	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (1)	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (1)	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	ug/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB   Site 25   Soil Analyses

Analyte	Units	Detection Limit	25-5:1	25-5:2	25-5:4	25-6:1	25-6:3	25-6:4	25-7:1	25-7:2	25-7:3	25-8:1	25-8:2	25-8:4
Methylene Chloride	µg/g	0.01	ND	ND	ND	ND	ND	0.07	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/g	0.01	ND	ND	ND	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 25 Soil Analyses

Analyte	Units	Detection Limit	25-9:1	25-9:2	25-9:4
Methylene Chloride	µg/g	0.01	ND	0.01	0.07
1,1,1-Trichloroethane	µg/g	0.01	ND	ND	ND
Carbon Tetrachloride	µg/g	0.01	ND	ND	ND
Trichloroethene	µg/g	0.01	ND	ND	ND
1,1,2-Trichloroethane	µg/g	0.01	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/g	0.01	ND	ND	ND
Chloromethane	µg/g	0.01	ND	ND	ND
Bromomethane	µg/g	0.01	ND	ND	ND
Dichlorodifluoromethane	µg/g	0.01	ND	ND	ND
Vinyl Chloride	µg/g	0.01	ND	ND	ND
Chloroethane	µg/g	0.01	ND	ND	ND
Trichlorofluoromethane	µg/g	0.01	ND	ND	ND
1,1-Dichloroethene	µg/g	0.01	ND	ND	ND
1,1-Dichloroethane	µg/g	0.01	ND	ND	ND
trans-1,2-Dichloroethene	µg/g	0.01	ND	ND	ND
Chloroform	µg/g	0.01	ND	ND	ND
1,2-Dichloroethane	µg/g	0.01	ND	ND	ND
Bromodichloromethane	µg/g	0.01	ND	ND	ND
1-2-Dichloropropene	µg/g	0.01	ND	ND	ND
trans-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND
Dibromochloromethane	µg/g	0.01	ND	ND	ND
cis-1,3-Dichloropropene	µg/g	0.01	ND	ND	ND
2-Chloroethylvinyl Ether	µg/g	0.01	ND	ND	ND
Bromoform	µg/g	0.01	ND	ND	ND
Tetrachloroethene	µg/g	0.01	ND	ND	ND
Chlorobenzene (1)	µg/g	0.01	ND	ND	ND
1,2-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND
1,3-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND
1,4-Dichlorobenzene (1)	µg/g	0.01	ND	ND	ND

(1) Analyzed by EPA Method 601

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 25 Soil Analyses

Analyte	Units	Detection Limit	25-1:1	25-1:2	25-1:4	25-2:1	25-2:2	25-2:3	25-3:1	25-3:2	25-3:3	25-4:1	25-4:2	25-4:4
Benzene	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	μg/g	0.05	ND	ND	ND	0.08	ND	ND	ND	ND	ND	ND	ND	ND
Oil & Grease	mg/g	0.06	ND	ND	0.07	0.08	ND	ND	10	ND	ND	ND	ND	ND
Lead	μg/g	10	21	14	14	24	15	ND	54	ND	ND	13	15	ND
Moisture	%	—	21	8.3	4.9	6.1	7.8	5.4	2.8	4.8	5.9	4.9	6.6	6.4

(2) Analyzed by EPA Method 602

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 25 Soil Analyses

Analyte	Units	Detection Limit	25-5:1	25-5:2	25-5:4	25-6:1	25-6:3	25-6:4	25-7:1	25-7:2	25-7:3	25-8:1	25-8:2	25-8:4
Benzene	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	μg/g	0.01	ND	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (2)	μg/g	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	μg/g	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Oil & Grease	mg/g	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	ND	ND
Lead	μg/g	10	ND	ND	ND	ND	ND	ND	ND	15	14	ND	ND	15
Moisture	%	—	6.5	8.4	3.4	9.0	1.8	4.1	6.6	8.4	6.8	3.0	5.3	8.0

(2) Analyzed by EPA Method 602

UBTL ANALYTICAL REPORT SUMMARY

Davis Monthan AFB Site 25 Soil Analyses

Analyte	Units	Detection Limit	25-9:1	25-9:2	25-9:4
Benzene	µg/g	0.01	ND	ND	ND
Toluene	µg/g	0.01	ND	ND	ND
Ethylbenzene	µg/g	0.01	ND	ND	ND
Chlorobenzene (2)	µg/g	0.01	ND	ND	ND
1,2-Dichlorobenzene (2)	µg/g	0.01	ND	ND	ND
1,3-Dichlorobenzene (2)	µg/g	0.01	ND	ND	ND
1,4-Dichlorobenzene (2)	µg/g	0.01	ND	ND	ND
Aroclor 1016	µg/g	0.05	ND	ND	ND
Aroclor 1221	µg/g	0.05	ND	ND	ND
Aroclor 1232	µg/g	0.05	ND	ND	ND
Aroclor 1242	µg/g	0.05	ND	ND	ND
Aroclor 1248	µg/g	0.05	ND	ND	ND
Aroclor 1254	µg/g	0.05	ND	ND	ND
Aroclor 1260	µg/g	0.05	ND	ND	ND
Oil & Grease	mg/g	0.06	ND	ND	ND
Lead	µg/g	10	15	15	ND
Moisture	%	--	8.3	5.2	5.2

(2) Analyzed by EPA Method 602

UBTL ANALYTCIAL REPORT

Davis Monthan Resample - Water Analysis

(15 November 84)

Parameter	Method	Units	Detection Limit	DM-1	DM-2	W-4	W-9	W-10	W-11
Aldrin	608 (2)	µg/L	0.01	*	*				
Dieldrin	608 (2)	µg/L	0.01	*	*				
Chlordane	608 (2)	µg/L	0.2	*	*				
p,p'-DDT	608 (2)	µg/L	0.05	*	*				
o,p-DDT	608 (2)	µg/L	0.05	*	*				
DDE	608 (2)	µg/L	0.02	*	*				
Endrin	608 (2)	µg/L	0.02	*	*				
Endrin Aldehyde	608 (2)	µg/L	0.05	*	*				
Heptachlor	608 (2)	µg/L	0.01	*	*				
Lindane	608 (2)	µg/L	0.01	*	*				
Oil & Grease	413.2 (1)	mg/L	0.5			3.8			
Benzene	602 (2)	µg/L	1.0				*	*	*
Toluene	602 (2)	µg/L	1.0				*	*	*
Ethyl Benzene	602 (2)	µg/L	1.0				*	*	*
Chlorobenzene	602 (2)	µg/L	1.0				*	*	*
1,4-Dichlorobenzene	602 (2)	µg/L	1.0				*	*	*
1,3-Dichlorobenzene	602 (2)	µg/L	1.0				*	*	*
1,2-Dichlorobenzene	602 (2)	µg/L	1.0				*	*	*
Bromodichlorobenzene	601 (2)	µg/L	1.0				*	*	*
Bromoform	601 (2)	µg/L	1.0				*	*	*
Bromomethane	601 (2)	µg/L	1.0				*	*	*
Carbon Tetrachloride	601 (2)	µg/L	1.0				*	*	*
Chlorobenzene	601 (2)	µg/L	1.0				*	*	*
Chloroethane	601 (2)	µg/L	1.0				*	*	*
2-Chloroethylvinyl ether	601 (2)	µg/L	1.0				*	*	*
Chloroform	601 (2)	µg/L	1.0				*	*	*

See Water Q.C. Report for footnotes.

*Not detected.

UBTL ANALYTCIAL REPORT
Davis Monthan Resample - Water Analysis
(15 November 84)

Parameter	Method	Units	Detection Limit	W-9	W-10	W-11
Chloromethane	601 (2)	µg/L	1.0	*	*	*
Dibromochloromethane	601 (2)	µg/L	1.0	*	*	*
1,2-Dichlorobenzene	601 (2)	µg/L	1.0	*	*	*
1,3-Dichlorobenzene	601 (2)	µg/L	1.0	*	*	*
1,4-Dichlorobenzene	601 (2)	µg/L	1.0	*	*	*
Dichlorofluoromethane	601 (2)	µg/L	1.0	*	*	*
1,1-Dichloroethane	601 (2)	µg/L	1.0	*	*	*
1,2-Dichloroethane	601 (2)	µg/L	1.0	*	*	*
1,1-Dichloroethene	601 (2)	µg/L	1.0	*	*	*
trans-1,2-Dichloroethene	601 (2)	µg/L	1.0	*	*	*
1,2-Dichloropropane	601 (2)	µg/L	1.0	*	*	*
Cis-1,3-Dichloropropene	601 (2)	µg/L	1.0	*	*	*
trans-1,3-Dichloropropene	601 (2)	µg/L	1.0	*	*	*
Methylene Chloride	601 (2)	µg/L	1.0	*	*	*
1,1,2,2-Tetrachloroethane	601 (2)	µg/L	1.0	*	*	*
Tetrachloroethene	601 (2)	µg/L	1.0	*	*	*
1,1,1-Trichloroethane	601 (2)	µg/L	1.0	*	*	*
1,1,2-Trichloroethane	601 (2)	µg/L	1.0	*	*	*
Trichloroethene	601 (2)	µg/L	1.0	*	*	*
Trichlorofluoromethane	601 (2)	µg/L	1.0	*	*	*
Vinyl Chloride	601 (2)	µg/L	1.0	*	*	*

See Water Q.C. Report for footnotes.

*Not detected.

UBTL, INC.
520 WAKARA WAY • SALT LAKE CITY, UTAH 84108 • 801 / 584-3232

March 6, 1985
Refer to: 85C087

DAMES & MOORE
MAR 7 1985
Park Ridge, Illinois

Dr. Kenneth J. Stimpfl
Dames & Moore
1550 Northwest Hwy
Park Ridge, IL 60068

RE: Analytical services in support of USAF Contract F3316-83-D-4002 Davis Monthan Resample under Purchase Order No. CH3874.

Dear Dr. Stimpfl:

Enclosed with this letter are the following:

Soil Sample Handling and Moisture Determination Protocols.

Chain of Custody Records for:
Water Samples (6 total)

Analytical Reports for Soil & Water Samples (for 624 analysis of soils, see explanation below).

Quality Control Reports for Soil and Water Samples.

The results of the volatile analysis for seven soil samples (18-2:1, 3-1:2, 3-2:2, 3-2:3, 3-6:2, 3-6:3 and 3-6:5) initially were reported with elevated detection limits because of a high background. As a part of the re-analysis the seven soil samples noted above were submitted for volatile analysis by gas chromatography/mass spectrometry (GC/MS) according to a modification of EPA method 624. The modification involved introducing a weighed portion of soil into five ml of water in the sparging unit and then proceeding with the purge-and-trap procedure followed by GC/MS analysis.

The background contamination was so severe that the GC/MS procedure was not able to achieve anything approximating the desired detection limits (1µg/g to 5µg/g). In addition, the GC/MS was contaminated and rendered non-functional in the attempt to analyze the samples.

Although direct analysis of these samples is not feasible, it may be worthwhile to investigate the possibility of a cleanup procedure to separate the background from the analytes of interest. The most direct approach would be to extract the soil samples with methanol. A portion of the methanol extract could then be injected into the purge-and-trap apparatus. This procedure currently is under investigation at UBTL. If it is successful, it can be implemented at the cost quoted for the usual

GC/MS method. If the methanol extraction does not result in sufficiently low detection limits, the next approach would probably involve multiple solvent extractions and/or absorbent cleanups. UBTL estimates 120 hours of chemist time at $47.93 per hour to prepare the seven samples for analysis by GC/MS at the cost quoted for the usual GC/MS method.

Sincerely,

A. Brent Torgensen
A. Brent Torgensen
Section Manager

BT/clc
Enclosures

APPENDIX E

REFERENCES

REFERENCES

American Petroleum Institute (API), 1981, Refinery wastewater priority pollutant study - sample analysis and evaluation of data. Publication 4346, Environmental Affairs Department, prepared by Radian Corporation, McLean, Virginia (December).

California Department of Health Services, 1983, Notice of proposed changes in regulations of the Department of Health Services regarding criteria for identification of hazardous and extremely hazardous wastes (R-45-78).

CH2M Hill, 1982, Installation restoration program records search for Davis-Monthan Air Force Base, Arizona, for Air Force Engineering and Services Center, Directorate of Environmental Planning, Tyndall Air Force Base, Florida 32403, and Tactical Air Command, Directorate of Engineering and Construction, Langley Air Force Base, Virginia 23665 (August).

Conner, J.J., and Shacklette, H.T., 1975, Background geochemistry of some rocks, soils, plants, and vegetables in the contiguous United States. U.S. Geological Survey Professional Paper 574-F, U.S. Department of Interior, U.S. Government Printing Office, Washington, D.C.

Davidson, E.S., 1973, Geohydrology and water resources of the Tucson Basin, Arizona. U.S. Geological Survey, Water Supply Paper 1939-E.

Department of Environment, 1980, Redevelopment of contaminated land: tentative guidelines for acceptable levels of selected elements in soils. London.

Federal Register, 1980, Water quality criteria documents; availability. pp. 79318-79379 (November 28).

Gass, T.E., 1982, Tucson ground water contamination mystery. Ground Water, vol. 20, no. 2, p. 253 (March-April).

Ground Water Newsletter, 1984, Washington update. Vol. 13, no. 2 (January 31).

Holzer, T.L., Davis, S.N., and Lofgren, B.E., 1979, Faulting caused by ground water. Journal of Geophysical Research, vol. 8, no. B2, pp. 603-612 (February 10).

U.S. Environmental Protection Agency, 1978, Methods for chemical analysis of water and wastes. EPA-600/4-79-020.

_____, 1979, Water-related environmental fate of 129 priority pollutants. Prepared by Versar, Inc., Springfield, Virginia, Report No. EPA-440/4-79-029a&b, two volumes (December).

_____, 1982, Methods for organic chemical analysis of municipal and industrial wastewater. J.E. Longbottom and J.J. Lichtenberg (eds.), Report No. EPA-600/4-82-057 (July).

_____, 1984, Telephone conversation with Ila Cate, Toxicologist, Denver Water Supply Branch (February 14).

Weston, R.R., Inc., 1983, Installation restoration program, Phase II problem confirmation and quantification, presurvey report, Davis-Monthan Air Force Base, Tucson, Arizona. Prepared for United States Air Force, Occupational and Environmental Health Laboratory (OEHL), Brooks Air Force Base, Texas (January).

APPENDIX F

BIOGRAPHIES OF KEY PERSONNEL

Curriculum Vitae

LUTZ "YOGI" KUNZE

Title	Associate
Expertise	Geotechnical/Civil Engineering Tailings and Earth Dam Design Soil and Foundation Engineering

Experience with Firm

Managing Principal-in-Charge, Tucson Office
- o Responsible for marketing and performance of geotechnical projects.

Principal-in-Charge, Lexington Office
- o Responsible for marketing and performance of geotechnical projects.

Senior Engineer, Chicago Office
- o Management of large-scale multidiscipline projects both in the United States and overseas, including the University of Riyadh, Saudi Arabia project and the Semen Padang Cement Plant Expansion in Sumatra, Indonesia.

Project Engineer, Chicago Office
- o Foundation investigations for U.S. Steel's Minntac mining facilities.
- o Soils and foundation investigations for highrise buildings, industrial plants, and power plants.

Staff Engineer, Los Angeles Office
- o Soils and foundation investigations for numerous residential and office buildings, refineries, and industrial plants.
- o Foundation investigation for offshore oil drilling platforms in Santa Barbara Channel.
- o Field explorations for various elements of Disney World near Orlando, Florida.

Past Experience

Manager of Geotechnical Engineering
- o Responsible for the management and execution of design studies for tailings dams, waste dumps, and sedimentation facilities in the Philippines, Dominican Republic, Mexico, and the United States.

Principal Engineer
- o Management and direction of complex geotechnical projects, including nuclear power plant siting studies, tailings dams in Missouri, dam safety inspections for U.S. Army Corps of Engineers.

Academic Background	M.S.E., Civil Engineering, Arizona State University, 1973 B.S.E., Civil Engineering, University of Connecticut, 1966 Short Course, Embankment Dams, University of Missouri, 1974
Professional Affiliations	American Society of Civil Engineers National Society of Professional Engineers Arizona Society of Professional Engineers Society of Mining Engineers of AIME U.S. National Society of the ISSM&FE
Registration	Professional Engineer: Arizona, California, Illinois, Kentucky, Maine, Missouri, Ohio, Tennessee, Virginia, Washington, Nevada
Publications	Coauthor, "Waste Disposal - Planning and Environmental Protection Aspects," to be published in the 1983 AIME Mudd Series Book on Surface Mining

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Curriculum Vitae

STEVEN B. JOHNSON

Title	Staff Hydrologist
Expertise	Ground Water Hydrology
Experience With Firm	As an assistant and staff hydrologist, STEVEN B. JOHNSON has been responsible for the organization and analysis of ground and surface water data. As a principal investigator, he has conducted ground water contamination studies and operated in situ permeability apparatus. In addition, Mr. Johnson has contributed to the hydrologic analyses of siting, baseline, environmental, and final safety analysis reports for several large utilities. Some of his more pertinent experience is as follows:

- Hydrogeological investigation of industrial site, West Virginia.
- Ground water contamination study of industrial site, Michigan.
- In situ permeability study, Missouri.
- Fossil fuel power plant siting study, Wisconsin.
- Deep well sampling project, Wisconsin.
- Baseline ground water and surface water study for fossil fuel plant, Michigan.
- Baseline ground water study for nickel-zinc mine, Wisconsin.
- Nuclear final safety analysis report, ground water section, Kansas.
- Nuclear environmental report, ground water section, Kansas.
- Nuclear preliminary safety analysis report, geology section, Illinois.
- Ground water contamination study of industrial site, Ohio.
- Underground natural gas storage study, Illinois.
- Preparation of RCRA and Arizona hazardous waste permits.
- Site selection for fossil fuel power plant wastes, Wisconsin.
- Installation of ground water monitoring system for uranium tailings pond, Wyoming.
- Investigation of nitrate contamination of ground water, Oklahoma.
- Ground water investigation and RCRA compliance at refinery, New Mexico and Utah.
- Investigation of gasoline spill at service station, Utah.
- Investigation of seepage from fertilizer tailings pond, Utah.
- Conducted pumping tests at a proposed landfill site, Utah.

Curriculum Vitae

GEORGE J. GEISER

Title Staff Engineer

Expertise Water Resources Engineering

Experience With Firm

Water Resources Investigations

- Investigation of numerous multipurpose water facilities for the Central Arizona Water Control Study.
- Water quality analysis for four major rivers in Arizona to assess the effects of mixing with Colorado River water from the Central Arizona Project.
- Impact assessment and analysis for Central Arizona Project municipal and industrial water allocations.
- Design of a water quality monitoring network to establish baseline data for a proposed reservoir in Arizona.
- Hydrologic studies and hydraulic investigations involving flood routing and backwater analysis to evaluate alternative flood control systems for Ephriam Canyon Wash in Nogales, Arizona.
- Water resources impact study for transmission line corridors.
- Installation of ground water monitoring devices.
- Seepage analysis for earth dams.
- Water balance and flood analysis for various mine tailings facilities.
- Computer-based reservoir flood routing to evaluate dam over-topping potential and emergency spillway design.
- Investigation of scour potential and riverbed stability for a proposed 36-inch-diameter sewer line siphon crossing of the Salt River.
- Hydrologic and scour analyses for the Interstate-10 and the proposed Hayden Road bridges at the Salt River.
- Liner evaluation for gold leaching operation in New Mexico.

Geotechnical Investigation

- Supervision of subsurface sample collection.
- Computer-based slope stability analysis for earth dams.
- Supervision of pressure grouting operations to stabilize structural settlement problems.

Hazardous Waste Experience

- Preparation of hazardous waste permit applications under U.S. Resource Conservation and Recovery Act and State of Arizona Guidelines for a large manufacturing facility.
- Hazardous waste sampling at a spill site in southern Arizona.

Past Experience

Researach Assistant, U.S. Forestry Service

- Hydrologic analysis of high mountain streams.
- Energy studies for streambed movement in western United States.

Academic Background

B.S., Civil Engineering (Water Resources), Arizona State University, 1977
Graduate studies in civil engineering, Arizona State University, 1978

Professional Affiliations

American Society of Civil Engineers
American Water Resources Association

Registration Civil Engineer, Arizona

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Curriculum Vitae

RONALD P. ANDERSON

Title	Staff Engineer
Expertise	Civil Engineering Soils, Foundations, Pavements, and Geotechnical Engineering

Experience with Firm

Civil Engineer

- Project engineer for geotechnical investigation of a proposed new crossing of Interstate 10 over the Salt River, Phoenix, Arizona.
- Project engineer for design services of proposed improvements to Pulliam Airport, Flagstaff, Arizona.

Past Experience

Associate, Western Technologies, Inc. (formerly Engineers Testing Laboratories, Inc.), Phoenix, Arizona.

- Project manager for flexible pavement design of an access road and yard at a hydrant fuel storage facility, Sky Harbor International Airport, Phoenix, Arizona.
- Project manager for evaluation of pavement damage at the Arizona Correctional Training Center, Perryville, Arizona.
- Project manager for alternative pavement analyses and design for a new parking apron at the Page Municipal Airport, Page, Arizona.
- Project manager for foundation analyses of a proposed 500-ton cement kiln near Clarkdale, Arizona.
- Project engineer for foundation analyses of various facilities of the proposed City of Mesa Wastewater Treatment Plant at the Central Arizona Project Canal near Brown Road, Mesa, Arizona.
- Staff engineer for a preliminary geotechnical evaluation for a proposed underpass of Jackson Street on First Avenue, Phoenix, Arizona.
- Project engineer for pavement design recommendations for improvements to Willow Springs Lake campground, Coconino County, Arizona.
- Staff enginner for developed foundation system and earthwork procedures recommendations for a proposed bridge crossing of Canyon Diablo near Leupp, Arizona.
- Staff engineer for consultation concerning geotechnical aspects of an access haul road at the Inspiration Copper Mine near Miami, Arizona.

- Project engineer for design consultation and geotechnical analyses of levees along the Little Colorado River near Winslow, Arizona.
- Project engineer for several remote microwave relay towers throughout Arizona.
- Staff engineer for soils investigations, foundations analyses, and preliminary scour analysis for portions of the Southern Avenue Intesceptor Sewer, Phoenix and Tempe, Arizona.
- Staff engineer for an investigation and evaluation of portland concrete pavement damage at a commerce park at Dallas-Fort Worth Freeport, Irving, Texas.
- Staff engineer for foundation analyses of a 900-ton aluminum extrusion press in Chandler, Arizona.
- Staff engineer for hospital foundation projects in Phoenix, Chandler, Scottsdale, and Prescott, Arizona.
- Staff engineer for foundation explorations of proposed U.S. Highway 666 bridges over Rattlesnake Canyon, Cold Creek Canyon, and Buzzard Roost Canyon near Clifton, Arizona.
- Staff engineer for foundation explorations of proposed Carefree Highway bridges over the New River in Maricopa County, Arizona.
- Staff engineer for foundation explorations of the proposed 24th Street bridge over the Salt River, Phoenix, Arizona.
- Staff engineer for mat foundation analyses for a modular jacking test apparatus near Avondale, Arizona.
- Project engineer for geotechnical consultation for the proposed McCume Mansion development in Phoenix, Arizona.

Graduate Assistant, The Pennsylvania Transportation Institute, State College, Pennsylvania.

- Responsible for collection and statistical analysis of certain pavement deflection data obtained at a full-scale test-track facility.

Academic Background	B.S., Civil Engineering, South Dakota State University, Brookings, South Dakota M.S., Civil Engineering, Pennsylvania State University, State College, Pennsylvania Graduate Study, Arizona State University, Tempe, Arizona
Professional Affiliations	American Society of Civil Engineers; Order of the Engineer
Publications	"Load Equivalency Factors of Triaxial Loading for Flexible Pavements", Transportation Research Record
Professional Registration	Civil Engineer, Arizona, 1983

Curriculum Vitae

Academic background	1975, B.A., Geology, Macalester College, St. Paul, Minnesota. 1977, M.S., Geology, Arizona State University, Tempe, Arizona. M.S. Thesis Topic: Delayed Yield in Unconfined Aquifers.

Curriculum Vitae

KENNETH J. STIMPFL

Title Partner

Expertise
Environmental Analysis
Impact Assessment
Site and Route Selection
Aquatic Ecology

Experience With Firm

Principal-in-Charge/Project Director

- Site selection and evaluation study for additions to existing fossil power plants, Michigan.
- Environmental assessment, permits and hearing for a new manufacturing plant in Michigan.
- Environmental baseline studies for a fossil-fueled power plant, Michigan.
- Environmental and geohydrological assessment of inactive industrial waste site, Michigan.
- Geohydrological assessment of chemically contaminated site, Michigan.
- Environmental assessment and defense in litigation for oil well development, Michigan.
- Environmental and engineering evaluation of manufacturing plant sites in Iowa, Indiana, Missouri, Michigan, Wisconsin, and Ontario.
- Ecological assessment of potential chemical contamination in the Menominee River, Wisconsin.
- Environmental assessment, preliminary containment design, and negotiation of consent judgment with state and federal agencies for a contaminated chemical plant site, Michigan.
- Site selection study for a new fossil or nuclear power plant, Michigan.
- Preparation of a regulatory compliance plan for a proposed synfuels project, Illinois.
- Radiation survey, assessment, decontamination and health physics monitoring for NRC release of contaminated plant site, Michigan.
- Wetland assessment, development of alternative layouts and agency negotiations regarding a denied 404 permit for a dock in Wisconsin.
- Assessment of environmental enhancement potential through selective dredging of the Little Calumet River for the Chicago District, Corps of Engineers.
- Assessment of potential economic impacts from a proposed regulation to ban landfill disposal of chlorinated solvents for the Illinois Department of Energy and Natural Resources.
- Assessment of aquatic impacts and effects on low-level hydroelectric potential for a variety of proposed dam modifications on the Fox River for the Chicago District, Corps of Engineers.

Project Manager

- Aquatic ecology baseline study and impact assessment for nuclear power plant in Wisconsin, Wisconsin Electric Power Company.

- Environmental baseline studies and impact assessment for copper/zinc mine in Wisconsin, Exxon Minerals Company.
- Power plant site selection study.

Past Experience

Sargent & Lundy Engineers, Chicago, Illinois

- Power plant site selection and evaluation studies in Illinois, Iowa, Wisconsin, Indiana, and Oklahoma.
- Ecological baseline studies and impact assessments for thirteen fossil and nuclear power plants.
- Impact assessment, route selection and evaluation of alternative designs for transmission line in West Virginia.
- Evaluation of alternate cooling systems for nuclear power plant.

Faculty Appointment, Indiana University

Assistant Professor of Zoology, Colorado State University

Academic Background

B.S., zoology, Northern Illinois University
M.S., zoology, Colorado State University
Ph.D., limnology, Indiana University

Professional Affiliations

Ecological Society of America; American Society of Limnology and Oceanography; Freshwater Biological Association; Societas Internationalis Limnologiae; Illinois Association of Environmental Professionals; Consulting Engineers Council of Illinois

Registration

Certified senior ecologist (Ecological Society of America)

Publications

Numerous technical reports, environmental assessments and environmental reports

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APPENDIX G

DAMES & MOORE HEALTH AND SAFETY PLAN

DAMES & MOORE
HEALTH AND SAFETY PLAN

Job Number: 01016-185-07 and 01016-179-22
Project Name and Site Location: Davis-Monthan Air Force Base, Tucson, Arizona
Project Manager: Lutz Kunze
On-Site Safety Officer:
Plan Preparer: Michael W. Ander
Plan Reviewer: Kim Petschek
Date of Preparation: October 14, 1983

Plan Approvals:

Kim Petschek 10/26/83
Kim Petschek (date)
Program Director-Industrial Hygiene and Safety

George U. Nuhalson for A.P. Campbell 10/17/83
A. Peter Campbell, MPIC (date)

Lutz Kunze 10/21/83
Lutz Kunze, Project Manager (date)

I. PURPOSE

The purpose of this Plan is to assign responsibilities, establish personnel protection standards, specify mandatory operating procedures, and provide for contingencies that may arise while operations are being conducted at the site.

II. APPLICABILITY

The provisions of the Plan are mandatory for all on-site Dames & Moore employees and subcontractors engaged in hazardous material management activities including but not limited to initial site reconnaissance, preliminary field investigations, mobilization, project operations, and demobilization.

III. RESPONSIBILITIES

A. Project Manager

The PM shall direct on-site investigation and operational efforts. At the site, the PM, assisted by the on-site Safety Officer, has the primary responsibility for:

1. Assuring that appropriate personnel protective equipment is available and properly utilized by all on-site personnel.

2. Assuring that personnel are aware of the provisions of this plan, are instructed in the work practices necessary to ensure safety, and in planned procedures for dealing with emergencies.

3. Assuring that personnel are aware of the potential hazards associated with site operations (see Tables 1 and 2).

4. Monitoring the safety performance of all personnel to ensure that the required work practices are employed.

5. Correcting any work practices or conditions that may result in injury or exposure to hazardous substances.

6. Preparing any accident/incident reports (see attached Accident Report Form).

7. Assuring the completion of Plan Acceptance and Feedback forms attached herein.

B. Project Personnel

Project personnel involved in on-site investigations and operations are responsible for:

1. Taking all reasonable precautions to prevent injury to themselves and to their fellow employees.

2. Implementing Project Health and Safety Plans, and reporting to the PM for action any deviations from the anticipated conditions described in the Plan.

3. Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions to the PM.

IV. BACKGROUND

Based on preliminary site evaluations of the Davis-Monthan Air Force Base, there appear to be 12 areas that may have generated some environmental contamination over the lifetime of the facility. Although suspected contaminants have been identified, none has been quantified. However, we anticipate that only relatively low levels of contaminants will be encountered in the proposed drilling and soil and water sampling.

Sites 1 and 10, Landfill Waste Management Area, have accepted household wastes and possibly paint residues and thinners and solvents at a rate of 10 drums per month. It has been in operation from the early 1940s through 1976.

Site 18, MASDC Flush Farm Drainage Ditch, contains waste oil from a recent spill and may have received solvents.

Site 25, MASDC Tow Road, has had waste oil and possibly solvents and residual fuels spread on the road as a dust control.

Site 7, Old Electrical Substation Site, has had 10,000 gallons of transformer oil spilled onto the ground. The oil may have contained PCBs.

Site 19, Runway No. 4 Drainage Ditch, received waste oil and residual fuels drained from aircraft.

Sites 20 and 21, Storm Drain Outfalls Nos. 1 and 2, are discharge points that received drainage from industrial shop areas and, as a result, may have accumulated waste solvents, oils, and other chemicals.

Site 17, MASDC/Ammo Area Drainage Ditch, contained the contents of approximately 1000 fire extinguishers that were emptied here in 1972. Probable contents of the fire extinguishers was bromochloromethane.

Site 3, Existing Fire Training Area, received about 200 gallons per month of JP-4 fuel per month in fire-fighting exercises. Most of this material was consumed in the fires, but some may have penetrated into the soil.

Site 8, Transformer Oil Spill Site, received approximately 100 to 500 gallons of transformer oil that may have contained PCBs.

Site 4, North Ramp Fire Training Area, received approximately 200 gallons per week of waste petroleum, oils, and lubricants (POL) in fire-fighting exercises. Most of the POL was consumed in the fires, but some may have penetrated into the soils.

A. Dames & Moore Activity

Dames & Moore will drill soil borings and collect soil samples at all sites. Monitoring wells will be installed at Sites 1 and 10, and water samples will be collected at Sites 1, 10, 18, 19, 20, 21, and 3.

B. Suspected Hazards

Suspected hazards are presented above in as much detail as is currently available. Contaminants include PCBs, bromochloromethane, solvents, paint thinners, fuels, and waste oil.

V. EMERGENCY CONTACTS AND PROCEDURES

Should any situation or unplanned occurrence require outside or support services, the appropriate contact from the following list should be made:

Agency	Person to Contact		Telephone
D&M Project Manager	L. Kunze	(office) (home)	602-790-5813 602-299-5876
D&M Industrial Hygiene and Safety Director	K. Petschek	(office) (home)	914-761-6323 212-724-6414
Police			748-4791
Fire			748-4757
Ambulance			748-3878
Hospital			748-3878

In the event that an emergency develops on site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- o Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on scene.
- o A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

The following emergency procedures should be followed:

a. In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while on scene, the entire field crew should immediately halt work and act according to the instructions provided by the Project Manager.

b. The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team and reevaluation of the hazard and the level of protection required.

c. In the event that an accident occurs, the PM is to complete an Accident Report Form for submittal to the MPIC of the office, with a copy to the Health and Safety Program Office. The MPIC should assure that followup action is taken to correct the situation that caused the accident.

VI. HAZARD CHARACTERISTICS, MONITORING METHODS, AND PROTECTION REQUIRED

Exposure Limits and Recognition Qualities

Information concerning exposure limits and recognition qualities of the contaminants that are suspected to be on site is presented in Table 1.

Symptoms of Overexposure, Potential Chronic Effects and First Aid Treatment

Symptoms of overexposure to the suspected contaminants, potential chronic effects of these substances, and first aid treatment information are presented in Table 2.

Monitoring Methods, Action Levels and Protective Measures

Methods for monitoring for suspected contaminants, action levels, and protective measures to be used for various contaminant concentration levels are presented in Table 3.

Protective Equipment Required for On-Site Activities

The protective equipment required may vary, depending on the concentrations and dispersion of contaminants encountered during each phase of the work. Table 4 specifies protective equipment required for each on-site activity.

FORM #IHST-1

REVIEW RECEIPT

PROJECT HEALTH AND SAFETY PLAN

Instructions: This form is to be completed by each person to work on the site and returned to the Program Director-Industrial Hygiene and Safety.

Job No. 01016-185-07

Project: Davis-Monthan Air Force Base, Tucson, Arizona

Rev. No. 1 Date 10/31/83

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

____
Signed

____
Date

TABLE 1

EXPOSURE LIMITS AND RECOGNITION QUALITIES

Compound	Exposure Standard[a]	IDLH[b] Level	Recognition Qualities: Color	Odor	State
Bromochloromethane	200 ppm	5000 ppm	None to pale	Sweet	Liquid
PCB (42% chlorine)	1 mg/m^3	10 mg/m^3	None to dark brown	Mild hydro-carbon	Liquid
PCB (54% chlorine)	0.5-mg/m^3	5 mg/m^3	Pale yellow	Mild hydro-carbon	Viscous liquid

[a]OSHA permissible exposure limit or *ACGIH Threshold Limit Value*.

[b]IDLH = immediately dangerous to life or health.

TABLE 2

SYMPTOMS OF OVEREXPOSURE, POTENTIAL CHRONIC EFFECTS AND FIRST AID TREATMENT

Compound	Symptoms of Overexposure: Eye	Skin	Inhalation/Ingestion	Potential Chronic Effects
Bromochloromethane	Irritation	Dermatitis	Respiratory tract irritation, disorientation, headache, nausea	None specified.
PCB (42% chlorine)	Irritation	Chloro-acne*	Nausea, edema of the face and hands, abdominal pain, anorexia	
PCB (54% chlorine)	Irritation	Chloro-acne,* brown pigment	Jaundice, dark urine	

General First Aid Treatment

Eye	Irrigate immediately
Skin	Soap wash promptly
Inhalation	Move to fresh air
Ingestion	Get medical attention

*Absorbs through the skin.

TABLE 3

HAZARD MONITORING METHOD, ACTION LEVELS, AND PROTECTIVE MEASURES

Hazard	Monitoring Method	Action Level	Protective Measures
Explosive atmosphere	Explosimeter or combustible gas meter	<10% LEL*	Continue working.
		10 - 25% LEL	Continue working with continuous monitoring.
		>25% LEL	EVACUATE the area; EXPLOSION HAZARD.
Toxic atmosphere	HNU continuous recorder	Depends on species for which the HNU is calibrated.	See Table 1 for exposure standards.

*Lower Explosive Limit (LEL) of the calibration gas.

TABLE 4

PROTECTIVE EQUIPMENT

Level	Protective Equipment	Criteria for Use
C	Half-face respirator with air-purifying cartridges for gas/dusts, organic vapors/dusts and mists Disposable coveralls Rubber boots Hard hat with splash shield or safety glasses/goggles Nitrile gloves	When drilling or sampling where dusts become airborne, when organic odors are noticeable, or when the HNU reads 5 or more units.
D	Rubber boots Disposable coveralls (optional) Nitrile gloves Safety glasses or goggles Hard hat	During sampling activities other than those mentioned above

ATTACHMENT 1

PROTECTIVE EQUIPMENT

I. INTRODUCTION

When field investigation activities are conducted where atmospheric contamination is known or suspected to exist, where there is a potential for the generation of vapors or gases, or where direct contact with toxic substances may occur, equipment to protect personnel must be worn. Respirators are used to protect against inhalation and ingestion of atmospheric contaminants. Protective clothing is worn to protect against contact with and possible absorption of chemicals through the skin. In addition to protective clothing and respiratory protection, safe work practices must be followed. Good personal hygiene practice prevents ingestion of toxic materials.

Personnel equipment to be used has been divided into two categories commensurate with the degree of protection required, namely Levels C and D protection.

II. LEVELS OF PROTECTION

A. Level C

1. Personal Protective Equipment

- o Air-purifying respirator (MSHA/NIOSH approved)
- o Disposable chemical resistant coveralls
- o Gloves, outer, working gloves
- o Gloves, inner, chemical resistant
- o Boots, steel toe and shank
- o Hard hat (face shield)
- o Rubber boots, outer, chemical resistant (disposable)

2. Criteria for Selection

a. Air concentrations of identified substances are such that reduction to at or below the substance's exposure limit is necessary and the concentration is within the service limit of the cartridge.

b. Atmospheric contaminant concentrations do not exceed the Immediately Dangerous to Life or Health (IDHL) levels.

c. Contaminant exposure to unprotected areas (head and neck) are within skin exposure guidelines, or dermal hazards do not exist.

d. Job functions have been determined not to require a higher level of protection.

B. Level D

1. **Personal Protective Equipment**

- o Coveralls
- o Boots/shoes, safety or chemical resistant, steel toe and shank
- o Boots, outer (chemical resistant disposables)
- o Hard hat (face shield)
- o Gloves

2. **Criteria for Selection**

a. No indication of any atmospheric hazards.

b. Work function precludes dusting, splashes, immersion, or potential for exposure to any chemicals.

3. Guidance on Selection Criteria

a. Level D protection is primarily a work uniform and should not be worn in any area where the potential for contamination exists.

b. In situations where respiratory protection is not necessary, but site activities are needed, chemical resistant garments — high quality or disposable — must be worn.

III. RESPIRATORY PROTECTION

The following procedures should be used for respiratory protection:

A. Inspect all washers, diaphragms, and facepiece-to-face seal area for any tears, pinholes, deformation, or brittleness. Should any of these exist, use a different respirator.

B. Place the respirator on the face, tighten and use both a positive and a negative pressure test, prior to entering the site, to assure a proper fit. Checking for proper fit involves the following:

1. **Negative Pressure Test**

Close off the inlet opening of the cartridge or the breathing tube by covering it with the palm of the hand or by replacing the tap seal. Gently inhale so that the facepiece collapses slightly, and hold the breath for 10 seconds. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is satisfactory.

2. **Positive Pressure Test**

Remove the exhalation valve cover. Close off the exhalation valve with the palm of the hand. Exhale gently so that a slight positive pressure is built up in the facepiece. If no outward leakage of air is detected at the periphery of the facepiece, the face fit is satisfactory. (Note: With certain devices, removal of the exhaust valve cover is very difficult, making the test almost impossible to perform.)

ATTACHMENT 2

DAMES & MOORE STANDARD OPERATING PROCEDURES

WORK PRACTICES

1. Smoking, eating, drinking, and chewing tobacco are prohibited in the contaminated or potentially contaminated area.

2. Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling on the ground, leaning or sitting on equipment or ground. Do not place monitoring equipment on potentially contaminated surface (i.e., ground, etc.).

3. All field crew members should make use of their senses (<u>all senses</u>) to alert them to potentially dangerous situations (i.e., presence of strong and irritating or nauseating odors).

4. Prevent, to the extent possible, spillages. In the event that a spillage occurs, contain liquid if possible.

5. Prevent splashing of the contaminated materials.

6. Field crew members shall be familiar with the physical characteristics of investigations, including:

   - wind direction
   - accessibility to associates, equipment, vehicles
   - communication
   - hot zone (areas of known or suspected contamination)
   - site access
   - nearest water sources

7. The number of personnel and equipment in the contaminated area should be minimized consistent with site operations.

8. All wastes generated during D&M and/or subcontractor activities on site should be disposed of as directed by the Field Activity Leader.

Half-face Respirators

Inspection Procedure

1. Look for breaks or tears in the headband material. Also stretch to check the elasticity.

2. Make sure all headbands, fasteners and adjusters are in place and not bent.

3. Check the facepiece for dirt, cracks, tears or holes. The rubber should be flexible not stiff.

4. Look at the shape of the facepiece for possible distortion that may occur if the respirator is not protected during storage.

5. Check the exhalation valve located near the chin between the cartridges by the following:.
   - unsnap the cover
   - lift the valve and inspect the seat and valve for cracks, tears, dirt and distortion.
   - replace the cover, it should spin freely.

6. Check both inhalation valves (inside the cartridges holders). Look for same signs as above.

7. Check the yoke for cracks.

8. Make sure the cartridge holders are clean. Make sure the gaskets are in place and the threads are not worn. Also look for cracks and other damage.

9. Check the cartridges for dents or other damage, especially in the threaded part.

Donning Procedure

1. Screw the cartridge into the holder hand tight so there is a good seal with the gasket in the bottom of the holder...but don't force it. If the cartridge won't go in easily back it out and try again.

   Always use cartridges made by the same manufacturer who made the respirator.

2. Place the facepiece over the bridge of your nose and swing the bottom in so that it rests against your chin.

3. Hold the respirator in place and fasten the top strap over the crown of your head.

4. Fit the respirator on your face and fasten the strap around your neck. Don't twist the straps. Use the metal slide to tighten or loosen the fit...but not too tight.

5. Test the fit by:

   - lightly covering the exhalation valve with the palm of your hand. Exhale...if there is a leak, you will feel the air on your face.

   and

   - covering the cartridges with the palms of your hands. Again don't press too hard. Inhale...the face piece should collapse against your face.

   - If there is a leak with either test adjust the headbands or reposition the facepiece and test until no leakage is detected.

Sanitizing Procedures

1. Remove all cartridges plus or seals not affixed to their seats.

2. Remove elastic headbands.

3. Remove exhalation cover.

4. Remove speaking diaphragm or speaking diaphragm-exhalation valve assembly.

5. Remove inhalation valves.

6. Wash facepiece and breathing tube in cleaner/sanitizer powder mixed with warm water, preferably at 120° to 140° F. Wash components separately from the facemask, as necessary. Remove heavy soil from surfaces with a hand brush.

7. Remove all parts from the wash water and rinse twice in clean warm water.

8. Air dry parts in a designated clean area.

9. Wipe facepieces, valves, and seats with a damp lint-free cloth to remove any remaining soap or other foreign materials.

Environmental Samples

Environmental samples must be packaged and shipped according to the following procedure:

Packaging

1. Place sample container, properly identified and with a sealed lid, in a polyethylene bag, and seal bag.
2. Place sample in a fiberboard container or metal picnic cooler which has been lined with a large polyethylene bag.
3. Pack with enough noncombustible, absorbent, cushioning material to minimize the possibility of the container breaking.
4. Seal large bag.
5. Seal or close outside container.

Environmental samples may also be packaged following the procedures outlined later for samples classified as "flammable liquids" or "flammable solids". Requirements for marking, labeling, and shipping papers do not apply.

Marking/Labeling

Sample containers must have a completed sample identification tag and the outside container must be marked "Environmental Sample". The appropriate side of the container must be marked "This End Up" and arrows should be drawn accordingly. No DOT marking and labeling is required.

Shipping Papers

No DOT shipping papers are required.

Transportation

There are no DOT restrictions on mode of transportation.

ACCIDENT REPORT FORM

SUPERVISOR'S REPORT OF ACCIDENT	DO NOT USE FOR MOTOR VEHICLE OR AIRCRAFT ACCIDENTS
TO	FROM TELEPHONE (include area code)

NAME OF INJURED OR ILL EMPLOYEE		
DATE OF ACCIDENT	TIME OF ACCIDENT	EXACT LOCATION OF ACCIDENT

NARRATIVE DESCRIPTION OF ACCIDENT

NATURE OF ILLNESS OR INJURY AND PART OF BODY INVOLVED	LOST TIME YES ☐ NO ☐

PROBABLE DISABILITY (Check One)

FATAL	LOST WORK DAY WITH DAYS AWAY FROM WORK	LOST WORK DAY WITH DAYS OF RESTRICTED ACTIVITY	NO LOST WORK DAY	FIRST AID ONLY
☐	☐	☐	☐	☐

CORRECTIVE ACTION TAKEN BY REPORTING UNIT

CORRECTIVE ACTION WHICH REMAINS TO BE TAKEN (By whom and by when)

NAME OF SUPERVISOR	TITLE
SIGNATURE	DATE

PLAN FEEDBACK FORM

Problems with plan requirements:

Unexpected situations encountered:

Recommendations for future revisions:

PLEASE RETURN TO THE FIRMWIDE HEALTH AND SAFETY OFFICE-WP

APPENDIX H

SCOPE OF WORK

2 7 SEP [illegible]

INSTALLATION RESTORATION PROGRAM*
Phase IIB Field Evaluation
Davis-Monthan AFB Arizona
Nellis AFB Nevada

I. Description of Work:

(Davis-Monthan AFB)

The purpose of this task is to determine if environmental contamination has resulted from waste disposal practices at Davis-Monthan AFB AZ; to provide estimates of the magnitude and extent of contamination, should contamination be found; to identify potential environmental consequences of migrating pollutants; to identify any additional investigations and their attendant costs necessary to identify the magnitude, extent and direction of movement of discovered contaminants.

The presurvey report (mailed under separate cover) and Phase I IRP report (mailed under separate cover) incorporated background and description of the sites for this task. To accomplish the survey effort, the contractor shall take the following steps:

Ambient air monitoring of hazardous and/or toxic material for the protection of contractor and Air Force personnel shall be accomplished when necessary, especially during the drilling operation.

A. General

1. Determine the areal extent of each zone by reviewing available aerial photos of the base, both historical and the most recent panchromatic and infrared.

2. All water samples collected shall be analyzed on site by the contractor for pH, temperature and specific conductance. Sampling, maximum holding time and preservation of samples shall strictly comply with the following references: Standard Methods for The Examination of Water and Wastewater, 15th Ed., (1980), pp. 35-42; ASTM, Part 31, pp. 76-86, (1980), Method D-3370; and Methods for Chemical Analysis of Waters and Wastes, EPA Manual 600/4-79-020, pp. xiii to xix (1979). Volatile organic analyses shall be determined according to EPA Methods 601 and 602. Mass spectrometric confirmation should only be used on samples that contain an inordinate number of interferences. The contractor shall strictly adhere to the detection limits specified for analytical testing which are specified in Attachment 1.

3. Each well or borehole shall be monitored for organic vapors with an HNU detector and an explosimeter throughout drilling. The readings obtained shall become part of the well or boring logs.

*Highlights of modification underscored

4. Upon completion, each boring shall be pressure grout back filled with a bentonite-cement mixture.

5. All contractor installed wells shall be developed, water levels measured, and recorded on a project map and on a specific zone map.

6. All soil borings shall be installed using hollow stem augering techniques. Soil samples shall be collected using split spoon sampling techniques.

7. Field data collected for each zone shall be plotted and mapped. The nature, magnitude and potential for contaminant flow within each zone to groundwaters shall be estimated. Upon completion of the sampling and analysis, the data shall be included in the next R&D status report as specified in Item VI below.

8. All field samples, both water and soils, shall be shipped under refrigeration to the contractor laboratory for subsequent analysis. Soil samples not selected for analysis shall be frozen by the contractor and archived for a period of one year.

9. Soil sample selection for subsequent analysis shall be based upon HNU readings for the sample and on the physical appearance of the sample itself.

10. Pesticide analysis unless otherwise specified shall include analysis for aldrin, dieldrin, chlordane, DDT isomers, endrin, endrin aldehyde, heptachlor and lindane. Pesticides shall be determined using the Standard Method reference.

11. With base approval, contractor will be allowed to work past 1630 hours.

B. In addition to items delineated in A above, conduct the following specific actions at sites identified on Davis-Monthan AFB:

1. Zone 1. (Site 1 and Site 10)

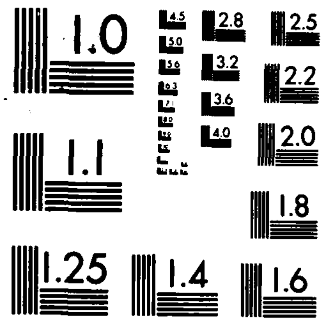
a. The contractor shall install two groundwater monitoring wells within the zone. Locations of these wells shall be finalized in the field. Both wells shall be located downgradient of Landfill 1. One of the wells shall be located between the Landfill and the closest existing off base well. Wells shall be six inches in diameter and approximately 400 feet deep and constructed of six inch diameter schedule 80 PVC casing. Wells shall be screened from 10 feet above the water table to 40 feet below the water table with 50 feet of schedule 80 PVC Johnson UOP well screen. Wells shall be completed within the Tinaja Bed formations. Installation of the wells shall be accomplished using either mud rotary or reverse mud rotary equipment. Each well shall be developed using compressed air and surge block techniques until pumpage is sand free. Each well head shall be completed with the installation of a lockable cap and concrete pad.

b. Continuous soil samples shall be collected and a geologic log shall be prepared for each well installed.

AD-A173 737 INSTALLATION RESTORATION PROGRAM PHASE II - CONFIRMATION/QUANTIFICATION S..(U) DAMES AND MOORE PARK RIDGE IL 18 AUG 86 F33615-83-D-4002

4/4

UNCLASSIFIED F/G 13/2 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

c. The contractor shall collect one water sample from each well installed. A total of two water samples shall be collected. A minimum of three times the volume of standing water in each well shall be pumped out prior to taking samples. Immediately prior to pumping and sampling each well, the static water level in the well shall be measured using an electric tape.

d. The contractor laboratory shall use GC techniques to analyze the water samples collected for the 31 volatile organic compounds (VOC) listed on the U.S. EPA priority organic pollutant listing. Arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver and zinc shall be determined using atomic adsorption techniques. Water samples shall also be analyzed for pesticides.

e. The contractor shall install six exploratory borings 50 feet deep within Site Number 1. Soil samples shall be collected at approximately five foot intervals from the surface to 50 feet in each boring. A total of 30 soil samples shall be collected.

f. The contractor shall select a maximum of 20 soil samples for analysis. Samples selected for analysis shall be analyzed for phenol, oil and grease and the U.S. EPA Priority Pollutant List Volatile Organic Fraction (VOC). Ten samples shall be selected by the contractor and analyzed for pesticides.

g. Samples of leachate shall be collected from a maximum of four borings. A maximum of four leachate samples shall be analyzed for compounds listed on U.S. EPA Priority Pollutant List volatile organic fractions (VOC) and for the heavy metals identified in B.1.d.

2. Site 18. MASDC Flush Farm Drainage Ditch

a. The contractor shall install a total of three 20 foot deep boreholes in the drainage ditch downstream of the oil-water separator discharge point. Boreholes shall be separated by a minimum of 100 feet.

b. Soil samples shall be collected at two foot intervals from the surface to 10 feet and approximately at depths of 15 and 20 feet.

c. The contractor shall select a maximum of 12 samples for analysis. Samples selected for analysis shall be analyzed for phenol, oil and grease, lead and VOC compounds.

d. The contractor shall collect one water sample each from base production wells Numbers 4 and 5. Groundwater levels shall be measured at the time of sampling. Each water sample collected shall be analyzed for total organic carbon, oil and grease and VOC compounds.

3. Site 7. Old Electrical Substation Site

a. The contractor shall install 10 soil borings each six feet deep in a general grid array encompassing both of the potential locations of the former substation.

b. Samples shall be collected at depths of 0, 2, 4, and 6 feet.

c. Twenty soil samples shall be selected and PCB analysis performed on the selected samples.

4. Site 19. Runway No. 4 Drainage Ditch

a. The contractor shall install four soil exploration borings along the axis of the ditch. These borings shall be 20 feet deep. Soil samples shall be collected at depths of 2, 5, 10, 15 and 20 feet.

b. Twelve samples shall be selected for analysis. Samples seleted shall be analyzed for phenol, oil and grease, lead and VOC compounds.

c. The contractor shall collect one water sample from the DMAFB well Number 9. Sample shall be analyzed for phenol, oil and grease, lead and VOC compounds.

5. Sites 20 and 21. Storm Drain Outfalls No. 1 and No. 2

a. The contractor shall install one soil-boring 20 feet deep adjacent to each storm drain outfall. Soil samples shall be collected at depths of 2, 5, 10, 15 and 20 feet.

b. The contractor sahll select three samples from each boring for analysis. The samples selected at these sites shall be analyzed for phenol, oil and grease, U.S. EPA Priority Pollutant List volatile organic fraction and for the heacy metals listed in B.1.d. In addition the three samples selected from Site 21 shall be analyzed for PCBs.

6. Site No. 17. MASDC/AMMO Drainage Ditch

a. The contractor shall install a single boring within the drainage ditch at the southeastern corner of the MASDC area. The boring shall be advanced to a depth of 20 feet. Soil samples shall be collected at depths of 1, 3, 5, 10, 15 and 20 feet.

b. The contractor shall select four samples for analysis. Samples selected shall be analyzed for phenol, oil and grease, lead and compounds listed on the U.S. EPA Priority Pollutant Listing Volatile Organic Fraction (VOA).

7. Site No. 3. Existing Fire Training Area

a. The contractor shall install three shallow soil borings within the fire training area and three shallow soil borings in the vicinity of the fire training area waste fuel storage facilities. The borings shall be advanced to a depth of 20 feet. Soil samples shall be collected at depths of 1, 5, 10, 15 and 20 feet.

b. Twelve samples shall be selected for analysis. Samples selected for analysis shall be analyzed for VOC compounds.

c. The contractor shall collect one water sample each from DMAFB production wells Numbers 10 and 11. Well samples shall be analyzed for oil grease, phenol and VOC compounds.

8. Site No. 8. Transformer Oil Spill Site

a. The contractor shall install four shallow soil borings around Site number 8. Borings shall be advanced to a total depth of 10 feet. Collect soil samples at the surface and at depths of 2, 5 and 10 feet.

b. A maximum of 15 samples shall be analyzed for oil and grease and PCBs.

9. Site No. 4. North Ramp Fire Training Area

a. The contractor shall install two exploratory soil borings within the confines of the fire training area. Borings shall be advanced to a total depth of 10 feet. Samples shall be collected at depths of 2, 5, 10 feet.

b. Six samples shall be selected for analysis. Samples selected for analysis shall be analyzed for oil and grease, lead and VOC compounds.

10. Site No. 25. MASDC Tow Road

a. The contractor shall install five shallow soil borings 10 feet deep. Soil samples shall be collected at the surface and at depths of 2, 5, 10 feet.

b. Twenty-seven samples shall be selected by the contractor for analysis. Samples selected for analysis shall be analyzed for lead, oil and grease, VOC compounds and PCBs.

11. Base Production Wells

The contractor shall obtain a groundwater sample from Base Wells 2, 6 and 8. One sample per well (3 total) shall be analyzed for VOC compounds and oil and grease.

C. Resampling for Confirmation: The contractor shall provide additional chemical analyses of water and soils to confirm results. The following activities shall be accomplished:

1. Take groundwater samples from monitor wells DM-1 and DM-2 and base wells W-4, W-9, W-10, and W-11.

2. Recover the following soil samples from frozen storage: 18-2/1, 3-1/2, 3-2/2, 3-6/2, 3-6/3, 3-6/5.

3. Perform chemical analyses on soil and water samples as follows:

Sample	Analysis Parameters
DM-1	Pesticides
DM-2	Pesticides
W-4	Oil and Grease
W-9	Volatile Aromatics and Halocarbons (601/602)
W-10	Volatile Aromatics and Halocarbons (601/602)
W-11	Volatile Aromatics and Halocarbons (601/602)
7 soil samples	Purgeable Organics (EPA 624)

4. Report analytical results to USAF OEHL in the form of an Informal Technical Report.

5. Incorporate analytical results and discussion into Second Draft of the Davis-Monthan Phase II - Stage 1 report.

(Nellis AFB NV)

The purpose of this task is to determine if environmental contamination has resulted from waste disposal practices at Nellis AFB NV; to provide estimates of the magnitude and extent of contamination, should contamination be found; to identify potential environmental consequences of migrating pollutants; to identify any additional investigations and their attendant costs necessary to identify the magnitude, extent and direction of movement of discovered contaminants.

The presurvey report (mailed under separate cover) and Phase I IRP report (mailed under separate cover) incorporated background and description of the sites for this task. To accomplish the survey effort, the contractor shall take the following steps:

A. General

1. Water sampling shall be accomplished only once at each location.

2. Sampling, maximum holding time and preservation of samples shall strictly comply with the following references: Standard Methods for Examination of Water and Wastewater, 15th Ed. (1980), pp. 35-42: ASTM, Part 31, pp. 72-82, (1976), Standard Method D-3370: and Methods for Chemical Analysis of Waters and Wastes, EPA Manual 600/4-79-020, pp. xiii to xix (1979).

3. Groundwater monitoring wells installed during this effort shall be completed to a depth of 20 feet below the surface of the groundwater table. Standard penetration tests and split spoon sampling shall be accomplished as the wells are installed.

4. All wells shall be developed, water levels measured and locations surveyed and recorded on a project map and specific zone map. Groundwater monitoring wells shall as a minimum comply with EPA publication 330/9-81-002

"NEIC Manual for Groundwater/Subsurface Investigations at Hazardous Waste Sites" or State of Nevada requirements for monitoring well installation whichever is more stringent. Only screw type joints shall be used. No glue fittings are permitted.

5. Bore holes shall be monitored for organic vapors with an HNU and explosimeter throughout drilling, and readings thus obtained shall become part of the boring logs.

B. In addition to items delineated above, conduct the following specific actions at sites identified on Nellis AFB.

1. Zone No. 1, (Sites 1, 17 and 24 The Base Landfill, STP Percolation Ponds and Fuel Tank Storage Area)

a. The contractor shall construct three new water table monitor wells in such a manner as to locate a contaminant plume if any. All wells shall be downgradient of the site and generally located as follows: one well downgradient to the southwest of the Area near the southern base boundary; one well downgradient due south of the Area along the southern base boundary; one well downgradient southeast of the Area along the southeastern base boundary. Estimated maximum well depths are 175 feet.

b. Each monitoring well shall be sampled. Samples shall be shipped to the contractor laboratory for analysis. Each sample shall be analyzed for oil and grease by EPA method 413.2, lead, phenol, pesticides, nitrates and, using GC techniques, volatile aromatics and volatile halocarbons.

c. Three base production wells, one north, one northeast and one southwest of the golf course, shall be sampled and analyzed for oil and grease by EPA method 413.2, lead, phenol, pesticides, nitrates and, using GC techniques, volatile aromatic and volatile halocarbons.

2. Zone No. 2, (Site 15, Storm Drain Gully)

a. The contractor shall install five soil borings 20 feet deep in the area where the site is believed to be located. Representative samples of each one foot increment (a total of 20) shall be collected from each boring and shipped to the contractor laboratory. A maximum of four samples from each boring shall be selected for analysis. A maximum of 16 samples total shall be analyzed from this zone. Those samples not analyzed shall be frozen for possible future analyses. Samples shall be analyzed for oil and grease by EPA method 413.2, and volatile aromatics and volatile halocarbons utilizing GC techniques.

b. Water samples shall also be collected from two base production wells, one north and one northwest of the discharge outfall to Zone 2. The water samples shall be analyzed for oil and grease by EPA method 413.2 and volatile aromatics and volatile halocarbons using GC techniques.

3. Zone No. 3, (Site 20, Existing Fire Training Area)

The contractor shall install four soil borings 20 feet deep in the area the site is believed to be located. Representative samples of each one foot increment (a total of 20) shall be collected from each boring and shipped to the contractor laboratory. A maximum of four samples from each boring shall be selected for analysis. A maximum of 12 soil samples total shall be analyzed from this zone. Those samples not analyzed shall be frozen for possible future analyses. Samples shall be analyzed for oil and grease by EPA method 413.2 and volatile aromatics and volatile halocarbons using GC techniques.

(Davis-Monthan and Nellis AFBs)

C. Well Installation and Clean-up

Well and boring area locations shall be cleaned following the completion of each well and boring. Drill cuttings shall be removed and the general area cleaned. Disposal of drill cuttings is not the responsibility of the contractor.

D. Data Review

Results of sampling and analysis shall be tabulated and incorporated in the Informal Technical Information report (Sequence 3, Atch 1 and Sequence 2, Atch 3 as reflected in Item VI below) and forwarded to USAF OEHL TS for review.

E. Reporting

1. A draft report delineating all findings of this field investigation shall be prepared and forwarded to the USAF OEHL as specified in Item VI below for Air Force review and comment. This report shall include a discussion of the regional hyrdogeology, well logs of all project wells, data from water level surveys, boring logs from all project borings, water quality analysis results, and Laboratory quality assurance information. This report shall follow the USAF OEHL supplied format (mailed under separate cover).

2. Estimates shall be made of the magnitude, extent and direction of movement of contaminants discovered. Potential environmental consequences of discovered contamination must be identified or estimated. Where data are insufficient to properly determine or estimate the magnitude and extent of movement of discovered contaminants specific recommendations, fully justified, shall be made for additional efforts required to properly evaluate contamination migration. These recommendations shall be included in a separately bound appendix to the draft final report (see F below).

F. Cost Estimates

Detailed cost estimates for all additional work recommended for those sites in need of proper determination or estimate of magnitude, extent and direction of movement of discovered contaminants shall be provided, along with an estimate of the time required to accomplish the proposed effort. This information shall be provided in a separately bound appendix to the draft final report.

II. Site Location and Dates

Davis-Monthan AFB AZ	Nellis AFB NV
USAF Clinic/SGPB	USAF Hospital Nellis/SGPB
Dates to be established	Dates to be established

III. Base Support: None

IV. Government Furnished Property: None

V. Government Points of Contact:

1. Dee Ann Sanders
USAF OEHL/TS
Brooks AFB TX 78235
(512) 536-2158
AV 240-2158

2. Major Dennis Brownley
USAF OEHL/TSS
Brooks AFB TX 78235
(512) 536-2158
AV 240-2158

3. Col Jerry Dougherty
HQ TAC/SGPAE
Langley AFB VA 23665
(804) 764-2180
AV 432-2180

4. Maj Peter Lurker
USAF Clinic/SGPB
Davis-Monthan AFB AZ 85707
(602) 748-5369
AV 361-5369

5. Maj Nic Farinacci
USAF Hospital Nellis/SGPB
Nellis AFB NV 89191
(702) 643-3316
AV 682-3316

VI. In addition to sequence numbers 1, 5 and 10 listed in Attachment 1 to the contract, which are applicable to all orders, the reference numbers below are applicable to this order. Also shown are data applicable to this order.

Davis-Monthan AFB

	Sequence No.	Block 10	Block 11	Block 12	Block 13	Block 14
Atch 1						
	4	ONE/R	84MAR15	84JUN29	85JAN18	
	3	O/TIME	**	**		
Atch 3						
	2	O/TIME	**	**		

Davis - Monthan
Nellis AFB

Sequence No.	Block 10	Block 11	Block 12	Block 13	Block 14
Atch 1					
4	ONE/R	84MAR15	84MAY31	84OCT24	*
3	O/TIME	**	**		
Atch 3					
2	O/TIME	**	**		

*A minimum of two draft reports will be required. After incorporating Air Force comments concerning the first draft report, the contractor shall supply the USAF OEHL with one copy of the second draft report. Upon acceptance of the second draft, the USAF OEHL will furnish a distribution list for the remaining 24 copies of the second draft. The contractor shall supply 50 copies plus the original camera ready copy of the final report.
**Upon completion of analysis

VII. The ceiling price of Item 0001 and 0002, as contemplated by the payments clause, is $68,931.40.

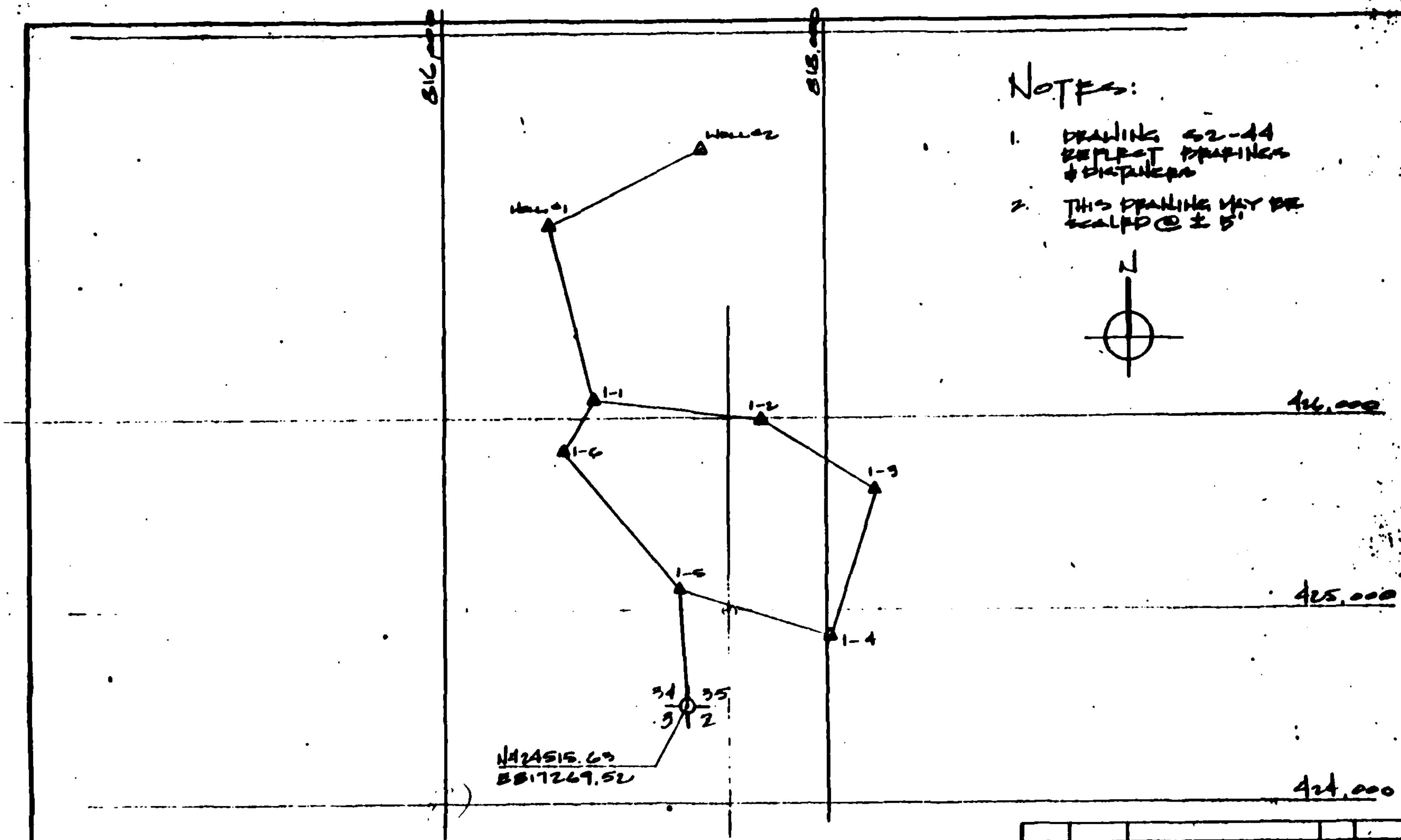
Required Sample Detection Limits

Compound	Concentration Water	Concentration Soil
Volatile Organic Compounds	*	*
Arsenic	10 µg/L	0.1 µg/g
Cadmium	50 µg/L	0.5 µg/g
Chromium	100 µg/L	1.0 µg/g
Copper	50 µg/L	0.5 µg/g
Lead	20 µg/L	0.2 µg/g
Mercury	1 µg/L	0.01 µg/g
Nickel	100 µg/L	1.0 µg/g
Selenium	10 µg/L	0.1 µg/g
Silver	10 µg/L	0.1 µg/g
Zinc	50 µg/L	0.5 µg/g
Phenol	10 µg/L	
Oil and Greases	0.3 mg/L	100 µg/g
Polychlorinated Biphenyls	0.25 µg/L	1 µg/g
Aldrin	0.02 µg/L	0.02 µg/g
Dieldrin	0.02 µg/L	0.02 µg/g
Chlordane	0.02 µg/L	0.02 µg/g
DDT Isomers	0.02 µg/L	0.02 µg/g
Endrin	0.02 µg/L	0.02 µg/g
Endrin Aldehyde	0.02 µg/L	0.02 µg/g
Heptachlor	0.02 µg/L	0.02 µg/g
Lindane	0.02 µg/L	0.02 µg/g
Nitrates	0.1 mg/L	—

*Detection limits for volatile organic compounds shall be as specified for the compounds by EPA Methods 601-602.

APPENDIX I

MONITOR WELL LOCATION AND ELEVATION SURVEY



NOTES:

1. DRAWING 52-44 REFLECT BEARINGS & DISTANCES

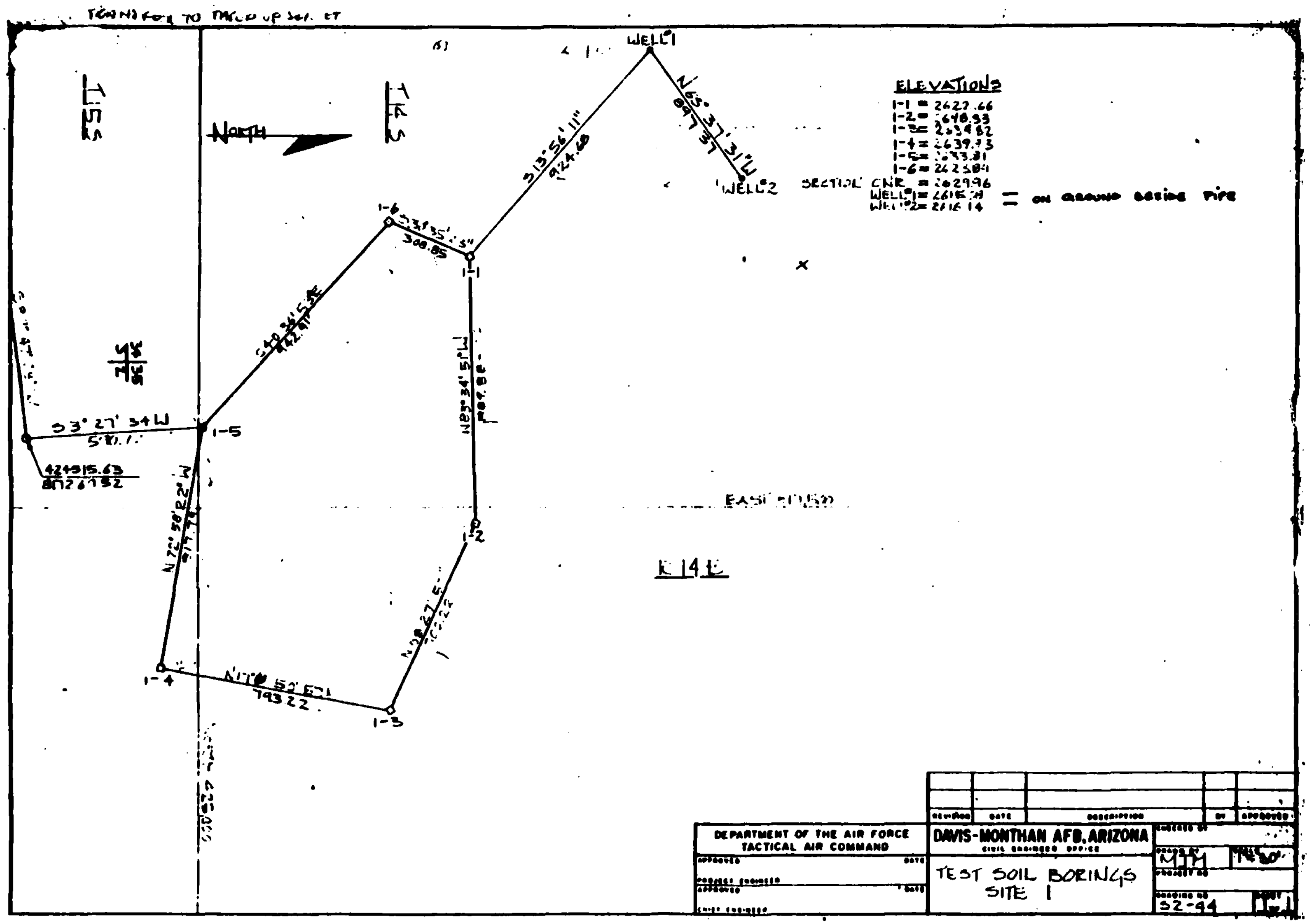
2. THIS DRAWING MAY BE SCALED @ ± 5'

DEPARTMENT OF THE AIR FORCE
TACTICAL AIR COMMAND

DAVIS-MONTHAN AFB, ARIZONA
CIVIL ENGINEERING OFFICE

TEST SOIL BORINGS - SITE 1

52-44


TRANSFER TO TAKE UP SECT.
T15S
T14S
NORTH
R14E
WELL 1
WELL 2
N65° 37' 31"W
897.37
S13°56'11"
924.68
1-6
308.85
1-1
N89°34'51"W
1-2
1-3
1-4
1-5
743.22
S3° 27' 34 W
424915.63
ELEVATIONS
1-1 = 2627.66
1-2 = 2648.53
1-3 = 2634.82
1-4 = 2639.73
1-6 = 2625.84
SECTION CNR = 2629.96
WELL 2 = 2616.14
= ON GROUND BESIDE PIPE
DEPARTMENT OF THE AIR FORCE
TACTICAL AIR COMMAND
DAVIS-MONTHAN AFB, ARIZONA
CIVIL ENGINEER OFFICE
TEST SOIL BORINGS
SITE 1
MJM
52-44

APPENDIX J

DEFINITIONS, NOMENCLATURE, AND UNITS OF MEASUREMENT

DEFINITIONS, NOMENCLATURE, AND UNITS OF MEASUREMENT

AAC Alaskan Air Command

AFB Air Force Base

alluvium Unconsolidated sediments deposited during comparatively recent geologic time by a stream or other body of running water.

alluvial fan Alluvial material deposited as a cone or fan at the base of a mountain slope.

aquifer A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring.

aquiclude A body of relatively impermeable rock that is capable of absorbing water slowly but functions as an upper or lower boundary of an aquifer and does not transmit ground water rapidly enough to supply a well or spring.

aquitard A confining bed that retards but does not prevent the flow of water to or from an adjacent aquifer.

aromatic Designating cyclic organic compounds characterized by a high degree of stability in spite of their apparent unsaturated bonds and best exemplified by benzene and related structures, but also evident in other compounds.

artesian Ground water confined under hydrostatic pressure.

as N As weight of nitrogen

AVGAS Aviation gasoline

caliche An opaque, reddish brown to buff or white calcareous material of secondary accumulation (in place), commonly found in layers on, near, or within the surface of stony soils of arid and semiarid regions, but also occurring as a subsoil deposit in subhumid climates. The cementing material is essentially calcium carbonate, but may contain magnesium carbonate, silica, or gypsum.

cm/sec Centimeter(s) per second

cone of depression A depression in the potentiometric surface of a body of water that has the shape of an inverted cone and develops around a well from which water is being withdrawn.

conglomerate The consolidated equivalent of gravel, both in size range and in the essential roundness and sorting of its constituent particles.

POL	Petroleum, oil and lubricants
porosity	The property of a rock, soil, or other material of containing interstices.
potentiometric surface	An imaginary surface representing the static head of ground water and defined by the level to which water will rise in a well.
ppm	Part(s) per million
Precambrian age	Geologic time before the beginning of the Paleozoic; it is equivalent to about 90 percent of geologic time and ended approximately 570 million years ago.
PVC	Polyvinyl chloride
QC	Quality control
RCRA	Resource Conservation and Recovery Act
Recent	An epoch of geologic time thought to have covered the last 10,000 years.
RED HORSE	Rapid Emergency Deployable Heavy Operational Repair Structural Engineering
specific capacity	*The rate of discharge* of a water well per unit of drawdown, commonly expressed as gallons per minute per foot.
specific conductivity	With reference to the movement of water in soil, a factor expressing the volume of transported water per unit of time in a given area.
STP	Sewage treatment plant
TAC	Tactical Air Command
TAC/NORAD	Tactical Air Command/North American Air Defense Command
TCE	Trichloroethylene
TDS	Total dissolved solids
Tertiary	The first period of the Cenozoic era, thought to have covered the span of time between 66 and 3 to 2 million years ago.
TFWC	Tactical Fighter Weapons Center
TOC	Total organic carbon
TOX	Total organic halogens

transmissivity The rate at which water is transmitted through a unit width under a unit hydraulic gradient.

USAF United States Air Force

USEPA United States Environmental Protection Agency

USGS United States Geological Survey

wash A term applied in the western United States to the broad, shallow, gravelly or stony, normally dry bed of an intermittent stream, often situated at the bottom of a canyon; it is occasionally filled by a torrent of water.

water table That surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere.

[usaf-app/def]

END

12-86

DTIC