LAW

ENGINEERING AND ENVIRONMENTAL SERVICES

DRAFT FINAL
REMEDIAL INVESTIGATION

FOR

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
PESTICIDE STORAGE FACILITY
FORT RILEY MILITARY INSTALLATION
FORT RILEY, KANSAS

PREPARED FOR

U.S. ARMY CORPS OF ENGINEERS
KANSAS CITY DISTRICT

JOB No. 11-1531
CONTRACT No. DACW41-89-D-0124

JULY 1993
REVISED DECEMBER 1993

PSF_4_4_001

LAW ENVIRONMENTAL, INC.

10100 N. EXECUTIVE HILLS BLVD.
SUITE 350
KANSAS CITY, MISSOURI 64153
816-891-9332

July 16, 1993

U.S. Army Corps of Engineers
647 Federal Building
601 East 12th Street
Kansas City, Missouri 64106-2896

Attention: Mr. William A. McFarland, P.G.
Project Manager

Subject: Submittal of Draft Final Remedial Investigation Report
Pesticide Storage Facility (PSF) Fort Riley, Kansas
Contract No. DACW41-89D-0124
Delivery Order No. 0033
LEGS Project No. 11-1531

Dear Mr. McFarland:

Law Environmental Government Services (LEGS) Division, respectfully submits the Draft Final Remedial Investigation Report, for the RI/FS investigation of the Pesticide Storage Facility, Fort Riley, Kansas. The report consists of a single volume contained in one, three-ring binder.

The report distribution list is attached for your convenience and follows the CEMRK scope of work document dated March 14, 1991, revised June 18, 1991 and January 28, 1993, and our phone conversation of July 16, 1993.

As has been discussed, the CEMRK-MD-H copies are being forwarded to you for internal distribution. All other copies have been sent directly to the listed recipients.

Final Comment responses to EPA and KDHE comments are presented under a separate cover and have been transmitted with the Draft Final RI report.

If you have questions concerning this submittal, please contact us. Thank you for allowing Law Environmental Government Services to support your project needs.

Sincerely,

John K. Cook
Project Manager

Arthur J. Whallon, P.G.
Project Principal

Enclosures

REPORT DISTRIBUTION LIST

7 copies - 1 volume each

Mr. William A. McFarland
U.S. Army Corps of Engineers
Attn: CEMRK-MD-H
601 East 12th Street
Kansas City, MO 64106-2896

1 copy - 1 volume

U.S. Army Corps of Engineers
Missouri River Division
Attn: CEMRD-EP-C
2945 South 132nd Street
Omaha, NE 68144

1 copy - 1 volume

US Army Environmental Hygiene Agency
Attn: HSHB-ME-SR/Keith Hoddinott
Aberdeen Proving Ground, MD 21010-5422

2 copy - 1 volume each

Kansas Department of Health and Environment
Bureau of Environmental Remediation
Attn: Mr. Randolf Brown
Forbes Field, Building 740
Topeka, KS 66620-7500

5 copies - 1 volume each

U.S. Army Corps of Engineers
Missouri River Division
Attn: CEMRD-ED-GL
420 South 18th Street
Omaha, NE 68101

6 copies - 1 volume each

Directorate of Engineering & Housing
Environment & Natural Resources Division
Attn: Ms. Janet Wade, AFZN-DE-V
Building 1970
Fort Riley, KS 66442-6000

3 copies - 1 volume each

US Environmental Protection Agency
Region VII
Attn: Scott Marquess, Superfund Section
726 Minnesota Avenue
Kansas City, KS 66101

1 copy - 1 volume

U.S. Army Environmental Center
Attn: ENAEC-IR-P/Joe King
Aberdeen Proving Grounds, MD 21010-5401

DRAFT FINAL
REMEDIAL INVESTIGATION REPORT

FOR

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
PESTICIDE STORAGE FACILITY

FORT RILEY MILITARY INSTALLATION
FORT RILEY, KANSAS

Prepared For:

U.S. Army Corps of Engineers
Missouri River Division, Kansas City District
601 East 12th Street
Kansas City, Missouri 64106

Prepared By:

Law Environmental, Inc.
Government Services Division
10100 North Executive Hills Boulevard
Kansas City, Missouri 64153

July 1993
Revised December 1993

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

Page

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

Page

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

LIST OF APPENDICES

LIST OF APPENDICES
(Continued)

LIST OF FIGURES

LIST OF FIGURES
(continued)

LIST OF FIGURES
(continued)

LIST OF TABLES

LIST OF TABLES
(continued)

LIST OF TABLES
(continued)

LIST OF TABLES
(continued)

LIST OF TABLES
(continued)

LIST OF ACRONYMS

ACL	Alternate Concentration Limits
A-E	Architect-Engineer
ARAR	Applicable or Relevant and Appropriate Requirement
ASTDR	Agency for Toxic Substances and Disease Registry
BGS	Below Ground Surface
CAL	Corrective Action Level (RCRA)
CAS	Chemical Abstract Service
CEMRD	Corps of Engineers - Missouri River Division
CEMRK	Corps of Engineers - Missouri River Division, Kansas City District
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
cfs	Cubic Feet Per Second
cm^2	Centimeter Squared
cm/sec	Centimeters Per Second
COE-PM	Corps of Engineers - Project Manager
CSF	Carcinogenic Slope Factor
CWA	Clean Water Act
DCF	Dry Cleaning Facility
DEH	Directorate of Engineering and Housing
DFAE	Directorate of Facilities Engineering (now DEH)
DOD	Department of Defense
DOT	Department of Transportation
DPDO	Defense Property Disposal Office (now DRMO)

LIST OF ACRONYMS
(continued)

DQCR	Daily Quality Control Report
DQO	Data Quality Objectives
DRMO	Defense Reutilization and Marketing Office
ECD	Electron Capture Detector
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
ESE	Environmental Science and Engineering, Inc.
FEMA	Federal Emergency Management Agency
FID	Flame Ionization Detector
FS	Feasibility Study
FSP	Field Sampling Plan
GC/MS	Gas Chromatograph/Mass Spectrometer
GPC	Gel Permeation Clean-up
gpm	Gallons Per Minute
GWPS	Ground Water Protection Strategy
HABS	Historic American Buildings Survey
HAER	Historic Architecture and Engineering Record
HAN	Heavy Aromatic Naphtha
HRS	Hazard Ranking Score
IAG	Federal Facilities Agreement
ID	Inside Diameter
IRP	Installation Restoration Program
K	Character Representing Ground-Water Velocity

KDHE	Kansas Department of Health and Environment
kg	Kilogram
KGS	Kansas Geological Survey
l	Liter
LAN	Local Area Network
LEGS	Law Environmental, Inc., Government Services Division
LENL	Law Environmental National Laboratory
m	Meter
MCL	Maximum Contamination Level
MCLG	Maximum Contaminant Level Goal
MDL	Method Detection Limit
mg	Milligram
mg/l	Milligram per Liter
MSL	Mean Sea Level
MTV	Mobility, Toxicity, Volume
NAAQS	National Ambient Air Quality Standard
NCP	National Contingency Plan
ND	Not Detected (Above Method Detection Limits)
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List (Superfund List)
NTU	Nephelometric Turbidity Units
OD	Outside Diameter
OSHA	Occupational Safety and Health Administration

LIST OF ACRONYMS
(continued)

PAH	Polynuclear Aromatic Hydrocarbon
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene, also Perchloroethylene
PID	Photoionization Detector
ppb	Part Per Billion
PPE	Personal Protective Equipment
ppm	Part Per Million
PSCS	Preliminary Site Characterization Summary
PSF	Pesticide Storage Facility
PSF "___"	Pesticide Storage Facility "Sample Designation Number"
PVC	Poly Vinyl Chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QCSR	Quality Control Summary Report
RA	Risk Assessment
RCRA	Resource Conservation and Recovery Act
RFCs	Reference Concentrations
RFDs	Reference Doses
RI	Remedial Investigation
RI/FS	Remedial Investigation and Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986

LIST OF ACRONYMS
(continued)

SFL	Southwest Funston Landfill
SOC	Site(s) Operation Center
SOW	Scope of Work
SPHEM	Superfund Public Health Evaluation Manual
SWLO	Southwest Laboratory of Oklahoma
TBC	To Be Considered
2,3,7,8-TCDD	Tetrachlorodibenzo-p-dioxin
TCL	Target Compound Lists
TEF	Toxicity Equivalency Factor
TLV	Threshold Limit Value
TM	Technical Memorandum
TOC	Top of Casing (Monitoring Well Casing)
μg/kg	Microgram Per Kilogram
μg/L	Microgram Per Liter
USAEHA	United States Army Environmental Hygiene Agency
USAETL	United States Army Engineer Topographic Laboratories
USDASCS	United States Department of Agriculture - Soil Conservation Service
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WQC	Water Quality Criteria
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

In support to Fort Riley, the U.S. Army Corps of Engineers has contracted with Law Environmental Government Services (LEGS) Division to evaluate the nature and extent of contamination associated with the operation of the Pesticide Storage Facility (PSF), in support of the Feasibility Study (FS) objectives of providing remedial technology(ies) suitable for site cleanup, and to prepare separate documents of the Remedial Investigation (RI) and Feasibility Study for the site. This RI objective was accomplished by conducting a field investigation program at the site that included shallow soil borings and sample collection, installation of groundwater monitoring wells, collection of surface water and sediment samples from drainage features adjacent to the site, collection of groundwater samples, and hydrologic investigations.

The PSF is located in Building 348 of the Main Post area, Fort Riley, Kansas. Building 348 was constructed in 1941 as a warehouse facility and has been used as such since. Fort Riley records do not state when pesticides were first stored there. However, discussions with Fort Riley personnel indicate that Building 348 has been used for pesticide storage since at least 1973. The building was improved in 1982, adding fireproofing to the walls and insulation to the ceiling/roof spaces. In 1984, the building was renovated to conform/comply with federal standards for the storage of pesticides. Future use of the building is not expected to change.

Electrical transformers containing polychlorinated biphenyls (PCBs) were once stored outside the southeast corner of Building 348. Prior to the late 1970s, the maintenance area east of and adjacent to Building 348 was used to wash down vehicles and spray-equipment used for pesticide applications.

Environmental sampling and analyses of shallow soils at the site in the 1970s and 1980s indicated chlordane, methoxychlor, malathion, diazinon, dieldrin, and DDT (and its metabolites) in the soil east of the building.

Subsequent to these past sampling events, Fort Riley was included on the Environmental Protection Agency's (EPA) National Priorities List (NPL) (Superfund) on August 30, 1990. The Department of the Army, the EPA and the state of Kansas entered into a Federal Facility Agreement (IAG) designed to facilitate investigative and remedial activities which comply with applicable law under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA).

Specific RI field activities at the PSF included the installation of five monitoring wells screened across the water table. Fifteen soil samples from the five monitoring well boreholes and 20 shallow samples were collected from hand-augered borings. Six surface water and 14 sediment samples were collected from seven locations along a nearby drainage feature east and southeast of the site. Groundwater, surface water, soil and sediment samples were analyzed for volatile and semi-volatile organics, pesticides/PCBs, metals, organophosphorus pesticides, and herbicides. The tetra-chlorodibenzo-p-dioxin (2,3,7,8-TCDD) isomer was analyzed in the ten soil samples and one sediment sample containing the highest pesticides/PCB content. In addition, groundwater and surface water samples were analyzed for chloride, sulfate, nitrate and bicarbonate.

Analytical results reveal that the highest concentrations of contaminants/constituents are present in the surface (0-24 inches) and subsurface soils at and adjacent to the PSF. Of the constituents detected, pesticides, PAHs and metals were found with the greatest frequency.

Pesticides detected in soil samples consisted of DDT and its metabolites (DDO and DDE), alpha- and gamma-chlordane, heptachlor, dieldrin, methoxychlor, endrin, Ronnel(Fenchlorphos) and malathion. Constituents were indicated in three major areas. Pesticides were found around the north end of the PSF and extending to the east. Another area of pesticide detections is near the southeast corner of the PSF and extending to the east. A third area of pesticide detections, in soils, was in the area of stressed vegetation near the drainage ditch east of the PSF.

PAHs detected in the soil samples include acenaphthe, anthracenes, chrysene, fluoranthenes, naphthalene, phenanthrene and pyrene. The analytical results reveal that PAH constituents are present in the soil along the fence to the east of the PSF and extending to the east. Another area of PAHs is located at the bottom of the culvert leading away (to the east) from the southeastern corner of the fence. In both of these areas, the distribution of PAHs tends to follow the pathways of surface water runoff. A third area of PAH constituents is located near the southeastern corner of the PSF.

The metals analyses of soil samples reveal that arsenic, barium, chromium and lead were routinely found in detectable concentrations in downgradient and background samples. The following two samples contained concentrations of lead which exceeded the RCRA CALs of 500 mg/kg: PSFSS-03 (540 mg/kg) and PSFSB-08A (770 mg/kg). The RCRA CALs for arsenic (80 mg/kg) was exceeded in sample PSFSB-10C (120 mg/kg), a duplicate sample of PSFSB-10B.

Analytical results reveal that volatile organic compounds, pesticides, PAHs and total metals exist in the sediment within the drainage ditch to the east of the PSF. Volatile organic compounds detected in the sediment samples included toluene, carbon disulfide, 1,2-dichloropropane and 1,1,2,2-tetrachloroethane. Concentrations of carbon disulfide, 1,2-dichloropropane and 1,1,2,2-tetrachloroethane were only found in one sample each.

Concentrations of pesticides in the sediment samples increased downstream of the PSF (samples PSFSD-04A/B through PSFSD-09A/B). While pesticide concentrations decreased with distance, the extent of pesticide contamination in the sediments downstream of the PSF has not been fully defined. PAHs were detected in all but three sediment samples (PSFSD-01B, PSFSD-04B and PSFSD-06A) collected. The concentrations of PAHs did not always decrease with depth, and the extent of PAH contamination in the sediments downstream of the PSF also has not been defined. Of the metals analyzed, arsenic, barium, cadmium, chromium and lead were often found in the sediment samples in both upstream and downstream samples.

Groundwater samples were collected from the five monitoring wells installed within the study area. Analytical results reveal metals and inorganics in the groundwater samples collected from the PSF wells. Of the metals analyzed, the alkali earth metals (calcium, magnesium, potassium and sodium) were detected at the highest concentrations.

Concentrations of nitrate and thallium exceeded their federal maximum contaminant levels (10 mg/L [as nitrogen] and 0.002 mg/L, respectively). Concentrations of total and dissolved manganese, total aluminum, and total iron in downgradient PSF wells slightly increased above upgradient well (background) conditions. Concentrations of manganese (total and dissolved) exceeded secondary Maximum Contaminant Levels (50 μg/L) in samples PSF92-02 and PSF92-03.

Sample PSF92-02 detected a total zinc concentration above background conditions. Detectable concentrations (total and dissolved) of arsenic were found in sample PSF92-05. The dissolved mercury concentration from sample PSF92-04 (0.4 μg/L) has been discounted because it exceeds the total mercury concentration (non-detect) for this sample. In addition, associated soil samples and groundwater samples from subsequent sampling events do not contain mercury. Concentrations of inorganic constituents (chloride, nitrate, sulfate and bicarbonate) increased above background conditions downgradient of the PSF. The increased concentrations of inorganic chloride and sulfate downgradient of the PSF may be a result of the breakdown of pesticides.

Analytical results reveal that metals and inorganic constituents exist in the surface water to the east of the PSF in both upstream and downstream . Of the metals analyzed, total concentrations of aluminum, iron and zinc increased immediately downstream of the

PSF. Of the inorganic constituents analyzed, concentrations of chloride and bicarbonate decreased downstream of the background sampling location (PSFSW-01), while sulfate concentrations increased immediately downstream of the PSF.

The fate and transport evaluation of constituents detected on the PSF was based on physical and chemical information from all sampled media. In general, the pesticides and other semi-volatiles (PAHs) detected in site soils have low water solubilities and high K_{oc} values, indicating that these constituents have a high affinity for binding to soil particles, and a low potential for transfer to groundwater or surface water (ATSDR, 1987-1991; Howard, 1991). Secondary transport pathways for PAHs and pesticides include the transportation of adsorbed contaminants on soil particles by storm or surface water runoff to sediments, and the subsequent transportation of these sediments to points downstream. Soil particles containing sorbed contaminants may also be dispersed as airborne particulates.

The primary and secondary transport pathways for metals detected in site soils are similar to the pathways discussed above, with the addition of water soluble species leaching to ground and surface water. The volatile organic compounds (VOCs) detected in site soils are also water soluble, so they may also leach to groundwater or surface water, or, if they are present in the upper surface soils or in surface water these constituents may volatilize out into the atmosphere.

If constituents dissolve and transfer to the groundwater, they can be expected to travel within the aquifer in the direction of groundwater flow. Metals constituents dissolved in surface water will continue to flow downstream; VOCs will tend to volatilize out of surface water to the atmosphere. Nonionic metals species and organic compounds with lower water solubility and high K_{oc} values may precipitate out of surface water and settle into or become bound to sediments. Constituents present in the sediments may act as a future source of surface water contamination, if conditions favor their reentry into the water column.

The low levels of VOCs detected in site soils are unlikely to affect the groundwater column to a great extent. Likewise, the pesticides and PAHs detected in site soils tend to remain strongly bound to soil particles, resisting transfer to the water column. Therefore, the modelling of constituents from the soil to the ground or surface water is considered unnecessary at this site.

A baseline risk assessment was conducted for the PSF site, which includes a human health evaluation and an ecological risk assessment. The human health evaluation identified 26 potential exposure pathways, including 12 current pathways and 14 future pathways. The baseline risk assessment indicates that there may be a concern for potential risk to human health, based on the exposure pathways developed for the site.

Specifically, the risk assessment identifies several receptor exposure pathways that have the potential to cause noncarcinogenic health effects. A calculated hazard index (HI) greater than 1.0 indicates that the "threshold" for noncarcinogenic health effects for a particular pathway has been exceeded. Unacceptable noncarcinogenic (systemic) risks were identified at the PSF for the following receptors and exposure pathways in the risk assessment:

Receptor	Exposure Pathway - Medium	HI
current on-site worker	dermal exposure to surface soil	9.2
future on-site worker	dermal exposure to surface soil	33
future construction worker	dermal exposure to surface soil	16
future construction worker	dermal exposure to subsurface soil	7.3
future recreational child	dermal exposure to surface soil	1.9
future (off-site) adult	ingestion of groundwater	4.6
future (off-site) child	ingestion of groundwater	22

The baseline risk assessment also identified several receptor exposure pathways with the potential to cause carcinogenic effects. Risks from potential carcinogens are estimated as probabilities of excess cancers as a result of exposure to the chemicals from the site. The National Contingency Plan defines the range of acceptable risks for evaluating cancer risks as 1×10^{-4} to 1×10^{-6}, which corresponds to one excess cancer in a population of ten thousand to one excess cancer in a population of one million. Cancer risk estimates were calculated for three receptors that exceed the acceptable risk range of 1×10^{-6} to 1×10^{-4}, as follows:

Receptor	Exposure Pathway - Medium	Cancer Risk
current on-site worker	dermal exposure to surface soil	8×10^{-4}
future on-site worker	dermal exposure to surface soil	4×10^{-3}
future (off-site) adult	ingestion of groundwater	2×10^{-4}

In addition, fifteen cancer risk estimates were calculated that exceed the standard point of departure, but are within the acceptable risk range identified by the NCP (1×10^{-6} to 1×10^{-4}). A list of these acceptable risks, by receptor and pathway, is located in Section 6.1.5, which summarizes the human health portion of the risk assessment. It should be noted that the estimations of risks due to dermal exposure are likely to be overestimated, due to the conservative assumptions used in calculating the risks. The risks estimated for future consumption of site groundwater may also be overestimated, since there are no current plans to develop the site as a well field for residential users, and since there is an adequate supply of drinking water available from the Fort Riley wells, located 1.8 miles upgradient from the PSF site.

A qualitative ecological risk assessment was conducted as part of the baseline risk assessment. The ecological risk assessment did not identify any current negative impact to flora and fauna at the site. Terrestrial and aquatic life in the area of the drainage ditch may potentially suffer adverse effects from constituents detected in site surface water and sediment samples. However, other (larger) sources of surface water are located nearby, and ecological receptors would probably favor these sources over the intermittent stream on-site. Therefore, the environmental impact of the contamination detected in the surface water and sediment should not impact downstream media because the natural character of the drainage ditch (i.e., its intermittent flow) does not consistently discharge surface water and flush sediments to downstream points.

Likewise, the risk to environmental receptors due to exposure to surface soils is also minimal or low. The area most impacted by soil contamination (the previously stressed area of vegetation) is small (20 ft. x 20 ft.), and there are areas adjacent to the site that provide suitable habitats and food supplies for animal species that may pass by or frequent the site. And, because the area of stressed vegetation has experienced regrowth this growing season, the effects of the surface soil contamination do not appear to be long-lasting in nature.

1.0 INTRODUCTION

In support to Fort Riley, the United States Army Corps of Engineers, Missouri River Division, Kansas City District (CEMRK), and Law Environmental, Inc., Government Services Division is conducting a Remedial Investigation/Feasibility Study (RI/FS) at the Pesticide Storage Facility, Building 348, Fort Riley Military Installation, Fort Riley, Kansas (Figure 1-1). This project is performed in accordance with the Draft Final planning documents dated December 1991. These Draft Final planning documents were conditionally approved by the Environmental Protection Agency (EPA) and the Kansas Department of Health and Environment (KDHE) on 21 and 22 January 1992. An addendum to these planning documents, entitled Draft Final Modified, were issued in September 1992. These Modified documents reflect revisions addressing the conditions of approval, provide additional historical and background information, and include additional descriptions of subsequent RI and FS tasks. These Modified documents in no way alter the execution of the plans as previously approved. Modifications to field activities have been approved per the Federal Facilities Agreement and are documented by Technical Memoranda.

Pursuant to the National Contingency Plan (NCP) and Section 105 of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Fort Riley was proposed for inclusion on the National Priorities List (NPL) on July 14, 1989, and finalized on the NPL on August 30, 1990. The Pesticide Storage Facility (PSF) and the Fort Riley Southwest Funston Landfill (SFL) were combined as one site by the EPA. EPA reasoned that both alleged contaminant sources potentially affected the same shallow aquifer and target populations. These two sites attained an aggregate score of 33.79 on the Hazard Ranking Score (HRS) but are the subjects of separate RI/FS efforts. An HRS of 28.5 is needed for inclusion onto the NPL.

Fort Riley, the Department of the Army, the EPA and the State of Kansas entered into a Federal Facility Agreement effective June 28, 1991 (IAG Docket No. VII-90-5-0015). Under Section VII B, paragraphs 4, 5 and 6 of the agreement, the PSF is specifically addressed as a contaminant source. The purposes of the IAG are to:

- ensure that sites such as the PSF are thoroughly investigated and appropriately remediated;
- establish procedures and schedules to develop, implement and monitor appropriate response actions in accordance with federal and state law; and
- facilitate cooperation and participation of the parties in the agreement.

1.1 PURPOSE AND OBJECTIVES

The general purpose of this investigation was to perform an RI/FS that evaluated the nature and extent of contamination and developed alternatives for remedial actions at the PSF.

The specific objectives of the RI are to evaluate the nature and extent of constituent releases, assess the potential for constituent migration, identify public health and environmental risks associated with the site with respect to regulatory environmental standards and advisories, and provide objectives for future response actions that may be required at the site.

Specific objectives of the FS are to develop site specific remedial alternatives based on response actions, identify and screen appropriate technologies for implementation of alternatives, develop an analysis for the selection of cost-effective alternatives, develop a health exposure evaluation and develop an organized comparison of findings for each remedial alternative.

The general RI/FS program as presented in EPA guidance involves a sampling and analysis effort leading to the development of remedial alternatives. If necessary, a more detailed sampling and analytical effort will be conducted to delineate contamination and quantify pathways to aid in the selection of remedial alternatives. The PSF RI/FS encompasses several key elements necessary to select an appropriate remedial action. These include:

- Determination of the federal and state Applicable or Relevant and Appropriate Requirement (ARAR)s.

- Development of the Data Quality Objectives (DQOs) consistent with the Applicable or ARARs and achievable with acceptable field and analytical procedures.

- Performance of a field investigation in one or more phases to collect sufficient information to assess contaminant movement and pathways, and to support development of remedial alternatives.

- Quantitatively evaluate the impact on human and environmental receptors associated with the PSF through reasonable exposure pathways, to include surface water, ground water and soil media, and incorporating the exposure and risk assessment criteria as required under CERCLA, NCP, and Superfund Amendments Re-authorization Act, 1986 (SARA), and as defined in the Superfund Public Health Evaluation Manual (SPHEM).

- Identification of those media where the results of the field investigation and risk assessment indicate no significant threat (according to guidance) to human health or welfare, or to the environment.

- Development of a set of potential remedial alternatives, in the event a significant threat exists, consisting of appropriate technologies, that can remove the contamination or control its migration, provide a range of reduction of the mobility, toxicity, or volume (MTV) associated with the contamination, and meet or exceed established ARARs.

- Preparation of a decision document identifying any necessary control measures, if any.

As part of the general FS process, an initial screening of remedial alternatives is conducted using criteria of effectiveness, implementability and cost. If necessary, additional studies are performed to support selection of remedial technologies. A detailed analysis is then conducted to evaluate remedial alternatives using a set of criteria that includes protectiveness, compliance with ARARs, reduction of MTV, schedule, reliability, capital, operation and maintenance costs.

After a remedial alternative is selected, a Record of Decision (ROD) is created, which documents the selection based on information and recommendations contained in the Installation Restoration Program (IRP) RI and FS reports. If an engineering solution is selected, the remedial design is specified and then implemented.

1.1.1 RI Approach

The RI rationale for the PSF was intended to confirm findings from previous investigative activities at the site, to characterize the extent of contamination and better define the physical characteristics (hydrologic gradient, soil properties, etc.) of the site. The findings of this initial phase of the RI were evaluated to identify the need for additional field investigation prior to completing the baseline risk assessment and feasibility study. A baseline risk assessment is included as Section 6.0.

1.1.2 Data Quality Objectives

The data generated from the RI/FS must be of sufficient quality and quantity to meet the overall objective, which is to evaluate the nature and extent of contamination and develop appropriate remedial responses at the PSF. The DQOs were considered in categories as listed below:

- Site Characterization - Characterization of this site was accomplished through use of data generated by the collection and analysis of soil, ground-water, surface water and sediment samples. Air quality was not assessed based on the physical/chemical properties of the suspected contaminants as noted in Section 5.1 of the PSF RI report.

- Laboratory Analyses - Quality Assurance Evaluation was performed to determine that the analytical methods and their appropriate detection limits were in agreement/suitable with the ARARs.

- Health and Safety - Field monitoring was used to establish the level of protection needed for the work party and other site related personnel. This data was gathered by the use of a photoionization detector (PID) and realtime dust monitor during intrusive activities.

- Risk Assessment - The data was used to evaluate the threat to public health and the environment and help develop and evaluate alternatives.

- Evaluation of Alternatives - Data collected from the various matrices will be used to evaluate remedial alternatives and support a feasibility study.

1.2 SITE BACKGROUND

This section summarizes background information and data including a description of the site, discussion of historical practices and activities at the PSF and a discussion of previous environmental sampling events and investigations. Specific discussions covering the characterization of the site and the results of the field investigation are presented in Sections 2.0 and 3.0 of this report.

1.2.1 Site Description

The PSF area of investigation consists of Building 348 and adjacent land area as shown in Figure 1-2. Building 348 was formerly numbered 292.

The PSF building was constructed May 21, 1941, to serve as a general purpose warehouse facility. In preparation for construction of Building 348, the then existing grade was raised by emplacement of fill material. The fill material consisted of soil native to the area (silty clays) and minor amounts of miscellaneous material (bricks, cinders, horse shoes, rubble, etc.). A more in-depth discussion of the estimated fill intervals and the impact on site characterization and analytical chemistry/data interpretation are presented in Sections 3.1.3.2 and 4, respectively. Fort Riley records do not state what was initially stored in this building. However, a personal interview with the Fort Riley Senior Pesticide and Herbicide Program Manager and the Exterior Works Branch Chief state that Building 348 has been used for the storage of pesticides since at least 1973. In 1982, general improvements were made to the building consisting of the addition of insulation to the roof/ceiling spaces and installation of fireproofing to the vertical walls. Finally, in 1984, the PSF portion of Building 348 was renovated to "correct for deficiencies to meet federal standard for pesticide storage" (Realty Specialist, Fort Riley 1993)

Building 348 measures approximately 110 by 30 feet. The northern portion of the building (approximately 30' x 30') is used to store herbicides and preformulated pesticides (Senior Pesticide and Herbicide Program Manager, 1992). The remainder of Building 348 is used to store general improvement materials and paint.

The DEH yard extends south of Dickman Avenue to the south central edge of the Main Post cantonment area. The area of investigation is approximately two thirds of an acre and consists of the southeast portion of the DEH yard which is a fenced, secured storage and maintenance area that supports services necessary to maintain the buildings, grounds and utility systems at Fort Riley. Items currently stored within the study area include paint, pesticides/herbicides, pressure treated lumber, electrical and plumbing materials, bulk asphalt, bulk aggregate, and fence materials. Vehicle maintenance and storage facilities are also located at the DEH yard. Stored items include heavy equipment, pick-up trucks, mowers, dump trucks, loaders, lift trucks and equipment and tools used to perform maintenance activities.

Figure 1-2 shows the configuration of the DEH yard within the vicinity of the PSF as it appeared during the 1992 field investigation. Items and materials that have been stored in "outside warehouse areas" have been relocated over time. However, information derived from photographs dated pre-1990 (DEH - Files) show that pressure treated lumber was stored along the eastern fence. DEH photographs taken in the spring and summer of 1991 also show what again appears to be pressure treated lumber storage adjacent to the eastern fence. The pressure treated lumber was removed to accommodate access to field work for the 1992 field investigation.

The RI area of investigation consists of Building 348, property adjacent to and adjoining Building 348 (within the eastern and southern fence) and the paved area immediately south of Building 348. In addition, the area of investigation included the limestone-lined drainage located to the east and outside of the fenced portion of the PSF, and the soils between the limestone-lined drainage and the eastern fence.

During 1988, according to the Polychloronated Biphenyl (PCB) Program Manager, DEH, several PCB containing electrical transformers were stored in two CONEX containers next to Building 348 (Figure 1-2). A CONEX is a ribbed metal container used for shipping and temporary storage of goods and materials by the Army. A specific discussion of the CONEX closure investigation is presented in Section 1.2.3 of this report. Non-PCB transformers are presently stored along the southeast side of Building 343 and northeast side of Building 344. During the fieldwork (February 1992 through May 1993) it was observed by field personnel that along the east side of the PSF, east of the fenceline, there were an undetermined number of electrical parts half buried under bank material. The precise number and spatial distribution of these parts have not been surveyed. These parts included electrical insulators and other parts appearing to originate from electrical transformers. During the field investigation, an area of stressed vegetation measuring approximately 20' x 20' was observed located downslope of the PSF outside of the perimeter fence (Figure 1-2). Vegetation in this area has recovered as observed and reported by Fort Riley DEH staff on June 24, 1993.

General surface drainage follows the general topography and is directed to the east (Plate 1). It then enters drainage features which have been artificially channelized from Dickman Avenue to the railroad tracks southeast of the site. This channel is constructed of cemented limestone blocks. The channel was reported to have been lined during the 1930s. The channel proceeds southward under the railroad tracks and then flows into an unnamed tributary leading to the Kansas River which is approximately one-half mile south of the PSF.

1.2.2 Site History

The Fort Riley Military Installation was established in 1852 as an outpost near the confluence of the Smoky Hill and Republican Rivers in Geary and Riley Counties, Kansas. This was in response to the need for military protection of civilian populations during westward expansion of the territory. The development and growth of Fort Riley proceeded in response to the evolution of the American military mission, in response to the Indian conflicts of the last half of the 1800s, the Spanish American War, World Wars I and II, the Korean and Vietnamese conflicts, and the Persian Gulf War.

Since its inception, Fort Riley has continuously served as a center of military education and readiness. Fort Riley has functioned as a small municipality and light industrial complex, at times having an installation population, including military and civilian residents, of over 20,000. Municipal activities on the installation include solid waste disposal (land filling), wastewater treatment, wastewater discharge and general infrastructure maintenance. Specific tasks associated with maintenance duties would include general construction activities, pesticide and herbicide application, fleet maintenance and general storage and repair services.

Fort Riley serves in a military capacity as a training, equipment supply and military maintenance center and, therefore, has historically required management and disposal of wastes associated with these activities.

Pesticides and herbicides have been used at the Fort Riley reservation for a variety of applications. For this reason, the presence of inorganic as well as organic contaminants was investigated.

Prior to about 1975, pesticide wastewaters, rinse water and concentrated spills came into contact with the ground surface on site. Currently, pesticide solutions are diluted with rinse water and sprayed over the area treated that day or saved for future applications (Senior Pesticide and Herbicide Program Manager, Fort Riley, 1992). However, during the 1992 field investigation, sample collection personnel observed herbicide application staff rinsing the equipment and spray vehicles. This rinsing occurred adjacent to the northwest portion of Building 348. The herbicide application staff did not collect or contain the resulting rinse water, allowing it to run onto the ground surface. This is not an official procedure and appears to be sporadic in nature. How this relates to analytical results is discussed in Section 4.1.2.

Since 1976, the majority of insecticide application has been performed by outside contractors to Fort Riley (Senior Pesticide and Herbicide Program Manager, 1992). Contractors do not use the PSF for formulation or mixing of the pesticides (Senior Pesticide and Herbicide Program Manager, 1992). In 1984, the building interior was renovated to conform to current operating practices (see Section 2.1.2). A list (Dec. 1991) of stored chemicals is included as Table 1-1 and provides an indication of the material currently used by Fort Riley (in house).

DEH personnel have indicated during personal interviews that numerous heavy thunderstorms occurred between 1981 and 1983 (Chief, Env. & Nat. Res. Div., DEH, 1992). The resulting storm water run-off followed natural topography and eroded sizeable channels, ruts, and "wash outs" along and underneath the east and south PSF fence lines. Some of these erosional features were large enough for a man to crawl through (Chief, Env. & Nat. Res. Div., DEH, 1992). Estimates indicate that between three and five feet of material was eroded from underneath the train tracks adjacent to the PSF at one time. In each case new "fill" material was emplaced, returning the site to existing grade. The Chief of the Environmental & Natural Resources Division of the DEH also stated that, at the time of paving (August/September 1990), the blacktop area was built up anywhere from 1 to 1.5 feet, based on original fence height and surface of blacktop.

In December of 1991, a natural gas line leak developed in gas piping south of the railroad tracks. Repairs of this leak occurred December 10, 1991, and resulted in the excavation of a portion of the gas line (to expose gas valving) east of Building 348. While the excations were open, slide photographs were taken. Review of these slides did not reveal obvious indications of fill material and are inconclusive. Sections 1.2.1 and 3.1.3.2 present additional information about fill material on site. The excavated material was returned to the trench(es) when repairs were finished. Since that time, less than one foot of settlement has occurred where the excavations were developed as observed by field personnel during the field work (February 1992 through May 1993).

1.2.3 Previous Evaluations

During the months of July 1974 and November 1974, the U.S. Army Environmental Hygiene Agency (USAEHA) collected soil samples from outside the PSF as part of the U.S. Army Pesticide Monitoring and Entomological Studies Programs. Data collected during these sampling events was presented in "Entomological Special Study No. 44-015-75/76" (USAEHA, 1975). The program's purpose was to evaluate the pesticide formulation, mixing and storage area at Fort

Riley, confirm alleged soil contamination, and estimate the potential for pesticide migration to sensitive areas of the environment. For the July sampling, a single soil sample was collected east of the PSF. In November, four soil, two sediment and two surface water samples were collected near the PSF and along the small, stone-lined channel east of the building.

According to Pesticide Monitoring Study No. 17-44-1356-88 by USAEHA, the then Environmental Coordinator, Fort Riley DEH, collected six soil samples from a depth of approximately two inches in the vicinity of the PSF during May 1986 (Figure 1-3). The study was conducted to fulfill a requirement for issuance of a Part B permit to Fort Riley under the Resource Conservation and Recovery Act (RCRA). The Pesticide Monitoring and Entomological Studies are included as Appendix Aa and Ab, respectively.

A "Closure Plan for Hazardous Waste Storage Facilities, Building 292 and Two CONEXs" and its appendices were written in 1987 by USAEHA (Appendix B) for a portion of the formerly designated Building 292 (now Building 348) and for two CONEX containers. These were considered hazardous waste storage facilities and closed under the provisions of 40 CFR 265 on December 3, 1990. The hazardous waste and materials stored in the CONEXs included PCB-containing electrical transformers (PCB Program Manager, DEH, 1992). The CONEXs were located next to Building 348, as shown in Figure 1-2.

An area inside Building 348, in the northwest corner of the building and measuring four feet by eight feet, was used to store the following items (Senior Pesticide and Herbicide Program Manager, Fort Riley; Chief, Env. & Nat. Res. Div., DEH, 1992):

- Decontamination agent DS-2;
- Fungicide, mercury powder;
- Metallic mercury spill cleanup residual;
- SEVIN® pesticide;
- Calcium hypochloride;
- Methanol;
- Miscellaneous pharmaceutical items, such as skin cream, shampoo, medication, lindane pesticide.

The listed items were first stored at Building 292 (now Building number 348) between 1981 and 1982. These were transferred to the Defense Reutilization and Marketing Office (DRMO) in October 1982. By the first quarter of 1983, these items were transported and disposed of by licensed contractors (Chief, Env. & Nat. Res. Div., DEH, 1992).

In August of 1990, wipe samples were collected from the inside of the CONEX containers located adjacent to the southeast corner of the PSF building. This sampling was conducted to comply with the procedures specified in the CONEX closure plan approved by the State of Kansas (KDHE, 1990). Preliminary data reported no detectable concentrations of PCB or semi-volatile contamination. Minimal levels of several pesticides and heavy metals were also detected. Subsequent evaluation of the analytical data revealed that positive test results were determined to have been caused by matrix effects during analysis. A later report submitted by the contractor and verified by the Army showed the samples to be free of the pesticide and heavy metal contamination discussed above.

After an additional explanation of the sampling results, the KDHE accepted the Closure of Building 348 and CONEXs on December 3, 1990 (Appendix B). The CONEX containers have since been removed by Fort Riley personnel (DEH, PCB Program Manager, 1992).

1.2.4 Evaluation of Existing Data

The review and analysis of readily available existing data serves to provide a more complete understanding of the nature of possible contamination. It also aids in the design of RI tasks. A review of analytical data generated from previous investigations has been performed for this site. Critical factors considered during this review include:

- Data sufficiency;
- Comparability of data (e.g., time of sampling);
- Field methodologies and procedures;
- Laboratory data - analytical detection limits, analytical methods and Quality Assurance/Quality Control (QA/QC) procedures;
- Accuracy and completeness of field notes;
- Sample collection and handling methods.

The review incorporated the following format:

- Review previous analytical data submittal sets.
- Compile pertinent data from previous investigations with respect to analytical methods used and analytical method detection limits.
- Compare and contrast previous analytical data submittal sets.

Two analytical data submittal reports, generated by the U.S. Army Environmental Hygiene Agency (USAEHA), were evaluated. The first is from a 1975 report, "Entomological Special Study No. 44-015-75/76". The second is from a 1988 report, "Pesticide Monitoring Study No. 17-44-1356-88". The latter sample collection event was conducted by the then Environmental Coordinator for the DEH, Fort Riley.

Evaluation of the data and reports reveal that key pieces of information were not included. These include presentation/ discussion of the field procedures employed. There is no discussion of sample collection methods, field documentation (log books, field sheets, chain-of-custody), sample locations and depth of collection, and/or general field QA/QC. The reports also do not present and/or discuss analytical laboratory QA/QC methods and procedures. Both reports provide analytical data tables and include analytical (method) limits of detection. Comparing these data sets for parameters included in both the 1975 Entomological Special Study No. 44-015-75/76 and the 1988 Pesticide Monitoring Study report No. 17-44-1356-88 reveals that there is one full order of magnitude difference in detection limit(s), and that the 1975 data reported the lower detection limit(s).

Interviews with USAEHA laboratory personnel (via telephone) indicate that prior to the enactment of RCRA, standardized EPA-enforced analytical methods were not in effect (Chief Chemist, Entomological Division, USAEHA, 1992). Therefore, the Department of Defense (DOD), through the National Monitoring Program, established its own methods and procedures for the handling and analysis of environmental samples. DOD also developed general QA/QC procedures (Chief Chemist, Entomological Division, USAEHA, 1992).

The general QA/QC procedures included preparation and analysis of duplicate samples (one out of every 10). Field and/or trip blank samples were not routinely requested or analyzed. The laboratory also did not spike field samples for analysis and evaluation of percent (%) recovery. Rather, laboratory personnel would take "clean" soil and add (or cut) sand to it. Then a known quantity (concentration) of a known compound was added to the soil/sand matrix. This sample was analyzed and percent recovery was evaluated. Since percent recovery is variable, depending on many factors, evaluation relied on professional laboratory judgement. Further interview discussions revealed that analytical data went through "limited" validation. Finally, the laboratory, instead of analyzing for a complete suite of analytes (e.g., pesticides), the laboratory would extract and analyze for a particular class (e.g., organophosphates) of expected pesticides.

After the enactment of RCRA in 1976 and the development of Analytical Methods for Solid Wastes (SW-846), the USAEHA followed procedures and methods similar to EPA Method No. 8080 (Extension Entomologist, state of Kansas, 1992). The September 1988 USAEHA report does not present, discuss or reference this analytical method or the QA/QC procedures followed.

Without adequate documentation, presentation and discussion of the referenced data and information requirements, comparison of the existing data sets, resulting report(s), conclusions and recommendations can not be made. Discussions and comparisons of current analytical data with past analytical results are presented in Section 4.0.

1.3 REPORT ORGANIZATION

This report was prepared in accordance with the Draft Revision of Engineering and Design Chemical Data Quality Management For Hazardous Waste Remedial Activities, ER 1110-1-263 U.S. Army Corps of Engineers, December 1, 1990 and EPA's Guidance on Conducting Remedial Investigation and Feasibility Studies under CERCLA, OSWER Directive 9355.3-01, October 1988.

The field investigations at the PSF consisted of shallow soil borings, monitoring well installation and sampling, and surface water and sediment sampling and analysis.

Section 1.0 of this report presents a general overview and description of the PSF site and provides historic and previous studies information.

Section 2.0 describes the study area investigation which includes details of the performed field activities, both physically and chemically, associated with site characterization.

Section 3.0 of this report describes the physical characteristics of the study area which include the results of the field investigation as described in Section 2.0.

Section 4.0 of this report addresses the sources, nature and extent of detected and naturally occurring contaminants.

Section 5.0 of this report addresses the Contaminant Fate and Transport mechanisms at the PSF.

Section 6.0 of this report presents the Baseline Risk Assessment.

Section 7.0 provides a summary of Sections 4.0, 5.0 and 6.0. Project conclusions are also presented.

2.0 STUDY AREA INVESTIGATION

2.1 STUDY AREA INTRODUCTION

This section presents and summarizes the field activities and scoped tasks relevant to the characterization of the PSF. Field work conducted during the initial phase of the RI at the PSF was performed to achieve the objectives stated in Section 1.1 and include the following key elements.

- Expand the data base at the site;
- Evaluate the nature and extent of previously detected contaminants;
- Confirm the presence/absence of additional contaminants;
- Improve understanding of spatial distribution of contaminants;
- Improve understanding of contaminant migration;
- Evaluate subsurface stratigraphy;
- Evaluate selected aquifer characteristics;
- Characterize ground-water flow;
- Establish background levels for the chemical characteristics of soil and ground water;
- Access remedial action technologies/alternatives;
- Provide adequate data to perform the risk assessment; and
- Provide adequate data to perform the Feasibility Study.

Specific field tasks performed at the site are discussed in the following sections and are presented in Table 2-1, Project Activities and Rationale.

In order to more thoroughly characterize the site and to comply with prudent environmental health and safety concerns, field instruments were used to monitor possible exposure events to field personnel. The December 1991 and September 1992 planning documents, hereafter referred to as "the planning documents", contain a discussion (and list) of the general theory of application; description of the instruments and calibration requirements; sample collection devices; decontamination procedures and sample shipment protocols. Field activities were performed in modified level D personal protective equipment (PPE).

Log books were filled out during the day detailing the activities of the field investigation. In addition to the field log book, Daily Quality Control Reports (DQCRs) were prepared by the site manager and submitted to the Corps of Engineers Project Manager. The DQCRs summarized the daily activities and included general and specific sample collection activities, decontamination, field instruments used, and problems encountered during the field work.

Investigation derived waste(s), including, decontamination water, purge water, drill cuttings, development water and discarded PPE clothing were stored in 55-gallon Department of Transportation (DOT) approved liquid and solid waste drums. The drums were labeled to facilitate correct identification and included type of material, source of material, date and location of waste. The drums were then transported and staged at the Site Operations Center (SOC) located in the northern portion of the Southwest Funston Landfill (SFL) site. Details of the SOC and its construction are described in the December 1991 and September 1992 Work Plans.

2.1.1 Surface Features

General observations were noted concerning surface features during the initial site visits and subsequent field activities of the RI. These included geomorphic landforms and cultural features. A summary discussion is presented in section 3.1.1 of this report.

A topographic site survey was performed prior to field investigations with sample collection locations and elevations surveyed later. Location coordinates were surveyed to the closest 0.1 foot and referenced to the Lambert Coordinate System. Elevations were determined to within 0.01 foot, including the top of the well riser and the top of protective casing. Elevations are referenced to mean sea level (MSL). Horizontal and vertical control of these elevations was attained by their reference to the State Plane Coordinate System and published United States Geological Survey (USGS) benchmarks.

The topographic survey and resulting map provide elevation and location data necessary to evaluate potential contaminant migration pathways. These include surface water flow patterns and ground-water flow direction and gradient. These data are critical in evaluating the potential hazards and risks associated with past or current site activities.

In order to more thoroughly characterize the PSF and the potential impacts on the local environment, an evaluation of adjacent land, including identification of possible wetlands, was conducted. Part of this evaluation included interviewing Fort Riley personnel and officials with the Army Corps of Engineers-Missouri River Division Kansas City District (CEMRK). This information is presented in Section 3.1.1 of this RI report.

2.1.2 Contaminant Source Investigations

Pesticides (including insecticides and rodenticides), herbicides, fungicides, insect repellents, and soil fumigant have been used at Fort Riley for a variety of applications, and are referred herein collectively as "pesticides and herbicides". Historically, the types of pesticides and herbicides used can be expected to have parallelled those that were generally available to the public at the time of use. Prior to about 1975, pesticide and herbicide wastewaters, rinse water and concentrated spills were allowed to run onto the ground surface east of the PSF (Figure 1-2). Currently, rinsewater is diluted to the appropriate application concentration and either sprayed over the days task area or saved for future herbicide application. Since at least 1976, the majority of insecticide application has been performed by outside contractors to Fort Riley (Senior Pesticide and Herbicide Program Manager, 1992). Contractors do not use the PSF for formulation or mixing of pesticides. The northern portion of the PSF Building 348 is used to store pesticides and herbicides (Figure 2-1). A listing of pesticides and herbicides available to Fort Riley during the time when formulation and mixing operations and activities occurred (during 1971) is listed in Table 2-2. However, not all of the pesticides/herbicides listed were used for base-type, domestic applications and therefore were not stored at the PSF. For example, the herbicide 2,4,D + 2,4,5-T, high volatile ester, commonly known as Agent Orange, was intended for tactical military purposes and was not stored at the PSF. Only base-type, domestic use chemicals were stored at the PSF. Tables 2-3 and 2-4 do list pesticides stored at the PSF during 1979 and 1984 respectively. The remainder of the building is used to store general improvement materials, equipment and paint. The December, 1991 inventory is tabulated on Table 1-1.

Personal discussions and interviews with DEH staff and map representations indicate that a livestock dipping facility was formerly operated within the general vicinity of the PSF. An installation map, No. 6139-407.0G, of the Fort Riley Installation dated May 15, 1941 and a General Site Plan and Building Use map of the Ft. Riley post property dated November 12, 1946 depict the location of this dipping facility. Review and evaluation of these maps with respect to the current Fort Riley configuration reveals that the former animal dipping facility (Building T621) was located approximately 300 feet east of the PSF. After evaluation of a series of maps including general topography (circa 1907, 1941, 1976, and 1992) and general installation layout, it has been noted that the former dipping facility was located topographically down gradient of the PSF. Figure 3-1B shows this relationship. The PSF lies west of the rock lined drainage at approximately 1075 feet above MSL. The dipping facility lies at approximately 1065 feet MSL on the west side of the current rock lined drainage and up to 1078 feet MSL on the west side of the drainage. As a result, it is unlikely that storm water runoff from this former dipping facility site impacted the PSF directly.

Telephone interviews with the Extension Specialist (Livestock Entomology, State of Kansas) and the Extension Entomologist (State of Kansas [ret.]) reveal that prior to the end of the Second World War (1945), it was common practice to dip livestock in a solution of "Hot Lime" to protect the animals from lice, biting flies and other pests. From 1945 through 1948, DDT was the dipping solution of choice. From 1948 until the mid 1980s, Lindane (Gamma BHC) was used.

The investigation of the PSF necessarily allows for the analysis of specific wastes from a broad range of analytes as specified in the following sections. Samples were collected from soil, surface water/sediment, and ground water for laboratory analysis. A description of field sampling activities is presented in the following sections.

Samples collected are designated using the following alpha and numeric references:

- PSF92 - Monitoring wells installed by Law Environmental
- SW - Surface Water
- SD - Sediment
- SB - Soil Boring/hand auger boring
- SS - Surface Soil
- TB - Trip Blank
- RN - Equipment Rinsate

Monitoring well samples contain the prefix "PSF92" with consecutive numbers ranging from 01-05.

Soil boring locations were labeled as: PSFSB-XXQ. Soils from monitoring well borings were labeled PSFMWSB-XXQ to differentiate from hand-augered soil boring samples. The "XX" notation represents the number of the boring. The "Q" represents the depth of the sample within the boring.

Surface soil samples were labeled with the "SS" prefix and followed by consecutive numbers ranging from 01-04.

Surface water/sediment samples were labeled with the prefix "PSFSW" and "PSFSD" followed by consecutive numbers ranging from 01-09.

2.1.3 Surface Water and Sediment Investigation

Surface water and sediment samples were collected and analyzed in order to evaluate possible migration of contamination off site via surface water run off. Section 3.1.2 summarizes the physical findings of this investigation while Section 4.3.3 and 4.3.4 presents the analytical results.

Samples of surface water and sediments were designated as PSFSW and PSFSD, respectively. PSFSW-01, 02, 03, 04, 06, and 07 were collected between March 31, 1992, and April 2, 1992. Sample PSFSW-05 was not collected because of the absence of water at the sampling location. PSFSD-01A/B, 02A/B, 04A/B, 05A/B, 06A/B and 07A/B were also collected between March 31, 1992 and April 2, 1992. Sample PSFSW-09A/B was collected July 16, 1992 (sample PSFSD-08 is a duplicate of PSFSD-02). Samples PSFSW/SD 01, 02, 03 (SW only), and 04 were collected from the lined portion of the ditch. Samples PSFSW/SD 06, 07 and 09 (SD only) were collected from the eroded channel downstream of the lined ditch. Grading activities were carried out in the vicinity of sediment sample PSFSW/SD-09 in August 1991. This may not be a representative sample in defining the horizontal extent of contamination as soil could have been introduced to the stream during grading activities. Sediment sample PSFSD-05A/B was collected from the east/west trending drainage that feeds into the limestone drainage. The location of surface water and sediment samples collected is shown in Figure 2-3 and Plate 1.

Surface water samples were collected from a natural drainage that feeds into the limestone-lined drainage, starting with the downstream location and progressing upstream. Samples were collected by slowly submerging a stainless steel beaker into the water. When the beaker was full, the contents were slowly poured down the inside surface of the sample bottles. Samples for volatile organic compound (VOC) analyses were filled first. Subsequent containers were then filled for the remaining analytical parameters. Preservatives were added in the field and tested for correct Ph. Samples were analyzed for VOCs, semi-volatile organic compounds, pesticides/PCBs, metals (total and dissolved), organophosphorus pesticides, herbicides and inorganic anions (chloride, sulfate, nitrate and bicarbonate).

Sediment samples were collected with a pre-cleaned stainless steel hand auger. Two sediment samples were collected from each location at depths of zero to one foot (sample suffix "A") and one to two feet below the stream bed (sample suffix "B"). Samples retrieved from the hand auger were emptied into a stainless steel bowl. Samples for VOC analysis were collected first without mixing, filling the jars with no headspace. The remaining sediment was composited and transferred to the appropriate bottles. Samples were analyzed for VOCs, semi-volatile organic compounds, pesticides/PCBs, metals, organophosphorus pesticides and herbicides. One sediment sample (PSFSD-04A) was analyzed for the 2,3,7,8-TCDD dioxin isomer. Discussion of analytical results and rationale for parameter selection are presented in Section 4.3.4 of this report.

2.1.4 Geological Investigation

The geologic and hydrogeologic characteristics of the area were investigated to help evaluate the extent of contamination. The initial investigation consisted of reviewing existing geologic literature, personnel interviews and a pilot-hole boring. The pilot hole boring investigation was conducted January 24, 1992, in order to 1) measure the depth to ground water, 2) log the stratigraphy (soil type, etc.) beneath the site and 3) select the appropriate well screen slot size and gradation of the filter pack (sand).

The subsequent field investigation consisted of sampling soil and ground water coincident with the installation of five monitoring wells. Monitoring well PSF92-01 was installed upgradient of the site and is the background well for the study. Monitoring wells PSF92-02, PSF92-03, PSF92-04, PSF92-05 were installed topographically downgradient of the site to provide data on soil and ground-water contaminants which may be migrating from suspected sources (Figure 2-4 and Plate 1). Results of the geological investigation are discussed in Section 3.1.3 of this report.

The monitoring wells were installed by Layne-Western Co. Inc. of Kansas City, Kansas. A truck-mounted Mobile Drill B-57 drill rig was used for advancing the monitoring well borings using 10-inch outside diameter (O.D.) hollow stem augers. The drill rig and sampling equipment were steam cleaned decontaminated prior to setting up on each well location. No lubricants were used during drilling or sampling and field monitoring of ambient air did not record contaminant levels above background.

The monitoring well borings were continuously sampled using a 2-inch diameter split spoon. Soil samples were collected for geotechnical analysis to evaluate site specific stratigraphy and to aid in the selection/design of well screen slot size and filter pack size. Two geotechnical samples were collected from the screened interval from each well and analyzed for grain size distribution (ASTM 421 and 422), Atterberg Limits (ASTM-D-423 and 424), and moisture content (ASTM-D 2116). Results of geotechnical analysis are shown in Table 3-1 and Appendix G.

A soil chemical profile was performed on well boring PSF92-02 to assist in evaluating the extent of vertical contamination in the soil profile. Continuous soil samples were collected and submitted for chemical analysis. The results of the analyses are discussed in Section 4.3.1.

Soils and ambient air conditions around the borehole were monitored using an Hnu-101 photoionization detector (PID). A real-time aerosol (dust) monitor was used to monitor the ambient air for total dust concentration within the working zone. Ambient air conditions during drilling are shown in the HTW drilling logs (Appendix E).

2.1.5 Soil Investigations

During the field activities at the PSF, soil samples were collected for chemical analysis to evaluate the nature and extent of alleged contaminants in both surface soil and subsurface soil. These soil samples were submitted for laboratory analysis of VOCs, semi-volatile organic compounds, pesticides/PCBs, organophosphorus pesticides, herbicides, and the eight RCRA metals. The ten (10) soil samples containing the highest pesticide content were also analyzed for dioxin (2,3,7,8-TCDD isomer).

Four near-surface soil samples were collected to assess the potential for dermal exposure. Sample locations included an area representing background conditions (PSFSS-01), high traffic areas (PSFSS-02), former PCB transformer storage areas (PSFSS-03), and the area of stressed vegetation (PSFSS-04) (Figure 2-4 and Plate 1). The near-surface soils (PSFSS-01 through PSFSS-04) were collected at the following depths: 12 to 24 inches, 6 to 18 inches, 3 to 12 inches, and 1 to 12 inches, respectively. These sampling depths were influenced by the thickness of asphalt and/or gravel cover encountered at each location. These samples were collected using a stainless steel hand auger. Samples for VOC analysis were collected first and placed in two 2-ounce wide-mouth soil vials. The sample was disturbed as little as possible to minimize volatilization of organic compounds in the sample. The remainder of the sample was placed in a stainless steel mixing bowl. The soil was homogenized thoroughly and placed in the appropriate pre-cleaned jars for laboratory analysis. Sampling equipment (hand auger, mixing bowl and stainless steel spoon) were decontaminated between samples.

Twenty shallow soil borings were advanced to a depth of approximately 4.5 feet using stainless steel hand augering equipment. Two soil samples designated "A" and "B" were collected from each soil boring. The number of shallow soil borings was selected based on the approximate areas of suspected contamination. The location of those borings are shown on Figure 2-5 and Plate 1.

The shallow soil samples were collected from 1.5 to 2.5 feet deep (suffix "A") and 3.5 to 4.5 feet deep (suffix "B") to evaluate potential vertical migration of contaminants. These sampling intervals were consistent with shallow soil samples except for samples PSFSB-01A and PSFSB-02A. These samples were collected at a depth of 2.0 to 2.5 feet due to the prior collection of surface soils (PSFSS-01 and PSFSS-02) at these locations. The borings were positioned at or near the areas of most probable subsurface contamination and include the exits to the Pesticide Storage Facility (PSF), the equipment/vehicle rinse area, around the former CONEXs placed in 1988 (PCB Program Manager), adjacent to transformer storage areas, around the PSF, and downslope of the PSF. The sample depth of 1.5 to 2.5 feet was selected because some, but not all pesticides can degrade immediately after, or even before, application and during storage (Pesticide Transformation Products, Division of Agrochemicals Symposium, August 1990). The samples were collected from a depth of 3.5 to 4.5 feet or at the estimated base depth of the fill material. These were collected to account for fill operations which have occurred, and to assess the presence of degradation products which may have migrated to that depth. Chemical isoconcentration maps for the 1.5 to 2.5 feet deep samples (refer to figures 4-7 through 4-11) exhibit patterns similar to those of the 3.5 and 4.5 feet samples (Figures 4-12 through 4-15). This similarity suggests that the 3.5 to 4.5 samples reflect the same source (origin) that produced the shallower contamination.

Samples were containerized following the same procedures as described in the collection of surface soil samples. The sampling equipment was decontaminated prior to each sample collection.

Soil samples were collected from the five monitoring well boring locations as shown on Figure 2-4 and Plate 1. Each boring was advanced using 6.25-inch inside diameter (ID), hollow stem augers. Split-spoon samples were collected continuously. Two soil samples were collected for analysis from borings PSF92-01, PSF92-03, PSF92-04 and PSF92-05. These samples were collected at depths representing approximately half the distance to the water table (approximately 14 feet deep) and at the water table (approximately 25 feet). The soil chemical profile was evaluated in more detail by collecting samples from boring PSF92-02 at 1.0 to 2.0 feet below ground surface and thereafter at five foot intervals down to the water table. Samples were containerized following the same procedures described in the collection of surface soil samples. The sampling equipment was decontaminated prior to each sample collection.

2.1.6 Ground-Water Investigations

The primary objectives of the ground-water sampling program were to better evaluate the hydrogeologic conditions at the site and to evaluate the extent of contaminant migration via ground water. Five monitoring wells were installed at and around the facility. Well locations are shown in Figure 2-4. Monitoring well PSF92-01 is the upgradient, background well and was installed to evaluate baseline ground-water conditions. Monitoring well PSF92-02 is located topographically downgradient of the former rinsing activities that occurred on site. Monitoring wells PSF92-03 and PSF92-04 are located downgradient of the former PCB electrical transformer storage area. Monitoring well PSF92-05 is located where the geomorphology transitions from the alluvial plain (flood plain) to the adjacent terraces of the Kansas River and was installed to evaluate whether contaminants have migrated downgradient away from the site.

The initial well development was performed at the PSF site following the procedures described in the Work Plans. However, turbid samples were observed during post-development purging for the baseline sampling event using the prescribed sampling procedure. Modifications to well development procedures and well sampling procedures (Appendix C) were approved and implemented. The modified development procedures were:

- Measure static water level of water.

- Measure total well depth.

- Surge as follows: 1) lower the surge ring/QED-brand system pump to the bottom of the monitoring well and surge the well screen with a short and gentle push/pull action (plunger-type motion) for 5 to 10 minutes; 2) pump the sediments and water from the well; 3) repeat step 1, increasing the plunger motion of the surge block to a more vigorous and longer stroking motion for 5 to 10 minutes; 4) repeat step 2 to remove sediments from the wellbore; and 5) continue alternating the surging action with pumping for a minimum of 4 hours or until the water was cleared and free of sediment.

- An attempt to remove five well volumes of ground water plus three times the water loss during drilling/installation was made. Temperature, pH, conductivity, and turbidity (in Nephelometric Turbidity Units) are recorded after removal of each well volume. Continue to remove water until a reading of 30 or less NTUs was achieved, if not, notify the Corps of Engineers Project Manager (COE-PM).

- Collect approximately 1 liter of water from the well in a clear glass jar, label and photograph it and submit a 35mm color slide to the COE-PM as part of the well log. The photograph was a closeup and suitably backlit to show the clarity of the water.

- Record the total quantity of water removed.

- Measure static water level after 24 hours.

- Measure total well depth.

Well development data were recorded on the forms included as Appendix I.

Ground water sample collection, as noted in the work plans, was to be conducted in a manner which lessened the interaction between the sample and ambient (surface) environmental conditions, thus maintaining sample integrity. The work plans specified the use of dedicated bailers for sample collection.

As noted in the previous text discussing well development, the NTU criteria for sampling was not being satisfied during sample collection (May 1992) using bailers. Therefore, during the additional well development activities, it was agreed upon to use dedicated bladder pumps.

Use of these pumps not only provided samples satisfying the 30 NTU requirement (as published literature supports) but also provided samples more closely representing the ground water quality at the well at the time of sampling. The sampling protocols at this facility were as follows:

- Total depth of well is recorded.

- A water level indicator was used to establish the level of water in each boring (which enables the calculating of fluid volume in the casing). The water level indicator was decontaminated between each measurement.

- A dedicated well system bladder pump was used at the facility to purge and collect ground-water samples (Figure 2-6). The bladder pump was designed to deliver a flow stream of 100 milliliters/minute to help insure VOC integrity as well as maintaining a constant flow rate throughout the sampling process. The bladder pumps were placed two feet above the bottom of the screened interval. After purging a minimum five casing volumes and achieving turbidity below 30 NTUs, samples were collected and analyzed for the indicator parameters. Results of the analysis are presented in Section 2.1.6.

A permeability test was conducted at each of the PSF wells. These tests were performed to evaluate the hydraulic conductivity of the "aquifer" media and to estimate ground-water flow velocity on site. The resulting data were reduced using the equation and methods developed by Bouwer and Rice (1976). The Bouwer and Rice equation, as analyzed by the software program AQTESOLV, is as follows:

$$K = \frac{r_c^2 \ln (R_e/r_w)}{2L_e} \frac{1}{t} \ln \frac{Y_0}{Y_t}$$

Where:

- K = Hydraulic conductivity
- L_e = Saturated screen/sandpack length
- Y = Vertical difference in water level inside well and static water table
- R_e = Effective radius distance over which Y is dissipated
- r_w = Radius of screen plus filter pack
- r_c = Casing (riser) radius
- Y_0 = Displacement at time zero
- Y_t = Displacement at time "t"

The depth to ground water was measured from the top of the casing. This static water level, along with the total depth of the well, was used in determining the length of the water column and placement of the pressure transducer. The existing bladder pump was then removed and placed on clean plastic sheeting. The transducer cable was connected to the Hermit Data Logger (Hermit) and the transducer was lowered into the water to a depth of less than 23 feet below the top of the water (the transducer will be damaged if subjected to water pressure at depths greater than found at 23 feet). The transducer depth was displayed on the Hermit and the water level was allowed to stabilize. The transducer was then referenced to zero feet. The "slug out" water levels were then monitored and recorded.

For slug-out tests, the transducer is referenced to zero. The data logger is turned on at the same time the slug is pulled above the water. The water level lowers and the data logger records the levels in a logarithmic mode until the water returns to static. The transducer is removed from the well and the bladder pump is placed back to the well. All downhole equipment is cleaned between wells. Data is transferred from the data logger to a computer disk for later analysis. The results are presented in Section 3.1.5.2 and Appendix K.

2.1.7 Human Population Survey

A population survey was conducted to assist in the evaluation of potential risk(s) associated with PSF activities. The survey consisted of conducting telephone interviews with appropriate local officials and review of available literature/documentation. The results are presented in Section 3.1.6.

2.1.8 Ecological Investigation

Qualitative evaluation of ecological parameters, primarily threatened and endangered species and species habitat and wetlands survey, was performed to assess the potential environmental risk(s) associated with PSF activities. Specific activities for this task include review of available literature, interviews/discussions with the U.S. Fish and Wildlife Service (Kansas State Office) personnel, personal discussions with the Fish and Wildlife Administrator, Fort Riley, discussion with CEMRK wetland specialists, and site reconnaissances by Law personnel. Results of these activities are presented in Section 3.0 of this report.

2.2 TECHNICAL MEMORANDA

This section summarizes the changes or deviation from the planned field activities which are presented in the Work Plan and Field Sampling Plan documents. These changes are the result of either encountering unanticipated conditions while in the field and/or LEGS receiving specific changes in scoping or tasks from CEMRK and/or Fort Riley personnel. In the event that significant changes in field activities occurred, LEGS documented these changes in the form of a Technical Memorandum(a) (TM) as required by the FFA. These TMs are included in Appendix C. A list by subject of the PSF TMs included in Appendix C are as follows:

- Chemical Profile Sampling of PSF92-02 Monitoring Well Boring, March 30, 1992 (Appendix Ca).
- Sampling Procedures for Monitoring Wells at the Pesticide Storage Facility, July 10, 1992, Tech Memo #PSF-001 (Appendix Cb).

3.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

3.1 INTRODUCTION

LEGS conducted a field investigation to evaluate the nature and extent of potential surface and sub-surface contamination in the vicinity of the PSF. Investigation tasks and rationale are presented in Section 2.0 of this report. Section 3.0 summarizes field activity results. Project field investigation activities were initiated February 11, 1992 and ended July 20, 1992, upon completion of the topographic survey.

3.1.1 Surface Features

The PSF is situated on an escarpment on the north side of the Kansas River Valley approximately 2,000 feet west of the Kansas River, on the southeast edge of the Main Post cantonment area. Topographic elevations at the PSF are about 25 feet higher than the Kansas River. The easterly flowing Kansas River is formed by the confluence of the Smoky Hill and Republican Rivers, approximately 1.5 miles west of the PSF.

In general, the relative positions of the alluvium and terrace areas are described as follows. Geologically recent alluvium extends from the Kansas River to the first distinguishable escarpment. Older alluvial deposits underlie the Newman terrace that extends from the first escarpment to the next escarpment (or change in soil texture) towards the valley wall. Finally, still older alluvium underlies the second Buck Creek terrace, which extends to the valley wall. The alluvium beneath these two terraces are referred to as terrace deposits.

Surface water impoundments at or near Fort Riley include a man-made reservoir, several oxbow lakes (crescent shaped lake formed in an abandoned river meander which has become separated from the main stream by a change in the course of the river), and several large and smaller ponds. Milford Reservoir is located west of Fort Riley and is fed by the Republican River. There are no surface water impoundments within the PSF drainage basin or immediately downstream of the Kansas River (Figure 2-1).

Surface drainage at the PSF follows the general topography and is directed to the east. It then enters the lined drainage ditch running from Dickman Avenue to the railroad tracks southeast of the site (Figure 1-3). The sides of the drainage are constructed of cemented limestone blocks. This lined drainage proceeds southward under the railroad tracks (approximately 100 feet) and then flows into an unnamed tributary flowing approximately 2,000 feet south to the Kansas River.

The topographic survey confirmed the general observations of the site reconnaissance. The ground surface slopes downward towards the east-southeast with a gradient of approximately one foot fall for every 13 feet of run (1:13) or a slope of approximately 4.83° or 10.73%. There is an abrupt drop or slope change just east of the PSF fence line (Plate 1). The resulting topographic map is attached to this document as Plate 1. The topographical survey data for all sampling locations is attached as Appendix D.

3.1.2 Surface Water Hydrology

Surface water features at Fort Riley can be characterized into three distinct categories: rivers, streams/drainages and impoundments. Refer to Figure 3-1 and Plate 1 for the locations of these features.

The major rivers in the vicinity of the PSF are the Republican, Smoky Hill and Kansas Rivers. The Kansas River is located approximately 2,000 feet south of the PSF (USGS, 1982). There is no levee between the PSF and the Kansas River (USGS, 1982).

A Flood Insurance Study report (FEMA, 1988), lists the following flood elevations, above mean sea level for the Kansas River: 10 year = 1,059 feet; 50 year = 1,067 feet; 100 year = 1,070.5 feet; and 500 year = 1,078 feet. Figure 3-1a shows the area of flood hazard around the PSF. Therefore, based on these data and the ground surface (1,088 feet to 1,062 feet MSL) for the PSF (Plate 1), the southern portion of the area of investigation lies within the 100 year flood plain. Previous Kansas River flood events are not documented to have reached or inundated the PSF. However, DEH personnel state that floods of the early 1950s reached and inundated the DEH yard in general and PSF specifically. High water stages in the Kansas River occur from the last part of February through the first part of June. The lowest river stages occur from late October through January (USGS, 1992). Before the construction of Milford Reservoir, major flooding occurred approximately every eight to 10 years, with a three to five day duration (USGS, 1992).

The Kansas River flows at a mean annual discharge rate of 2,750 cubic feet per second (cfs), calculated as the combined flow from the Republican and Smoky Hill Rivers (USGS, 1992) at the USGS gaging station on Henry Drive off Interstate 70. The Republican

River flows at a mean annual discharge rate of 1,007 cfs. The lowest flow recorded was 50 cfs, and the highest flow recorded was 13,500 cfs (USGS, 1992). The Smoky Hill River discharges approximately 1,760 cfs (USGS, 1992).

General surface water quality is considered moderate to poor (USGS, 1992), especially during periods of lower flow. The waters are characterized as turbid, alkaline, moderately mineralized, buffered, with high dissolved oxygen content, low organic load, high nutrient levels, and high bacterial levels. However, the Kansas Department of Health and Environment has not issued restrictions on fish consumption and class III recreation along the Kansas River near Fort Riley.

The streams/creeks and drainages within the installation boundaries are ephemeral in nature. This includes the drainages within the immediate vicinity of the PSF (Figures 1-1, 2-1 and Plate 1).

Surface run-off would flow easterly, following the general topography of the site (Section 3.1.1). Direct observation during a thunderstorm confirms that surface run-off follows the general topographic trends (Figure 3-2) (IRP Manager, 1992). Surface run-off behaves as sheet flow in the unobstructed areas of the DEH yard topographically upgradient of the PSF. As the run-off follows the general slope it is, to a degree, interrupted by Buildings 345, 346, 347 and 348. Once the flow has "navigated" these obstacles, it then enters the drainage box (12-inch corrugated metal pipe) culvert discharging via overland into the rock-lined drainage and eventually into the Kansas River (Plate 1).

3.1.3 Geology

This section presents a discussion of the regional and site specific geology as related to the PSF investigation. This section references heavily the Kansas Geological Survey (KGS) Bulletin #189 - "The Stratigraphic Succession in Kansas", 1968.

3.1.3.1 Regional Geology - Fort Riley is situated in three distinct geomorphic areas (Figure 3-3). The first is the uplands area, which are underlain by flat-lying and gently-dipping (northwesterly), interbedded limestone and shale units. The shallowest rocks beneath the uplands area consists of various shale units. The deeper limestone are typically exposed along the escarpments. Small streams have dissected these thick shale units and eroded much of the area into a rolling plateau. Local relief ranges from 164 to 240 feet in the uplands area. The second is steep to hilly country which extends from the uplands down to the alluvial bottomlands. This second geomorphic area is occasionally mantled by loess deposits. The third is the alluvial bottomlands of the Republican and Kansas Rivers. Relief in this area ranges from 25 to 60 feet.

Stratigraphic units present at Fort Riley are Lower Permian in age and consist of alternating limestones and shales (Figure 3-4). The Chase Group and the Council Grove Group are the uppermost geologic units, with the Chase Group being the uppermost of the two. Bedding planes dip gently to the northwest at approximately 15 feet per mile.

Geologic formations at Fort Riley within the Council Grove Group, include Stearns Shale, Bader Limestone, Easly Creek Shale, Crouse Limestone, Blue Rapids Shale, Funston Limestone, and Speiser Shale.

Of these, the lowermost formation, the Stearns Shale is mostly gray to olive-gray, but red shale occurs in the middle and lower parts. It contains a minor amount of argillaceous limestone. The thickness ranges from about five feet to 20 feet.

The Bader Limestone formation consists of the Middleburg Limestone member, the Hooser Shale member and the lower Eiss Limestone member. The formation thickness ranges between 15 and 33 feet (KGS 1968).

The Eiss member contains two limestone beds separated by shale and is remarkably persistent across Kansas (KGS 1968). The lower limestone, which is between 1.5 feet and six feet thick is shaley, thin bedded and fossiliferous, containing many small, high spired gastropods (KGS 1968). The middle part is two to 11 feet thick and consists of gray fossiliferous shale. The uppermost limestone bed is two to three feet thick and can contain locally abundant chert.

The Hooser Shale Member, of the Bader Limestone Formation, is a gray to grayish-green and red shale. It ranges in thickness from approximately seven to 11 feet.

The Middleburg Limestone Member consists of a massive, slabby limestone and, a light olive to gray shale. The lower part of this member is fossiliferous (no species are noted in the reference). Thicknesses range between 1.5 feet and eight feet.

The Easly Creek Shale formation consists of a single member approximately 10 feet to 20 feet thick. This shale is red, green and gray and can contain locally thin limestone beds.

The Crouse Limestone Formation comprises an upper and a lower limestone separated by a few feet of fossiliferous shale. The upper part displays platy structure and weathers tan to brown. The limestone beds locally are cherty. The thickness ranges from about six to 18 feet (KGS, 1968).

The Blue Rapids Shale Formation is a gray, green and red shale, locally containing some limestone. The thickness ranges from about 15 to 30 feet.

The Funston Limestone Formation is a light-gray to bluish-gray limestone separated by gray to yellowish-gray shale and is locally fossiliferous. The thickness ranges from about five to 28 feet.

The upper part of the Speiser Shale Formation consists of gray fossiliferous shale underlain by a fairly persistent limestone bed, which is commonly less than one foot thick and occurs about three feet below the Wreford Limestone. The remainder consists of beds of varicolored shale, red shale being predominant. The thickness is about 18 feet.

Geologic formations within the Chase Group from lower to upper include the Wreford Limestone, Matfield Shale, Barneston Limestone and Doyle Shale. This group is approximately 335 feet thick and its chert-bearing limestones typically form escarpments in the region.

The Wreford Limestone Formation contains two limestone members and a shale member. The Limestones are characterized by an abundance of chert. The thickness ranges from about 30 to 40 feet.

The Matfield Shale Formation contains two varicolored shale members separated by a limestone member. The thickness ranges from about 50 to 80 feet.

The Barneston Limestone Formation comprises two thick limestone members separated by a thin shale member. The upper limestone makes an extensive dip slope and crops out as a steep escarpment that extends from north to south across eastern Kansas. The Barneston Limestone Formation caps much of the western part of the Flint Hills. The thickness of the formation ranges from about 80 to 90 feet.

The Doyle Shale Formation is comprised of two shale members and a separating limestone member. The thickness is about 70 feet.

Overlying the bedrock are alluvial deposits, residual soil developed from the bedrock, and windblown loess of Pleistocene and Recent age. The loess deposits on Fort Riley range from 0 to 2 feet in thickness (USAETL, Terrain Analysis Center, 1977). Where the Republican and Kansas Rivers have eroded into the Permian limestones and shales, there may be found alluvial deposits of silt, clay, and very fine sand near the surface grading to coarser sand and gravel with depth. The maximum thickness of the alluvium at Fort Riley, as determined from well logs, is 91 feet.

3.1.3.2 Site Specific Geology - The PSF is located in the Buck Creek Terrace deposits north of the Kansas River alluvium. These terrace deposits are part of the valley-fill deposits of the Kansas River valley and contain water-bearing sand and gravel (KGS, 1974). They are described as grading upward from brownish-yellow sand, sandy silt and fine gravel in the lower part to reddish-brown and reddish-tan silt in the upper part. The soils formed in this material are described as reddish-brown or reddish-tan silt and clay and are discussed in Section 3.1.4.

The downgradient well, PSF92-05, is located south of the PSF in the Kansas River alluvium. The lithology is described as grading upward from locally derived flat limestone pebbles and boulders on the bedrock surface to brownish-gray arkosic sand and gravel in the lower part to fine sand, silt and silty clay in the upper part. The soils overlying the alluvium generally are tannish-brown sandy silt and silty sand. Surface elevations of the investigation area range from approximately 1093 feet to 1063 feet MSL.

Field investigations revealed depths (BGS) to the competent shale and limestone bedrock in the study area to range from approximately 28 to 29.5 feet, or elevations 1049.09 to 1049.8 feet MSL. The materials were generally found to be yellow-orange to brown, coarse to fine sand, silty sand and clayey sand to brown and black silt and clayey silt. The unconsolidated materials alternate between brown and black silt or clayey silt and brown to yellow-brown fine to coarse sand or clayey sand. In the monitoring well borings (PSF92-02, 03, 04), asphalt or gravel was present at the surface. Refer to Figure 3-5, "Location of Geologic Cross Section", and Figure 3-5a, "Geologic Cross Section A-A'", for graphical representations of the site-specific geological conditions.

An area fill is interpreted to have been placed for site grading during the original site construction in 1941. This is based in part on comparing with pre-construction topographic maps dated 1907 and the survey map 1993 (Figure 3-5B). The highest fill occurred on the east side of Building 348 near PSF92-03 (≈10 ft.). Schematic Cross sections A-A (Figure 3-5c) and B-B (Figure 3-5D) illustrate approximate profiles north of and through Building 348. Substantially more fill was placed near Building 348, probably in an effort to extent the terrace surface southward. The source of this fill during original construction in 1941 is unknown. Fill at PSF92-02 and PSF92-04 is estimated to be at 7 and 3 feet, respectively. Detailed descriptions can be found on the HTW Drilling Logs and Test Boring Records, Appendix E and F, respectively.

The bedrock encountered beneath the alluvial and terrace deposits is Lower Permian in age and is believed to be of the Council Grove Group, Gearyan Stage (Figure 3-3).

3.1.4 Soils

Two geotechnical samples were collected at each of the five well soil borings. Monitoring wells were later installed in these borings using hollow stem augers. Soil samples were collected at specified horizons using two-inch split spoon samplers. The first sample was collected in the fill material zone and the second sample was collected at the screened interval. The geotechnical analysis from the five borings has classified the soil as clayey sands (SC) and clayey silts (ML) under the Unified Soil Classification System. Table 3-1 shows the classification of the soil at each boring together with parameters analyzed and the Unified Soil Classification System identification.

Soil Survey of Riley County and Part of Geary County, Kansas by the United States Department of Agriculture Soil Conservation Service (USDASCS, June 1975) has classified the soil at the PSF and its vicinity to be of the Kennesaw Series (Kf) silt loam, with six to ten percent slopes. The surface layer is about 12 inches thick consisting of dark gray to dark grayish-brown silt loam. The subsoil which extends to 36 inches deep is made up of brown to light brown silt loam. The Kennesaw soils are well drained and moderately permeable. Surface run-off is medium to rapid in some cultivated areas, and erosion is a severe hazard.

A Soil Test Boring Record for each boring is contained in Appendix F. Detailed geotechnical analytical results consisting of Grain Size Distribution graphs and Analysis of Aggregate reports are contained in Appendix G.

3.1.5 Hydrogeology

This section presents the available general hydrogeology of the region. Site specific hydrogeology conditions and results are also presented in this section.

3.1.5.1 Regional Hydrogeology - The Fort Riley Military Installation covers a portion of the Republican and Kansas Rivers and Milford Reservoir watersheds. This area is characterized by poorly developed karst topography (KGS, 1968) and cyclothemic stratigraphic sequences of interbedded limestones and shales. The term "karst" refers to lithologic characteristics associated with dissolution of carbonate rock by ground-water movement through the rock column.

Karst topography from a classical perspective, generally refers to geomorphic and geologic structures associated with physiographic regions other than the state of Kansas. However, sinkholes and other solution features associated with Karst topography are known to occur in beds as old as the Cambrian-Ordovician Age Arbuckle Group and "affect almost every rock formation of the geologic column in Kansas, including recent deposits (Merriam and Mann 1957)." The area of large-scale karst features is limited in Kansas; most shallow karst features in the study area are solution joints and small sinks related to collapse over solution joints.

Sinkholes have been reported in 26 of the 105 Kansas counties (KGS, 1968). The geographic distribution of Kansas sinkholes (and again other solution features) is controlled by the outcrop or sup-outcrop pattern of soluble stratigraphic units (KGS, 1968).

The term "cyclothemic" or cyclothem refers to the interbedded sequence of limestones and shales resulting from the encroachment and receding of ancestral seas. The bedrock is overlain by unconsolidated material consisting of soil, alluvium and loess.

The principal source of water for municipal, industrial and irrigation supplies is the combined river and valley fill deposits of the Kansas River Valley (KGS, 1974). Ground water is also produced, to a lesser degree, from solution channels and joints in the Permian Age limestone bedrock aquifer which underlies the unconsolidated overburden (KGS, 1974).

The alluvium adjacent to the Kansas River and the Pleistocene Age Newman and Buck Creek terrace deposits are major geologic units in the Kansas River Valley (KGS, 1974). Within these deposits are zones of sands and gravels which are considered important water-bearing units.

Supplies adequate for local drinking water and moderate-scale agricultural activities can be derived from bedrock wells (KGS, 1974). Depth and presence of ground water varies depending on local physiographic, geologic, and hydrologic conditions. Wells completed in limestone at Fort Riley are producing from zones approximately 70 feet below the ground surface.

The primary source of drinking water for Fort Riley, Junction City and Ogden is the valley fill alluvium (alluvial aquifer) of the Republican and Kansas Rivers (KGS, 1974). Junction City and Fort Riley's water supply wells are within the Republican River floodplain (Figure 3-6).

The alluvial deposits are capable of yielding more than 1,400 gpm from a single well (KGS, 1974). This aquifer is recharged through direct infiltration of rain and seepage from limestone and shales. The Kansas and Republican Rivers are also primary sources of recharge to the alluvial aquifer. The regional direction of ground-water flow is generally towards the Kansas River and is influenced by river stage. Water levels in the Fort Riley water supply wells generally range from 15 to 25 feet below land surface (KGS 1949, 1974).

The Fort Riley and Florence limestones, members of the Barneston Limestone Formation, are the chief bedrock aquifers, producing a maximum flow of as much as 89 gallons per minute (gpm) (KGS 1941). These units occur in the plateau-like uplands and have relatively large catchment basins. Rainfall infiltration through the surface soil mantle can expect to produce weathering features that create more open textures in the rock, and subsequent enlargement of water bearing pathways along bedding and joint planes. Springs issue from these limestone units along exposed rock ledges on hillslopes. It is possible to obtain reliable water supply from these units, especially where wells are placed near the foot of westward facing hillsides. Limestone units that are topographically low and are overlain by thicker unconsolidated deposits than occur in the uplands are generally less weathered. The development of solution channels along bedding and joint planes would not be expected to be as extensive and therefore the water bearing capacity would be limited. Water levels and flow directions would vary widely depending upon the availability of rainfall to recharge these units and the stratigraphic relationships of intervening rock units to promote discharge from springs or wells.

3.1.5.2 Site Specific Hydrogeology - Five ground-water monitoring wells were installed at the PSF. Well construction/installation diagrams are included in Appendix I. They are numbered PSF92-01, PSF92-02, PSF92-03, PSF92-04 and PSF92-05. The wells were constructed out of two inch outside diameter (2" OD) poly vinyl chloride (PVC), flush threaded, schedule 40 casing (riser). Monitoring wells PSF92-01 through PSF92-04 used 2" OD, schedule 40 well screen with No. 10 (.010") screen slot size and 20/40 grade clean silica sand as filter pack media. Monitoring well PSF92-05 was constructed with 2" OD, schedule 40 well screen with No. 35 (.035") screen slot size and 10/20 grade clean silica sand as filter pack media. Appendices F, G and H (Well Installation Diagram) provide construction details and general hydrogeologic data for the PSF ground-water monitoring wells.

Additional well development was conducted according to procedures established by Fort Riley and the CEMRK. These procedures are discussed in Section 2.1.5 of this report. A summary of well development data is presented in Table 3-2. Development methods are also a topic of a Technical Memorandum which is included as an attachment to the addendum to the Draft Final Work Plan. However, well development data are included as Appendix I to this report.

Estimates of hydraulic conductivity (K) were calculated from slug out tests, as described in Section 2.1.6.1. The units of hydraulic conductivity are those of velocity (or distance divided by time). However, hydraulic conductivity should be used in referring to the water-transmitting characteristic of material in quantitative terms. When calculating ground-water velocity, the hydraulic conductivity is divided by the effective porosity, or the hydraulically interconnected pore volume, and then multiplied by the hydraulic gradient as measured normal to equipotential lines. Typically K is reported as feet per minute (ft/min) or centimeters per second (cm/sec). The unprocessed insitu permeability test results/data, recorded as change in head (displacement) versus time, is included as Appendix J. The resulting graphs of displacement versus time are included as Appendix K. The K-testing procedure is presented/discussed in Section 2.1.6.1 of this report.

Analysis and reduction of the raw slug test data according to Bouwer and Rice, 1976, resulted in calculated K values for the PSF wells ranging from 1.171 x 10^{-4} ft/min (5.9 x 10^{-5} cm/sec) to 1.03 x 10^{-3} ft/min (5.21 x 10^{-4} cm/sec) (Table 3-3).

The calculated direction of flow is east southeast with a gradient of approximately 0.07 ft/ft (2.13 cm/cm). The direction of flow was derived by performing three point calculations on grouped wells PSF92-02, PSF92-04 and PSF92-05. This is toward the Kansas River and appears to follow the approximate dip of the bedrock surface and the general topographic trends (Figure 3-7).

The average ground water flow rate, also referred to as the average seepage velocity, was calculated using the equation below:

$$\bar{V} = \frac{K \frac{dh}{dl}}{N}$$

where,
$\bar{V}$ = average seepage velocity (ft/min)
K = hydraulic conductivity (ft/min)
dh= difference of static head (ft)
dl= distance between wells (ft)
N = Avg. Porosity (30%) (Peck, Hanson & Thornburn, 1974)

Based on the range of estimates for hydraulic conductivity and the estimated hydraulic gradient given above, and assuming an effective porosity value for the geologic media of 0.30, calculated ground water flow velocities range from 2.7 x 10^{-5} ft/min to 2.4 x 10^{-4} ft/min.

3.1.6 Human Population Survey

The Fort Riley Military Installation is situated along the north bank of the Kansas River in Riley and Geary counties in north central Kansas, near the cities of Manhattan, Ogden, Junction City, and Grandview Plaza, Kansas. Respective populations of these cities and Fort Riley are as follows:

COMMUNITY	POPULATION	SOURCE
Fort Riley	17,164	(1990 Economic Impact Survey)
Manhattan	37,712	(Assistant Director of Planning, Manhattan)
Ogden	1,500	(City Clerk of Ogden)
Junction City	21,000	(Deputy City Clerk, Junction City)
Grandview Plaza	1,266	(City Clerk, Grandview Plaza)

Troop housing and support facilities are in the southern portion of Fort Riley and consist of the Main Post, Camp Forsyth, Custer Hill, Camp Whitside, Camp Funston, and Marshall Army Air Field. The remainder of the installation consists of troop/family housing, numerous training areas, gunnery complexes, small arms firing ranges, drop zones, tank trails, and an impact area used for live fire artillery. A more detailed discussion of demographics and land use is presented in Section 6.1.2.2.

3.1.7 Cultural and Historical Survey

Mobile hunters and gatherers, organized at the band level were the first inhabitants of the Plains. These bands, probably consisted of multiple families, hunted the large and small fauna of the Plains as well as exploited a broad spectrum of the plant community.

Paleoindian sites in the west and midwest are typified by the presence of fluted and unfluted lanceolate projectile points. No definitive Paleoindian camp or kill sites are documented for Kansas. Numerous "point finds", however, attest to the presence of these early bands within the present state's limits (Rohn and Blassing 1986:13)

The Archaic Period is divided into three major divisions Early, Middle, and Late. Seven complexes have been defined for the Flint Hills 1) Logan Creek complex; 2) Munkers Creek Phase; 3) Black-Vermilion Phase; 4) Chelsea Phase; 5) El Dorado Phase; 6) Nebo Hill Phase; and 7) Walnut Phase (Brown nd:XII-1). A general decrease in human population is seen for the Plains during the Early Archaic. In contrast to this trend, the Flint Hills appear to have sustained significant Archaic populations (O'Brien 1984:39-40).

Archaic peoples economic activities focused on hunting and gathering. Archaeologists have documented a range of site types that include camp sites, bison kill sites, and burial areas. A significant range of projectile point/knives and other lithic tools formed part of the material culture.

Clear and distinct changes in economic, political and religious systems of the Plains began to emerge at approximately 1,000-500 B.C. These changes were brought about because of site-unit intrusion to the area by people from the east.

The Early Ceramic Period is characterized by the introduction of pottery and horticulture. Other notable characteristics of the Early Ceramic Period include changes toward a more complex social organization, religious systems, and long-distance trade networks (O'Brien 1984:45).

In the Flint Hills, the Middle Ceramic Period is characterized by an intensification of those processes introduced and subsequently elaborated on during the previous stage.

By the Late Ceramic Period in the Flint hills, the primary settlements were large, fortified villages with semi-subterranean structures. These earth lodges were occupied for approximately five months of the year. Dome shelters and tents with open fronts were used as summer dwelling. During bison hunts, the tipi served as shelter. The subsistence regime of the Pawnee is reported to have been focused on maize and bison.

Interest in the antiquities within Fort Riley and the region have been documented to extend back to the Late 19th-Century. Prominent figures in this movement were members of the Scientific Club of Kansas State Agricultural College, the Quivira Historical Society and the Kansas State Historical Society.

Since the 1930s, several institutions and individuals have conducted archaeological research in the region, and, within the Fort Riley complex. The Smithsonian Institution's River Basin Surveys conducted surveys in the Tuttle Creek Reservoir that resulted in the identification of 119 sites. The National Park Service and the Kansas State Historical Society carried out excavations of sites to be affected by the construction of Milford Reservoir (Rohn and Blassing 1986:11).

Since the late 1960s, several researchers have continued investigating the Milford Reservoir district. These endeavors have resulted in the identification of close to 100 sites ranging in age from Archaic to Pawnee Indian village (Rohn and Blassing 1986:11).

Survey projects designed to inventory the military installation include the work undertaken by the Kansas State Historical Society. This project included surveys of the cantonment zones and of the training and maneuver areas. This study resulted in the recording of 23 prehistoric sites and 336 historic buildings.

Most recently, the Public Service Archaeology Program of the University of Illinois Urbana-Champaign conducted a Phase I Survey of 557 hectors along the boundaries of Fort Riley. This survey resulted in the identification of 46 "Areas of Scatter" and 11 Isolated Finds. Thirty-six "Areas of Scatter" were assigned a prehistoric provenance and the other 10 determined to be historic.

The main post complex comprising approximately 271 acres was placed on the National Register of Historic Places in 1974 by the U.S. Department of Interior. These resources consist primarily of historic structures, several archaeological resources are also contained within the historical district.

The architecture of Fort Riley has been documented employing Historic American Buildings Survey/Historic Architecture and Engineering Record (HABS/HAER) levels of documentation. Historical documentation has been conducted to identify primary and secondary sources relating to the history and construction efforts at the installation, and a draft has been issued (Andros et al. 1993).

The records search revealed that a hay barn constructed in 1909 was formerly located within the study area. According to Dr. Martin Stein (personal communication to Carlos Solis: 7 April 1993), the barn appears to have been located in the area designated for the storage of electrical equipment. Examination of the list of buildings designated to have historic significance did not list Building 348. The review of published and unpublished literature did not provide evidence for the presence of other potential resources.

Examination of recent cartography and records revealed that this part of Fort Riley has been an integral part of the main post at least since the early part of this century. Current cartography documents that parts of the study area have been urbanized. The Study Area contains large and small structures, paved expanses, streets, former and existing railroad beds, and a space described as an area of stressed vegetation.

The estimated potential for the presence of prehistoric sites within parts of the study area are considered significant. There exists the potential for the presence of archaeological evidence of the barn and associated features and/or structures. In addition to historic resources, this area, within a context defined as "unexplored areas", may include historical/cultural sites.

Activities associated with the mission of the military reservation are considered to probably have, in part, adversely affected cultural resources present or that may have existed. This is particularly the case for sites that are represented by surface scatters.

3.1.8 Ecological Survey

Land use in the undeveloped portions of Fort Riley consists primarily of grasslands or woodlands, with very little acreage devoted to crop production. Cropland on the reservation is planted primarily as wildlife food plots or as a firebreak between private and federal lands. Grasslands may be comprised either of native prairie species, of cool-season tame grasses, or of naturally invaded grasses and forbs on old field or "go-back" acres where crops once grew (U.S. Department of Interior, 1992).

A survey of threatened and endangered species on the Fort Riley Military Reservation was conducted by the State of Kansas Fish and Wildlife Service. Although the eastern hognose snake was included in this survey, it was delisted by the state of Kansas effective August 31, 1992. According to the Terrestrial Ecologist for the Fish and Wildlife Service, the status of this species has changed from "state-listed endangered" to a species "in need of conservation."

A site survey was conducted with the Fish and Wildlife Administrator at Fort Riley with LEGS personnel on August 5, 1992. The purpose of this survey was to determine if PSF activities impact any habitats suitable for threatened and endangered species. Due to the close proximity of the PSF to the floodplain of the Kansas River, the wooded area to the east of the PSF can be categorized as a riparian woodland, however there are no documented sightings of wintering bald eagles in this area. The Fish and Wildlife Administrator did mention that the confluence of the drainage ditch to the east of the PSF and the Kansas River provides a suitable habitat for the sturgeon chub, which is a federal category 2 species. However, the summary report on threatened and endangered species states that the occurrence of the sturgeon chub at Fort Riley is very unlikely. Category 2 candidate species are those for which the Fish and Wildlife Service is seeking additional information regarding their biological status, in order to determine if listing of these species appears warranted (U.S. Department of Interior, 1992). Section 6.2 describes the exposure assessment criteria for ecological populations.

3.1.9 Climate

The Fort Riley area experiences four distinct seasons; summer, fall, winter, and spring. During the summer months (June, July, and August), the average daily high temperature is 89°F while the average daily low temperature is 65°F. the summer daily mean temperature is 77°F.

During the winter months (December, January, and February), the average daily high and low temperatures are 47°F and 27°F, respectively. The winter daily mean temperature is 30°F.

Extreme high and low summer temperatures are 110°F and 42°F, respectively, while the extreme high and low winter temperatures are 79°F and -20°F, respectively.

The average amount of precipitation for this area of Kansas is approximately 34 inches per year with 70 per cent of that occurring during the six month period between April and September. However, during the 1992 calendar year, when a majority of the field activities took place, the Fort Riley Marshall Army Air Field Weather Station recorded nearly 45 inches of precipitation. Equally unusual is that approximately one-half, or 24 inches, occurred during the summer months, which for Kansas are typically the dryer months of the year. Thirteen inches of rain fell in the month of July 1992 alone.

The data presented above are averages over a 30-year period (1962-1992) as recorded by the First Weather Group, Detachment 8, Fort Riley Marshall Air Field. Table 3-4 presents this data in tabular form.

3.1.10 Wetlands Survey

A wetland delineation was completed on March 8, 1993, by the Corps of Engineers, Kansas City District (CEMRK, 1993). The site was surveyed both upstream and downstream of the railroad right-of-way. The area above the railroad was characterized by mature riparian timber along a rock lined intermittent drainage. The lowest elevation in the riparian area on the east side of the creek was selected as the data point. The area was not considered a wetland.

The area below the railroad was surveyed by foot and characterized by mown fescue with a grassed waterway to convey drainage from the rock-lined channel. Data sites were not selected in this area as no evidence of wetlands existed.

Based on the wetlands report and Section 404 of the Clean Water Act (CWA), there are no wetlands within the immediate vicinity of the PSF that meet jurisdictional requirements (Fish and Wildlife Administrator, 1992). A review of the National Wetlands inventory conducted by the U.S. Fish and Wildlife Service did not identify wetlands within the immediate vicinity of the PSF. The Fort Riley Fish and Wildlife Administrator indicated that based on facultative plant types, soil types (mottles for example) and/or duration of inundation (annually) there could be wetlands (non-jurisdictional). The Administrator further stated that these were likely associated with the drainages nearby. However, they would be small (less than one-fourth acre) and of low quality.

4.0 NATURE AND EXTENT OF CONTAMINATION

The objective of this investigation is to determine the nature and extent of contamination caused by the discharge of rinse water from the washing of vehicles and spray equipment and mixing operations at the PSF (old Building 292, new Building Number 348). Representative surface soil, subsurface soil, sediment, surface water and ground-water samples were collected at the site for chemical analysis. The following sections discuss the results of the analytical program. The discussion includes positive analytical results, as well as the non-detected analytical results. It should be noted that PCBs, acid herbicides, and dioxin were not detected in any samples. Analytical results are provided in Appendix L. Evaluations of data quality were provided in the Quality Control Summary Reports (QCSRs) dated September 1992, January 1993, April 1993, and July 1993 (Law, 1992b; 1993a; 1993b; and 1993c).

4.1 CONTAMINANT SOURCES

The PSF is located within the DEH yard (Figure 1-2). The northern portion of the building (approximately 30 ft. x 30 ft.) is used to store pesticides and herbicides (Figure 2-1). In the past, pesticides and herbicides were also mixed at this facility prior to application. Historically, the types of pesticides and herbicides used can be expected to have paralleled those that were generally available to the public at the time of use. Tables 2-3 and 2-4 provide inventories of the PSF in 1979 and 1983, respectively.

4.1.1 Primary Source

Prior to about 1975, pesticide wastewater and concentrated spills were allowed to run onto the ground surface east of the PSF. The rinse water from the washing of vehicles and spraying equipment was also allowed to run onto the ground surface in this area. An area of stressed vegetation measuring approximately 20 ft. x 20 ft. is located downgradient (to the east) of the PSF outside of the perimeter fence. Currently, rinse water is sprayed over the treated area or saved for future pesticide applications. Since at least 1976, the majority of insecticide application has been performed by outside contractors to Fort Riley. Contractors do not use the PSF for formulation or mixing of the pesticides.

The presence of polynuclear aromatic hydrocarbons (PAHs) in the soil samples may be attributed to treated lumber and asphalt that are stored within the DEH yard north of the PSF (Figure 4-1). Pressure treated lumber may be preserved with pesticide-containing pentachlorophenol or creosote to protect it from insect attack and decay. Asphalt is a complex mixture composed primarily of heavy molecular hydrocarbons similar to creosote. Both creosote and asphalt contain PAHs which may explain the presence of PAHs detected in the soil samples collected from the PSF vicinity.

According to discussions with a civil engineer in the Design Branch at Fort Riley, the Stored Electrical Equipment area (Figure 4-1) was paved with asphalt during August/September 1990. This activity may also be related to the presence of PAHs in soil samples from the site.

4.1.2 Other Sources

Another possible source area is the Former Dip Tanks. The Former Dip Tanks were located east southeast of the PSF and north of the existing railroad tracks (Figure 2-2).

The dip tanks were used to treat horses against body lice and other insects. According to discussions with the Extension Specialist and the Extension Entomologist, the pesticides used for dipping livestock were: "Hot Lime" prior to 1945, DDT from 1945 to 1948 and Lindane (gamma BHC) from 1948 to the mid 1980s. Because the location of the Former Dip Tanks was downgradient of the PSF, its impact on the current investigation-derived data is minimal to non-existent.

A possible secondary source of PAHs in the soil samples is historic pesticide application practices. Many technical grade pesticides were dissolved in a heavy aromatic naphtha (HAN) and diluted with kerosene or other light oils to aid in adherence to the plant surfaces (Law Environmental National Laboratories QA Officer, 1992). This was the common practice up into the late 1970s (Law Environmental National Laboratories QA Officer, 1992). However, there is no documentation that pesticides were applied in a petroleum distillate at Fort Riley prior to 1970. Currently, only herbicides are applied by Fort Riley personnel and they are mixed with water at the site to be treated. The Senior Pesticide and Herbicide Program Manager stated that occasionally 2,4-D was mixed with crop oil (highly purified mineral oil) for "hard-to-kill" pests.

PAHs such as naphthalene, phenanthrene and anthracene have also been used as pesticides. Their use in this capacity, however, has never been documented at Fort Riley.

Current activities at Fort Riley include the application of herbicides to control weed species. These activities thus involve the transfer of bulk material (either wetable powders, other powders or liquids) from storage (in building 348) to application equipment for herbicide formulation and application. It was noticed by Law personnel, during the collection of shallow hand auger boring samples, that Fort Riley personnel filled up the tanks on the herbicide equipment and rinsed off their vehicle/equipment at the northwest corner of the building. Since concentrations of herbicides were not detected in any samples collected during this investigation, these current activities may not be acting as a source to the contamination found at and around the PSF.

4.2 SAMPLING PROGRAM AND ANALYTICAL RESULTS

The following sections discuss the sampling program and summarize the analytical program used to evaluate the nature and extent of contamination of the site. The following sections are divided into separate discussions of results by matrix.

Field samples which were collected for chemical analysis are summarized below by matrix.

Location Description	Matrix	No. of Locations	Samples per Location	Total Samples
Surface	Soil	4	1	4
Shallow borings	Soil	20	2	40
Pilot Hole	Soil	1	2	2
Monitoring Well	Soil	4	2	8
Chemical Profile [a]	Soil	1	5	5
Monitoring Well	Ground Water	5	1	5
Ditch	Surface Water	8	1	6*
Ditch	Sediment	8	2	14*

*Surface water/sediment not present at all locations.
[a]Monitoring well PSF92-02 served as a chemical profile boring.

Samples were collected in accordance with the Work Plans (Law, 1992). Surface soils, subsurface soils, surface water, and sediment samples were collected March through May, 1992. Ground-water samples and sediment samples PSFSD-09A and PSFSD-09B were collected in July 1992. Sampling locations are shown on Figures 4-1 through 4-4. Information concerning the detection limits for constituents, sample containers and preservation and holding time requirements is provided in Appendix M. The methods chosen were appropriate to identify contaminants of concern. A comparison of ARARs and To Be Considered (TBC) requirements to method detection limits is presented in Tables 4-1 through 4-4 and is also included in Appendix M.

This section focuses on the contaminants of concern which are chlorinated and organophosphorus pesticides, PAHs, and metals. Methylene chloride is not discussed because it was detected in several method blanks indicating laboratory contamination. Refer to the Quality Control Summary Reports (Law, 1992) for additional details regarding laboratory blank contamination.

As stated in Section 4.0, PCBs, acid herbicides, and dioxin were not detected in any samples. While every sample was analyzed for PCBs and acid herbicides, dioxin analysis (2,3,7,8-TCDD isomer only) was performed on the following soil samples:

Shallow soil borings:	PSFSB-03B	Pilot hole:	PSF92SB-01A
	PSFSB-05A		PSF92SB-01B
	PSFSB-07B		
	PSFSB-09A	Surface Soils:	PSFSS-01
	PSFSB-10A		PSFSS-02
	PSFSB-12B		PSFSS-04
	PSFSB-17A		
Sediment:	PSFSD-04A		

4.2.1 Ground-Water Analytical Results

Ground-water samples collected from the monitoring wells were analyzed for the parameters listed in Table 4-5. Ground-water samples were not analyzed for all dioxins because the isomer 2,3,7,8-TCDD was not found in any of the sediment and soil samples analyzed. Ground-water samples were measured in the field for pH, temperature, specific conductance and turbidity during the purging process at each monitoring well.

4.2.1.1 Historical Ground-Water Data - A background search of historical data was conducted as part of this investigation. This search did not produce any site-specific data concerning ground-water quality at or near the PSF. However, general ground-water quality for Riley County was obtained from the Kansas Geological Survey Bulletin 206, 1973. Ground-water results from the baseline and first quarter sampling events have been generally compared to Riley County information. This comparison of data is provided in Table 4-6.

4.2.1.2 Ground-Water Sampling - Five monitoring wells were installed at the locations shown in Figure 4-1. The screened interval for each monitoring well was placed across the water table to monitor whether light nonaqueous phase liquid contaminants have travelled from the soil surface/subsurface to the water table surface.

In accordance with requests from the EPA and KDHE, current plans are to collect and analyze ground-water samples on a quarterly basis (July 1992, November 1992, February 1993, and May 1993) to assess temporal fluctuations of water quality. Should the data support an early termination of this sampling or a reduction in parameters analyzed, discussions will be held with the regulatory agencies.

Monitoring well PSF92-01 was installed to a depth of 33 feet upgradient of the PSF so that background data could be collected. Monitoring well PSF92-02 was installed to a depth of 28 feet and is located downgradient of the pesticide rinsing activities. Monitoring wells PSF92-03 and PSF92-04 were installed to depths of 28-30 feet and are located downgradient of the stored electrical equipment area (former PCB transformer and hazardous material storage areas). Monitoring well PSF92-05 was installed to a depth of 26 feet and is located approximately 275 feet southeast of the PSF in the floodplain of the Kansas River. This well is being used to determine if contaminants have moved downgradient in the alluvial aquifer. Elevation data for all monitoring wells are presented in Table 3-3. Ground-water samples were collected using dedicated stainless steel bladder pumps. Sampling procedures are discussed in Section 2.1.6. Installation procedures and pump placement relative to the water table is described in Appendix C.

4.2.1.3 Baseline Ground-water Analysis - Ground-water samples were collected from the monitoring wells in July 1992, in order to establish baseline data for ground-water quality at the site. Analytical results indicate that metals and inorganic constituents exist in the ground water at and around the PSF. Volatile organic compounds were not detected in the ground-water samples collected except for 3 µg/L of trichloroethene in sample PSF92-05. Organophosphorus and chlorinated pesticides, PCBs, acid herbicides, and semi-volatile organic compounds were not detected in any samples. The positive analytical results for the ground-water samples are presented in Table 4-7 and Appendix L.

The alkali earth metals (calcium, magnesium, potassium and sodium) were detected with the highest concentrations. For these metals, dissolved concentrations were similar to total concentrations. The alkali earth metals detected in the PSF wells were within the average concentrations of the Riley County wells as listed in the Kansas Geological Survey Bulletin 206 (Appendix Ac). Concentrations (total and dissolved) of four metals (barium, beryllium, chromium and selenium) were consistent with background conditions (within 30%), while concentrations of total and dissolved manganese, total aluminum and total iron slightly increased (two to four times) above background conditions (PSF92-01) downgradient of the PSF. The only sample with a total zinc concentration above background conditions was sample PSF92-02. Detectable concentrations (total and dissolved) of arsenic were found only in sample PSF92-05. The dissolved mercury concentration from sample PSF92-04 (0.4 µg/L) has been discounted because it exceeds the total mercury concentration (non-detect) for this sample. In addition, mercury was not detected in samples from this well in subsequent sampling events or in the corresponding soil samples. Therefore, the dissolved mercury results were determined to be an anomaly. All concentrations of inorganic constituents (chloride, nitrate, sulfate and bicarbonate) increased above background conditions downgradient of the PSF and were two to four times higher than the concentrations detected in the two Riley County wells (9-8E30 dac and 10-7E-35 aad) - Survey Bulletin 206 (Appendix Ac). The increased concentrations of inorganic chloride and sulfate downgradient of PSF may be a result of the breakdown of pesticides used at the site.

4.2.1.4 <u>First Quarter Ground-water Analysis</u> - The first quarter sampling event was performed in November 1992. Analytical results indicate that metals and inorganic constituents exist in the ground water at and around the PSF. Organophosphorus and chlorinated pesticides, PCBs, acid herbicides, and semi-volatile organic compounds were not detected in any samples. The only VOC detected was methylene chloride which is a common laboratory contaminant. The positive analytical results for the ground-water samples are presented in Table 4-8.

The alkali earth metals were detected with the highest concentrations. For these metals, dissolved concentrations were similar to total concentrations. The results for these metals were within the average concentrations of the two Riley County wells as listed in the Kansas Geological Survey Bulletin 206. Total and dissolved concentrations of four metals (barium, beryllium, manganese, and zinc) and total concentrations of three metals (nickel, selenium, and vanadium) were consistent with background conditions (within 30 per cent).

Total concentrations of aluminum and iron and dissolved concentrations of selenium were two to ten times above the upgradient (background) monitoring well concentrations. A concentration of total copper was only detected in the background well, while dissolved concentrations of nickel and vanadium were only detected in samples PSF92-03 and PSF92-05, respectively. Please refer to Section 6.1.1.4 for the metals retained for the risk assessment.

Of the inorganic constituents analyzed, concentrations of nitrate and sulfate are three to six times above background concentrations. The background concentrations for chloride were only exceeded by sample PSF92-02. Concentrations of bicarbonate ranged from 190 mg/L (PSF92-01) to 348 μg/L (PSF92-05) in first quarter samples. When compared to data from the Riley County wells (KSG Bulletin 206), concentrations of chloride in PSF wells remained consistent. Concentrations of sulfate are two to four times and concentrations of nitrate are two to thirteen times greater than the Riley County wells.

4.2.1.5 <u>Second Quarter Ground-water Analysis</u> - The second quarter sampling event was performed in February 1993. Analytical results indicate that metal and inorganic constituents exist in the ground water at and around the PSF. Organophosphorus and chlorinated pesticides, PCBs, acid herbicides, semi-volatile and volatile organic compounds were not detected in any samples. The positive analytical results for ground water samples are presented in Table 4-9.

The alkali earth metals were detected with the highest concentrations. For these metals, dissolved concentrations were similar to total concentrations. The alkali earth metals detected in the PSF wells were within the average concentrations of the Riley County wells as listed in the Kansas Geological Survey Bulletin 206 (Appendix Ac). Total and dissolved arsenic and total aluminum were both above background concentrations (non-detect for PSF92-01) in monitoring wells PSF92-05 for both metals and PSF92-03 for total aluminum. Total and dissolved manganese and total zinc results were two times above background concentrations in monitoring well PSF92-03. Total beryllium concentrations ranged from two to three times higher than background.

4.2.1.6 Comparison of Baseline, First Quarter and Second Quarter Ground-water Analyses - Concentrations (total and dissolved) of eight metals (barium, beryllium, calcium, iron, magnesium, manganese, selenium and zinc) detected in first quarter and second quarter ground-water samples were consistent (within 30 percent) with baseline concentrations. First quarter concentrations (total and dissolved) of potassium and sodium remained consistent with baseline concentrations in all samples except PSF92-05 and PSF92-02, respectively. In these samples, first quarter concentrations showed a decrease from baseline concentrations ranging from 37 to 47 percent. However, total and dissolved potassium and sodium levels increased to background levels in PSF92-02 during the second quarter sampling effort. PSF92-05 remained consistent with first quarter levels.

During all three sampling events, concentrations (total and dissolved) of arsenic were only detected in sample PSF92-05, however, first and second quarter concentrations decreased from baseline concentrations by 72 percent and 76 percent, respectively. A concentration of total copper was only detected in the background sample (PSF92-01) during the first quarter sampling event. Total copper was detected in four monitoring wells (PSF92-01, PSF92-02, PSF92-04, and PSF92-05) during the second quarter sampling event. Lead was not detected in any samples from any sampling event. Total iron and aluminum decreased from the first quarter sampling effort, eleven-fold and five-fold, respectively, in monitoring well PSF92-05 during the second quarter sampling effort.

Of the inorganic constituents analyzed, first quarter concentrations of nitrate and sulfate remained consistent (within 30 percent) with baseline concentrations. Nitrate results increased two to five times during the second quarter in all samples except PSF92-01. The first quarter background (PSF92-01) concentration of chloride increased six times over the baseline concentration and increased an additional two times during the second quarter for that sample. However, concentrations of chloride in the remaining samples showed a decrease (up to three times) from baseline concentrations. Second quarter chloride results increased to baseline levels in all samples except PSF92-04 and PSF92-05 which remained consistent with first quarter results. Concentrations of bicarbonate ranged from 236 mg/L (PSF92-04) to 493 mg/L (PSF92-05) in baseline samples and remained consistent during first and second quarter. Baseline samples were analyzed for bicarbonate using Standard Methods (SM) 403. First quarter and second quarter samples were analyzed for bicarbonate using USEPA Method 310.1. Although different methods were used to analyze for bicarbonate at PSF, the methodology (titration at pH 4.5) and calculations for bicarbonate are similar. A comparison of data between the baseline, first quarter, and second quarter ground-water sampling events is presented in Table 4-10.

4.2.2 Soil Analytical Results

Soil samples were collected and submitted for analysis from surface soils, shallow soil borings, a pilot hole, and monitoring well borings. Soil samples were analyzed for the parameters listed in Table 4-11. Three surface soil samples, both soil samples from the pilot hole boring, and seven samples collected from the shallow soil borings were also analyzed for dioxin (2,3,7,8-TCDD isomer only).

4.2.2.1 Historical Soil Data - Investigations were conducted prior to this report to determine if operating practices at the PSF have impacted the environment. During the months of July and November, 1974, the USAEHA collected soil samples from behind the PSF as part of the U.S. Army Pesticide Monitoring Program. The soil samples contained measurable concentrations of pesticides such as chlordane, methoxychlor, malathion, diazinon, and DDT and its associated metabolites (DDE and DDD). USAEHA stated that one of the samples (No. 00760), collected from an unspecified area east of the PSF, was cause of concern for the aquatic environment. The results for this sample are provided in Table 4-12.

Six soil samples were collected in the vicinity of the PSF during May, 1986, as part of the Pesticide Monitoring Study No. 17-44-1356-88 conducted by USAEHA. The approximate sampling locations are shown on Figure 4-5. Analytical testing found pesticides present in the soil and drainageway sediments as well, but in much lower concentrations than were found previously. RCRA CALs (1988) were exceeded for DDT, dieldrin and chlordane. The results of this sampling are provided in Table 4-13.

The data compiled from these previous investigations have been compared to the soil data generated from this investigation. This comparison of data is presented in Table 4-14.

4.2.2.2 Soil Sampling - Surface soil samples were collected to assess the presence of contamination and the concentration at which these contaminants might exist. These values will be used to describe the nature and extent of contamination in the soils at this site. Surface soil sample PSFSS-01 was thought to be located in an area where pesticide PSF activities were expected to be non-existent or minimal to represent background conditions. Samples PSFSS-02, PSFSS-03 and PSFSS-04 were located in high traffic areas, former PCB transformer storage areas, and the area of stressed vegetation. The sampling locations are shown on Figure 4-2.

A total of 20 shallow soil borings were advanced to a depth of approximately 4.5 feet using stainless steel hand augering equipment. Two soil samples were collected from each boring as described in Section 2.1.5. The locations of the borings suggest the most probable areas of subsurface contamination. These areas include the exits to the PSF, the equipment/vehicle rinse area, around the former CONEXs, adjacent to transformer storage areas, around the PSF, and downgradient of the PSF. The sampling locations are shown on Figure 4-3. At the completion of sampling, all borings were grouted to the surface.

Prior to the installation of the monitoring wells, a pilot hole was advanced approximately 40 feet to the west of monitoring well boring PSF92-01. The purpose of this pilot hole was to allow for the collection of two representative soil samples for geotechnical analysis of grain-size distribution. This information was used to select proper well construction materials. Two soil samples (PSF92SB-01A and PSF92SB-01B) were also collected from this boring for chemical analysis.

Soil samples were collected from the five monitoring well borings (see Figure 4-1). Two soil samples were collected from borings PSF92-01, PSF92-03, PSF92-04 and PSF92-05. These samples were collected at a depth midway between the ground surface and the water table and at the water table to determine if contamination is travelling through the vadose zone by surface water percolation. Approximate depths of sample collection ranged from 9 to 17 ft. and 17 to 24 ft. A chemical profile of soil was conducted at monitoring well boring PSF92-02 to assist in defining the vertical extent of contaminants. Soil samples were collected near the surface (1-2 feet; top 12" was gravel fill) and at 5-foot intervals to the water table (approximately 22 feet).

4.2.2.3 Soil Analysis - Analytical results indicate that pesticides, PAHs and metals exist in the soil at and around the PSF. Chlorinated solvents, toluene, and phthalates were also present in the soils but at a lower frequency than the previously mentioned parameters. Herbicides and dioxins were not detected in the soil from this site. The positive analytical results for the soil samples collected from the surface soils, shallow soil borings, pilot hole and the monitoring well borings are presented in Tables 4-15 to 4-18 and Appendix L. The results of the analyses of the soil samples will be discussed according to sampling depths. In evaluating the analytical results for the soil samples the estimated fill depth, area of fill and the time the fill was emplaced were considered. Since the activities associated with the PSF post dates the filling, it is unlikely that the analytical results would be impacted (i.e. the alleged spills/revising occurred after fill emplacement).

Surface soil sample PSFSS-01 and shallow soil boring samples PSFSB-01A/B were collected from the same location (on the north side of the PSF, see Figure 4-3) and were expected to provide data representative of background conditions. However, this assumption was proved incorrect based on the measurable concentrations of pesticides that were detected in these samples. Monitoring well boring PSF92-01 was located north of the PSF across Dickman Avenue (Figure 4-3). Soil samples collected from this boring were also expected to provide baseline data. Analytical results from these samples suggest that representative background data were obtained.

4.2.2.3.1 Results of Soil Samples Collected Between Surface and 2.5 Foot Depth - This section discusses the results of soil samples collected between ground surface and a depth of 2.5 feet. The surface soils (PSFSS-01 through PSFSS-04) were collected at the following depths: 12 to 24 inches, 6 to 18 inches, 3 to 12 inches, and 1 to 12 inches, respectively. These sampling depths were influenced by the thickness of asphalt and/or gravel cover encountered at each location. Samples PSFSB-03A through PSFSB-20A were collected from the shallow soil borings at a depth of 1.5 to 4.5 feet. Samples PSFSB-01A and PSFSB-02A were collected at a depth of 2.0 to 2.5 feet due to the collection of surface soils (PSFSS-01 and PSFSS-02) at these locations. The first soil sample (MWSB-02A) from the chemical profile boring (PSF92-02) was collected at a depth of 1.0 to 2.0 feet.

The pesticides detected in these samples consisted of DDT and its metabolites, alpha- and gamma- chlordane, heptachlor, dieldrin, methoxychlor, endrin and malathion. The highest concentrations of DDT (and/or its metabolites) detected in the surface and shallow soils were found in the following samples: PSFSB-03A (DDT: 7.700 mg/kg), PSFSB-09A (DDT: 5.700, DDE: 0.870 mg/kg), PSFSB-17A (DDT: 0.610, DDE: 0.370 mg/kg), PSFSS-04 (DDE: 1.800 mg/kg) and PSFSS-02 (DDT: 1.000, DDE: 0.270 mg/kg). Cumulative concentrations of DDT and its metabolites detected in surface soil samples are provided in Figure 4-6. An isopleth map showing the cumulative concentration of DDT and its metabolites (DDE and DDD) detected in shallow boring samples is provided on Figure 4-7.

The highest concentrations of total chlordane (alpha- and gamma-chlordane) were detected in the following samples: PSFSS-02 (3.200 mg/kg), PSFSB-05A (1.580 mg/kg), PSFSS-04 (1.300 mg/kg) and PSFSB-10A (0.890 mg/kg). Concentrations of total chlordane detected in surface soil samples are provided in Figure 4-6. An isopleth map showing concentrations of total chlordane detected in shallow boring samples is provided on Figure 4-8.

Detectable concentrations of dieldrin, heptachlor, methoxychlor, endrin and malathion were limited to samples collected near the northern portion of the PSF. Concentrations of dieldrin were detected in the following samples: PSFSS-02 (0.077 mg/kg), PSFSS-01 (0.094 mg/kg) and PSFSB-05A (0.200 mg/kg). Concentrations of heptachlor were detected in the following samples: PSFSB-11A (0.005 mg/kg), PSFSB-02A (0.045 mg/kg), PSFSB-05A (0.230 mg/kg) and PSFSS-02 (0.300 mg/kg). These samples were collected in the immediate vicinity (within 20 feet) of the northern portion of the PSF except sample PSFSB-11A, which was collected approximately 60 feet to the east of the northern portion of the PSF. An isopleth map showing concentrations of heptachlor detected in shallow boring samples is provided on Figure 4-9.

Methoxychlor was detected in three soil samples at the following concentrations: 0.056 mg/kg (PSFSB-01A), 0.080 mg/kg (PSFSB-11A) and 2.400 mg/kg (PSFSS-01). Samples PSFSS-01 and PSFSB-01A were collected from the same sampling location (along the northern side of the PSF). An isopleth map showing concentrations of methoxychlor detected in the shallow boring samples is provided on Figure 4-10.

Concentrations of endrin and malathion were each found in one of the soil samples collected. Endrin was detected in sample PSFSB-05A (0.140 mg/kg) while malathion was detected in sample PSFSS-01 (0.419 mg/kg).

The analytical results indicate that pesticide contamination is present in the shallow soil around the north end of the PSF and extending to the east. This contamination may be attributed to rinse water from the washing of vehicles and pesticide spraying equipment being allowed to run onto the ground and drain away from the PSF to the east. Another area of increased pesticide concentrations was noticed near the southeast corner of the PSF and extending to the east. CONEX containers were formerly located in this area. It has been documented that these containers were used to store hazardous waste. This contamination may be attributed to a surface spill. A third area of increased pesticide concentrations was noticed in the area of stressed vegetation near the drainage ditch to the east of the PSF. Shallow soil boring PSFSB-17 was located in the center of this area. It is not known if this area of stressed vegetation is the result of a surface spill or indiscriminate disposal of pesticide waste. However, the stressed vegetation area is in an erosion pathway and may be the endpoint of surface water runoff.

PAHs detected in these samples included anthracenes, chrysene, fluoranthenes, phenanthrene and pyrenes. The highest concentrations of total PAHs were detected in the following samples: PSFSB-14A (15.010 mg/kg), MWSB-02A (6.160 mg/kg), PSFSB-12A (3.740 mg/kg), PSFSS-04 (3.690 mg/kg) and PSFSB-07A (3.090 mg/kg). An isopleth map showing total PAH concentrations in shallow boring samples is provided on Figure 4-11.

The analytical results indicate that PAH contamination is present in the soil along the fence to the east of the PSF and extending to the east. Another area of increased PAH concentration is located at the bottom of the culvert leading away (to the east) from the southeastern corner of the fence. In both of these areas, the pattern of PAH contamination tends to follow the pathways of surface water runoff. A third area of PAH contamination was located near the southeastern corner of the PSF. The presence of PAH contamination in these areas may be the result of pesticide formulation, mixing, application, or spills. Many pesticides were dissolved in a heavy aromatic naphtha and then diluted in kerosene prior to application. In some cases, anthracene and naphthalene have been used as pesticides, however their use in this capacity at Fort Riley is not documented. Line poles preserved with creosote are stored in the DEH yard approximately 400 feet northwest of the PSF and asphalt is routinely stored within the DEH yard to the north of the PSF. Both creosote and asphalt contain PAHs.

Detectable concentrations of bis(2-ethylhexyl)phthalate were found in five samples collected (PSFSS-01, MWSB-02, PSFSB-09A, PSFSB-16A and PSFSB-19A). The concentrations ranged from 0.420 mg/kg (PSFSB-09A) to 0.960 mg/kg (PSFSB-16A). Another phthalate, diethylphthalate, was detected in two samples: PSFSB-12A (0.700 mg/kg) and PSFSB-20A (0.510 mg/kg).

Of the metals analyzed, arsenic, barium, chromium and lead were routinely found in detectable concentrations in both the downgradient and background samples. The range of detectable concentrations for each metal in these samples was as follows: arsenic, 0.8 mg/kg (PSFSB-03A) - 20 mg/kg (PSFSB-02A); barium, 35 mg/kg (PSFSS-02) - 160 mg/kg (PSFSB-08A and PSFSB-19A); chromium, 4.5 mg/kg (PSFSB-15A) - 41 mg/kg (PSFSB-09A); lead, 4.3 mg/kg (PSFSB-01A) - 770 mg/kg (PSFSB-08A). Total mercury was detected in samples PSFSB-07A, PSFSB-13A and its duplicate - PSFSB-14A, PSFSB-17a and its duplicate - PSFSB-19A, and PSFSB-20A. Concentrations ranged from 0.1 mg/kg (PSFSB-07A) to 1.3 mg/kg (PSFSB-19A). Silver was detected in three soil samples collected from 0-2.5 feet, PSFSB-03A (0.8 mg/Kg), PSFSB-13C (duplicate of PSFSB-13A - 1.2 mg/Kg), and PSFSB-19A (1.1 mg/Kg). Background concentrations of arsenic, barium, cadmium, chromium, lead, silver and selenium were exceeded in samples from borings downgradient of the PSF.

The highest concentrations of the metals analyzed were found in the areas of greatest pesticide and PAH contamination: around the northern portion of the PSF, near the southeastern corner of the PSF and extending toward the east, and in the area of stressed vegetation near the drainage ditch to the east of the PSF.

4.2.2.3.2 Results of Soil Samples Collected from 3.5 to 4.5 foot Depth - A sampling interval of 3.5 to 4.5 feet below ground surface was used for the second soil sample (PSFSB-01B through PSFSB-20B) collected from the shallow soil borings. At this depth, concentrations of pesticides, PAHs and metals were detected. Methylene chloride, toluene and phthalates were also detected but not as frequently.

The pesticides detected in these samples included DDT and its metabolites, alpha- and gamma-chlordane, dieldrin, heptachlor, methoxychlor and Ronnel (Fenchlorphos). With the exception of Ronnel (Fenchlorphos), these pesticides were also detected in the soil samples collected from 0 to 2.5 feet. The highest concentrations of DDT (and its metabolites) were detected in the following samples: PSFSB-03C (DDT: 33.000 mg/kg, duplicate of PSFSB-03B), PSFSB-07B (DDT and DDE: 3.040 mg/kg) and PSFSB-09B (DDT and DDE: 3.020 mg/kg). An isopleth map showing the cumulative concentration of DDT and its metabolites (DDE and DDD) is provided on Figure 4-12.

The greatest concentrations of total chlordane (alpha- and gamma-chlordane) were detected in the following samples: PSFSB-03C (3.100 mg/kg), PSFSB-12B (1.700 mg/kg), PSFSB-11B (0.430 mg/kg), PSFSB-09B (0.410 mg/kg) and PSFSB-02B (0.320 mg/kg). An isopleth map showing concentrations of total chlordane is provided on Figure 4-13.

Detectable concentrations of methoxychlor, heptachlor and dieldrin were limited to samples collected near the northern portion of the PSF. Detectable concentrations of methoxychlor were found in three samples: PSFSB-03B (10.000 mg/kg), PSFSB-01B (0.530 mg/kg) and PSFSB-11B (0.390 mg/kg). Samples PSFSB-01B and PSFSB-03B were collected in the immediate vicinity (within 20 feet) of the northern portion of the PSF, while sample PSFSB-11B was collected approximately 60 feet east of the northern portion of the PSF. An isopleth map showing concentrations of methoxychlor is provided on Figure 4-14. Concentrations of heptachlor were detected in three of the samples collected: PSFSB-02B (0.028 mg/kg), PSFSB-05B (0.017 mg/kg) and PSFSB-01B (0.004 mg/kg). An isopleth map showing heptachlor concentrations is provided on Figure 4-15. Concentrations of dieldrin were detected in two of the samples collected: PSFSB-01B (0.027 mg/kg) and PSFSB-05B (0.010 mg/kg). An isopleth map showing dieldrin concentrations is provided on Figure 4-16. Ronnel (Fenchlorphos) was detected in only one sample (PSFSB-12B) at a concentration of 0.044 mg/kg.

At this depth, the patterns of pesticide contamination reflect those patterns established by the soil samples collected from 0 to 2.5 feet below ground surface. Concentrations of pesticides do not always decrease with depth.

The PAHs detected in samples collected at a depth of 3.5 to 4.5 feet included acenaphthene, anthracenes, chrysene, fluoranthenes, naphthalene, phenanthrene and pyrenes. With the exception of acenaphthene and naphthalene, these PAHs were also detected in the soil samples collected from 0 to 2.5 feet. The highest concentrations of total PAHs were detected in the following samples: PSFSB-07B (18.890 mg/kg), PSFSB-12B (9.390 mg/kg), PSFSB-10B (4.190 mg/kg), PSFSB-14B (1.970 mg/kg) and PSFSB-20B (1.640 mg/kg). An isopleth map showing total PAH concentrations is provided on Figure 4-17.

At this depth, the patterns of PAH contamination reflect those patterns established by the soil samples collected from 0 to 2.5 feet below ground surface. As with the pesticide contamination, the concentrations of PAHs do not always decrease with depth.

Concentrations of bis(2-ethylhexyl)phthalate were detected in five samples collected (PSFSB-01B, PSFSB-03B, PSFSB-06B, PSFSB-10B and PSFSB-14B). The concentrations ranged from 0.410 mg/kg (PSFSB-14B) to 1.400 mg/kg (PSFSB-10B). Another phthalate, diethylphthalate, was found only in sample PSFSB-20B at a concentration of 0.430 mg/kg.

Almost all of the soil samples contained detectable levels of methylene chloride. Most of these detections were due to laboratory contamination. Please refer to Second Quarter Quality Control Summary Report (QCSR) (Law, 1992) for a detailed explanation of criteria used in order to determine if a compound is laboratory contamination. However, methylene chloride results for soil samples PSFSB-4B, PSFSB-5B, PSFSB-6B, PSFSB-17B, and PSFSB-18B could not be qualified as laboratory contamination. Toluene was detected in seven samples collected from this depth. Concentrations of toluene ranged from 0.006 mg/kg (PSFSB-17B) to 0.038 mg/kg (PSFSB-15B). Although the source of toluene is unknown, toluene is present in creosote mixtures and therefore may be indicative of the current storage of treated lumber and asphalt.

Of the metals analyzed, arsenic, barium, chromium and lead were routinely found in the samples collected from 3.5 to 4.5 feet below the ground surface in both background and downgradient samples. The range of detectable concentrations for each metal was as follows: arsenic, 0.9 mg/kg (PSFSB-17B) - 120 mg/kg (PSFSB-10C; duplicate sample of PSFSB-10B); barium, 39 mg/kg (PSFSB-06B) - 130 mg/kg (PSFSB-08B, -13B and -15B); chromium, 4.6 mg/kg (PSFSB-06B) - 15 mg/kg (PSFSB-12B); lead, 4.4 mg/kg (PSFSB-03B) - 310 mg/kg (PSFSB-07B). Only two samples contained detectable concentrations of total mercury: PSFSB-13B (0.6 mg/kg) and PSFSB-07B (0.1 mg/kg). In general, mercury concentrations decreased from the 0 to 2.5 foot sample to the 3.5 to 4.5 foot sample. Background concentrations of arsenic, barium, cadmium, chromium, lead, silver and selenium were exceeded in samples collected downgradient of the PSF.

4.2.2.3.3 Chemical Profile Boring Analytical Results - As stated in Section 4.2.2.2, a chemical profile of the soil in the vicinity of the PSF was conducted at monitoring well boring PSF92-02 to assist in defining vertical extent of contaminants. Five soil samples were collected from this boring for chemical analysis. The depths of sample collection are as follows: 1.0 to 2.0 ft. (analytical results are discussed previously in this section), 4.0 to 6.0 ft., 8.0 to 12.0 ft., 14.0 to 16.0 ft. and 20.0 to 22.0 ft. Analytical results indicate that increased concentrations of PAHs were present only in the sample from 1.0 to 2.0 feet. All five samples contained concentrations of metals (arsenic, barium, chromium, lead and silver) consistent with background conditions.

Methylene chloride was also present in each sample collected. A chemical profile of positive analytical results is provided on Figure 4-18.

4.2.2.3.4 Monitoring Well Soil Boring Analytical Results - Two soil samples were collected from monitoring well borings PSF92-01, PSF92-03, PSF92-04 and PSF92-05. Approximate depths of sample collection ranged from 9 to 17 feet (MWSB-01A to MWSB-05A) and 17 to 24 feet (MWSB-01B to MWSB-05B).

Detectable concentrations of pesticides were found in two samples, MWSB-03A and MWSB-04A. Sample MWSB-03A was collected from a depth of 10.0 to 14.0 feet and contained 0.009 mg/kg of dieldrin and 0.005 mg/kg of gamma-chlordane. Sample MWSB-04A was collected from a depth of 12.0 to 14.0 feet and contained 0.012 mg/kg of DDE (a metabolite of DDT), 0.013 mg/kg of dieldrin and 0.033 mg/kg of total chlordane. Total PAH concentrations were detected only in sample MWSB-05A (0.580 mg/kg). This sample was collected from a depth of 9.0 to 11.0 feet. Concentrations of benzene were found in samples MWSB-01A (0.007 mg/kg) and MWSB-01B (0.006 mg/kg). These samples were collected from the background monitoring well boring from depths of 15.0 to 17.0 feet and 21.0 to 25.0 feet, respectively. Concentrations of metals found in the monitoring well borings were consistent with background conditions.

4.2.2.3.5 Pilot Hole Soil Boring Analytical Results - Two soil samples (PSF92SB-01A and PSFSB92-01B) were collected from the pilot hole at depths of 5 feet and 38 feet below ground surface. The pilot hole soil samples were analyzed for all metals. Aluminum, calcium, iron, magnesium and potassium were found in the highest concentrations. All of these metals are known to be naturally occurring in the soil.

4.2.3 Surface Water Analytical Results

All surface water samples were collected from the drainage ditch to the east of the PSF (Figure 4-4). Samples from PSFSW-05 and PSFSW-09 locations were planned but could not be collected because no surface water was present at the time of sampling. All samples were analyzed for the parameters listed in Table 4-5.

4.2.3.1 Historical Surface Water Data - In 1974, two surface water samples were collected by USAEHA for pesticide analysis as part of the U.S. Army Pesticide Monitoring Program (Appendix B). These samples were collected from the drainage ditch to the east of the PSF and where this ditch connects with the Kansas River. No detectable concentrations of pesticides were found in these samples.

4.2.3.2 Surface Water Sampling - Surface water samples were collected from the drainage ditch to the east of the PSF (Figure 4-4). The locations for these surface water samples were chosen to represent samples upstream (PSFSW-01) and downstream (PSFSW-02 through PSFSW-07) of the site. The locations for samples PSFSW-02 through PSFSW-04 were chosen to define contaminants from surface water runoff into the stream from PSF rinsing and storage activities. The downstream samples were collected prior to the next upstream sample. Surface water samples were collected in "high-flow" (steadily flowing) areas prior to the collection of their associated sediment samples.

4.2.3.3 Surface Water Analysis - Analytical results indicate that total metals and inorganic constituents exist in the surface water to the east of the PSF. Organophosphorus and chlorinated pesticides, herbicides, and semi-volatile organic compounds were not detected in the surface water samples collected. The only volatile organic compound detected was methylene chloride which may be attributed to laboratory contamination. The positive analytical results for the surface water samples are provided in Table 4-19 and Appendix L. Of the metals analyzed, the alkali earth metals (calcium, magnesium, potassium and sodium), aluminum, and iron were detected with the highest concentrations.

The alkali earth metals were detected in concentrations consistent with the background/upstream sample PSFSW-01, while total iron concentrations increased immediately downstream of the PSF. These metals are assumed to be naturally occurring in the soil. Total aluminum and zinc concentrations also increased immediately downstream of the PSF while the concentrations of eight other metals (arsenic, barium, cadmium, chromium, copper, lead, manganese and vanadium) remained consistent with background/upstream conditions. Of the inorganic constituents analyzed, concentrations of chloride and bicarbonate decreased downstream of the background sampling location, while sulfate concentrations increased slightly immediately downstream of the PSF. This increase in sulfate concentrations can possibly be attributed to sulfate being a break-down product of some pesticides.

4.2.4 Sediment Analytical Results

Sediment samples were collected from the drainage ditch approximately 150 feet to the east of the PSF. All sediment samples were analyzed according to requirements listed on Table 4-11. One sediment sample (PSFSD-04A) was also analyzed for dioxin (2,3,7,8-TCDD isomer only).

4.2.4.1 Historical Sediment Data - During the months of July and November, 1974, the U.S. Army Environmental Hygiene Agency (USAEHA) collected samples from behind the PSF as part of the U.S. Army Pesticide Monitoring Program. USAEHA stated that one of the samples (No. 00760) was cause of concern for the aquatic environment. It is not known if this sample was collected from the sediment within the drainage ditch or from soils near the drainage ditch. The analytical results for this sample were provided in Table 4-12.

Samples were collected in the vicinity of the PSF during May, 1986, as part of the Pesticide Monitoring Study No. 17-44-1356-88 conducted by USAEHA. Four of the six samples (86S3, 86S4, 86S5, and 86S6) collected for this study were taken from sediment in the drainage ditch. The approximate sampling locations were shown on Figure 4-5. RCRA CALs were exceeded in the sediment samples for the following pesticides: DDT (86S4), dieldrin (86S4 and 86S6) and chlordane (86S4). Results of this sampling were provided in Table 4-13.

4.2.4.2 Sediment Sampling - Two sediment samples each were collected from the seven locations shown on Figure 4-19. Two sediment samples (PSFSD-03A and PSFSD-03B) were omitted due to the absence of sediment at the sampling location. The locations for these samples were chosen to represent samples upstream (PSFSD-

01A/B) and downstream (PSFSD-02A/B through PSFSD-09A/B) of the site. The locations for samples PSFSD-02A/B through PSFSD-05A/B were chosen to define contaminants from surface water/sediment runoff into the stream from PSF rinsing and storage activities. Sediment samples were collected in "low-flow" areas (near the embankment but away from embankment erosion) after the collection of their associated surface water samples. Two sediment samples were collected from each location in an attempt to characterize sediment contamination through erosion and recent cut and fill activities near the drainage ditch. The sediment samples were collected from surface to one foot and one foot to two feet below the surface. The downstream samples were collected prior to the next upstream sample, with the exception of sediment samples PSFSD-09A and PSFSD-09B. These samples were collected after the receipt of analytical data from the initial sampling.

4.2.4.3 Sediment Analysis - Analytical results indicate that volatile organic compounds, pesticides, PAHs and total metals exist in the sediment within the drainage ditch to the east of the PSF. Organophosphorus pesticides, herbicides, and dioxins were not detected in the sediment from this site. The positive analytical results for the sediment samples are presented in Table 4-20. Two sediment samples were collected at each sampling location. The samples were collected from the surface to one foot (PSFSD-01A, PSFSD-02A, etc.) and one foot to two feet (PSFSD-01B, PSFSD-02B, etc.) below ground level.

4.2.4.3.1 Organic Results - Volatile organic compounds detected in the sediment samples included toluene, carbon disulfide, 1,2-dichloropropane and 1,1,2,2-tetrachloroethane. Toluene was detected in concentrations ranging from 0.006 mg/kg (PSFSD-02A) to 0.013 mg/kg (PSFSD-04A and PSFSD-05A); however, many of the results may be biased high due to a low internal standard recovery. Carbon disulfide was detected only in sample PSFSD-04B (0.007 mg/kg). Concentrations of 1,2-dichloropropane and 1,1,2,2-tetrachloroethane were detected only in sample PSFSD-02A (0.084 mg/kg and 0.039 mg/kg, respectively).

Concentrations of pesticides in the sediment samples increased downstream of the PSF (samples PSFSD-04A/B through PSFSD-09A/B). However, it was noticed that pesticide concentrations decreased with depth. Detectable concentrations of DDT (and its metabolites) ranged from 0.009 mg/kg (PSFSD-07B) to 0.860 mg/kg (PSFSD-05A). Detectable concentrations of total chlordane (alpha- and gamma-chlordane) were found to range from 0.012 mg/kg (PSFSD-02A) to 0.132 mg/kg (PSFSD-05A). Dieldrin was detected in only two samples: PSFSD-04A (0.020 mg/kg) and PSFSD-05A (0.056 mg/kg). Detectable concentrations of pesticides for each sediment sample are provided on Figure 4-19.

PAHs were detected in all but three sediment samples (PSFSD-01B, PSFSD-04B and PSFSD-06A) collected. Detectable concentrations of PAHs ranged from 0.120 mg/kg (PSFSD-02B) to 1.560 mg/kg (PSFSD-09A). The sample collected at the upstream location (PSFSD-01A) contained 0.880 mg/kg of pyrene. This could be attributed to the storage of asphalt within the DEH yard to the west of this sampling location. Detectable concentrations of PAHs for each sediment sample are provided on Figure 4-19. The concentrations of PAHs did not always decrease with depth and the extent of PAH contamination in the sediments downstream of the PSF has not been defined. Railroad ties are preserved with creosote and may also contribute to the PAH contamination in the downstream samples.

Concentrations of bis(2-ethylhexyl)phthalate were detected in four of the sediment samples (PSFSD-02A, PSFSD-04A, PSFSD-04B and PSFSD-07B) collected. Concentrations ranged from 0.450 mg/kg (PSFSD-04A) to 0.640 mg/kg (PSFSD-08, a duplicate sample of PSFSD-02A).

4.2.4.3.2 Inorganic Results - Of the metals analyzed for, arsenic, barium, cadmium, chromium and lead were often found in the sediment samples. While concentrations of lead increased immediately downstream of the PSF (samples PSFSD-02A and PSFSD-04A), concentrations of arsenic, barium, cadmium and chromium showed no significant (order of magnitude) increases above background conditions. Concentrations of selenium were detected in four samples (PSFSD-01A, PSFSD-06A, PSFSD-09A and PSFSD-09B) ranging from 0.2 mg/kg to 0.3 mg/kg. Five sediment samples (PSFSD-04A, PSFSD-06A, PSFSD-06B, PSFSD-07A and PSFSD-09B) contained concentrations of mercury ranging from 0.1 mg/kg to 0.4 mg/kg. A concentration of total silver was detected only in sample PSFSD-04A (0.8 mg/kg). Detectable concentrations of metals for each sample are provided on Figure 4-20.

4.3 SUMMARY OF NATURE AND EXTENT

Analytical results indicate that the highest concentrations of contaminants are present in the surface and shallow soils at and around the PSF. Of the contaminants detected, pesticides (insecticides and rodenticides), PAHs and metals were found with the greatest frequency.

4.3.1 Summary of Results from Soil Samples

The pesticides detected in the soil samples consisted of DDT and its metabolites (DDD and DDE), alpha- and gamma-chlordane, heptachlor, dieldrin, methoxychlor, endrin, Ronnel (Fenchlorphos) and malathion. Areas of contamination were indicated in three major areas. Pesticide contamination was found around the north end of the PSF and extending to the east. This contamination may be attributed to rinse water from the washing of vehicles and pesticide spraying equipment being allowed to run onto the ground and drain away from the PSF to the east.

Another area of pesticide contamination in soil samples was noticed near the southeast corner of the PSF and extending to the east. This contamination may be attributed to a surface spill.

A third area of pesticide contamination was detected in the area of stressed vegetation near the drainage ditch to the east of the PSF. Shallow soil boring PSFSB-17 was located in the center of this area. It is not known if this area of stressed vegetation is the result of a surface spill or indiscriminate disposal of pesticide waste. However, the stressed vegetation area is in an erosion pathway and may be the endpoint of surface water runoff.

The soil samples taken and analyzed indicate contamination of chlorinated pesticides, one organophosphate pesticide and polynuclear aromatic compounds. The depth of the characterization has not shown the "non detected" concentrations for the study area. However, the positive values are less than the RCRA corrective action levels.

Many samples contained concentrations of pesticides at levels which exceeded RCRA CALs. This data is presented in Table 4-21. Although several of the samples collected from the 3.5 to 4.5-foot sampling interval contained pesticides, the characterization of site soils does not present an unacceptable level of uncertainty for the estimation of soil remediation requirements based upon RCRA CALs. An isopleth map of pesticide concentrations which exceed CALs is provided on Figure 4-21.

PAHs detected in the soil samples included acenaphthene, anthracenes, chrysene, fluoranthenes, naphthalene, phenanthrene and pyrenes. The analytical results indicate that PAH contamination is present in the soil along the fence to the east of the PSF and extending to the east. Another area of PAH contamination is located at the bottom of the culvert leading away (to the east) from the southeastern corner of the fence. In both of these areas, the pattern of PAH contamination tends to follow the pathways of surface water runoff. A third area of PAH contamination was located near the southeastern corner of the PSF.

The presence of PAH contamination in these areas may be the result of treated lumber that is stored in the DEH yard approximately 400 feet northwest of the PSF and asphalt that is routinely stored within the DEH yard to the north of the PSF. It should be noted that soil samples were obtained and analyzed from locations near the stored lumber and that asphalt paving activities occurred on site during the week prior to the sampling effort. Both wood preservatives and asphalt contain PAHs. Another possible source of PAHs is the historic use of pesticides dissolved in a heavy aromatic (naphtha). In some cases, anthracene and naphthalene have been used as pesticides; however, their use in this capacity at Fort Riley is not documented.

At the time of this writing, there are no RCRA CALs associated with PAHs in soil. Although concentrations of PAHs may exist in the soils beyond the boundary of our investigation, the characterization of site soils does not present an unacceptable level of uncertainty for the estimation of soil remediation requirements.

Of the metals analyzed, arsenic, barium, chromium and lead were routinely found in detectable concentrations in both background and downgradient samples. The following two samples contained concentrations of lead which exceeded the CAL of 500 mg/kg: PSFSS-03 (540 mg/kg) and PSFSB-08A (770 mg/kg). The CAL for arsenic (80 mg/kg) was exceeded in sample PSFSB-10C (120 mg/kg), a duplicate sample of PSFSB-10B.

4.3.2 Summary of Results from Ground-Water Samples

Ground-water samples were collected from the five monitoring wells installed. Analytical results indicate that metals and inorganics are the main constituents of the ground water at and around the PSF. Of the metals analyzed, the alkali earth metals (calcium, magnesium, potassium and sodium) were detected with the highest concentrations. Concentrations (total and dissolved) of four metals (barium, beryllium, chromium and selenium) were consistent with background conditions, while concentrations of total and dissolved manganese, total aluminum and total iron slightly increased above background conditions downgradient of the PSF. Concentrations of manganese (total and dissolved) exceeded secondary Maximum Contaminant Levels (MCLs) (50 μg/L) in samples PSF92-02 and PSF92-03. The only sample with a total zinc concentration above background conditions was sample PSF92-02. Detectable concentrations (total and dissolved) of arsenic were found only in sample PSF92-05. All concentrations of inorganic constituents (chloride, nitrate, sulfate and bicarbonate) increased above background conditions downgradient of the PSF. The increased concentrations of inorganic chloride and sulfate downgradient of PSF may be a result of the breakdown of pesticides used at the site.

4.3.3 Summary of Results from Surface Water Samples

Analytical results indicate that total metals and inorganic constituents exist in the surface water upstream and downstream of the PSF. Of the metals analyzed, total concentrations of aluminum, iron and zinc increased immediately downstream of the PSF. Of the inorganic constituents analyzed, concentrations of chloride and bicarbonate decreased downstream of the background sampling location (PSFSW-01), while sulfate concentrations increased immediately downstream of the PSF. This increase in sulfate concentrations may be attributed to sulfate being a break-down product of some pesticides.

4.3.4 Summary of Results from Sediment Samples

Analytical results indicate that VOCs, pesticides, PAHs, and total metals exist in the sediment within the drainage ditch to the east of the PSF. RCRA CALs have not been established for sediments. A comparison between the analytical results and National Oceanographic and Atmospheric Administration (NOAA) TBC requirements is presented in Section 6.2.2.2.

VOCs detected in the sediment samples included toluene, carbon disulfide, 1,2-dichloropropane and 1,1,2,2-tetrachloroethane. Concentrations of carbon disulfide, 1,2-dichloropropane and 1,1,2,2-tetrachloroethane were only found in one sample each.

Concentrations of pesticides in the sediment samples increased downstream of the PSF (samples PSFSD-04A/B through PSFSD-09A/B). While pesticide concentrations decreased with downstream distance, the extent of contamination of DDT, the breakdown products of DDT, chlordan and PAH, has not been fully characterized (a zero line of contamination has not been established).

PAHs were detected in all but three sediment samples (PSFSD-01B, PSFSD-04B and PSFSD-06A) collected. The concentrations of PAHs did not always decrease with depth and the extent of PAH contamination in the sediments downstream of the PSF also has not been defined.

Of the metals analyzed, arsenic, barium, cadmium, chromium and lead were found in the sediment samples upstream and downstream of the PSF. While concentrations of lead increased immediately downstream of the PSF (samples PSFSD-02A and PSFSD-04A), concentrations of arsenic, barium, cadmium and chromium showed no significant (order of magnitude) increases above background conditions.

5.0 CONTAMINANT FATE AND TRANSPORT

The potential for human exposure to a particular compound or element depends upon whether it can persist in the environmental medium of interest. The fate and transport of site contaminants depends upon the site's physical conditions, the physical and chemical characteristics of the constituents, and the nature and extent of the constituent release. The following topics will be discussed in this section:

- Contaminant chemical and physical characteristics
- Potential routes of migration
- Persistence of contaminants
- Migration of contaminants

5.1 CHEMICAL AND PHYSICAL CHARACTERISTICS OF CONTAMINANTS

Chemical and physical characteristics for the organic and inorganic compounds detected (above method detection limits) at the Ft. Riley PSF are summarized in Tables 5-1 through 5-3. A brief description of these characteristics and their significance is presented below. The following discussions are based on information from Howard (1989), Howard (1990), Howard et al. (1991), Montgomery and Welkom (1990), Rao and Hornsby (1989), and Toxicological Profiles from the Agency for Toxic Substances and Disease Registry (ATSDR) (1987-1991).

5.1.1 Solubility

Solubility is the amount of a compound which can dissolve in water at a given temperature. Compounds which are highly soluble are generally more likely to remain dissolved in the water column, and to be transported more quickly and for greater distances in surface waters, saturated soils, or ground water than compounds with low solubilities. Often, highly soluble compounds are less likely to volatilize (see vapor pressure Section 5.1.2) and are more likely to biodegrade.

5.1.2 Vapor Pressure

An indication of the potential of a constituent to volatilize is the vapor pressure of the constituent; the higher the vapor pressure, the more likely the constituent will volatilize.

5.1.3 Specific Gravity

Specific gravity indicates whether a free-phase (i.e., neat or "pure") constituent in water tends to "float" (specific gravity less than one) or "sink" (specific gravity greater than one). Constituents with a specific gravity equal to one are miscible in water.

5.1.4 Henry's Law Constant

The Henry's Law Constant values reported on Table 5-1 indicate the compound's tendency to volatilize from water. The larger the value of this constant, the more rapidly the compound is likely to volatilize from water.

5.1.5 Log K_{oc}

The organic-carbon partition coefficient, K_{oc}, is an indicator of the constituents' tendency to adsorb to organic matter in soil. This adsorption of non-polar organic constituents is treated as an equilibrium-partitioning process between the aqueous phase and the porous medium. The equilibrium partitioning coefficient, or distribution coefficient (K_d), is a function of the chemical properties of the constituent and the organic carbon content of the soil:

$K_d = K_{oc} \times OC$; where
K_d = distribution coefficient (mL/g)
K_{oc} = soil organic matter-water partition coefficient (mL/g)
OC = fraction of organic carbon content of soil

The lower the K_{oc}, the less the constituent is adsorbed to the soil.

5.1.6 Log K_{ow}

The octanol-water partition coefficient, K_{ow}, is an indicator of a compound's tendency to partition itself between an organic phase (lipophilic or fat-soluble) and an aqueous phase (lipophobic or water soluble). High values of K_{ow} indicate lipophilic compounds which typically bioaccumulate in aquatic organisms and have a greater tendency for adsorption in soils and sediments.

5.1.7 BCF

The bioconcentration factor (BCF) is an indicator of how likely a compound dissolved or suspended in water is to accumulate in aquatic organisms. The higher the BCF reported, the more likely the expectation that the compound will accumulate in aquatic organisms.

5.2 POTENTIAL ROUTES OF CONTAMINANT MIGRATION

Contaminant migration can occur in several ways, depending upon the characteristics of the element or compound in question, the medium in which the element or compound is located and the type(s) of media in close proximity. Various physical processes may be involved. The transport of pollutants by water to receptors is a central theme because of the importance of water to life, its contribution to the generation of leachate, and its ability to mobilize contaminants from source areas. Contaminant transport in water may occur in either the dissolved or adsorbed (onto sediment or soil) phase. Transformation into a gaseous state (volatilization) is also an important transport process. Accumulation within the body of organisms (bioaccumulation) can also be a migration pathway from water, soils, or sediments if the organisms carry the contaminants away from the site where they are released by excretion, ingested (through the food chain) or by the decaying process of dead organisms.

Potential transport processes of the contaminants detected at the Fort Riley PSF are discussed below. At this site, metals were detected in soil, ground-water, surface water and sediment samples. Volatile organics were detected in soil, ground-water and sediment samples, and semi-volatile organics (including pesticides) were detected in soil and sediment samples.

5.2.1 Metals

Predicting the migration of metals in the environment is complicated because metals can exist in a variety of forms. For instance, they may exist as charged particles (i.e., ions in solution) or in an uncharged, or neutral state. Metals may also interact with both inorganic and organic species to form a variety of different compounds. Multiple oxidation states of some metals further complicate their behavior. Therefore, the potential for migration will depend upon the solubility of these forms in water. Metals in solution will exist in an ionic form, while non-ionic forms will precipitate and remain bound to sediments and soil. Metals may cycle between surface water and sediments with limited actual transport from the site area. Further site-specific data on the ionic forms present of the inorganic chemicals detected at the site would be needed to describe their chemical-specific transport and fate.

Nineteen different metals were detected in samples collected from this site; the 14 metals discussed below include all the metal detected at this site except the essential nutrients (i.e., iron, calcium, magnesium, sodium and potassium).

5.2.1.1 Aluminum - Aluminum is highly reactive; therefore, it is found in combination with other substances such as oxygen, fluorine and silica. Major transport processes include leaching from geochemical material and soil particulates to water, complexation with electron rich anions, and adsorption onto soil or sediment particulates. There is only one oxidation state for aluminum, 3+; therefore, its behavior depends on its coordination chemistry. Aluminum partitions between solid and liquid phases by reacting and complexing with water, electron rich anions (i.e., chloride, fluorine, sulfate, nitrate and phosphate) and negatively charged functional groups on clay and humic material. At pH greater than 5.5, most of the aluminum is in an insoluble form (i.e., gibbsite or aluminosilicates) except when in the presence of high organic matter which binds with the aluminum and solubilizes it. In general, the mobility of aluminum increases as the pH decreases for monomeric forms. However, hydroxyaluminum compounds are considered "amphoteric"; they can exist as both acids and bases in solution. Above the pH of 9 to 10, the soluble species $Al(OH)_4^-$ is the predominant form of aluminum (ATSDR, 1990). Adsorption onto clay and suspended particulates is a significant and rapid process (ATSDR, 1990). At this site, based on the soil pH (estimated at 5-7) and moderate soil clay content, aluminum will likely be immobilized and retained in the soil because of the formation of insoluble aluminum hydroxides/sesquioxides (due to pH) and soil adsorption (due to clay content).

5.2.1.2 Arsenic - Because of its multiple oxidation states and its tendency to form soluble complexes, the geochemistry of arsenic is both intricate and poorly characterized. The adsorption of arsenic onto clays, ion oxides and organic (humic) material is an important transport pathway. Arsenic is also mobile in the aquatic environment; it cycles through water columns, sediments and biota. The solubility of arsenic varies widely according to the oxidation state. In the natural environment, four oxidation states are possible for arsenic: 3-, 0 (metallic), 3+ and 5+. The 3+ and 5+ states are common in a variety of complex minerals and in dissolved salts in natural waters. The element most commonly associated with arsenic in nature is sulfur. In all, there are one hundred or more arsenic-bearing minerals known to occur in nature. The oxo acids, arsenious acid (H_3AsO_3) and arsenic acid (H_3AsO_4) are the prevalent forms of arsenic in aerobic waters. Arsenic can form complexes with a number of organic compounds, most of which increase its water solubility (Callahan et al., 1979; ATSDR, 1987). At this site, it appears that arsenic will be largely retained in the soil due to adsorption mediated by the moderate amount of soil clays. The arsenic that does leach to ground water and surface water will likely be soluble and, therefore, mobile.

5.2.1.3 Barium - Barium exists as a salt. Several salts including the most common, Barite ($BaSO_4$) and Witherite ($BaCO_3$), have low solubility, so precipitation into sediments is likely. Due to low vapor pressures and high boiling points, these salts are unlikely to volatilize. Bioaccumulation of barium is not a common migration process except in systems in which the barium concentration exceeds that of calcium and magnesium (ATSDR, 1990). At this site, due to soil pH (estimated at 5-7), likely most of the barium present in soil will remain as $BaCo^3$ and be precipitated to accumulate in sediments. Migration from the site will likely be minimal.

5.2.1.4 Beryllium - The behavior of beryllium is controlled chiefly by precipitation, adsorption, and complexation. Soluble beryllium salts are hydrolyzed in natural waters to form insoluble beryllium hydroxide, $Be(OH)_2$. Adsorption to clay and minerals is important at low pH. The coordination chemistry of beryllium is complicated; it can form complexes, oxycarboxylates, and chelates with a variety of materials resulting in increased solubility of the beryllium species. Despite this, in natural waters, the concentration of dissolved beryllium is very low. Most of the beryllium is found in particulate form, either adsorbed (low pH) or precipitated (high pH). Bioconcentration is a minor process (BCF ranges from 20 to 100) (Callahan et al., 1979).

Beryllium was detected in groundwater, and soil samples, and in one downstream sediment sample collected from this site. Most of the beryllium will likely exist in a particulate form in soil, primarily precipitated as $Be(OH)_2$, due to the near neutrality of the groundwater and soil pH values. Therefore, off-site migration is expected to be minimal.

5.2.1.5 Cadmium - Complexation, adsorption, co-precipitation, isomorphous substitution and bioaccumulation are processes which affect the movement of cadmium in the environment. Cadmium exists in one oxidation state, 2+. Compared to other heavy metals, cadmium is relatively mobile and may be transported as either hydrated cations or as organic or inorganic complexes. Sorption to mineral surfaces generally increases as the pH increases and is responsible for removal of cadmium from the aqueous phase. Other processes which serve to remove cadmium from water include adsorption onto organic matter, co-precipitation with hydrous metal oxides and isomorphous substitution in carbonate minerals. Cadmium is strongly accumulated by organisms at all trophic levels (Callahan et al., 1979; ATSDR, 1991). At this site, cadmium present in soils will likely be adsorbed onto mineral surfaces (due to near neutral soil pH), thus retained in the soil and not translocated to ground or surface water. If any cadmium is present in ground or surface water, it will likely be coprecipitated with hydrous metal oxides present in the aqueous environment and accumulate in sediments. Thus, cadmium will likely not be lost from the system.

5.2.1.6 Chromium - Chromium exists in two oxidation states in aqueous systems: 3+ and 6+. The hexavalent form is soluble, existing in solution as an anion complex, and is not absorbed to any significant degree by clays or hydrous metal oxides. It is, however, absorbed strongly to activated carbon. Hexavalent chromium is a moderately strong oxidizing agent and reacts with organic or other oxidizable material to form trivalent chromium. Trivalent chromium combines with aqueous hydroxide ion (OH^-) to form insoluble chromium hydroxide ($Cr(OH)_3$). Precipitation of this material is thought to be the dominant transport process of chromium in natural waters. Adsorption processes also result in removal of dissolved chromium to the bed sediments. Chromium is bioaccumulated by aquatic organisms and the passage of chromium through the food chain has been documented. Chromium in soil can occur as the insoluble oxide dichromate (Cr_2O_3) and may be aerosolized into the atmosphere or transported to surface waters and ground waters in run-off and leachates (Callahan et al., 1979; ATSDR, 1987). At this site, chromium present in the soil will likely be present as either dichromate or chromium hydroxide (due to the near neutral pH of the soil). The chromium present in these forms will likely be translocated to ground water and surface water in leachate or run off, where it will remain as an insoluble salt (in sediments). Thus, migration of chromium from this site will likely be minimal.

5.2.1.7 Copper - The transport of copper is controlled by complexation, adsorption, precipitation and bioaccumulation. Copper exists in two oxidation states, 1+ and 2+. The only cuprous (Cu^{+}) compounds that are stable in aqueous solutions are highly insoluble (i.e., CuCl, CuF and CuCN). Most of the cupric salts (Cu^{2+}) are also relatively insoluble. Exceptions include $CuCl_2$, $Cu(NO_3)_2$ and $CuSO_4$. Cu^{2+} forms coordination compounds or complexes with inorganic and organic ligands such as ammonia, chloride and humic acids. For instance, copper forms strong complexes with dissolved organic matter, which enhances both its solubility and its adsorption to clay and other surfaces. Strong adsorption of copper to hydrous metal oxides, clays, carbonate minerals and organic matter is an effective control on dissolved copper concentration. Copper is also strongly bioaccumulated, and can be toxic to aquatic organisms at high concentrations (Callahan et al., 1979; ATSDR, 1990). At this site, copper will likely be retained in the soil due to sorption. The copper that does leach to ground water or run off to surface water will likely be soluble and mobile, due to complexation with chloride and humic acid.

5.2.1.8 Lead - Lead is transferred continuously between air, water and soil. Soil leaching of lead into ground water is determined by the chemical characteristics of the soil. The availability of lead in soils is related to moisture content, soil pH, organic matter and the concentration of calcium and phosphates. Lead is bioaccumulated in shellfish and plants (Callahan et al., 1979; ATSDR, 1988). At this site, lead will likely be insoluble in the soil, due to the moderate pH and formation of lead hydroxides. The insoluble forms of lead will likely be translocated to ground water, where they will probably precipitate and remain. Thus, the potential for lead migration is probably minimal.

5.2.1.9 Manganese - Four oxidation states exist for manganese: 2+, 3+, 4+ and 7+. From pH 4 to pH 7, Mn^{2+} predominates; above pH 8, the higher oxidation states dominate. The principle anion associated with Mn is CO_3^{2-}; $MnCO_3$ is relatively insoluble. In oxidized environments, manganese solubility is controlled by oxidation of Mn^{2+} to Mn^{3+} and Mn^{4+}. In reducing environments, manganese solubility is controlled by the poorly soluble manganese sulfide. Manganese is often transported in water adsorbed to suspended particulates. Manganese may become fixed to soil at low concentrations, but at high concentrations it may be desorbed by ion exchange reactions (ATSDR, 1991). At this site, the principal redox state of manganese in soil will likely be Mn^{2+} (due to estimated soil pH of 5-7). Likely, Mn^{2+} will be complexed with available carbonate to form MnCo3 as an insoluble salt. This may leach to ground and surface water, but will probably accumulate in sediments due to the bicarbonate concentration and pH of ground and surface water.

5.2.1.10 Mercury - The major removal mechanism for mercury from a natural system is adsorption onto the surfaces of clay particles and subsequent settling as part of the sediment. The majority of dissolved mercury is removed in this manner within a relatively short time, generally in the immediate vicinity of the source. Much smaller portions of the dissolved mercury are ingested by the aquatic biota or transported by current movement and dilution. Secondary transformations of mercury in the sediments can occur; these include precipitation as mercury sulfide and methylation reactions caused by bacteria. Since mercury itself is not destroyed, these inorganic and organic forms of mercury may then release ionic or metallic mercury into the water column as part of a recycling process. Resuspension of sediments by turbulence or the activity of benthic organisms can also release these compounds of mercury directly into the water column (Callahan et al., 1979; ATSDR, 1988). At this site, much of the mercury will likely be adsorbed to the soil matrix or adsorbed to clay particles in sediments. It likely will not be removed from this site to any great extent.

5.2.1.11 Nitrate - Most of the nitrogen in the world exists as N_2, with a smaller fraction existing as amino nitrogen in reduced carbon compounds. Only a very small fraction exists as nitrates. Nitrogen reactions are generally highly irreversible, and enzymatic catalysis is necessary for nitrogen conversions in soils (Stumm and Morgan, 1981). Significant reactions involving nitrogen include the oxidation of ammonia (NH_4^+) to nitrite (NO_2^-) and then to nitrate (NO_3^-) (nitrification), the reduction of NO_3^- to NO_2^- and then to NH_4^+ (nitrate reduction), the reduction of NO_3^- to nitrogen gas (N_2 (g)) (denitrification), and the reduction of N_2 (g) to NH_4^+ (nitrogen fixation). The incorporation of NH_4^+ into nitrogen-containing organic matter (amination) or its release (deamination or ammonification) is the only nonredox reaction involving nitrogen transformation. Reactions involving the conversion of N_2 (g) to NH_4^+ or NO_3^- proceed slowly, while interconversions of the other nitrogen-containing species proceed rapidly (Snoeyink and Jenkins, 1980).

The predominate forms of nitrogen in water are NO_3^-, N_2 (aq), and NH_4^+. Nitrate and ammonia are the predominate forms of inorganic nitrogen in soils. For most of the aqueous range of pϵ (electron activity), N_2 gas is the most stable species, but at negative pϵ values ammonia becomes predominant, and nitrate dominates for pϵ greater than +12 and pH of 7 (Stumm and Morgan, 1981).

In general, nitrate is expected to be quite mobile in soils because it is a negatively charged ion and is not retained by negatively charged soil particles. However, some of the available NO_3^- may be taken up by plants or microbes, or may be transformed to N_2 or N_2O via denitrification in anaerobic environments.

5.2.1.12 Silver - Silver exists in four oxidation states: 0, 1+, 2+ and 3+. Silver occurs primarily as sulfides and in association with iron, lead, tellurides and gold. In surface water, silver exists as the monovalent ion, as part of more complex ions with chlorides and sulfates, and adsorbed onto particulate matter. Metallic silver is stable in water. Formation of this metal, which has a very low solubility, may affect the mobility of silver. In oxidizing, aqueous environments, silver exists predominately in conjunction with bromides, chlorides and iodides. The free metal and silver sulfide dominate in reducing, aqueous environments. Both the silver halides and silver sulfide have very low aqueous solubilities. Soil mobility is affected by drainage, redox conditions, pH and organic matter content. Silver is strongly adsorbed to manganese and iron oxides and clay minerals. Bioaccumulation may be significant for silver; however, it has a short biological half-life, and biomagnification does not appear to occur (Callahan et al., 1979; ATSDR, 1990). At this site, silver will likely be adsorbed to clay particles and retained in the soil matrix. If silver is encountered in ground water or surface water it will likely be present in an insoluble form (e.g., halides). Thus, the silver will likely precipitate to the sediment and will probably migrate from the site.

5.2.1.13 Thallium - Thallium typically exists in the environment combined with other elements such as oxygen, sulfur, and the halogens. These compounds are generally quite soluble in water. Thallium is typically found as the monovalent ion (Tl^{1+}), but may be trivalent (Tl^{3+}) in very oxidizing environments. In extremely reducing water, thallium may precipitate as a sulfide (Tl_2S); in oxidizing water, it may be removed from solution as $Tl(OH)_3$. Soluble thallium tends to adsorb to soils and sediments and bioconcentrate in biota (Callahan et al., 1979; ATSDR, 1990).

At this site, thallium was detected in two soil samples. Thallium will likely be present in the soil in the soluble Tl^{1+} oxidation state. The soluble thallium will likely adsorb to soil or precipitate as Tl_2S.

5.2.1.14 Vanadium - Six oxidations states exist for vanadium: 1-, 0, 2+, 3+, 4+ and 5+. In natural aqueous systems, vanadium exists as part of or adsorbed onto particulate matter and as the soluble species VO^{2+} and $VO(OH)^+$ under reducing conditions and $H_2VO_4^-$ and HVO_4^{2-} under oxidizing conditions. Both V^{4+} and V^{5+} bind strongly to mineral or biogenic surfaces. Vanadium is fairly mobile in neutral and alkaline soils, with mobility decreasing in acidic soils. Vanadium is somewhat mobile under oxidizing, unsaturated conditions, and very immobile under reducing, saturated conditions (ATSDR 1990). At this site, vanadium will likely be somewhat mobile in both the soil and ground/surface water. Off-site contaminant migration could occur.

5.2.2 Volatile Organics

The primary transport process for the volatile organics is via volatilization. The volatile compounds detected at this site are relatively water soluble (1,100 - 16,700 mg/L); therefore, transport in the dissolved, aqueous phase is also possible. Adsorption to soil is not a significant process for these compounds (log K_{oc} 0.94 - 2.47). Bioconcentration is also insignificant for this class of compounds (BCF 0 - 11).

5.2.3 Semi-Volatile Organics

The semi-volatile compounds detected at the site have a variety of different characteristics and may be divided into three general groups for the purposes of this discussion. In general, semi-volatile compounds tend to be durable and may cycle between surface water and sediments with limited transport occurring.

5.2.3.1 Group 1 Semi-Volatiles - For the purposes of this report, Group 1 semi-volatiles include the chlorinated pesticides, DDD, DDE, DDT, heptachlor epoxide and endrin aldehyde. These organics are generally reported to exhibit moderate to strong adsorption to soil and sediments. Log K_{oc} values range from 4.08 for dieldrin to 5.57 for alpha-chlordane. The potential for bioaccumulation of this group is high (BCF 5,000 - 54,000) and may result in minor transport from the site. In general, these compounds are assumed to be immobile in soil under normal conditions.

5.2.3.2 Group 2 Semi-Volatiles - This group of compounds includes the polynuclear aromatic hydrocarbons (PAHs). The PAHs exhibit a wide range of characteristics. Log K_{oc} values range from 1.25 for acenaphthene to 7.49 for indeno(1,2,3-cd)pyrene. In general, as the molecular weight of these compounds increases, the K_{oc} value and BCF increase and water solubility decreases. Bioaccumulation can be significant for some of the PAHs (BCF 242 - 2,630), possibly resulting in minor transport from the site. Based on K_{oc} values, acenaphthene is the only PAH with a potential to migrate; however, considering the relatively low water solubility (3.5 mg/L) of acenaphthene, its mobility is not expected to be significant. The remainder of the Group 2 constituents are expected to be immobile under ordinary conditions.

5.2.3.3 Group 3 Semi-Volatiles - This group includes the remaining compounds: bis(2-ethylhexyl)phthalate, dibenzofuran, 2,4-dichlorophenol, diethylphthalate, malathion and 2,4,6-trichlorophenol. The log K_{oc} values for these compounds range from 1.84 for diethylphthalate to 5.00 for bis(2-ethylhexyl)phthalate. Bioaccumulation is not significant for this group of compounds (BCF 0 - 150). Considering the relatively high water solubility (1,080 mg/L) and relatively low K_{oc} value for diethylphthalate, this compound may be mobile under certain circumstances (i.e., low organic matter and heavy rains). The other compounds are expected to be relatively immobile.

Although these three groupings of the semi-volatile compounds are a generalized categorization, and some compounds may exhibit certain aspects of the other groups, the above groupings are intended to provide a useful mechanism for assessing the mobility and fate of compounds detected at the PSF.

5.3 PERSISTENCE OF CONTAMINANTS

The persistence of a contaminant in a particular environmental compartment is a measure of the length of time that it remains in that compartment. Processes of contaminant removal include degradation, transformation and transport to another compartment. The longer a compound remains in a compartment, the more persistent it is in that media. The term half-life is often used when discussing persistence. The half-life of a compound is the time needed for the concentration of the chemical to decrease to one half of the original concentration. Adsorption may affect the persistence of a compound. For example, the soil or sediment binding the chemical may act as a catalyst for chemical degradation or it may protect the chemical from biodegradation.

Bioaccumulation may increase a chemical's persistence by protecting it from processes of environmental degradation.

The potential for persistence of constituents detected in ground water, surface water, sediments and soils at the PSF will be discussed in the following sections.

5.3.1 Metals

Since metals are not actually degraded, persistence is addressed in terms of the removal or transport of the metals from one media to another (i.e., from sediment to water). As might be expected from their ability to exist in a variety of forms, metals were detected in ground-water, soil, surface water and sediment samples collected from this site. In general, one would expect migration, via leaching, for metals forming soluble organic or ionic complexes. Insoluble metal compounds and adsorbed metals will tend to persist in surface soils and sediments.

In general, since metals do not degrade, the constituents currently in the soil and sediment may continue to act as a potential source of future contamination to ground water or surface water. The metals that are currently in the soil and sediment are either ionic and adsorbed to the solid phase or in a nonionic, precipitated form. A variety of factors will determine whether or not these metals will be mobilized in the future. For instance, the adsorbed species may be removed by ion-exchange reactions and the solid phases may be dissolved during the infiltration of rainwater and flow of surface water runoff. Physical and chemical characteristics of the water that may influence the mobility include pH, the presence of competing ions (to compete for ion exchange sites) and temperature. Changes in the redox conditions of the soil will also affect the metal species with multiple oxidation states. Section 5.2.1 specifically addresses the behavior of the metal species of interest at this site.

5.3.2 Volatile Organics

The persistence of the volatile organics at this site varies depending on the properties of the contaminant and the environmental compartment in which it exists. Toluene was detected in both surface and subsurface soil samples taken from this site. Volatilization is the dominant removal process of toluene in surface soil. In subsurface soils, biodegradation becomes more significant because volatilization may be somewhat inhibited. The half-life of toluene in soil ranges from 4 to 22 days based on aerobic aqueous biodegradation rates (Howard et al., 1991). Therefore, toluene is not expected to persist in soil.

Methylene chloride was detected in site surface soil, subsurface soil, surface water and ground-water samples. The presence of methylene chloride in surface water and ground water may be attributed to blank contamination. Volatilization is the dominant removal process for methylene chloride in surface soil; in subsurface soil, this process is hindered. The half-life of methylene chloride in soil ranges from 7 to 28 days under aerobic conditions, and from 28 days to 16 weeks under anaerobic conditions. Therefore, it is not expected to persist in soil.

Toluene, 1-2-dichloropropane, 1,1,2,2-tetrachloroethane, and carbon disulfide were detected in sediment samples from this site. The half-lives of these compounds in sediments varies depending on factors such as depth in the sediment, water turbulence and disturbance of the sediment. Since these constituents were detected in sediment samples collected at the surface water interface, they are not expected to persist. Methylene chloride was also detected in site sediment samples, but its presence in these samples is associated with blank contamination.

Trichloroethene (TCE) was detected at low levels in one ground-water sample collected from this site. Chlorinated solvents such as TCE are often used in the cleaning and/or the maintenance of motor vehicles. Since vehicle maintenance occurs at the DEH yard, TCE present in site media may be attributed to this source (i.e., a small spill which leached from the soil to the ground water). Transformation studies of chlorinated alkenes in systems simulating underground environments indicate that trichloroethene undergoes reductive halogenation to form cis- and trans-1,2-dichloroethene. Chlorinated ethenes biologically transform very slowly and apparently with several simultaneous removal actions (Barrio-Lage, et al. 1986). The half-life of trichloroethene in ground water ranges from 11 months to 5 years (Howard et al., 1991).

It should be noted that the toluene detected in site media may be the result of fuel spillage or leakage in the DEH yard, which was transported via surface run off. Likewise, the presence of 1,2-dichloropropane and 1,1,2,2-tetrachloroethane in site sediments may be the result of a spill of solvents used to degrease machinery in the DEH yard. This may account for the detection of these compounds in site media, in spite of their relatively short half-lives.

In general, the volatile organic compound detected in the soil and sediment samples will likely be removed via volatilization and biodegradation. Trichloroethene, detected in subsurface regions where volatilization is not expected, may be relatively persistent.

5.3.3 Semi-Volatile Organics

The semi-volatile organics at this site were detected in soil and sediment samples. Dominant removal processes from these media include biodegradation and hydrolysis.

5.3.3.1 Group 1 Semi-Volatiles - The chlorinated pesticides and their degradation products, are considered to be moderately to highly persistent. The half-lives of these compounds under aerobic conditions (i.e., soil and surface sediment) range from 1 day for heptachlor to 16 years for DDT and its metabolites. Although the half-life of heptachlor is relatively short, its major degradation product, heptachlor epoxide, is more persistent (half-life 1 month to 1 year). The large K_{oc} values and low water solubilities of this class of compounds indicates that they will tend to remain adsorbed to the soil and sediment until they are degraded. This is an important fate process for the Group 1 semi-volatiles detected in the sediments because most of these compounds are more readily degraded under anaerobic conditions (half-lives 1 day to 10 months). Over time, the compounds present in sediments will become buried deeper and will eventually experience anaerobic conditions (Howard et al., 1991).

5.3.3.2 Group 2 Semi-Volatiles - The PAHs are also considered to be moderately to highly persistent. The aerobic half-lives of these compounds range from 12 days for acenaphthene to 6 years for indeno(1,2,3-cd)pyrene under aerobic conditions (Howard et al., 1991). In general, the persistence of these compounds increases with increasing molecular weight. Photodegradation is a very important fate process for PAHs (half-lives 0.5 to 28 days) but is only significant where the PAHs are directly exposed to sunlight (i.e., soil surface) (Howard et al., 1991). Again, considering the high K_{oc} values and low water solubilities of most of these constituents, these compounds are expected to remain in the soil and sediments until they are degraded.

5.3.3.3 Group 3 Semi-Volatiles - These compounds are relatively non-persistent. Aerobic half-lives of this group range from 3 days for diethylphthalate to 70 days for 2,4,6-trichlorophenol (Howard et al., 1991). The contaminants in this group are not expected to persist in soil or in sediment.

The semi-volatile compounds range from highly persistent to non-persistent in the environmental media of interest. However, most of these constituents are expected to remain in the soil and sediment until they are degraded.

5.4 MIGRATION OF CONTAMINANTS

The dominant transport pathways of importance at the PSF include horizontal movement to the east by surface water runoff and downward (vertical) movement by percolation of rain water through the soil. Migration can occur in the ground water and surface water.

5.4.1 Soil

The soil at the PSF is contaminated with metals, volatile organics and semi-volatile organics (including pesticides). The areas of most highly contaminated soil are identified in Sections 4.2.2 and 4.3.1. These areas were areas of pesticide waste water discharge and concentrated pesticide spills, and they remain sources of further contamination due to the persistence of the contaminants in the soil. The volatile organics and the soluble species of metals may partition between the soil and rain water causing migration to the ground water or to the east in surface water runoff.

The chemical properties of the pesticides and other semi-volatiles detected in site soils are such that transportation from soil to ground water is not likely to occur. Specifically, the solubilities of these constituents in water is low and their K_{oc} values are high, indicating an affinity for binding to soil particles. The assumption that these constituents are unlikely to partition to ground water or surface water is substantiated by the lack of positive pesticide and semi-volatile detection in ground- and surface water samples. Therefore, modelling of contaminants from soil to other media is considered unnecessary at this site.

5.4.2 Ground Water

Heavy metals and trichloroethene were detected in the ground water at this site. Metal contamination of the ground water is likely a result of percolation of rainwater through soil. Soluble (ionic) metal species are mobilized in the aqueous phase. Trichloroethene

(TCE) most likely exists in the dissolved phase, possibly having leached from spills onto the soil into the ground water. TCE was not detected in any samples from site soils. Both the metals and trichloroethene may be transported through the aquifer with ground-water flow.

5.4.3 Surface Water

Heavy metals and volatile organics were detected in surface water samples collected from the ditch to the east of the PSF. Contamination of the surface water is likely a result of surface water runoff containing contaminants in both the dissolved phase and adsorbed onto suspended particulates (especially during times of heavy flow). The contaminants in the surface water will continue to flow downstream.

5.4.4 Sediment

Metals, volatile organics and semi-volatile organics (including pesticides) were detected in sediment samples collected from the ditch to the east of the PSF. Metals are likely to migrate to the sediments of the drainage ditch in either the ionic (dissolved) phase or adsorbed to particulates. The volatile organics are probably transported in the dissolved phase. Semi-volatile contamination likely resulted from the transport of constituents adsorbed to suspended particulates in surface water runoff and wastewater. The organic constituents with low water solubilities and high K_{oc} values and the nonionic metal species settled into the sediments. This sediment contamination may act as a source of future surface water contamination. The contaminants may enter the water column by future partitioning, particularly if the water quality changes, and by the action of benthic organisms.

5.5 SUMMARY AND CONCLUSIONS

The dominant transport pathways of importance at the PSF include horizontal movement to the east by surface water runoff and downward (vertical) movement by percolation of rain water through the soil. Migration also occurs in the ground water and surface water.

5.5.1 Metals

Leaching, precipitation and adsorption of metals are likely transport systems as indicated by the presence of metal contamination of the soil, ground water, sediment and surface water. "Hot spots" of soil contamination of metals are identified in Section 4.3. The soil continues to serve as a source of metal contamination to both the ground water and drainage ditch to the east of the PSF.

Metals in the ground water likely resulted from percolation of rainwater through the soil, mobilizing the ionic species and possibly the fine grained particulates containing adsorbed metals. The metals in the ground water are expected to travel eastward with the ground-water flow.

Metal contamination of the drainage ditch likely resulted from surface water runoff which transported both dissolved metals and metals adsorbed to particulate matter. After entering the surface water in the drainage ditch, the metals were partitioned between the sediment and surface water. Dissolved constituents are expected to travel with surface water flow, while the metals in the sediments are likely to remain in the solid phase or partition into the water column depending on the physical and chemical characteristics of the sediments and water.

5.5.2 Volatile Organics

Low levels of volatile organics were detected in the soil, ground water and sediments. The constituents in the soil and sediments are not expected to persist. Therefore, the soil is not a likely source of future contamination. Trichloroethene, detected in one ground-water sample at the detection limit, was likely transported in the dissolved phase by percolation of rain water through the soil. As a dissolved constituent of the ground water, trichloroethene is expected to migrate eastward with the ground-water flow.

5.5.3 Semi-Volatile Organics

Semi-volatile constituents (including pesticides) were indicated in soil and sediment samples collected from this site. The areas of highest soil contamination are identified in Sections 4.3.1 and 4.3.4. It appears that the semi-volatiles found at this site have not migrated from their point of application (adsorbed onto soil particles) to other media. This adsorption to soil particles is the likely explanation for the persistence of these compounds.

The soil containing semi-volatiles is not expected to remain a source of future ground-water or surface water contamination. However, the movement of soil particles (carried by storm or surface water runoff) containing adsorbed semi-volatile organics is probably responsible for their presence in the drainage ditch sediments to the east of the site. Some of the more soluble species may have been transported to this location in the dissolved phase. Considering the strong adsorption of these compounds, the sediment contamination is not likely to be a source of future surface water contamination.

6.0 BASELINE RISK ASSESSMENT

This section presents the results of the baseline risk assessment for the Pesticide Storage Facility (PSF) at Fort Riley, Kansas. The baseline risk assessment includes a human health evaluation and an ecological risk assessment of the PSF site.

6.1 HUMAN HEALTH EVALUATION

A risk assessment approach, consistent with that presented by the USEPA's "Risk Assessment Guidance for Superfund" (USEPA, 1989a), was used to evaluate potential impacts to public health as a result of existing contamination at the Pesticide Storage Facility, Building 348, Fort Riley, Kansas.

The objective of the baseline human health evaluation is to determine the effects of the existing conditions on the exposed and potentially exposed populations if no action is taken to remediate conditions at the site. The results of the baseline human health evaluation are used to determine whether further study and/or remedial actions are necessary.

The baseline human health evaluation consists of four steps. The discussion in this section will be presented according to these four steps as outlined below:

1. Data evaluation and identification of chemicals of potential concern

2. Exposure Assessment

   - Characterization of exposure setting
   - Identification of exposure pathways
   - Quantification of exposure
   - Identification of uncertainties

3. Toxicity Assessment

   - Identification of Applicable or Relevant and Appropriate Requirements (ARARs)

   - Characterization of toxicological properties of chemicals of potential concern

   - Identification of critical toxicity values

4. Risk Characterization

   - Characterization of potential risks due to exposure to carcinogenic chemicals of concern
   - Characterization of potential risks due to exposure to noncarcinogenic chemicals of concern
   - Identification of uncertainties

6.1.1 Identification of Chemicals of Potential Concern

The results of the data collection and data evaluation efforts are presented in this section. Based on the results of the data evaluation, a subset of chemicals present at the site were selected as chemicals of potential concern.

6.1.1.1 Data Collection - The following section summarizes the data collection efforts performed prior to and during the 1992-1993 sampling efforts.

6.1.1.1.1 Historical Data Collection - There have been three data collection efforts at or in the vicinity of the PSF:

- During the months of July and November, 1974, the U.S. Army Environmental Hygiene Agency (USAEHA) collected soil, sediment, and surface water samples as part of the U.S. Army Pesticide Monitoring Program.

- In May 1986, USAEHA collected six more soil samples as part of the Pesticide Monitoring Study No. 17-44-1356-88.

- In August 1990, wipe samples were collected from the CONEX containers outside the PSF.

Detectable levels of pesticides and herbicides were found in the sediment and soil samples collected during the 1974 and 1986 sampling episodes; the surface water samples collected in 1974 contained no detectable concentrations of pesticides. The preliminary data reported for the wipe samples collected from the CONEX containers revealed minimal levels of several pesticides and heavy metals, but these results were later determined to have been caused by matrix effects during analysis.

More information regarding the previous investigations conducted at the site, along with an evaluation of the data generated from these investigations, can be found in Section 1.2.3 of this report. The data results from these previous investigations for soils, surface water, and sediments can also be found earlier in this report in Sections 4.2.2.1, 4.2.3.1, and 4.2.4.1, respectively.

6.1.1.1.2 Current Sample Collection - Law Environmental, Inc., (Law) collected soil, sediment, and surface water samples at the site from March to July 1992. Sections 2.1.3 through 2.1.6 discuss and present the data collection efforts for the media sampled. Groundwater samples were collected and analyzed on a quarterly basis (July 1992, November 1992, February 1993, and May 1993) to assess temporal fluctuations of water quality.

6.1.1.1.3 Sampling Methods and Locations - The sample collection procedures and analytical methods for the PSF field efforts were performed in accordance with the PSF Planning Documents, May 1992 (Law, 1992a). The quality control (QC) samples collected during these efforts included field blanks (rinsates and trip blanks), split and duplicate samples, laboratory blanks (method blanks), and matrix spike/matrix spike duplicate samples. Upgradient samples were collected to establish background conditions for each medium of potential concern. Sample locations are identified in Figures 4-1 through 4-4.

6.1.1.2 <u>Data Evaluation</u> - The human health and environmental evaluations will be based on the results of the Remedial Investigation (RI) data collection efforts (i.e.; March 1992 to May 1993).

The data collection efforts of the current RI for the PSF focused on evaluating the extent of contamination in study area soils, the possible migration of these constituents via groundwater flow, and the discharge of contaminants to surface water and sediments adjacent to the site. Surface soil, subsurface soil, and monitoring well soil boring samples were collected to determine the composition and extent of contamination in site soils. Monitoring wells were designed and installed after the geologic and hydrogeologic characteristics of the area were investigated.

Monitoring wells which were sampled included an upgradient well (PSF92-01), and four downgradient wells (PSF92-02, PSF92-03, PSF92-04, and PSF92-05). The depth to groundwater for these wells ranged from 21.8 feet (PSF92-05) to 27.4 feet (PSF92-01). Monitoring well boring samples and groundwater samples were used to provide data on soil and groundwater contaminants migrating from suspected sources. Surface water and sediment samples were designed to address impacts from possible migrating constituents into the adjacent aquatic ecosystem.

The analytical data were evaluated according to the data evaluation procedures specified in USEPA's risk assessment guidance (USEPA, 1989a) and the USEPA's "Guidance for Data Useability in Risk Assessment" (USEPA, 1992c). These procedures outline specific aspects of data quality which must be addressed in compiling a data set to be used in quantitative risk assessment. The following aspects will be addressed in the evaluation of the data set: analytical methods, quantitation limits, use of qualified data, contamination of blank samples, and comparison of site samples with background.

6.1.1.2.1 Analytical Methods and Quantitation Limits - The analytical methods used were appropriate for quantitative risk assessment. The quality of the data produced were scientifically correct and legally defensible, as USEPA-approved methods with known limits of precision and accuracy were used. Sample Method Detection Limits (MDLs) were compared to regulatory criteria, such as Maximum Contaminant Levels (MCLs) to determine whether the methods used were sensitive enough for the purpose of regulatory review. In most cases, the MDLs provided by the laboratory were less than the relevant health-based standards for the constituents detected at the site. An exception for groundwater constituents was thallium, which, with an MDL of 0.1 mg/L for the first three sampling rounds, did not meet the proposed MCL of 0.002 mg/L. Using a different analytical method, the MDL for thallium was decreased to 0.001 mg/L for the fourth sampling round. Exceptions also occurred for some surface water constituents. The MDL for methylene chloride (0.005 mg/L) did not meet the Ambient Water Quality Criteria (AWQC) for the protection of human health via ingestion of water and fish (0.00019 mg/L). The MDLs for cadmium (0.005 mg/L) and inorganic chloride (0.500 mg/L) exceeded both the acute and chronic AWQC for the protection of aquatic life. The AWQC for these two constituents are as follows: cadmium - acute AWQC = 0.0039 mg/L, chronic AWQC = 0.0011 mg/L; inorganic chloride - acute AWQC = 0.019 mg/L, chronic AWQC = 0.011 mg/L.

6.1.1.2.2 Qualified Data - Matrix interference was noted with several samples. Several soil and sediment samples exhibited internal standard (IS) responses below the QC limit for volatile and semi-volatile organic compounds analyses. Some of these samples also had high surrogate recoveries which can be attributed to the low IS response. Data results in affected samples were flagged (data qualifier coding is defined later in this section) with appropriate qualifiers.

Eight soil samples for pesticides/PCBs also exhibited low surrogate recovery. All pesticide/PCB compounds in these samples were qualified "S" as biased low, based on surrogate recoveries. Five samples also showed surrogate recovery below QC limits. These latter samples, when re-extracted and reanalyzed, exceeded holding times (and are qualified "H"), although the surrogate recoveries were within limits. The data set with more positive hits was used (initial versus re-extracted data sets) for the risk assessment.

The soil and sediment samples affected by low IS responses are listed in a table in Appendix N. More information regarding these samples and their analysis can be found in the Quality Control Summary Report for the PSF (Law, 1992b).

All pesticide/PCB samples in soil were diluted by a factor of at least 2 times due to using Gel Permeation Clean-up procedures. Some samples were diluted by a factor of 100 times (PSFSB03A, PSFSB03B) or 400 times (PSFSB03C) to bring sample response into the linear range of the instrument, because of the high concentrations of pesticides detected in these samples. These latter sample results are flagged with "D_1" and "D_2," respectively, and qualified as an estimated result due to the high dilution factor.

Metals data for soil and sediment were of acceptable quality with the exception of selenium and antimony. The matrix spike/matrix spike duplicate (MS/MSD) recoveries for these metals were low in several samples, indicating poor accuracy. All selenium and antimony results were flagged with "M_2" to indicate matrix interference which may have caused a false negative or results that are biased low.

Matrix interference was also noted in surface water samples. The MS/MSD recoveries for lead are below the QC limits, and the MS/MSD recoveries for iron are above the QC limit. All lead results in surface water are flagged with an "M_2" identifier, indicating a matrix interference which may cause a false negative or biased low results. All positive iron results are flagged with the identifier "M_1" to indicate a matrix interference which may cause results to be biased high.

Matrix interference was observed in the groundwater samples for metals. The MS/MSD recoveries for dissolved lead and the MS recovery for total lead are below the QC limit. The samples were diluted 5 times due to this matrix interference. Recoveries improved upon dilution but were still below the QC limit. Therefore, all total and dissolved lead results are flagged with the identified "M_2" to indicate a matrix interference which may cause a false negative or biased low results. Positive results for total lead are also flagged with an "E," indicating poor precision due to matrix interference.

6.1.1.2.3 Contamination of Blank Samples - In addition, several chemicals were detected in the blank and rinsate samples. Methylene chloride, a common laboratory contaminant, was noted in the trip blanks of all media sampled, as well as in the trip blanks associated with the method blanks for soil and sediment samples. Affected samples are flagged with a "B" or "T," whichever is appropriate, indicating possible laboratory contamination or cross-contamination, respectively.

Several metals and/or inorganics were also detected in the method blanks. Qualification of some mercury results in sediment was necessary due to method blank contamination. Aluminum was detected in the method blank for surface water, and zinc and calcium were detected in the groundwater method blanks. Any samples associated with the method blanks of concern having positive detection of these inorganics less than five times the amount detected in the blank are flagged with the identifier "B_1."

Metals were also detected in some rinsate samples collected at the site. Lead was detected in the rinsate sample associated with soils, but was not detected in the method blank, indicating possible cross-contamination which occurred during sampling or inadequate decontamination of equipment. Positive results for lead in soil samples associated with the rinsate sample are flagged with an "R_2" qualifier. Zinc was detected in the groundwater rinsate sample, but was also found in the method blank, indicating possible laboratory contamination.

The coding for the data qualifiers used to examine the data set is defined below. According to risk assessment guidance (USEPA, 1989a; USEPA, 1992c), qualified data should not be eliminated from the data set as long as the uncertainties associated with the data are clearly defined.

Qualifier	Definition
S	Low surrogate recovery. Results are biased low.
H	Holding time exceeded. Results are biased low.
D_1	100 times dilution factor. Result is estimated.
D_2	400 times dilution factor. Result is estimated.
B_1	Sample results are less than 5 times the amount detected in the method blank. Result is estimated.

Qualifier	Definition
B_2	Sample results are less than 10 times the amount detected in the method blank. Result is estimated.
T	Sample results are less than 10 times the amount detected in the trip blank. Result is estimated.
I	Low internal standard response. Result is an estimated quantitation.
I_2	Low internal standard response and high surrogate recovery. Result is biased high.
M_1	Matrix spike recovery is high due to sample matrix effect. Sample result is a false positive or biased high.
M_2	Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
R_1	Sample result is less than 10 times the amount detected in the rinsate. Result is estimated.
R_2	Sample result is less than 5 times the amount detected in the rinsate. Result is estimated.
IR	The internal standard response is less than 10 percent of the internal standard area. Result is rejected.
S_1	Surrogate recovery is unknown. Result is estimated.

6.1.1.2.4 Background Samples - Samples were collected for each medium of concern from a location upgradient of the suspected area of contamination. These samples will be used to evaluate background conditions (i.e., background concentrations of constituents) at the site.

6.1.1.2.5 Summary of Data Evaluation - The quality of the data generated for this investigation is scientifically correct and legally defensible; USEPA-approved methods with known limits of precision and accuracy were used to evaluate the data. In general, the quality of the data was good. While some data required qualification based on quality control performance (e.g., the soil data), no data were discarded as unusable.

Quality Assurance (QA) objectives for measuring data are expressed in terms of precision, accuracy, completeness, representativeness and comparability. Laboratory and field accuracy and precision goals were met for most of the analyses. Problems did occur in some soil and sediment samples, as stated earlier, but these problems are most likely due to the heterogenous nature of the sample media. The presence of various constituents in laboratory and trip blanks were accounted for during the analysis of the data. In general, the analytical completeness goal of 90 percent was accomplished, except for the pesticide/PCB analysis of soil. In a few of these latter samples, low surrogate recoveries and exceeded holding times lowered the completeness to 78 percent.

The samples collected from the PSF are, for the most part, representative of the site. The rationale for sampling locations was provided in the approved Field Sampling Plan (Law, 1992a). However, the number and location of surface soil samples collected may not adequately represent the current conditions (contamination) to which site workers are exposed. Surface soil samples SS-01, SS-02, and SS-03 were collected from surface soil which lies beneath six inches of gravel; no direct exposure to these surface soils currently occurs at the site.

Furthermore, these samples cannot be used to estimate any possible contamination present in the gravel fill covering the site. Approximately six to eight inches of fresh gravel was applied on the site in 1988 (DEH, 1993r), after pesticide mixing and formulation activities were discontinued. Therefore, the top layer of gravel on the site should be relatively free from pesticide residues, if proper procedures were followed at the site. As stated earlier in Section 4.0, Law's field RI personnel noticed that Fort Riley personnel rinsed off the exterior of their vehicle and equipment at the northwest corner of the PSF building. Soil samples in this area failed to detect herbicides in the soil matrix, so the current practices do not appear to be influencing the site. However, based on the observation of such practices at the site, it cannot be stated with certainty that the gravel covering the site at the current time is "clean", but that it is probably not contaminated with pesticides.

One surface soil sample, SS-04, was collected from the grassy area outside the DEH yard fence in the area of (previously) stressed vegetation. An area of stressed vegetation measuring 20 feet x 20 feet was located downgradient of the PSF outside the perimeter fence. However, it appears that this area has experienced regrowth this growing season. For purposes of the risk assessment, this sample (SS-04) was used as proxy for surface soil contamination in the grassy area. The use of sample SS-04 for this purpose was discussed in meetings with USEPA Region VII, KDHE, Fort Riley, and the Corps of Engineers, and, while it was generally agreed that the use of SS-04 may overestimate the contamination (and associated risk) present in the area of concern, the use of SS-04 as a proxy sample was accepted in lieu of collecting additional surface soil samples.

Finally, the soil, surface water, sediment and groundwater samples generated Level III analytical data which allows for comparison of the results to ARARs. Two previous analytical data reports generated by USAEHA were not able to be compared directly to the data generated during the RI investigation, because critical pieces of information needed to make comparisons (sample collection methods, sample locations, sample depths, and methods of analysis) were not included in the USAEHA reports. Therefore, the historical information available regarding site contaminants is qualitative, rather than quantitative, in nature, and any predictions or assumptions regarding the attenuation or breakdown of the site constituents are somewhat speculative in nature.

A comparison of the soil data generated from the RI investigation to the historical soil data is provided in Table 4-11. As shown in this table, several pesticides were detected in site soils at relatively high concentrations during the 1974 investigation conducted by USAEHA. The constituents detected in the AEHA study and their maximum concentrations are summarized below:

Pesticide	Maximum Concentration (mg/kg)
Aldrin	0.01
Chlordane (technical grade)	544.6
2,4'-DDD	16.98
4,4'-DDD	37.87
4,4'-DDE	12.5
2,4'-DDT	50.0
4,4'-DDT	159.5
Dieldrin	9.2
Methoxychlor	824.04
Diazinon	29.85
Malathion	87.7

Fort Riley collected and USAEHA analyzed another six soil samples in the vicinity of the PSF in a 1986 investigation. The concentrations of pesticides detected in this study were much lower than those detected during the previous (1974) investigation. Specifically, the pesticides chlordane, diazinon, and malathion were not detected in the 1986 samples, and samples with positive detection of dieldrin, methoxychlor, and DDT and its metabolites were below the concentration of 1 mg/kg (1 ppm).

The concentrations of pesticides in the soil samples collected as part of the 1992 RI investigation were, in general, less than the concentrations detected in the 1974 episode, but, in some cases, greater than the levels measured in the 1986 investigation. Several explanations are possible for the differences noted. [It should be noted that fill activities at the PSF site occurred prior to the 1974 sampling episode; therefore, the differences in concentrations cannot be attributed to fill activity.] First, the locations and depths of the 1974 samples are unknown. These samples may have been collected in "hot spot" areas. Thus, the elevated concentrations detected may not be representative of the entire PSF site as it existed in 1974. Secondly, the method of analysis and methods of collection for the samples is unknown. These two factors may have biased the 1974 analytical results. In addition, practices at the PSF have changed since the original 1974 investigation. Prior to about 1975, pesticide wastewater and concentrated spills were allowed to run onto the ground surface at the site. This may be another reason for the elevated levels detected in the 1974 study.

Lastly, the degradation process is the most likely reason for the decreased concentrations detected in soils in recent investigations. The pesticide 4,4'-DDT and its metabolites are some of the most persistent pesticides detected in site soils. The soil half-life for these constituents is approximately 16 years (see Table 5-3). A time period of twelve years lapsed between the first (1974) sampling investigation and the second one conducted in 1986. Another six years passed before the RI investigation, for a total of 18 years since 1974. It is highly probable that much of the contamination detected in 1974 simply degraded over that 18-year period.

6.1.1.3 <u>Summary of Contamination</u> - Table 6-1 summarizes the analytical results for the surface soil samples collected during the RI sampling events. A total of eight pesticides, two volatile organic compounds, six semi-volatile organic compounds, and four metals were detected in the four surface soil samples from the site.

The subsurface soil results are presented in Table 6-2. A total of ten pesticides, two volatile organic compounds, 18 semi-volatile compounds, and eight metals were detected in the samples.

The results of the soil borings collected from the monitoring well boreholes are presented in Table 6-3. A total of four pesticides, two volatile organic compounds, ten semi-volatile organic compounds, and six metals were detected in these samples.

Table 6-4 summarizes the groundwater results collected from the monitoring wells installed at or near the PSF. Monitoring well PSF92-01 was installed upgradient of the site, on the other side of Dickman Avenue. This well will serve as background for groundwater results. A total of 21 metals, five inorganic compounds, and two volatile organic compounds were detected in the groundwater samples. Pesticides and semi-volatile compounds were not detected in any of the groundwater samples.

The surface water results are presented in Table 6-5. A total of 15 metals, three inorganic compounds, and one organic compound were detected in the surface water samples collected from the drainage ditch located east of the PSF.

The sediment results are presented in Table 6-6. The sediment samples were collected in the same locations as the corresponding surface water samples. A total of six pesticides, five volatile organic compounds, six semi-volatile organic compounds, and eight metals were detected in these samples.

Air samples were not collected at the site. However, air exposures will be addressed in the risk assessment by using soil concentrations to estimate exposure point concentrations based on fugitive dust models (see Section 6.1.2.6).

In Tables 6-1 through 6-6, the 95 percent upper confidence limit (UCL) on the arithmetic mean was calculated assuming that non-detect values were equal to one-half the method detection limit for a constituent. Also, in accordance with USEPA guidance (USEPA, 1989a), samples containing a blank-related chemical that is not a common laboratory contaminant in concentrations less than five times the amount detected in any blank were treated as non-detects. In this case, one-half the blank-related concentration was used as the proxy concentration.

The method used to calculate the 95 percent UCL is based on the assumption that the sample population has an approximate lognormal distribution, which is the most commonly used distribution for environmental contaminant data (Gilbert, 1987). A W-test (Gilbert, 1987) was conducted on the soil sample data to determine if the data set was consistent with a normal or lognormal distribution. The W-test failed to determine the distribution (i.e., the data did not seem to fit either distribution because the sample size was small). Because the data set did not fit either the normal or lognormal distribution, a lognormal distribution was assumed. Although USEPA Region VII does not have an explicit policy, this approach is consistent with current USEPA guidance in other regions (i.e., Region IV). In addition, according to USEPA guidance (USEPA, 1992f), most "complete" environmental data sets from soil sampling are lognormally distributed rather than normally distributed. Therefore, in most cases, it is reasonable to assume that Superfund soil sampling data are lognormally distributed (USEPA, 1992f). The equation used to calculate the 95 percent UCL is shown below:

$$UCL_{0.95} = \exp\left(\overline{y} + 0.5\, S_y^2 + \frac{S_y H_{0.95}}{\sqrt{n-1}} \right)$$

where:

$\underline{n}$ = sample size
$\bar{y}$ = arithmetic mean of the n transformed values of samples: $y_i = \ln y_i$
S_y^2 = variance of the mean
$H_{0.95}$ = value obtained from tables provided by Land (1975) for computing a one-sided 95 percent UCL on a lognormal mean

The 95 percent UCL calculations for constituents detected in site media are included in Appendix N. It should be noted that the 95 percent UCL values generated for some of the constituents may be higher than the maximum detected concentration in site samples. In these cases, the UCL values may be "artificially" elevated due to small sample size and/or large standard deviation of the samples in a given medium. When the 95 percent UCL value exceeds the maximum concentration detected, the maximum detected concentration is used in the risk characterization, per USEPA guidance (USEPA, 1992f). Also, per USEPA guidance (USEPA, 1989a), UCLs were calculated using only analytical data representing total metals in the groundwater (UCLs were not calculated for volatile organic compounds because they were not detected at concentrations greater than the detection limits or the analyte was also detected in associated trip blanks).

6.1.1.4 Chemicals of Potential Concern - The constituents of potential concern identified in the soil, surface water, groundwater, and sediments sampled at the site are discussed in this section. Chemicals of potential concern were selected for evaluation in the baseline risk assessment based on the following criteria, in accordance with guidance (USEPA, 1989a):

- Comparison of chemical concentrations with naturally occurring levels
- Evaluation of measured concentrations and frequency of detection at the site
- Evaluation of essential nutrients
- Comparison of chemical concentrations with levels detected in associated blank samples
- Evaluation of data qualifiers
- Evaluation of toxicity and use of a concentration-toxicity screen
- Physical and chemical characteristics related to environmental mobility and persistence.

A comparison of sample concentrations with background concentrations was used to identify the non-site-related chemicals (i.e., metals) that were found at or near the site, in accordance with guidance (USEPA, 1989a). Metals constituents with maximum detected concentrations less than the maximum detected background concentration in a given medium were eliminated from consideration as chemicals of concern in accordance with USEPA Region VII policy (USEPA, 1992d).

In accordance with guidance, background samples that may have been influenced or potentially influenced by the site (i.e., background samples contaminated with non-naturally occurring organic compounds or pesticides) were not used as background for the site with regard to organic compounds. They were, however, used as background for comparison to metals concentrations. Sampling media affected by possible background contamination (i.e., sampling media with positive "hits" of organic compounds in background samples) include surface soils, subsurface soils, monitoring well soil borings, and sediments. In these media, there is no "background" for pesticides, because the presence of the pesticides in the upgradient samples may indicate contamination from the site rather than background levels resulting from the "normal" application of the pesticides for gardening/landscaping purposes.

All constituents were screened for potential toxicity by comparing the maximum detected concentrations in each medium to available reference doses or slope factors (IRIS, 1993) according to the concentration-toxicity screening procedures described in guidance (USEPA, 1989a). For groundwater, this was done using results from only the baseline sampling effort (July 1992) and, therefore, the screening did not consider constituents that were not detected or not thought to be problematic after this first round of data (e.g., nitrates and thallium). If the "risk ratio" for a chemical did not exceed one percent of the total screening risk for that media, the chemical was not considered a constituent of concern for that media. Chemicals without toxicity values (see Tables 6-29 and 6-30) were not eliminated from the risk assessment, per USEPA guidance (USEPA, 1989a). Concentration-toxicity screening tables are included in Appendix N.

Constituents that were not detected in at least one sample were eliminated as constituents of concern unless the constituent scored above one percent in the toxicity screen. The carcinogenic polycyclic aromatic hydrocarbons (PAHs) were included in the risk assessment data set, even though the risk associated with benzo[a]pyrene was less than one percent, because of the uncertainty associated with estimating the toxicity of these compounds with toxicity equivalency factors (see Section 6.1.3.3). All positively detected pesticides were retained in the risk assessment data set, because of their relationship to site activities. Removed from consideration were constituents which can be considered essential nutrients (i.e., iron, magnesium, calcium, potassium, and sodium), and the wet chemical inorganics (bicarbonate, chloride, and sulfate), which were included in the chemical analysis for purposes associated with determining remedial alternatives during the feasibility study for the site.

As stated previously in the text, several chemicals were detected in the blank samples in the baseline sampling effort. Methylene chloride, a common laboratory contaminant, was detected in the trip blanks of all media sampled and in the method blanks for soil and sediment samples. Metals were also detected in method blanks and in the rinsate samples. Mercury was detected in the method blank for sediment samples, aluminum was detected in the method blank for surface water, and zinc and calcium were detected in the groundwater method blanks. Lead and zinc were found in the rinsates associated with soils and groundwater, respectively.

In order to compile the data set to be used in the risk assessment, the concentrations of the constituents detected in the blank samples were compared to their concentrations in the site samples, using methodology consistent with risk assessment guidance (USEPA, 1989a). A constituent recognized as a common laboratory contaminant was assumed to be present if its concentration in the environmental sample was ten times greater than its concentration in the blank sample. For those constituents not classified as common laboratory contaminants, a sample concentration five times that of the blank concentration was considered to be evidence of that constituent's presence in a sample. Based on this evaluation of the data, methylene chloride was deleted from the risk assessment data set because it was present in the blanks, and its sample concentrations did not exceed the blank concentrations by the required margin. Although zinc and aluminum were present in blanks and their blank-associated samples did not exceed the required margin, these two metals were not deleted from the risk assessment data set because not all the positive samples were associated with the contaminated blanks. Blank-associated concentrations of these two metals were qualified and treated as non-detects for the purpose of statistical computations. Mercury was not deleted from the data set because its sample concentrations did not exceed the blank concentrations by the required margin. Calcium was deleted because it is considered an essential nutrient (see above).

Table 6-7 summarizes all constituents detected on site by medium, indicates which constituents were selected as potential chemicals of concern, and includes an explanation for each chemical's elimination from the data set. Chemicals selected for evaluation of human health exposure and risk, according to medium, are presented in Table 6-8.

6.1.2 Exposure Assessment

The objectives of the exposure assessment are to characterize the exposure setting, to identify the potential exposure pathways, and to quantify the potential exposure to site-related contaminants that are expected to occur.

6.1.2.1 Characterization of Exposure Setting - The physical characteristics of the site which may impact potential exposures at the site include climate, vegetation, soil type, and hydrology. The soils of Riley and Geary counties are described in Section 3.1.4 of this report. Surface water hydrology, geology, and hydrogeology of the region are discussed in Sections 3.1.2, 3.1.3, and 3.1.5, respectively. The two remaining physical characteristics, climate and vegetation, are summarized briefly below.

6.1.2.1.1 Climate - The area has four distinct seasons with average daily temperatures at the Manhattan, Kansas Climate Station ranging from a minimum of 16°F in January to maximum of 90°F in July. The annual average precipitation is 31 inches with approximately 70 percent of the annual precipitation occurring from April to September. Twenty-four hour rainfall events can exceed 3.5 inches from April through October, during thunderstorm periods.

6.1.2.1.2 Vegetation - The vegetation type on the post consists primarily of grasslands or woodland forest. This plant community is dominated by a large diversity of hardwoods and various grasses.

The site's surface elevation ranges from 1093 and 1063 feet. Due to the close proximity of the PSF to the floodplain of the Kansas River, the wooded area to the east of the PSF can be categorized as a riparian woodland. Thus, the terrain could support a variety of species. However, because the areas around and downgradient of the PSF are "high traffic" areas with a high frequency of movement and human activity during the day (i.e., the DEH yard is a vehicle compound area), these areas do not provide suitable habitats for most species.

6.1.2.2 Potentially Exposed Populations

6.1.2.2.1 Populations in the Vicinity of the Site - The PSF is located within the Directorate of Engineering and Housing (DEH) yard. It is situated on an escarpment on the north side of the Kansas River Valley, approximately 2,000 feet west of the Kansas River, on the southeast edge of the Main Post cantonment area. The area immediately surrounding and including the PSF is moderately industrial/commercial in nature. The DEH yard includes areas used to perform vehicle and heavy equipment maintenance, and is also used for the storage of vehicles, equipment, and supplies. The DEH yard is enclosed by a fence and a gate that is locked after normal work hours.

The human populations which are potentially exposed to the chemicals of concern at the PSF site are those persons who may come into contact with the soils, sediment, or surface water at the site, and those persons coming into contact with groundwater originating from the site. Due to the industrialized nature of the PSF site, and the fact that the DEH yard is restricted (i.e., fenced and secured), utility workers, landscaping crews, or on-site workers are the most likely current human receptors for exposure to potential soil contamination at the PSF site. Site workers or landscapers may also contact contaminated surface water and sediments while performing maintenance or landscaping activities in the lined channel located to the east of the site, outside the fenced area.

While it is true that some contamination may exist outside the fenced DEH yard (e.g., in the area of [previously] stressed vegetation and along the lined channel which drains surface run-off from the site), the steep terrain, the intermittent nature of the stream in the lined channel, the presence of overgrown vegetation, as well as the industrial uses of the area, would deter most visitors from exploring or playing in this area.

The closest residential area on post, Housing Area No. 5, is located approximately 0.3 miles northwest of the site, along Lowe Place, Carpenter Avenue, and Carpenter Place (see Figure 6-1). Housing Area No. 5 consists of 63 living units, which house officers with the rank of captain or major. Most units in this area are three-bedroom units. According to the Chief of Facilities for Fort Riley Family Housing (FH, 1993), approximately 125 to 140 children, aged 5 to 18 years, live in Housing Area No. 5. A playground and recreational area are located in the center of the units along Lowe Place.

Another family housing area, Housing Area No. 2, exists west of Housing Area No. 5 along Schoefield Circle, approximately 0.4 miles from the site. This area houses lieutenant colonels, colonels, and their families. A total of 46 living units are in Housing Area No. 2. Since the officers residing here are of higher rank and generally are older, less children occupy the residences in this area. The Chief of Facilities for Family Housing estimates 10 to 20 older children (teens) make their home in Housing Area No. 2 (FH, 1993).

A troop housing area (barracks) is located southeast of Housing Area No. 5. "Unaccompanied" soldiers reside there (FH, 1993). The field located in the center of this area is used as a parade or practice field. The softball diamonds shown on the map are rough practice areas rather than developed recreational areas (FH, 1993).

Although the closest residential area is only 0.3 miles away, it is unlikely that on-post residents would come in contact with site media during recreational activities (i.e., running or jogging) due to the restricted nature of the DEH yard and the overgrowth present in the contaminated areas outside the fence. Any exposure due to inhalation of fugitive dust should be no more than that experienced by on-site workers.

Likewise, the children living in the housing areas nearby are unlikely to be exposed to contaminants detected in site media during play or exploration activities because Housing Area No. 5 provides a playground for children's recreational use. The equipment present on this playground includes swing sets, a set of rings, see-saws, a slide, a tennis court, a basketball hoop, and two activity centers. With all this equipment available for their use, it is unlikely that children would travel to the PSF site to play. Also, children have not been observed playing near the DEH yard. However, in order to conservatively estimate exposures at the site, a children's recreational scenario will be developed in order to estimate exposures due to the event of play in the grassy area and in the lined channel adjacent to the site.

The primary source of drinking water for Fort Riley, Junction City, and Ogden is the alluvial aquifer of the Republican and Kansas Rivers. The alluvial deposits are capable of yielding more than 1,400 gpm from a single well (KGS, 1974). The alluvial aquifer is recharged through direct infiltration of rain and seepage from limestone and shales, as well as through the influence of the Kansas and Republican Rivers. Junction City and Fort Riley's water supply wells are located within the Republican River floodplain, approximately 1.8 miles upstream from the PSF. Ogden's water supply wells are located downstream, approximately 3 miles from the site.

Currently, the groundwater beneath the PSF site is not used as a potable water supply. Therefore, it is unlikely that the contamination detected in the groundwater beneath the site would have an impact on current human populations. The aquifer beneath the site is capable of yielding approximately one to two gpm per well. The decreased yield of an on-site well (when compared to an alluvial well) is due to soil type beneath the site (clays, instead of the characteristic silts and fine sands of the alluvial deposits). On-site groundwater is recharged primarily through rainwater infiltration. If a potable water well were to be installed in proximity to the PSF in the future, aquifer characteristics make the placement of a well in the alluvium (located less than 2,000 feet away) preferable to the placement of a well on the PSF site itself. However, because the aquifer at the site is classified by the State of Kansas as a potential potable water source, its future use as a potable water supply aquifer will be evaluated in this assessment as part of the future land use pathway assessment.

6.1.2.2.2 Current Land Use - The PSF and DEH yard are currently used as a storage and maintenance area which supports services necessary to maintain the buildings, grounds, and utilities systems at Fort Riley. Building 348 (PSF) itself is used to store herbicides, preformulated pesticides, general improvement materials, and paint. Several subsurface utility lines are located adjacent to and beneath the site.

As stated earlier, the PSF is currently used as a storage facility; no mixing or formulation of pesticides/herbicides currently occurs on the site. Therefore, if proper application and storage procedures are followed, the potential for contaminant release at the site should be minimal. However, during the collection of shallow hand auger boring samples at the site, Law's RI field personnel noticed that Fort Riley personnel rinsed off the exterior of their vehicle/equipment at the northwest corner of Building 348 (PSF). (These observations are documented in the field log books for the PSF site). Since herbicides were not detected in the samples collected during the RI investigation, these current practices do not appear to be acting as a source of contamination at the site.

6.1.2.2.3 Potential Alternate Future Land Uses - In developing future use scenarios, it is assumed that no remedial actions will be undertaken. Such "no-action" scenarios also provide a baseline for the comparison of remedial alternatives in the Feasibility Study. According to interviews with Fort Riley's DEH Master Planner (DEH employment dates 1975 to present) (DEH, 1993a) and personnel from Fort Riley's Real Property Section (DEH, 1992b), the future use of the PSF and the surrounding land is unlikely to change from its present use as an equipment storage area as long as Fort Riley remains an active military installation. Fort Riley is not currently placed or being considered for placement on the military installation closure lists. Therefore, the site's current use is unlikely to change in the future. (If Fort Riley is placed on the closure list, the PSF site [and the entire installation] will need to be re-evaluated.)

Residential development of the site at some future date is unlikely because of the established land use patterns at the site, the fact that on-post housing is not planned in the DEH yard area, and because the elevation of the PSF is only 10 to 15 feet above the Kansas River flood plain and the land is not protected by a levee. Conversations and correspondence with USEPA Region VII (USEPA, 1992b) indicate a future residential scenario is considered for all Superfund sites whenever residential development cannot reasonably be ruled out. Because the site is located on an active military installation and because of the flood hazard at the site, residential development of this area (i.e., on site) can be reasonably ruled out. Therefore, because the future use of the PSF site as a residential area is highly unlikely, a future on-site residential scenario will not be developed for the baseline risk assessment. However, an on-site residential scenario will be included in Appendix P, to be used for information purposes in developing possible remedial alternatives for the site.

6.1.2.2.4 Subpopulations of Potential Concern - Sensitive subpopulations (i.e., nurseries, nursing homes, or hospitals) present within a three-mile radius of the PSF site include Irwin Army Community Hospital. Children, the elderly, and women of child-bearing age living nearby are considered sensitive subpopulations. Women of child-bearing age and children live in Main Post Family Housing Area No. 5, located approximately 0.3 miles northwest of PSF. Children will be evaluated as a sensitive subpopulation for the soil, sediment, and surface water exposures in the recreational child scenario considered in this risk assessment.

6.1.2.3 <u>Identification of Exposure Pathways</u> - A complete exposure pathway has four essential components. The USEPA guidance (USEPA, 1989a) defines an exposure pathway as consisting of the following elements:

1. A source and mechanism of chemical release to the environment (i.e., a source of contamination);

2. An environmental transport medium for the released chemical (e.g., groundwater, air);

3. A point of potential human or biota contact with the contaminated medium (i.e., an exposure point); and

4. A route of exposure at the exposure point (e.g., ingestion, inhalation, or dermal contact).

Without the presence of all four components, exposure cannot occur. The source of release, transport mechanisms, exposed populations, and routes and pathways of exposure to chemicals present in environmental media at the PSF site will be described in the following section.

There is potential for the constituents in the groundwater, surface water, soil, and sediments to reach human target populations through several exposure routes. Potential exposure routes and potentially exposed human populations will be identified, and potential exposure intakes for each exposure scenario will be calculated. Risk due to carcinogenic and noncarcinogenic compounds at the site will be characterized in Section 6.1.4.

6.1.2.3.1 Sources and Receiving Media - Prior to about 1975, pesticide wastewater and concentrated spills were routinely allowed to run onto the ground surface at the PSF. The rinse water from the washing of vehicles and spraying equipment was also allowed to run onto the ground surface in this area. Current activities (Law 1992a) (i.e., rinsing the exterior of herbicide application vehicles) may also contribute to the contamination found on site. (However, samples collected in the area where vehicle rinsing occurred failed to detect herbicides in the soil matrix, so current practices do not appear to be influencing the site.) All of these practices/accidents are considered to be the primary source for contamination at the PSF.

Five potential contaminant transport media have been identified: surface water, stream sediments, groundwater, air, and soils. Contaminants in the groundwater and surface water may be transported in the groundwater or surface water to a potential exposure point. Volatile constituents were present in very low concentrations in soil and sediment matrices, and were not present at all in surface water and groundwater. Therefore, outdoor air exposures to volatile compounds related to site activities are expected to be insignificant or are not expected to occur via everyday exposures. At present, the contaminants detected in the groundwater are unlikely to contact current human receptors. Nor should site groundwater constituents contact human receptors in the future, because placement of a new potable water well in the vicinity of the PSF would probably be in the alluvium, rather than on the site itself, especially since higher yielding alluvial deposits are located less than 2,000 feet away from the site. However, exposure to groundwater constituents is assumed in the conservative future groundwater scenario developed for the baseline risk assessment. Contaminants in the soil may be transported as dust which can be carried through the air to a potential receptor, or tracked off-site by heavy equipment, trespassers or migratory wildlife. Contaminated sediment may be carried via surface water to a potential receptor or, together with surface water, may come into contact with a receptor directly (i.e., on-site worker or a child at play).

6.1.2.3.2 Fate and Transport in Release Media - Physical and chemical information concerning the transport and fate of contaminants is used to identify the possible extent and magnitude of environmental contamination, such as which environmental media will be affected. The fate and transport of constituents detected in site media is discussed in Section 5.0 of this report, and summarized in the following paragraphs.

The primary environmental transport pathways for chemicals at the site is dependent upon the physical characteristics the chemicals possess. In general, the pesticides and other semi-volatiles (PAHs) detected in site soils have low water solubilities and high K_{oc} values, indicating that these constituents have a high affinity for binding to soil particles, and a low potential for transfer to groundwater or surface water (ATSDR, 1987-1991; Howard, 1991). Almost without exception, the pesticides detected at the site bind strongly to soils, and resist displacement from the soil particle even under prolonged leaching tests. This binding process appears to occur regardless of soil type (i.e., organic content of soil) and pH (ATSDR, 1987-1991; Howard, 1991). An exception to this is malathion, which binds only moderately to soil particles. However, malathion is very rapidly degraded in soil, with a half-life of four to six days, thereby minimizing the potential for leaching to groundwater (Howard, 1991). Similarly, the high K_{oc} values and low water solubilities of the PAHs detected on site indicate that these constituents would also remain bound to soil. Acenaphthene, with a low binding affinity, is the exception to this group. However, its low water solubility would preclude its transfer to groundwater (see Table 5-1).

The assumption that these compounds are immobile in soil is substantiated by the fact that no pesticides or PAHs were detected in the ground- and surface water samples collected from the site during the RI investigation. Pesticide contamination has been present in the PSF site's soil for at least twenty years; the 1974 study performed by USAEHA confirmed the presence of pesticides within site soils. If leaching to groundwater was a significant transport pathway for these compounds, pesticides would have been detected in the site's groundwater samples. Therefore, the modelling of pesticide concentrations from the soil to the ground or surface water is considered unnecessary at this site.

Because pesticides and PAHs are likely to remain bound to soil particles, secondary transport pathways include the transportation of adsorbed contaminants on soil particles by storm or surface water runoff to sediments, and the subsequent transportation of these sediments to points downstream. Soil particles containing sorbed contaminants may also be dispersed as airborne particulates.

The primary and secondary transport pathways for metals detected in site soils are similar to the pathways discussed above, with the addition of water soluble species leaching to ground and surface water. Because the volatile organic compounds (VOCs) detected in site soils are also water soluble, they may also leach to groundwater or surface water, or, if VOCs are present in the upper surface soils, these constituents may volatilize out into the atmosphere. The low levels of VOCs detected in site soils are unlikely to affect the groundwater column to a great extent; modelling of the low VOC concentrations to groundwater is also considered unnecessary for the site. If constituents dissolve and transfer to the groundwater, they can be expected to travel within the aquifer in the direction of groundwater flow. Metals constituents dissolved in surface water will continue to flow downstream; VOCs will tend to volatilize out of surface water to the atmosphere. Nonionic metals species and organic compounds with lower water solubility and high K_{oc} values may also precipitate out of surface water and settle into or become bound to sediments. Metals constituents present in the sediments may act as a future source of surface water contamination, if conditions favor their reentry into the water column (see Section 5.2.1).

6.1.2.4 Exposure Points and Exposure Routes - In this risk assessment, exposure pathways are divided according to current use and future site use scenarios. Under the current use scenario, exposures and risks to which on-site workers and children at play in the area are or could be subject under continued normal site use are assessed. In developing future use scenarios, it is assumed that no remedial action will be taken. Because alternative development of the site is not likely, future residential development at the site is not assessed. However, future use of site groundwater as a potable water source is assessed in the conservative groundwater scenario developed for the baseline risk assessment because the aquifer at the site is classified by the State of Kansas as a potential potable water source.

There is a potential for constituents in the soil, sediments, surface water and groundwater at the PSF to reach human target populations via several exposure routes. The routes of exposure which are of primary concern at this site are as follows:

1. Dermal contact with and incidental ingestion (via hand to mouth contact) of potentially contaminated on-site soils; inhalation of fugitive dusts from contaminated on-site soils.

2. Ingestion and dermal exposure to potentially contaminated drinking water drawn from (future) groundwater wells screened in the upper water bearing zone. (Inhalation exposures to constituents detected in groundwater samples are not assessed because no volatile organic compounds were identified as groundwater constituents of concern at the site [see Table 6-4]).

3. During children's recreational activities in the lined channel adjacent to the site, dermal contact with potentially contaminated surface waters present which receive surface runoff from contaminated soils on-site; in the grassy area adjacent to the PSF fence, incidental ingestion of and dermal contact with surface soils, inhalation of fugitive dust generated from site soils.

4. Dermal contact with and incidental ingestion of contaminants in sediments associated with potentially contaminated surface waters present in the lined channel adjacent to the site.

5. Ingestion of potentially contaminated wildlife feeding on-site or plants growing on-site (a qualitative discussion will be included).

The exposure routes considered for this assessment are summarized in Table 6-9. A brief discussion of the potential for exposure via each of these pathways is provided below.

6.1.2.5 Summary of Exposure Pathways

6.1.2.5.1 Soil Exposures - Current and future workers, visitors and recreational children playing at the PSF site may be exposed to contaminants in the surface soils at the site while visiting the site. Future workers at the PSF may be exposed to the contaminants in the subsurface soils at the site when the soils are disturbed during construction or remediation. Potential exposure may occur through absorption of contaminants from the soil through the skin, and from incidental ingestion of soil on the hands by individuals who smoke, drink or eat after visiting the site. Fugitive dust containing adsorbed contaminants can be generated by vehicles (e.g., mowing and construction equipment) on the site and may result in inhalation of contaminated soil by current or future workers. Currently, the surface soils of the site within the DEH yard are covered with approximately 12 inches of compacted gravel. The area outside the DEH yard fence is grassy, but dust is usually generated during the more arid seasons and during mowing or similar landscaping activities. The fact that surface soils are, for the most part, covered with grass or gravel, should reduce soil exposures for the workers unless intrusive activities such as excavation occur.

The 95 percent UCL on the arithmetic mean of the contaminant concentrations in the sampled subsurface soils will be used to quantify exposure of current and future utility workers on and around the PSF site. For current exposures of site workers to fugitive dust, the concentrations detected in surface soil sample SS-04 will be used to quantify exposure to current site workers and landscapers. The reasoning for this is that the other "surface" soil samples (SS-01, SS-02, and SS-03) were collected beneath one foot of packed gravel in the DEH yard, and thus the exposure pathway to these soils is incomplete unless excavation occurs. The packed gravel effectively "caps" the DEH yard soils. The approach of using surface soil sample SS-04 for current exposures to surface soil is conservative, because the sample was collected in the area of (previously) stressed vegetation outside the DEH fence, and this area most likely contains the most contaminated soils. For the future surface soil scenarios, because it is plausible that the gravel pack may be removed, the 95 percent UCL on the arithmetic mean of the contaminant concentrations in all four surface soil samples will be used to quantify exposure. In all cases the 95 percent UCL is considered for the exposure point concentration; if the 95 percent UCL exceeds the maximum detected concentration, then the maximum detected concentration will be used as the exposure point concentration.

6.1.2.5.2 Groundwater Exposures - Currently, groundwater beneath the PSF is not used as a potable water source. Fort Riley obtains its potable water from well fields approximately 1.8 miles upgradient from the PSF and Ogden obtains its water supply from wells located approximately 3 miles downstream from the site. However, the state of Kansas considers the groundwater beneath the site as a possible potable water source; therefore, a conservative future groundwater scenario is developed in the risk assessment which assumes the use of the aquifer on site as a source of potable water.

As stated earlier, the modelling of pesticides and PAHs (detected in the soil) to groundwater is considered unnecessary for the site because these constituents tend to remain sorbed to soil and do not readily transfer to the groundwater column. Therefore, the 95 percent UCL on the arithmetic mean of the contaminant concentrations in the groundwater samples will be used to quantify exposure of future (off-site) residents to groundwater originating from the PSF site. If the 95 percent UCL exceeds the maximum detected concentration, then the maximum detected concentration will be used as the exposure point concentration.

Groundwater exposure may occur via ingestion of groundwater and dermal absorption of contaminants during bathing or household use. Volatile organic were not identified as contaminants of potential concern in the groundwater. Therefore, inhalation of volatilized organic during bathing and household use will not be evaluated as a potential exposure pathway. These potential exposure pathways will be evaluated for the future residential groundwater scenario present in this risk assessment.

6.1.2.5.3 Surface Water and Sediment Exposures - Potentially contaminated surface waters and sediments can occur on-site, in the lined channel located to the east of the site. Contaminants may be released into these media via surface runoff, soil erosion, and groundwater discharge into the surface water, and may then settle in sediments. Exposure to contaminated surface water and sediments can occur via direct contact by current or future workers and children at play wading in the creek.

The recreational uses of the lined channel are limited due to its location (in an industrial area) and depth (surface water is usually less than one foot deep), although it is assumed currently that children may occasionally play in the channel. The flow through the channel is too low and intermittent to support large aquatic life. The ingestion of fish from the points downstream will therefore not be considered as a potential exposure pathway for off-site residents in this evaluation.

Exposure to contaminants in surface water may occur via dermal absorption during work activities and while wading in the channel. These pathways will be included in this risk assessment. A primary concern of contaminated sediments is that they provide a continual source of release of contaminants. The primary exposure pathway for sediments is also via dermal absorption of contaminants, although some incidental ingestion of sediments may occur. These pathways will also be included in this risk assessment.

6.1.2.5.4 Ingestion of Plants and Wildlife - Fishing and hunting of game birds (quail, pheasant, prairie chickens, and doves), deer, turkey, elk, and small game (rabbits and squirrels) takes place on most areas of Fort Riley, excluding the impact area, the multipurpose range complex, and the closed (SFL) landfill. Therefore, there is a potential for current or future residents to ingest wildlife that may have been exposed to site contamination, or vegetation on-site that may have taken up site contamination. The ability of contaminants to bioaccumulate in plant and animal tissue and the extent to which they may bioaccumulate vary according to chemical and organism exposed. Site-specific data are not available to adequately address the quantitative risk to such exposures. However, the contribution of game animals, fish and garden produce to the diet of current residents is expected to be minimal. (Subsistence hunting is not expected on an active military installation.) And, since Fort Riley has not been placed on the closure list and the site itself is unlikely to change from its current use as an equipment storage center, the contribution of these foods to future residents is also expected to be minimal. Therefore, these pathways will not be quantitated in this risk assessment. A more thorough discussion of exposures of environmental receptors to site contaminants is included in Section 6.2.

6.1.2.6 Quantification of Exposure - The next step in the exposure assessment is to quantify the magnitude, frequency and duration of exposure for the populations and exposure pathways selected for quantitative evaluation. This step is most often conducted in two stages: first, exposure point concentrations are estimated; then, pathway-specific intakes are quantified. Intake variables and exposure point concentrations are selected so that the combination of variables results in an estimate of the reasonable maximum exposure (RME) for each pathway. The RME is the maximum exposure that is reasonably expected to occur at a site. The RME results present an exposure scenario that is "protective and reasonable" but not the worst possible case (USEPA, 1991). The RME scenario is used to provide decision makers with an understanding of potential exposures and provides one basis for the development of protective exposure levels (NCP, 1988).

6.1.2.6.1 Estimation of Exposure Point Concentrations - Concentrations of contaminants of concern at the exposure points identified in the previous section must be estimated in order to assess risk. Table 6-9 summarizes the pathway-specific exposure point concentrations for the pathways selected for quantitative evaluation.

The exposure point concentrations for fugitive dust emitted from surficial soils are based on the ambient air concentration of contaminant particulates less than 10 μm diameter in air. The ambient concentration of contaminant air particulates is estimated based on the Wind Erosion Model (Cowherd et al., 1985) and Simple Box Model (Hwang and Falco, 1986). The wind erosion model estimates annual average flux rate of respirable particles and utilizes site specific factors such as the area of the contaminated surface, the percent vegetative cover, and the mean annual wind speed and threshold wind speed.

Assuming a respirable particle fraction (RP) of 0.036 g/m^2-hour (default value - derived from empirical data; Cowherd et al., 1985), an estimated vegetative cover (G) of 0.75 in the grassy area, a mean annual wind speed (Um) of 4.896 m/s (PCGEMs), a threshold wind speed (Ut) of 8.25 m/s (calculated - see Appendix N), and a function value (F(x)) of 0.92 (calculated - see Appendix N), an annual average flux rate (N_{10}) of respirable particles (PM_{10}) is calculated as follows:

$$N_{10} = RP * (1-G) * (Um/Ut)^3 * F(x) = 1.73 \times 10^{-3} \ g/m^2\text{-hour}$$

The simple box model is then applied to estimate the ambient air concentration of dust generated from the contaminated area of concern (PM_{10}), assuming the area of contamination (A), 2,613 m^2, is equal to the area in which the soil samples were collected. The width of the area of contamination perpendicular to the prevailing wind direction (LS) is 82 m. The average wind speed in the mixing zone (V) is assumed to be equal to half of the annual wind speed, or 2.5 m/s. A mixing height (MH) of 2 m (approximately equal to the average man's height) is also assumed. A conversion factor of 3600 s/hour is also incorporated. The equation of the simple box model is shown below:

$$PM_{10} = (N_{10} * A)/(LS * V * MH * 3600 \ s/hr) = 3.06 \times 10^{-6} g/m^3$$

The equation below relates detected contaminant concentration in soil (CS) to the concentration of contaminants on respirable particles in the air (CA), using a conversion factor of 0.001 kg/g:

$$CA \ (mg/m^3) = CS * PM_{10} * 0.001 \ kg/g = CS \ (mg/kg) * 3.06 \times 10^{-9}$$

For current scenarios, the concentrations of contaminants detected in surface soil sample SS-04 are used as CS. As stated earlier, the use of SS-04 as a proxy surface soil sample is conservative because this sample was collected in the area of (previously) stressed vegetation, and this area most likely contains the most contaminated soils. For future occupational and recreational child scenarios, the 95 percent UCL on the arithmetic mean of all four surface soil samples is used as CS because it is conservative to assume the gravel over the DEH yard may be removed in the future. If the 95 percent UCL is greater than the maximum concentration, then the maximum concentration will be used as the exposure concentration.

Unless stated otherwise, the exposure point concentrations for all other exposure pathways are based on the 95 percent UCL on the arithmetic mean of the constituent concentrations in all samples from each of the environmental media on-site, respectively. Because of the uncertainty associated with any estimate of exposure concentration, the use of the 95 percent UCL exposure will provide an estimate of reasonable maximum exposures. In the event that the 95 percent UCL is greater than the maximum concentration, then the maximum concentration will be used as the exposure concentration.

The use of the 95 percent UCL values as exposure point concentrations for future scenarios assumes that constituent concentrations in the groundwater, surface water, soils, and sediments will be the same as those currently found in those media on-site. This is an assumption which will tend to overestimate the risks from the site, especially with respect to the groundwater pathways, as actual on-site drinking water well development may never occur, and natural decay and degradation of contaminants may also decrease future risks.

6.1.2.6.2 Pathway-Specific Intake Estimates - Pathway-specific intakes are quantified by defining a series of variables that describe the exposed population, such as contact rate, exposure frequency and duration, and body weight. The specific calculation procedures and variables used to determine pathway-specific intakes are described below. These exposure variables are multiplied by the exposure point concentrations shown in Table 6-9 to yield estimates of the chemical-specific intakes for these pathways. The chemical-specific intakes are calculated individually in the Risk Calculation Tables in Appendix N.

Standard default body weights of 70 kg for an adult, and 15 kg for a child aged 6 years were used. Standard default exposure values were taken from the "Supplemental Guidance to the Human Health Evaluation Manual" (USEPA, 1991), unless otherwise noted. The following paragraphs describe the site-specific information that was used in developing the exposure scenarios used in the Baseline Risk Assessment.

<u>Occupational Receptors Exposures</u> - Sixteen Fort Riley DEH employees, including six former and nine current DEH employees, were interviewed by Law for information regarding occupational exposures to on-site media. The results of the interviews are included in Appendix N, and summarized in Table 6-10. An additional five Fort Riley employees were interviewed by Fort Riley personnel; the text of these interviews is also provided in Appendix N and summarized in Table 6-10. Interviews were planned with three additional former (retired) employees. However, when contacted by telephone, one individual refused to participate in the interview process (the individual denied ever working at the PSF, but said he had applied for a job at the installation). The second individual had apparently changed his location and/or telephone number, and the remaining individual was unable to be reached by telephone. These three former employees have various DEH backgrounds: the first was a pesticide worker, the second was

Chief of the Mechanical Branch, and the last was foreman of the Heat Shop. Although the former pesticide employee was not interviewed, similar exposure information was probably gained through interviews with two current pesticide employees (see Table 6-10).

As shown in Table 6-10, twelve employees have knowledge of work exposures within the PSF study area, or have or have had the potential for contact with site media in the area immediately surrounding the PSF (that is, the area of investigation). The exposures associated with work in the area of investigation are denoted by an "X" under "PSF" in the columns indicating exposure area on Table 6-10. The remaining individuals listed on Table 6-10 have knowledge of work exposures within the DEH yard or currently work (or have worked) within the DEH yard, but these individuals do not or have not worked **within** the PSF study area. Individuals working within the DEH yard but **not** working within the PSF investigation area, are indicated by the presence of an "X" in the "DEH yard" exposure area column (see Table 6-10).

The last entries on Table 6-10 represent USEPA Region VII recommendations and suggestions for developing exposure scenarios at the site. These suggestions were obtained from a memorandum dated 6 November, 1992, issued by USEPA Region VII to Fort Riley (USEPA, 1992b). The memo was issued in response to the exposure scenarios developed and presented at the Preliminary Site Characterization Study (PSCS) meeting for the PSF site on 4 November, 1992. The exposure scenarios developed for the PSCS meeting were based on interviews with two individuals (DEH, 1992a) who have worked at the DEH yard for ten to twenty years; the information obtained from these individuals indicated that exposure to current and past employees at the PSF site is extremely intermittent in nature. In response, USEPA Region VII has stated that it would be "imprudent for [US]EPA to allow a significant portion of the risk assessment [exposure scenarios] to be determined by a phone conversation with 2 Fort Riley employees whose credentials have not been established nor their claims verified" (USEPA, 1992b). As shown in Table 6-10, additional interviews were conducted in an attempt to confirm the information obtained from the two employees. The information gained from the interviews is used in conjunction with USEPA's suggestions to develop the occupational scenarios for the PSF site.

Current Occupational Exposure Estimates - In order to estimate occupational intakes, exposure patterns were compared, and the most conservative exposure patterns were selected for use in developing the occupational scenarios. Four potential current occupational receptors exist at the site: (1) a PSF area worker, (2) a utility worker, (3) a landscaper/mower, and (4) a DEH yard (non-PSF) worker. As stated earlier, current occupational exposure information for the area of investigation (Building 348, the PSF) is available from interviews conducted with seven current or former DEH employees, as follows:

- Senior Pest Controller (DEH, 1993g)
- Pesticide Worker (DEH, 1993h)
- Materials Coordinator, Holding Area (DEH, 1993c)
- DEH Chief of Maintenance (DEH, 1992a)
- General Foreman, Mobile Equipment Operator (DEH, 1992a; DEH, 1993i)
- Grounds Foreman (mower) (DEH, 1993d)

The exposure information collected from these individuals was the predominant source of information used to estimate exposures for current occupational receptors, because these individuals either work in the study area, or have knowledge of work exposures within the study area. Based upon this comparison of individuals actually visiting or working within the PSF structure (Building 348), the Materials Coordinator for the Holding Area in Building 348 (DEH employment 1985 to present) appears to be the individual with the most potential for exposure to site constituents. During the interview, this individual stated that during most work days he visits the PSF building between 15 to 25 times daily, for periods lasting approximately 15 minutes at a time (DEH, 1993c). This corresponds to an exposure frequency of 250 days per year, for a total of 3.75 to 6.25 hours daily. All other site workers currently coming in contact with media within the PSF study area appear to have exposures less than that experienced by the Materials Coordinator. Therefore, the Materials Coordinator's exposure patterns will be used to develop the intakes for the current PSF on-site worker.

The second potential current occupational receptor identified for the PSF site is the utility worker. According to the Chief of Maintenance (DEH employment 1983 to present) and the Mobile Equipment Operator - General Foreman (DEH employment 1973 to present), there have been two utility breaks requiring subsurface soil work in the area of concern in the past 20 years. In each instance, the work crew was exposed to subsurface soils for approximately 6.5 to 8 hours a day for three days duration. This corresponds to an exposure time and frequency of six 8-hour days in twenty years, or 0.3 days per year. Two other utility workers were interviewed in an attempt to confirm this exposure pattern, including the Air Conditioning Worker (DEH, 1993j), and an Exterior Plumber (DEH, 1993k). Both of these individuals worked on the Fort

Riley installation approximately 30 years. Neither can remember performing any work within the PSF study area, and both had intermittent exposure patterns within the DEH yard. Therefore, the exposure parameters identified previously in this paragraph are used as the basis for determining current exposure to utility workers within the area of concern.

Landscaping activities at the site consists of mowing the grassy areas to the east of the DEH fence. Information regarding exposures to landscapers/mowers was obtained from the following three individuals: the DEH's Chief of Maintenance, the Mobile Equipment Operator-General Foreman, and the Grounds Foreman. According to the first two individuals, the grassy area outside the east fence of the DEH yard, within the PSF study area, is mowed a maximum of one time yearly; the area where the grass extends to the railroad tracks is mowed a maximum of twice yearly. The average amount of time spent on this activity is approximately 0.5 hours per mowing event, and different individuals are rotated through this task (DEH, 1992a). The latter individual, the Grounds Foreman, has been employed by Fort Riley DEH since 1969. From 1969 through 1972, he was a mower; from 1972 to 1980, he was a tractor leader. He became foreman in 1980; as such, he makes the mowing assignments. The Grounds Foreman estimates that mowing outside the east fence at PSF occurs no more than twice yearly, and usually only once a year (DEH, 1993d). Mowing is always performed with a tractor mounted with a mowing platform, and is only mowed to provide a line of sight (visual security) for the site (DEH, 1993d). The duration of the task is no more than one hour in length, and mowing is not performed by the same individual each time (DEH, 1993d). The Grounds Foreman's information confirms the information obtained from the earlier individuals, except for the exposure time per mowing event. (It is reasonable to assume that the area near the railroad tracks is mowed at the same time the yearly or twice yearly mowing occurs.) Because the Grounds Foreman was an actual mower in the past, the exposure time he provides may be more accurate, so it is used to develop the intake scenario for current mowers/landscapers.

The last possible current receptor at the site is the DEH yard (non-PSF) worker. These individuals are unlikely to come in contact with site soil media, as they work in DEH yard areas outside the study area. However, these individuals may be exposed to any fugitive dust emissions from contaminated soils on the site. Soil intakes for current DEH workers are not calculated, because any exposure to them should be no more than that experienced by the current on-site (PSF worker) receptor. In any case, the intakes for a current full-time DEH worker are equivalent to the intakes of a future (full-time) site worker, which will be described in the following subsection.

DEH yard workers also clean the drainage ditch located to the east of the site. According to the Chief of DEH's Maintenance Division and the Mobile Equipment Operator-General Foreman, the drainage ditch has been cleaned out twice in the past twenty years (DEH, 1992a). In each instance, three men spent a total of eight hours each working in the channel (DEH, 1992a). This information could not be confirmed by a third party, but the two individuals interviewed have worked at the DEH yard for ten and twenty years, respectively, and should have a good historical knowledge of the site. Therefore, these exposure parameters are used to develop current occupational intakes for site surface water and sediment media.

In developing all current occupational intakes, it is assumed that the same individual contacts site media with the exposure frequency and time described in the above paragraphs, for the default occupational duration of 25 years (USEPA, 1991), even if several different workers are rotated through the tasks and do not remain employed by DEH for 25 years. In addition, it is assumed that one individual performs the work and accomplishes the task using the same man-hours that a team of individuals would in performing the task. That is, if three men work one 8-hour day, one man is assumed to work three 8-hour days to accomplish the same task. Assuming that one person performs the task instead of several individuals increases the exposure and intake for that one worker. Thus, a degree of conservatism is built into the intakes, so that they may be considered reasonable maximum exposures (RME) for the occupational receptors currently working on the site.

<u>Future Occupational Receptors</u> - In order to estimate future occupational intakes, exposure patterns for each employee interviewed were compared. In addition, the tasks each interviewed worker performs in the DEH yard were examined. Exposures associated with work activities that could reasonably be transferred to or accomplished in the PSF location in the future were considered feasible future occupational exposures. Of this subset, the most conservative exposure patterns were selected for use in developing the future occupational scenarios.

Five potential future occupational receptors exist at the site: (1) a PSF area worker, (2) a utility worker, (3) a landscaper/mower, (4) a DEH yard (non-PSF) worker, and (5) a construction worker. As shown in Table 6-10, several of the individuals interviewed indicated that they had offices in the DEH yard that they occupied every work day, for eight hours daily (DEH, 1993e; DEH, 1993f; and DEH, 1993j). Since the Materials Coordinator using the PSF building as a storage space is in the PSF area for more than six hours daily (DEH, 1993c), it is not unreasonable to assume that the PSF site area may be occupied by DEH (warehouse) workers a full eight hours daily in the future. Therefore, the future site worker scenario is developed using the standard default exposure values recommended by USEPA (1991).

As stated earlier, the exposure patterns obtained for the current utility worker cannot be confirmed by a third party. In the 6 November memo, USEPA Region VII indicates that at least two utility problems requiring subsurface exposure occurred in the past year (USEPA, 1992b). This information does not necessarily refute the information obtained from the DEH employees interviewed; the two breaks occurring in the past twenty years may have both occurred within the same year. However, basing future exposures on the assumption of two utility breaks yearly may be overly conservative, because utility lines would most likely be replaced if frequent breakages or leaks occur.

Two additional DEH employees from the Exterior Utilities Section of the Structures Branch were located and interviewed by Fort Riley personnel in an attempt to gain more information about utility lines and associated work in the area of concern (DEH, 1993n; DEH, 1993o). Both individuals stated that a reasonable estimate of the life expectancy of a utility line in the area of concern was approximately 20 to 30 years; a line would probably need replacement after this time period, especially if numerous leaks or breaks occurred. In addition, both individuals stated that they would expect no more than one or two leaks during that 20- to 30-year time period. The estimated repair time for a utility line leak is approximately 4 hours. The two men interviewed give slightly different estimates for the number of men needed to completely replace a broken/leaking line. One stated that four men would need two days to make a replacement, while the other that a crew of up to 3 men would require 2 days to make the replacement.

Based on these latter interviews, and the information gained from prior interviews, the future utility worker's exposure frequency is estimated to be approximately 1.12 days yearly for 25 years. The rationale used to arrive at this exposure frequency follows.

Since the life expectancy of a utility line is 20 to 30 years, it is reasonable to believe a line will be completely replaced during the 25-year time period used to estimate occupational exposures. In addition, since no more than two leaks or breaks are expected in 20 to 30 years, a conservative estimate of the number of leaks in the receptor's exposure duration of 25 years would be 1 in 10 years, or approximately 3 leaks in 25 years. To conservatively estimate exposure time, it is assumed that it takes one full 8-hour day to repair a broken line, which is twice the duration of repair estimated by the utility workers (1/2 day or 4 hours); it is also assumed that each line present in the area of concern would need replacement and repair during a 25-year period.

In the other occupational scenarios developed in this risk assessment, it is assumed that one individual will repeatedly contact contaminated media, instead of a crew of individuals, or several different employees rotating through job tasks. Therefore, the following exposure frequency is estimated:

> 2 (lines in PSF area) * 2 (days to replace line) * 4 (man crew) = **16 man-days**
>
> 2 (lines in PSF area) * 1 (day for repair) * 3 breaks (in 25 years) * 2 (men) = **12 man-days**
>
> TOTAL = 16 + 12 = **28 man-days** in twenty-five years or **1.12 days/year**

It should be noted that this scenario is conservative in that it assumes that utilities are repaired by a lone individual, instead of two to three individuals. Therefore, this scenario essentially doubles the exposure a single individual may receive in the given time period. In addition, this scenarios assumes total replacement of utility lines and three breaks in a 25-year period; repair work of this magnitude may not occur at the site.

The third potential future receptor at the site is the landscaper/mower. In the 6 November memo, USEPA Region VII stated that "[a]lthough historically the site grounds may be mowed only a few times per year, it is feasible and reasonable to assume that mowing could occur weekly during the growing season" (USEPA, 1992b). The growing season in the Fort Riley area is approximately six months, or 26 weeks, long (Riley County Extension Service, 1992). As stated earlier, the grass near the PSF site is currently mowed only twice per year, and is primarily mowed only for security reasons (DEH, 1993d). Since the PSF site is in an industrialized area, and since there are no plans to change the use of the site from its current use as an equipment storage area, it may be overly conservative to assume that weekly mowing will occur in the future. Fort Riley personnel provided an interview with the Contract Administrator the Range Mowing Contract at Fort Riley (DOC, 1993). The Range Mowing Contract designates that certain areas of the Fort be mowed **at least** as often as stated in the contract. The terms of the Range Mowing contract are outlined below (DOC, 1993):

> Type B - Mow 1 time every 14 days (Infantry Parade Field only)
> Mow 1 time every 23 days at 3-1/2 inches
>
> Type C - Mow 1 time every 23 days at 4-1/2 inches (Most weapons ranges)
>
> Type D - Mow 1 time every 30 days at 6 inches (Demo range)

The area adjacent to the PSF site is mowed using a platform attached to a tractor. This method cuts a 4-foot wide swath with each pass; thus, mowing events usually last well under one hour. In order to adequately protect the individuals performing the mowing, it is assumed that the exposure time for the task is one hour. In addition, it is assumed that the lawn in the area of concern will be mowed at least as often as the most frequently mowed range area, or once every 23 days for a total of eight times during the growing season. (Although the Infantry Parade Area is included in the Range Mowing contract, it is not considered a "range" by the installation, because the field is in a public area, and is maintained better than the range areas.) Because the Range Contract contains the provision that the ranges are mowed at least as often as stated, one may postulate that in the future the PSF site may be mowed more often than once every 23 days. However, given the current frequency of the mowing events at the PSF (twice yearly at most), it is unreasonable to estimate a future mowing frequency of more than once every 23 days, even during a rainy growing season.

The fourth possible future occupational receptor at the PSF site is the DEH worker that cleans out the channel adjacent to the site. In the 6 November memo, USEPA Region VII stated that "it does not appear conservative to assume that the drainage ditch will be cleaned out once every five [sic] years" (USEPA, 1992b). Therefore, in order to adequately protect future site workers, the future occupational surface water and sediment scenarios will be based on an exposure frequency of one cleaning event in the channel **per year**. Because yearly cleaning will reduce the accumulated plant matter and debris within the channel, it is reasonable to assume a decreased exposure duration of 2 days per year for the future cleaning events.

The last possible future occupational receptor at the site is a construction worker. According to DEH's Master Planner, DEH has plans to raze the current PSF, cap the soil surface, and rebuild a new facility (DEH, 1993b). Two individuals from DEH Engineering Plans and Services were interviewed by Fort Riley personnel to gain information regarding possible future construction exposures: an individual from the Job Order Contracting Branch (DEH, 1993l), and an individual from the Design Branch (DEH, 1993m). According to these individuals, construction of this storage facility is estimated to take no more than 120 days in duration, from beginning to end. The Delivery Order Estimated Construction Time worksheet, provided in Appendix N, estimates the construction time for the project to be 130 days (DEH, 1993p). According to the individual from the Job Order Contracting Branch, after the worksheet determined 130 days, the contract would be written for 120 days (DEH, 1993l). Since the construction crew is not expected to be on the site for the entire duration of the project, and since the newly constructed PSF would not be reconstructed at its current location on the site (DEH, 1993q), this exposure duration is believed to be adequately protective of the individuals assigned to the task.

Residential Receptors Exposures - USEPA Region VII's November memo also suggests using residential scenarios to evaluate groundwater risk (USEPA, 1992b); these scenarios are presented in this baseline risk assessment. Residential scenarios used to evaluate risk to other media of concern at PSF are presented in Appendix P for comparison purposes. Residential scenarios are not included in the baseline risk assessment because residential development of the PSF site is precluded by the presence of the 100-year flood plain. In addition, Fort Riley's master plan does not include residential development of the PSF site or the surrounding area (DEH, 1993a). A recreational child scenario is developed in the baseline risk assessment and included as an RME. This scenario is based on estimating exposures to children who may play in areas adjacent to the site.

Incidental Ingestion of Soil - The equations for determining chemical intakes from the incidental ingestion of soil are shown in Tables 6-11a, 6-11b, and 6-12. Based on the variables provided in the table, intakes are calculated for current and future workers, and for current and future recreational children.

The current DEH yard worker is based on the exposure patterns of the Materials Coordinator (DEH, 1993c), the current occupational receptor at the PSF site with the most potential for exposure. This individual is present at the PSF for approximately 6.25 hours every work day; the decreased ingestion fraction of 78 percent accounts for this exposure time (6.25 hours/8 hours = 78 percent). Since the current Materials Coordinator spends nearly 80 percent of his time on-site, it is not unreasonable to postulate that future warehousing activities may occur "full-time". Therefore, future scenarios are developed with DEH yard workers assumed to be on the PSF site for the entire work day (exposure time = 8 hours). For future exposures, 100 percent of the soil ingested during the workday comes from the site. The standard default values for exposure frequency (250 days per years, which accounts for a two-week vacation away from the workplace) and for the incidental ingestion rate (50 mg/day) are also used in developing the intake equations for both the current and future DEH yard worker (USEPA, 1991).

The current utility worker scenario is based on an exposure frequency of 6 eight-hour days in twenty years, or 0.3 days per year (DEH, 1992a), while the future utility worker scenario is based on an exposure frequency of 1.12 8-hour days per year. That is, for the future scenario, a conservative assumption is made in that the same worker is exposed to soils during excavation work 28 days in 25 years. The rationale used to develop this exposure frequency is explained earlier in this section.

The current landscaper/mower is based on an exposure frequency of two days per year; the 12.5 percent ingestion fraction accounts for the exposure time spent on the site (1 hour/8 hours = 12.5 percent) (DEH, 1993d). The future landscaper/mower scenario is modified by changing the exposure frequency from two days per year to eight days per year, which corresponds to one mowing event every 23 days during the growing season (DOC, 1993). The growing season in the Fort Riley area is approximately six months long, or 26 weeks (Riley County Extension Service, 1992). Lastly, the future construction worker scenario is based on an exposure duration of 120 days, which is the DEH estimate of the duration of construction for a storage facility building (DEH, 1993l; DEH, 1993p).

The landscaper/mower, construction worker, and the utility worker are expected to be in repeated contact with soils throughout the day, so an upper-bound value of 480 mg/day was used for incidental ingestion of soil (USEPA, 1991; USEPA, 1989b). All occupational scenarios are based on the premise that the same worker will be exposed to site constituents each time a work activity is performed, regardless of whether or not different employees are rotated through the tasks. The exposure duration value of 25 years represents the upper-bound value of time spent with the same employer (USEPA, 1991).

The intake for children playing adjacent to the PSF site is presented in Table 6-12. Exposure duration is assumed to be a total of 6 years (USEPA, 1991). It is assumed that children one to six years old will ingest 200 mg soil per day (USEPA, 1991). Children are assumed to play adjacent to the site seven days per year, for a total of 2.6 hours daily. The exposure frequency and exposure time parameters used in developing the recreational child's soil intake were suggested by USEPA Region VII at the 25 May review meeting for the PSF project (USEPA, 1993a).

Inhalation of Fugitive Dusts - The chemical intakes for inhalation of fugitive dusts by current and future on-site workers, utility workers, and landscapers, and for future construction workers and recreational children are calculated using the equations in Table 6-12a, 6-12b, and 6-13. The inhalation rate of 2.5 m^3/hour (moderate activity, adult) (USEPA, 1989b), and an exposure duration of 25 years is assumed for occupational receptors (USEPA, 1991), with the exception of the future construction worker, whose exposure duration is 120 days (USEPA, 1993p). Exposure times and frequencies for the current and future occupational receptors are the same as discussed in the paragraphs above. As in the ingestion scenarios above, each occupational receptor is assumed to be exposed to site soils each time a work-related task is accomplished over a 25-year period, regardless of whether or not the same individual performs the task over that time.

As shown in Table 6-14, an inhalation rate of 0.83 m^3/hour is assumed for current and future recreational children (USEPA, 1991; USEPA, 1989b). Recreational children are assumed to be exposed to fugitive dusts for the entire duration of their play time, or for 2.6 hours, seven days per year for six years (USEPA, 1993a).

For all inhalation scenarios, a conversion factor from the Cowherd model is used to estimate the concentration of particulate in air that originated from the area of concern (the area of contamination). That is, the model estimates the concentration of respirable particulate for the portion (of the total dust in the air) that comes from the site (see Section 6.1.2.6.1).

Dermal Contact with Soils - The equations for determining current and future occupational intakes from dermal contact with soils are shown in Tables 6-15a and 6-15b. Exposure frequencies and durations for the occupational receptors are the same as described in the previous two scenarios. An exposed surface area of 3,600 cm^2 (the 50^{th} percentile value for the surface area of an adult male's forearms, hands, and head) is assumed for all occupational receptors (USEPA, 1989b).

Table 6-16 shows the soil dermal intake equations for possible current and future recreational children. A surface area of 5,025 cm^2 (head, hands, arms and legs) is assumed for the child receptors (50^{th} percentile values from USEPA, 1989b). Exposure duration, time, and frequency for the recreational child are the same as described in earlier sections.

A soil adherence factor of 1.0 mg/cm^3 (USEPA, 1992) and a conservative absorption factor of 100 percent (USEPA, 1992e) is used for all receptors.

Ingestion of Groundwater - The (future) residential intakes for the ingestion of groundwater are shown in Table 6-17. The calculations are based on the assumption that people live at one residence for 30 years, the 90th percentile average value for time at one residence (USEPA, 1991; USEPA, 1989b). Resident children are also evaluated using an exposure duration of six years (USEPA, 1991). Residents are assumed to consume two liters of water from the contaminated aquifer daily at a frequency of 350 days per year (USEPA, 1991; USEPA, 1989b). The exposure frequency value assumes a two-week period away from the home each year (USEPA, 1991).

Dermal Exposure to Groundwater - The equation for calculating future residential dermal contact to groundwater during bathing and other household activities is shown in Table 6-18. Surface area values of 19,400 cm^2 and 8,660 cm^2, representing the 50^{th} percentile values for an adult male and a six year old child, respectively, are used in the calculation (USEPA, 1989b). A shower or bath duration of twelve minutes once daily, which is the 90^{th} percentile for bathing duration, is assumed for exposed receptors (USEPA, 1992). Standard default exposure frequencies and durations (350 days per year for 30 years or six years) were also used in the calculation (USEPA, 1991).

The dermal permeability constant included in the equation is based on the default permeability coefficient for metals in water (USEPA, 1992). All groundwater constituents of concern are inorganics (see Table 6-4). Of the constituents of concern detected in groundwater, a chemical-specific permeability constant exists only for chromium. Since the permeability constant for chromium is equivalent to the default permeability constant for metals (0.001 cm/hour), this value is used to develop the intakes for all metal contaminants of concern in groundwater. In the absence of a chemical-specific permeability constant for nitrate, a non-metallic inorganic chemical of concern, this default value has been used.

Dermal Exposure to Surface Water - The equation for determining chemical intakes from dermal contact during work in surface waters are presented in Tables 6-19a and 6-19b. The current worker scenario is based on one three-day cleaning event every ten years, for an exposure frequency totalling 0.3 days per year (DEH, 1992a). For future site workers, an exposure frequency and duration of one cleaning event per year over 25 years, lasting approximately two days per event, is used in the calculation (see Table 6-19b). As stated earlier, because yearly cleaning of the drainage ditch will reduce the accumulated plant matter and debris within the channel, it is reasonable to assume a decreased exposure duration of 2 days per year for the future cleaning events.

These occupational exposure values are conservative in that it is assumed that the same individual, over a period of 25 years, cleans out the channel two days each year. A surface area value of 6,170 cm^2, the 50^{th} percentile value of an adult male's lower arms, lower legs, hands, and feet (USEPA, 1989b), and an exposure duration of 25 years, representing the upper-bound of time spent with one employer (USEPA, 1991), are also used in both the current and future occupational intake equations.

Recreational surface water intakes for the child are calculated in Table 6-20. The recreational scenario assumes that a child will wade and play in the water for 2.6 hours a day, seven days per year. This is the national average for time and frequency for swimming activities (USEPA, 1992a). A fiftieth percentile surface area value of 4,490 cm^2 for a child's arms, legs, hands, and feet is used in the equation (USEPA, 1989b). The intakes for current and future recreational children are assumed to be equal.

In both the recreational and occupational scenarios, the dermal permeability constants (PCs) are obtained from dermal guidance (USEPA, 1992). Only metals were detected in surface water (see Table 6-5). Of the metals detected in site surface water, only cadmium, chromium, and lead have chemical specific PC values. Chromium and cadmium compounds have the same PC value as the default PC for metals (0.001 cm/hour), while lead's PC value is 0.000004 cm/hour (USEPA, 1992). Therefore, two intakes are calculated for each receptor in Tables 6-19a, 6-19b, and 6-20: one for the default metals (including chromium and cadmium) using a PC of 0.001 cm/hour, and one for lead, using a PC value of 0.000004 cm/hour.

Dermal Contact with Sediments - The equations for determining current and future occupational intakes from dermal contact with sediments are shown in Tables 6-21a and 6-21b. For the occupational scenario, an exposed surface area of 1,980 cm^2 is assumed (50th percentile surface area of hands and forearms; USEPA 1989b). The exposure duration, frequency, and time for the occupational receptors are the same as described in the surface water scenario, above.

The dermal sediment intake for recreational children is shown in Table 6-22. A 50th percentile surface area of 4,490 cm^2 (arms, legs, hands, and feet) is assumed (USEPA, 1989b). Current and future intakes for recreational children are assumed to be equal. The exposure duration is assumed to be 6 years (USEPA, 1991), with an exposure frequency of 7 days/year at 2.6 hours/day (USEPA, 1989a; USEPA, 1992).

A soil adherence factor of 1.0 mg/cm^2 (USEPA, 1992) and a conservative absorption factor of 100 percent (USEPA, 1992e) is assumed for all receptors.

Incidental Ingestion of Sediments - The equations for determining chemical intakes from the incidental ingestion of sediment are shown in Tables 6-23a, 6-23b, and 6-24. Based on the variables provided in this table, intakes were calculated for current and future occupational exposure (channel cleaning activities), and for recreational children (current and future exposure for children are assumed to be equal).

The exposure duration, frequency, and time for the occupational and recreational receptors are the same as described in the surface water scenarios, above. In addition, the worker is assumed to ingest 480 mg of sediment daily, which is the upper-bound value used for incidental ingestion of soil (USEPA, 1991; USEPA, 1989b). The recreational child is assumed to ingest 200 mg of sediments daily (USEPA, 1991).

6.1.2.7 Summary of Exposure Assessment - Twenty six potential exposure pathways were quantified in this assessment, including twelve current exposure pathways and fourteen future pathways. The pathways quantified include the following:

Current Land Uses - Occupational Scenarios

1. Incidental ingestion of soil
2. Inhalation of contaminants in fugitive dust
3. Dermal contact with soils
4. Dermal contact with surface water
5. Dermal contact with sediments
6. Incidental ingestion of sediments

Current Land Uses - Recreational Scenarios

7. Incidental ingestion of soil
8. Inhalation of contaminants in fugitive dust
9. Dermal contact with soils
10. Dermal contact with surface water
11. Dermal contact with sediments
12. Incidental ingestion of sediments

Future Land Uses - Occupational Scenarios

13. Incidental ingestion of soil
14. Inhalation of contaminants in fugitive dust
15. Dermal contact with soils
16. Dermal contact with surface water
17. Dermal contact with sediments
18. Incidental ingestion of sediments

Future Land Uses - Residential Scenarios

19. Ingestion of drinking water
20. Dermal contact while showering

Future Land Uses - Recreational Scenarios

21. Incidental ingestion of soil
22. Inhalation of contaminants in fugitive dust
23. Dermal contact with soils
24. Dermal contact with surface water
25. Dermal contact with sediments
26. Incidental ingestion of sediments

In addition, six residential scenarios are quantified for comparison purposes only; these intakes and resulting risks are presented in Appendix P. Following is a list of the scenarios developed in Appendix P for both future adult and child residents:

1. Incidental ingestion of soil
2. Inhalation of contaminants in fugitive dust

3. Dermal contact with soils
4. Dermal contact with surface water
5. Dermal contact with sediments
6. Incidental ingestion of sediments

Exposure point concentrations for each of these pathways were determined based on the results of baseline monitoring data from sampling locations on-site. The exposure point concentrations are multiplied by pathway-specific intake assumptions to yield quantitative estimates of chemical intakes for each pathway. Chemical-specific intake estimates for the scenarios included in the baseline risk assessment are presented, by pathway, in Appendix N.

6.1.2.8 Uncertainties - There are a number of assumptions required in developing quantitative estimates of chemical intakes. A certain amount of uncertainty is inherent in all assumptions. Table 6-25 summarizes the major assumptions associated with this exposure assessment, and their inherent uncertainties, which may tend to overestimate or underestimate potential risks to receptors contacting site media. As shown, most of the assumptions will lead to an overestimate of the potential risks. This is consistent with the RME approach of this exposure assessment.

6.1.3 Toxicity Assessment

The toxicity assessment is an integral part of the preliminary risk evaluation process. First, a comparison of site concentrations to regulatory requirements, standards and criteria is made. State and Federal regulations, rules, guidelines and criteria are compared to site concentrations in a sampled media. This comparison serves as a qualitative guide and points out media that may be serving as potential sources of risk.

In addition, quantitative reference values describing the toxicity of the constituents of concern are evaluated. Toxicity values such as Reference Dose or Reference Concentration (RfD/RfC) and Carcinogen Slope Factor (CSF) are based primarily on human and animal studies with supportive evidence from pharmacokinetics, mutagenicity and chemical structure studies. The following sections will describe toxicity values used to evaluate current and potential future exposures associated with the current and future exposed populations at the PSF.

Several constituents that have the potential for causing adverse human health effects have been found in the environmental media at the site. This section presents the available guidelines and standards which have been established by the USEPA for the chemicals of potential concern at the site. Additionally, a short description of the toxic effects of each chemical of concern is presented in Appendix O, Toxicological Profiles.

6.1.3.1 <u>Summary of Potential ARARs</u> - The potential chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) requirements which apply for the chemicals and exposures at this site are summarized in this section.

6.1.3.1.1 Drinking Water Standards - The National Primary Drinking Water Regulations established by the USEPA provide Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for a number of constituents (Federal Register, 1987). By definition, the MCLGs are non-enforceable health-based goals while the MCLs are the enforceable standards which must be set as close to the MCLGs as feasible. The MCLs combine health effects data on specific chemicals with other concerns, such as analytical detection limits, treatment technology, and economic impact. Relevant state water regulations which set state MCLs for constituents may be more stringent than federal MCLs.

The receptor population's total environmental exposure to a specific chemical is considered in developing the MCL, which attempts to set lifetime limits at the lowest practicable level to minimize the amount of toxicants contributed by drinking water. An intake of two liters of water per day is assumed in developing MCLs. The MCLs are relevant and appropriate for constituents in the groundwater at the site because the aquifer beneath the site is a potential potable water supply. Applicable State and Federal MCLs for the chemicals of potential concern are provided in Table 6-26.

In addition to MCLs, the State of Kansas has developed Kansas Action Levels (KALs), Kansas Notification Levels (KNLs), Alternate Kansas Action Levels (AKALs), and Alternate Kansas Notification Levels (AKNLs). The KNL or AKNL is used to constitute administrative confirmation that groundwater contamination exists. The KAL or AKAL is applied to represent the level at which long-term exposure to contaminant concentrations is unacceptable. The KNL/KAL apply to fresh and usable water aquifers in the state, whereas the AKNL/AKAL apply to alluvial aquifers and/or specific aquifers which surface through springs or seeps to become contributors to the surface water of the state (KDHE, 1988). Discussions with the Kansas Department of Health and the Environment indicate that the State of Kansas did not meet the federally mandated deadline for completing revisions to the drinking water regulations and health advisories (KDHE, 1992). Therefore, the state is required to enforce the federally established MCLs by reference.

The KALS, KNLs, AKALs, and AKNLs for constituents detected in the groundwater samples are included in Table 6-26 as TBCs. The AKALs and AKNLs were not available for most of these constituents. In general, the KNL values are one-tenth the KAL values.

6.1.3.1.2 Ambient Water Quality Criteria - The USEPA has developed Ambient Water Quality Criteria (AWQC) for constituents in surface waters. The AWQC for the protection of aquatic organisms are derived based on two criteria: (1) acute criterion representing the maximum concentrations permissible at any time, and (2) chronic criterion representing the maximum permissible concentration averaged over a 24-hour time period.

The AWQC for the protection of human health accounts for ingestion of contaminated water and/or for the ingestion of contaminated organisms in surface waters (USEPA, 1987). The AWQC for the protection of human health from the ingestion of water and organisms assumes a daily intake of two liters of water and 6.5 grams of fish, while the AWQC for the protection of human health due to the ingestion of fish assumes an intake of 6.5 grams of fish daily. Ambient concentrations corresponding to several incremental lifetime cancer risk levels have been estimated for constituents exhibiting carcinogenic and/or mutagenic effects in laboratory tests and are, therefore, suspected of being carcinogenic to humans. The ambient concentrations which may result in one excess cancer per one million persons (i.e., risk = 1×10^{-6}) are presented as AWQC for constituents known or suspected to be carcinogens.

The State of Kansas incorporates the Federal AWQC for the protection of aquatic life as the State Water Quality Standards by reference (KAR, 1987). Surface water AWQC are relevant for this site because contaminated groundwater may discharge to the creeks and rivers surrounding the PSF. In addition, surface runoff from the site may also impact the adjacent creeks and stream. Table 6-27, Regulatory and Guidance Criteria for Surface Water, presents the potential ARARs and TBCs for the constituents detected in the site's surface water.

According to the CERCLA Compliance with Other Laws Manual (USEPA, 1988a) published by USEPA, whether a water quality criteria is relevant and appropriate depends on the use(s) designated by the State (of Kansas), which is based on existing and attainable uses, and whether the water quality criteria is intended to be protective of that use. The Kansas Water Pollution Control Standards (KAR,

1988) define classified streams and rivers as "streams and rivers with mean summer base flows of greater than 0.1 cfs" or streams where "pooling during periods of zero stream flow provides important refuges of aquatic life for downstream segments or recolonization of the dried segment". "Base flow" is defined as "the portion of the stream flow that is not contributed to the stream by surface runoff" (KAR, 1988). Since the stream in the lined channel only flows intermittently as a result of surface water runoff, and stagnant or pooled water collected in this drainage channel during periods of no flow do not provide "important" refuges for aquatic life, the AWQC are not strictly applicable to the on-site surface waters. In addition, due to on-site conditions, the AWQC are not relevant and appropriate for protection of possible aquatic life associated with the lined channel east of the PSF. However, the drainage ditch ends at a tributary that eventually empties into the Kansas River. Both this tributary and the Kansas River (located some 2,000 feet downstream) are able to support aquatic life. Therefore, although surface water AWQC are not considered applicable or relevant and appropriate to site surface waters in the drainage ditch, they may be considered relevant to off-site surface water bodies because of these downstream concerns.

6.1.3.1.3 Soil and Sediment Criteria - Currently under CERCLA regulations, there are no guidelines for allowable soil concentrations. In the proposed RCRA Subpart S regulations (55 FR 30798-30884), Corrective Action Levels (CALs) have been developed. These are health-based criteria serving as an indication of whether corrective measures are required. The RCRA CALs for carcinogens are calculated based on Carcinogenic Slope Factors (CSFs). The calculation of lifetime (carcinogenic) soil criteria assumes that 0.1 grams of soil are ingested per day by a 70 kilogram (kg) person for 70 years (lifetime) (Federal Register, 1990). The CALs for systemic toxicants are calculated based on RFDs and are an estimate of the daily exposure an individual, including sensitive individuals, can experience without appreciable risk of health effects during a lifetime. The calculation of these criteria assumes that 0.2 grams of soil are ingested per day by a 15 kg child for a five year period (1 to 6 years of age). The concentrations of constituents detected in the site's surface and subsurface soil samples are compared to the proposed RCRA CALs in Table 6-28. Note that there are no CALs for PAH compounds.

The National Oceanic and Atmospheric Administration (NOAA) has developed Effects Range concentrations which are non-enforceable guidance criteria for sediments (NOAA, 1990). These concentrations were derived from data on the potential of these chemicals to cause adverse biological effects in coastal marine and estuarine environments. The Effects Range - Low (ER-L) is the lower 10th percentile of concentrations with detectable adverse effects. The Effects Range - Median (ER-M) is the corresponding median concentration. The NOAA criteria are not strictly applicable to the site because they were developed for estuarine and marine environments, but they may be used as an indication of the general health of the ecosystem. The NOAA sediment criteria values are presented in Section 6.2 and are used as a basis for the environmental risk evaluation.

6.1.3.2 Comparison of Exposure Point Concentrations to ARARs - The exposure point concentrations of the constituents of concern in the environmental media sampled for the PSF were compared to the ARARs for each medium. The Kansas MCLs are based on the federal MCLs, which are either the same or more conservative. Therefore, all discussions of comparisons to MCLs will refer to federal MCLs. The results of the comparisons are presented and Tables 6-26 through 6-28 and are discussed below.

6.1.3.2.1 Groundwater - Table 6-26 presents a comparison of the exposure point concentrations (either the 95 percent UCL or the maximum detection) for the nine constituents of concern in the groundwater to the available state and federal regulatory and guidance criteria. This comparison shows that: exposure point concentrations for four of the chemicals of concern are below their federal MCLs (arsenic, barium, beryllium, and chromium); and exposure point concentrations for two of the chemicals of concern are above their MCLs (nitrate and thallium). MCLs have not been promulgated for the three remaining chemicals of concern (aluminum, manganese, and vanadium); however, secondary MCLs (based on aesthetic considerations) exist and are slightly exceeded by aluminum and manganese. In addition, the exposure point concentrations for two of the chemicals of concern exceed their respective MCLGs (nitrate and thallium).

Regarding regulatory and guidance criteria for the State of Kansas, exposure point concentrations for four of the chemicals of concern exceed their Kansas Action Levels (beryllium, manganese, nitrate, and thallium), and nitrate also exceeds the Kansas MCL (which is the same as the federal MCL). It should be noted that two of the four chemicals of concern (manganese and thallium) exceed their Kansas Action Levels.

6.1.3.2.2 Surface Water - The exposure point concentrations for contaminants of concern in surface water were compared to AWQC for human health, for the ingestion of water and fish and the ingestion of fish, and AWQC for the protection of aquatic life from acute and chronic exposures. The results are presented in Table 6-27. Manganese and arsenic concentrations in the surface water samples collected near the site exceeded the AWQC for the protection of human health even though they appeared to be within the range of background. Cadmium and inorganic chloride concentrations exceeded AWQC for the protection of aquatic life. The exposure point concentration of total chromium exceeded the AWQC for the protection of aquatic life for hexavalent chromium, but not for trivalent chromium (chromium valence was not specified in the analysis). Finally, the concentrations of copper and lead exceeded the chronic AWQC for the protection of aquatic life. There are no current regulatory criteria for aluminum, barium, bicarbonate, sulfate, or vanadium.

6.1.3.2.3 Surface Soils - The exposure point concentrations for contaminants of concern in surface soil and in subsurface soil were compared to RCRA Corrective Action Levels (CALs) for soil. The comparisons are presented in Table 6-28. The exposure point concentrations of alpha- and gamma-chlordane and dieldrin exceeded the RCRA CALs in both surface and subsurface soils, while the exposure point concentrations of 4,4'-DDT and heptachlor exceeded the RCRA CALs in subsurface and surface soil samples, respectively. It should be noted that the concentration of dieldrin detected in subsurface soils only slightly exceeds its RCRA CAL (see Table 6-28). Metals identified as chemicals of potential concern were present at concentrations below available CALs in both subsurface and surface soil samples. There are no RCRA action levels for the PAHs, dibenzofuran, or 2-methylnaphthalene.

6.1.3.3 <u>Toxicity Values for Noncarcinogenic and Carcinogenic Effects</u> - The USEPA has developed toxicity values which reflect the magnitude of the adverse noncarcinogenic and carcinogenic effects from exposure to specific chemicals. Toxicity values for the chemicals of potential concern at this site are presented in this section.

6.1.3.3.1 Noncarcinogenic Effects - Chemicals that give rise to toxic endpoints other than cancer and gene mutations are often referred to as "systemic toxicants" because of their effects on the function of various organ systems. Chemicals considered to be carcinogenic can also exhibit systemic toxicity effects. For many noncarcinogenic effects, protective mechanisms (i.e., exposure or dose thresholds) are believed to exist that must be overcome before an adverse effect is manifested. This characteristic distinguishes systemic toxicants from carcinogens and mutagens which are often treated as acting without a distinct threshold. As a result, a range of exposure exists from zero to some finite value that can be tolerated with essentially no probability of the organism expressing adverse effects. In developing toxicity values for evaluating noncarcinogenic effects, the standard approach is to identify the upper bound, or threshold, of this tolerance range and to establish the toxicity values based on this threshold.

The toxicity value most often used in evaluating noncarcinogenic effects is a reference dose (RfD) (expressed in units of mg/kg-day) for oral or dermal exposure, or reference concentration (RfC) (expressed in units of mg/m^3) for inhalation exposure. Various types of RfDs/RfCs are available, depending on the exposure route of concern (e.g., oral or inhalation), the critical effect of the chemical (e.g., developmental or other), and the length of exposure being evaluated (e.g., chronic or subchronic).

A chronic RfD/RfC is defined as an estimate of a daily exposure level for the human population that is likely to be without appreciable risk of deleterious effects during a lifetime. Chronic RfDs/RfCs are specifically developed to be protective for long-term exposures, i.e., seven years to a lifetime (70 years). All exposures except childhood exposures in this risk evaluation are assumed to be long-term.

Childhood exposures (such as the recreational child) in this risk assessment are evaluated using subchronic RfD_{sc} /RfC_{sc}. By definition, a subchronic RfD is an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a portion of a lifetime (USEPA, 1989a). For sites evaluated under the Superfund program, the subchronic RfD_{sc}/RfC_{sc} is used for exposures lasting from two weeks to seven years. Since the recreational child being evaluated in this risk assessment is six years old, the use of a subchronic RfD_{sc}/RfC_{sc} is appropriate. Subchronic RfD_{sc}/RfC_{sc} values are obtained from the Health Effects Assessment Summary Tables (HEAST, 1992). In most cases, the subchronic RfD_{sc}/RfC_{sc} values listed in HEAST for the constituents of concern are equivalent to the chronic values. However, the following three exceptions exist, and therefore are used in evaluating childhood exposures in this risk assessment:

Constituent	Subchronic RfD_{sc}	Chronic RfD
Anthracene	ORAL - 3 mg/kg/day	ORAL - 0.3 mg/kg/day
Chromium	ORAL - 0.02 mg/kg/day	ORAL - 0.005 mg/kg/day
Barium	INH - 0.0014 mg/kg/day	INH - 0.00014 mg/kg/day

The chronic RfDs/RfCs for the chemicals of concern at this site are presented in Table 6-29. As stated earlier, noncarcinogenic toxicity values for the inhalation route are often expressed as RFCs, in units of mg/m^3. Prior to input in Table 6-29, RfCs were converted to RfDs using standard default values, as follows:

$$RfC(mg/m^3) * 20m^3/day * 1/70kg = RfD(mg/kg\text{-}day)$$

The inhalation rate of 20 m^3/day and body weight of 70 kg are USEPA standard default values for an average adult male (USEPA, 1991).

6.1.3.3.2 Carcinogenic Effects - Carcinogenesis, unlike many noncarcinogenic health effects, is generally thought to be a nonthreshold effect. In other words, USEPA assumes that a small number of molecular events can cause changes in a single cell that can lead to uncontrolled cellular growth. This hypothesized mechanism for carcinogenesis is referred to as "nonthreshold," because there is believed to be essentially no level of exposure to such a chemical that does not pose a finite probability of generating a carcinogenic response.

To evaluate carcinogenic effects, USEPA uses a two-part evaluation in which the chemical is first assigned a weight-of-evidence classification, and then a Carcinogenic Slope Factor (CSF) is calculated. These indices can be derived for either oral or inhalation exposures. The weight-of-evidence classification is based on an evaluation of the available data to determine the likelihood that the chemical is a human carcinogen. Chemicals with the strongest evidence of human carcinogenicity are denoted with Class A, B1, or B2, while chemicals with less supporting evidence are classified as C or D. The slope factor quantitatively defines the relationship between the dose and the response. The slope factor is generally expressed as a plausible upper-bound estimate of the probability of response occurring per unit of chemical. The carcinogenic slope factors for the chemicals of concern at this site are presented in Table 6-30.

It should be noted that toxicity values have not been derived for many of the PAHs detected at the PSF site. A methodology which utilizes toxicity equivalency factors (TEFs) to derive oral cancer slope factors for carcinogenic PAHs is employed by several USEPA Regions. This methodology is based on each compound's relative potency to the potency of benzo[a]pyrene, a PAH for which a slope factor has been calculated. The oral CSFs derived from TEFs relative to benzo[a]pyrene toxicity are as follows (USEPA, 1992a; USEPA, 1992g):

Constituent	TEF	CSF (kg-day/mg)
Benzo[a]anthracene	0.145	1.06
Benzo[b]fluoranthene	0.14	1.02
Benzo[k]fluoranthene	0.066	0.48
Benzo[a]pyrene	1.0	7.3
Benzo[g,h,i]perylene	0.022	0.16
Chrysene	0.004	0.029
Indeno[1,2,3-cd]pyrene	0.233	1.7
Dibenzo[a,h]anthracene	1.11	8.1

The derived CSFs (denoted with an asterisk) for the constituents detected at the site are included in Table 6-30.

In May 1993, a memorandum was issued by USEPA Region VII regarding the use of equivalency factors in determining CSFs for carcinogenic PAHs without USEPA-established slope factors. In this guidance, USEPA Region VII states that "risk assessments substantially complete do not have to be redone" (USEPA, 1993b). Therefore, the TEFs used in determining the risk to site constituents were not changed from the values listed above, which are adopted in Region III guidance. In any case, it appears that the equivalency factors provided by Region VII are a rounding of the values adopted by Region III, so the risk assessment results would not change appreciably if the Region VII values were substituted for the Region III values. It should be noted, however, that although Region III provides an equivalency factor for benzo[g,h,i]perylene, Region VII guidance does not.

6.1.3.4 Toxicity Assessment of Dermal Exposures - Dermal intakes associated with groundwater and surface water exposures were adjusted to absorbed dose estimates by assuming that the contaminants permeate skin at chemical-specific permeability rates (USEPA, 1992). Permeability constants for constituents detected in aqueous media are listed on the Risk Characterization Tables in Appendix N. Chemical-specific permeability constants are not currently available for constituents detected in soil and sediment media; therefore, dermal intakes for these media are not adjusted to absorbed doses by using permeation rates.

No RfDs or CSFs have been derived for dermal absorption. According to USEPA guidance, risks associated with dermal exposures may be evaluated with Oral Absorbed Dose RfDs or Oral Absorbed Slope Factors (after dermal exposures are converted to their respective absorbed dose) (USEPA, 1991). However, in accordance with USEPA Region VII guidance (USEPA, 1992e), oral RfDs and CSFs were not adjusted by oral absorption rates (i.e., the default absorbance factor used in Region VII is 100 percent). The constituents are assumed to be completely absorbed through the skin. Thus, bioavailability is assumed to be equal to that received from an oral dose. This is a conservative assessment process that may be warranted at the site because of the presence of pesticides in site media. Because pesticides are highly lipid soluble, they may in fact be taken in faster and more completely via dermal contact than by oral ingestion. This assessment process may, however, tend to overestimate intakes from non-lipid soluble constituents (i.e., metals).

6.1.4 Risk Characterization

The risk characterization integrates the results of the exposure and toxicity assessments into quantitative and qualitative expressions of risk. To characterize potential noncarcinogenic effects, comparisons are made between the estimated chemical intakes and the RfDs/RfCs for those chemicals; to characterize potential carcinogenic effects, estimated chemical intakes are multiplied by the chemical-specific slope factors to yield chemical-specific dose-response information.

6.1.4.1 Noncarcinogenic Effects Characterization - Noncarcinogenic effects are characterized by comparing the estimated chemical intakes to the appropriate RfD/RfC value. The RfD/RfC value is, by definition, an estimate of a daily exposure level for the human population that is likely to be without appreciable risk of deleterious effects during a lifetime. Therefore, when the estimated chronic daily intake of a chemical exceeds the appropriate RfD/RfC, there may be a concern for potential noncancer effects from exposure to that chemical. The ratio of the chronic daily intake to the chronic RfD/RfC is referred to as the "hazard quotient." The sum of the hazard quotients for each chemical in a specific pathway is termed the "hazard index." It is important to note that the hazard quotient does not represent a statistical probability; a ratio of 0.01 does not mean that there is a one in one hundred chance of the effect occurring. Rather, a hazard quotient greater than 1.0 indicates that the "threshold" for that chemical has been exceeded. The chemical-specific hazard quotient calculations are presented, by pathway, in Appendix N.

The USEPA assumes additivity of effects in evaluating noncarcinogenic effects from a mixture of chemicals. The chemical-specific hazard quotients are summed to yield an overall pathway hazard index; pathway hazard indices are then summed to yield a total risk for each relevant population. Table 6-31 presents a summary of the chronic hazard index estimates for exposed adults and children by pathway.

The following sections will discuss the risk of noncarcinogenic effects for current and future exposed populations, by media and exposure pathway.

6.1.4.1.1 Current Noncarcinogenic Risk - Currently exposed populations include occupational adults and trespassers (children playing near the site) only. The media-specific risks, by pathway, are presented as follows.

Surface Soils - The calculated hazard indices for noncarcinogenic effects of exposure of current landscapers and utility workers and for current recreational children to surface soil via ingestion, dermal contact, and inhalation of fugitive dust are all below the departure point of 1.0. In addition, the calculated hazard quotients for on-site worker exposure to surface soil via incidental ingestion and inhalation of fugitive dust are also less than 1.0. Based on current site-specific data, there is no unacceptable noncarcinogenic risk from exposure to surface soil for landscapers, utility workers, recreational children and on-site workers via these pathways.

The dermal hazard quotient calculated for an on-site worker is 9.2, a value that exceeds the departure point of 1.0. The dermal risk to on-site workers is attributed to the presence of alpha- and gamma-chlordane and arsenic detected in the surface soil sample (SS-04) collected from the area of previously stressed vegetation located adjacent to the site. The concentrations of the constituents detected in sample SS-04 were used as proxy concentrations for the entire portion of the site that is not covered by the gravel "cap". As stated earlier, since sample SS-04 was collected from the area of previously stressed vegetation, and since the gravel currently covering the site should be free from pesticide contamination, the detected concentrations in surface soil sample SS-04 are worst case, and are likely to be an overestimation of the actual contamination present in the surface materials (soil or gravel) currently available for exposure.

Additionally, the hazard indices for dermal exposure were calculated using conservative assumptions of 100 percent absorption of the constituent from the medium, and no adjustment of the oral RfD to a dermal absorbed dose. Dermal exposure is also estimated by assuming that the constituent concentrations coming in contact with exposed skin are equal to the concentrations detected in site soils, even though the receptor may only be "contacting" the soil through dust exposures, which should be less than what is detected in soil samples. Therefore, the use of sample SS-04 concentrations together with the use of these assumptions in calculating the hazard indices may have resulted in an overestimate of the potential risks.

It should be noted that the exposure point concentration used to determine the noncarcinogenic risk due to arsenic for current receptors (4.6 mg/kg) is greater than the site-specific background concentration of 3.4 mg/kg, but it is within the range of naturally occurring arsenic levels in Missourian uncultivated, unglaciated prairie soils (3.4 - 38 mg/kg; USGS, 1975). Therefore, since the arsenic concentration used to determine risk for current receptors is within the range of background in regional soils, the unacceptable risk associated with that level of arsenic may or may not be attributable to site-related activities.

Subsurface Soils - The calculated hazard indices for exposure of current utility workers, landscapers, and recreational children to subsurface soil via incidental ingestion, inhalation of fugitive dust, and dermal contact are below the departure point of 1.0. Based on current site-specific data, there is no unacceptable noncarcinogenic risk from exposure to subsurface soil to these receptors via these pathways.

Hazard quotients for on-site worker exposure to subsurface soils were not calculated because these receptors do not have direct exposure to subsurface soil. Any risk to on-site workers due to inhalation of subsurface soils should be no more than that experienced by the utility worker.

Groundwater - Noncarcinogenic risk due to current exposures to groundwater was not calculated because there are no wells currently located on the PSF site.

Surface Water - The chronic hazard indices for dermal exposure to surface water via wading and during channel clearing activities fall below the departure point of 1.0 for both occupational adults and recreational children. Therefore, based on current site data, there is no evidence of potentially unacceptable risks to persons exposed surface water in the lined channel adjacent to the site.

Volatile organic were not detected in surface water samples and are not available for exposure via inhalation. Therefore, no hazard index was calculated for exposure via this pathway.

Sediments - The hazard indices for exposure of current occupational adults and recreational children to sediments via incidental ingestion and dermal contact fall below the departure point of 1.0. Therefore, potentially unacceptable risks from exposure to sediments are not currently present.

6.1.4.1.2 Future Noncarcinogenic Risk - Future potentially exposed populations include occupational receptors (on-site workers, utility workers, construction workers, and landscapers), future recreational children, and residents residing off-site who may use on-site groundwater as drinking water. The media-specific risks, by pathway, are presented as follows.

Surface Soils - The calculated hazard indices for exposure of future landscapers and utility workers to surface soils via incidental ingestion, inhalation of fugitive dust, and dermal contact are all below the departure point of 1.0 (Section 6.1.4.1). The hazard indices for exposure of on-site workers, construction workers, and recreational children to surface soils via incidental ingestion and inhalation of fugitive dust also fall below the departure point of 1.0. Based on current site-specific data, and assuming no increase in constituent concentrations, there are no projected unacceptable systemic risks from exposure to surface soil via these pathways.

The hazard indices for exposure of future recreational children (HI=1.9), on-site workers (HI = 33), and construction workers (HI = 16) via dermal absorption exceed the departure point of 1.0. The risk is attributed to the presence of arsenic and the chlordanes detected in surface soil. As stated earlier, the hazard indices for dermal exposure were calculated using conservative assumptions and may have resulted in an overestimate of the potential risks. In addition, the risk calculated for the construction worker may also be increased because the construction workers are not expected to be on the site for the entire duration of the construction project.

It should also be noted that while the exposure point concentration used to determine the noncarcinogenic risk due to arsenic for future receptors (16 mg/kg) is greater than the site-specific background concentration of 2.4 mg/kg, it is within the range of naturally occurring arsenic levels in Missourian uncultivated, unglaciated prairie soils (3.4 - 38 mg/kg; USGS, 1975). Therefore, since the arsenic concentration used to determine the risk for future exposure to surface soils appears to be within the range of regional arsenic background levels, the unacceptable risks associated with arsenic may or may not be directly attributable to site-related activities.

Subsurface Soils - The calculated hazard indices for exposure to a future child playing near the site and to future occupational workers to constituents in subsurface soil via incidental ingestion, inhalation of fugitive dust, and dermal contact are below the departure point of 1.0 (Section 6.1.4.1). An exception to this is the hazard index calculated for the construction worker's dermal exposure to subsurface soils, which exceeds the departure point of 1.0 (HI = 7.3).

As stated earlier, the dermal exposure hazard indices are calculated using conservative assumptions. The risk is also calculated using current site-specific data which assumes the detected concentrations of constituents will not degrade over time. Furthermore, the construction worker scenario most likely overestimates the exposure patterns that will be followed on site (based on the personal interviews with DEH Job Order and Design Branch employees). Therefore, the exposure and calculation assumptions used in calculating the dermal risk of the future construction worker due to subsurface soils may have resulted in an overestimate of the potential risk.

It should be noted that the exposure point concentration used to determine the noncarcinogenic risk due to arsenic for future receptors exposed to subsurface soils (6.4 mg/kg) is greater than the site-specific background concentration of 1.4 mg/kg, but it is within the range of naturally occurring arsenic levels in Missourian uncultivated, unglaciated prairie soils (3.4 - 38 mg/kg; USGS, 1975). Therefore, the arsenic concentration used to determine risk for current receptors is within the range of background in regional soils, and the unacceptable risk associated with that level of arsenic in subsurface soils may or may not be attributable to site-related activities.

Groundwater - The hazard indices for future exposure to groundwater via ingestion of drinking water by adults and children using on-site groundwater as a potable water supply exceed the departure point of 1.0 (hazard indices are 4.6 and 22, respectively). The risk is primarily due to the presence of nitrates, thallium, arsenic, and manganese in the groundwater. The estimate of risk is conservative, and is based on the assumption that all of the drinking water ingested in a given day comes from the contaminated source. In addition, the reduction of constituent concentrations through attenuation are not accounted for. Therefore, the unacceptable risk that is currently estimated may be excessively conservative, as the concentrations and thus the risk may be naturally reduced in the future.

It should be noted that this estimation of risk is based on the conservative assumption that a drinking water well will be installed and developed on the site, and used as a potable water supply for residents in the area. As stated earlier, the future development of the PSF site for this purpose is not likely to occur. Drinking water wells in the Fort Riley area are typically placed in the alluvial deposits of rivers, where the water yield is much higher than the on-site yield. Fort Riley and the surrounding areas are currently serviced by drinking water wells located out of the influence of the source area.

The hazard indices for future dermal exposure to groundwater by residential adults and children are well below the departure point of 1.0. Therefore, there is no project unacceptable systemic risk from dermal exposure to groundwater.

Volatile organic were not selected as contaminants of concern in the groundwater. Therefore, no hazard index was calculated for exposure via inhalation during showers and household use.

Surface Water - The chronic hazard indices are less than 1.0 for dermal exposure to surface water during channel clearing activities for occupational receptors and for recreational dermal exposure (while wading) for recreational children. Therefore, based on current site data, there is no evidence of potentially unacceptable systemic risks to persons who may be exposed to surface water during maintenance activities and or during recreational (wading) activities.

Volatile organic were not detected in surface water samples collected from the site. Therefore, no hazard index was calculated for exposure via inhalation.

Sediments - The hazard indices for exposure of future recreational children and future occupational workers to sediments via incidental ingestion and dermal contact fall below the departure point of 1.0. Therefore, there is no projected unacceptable systemic risk from dermal exposure to stream sediments.

6.1.4.2 Carcinogenic Risk Characterization - Risks from potential carcinogens are estimated as probabilities of excess cancers as a result of exposure to chemicals from the site. The carcinogenic slope factor correlates estimated total chronic daily intake directly to incremental cancer risk. The results of the risk characterization are expressed as upper-bound estimates of the potential carcinogenic risk for each exposure point. Chemical-specific cancer risks are estimated by multiplying the slope factor by the chronic daily intake estimates. Chemical-specific risk calculations are presented by pathway in Appendix N.

To assess the overall potential for cancer effects posed by the mixture of chemicals present at the site, USEPA assumes additivity. Therefore, cancer risks are estimated for each chemical, then the chemical-specific risks are summed to yield an estimate of the overall pathway-specific cancer risk. Table 6-32 provides a summary of the cancer risk estimates for each receptor population by pathway. The National Contingency Plan defines the range of acceptable risks for evaluating cancer risks as 1×10^{-4} to 1×10^{-6}. This corresponds to one excess cancer occurrence in a population of ten thousand to one excess cancer in a population of one million people. The risk of carcinogenic effects for current and future exposed populations, by media and exposure pathway, will be discussed in the following sections.

6.1.4.2.1 Current Carcinogenic Risk - The current risks from exposure to carcinogens present at the PSF were evaluated for occupational adult populations. Current carcinogenic risks for children are not evaluated because carcinogenic risk is routinely determined from chronic exposure (> 7 years) to site constituents; therefore, the calculation of carcinogenic risk for a six-year-old child is not performed, given their length of exposure. USEPA assumes carcinogenesis is a nonthreshold event which can result from a single exposure to a carcinogen. However, the exposures for the recreational child evaluated in this risk assessment are very limited in frequency (7 days per year at 2.6 hours daily). Therefore, childhood exposures should not pose a significant risk when compared to the occupational receptors at the site. The media-specific carcinogenic risks, by pathway, are presented below. Carcinogenic risks are presented in Table 6-32 for each occupational receptor.

Surface Soils - The calculated carcinogenic risks for current landscaper's and utility worker's exposure to surface soil via ingestion and inhalation of fugitive dust are all below the acceptable range. The calculated risk for the on-site worker due to inhalation of fugitive dust is also below the acceptable risk range. Based on current data, there is no unacceptable carcinogenic risk due to these pathways.

The calculated carcinogenic risks for the following receptors and pathways all fall within the acceptable risk range of 1×10^{-6} to 1×10^{-4}: the on-site worker's incidental ingestion of surface soil (cancer risk = 1×10^{-6}), the landscaper's dermal exposure to surface soils, (cancer risk = 1×10^{-6}) and the utility worker's dermal exposure to surface soil (cancer risk = 4×10^{-6}). These calculated risks all fall within the 10^{-6} range, indicating the site has the potential to cause carcinogenic effects for these receptors. Additionally, the risk calculated for an on-site worker's dermal exposure to surface soil exceeds the acceptable risk range at 8×10^{-4}, which indicates some action at the site may be warranted.

The risks to occupational receptors exposed to surface soil is due to the presence of arsenic and the chlordanes. As stated earlier, calculated dermal risks may be overestimated due to the conservative assumptions used in estimating the risk. In addition, the arsenic concentration used to determine carcinogenic risk is within the range of background for regional soils (see earlier sections), and may not be the result of site-related activities.

Subsurface Soils - The current carcinogenic risk for utility workers and landscapers associated with incidental ingestion and inhalation of fugitive dust exposures to subsurface soils fall below the acceptable cancer risk range. The calculated carcinogenic risks to subsurface soils for current landscape workers and utility workers due to dermal contact fall just within the acceptable range at 2 x 10^{-6} for each receptor. Based on current exposures, there are no unacceptable cancer risks for current occupational receptors due to subsurface soil exposures.

Groundwater - Carcinogenic risk due to current exposure to groundwater was not calculated because currently there are no potable water supply wells located on the PSF site, and the nearest potable well is approximately two miles away.

Surface Water - The carcinogenic risks to occupational adults from dermal exposure to surface waters fall below the acceptable range (Section 6.1.4.2). There were no volatile organic detected in the surface water samples collected at the site, so there is no quantitative estimate of carcinogenic risk from current exposure to surface water via inhalation. Based on current exposures, there are no unacceptable cancer risks for receptors contacting site surface water.

Sediments - The risk of exposure to current occupational adults via incidental ingestion and dermal contact with the lined channel sediments falls below the acceptable cancer risk range of 1 x 10^{-6} to 1 x 10^{-4}. Based on current data, there is no unacceptable carcinogenic risk associated with these pathways.

6.1.4.2.2 Future Carcinogenic Risk - Future risk from carcinogens present at the PSF were evaluated for off-site residential adult using groundwater from the site and occupational adult populations. Future carcinogenic risks for children are not evaluated because carcinogenic risk is routinely determined from chronic exposures lasting seven or more years. Therefore, the calculation of carcinogenic risk for a six-year-old is not performed given their length of exposure. The media-specific carcinogenic risks, by pathway, are presented below.

Surface Soils - The calculated carcinogenic risks for future exposure of landscape workers and utility workers to surface soil via ingestion and inhalation of fugitive dust are all below the acceptable range (Section 6.1.4.2). In addition, the calculated carcinogenic risks to on-site workers and construction workers due to inhalation of fugitive dust originating from surface soils also falls below the acceptable risk range. The carcinogenic risks calculated for the following receptors and pathways fall within the acceptable risk range of 1 x 10^{-6} to 1 x 10^{-4}: the on-site worker's ingestion exposure (cancer risk = 6 x 10^{-6}); the construction worker's ingestion exposure (cancer risk = 1 x 10^{-6}) and dermal exposure (7 x 10^{-5} = cancer risk); and both the landscaper's and utility worker's dermal exposure to surface soils, with cancer risks of 1 x 10^{-5} and 2 x 10^{-5}, respectively. Therefore, based on current site-specific data, there is no unacceptable carcinogenic risk from exposure to surface soil via these pathways.

However, the carcinogenic risk calculated for an on-site worker's dermal exposure to surface soils exceeds the range (risk =4 x 10^{-3}). The major contributor to this risk is arsenic. As stated earlier, the arsenic exposure point concentration in surface soils (16 mg/kg) falls within the range of background for arsenic in regional soils (3.4 - 38 mg/kg). In addition, the dermal carcinogenic risk for occupational receptors is calculated using conservative assumptions of 100 percent absorption of the constituent from the medium, and no adjustment of the oral CSF to a dermal absorbed dose. Therefore, the use of these assumptions in calculating the carcinogenic risk may have resulted in increased estimated risks.

Subsurface Soils - The carcinogenic risks to future occupational workers from exposure to constituents in subsurface soil via incidental ingestion and inhalation of fugitive dust fall below the acceptable range of 1 x 10^{-6} to 1 x 10^{-4}. However, the carcinogenic risks calculated for all occupational receptors' dermal exposure to subsurface soils fall within the acceptable risk range as follows:

Receptor	Calculated Cancer Risk
Landscaper	7 x 10^{-6}
Utility Worker	8 x 10^{-6}
Construction Worker	4 x 10^{-5}

Therefore, based on current site-specific data, there is no unacceptable carcinogenic risk from any of the occupational exposure scenarios developed for subsurface soil via these pathways.

As stated earlier, the dermal exposure carcinogenic risk for these receptors is calculated using conservative assumptions. Therefore, the use these assumptions in calculating the dermal carcinogenic risk may have resulted in significantly increased calculated risks.

Groundwater - The carcinogenic risk to off-site residential adults from potential use of on-site groundwater as drinking water exceeds the acceptable cancer risk, with an estimated cancer risk of 2 x 10^{-4}. This risk is due to the presence of beryllium and arsenic in the groundwater, and the major portion of the contribution from beryllium is due to background-associated concentrations. In addition, the risk contribution from arsenic is similar to that of other nearby background wells (such as at the Southwest Funston Landfill, Ogden City wells, and USGS wells) though not the site background well.

Conservative intake estimates were used to calculate exposure via this pathway; it was assumed that 100 percent of an individual's drinking water comes from groundwater on site. As stated earlier, future development of this site as a residential well field is unlikely to occur. And, because publicly supplied water is currently available to off-site residents (from the Fort's well fields), the assumption that this groundwater may be consumed as drinking water in the future may significantly overestimate risk for this pathway. The use of the aquifer on site as a drinking water supply is extremely unlikely, because of the current use of the site and also due to the on-site aquifer characteristics themselves. Drinking water wells in the region of Fort Riley are typically developed in alluvial deposits, near one of the many rivers passing through the area, where the water yield is much higher.

The calculated carcinogenic risk due to dermal contact with groundwater is less than the acceptable range (Section 6.1.4.2). Volatile organics were not selected as contaminants of concern in groundwater, so there is no quantitative estimate of carcinogenic risk from future exposure to groundwater via inhalation during showers and household use.

Surface Water - The carcinogenic risks to occupational adults from exposure via dermal contact with surface water fall below the acceptable risk range. Volatile organic were not detected in site surface water samples, so there is no quantitative estimate of carcinogenic risk from future exposure to surface water via inhalation. Based on these results, there are no unacceptable cancer risks from future occupational exposure to site surface water.

Sediments - The risk of exposure to future occupational adults via incidental ingestion of stream sediments falls below the acceptable cancer risk range, while risk due to dermal exposure falls within the acceptable risk range (cancer risk = 3×10^{-6}). Therefore, based on site-specific data, there are no unacceptable carcinogenic risks from future occupational exposure to site sediments.

6.1.4.3 Risk Due to Background Concentrations of Site Constituents - Naturally occurring levels are levels of chemicals that are present under ambient conditions and that have not been increased by anthropogenic (i.e., human-caused) sources. In some cases, the background concentrations of constituents may present a significant risk. This risk due to background may be an important site characteristic to those exposed.

In order to assess the risk due to background at the PSF, the noncarcinogenic and carcinogenic risks due to the naturally-occurring ("background") levels of metals detected in site media are characterized. This risk characterization is accomplished in the same manner as described in earlier sections (Sections 6.1.4.1 and 6.1.4.2), using the exposure scenarios identified in Section 6.1.2. The difference in this process is that a chemical's maximum site-specific background concentration is used as the exposure point concentration in the characterization of risk, instead of the 95 percent upper confidence limit of concentrations detected in site samples.

The results of the analysis of risk due to background is presented in the following paragraphs. A summary of these results is presented in Table 6-33.

6.1.4.3.1 Noncarcinogenic Risk Due to Background - A hazard index greater than 1.0 was calculated for both the current and future on-site workers' dermal contact with surface soils. A hazard index greater than 1.0 was also calculated for future construction workers' exposure to surface soils (HI = 1.5) and subsurface soils (HI = 1.04). The total noncarcinogenic risks calculated for the future construction worker are only slightly above the departure point of 1.0, while the total noncarcinogenic risk calculated for the current and future on-site worker are slightly higher, at 2.5 and 3.2, respectively. In each case, the majority of the risk is due to naturally occurring background concentrations of arsenic in soils. For the current and future on-site worker, arsenic contributes an HI of 1.8 and 2.3, respectively, to the total risk for surface soils; for the construction worker, arsenic contributes an HI of 1.1 in surface soils, and an HI of 0.6 in subsurface soils.

As stated earlier, the hazard indices for dermal exposures are calculated using conservative assumptions which may have resulted in significantly increased estimations of risks to these receptors. In addition, an HI slightly greater than the point of departure (HI = 2.1 for ingestion of groundwater) was calculated for future off-site residential children using the aquifer beneath the site as a source of drinking water. This risk is primarily due to background concentrations of manganese and nitrates in the groundwater. As stated earlier, future development of the site as a drinking water well field is not likely to occur, given the aquifer characteristics at the site. In addition, data from other nearby wells not impacted by the site (e.g., Southwest Funston Landfill background wells, Ogden City wells, and USGS wells) indicate that the concentrations from PSF92-01 (the site background well) represent the low end of regional background concentrations. Therefore, the estimate of risk due to groundwater exposures is conservative in nature.

6.1.4.3.2 Carcinogenic Risk Due to Background - Background carcinogenic risks greater than the point of departure for determining remediation goals in the absence of ARARs (1×10^{-6}), but still within the acceptable exposure levels set forth by the National Contingency Plan (cancer risk = 1 x 10^{-6} to 1 x 10^{-4}), were calculated for the following receptors and exposures:

Receptor	Exposure / Media	Cancer Risk
Future Site Worker	Dermal Contact - Sediment	2 x 10^{-6}
Future Landscaper	Dermal Contact - Surface Soil	2 x 10^{-6}
Future Utility Worker	Dermal Contact - Surface Soil	2 x 10^{-6}
	Dermal Contact - Subsurface Soil	1 x 10^{-6}
Construction Worker	Dermal Contact - Surface Soil	8 x 10^{-6}
	Dermal Contact - Subsurface Soil	5 x 10^{-6}
Residential Adult	Ingestion - Groundwater	1 x 10^{-4}

As stated earlier, the National Contingency Plan (NCP) defines the range of acceptable risks for evaluating cancer risks as 1 x 10^{-6} to 1 x 10^{-4}, which corresponds to one excess cancer in a population of one million people to one excess cancer case in ten thousand people. The risks presented above fall within the range identified as acceptable by the NCP.

Only two pathways identified for the site were associated with unacceptable carcinogenic risk: the current on-site worker's and future on-site worker's dermal exposure to background concentrations in surface soils. The excess cancer risk for these receptors only slightly exceed the unacceptable range, with a cancer risk equal to 3 x 10^{-4} and 4 x 10^{-4}, respectively. The excess cancer risk is due to the background level of arsenic (2.4 mg/kg) detected in site surface soils. As stated earlier, risks due to dermal exposures to site constituents are calculated using several conservative assumptions which may result in an estimation of increased risk.

The background level of arsenic measured in PSF site soils (2.4 mg/kg) appears to be slightly below the range of naturally occurring arsenic levels in both Missourian uncultivated, unglaciated prairie soils (3.4 - 38 mg/kg; USGS, 1975), and in the background soil samples collected from the Southwest Funston Landfill (<0.7 - 3.4 mg/kg) site. Although concentrations of arsenic in soils at the site (with the exception of SSB10B) appear to be within the range of naturally occurring arsenic in the soils of this region, it cannot be conclusively stated that the arsenic is not site-related without additional site-specific background samples. It is also possible that arsenic may be present in site soils due to its presence as an active ingredient in rodenticides used at the site.

Based on the results of this analysis, the background level of arsenic detected in site subsurface soils appears to be associated with unacceptable noncarcinogenic risks for the future construction workers, while arsenic background concentrations in surface soils appear to be associated with unacceptable noncarcinogenic risks for current and future on-site workers and for future construction workers. Unacceptable carcinogenic risks due to background levels of arsenic in site soils were also estimated for current and future on-site workers. This information may be useful in assessing the risks due to concentrations of arsenic detected in site samples, as well as assessing possible remedial action alternatives at the PSF site.

6.1.5 Summary of Baseline Risk Assessment

This section presents a summary of the results of the risk characterization. Though this section presents risk to a number of potential receptors, only three of these receptors are considered to represent reasonable maximum exposure (RME) for the site. These three receptors are the future on-site worker, the future construction worker, and the future (off-site) residential adult. For the purposes of the risk assessment, these three receptors represent the RME as it pertains to surface soil, subsurface soil, and groundwater, respectively.

6.1.5.1 Hazard Indices - The Baseline Risk Assessment at PSF indicates that there may be a concern for potential risk to human health, based on the exposure scenario developed in the baseline risk assessment.

A hazard index (HI) greater than 1.0 was calculated for the following receptors and exposure pathways:

Receptor	Exposure Pathway - Medium	HI	HI*	MCL**
•occupational•				
current on-site worker	dermal exposure to surface soil	9.2	2.5	--
future on-site worker (RME)	dermal exposure to surface soil	33	3.2	--
future construction worker (RME)	dermal exposure to surface soil	16	1.5	--
future construction worker (RME)	dermal exposure to subsurface soil	7.3	0.8	--
•recreational•				
future child	dermal exposure to surface soil	1.9	0.2	--
•residential•				
future (off-site) adult (RME)	ingestion of groundwater	4.6	0.5	7.7
future (off-site) child	ingestion of groundwater	22	2.1	34

HI* HI calculated using background concentrations as exposure point concentrations (see Appendix Ne)
MCL** HI calculated using MCLs as exposure point concentrations (see Appendix Ne)

As stated earlier, estimations of risks due to dermal exposure are likely to be overestimated, due to the conservative assumptions used in calculating the risks. This is especially true for the two occupational receptors listed above. For instance, the dermal exposure experienced by the on-site worker is due mainly to dust exposure, rather than gross surface soil exposure (that is, actual direct skin contact with site soils). The amount of contaminated dust present in ambient air and subsequently contacting the exposed skin of the on-site worker should be less than the contaminant concentrations detected in the soil itself. In the case of the construction worker, risks are estimated using an exposure duration of 120 total days. According to the individuals interviewed (DEH, 1993l; DEH, 1993m), the construction crew is not expected to be on the site for the entire duration of the project. In addition, DEH indicates that the newly constructed PSF will not be placed in the same location as the old PSF, within the contaminated area of concern (DEH, 1993q). Therefore, the dermal risks estimated for the construction worker are likely to be overestimated.

Lastly, the risks estimated for future consumption of site groundwater may also be overestimated, since there are no current plans to develop the site as a well field for residential users, and since there is an adequate supply of drinking water available from the Fort Riley wells, located 1.8 miles upgradient from the PSF site.

It is noteworthy that the HIs for the residential groundwater receptors are less than the HIs based on MCLs, but greater than the HIs based on background concentrations. The chemicals of concern primarily responsible for the exposure point concentration HIs are nitrate and thallium and, to a lesser extent, arsenic and manganese.

6.1.5.2 Cancer Risk Estimates - Cancer risk estimates were calculated for three receptors that equal or exceed the acceptable risk range of 1×10^{-6} to 1×10^{-4}, as follows:

Receptor	Exposure Pathway - Medium	Cancer Risk (CR)	CR*	MCL**
•occupational•				
current on-site worker	dermal exposure to surface soil	8×10^{-4}	3×10^{-4}	--
future on-site worker (RME)	dermal exposure to surface soil	4×10^{-3}	4×10^{-3}	--
•residential•				
future (off-site) adult (RME)	ingestion of groundwater	2×10^{-4}	1×10^{-4}	1×10^{-3}

CR* CR calculated using background concentrations as exposure point concentrations (see Appendix Ne)
MCL** CR calculated using MCLs as exposure point concentrations (see Appendix Ne)

It is of interest to note that the cancer risk for the residential groundwater receptors are only slightly greater than the risk based on background concentrations, and nearly a full order of magnitude less than the risk based on MCLs. The chemical of concern primarily responsible for the exposure point concentration risk is beryllium.

In addition, fifteen cancer risk estimates were calculated that exceed the standard point of departure, but are within the acceptable risk range identified by the NCP (1×10^{-6} to 1×10^{-4}). A list of these risks, by receptor and pathway, follows:

Receptor	Exposure Pathway - Medium	Cancer Risk
•occupational•		
current on-site worker	incidental ingestion of surface soil	1×10^{-6}
current landscaper	dermal exposure to surface soil	1×10^{-6}
current landscaper	dermal exposure to subsurface soil	2×10^{-6}
current utility worker	dermal exposure to surface soil	4×10^{-6}
current utility worker	dermal exposure to subsurface soil	2×10^{-6}
future on-site worker (RME)	incidental ingestion of surface soil	6×10^{-6}
future on-site worker (RME)	inhalation fugitive dust-surface soil	1×10^{-6}
future on-site worker (RME)	dermal exposure to sediment	2×10^{-6}
future landscaper	dermal exposure to surface soil	2×10^{-5}
future landscaper	dermal exposure to subsurface soil	7×10^{-6}
future utility worker	dermal exposure to surface soil	2×10^{-5}
future utility worker	dermal exposure to subsurface soil	8×10^{-6}
future construction worker (RME)	incidental ingestion of surface soil	1×10^{-6}
future construction worker (RME)	dermal exposure to surface soil	7×10^{-5}
future construction worker (RME)	dermal exposure to subsurface soil	4×10^{-5}

The unacceptable carcinogenic risks determined for the three pathways listed earlier are overestimated for the same reasons explained in the noncarcinogenic risk summary. It should be noted that these three scenarios were the only unacceptable carcinogenic risks identified with current site knowledge. The fifteen scenarios following these three are within the acceptable cancer risk range, although the calculated risks are above the standard point of departure of 1×10^{-6} of concern for carcinogenic effects.

6.1.5.3 Uncertainties - Several caveats need to be noted while evaluating this risk assessment. These caveats, based on assumptions made and data gaps identified, increase the uncertainties associated with the risk assessment results.

- Chemical-specific absorption factors are not currently available to convert dermal intakes into dermal absorbed doses for constituents detected in soil and sediment media. The use of these factors, if they were indeed available, in calculating risks due to dermal exposures to soil and sediment may have resulted in reduced risk estimations via these pathways.

- In accordance with USEPA Region VII guidance (EPA, 1992d), when calculating risks due to dermal exposures, oral toxicity values were not adjusted by oral absorption rates. The default dermal absorbance factor used in Region VII is 100 percent; the constituents are assumed to be completely absorbed through the skin. Thus, the bioavailability of a constituent via dermal exposure is assumed to be equal to that received from an oral dose. This assessment process tends to overestimate risks associated with dermal exposures and may, in particular, overestimate dermal risks due to constituents that are non-lipid soluble (i.e., metals).

- Toxicity values are not available for several constituents of concern, and the risk due to these constituents was unable to be quantified. Thus, the total noncarcinogenic and carcinogenic risks calculated for the pathways of interest at the site may be underestimated, because they do not account for constituents without toxicity values.

- The assumption of the exclusive use of the groundwater beneath the site as a potable water source is conservative. Currently, a public supply of potable water is readily available nearby. A well placed in the aquifer beneath the PSF site is capable of yielding approximately one to two gpm, compared to a well located in river alluvial deposits, which can yield up to 1,400 gpm. It is reasonable to assume that if a drinking water well is needed in the vicinity of the site, it would probably be placed in the alluvium, located just 2,000 feet away from the PSF. However, because the aquifer at the site is classified as a usable aquifer by the State of Kansas, the potential risk associated with this water supply must be assessed. Evaluating risk based on using site groundwater as a source of future potable water results in an overestimation of risk.

- The assumption that exposure to constituents in soils indoors (e.g., for the future on-site worker pathways) equals that of outdoors is conservative and results in increased risks of exposure to surface soils.

- In evaluating future risks to receptors contacting site sediments, the assumption that the constituents present at the time of sampling will be present at the same concentrations in the future. The scenario does not account for the removal and cleaning of sediment residue from the channel during routine clearing activities. The assumption that the same constituents will be present at the same concentrations may over or underestimate the risk associated with this route.

- The assumption that exposure to constituents in surface soils for the current recreational child, landscaper, utility worker, and on-site worker equals that which was detected in surface soil sample SS-04 (collected in the area of [previously] stressed vegetation and thus the worst case) results in increased risks of exposure to surface soils. A layer of gravel six to eight inches thick was applied to the site in 1988 (DEH 1993r), after pesticide formulation and mixing practices were discontinued at the site. Therefore, the layer of gravel currently covering the site should be relatively free of pesticide contamination, when compared to soils.

- In evaluating risks from future exposures to site media, the assumption was made that future constituent concentrations will remain the same as current concentrations. Dilution, decay, degradation, and attenuation of constituents occurs naturally over time, and site contaminants would thus present a reduced risk in future scenarios.

- In evaluating risks due to chromium exposure, all chromium detected on site was assumed to be hexavalent chromium (the more toxic species) when in truth, only a portion of the total chromium detected is hexavalent. Hexavalent chromium is considered by USEPA to be a Group A (known human) carcinogen by the inhalation route. Therefore, the use of hexavalent chromium toxicity values may have overestimated carcinogenic risks due to the inhalation of fugitive dust containing chromium.

- In evaluating risks due to thallium exposure, the maximum detected concentration was used as the exposure point concentration. This was necessary, in part, because of the large MDLs employed during the first three groundwater sampling rounds. Therefore, the noncarcinogenic risks due to exposure to thallium are probably an overestimation.

- In evaluating risks due to PAHs, it was assumed that the samples obtained were representative of the site as a whole. In reality, however, the samples were probably obtained at locations (near the former treated wood storage pile) and time (the week following paving activities) that limit the representativeness of the samples as they pertain to PAHs.

For this reason, the noncarcinogenic and carcinogenic risks due to exposure to PAHs are probably overestimated.

This risk assessment indicates that there may be concern for potential risk to current or future occupational receptors, based on realistic conservative exposure scenarios. Additionally, using a reasonable maximum exposure (RME) scenario, a borderline risk to possible off-site residential receptors' drinking water from the site was also identified.

This risk assessment should not be viewed as an absolute quantitative measure of the risk to public health presented by site-specific contaminants. The assumptions and inherent uncertainties in the risk assessment process do not allow this level of confidence. This risk assessment provides a conservative indication of the potential for risk due to exposure to site-specific chemicals and should help guide the management of the site to reduce that potential risk to acceptable levels.

6.2 ECOLOGICAL RISK ASSESSMENT

The Ecological Risk Assessment for the PSF was conducted in accordance with the guidance provided in the "Risk Assessment Guidance for Superfund, Vol. II - Environmental Evaluation Manual" (USEPA, 1989c). The objectives of the environmental assessment are to:

1. Determine the value or uses of nearby natural resources (land, air, water, biota);
2. Identify potential environmental impacts;
3. Assess the significance of any environmental impacts.

In this ecological risk assessment, potential receptors present in the vicinity of the PSF and the potential pathways by which these receptors might be exposed to chemicals of concern present in surface soils, surface water and sediments were identified. Possible risks to environmental receptors arising from exposure to site constituents were characterized.

The ecological risk assessment is comprised of the following tasks:

- Ecological Receptor Identification
- Exposure Pathway Evaluation
- Selection of Relevant Exposures
- Toxicity Assessment and Identification of ARARs
- Risk Characterization

6.2.1 Exposure Assessment

6.2.1.1 Potential Ecological Receptors - This section presents the potential ecological receptors that may be affected by contamination present at the PSF site. Most of this information presented here is taken from the "Survey of Threatened and Endangered Species on Fort Riley Military Reservation" (February 1992; updated December 1992) conducted by the U.S. Fish and Wildlife Service.

6.2.1.1.1 Terrestrial Vegetation - Fort Riley is located within the Flint Hills region of the Central Plains. The ecological region is known as a tall grass prairie. Terrestrial systems associated with the PSF and surrounding area consisted of two major habitat types: grassland/prairie habitats and riverain habitats. The grassland/prairie habitats include various grass species including switchgrass (*Panicum virginatum*), Indian grass, (*Sorgastrum nutans*), thistle (*Canduus hataus*), Johnson grass (*Sorghum halepense*), and sunflower (*Helianthus* sp.). Vegetation typically noted in riverain and densely vegetated drainage habitats in the Fort Riley area include cottonwood (*Populus deltoides*), sycamore (*Platanus occidentalis*), box elder (*Acer negundo*), and hackberry (*Celtis occidentalis*) as canopy cover and dominated by redbud (*Cercis canadensis*), dogwood (*Cornus* sp.), greenbrier (*Smilax* sp.), poison ivy (*Rhus radicans*), Virginia creeper (*Parthenocissus quinquefolia*), and seedling overstory species.

The PSF site consists primarily of cleared areas, vegetated by grasses and other herbaceous vegetation intermixed with non-vegetated areas. A wooded area, located to the east of the site, can be classified as riparian woodland.

6.2.1.1.2 Terrestrial Wildlife - The animal community frequenting the general area of the site includes many species of birds (rock doves, starlings, song birds, pigeons, wild turkey), insects, and small mammals (deer, an occasional bobcat, bats, raccoons, possums, rabbits, squirrels, and other rodents) (Fish and Wildlife Administrator, 1993; DEH, 1993r). The areas in the immediate vicinity of the PSF do not provide suitable habitats for most species, because these areas are industrialized "high traffic" areas (Fish and Wildlife Administrator, 1992). That is, the PSF area is within a vehicle compound area (the DEH yard), an area where there is a high frequency of movement and activity during the day. The daytime activities at the site should not affect the habits of nocturnal animals using the area. Therefore, although a variety of animals may pass through the PSF site and DEH yard during hunting/foraging activities, they are not thought to inhabit the immediate area of the DEH yard in significant numbers.

6.2.1.1.3 Endangered Species - As previously discussed (Section 3.1.7), a recent survey conducted by the U.S. Fish and Wildlife Service (1992) provided much of the necessary background information regarding the potential for threatened and endangered species on site. According to this report, eight federally-listed threatened and endangered species along with twelve federal category 2 candidate species could potentially occur on Fort Riley. Category 2 candidate species are those which the U.S. Fish and Wildlife Service is seeking additional information regarding their biological status, in order to determine if listing of these species is warranted. A listing of the threatened and endangered species known to occur in the Fort Riley area, along with their typical habitats, is provided in Table 6-34.

As shown in Table 6-34, the PSF site does not provide a suitable habitat for most of the species listed. It is possible that the wooded area east of the site may be utilized although not inhabited by species favoring riparian forests (the bald eagle). The loggerhead shrike may similarly pass near the PSF, because this species favors manmade perches such as fence posts and power lines (U.S. Fish and Wildlife Service, 1992). Both the bald eagle and the loggerhead shrike have been sighted on various areas of Fort Riley although there are no confirmed sightings of these species at the PSF. And, although the confluence of the drainage ditch to the east of the PSF and the Kansas River provides a suitable habitat for the sturgeon chub (Fish and Wildlife Administrator, 1992), a federal category 2 species, the summary report on threatened and endangered species states that the occurrence of the sturgeon chub at Fort Riley is very unlikely (U.S. Fish and Wildlife Service, 1992). Therefore, although threatened and endangered species are known to occur in the Fort Riley area, the actual habitation of these species on the PSF site and surrounding area is unlikely to occur. However, bald eagles have been sighted in riparian areas located near the PSF site. Although the eagles may pass through the PSF area, they are unlikely to inhabit the PSF site itself.

6.2.1.1.4 Aquatic Species - Because of the intermittent flow within the drainage channel, aquatic organisms at the site are most likely limited both in quantity and species richness. However, benthic organisms may be supported by these intermittent streams. The drainage ditch could also potentially provide habitat and a drinking water source for amphibians and other bank dwelling species.

6.2.1.2 Potential Exposure Pathways

6.2.1.2.1 Terrestrial Life Forms - Terrestrial plants may be exposed to constituents of potential concern present in surficial soils through root uptake. Terrestrial wildlife may be exposed to constituents present in surficial soils through dermal contact, inhalation or incidental ingestion as a result of burrowing activities, ingestion of contaminated foodstuffs and preening activities. Additionally, terrestrial animals may be exposed to constituents present in surface waters and sediments by drinking from the surface water present in the drainage ditch with incidental ingestion of disturbed sediments. Exposure of those animals at the upper end of the food chain may be augmented as a result of biomagnification and bioaccumulation. Bioaccumulation and biomagnification are of most immediate concern with reference to lipid soluble organic compounds, such as pesticides. Several constituents are present in site media that have the potential to bioaccumulate, as follows: chlordane, 4,4'-DDD, 4,4'-DDT, dieldrin, heptachlor, heptachlor epoxide, and, to a lesser extent, mercury, silver, fluoranthene, fluorene, and phenanthrene.

6.2.1.2.2 Aquatic Life Forms - Aquatic life forms that may be present in surface water adjacent to the site may be exposed to chemical constituents in surface sediments and waters. Benthic organisms can be in direct contact with constituents present in sediments. Additional exposure may occur with the ingestion of contaminated foodstuffs according to their position in the food chain. Organic compounds with high lipid solubility (e.g., pesticides) and metals may become progressively accumulated at higher trophic levels in aquatic food chains due to processes of bioaccumulation and biomagnification. The potential for each constituent detected at the site to bioconcentrate in organisms is indicated in Tables 5-1 and 5-2. The constituents with the highest potential for bioconcentration are listed in the previous paragraph.

6.2.1.3 Selection of Relevant Exposures - Chemical constituents identified in surficial soil, surface water and sediment samples collected in the vicinity of PSF are listed in Tables 6-1, 6-5, and 6-6, respectively. Metals, including arsenic, barium, cadmium, chromium, lead, and mercury, as well as pesticides (including alpha and gamma- chlordane, DDT and its metabolites, and dieldrin) and polycyclic aromatic hydrocarbons (PAHs) were detected in surface soils and sediments. Surface waters contained metals, including aluminum, arsenic, barium, cadmium, chromium, copper, lead, manganese, and vanadium.

Terrestrial organisms may be exposed to metals, PAHs, and pesticides via dermal contact and incidental ingestion of contaminated soils. Site animals may also be potentially exposed to constituents in surficial soils via inhalation of fugitive dusts. Terrestrial organisms may also be exposed to metals and PAHs by drinking surface waters, and incidentally ingesting contaminated sediments. Finally, terrestrial organisms at the upper end of the food chain may additionally be exposed to pesticides, metals, and PAHs through consumption of lower life forms. These compounds are easily absorbed and demonstrate a tendency to accumulate in fatty tissues.

Aquatic organisms may be exposed to constituents in surface waters and sediments. Sediments are not easily flushed from the ditch bed and may serve as a continuing source of contaminants in the surface water features. Surface water flow is intermittent and does not readily support aquatic life; therefore, fish are unlikely to reside in the surface waters adjacent to the site. However, lower aquatic forms present in the surface waters may potentially be exposed to metals detected in surface waters, and as well to the metals, PAHs, and pesticides detected in sediments. The pesticides detected in site sediment samples, dieldrin, chlordane, 4,4'-DDT, 4,4'-DDD, and 4,4'-DDE, as well as the PAHs, all have very high bioconcentration factors (see Table 5-1). This indicates that these constituents are very likely to accumulate in aquatic or benthic organisms. Several of the metals present in site surface water and sediment also tend to bioconcentrate in aquatic organisms, although to a lesser extent than the pesticides. Metals that may bioaccumulate include silver, mercury, arsenic, cadmium and lead.

Bioconcentration is an important mechanism for exposure for environmental receptors. Higher aquatic organisms may be exposed to these contaminants via food chain exposures, through the consumption of surface water or lower (benthic) aquatic organisms that live in the sediment. Terrestrial animals foraging near the site may also be exposed to constituents in surface water or sediments in the same manner. This may be significant, because bald eagles (an endangered species) have been noticed in areas that border the site. Since eagles are opportunistic hunters, it is not unreasonable to assume they may pass through the PSF area, and if the opportunity exists, feed on amphibians or other small aquatic organisms that may be present in the drainage ditch. However, more suitable habitat and foraging areas (i.e., Kansas River) exist for eagles and other raptors in a much greater abundance than the PSF site.

6.2.2 Toxicity Assessment

This section will address the applicable or relevant and appropriate requirements (ARARs) which are used as a basis to determine which contaminants detected in surface waters, sediments, and soils may pose a risk to environmental receptors.

6.2.2.1 Surface Water - Potential ARARs for protection of aquatic life in surface water include Ambient Water Quality Criteria (AWQC) and State of Kansas Ambient Water Criteria. Ambient Water Quality Criteria for protection of aquatic life were established under the Clean Water Act (CWA). These criteria represent guidance on the environmental effects of pollutants which can be used to derive regulatory requirements. The State of Kansas incorporates the federal AWQC by reference. Relevant State and Federal Surface Water criteria are shown in Table 6-27. Water quality criteria are used for comparison with surface water data, even though they are not considered strictly applicable or relevant and appropriate for the surface water present on site (see Section 6.1.3.1.2).

However, because the surface water from the site discharges into nearby surface waters (i.e., streams and creeks which eventually empty into the Kansas River), these criteria have been used in order to obtain a qualitative understanding of potential impacts to these nearby surface waters.

The maximum detected concentrations of cadmium and inorganic chloride (0.0045 mg/L and 65 mg/L, respectively) exceeded AWQC for the protection of aquatic life, as follows:

	Acute AWQC	Chronic AWQC
Cadmium	0.0039 mg/L	0.0011 mg/L
Chloride	0.019 mg/L	0.011 mg/L

The maximum concentration of total chromium (0.024 mg/L) exceeded the AWQC for the protection of aquatic life for hexavalent chromium, (0.016 mg/L for acute effects, 0.011 mg/L for chronic effects) but not for trivalent chromium (acute AWQC 1.7 mg/L; chronic AWQC 0.21 mg/L). Chromium valence was not specified in the analysis. Finally, the maximum detected concentrations of copper (0.013 mg/L) and lead (0.0042 mg/L) exceeded their chronic AWQC for the protection of aquatic life, 0.012 mg/L and 0.0032 mg/L, respectively. There are no current regulatory criteria for aluminum, barium, manganese, or vanadium.

Background surface water data were compared to data obtained from potentially impacted on-site locations. This analysis shows that three of the chemicals of concern have average concentrations less than their background concentrations (arsenic, barium, and chromium). In addition, three other chemicals of concern have average concentrations approximately equal to their background concentrations (copper, manganese, and vanadium). The remaining three chemicals of concern have average concentrations greater than their respective background concentrations (aluminum, cadmium, and lead).

6.2.2.2 <u>Sediments</u> - The NOAA has developed Effects Range Concentrations which are non-enforceable guidance criteria for sediments. These concentrations were derived from data on the potential of these chemicals to cause adverse biological effects in costal marine and estuarine environments. Effects threshold range concentrations are defined as those concentrations at which effects may be perceived in an organism due to exposure to the constituent of concern. These values are presented in Table 6-34 and are used as a basis for the ecological risk evaluation.

As shown in Table 6-35, two effects-based values, the Effects Range - Low (ER-L) and the Effects Range - Median (ER-M), are usually determined for a given constituent, using a method (Klapow and Lewis, 1979 as cited in NOAA, 1990) similar to that used in establishing marine quality standards for the State of California (NOAA, 1990). This method involves a three-step approach. First, currently available information (i.e., studies and reports) which contain estimates of chemical sediment concentrations associated with adverse biological effects are assembled and reviewed. Next, a range is established for a particular constituent, based upon a preponderance of evidence, which reflects the concentrations at which biological effects are noted. Lastly, this range is evaluated relative to the sediment chemical data available from the National Status and Trends (NS&T) Program. The ER-L and ER-M values are generated as a result of this process. The ER-L is the 10^{th} percentile of this effects range, while the ER-M is the 50^{th} percentile of the reported range of concentrations associated with biological effects.

A description of the relative degree of confidence associated with the ER-L and ER-M values is also provided by NOAA. The ER-L and ER-M values associated with a high degree of confidence were supported by clusters of data with similar concentrations, by data from multiple geographic locations, by data sets that included more than results from an approach, and for chemicals for which the overall apparent effects threshold was similar to or within the range of the ER-L and ER-M values (NOAA, 1990). Values associated with a low degree of confidence were based on data sets without these qualities.

The sediment concentrations of chlordane, DDD, DDE, DDT, and dieldrin exceed available NOAA low effects and median effects threshold values. One metal, lead, is present in sediments in concentrations which exceed both the low and median NOAA effects threshold range concentrations, while the concentration of mercury exceeds the available low NOAA effects threshold value. The concentration of phenanthrene exceeds the ER-L value and the overall effects threshold value. All the PAHs are present in concentrations below the effects threshold range.

6.2.2.3 Soils - Criteria have not as yet been established for the protection of terrestrial organisms from potential exposure to constituents present in soils. Soils could serve as a potential source of contaminants to surface water via surface runoff. Also, metals and some organic compounds have been shown to accumulate in plants. The uptake of metals by plants depends upon metal availability in the soil, which in turn is related to metal speciation and soil properties such as pH, mineralogy, organic content, and aeration. The effect of metals on plants depends on whether or not the element is plant essential. Generally, nonessential metals are toxic at low concentrations, while essential elements become toxic only at high concentrations. The accumulation of such constituents in plants may be directly toxic to the plants as well, and such accumulation by plants provides an exposure pathway for grazing animals and other herbivorous creatures. Most of the constituents detected in site soils can be taken up by plants, including the pesticides (chlordane, 4,4'-DDT), the PAHs (benzo[a]anthracene, anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, indeno[1,2,3-cd]pyrene, and phenanthrene) and the metals (arsenic, cadmium, lead, and, to a lesser extent, barium and inorganic mercury). Chromium is taken up by plants, but tends to remain concentrated in the roots, not in the edible above-ground portions of the plant.

6.2.3 Risk Characterization

The risk characterization integrates the results of the exposure and toxicity assessments into a qualitative expression of risk. First, contaminant concentrations detected in site media are compared to available ARARs or To Be Considered (TBC) requirements. In addition to exceedances of criteria, ecological risk characterization may involve both temporal and spatial components. That is, the risk assessor may predict (if sufficient information is available) how long the media and ecological receptors will be affected by site contamination, and how large an area will be affected by the constituents detected on the site.

Currently, there is no available guidance that describes criteria for classifying risks to ecological receptors. Therefore, ecological risk assessors typically conduct the risk characterization portion of an ecological risk assessment using professional judgement (USEPA, 1989c). For purposes of this assessment, the magnitude of risk each sampled medium may present to biota living on or passing through the site will be qualitatively characterized into three categories, as follows:

LOW - A small number of species (1-2), if any at all, may be adversely affected by contamination present in site media. Adverse effects are to individual members of each species and are not long-lasting or long-reaching. No reproductive effects or other multi-generational effects are noted.

MEDIUM - More species are affected with some potential flux in communities, but not every species. Some systemic (acute) or reproductive effects may be seen, but the results do not upset the total ecosystem.

HIGH - Almost all species in the vicinity are expected to be affected by the contaminated media on the site. Reproductive and acute toxic effects are common; the ecosystem, as a result, may become imbalanced due to impacts to communities, food webs, and total ecosystem populations.

In this assessment, risk is characterized by grouping general species categories for each medium of concern. General categories rather than specific species are used because a site walkover was not part of the scope for the project, and therefore this task not performed by Law personnel. The general species categories used for this assessment follow:

AQUATIC	TERRESTRIAL
Benthic organisms	Herbivores (non-grass eaters and grazers/browsers)
Amphibian	Reptiles
Fish	Raptors (birds of prey)

6.2.3.1 Surface Water - As stated in Section 6.2.2.1, AWQC were exceeded by a number of constituents detected in on-site surface water. Because surface water flow is intermittent in the lined channel adjacent on the PSF site, aquatic life is scarce or non-existent. Fish are not able to survive in this environment, but benthic species and amphibians may live near or in site surface water features. Terrestrial organisms passing through the site may also drink any surface water present in the channel.

Because the flow in the channel is intermittent, the impact of the exceedance of AWQC for surface water is expected to be limited under current conditions. The small variety of organisms residing in the channel are expected to be only impacted by the presence of metals in site surface water. Likewise, the terrestrial organisms using the surface water as drinking water have a low risk potential because the on-site surface water available for use as drinking water by these species is only periodically present in the channel. In addition, the entire length of the channel at the site affected by site surface water run-off is approximately 100 feet. Given the intermittent nature of the stream, its small size, and the ready availability of surface water in both the Kansas River (located only 2,000 feet south of the site) and in the unnamed tributary that connects the on-site channel to the Kansas River, environmental impacts of site surface water exceedances appear to be low for both aquatic and terrestrial species.

AWQC exceedances may be more significant in times of increased surface water flow during storm events, if surface water contaminants are carried with the flow. However, surface water samples collected from the Kansas River adjacent to the Southwest Funston Landfill (downgradient from the PSF site) failed to indicate pesticide surface water contamination. Therefore, the PSF does not appear to be adversely affecting the river, and the potential environmental risk due to migration of PSF contaminants via surface water is believed to be low, even under circumstances of high flow.

6.2.3.2 Sediments - As mentioned in Section 6.2.2.2, the concentrations of five pesticides (chlordane, DDD, DDE, DDT, and dieldrin), one polynuclear aromatic hydrocarbon (phenanthrene), and two metals (lead and mercury) exceed the NOAA sediment low and median effects range values. All five of the pesticides and one of the metals (lead) exceed the median effects range values by several orders of magnitude. The concentration of the other two constituents (phenanthrene and mercury) exceed the low effects range values, but do not exceed the median effects range values.

The NOAA summary of sediment effects data available for chlordane, dieldrin, DDT, lead, and mercury indicate potential adverse effects on benthic species richness and/or abundance. A decrease in benthos population size is indicated for DDE, but the concentrations used in the studies cited by NOAA exceeded the DDE concentration at the site. NOAA data on DDD and phenanthrene was insufficient for evaluating the effect on benthos population diversity or size. In addition, on-site amphibians could potentially be impacted by exposure to the sediments and/or consumption of the benthic organisms.

All eight constituents have the potential to bioaccumulate. Therefore, terrestrial and riparian species preying on amphibians or other bank-dwelling species that contact site sediments may be exposed to pesticides or metals via food chain exposures. Exposure to pesticides may alter the reproductive capabilities of animals in higher trophic levels (especially birds of prey).

The Kansas River is located less than a half-mile to the south. Riparian species would favor this large open area over the industrialized area of the PSF. In addition, site sediments should not adversely affect downstream surface water and sediments, because the flow within the channel is intermittent and therefore sediments are not readily flushed out of the channel. Based on this evaluation, the impact of site sediment contamination appears to be limited to the benthic organisms present in stream sediments, and may possibly impact bank-dwelling species residing on the site. Since the stream is intermittent in nature and does not support larger aquatic life, the decreased number and size of the benthic species is not a concern. Likewise, bank-dwelling species would most likely be minimally affected, with other sources of surface water located nearby. Therefore, the overall impact that the PSF sediment contamination has on the ecosystem is expected to be minimal or low.

6.2.3.3 Soils - There are currently no criteria established for the protection of ecological receptors from potential exposure to constituents present in soils. As stated earlier, many constituents detected in site soils have the ability to concentrate in plants. While the presence of these constituents may not be directly toxic to the plants themselves, metals and pesticides present in plant matter may potentially affect terrestrial species that graze/browse in the area for food. However, since there is a undeveloped wooded area to the east of the site that can act as another source of food for herbivores, any contamination present in the small grassy area near the PSF should not significantly impact terrestrial species.

Metals, pesticides, and PAHs were detected in site soils. The presence of these constituents in site soils may impact animals foraging or burrowing in the area. As stated earlier, the presence of pesticides in environmental media may affect the reproductive capabilities of exposed animals. However, as stated earlier, there are many other areas adjacent to the site that may be populated by foraging species. Therefore, the overall impact of surface soil contamination to these species appears to be low.

Until recently, there was an indication of harm to terrestrial vegetation with respect to growth and foliage in the grassy area south of the site. An area of stressed vegetation measuring 20 ft.

x 20 ft. was located downgradient of the PSF outside the perimeter fence. It is not known whether this previously stressed area was the result of a surface spill or indiscriminate disposal of pesticide waste. Another possibility is that the stress occurred because the area is in an erosion pathway, and may have occurred due to surface water run-off. Foraging herbivores were probably only minimally impacted by the presence of this stressed area. The stressed area represented a small area of destruction or deterioration to their food supply, and other sources of food were readily available nearby. Insects or other small soil-dwelling species may have been harmed by the presence of contamination in the stressed area. But, since other non-stressed areas were available adjacent to the area of concern that could be populated by these species, the overall impact to the environmental community was low. In any case, it appears that the area of previously stressed vegetation is now recovering, because it has experienced regrowth this growing season. Therefore, the environmental impact of contamination in this previously stressed area does not appear to be long-lasting in nature.

Based on this qualitative evaluation, the impact that site surface soil contamination has on terrestrial species passing through and habitating the site appears to be low.

6.2.4 Uncertainties

Uncertainties can arise from many sources in any qualitative risk assessment. These sources include:

- Confidence that all key contaminants were identified and quantified accurately.
- Dependence on toxicity data which are the foundation for all health-based ARARs and which are based on animal experiments and epidemiological study groups.
- Confidence in the identification of all exposure parameters and exposure pathways appropriate to the sites.
- Uncertainty in the comparison of site concentrations to ARARs by which additive effects may be overlooked.
- Uncertainty in the comparison of site concentrations to ARARs or TBCs that may not be truly applicable to site conditions.
- Confidence in the identification and characterization of the exposed populations, both current and future and also, the land use, both current and future.

Qualitative risk assessments which rely on a comparison to background concentrations and chemical-specific ARARs are somewhat limited in that they cannot account for cumulative toxic effects from several chemicals or several exposure routes.

Additional uncertainties in the present assessment of risk to environmental receptors are derived in part from the imprecision of present scientific data on exactly what constituent concentrations pose a hazard to environmental receptors. For example, NOAA guidance defined with respect to coastal and estuarine sediments was employed for an evaluation of the possible hazards associated with the presence of site specific constituents in riverain sediments in the absence of appropriate reference criteria for freshwater sediments.

Additional uncertainty in the assessment of the potential toxicity of constituent concentrations present in surface water at the site and whether they will affect surface water areas off-site.

6.2.5 Summary

Any negative impact to fauna and flora by constituents exceeding relevant ARARs and guidance values is not readily apparent at this time. Terrestrial and aquatic life in the area of the drainage ditch may potentially suffer adverse effects from constituents detected in site surface water and sediment samples. However, other (larger) sources of surface water are located nearby, and ecological receptors would probably favor these sources over the intermittent stream on-site. Therefore, the environmental impact of the contamination detected in the surface water and sediment on site appears to be low. In addition, the contamination present in site surface water and sediment should not impact downstream media because the natural character of the drainage ditch (i.e., its intermittent flow) does not consistently discharge surface water and flush sediments to downstream points.

Likewise, the risk to environmental receptors due to exposure to surface soils is also minimal or low. The area most impacted by soil contamination (the previously stressed area of vegetation) is small (20 ft. x 20 ft.), and there are areas adjacent to the site that provide suitable habitats and food supplies for animal species that may pass by or frequent the site. And, because the area of stressed vegetation has experienced regrowth this growing season, the effects of the surface soil contamination would not appear to be long-lasting.

7.0 SUMMARY AND CONCLUSIONS

7.1 INTRODUCTION - SUMMARY AND CONCLUSIONS

A RI of the PSF and adjacent land was performed to evaluate the nature and extent of contaminant releases to the environment associated with past PSF activities. A summary and the conclusions derived from the evaluation of data collected during the PSF RI activities (both field and desktop) are presented in the following section.

7.1.1 Summary and Conclusions of Nature and Extent

Analytical results reveal that the highest concentrations of contaminants/constituents are present in the surface (0 to 24 inches) and subsurface soils at and adjacent to the PSF. Of the contaminants detected, pesticides, PAHs and metals were found with the greatest frequency.

Constituents were indicated in three major areas. Pesticides were found around the north end of the PSF and extending to the east. Another area of pesticide detections, in the soil, is near the southeast corner of the PSF and extending to the east. A third area of pesticide detections, in soils, was in the area of stressed vegetation near the drainage ditch to the east of the PSF.

The soil contamination around the north end and southeast corner of the PSF may be attributed to rinse water from the washing of vehicles and pesticide spraying equipment being allowed to run onto the ground and drain away from the PSF to the east.

Pesticides were detected in the area of stressed vegetation near the drainage ditch to the east of the PSF. It is not known if this area of stressed vegetation is the result of a surface spill or indiscriminate disposal of pesticide waste. However, the stressed vegetation area is in an erosion pathway and may be the endpoint of surface water runoff.

The source of PAHs in the study area may be attributed to the on-site storage of treated lumber and asphalt. Line poles preserved with creosote have been stored in the DEH yard near the PSF and asphalt is routinely stored within the DEH yard to the north of the PSF. Both creosote and asphalt contain PAHs. The analytical data are insufficient to determine the horizontal and vertical extent of PAH contamination outside the fenceline to the east of the PSF.

Because of the occurrence of PAHs in samples collected from 3.5 to 4.5 feet below ground surface, the vertical extent of PAH contamination has not been determined for the PSF.

The pesticides detected in the soil samples consisted of DDT and its metabolites (DDD and DDE), alpha- and gamma-chlordane, heptachlor, dieldrin, methoxychlor, endrin, Ronnel (Fenchlorphos) and malathion. Surface and subsurface soil samples contained concentrations of pesticides at levels which exceeded RCRA CALs (see Table 4-21). The RCRA CALs for DDT (and its metabolites) is 2000 μg/kg. This value was exceeded in the following samples: PSFSB-03C (a duplicate sample of PSFSB-03B), (33,000 μg/kg), PSFSB-03A (7700 μg/kg), PSFSB-09A (6570 μg/kg), PSFSB-07B (3040 μg/kg), PSFSB-09B (3020 μg/kg) and PSFSB-17C (a duplicate sample of PSFSB-17A; 2050 μg/kg). The RCRA CALs for total chlordane (alpha- and gamma-chlordane) is 500 μg/kg. This value was exceeded in the following samples: PSFSS-02 (3200 μg/kg), PSFSB-03B (3100 μg/kg), PSFSB-12B (1700 μg/kg), PSFSB-05A (1580 μg/kg), PSFSS-04 (1300 μg/kg), PSFSB-17C (a duplicate sample of PSFSB-17A; 940 μg/kg), PSFSB-10A (890 μg/kg), PSFSB-09A (780 μg/kg), PSFSB-12A (780 μg/kg) and PSFSS-01 (750 μg/kg). The RCRA CALs for dieldrin is 40 μg/kg. This value was exceeded in the following samples: PSFSB-05A (200 μg/kg), PSFSS-01 (94 μg/kg) and PSFSS-02 (77 μg/kg). The CALs for heptachlor (200 μg/kg) was exceeded in samples PSFSS-02 (300 μg/kg) and PSFSB-05A (230 μg/kg). An areal view of pesticide concentrations which exceed RCRA CALs is provided on Figure 4-21.

PAHs detected in the soil samples include acenaphthene, anthracenes, chrysene, fluoranthenes, naphthalene, phenanthrene and pyrenes. The analytical results reveal that PAH constituents are present in the soil along the fence to the east of the PSF and extending to the east. Another area of PAHs is located at the bottom of the culvert leading away (to the east) from the southeastern corner of the fence. In both of these areas, the distribution of PAHs tends to follow the pathways of surface water runoff. A third area of PAH constituents was located near the southeastern corner of the PSF.

The metals analyses of soil samples reveal that arsenic, barium, chromium and lead were routinely found in detectable concentrations in downgradient and background samples. The following two samples contained concentrations of lead which exceeded the RCRA CALs of 500 mg/kg: PSFSS-03 (540 mg/kg) and PSFSB-08A (770 mg/kg). The RCRA CALs for arsenic (80 mg/kg) was exceeded in sample PSFSB-10C (120 mg/kg), a duplicate sample of PSFSB-10B.

Analytical results reveal that volatile organic compounds, pesticides, PAHs and total metals exist in the sediment within the drainage ditch to the east of the PSF. Volatile organic compounds detected in the sediment samples included toluene, carbon disulfide, 1,2-dichloropropane and 1,1,2,2-tetrachloroethane.

Concentrations of carbon disulfide, 1,2-dichloropropane and 1,1,2,2-tetrachloroethane were only found in one sample each.

Concentrations of pesticides in the sediment samples increased downstream of the PSF (samples PSFSD-04A/B through PSFSD-09A/B). While pesticide concentrations decreased with distance, the extent of pesticide contamination in the sediments downstream of the PSF has not been fully defined. PAHs were detected in all but three sediment samples (PSFSD-01B, PSFSD-04B and PSFSD-06A) collected. The concentrations of PAHs did not always decrease with depth, and the extent of PAH contamination in the sediments downstream of the PSF also has not been defined. Of the metals analyzed, arsenic, barium, cadmium, chromium and lead were often found in the sediment samples in both upstream and downstream samples.

Groundwater samples were collected from the five monitoring wells installed within the study area. Analytical results reveal metals and inorganics in the groundwater samples collected from the PSF wells. Of the metals analyzed, the alkali earth metals (calcium, magnesium, potassium and sodium) were detected at the highest concentrations.

Concentrations of nitrate and thallium exceeded their federal maximum contaminant levels (10 mg/L [as nitrogen] and 0.002 mg/L, respectively). Concentrations of total and dissolved manganese, total aluminum, and total iron in downgradient PSF wells slightly increased above upgradient well (background) conditions. Concentrations of manganese (total and dissolved) exceeded secondary Maximum Contaminant Levels (50 μg/L) in samples PSF92-02 and PSF92-03.

Sample PSF92-02 detected a total zinc concentration above background conditions. Detectable concentrations (total and dissolved) of arsenic were found in sample PSF92-05. The dissolved mercury concentration from sample PSF92-04 (0.4 μg/L) has been discounted because it exceeds the total mercury concentration (non-detect) for this sample. In addition, associated soil samples and groundwater samples from subsequent sampling events do not contain mercury. Concentrations of inorganic constituents (chloride, nitrate, sulfate and bicarbonate) increased above background conditions downgradient of the PSF. The increased concentrations of inorganic chloride and sulfate downgradient of the PSF may be a result of the breakdown of pesticides.

Analytical results reveal that metals and inorganic constituents exist in the surface water to the east of the PSF in both upstream and downstream . Of the metals analyzed, total concentrations of aluminum, iron and zinc increased immediately downstream of the PSF. Of the inorganic constituents analyzed, concentrations of chloride and bicarbonate decreased downstream of the background sampling location (PSFSW-01), while sulfate concentrations increased immediately downstream of the PSF.

7.1.2 Summary and Conclusions - Fate and Transport

The pesticides and other semi-volatiles (PAHs) detected in site soils have low water solubilities and high K_{oc} values, indicating that these constituents have a high affinity for binding to soil particles, and a low potential for transfer to groundwater or surface water (ATSDR, 1987-1991; Howard, 1991). Secondary transport pathways for PAHs and pesticides include the transportation of adsorbed contaminants on soil particles by storm or surface water runoff to sediments, and the subsequent transportation of these sediments to points downstream. Soil particles containing sorbed contaminants may also be dispersed as airborne particulates.

The primary and secondary transport pathways for metals detected in site soils are similar to the pathways discussed above, with the addition of water soluble species leaching to ground and surface water. The volatile organic compounds (VOCs) detected in site soils are also water soluble, so they may also leach to groundwater or surface water, or, if they are present in the upper surface soils, these constituents may volatilize out into the atmosphere.

Constituents that dissolve and transfer to the groundwater can be expected to travel within the aquifer in the direction of groundwater flow. Metals constituents dissolved in surface water will continue to flow downstream, but VOCs will tend to volatilize out of surface water to the atmosphere. Nonionic metals species and organic compounds with lower water solubility and high K_{oc} values may also precipitate out of surface water and settle into or become bound to sediments. Constituents present in the sediments may act as a future source of surface water contamination, if conditions favor their reentry into the water column.

The low levels of VOCs detected in site soils are unlikely to affect the groundwater column to a great extent. In addition, the pesticides and PAHs detected in site soils tend to remain strongly bound to soil particles, also resisting transfer to the water column.

7.1.3 Summary and Conclusions - Baseline Risk Assessment

A baseline risk assessment was conducted for the PSF site, which includes a human health evaluation and an ecological risk assessment. The human health evaluation identified 26 potential exposure pathways, including 12 current pathways and 14 future pathways. The baseline risk assessment indicates that there may a concern for potential risk to human health, based on the exposure pathways developed for the site.

Specifically, the risk assessment identifies several receptor exposure pathways that have the potential to cause noncarcinogenic health effects. A calculated hazard index (HI) greater than 1.0 indicates that the "threshold" for noncarcinogenic health effects for a particular pathway has been exceeded. Unacceptable noncarcinogenic (systemic) risks were identified for the following receptors and exposure pathways in the risk assessment:

Receptor	Exposure Pathway - Medium	HI
current on-site worker	dermal exposure to surface soil	9.2
future on-site worker	dermal exposure to surface soil	33
future construction worker	dermal exposure to surface soil	16
future construction worker	dermal exposure to subsurface soil	7.3
future recreational child	dermal exposure to surface soil	1.9
future (off-site) adult	ingestion of groundwater	4.6
future (off-site) child	ingestion of groundwater	22

The baseline risk assessment also identified several receptor exposure pathways with the potential to cause carcinogenic effects. Risks from potential carcinogens are estimated as probabilities of excess cancers as a result of exposure to the chemicals from the site. The National Contingency Plan defines the range of acceptable risks for evaluating cancer risks as 1×10^{-4} to 1×10^{-6}, which corresponds to one excess cancer in a population of ten thousand to one excess cancer in a population of one million. Cancer risk estimates were calculated for three receptors that exceed the acceptable risk range of 1×10^{-6} to 1×10^{-4}, as follows:

Receptor	Exposure Pathway - Medium	Cancer Risk
current on-site worker	dermal exposure to surface soil	8×10^{-4}
future on-site worker	dermal exposure to surface soil	4×10^{-3}
future (off-site) adult	ingestion of groundwater	2×10^{-4}

In addition, fifteen cancer risk estimates were calculated that exceed the standard point of departure, but are within the acceptable risk range identified by the NCP (1×10^{-6} to 1×10^{-4}). A list of these acceptable risks, by receptor and pathway, is located in Section 6.1.5, which summarizes the human health portion of the risk assessment. It should be noted that the estimations of risks due to dermal exposure are likely to be overestimated, due to the conservative assumptions used in calculating the risks. The risks estimated for future consumption of site groundwater may also be overestimated, since there are no current plans to develop the site as a well field for residential users, and since there is an adequate supply of drinking water available from the Fort Riley wells, located 1.8 miles upgradient from the PSF site.

A qualitative ecological risk assessment was conducted as part of the baseline risk assessment. The ecological risk assessment did not identify any current negative impact to flora and fauna at the site. Terrestrial and aquatic life in the area of the drainage ditch may potentially suffer adverse effects from constituents detected in site surface water and sediment samples. However, other (larger) sources of surface water are located nearby, and ecological receptors would probably favor these sources over the intermittent stream on site. Therefore, the environmental impact of the contamination detected in the surface water and sediment on site appears to be low. In addition, the contamination present in site surface water and sediment should not impact downstream media because the natural character of the drainage ditch (i.e., its intermittent flow) does not consistently discharge surface water and flush sediments to downstream points.

Likewise, the risk to environmental receptors due to exposure to surface soils is also minimal or low. The area most impacted by soil contamination (the previously stressed area of vegetation) is small (20 ft. x 20 ft.), and there are areas adjacent to the site that provide suitable habitats and food supplies for animal species that may pass by or frequent the site. And, because the area of stressed vegetation has experienced regrowth this growing season, the effects of the surface soil contamination do not appear to be long-lasting in nature.

7.1.4 OVERALL CONCLUSIONS

These final concluding statements have been made based on a number of criteria that include: quality and quantity of data collected as part of the RI, limitations of the collected data, whether or not the data supports the purposes and objectives of the RI (as stated in Section 1.1 of this report), and evaluation of the risk posed and/or associated with past and/or current PSF activities.

Based on the conclusions derived from the information in Sections 4, 5 and 6 and presented in Sections 7.1.1., 7.1.2. and 7.1.3., the surface soils, subsurface soils, and groundwater on site may present limited risks to on-site workers and future residents.

Although a "zero" line of contamination was not identified, the nature and extent of contamination, based on regulatory cleanup criteria and requirements, was developed. Therefore, the data are adequate for developing risk-based remedial objectives. At this time, additional sampling and analyses of surface and subsurface soils and groundwater is not necessary to further characterize the site.

REFERENCES

Andros, Pamela, Dan Lapp, Mira Metzinger, Patrick Nowlax, Carla Spradlin, Steve Turner, and Julie Webster, 1993. Historical and Architectural Documentation Reports for Fort Riley, Kansas. USACERAL Tri-Services Cultural Resources Research Center.

ATSDR, 1987-1991. Toxicological Profile for "Constituents." Agency for Toxic Substances and Disease Registry, U.S. Public Health Service.

Barrio-Lage, G., Parsons, F.Z., Nassar, R.S., and Lorenzo, P.A., 1986. Sequential Dehalogenation of Chlorinated Ethenes. Environmental Science Technology, 20, pp. 96-99.

Callahan, M. et al., 1979. Water-related Environmental Fate of 129 Priority Pollutants. EPA-440/4-49-029.

CERCLA Compliance with Other Laws Manual: Part II. Clean Air Act and Other Environmental Statutes and State Requirements, EPA/540/G-89/009, August 1989.

CEMRK-OD-PE, Wetland Delineation, Fort Riley, Kansas, Former Pesticide Storage Facility. Memorandum For Record, March 12, 1993.

Chief Chemist, Entomological Division AEHA, Personal Interview, March 1992.

Chief, Environmental and Natural Resources Division, DEH, Fort Riley, Personal Interviews, February, September 1992.

Chief, Maintenance Division, DEH, Personal Communication, Fort Riley, November, 1992.

Closure Plan for Hazardous Waste Storage Facilities Building 292 and Two Conexs, Fort Riley, Kansas, U.S. Army Environmental Hygiene Agency Project No. 37-26-0153-87, February 1987.

Conex Closure Building 348 Fort Riley, Kansas, Epic, Inc., August 31, 1990.

Cowherd C., Muleski, G., Englehart P. and Gillette D., 1985. Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. Prepared by Midwest Research Institute, Washington, DC: U.S. Environmental Protection Agency, Office of Health and Environmental Assessment, EPA-600/8-85-002.

DEH, 1992a. Personal Communication between Fort Riley DEH employees (Chief of Maintenance Division and Mobile Equipment Operator, General Foreman) and Law, November 1992.

DEH, 1992b. Personal Communication between DEH Real Property Section and Law, August 1992.

DEH, 1993a. Personal Communication between DEH Master Planner (1975 to present) and Law, Fort Riley, January 1993.

DEH, 1993b. Personal communication between Law and Fort Riley DEH Master Planner re: future demolition/reconstruction of PSF site, May, 1993.

DEH, 1993c. Personal communication between Law and Fort Riley DEH Materials Coordinator, Holding Area re: PSF exposure scenarios, May 1993.

DEH, 1993d. Personal communication between Law and Fort Riley DEH Grounds Foreman (mowing) re: PSF exposure scenarios, May 1993.

DEH, 1993e. Personal communication between Law and Fort Riley DEH Chief, Engineering Plans and Services, re: PSF exposure scenarios, May 1993.

DEH, 1993f. Personal communication between Law and Fort Riley DEH Paint leader (roads section) re: PSF exposure scenarios, May 1993.

DEH, 1993g. Personal communication between Law and Fort Riley DEH Senior Pest Controller re: PSF exposure scenarios, May 1993.

DEH, 1993h. Personal communication between Law and Fort Riley DEH Pesticide Worker re: PSF exposure scenarios, May 1993.

DEH, 1993i. Personal communication between Law and Fort Riley DEH Mobile Equipment Operator, General Foreman re: PSF exposure scenarios, May 1993.

DEH, 1993j. Personal communication between Law and Fort Riley DEH Air Conditioning Worker (retired) re: PSF exposure scenarios, May 1993.

DEH, 1993k. Personal communication between Law and Fort Riley DEH Exterior Plumber (retired) re: PSF exposure scenarios, May 1993.

DEH, 1993l. Interview conducted by Ft. Riley DEH, forwarded to Law. Fort Riley DEH Engineering Plans and Services, Job Order Contracting Branch re: PSF exposure scenarios, May 1993.

DEH, 1993m. Interview conducted by Fort Riley DEH, forwarded to Law. Fort Riley DEH, Engineering Plans and Services, Design Branch re: PSF exposure scenarios, May 1993.

DEH, 1993n. Interview conducted by Fort Riley DEH, forwarded to Law. Fort Riley DEH, Maintenance Division Structures Branch, Exterior Utilities Section, (supervisor) re: PSF exposure scenarios, May 1993.

DEH, 1993o. Interview conducted by Fort Riley DEH, forwarded to Law. Fort Riley DEH, Maintenance Division, Structures Branch, Exterior Utilities Section (plumber) re: PSF exposure scenarios, May 1993.

DEH, 1993p. Delivery Order Estimated Construction Time Worksheet, Provided by Fort Riley DEH to Law, May 1993.

DEH, 1993q. Personal communication between Law and Fort Riley DEH re: future site of constructed PSF building, PSF review meeting, May 1993.

DEH, 1993r. Personal communication between Law and Fort Riley DEH, Draft Final RI in-progress review meeting, June, 1993.

DOC, 1993. Interview conducted by Fort Riley DEH provided to Law. Directorate of Contracting, Contract Administration Division, Contract Administrator re: range mowing contracts. (For use in PSF exposure scenarios), May 1993.

Entomological Special Study No. 44-015-75/76 Monitoring of Pesticide Contamination, Fort Riley, Kansas, U.S. Army Environmental Hygiene Agency, 23 November 1974 - 21 August 1975.

Environmental Engineer, UST Coordinator, Fort Riley DEH, Personal Interview, February, September 1992.

Extension Entomologist State of Kansas, Livestock Entomology Division and Professor of Entomology, Kansas State University, Personal Interview, October 9, 1992.

Federal Facility Agreement, U.S. EPA Region VII, State of Kansas and U.S. Army Fort Riley, Docket No. VII-90-F-0015, February 28, 1991.

Federal Register, 1987. Maximum Contaminant Levels and Maximum Contaminant Level Goals, 40 CFR Subpart B.

Federal Register, 1990. RCRA Action Levels, Vol. 55, No. 145, pp 30798-30884. Corrective Action for Solid Waste Management Facilities, Proposed Rule.

FH, 1993. Fort Riley Family Housing Department, Chief of Facilities, Personal Interview, January 1993.

Fish and Wildlife Administrator, Fort Riley, Personal Interview, August, October 1992.

Fort Riley, 1992. Memorandum transmitted by IRP Manager via fax re: threatened and endangered species and occurrence on Fort Riley. August, 1992.

Fort Riley, Its Historic Past, U.S. Government Printing Office 1987-757-071/60010.

Geary County Kansas, Flood Insurance Study, February 4, 1988, Federal Emergency Management Agency.

Geologic History of Kansas (The), Merriam, Daniel F., et al., Kansas Geological Survey, Bulletin No. 162, December 1963, reprinted 1983.

Gilbert, Richard O., 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold, Company, New York.

Ground Water in the Kansas River Valley Junction City to Kansas City, Kansas, Fader S.W., Kansas Geological Survey Bulletin No. 206, Part 2 1974.

Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA, U.S. EPA/540/G-89/004, October 1988.

Hawley, 1985. Assessment of health risk from exposure to contaminated soil. Risk Analysis. Volume 5, pp 289-302.

Hazard Ranking System Report for Fort Riley, Kansas. USEPA, Region VII, reviewer, January 12, 1988.

HEAST, 1992. Health Effects Assessment Summary Tables. USEPA Office of Research and Development.

Howard, P. H., 1990. Handbook of Environmental Fate and Exposure Data, Volume II. Lewis Publishers, Inc., Chelsea, MI.

Howard, P.H., 1989. Handbook of Environmental fate and exposure Data, Vol. 1, Lewis Publishers, Inc., Chelsea, MI.

Howard, P.H., 1991. Handbook of Environmental Fate and Exposure Data, Volume III - Pesticides. Lewis Publishers, Inc., Chelsea, MI.

Howard, P.H., Boethling, R.S., Jarvis, W.F., Meylan, W.M., and Michalenko, E.M., 1991. Handbook of Environmental Degradation Rates. Lewis Publishers, Inc., Chelsea, MI.

HSDB, 1988. Hazardous Substances Database, National Library of Medicine, Bethesda, Maryland.

Hwang T.S., and Falco, J., W. 1986. Estimation of multimedia exposures related to hazardous waste facilities. Pollutants in a Multimedia Environment. New York, NY, Plenum Publishing Corporation. pp 229-264.

Installation Assessment of the Headquarters, 1st Infantry Division (Mechanized), and Fort Riley, Kansas. Report No. ESE-341. Govt. Report No. AMXTH-AS-IA-82341. B.N. McMaster, C.D. Henry, J.D. Bonds, S.A. Denahah, C.F. Jones, D.F. McNeill, C.R. Neff, K.A. Civitarese. December 1984.

Installation Pest Management Program Review No. 16-66-0502-80, Fort Riley, Kansas, U.S. Army Environmental Hygiene Agency 30 July-9 August 1979.

Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites. Memorandum from H. Longest and B. Diamond to EPA Regions. OSWER Directive No. 9355.4-02.

IRIS, 1993. Integrated Risk Information System (IRIS) - Database. USEPA. Environmental Criteria and Assessment Office, Cincinnati, Ohio.

IRP, 1989. The Installation Restoration Program Toxicology Guide, under DOE Interagency Agreement No. 1891-A076-A1, Biomedical and Environmental Information Analysis, Oak Ridge, TN.

IRP Manager, Fort Riley DEH, Personal Interviews/Conversations, 1992.

Kansas Extension Entomologist (ret.) 1949 through 1982, State of Kansas, Personal Interview, October 9, 1992.

Kansas State Historical Society, Personal Communication between Law and an Archaeologist, 1993.

KAR, 1987. Kansas Water Quality Standards. Kansas Administrative Regulations, Title 28, Department of Health and Environment, Article 16-Water Pollution Control, Chapter 28. Last 28. Last amended 1 May, 1987.

KAR, 1988. Kansas Water Quality Standards. Kansas Administrative Regulations, Title 28, Department of Health and Environment, Article 15-Application for Permits; Domestic Water Supply. Last amended 1 May, 1988.

KDHE, 1988. Memorandum entitled Revised Groundwater Contaminant Cleanup Target Concentrations for Aluminum and Selenium. Kansas Department of Health and Environment. 5 December, 1988.

KDHE, Letter Confirming Closure of Building 348 Waste Storage Area and CONEXs, December 3, 1990.

KDHE, 1992. Personal communication between Law and Kansas Department of Health and the Environment re: ground water contaminant guidance, September, 1992.

KGS, 1974. Ground Water in the Kansas River Valley, Junction City to Kansas City, Kansas, Bulletin No. 206, Part 2.

KGS, 1968. The Stratigraphic Succession in Kansas, Bulletin 189.

KGS, 1949. Ground-Water Conditions in the Smoky Hill Valley in Saline, Dickinson and Geary Counties, Kansas, Bulletin No. 84.

KGS, 1941, The Geology of Riley and Geary Counties, Kansas, Bulletin No. 39.

Klaassen, C.D., Amdur, M.O., and Doull, J. (editors), 1986. Toxicology: The Basic Science of Poisons, 3rd ed. Macmillan Publishing Company, New York, NY.

Klapow and Lewis, 1979. Analysis of toxicity data for California marinewater quality standards. Journal Water Pollution Control Federation 51(8): 2051-2070. (cited by NOAA, 1990).

Land, C.E., 1975. Tables of confidence Limits for Linear Functions of the Normal Mean and Variance. Selected Tables in Mathematical Statistics, Vol. III. American Mathematical Society.

Law, 1992a. Draft Final Modified Field Sampling Plan for Remedial Investigation/Feasibility Study Pesticide Storage Facility (Volume V) Fort Riley, Kansas. Prepared for U.S. Army Corps of Engineers, Kansas City District. September, 1992.

Law, 1992b. Quality Control Summary Report (Baseline) for Pesticide Storage Facility, Fort Riley, Kansas. Prepared for U.S. Army Corps of Engineers, Kansas City District. September, 1992.

Law, 1993a. Quality Control Summary Report (First Quarter) for Pesticide Storage Facility, Fort Riley, Kansas. Prepared for U.S. Army Corps of Engineers, Kansas City District. January 1993.

Law, 1993b. Quality Control Summary Report (Second Quarter) for Pesticide Storage Facility, Fort Riley, Kansas. Prepared for U.S. Army Corps of Engineers, Kansas City District. April 1993.

Law, 1993c. Quality Control Summary Report (Third Quarter) for Pesticide Storage Facility, Fort Riley, Kansas. Prepared for U.S. Army Corps of Engineers, Kansas City District. July 1993.

Law Environmental National Laboratory, Quality Control Officer (ret.), Personal Interview with Senior Chemist, LEGS, November 18, 1992.

MAP: "Miscellaneous Areas, Survey Control" Map No. 6139-407.0-G, Widmer Engineering Co., St. Louis, Missouri, June 15, 1941.

Military Entomology Operational Handbook Navfac Mo-310, Army TM 5-632, Air Force AFM 91-16, December 1971.

Montgomery, John H., and Welkom, Linda M., 1990. Ground-water Chemicals Desk Reference. Lewis Publishers, Inc., Chelsea, MI.

NCP, 1988, National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR, Part 300, December, 1988.

National Academy of Sciences, 1977. Drinking Water and Health, Vol. 1.

National Public Drinking Water Rules for 38 Inorganic and Synthetic Organic Chemicals, 1991. Phase II Fact Sheet.

NOAA, 1990. The Potential for Biological Effects of Sediment. National Oceanic and Atmospheric Administration. Technical memorandum NOS OMA 52, Seattle WA.

O'Brien, Patricia J., 1984. Archaeology in Kansas. Public Education Series No. 9 University of Kansas, Lawrence.

PCB Program Manager, Fort Riley DEH, Personal Interview, February 1992.

Pesticide Inventory (December 1983). Headquarters, 1st Infantry Division (Mechanized) and Fort Riley (FR) Directorate of Facilities Engineering (DFAE). 1983.

Pesticide Monitoring Study No. 17-44-1356-88, "Pesticide Residue Sampling in the Vicinity of the Pesticide Storage Site, Fort Riley, Kansas", U.S. Army Environmental Hygiene Agency, May 1986.

Pesticide Transformation Products, Division of Agrochemicals Symposium, August 1990.

Rao, P.F.C., and Hornsby, A.G., 1989. Behavior of Pesticides in Soil and Water. Institute of food and Agricultural Sciences, University of Florida, Gainesville, FL.

Real Property Specialist, Fort Riley, Personal Communication, August 1992.

Riley County Extension Service, Personal Communication, re: length of growing season, November, 1992.

Rohn, Arthur, and Blassing, Rober K., 1986. Archaeological Testing at Four Prehistoric Sites at Fort Riley, Kansas. Submitted to the U.S. Army Corps of Engineers, Kansas City District.

Senior Pesticide and Herbicide Program Manager, Fort Riley, Personal Interview, February 1992.

Sittig, M., 1985. Handbook of Toxic and Hazardous Chemicals and Carcinogens, Noyes Publications, Park Ridge, NJ.

Snoeyink, V.L. and Jenkins, D. 1980. Water Chemistry. John Wiley & Sons, Inc., New York, NY.

Soil Survey of Riley County and Part of Geary County, Kansas. United States Department of Agriculture Soil conservation Service. June 1975.

Stratigraphic Succession in Kansas, Edited by Doris Zeller, Kansas Geological Survey, Bulletin No. 189, 1968.

Stumm, W. and Morgan, J.J. 1981. Aquatic Chemistry, 2nd edition. John Wiley & Sons, Inc., New York, NY.

Summary of Fort Riley Hunting Regulations, 1992-1993. Natural Resources Branch, Directorate of Engineering and Housing, Pamphlet.

Supervisor, Exterior Utilities, Fort Riley, Personal Interview, February 1992.

Terrain Analysis, Fort Riley Kansas, Soil Systems, Inc. Marietta, Georgia. December 1977.

United States Army Corps of Engineers, Letter to LEGS Branch Chief, Law Environmental, Inc., June 12, 1992.

USAEHA, 1975. Entomological Special Study No. 44-015-75/76.

USAEHA, 1988. Pesticide Monitoriing Study No. 17-44-1356-88.

USAEHA, Interim Final Report: Hazardous Waste Management Consultation No. 37-26-0190-89 Evaluation of Solid Waste Management Units, Fort Riley, Kansas, 9-13 May 1988.

US Department of Health and Human Services, 1991. Strategic Plan for the Elimination of Childhood Lead Poisoning, Public Health Service and Centers for Disease Control. February 1991.

USEPA, 1986. Superfund Public Health Evaluation Manual. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response. EPA/540/1-861060.

USEPA, 1987. Quality Criteria for Water 1986. U.S. Environmental Protection Agency, Office of Water Regulations and Standards. USEPA Publication No. EPA/44015-86-001.

USEPA, 1988. Memorandum to Assistant Administrators. Recommended Agency Policy on the carcinogenicity Risk Associated with the Ingestion of Inorganic Arsenic. USEPA, Office of the Administrator, Washington, D.C.

USEPA, 1988a. CERCLA Compliance with Other Laws Manual: Interim Final Guidance U.S. EPA/540/G-89/006 August 1988.

USEPA, 1989a. Risk Assessment Guidance for Superfund, Volume I, Health Evaluation Manual. USEPA Publication No. 540/1-89/002.

USEPA, 1989b. Exposure Factors Handbook. USEPA Exposure Assessment Group. EPA/600/8-89/043.

USEPA, 1989c. Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual, USEPA Publication No. 540-/1-89/001.

USEPA, 1991. Memorandum from Timothy Fields and Bruce Diamond to USEPA Regional Directors. RE: Human Evaluation Manual, Supplemental Guidance. OSWER Directive 9285.6-03.

USEPA, 1992. Dermal Exposure Assessment: Principles and Applications. Interim Report. USEPA Publication No. 660/8-91/011B.

USEPA, 1992a. Memorandum entitled "Suggested Risk Assessment Parameters for Polynuclear Aromatic Hydrocarbons" EPA Region III, transmitted by P. Muraca, 10 June 1992.

USEPA, 1992b. Memorandum from EPA Project Manager, EPA Region VII to Capt. C. Charette re: exposure scenarios for PSF site. November, 1992.

USEPA, 1992c. Guidance for Data Useability in Risk Assessment, Final. Office of Emergency and Remedial Response. Publication No. 9285.7-094.

USEPA, 1992d. Personal communication between EPA Region VII project manager for Fort Riley and Law, re: use of background samples, August, 1992.

USEPA, 1992e. Personal communication between Risk Assessment Contractor to USEPA Region VII re: Region VII "defaults" used in dermal risk assessment, September, 1992.

USEPA, 1992f. Supplemental Guidance to RAGS: Calculating the Concentration Term. USEPA, OSWER Publication No. 9258.7-081, May 1992.

USEPA, 1992g. Memorandum entitled "New Interim Region IV Guidance" re: Toxicity Equivalency Factors for Carcinogenic PAHs. EPA Region IV, 11 February, 1992.

USEPA, 1993a. Personal communication between Law and Region VII Project Manager re: surface soil exposure parameters to be used in developing a child trespasser scenario, 25 May 1993.

USEPA, 1993b. Memorandum entitled "Slope Factors for Polynuclear Aromatic Hydrocarbons" USEPA Region VII, May 1993.

U.S. Fish and Wildlife, 1992. A Survey of Threatened and Endangered Species on Fort Riley Military Reservation, Kansas. Summary Report. U.S. Dept. of the Interior, Fish and Wildlife Service, Kansas State Office, Febrary 1992.

USEPA/IRIS, 1988-1992. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS) Database. Cincinnati, Ohio: USEPA, Environmental Criteria and Assessment Office.

USGS, 1975. Background geochemistry of Some Rocks, Soils, Plants, and Vegetables in the Conterminous United States.

USGS, 1984. Element Concentrations in Soils and Other Surficial Materials of the Continuous United States, USGS Professional Paper #1270.

USGS, Personal Discussions, January through September 1992.

Well Logs, U.S. Army Corps of Engineers Kansas City District, June 16, 1982.

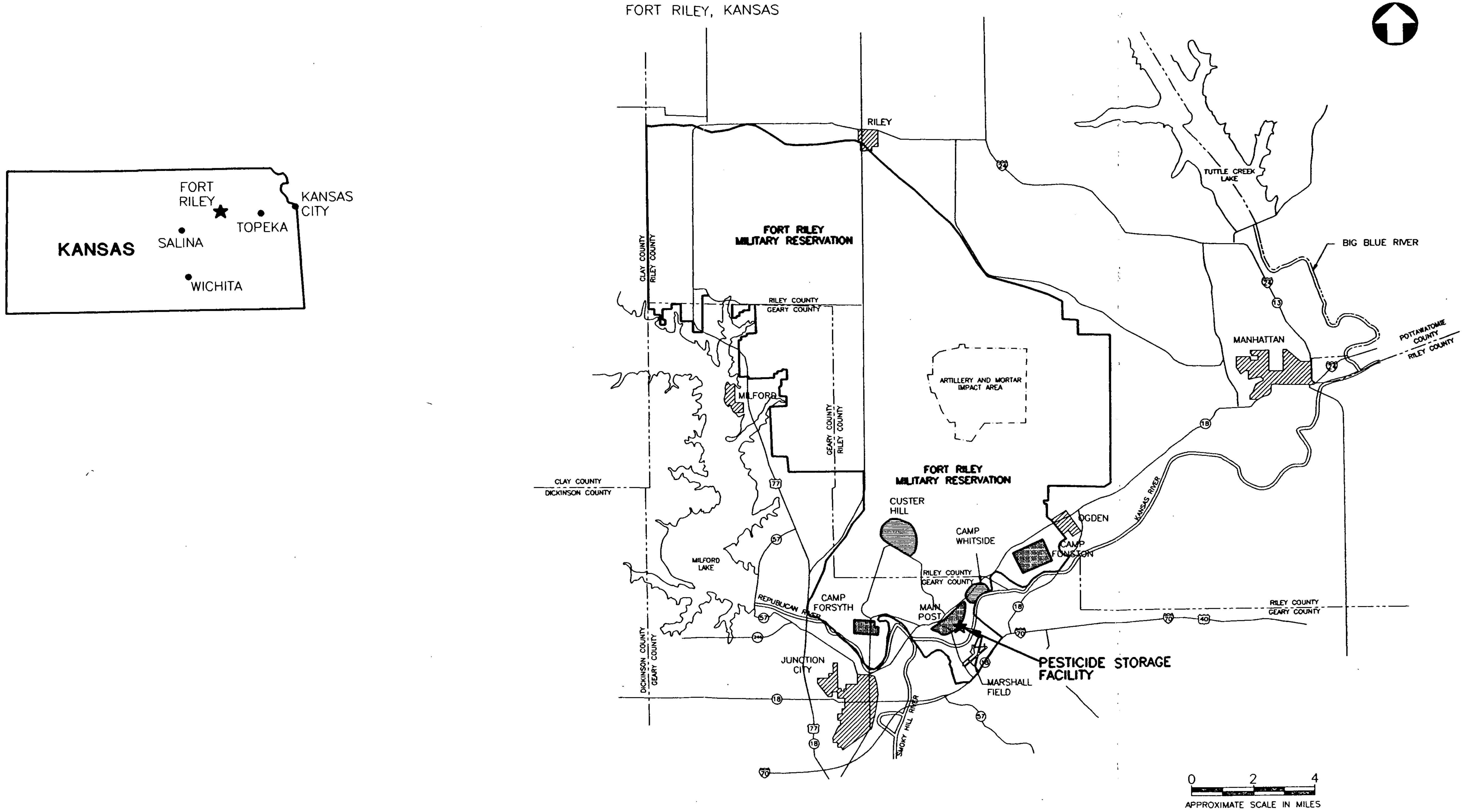
Well Logs, Widmer Engineering Company, St. Louis, MO. June 8, 1941.

Wetland Assessment Specialist, United States Army Corps of Engineers, Personal Interview, October 30, 1992.

FIGURE 1-1

PESTICIDE STORAGE FACILITY LOCATION MAP

FORT RILEY, KANSAS



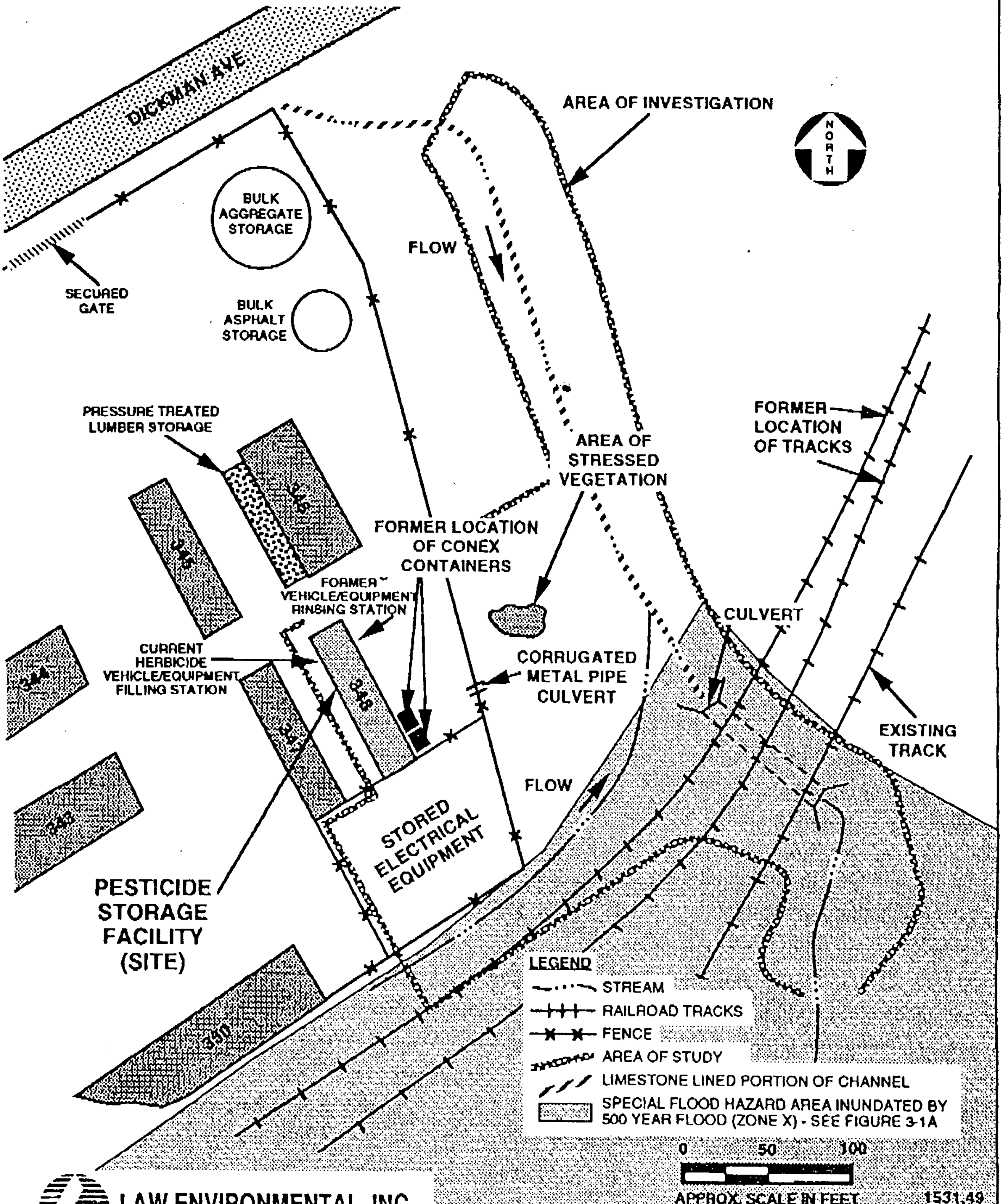
LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

filename: pest/fig1-1

FIGURE 1-2

PESTICIDE STORAGE FACILITY

FORT RILEY, KANSAS

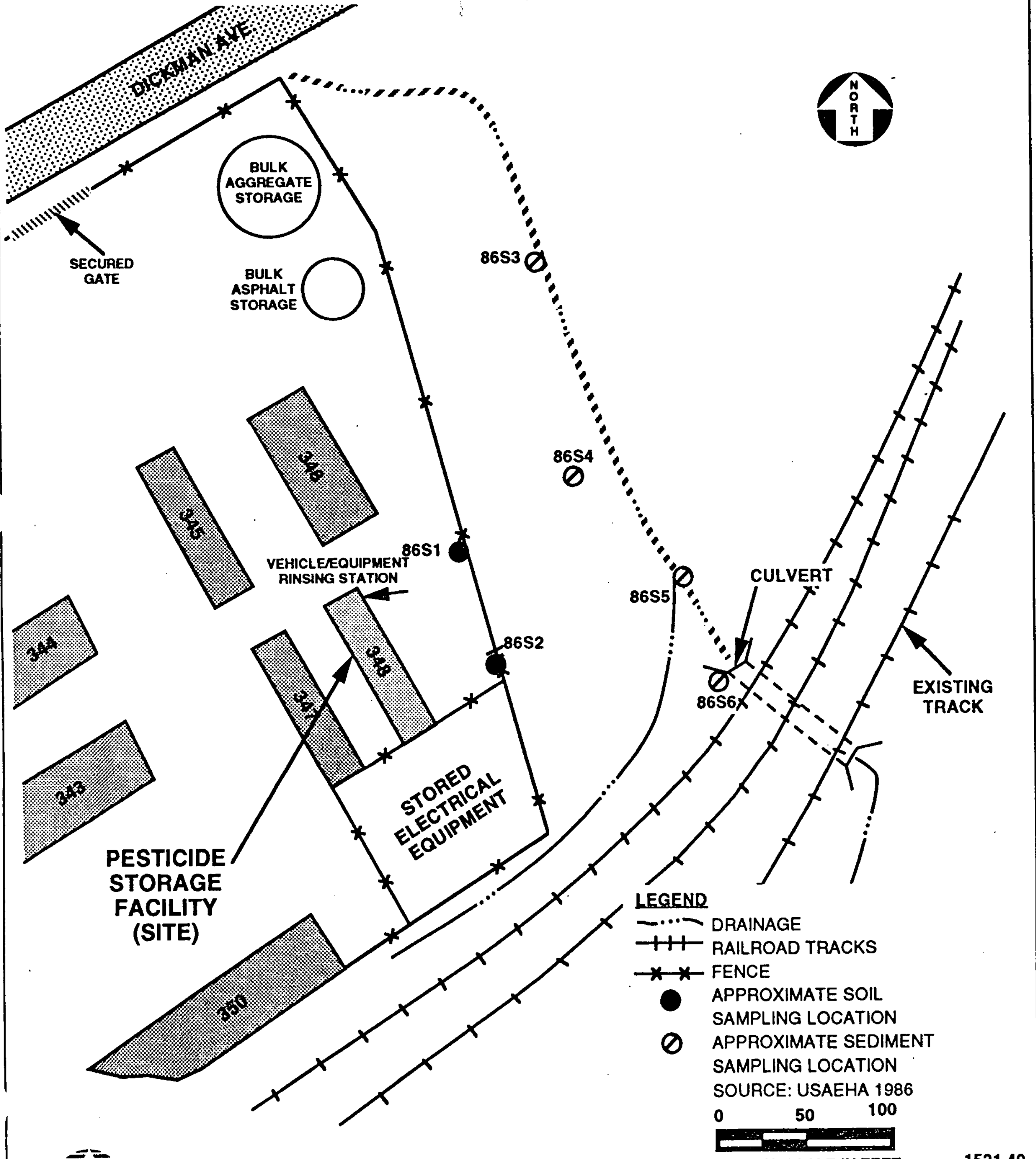


LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 1-3

USAEHA APPROXIMATE SOIL/SEDIMENT SAMPLING LOCATIONS, MAY 1986

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



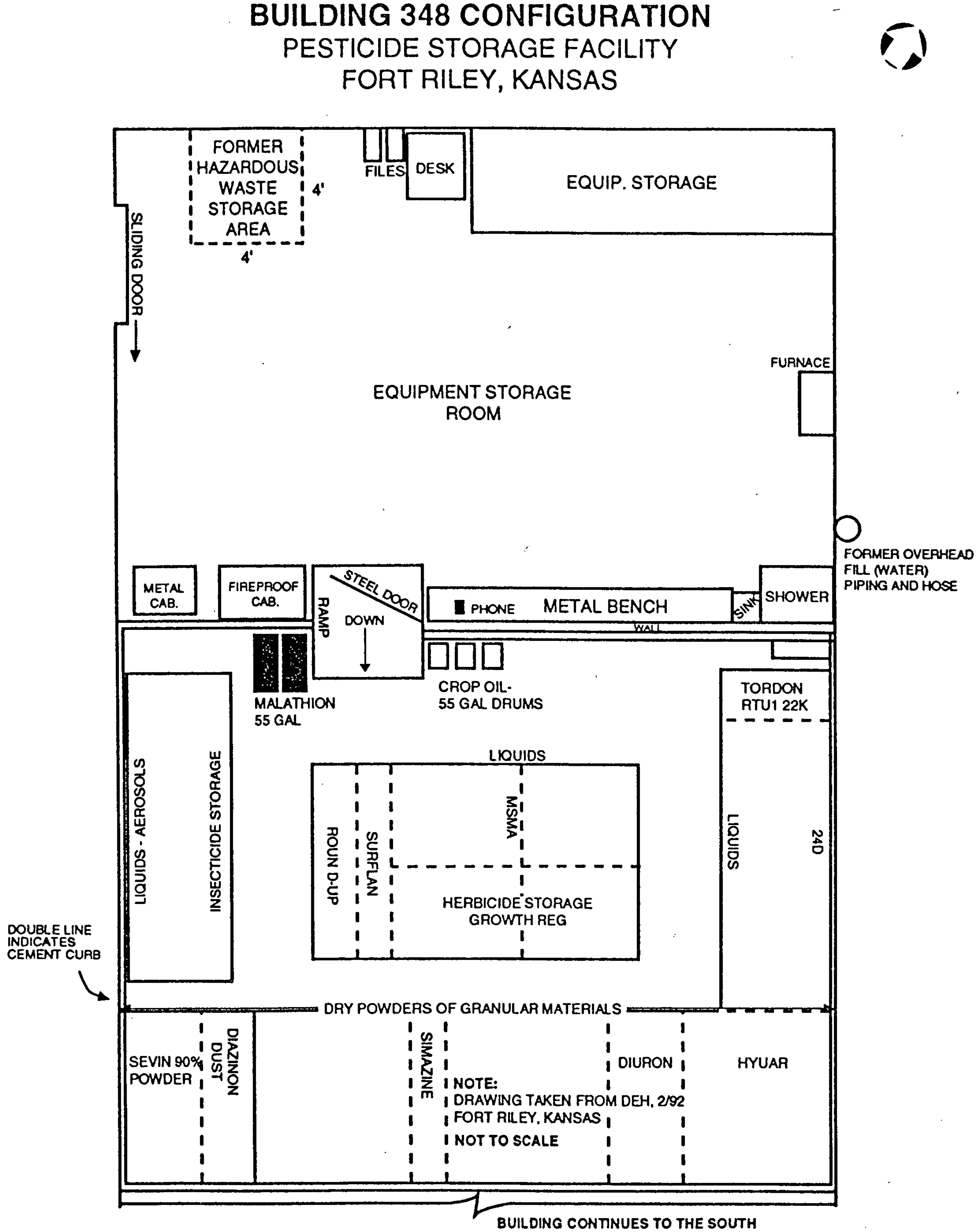
1531.49

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 2-1

BUILDING 348 CONFIGURATION

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



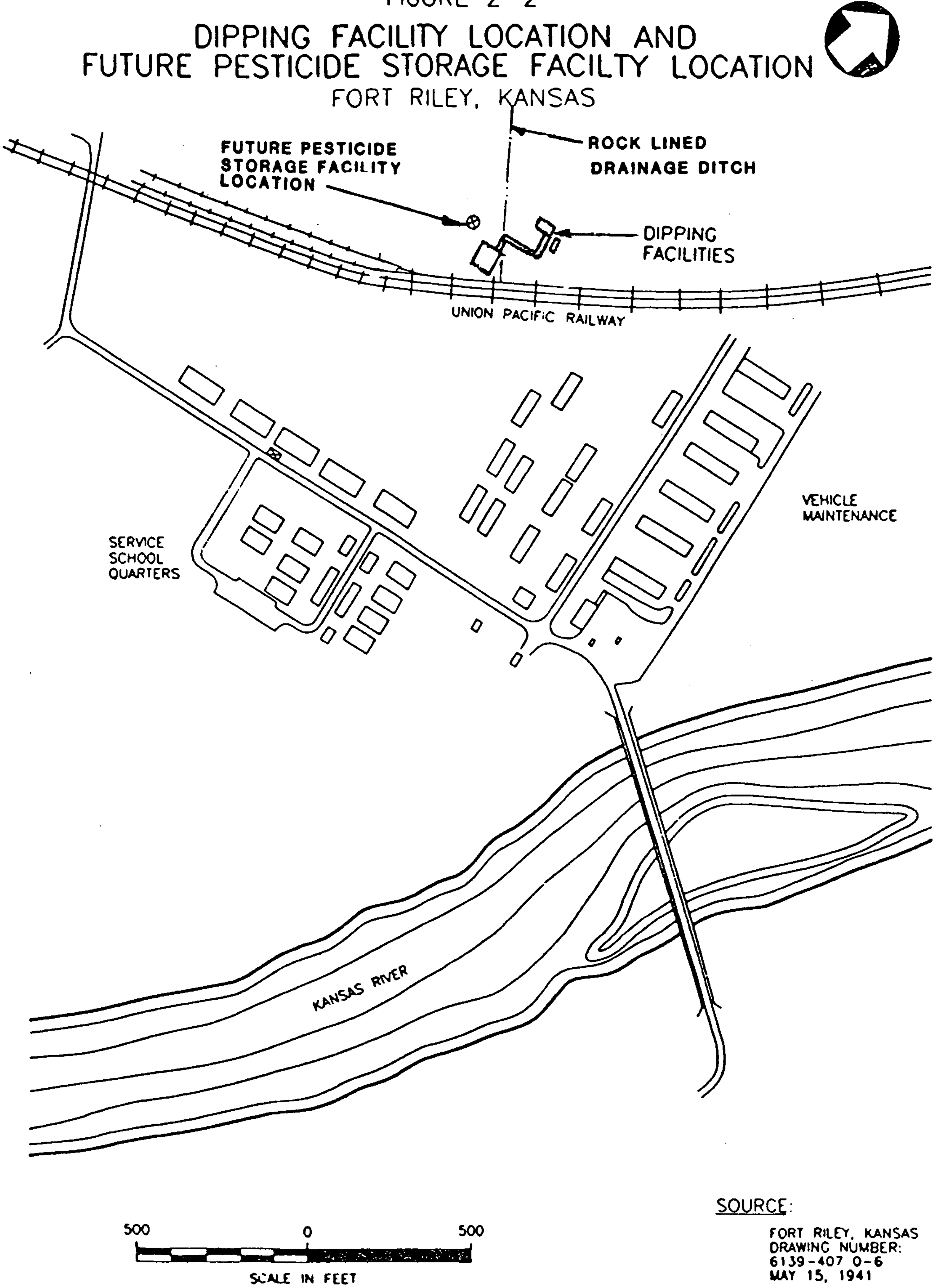
LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

1531.49

FIGURE 2-2

DIPPING FACILITY LOCATION AND FUTURE PESTICIDE STORAGE FACILTY LOCATION

FORT RILEY, KANSAS



SOURCE:

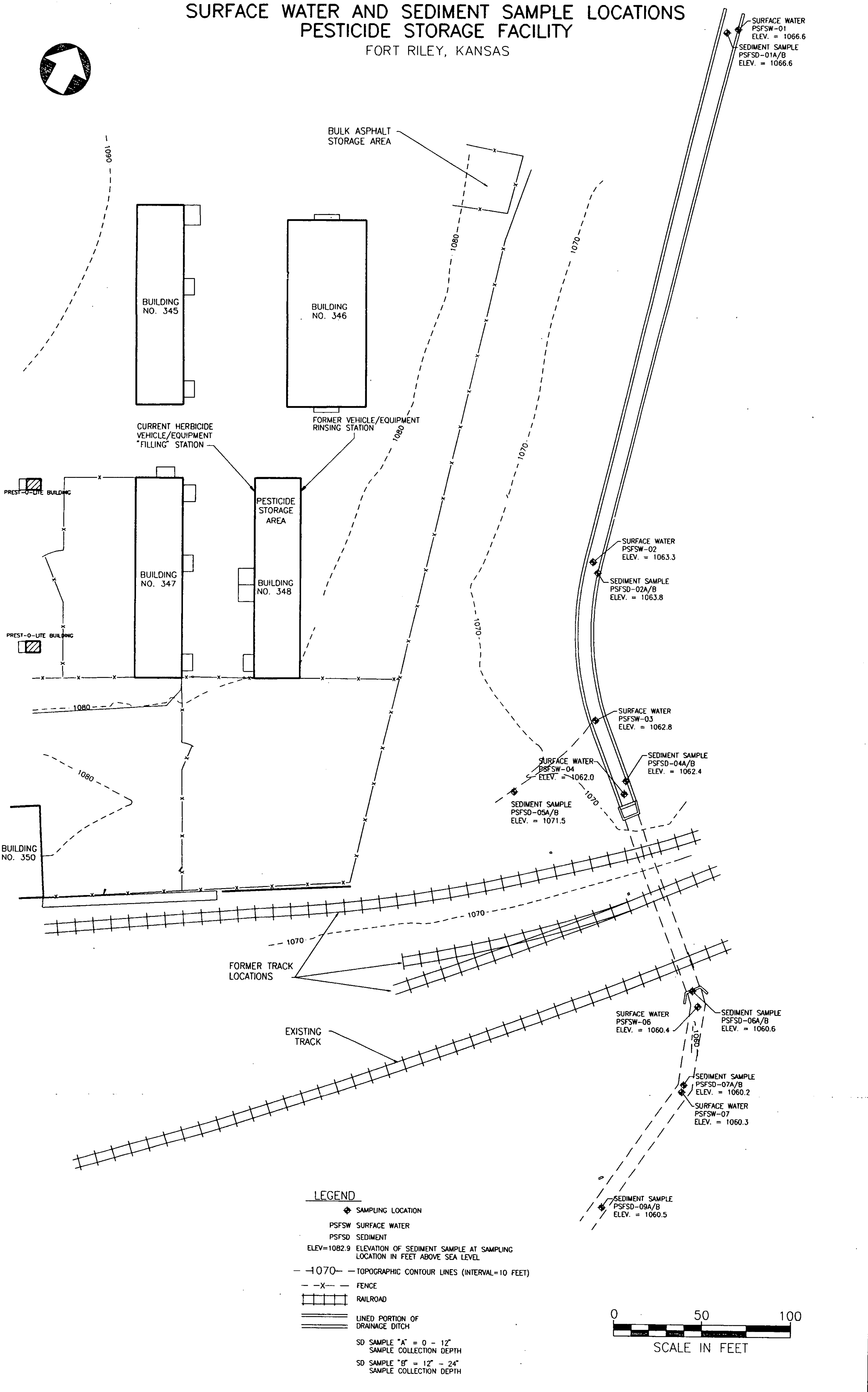
FORT RILEY, KANSAS
DRAWING NUMBER:
6139-407 0-6
MAY 15, 1941

LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES DIVISION

FIGURE 2–3

SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS PESTICIDE STORAGE FACILITY

FORT RILEY, KANSAS



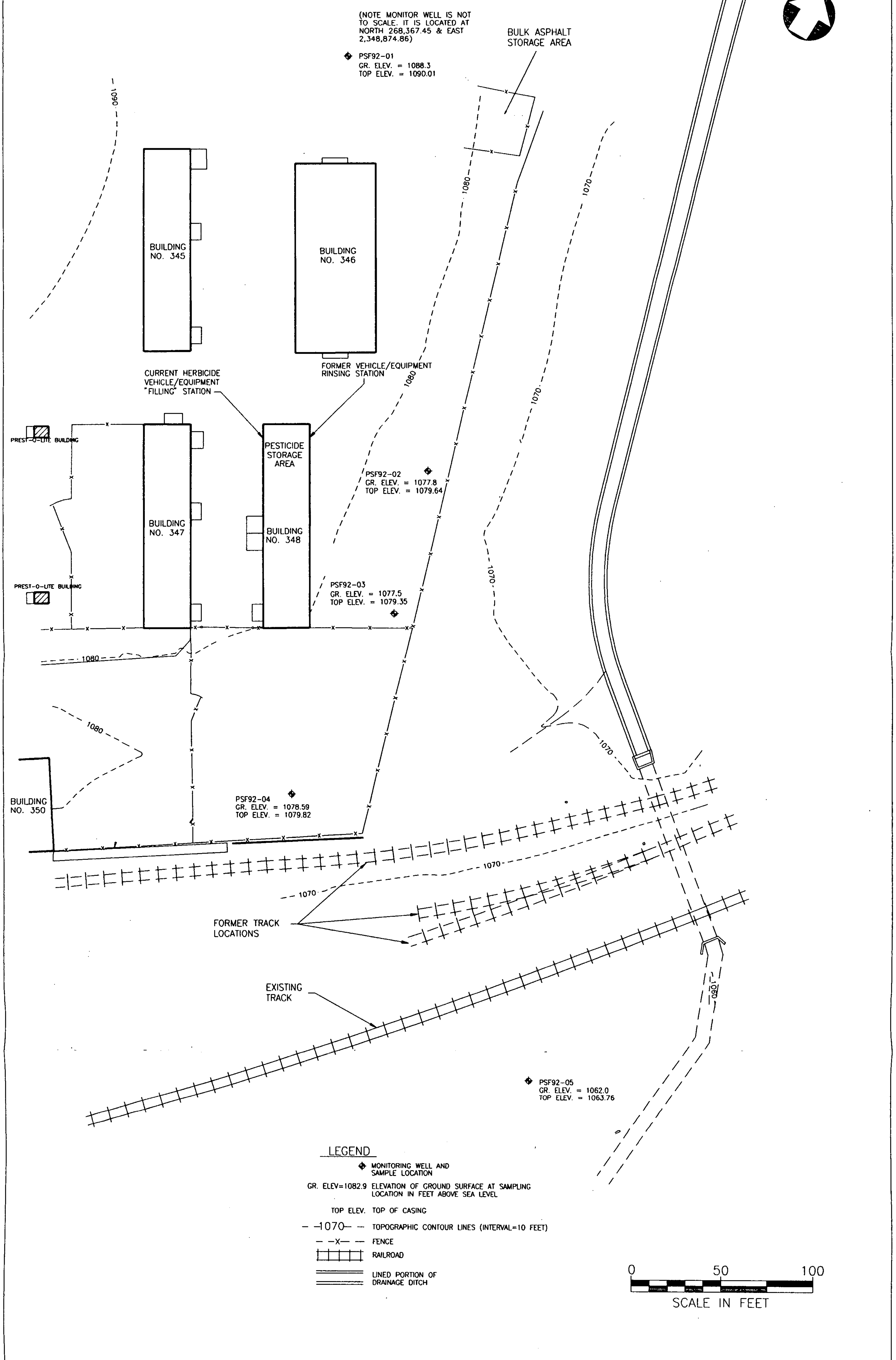
filename: fig2–2.dwg

LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FIGURE 2-4

MONITORING WELL AND GROUNDWATER SAMPLING LOCATIONS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



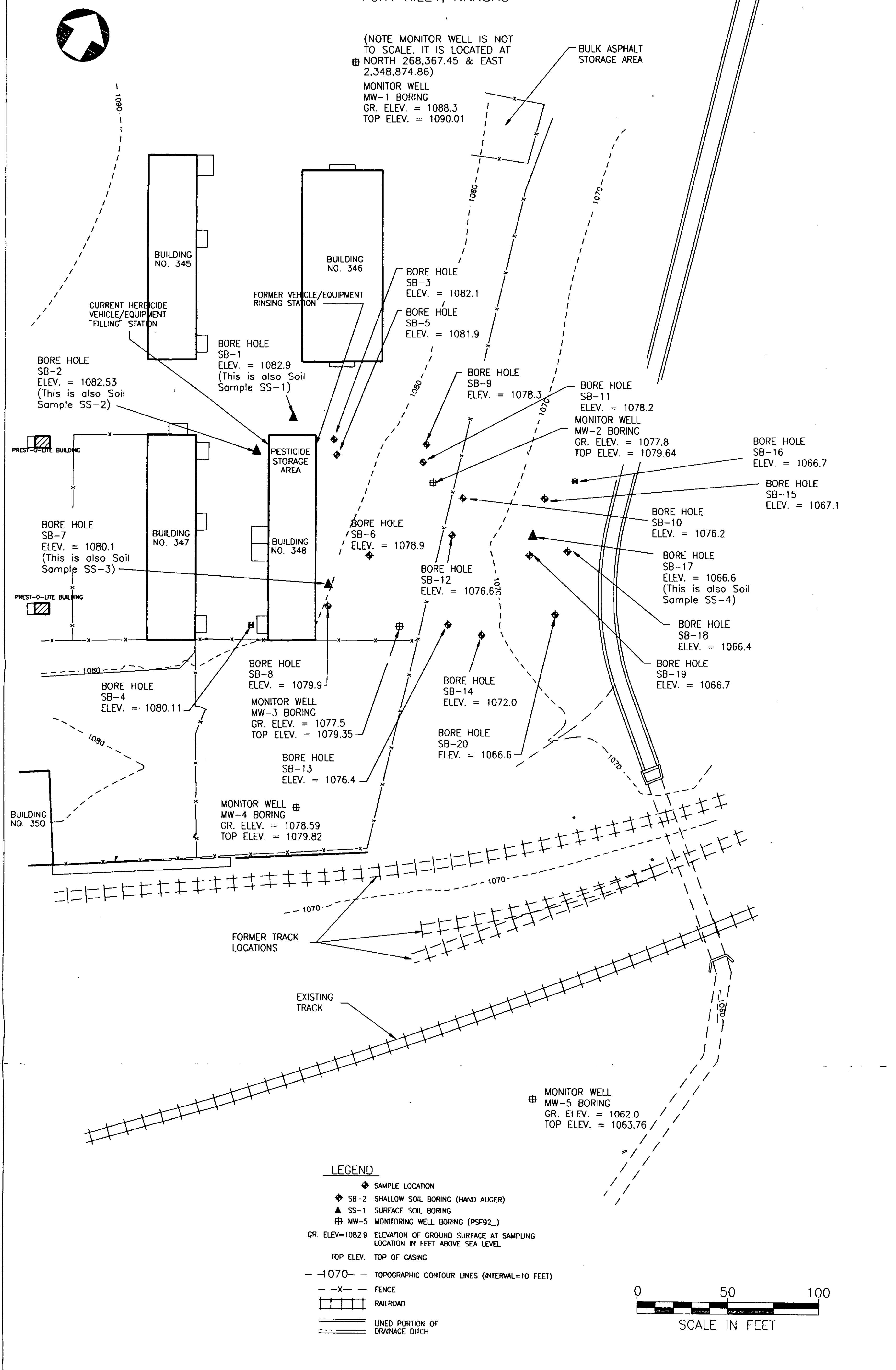
filename: fig2-3.dwg

LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FIGURE 2-5

SURFACE AND SHALLOW SUB-SURFACE SOIL SAMPLE LOCATION

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



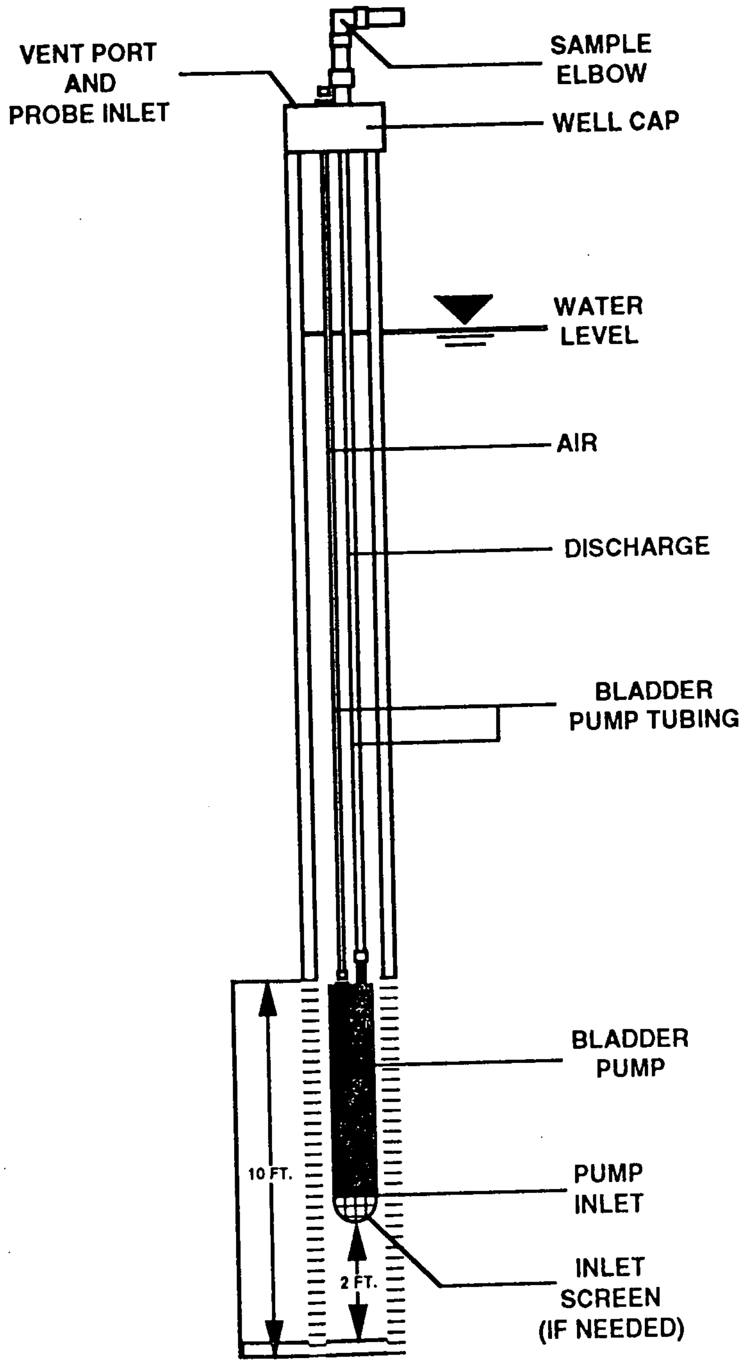
filename: fig2-4.dwg

LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FIGURE 2-6

DEDICATED WELL SYSTEM BLADDER PUMP

PESTICIDE STORAGE FACILITY
FT. RILEY, KANSAS

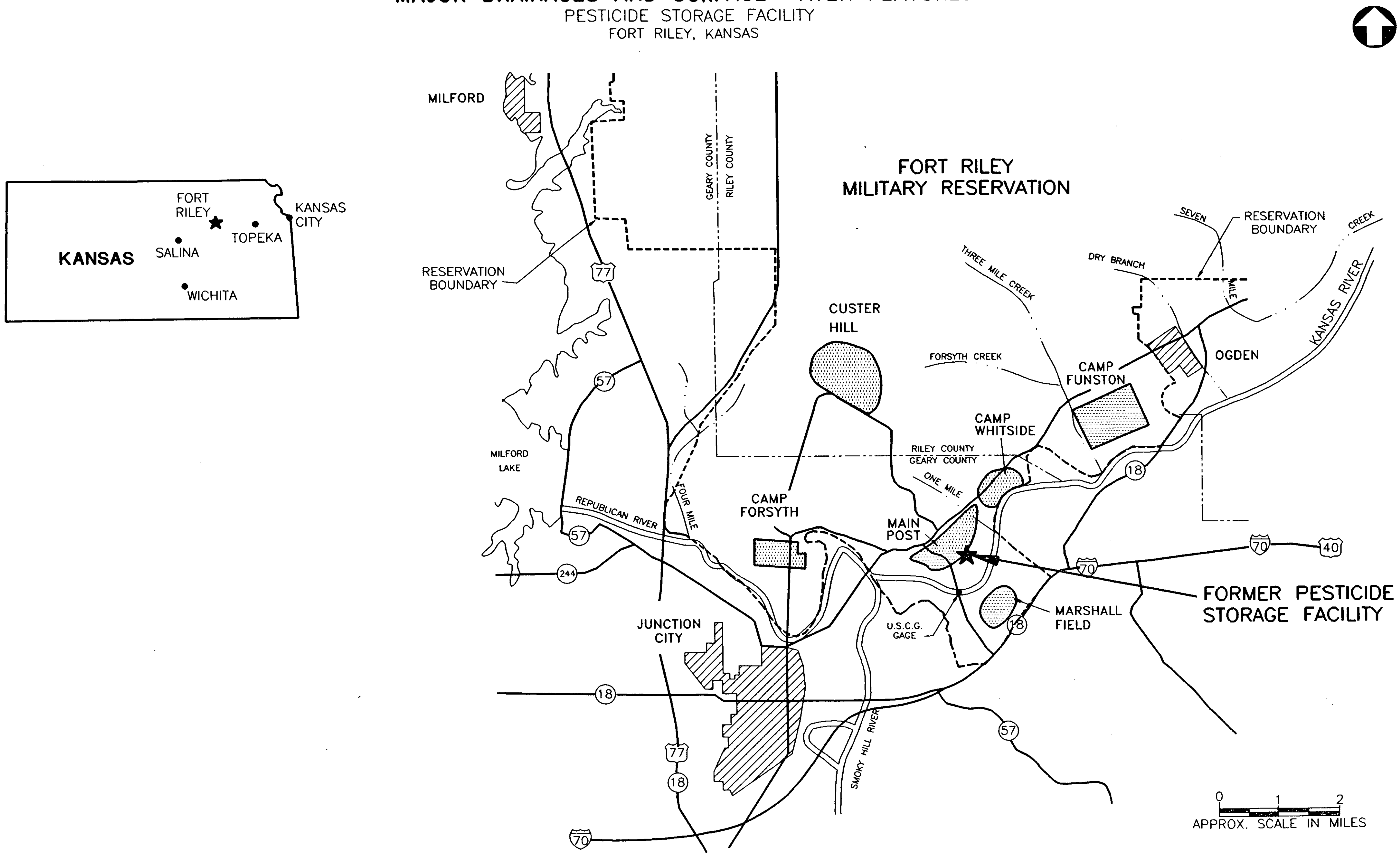


NOT TO SCALE

1531.49

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 3-1
MAJOR DRAINAGES AND SURFACE WATER FEATURES
PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



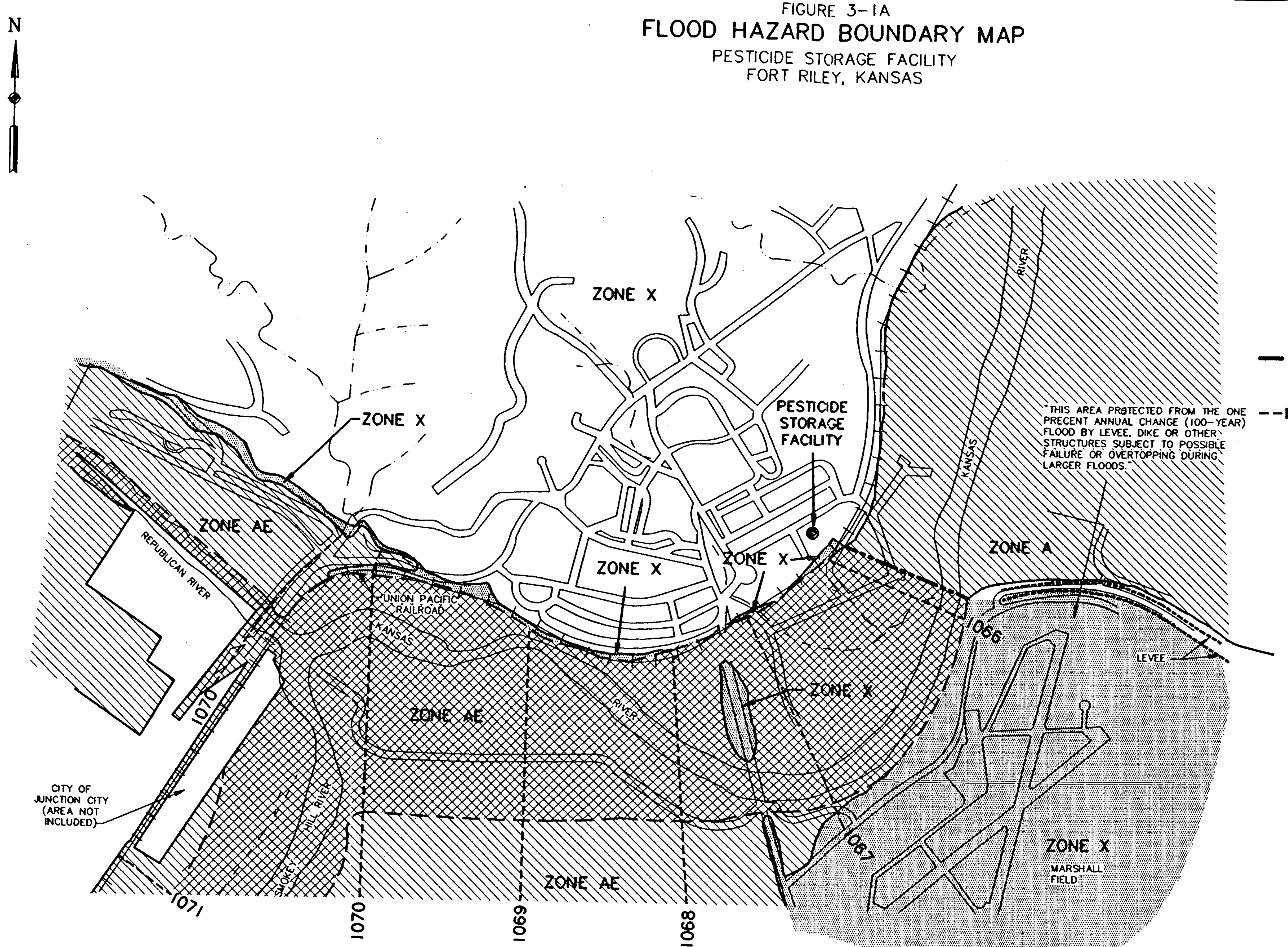
LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FILENAME: RILEY/PEST/FIG3-1.DWG

FIGURE 3–1A

FLOOD HAZARD BOUNDARY MAP

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD
ZONE A NO BASE FLOOD ELEV. DETERMINED
ZONE AE BASE FLOOD ELEV. DETERMINED

FLOODWAY AREA IN ZONE AE

OTHER FLOOD AREAS
ZONE X AREAS OF 500-YEAR FLOOD; AREAS OF 100 YEAR FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR DRAINAGE AREA LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 100-YEAR FLOOD

OTHER AREAS
ZONE X AREAS DETERMINED TO BE OUTSIDE 500-YEAR FLOOD PLAIN
ZONE D AREAS IN WHICH FLOOD HAZARDS ARE UNDETERMINED

BOUNDARY DIVIDING SPECIAL FLOOD HAZARD ZONES, AND BOUNDARY DIVIDING AREA OF DIFFENRENT COASTAL BASE FLOOD ELEVATIONS WITHIN SPECIAL FLOOD HAZARD ZONES

--1067-- BASE FLOOD ELEVATION LINE; ELEVATION IN FEET*

* REFERENCED TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929

NOTES

THIS MAP IS FOR USE IN ADMINISTERING THE NATIONAL FLOOD INSURANCE PROGRAM; IT DOES NOT NECESSARILY IDENTIFY ALL AREAS SUBJECT TO FLOODING PARTICULALY FROM LOCAL DRAINAGE SOURCES OF SMALL SIZES, OR ALL PLANIMETRIC FEATURES OUTSIDE SPECIAL FLOOD HAZARD AREAS.

CERTAIN AREAS NOT IN SPECIAL FLOOD HAZARD AREAS MAY BE PROTECTED BY FLOOD CONTROL STRUCTURES

BOUNDARIES OF THE FLOODWAYS WERE COMPUTED AT CROSS SECTIONS AND INTERPOLATED BETWEEN CROSS SECTIONS. THE FLOODWAYS WERE BASED ON HYDRAULIC CONSIDERATIONS WITH REGARD TO REQUIREMENTS OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY.

FLOODWAY WIDTHS IN SOME AREAS MAY BE TO NARROW TO SHOW TO SCALE. REFER TO FLOODWAY DATA TABLE WHERE FLOODWAY WIDTH IS SHOWN AT 1/20 INCH.

COASTAL BASE FLOOD ELEVATIONS APPLY ONLY LANDWARD OF THE SHORELINE

ELEVATION REFERENCE MARKS ARE DESCRIBED IN THE FLOOD INSURANCE STUDY REPORT.

CORPORATE LIMITS SHOWN ARE CURRENT AS OF THE DATE OF THIS MAP. THE USER SHOULD CONTACT APPROPRIATE COMMUNITY OFFICALS TO DETERMINE IF CORPORATE LIMITS HAVE CHANGED SUBSEQUENT TO THE ISSUANCE OF THIS MAP.

FOR ADJOINING PANELS, SEE SEPARATELY PRINTED MAP INDEX.

MAP REPOSITORY

COUNTY COURTHOUSE ANNEX, JUNCTION CITY, KANSAS (MAPS AVAILABLE FOR REFERENCE ONLY, NOT FOR DISTRIBUTION)

INITIAL IDENTIFICATION:
OCTOBER 18, 1977

FLOOD HAZARD BOUNDARY MAP REVISIONS:
FEBRUARY 20, 1979

FLOOD INSURANCE RATE MAP EFFECTIVE:
FEBRUARY 4, 1988

FLOOD INSURANCE RATE MAP REVISIONS:

SOURCE

FEDERAL EMERGENCY MANAGEMENT AGENCY
PANEL NUMBER 200579-0055C
FEB. 4, 1988

0 1600 3200
SCALE IN FEET

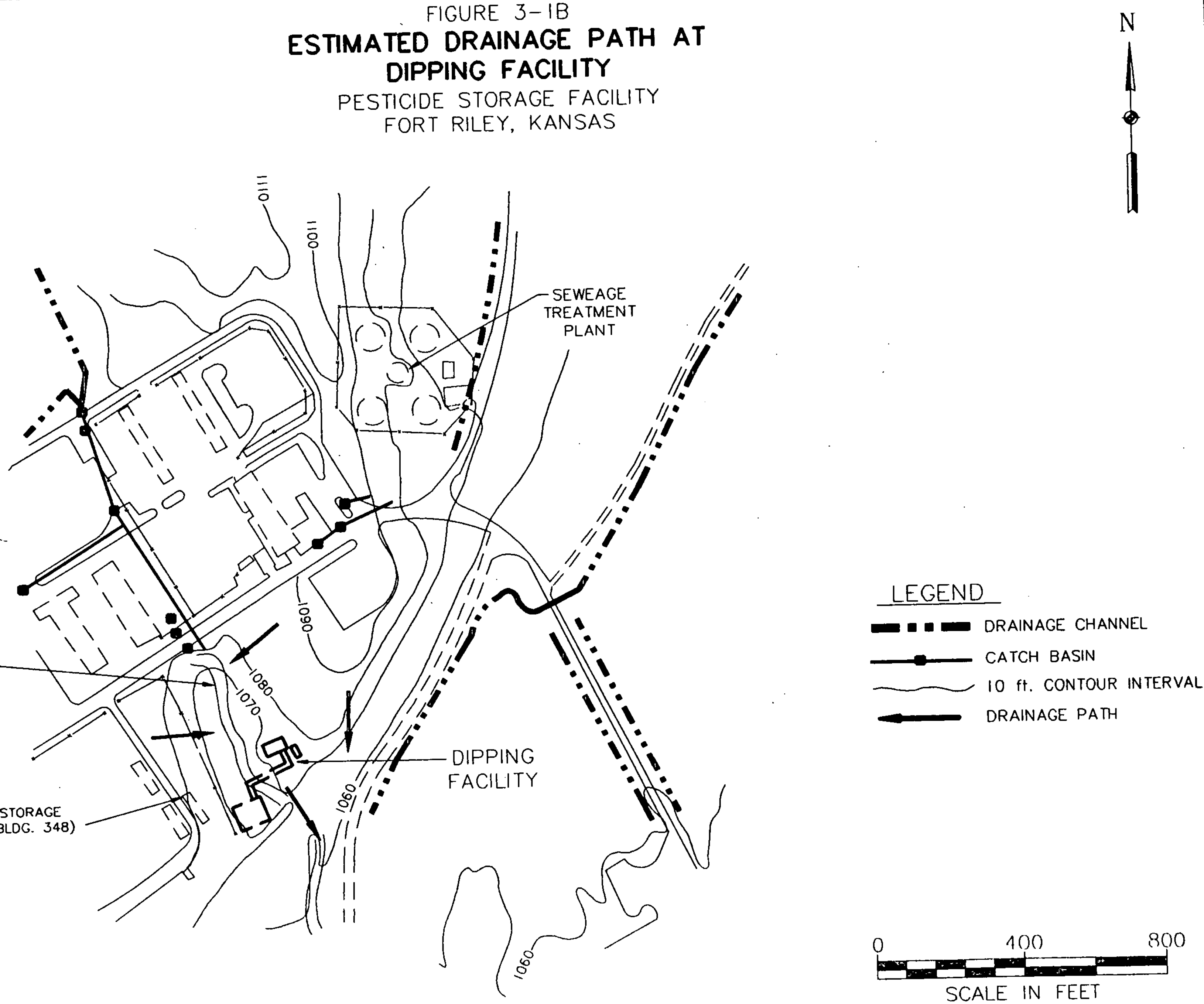
LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

filename: /riley/pest/floodmap.dwg

FIGURE 3-1B

ESTIMATED DRAINAGE PATH AT DIPPING FACILITY

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



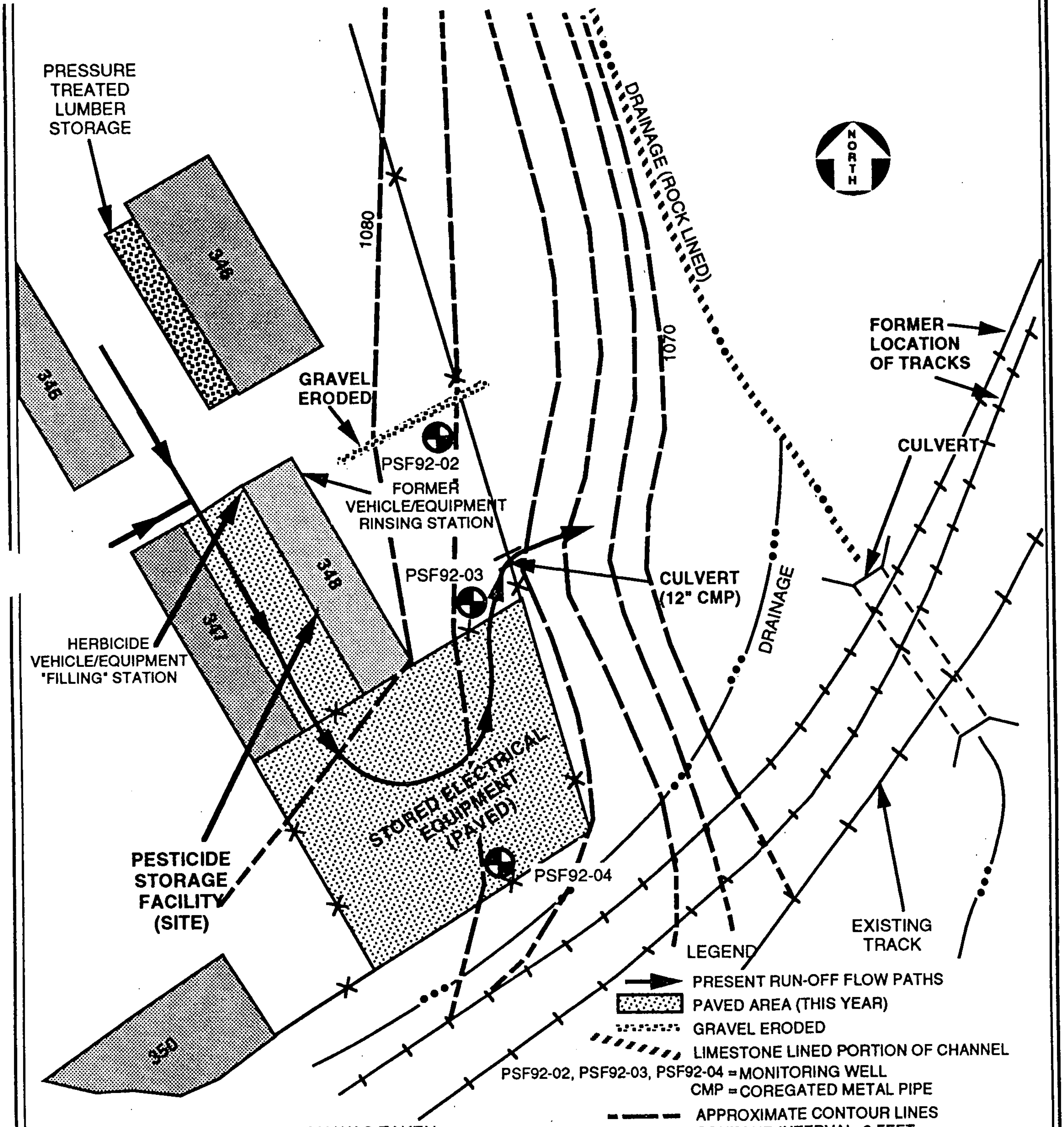
LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

filename: riley/pest/fig3-1b.dwg

FIGURE 3-2

OBSERVED PATH OF SURFACE WATER RUNOFF

FORT RILEY, KANSAS

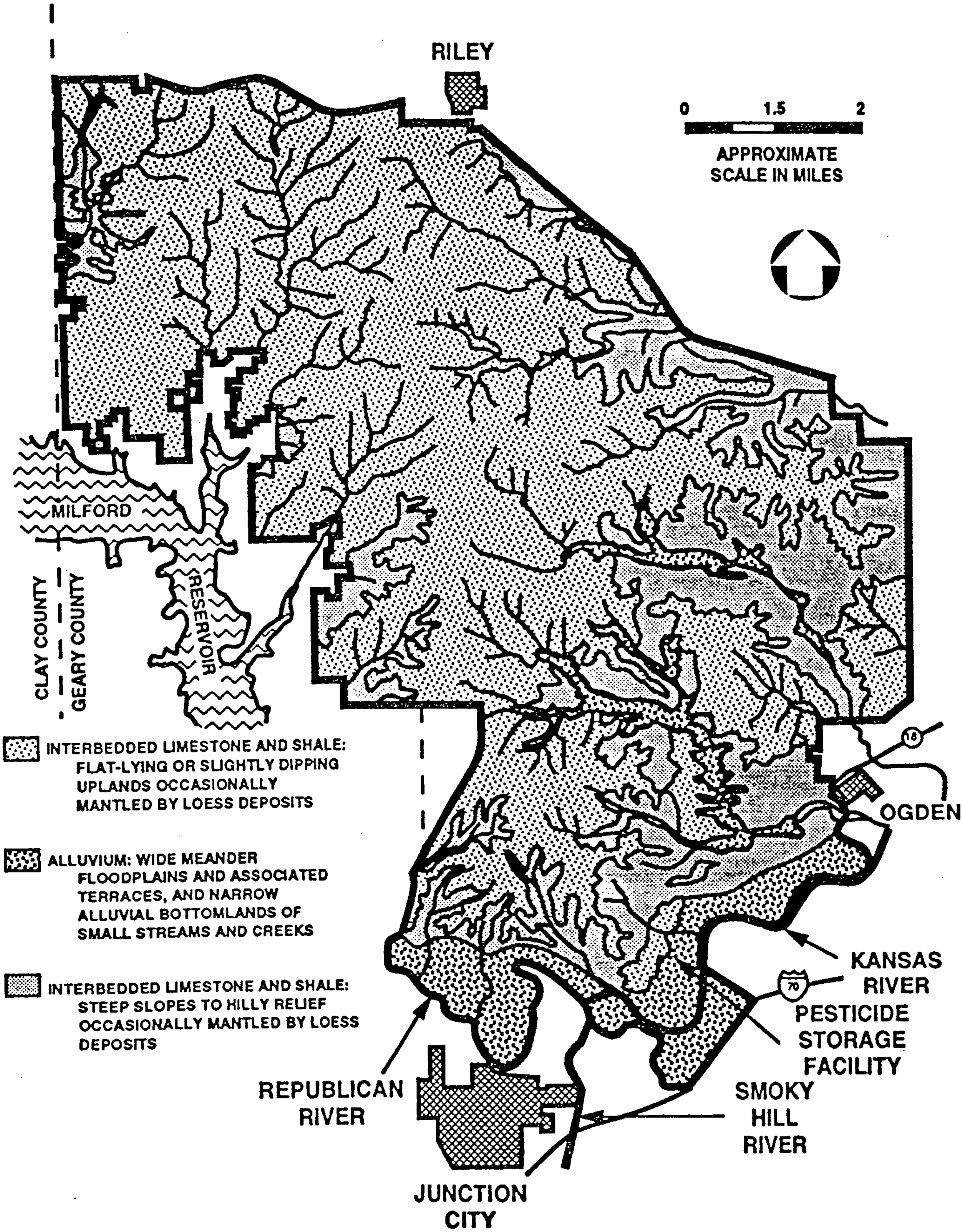


NOTE: OBSERVATION WAS TAKEN AT PSF, 23 JULY 92, ~0900 HRS DURING HEAVY RAIN (IRP MANAGER 1992)

1531.49

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

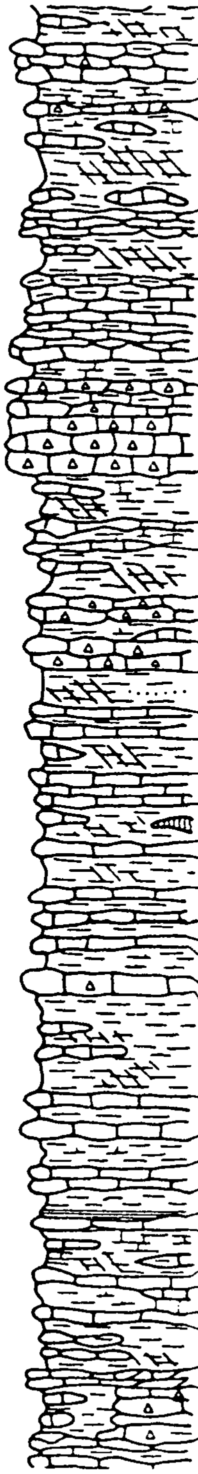
FIGURE 3-3
GEOLOGIC MAP OF FORT RILEY
FORT RILEY, KANSAS



SOURCE: USAETL, TERRAIN ANALYSIS CENTER, 1977.

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES BRANCH

FIGURE 3-4
GENERAL STRATIGRAPHIC SEQUENCE-ROCK COLUMN
FORT RILEY, KANSAS



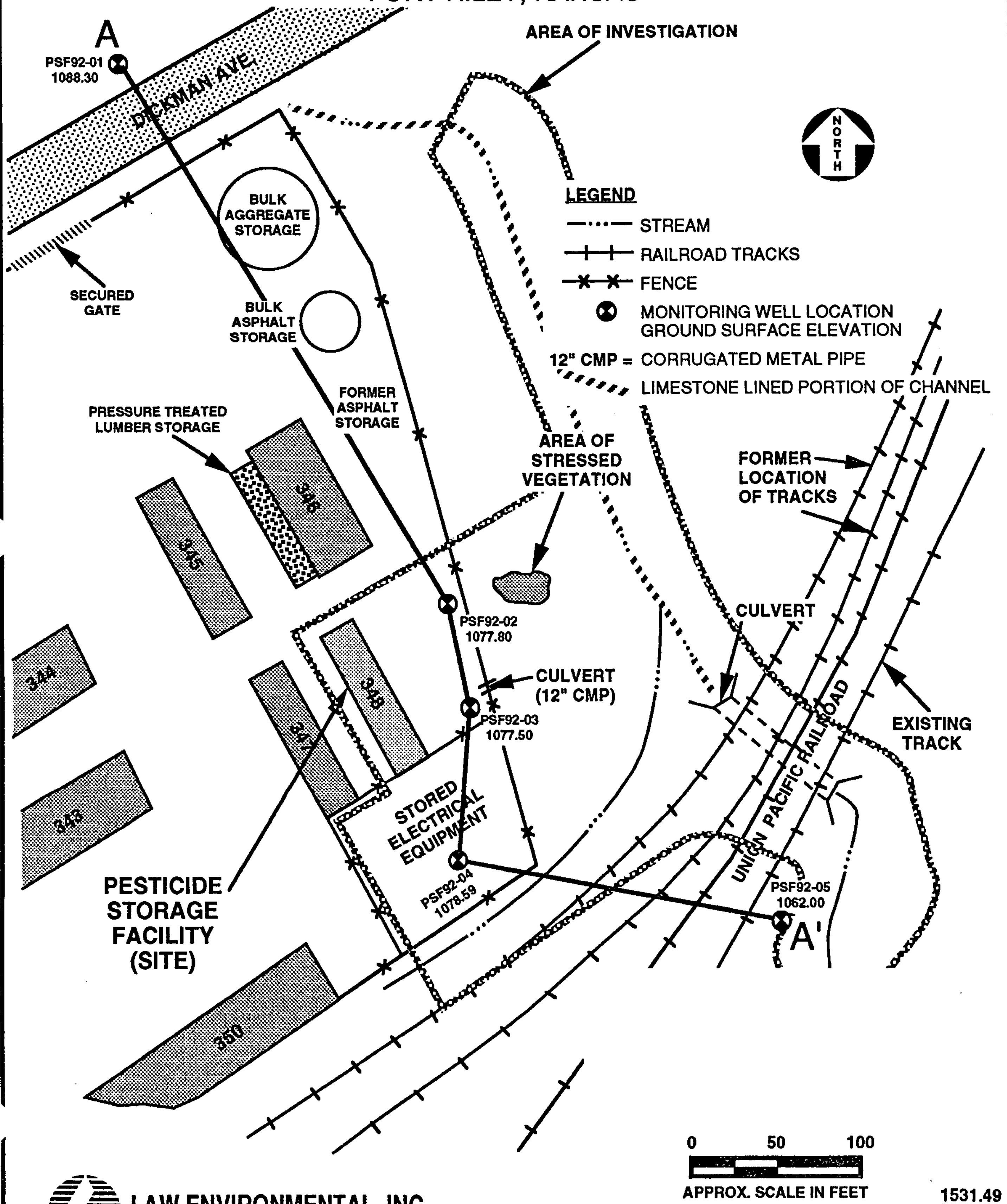
MEMBERS	FORMATIONS	Group	Stage	Series	System
	Odell Shale	Chase Group	GEARYAN STAGE	LOWER PERMIAN SERIES	PERMIAN SYSTEM
Cresswell Ls. Mbr.	Winfield Limestone				
Grant Shale Member					
Stovall Limestone Mbr.					
Gage Shale Member	Doyle Shale				
Towanda Limestone Mbr.					
Holmesville Sh. Mbr.					
Fort Riley Ls. Mbr.	Barneston Limestone				
Oketo Shale Member					
Florence Ls. Mbr.					
Blue Springs Sh. Mbr.	Matfield Shale				
Kinney Limestone Mbr.					
Wymore Shale Member					
Schroyer Ls. Mbr.	Wreford Limestone				
Havensville Shale Mbr.					
Threemile Ls. Mbr.					
	Speiser Shale	Council Grove Group			
	Funston Limestone				
	Blue Rapids Shale				
	Crouse Limestone				
	Easly Creek Shale				
Middleburg Ls. Mbr.	Bader Limestone				
Hooser Shale Member					
Eiss Limestone Member					
	Stearns Shale				
Morrill Limestone Mbr.	Beattie Limestone				
Florena Shale Member					
Cottonwood Ls. Mbr.					
	Eskridge Shale				
Neva Limestone Mbr.	Grenola Limestone				
Salem Point Shale Mbr.					
Burr Limestone Mbr					
Legion Shale Member					
Sallyards Ls. Mbr.					
	Roca Shale				
Howe Limestone Member	Red Eagle Limestone				
Bennett Shale Member					
Glenrock Ls. Mbr.					
	Johnson Shale				
Long Creek Ls. Mbr.	Foraker Limestone				
Hughes Creek Sh Mbr					
Americus Ls Mbr					

SOURCE: ZELLER, 1968

FIGURE 3-5

LOCATION OF GEOLOGIC CROSS SECTION

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS

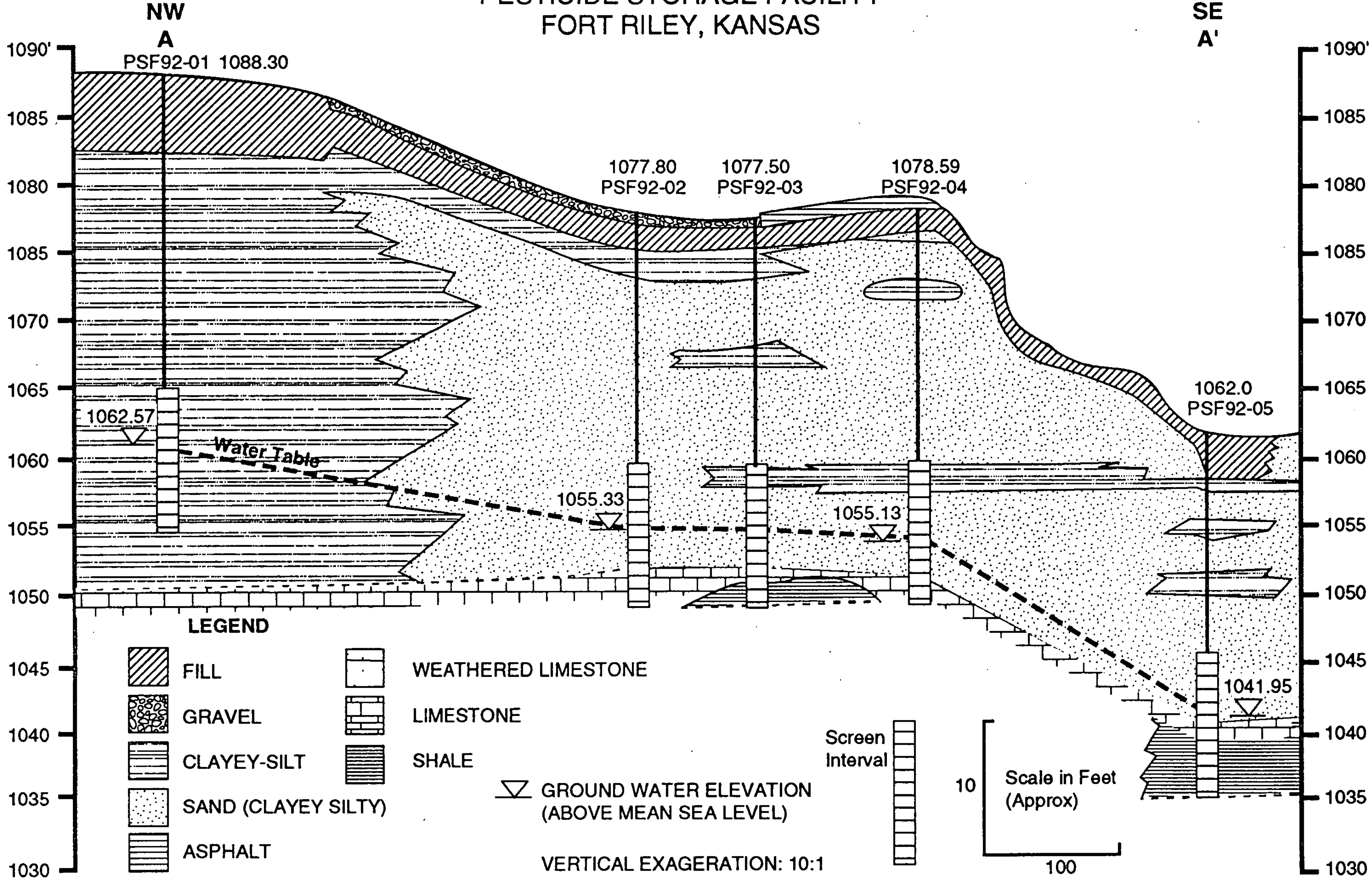


LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 3-5a

GEOLOGIC CROSS SECTION A-A'

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



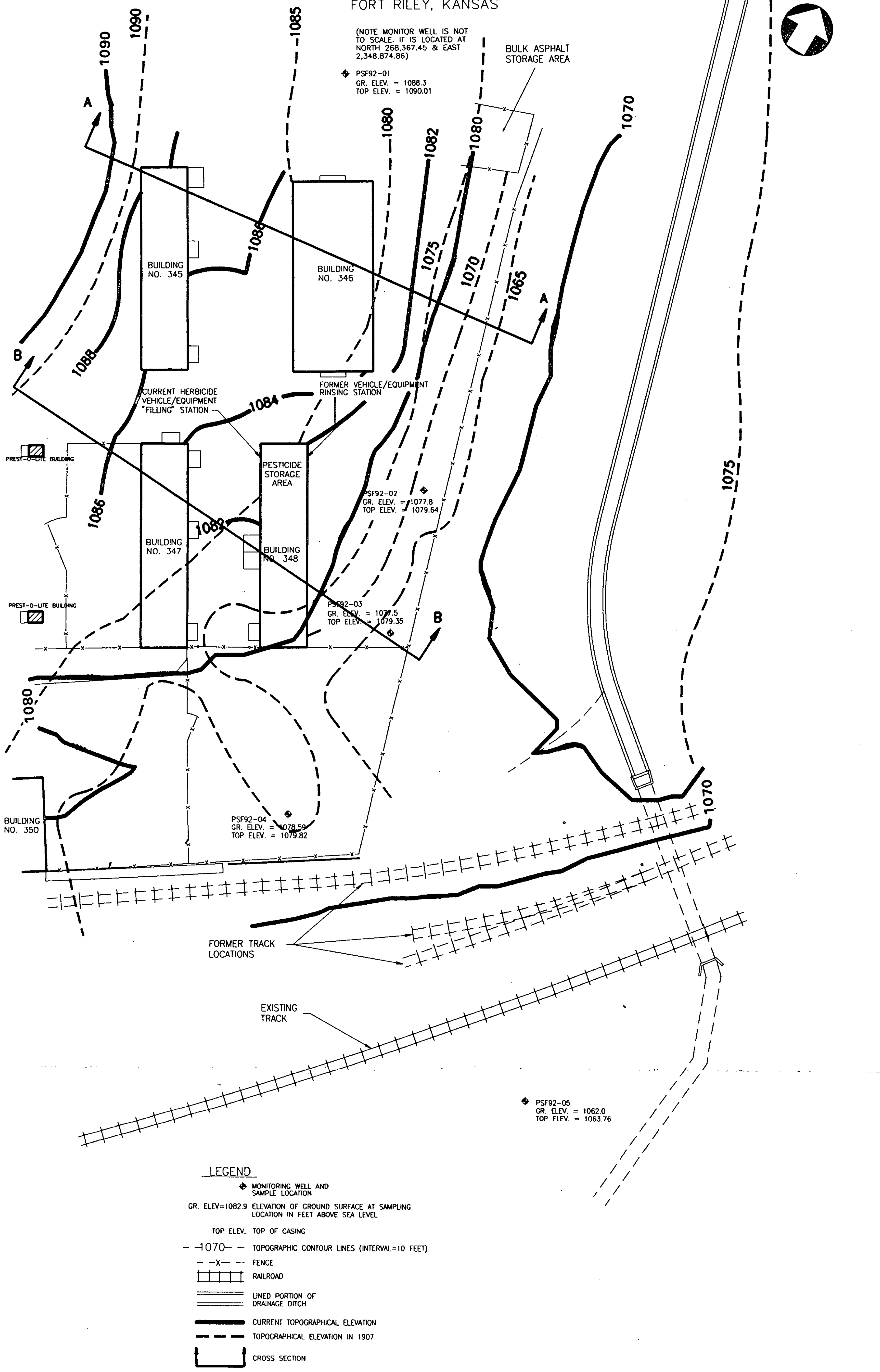
1531.49

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 3-5B

CONTOUR ELEVATIONS OF 1907 vs. CURRENT TOPOGRAPHY

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



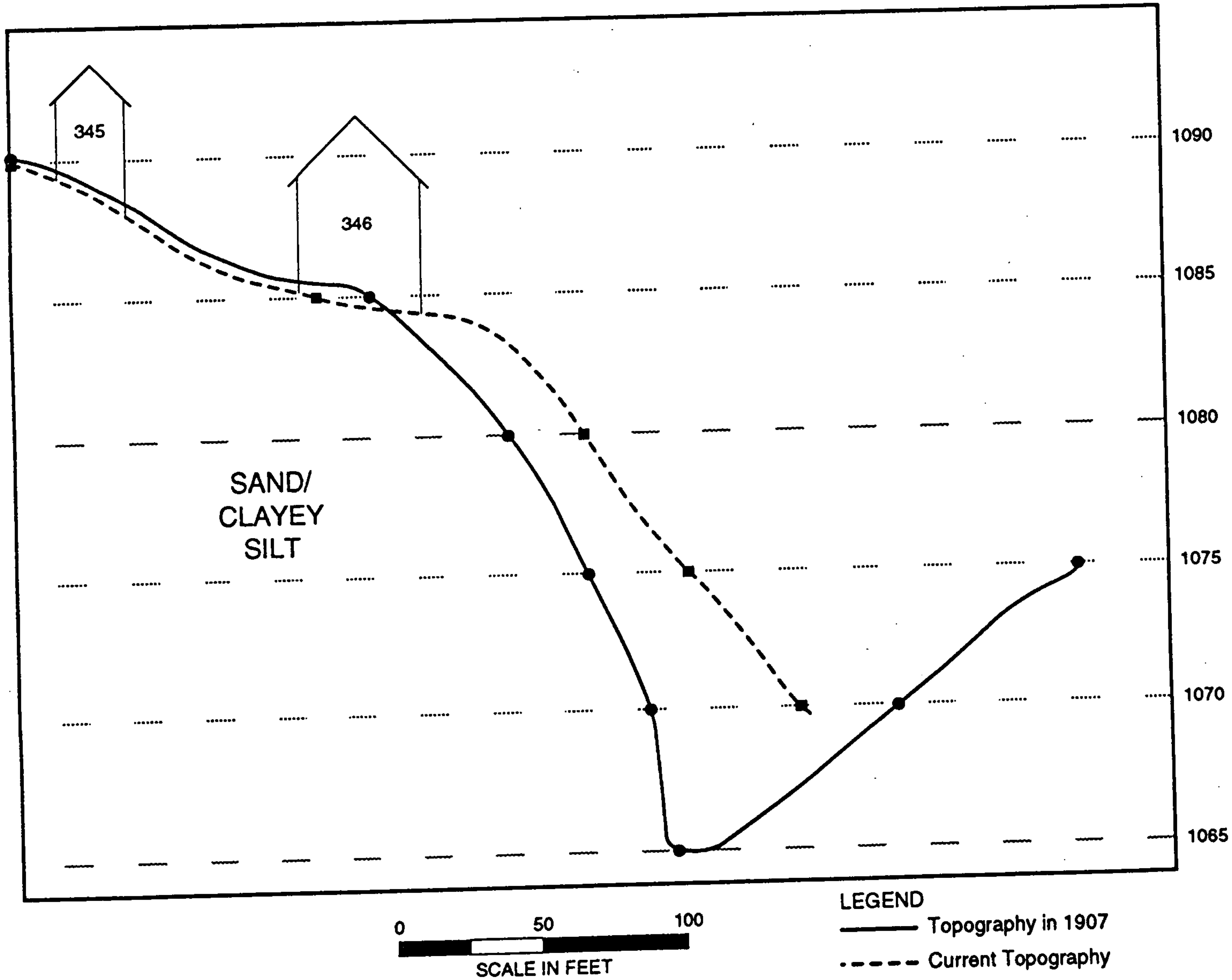
filename: FT-RILEY\FIG3-5B.DWG

LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FIGURE 3-5C

COMPARISON OF FILL ACTIVITY - CROSS SECTION A-A'

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



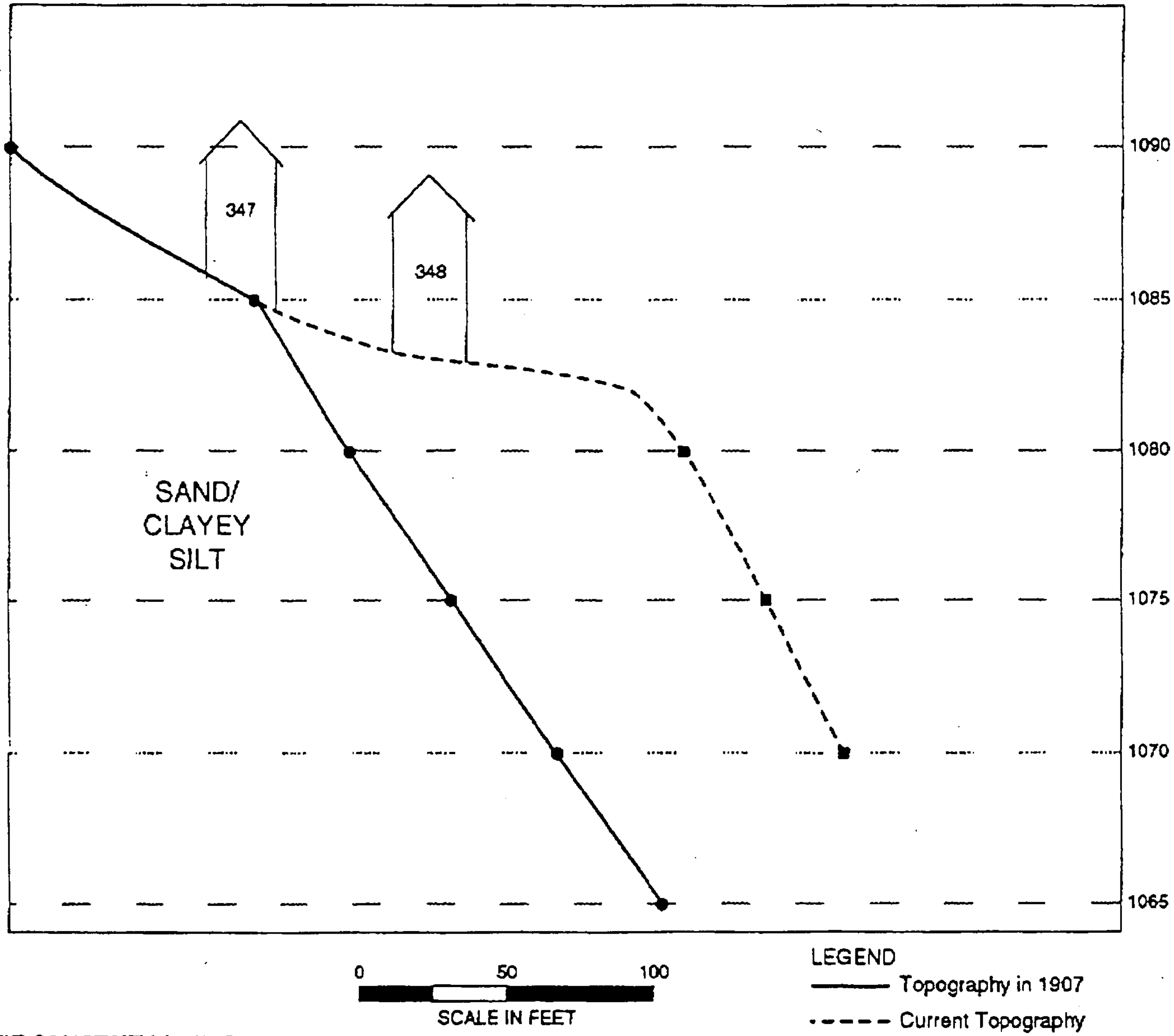
1531.49

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 3-5D

COMPARISON OF FILL ACTIVITY - CROSS SECTION B-B

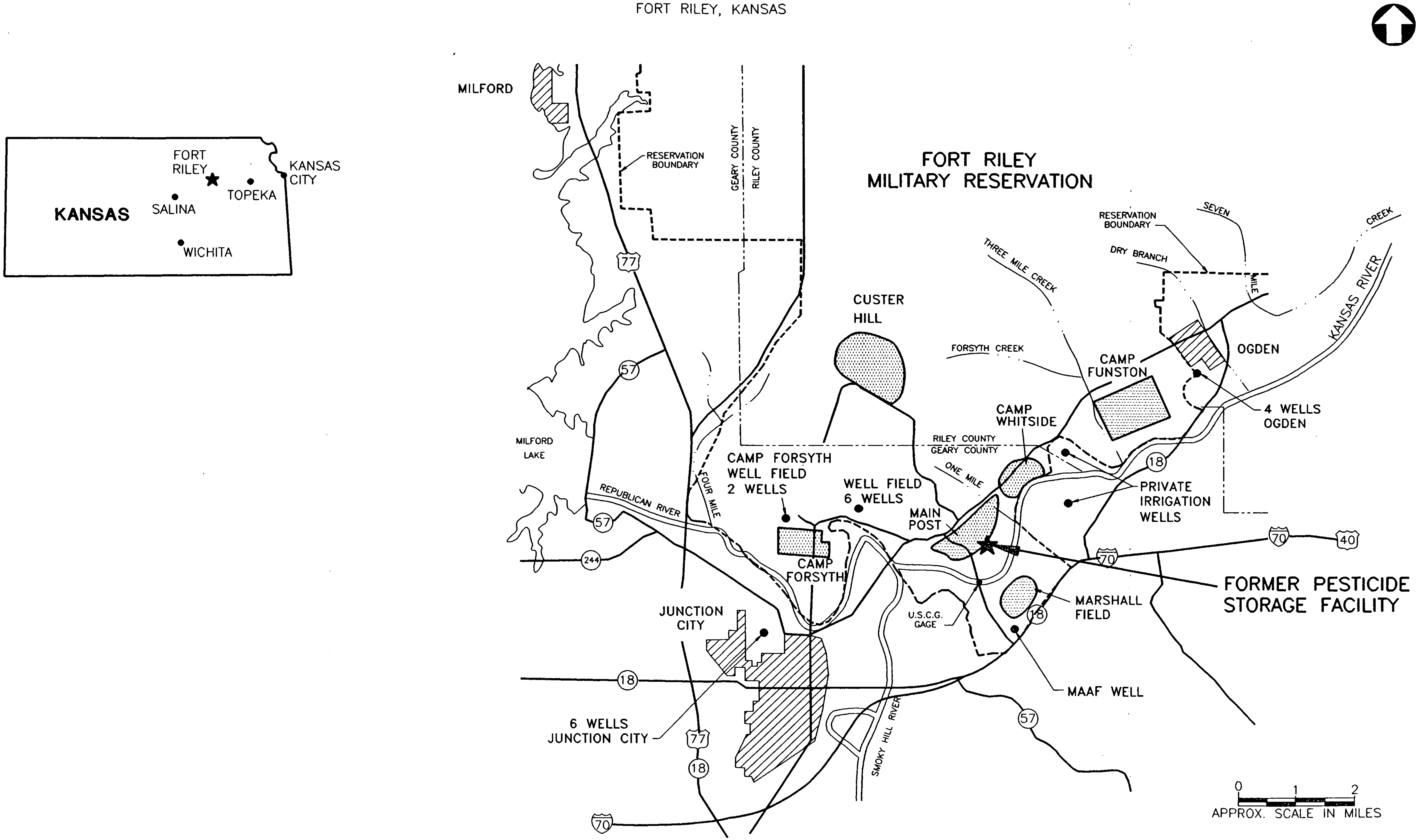
PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



1531.49

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 3-6
SUPPLY WELL LOCATIONS NEAR PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



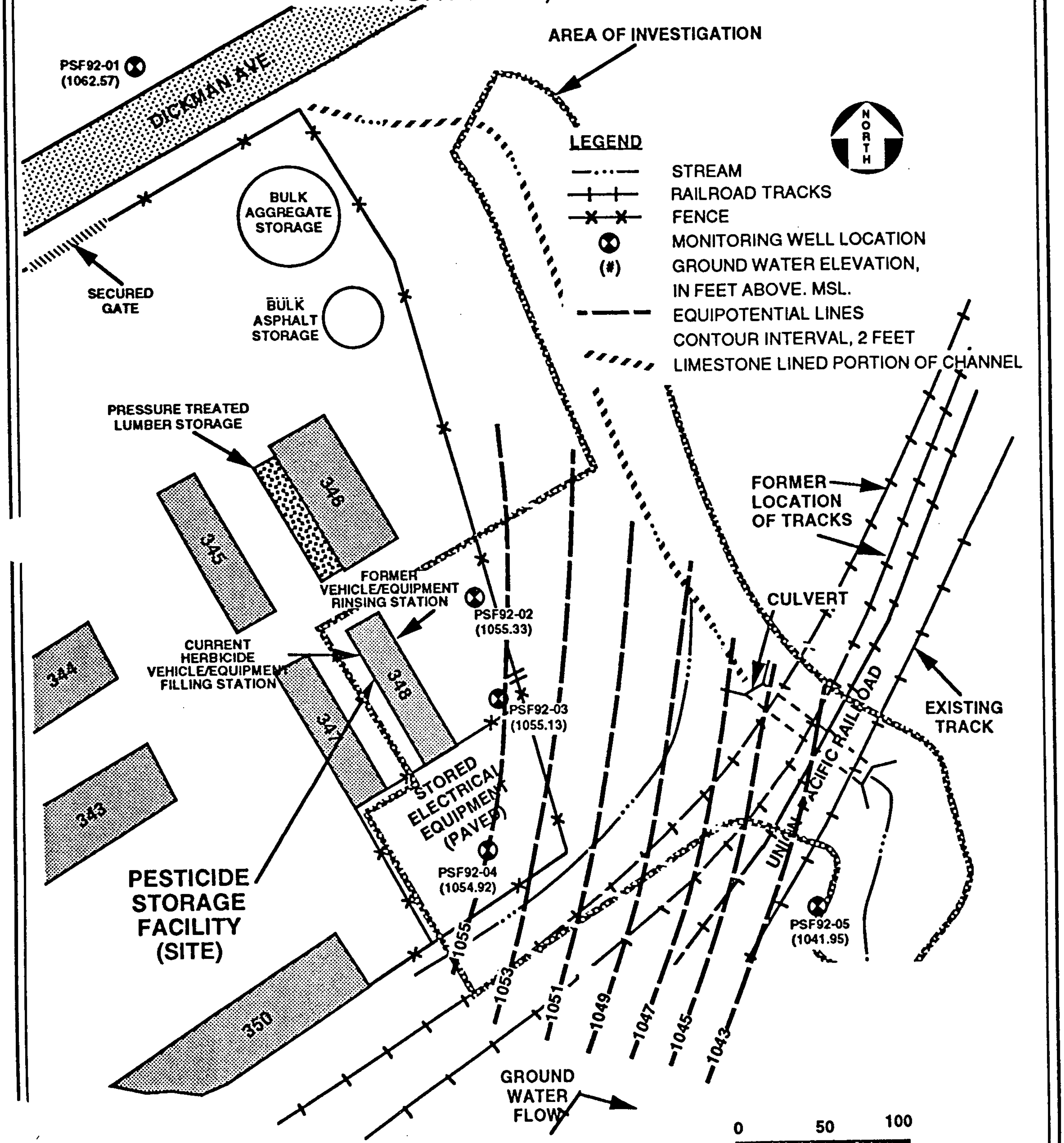
LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES DIVISION

FILENAME: RILEY/PEST/FIG3-6.DWG

FIGURE 3-7

POTENTIOMETRIC SURFACE MAP, DEC. 1992

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS

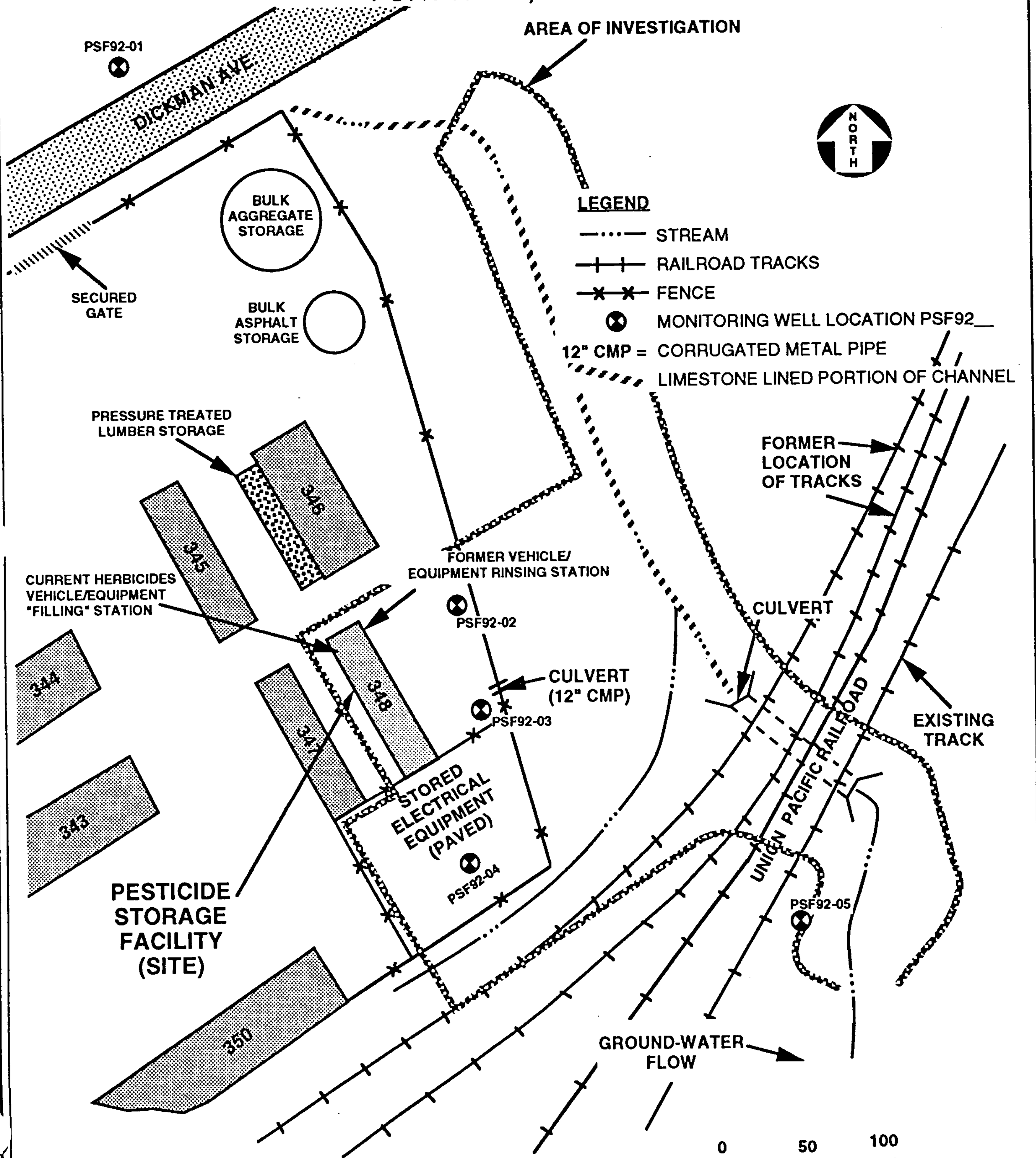


LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 4-1

MONITORING WELL LOCATIONS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



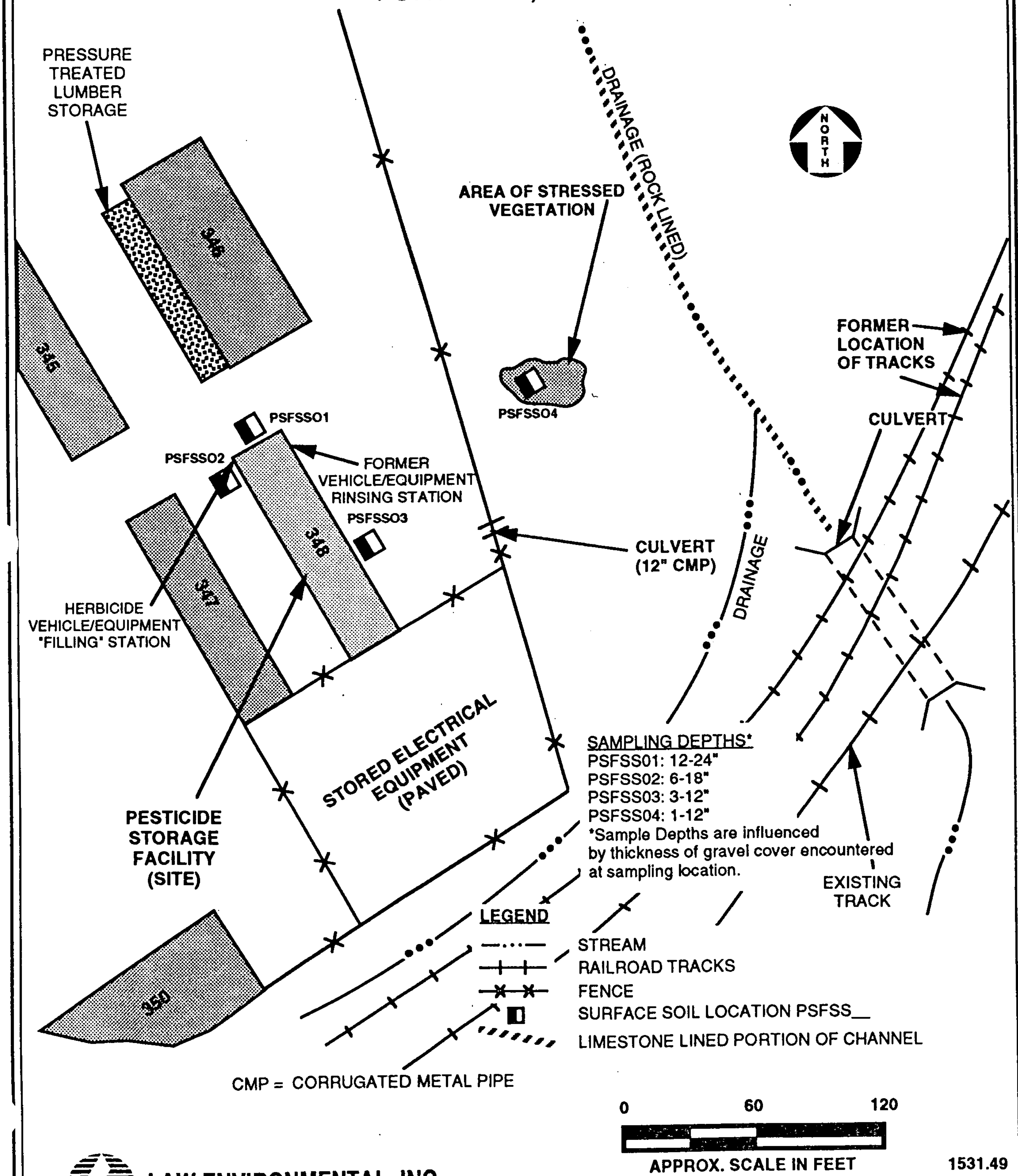
1531.49

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 4-2

SURFACE SOIL SAMPLE LOCATIONS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



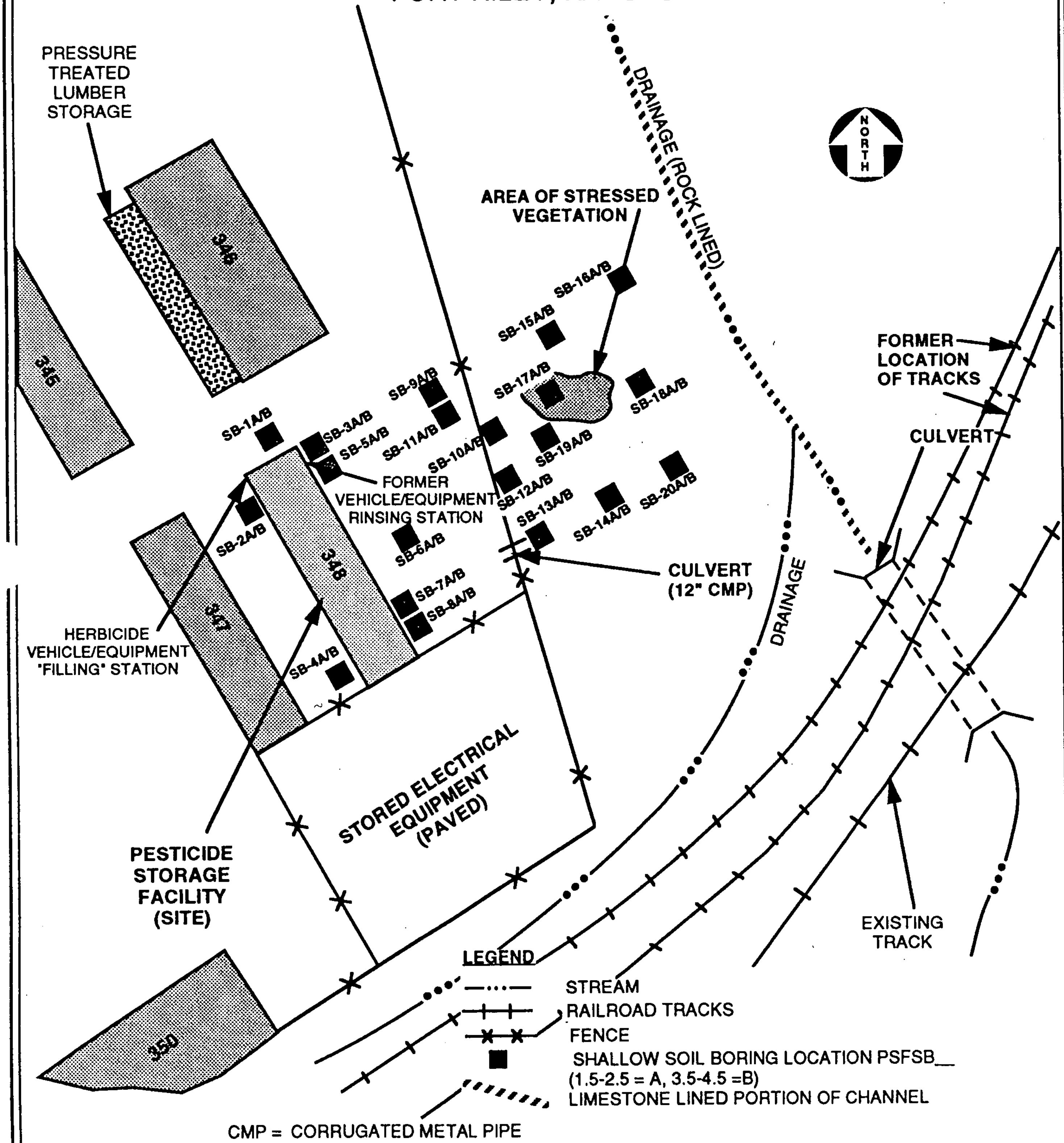
1531.49

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 4-3

SHALLOW SOIL BORING SAMPLE LOCATIONS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



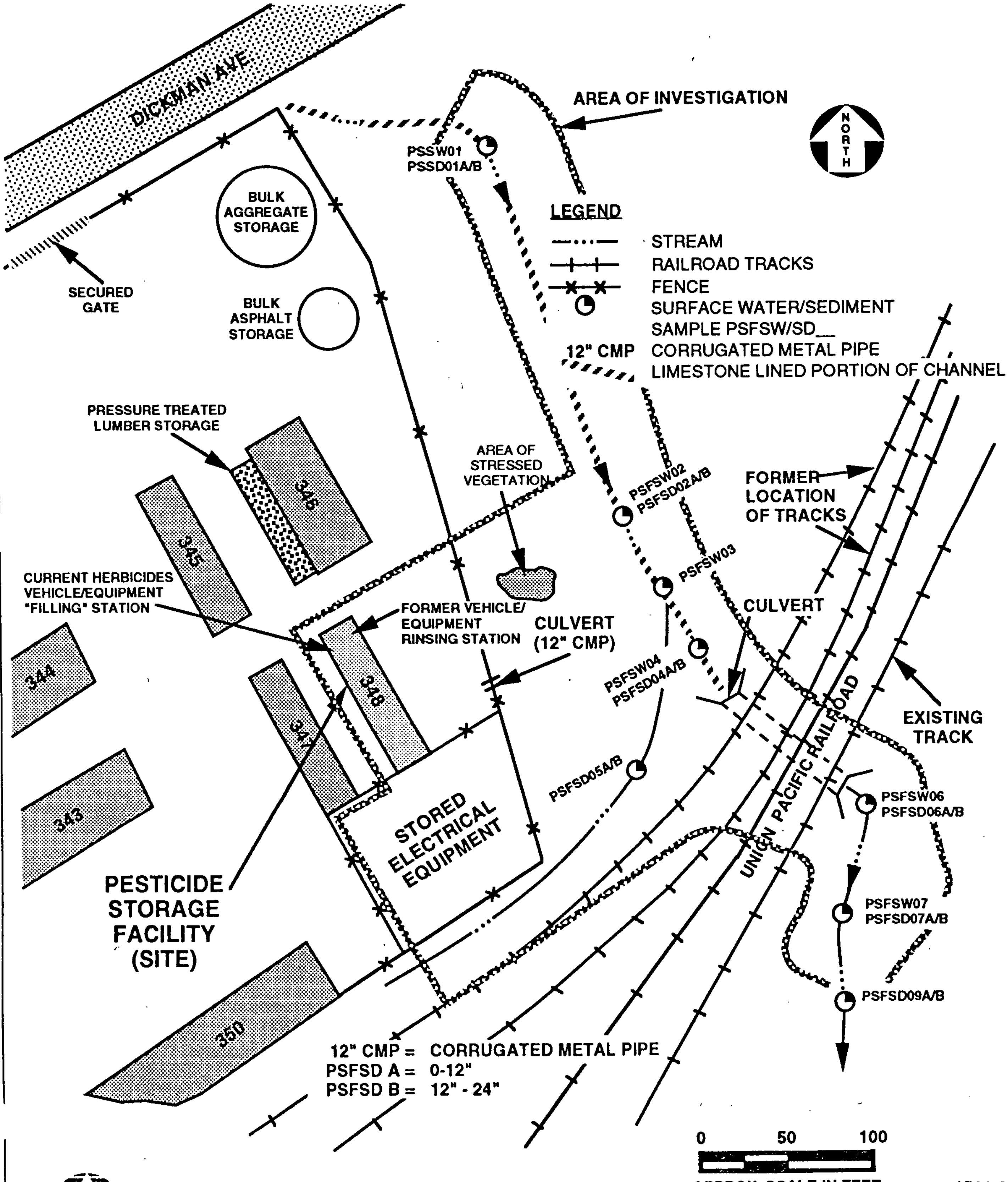
1531.49

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 4-4

SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



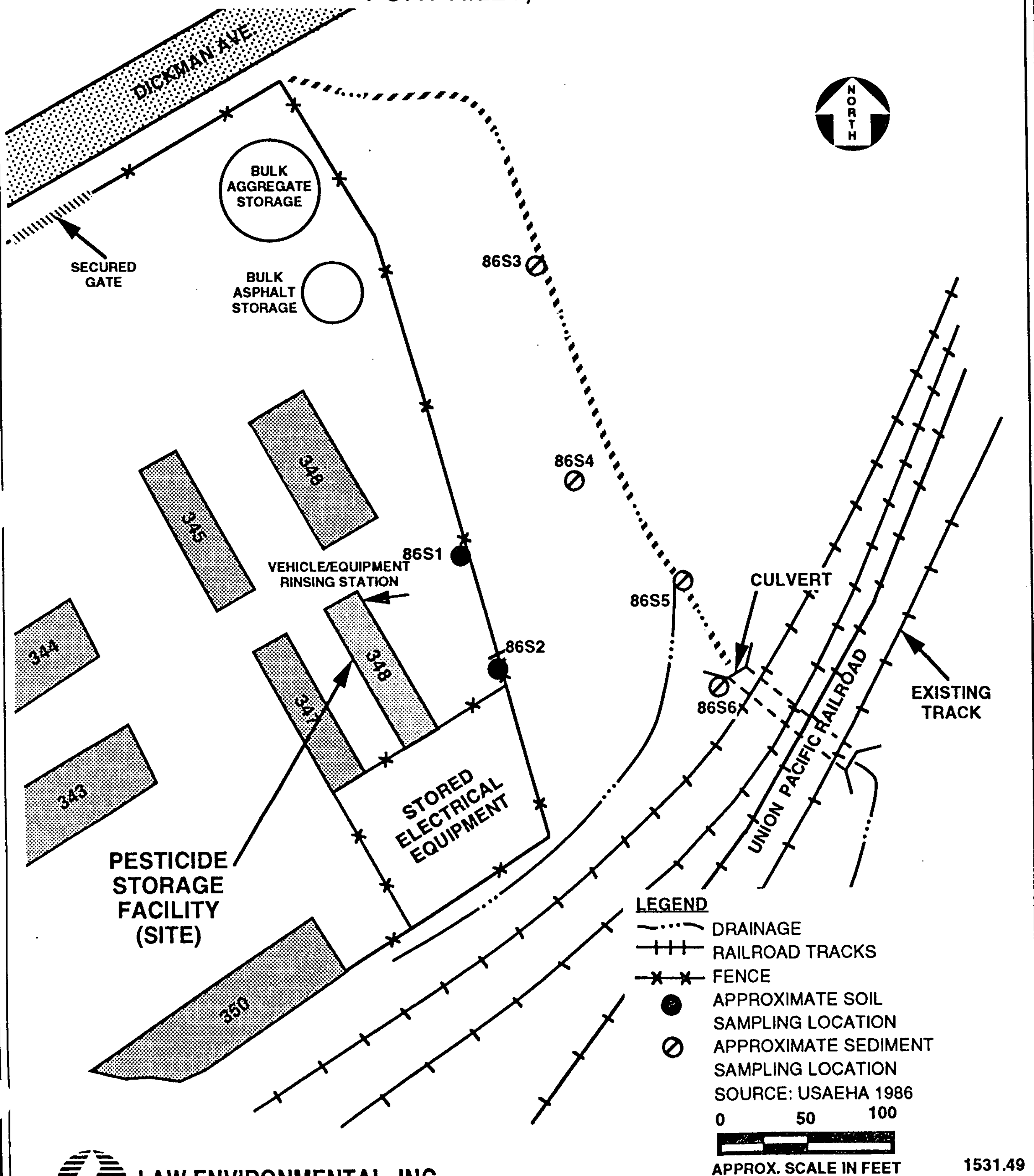
1531.49

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 4-5

USAEHA APPROXIMATE SOIL/SEDIMENT SAMPLING LOCATIONS, MAY 1986

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS

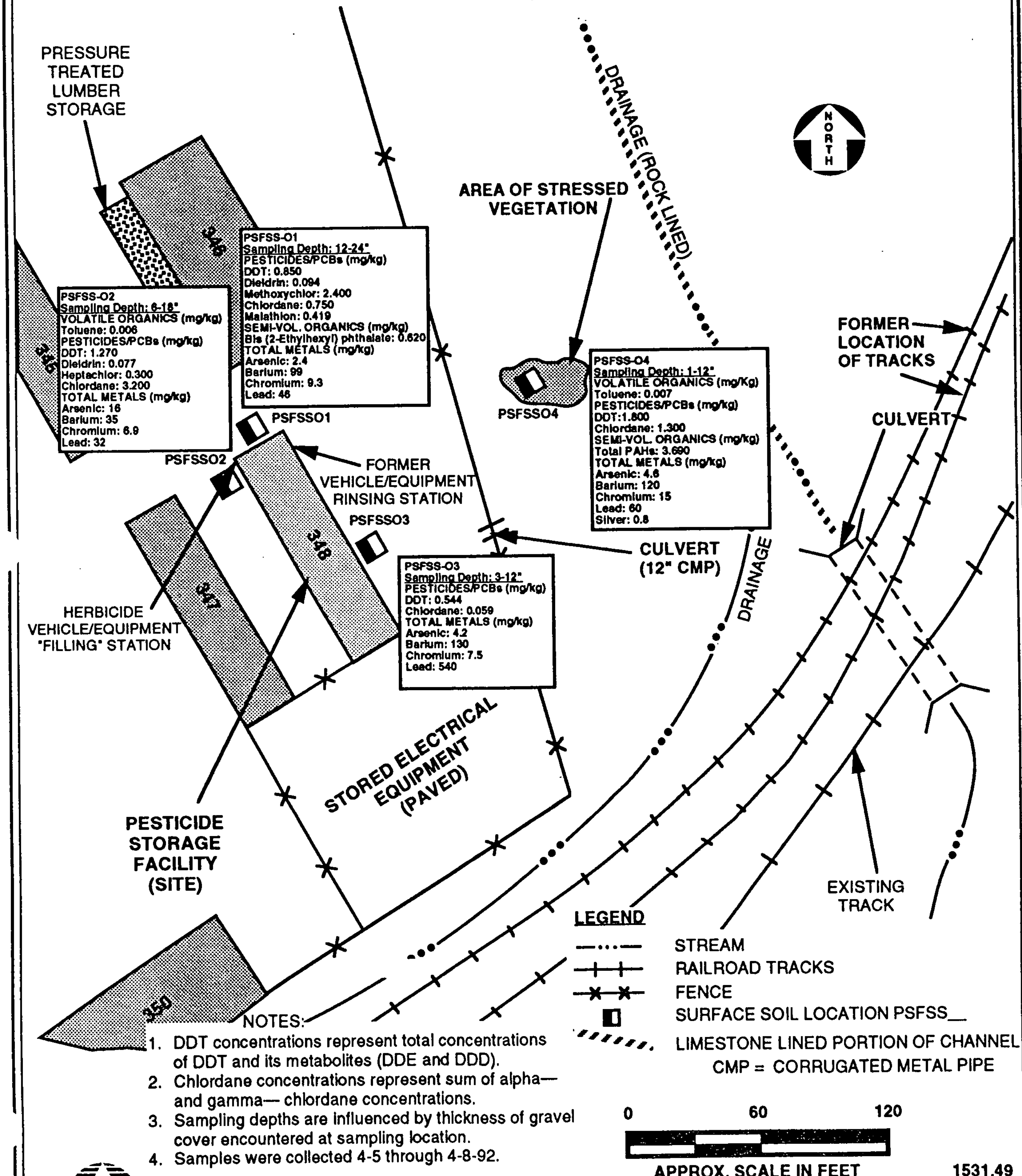


LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 4-6

SURFACE SOIL SAMPLE LOCATIONS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS



NOTES:

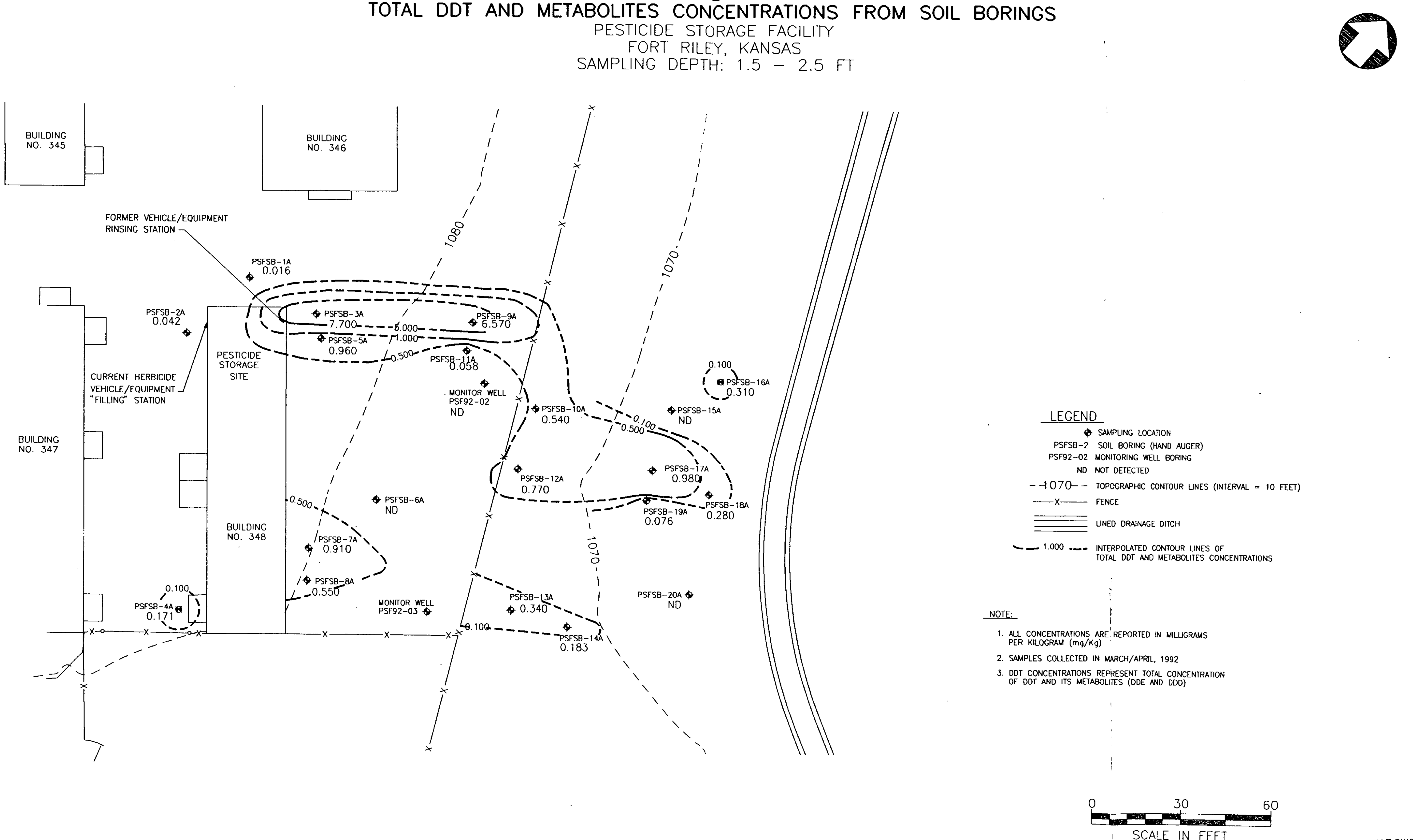
1. DDT concentrations represent total concentrations of DDT and its metabolites (DDE and DDD).
2. Chlordane concentrations represent sum of alpha— and gamma— chlordane concentrations.
3. Sampling depths are influenced by thickness of gravel cover encountered at sampling location.
4. Samples were collected 4-5 through 4-8-92.

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

FIGURE 4-7

TOTAL DDT AND METABOLITES CONCENTRATIONS FROM SOIL BORINGS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS
SAMPLING DEPTH: 1.5 – 2.5 FT



NOTE:

1. ALL CONCENTRATIONS ARE REPORTED IN MILLIGRAMS PER KILOGRAM (mg/Kg)
2. SAMPLES COLLECTED IN MARCH/APRIL, 1992
3. DDT CONCENTRATIONS REPRESENT TOTAL CONCENTRATION OF DDT AND ITS METABOLITES (DDE AND DDD)

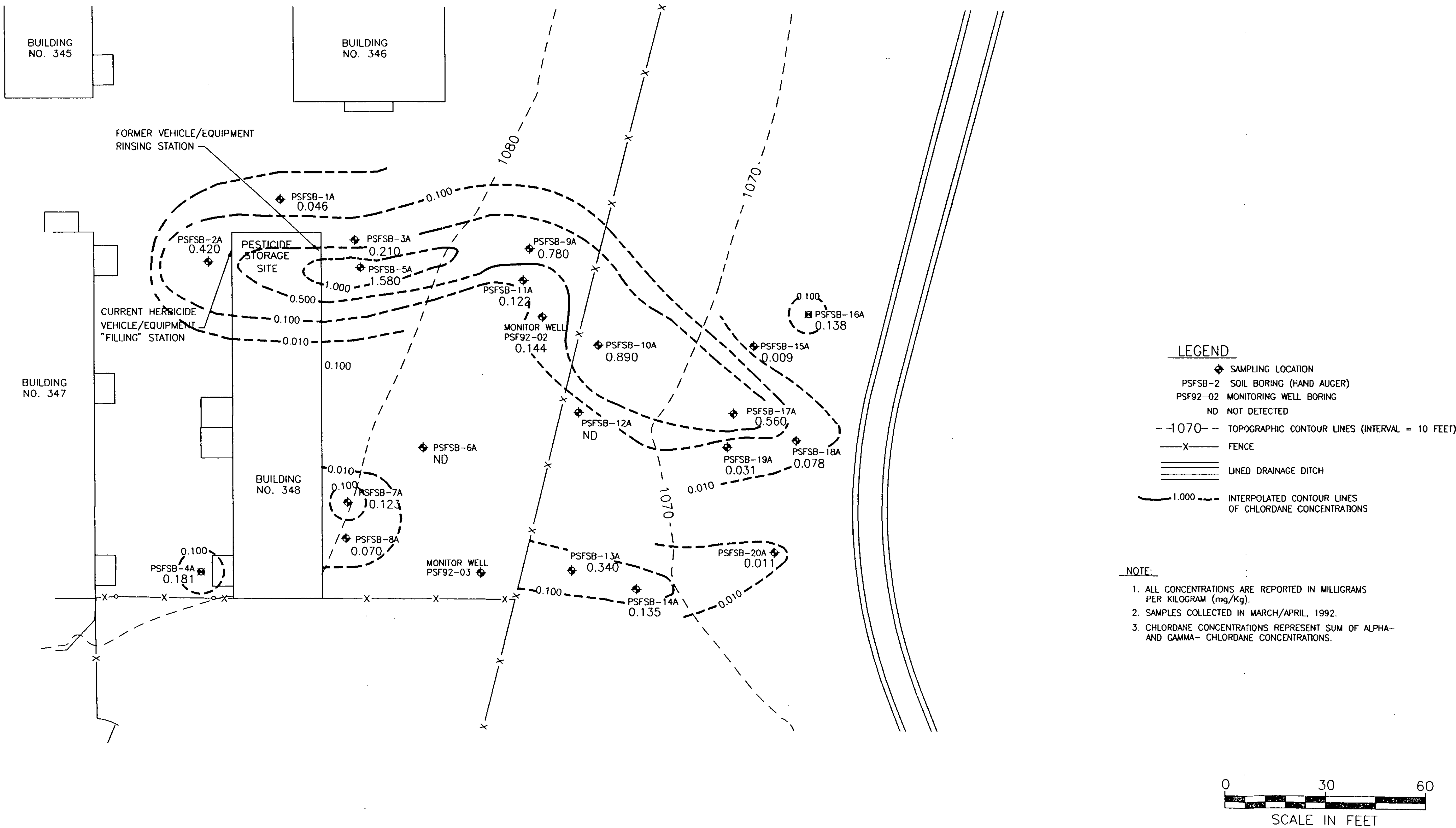
FILENAME: 11X17.DWG
LAYER: DDTCO-25

LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FIGURE 4-8

TOTAL CHLORDANE CONCENTRATIONS FROM SOIL BORINGS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS
SAMPLING DEPTH: 1.5 – 2.5 FT.



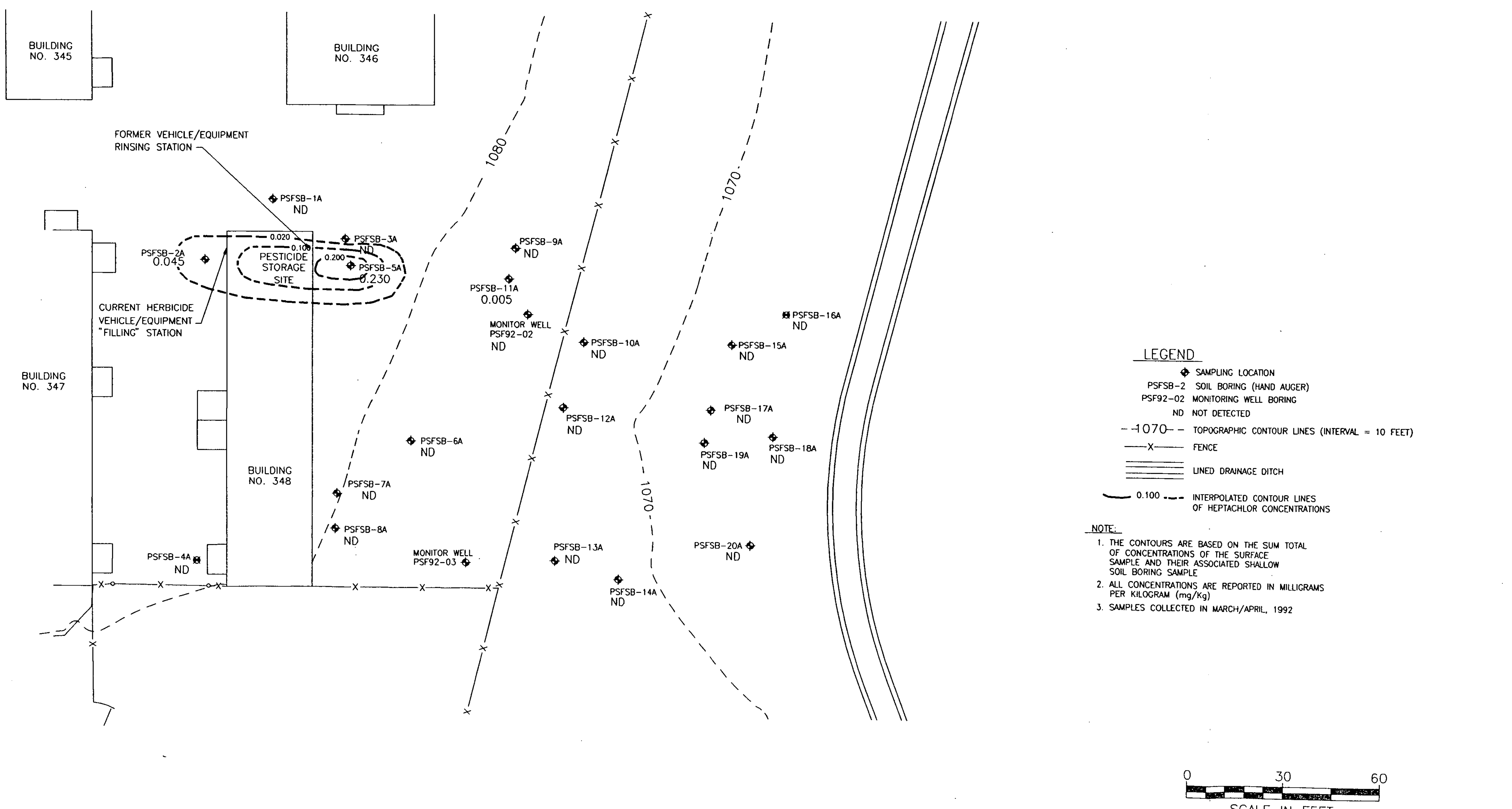
FILENAME: 11X17.DWG
LAYER: CCO-25

LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FIGURE 4-9

HEPTACHLOR CONCENTRATIONS FROM SOIL BORINGS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS
SAMPLING DEPTH: 1.5 – 2.5 FT



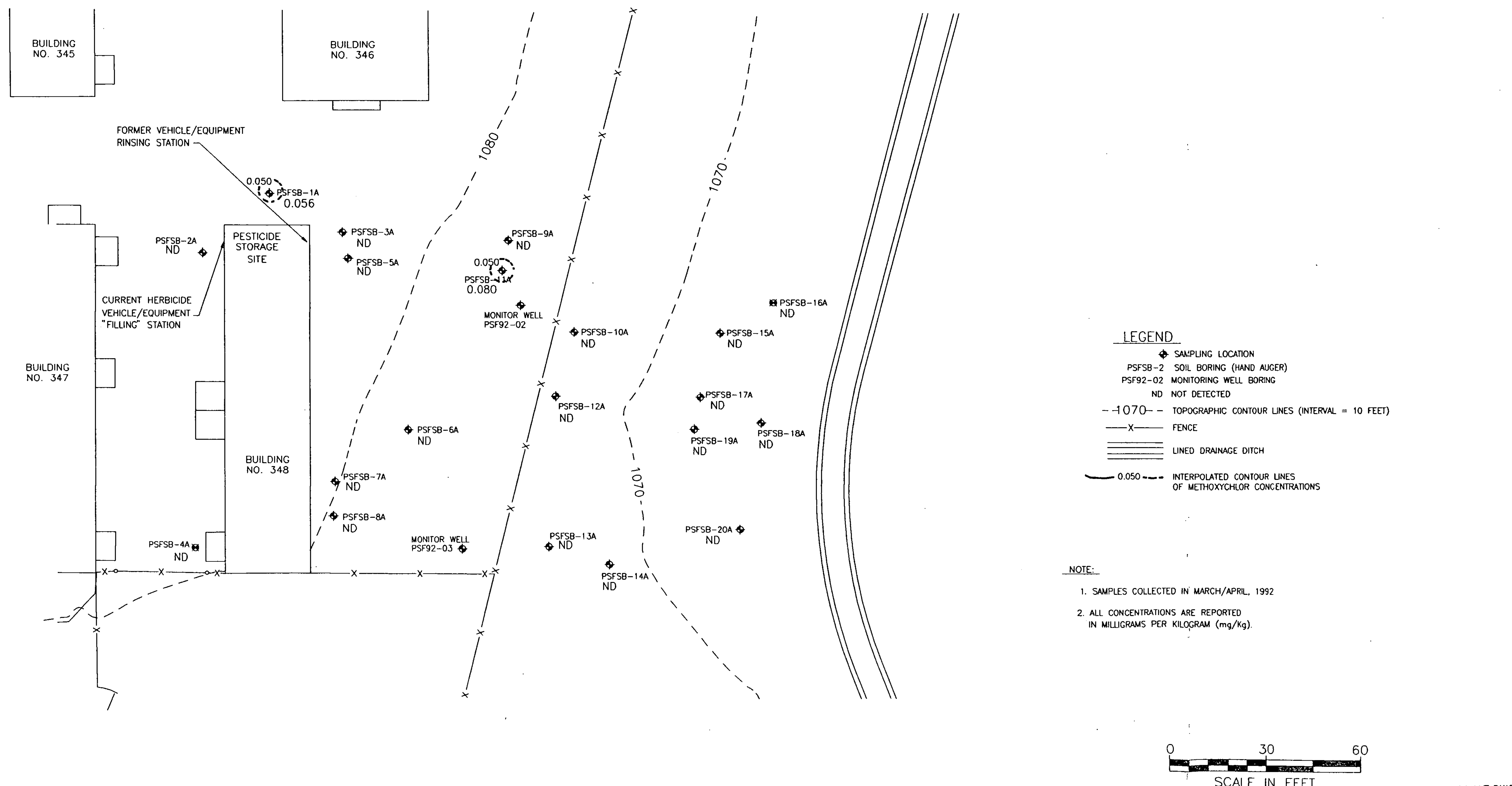
LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FILENAME: 11X17.DWG
LAYER: HEPTCO-25

FIGURE 4-10

METHOXYCHLOR CONCENTRATIONS FROM SOIL BORINGS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS
SAMPLING DEPTH: 1.5 – 2.5 FT



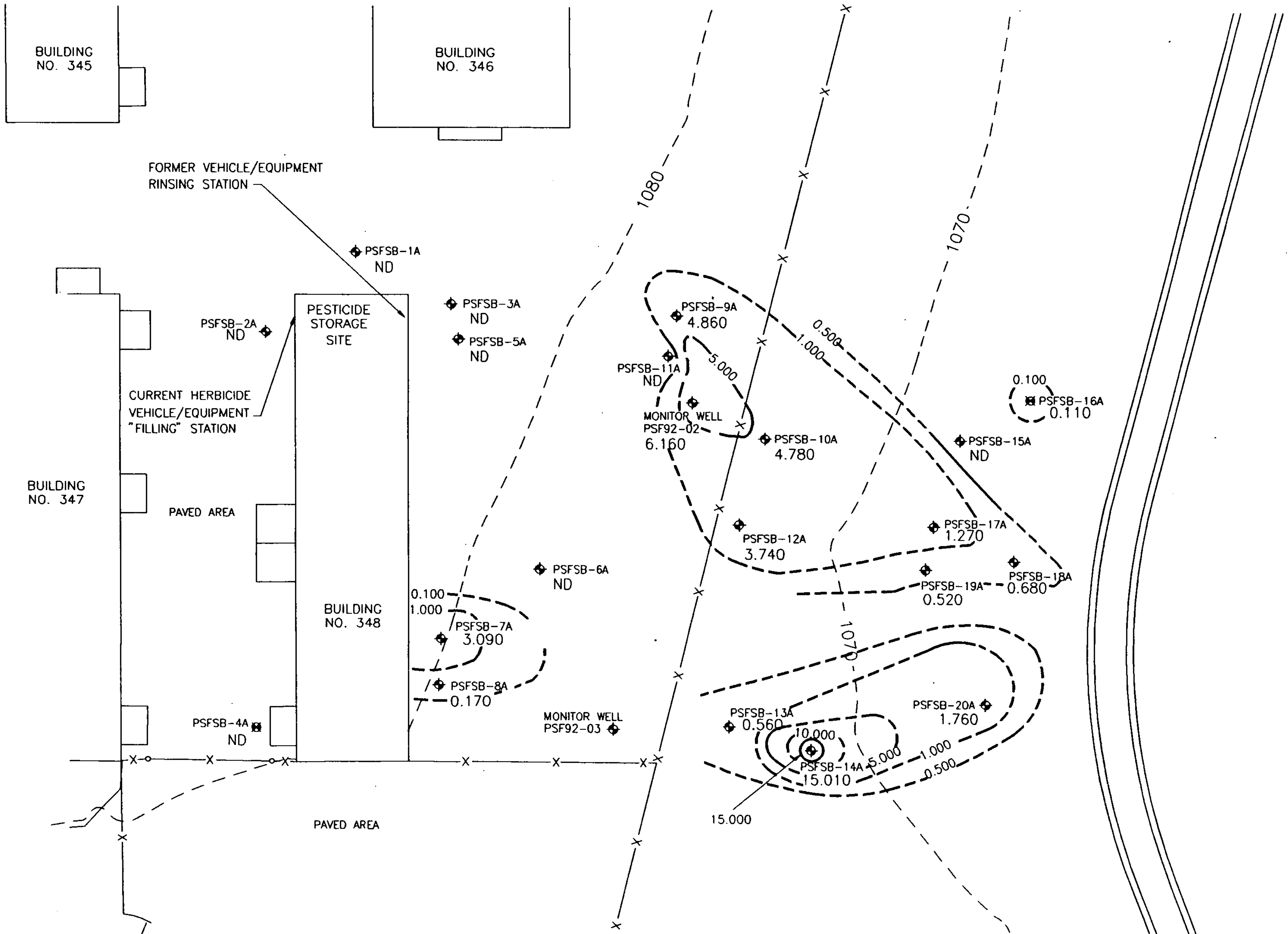
NOTE:

1. SAMPLES COLLECTED IN MARCH/APRIL, 1992
2. ALL CONCENTRATIONS ARE REPORTED IN MILLIGRAMS PER KILOGRAM (mg/Kg).

FILENAME: 11X17.DWG
LAYER: methc0-25

LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FIGURE 4-11
TOTAL PAH CONCENTRATIONS FROM SOIL BORINGS
PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS
SAMPLING DEPTH: 1.5 – 2.5 FT



LEGEND

- ◈ SAMPLING LOCATION
- PSFSB-2 SOIL BORING (HAND AUGER)
- PSF92-02 MONITORING WELL BORING
- ND NOT DETECTED
- – –1070– – TOPOGRAPHIC CONTOUR LINES (INTERVAL = 10 FEET)
- ——X—— FENCE
- LINED DRAINAGE DITCH
- ——1.000– – INTERPOLATED CONTOUR LINES OF TOTAL PAH CONCENTRATIONS
- PAH POLYNUCLEAR AROMATIC HYDROCARBON

NOTE:

1. ALL CONCENTRATIONS ARE REPORTED IN MILLIGRAMS PER KILOGRAM (mg/Kg)
2. SAMPLES COLLECTED IN MARCH/APRIL, 1992
3. PAHs DETECTED IN 1.5-2.5 FT SAMPLING DEPTH INCLUDED ANTHRACENES, CHRYSENE, FLUORANTHENES, PHENANTHRENE AND PYRENES.

0 30 60
SCALE IN FEET

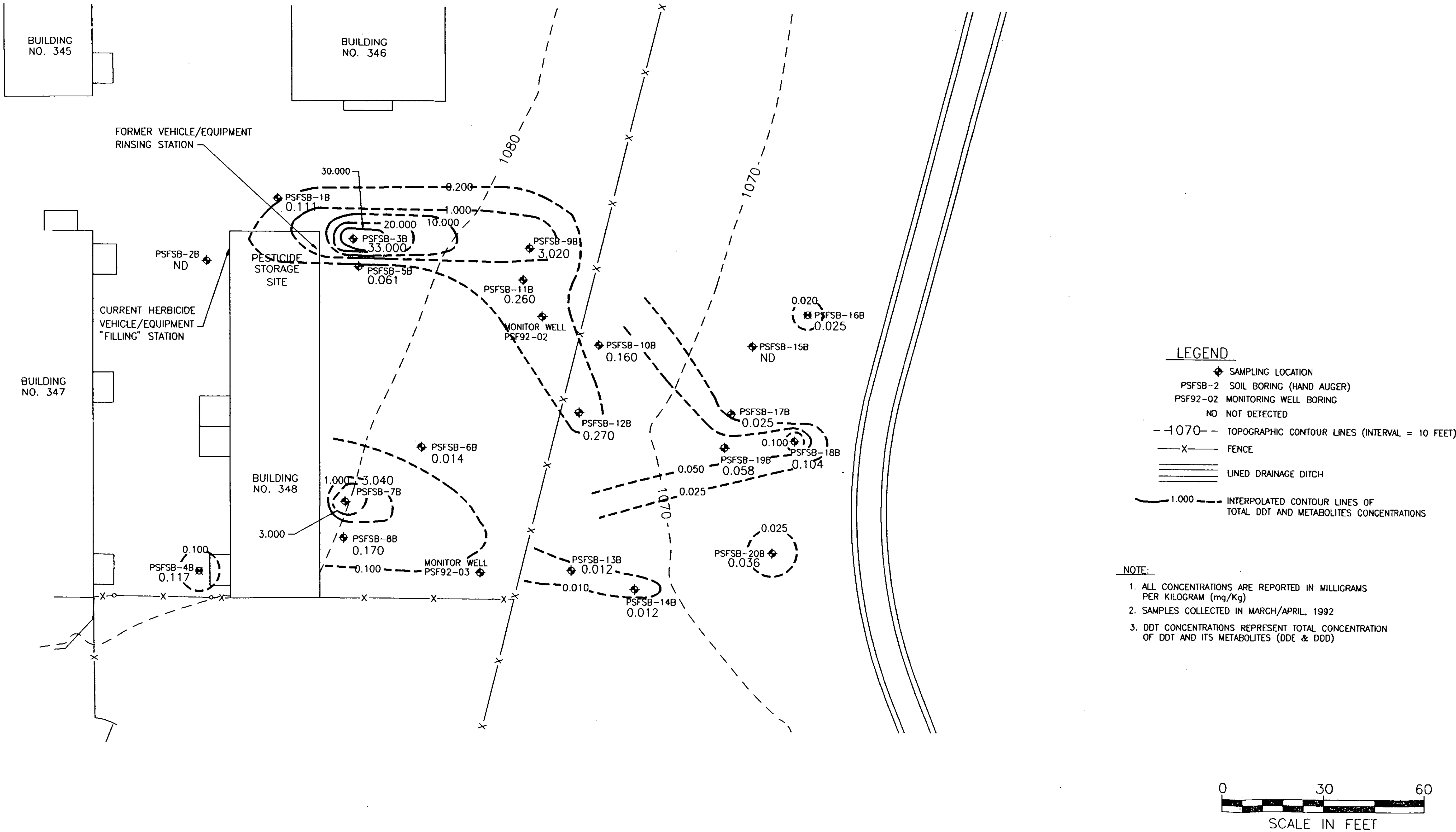
FILENAME: 11X17.DWG
LAYER: TOTALPAHCO-25

LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FIGURE 4-12

TOTAL DDT AND METABOLITES CONCENTRATIONS FROM SOIL BORINGS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS
SAMPLING DEPTH: 3.5 – 4.5 FT.



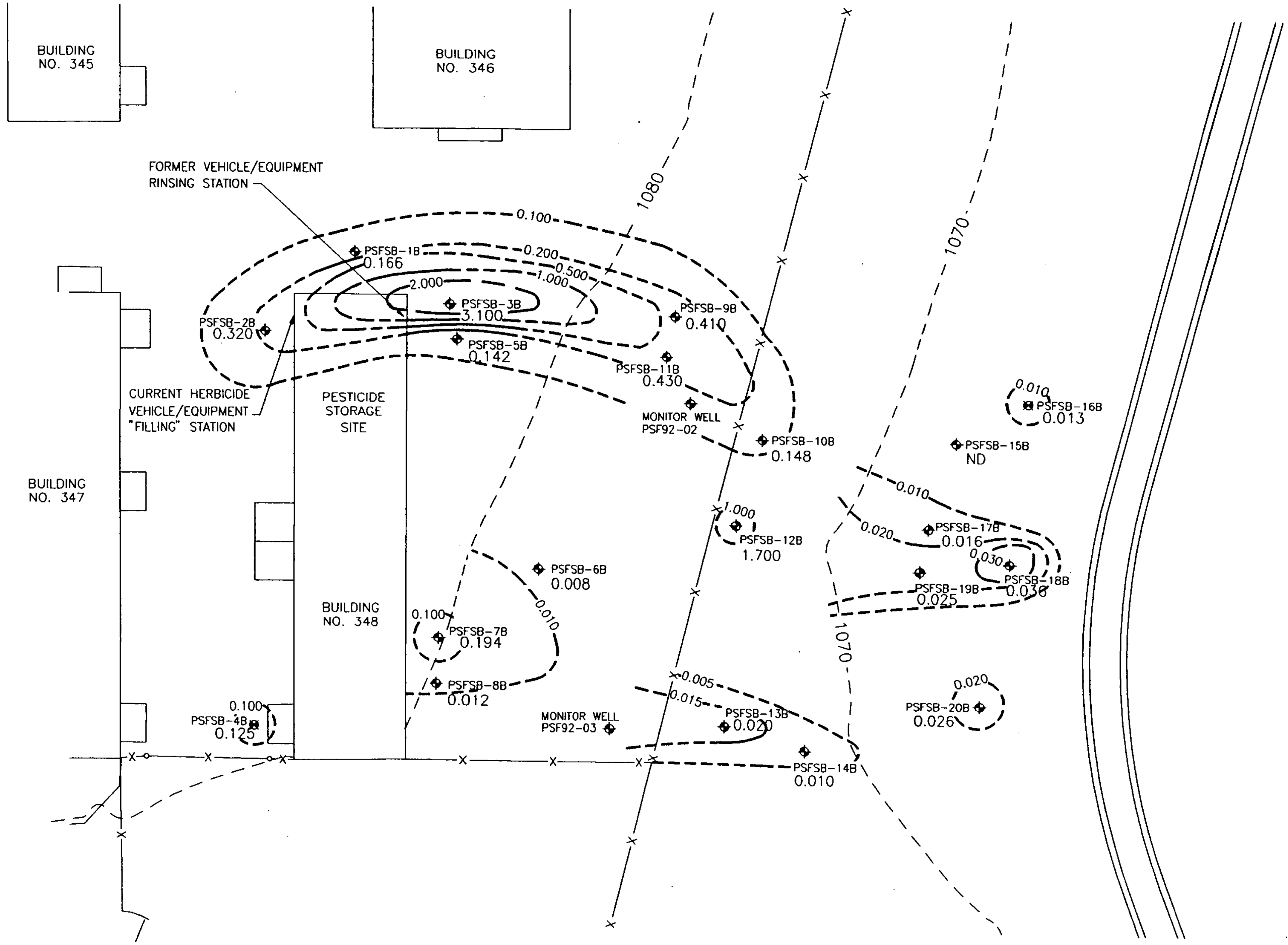
FILENAME: 11X17.DWG
LAYER: DDTC35-45

LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FIGURE 4-13

TOTAL CHLORDANE CONCENTRATIONS FROM SOIL BORINGS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS
SAMPLING DEPTH: 3.5 – 4.5 FT.



LEGEND

- ◆ SAMPLING LOCATION
- PSFSB-2 SOIL BORING (HAND AUGER)
- PSF92-02 MONITORING WELL BORING
- ND NOT DETECTED
- - -1070- - TOPOGRAPHIC CONTOUR LINES (INTERVAL = 10 FEET)
- —X— FENCE
- LINED DRAINAGE DITCH
- —1.000- - INTERPOLATED CONTOUR LINES OF CHLORDANE CONCENTRATIONS

NOTE:

1. ALL CONCENTRATIONS ARE REPORTED IN MILLIGRAMS PER KILOGRAM (mg/Kg)
2. SAMPLES COLLECTED IN MARCH/APRIL, 1992
3. CHLORDANE CONCENTRATIONS REPRESENT SUM ALPHA- AND GAMMA- CHLORDANE CONCENTRATIONS.

0 30 60
SCALE IN FEET

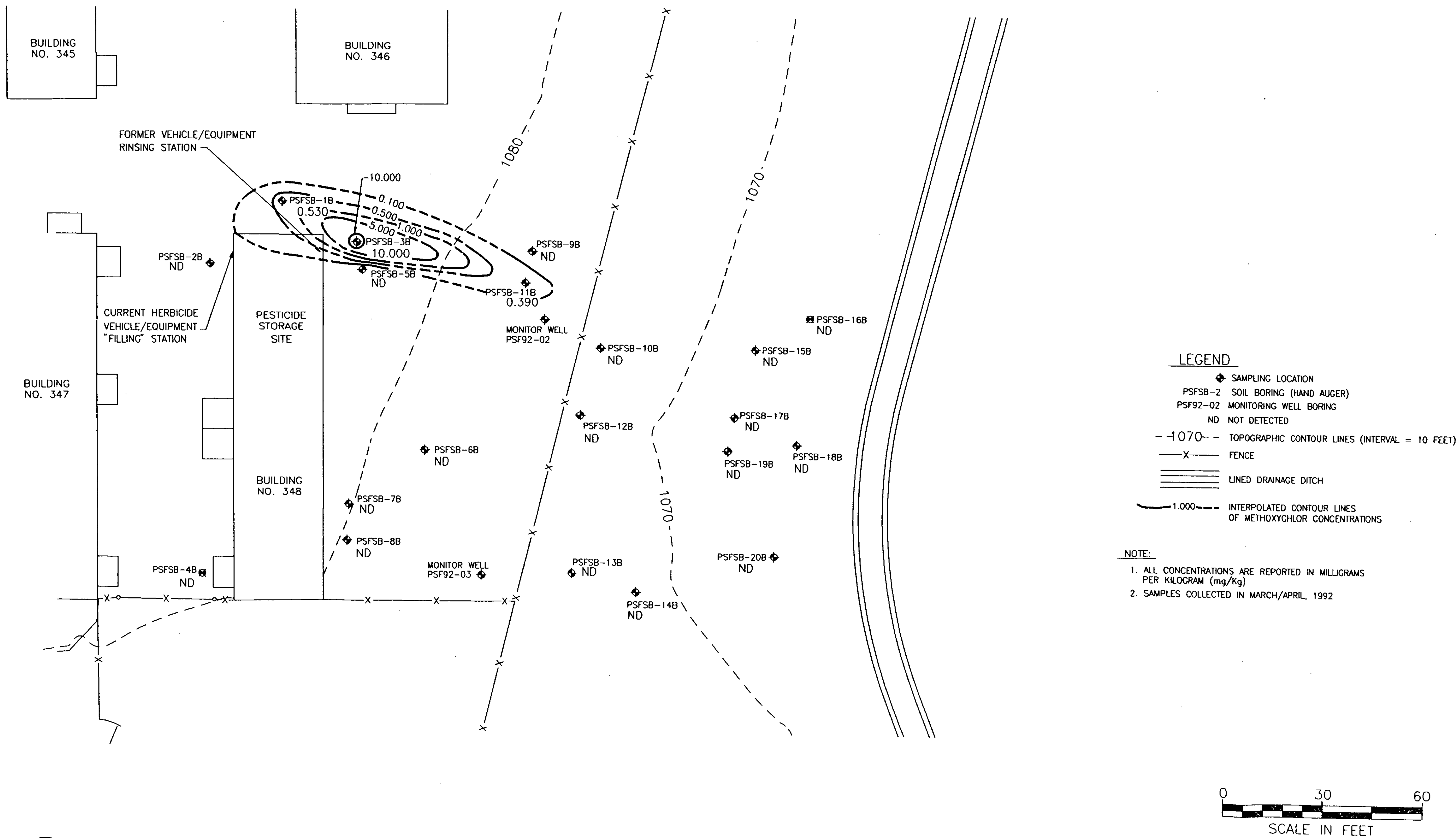
LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FILENAME: 11X17.DWG
LAYER: CC35-45

FIGURE 4-14

METHOXYCHLOR CONCENTRATIONS FROM SOIL BORINGS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS
SAMPLING DEPTH: 3.5 - 4.5 FT.



NOTE:
1. ALL CONCENTRATIONS ARE REPORTED IN MILLIGRAMS PER KILOGRAM (mg/Kg)
2. SAMPLES COLLECTED IN MARCH/APRIL, 1992

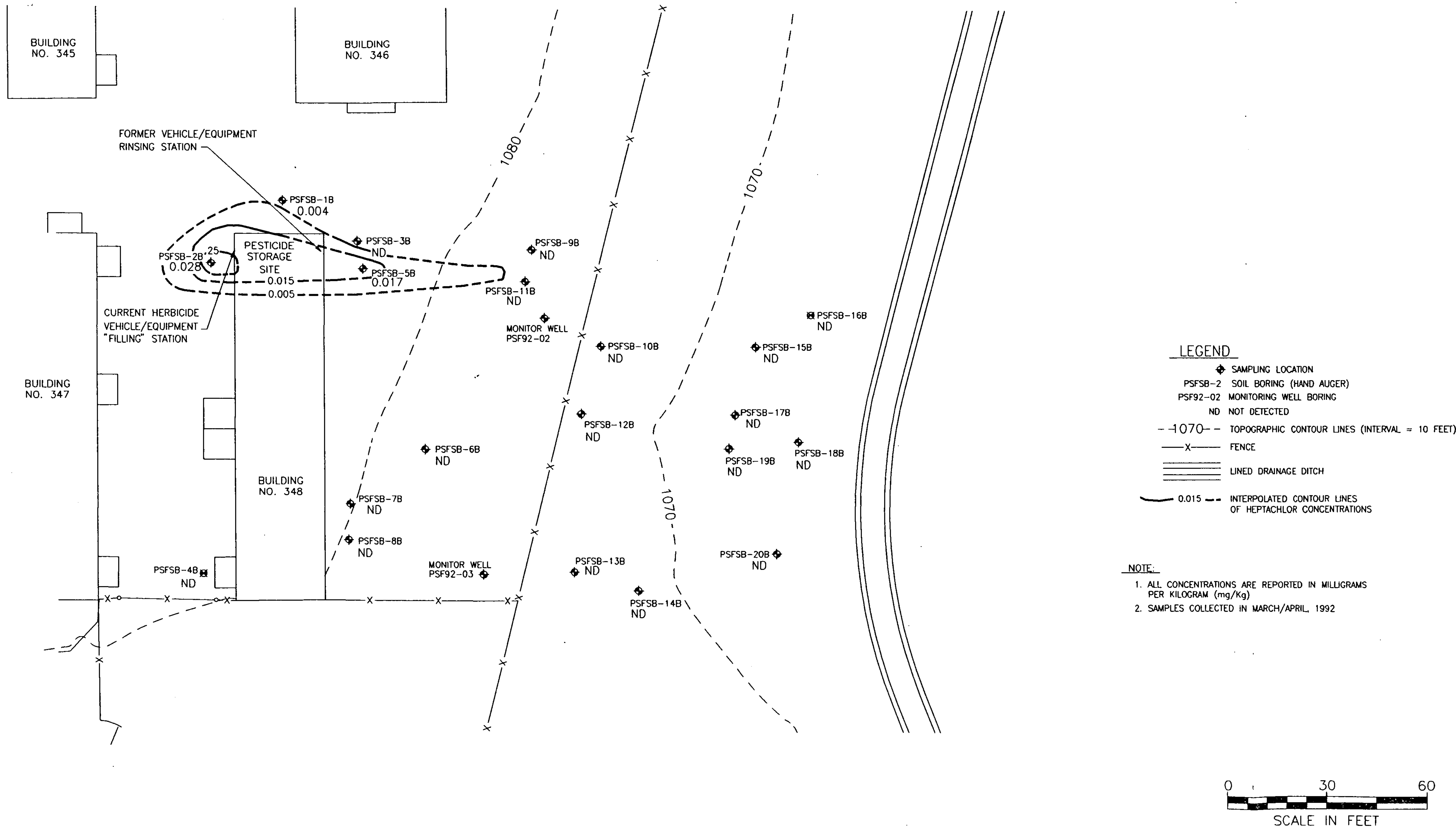
LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FILENAME: 11X17.DWG
LAYER: methc35-45

FIGURE 4–15

HEPTACHLOR CONCENTRATIONS FROM SOIL BORINGS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS
SAMPLING DEPTH: 3.5 – 4.5 FT



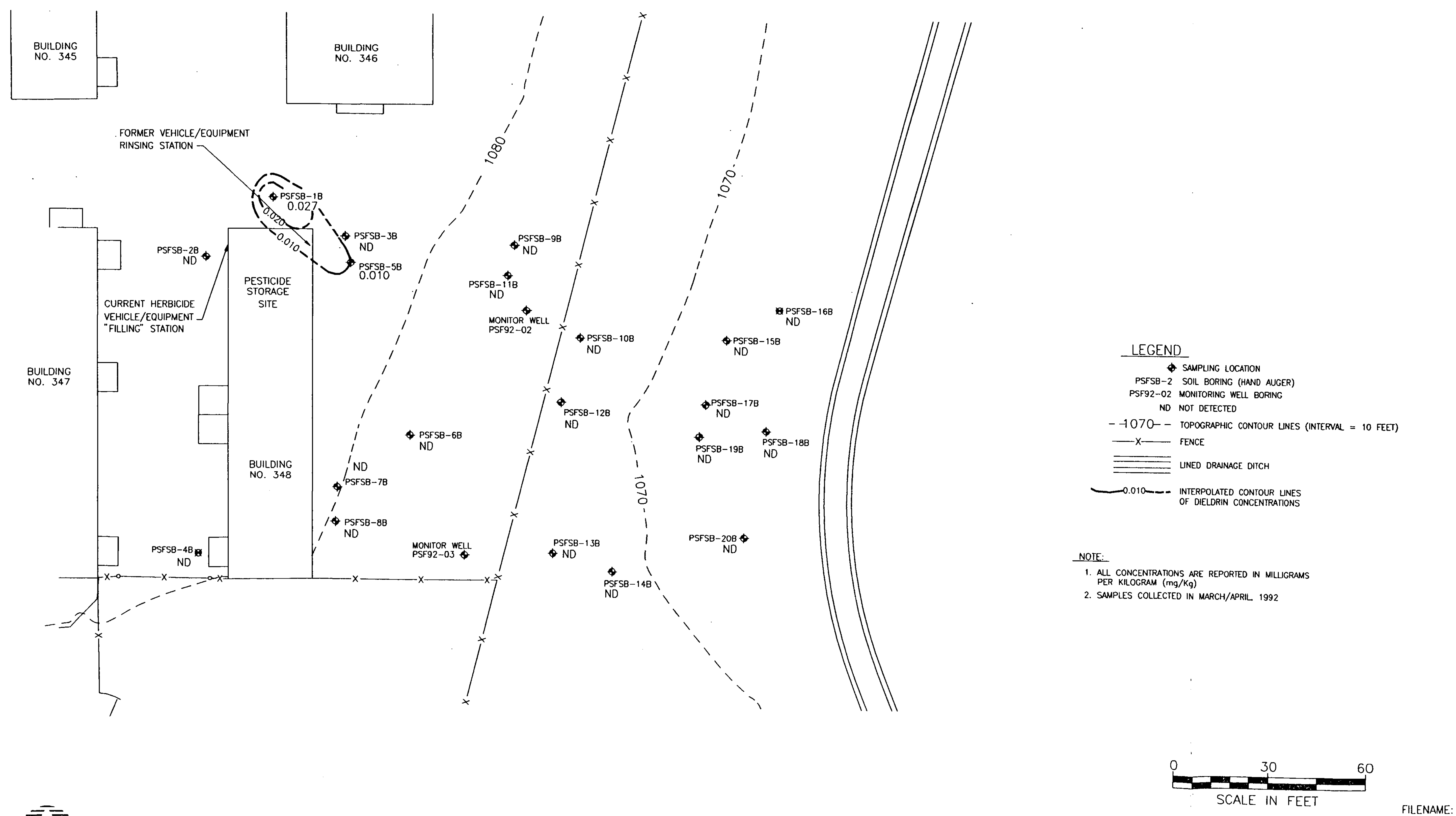
FILENAME: 11X17.DWG
LAYER: HEPTC35-45

LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FIGURE 4-16

DIELDRIN CONCENTRATIONS FROM SOIL BORINGS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS
SAMPLING DEPTH: 3.5 – 4.5 FT.



NOTE:

1. ALL CONCENTRATIONS ARE REPORTED IN MILLIGRAMS PER KILOGRAM (mg/Kg)
2. SAMPLES COLLECTED IN MARCH/APRIL 1992

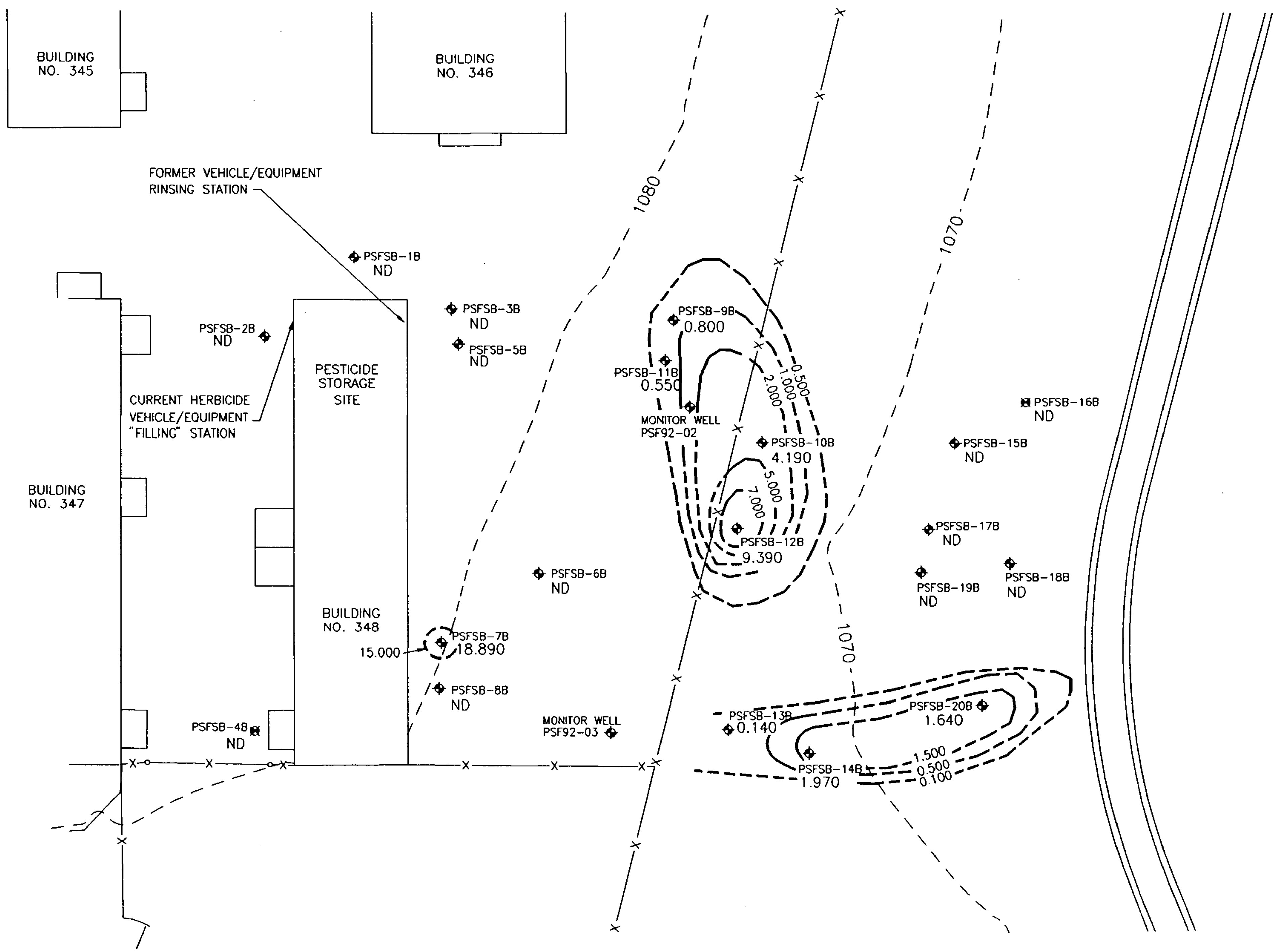
LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FILENAME: 11X17.DWG
LAYER: DLDC35-45

FIGURE 4-17

TOTAL PAH CONCENTRATIONS FROM SOIL BORINGS

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS
SAMPLING DEPTH: 3.5 - 4.5 FT



LEGEND

- SAMPLING LOCATION
- PSFSB-2 SOIL BORING (HAND AUGER)
- PSF92-02 MONITORING WELL BORING
- ND NOT DETECTED
- -1070- TOPOGRAPHIC CONTOUR LINES (INTERVAL = 10 FEET)
- —X— FENCE
- LINED DRAINAGE DITCH
- —1.000— INTERPOLATED CONTOUR LINES OF TOTAL PAH CONCENTRATIONS
- PAH POLYNUCLEAR AROMATIC HYDROCARBON

NOTE:

1. ALL CONCENTRATIONS ARE REPORTED IN MILLIGRAMS PER KILOGRAM (mg/Kg)
2. SAMPLES COLLECTED IN MARCH/APRIL, 1992
3. PAHs DETECTED IN 3.5 - 4.5 FT SAMPLING DEPTH INCLUDED ACENAPHTHENE, ANTHRACENES, CHRYSENE, FLUORANTHENES, NAPHTHALENE, PHENANTHRENE AND PYRENES.

0 30 60
SCALE IN FEET

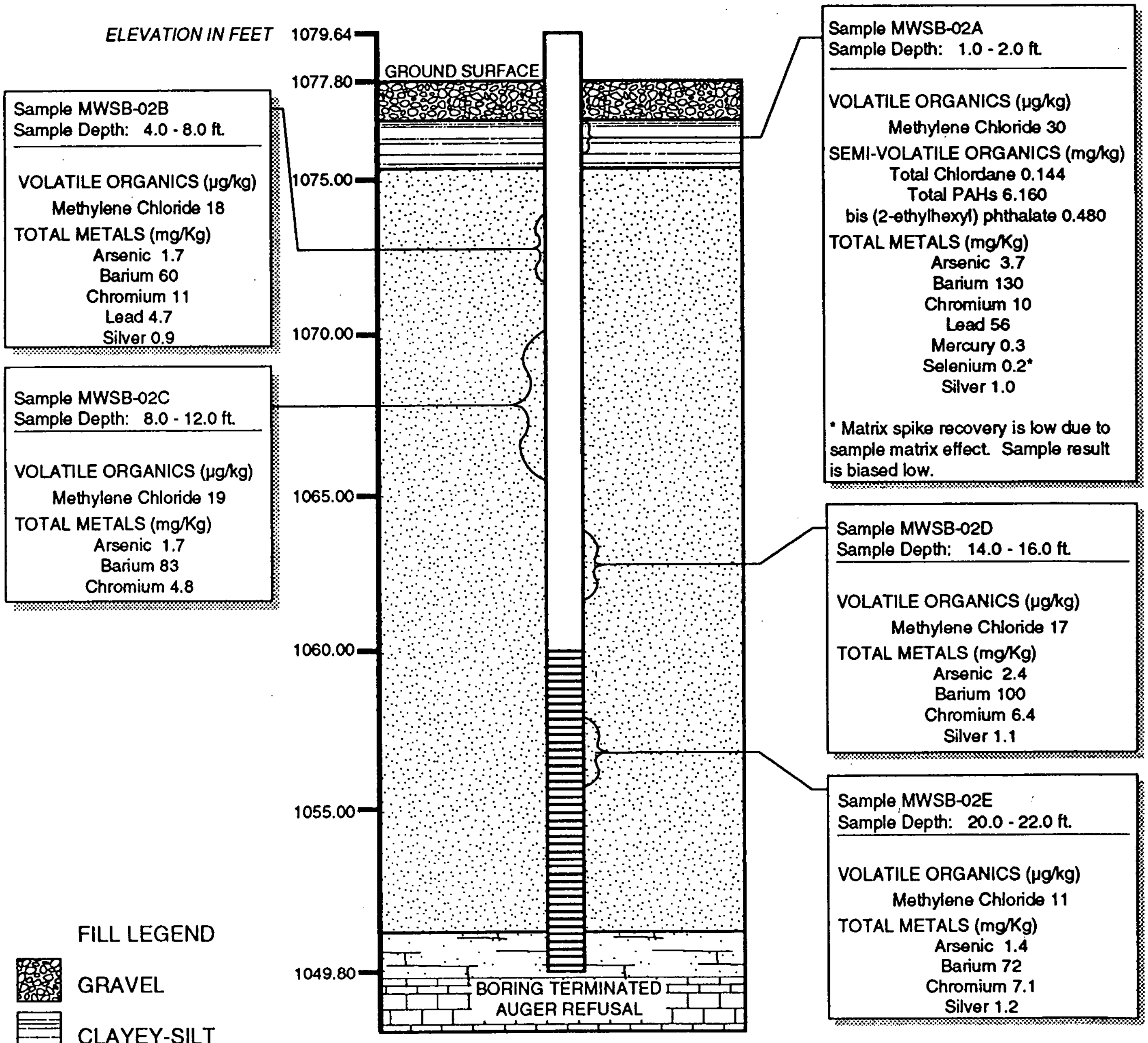
FILENAME: 11X17.DWG
LAYER: TOTALPAHC35-45

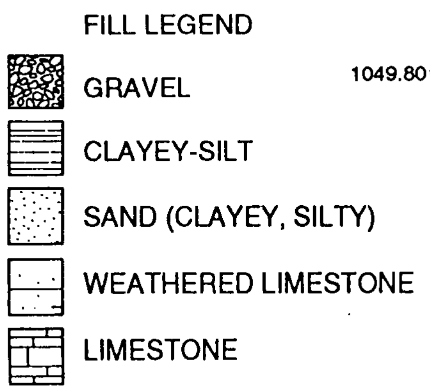
LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FIGURE 4-18

CHEMICAL PROFILE OF SOIL FROM BORING PSF92-02

PESTICIDE STORAGE FACILITY
FORT RILEY, KANSAS





Notes:
1. This figure displays positive analytical results only (non-detect readings are not included).
2. Samples collected on May 5, 1992.

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

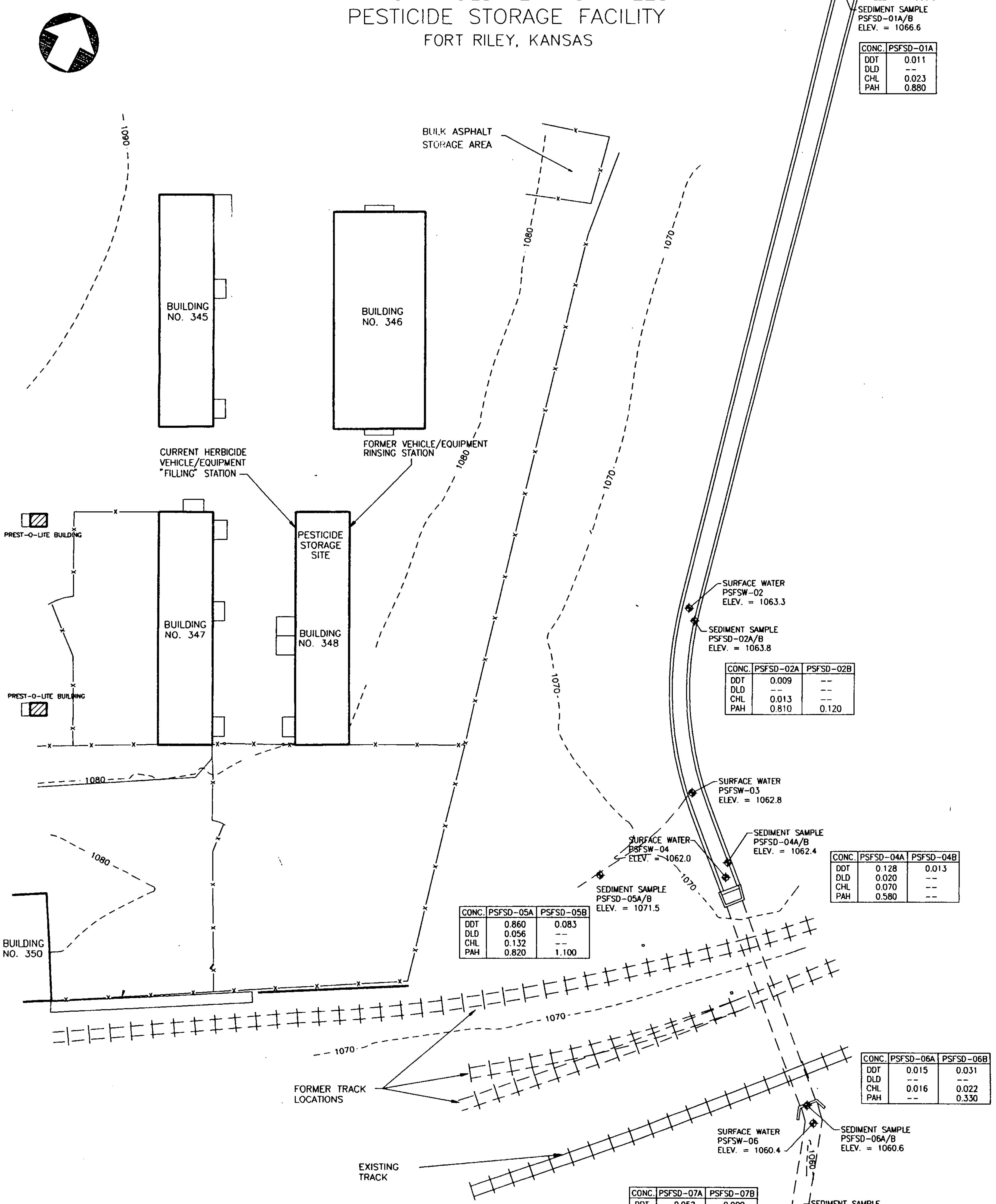
1531.41

FIGURE 4-19

CONCENTRATION OF PESTICIDES AND PAHs IN SEDIMENT SAMPLES

PESTICIDE STORAGE FACILITY

FORT RILEY, KANSAS



CONC.	PSFSD-01A
DDT	0.011
DLD	--
CHL	0.023
PAH	0.880

CONC.	PSFSD-02A	PSFSD-02B
DDT	0.009	--
DLD	--	--
CHL	0.013	--
PAH	0.810	0.120

CONC.	PSFSD-04A	PSFSD-04B
DDT	0.128	0.013
DLD	0.020	--
CHL	0.070	--
PAH	0.580	--

CONC.	PSFSD-05A	PSFSD-05B
DDT	0.860	0.083
DLD	0.056	--
CHL	0.132	--
PAH	0.820	1.100

CONC.	PSFSD-06A	PSFSD-06B
DDT	0.015	0.031
DLD	--	--
CHL	0.016	0.022
PAH	--	0.330

CONC.	PSFSD-07A	PSFSD-07B
DDT	0.052	0.009
DLD	--	--
CHL	0.050	0.022
PAH	0.280	0.240

CONC.	PSFSD-09A	PSFSD-09B
DDT	0.040	0.017
DLD	--	--
CHL	0.035	0.031
PAH	1.560	1.140

NOTES:

1. ALL CONCENTRATIONS ARE REPORTED IN MILLIGRAMS PER KILOGRAM (mg/kg).
2. SAMPLES COLLECTED IN MARCH/APRIL, 1992. (SAMPLES PSFSD-09A AND PSFSD-09B COLLECTED JULY 16, 1992).
3. THE SAMPLES WERE COLLECTED FROM SURFACE TO ONE FOOT (PSFSD-01A, PSFSD-02A, etc.) AND ONE FOOT TO TWO FEET (PSFSD-01B, PSFSD-02B etc.) BELOW GROUND LEVEL.
4. DDT CONCENTRATION REPRESENTS TOTAL CONCENTRATION OF DDT AND ITS METABOLITES (DDE AND DDD)
5. CHLORDANE CONCENTRATIONS REPRESENT SUM OF ALPHA- AND GAMMA- CHLORDANE CONCENTRATIONS.
6. PAH CONCENTRATION REPRESENTS TOTAL PAHs DETECTED.
7. THIS MAP DISPLAYS POSITIVE CONCENTRATIONS OF CONTAMINANTS ONLY (NON-DETECT READINGS ARE NOT SHOWN)

LEGEND

- ◆ SAMPLING LOCATION
- ELEV=1082.9 ELEVATION OF GROUND SURFACE AT SAMPLING LOCATION IN FEET ABOVE SEA LEVEL
- – –1070– – TOPOGRAPHIC CONTOUR LINES (SEE FIGURE 4-6) (INTERVAL=10 FEET)
- —x— FENCE
- RAILROAD TRACKS
- LINED PORTION OF DRAINAGE DITCH
- PAH POLYNUCLEAR AROMATIC HYDROCARBON
- DLD DIELDRIN
- CHL CHLORDANE

0 50 100

SCALE IN FEET

filename: sd-loc.dwg
layer: pesticides-pah

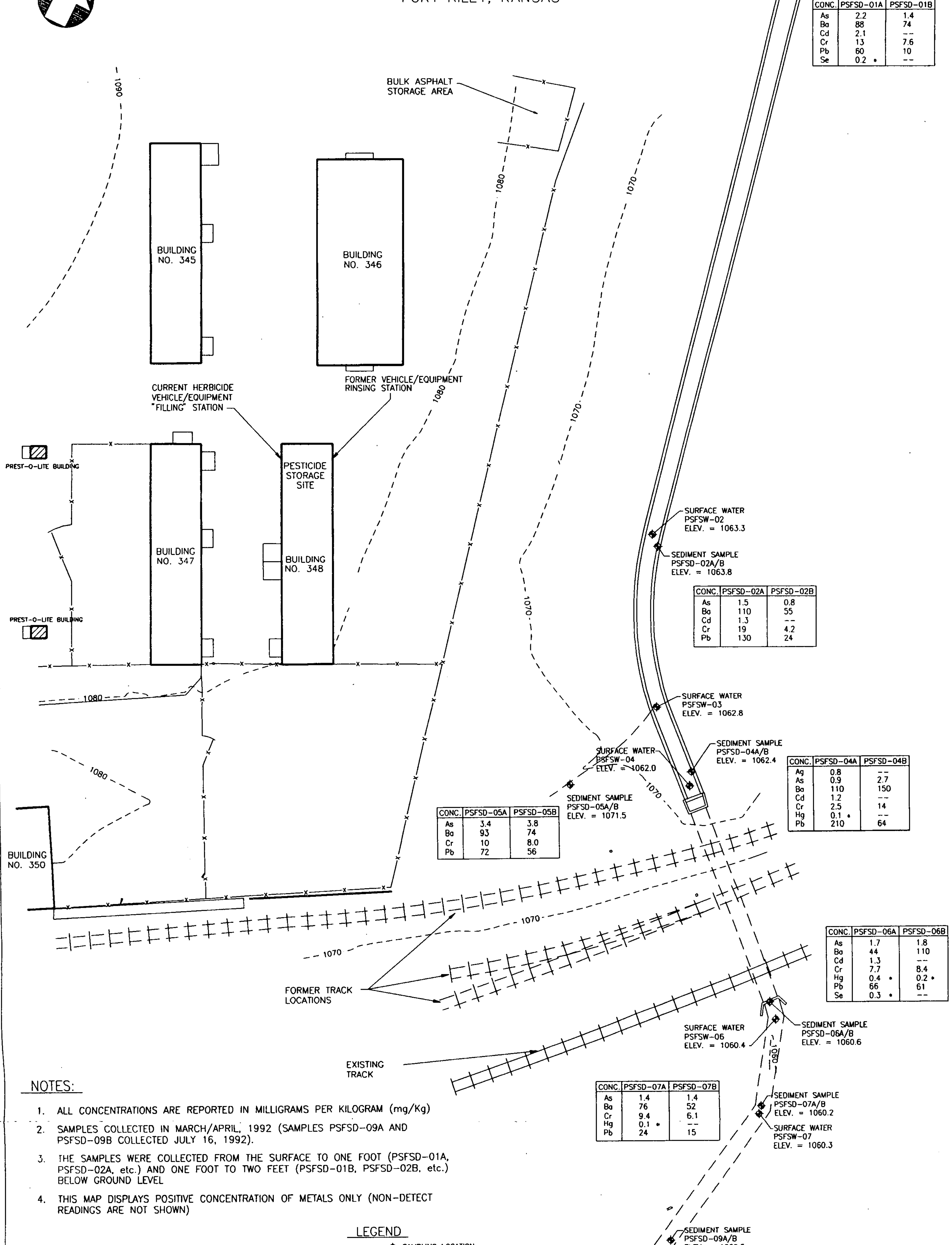
LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FIGURE 4-20

CONCENTRATIONS OF TOTAL METALS IN SEDIMENT SAMPLES

PESTICIDE STORAGE FACILITY

FORT RILEY, KANSAS



CONC.	PSFSD-01A	PSFSD-01B
As	2.2	1.4
Ba	88	74
Cd	2.1	--
Cr	13	7.6
Pb	60	10
Se	0.2 •	--

CONC.	PSFSD-02A	PSFSD-02B
As	1.5	0.8
Ba	110	55
Cd	1.3	--
Cr	19	4.2
Pb	130	24

CONC.	PSFSD-04A	PSFSD-04B
Ag	0.8	--
As	0.9	2.7
Ba	110	150
Cd	1.2	--
Cr	2.5	14
Hg	0.1 •	--
Pb	210	64

CONC.	PSFSD-05A	PSFSD-05B
As	3.4	3.8
Ba	93	74
Cr	10	8.0
Pb	72	56

CONC.	PSFSD-06A	PSFSD-06B
As	1.7	1.8
Ba	44	110
Cd	1.3	--
Cr	7.7	8.4
Hg	0.4 •	0.2 •
Pb	66	61
Se	0.3 •	--

CONC.	PSFSD-07A	PSFSD-07B
As	1.4	1.4
Ba	76	52
Cr	9.4	6.1
Hg	0.1 •	--
Pb	24	15

CONC.	PSFSD-09A	PSFSD-09B
As	2.6	2.5
Ba	97	130
Cd	1.9	3.3
Cr	14	17
Hg	--	0.4
Pb	88	140
Se	0.2 •	0.3 •

NOTES:

1. ALL CONCENTRATIONS ARE REPORTED IN MILLIGRAMS PER KILOGRAM (mg/Kg)
2. SAMPLES COLLECTED IN MARCH/APRIL, 1992 (SAMPLES PSFSD-09A AND PSFSD-09B COLLECTED JULY 16, 1992).
3. THE SAMPLES WERE COLLECTED FROM THE SURFACE TO ONE FOOT (PSFSD-01A, PSFSD-02A, etc.) AND ONE FOOT TO TWO FEET (PSFSD-01B, PSFSD-02B, etc.) BELOW GROUND LEVEL
4. THIS MAP DISPLAYS POSITIVE CONCENTRATION OF METALS ONLY (NON-DETECT READINGS ARE NOT SHOWN)

LEGEND

SAMPLING LOCATION

ELEV=1082.9 ELEVATION OF GROUND SURFACE AT SAMPLING LOCATION IN FEET ABOVE SEA LEVEL

— —1070— — TOPOGRAPHIC CONTOUR LINES (SEE FIGURE 4-6) (INTERVAL=10 FEET)

—x— FENCE

RAILROAD TRACKS

LINED PORTION OF DRAINAGE DITCH

Ag SILVER
As ARSENIC
Ba BARIUM
Cd CADMIUM
Cr CHROMIUM
Hg MERCURY
Pb LEAD
Se SELENIUM
• RESULT IS AN ESTIMATED VALUE

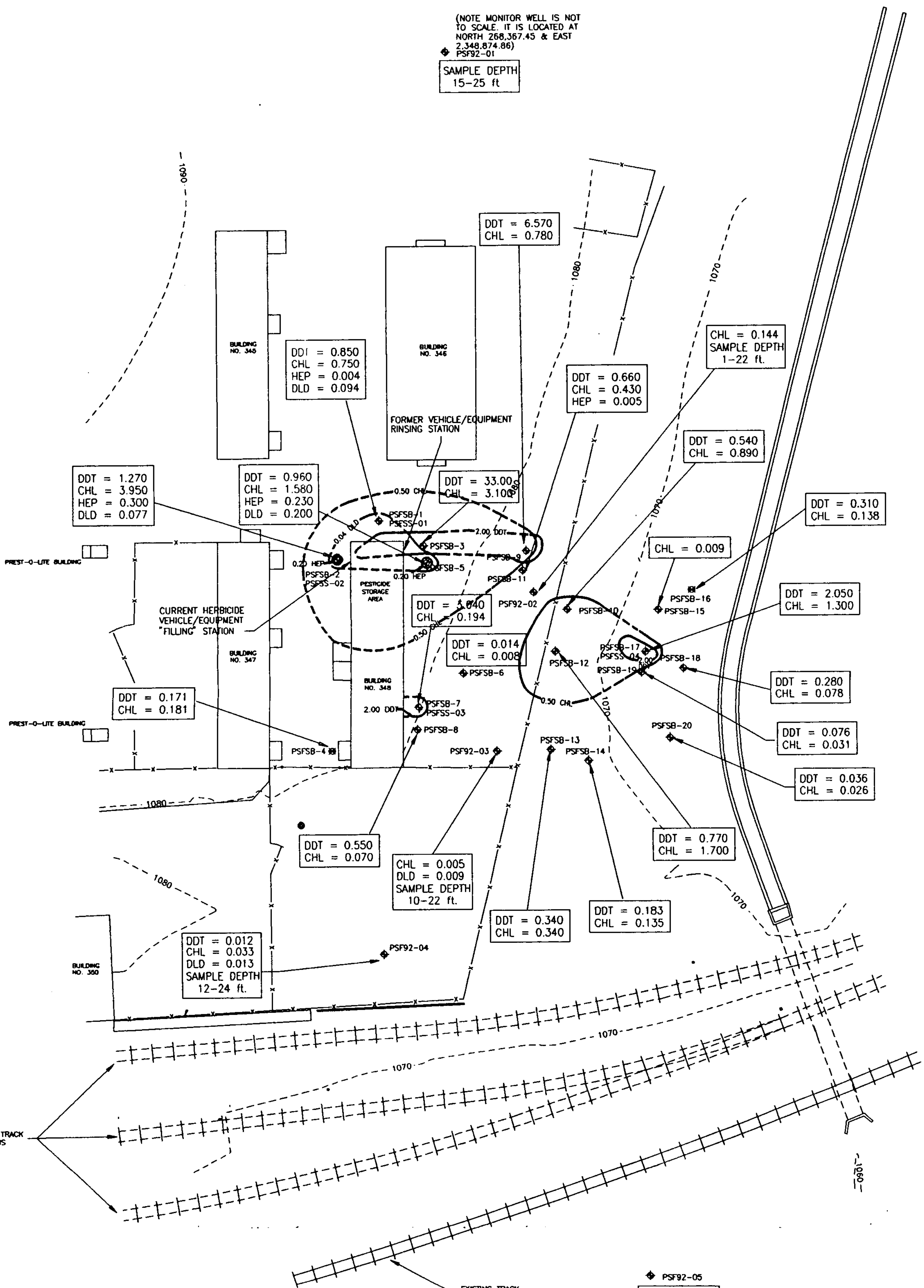
filename: sd-loc.dwg
layer: metals

LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

FIGURE 4-21

PESTICIDE CONTAMINATION OF SOIL (BASED ON RCRA SOIL ACTION LEVELS)

PESTICIDE STORAGE AREA
FORT RILEY, KANSAS



LEGEND

- SAMPLING LOCATION
- SB-2 SOIL BORING (HAND AUGER)
- SS-1 SURFACE SOIL BORING
- MW-5 MONITORING WELL BORING
- ELEV=1082.9 ELEVATION OF GROUND SURFACE AT SAMPLING LOCATION IN FEET ABOVE SEA LEVEL
- -1070- TOPOGRAPHIC CONTOUR LINES (SEE FIGURE 4-6)
- —x— FENCE
- RAILROAD
- LINED PORTION OF DRAINAGE DITCH
- HEP HEPTACHLOR
- CHL CHLORDANE
- DLD DIELDRIN
- —2.00 DDT— INTERPOLATED CONTOUR LINE OF DDT CONCENTRATIONS–RCRA ACTION LEVEL: 2.00 mg/Kg
- —0.50 CHL— INTERPOLATED CONTOUR LINE OF CHLORDANE CONCENTRATIONS–RCRA ACTION LEVEL: 0.50 mg/Kg
- —0.20 HEP— INTERPOLATED CONTOUR LINE OF HEPTACHLOR CONCENTRATIONS–RCRA ACTION LEVEL: 0.20 mg/Kg
- —0.04 DLD— INTERPOLATED CONTOUR LINE OF DIELDRIN CONCENTRATIONS–RCRA ACTION LEVEL: 0.04 mg/Kg

NOTES:

1. ALL CONCENTRATIONS ARE REPORTED IN MILLIGRAMS PER KILOGRAM (mg/Kg).
2. ALL CONCENTRATIONS REPRESENT SAMPLES COLLECTED FROM 0-4.5 FEET BELOW GROUND SURFACE, UNLESS OTHERWISE INDICATED.
3. SAMPLES COLLECTED IN APRIL/MAY, 1992.
4. DDT CONCENTRATIONS REPRESENT TOTAL CONCENTRATION OF DDT AND ITS METABOLITES (DDE AND DDD).
5. CHLORDANE CONCENTRATIONS REPRESENT SUM OF ALPHA- AND GAMMA-CHLORDANE CONCENTRATIONS.
6. THIS MAP DISPLAYS POSITIVE CONCENTRATIONS OF CONTAMINANTS ONLY (NON-DETECT READINGS ARE NOT SHOWN).
7. CONCENTRATIONS SHOWN REPRESENT THE HIGHEST VALUE OF EACH PARAMETER FROM SAMPLES COLLECTED FROM 0 - 4.5 FEET BELOW GROUND SURFACE

0 60 120
SCALE IN FEET

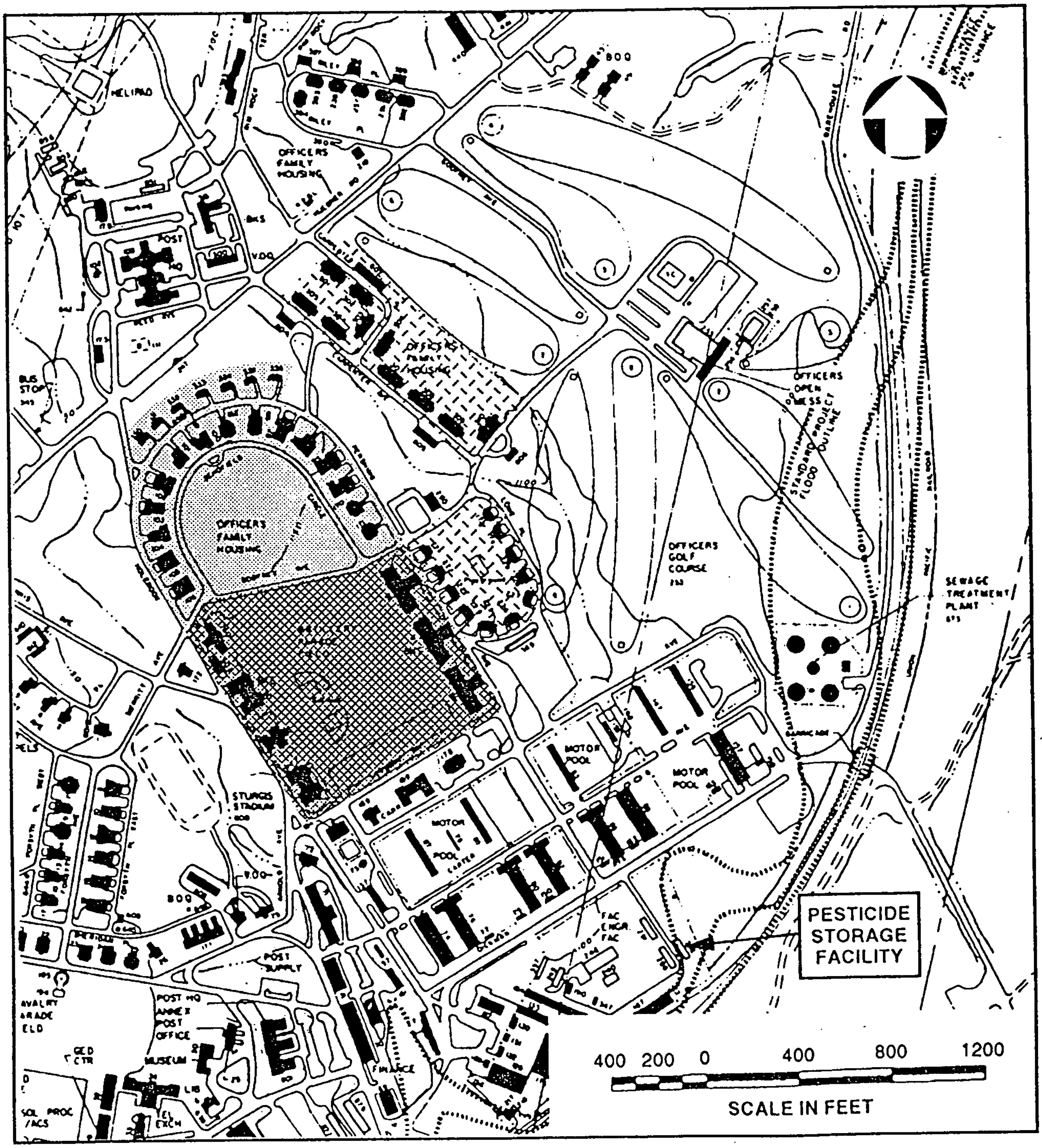
LAW ENVIRONMENTAL INC.
GOVERNMENT SERVICES BRANCH

filename: 36383pef.dwg

FIGURE 6-1

RESIDENTIAL AREAS LOCATED NEAR THE PESTICIDE STORAGE FACILITY

PESTICIDE STORAGE FACILITY
FT RILEY, KANSAS



HOUSING AREA NO. 2

HOUSING AREA NO. 5

TROOP HOUSING (BARRACKS)

MRFR

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

TABLE 1-1

CHEMICAL INVENTORY - BUILDING 348
Pesticide Storage Facility
Fort Riley, Kansas

DESCRIPTION	AMOUNT	DESCRIPTION	AMOUNT
24D Amine	90 gals		
Banvil	25 gals		
Simazine (Pricep 80W)	735 lbs		
Crop Oil	195.5 gals		
Dachthal W 75	216.5 lbs	Diazinon 2% Dust	375 lbs
Diuron 80%	1050 lbs		
D.-Phenophrin 2%	36-12 oz cans		
Dursban 10 CR	200 lbs		
Embark 25	24 gals		
Hyvar X	1000 lbs		
Malathion 57%	41 gals		
M.S.M.A.	18 gals	Norosac 10 G	125 lbs
P.T 140 Resmethrin	45 lbs		
Round Up	37.5 gals		
Rodeo	12.5 gals	Roach Bait "Combat"	
Sevin 80%	95 bags		
Strychnine Alkaloid	0		
Spike 40P	80 lbs		
Spike 20P	20 lbs		
Surflan A.S.	99 gals	Sequestrine	
Tordon R.T.U.	5 gals		
Weedone 170	21 gals		
Waspfreeze P.T. 515	12-14 oz		
Wasp & Hornet Freeze	44-14 oz		
Volick Oil Spray	11 qts		
Ornamec	14 gals		

Source: Inventory sheet provided by the Senior Pesticide/Herbicide Program Manager, Dec. 1991.

TABLE 2-1

PROJECT ACTIVITIES AND RATIONALE
Pesticide Storage Facility
Fort Riley, Kansas

SITE	ACTIVITIES	RATIONALE
Pesticide Storage Facility	Collect 40 shallow soil samples	Evaluate shallow subsurface soil contamination
	Install 5 monitoring wells and perform ground-water sampling on a quarterly basis	Evaluate vertical and horizontal extent of contamination of the water bearing zones
	Perform chemical profile on monitoring well bore PSF92-02 by collecting 1 surface soil and a soil sample every five feet to 30 feet (7 samples)	Evaluate vertical extent of soil contamination at PSF92-02
	Collect 2 soil samples for chemical and geotechnical analyses from each of monitoring well borings PSF92-01, PSF92-03, PSF92-04 and PSF92-05 (8 samples)	Evaluate vertical extent of soil contamination and provide physical soil characteristics
	Collect 7 surface water and 14 sediment samples	Evaluate extent of contamination of surficial waters and sediments
	Collect 4 surface soil samples	Evaluate dermal exposure for risk assessment
	Perform quarterly ground-water sampling	Evaluate fluctuation in contamination due to seasonal changes in the water table

TABLE 2-2

PESTICIDES COMMONLY AVAILABLE FOR USE
Army/DOD Facilities
1971

	PESTICIDE	STOCK NO.
Insecticides:		
	Aluminum phosphide, tablets	6840-145-0016
	Aluminum phosphide, pellets	6840-442-5698
	Baygon, 1% solution	6840-180-6069
	Baygon, 2% bait	6840-498-4057
	Carbaryl, 80% powder	6840-932-7297
	Carbaryl-DDT, micronized dust***	6840-180-6141
	Carbaryl-DDT, micronized dust***	6840-180-6142
	Carbaryl-DDT, micronized dust***	6840-180-6143
	Chlordane, 72% emulsifiable concentrate	6840-270-8262
	Chlordane, 5%-6% dust	6840-543-7825
	Diazinon, 2% dust	6840-753-5038
	Diazinon, 0.5% solution	6840-844-7355
	Diazinon, 48% emulsifiable concentrate	6840-782-3925
	Dieldrin, 15% emulsifiable concentrate	6840-264-9043
	DDT, 25% emulsiviable concentrate	6840-246-6432
	DDT, 75% wettable powder	6840-264-6692
	DDT-Pyrethrum aerosol, G-1152*	6840-766-9631
	Dichlorovos, 20% impregnated pellets	Not yet assigned
	Dichlorovos, 20% impregnated strips	Not yet assigned
	Dursban, 40.8% emulsifiable concentrate	Not yet assigned
	Lindane, 12% emulsifiable concentrate	6840-242-4213
	Lindane, 1% dusting powder	6840-242-4217
	Lindane, 1% dusting powder**	6840-242-4219
	Malathion, 57% emulsifiable concentrate, Grade A	6840-655-9222
	Malathion, 57% emulsifiable concentrate, Grade B	6840-685-5437
	Malathion, 57% emulsifiable concentrate, Grade A	6840-685-5438
	Malathion, 95% solution concentrate	6840-926-1481
	Methyl bromide, 98%	6840-680-0142
	Methyl bromide, 98%	6840-823-7946
	Naled, 85% solution concentrate	6840-926-9163
	Pyrethrum, 0.6% aerosol	6840-823-7849
	Pyrethrum, 0.4% solution	6840-400-2140
Herbicides:		
	Borate-Bromacil mixture	6840-027-6467
	Bromacil, 80% powder	6840-890-2146
	Cacodylic Acid (Blue) ****	6840-926-9094
	Chlorate-Borate mixture	6840-684-8975

TABLE 2-2

PESTICIDES COMMONLY AVAILABLE FOR USE
Army/DOD Facilities
1971

	PESTICIDE	STOCK NO.
	Dacthal, 75% powder	6840-681-9475
	Dalapon, 85% powder	6840-577-4204
	Dicamba, 49% solution	6840-905-4304
	Diquat, 35.3% solution	6840-815-2799
	Diuron, 80% powder	6840-825-7790
	DSMA, 63% disodium methylarsonate	6840-965-2071
	Monuron, 80% powder	6840-514-0644
	Picloram + 2,4-D ****	6840-629-1638
	Picloram + 2,4-D, (White)	6840-926-9093
	Picloram, 11.6% pellets	6840-990-1464
	Silvex, Low Volatile Ester	6840-882-4810
	Simazinc, 80% powder	6840-814-7334
	2,4-D, Low Volatile Ester	6840-577-4194
	2,4-D, Amine	6840-664-7060
	2,4,5-T, Low Volatile Ester	6840-577-4201
	2,4,5-T, Low Volatile Ester	6840-582-5440
	2,4-D + 2,4,5-T, High Volatile Ester (Orange) ****	6840-926-9095
Repellents:		
	Clothing and personal application, 75% DEET	6840-935-0984
	Clothing and personal application, 75% DEET	6840-753-4963
	Clothing and personal application, 75% DEET	6840-935-0984
Rodenticides:		
	Anticoagulant, Ready mixed bait	6840-753-4973
	Anticoagulant, Universal concentrate	6840-753-4972
	Bait block, diaphacin	6840-089-4664
	Calcium cyanide, 42% powder	6840-246-6436
	Zinc phosphide, 80% powder	6840-285-7091
Fungicide:		
	Pentachlorophenol, 5% moisture retardant	8030-634-7970
Soil Fumigant:		
	SMDC (VAPAM) 32.7% solution	Not yet assigned

* For disinsectization of aircraft in compliance with Public-Health Quarantine.
** For use in control of body lice.
*** For disinsection of aircraft in compliance with Agricultural Quarantine.
****For tactical purposes and not base-type pest control operations.

Source: Military Entomology Operational Handbook, December 1971.

TABLE 2-3

INVENTORY OF PESTICIDE STORAGE FACILITY IN 1979 (BUILDING 348)
Fort Riley, Kansas

PESTICIDE-PERCENT	REGISTRATION NO.	QUANTITY
aluminum phosphide 55% Phostoxin®	EPA 5857-1	4 cans
benfluralin 2.5% Balan® granular	EPA 1471-62-AC	1480 lb
bromacil 80% Hyvar X®	EPA 352-287-AA	150 lb
carbaryl 80% Sevin®	EPA 1016-43	15 lb
chlorobenzilate 45.5%	USDA 100-458	2.5 gal
chlorpyrifos 40.8%	USDA 464-368	1 gal
chlorpyrifos 10.6% Dursban® 10 CR	EPA 464-517	75 lb
copper 12.75% Bordeaux Mixture	USDA 577-97	4 lb
copper 12.5%	Unknown	8 lb
DCPA 75% Dacthal®W75	EPA 677-166-AA	168 lb
DDT 5%	Unknown	160 gal
diazinon 2%	EPA 6830-19	575 lb
diazinon 47.79%	EPA 7273-131	2 gal
dichlobenil 4% Casoron G-4®	EPA 148-614	150 lb
DSMA 66.6%	EPA 2853-13	300 lb
indandione 0.5%	EPA 255-69	2 lb
malathion 57%	EPA 551-131	20 gal
malathion 95%	EPA 241-76	190 gal
maneb 80% Manzat®D	USDA 352-291	12 lb
methoxychlor 25%	USDA 5602-86	30 gal
monuron 32.25% Urox Liquid®	USDA 218-439	15 gal
norbormide 0.92% Raticate®	Unknown	10 oz
oil 97% Volck® Oil Spray	EPA 239-16	11 qt
pentachlorophenol 5%	Unknown	30 gal
pyrethrins 3% Micro-gen BP 300®	EPA 11540-1	.75 gal
resmethrin 1% Prescription Treatment No. 110®	EPA 499-160-AA	52.5 lb
resmethrin 0.5% Prescription Treatment No. 140®	EPA 499-166-AA	18 lb
rotenone 2.5% Pro-Nox Fish®	USDA 432-171	2 gal
silvex 63%	EPA 264-289	110 gal
silvex 69.2% KURON®	EPA 464-162-AA	1 gal
simazine 80% Aquazine®	EPA 100-437	5 lb
2,2 Dichloropropionic Acid 74% Dowpon®	EPA 464-164	50 lb
2,2-Dichloroproionic Acid 85% Dalapon® Grass Killer	EPA 2749-52	200 lb
2,4-D Amine 49.3%	EPA 2217-633-AA	110 gal
2,4-D 49.3% DMA 4®	EPA 464-196	364 gal
2,4-D 39.6%	USDA 218-439	40 gal

Sources: Installation Pest Management Program Review No. 16-66-0502-80, Fort Riley, Kansas, 1979. AEHA, 1979

Note: Military Army Regulation 420-76

TABLE 2-4

INVENTORY OF PESTICIDE STORAGE FACILITY IN 1983 (BUILDING 348)
Fort Riley, Kansas

PESTICIDE	REGISTRATION NO.	QUANTITY
Balan	EPA 1471-62-AC	281 kg
Hyvar-X "Bromacil"	EPA 352-287-AA	272 kg
Casoron	EPA 148-614	57 kg
Chemweed-265	EPA 1769-122-AA	26 l
Dacthal W-75	EPA 677-166-AA	45 kg
Dalapon 85	EPA 677-358-ZA	41 kg
2,4-D "Amine"	EPA 39511-64-34704	946 l
2,4-D "Amine"	EPA 2217-633-AA	568 l
2,4-D "Amine" DMA-4	EPA 464-196	8 l
2,4,5-TP "Silvex"	EPA 264-289	53 l
Disodium Methanearsonate 63%	EPA 677-289-AA	45 kg
Embark-25	EPA 7182-7-AA	155 l
Ronstar G	EPA 359-659	907 kg
Round-Up Glyphosate	EPA 524-308-AA	34 l
Simazine 80W	EPA 2749-163-34704	23 kg
Verton-2-D	*	19 l
MH 30T "Malichydrazide"	*	227 l
Bordeaux "Fungicide"	*	4 kg
BP 300 Pyrethins	EPA 4540-1	2 kg
Sevin "Carbaryl" 80%	EPA 264-318	694 kg
Chlordane 72%	EPA 876-63-AA	11 l
Chlordane 46%	EPA 7122-3	4 kg
Chlorobenzilate	Cont. No. 89545 601-403-1	9 l
Diazinon-D-Tox-4E	EPA 551-220	42 l
Diazinon 2% "Powder Form"	EPA 6830-19	175 kg
Dursban 10CR	EPA 464-517	68 kg
Gopher Bait "Mild-Maize"	EPA 8612-97	7 kg
Fungicide Manzate "D"	U.S. Reg. 352-291	5 kg
Methoxychlor 25% E	USDA 5602-86	20 l
Malathion 57%	EPA 551-131	208 l
"Fumigant" Phostoxin	EPA 5857-1	630 tablets
PT-140 Resmethrin	EPA 499-166-AA	82 kg
PT-10 Resmethrin	EPA 499-160-AA	79 kg
Pro-Noxfish "Rotenone"	USDA 432-171	7 kg
Wasp Freeze PT-515	EPA 499-153-ZB	36 kg
Copper Sulfate	*	23 kg
Ferrous Sulfate	*	69 kg
Warfarin Rodenticide Bait	EPA 6830-25	3 kg
Daconil 2787	EPA 677-315-2A	76 l
I.O. Teen Detergent Disinfectant	EPA 267-152	19 l

2,4,5-TP = 2,4,5-trichlorophenoxy propionic acid.
USDA = U.S. Department of Agriculture

*Label torn or illegible

Sources: Fort Riley Directorate of Facilities Engineering, 1983.
ESE, 1984

TABLE 3-1

ANALYTICAL RESULTS - GEOTECHNICAL SAMPLES
Pesticide Storage Facility
Fort Riley, Kansas

WELL NO/ SAMPLE DEPTH	% SAND	% SILT	% CLAY	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNIFIED SOIL CLASSIFICATION
PSF92-01 GT/ 7' - 9'	46.0	46.0	8.0	26	18	8	CL
PSF92-01 GT/ 25' - 27'	27.0	62.0	11.0	27	18	9	CL
PSF92-02 GT/ 2' - 4'	19.5	60.0	20.5	19	19	N.P.	SC
PSF92-02 GT/ 22' - 24'	82.5	13.0	4.5	NR	NR	N.P.	SC
PSF92-03 GT/ 2' - 4'	12.5	67.5	20.0	35	22	13	CL
PSF92-03 GT/ 20' - 22'	17.0	69.5	13.5	24	18	6	CL
PSF92-04 GT/ 2' - 4'	69.5	25.0	5.5	15	15	N.P.	SC
PSF92-04 GT/ 22' - 24'	12.0	80.0	8.0	24	21	3	ML
PSF92-05 GT/ 3' - 5'	56.0	35.0	9.0	22	18	4	SC
PSF92-05 GT/ 17' - 19'	61.0	33.5	5.5	NR	NR	N.P.	SC

NOTES: CL = Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
SC = Clayey sands, sand-clay mixtures.
ML = Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts, with slight plasticity.
GT = Geotechnical
NP = Non Plastic
NR = Not Reported

Source: Unified Soil Classification System

TABLE 3-2

WELL DEVELOPMENT SUMMARY
Pesticide Storage Facility
Fort Riley, Kansas

INITIAL

WELL #	DATE OF DEVELOPMENT	FINAL NTU	FINAL TEMP (C)	FINAL CONDUCTIVITY	FINAL pH	TOTAL # OF CYCLES
PSF92-01	5/13-14/92	5.8	20.5	850	7.2	NR
PSF92-02	5/16/92	16.5	23.3	1264	7.8	NR
PSF92-03	5/14-16/92	8.0	21.0	1100	7.3	NR
PSF92-04	5/14-15/92	15.6	22.0	883	7.9	NR
PSF92-05	5/13-14/92	68	18.0	1000	6.8	NR

ADDITIONAL

WELL #	DATE OF DEVELOPMENT	FINAL NTU	FINAL TEMP (C)	FINAL CONDUCTIVITY	FINAL pH	TOTAL # OF CYCLES
PSF92-01	6/27/92	16	19.6	828	7.52	8
PSF92-02	*	*	*	*	*	*
PSF92-03	6/29-30/92	12	21	1264	7.72	8
PSF92-04	6/30/92	24	22.0	1020	6.99	5
PSF92-05	6/29/92	15	17.3	1150	6.94	8

NOTE: C = Celsius
* = Data Unavailable
NR = Not Recorded

TABLE 3-3

MONITORING WELL CONSTRUCTION DETAILS AND SELECTED HYDROGEOLOGIC DATA
Pesticide Storage Facility
Fort Riley, Kansas

WELL NO.	DATE WATER ELEVATION TAKEN	TOP OF CASING*	GROUND ELEVATION	STICK-UP	TOTAL DEPTH	SCREEN INTERVAL (ELEVATION)	DEPTH TO WATER*	GROUND-WATER ELEVATION	HYDRAULIC CONDUCTIVITY (ft/min)	HYDRAULIC CONDUCTIVITY (cm/sec)
PSF92-01	6-27-92	1090.01	1088.30	1.71	33.00	1065.30-1055.30	27.44	1062.57	1.21E-04	6.16E-05
PSF92-02	5-16-92	1079.64	1077.80	1.84	28.00	1059.80-1049.80	24.31	1055.33	5.16E-04	2.62E-04
PSF92-03	6-29-92	1079.35	1077.50	1.85	28.00	1059.50-1049.50	24.22	1055.13	1.92E-04	9.75E-05
PSF92-04	6-30-92	1079.82	1078.59	1.23	29.50	1059.09-1049.09	24.90	1054.92	1.17E-04	5.95E-05
PSF92-05	6-29-92	1063.76	1062.00	1.76	28.00	1044.00-1034.00	21.81	1041.95	1.03E-03	5.21E-04

*including stick-up

TABLE 3–4
AVERAGED CLIMATOLOGICAL DATA – 1962 THROUGH 1992
FORT RILEY AREA
Pesticide Storge Facility
Fort Riley, Kansas

		EXTREME MAXIMUM TEMPERATURE	MEAN TEMPERATURE	EXTREME MINIMUM TEMPERATURE	RAINFALL	SNOWFALL
Winter	JAN	75°F	27°F	−26°F	0.90"	5.00"
	FEB	86°F	32°F	−21°F	1.00"	4.00"
Spring	MAR	90°F	42°F	−10°F	2.20"	4.00"
	APR	94°F	55°F	7°F	3.00"	1.00"
	MAY	100°F	65°F	27°F	4.60"	0.00"
Summer	JUN	110°F	74°F	40°F	5.70"	0.00"
	JUL	112°F	80°F	43°F	3.80"	0.00"
	AUG	109°F	78°F	45°F	3.40"	0.00"
Fall	SEP	112°F	69°F	30°F	3.50"	0.00"
	OCT	100°F	56°F	20°F	2.90"	0.00"
	NOV	84°F	43°F	−9°F	1.40"	1.00"
Winter	DEC	77°F	32°F	−14°F	1.20"	4.00"

Source: First Weather Group, Detachment 8, Fort Riley Marshall Air Field

TABLE 4–1

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND TO BE CONSIDERED (TBC) REQUIREMENTS
FOR GROUND WATER
Pesticide Storage Facility Area
Fort Riley, Kansas

CHEMICAL	METHOD	MDL (mg/L)	FEDERAL MCL (mg/L)	FEDERAL MCLG (mg/L)	KANSAS MCL (mg/L)	KAL[g] (mg/L)	KNL[h]	RCRA ACTION LEVELS[a] GROUND WATER (mg/L)
Pesticides:								
Aldrin	8080	.00005	NA	NA	NA	0.000031	0.0000031	0.000002
Chlordane	8080	.00005	0.002	0	NA	0.00027	0.000027	0.00003
DDD	8080	.0001	NA	NA	NA	2.4E–08	2.4E–09	0.0001
DDE	8080	.0001	NA	NA	NA	2.4E–08	2.4E–09	0.0001
DDT	8080	.0001	NA	NA	NA	0.00042	0.000042	0.0001
Total DDT	8080	.0001	NA	NA	NA	NA	NA	0.0001
Dieldrin	8080	.0001	NA	NA	NA	0.000219	0.00000219	0.000002
Endrin aldehyde	8080	.0001	NA	NA	NA	0.0002	0.00002	NA
Fenchlorphos	8140	.0003	NA	NA	NA	NA	NE	NA
Heptachlor	8080	.00005	0.0004	0	NA	0.00076	0.000076	0.000008
Heptachlor epoxide	8080	.00005	0.0002	0	NA	0.00038	0.000038	0.000004
Methoxychlor	8080	.0005	0.04	0.04	0.1	0.1	0.01	NA
Volatiles:								
Benzene	8240	.003	0.005	0	NA	0.005	0.0005	NA
Carbon Disulfide	8240	.003	NA	NA	NA	NA	NA	4
Methylene Chloride	8240	.005	0.005 *	NA	NA	0.05	0.005	0.005
Toluene	8240	.005	1	1	NA	2	0.2	10
Trichloroethene	8240	.003	.005	0	NA	0.005	0.0005	0.005 [c]
Semi–Volatiles:								
Acenaphthene	8270	.005	NA	NA	NA	NA	NA	NA
Anthracene	8270	.005	NA	NA	NA	0.000029	0.0000029	NA
Benzo[a]anthracene	8270	.003	NA	0	NA	0.000029	0.0000029	NA
Benzo[a]pyrene	8270	.007	0.0002 *	0	NA	0.00003	0.000003	NA
Benzo[b]fluoranthene	8270	.010	NA	0	NA	0.000029	0.0000029	NA

TABLE 4-1

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND TO BE CONSIDERED (TBC) REQUIREMENTS
FOR GROUND WATER
Pesticide Storage Facility Area
Fort Riley, Kansas

CHEMICAL	METHOD	MDL (mg/L)	FEDERAL MCL (mg/L)	FEDERAL MCLG (mg/L)	KANSAS MCL (mg/L)	KAL[g] (mg/L)	KNL[h]	RCRA ACTION LEVELS[a] GROUND WATER (mg/L)
Benzo[k]fluoranthene	8270	.010	NA	0	NA	0.000029	0.0000029	NA
Bis(2-ethylhexyl)phthalate	8270	.005	0.006 *	0	NA	4.2	0.42	0.003
Chrysene	8270	.003	NA	0	NA	0.000029	0.0000029	NA
Dibenzofuran	8270	.010	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	8270	.006	NA	NA	NA	NA	NA	0.1
Diethylphthalate	8270	.005	NA	0	NA	350	35	30
Fluoranthene	8270	.004	NA	NA	NA	0.000029	0.0000029	NA
Fluorene	8270	.007	NA	0	NA	0.000029	0.0000029	NA
Indeno[1,2,3-cd]pyrene	8270	.010	NA	0	NA	0.000029	0.0000029	NA
2-Methylnaphthalene	8270	.004	NA	NA	NA	NA	NA	NA
Phenanthrene	8270	.004	NA	0	NA	0.000029	0.0000029	NA
Pyrene	8270	.003	NA	0	NA	0.000029	0.0000029	NA
2,4,6-Trichlorophenol	8270	.008	NA	NA	NA	0.017	0.0017	0.002
Metals:								
Aluminum	6010	.100	NA	NA	NA	5	NA	NA
Arsenic	7060	.002	0.05	0	0.05	0.05	NA	0.05 [c]
Barium	6010	.005	2	2	1	1	NA	2 [c]
Beryllium	6010	.002	0.004	0.004	NA	0.00013	NA	0.000008
Cadmium	6010	.005	0.005	0.005	0.01	0.005	NA	0.005 [c]
Chromium	6010	.010	0.1	0.1	0.05	0.05	NA	0.1 [c]
Cobalt	6010	.010	NA	NA	NA	NA	NA	NA
Copper	6010	.005	1.3	1.3	NA	1	NA	NA
Iron	6010	.045	0.3 (S)	NA	NA	0.3	NA	NA
Lead	7421	.001	T T	0	0.05	0.05	NA	NA
Magnesium	6010	.171	NA	NA	NA	NA	NA	NA
Manganese	6010	.015	0.05 (S)	NA	NA	0.05	NA	NA

TABLE 4-1

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND TO BE CONSIDERED (TBC) REQUIREMENTS
FOR GROUND WATER
Pesticide Storage Facility Area
Fort Riley, Kansas

CHEMICAL	METHOD	MDL (mg/L)	FEDERAL MCL (mg/L)	FEDERAL MCLG (mg/L)	KANSAS MCL (mg/L)	KAL[g] (mg/L)	KNL[h]	RCRA ACTION LEVELS[a] GROUND WATER (mg/L)
Mercury	7470	.0002	0.002	0.002	0.002	0.002	NA	0.002 [c]
Nickel	6010	.018	0.1 *	NA	NA	0.15	NA	.7
Potassium	6010	.216	NA	NA	NA	NA	NA	NA
Selenium	7740	.0012	0.05	0.05	0.01	0.045	NA	NA
Silver	6010	.004	0.05	NA	0.05	0.05	NA	0.05 [c]
Sodium	6010	.289	NA	NA	NA	100	NA	NA
Thallium	6010/7841 [i]	.100/.001	0.002 *	NA	NA	0.013	NA	0.003 [f]
Vanadium	6010	.007	NA	NA	NA	NA	NA	NA
Zinc	6010	.004	NA	NA	NA	5	NA	NA

NA – Not available S – Secondary MCL T T – Treatment Technique (0.015 mg/L at tap)

(a) RCRA Action Levels – Federal Register, Vol. 55, No. 145, July 27, 1990. Pages 30798–30884. Corrective Action for Solid Waste Management Facilities, Proposed Rule
(b) Value is for Endrin.
(c) Value listed is Maximum Contaminant Level (MCL).
(d) Value is for hexavalent chromium.
(e) Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites. Memorandum from H. Longest and B. Diamond to EPA Regions. OSWER Directive 9355.4–02.
(f) Value is for Thallium Acetate.
(g) KAL – Kansas Action Level
(h) KNL – Kansas Notification Level
(i) Thallium method (and associated MDL) changed to EPA 7841 for third quarter sampling activities.

Sources: Maximum Contaminant Levels (40 CFR 141 Subpart B); Kansas Drinking Water Rules (KAR 28.15).
* USEPA (57 FR 31776), 17 July 1992

MDL Method Detection Limit

TABLE 4-2

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND TO BE CONSIDERED (TBC) REQUIREMENTS FOR SOILS
Pesticide Storage Facility Area
Fort Riley, Kansas

CHEMICAL	METHOD	MDL (mg/kg)	RCRA ACTION LEVELS [a] SOILS (mg/kg)
Pesticides:			
Aldrin	8080	.0013	0.04
Chlordane	8080	.0047	0.5
DDD	8080	.0(	3
DDE	8080	.0013	2
DDT	8080	.004	2
Total DDT	8080	.004	2
Dieldrin	8080	.00067	0.04
Endrin aldehyde	8080	.0077	20 [b]
Fenchlorphos	8140	99	NA
Heptachlor	8080	.001	0.2
Heptachlor epoxide	8080	.010	0.08
Methoxychlor	8080	.059	NA
Volatiles:			
Benzene	8240	.002	NA
Carbon Disulfide	8240	.005	8,000
Methylene Chloride	8240	.005	90
Toluene	8240	.002	20,000
Trichloroethene	8240	.003	60
Semi-Volatiles:			
Acenaphthene	8270	0.14	NA
Anthracene	8270	0.15	NA
Benzo[a]anthracene	8270	0.09	NA
Benzo[a]pyrene	8270	0.22	NA
Benzo[b]fluoranthene	8270	0.33	NA
Benzo[k]fluoranthene	8270	0.33	NA
Bis(2-ethylhexyl)phthalate	8270	0.14	50
Chrysene	8270	0.1	NA
Dibenzofuran	8270	0.09	NA
2,4-Dichlorophenol	8270	0.2	200
Diethylphthalate	8270	0.15	60,000
Fluoranthene	8270	0.13	NA
Fluorene	8270	0.21	NA
Indeno[1,2,3-cd]pyrene	8270	0.33	NA
2-Methylnaphthalene	8270	0.12	NA
Phenanthrene	8270	0.12	NA
Pyrene	8270	0.08	NA
2,4,6-Trichlorophenol	8270	0.24	40

TABLE 4-2

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND TO BE CONSIDERED (TBC) REQUIREMENTS FOR SOILS
Pesticide Storage Facility Area
Fort Riley, Kansas

CHEMICAL	METHOD	MDL (mg/kg)	RCRA ACTION LEVELS [a] SOILS (mg/kg)
Metals:			
Aluminum	6010	5.4	NA
Arsenic	7060	0.34	80
Barium	6010	1.0	4,000
Cadmium	6010	0.8	40
Chromium	6010	1.2	400 [d]
Cobalt	6010	1.0	NA
Copper	6010	0.2	NA
Iron	6010	2.2	NA
Lead	6010	3.4	500 [e]
Magnesium	6010	34.2	NA
Manganese	6010	0.2	NA
Mercury	7471	0.04	20
Nickel	6010	1.8	2,000
Potassium	6010	43.2	NA
Selenium	7740	0.232	NA
Silver	6010	0.4	200
Sodium	6010	57.8	NA
Thallium	6010	4.4	7 [f]
Vanadium	6010	0.6	NA
Zinc	6010	0.4	NA

NA – Not available

(a) RCRA Action Levels – Federal Register, Vol. 55, No. 145, July 27, 1990. Pages 30798–30884. Corrective Action for Solid Waste Management Facilities, Propose
(b) Value is for Endrin.
(c) Value listed is Maximum Contaminant Level (MCL).
(d) Value is for hexavalent chromium.
(e) Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites. Memorandum from H. Longest and B. Diamond to EPA Regions Oswer Direc
(f) Value is for Thallium Acetate.

Sources: Maximum Contaminant Levels (40 CFR 141 Subpart B); Kansas Drinking Water Rules (KAR 28.16) * USEPA (57 FR 31776), 17 July, 1992

MDL: Method Detection Limit

TABLE 4–3

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) FOR SURFACE WATER AMBIENT WATER QUALITY CRITERIA (AWQC)
Pesticide Storage Facility Area
Fort Riley, Kansas

Method	Chemical	MDL	Maximum Concentration Detected	FEDERAL AMBIENT WATER QUALITY CRITERIA: For the Protection of Aquatic Life: Acute	Chronic	For the Protection of Human Health: (consumption of) Water & Fish	Fish only	KANSAS STATE WATER QUALITY STANDARDS [c] For the Protection of Aquatic Life:
8240	Methylene Chloride	5	33	11,000 [a,d]	NA	0.19 [b,d]	15.7 [b,d]	NA
6010	Aluminum	100	12,000	NA	NA	NA	NA	NA
7060	Arsenic, pentavalent	2	4.4 [T]	850 [a]	48 [a]	2.2 [b]	17.5 [b]	NA
7060	Arsenic, trivalent	2	4.4 [T]	360	190	2.2 [b]	17.5 [b]	NA
6010	Barium	5	290	NA	NA	1 mg	NA	NA
310.1	Bicarbonate	500	310,000	NA	NA	NA	NA	NA
6010	Cadmium	5	4.5	3.9 [e]	1.1 [e]	10	NA	NA
6010	Calcium	1000	110,000	NA	NA	NA	NA	NA
300	Chloride, inorganic	500	71,300	19	11	NA	NA	NA
--	Chromium, hexavalent	NR	24 [T]	16	11	50	NA	NA
6010	Chromium, trivalent	10	24 [T]	1,700 [e]	210 [e]	170	3.433 mg	NA
6010	Copper	5	13	18 [e]	12 [e]	NA	NA	NA
6010	Iron	45	9,400 [M1]	NA	1,000	0.3 mg	NA	NA
7421	Lead	1	4.2 [M2]	82 [e]	3.2 [e]	50	NA	NA
6010	Magnesium	171	23,000	NA	NA	NA	NA	NA
6010	Manganese	15	190	NA	NA	50	100	NA
300	Nitrate	500	ND	NA	NA	10 mg	NA	NA
6010	Potassium	216	11,000	NA	NA	NA	NA	NA
6010	Sodium	289	49,000	NA	NA	NA	NA	NA
300	Sulfate	500	106,000	NA	NA	NA	NA	NA
6010	Vanadium	7	26	NA	NA	NA	NA	NA
6010	Zinc	4	70	120 [e]	110 [e]	NA	NA	47

All concentrations are in ug/L (ppb), unless indicated otherwise.
NA – Not available ND – Not Detected NR – Not Run
a – Insufficient data to develop criteria. Value presented is lowest observed effect level.
b – Human health criteria for carcinogens reported for three risk levels. Value presented in this table is the 10^{-6} risk level.
c – The State of Kansas has incorporated the Federal AWQC for the protection of aquatic life as the State Water Quality Standards by reference.
d – Value is for Halomethanes.
e – Hardness Dependent Criteria (100 mg/l used).
T – Valence of metal was not established; concentration listed in table is for total metal(s).
M_1 – Matrix spike recovery is high due to sample matrix effect. Sample result is a false positive or biased high.
M_2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
Sources: RCRA Facility Investigation Guidance, Interim Final. Health-Based Criteria Tables, Section 8.0. EPA 530/SW-89-031, 1989.
Kansas Water Quality Standards (KAR 28.16.28), 1 May, 1987.
MDL – Method Detection Limit

TABLE 4-4

POTENTIAL TO BE CONSIDERED (TBC) REQUIREMENTS FOR SEDIMENTS
Pesticide Storage Facility Area
Fort Riley, Kansas

Method	Chemical	MDL	Maximum Detected Concentration	ER-L(a) Concentration	ER-M(b) Concentration	ER-L : ER-M Ratio	Overall Apparent Effects Threshold	Degree of Confidence
	PESTICIDES (μg/kg):							
8080	Chlordane	4.0	67	0.5	6	12	2	Low / Low
8080	DDD	8.0	100	2	20	10	NSD	Moderate / Low
8080	DDE	8.0	280	2	15	7.5	NSD	Low / Low
8080	DDT	8.0	480	1	7	7	6	Low / Low
8080	Total DDT	8.0	--	3	350	117	No	Moderate / Moderate
8080	Dieldrin	8.0	56	0.02	8	400	No	Low / Low
	SEMI-VOLATILES (μg/kg):							
8270	Benzo[a]anthracene	120	160	230	1600	7	550	Low/Moderate
8270	Chrysene	120	170	400	2800	7	900	Moderate/Moderate
8270	bis(2-Ethylhexyl)phthalate	410	640	NA	NA	NA	NA	NA
8270	Fluoranthene	160	270	600	3600	6	1000	High/High
8270	Phenanthrene	160	200	225	1380	6.1	260	Moderate/Moderate
8270	Pyrene	120	880	350	2200	6.3	1000	Moderate/Moderate
	VOLATILES (μg/kg):							
8240	Carbon Disulfide	5.0	6.9	NA	NA	NA	NA	NA
8240	1,2-Dichloropropane	3.0	84	NA	NA	NA	NA	NA
8240	Methylene Chloride	5.0	82 (B2)	NA	NA	NA	NA	NA
8240	1,1,2,2-Tetrachloroethane	5.0	39	NA	NA	NA	NA	NA
8240	Toluene	2.0	13 (I)	NA	NA	NA	NA	NA
	METALS (mg/kg):							
7060	Arsenic	2.0	3.8	33	85	2.6	50	Low/Moderate
6010	Barium	7.8	150	NA	NA	NA	NA	NA
6010	Cadmium	0.7	2.1	5	9	1.8	5	High/High
6010	Chromium	2.0	25	80	145	1.8	No	Moderate/Moderate
6010	Lead	4.0	210	35	110	3.1	300	Moderate/High
7470	Mercury	0.1	0.4	0.15	1.3	8.7	1	Moderate/High
7740	Selenium	0.2	0.3 (M2)	NA	NA	NA	NA	NA
6010	Silver	0.7	0.8	1	2.2	2.2	1.7	Moderate/Moderate

NSD – Not sufficient data
NA – Not available
B2 – Sample is less than 10 times amount detected in method blank. Result is estimated.
M2 – Matrix spike recovery is low due to sample matrix effect. Result is biased low.
I – Low internal standard recoveries. Results are biased high.
(a) Effects range – low
(b) Effects range – medium
Source: National Oceanic and Atmospheric Administration, Technical Memorandum, NOS OMA 52, 1990.
MDL – Method Detection Limit

ER-L = Effects Range-Low
ER-M = Effects Range-Medium

TABLE 4-5

GROUND-WATER/SURFACE WATER SAMPLE ANALYTICAL REQUIREMENTS
Pesticide Storage Facility
Fort Riley, Kansas

ANALYSIS	EPA METHOD
LENL:	
Volatile Organics	8260
Semi-volatile Organics	3520/8270
Pesticides/PCBs	3520/8080
Total and Dissolved Metals	
Aluminum	3005/6010
Antimony	3005/6010
Arsenic	3005/7060
Barium	3005/6010
Beryllium	3005/6010
Cadmium	3005/6010
Calcium	3005/6010
Cobalt	3005/6010
Copper	3005/6010
Chromium	3005/6010
Iron	3005/6010
Lead	3020/7421
Magnesium	3005/6010
Manganese	3005/6010
Mercury	7470
Nickel	3005/6010
Potassium	3005/6010
Selenium	3005/7740
Silver	3005/6010
Sodium	3005/6010
Thallium	3005/6010
Vanadium	3005/6010
Zinc	3005/6010
SWLO:	
2,3,7,8-TCDD (Dioxin Isomer)	8280
Herbicides	8150
Organophosphorous Pesticides	3510/8140
Wet Chemical Inorganics:	
Chloride	300
Sulfate	300
Nitrate	300
Bicarbonate	310.1

LENL - Law Environmental National Laboratories
SWLO - Southwest Laboratory of Oklahoma

TABLE 4–6

HISTORICAL GROUND–WATER DATA COMPARISON
Pesticide Storage Facility
Fort Riley, Kansas

PARAMETER Date Sampled	1986 (a)	1987 (b)	1988 (c)	1990 (d)	1991 (e)	1992 (f)	1992 (g)
METALS, TOTAL							
Arsenic, μg/L	<5.0	<5.0	na	na	<1.0 – 3.0	na	<2.0 – 163
Selenium, μg/L	<5.0	1.0 – 3.0	na	na	<1.0 – 2.0	na	1.1 – 2.7
Aluminum, μg/L	na	na	na	na	<26 – 220	na	<100 – 550
Barium, μg/L	231 – 367	232 – 416	na	na	181 – 331	na	47 – 130
Beryllium, μg/L	na	na	na	na	<1.0	na	1.0 – 3.0
Calcium, μg/L	85,600 – 109,000	83,800 – 114,000	na	na	72,900 – 114,526	na	89,000 – 350,000
Cobalt, μg/L	na	na	na	na	<4.0 – 5.0	na	<8.0
Iron, μg/L	<100 – 114	<100	na	na	9.0 – 500	na	<50 – 990
Lead, μg/L	<1.0	<1.0	na	na	1.0 – 4.0	na	<1.0
Magnesium, μg/L	16,300 – 39,000	19,200 – 47,300	na	na	16,600 – 29,900	na	14,000 – 560,000
Manganese, μg/L	<30 – 197	<30 – 70	na	na	<1.0 – 110	na	24 – 91
Mercury, μg/L	<0.2	<1.0 – 1.7	na	na	<0.5	na	<0.2
Potassium, μg/L	na	na	na	na	<600 – 9140	na	3,400 – 20,000
Silver, μg/L	<25	<20	na	na	<1.0	na	<3.0
Sodium, μg/L	8,300 – 93,100	26,300 – 82,000	na	na	7,190 – 46,300	na	11,000 – 90,000
Zinc, μg/L	53 – 327	20 – 221	na	na	11 – 266	na	7.8 – 98
INORGANICS							
Chloride	9,100 – 41,000	7,000	na	na	4,000 – 46,200	na	10,300 – 272,000
Nitrate	160 – 6,700	350 – 3,500	na	na	60 – 1,100	na	<100 – 33,000
Sulfate	21,000 – 95,000	18,000 – 88,000	na	na	14,000 – 101,000	na	70,800 – 383,000
VOLATILES							
THMS, μg/L	<1.0 – 93	6 – 54	<1.0	<0.5 – 5.1	26.3 – 47.3	24.9	<5.0
Trichloroethene, μg/L	na	na	<0.5	<0.5	<0.5	<0.5	<3.0
SEMI – VOLATILES							
Butyl benzyl phthalate, μg/L	na	na	<20	10	na	na	<10

TABLE 4–6

HISTORICAL GROUND–WATER DATA COMPARISON
Pesticide Storage Facility
Fort Riley, Kansas

PARAMETER Date Sampled	1986 (a)	1987 (b)	1988 (c)	1990 (d)	1991 (e)	1992 (f)	1992 (g)
PESTICIDES/PCB's							
Alpha – BHC, µg/L	na	na	<0.05	0.07	na	na	<0.05
Gamma – BHC, µg/L	na	na	<0.05	0.31	na	na	<0.05
Atrazine, µg/L	na	na	na	0.83 – 1.26	na	na	na
HERBICIDES	na	na	nd	nd	na	na	nd

Data collected from 1986 to 1992 (f) are from Ft. Riley drinking water wells.
Comparison of data is qualitative only.
Analytical methods for the FT. Riley drinking water wells are drinking water methods; whereas analytical methods for the ground–water wells (g) conducted by Law are from SW–846 test methods for evaluating solid wastes.
na – Not analyzed
nd – Not detected

Sources:
a – Department of the Army, Letter, USAHEA, HSHB–ME–WR, 21 November 1986.
a – Department of the Army, Letter, HSE–EW–C, 10 August 1977.
b – Department of the Army, Memorandum, AFZN–DE–EN, November 1987.
c – Department of the Army, Lancaster Laboratories results, October 1988.
d – Department of the Army, Letter, USAHEA, HSHB–ME–WR, 21 November 1986.
e – Kansas Department of Health and Environment, May 14, 1991 and August 20, 1991.
f – Kansas Department of Health and Environment, Feb. 25, 1992 and April 24, 1992.
g – Law Environmental, Quality Control Summary Reports, September 1992 and January 1993.

TABLE 4-7

POSITIVE ANALYTICAL RESULTS/GROUND WATERS
BASELINE/JULY 1992
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Date Collected	PSF9201 7-16-92	SAMPLE PSF9202 7-14-92	DUPLICATE PSF9206 7-14-92	PSF9203 7-16-92	PSF9204 7-23-92	PSF9205 7-16-92
PESTICIDES/PCBs:	--	--	--	--	--	--
SEMI-VOLATILE ORGANICS:	--	--	--	--	--	--
VOLATILE ORGANICS:						
Methylene chloride, µg/L	9.3(T)	--	--	21(T)	5.4(T)	18(T)
Trichloroethene, µg/L	--	--	--	--	--	3.0
DISSOLVED FURNACE METALS:						
Arsenic, µg/L	--	--	--	--	--	15
Selenium, µg/L	1.1	2.2	2.1	1.5	1.2	2.6
Lead, µg/L	--(M2)	--(M2)	--(M2)	--(M2)	--(M2)	--(M2)
DISSOLVED ICP METALS:						
Aluminum, µg/L	--	284	--	--	--	170
Barium, µg/L	88	100	83	92	84	120
Beryllium, µg/L	--	3.0	2.9	1.6	1.6	1.5
Calcium, µg/L	88000	340000	340000	180000	140000	170000
Iron, µg/L	--	--	--	--	78	--
Magnesium, µg/L	14000	55000	55000	29000	18000	27000
Manganese, µg/L	24	54	52	83	31	40
Potassium, µg/L	3300	6100	6200	5700	3800	19000
Sodium, µg/L	11000	89000	90000	47000	25000	41000
Vanadium, µg/L	--	--	--	--	--	24
Zinc, µg/L	13(B1)	16(B1)	14(B1)	11(B1)	11(B1)	15(B1)
TOTAL RECOVERABLE FURNACE METALS:						
Arsenic, µg/L	--	--	--	--	--	16
Selenium, µg/L	1.6	2.2	2.2	1.7	2.1	2.7
Lead, µg/L	--(M2)	--(M2)	--(M2)	--(M2)	--(M2)	--(M2)
TOTAL ICP METALS:						
Aluminum, µg/L	--	--	--	270	160	210
Barium, µg/L	100	84	82	81	85	130
Beryllium, µg/L	1.4	3.0	2.8	1.5	1.4	1.6
Calcium, µg/L	89000	350000	330000	180000	140000	180000
Chromium, µg/L	10	--	12	--	--	--
Iron, µg/L	52	68	--	290	90	230
Magnesium, µg/L	14000	56000	54000	29000	19000	28000
Manganese, µg/L	26	56	50	91	36	43
Potassium, µg/L	3400	6300	6000	5900	3900	20000
Sodium, µg/L	11000	90000	87000	47000	25000	42000
Vanadium, µg/L	8.3	--	--	--	--	27
Zinc, µg/L	12(B1)	98	16(B1)	18(B1)	7.8(B1)	9.7(B1)

TABLE 4-7

POSITIVE ANALYTICAL RESULTS/GROUND WATERS
BASELINE/JULY 1992
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Date Collected	PSF9201 7-16-92	SAMPLE PSF9202 7-14-92	DUPLICATE PSF9206 7-14-92	PSF9203 7-16-92	PSF9204 7-23-92	PSF9205 7-16-92
DISSOLVED MERCURY:						
Hg Diss. Metals, µg/L	--	--	--	--	0.4 (R)	--
ACID HERBICIDES:	--	--	--	--	--	--
ORGANOPHOSPHORUS PESTICIDES:	--	--	--	--	--	--
WET CHEMICAL INORGANICS:						
Inorganic Chloride, mg/L	10.30	267.00	272.00	70.40	139.00	56.70
Nitrate, mg/L	4.50	32.60	33.00	11.60	--	18.40
Sulfate, mg/L	84.70	380.00	386.00	171.00	125.00	119.00
Bicarbonate, mg/L	239.00	466.00	466.00	421.00	236.00	493.00

-- Not detected.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is estimated.
B1 – Sample results are less than 5 times the amount detected in the method blank. Result is estimated.
T – Sample results are less than 10 times the amount detected in the trip blank. Result is estimated.

TABLE 4-8

POSITIVE ANALYTICAL RESULTS/GROUND WATERS
FIRST QUARTER/NOVEMBER 1992
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER	PSF9201	SAMPLE PSF9202	DUPLICATE PSF9206	PSF9203	PSF9204	PSF9205
Date Collected	11-05-92	11-05-92	11-05-92	11-05-92	11-05-92	11-05-92
VOLATILE ORGANICS (µg/L):						
Methylene chloride	5.0 (T)	5.0 (T)	--	5.3 (T)	5.0 (T)	--
SEMI-VOLATILE ORGANICS (µg/L):	--	--	--	--	--	--
DISSOLVED FURNACE METALS (µg/L):						
Arsenic	--	--	--	--	--	4.3
Selenium	--	2.1	2.2	1.3	1.0	1.7
Lead	-- (M2)	-- (M2)	-- (M2)	-- (M2)	-- (M2)	-- (M2)
DISSOLVED MERCURY (µg/L):	--	--	--	--	--	--
DISSOLVED ICP METALS (µg/L):						
Barium	120	49	70	68	98	140
Beryllium	1.0	2.0	3.0	2.0	1.0	2.0
Calcium	96000	240000	240000	160000	150000	140000
Iron	58	--	--	--	--	--
Magnesium	16000	39000	40000	25000	20000	22000
Manganese	19	34	34	51	24	26
Nickel	--	--	--	34	--	--
Potassium	3400	4700	4800	4800	3600	10000
Sodium	16000	56000	57000	37000	30000	31000
Vanadium	--	--	--	--	--	14
Zinc	13	10	11	10	8.0	10
TOTAL RECOVERABLE FURNACE METALS (µg/L):						
Lead	-- (M2)	-- (M2)	-- (M2)	-- (M2)	-- (M2)	-- (M2)
Arsenic	--	--	--	--	--	4.4
Selenium	2.0	2.1	2.2	1.2	1.1	1.7
TOTAL RECOVERABLE MERCURY (µg/L):	--	--	--	--	--	--

TABLE 4–8

POSITIVE ANALYTICAL RESULTS/GROUND WATERS
FIRST QUARTER/NOVEMBER 1992
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Date Collected	PSF9201 11-05-92	SAMPLE PSF9202 11-05-92	DUPLICATE PSF9206 11-05-92	PSF9203 11-05-92	PSF9204 11-05-92	PSF9205 11-05-92
TOTAL RECOVERABLE ICP METALS (µg/L):						
Aluminum	--	170	190	550	--	550
Barium	120	68	47	94	100	130
Beryllium	2.0	3.0	2.0	2.0	1.0	2.0
Calcium	100000	240000	230000	160000	150000	150000
Copper	5.0	--	--	--	--	--
Iron	60	280	290	990	--	910
Magnesium	17000	40000	38000	25000	21000	23000
Manganese	24	41	39	71	26	47
Nickel	19	--	--	--	24	--
Potassium	3700	4800	4600	5000	3700	11000
Sodium	16000	57000	54000	37000	31000	31000
Vanadium	11	--	--	8.0	--	12
Zinc	23	16	15	21	15	13
WET CHEMICAL INORGANICS (mg/L):						
Inorganic Chloride	63.50	122.00	121.00	55.30	41.50	48.60
Nitrate	3.80	20.30	20.20	11.10	13.80	10.70
Sulfate	70.80	336.00	330.00	197.00	142.00	108.00
Bicarbonate	190	327	331	315	300	348
ORGANOPHOSPHORUS PESTICIDES (µg/L):	--	--	--	--	--	--
ACID HERBICIDES (µg/L):	--	--	--	--	--	--
PESTICIDES/PCBs (µg/L):	--	--	--	--	--	--

-- Not detected.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is estimated.
T – Sample results are less than 10 times the amount detected in the trip blank. Result is estimated.

TABLE 4–9

POSITIVE ANALYTICAL RESULTS/GROUND WATERS
SECOND QUARTER/FEBRUARY 1993
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Date Collected			Duplicate		PSF9204 2–3–93	PSF9205 2–3–93
VOLATILE ORGANICS (µg/L):	--	--	--	--	--	--
SEMI–VOLATILE ORGANICS (µg/L):	--	--	--	--	--	--
DISSOLVED METALS (µg/L):						
Arsenic	--	--	--	--	--	2.8
Selenium	1.9	2.1	2.2	1.2	1.2	1.2
Antimony	--	--	--	28	--	36
Barium	180	64	59	58	91	120
Beryllium	3.0	5.0	4.0	3.0	2.0	2.0
Calcium	130000	290000	290000	170000	140000	150000
Copper	6.0	10	--	5.0	8.0 (B1)	--
Magnesium	22000	50000	50000	28000	19000	23000
Manganese	25	35	34	50	23	23
Nickel	11	--	15	13	--	--
Potassium	4900	6000	6200	5900	3800	11000
Silver	4.0	11	11	7.0	--	6.0
Sodium	19000	110000	110000	46000	28000	33000
Vanadium	7.0	9.0	--	--	11 (B1)	7.0
Zinc	12	5.0	4.0	8.0	8.0	6.0
TOTAL METALS (µg/L):						
Arsenic	--	--	2.7	--	--	3.8
Selenium	2.3	3.0	2.6	1.7	1.4	1.9
Aluminum	--	--	--	800	--	110
Antimony	22	--	--	--	--	32
Barium	160	60	55	63	93	110
Beryllium	2.0	5.0	4.0	2.0	2.0	3.0
Calcium	120000	290000	290000	170000	150000	150000
Cobalt	--	--	--	--	--	9.0

TABLE 4-9

POSITIVE ANALYTICAL RESULTS/GROUND WATERS
SECOND QUARTER/FEBRUARY 1993
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Date Collected			Duplicate		PSF9204 2-3-93	PSF9205 2-3-93
TOTAL METALS (μg/L) (continued):						
Copper	--	4.0	--	--	6.0 (B1)	6.0
Iron	61	--	66	1500	--	84
Magnesium	20000	49000	49000	27000	20000	22000
Manganese	22	34	32	77	24	23
Nickel	30	15	22	13	--	17
Potassium	5300	6800	6600	6500	4000	12000
Silver	4.0	7.0	9.0	5.0	3.0	12
Sodium	17000	100000	100000	44000	30000	32000
Vanadium	6.0	--	--	--	9.0 (B1)	14
Zinc	7.0	7.0	--	14	--	4.0
WET CHEMICAL INORGANICS (mg/L):						
Inorganic Chloride	129.00	262.00	262.00	76.50	40.10	47.70
Nitrate	6.40	165.00	165.00	50.60	65.60	45.90
Sulfate	52.20	326.00	324.00	188.00	131.00	109.00
Bicarbonate	190.00	327.00	331.00	315.00	300.00	348.00
Bicarbonate as CaCO3	232.00	416.00	418.00	342.00	300.00	359.00
ORGANOPHOSPHORUS PESTICIDES (μg/L	--	--	--	--	--	--
ACID HERBICIDES (μg/L):	--	--	--	--	--	--
PESTICIDES/PCBs (μg/L):	--	--	--	--	--	--

B1 – Sample results are less than 5 times the amount detected in the method blank. Result is estimated.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result may be biased low.
-- Not Detected

TABLE 4–10

COMPARISON OF BASELINE, FIRST QUARTER AN… …OND QUARTER
GROUND–WATER POSITIVE RESULTS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Date Collected	PSF9201 7-16-92	PSF9201 11-5-92	PSF9201 2-3-93	SAMPLE PSF9202 7-14-92	SAMPLE PSF9202 11-05-92	SAMPLE PSF9202 2-3-93	DUPLICATE PSF9206 7-14-92	DUPLICATE PSF9206 11-05-92	DUPLICATE PSF9206 2-3-93
VOLATILE ORGANICS (ug/L):									
Methylene chloride	9.3(T)	5.0 (T)	--	--	5.0 (T)	--	--	--	--
Trichloroethene	--	--	--	--	--	--	--	--	--
SEMI-VOLATILE ORGANICS (ug/L):	--	--		--	--	--	--	--	--
DISSOLVED FURNACE METALS (ug/L):									
Arsenic	--	--	--	--	--	--	--	--	--
Selenium	1.1	1.0	--	2.2	2.1	--	2.1	2.2	--
Lead	-- (M2)	-- (M2)	--	-- (M2)	-- (M2)	--	-- (M2)	-- (M2)	--
DISSOLVED ICP METALS (ug/L):									
Aluminum	--	--	--	284	--	--	--	--	--
Barium	86	120	160	100	49	64	83	70	59
Beryllium	--	1.0	2.0	3.0	2.0	5.0	2.9	3.0	4.0
Calcium	86000	96000	120000	340000	240000	290000	340000	240000	290000
Iron	--	58	61	--	--	--	--	--	--
Magnesium	14000	16000	22000	55000	39000	50000	55000	40000	50000
Manganese	24	19	25	54	34	35	52	34	34
Nickel	--	--	11	--	--	--	--	--	15
Potassium	3300	3400	4900	6100	4700	6000	6200	4800	6200
Sodium	11000	16000	19000	89000	56000	110000	90000	57000	110000
Vanadium	--	--	7.0	--	--	9.0	--	--	--
Zinc	13(B1)	13	12	16(B1)	10	5.0	14(B1)	11	4.0
TOTAL RECOVERABLE FURNACE METALS (ug/L):									
Arsenic	--	--	--	--	--	--	--	--	--
Selenium	1.6	2.0	--	2.2	2.1	--	2.2	2.2	--
Lead	-- (M2)	-- (M2)	--	-- (M2)	-- (M2)	--	-- (M2)	-- (M2)	--
TOTAL RECOVERABLE ICP METALS (ug/L):									
Aluminum	--	--	--	--	170	--	--	190	--
Barium	100	120	180	84	66	60	82	47	55
Beryllium	1.4	2.0	2.0	3.0	3.0	5.0	2.8	2.0	4.0
Calcium	89000	100000	130000	350000	240000	290000	330000	230000	290000
Copper	--	5.0	6.0	--	--	4.0	--	--	--
Chromium	10	--	--	--	--	--	12	--	--
Iron	82	60	61	66	280	--	--	290	66
Magnesium	14000	17000	20000	56000	40000	49000	54000	38000	49000
Manganese	26	24	22	56	41	34	50	39	32
Nickel	--	19	30	--	--	15	--	--	22
Potassium	3400	3700	5300	6300	4800	6800	6000	4800	6600
Sodium	11000	16000	17000	90000	57000	100000	87000	54000	100000
Vanadium	8.3	11	6.0	--	--	--	--	--	--
Zinc	12(B1)	23	7.0	96	16	7.0	16(B1)	15	--
DISSOLVED MERCURY (ug/L):	--	--	--	--	--		--	--	--
TOTAL RECOVERABLE MERCURY (ug/L):	--	--	--	--	--		--	--	--
WET CHEMICAL INORGANICS (mg/L):									
Inorganic Chloride	10.30	63.50	129.00	267.00	122.00	282.00	272.00	121.00	282.00
Nitrate	4.50	3.80	6.40	32.60	20.30	165.00	33.00	20.20	165.00
Sulfate	84.70	70.60	82.20	380.00	336.00	326.00	386.00	330.00	324.00
Bicarbonate	239.00	190	232	466.00	327	416	466.00	361	416
ACID HERBICIDES (ug/L):	--	--	--	--	--	--	--	--	--
ORGANOPHOSPHORUS PESTICIDES (ug/L):	--	--	--	--	--	--	--	--	--
PESTICIDES/PCBs (ug/L):	--	--	--	--	--	--	--	--	--

-- Not detected.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is estimated.
B1 – Sample results are less than 5 times the amount detected in the method blank. Result is estimated.
T – Sample results are less than 10 times the amount detected in the trip blank. Result is estimated.

TAB'

COMPARISON OF BASELINE, F[illegible] QUARTER AND SECOND QUARTER
GROUND-WATER POSITIVE RESULTS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Date Collected	PSF9203 7-16-92	PSF9203 11-05-92	PSF9203 2-3-93	PSF9204 7-23-92	PSF9204 11-05-92	PSF9204 2-3-93	PSF9205 7-16-92	PSF9205 11-05-92	PSF9205 2-3-93
VOLATILE ORGANICS (ug/L):									
Methylene chloride	21(T)	5.3 (T)	--	5.4(T)	6.0 (T)	--	18(T)	--	--
Trichloroethene	--	--	--	--	--	--	3.0	--	--
SEMI-VOLATILE ORGANICS (ug/L):	--	--	--	--	--	--	--	--	--
DISSOLVED FURNACE METALS (ug/L):									
Arsenic	--	--	--	--	--	--	15	4.3	2.8
Selenium	1.5	1.3	--	1.2	1.0	--	2.6	1.7	--
Lead	-- (M2)	-- (M2)	--	-- (M2)	-- (M2)	--	-- (M2)	-- (M2)	--
DISSOLVED ICP METALS (ug/L):									
Aluminum	--	--	--	--	--	--	170	--	--
Barium	92	66	56	84	96	91	120	140	120
Beryllium	1.6	2.0	3.0	1.6	1.0	2.0	1.5	2.0	2.0
Calcium	180000	160000	170000	140000	150000	140000	170000	140000	150000
Iron	--	--	--	78	--	--	--	--	--
Magnesium	29000	25000	28000	18000	20000	19000	27000	22000	23000
Manganese	83	51	50	31	24	23	40	26	23
Nickel	--	34	13	--	--	--	--	--	--
Potassium	5700	4800	5900	3800	3600	3600	19000	10000	11000
Sodium	47000	37000	46000	25000	30000	28000	41000	31000	33000
Vanadium	--	--	--	--	--	11 (B1)	24	14	7.0
Zinc	11(B1)	10	8.0	11(B1)	8.0	8.0	15(B1)	10	6.0
TOTAL RECOVERABLE FURNACE METALS (ug/L):									
Arsenic	--	--	--	--	--	--	16	4.4	3.8
Selenium	1.7	1.2	--	2.1	1.1	--	2.7	1.7	--
Lead	-- (M2)	-- (M2)	--	-- (M2)	-- (M2)	--	-- (M2)	-- (M2)	--
TOTAL RECOVERABLE ICP METALS (ug/L):									
Aluminum	270	550	800	160	--	--	210	550	110
Barium	81	94	63	85	100	93	130	130	110
Beryllium	1.5	2.0	2.0	1.4	1.0	2.0	1.6	2.0	3.0
Calcium	180000	160000	170000	140000	150000	150000	180000	150000	150000
Copper	--	--	--	--	--	8.0 (B1)	--	--	6.0
Chromium	--	--	--	--	--	--	--	--	--
Iron	290	990	1500	90	--	--	230	910	84
Magnesium	29000	25000	27000	19000	21000	20000	26000	23000	22000
Manganese	91	71	77	36	26	24	43	47	23
Nickel	--	--	13	--	24	--	--	--	17
Potassium	5900	5000	6600	3900	3700	4000	20000	11000	12000
Sodium	47000	37000	44000	25000	31000	30000	42000	31000	32000
Vanadium	--	8.0	--	--	--	9.0 (B1)	27	12	14
Zinc	16(B1)	21	14	7.6(B1)	15	--	9.7(B1)	13	4.0
DISSOLVED MERCURY (ug/L):	--	--	--	--	--	--	--	--	--
TOTAL RECOVERABLE MERCURY (ug/L):	--	--	--	--	--	--	--	--	--
WET CHEMICAL INORGANICS (mg/L):									
Inorganic Chloride	70.40	66.30	78.50	139.00	41.50	40.10	56.70	48.60	47.70
Nitrate	11.60	11.10	50.80	--	13.80	65.60	18.40	10.70	45.90
Sulfate	171.00	197.00	198.00	125.00	142.00	131.00	119.00	108.00	109.00
Bicarbonate	421.00	315	342	236.00	300	300.00	493.00	348	359
ACID HERBICIDES (ug/L):	--	--	--	--	--	--	--	--	--
ORGANOPHOSPHORUS PESTICIDES (ug/L):	--	--	--	--	--	--	--	--	--
PESTICIDES/PCBs (ug/L):	--	--	--	--	--	--	--	--	--

-- Not detected.
M2 -- Matrix spike recovery is low due to sample matrix effect. Sample result is estimated.
B1 -- Sample results are less than 5 times the amount detected in the method blank. Result is estimated.
T -- Sample results are less than 10 times the amount detected in the trip blank. Result is estimated.

1531.k14

TABLE 4-11

SOIL/SEDIMENT SAMPLE ANALYTICAL REQUIREMENTS
Pesticide Storage Facility
Fort Riley, Kansas

ANALYSIS	EPA METHOD
LENL:	
Volatile Organics	8260
Semi-volatile Organics	3550/8270
Pesticides/PCBs	3550/8080
Metals[a]:	
Aluminum	3050/6010
Antimony	3050/6010
Arsenic[b]	3050/7060
Barium[b]	3050/6010
Beryllium	3050/6010
Cadmium[b]	3050/6010
Calcium	3050/6010
Cobalt	3050/6010
Copper	3050/6010
Chromium[b]	3050/6010
Iron	3050/6010
Lead[b]	3050/6010
Magnesium	3050/6010
Manganese	3050/6010
Mercury[b]	7470
Nickel	3050/6010
Potassium	3050/6010
Selenium[b]	7740
Silver[b]	3050/6010
Sodium	3050/6010
Thallium	3050/6010
Vanadium	3050/6010
Zinc	3050/6010
SWLO:	
Herbicides	8150
Organophosphorus Pesticides	3550/8140
2,3,7,8-TCDD (Dioxin Isomer)	8280

(a) The complete metals list was analyzed on the two Pilot Hole soil samples only.
(b) All other soil samples and sediment samples received analysis for these metals (RCRA 8 heavy metals).

LENL - Law Environmental National Laboratory
SWLO - Southwest Laboratory of Oklahoma

TABLE 4-12

SUMMARY OF RESULTS FOR SAMPLE 00760
Pesticide Storage Facility
Fort Riley, Kansas
July 1974

PARAMETER	CONCENTRATION (mg/kg)
Malathion	87.70
Diazinon	29.85
Methoxychlor	824.04
Mirex	3.72
Chlordane	423.53
Dieldrin	4.98
Aldrin	---
p,p'-DDT	53.78
o,p'-DDT	47.75
p,p'-DDE	1.30
p,p'-DDD	37.87
o,p'-DDD	16.98

Notes: 1. --- Not Detected
2. Source:USAEHA, 1976. Entomology Special Study No. 44-015-75/76.

TABLE 4-13

RESULTS FROM PESTICIDE RESIDUE SAMPLING
IN THE VICINITY OF THE PESTICIDE STORAGE FACILITY
Fort Riley, Kansas
May 1986

(Concentrations in mg/kg)

PARAMETER	Sample Number						RCRA CA Level 1988
	86S1[a]	86S2[a]	86S3[b]	86S4[b]	86S5[b]	86S6[b]	
p,p'-DDD	0.42	0.42	ND	0.20	ND	ND	3.0
p,p'-DDE	0.56	0.78	ND	0.63	ND	0.03	2.0
p,p'-DDT	0.42	0.86	ND	0.80	ND	ND	2.0
o,p'-DDT	2.04	3.01	ND	5.96	ND	0.05	2.0
dieldrin	0.23	0.04	ND	0.05	ND	0.06	0.04
chlordane metab./ total constituents	4.35	3.30	ND	2.15	ND	ND	0.5
methoxychlor	0.69	0.26	ND	0.18	ND	ND	N/A
TOTAL PESTICIDES	8.71	8.67	ND	9.97	ND	0.14	

Concentrations detected represent maximum values for one round of sampling.

(a) Soil sample
(b) Sediment sample

ND: None Detected
N/A: Not Applicable
RCRA CA: Resource Conservation and Recovery Act Corrective Action

Source: USAEHA Memorandum, April 22, 1988

TABLE 4-14

HISTORICAL SOIL & SEDIMENT DATA COMPARISON
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected Sample Type	ns 1974 (a) Soil	ns 1986 (b) Soil	(0-38') 1992 Soil (1)	(1.5-2.5') 1992 Soil	(3.0-4.5') 1992 Soil	(0-2') 1992 Surface Soil
PESTICIDES/PCBs:						
Aldrin, mg/kg	<0.008-0.01	<0.08	<0.004	<0.004	<0.004	<0.004
Chlordane (technical), mg/kg	<0.06-544.6	<0.6	<0.004	<0.004	<0.004	<0.004
alpha(cis)-Chlordane, mg/kg	<0.008	<0.08	<0.004-0.073	<0.004-0.790	<0.004-1.5(D2)	<0.004-1.6
gamma(trans)-Chlordane, mg/kg	<0.008	<0.08	<0.004-0.071	<0.004-0.470	<0.004-1.6(D2)	<0.004-1.6
2,4'(o,p')-DDD, mg/kg	<0.02-16.98	<0.2	na	na	na	na
4,4'(p,p')-DDD, mg/kg	<0.016-37.87	<0.16-.42	<0.007	<0.007-0.430(H)	<0.007-0.025	<0.007
2,4'(o,p')-DDE, mg/kg	<0.02	<0.2	na	na	na	na
4,4'(p,p')-DDE, mg/kg	<0.016-12.5	<0.16-0.78	<0.007-0.012	<0.007-0.870(S)	<0.007-0.420(S)	<0.007-1.8
2,4'(o,p')-DDT, mg/kg	<0.02-50.0	<0.2-0.80	na	na	na	na
4,4'(p,p')-DDT, mg/kg	<0.03-159.5	<0.3-0.86	<0.004	<0.004-7.7(D2)	<0.004-3.3(D2)	<0.004-1.0
Dieldrin, mg/kg	<0.012-9.2	<0.02-0.23	<0.007-0.013	<0.007-0.2	<0.007-0.027(H)	<0.007-0.094
Endrin, mg/kg	<0.021	<0.04	<0.007	<0.007	<0.007	<0.007
Heptachlor, mg/kg	<0.003	<0.03	<0.004	<0.004-0.230	<0.004-0.028	<0.004-0.3
Heptachlor epoxide, mg/kg	<0.008	<0.08	<0.004	<0.004	<0.004-0.0054	<0.004
Methoxychlor, mg/kg	<0.08-824.04	<0.8-0.69	<0.033	<0.033-0.08(S)	<0.033-10(D1)	<0.033 -2.4
ORGANOPHOSPHORUS PESTICIDES:						
Chlorpyrifos, mg/kg	<0.012	<0.10	<0.010	<0.010	<0.010	<0.010
Diazinon, mg/kg	<0.052-29.85	<0.052	<0.02	<0.02	<0.02	<0.02
Methyl parathion, mg/kg	<0.03	<0.03	<0.001	<0.001	<0.001	<0.001
Malathion, mg/kg	<0.01-87.7	<0.01	<0.170	<0.170	<0.170	<0.170-0.419
Ronnel (Fenchlorphos), mg/kg	na	<0.1	<0.010	<0.010	<0.010-0.0438	<0.010

Results with less than detection limits were analyzed for but no positive results were found.
na-not analyzed
D2-400x dilution factor. Result is estimated.
S-Low surrogate recovery. Results are biased low.
H-Holding time exceeded. Results biased low.
1-Represents the monitoring well soil samples as well as the pilot hole.
ns-Not specified

Sources :
a-Entomological special study No. 44-015-75/76.
b-Pesticide Monitoring Study No. 17-44-1356-88.

TABLE 4-14

HISTORICAL SOIL & SEDIMENT DATA COMPARISON
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER				
Sample Depth	ns	ns	(0-1')	(1-2')
Date Collected	1974 (a)	1986 (b)	1992	1992
Sample Type	Sediment	Sediment	Sediments	Sediments
PESTICIDES/PCBs:				
Aldrin, mg/kg	<0.008	<0.08	<0.004	<0.004
Chlordane (technical), mg/kg	<0.06-0.28	<0.6	<0.004	<0.004
alpha(cis)-Chlordane, mg/kg	<0.008	<0.08	<0.004-0.067	<0.004-0.01
gamma(trans)-Chlordane, mg/kg	<0.008	<0.08	<0.004-0.065	<0.004-0.021
2,4'(o,p')-DDD, mg/kg	<0.02-0.01	<0.2	na	na
4,4'(p,p')-DDD, mg/kg	<0.016-0.05	<0.16	<0.007-0.1	<0.007-0.031
2,4'(o,p')-DDE, mg/kg	<0.02	<0.2	na	na
4,4'(p,p')-DDE, mg/kg	<0.016-0.02	<0.16	<0.007-0.280	<0.007-0.046
2,4'(o,p')-DDT, mg/kg	<0.02-0.04	<0.2	na	na
4,4'(p,p')-DDT, mg/kg	<0.03-0.13	<0.3	<0.004-0.480	<0.004-0.037
Dieldrin, mg/kg	<0.012	<0.02-0.06	<0.007-0.056	<0.007
Endrin, mg/kg	<0.021	<0.04	<0.007	<0.007
Heptachlor, mg/kg	<0.003	<0.03	<0.004	<0.004
Heptachlor epoxide, mg/kg	<0.008	<0.08	<0.004	<0.004
Methoxychlor, mg/kg	<0.08-0.98	<0.8-0.69	<0.033	<0.033
ORGANOPHOSPHORUS PESTICIDES:				
Chlorpyrifos, mg/kg	<0.012	<0.10	<0.010	<0.010
Diazinon, mg/kg	<0.052	<0.052	<0.02	<0.02
Methyl parathion, mg/kg	<0.03	<0.03	<0.001	<0.001
Malathion, mg/kg	<0.01	<0.01	<0.170	<0.170
Ronnel (Fenchlorphos), mg/kg	na	<0.1	<0.010	<0.010

Results with less than detection limits were analyzed for but no positive results were found.
na-not analyzed
D2-400x dilution factor. Result is estimated.
S-Low surrogate recovery. Results are biased low.
H-Holding time exceeded. Results biased low.
1-Represents the monitoring well soil samples as well as the pilot hole.
ns-Not specified

Sources :
a-Entomological special study No. 44-015-75/76.
b-Pesticide Monitoring Study No. 17-44-1356-88.

TABLE 4-15

POSITIVE ANALYTICAL RESULTS/SURFACE SOILS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSS01 (1-2") 4-8-92	PSFSS02 (6-18") 4-7-92	PSFSS03 (3-12") 4-5-92	PSFSS04 (1-12") 4-6-92
PESTICIDES/PCBs:				
4,4'-DDE, µg/Kg	180	270	94	1800
4,4'-DDT, µg/Kg	670	1000	450	--
Dieldrin, µg/Kg	94	77	--	--
Heptachlor, µg/Kg	--	300	--	--
Methoxychlor, µg/Kg	2400	--	--	--
alpha-Chlordane, µg/Kg	370	1600	29	660
gamma-Chlordane, µg/Kg	380	1600	30	640
SEMI-VOLATILE ORGANICS:				
Benzo[a]anthracene, µg/Kg	--	--	--	160
Chrysene, µg/Kg	--	--	--	450
Fluoranthene, µg/Kg	--	--	--	1300
Phenanthrene, µg/Kg	--	--	--	780
Pyrene, µg/Kg	--	--	--	1000
bis(2-Ethylhexyl)phthalate, µg/Kg	620	--	--	--
VOLATILE ORGANICS:				
Methylene chloride, µg/Kg	16(B2)	24	39(B2)	35(B2)
Toluene, µg/Kg	--	6.0(I2)	--	7.3
TOTAL FURNACE METALS:				
Arsenic, mg/Kg	2.4	16	4.2	4.6
TOTAL ICP METALS:				
Barium, mg/Kg	99	35	130	120
Chromium, mg/Kg	9.3	6.9	7.5	15
Lead, mg/Kg	46	32	540	60
Silver, mg/Kg	--	--	--	0.8
ORGANOPHOSPHORUS PESTICIDES:				
Malathion, µg/kg	419	--	--	--
ACID HERBICIDE:	--	--	--	--
DIOXIN:	--	--	NA	--

B2 – Sample results are less than 10 times the amount detected in method blank. Result is estimated. Result is estimated.
I2 – Low internal standard response and high surrogate recovery. Result is biased high.
NA – Not analyzed
-- Not detected.

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSB01A (2-2.5') 4-8-92	PSFSB01B (4-4.5') 4-8-92	PSFSB02A (2-2.5') 4-7-92	PSFSB02B (4-4.5') 4-7-92	PSFSB03A (2-2.5') 4-5-92	SAMPLE PSFSB03B (4-4.5') 4-5-92	DUPLICATE PSFSB03C (4-4.5') 4-5-92
PESTICIDES/PCBs:							
4,4'-DDD, µg/Kg	--	--	--	--	--	--	--
4,4'-DDE, µg/Kg	--	24(H)	--	--	--	--	--
4,4'-DDT, µg/Kg	16(S)	87(H)	42	--	7700(D1)	4600(D1)	33000(D2)
Dieldrin, µg/Kg	--	27(H)	--	--	--	--	--
Endrin aldehyde, µg/Kg	--	--	--	--	--	--	--
Heptachlor, µg/Kg	--	4.3(H)	45	28	--	--	--
Heptachlor epoxide, µg/Kg	--	--	--	--	--	--	--
Methoxychlor, µg/Kg	56(S)	530(H)	--	--	--	10000(D1)	--
alpha-Chlordane, µg/Kg	22(S)	84(H)	210	160	--	--	1500(D2)
gamma-Chlordane, µg/Kg	24(S)	82(H)	210	160	210(D1)	--	1600(D2)
SEMI-VOLATILE ORGANICS:							
2,4,6-Trichlorophenol, µg/Kg	--	--	--	--	--	--	330
2,4-Dichlorophenol, µg/Kg	--	--	--	--	--	--	2300
2-Methylnaphthalene, µg/Kg	--	--	--	--	--	--	--
Acenaphthene, µg/Kg	--	--	--	--	--	--	--
Anthracene, µg/Kg	--	--	--	--	--	--	--
Benzo[a]anthracene, µg/Kg	--	--	--	--	--	--	--
Benzo[a]pyrene, µg/Kg	--	--	--	--	--	--	--
Benzo[b]fluoranthene, µg/Kg	--	--	--	--	--	--	--
Benzo[k]fluoranthene, µg/Kg	--	--	--	--	--	--	--
Chrysene, µg/Kg	--	--	--	--	--	--	--
Dibenzofuran, µg/Kg	--	--	--	--	--	--	--
Diethylphthalate, µg/Kg	--	--	--	--	--	--	--
Fluoranthene, µg/Kg	--	--	--	--	--	--	--
Fluorene, µg/Kg	--	--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene, µg/Kg	--	--	--	--	--	--	--
Phenanthrene, µg/Kg	--	--	--	--	--	--	--
Pyrene, µg/Kg	--	--	--	--	--	--	--
bis(2-Ethylhexyl)phthalate, µg/Kg	--	890	--	--	--	920	1000
TOTAL MERCURY:							
Mercury, mg/kg	--	--	--	--	--	--	--
VOLATILE ORGANICS:							
Methylene chloride, µg/Kg	17(B2)	14(B2)	19(B2)	16(B2)	29(B2)	22(B2)	23(B2)
Toluene, µg/Kg	--	--	--	--	--	--	--

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSB01A (2-2.5') 4-8-92	PSFSB01B (4-4.5') 4-6-92	PSFSB02A (2-2.5') 4-7-92	PSFSB02B (4-4.5') 4-7-92	PSFSB03A (2-2.5') 4-5-92	SAMPLE PSFSB03B (4-4.5') 4-5-92	DUPLICATE PSFSB03C (4-4.5') 4-5-92
TOTAL ICP METALS:							
Barium, mg/Kg	99	73	97	82	89	66	58
Cadmium, mg/Kg	--	--	--	--	--	--	--
Chromium, mg/Kg	8.2	6.7	6.5	8.3	6.9	6.4	5.3
Lead, mg/Kg	4.3	11	13	11	10	4.4	14
Silver, mg/Kg	--	--	--	--	0.8	--	--
TOTAL FURNACE METALS:							
Arsenic, mg/Kg	1.4	1.2	20	4.3	0.8	1.0	1.2
Selenium, mg/Kg	--	--	--	--	--	--	--
ORGANOPHOSPHORUS PESTICIDES:							
RONNEL (FENCHLORPHOS), µg/kg	--	--	--	--	--	--	--
DIOXIN:	NA	NA	NA	NA	NA	--	NA
ACID HERBICIDE:	--	--	--	--	--	--	--

S - Low surrogate recovery. Results are biased low.
H - Holding time exceeded. Results biased low.
D1 - 100X dilution factor. Result is estimated.
D2 - 400X dilution factor. Result is estimated.
B2 - Sample results are less than 10 times the amount detected in method blank. Result is estimated.
-- Not detected
NA - Not analyzed

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSB04A (2-2.5') 4-7-92	PSFSB04B (4-4.5') 4-7-92	PSFSB05A (2-2.5') 4-5-92	PSFSB05B (3.5-4.5') 4-5-92	PSFSB06A (2-2.5') 4-7-92	PSFSB06B (4-4.5') 4-7-92	PSFSB7A (2.5-3') 4-7-92
PESTICIDES/PCBs:							
4,4'-DDD, µg/Kg	--	--	--	--	--	--	--
4,4'-DDE, µg/Kg	31	21	110	8.3	--	--	160(S)
4,4'-DDT, µg/Kg	140	96	650	53	--	14	750(S)
Dieldrin, µg/Kg	--	--	200	10	--	--	--
Endrin aldehyde, µg/Kg	--	--	140	--	--	--	--
Heptachlor, µg/Kg	--	--	230	17	--	--	--
Heptachlor epoxide, µg/Kg	--	--	--	5.4	--	--	--
Methoxychlor, µg/Kg	--	--	--	--	--	--	--
alpha-Chlordane, µg/Kg	90	62	790	71	--	3.7	56(S)
gamma-Chlordane, µg/Kg	91	63	790	71	--	4.0	65(S)
SEMI-VOLATILE ORGANICS:							
2,4,6-Trichlorophenol, µg/Kg	--	--	--	--	--	--	--
2,4-Dichlorophenol, µg/Kg	--	--	--	--	--	--	--
2-Methylnaphthalene, µg/Kg	--	--	--	--	--	--	--
Acenaphthene, µg/Kg	--	--	--	--	--	--	--
Anthracene, µg/Kg	--	--	--	--	--	--	--
Benzo[a]anthracene, µg/Kg	--	--	--	--	--	--	390
Benzo[a]pyrene, µg/Kg	--	--	--	--	--	--	300(I)
Benzo[b]fluoranthene, µg/Kg	--	--	--	--	--	--	--
Benzo[k]fluoranthene, µg/Kg	--	--	--	--	--	--	--
Chrysene, µg/Kg	--	--	--	--	--	--	430
Dibenzofuran, µg/Kg	--	--	--	--	--	--	--
Diethylphthalate, µg/Kg	--	--	--	--	--	--	--
Fluoranthene, µg/Kg	--	--	--	--	--	--	740
Fluorene, µg/Kg	--	--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene, µg/Kg	--	--	--	--	--	--	--
Phenanthrene, µg/Kg	--	--	--	--	--	--	370
Pyrene, µg/Kg	--	--	--	--	--	--	860
bis(2-Ethylhexyl)phthalate, µg/Kg	--	--	--	--	--	1200	--
TOTAL MERCURY:							
Mercury, mg/kg	--	--	--	--	--	--	0.1
VOLATILE ORGANICS:							
Methylene chloride, µg/Kg	19(B2)	22	23(B2)	14	18(B2)	17	--
Toluene, µg/Kg	--	9.5	--	--	--	--	--

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSB04A (2-2.5') 4-7-92	PSFSB04B (4-4.5') 4-7-92	PSFSB05A (2-2.5') 4-5-92	PSFSB05B (3.5-4.5') 4-6-92	PSFSB06A (2-2.5') 4-7-92	PSFSB06B (4-4.5') 4-7-92	PSFSB7A (2.5-3') 4-7-92
TOTAL ICP METALS:							
Barium, mg/Kg	100	98	100	71	77	39	61
Cadmium, mg/Kg	--	--	--	--	--	--	--
Chromium, mg/Kg	11	6.3	6.3	6.6	5.3	4.6	6.4
Lead, mg/Kg	12	9.9	13	7.5	4.7	4.7	220
Silver, mg/Kg	--	--	--	--	--	--	--
TOTAL FURNACE METALS:							
Arsenic, mg/Kg	6.2	1.9	1.9	1.5	1.6	1.1	4.2
Selenium, mg/Kg	--	--	--	--	--	--	0.3(M2)
ORGANOPHOSPHORUS PESTICIDES:							
RONNEL (FENCHLORPHOS), µg/kg	--	--	--	--	--	--	--
DIOXIN:	NA	NA	--	NA	NA	NA	NA
ACID HERBICIDE:	--	--	--	--	--	--	--

S - Low surrogate recovery. Results are biased low.
B2 - Sample results are less than 10 times the amount detected in method blank. Result is estimated.
I - Low internal standard response. Result is an estimated quantitation.
M2 - Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
-- Not detected
NA - Not analyzed

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSB7B (4-4.5') 4-7-92	PSFSB8A (2-2.5') 4-7-92	PSFSB8B (4-4.5') 4-7-92	PSFSB9A (1.5-2.5') 4-7-92	PSFSB9B (4-4.5') 4-7-92	PSFSB10A (1.5-2.5') 4-4-92
PESTICIDES/PCBs:						
4,4'-DDD, µg/Kg	--	--	--	--	--	360
4,4'-DDE, µg/Kg	240(H)	110	20(S)	870(S)	420(S)	180
4,4'-DDT, µg/Kg	2600(H)	440	150(S)	5700(S)	2600(S)	--
Dieldrin, µg/Kg	--	--	--	--	--	--
Endrin aldehyde, µg/Kg	--	--	--	--	--	--
Heptachlor, µg/Kg	--	--	--	--	--	--
Heptachlor epoxide, µg/Kg	--	--	--	--	--	--
Methoxychlor, µg/Kg	--	--	--	--	--	--
alpha-Chlordane, µg/Kg	95(H)	32	5.3(S)	370(S)	190(S)	440
gamma-Chlordane, µg/Kg	99(H)	38	6.3(S)	410(S)	220(S)	450
SEMI-VOLATILE ORGANICS:						
2,4,6-Trichlorophenol, µg/Kg	--	--	--	--	--	--
2,4-Dichlorophenol, µg/Kg	--	--	--	--	--	--
2-Methylnaphthalene, µg/Kg	--	--	--	--	--	--
Acenaphthene, µg/Kg	230	--	--	--	--	--
Anthracene, µg/Kg	760	--	--	300	--	--
Benzo[a]anthracene, µg/Kg	1800(I)	--	--	570	180	620
Benzo[a]pyrene, µg/Kg	1200(I)	--	--	340	--	--
Benzo[b]fluoranthene, µg/Kg	1400(I)	--	--	380	--	--
Benzo[k]fluoranthene, µg/Kg	950(I)	--	--	--	--	--
Chrysene, µg/Kg	1700(I)	--	--	420	110	620
Dibenzofuran, µg/Kg	--	--	--	--	--	--
Diethylphthalate, µg/Kg	--	--	--	--	--	--
Fluoranthene, µg/Kg	3400	--	--	990	180	1200
Fluorene, µg/Kg	270	--	--	--	--	--
Indeno[1,2,3-cd]pyrene, µg/Kg	380(I)	--	--	--	--	--
Phenanthrene, µg/Kg	2700	--	--	990	150	940
Pyrene, µg/Kg	4100(I)	170(I2)	--	870	180	1400
bis(2-Ethylhexyl)phthalate, µg/Kg	--	--	--	420	--	--
TOTAL MERCURY:						
Mercury, mg/kg	0.1	--	--	--	--	--
VOLATILE ORGANICS:						
Methylene chloride, µg/Kg	--	9.5(B2)	13(B2)	15(B2)	14(B2)	31(B2)
Toluene, µg/Kg	--	--	--	--	--	--

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSB7B (4-4.5') 4-7-92	PSFSB8A (2-2.5') 4-7-92	PSFSB8B (4-4.5') 4-7-92	PSFSB9A (1.5-2.5') 4-7-92	PSFSB9B (4-4.5') 4-7-92	PSFSB10A (1.5-2.5') 4-4-92
TOTAL ICP METALS:						
Barium, mg/Kg	120	160	130	94	67	84
Cadmium, mg/Kg	--	--	--	0.7	--	--
Chromium, mg/Kg	8.0	4.8	6.5	41	5.8	15
Lead, mg/Kg	310	770	270	240	25	100
Silver, mg/Kg	--	--	--	--	--	--
TOTAL FURNACE METALS:						
Arsenic, mg/Kg	3.2	3.3	2.5	2.3	1.9	5.5
Selenium, mg/Kg	0.2(M2)	--	--	--	--	--
ORGANOPHOSPHORUS PESTICIDES:						
RONNEL (FENCHLORPHOS), µg/kg	--	--	--	--	--	--
DIOXIN:	--	NA	NA	--	NA	--
ACID HERBICIDE:	--	--	--	--	--	--

S – Low surrogate recovery. Results are biased low.
H – Holding time exceeded. Results biased low.
B2 – Sample results are less than 10 times the amount detected in method blank. Result is estimated.
I – Low internal standard response. Result is an estimated quantitation.
I2 – Low internal standard response and high surrogate recovery. Result is biased high.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
-- Not detected
NA – Not analyzed

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB10B (3.5-4.5') 4-4-92	DUPLICATE PSFSB10C (3.5-4.5') 4-4-92	PSFSB11A (2-2.5') 4-7-92	PSFSB11B (4-4.5') 4-7-92	PSFSB12A (2-2.5') 4-8-92	PSFSB12B (4-4.5') 4-8-92
PESTICIDES/PCBs:						
4,4'-DDD, μg/Kg	--	25	--	--	430(H)	--
4,4'-DDE, μg/Kg	36	52	26(S)	110(H)	190(H)	170
4,4'-DDT, μg/Kg	57	83	32(S)	150(H)	150(H)	100
Dieldrin, μg/Kg	--	--	--	--	--	--
Endrin aldehyde, μg/Kg	--	--	--	--	--	--
Heptachlor, μg/Kg	--	--	4.7(S)	--	--	--
Heptachlor epoxide, μg/Kg	--	--	--	--	--	--
Methoxychlor, μg/Kg	--	--	80(S)	390(H)	--	--
alpha-Chlordane, μg/Kg	82	75	57(S)	210(H)	370(H)	790
gamma-Chlordane, μg/Kg	60	73	65(S)	220(H)	390(H)	910
SEMI-VOLATILE ORGANICS:						
2,4,6-Trichlorophenol, μg/Kg	--	--	--	--	--	--
2,4-Dichlorophenol, μg/Kg	--	--	--	--	--	--
2-Methylnaphthalene, μg/Kg	170	200	--	--	--	--
Acenaphthene, μg/Kg	--	--	--	--	--	--
Anthracene, μg/Kg	--	--	--	--	--	250
Benzo[a]anthracene, μg/Kg	500	290	--	110	430	950(I2)
Benzo[a]pyrene, μg/Kg	550(I)	--	--	--	270(I)	660(I)
Benzo[b]fluoranthene, μg/Kg	460(I)	--	--	--	--	840(I)
Benzo[k]fluoranthene, μg/Kg	460(I)	--	--	--	--	680(I)
Chrysene, μg/Kg	500	330	--	110	740	1200(I2)
Dibenzofuran, μg/Kg	--	--	--	--	--	--
Diethylphthalate, μg/Kg	--	--	--	--	700	--
Fluoranthene, μg/Kg	500	330	--	160	430	1100
Fluorene, μg/Kg	--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene, μg/Kg	--	--	--	--	--	--
Phenanthrene, μg/Kg	420	410	--	--	230	990
Pyrene, μg/Kg	630	330	--	150	940	2700(I2)
bis(2-Ethylhexyl)phthalate, μg/Kg	1400	490	--	--	--	--
TOTAL MERCURY:						
Mercury, mg/kg	--	--	--	--	--	--
VOLATILE ORGANICS:						
Methylene chloride, μg/Kg	75(I)	50(B2)	15(B2)	16(B2)	28(B2)	25(B2)
Toluene, μg/Kg	33(I2)	30(I2)	--	--	8.9	19

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB10B (3.5-4.5') 4-4-92	DUPLICATE PSFSB10C (3.5-4.5') 4-4-92	PSFSB11A (2-2.5') 4-7-92	PSFSB11B (4-4.5') 4-7-92	PSFSB12A (2-2.5') 4-8-92	PSFSB12B (4-4.5') 4-8-92
TOTAL ICP METALS:						
Barium, mg/Kg	87	120	68	68	100	66
Cadmium, mg/Kg	5.0	3.2	--	--	--	0.7
Chromium, mg/Kg	8.8	8.6	6.4	6.1	11	15
Lead, mg/Kg	91	120	9.6	14	87	110
Silver, mg/Kg	--	1.1	--	--	--	--
TOTAL FURNACE METALS:						
Arsenic, mg/Kg	66	120	1.4	1.6	6.1	6.0
Selenium, mg/Kg	0.8(M2)	0.8(M2)	--	--	--	--
ORGANOPHOSPHORUS PESTICIDES:						
RONNEL (FENCHLORPHOS), µg/kg	--	--	--	--	--	43.60
DIOXIN:	NA	NA	NA	NA	NA	--
ACID HERBICIDE:	--	--	--	--	--	--

S - Low surrogate recovery. Results are biased low.
H - Holding time exceeded. Results biased low.
B2 - Sample results are less than 10 times the amount detected in method blank. Result is estimated.
M2 - Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
I - Low internal standard response. Result is an estimated quantitation.
I2 - Low internal standard response and high surrogate recovery. Result is biased high.
-- Not detected
NA - Not analyzed

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB13A (1.5-2.5') 4-6-92	DUPLICATE PSFSB13C (1.5-2.5') 4-6-92	PSFSB13B (4-4.5') 4-6-92	PSFSB14A (2-2.5') 4-4-92	PSFSB14B (4-4.5') 4-4-92	PSFSB15A (2-2.5') 4-4-92
PESTICIDES/PCBs:						
4,4'-DDD, µg/Kg	--	--	--	--	--	--
4,4'-DDE, µg/Kg	52	150	--	53	--	--
4,4'-DDT, µg/Kg	49	190	12	130	12	--
Dieldrin, µg/Kg	--	--	--	--	--	--
Endrin aldehyde, µg/Kg	--	--	--	--	--	--
Heptachlor, µg/Kg	--	--	--	--	--	--
Heptachlor epoxide, µg/Kg	--	--	--	--	--	--
Methoxychlor, µg/Kg	--	--	--	--	--	--
alpha-Chlordane, µg/Kg	52	160	11	69	4.7	4.7
gamma-Chlordane, µg/Kg	44	160	9.4	66	5.5	4.0
SEMI-VOLATILE ORGANICS:						
2,4,6-Trichlorophenol, µg/Kg	--	--	--	--	--	--
2,4-Dichlorophenol, µg/Kg	--	--	--	--	--	--
2-Methylnaphthalene, µg/Kg	--	--	--	--	--	--
Acenaphthene, µg/Kg	--	--	--	410	--	--
Anthracene, µg/Kg	--	170	--	1700	330	--
Benzo[a]anthracene, µg/Kg	--	--	--	1300(I)	--	--
Benzo[a]pyrene, µg/Kg	--	--	--	1100(I)	--	--
Benzo[b]fluoranthene, µg/Kg	--	--	--	1200(I)	--	--
Benzo[k]fluoranthene, µg/Kg	130	210	--	1600	290	--
Chrysene, µg/Kg	--	130	--	--	--	--
Dibenzofuran, µg/Kg	--	--	--	--	--	--
Diethylphthalate, µg/Kg	--	250	--	2700	530	--
Fluoranthene, µg/Kg	--	--	--	--	--	--
Fluorene, µg/Kg	--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene, µg/Kg	260	500	--	1600	250	--
Phenanthrene, µg/Kg	170	290	140	3400	570	--
Pyrene, µg/Kg	--	--	--	--	410	--
bis(2-Ethylhexyl)phthalate, µg/Kg						
TOTAL MERCURY:						
Mercury, mg/kg	0.1	0.2	0.6	0.2	--	--
VOLATILE ORGANICS:						
Methylene chloride, µg/Kg	55(B2)	47(B2)	74(I)	43(B2)	36(B2)	28
Toluene, µg/Kg	--	--	--	--	--	19

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB13A (1.5-2.5') 4-6-92	DUPLICATE PSFSB13C (1.5-2.5') 4-6-92	PSFSB13B (4-4.5') 4-6-92	PSFSB14A (2-2.5') 4-4-92	PSFSB14B (4-4.5') 4-4-92	PSFSB15A (2-2.5') 4-4-92
TOTAL ICP METALS:						
Barium, mg/Kg	140	160	130	140	100	50
Cadmium, mg/Kg	--	--	--	--	--	--
Chromium, mg/Kg	10	12	8.0	12	8.3	4.5
Lead, mg/Kg	63	110	36	39	140	7.0
Silver, mg/Kg	--	1.2	--	--	--	--
TOTAL FURNACE METALS:						
Arsenic, mg/Kg	12	14	3.6	5.2	3.0	1.6
Selenium, mg/Kg	0.4(M2)	0.3(M2)	--	0.4(M2)	--	--
ORGANOPHOSPHORUS PESTICIDES:						
RONNEL (FENCHLORPHOS), µg/kg	--	--	--	--	--	--
DIOXIN:	NA	NA	NA	NA	NA	NA
ACID HERBICIDE:	--	--	--	--	--	--

B2 – Sample results are less than 10 times the amount detected in method blank. Result is estimated.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
I – Low internal standard response. Result is an estimated quantitation.
I2 – Low internal standard response and high surrogate recovery. Result is biased high.
-- Not detected
NA – Not analyzed

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSB15B (4-4.5') 4-4-92	PSFSB16A (1.5-2.5') 4-4-92	PSFSB16B (3.5-4.5') 4-4-92	SAMPLE PSFSB17A (1.5-2.5') 4-6-92	DUPLICATE PSFSB17C (1.5-2.5') 4-6-92	PSFSB17B (4-4.5') 4-6-92
PESTICIDES/PCBs:						
4,4'-DDD, µg/Kg	--	--	--	--	--	--
4,4'-DDE, µg/Kg	--	--	--	370	750	--
4,4'-DDT, µg/Kg	--	310	25	610	1300	25
Dieldrin, µg/Kg	--	--	--	--	--	--
Endrin aldehyde, µg/Kg	--	--	--	--	--	--
Heptachlor, µg/Kg	--	--	--	--	--	--
Heptachlor epoxide, µg/Kg	--	--	--	--	--	--
Methoxychlor, µg/Kg	--	--	--	--	--	--
alpha-Chlordane, µg/Kg	--	68	6.1	280	470	7.9
gamma-Chlordane, µg/Kg	--	70	7.0	280	470	8.2
SEMI-VOLATILE ORGANICS:						
2,4,6-Trichlorophenol, µg/Kg	--	--	--	--	--	--
2,4-Dichlorophenol, µg/Kg	--	--	--	--	--	--
2-Methylnaphthalene, µg/Kg	--	--	--	--	--	--
Acenaphthene, µg/Kg	--	--	--	--	--	--
Anthracene, µg/Kg	--	--	--	200	--	--
Benzo[a]anthracene, µg/Kg	--	--	--	--	230	--
Benzo[a]pyrene, µg/Kg	--	--	--	--	--	--
Benzo[b]fluoranthene, µg/Kg	--	--	--	--	--	--
Benzo[k]fluoranthene, µg/Kg	--	--	--	--	--	--
Chrysene, µg/Kg	--	--	--	200	230	--
Dibenzofuran, µg/Kg	--	--	--	--	--	--
Diethylphthalate, µg/Kg	--	--	--	--	--	--
Fluoranthene, µg/Kg	--	--	--	280	310	--
Fluorene, µg/Kg	--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene, µg/Kg	--	--	--	--	--	--
Phenanthrene, µg/Kg	--	--	--	240	230	--
Pyrene, µg/Kg	--	110	--	360	270	--
bis(2-Ethylhexyl)phthalate, µg/Kg	--	960	--	--	--	--
TOTAL MERCURY:						
Mercury, mg/kg	--	--	--	0.3	0.3	--
VOLATILE ORGANICS:						
Methylene chloride, µg/Kg	35(B2)	28(B2)	34(B2)	71	41(B2)	29
Toluene, µg/Kg	38(I2)	8.9	18	12(I2)	7.8	5.9

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSB15B (4-4.5') 4-4-92	PSFSB16A (1.5-2.5') 4-4-92	PSFSB16B (3.5-4.5') 4-4-92	SAMPLE PSFSB17A (1.5-2.5') 4-6-92	DUPLICATE PSFSB17C (1.5-2.5') 4-6-92	PSFSB17B (4-4.5') 4-6-92
TOTAL ICP METALS:						
Barium, mg/Kg	130	47	120	150	120	71
Cadmium, mg/Kg	--	--	--	--	--	--
Chromium, mg/Kg	5.5	4.7	8.7	11	10	5.7
Lead, mg/Kg	7.6	18	12	110	80	8.0
Silver, mg/Kg	--	--	--	--	--	--
TOTAL FURNACE METALS:						
Arsenic, mg/Kg	1.8	1.9	1.6	4.1	4.0	0.9
Selenium, mg/Kg	--	--	--	0.2(M2)	0.2(M2)	--
ORGANOPHOSPHORUS PESTICIDES:						
RONNEL (FENCHLORPHOS), µg/kg	--	--	--	--	--	--
DIOXIN:	NA	NA	NA	--	NA	NA
ACID HERBICIDE:	--	--	--	--	--	--

B2 – Sample results are less than 10 times the amount detected in method blank. Result is estimated.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
I – Low internal standard response. Result is an estimated quantitation.
I2 – Low internal standard response and high surrogate recovery. Result is biased high.
-- Not detected
NA – Not analyzed

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSB18A (2-2.5') 4-5-92	PSFSB18B (4-4.5') 4-5-92	PSFSB19A (2-2.5') 4-4-92	PSFSB19B (4-4.5') 4-4-92	PSFSB20A (2-2.5') 4-6-92	PSFSB20B (4-4.5') 4-6-92
PESTICIDES/PCBs:						
4,4'-DDD, µg/Kg	--	--	--	--	--	--
4,4'-DDE, µg/Kg	110	22	26	22	--	11(H)
4,4'-DDT, µg/Kg	170	82	50	36	--	25(H)
Dieldrin, µg/Kg	--	--	--	--	--	--
Endrin aldehyde, µg/Kg	--	--	--	--	--	--
Heptachlor, µg/Kg	--	--	--	--	--	--
Heptachlor epoxide, µg/Kg	--	--	--	--	--	--
Methoxychlor, µg/Kg	--	--	--	--	--	--
alpha-Chlordane, µg/Kg	42	18	16	13	5.6(S)	14(H)
gamma-Chlordane, µg/Kg	36	18	15	12	5.4(S)	12(H)
SEMI-VOLATILE ORGANICS:						
2,4,6-Trichlorophenol, µg/Kg	--	--	--	--	--	--
2,4-Dichlorophenol, µg/Kg	--	--	--	--	--	--
2-Methylnaphthalene, µg/Kg	--	--	--	--	--	--
Acenaphthene, µg/Kg	--	--	--	--	--	--
Anthracene, µg/Kg	--	--	--	--	--	--
Benzo[a]anthracene, µg/Kg	160	--	--	--	160	160
Benzo[a]pyrene, µg/Kg	--	--	--	--	--	--
Benzo[b]fluoranthene, µg/Kg	--	--	--	--	--	--
Benzo[k]fluoranthene, µg/Kg	--	--	--	--	--	--
Chrysene, µg/Kg	160	--	120	--	200	200
Dibenzofuran, µg/Kg	--	--	--	--	--	--
Diethylphthalate, µg/Kg	--	--	--	--	510	430
Fluoranthene, µg/Kg	160	--	200	--	310	310
Fluorene, µg/Kg	--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene, µg/Kg	--	--	--	--	--	--
Phenanthrene, µg/Kg	--	--	--	--	270	230
Pyrene, µg/Kg	200	--	200	--	310	310
bis(2-Ethylhexyl)phthalate, µg/Kg	--	--	400	--	--	--
TOTAL MERCURY:						
Mercury, mg/kg	--	--	1.3	--	0.2	--
VOLATILE ORGANICS:						
Methylene chloride, µg/Kg	31	31	44	31(B2)	26	15(B2)
Toluene, µg/Kg	--	9.8	34(I)	--	14	--

TABLE 4-16

POSITIVE ANALYTICAL RESULTS/SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSB18A (2-2.5') 4-5-92	PSFSB18B (4-4.5') 4-5-92	PSFSB19A (2-2.5') 4-4-92	PSFSB19B (4-4.5') 4-4-92	PSFSB20A (2-2.5') 4-8-92	PSFSB20B (4-4.5') 4-8-92
TOTAL ICP METALS:						
Barium, mg/Kg	62	110	160	100	89	88
Cadmium, mg/Kg	--	--	--	--	--	--
Chromium, mg/Kg	5.5	6.8	14	6.9	5.6	6.9
Lead, mg/Kg	30	15	38	12	75	69
Silver, mg/Kg	--	--	1.1	--	--	--
TOTAL FURNACE METALS:						
Arsenic, mg/Kg	2.0	1.6	4.0	1.4	3.1	1.9
Selenium, mg/Kg	--	--	--	--	0.2(M2)	--
ORGANOPHOSPHORUS PESTICIDES:						
RONNEL (FENCHLORPHOS), µg/kg	--	--	--	--	--	--
DIOXIN:	NA	NA	NA	NA	NA	NA
ACID HERBICIDE:	--	--	--	--	--	--

S - Low surrogate recovery. Results are biased low.
H - Holding time exceeded. Results biased low.
B2 - Sample results are less than 10 times the amount detected in method blank. Result is estimated.
M2 - Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
-- Not detected
NA - Not analyzed

TABLE 4-17

POSITIVE ANALYTICAL RESULTS/PILOT HOLE
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSF92SB01A (5') 1-24-92	PSF92SB01B (38') 1-24-92
PESTICIDES/PCBs:	--	--
SEMI-VOLATILE ORGANICS:	--	--
VOLATILE ORGANICS:		
Methylene chloride, ug/Kg	21(T)	18(T)
TOTAL FURNACE METALS:		
Arsenic, mg/Kg	1.6	1.2
Selenium, mg/kg	0.2(M2)	--
TOTAL ICP METALS:		
Aluminum, mg/kg	5800	3900
Barium, mg/kg	66	75
Calcium, mg/kg	1600	2400
Chromium, mg/kg	5.2	5.4
Cobalt, mg/kg	3.6	3.4
Copper, mg/kg	3.5	3.6
Iron, mg/kg	5300	5600
Magnesium, mg/kg	970	1400
Manganese, mg/kg	120	130
Nickel, mg/kg	6.5	7.6
Potassium, mg/kg	940	820
Sodium, mg/kg	45	57
Vanadium, mg/kg	13	15
Zinc, mg/kg	14	16
TOTAL MERCURY:	--	--
ORGANOPHOSPHORUS PESTICIDES:	--	--
ACID HERBICIDE:	--	--
DIOXIN:	--	--

M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
T – Sample results are less than 10 times the amount detected in trip blank. Result is estimated.
-- Not detected

TABLE 4-18

POSITIVE ANALYTICAL RESULTS/MONITORING WELL SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	MWSB01A (15-17') 4-28-92	MWSB01B (21-25') 4-28-92	MWSB02A (1-2') 5-5-92	SAMPLE MWSB02B (4-8') 5-5-92	DUPLICATE MWSB02F (4-8') 5-5-92	MWSB02C (8-12') 5-5-92	MWSB02D (14-16') 5-5-92
PESTICIDES/PCBs:							
4,4'-DDE, ug/Kg	--	--	--	--	--	--	--
Dieldrin, ug/Kg	--	--	--	--	--	--	--
alpha-Chlordane, ug/Kg	--	--	73	--	--	--	--
gamma-Chlordane, ug/Kg	--	--	71	--	--	--	--
SEMI-VOLATILE ORGANICS:							
Benzo[a]anthracene, ug/Kg	--	--	600	--	--	--	--
Benzo[a]pyrene, ug/Kg	--	--	680	--	--	--	--
Benzo[b]fluoranthene, ug/Kg	--	--	1000	--	--	--	--
Benzo[ghi]perylene, ug/Kg	--	--	400	--	--	--	--
Chrysene, ug/Kg	--	--	640	--	--	--	--
Fluoranthene, ug/Kg	--	--	1000	--	--	--	--
Indeno[1,2,3-cd]pyrene, ug/Kg	--	--	480	--	--	--	--
Phenanthrene, ug/Kg	--	--	560	--	--	--	--
Pyrene, ug/Kg	--	--	600	--	--	--	--
bis(2-Ethylhexyl)phthalate, ug/Kg	--	--	480	--	--	--	--
VOLATILE ORGANICS:							
Benzene, ug/Kg	6.6	5.9	--	--	--	--	--
Methylene chloride, ug/Kg	62 (B2)	46 (B2)	30	18	17	19	17
TOTAL FURNACE METALS:							
Arsenic, mg/Kg	1.0	2.5	3.7	1.7	1.6	1.7	2.4
Selenium, mg/Kg	--	--	0.2 (M2)	--	--	--	--
TOTAL ICP METALS:							
Barium, mg/Kg	61	120	130	53	60	83	100
Chromium, mg/Kg	6.6	8.7	10	11	7.9	4.6	6.4
Lead, mg/Kg	5.1	10	56	--	4.7	--	--
Silver, mg/Kg	--	--	1.0	0.9	--		1.1
TOTAL MERCURY:							
Mercury, mg/kg	--	--	0.3	--	--	--	--
ORGANOPHOSPHORUS PESTICIDES:	--	--	--	--	--	--	--
ACID HERBICIDES:	--	--	--	--	--	--	--

B2 – Sample results are less than 10 times the amount detected in method blank. Result is estimated.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
-- Not detected

TABLE 4-18

POSITIVE ANALYTICAL RESULTS/MONITORING WELL SOIL BORINGS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	MWSB02E (20-22') 5-5-92	MWSB03A (10-14') 5-2-92	MWSB03B (20-22') 5-2-92	MWSB04A (12-14') 5-4-92	MWSB04B (22-24') 5-4-92	MWSB05A (9-11') 4-29-92	MWSB05B (17-19') 4-29-92
PESTICIDES/PCBs:							
4,4'-DDE, ug/Kg	--	--	--	12	--	--	--
Dieldrin, ug/Kg	--	8.7	--	13	--	--	--
alpha-Chlordane, ug/Kg	--	--	--	15	--	--	--
gamma-Chlordane, ug/Kg	--	5.1	--	18	--	--	--
SEMI-VOLATILE ORGANICS:							
Benzo[a]anthracene, ug/Kg	--	--	--	--	--	110	--
Benzo[a]pyrene, ug/Kg	--	--	--	--	--	--	--
Benzo[b]fluoranthene, ug/Kg	--	--	--	--	--	--	--
Benzo[ghi]perylene, ug/Kg	--	--	--	--	--	110	--
Chrysene, ug/Kg	--	--	--	--	--	180	--
Fluoranthene, ug/Kg	--	--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene, ug/Kg	--	--	--	--	--	--	--
Phenanthrene, ug/Kg	--	--	--	--	--	180	--
Pyrene, ug/Kg	--	--	--	--	--	--	--
bis(2-Ethylhexyl)phthalate, ug/Kg	--	--	--	--	--	--	--
VOLATILE ORGANICS:							
Benzene, ug/Kg	--	--	--	--	--	--	--
Methylene chloride, ug/Kg	11	19	22	21	20	70 (B2)	38 (B2)
TOTAL FURNACE METALS:							
Arsenic, mg/Kg	1.4	2.0	0.5	3.1	0.4	2.9	0.6
Selenium, mg/Kg	--	--	--	--	--	--	--
TOTAL ICP METALS:							
Barium, mg/Kg	72	190	68	60	70	98	44
Chromium, mg/Kg	7.1	11	6.1	20	6.0	10	6.6
Lead, mg/Kg	--	8.5	5.9	58	--	30	5.9
Silver, mg/Kg	1.2	--	--	--	--	--	--
TOTAL MERCURY:							
Mercury, mg/kg	--	--	--	--	--	0.1	--
ORGANOPHOSPHORUS PESTICIDES:	--	--	--	--	--	--	--
ACID HERBICIDES:	--	--	--	--	--	--	--

B2 - Sample results are less than 10 times the amount detected in method blank. Result is estimated.
M2 - Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
-- Not detected

TABLE 4-19

POSITIVE ANALYTICAL RESULTS/SURFACE WATERS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER	PSFSW01 4-2-92	SAMPLE PSFSW02 4-1-92	DUPLICATE PSFSW08 4-1-92	PSFSW03 4-1-92	PSFSW04 4-1-92	PSFSW06 3-31-92	PSFSW07 3-31-92
PESTICIDES/PCBs:	--	--	--	--	--	--	--
SEMI-VOLATILE ORGANICS:	--	--	--	--	--	--	--
VOLATILE ORGANICS:							
Methylene chloride, µg/L	--	--	--	--	--	30(T)	30(T)
TOTAL FURNACE METALS:							
Arsenic, µg/L	4.0	--	4.1	4.0	4.4	--	--
Lead, µg/L	--	--	--	4.2(M2)	--	--	--
TOTAL ICP METALS:							
Aluminum, µg/L	3900	5700	6700	8900	12000	600(B1)	620(B1)
Barium, µg/L	250	260	260	250	290	180	140
Cadmium, µg/L	--	--	4.5	--	--	--	--
Calcium, µg/L	110000	100000	100000	100000	110000	79000	70000
Chromium, µg/L	18	10	24	10	13	--	--
Copper, µg/L	10	7.2	10	12	13	6.4	8.0
Iron, µg/L	2800(M1)	4200(M1)	5100(M1)	6500(M1)	9400(M1)	410(M1)	410(M1)
Magnesium, µg/L	20000	22000	22000	22000	23000	14000	12000
Manganese, µg/L	100	92	110	120	190	110	63
Potassium, µg/L	9600	10000	10000	10000	11000	7300	6200
Sodium, µg/L	45000	49000	49000	47000	45000	42000	35000
Vanadium, µg/L	15	15	20	20	28	6.4	7.0
Zinc, µg/L	27	28	34	45	70	18	13
TOTAL MERCURY:	--	--	--	--	--	--	--
WET CHEMICAL INORGANICS:							
Inorganic Chloride, mg/l	71.30	65.40	65.40	65.00	61.10	50.00	37.60
Sulfate, mg/l	84.30	104.00	105.00	106.00	105.00	81.00	73.50
Bicarbonate, mg/l	310.00	240.00	248.00	234.00	292.00	194.00	172.00
ORGANOPHOSPHORUS PESTICIDES:	--	--	--	--	--	--	--
ACID HERBICIDES:	--	--	--	--	--	--	--

B1 – Sample results are less than 5 times the amount detected in method blank. Result is estimated.
M1 – Matrix spike recovery is high due to sample matrix effect. Sample result is a false positive or biased high.
M2 – Matrix spike reocvery is low due to sample matrix effect. Sample result is biased low.
T – Sample result is less than 10 times the amount detected in the trip blank. Result is estimated.
-- Not detected

TABLE 4-20

POSITIVE ANALYTICAL RESULTS/SEDIMENTS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSD01A (0-1') 4-2-92	PSFSD01B (1-2') 4-2-92	SAMPLE PSFSD02A (0-1') 4-1-92	DUPLICATE PSFSD08 (0-1') 4-1-92	PSFSD02B (1-2') 4-1-92	PSFSD04A (0-1') 4-1-92	PSFSD04B (1-2') 4-1-92
PESTICIDES/PCBs:							
4,4'-DDD, µg/Kg	--	--	8.7	--	--	91	13
4,4'-DDE, µg/Kg	--	--	--	--	--	21	--
4,4'-DDT, µg/Kg	11	--	--	--	--	16	--
Dieldrin, µg/Kg	--	--	--	--	--	20	--
alpha-Chlordane, µg/Kg	9.4	--	4.7	5.8	--	33	--
gamma-Chlordane, µg/Kg	14	--	7.0	7.6	--	37	--
SEMI-VOLATILE ORGANICS:							
Benzo[a]anthracene, µg/Kg	--	--	130	--	--	--	--
Chrysene, µg/Kg	--	--	170	--	--	120	--
Fluoranthene, µg/Kg	--	--	170	--	--	210	--
Phenanthrene, µg/Kg	--	--	--	--	--	--	--
Pyrene, µg/Kg	880	--	340	120	120	250	--
bis(2-Ethylhexyl)phthalate, µg/Kg	--	--	550	640	--	450	570
VOLATILE ORGANICS:							
1,1,2,2-Tetrachloroethane, µg/Kg	--	--	39(I)	--	--	--	--
1,2-Dichloropropane, µg/Kg	--	--	64	--	--	--	--
Carbon disulfide, µg/Kg	--	--	--	--	--	--	6.9
Methylene chloride, µg/Kg	49(B2)	47(B2)	55(B2)	55(B2)	66(B2)	38(B2)	77(B2)
Toluene, µg/Kg	6.0	6.7(I)	5.6(I)	9.8	7.1	13(I)	12(I2)
TOTAL FURNACE METALS:							
Arsenic, mg/Kg	2.2	1.4	1.1	1.5	0.8	0.9	2.7
Selenium, mg/Kg	0.2(M2)	--	--	--	--	--	--
TOTAL ICP METALS:							
Barium, mg/Kg	88	74	95	110	55	110	150
Cadmium, mg/Kg	2.1	--	1.3	0.9	--	1.2	--
Chromium, mg/Kg	13	7.6	19	16	4.2	25	14
Lead, mg/Kg	60	10	130	110	24	210	64
Silver, mg/Kg	--	--	--	--	--	0.8	--

TABLE 4-20

POSITIVE ANALYTICAL RESULTS/SEDIMENTS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSD01A (0-1') 4-2-92	PSFSD01B (1-2') 4-2-92	SAMPLE PSFSD02A (0-1') 4-1-92	DUPLICATE PSFSD08 (0-1') 4-1-92	PSFSD02B (1-2') 4-1-92	PSFSD04A (0-1') 4-1-92	PSFSD04B (1-2') 4-1-92
TOTAL MERCURY:							
Mercury, mg/kg	--	--	--	--	--	0.1(B1)	--
ORGANOPHOSPHORUS PESTICIDES:	--	--	--	--	--	--	--
ACID HERBICIDES:	--	--	--	--	--	--	--
DIOXIN:	NA	NA	NA	NA	NA	--	NA

B1 - Sample results are less than 10 times the amount detected in method blank. Result is estimated.
B2 - Sample results are less than 10 times the amount detected in method blank. Result is estimated.
M2 - Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
I - Low internal standard response. Result is an estimated quantitation.
I2 - Low internal standard response and high surrogate recovery. Result is biased high.
NA - Not analyzed

TABLE 4-20

POSITIVE ANALYTICAL RESULTS/SEDIMENTS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSD05A (0-1') 4-1-92	PSFSD05B (1-2') 4-1-92	PSFSD06A (0-1') 3-31-92	PSFSD06B (1-2') 3-31-92	PSFSD07 (0-1') 3-31-92	PSFSD07B (1-2') 3-31-92	PSFSD09A (0-1') 7-16-92	PSFSD09B (1-2') 7-16-92
PESTICIDES/PCBs:								
4,4'-DDD, µg/Kg	100	--	15	31	24	--	--	--
4,4'-DDE, µg/Kg	280	46	--	--	11	--	--	--
4,4'-DDT, µg/Kg	480	37	--	--	17	8.6	40	17
Dieldrin, µg/Kg	56	--	--	--	--	--	--	--
alpha-Chlordane, µg/Kg	67	--	7.1	9.6	22	9.5	11	10
gamma-Chlordane, µg/Kg	65	--	8.5	12	26	12	24	21
SEMI-VOLATILE ORGANICS:								
Benzo[a]anthracene, µg/Kg	120	160	--	--	--	--	160	130
Chrysene, µg/Kg	160	160	--	--	120	120	240	130
Fluoranthene, µg/Kg	250	270	--	190	--	--	360	290
Phenanthrene, µg/Kg	--	200	--	--	--	--	360	210
Pyrene, µg/Kg	290	310	--	140	160	120	440	380
bis(2-Ethylhexyl)phthalate, µg/Kg	--	--	--	--	--	470	--	--
VOLATILE ORGANICS:								
1,1,2,2-Tetrachloroethane, µg/Kg	--	--	--	--	--	--	--	--
1,2-Dichloropropane, µg/Kg	--	--	--	--	--	--	--	--
Carbon disulfide, µg/Kg	--	--	--	--	--	--	--	--
Methylene chloride, µg/Kg	82(B2)	66	12(B2)(T)	30(B2)(T)	27(B2)(T)	21(B2)(T)	21(B2)	23(B2)
Toluene, µg/Kg	13(I)	7.4(I)	--	--	--	--	--	--
TOTAL FURNACE METALS:								
Arsenic, mg/Kg	3.4	3.6	1.7	1.8	1.4	1.4	2.6	2.5
Selenium, mg/Kg	--	--	0.3(M2)	--	--	--	0.2(M2)	0.3(M2)
TOTAL ICP METALS:								
Barium, mg/Kg	93	74	44	110	76	52	97	130
Cadmium, mg/Kg	--	--	1.3	--	--	--	1.9	3.3
Chromium, mg/Kg	10	8.0	7.7	8.4	9.4	6.1	14	17
Lead, mg/Kg	72	56	66	61	24	15	66	140
Silver, mg/Kg	--	--	--	--	--	--	--	--

TABLE 4-20

POSITIVE ANALYTICAL RESULTS/SEDIMENTS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

PARAMETER Sample Depth Date Collected	PSFSD05A (0-1') 4-1-92	PSFSD05B (1-2') 4-1-92	PSFSD06A (0-1') 3-31-92	PSFSD06B (1-2') 3-31-92	PSFSD07 (0-1') 3-31-92	PSFSD07B (1-2') 3-31-92	PSFSD09A (0-1') 7-16-92	PSFSD09B (1-2') 7-16-92
TOTAL MERCURY:								
Mercury, mg/kg	--	--	0.4(B1)	0.2(B1)	0.1(B1)	--	--	0.4
ORGANOPHOSPHORUS PESTICIDES:	--	--	--	--	--	--	--	--
ACID HERBICIDES:	--	--	--	--	--	--	--	--
DIOXIN:	NA	NA	NA	NA	NA	NA	NA	NA

B1 - Sample results are less than 10 times the amount detected in method blank. Result is estimated.
B2 - Sample results are less than 10 times the amount detected in method blank. Result is estimated.
M2 - Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
I - Low internal standard response. Result is an estimated quantitation.
T - Sample results are less than 10 times the amount detected in trip blank. Result is estimated.
NA - Not analyzed

TABLE 4-21

SOIL SAMPLES EXCEEDING RCRA CALs FOR PESTICIDES
Pesticide Storage Facility
Fort Riley, Kansas

PESTICIDE	CAL (mg/kg)	Surface Soils Sample	Surface Soils Conc. (mg/kg)	Shallow Soil Borings Sample	Shallow Soil Borings Conc. (mg/kg)
DDT	2.00	---	---	PSFSB-03C*	33.00
				PSFSB-03A	7.70
				PSFSB-09A	6.57
				PSFSB-07B	3.04
				PSFSB-09B	3.02
				PSFSB-17C**	2.05
Total Chlordane	0.50	PSFSS-02	3.20	PSFSB-03B	3.10
		PSFSS-04	1.30	PSFSB-12B	1.70
		PSFSS-01	0.75	PSFSB-05A	1.58
				PSFSB-17C**	0.94
				PSFSB-10A	0.89
				PSFSB-09A	0.78
				PSFSB-12A	0.78
Dieldrin	0.04	PSFSS-01	0.094	PSFSB-05A	0.20
		PSFSS-02	0.077		
Heptachlor	0.20	PSFSS-02	0.30	PSFSB-05A	0.23

* duplicate sample of PSFSB-03B
** duplicate sample of PSFSB-17A

Notes:
1. CAL = Corrective Action Level
2. mg/kg = milligrams per kilogram
3. DDT concentrations represent total concentration of DDT and its metabolites (DDE and DDD).
4. Chlordane concentrations represent sum of alpha- and gamma-chlordane concentrations.
5. Source: Federal Register, Vol. 55, No. 145, July 27, 1990. Pages 30798-30884. Corrective Action for Solid Waste Management Facilities, Proposed Rule.

TABLE 5-1
ORGANIC CONTAMINANT FATE AND TRANSPORT DATA
Pesticide Storage Facility
Fort Riley, Kansas

CONSTITUENT	MOLECULAR WEIGHT (g/mole)	SOLUBILITY IN WATER (mg/L) (25 +/- 5° C)	ref.	VAPOR PRESSURE (atm) (25 +/- 5° C)	ref.	SPECIFIC GRAVITY (25 +/- 5° C)	ref.	HENRY'S LAW CONSTANT ($atm-m^3/mole$) (25 +/- 5° C)	ref.	LOG K_{oc}	ref.	LOG K_{ow}	ref.	AQUATIC BIOCONCENTRATION FACTOR (BCF)	ref.
VOLATILES:															
Benzene	78.11	1.80E+03	1	1.25E-01	1	0.87	1	5.48E-03	1	1.92	1	1.95	1	5.20E+00	2
Carbon Disulfide	76.13	1.70E+03	1	4.74E-01	1	1.26	1	2.12E-02	1	2.47	1	1.84	1	ND	
1,2-Dichloropropane	112.99	2.70E+03	1	6.58E-02	1	1.56	1	2.94E-03	1	1.71	1	2.28	1	1.82E+01	6
Methylene Chloride	84.93	1.67E+04	1	5.99E-01	1	1.33	1	2.18E-03	1	0.94	1	1.25	1	ND	
1,1,2,2-Tetrachloroethane	167.85	2.97E+03	1	1.05E-02	1	1.59	1	4.56E-04	1	2.56	1	2.56	1	4.20E+01	2
Toluene	92.14	5.24E+02	1	2.89E-02	1	0.86	1	6.74E-03	1	2.06	1	2.50	1	1.07E+01	2
Trichloroethene	131.39	1.10E+03	1	9.55E-02	1	1.46	1	9.10E-03	1	2.03	1	2.60	1	1.06E+01	2
SEMI-VOLATILES:															
Acenaphthene	154.21	3.47E+00	1	2.04E-06	1	1.02(a)	1	7.92E-05	1	1.25	1	3.92	1	2.42E+02	2
Alpha-chlordane	409.78	5.10E-02	1	3.00E-06	3	ND		ND		5.57	1	5.93	1	1.40E+04	2
Anthracene	178.24	7.30E-02	1	2.24E-08	1	1.29	1	1.77E-05	1	4.27	1	4.45	1	ND	
Benzo(a)anthracene	228.30	9.40E-03	1	1.45E-10	1	1.27	1	2.29E-08	1	6.14	1	5.90	1	ND	
Benzo(b)fluoroanthene	252.32	1.20E-03	1	6.58E-10	1	ND		1.20E-05	1	5.74	1	6.57	1	ND	
Benzo(k)fluoroanthene	252.32	5.50E-04	1	1.26E-13	1	ND		1.04E-03	1	6.64	1	6.85	1	ND	
Benzo(g,h,i)perylene	276.34	2.60E-04	1	1.33E-13	1	ND		1.40E-07	1	6.89	1	7.10	1	ND	
Benzo(a)pyrene	252.32	3.80E-03	1	7.22E-12	1	1.35	1	2.40E-06	1	5.95	1	5.81	1	ND	
Bis(2-ethylhexyl)phthalate	390.00	4.00E-01	1	8.16E-11	1	0.99	1	1.10E-05	1	5.00	1	4.20	1	ND	
Chrysene	228.30	2.00E-03	1	8.29E-12	1	1.27	1	7.26E-20	1	5.39	1	5.61	1	ND	
4,4'-DDD	320.05	9.00E-02	1	1.34E-09	1	1.48	1	2.16E-05	1	4.64	1	5.99	1	1.00E+04	4
4,4'-DDE	319.03	1.20E-02	1	8.54E-09	1	ND		2.34E-05	1	5.34	1	5.77	1	5.10E+04	2
4,4'-DDT	354.49	3.10E-03	1	1.32E-10	1	1.56(b)	1	5.20E-05	1	5.38	1	5.98	1	5.40E+04	2
Dibenzofuran	168.20	1.00E+01	1	ND		1.09(c)	1	ND		4.00	1	4.17	1	ND	
2,4-Dichlorophenol	163.00	4.50E+03	1	1.17E-04	1	1.38(b)	1	3.23E-06	1	2.94	1	3.15	1	4.10E+01	2
Dieldrin	380.91	2.00E-01	1	2.37E-10	1	1.75	1	3.18E-05	1	4.08	1	4.66	1	4.76E+03	2
Diethylphthalate	222.24	1.08E+03	1	2.18E-06	1	1.12	1	8.46E-07	1	1.84	1	2.47	1	1.17E+02	2

TABLE 5-1
ORGANIC CONTAMINANT FATE AND TRANSPORT DATA
Pesticide Storage Facility
Fort Riley, Kansas

CONSTITUENT	MOLECULAR WEIGHT (g/mole)	SOLUBILITY IN WATER (mg/L) (25 +/- 5° C)	ref.	VAPOR PRESSURE (atm) (25 +/- 5° C)	ref.	SPECIFIC GRAVITY (25 +/- 5° C)	ref.	HENRY'S LAW CONSTANT ($atm-m^3/mole$) (25 +/- 5° C)	ref.	LOG K_{oc}	ref.	LOG K_{ow}	ref.	AQUATIC BIOCONCENTRATION FACTOR (BCF)	ref.
SEMI-VOLATILES: (cont'd)															
Endrin Aldehyde	380.92	2.60E-01	1	2.63E-10	1	ND		3.86E-07	1	4.43	1	5.60	1	ND	
Fluoranthene	202.26	2.36E-01	1	6.58E-09	1	1.25(d)	1	1.69E-02	1	4.62	1	5.22	1	1.15E+03	2
Fluorene	166.22	1.69E+00	1	1.36E-06	1	1.20(d)	1	2.10E-04	1	3.70	1	4.18	1	1.30E+03	2
Gamma-chlordane	409.78	1.85E+00	3	3.90E-06	3	ND		ND	1	5.48	1	8.69	1	1.40E+04	2
Heptachlor	373.32	5.60E-02	1	5.26E-07	1	1.66	1	2.30E-03	1	4.34	1	4.40	1	1.57E+04	2
Heptachlor Epoxide	389.32	2.70E-01	1	3.42E-09	1	ND		3.20E-05	1	4.32	1	3.65	1	1.44E+04	2
Indeno(1,2,3-cd)pyrene	276.34	6.20E-02	1	1.32E-13	1	ND		2.96E-20	1	7.49	1	5.97	1	ND	
Malathion	330.36	1.45E+02	2	5.26E-08	2	ND		1.20E-07	2	3.26	5	2.89	2	0.00E+00	2
Methoxychlor	345.66	4.50E-02	1	ND		1.41	1	ND		4.90	1	4.40	1	ND	2
2-Methylnaphthalene	142.20	2.46E+01	1	ND		1.01	1	ND		3.87	1	3.86	1	ND	2
Phenanthrene	178.24	1.18E+00	1	8.95E-07	1	1.18	1	2.56E-05	1	4.36	1	4.46	1	2.63E+03	2
Pyrene	202.26	1.32E-01	1	3.29E-09	1	1.27	1	1.09E-05	1	4.80	1	5.09	1	ND	
2,4,6-Trichlorophenol	197.45	1.20E+03	1	2.89E-05	1	1.68	1	1.76E-07	1	2.85	1	3.85	1	1.50E+02	2

1. Montgomery and Welkom (1990).
2. Superfund Public Health Evaluation Manual (1986).
3. ATSDR, Toxicology Profiles (1988-91).
4. Callahan et al. (1979).
5. Rao and Hornsby (1989).
6. Howard et al. (1990)

a. Data obtained at 90 +/- 4° C.
b. Data obtained at 15 +/- 4° C.
c. Data obtained at 99 +/- 4° C.
d. Data obtained at 0 +/- 4° C.

ND - No data

TABLE 5-2

METAL CONTAMINANT FATE AND TRANSPORT DATA
Pesticide Storage Facility
Fort Riley, Kansas

CONSTITUENT	MOLECULAR WEIGHT (g/mole)	AQUATIC BIOCONCENTRATION FACTOR (BCF)	ref.
Aluminum	26.98	ND	
Arsenic	79.92	4.40E+01	1
Barium	137.33	ND	
Beryllium	9.01	1.90E+01	1
Cadmium	112.40	8.10E+01	1
Calcium	40.08	ND	
Chromium	51.99	1.60E+00	1
Copper	63.55	2.00E+02	1
Iron	55.85	ND	
Lead	207.20	4.90E+01	1
Magnesium	24.31	ND	
Manganese	54.94	ND	
Mercury	200.59	5.50E+03	1
Nitrate	62	ND	
Potassium	39.10	ND	
Selenium	78.96	1.60E+01	1
Silver	107.87	3.08E+03	1
Sodium	22.99	ND	
Thallium	204	ND	
Vanadium	50.94	ND	
Zinc	65.37	4.70E+01	1

1. Superfund Public Health Evaluation Manual (1986)
ND - No data

TABLE 5-3
ORGANIC CONTAMINANT DEGRADATION DATA
Pesticide Storage Facility
Fort Riley, Kansas

CONSTITUENT	HALF-LIFE SOIL	HALF-LIFE SURFACE WATER	HALF-LIFE AIR	HALF-LIFE GROUNDWATER	AEROBIC HALF-LIFE	ANAEROBIC HALF-LIFE	HYDROLYSIS HALF-LIFE
VOLATILES:							
Benzene	5-16 d	5-16 d	2-20 d	10 d-24 mo	5-16 d	16 w-24 m	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	10 d- 20 w	8 h- 10 d	>23 d	334 d- 7.1 y	167 d- 3.5 y	668 d- 14.1 y	15.8 y
Methylene Chloride	7-28 d	7-28 d	19-191 d	14 d-8 w	7-28 d	28 d-16 w	704 y
1,1,2,2-Tetrachloroethane	11 h- 45 d	10.7 h- 45 d	8.9- 88.8 d	11 h- 45 d	4 w - 6 m	7 d - 4 w	45 d
Toluene	4-22 d	4-22 d	10 h-4.3 d	7-28 d	4-22 d	8-30 w	ND
Trichloroethene	0.5-1 y	0.5-1 y	1.1-11 d	11 mo-5 y	0.5-1 y	98 d-4.5 y	10.7 mo
SEMI-VOLATILES:							
Acenaphthene	12-102 d	3 h-12 d	1-8 h	25-204 d	12-102 d	49-480 d	ND
Alpha-Chlordane	283 d-4 y	283 d-3 y	2 d	566 d-8 y	283 d-4 y	1-7 d	>197000 y
Anthracene	50 d-1.3 y	0.5-2 h	0.5-2 h	100 d-2.5 y	50 d-1.3 y	200 d-5 y	ND
Benzo(a)anthracene	100 d-1.9 y	1-3 h	1-3 h	200 d-3.8 y	100 d-1.9 y	1-8 y	ND
Benzo(b)fluoroanthene	1-1.7 y	8.7 h-30 d	1.4-14 h	2-3.3 y	1-1.7 y	4-6.7 y	ND
Benzo(k)fluoroanthene	2.5-5.8 y	3.8 h-21 d	1-11 h	5-11.7 y	2.5-5.8 y	9-24 y	ND
Benzo(ghi)perylene	1.5-1.8 y	1.5-1.8 y	0.3-3 h	3.2-3.6 y	1.5-1.8 y	6.5-7.1 y	ND
Benzo(a)pyrene	57 d-1.5 y	0.4-1.1 h	0.4-1 h	114 d-3 y	57 d-1.5 y	228 d-6 y	ND
Bis(2-ethylhexyl)phthalate	5-23 d	5-23 d	2.9-29 h	10-389 d	5-23 d	42-389 d	2000 y
Chrysene	1-2.7 y	4.4-13 h	0.8-8 h	2-5.5 y	1-2.7 y	4-11 y	ND
4,4'-DDD	2-15.6 y	2-15.6 y	18 h-7 d	70 d-31 y	2-15.6 y	70-294 d	28 y
4,4'-DDE	2-15.6 y	15 h-6 d	17 h-7 d	16 d-31 y	2-15.6 y	16-100 d	ND
4,4'-DDT	2-15.6 y	7-350 d	18 h- 7 d	16 d-31 y	2-15.6 y	16-100 d	22 y
Dibenzofuran	7-28 d	7-28 d	2-19 h	8.5-35 d	7-28 d	28-112 d	ND
2,4-Dichlorophenol	7-70 d	0.8-3 h	21 h-9 d	5.5-43 d	3-8 d	13-43 d	ND
Dieldrin	175 d-3 y	18 d-3 y	4 h-1.7 d	1-6 y	175 d-3 y	1-7 d	10.5 y
Diethylphthalate	3 d-8 w	3 d-8 w	21 h-9 d	6 d-16 w	3 d-8 w	4-32 w	8.8 y

TABLE 5-3
ORGANIC CONTAMINANT DEGRADATION DATA
Pesticide Storage Facility
Fort Riley, Kansas

CONSTITUENT	HALF-LIFE SOIL	HALF-LIFE SURFACE WATER	HALF-LIFE AIR	HALF-LIFE GROUNDWATER	AEROBIC HALF-LIFE	ANAEROBIC HALF-LIFE	HYDROLYSIS HALF-LIFE
SEMI-VOLATILES (cont'd):							
Endrin Aldehyde	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	140-440 d	21 h-2.6 d	2-20 h	280 d-2.5 y	140-440 d	1.5-4.8 y	ND
Fluorene	32-60 d	32 d-60 d	6.8 h-28 d	64-120 d	32-60 d	128-240 d	ND
Gamma-Chlordane	ND	ND	ND	ND	ND	ND	ND
Heptachlor	23 h-5.4 d	23 h-5.4 d	1-10 h	23 h-5.4 d	15-65 d	60-260 d	23 h-5 d
Heptachlor Epoxide	33-552 d	33-552 d	6 h-3 d	1-1104 d	33-552 d	1-7 d	ND
Indeno(1,2,3-cd)pyrene	1.6-2 y	125-250 d	1-6 h	3.3-4 y	1.6-2 y	6.6-8 y	ND
Malathion	3-7 d	4-52 d	1-10 h	8.4-103 d	4-52 d	16-206 d	8.8 y
Methoxychlor	0.5-1 y	2-5 h	1-11 h	50 d-1 y	0.5-1 y	50 d-0.5 y	1.1 y
2-Methylnaphthalene	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	16-200 d	3-25 h	2-20 h	32 d-1 y	16-200 d	64 h-2.2 y	ND
Pyrene	210 d-5.2 y	0.6-2 h	1-2 h	1.2-10 y	210 d-5.2 y	2.3 y-20.8 y	ND
2,4,6-Trichlorophenol	7-70 d	2-4 h	5-52 d	14 d-5 y	7-70 d	169 d-5 y	>8E+06 y

Source: Howard et al. (1991) min: minute h: hour d: day w: week mo: month y: year ND: no data

TABLE 6-1

CHEMICALS DETECTED IN SURFACE SOIL SAMPLES
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Concentration Detected in Background Sample [a] [SS-01]	Frequency of Detection [b]	Method Detection Limit	Arithmetic Mean	Range of Detected Concentrations [c]			95% Upper Confidence Limit [d]
Pesticides:								
* alpha-Chlordane	0.37	4/4	0.0013	0.66	0.029	-	1.6	5,300
* gamma-Chlordane	0.38	4/4	0.0013	0.66	0.03	-	1.6	4,700
* 4,4'-DDE	0.18	4/4	0.0076	0.59	0.094	-	1.8	54
* 4,4'-DDT	0.67	3/4	0.0076	0.54	0.45	-	1	440
* Dieldrin	0.094	2/4	0.0038	0.053	0.077	-	0.094	40
* Heptachlor	ND	1/4	0.0038	0.084	< 0.0038	-	0.3	13,000
* Methoxychlor	2.4	1/4	0.038	0.69	< 0.038	-	2.4	62,000
Organophosphorous Pesticides:								
* Malathion	0.419	1/4	0.17	0.17	< 0.17	-	0.419	1.1
Volatile Organics:								
Methylene Chloride	0.016 B_2	4/4	0.005	0.029	0.016	-	0.039 B_2	0.054
Toluene	ND	2/4	0.006	0.0048	0.006 I_2	-	0.0073	0.011
Semi-Volatile Organics:								
* Benzo[a]anthracene	ND	1/4	0.12	0.26	< 0.12	-	0.16	3.3
* Chrysene	ND	1/4	0.12	0.33	< 0.12	-	0.45	7.0
Fluoranthene	ND	1/4	0.16	0.62	< 0.16	-	1.3	56
* Phenanthrene	ND	1/4	0.16	0.49	< 0.16	-	0.78	13
Pyrene	ND	1/4	0.12	0.47	< 0.12	-	1	43
bis(2-Ethylhexyl)phthalate	0.62	1/4	0.4	0.89	< 0.4	-	0.62	11
Metals:								
* Arsenic	2.4	3/3	0.34	8.3	4.2	-	16	1,100
* Barium	99	3/3	1.0	95	35	-	130	12,000
* Chromium	9.3	3/3	1.2	9.8	6.9	-	15	49
* Lead	46	3/3	3.4	210	32	-	540	2.6 E+11

Note: All concentrations are in mg/kg (ppm).
ND Not detected at concentrations greater than or equal to the Method Detection Limit.
* Selected as a potential chemical of concern
a Comparison to background concentrations are applicable for inorganic constituents only; the presence of organic constituents in the background sample (SS-01) indicates that this sample may have been collected in an area influenced by site contamination.
b Number of samples in which the chemical was positively detected divided by the number of samples available. For organics, the denominator includes the background sample (that is, all 4 surface soil samples are used as site samples [SS-01, SS-02, SS-03, SS-04])
c For metals, the range does not include the concentration of chemicals detected in the background sample (i.e., it includes range of samples SS-02, SS-03, and SS-04)
d The 95% Upper Confidence Limit is calculated using statistical procedures appropriate for characterizing lognormal populations (Gilbert, 1987) The UCL may be "artificially" elevated because of the small sample size and the large standard deviation of the data set.
B_2 Constituent is associated with blanks.
I_2 Low internal standard response and high surrogate recovery. Result is biased high.

TABLE 6-2

CHEMICALS DETECTED IN SUBSURFACE SOIL SAMPLES
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

	Concentration Detected in Background Samples[a] [SB01A]	[SB01B]	Frequency of Detection[b]	Method Detection Limit	Arithmetic Mean	Range of Detected Concentrations [c]	95% Upper Confidence Limit
Pesticides:							
*alpha-Chlordane	0.022	0.084	35/40	0.005	0.17	0.0037 - 1.5	0.6
*gamma-Chlordane	0.024	0.082	38/40	0.005	0.17	0.004 - 1.6	0.57
* 4,4'-DDD	ND	ND	3/40	0.007	0.05	0.025 - 0.43	0.085
* 4,4'-DDE	ND	0.024	25/40	0.007	0.11	0.0083 - 0.87	0.33
* 4,4'-DDT	0.016	0.087	34/40	0.0073	1.4	0.012 - 33	3.9
* Dieldrin	ND	0.027	3/40	0.007	0.036	0.01 - 0.2	0.057
* Endrin aldehyde	ND	ND	1/40	0.008	0.033	< 0.008 - 0.014	0.052
* Heptachlor	ND	ND	5/40	0.001	0.023	0.0047 - 0.23	0.043
* Heptachlor epoxide	ND	0.004	2/40	0.01	0.036	0.0043 - 0.0054	0.037
* Methoxychlor	0.056	0.53	6/40	0.06	0.41	0.056 - 10	0.49
Volatile Organics:							
Methylene chloride	0.014T	0.017T	38/40	0.005	0.027	0.0095B2 - 0.075	0.036
Toluene	ND	ND	13/40	0.002	0.0077	0.0089 - 0.034	0.0096
Semi-Volatile Organics:							
Acenaphthene	ND	ND	1/40	0.18	0.104	< 0.18 - 0.23	0.109
*Anthracene	ND	ND	4/40	0.18	0.13	0.25 - 0.76	0.15
*Benzo(a)anthracene	ND	ND	17/40	0.11	0.25	0.11 - 1.8	0.32
*Benzo(a)pyrene	ND	ND	7/40	0.24	0.23	0.27 - 1.3	0.26
*Benzo(b)fluoroanthene	ND	ND	5/40	0.35	0.28	0.38 - 1.4	0.31
*Benzo(k)fluoroanthene	ND	ND	4/40	0.37	0.26	0.46 - 1.2	0.29
*Chrysene	ND	ND	17/40	0.11	0.25	0.11 - 1.7	0.33
*Dibenzofuran	ND	ND	1/40	0.11	0.062	< 0.11 - 0.13	0.065
2,4-Dichlorophenol	ND	ND	1/40	0.21	0.12	<0.21 - 2.3	0.12
Diethylphthalate	ND	ND	3/40	0.35	0.23	0.43 - 0.7	0.24
bis(2-Ethylhexyl)phthalate	ND	0.89	8/40	0.37	0.33	0.4 - 1.4	0.37
Fluoranthene	ND	ND	17/40	0.15	0.38	0.16 - 3.4	0.49
Fluorene	ND	ND	1/40	0.24	0.14	< 0.24 - 0.27	0.15
*Indeno(1,2,3-cd)pyrene	ND	ND	1/40	0.35	0.2	< 0.35 - 0.38	0.21
*2-Methylnaphthalene	ND	ND	1/40	0.15	0.084	< 0.15 - 0.2	0.08
*Phenanthrene	ND	ND	14/40	0.15	0.3	0.23 - 2.7	0.37
Pyrene	ND	ND	20/40	0.11	0.48	0.11 - 4.1	0.71
2,4,6-Trichlorophenol	ND	ND	1/40	0.3	0.16	< 0.3 - 0.33	0.17
Metals:							
*Arsenic	1.2	1.4	38/38	0.34	6.6	0.8 - 120	6.4
Barium	99	73	38/38	1	97	39 - 160	108
*Cadmium	ND	ND	3/38	0.8	0.49	0.7 - 5	0.49
*Chromium	8.2	6.7	38/38	1.2	8.7	4.5 - 41	9.7
*Lead	4.3	11	38/38	3.4	82	4.7 - 770	149
*Mercury	ND	ND	8/38	0.1	0.12	0.1 - 1.3	0.13
Silver	ND	ND	4/38	0.7	0.41	0.8 - 1.2	0.45
Selenium	ND	ND	7/38	0.2	0.14	0.2 - 0.8	0.16

Note: All concentrations are in mg/kg (ppm).

ND Not detected at concentrations greater than or equal to the Method Detection Limit

* Selected as a potential chemical of concern

a Comparison to background concentrations are applicable for inorganic constituents only; the presence of organic constituents in background samples indicates the "background" sample was collected in an area influenced by site contamination

b Number of samples in which the chemical was positively detected divided by the number of samples available (for organics, the denominator includes the background sample).

c Range does not include the concentration of chemicals detected in the background sample.

d The 95% Upper Confidence Limit is calculated using statistical procedures appropriate for characterizing lognormal populations (Gilbert, 1987)

T Sample results are associated with the trip blank (indicates possible cross-contamination).

B2 Sample results are associated with the method blank (indicates possible lab contamination).

TABLE 6-3

CHEMICALS DETECTED IN MONITORING WELL SOIL BORING SAMPLES
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Concentration Detected in Background Samples [a] [MWSB01A]	[MWSB01B]	Frequency of Detection [b]	Method Detection Limit	Arithmetic Mean	Range of Detected Concentrations [c]			95% Upper Confidence Limit [d]
Pesticides:									
alpha-Chlordane	ND	ND	2/13	0.0037	0.0084	0.015	-	0.073	0.014
gamma-Chlordane	ND	ND	3/13	0.0037	0.0087	0.0051	-	0.071	0.019
4,4'-DDE	ND	ND	1/13	0.0073	0.0045	< 0.0073	-	0.012	0.0054
Dieldrin	ND	ND	2/13	0.0073	0.005	0.0087	-	0.013	0.0061
Volatile Organics:									
Benzene	0.0066	0.0059	2/13	0.0031	0.0024	0.0059	-	0.0066 B_2	0.0032
Methylene Chloride	0.062 B_2	0.046 B_2	13/13	0.005	0.022	0.011	-	0.035	0.026
Semi-Volatile Organics:									
Benzo[a]anthracene	ND	ND	2/13	0.11	0.103	0.11	-	0.6	0.14
Benzo[a]pyrene	ND	ND	1/13	0.11	0.18	< 0.11	-	0.68	0.22
Benzo[b]fluoranthene	ND	ND	1/13	0.36	0.25	< 0.36	-	1	0.32
Benzo[g,h,i]perylene	ND	ND	1/13	0.36	0.21	< 0.36	-	0.4	0.23
Chrysene	ND	ND	2/13	0.11	0.11	0.11	-	0.64	0.15
Fluoranthene	ND	ND	2/13	0.14	0.16	0.18	-	1	0.22
Indeno[1,2,3-cd]pyrene	ND	ND	1/13	0.36	0.21	< 0.36	-	0.48	0.25
Phenanthrene	ND	ND	1/13	0.14	0.11	< 0.14	-	0.56	0.15
Pyrene	ND	ND	2/13	0.11	0.12	0.18	-	0.8	0.18
bis(2-Ethylhexyl)phthalate	ND	ND	1/13	0.36	0.21	< 0.36	-	0.48	0.25
Metals:									
Arsenic	1	2.5	11/11	0.34	1.9	0.4	-	3.7	3.9
Barium	61	120	11/11	1.0	88	44	-	190	116
Chromium	6.8	8.7	11/11	1.2	9.0	4.8	-	20	12
Lead	5.1	10	7/11	3.4	16	4.7	-	58	78
Mercury	ND	ND	2/11	0.1	0.077	0.1	-	0.3	0.11
Silver	ND	ND	4/11	0.5	0.58	0.9	-	1.2	0.94

Note: All concentrations are in mg/kg (ppm).
ND Not detected at concentrations greater than or equal to the Method Detection Limit.
* Selected as a potential chemical of concern
a Comparison to background concentrations are applicable for inorganic constituents only; the presence of organic constituents in background samples indicates the "background" sample was collected in an area influenced by site contamination.
b Number of samples in which the chemical was positively detected divided by the number of samples available (for organics, the denominator includes the background sample).
c Range does not include the concentration of chemicals detected in the background sample.
d The 95% Upper Confidence Limit is calculated using statistical procedures appropriate for characterizing lognormal populations (Gilbert, 1987). (PSF92-01,02,03,04)
B_2 Sample results are associated with the method blank (indicates possible lab contamination).

TABLE 6-4

CHEMICALS DETECTED IN GROUNDWATER SAMPLES
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Maximum Concentration Detected in Background Sample	Frequency of Detection [a]	Method Detection Limit	Arithmetic Mean	Range of Detected Concentrations [b]	95% Upper Confidence Limit [c]
Volatile Organics:						
Methylene Chloride	9.3 T	3/4	0.005	0.0080	0.0018 – 0.021 T	0.051
Trichloroethene	ND	1/4	0.003	0.0019	< 0.003 – 0.003	0.0030
Dissolved Metals:						
Arsenic	ND	1/4	0.002	0.0045	< 0.002 – 0.015	0.54
Aluminum	ND	2/4	0.11	0.14	0.17 – 0.28	1.1
Barium	0.088	4/4	0.005	0.099	0.084 – 0.12	0.12
Beryllium	ND	4/4	0.001	0.0019	0.0015 – 0.003	0.0031
Calcium	8.8	4/4	0.093	210	140 – 340	380
Iron	ND	1/4	0.045	0.036	< 0.045 – 0.078	0.12
Magnesium	14	4/4	0.17	33	18 – 55	72
Manganese	0.024	4/4	0.001	0.052	0.031 – 0.083	0.10
Mercury	ND	1/4 d	0.0002	0.00018	< 0.0002 – 0.0004 d	0.00078
Potassium	3.3	4/4	0.22	8.7	3.8 – 19	39
Selenium	0.0011	4/4	0.001	0.0019	0.0012 – 0.0026	0.0033
Sodium	11	4/4	0.29	51	25 – 90	130
Vanadium	ND	1/4	0.007	0.0086	< 0.007 – 0.024	0.14
Zinc	0.0065 B_1	4/4 B_1	0.002	0.0066	0.0055 – 0.0075	0.0086
Total Metals:						
Antimony	0.022	1/16	0.031	0.017	<0.031 – 0.032	0.018
• Arsenic	ND	5/16	0.002	0.0026	< 0.002 – 0.016	0.0039
• Aluminum	ND	10/16	0.1	0.22	< 0.100 – 0.800	0.44
• Barium	0.2	16/16	0.005	0.13	0.060 – 0.13	0.10
• Beryllium	0.002	15/16	0.002	0.0022	< 0.0020 – 0.005	0.0028
Calcium	150	16/16	0.11	190	130 – 350	220
• Chromium	0.01	2/16	0.01	0.0060	< 0.01 – 0.014	0.0070
Cobalt	ND	1/16	0.01	0.0050	<0.01 – 0.009	0.0056
Copper	0.011	6/16	0.005	0.0046	<0.005 – 0.012	0.0064
Iron	0.071	12/16	0.050	0.32	0.050 – 1.5	1.3
Lead	ND	2/16	0.005 / 0.001	0.0011	<0.001 – 2.5	0.0016
Magnesium	26	16/16	0.17	30	18 – 56	36
• Manganese	0.034	16/16	0.015	0.046	0.023 – 0.091	0.057
Nickel	0.019	4/16	0.018	0.012	<0.018 – 0.024	0.014
Potassium	5.3	16/16	0.216	10	3.7 – 50	14
Selenium	0.003	16/16	0.001	0.0020	0.0011 – 0.0036	0.0024
Sodium	22	16/16	0.29	50	25 – 130	65
• Thallium	ND	2/16	0.001 – 100	0.029	< 0.001 – 0.0029 [e]	NA
• Vanadium	0.011	4/16	0.007 – 0.010	0.0073	< 0.007 – 0.027	0.0097
Zinc	0.013	8/16	0.007	0.014	< 0.007 – 0.098	0.024
Wet Chemical Inorganics:						
Inorganic Chloride	147	16/16	0.2	110	39 – 399	180
• Nitrate	6.4	15/16	0.2	32	<0.2 – 165	250
Sulfate	85	16/16	0.2	180	108 – 386	230
Total Sulfide	ND	1/16	1.0	3.8	<1.0 – 52.5	3.4
Bicarbonate, as $CaCO_3$	249	12/16	1.0	270	<1.0 – 493	750000

Note: All concentrations are in mg/L (ppm). "Dissolved Metals" contains only baseline data.
ND = Not detected at concentrations greater than or equal to the Method Detection Limit.
NA = Due to the large number of NDs and large MDLs, calculation of a UCL for thallium was not appropriate.
• Selected as a potential chemical of concern
a Number of samples in which the chemical was positively detected divided by the number of samples available.
b Range does not include the concentration of chemicals detected in the background sample.
c The 95% Upper Confidence Limit is calculated using statistical procedures appropriate for characterizing lognormal populations (Gilbert, 1987). The UCL may be "artificially" elevated due to small sample size and large standard deviation of the data set.
d Total mercury was not detected in any samples. Since dissolved metals concentrations can not exceed total metals concentrations, this result may be a false positive resulting from lab contamination.
e For thallium, the largest concentration actually detected was 0.0029 mg/L (see 9/10//93 letter in Appendix L). However, thallium was not detected using methods with MDLs as large as 0.110 mg/L.
T = Sample results are associated with the trip blank (indicates possible cross-contamination).
B_1 = Sample results are associated with the method blank (indicates possible lab contamination).

TABLE 6–5

CHEMICALS DETECTED IN SURFACE WATER SAMPLES
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Concentration Detected in Background Sample	Frequency of Detection [a]	Method Detection Limit	Arithmetic Mean	Range of Detected Concentrations [b]	95% Upper Confidence Limit [c]
Volatile Organics:						
Methylene Chloride	ND	2/5 T	0.005	0.014	0.03 – 0.03 T	1.01
Metals:						
* Aluminum	3.9	3/5 B_1	0.027	5.6	< 0.6 – 12 B_1	28,000
* Arsenic	0.004	3/5	0.004	0.0033	0.004 – 0.0044	0.0057
* Barium	0.25	5/5	0.005	0.22	0.14 – 0.29	0.33
* Cadmium	ND	1/5	0.004	0.0025	< 0.004 – 0.0045	0.0041
Calcium	110	5/5	0.093	92	70 – 110	110
* Chromium	0.018	3/5	0.01	0.011	0.01 – 0.024	0.04
* Copper	0.01	5/5	0.001	0.0099	0.0064 – 0.013	0.014
Iron	2.8 M_1	5/5 M_1	0.011	4.4 M_1	0.41 – 9.4 M_1	1,800
* Lead	ND M_2	1/5 M_2	0.002	0.0032 M_2	< 0.002 – 0.0042 M_2	0.021
Magnesium	20	5/5	0.17	19	12 – 23	27
* Manganese	0.1	5/5	0.001	0.12	0.063 – 0.19	0.2
Potassium	9.6	5/5	0.22	8.9	6.2 – 11	12
Sodium	45	5/5	0.29	44	35 – 49	50
* Vanadium	0.015	5/5	0.003	0.016	0.0064 – 0.026	0.056
Zinc	0.027	5/5	0.002	0.036	0.013 – 0.07 B_1	0.13
Wet Chemical Inorganics:						
Inorganic Chloride	71.3	5/5	?	56	38 – 65	73
Sulfate	84.3	5/5	?	94	74 – 106	110
Bicarbonate, as $CaCO_3$	310	5/5	?	228	170 – 290	290

Note: All concentrations are in mg/L (ppm).

ND Not detected at concentrations greater than or equal to the Method Detection Limit.

* Selected as a potential chemical of concern

a Number of samples in which the chemical was positively detected divided by the number of samples available.

b Range does not include the concentration of chemicals detected in the background sample.

c The 95% Upper Confidence Limit is calculated using statistical procedures appropriate for characterizing lognormal populations (Gilbert, 1987).

M_1 Sample results for iron may be falsely positive or biased high due to matrix interference.

M_2 Sample results for lead may be falsely negative or biased low due to matrix interference.

T Sample results are associated with trip blank (indicates possible cross–contamination).

B_1 Sample results are associated with the method blank (indicates possible lab contamination).

TABLE 6–6

CHEMICALS DETECTED IN SEDIMENT SAMPLES
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Concentrations Detected in Background Samples[a] [SD01A]	[SD01B]	Frequency of Detection	Method Detection Limit	Arithmetic Mean	Range of Detected Concentrations[c]		95% Upper Confidence Limit[d]
Pesticides:								
*alpha–Chlordane	0.0094	ND	10/14	0.004	0.014	0.0058 –	0.067	0.032
*gamma–chlordane	0.014	ND	10/14	0.004	0.017	0.0076 –	0.065	0.054
*4,4'–DDD	ND	ND	7/14	0.0078	0.022	0.0087 –	0.1	0.059
*4,4'–DDE	ND	ND	4/14	0.0078	0.029	0.011 –	0.28	0.055
*4,4'–DDT	0.11	ND	8/14	0.0078	0.047	0.0086 –	0.48	0.096
*Dieldrin	ND	ND	2/14	0.0078	0.0091	0.02 –	0.056	0.013
Volatile Organics:								
Carbon Disulfide	ND	ND	1/14	0.0033	0.0022	<0.0033 –	0.0069	0.0026
1,2–Dichloropropane	ND	ND	1/14	0.0033	0.0087	<0.0033 –	0.084 I	0.012
Methylene Chloride	0.049 B_1,T	0.047 B_1,T	14/14	0.005	0.045	0.012 –	0.086 B_1,T	0.067
1,1,2,2,–Tetrachloroethane	ND	ND	1/14	0.0056	0.0061	<0.0056 –	0.039	0.0086
Toluene	0.006	0.0087	8/14	0.006	0.0069	0.006 –	0.013	0.01
Semi–Volatile Organics:								
*Benzo[a]anthracene	ND	ND	5/14	0.12	0.11	0.12 –	0.16	0.15
*Chrysene	ND	ND	8/14	0.12	0.13	0.12 –	0.24	0.18
Fluoranthene	ND	ND	7/14	0.16	0.19	0.17 –	0.36	0.29
*Phenanthrene	ND	ND	3/14	0.16	0.15	0.2 –	0.36	0.21
Pyrene	0.88	ND	11/14	0.12	0.26	0.12 –	0.88	0.46
bis(2–Ethylhexyl)phthalate	ND	ND	4/14	0.4	0.37	0.45 –	0.64	0.51
Metals:								
*Arsenic	2.2	1.4	12/12	0.34	2.04	0.8 –	3.8	2.8
*Barium	88	74	12/12	1.0	92	44 –	150	120
*Cadmium	2.1	ND	5/12	0.7	0.98	1.2 –	3.3	1.8
*Chromium	13	7.6	12/12	1.2	12	4.2 –	25	17
*Lead	60	10	12/12	3.4	79	15 –	210	150
*Mercury	ND	ND	5/12	0.1	0.13	0.1 –	0.4	0.24
Selenium	0.2 M_2	ND	3/12	0.2	0.14	0.2 –	0.3 M_2	0.18
Silver	ND	ND	1/12	0.7	0.41	<0.7 –	0.8	0.46

Note: All concentrations are in mg/kg (ppm).
* Selected as a potential chemical of concern

ND Not detected at concentrations greater than or equal to the Method Detection Limit.

a Comparison to background concentrations are applicable for inorganic constituents only; the presence of organic constituents in background samples indicates that this sample may have been collected in an area influenced by site contamination.

b Number of samples in which the chemical was positively detected divided by the number of samples available (for organics, the denominator includes the background sample).

c For metals, the range does not include the concentration of chemicals detected in the background sample.

d The 95% Upper Confidence Limit is calculated using statistical procedures appropriate for characterizing lognormal populations (Gilbert, 1987).

B_1 Sample results are associated with the method blank (indicates possible laboratory contamination).

M_2 Results are falsely negative or biased low due to matrix interferences.

T Constituent was detected in the trip blank (indicates possible lab or cross contamination).

I Low internal standard response. Result is an estimated quantitation.

TABLE 6-7

SUMMARY OF CHEMICALS DETECTED IN SITE SAMPLES
(IDENTIFICATION OF CHEMICALS ELIMINATED FROM RISK ASSESSMENT DATA SET)
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Chemical	Range of Detected Concentrations											
	Surface Soils (mg/kg)	*	Subsurface Soils (mg/kg)	*	Monitoring Well Soil Borings (mg/kg)	**	Ground Water (mg/L)	*	Surface Water (mg/L)	*	Sediment (mg/kg)	*
Acenaphthene	ND		<0.18–0..23	a	ND		ND		ND		ND	
Aluminum	ND		ND		ND		0.110–0.800		<0.6–12 B		ND	
Anthracene	ND		0.25–0.76		ND		ND		ND		ND	
Arsenic	4.2–16		0.8–120		0.4– 3.7		< 0.002–0.016		0.004–0.0044		0.8–3.8	
Barium	35–130		39–160	a	44– 190		0.060–0.13		0.14–0.29		44–150	
Benzene	ND		ND		0.0059– 0.0066	B	ND		ND		ND	
Benzo[a]anthracene	< 0.12–0.16		0.11–1.8		0.11– 0.6		ND		ND		0.12–0.16	
Benzo[a]pyrene	ND		0.27–1.3	a	<0.11– 0.68		ND		ND		ND	
Benzo[b]fluoroanthene	ND		0.38–1.4		<0.36– 1		ND		ND		ND	
Benzo[g,h,i]perylene	ND		ND		<0.36– 0.4		ND		ND		ND	
Benzo[k]fluoroanthene	ND		0.46–1.2		ND		ND		ND		ND	
Beryllium	ND		ND		ND		<0.0020–0.005		ND		ND	
Bicarbonate, as $CaCO_3$	NT		NT		NT		240 – 490	d	170 – 290	d	NT	
Cadmium	ND		0.7–5		ND		ND		< 0.004–0.0045		1.2–3.3	
Calcium	ND		ND		ND		130–350	c	70–110	c	ND	
Carbon disulfide	ND		ND		ND		ND		ND		<0.0033–0.0069	a
alpha–Chlordane	0.029–1.6		0.0037–1.5		0.015– 0.073		ND		ND		0.0058–0.067	
gamma–Chlordane	0.03–1.6		0.004–1.6		0.0051– 0.071		ND		ND		0.0076–0.065	
Chloride, inorganic	NT		NT		NT		57 – 270	d	38 – 65	d	NT	
Chromium	6.9–15		4.5–41		4.8– 20		< 0.01–0.014		0.01–0.024		4.2–25	
Chrysene	< 0.12–0.45		0.11–1.7		0.11– 0.64		ND		ND		0.12–0.24	
Copper	ND		ND		ND		ND		0.0064–0.013		ND	
4,4'–DDD	ND		0.025–0.43		ND		ND		ND		0.0087–0.1	
4,4'–DDE	0.094–1.8		0.0083–0.87		<0.0073– 0.012		ND		ND		0.011–0.28	
4,4'–DDT	0.45 – 1		0.012–33		ND		ND		ND		0.0086–0.48	
Dibenzofuran	ND		<0.11–0.13		ND		ND		ND		ND	
2,4–Dichlorophenol	ND		<0.21–2.3	a	ND		ND		ND		ND	
1,2–Dichloropropane	ND		ND		ND		ND		ND		<0.0033 – 0.084	a
Dieldrin	0.077–0.094		0.01–0.2		0.0087– 0.013		ND		ND		0.02–0.056	
Diethylphthalate	ND		0.43–0.7	a	ND		ND		ND		ND	
Endrin aldehyde	ND		<0.008–0.014		ND		ND		ND		ND	
bis(2–Ethylhexyl)phthalate	<0.4–0.62	a	0.4–1.4	a	<0.36– 0.48		ND		ND		0.45–0.64	a
Fluoranthene	<0.16–1.3	a	0.16–3.4	a	0.18– 1		ND		ND		0.17–0.36	a
Fluorene	ND		<0.24–0.27	a	ND		ND		ND		ND	
Heptachlor	<0.0038–0.3		0.0047–0.23		ND		ND		ND		ND	
Heptachlor epoxide	ND		0.0043–0.0054		ND		ND		ND		ND	
Indeno[1,2,3–cd]pyrene	ND		<0.35–0.38		<0.36– 0.48		ND		ND		ND	
Iron	ND		ND		ND		<0.050–1.5	c	0.41–9.4	c	ND	
Lead	32–540		4.7–770		4.7 – 58		ND		< 0.002–0.0042 M		15–210	
Malathion	<0.17–0.419		ND		ND		ND		ND		ND	
Magnesium	ND		ND		ND		18–56	c	12–23	c	ND	
Manganese	ND		ND		ND		0.023–0.091		0.063–0.19		ND	
Mercury	ND		0.1–1.3		0.1– 0.3		ND		ND		0.1–0.4	
Methoxychlor	<0.035–2.4		0.056–10		ND		ND		ND		ND	
Methylene chloride	0.016–0.039	a	0.0095– 0.075	b	0.011– 0.035		0.0018–21	b	0.03–0.03	b	0.012–0.086	b
2–Methylnaphthalene	ND		<0.15 – 0.2		ND		ND		ND		ND	
Nitrate	NT		NT		NT		<0.2–165		NT		NT	
Phenanthrene	< 0.16–0.78		0.23–2.7		<0.14– 0.56		ND		ND		0.2–0.36	
Potassium	ND		ND		ND		3.7–50	c	6.2–11	c	ND	
Pyrene	<0.12–1	a	0.11–4.1	a	0.18– 0.8		ND		ND		0.12–0.88	a
Selenium	ND		0.2–0.8	a	ND		0.0011–0.0036	c	ND		0.2–0.3	a
Silver	ND		0.8–1.2	a	0.9–1.2		ND		ND		<0.7–0.8	a
Sodium	ND		ND		ND		25–130	c	35–49	c	ND	
Sulfate	NT		NT		NT		108 – 386	d	74 – 106	d	NT	
1,1,2,2–Tetrachloroethane	ND		ND		ND		ND		ND		<0.0056 – 0.039	a
Thallium	ND		ND		ND		<0.001–0.0029		ND		ND	
Toluene	0.006–0.0073	a	0.0089– 0.034	a	ND		ND		ND		0.006–0.013	a
Trichloroethene	ND		ND		ND		<0.003–0.003	a	ND		ND	
2,4,6–Trichlorophenol	ND		<0.3–0.33	a	ND		ND		ND		ND	
Vanadium	ND		ND		ND		< 0.007–0.027		0.0064–0.026		ND	
Zinc	ND		ND		ND		<0.007–0.098	a	0.013–0.07	a	ND	

ND – Not detected
NT – Not tested
B – Associated with blank contamination
M – Matrix interference
* A Letter in This Column Identifies Constituents Eliminated from the Data Set, For the Following Reasons:
a– failed to score above one percemt in the concentration–toxicity screen
b– associated with blank contamination
c– essential nutrient
d– used for feasibility study purposes
e– metal; not detected at levels exceeding those found in background samples
**NOTE: The soil samples collected from monitoring soil borings were not used in the statistical analysis of the risk assessment data set

TABLE 6-8

SUMMARY OF CHEMICALS OF CONCERN, BY MEDIUM
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Chemical	Range of Detected Concentrations				
	Surface Soils (mg/kg)	Subsurface Soils (mg/kg)	Ground Water (mg/L)	Surface Water (mg/L)	Sediment (mg/kg)
Aluminum	ND	ND	0.110-0.800	<0.6-12 B	ND
Anthracene	ND	0.25-0.76	ND	ND	ND
Arsenic	4.2-16	0.8-120	< 0.002-0.016	0.004-0.0044	0.8-3.8
Barium	35 - 130	39 - 160	0.060 - 0.13	0.14 - 0.29	44 - 150
Benzo[a]anthracene	< 0.12-0.16	0.11-1.8	ND	ND	0.12-0.16
Benzo[a]pyrene	ND	0.27 - 1.3	ND	ND	ND
Benzo[b]fluoroanthene	ND	0.38-1.4	ND	ND	ND
Benzo[k]fluoroanthene	ND	0.46-1.2	ND	ND	ND
Beryllium	ND	ND	<0.0020-0.005	ND	ND
Cadmium	ND	0.7-5	ND	< 0.004-0.0045	1.2-3.3
alpha-Chlordane	0.029-1.6	0.0037-1.5	ND	ND	0.0058-0.067
gamma-Chlordane	0.03-1.6	0.004-1.6	ND	ND	0.0076-0.065
Chromium	6.9-15	4.5-41	< 0.01-0.014	0.01-0.024	4.2-25
Chrysene	< 0.12-0.45	0.11-1.7	ND	ND	0.12-0.24
Copper	ND	ND	ND	0.0064-0.013	ND
4,4'-DDD	ND	0.025-0.43	ND	ND	0.0087-0.1
4,4'-DDE	0.094-1.8	0.0083-0.87	ND	ND	0.011-0.28
4,4'-DDT	0.45 - 1	0.012-33	ND	ND	0.0086-0.48
Dibenzofuran	ND	<0.11-0.13	ND	ND	ND
Dieldrin	0.077-0.094	0.01-0.2	ND	ND	0.02-0.056
Endrin aldehyde	ND	<0.008-0.014	ND	ND	ND
Heptachlor	<0.0038-0.3	0.0047-0.23	ND	ND	ND
Heptachlor epoxide	ND	0.0043-0.0054	ND	ND	ND
Indeno[1,2,3-cd]pyrene	ND	<0.35-0.38	ND	ND	ND
Lead	32-540	4.7-770	ND	< 0.002-0.0042 M	15-210
Malathion	<0.17-0.419	ND	ND	ND	ND
Manganese	ND	ND	0.023-0.091	0.063-0.19	ND
Mercury	ND	0.1-1.3	ND	ND	0.1-0.4
Methoxychlor	<0.035-2.4	0.056-10	ND	ND	ND
Nitrate	ND	ND	0.2-165	ND	ND
2-Methylnaphthalene	ND	<0.15 - 0.2	ND	ND	ND
Phenanthrene	< 0.16-0.78	0.23-2.7	ND	ND	0.2-0.36
Thallium	ND	ND	<0.001-0.0029	ND	ND
Vanadium	ND	ND	< 0.007-0.027	0.0064-0.026	ND

ND - Not detected
NT - Not tested
B - Associated with blank contamination
M - Matrix interference

TABLE 6–9

ESTIMATED EXPOSURE POINT CONCENTRATIONS
Pesticide Storage Facility
Fort Riley, Kansas

Medium	Land Use/Populations	Exposure Pathway	Parameter	Exposure Concentration	Comments
Surface Soils	<u>Current Land Use:</u>				
	On–Site Worker Landscaper Recreational Child	Incidental Ingestion, Inhalation of Fugitive Dust, Dermal Contact	alpha–Chlordane	0.66 mg/kg	Concentrations are the constituent concentrations detected in surface soil sample SS–04, the only "exposed" surface soil sample collected (i.e., samples SS–01, SS–02 and SS–03 were collected at the surface of the soil, but beneath one foot of gravel).
			gamma–Chlordane	0.64 mg/kg	
			4,4'–DDE	1.8 mg/kg	
			Benzo[a]anthracene	0.16 mg/kg	
			Chrysene	0.45 mg/kg	
			Phenanthrene	0.78 mg/kg	
			Arsenic	4.6 mg/kg	
			Barium	120 mg/kg	
			Chromium	15 mg/kg	
			Lead	60 mg/kg	
	<u>Current & Future Land Use:</u>				
	Landscaper (future) Utility Worker On–Site Worker (future) Construction Worker (future) Recreational Child (future)	Incidental Ingestion, Inhalation of Fugitive Dust, Dermal Contact	alpha–Chlordane	1.6 mg/kg *	Concentrations are the 95% UCL of measured concentrations in all surface soil samples collected for the site(SS–01, SS–02, SS–03, SS–04) *When the 95%UCL exceeded the maximum detected concentration, the maximum concentration was used as the exposure point concentration.
			gamma–Chlordane	1.6 mg/kg *	
			4,4'–DDE	1.8 mg/kg *	
			4,4'–DDT	1 mg/kg *	
			Dieldrin	0.094 mg/kg *	
			Heptachlor	0.3 mg/kg *	
			Malathion	0.42 mg/kg *	
			Methoxychlor	2.4 mg/kg *	
			Benzo[a]anthracene	0.16 mg/kg *	
			Chrysene	0.45 mg/kg *	
			Phenanthrene	0.78 mg/kg *	
			Arsenic	16 mg/kg *	
			Barium	130 mg/kg *	
			Chromium	15 mg/kg *	
			Lead	540 mg/kg *	

TABLE 6–9

ESTIMATED EXPOSURE POINT CONCENTRATIONS
Pesticide Storage Facility
Fort Riley, Kansas

Medium	Land Use/Populations	Exposure Pathway	Parameter	Exposure Concentration	Comments
	<u>Current & Future Land Use:</u>				
Subsurface Soils	Landscaper Utility Worker On–Site Worker Construction Worker (future)	Incidental Ingestion, Inhalation of Fugitive Dust, Dermal Contact	alpha–Chlordane	0.6 mg/kg	Concentrations are the 95% UCL of measured
			gamma–Chlordane	0.57 mg/kg	concentrations in all subsurface soil boring samples
			4,4'–DDD	0.085 mg/kg	collected for the site. The samples used follow:
			4,4'–DDE	0.33 mg/kg	SB1A ** SB8A SB15A
			4,4'–DDT	3.9 mg/kg	SB1B ** SB8B SB15B
			Dieldrin	0.057 mg/kg	SB2A SB9A SB16A
			Endrin aldehyde	0.014 mg/kg *	SB2B SB9B SB16B
			Heptachlor	0.043 mg/kg	SB3A SB10A SB17A
			Heptachlor epoxide	0.0054 mg/kg *	SB3B SB10B SB17B
			Methoxychlor	0.49 mg/kg	SB4A SB11A SB18A
			Anthracene	0.15 mg/kg	SB4B SB11B SB18B
			Benzo[a]anthracene	0.32 mg/kg	SB5A SB12A SB19A
			Benzo[a]pyrene	0.26 mg/kg	SB5B SB12B SB19B
			Benzo[b]fluoranthene	0.31 mg/kg	SB6A SB13A SB20A
			Benzo[k]fluoranthene	0.29 mg/kg	SB6B SB13B SB20B
			Chrysene	0.33 mg/kg	SB7A SB14A
			Dibenzofuran	0.065 mg/kg	SB7B SB14B
			Indeno[1,2,3–cd]pyrene	0.21 mg/kg	
			2–Methylnaphthalene	0.08 mg/kg	** Samples SB1A and SB1B were not included in the
			Phenanthrene	0.37 mg/kg	statistical analysis for metals; these are background
			Arsenic	6.4 mg/kg	samples for inorganics
			Cadmium	0.49 mg/kg	
			Chromium	9.7 mg/kg	*When the 95%UCL exceeded the maximum
			Lead	150 mg/kg	detected concentration, the maximum concentration
			Mercury	0.13 mg/kg	was used as the exposure point concentration.

TABLE 6–9

ESTIMATED EXPOSURE POINT CONCENTRATIONS
Pesticide Storage Facility
Fort Riley, Kansas

Medium	Land Use/Populations	Exposure Pathway	Parameter	Exposure Concentration	Comments
	Future Land Use:				
Ground Water	Off–Site Residents	Ingestion of Drinking Water, Dermal Contact	Aluminum	0.44 mg/L	Concentrations are the 95% UCL of measured concentrations in all ground water samples collected from the monitoring wells for the site (PSF92–02, PSF92–03, PSF92–04, and PSF92–05 [PSF92–01 is background, and is not included when generating UCL values])
			Arsenic	0.0040 mg/L	
			Barium	0.11 mg/L	
			Beryllium	0.0028 mg/L	
			Chromium	0.0070 mg/L	
			Manganese	0.057 mg/L	
			Vanadium	0.0097 mg/L	
			Inorganic Chloride	180 mg/L	*When the 95%UCL exceeded the maximum detected concentration, the maximum concentration was used as the exposure point concentration.
			Nitrate	170 mg/L *	
			Sulfate	230 mg/L	
			Bicarbonate, as $CaCO_3$	490 mg/L *	
			Thallium	0.0029 mg/L *	
	Current & Future Land Use:				
Surface Water	On–Site Worker Recreational Child	Dermal Contact	Aluminum	12 mg/L *	Concentrations are the 95% UCL of measured concentrations in all surface water samples collected from the site (SW–02, SW–03, SW–04, SW–06, and SW–07 [SW–01 is background, and is not included in generating UCL values])
			Arsenic	0.0044 mg/L *	
			Barium	0.29 mg/L *	
			Cadmium	0.0041 mg/L	
			Chromium	0.024 mg/L *	
			Copper	0.013 mg/L *	
			Lead	0.0042 mg/L *	
			Manganese	0.19 mg/L *	*When the 95%UCL exceeded the maximum detected concentration, the maximum concentration was used as the exposure point concentration.
			Vanadium	0.026 mg/L *	
			Inorganic Chloride	65 mg/L *	
			Sulfate	110 mg/L *	
			Bicarbonate, as $CaCO_3$	290 mg/L	

TABLE 6-9

ESTIMATED EXPOSURE POINT CONCENTRATIONS
Pesticide Storage Facility
Fort Riley, Kansas

Medium	Land Use/Populations	Exposure Pathway	Parameter	Exposure Concentration	Comments
	Current & Future Land Use:				
Sediments	On-Site Worker Recreational Child	Dermal Contact, Incidental Ingestion	alpha-Chlordane	0.032 mg/kg	Concentrations are the 95% UCL of measured concentrations in all sediment samples collected from the site.
			gamma-Chlordane	0.054 mg/kg	
			4,4'-DDD	0.059 mg/kg	
			4,4'-DDE	0.055 mg/kg	SD1A ** SD4A SD7A
			4,4'-DDT	0.096 mg/kg	SD1B ** SD4B SD7B
			Dieldrin	0.013 mg/kg	SD2A SD5A SB8A
			Benzo[a]anthracene	0.15 mg/kg	SD2B SD5B SB8B
			Chrysene	0.18 mg/kg	SD3A SD6A SB9A
			Phenanthrene	0.21 mg/kg	SD3B SD6B SB9B
			Arsenic	2.8 mg/kg	
			Barium	120 mg/kg	
			Cadmium	1.8 mg/kg	** Samples SD1A and SD1B were not included in the statistical analysis for metals; these are background samples for inorganics
			Chromium	17 mg/kg	
			Lead	150 mg/kg	
			Mercury	0.24 mg/kg	

TABLE 6-10

SUMMARY OF INTERVIEWS CONDUCTED AND MATERIALS COMPILED TO DETERMINE EXPOSURE SCENARIOS
Pesticide Storage Facility
Fort Riley, Kansas

Source	Description of work duties	Exposure Patterns	Work conducted within area of: PSF	DEH yard
Senior Pest Controller	Supervisor; Weed Control Officer for entomology contact with Army	Checks PSF once weekly (for 10 min) between April and November to check supplies; Checks PSF once monthly (or biweekly) for heating and ventilation. Verifies exposure below:	X	
Pesticide Worker	Pesticide applier for last 2 years Fort Riley employment from 1984 to present	Exposure patterns vary (seasonally and by worker) Maximum exposure is in fair weather (spring, summer, fall), when PSF is visited 1 to 3 times daily, with each visit lasting less than 15 minutes	X	
Supervisor, Supply Section	Responsible for storage of supplies in DEH area (works in Bldg. 352) – Responsibility includes warehouse and lumber yard	No day to day exposure; he is only in PSF/DEH yard area as needed Estimates exposure to be twice yearly for 1 to 1.5 hours each time		X
Materials Coordinator, Holding Area	Gathers materials for work; Orders and oversees: 1 – middle portion of PSF 2 – 2 other DEH buildings (Buildings 347 and 375) 3 – 1 other non-DEH bldg DEH employment from 1985 to present	Has no "routine" exposure patterns; Estimates exposure to be daily (250 days/yr), but only visits PSF area 15 to 25 times daily for up to 15 minutes each visit	X	
Chief of Maintenance	Supervises DEH yard maintenance activities	PSF biulding does not have adequate heating or utilities; PSF worker is on site 2 to 3 times weekly for 15 to 30 minutes; Mower mows grassy area outside the gate 1 to 2 times yearly, at 30 minutes each time; Drainage ditch cleaned twice in 20 years using a crew of 3 men, each working 8 hours Utility lines had one break in 20 years, requiring 3 men working 8 hours each to repair the break	X	X
Mobile Equipment Operator, General Foreman	Equipment maintenance DEH employment from 1973 to present	On PSF site 3 times a week during the spring and summer, for 15 minutes each trip	X	X
Paint Leader	Paints signs and places them around installation; Paint shop located in DEH yard in Building 336	90 percent of his time is spent outside the DEH yard putting up signs Another person works with him – this person paints signs 8 hours daily, 250 days per year Each painter has 2 GI's helping him; the GI's rotate through every 90 days		X
Buildings and Structures Chief	Supervises buildings and structures activities; Cabinet maker; Foreman	As a cabinet maker, 90–95 percent of his time was spent outside of the shop As foreman, 50 precent of his time was spent in the DEH yard (250 days per year)		X

TABLE 6-10

SUMMARY OF INTERVIEWS CONDUCTED AND MATERIALS COMPILED TO DETERMINE EXPOSURE SCENARIOS
Pesticide Storage Facility
Fort Riley, Kansas

Source	Description of work duties	Exposure Patterns	Work conducted within area of: PSF	DEH yard
Air Conditioning Worker Later, foreman	Worked on air conditioning units all over the installation DEH employment from 1956 to 1985	As a worker, exposure was not consistent; As foreman, was in the DEH yard shop building about 6 to 8 hours daily		X
Engineering Plans & Services Deputy DEH – 1 yr Contracting – 2 yr	Supervised carpenters, painters, welders DEH employment from 1962 to 1985; and 1988 to 1990	In DEH yard inside office 8 hours daily every work day Outside in DEH yard 2 hours weekly		X
Grounds Foreman Mower from 1969 to 1972 Tractor leader from 1972 to 1980	Makes mowing assignments (mowing is not performed by same individual each time) Mowing done to provide a line of site (security)	Mows outside of east fence at DEH no more than twice yearly; Maximum mowing time = 1 hour Mowing always done with a platform mounted on a tractor which cuts a 4 foot path	X	
Exterior Plumber (retired)	Repaired/ installed plumbing; Used DEH yard as storage area for "emergency supplies"	Exposure intermittent; at most, exposure was 0.5 hours weekly No plumbing work within the DEH yard		X
Heavy Equipment Operator	Used heavy equipment; Loaded gravel; Maintained ranges; Built roads; Removed snow and ice DEH employment from 1977 to 1990	Exposure intermittent; at most, exposure was 0.5 hours daily (250 days/year)		X
Pesticide Worker (retired)	***DENIES EVER WORKING AT PSF SITE**			
Chief, Mechanical Branch (retired)	***UNABLE TO REACH – PHONE/ADDRESS CHANGED *NEW PHONE NUMBER UNLISTED**			
Heat Shop Foreman (retired)	Supervised heat shop activities, workers, and supplies	**UNABLE TO REACH**		
Troop Construction	Responsible for construction of troop housing Stores supplies in PSF Bldg	Exposure extremely limited; Uses PSF for storage of large items or for items not used daily	X	
DEH Master Planner	No use planned for the PSF area other than its present use; Construction of a new PSF is planned for later this year (old PSF will be demolished)	NA	NA	NA

TABLE 6-10

SUMMARY OF INTERVIEWS CONDUCTED AND MATERIALS COMPILED TO DETERMINE EXPOSURE SCENARIOS
Pesticide Storage Facility
Fort Riley, Kansas

Source	Description of work duties	Exposure Patterns	Work conducted within area of: PSF	DEH yard
Real Property Division	No zoning changes are planned for the DEH yard area	NA	NA	NA
Engineering Plans and Services Job Order Contracting Branch [a]	Responsible for proper contract development; Ensures contracts are fulfilled according to terms DEH employment from 1974 present	Re: construction of new PSF: Entire project contract is for 120 days construction crew on the site for Construction crew will be on the site for only 90 days of this time Provided copy of planning worksheet	X	
Engineering Plans and Services Design Branch [a] Civil Engineer	Oversees the planning and execution of demolition projects DEH employment 1984 to present	Demolition of existing PSF should take approximately 10 working days, with a crew size of 6 to 8 workers	X	
Maintenance Division, Structures Branch, Exterior Utilities Section [a] Foreman	Manages exterior utility crews; Oversees the workload and duties of work crews DEH employment for 16 years Last 2.5 years as foreman	Re: utility work in PSF area : There are 2 utility lines on site (water and gas); work has been performed on both lines in the past year Estimate for line replacement: once every 20 to 30 years, with a crew of 4 men working 2 days Estimate for line repair: 1 to 2 leaks every 20 to 30 years, with a crew of 2 men working 4 hours	X	X
Maintenance Division, Structures Branch, Exterior Utilities Section [a] Exterior Plumber	Repairs plumbing lines DEH employment for last 9.5 years	Re: utility work in PSF area: Average life expectancy of utility line is 20 to 30 years (estimated) Estimate of line replacement – once every 20 to 30 years, with a crew of 2 to 3 men working 2 days Estimate for line repair: 1 to 2 leaks every 20 to 30 years, with a 4-hour repair time	X	
Directorate of Contracting (DOC) Contract Administration Division Contract Administrator [a]	Contract administrator for Range Mowing Contract	There are 3 types of mowing in contract: Type B: Mow once every 23 days at 3.5" (except parade field which is once every 14 days) Type C: Mow once every 23 days at 4.5" (most weapons ranges) Type D: Mow once every 30 days at 6" (demo range) Mowing rates may be adjusted, based on needs and according to rainfall	X	
EPA Region VII Project Manager (memorandum dated 11/6/92)	NA	The following exposure assumptions were suggested in the memo:		
		Groundwater – Use default residential scenario	NA	NA
		Warehouse scenario (future use) Receptor is outdoors for 8 hours daily for 250 days per year	NA	NA
		Mowing scenario – "reasonable to assume mowing [occurs] once weekly during the growing season"	NA	NA

a – Interview conducted and provided by Fort Riley DEH personnel – information needs provided by risk assessor
NA – Not applicable

TABLE 6-11a
CURRENT OCCUPATIONAL EXPOSURE: INCIDENTAL INGESTION OF SOILS
INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

INGESTION INTAKE (a) = $\frac{C * FI * IR * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in soil, mg/kg
FI	=	Fraction Ingested from source, unitless
IR	=	Ingestion Rate, mg/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Incidental Ingestion of Soil: DEH Yard Worker	Utility Worker	Landscaper
FI	78% [b]	100%	12.5% [d]
IR	50 [e]	480 [e]	480 [e]
EF	250 [b,d]	0.3 [c]	2 [c,d]
ED	25 [e]	25 [e]	25 [e]
CF	10^{-6}	10^{-6}	10^{-6}
BW	70 [e]	70 [e]	70 [e]
AT (Noncarcinogen)	9,125 [e]	9,125 [e]	9,125 [e]
AT (Carcinogen)	25,550 [e]	25,550 [e]	25,550 [e]

PATHWAY-SPECIFIC INTAKES:

Incidental Ingestion of Soil (current):

DEH Yard Worker (Noncarcinogens):	C (mg/kg) *	3.82E-07 day^{-1}
DEH Yard Worker (Carcinogens):	C (mg/kg) *	1.36E-07 day^{-1}
Utility Worker (Noncarcinogens):	C (mg/kg) *	5.64E-09 day^{-1}
Utility Worker (Carcinogens):	C (mg/kg) *	2.01E-09 day^{-1}
Landscaper (Noncarcinogens):	C (mg/kg) *	4.70E-09 day^{-1}
Landscaper (Carcinogens):	C (mg/kg) *	1.68E-09 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) DEH, 1993c
(c) DEH, 1992a
(d) DEH, 1993d
(e) USEPA, 1991

TABLE 6-11b
FUTURE OCCUPATIONAL EXPOSURE:
INCIDENTAL INGESTION OF SOILS
INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

INGESTION INTAKE (a) = $\frac{C * FI * IR * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in soil, mg/kg
FI	=	Fraction Ingested from source, unitless
IR	=	Ingestion Rate, mg/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Incidental Ingestion of Soil: DEH Yard Worker	Utility Worker	Landscaper	Construction Worker
FI	100%	100%	12.5% [g]	100%
IR	50 [d]	480 [d]	480 [d]	480 [d]
EF	250 [c, d]	1.12 [b]	8 [g, e]	120 [f]
ED	25 [c, d]	25 [d]	25 [d]	1
CF	10^{-6}	10^{-6}	10^{-6}	10^{-6}
BW	70 [d]	70 [d]	70 [d]	70 [d]
AT (Noncarcinogen)	9,125 [d]	9,125 [d]	9,125 [d]	365 [f]
AT (Carcinogen)	25,550 [d]	25,550 [d]	25,550 [d]	25,550 [d]

PATHWAY-SPECIFIC INTAKES:

Incidental Ingestion of Soil (future):

DEH Yard Worker (Noncarcinogens):	C (mg/kg) * 4.89E-07 day^{-1}
DEH Yard Worker (Carcinogens):	C (mg/kg) * 1.75E-07 day^{-1}
Utility Worker (Noncarcinogens):	C (mg/kg) * 2.10E-08 day^{-1}
Utility Worker (Carcinogens):	C (mg/kg) * 7.51E-09 day^{-1}
Landscaper (Noncarcinogens):	C (mg/kg) * 1.88E-08 day^{-1}
Landscaper (Carcinogens):	C (mg/kg) * 6.71E-09 day^{-1}
Construction (Noncarcinogens):	C (mg/kg) * 2.25E-06 day^{-1}
Construction (Carcinogens):	C (mg/kg) * 3.22E-08 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) DEH, 1993n; DEH, 1993o
(c) DEH, 1993e; DEH, 1993f
(d) USEPA, 1991
(e) Riley County Extension Service, 1992
(f) DEH, 1993l; DEH, 1993m
(g) DOC, 1993

TABLE 6-12
CURRENT & FUTURE "RECREATIONAL" EXPOSURE:
INCIDENTAL INGESTION OF SOILS
INGESTION INTAKE
Pesticide Storage Facility
Fort Riley, Kansas

INGESTION INTAKE (a) = $\frac{C * FI * IR * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in soil, mg/kg
FI	=	Fraction Ingested from source, unitless
IR	=	Ingestion Rate, mg/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Incidental Ingestion of Soil Recreational Child
FI	100%
IR	200 [b]
EF	7 [c]
ED	6 [b]
CF	10^{-6}
BW	15 [b]
AT (Noncarcinogen)	2,190 [b]
AT (Carcinogen)	NA

PATHWAY-SPECIFIC INTAKES:
Incidental Ingestion of Soil (current & future):

Recreational Child (Noncarcinogens): C (mg/kg) * 2.56E-07 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1991
(c) USEPA, 1989a; USEPA, 1993a

TABLE 6-13a
CURRENT OCCUPATIONAL EXPOSURE:
INHALATION OF FUGITIVE DUST
INHALATION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

INHALATION INTAKE (a) = $\frac{C * IR * ET * EF * ED * CF}{BW * AT}$

Where:
C = Concentration of constituent in soil, mg/kg
IR = Inhalation Rate, m^3/hr
ET = Exposure Time, hours/day
EF = Exposure Frequency, days/year
ED = Exposure Duration, years
CF = Conversion Factor from Cowherd Model[b], kg/m^3
BW = Body Weight, kg
AT = Averaging Time, days

Exposure Variable	Inhalation of Fugitive Dust		
	DEH Worker	Utility Worker	Landscaper
IR	2.5 [e]	2.5 [e]	2.5 [e]
ET	6.25 [c]	8 [d,f]	1 [g]
EF	250 [c,d]	0.3 [f]	2 [g]
ED	25 [d]	25 [d]	25 [d]
CF	3.06E-09	3.06E-09	3.06E-09
BW	70 [d]	70 [d]	70 [d]
AT (Noncarcinogen)	9,125 [d]	9,125 [d]	9,125 [d]
AT (Carcinogen)	25,550 [d]	25,550 [d]	25,550 [d]

PATHWAY-SPECIFIC INTAKES:

Inhalation of Fugitive Dust (current):

DEH Yard Worker (Noncarcinogens):	C (mg/kg)	*	4.68E-10 day^{-1}
DEH Yard Worker (Carcinogens):	C (mg/kg)	*	1.60E-10 day^{-1}
Utility Worker (Noncarcinogens):	C (mg/kg)	*	7.19E-13 day^{-1}
Utility Worker (Carcinogens):	C (mg/kg)	*	2.57E-13 day^{-1}
Landscaper (Noncarcinogens):	C (mg/kg)	*	5.99E-13 day^{-1}
Landscaper (Carcinogens):	C (mg/kg)	*	2.14E-13 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) Cowherd et al, 1985
(c) DEH, 1993c
(d) USEPA, 1991
(e) USEPA, 1989b
(f) DEH, 1992a
(g) DEH, 1993a

TABLE 6-13b
FUTURE OCCUPATIONAL EXPOSURE:
INHALATION OF FUGITIVE DUST
INHALATION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{INHALATION INTAKE (a)} = \frac{C * IR * ET * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in soil, mg/kg
IR	=	Inhalation Rate, m^3/hr
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor from Cowherd Model[b], kg/m^3
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Inhalation of Fugitive Dust: DEH Worker	Utility Worker	Landscaper	Construction Worker
IR	2.5 [e]	2.5 [e]	2.5 [e]	2.5[e]
ET	8 [c,d]	8 [c]	1 [g]	8[d]
EF	250 [d,g]	1.12 [c]	8 [c,f]	120[h]
ED	25 [d]	25 [d]	25 [d]	1
CF [b]	3.06E-09	3.06E-09	3.06E-09	3.06E-09
BW	70 [d]	70 [d]	70 [d]	70[d]
AT (Noncarcinogen)	9,125 [d]	9,125 [d]	9,125 [d]	365[h]
AT (Carcinogen)	25,550 [d]	25,550 [d]	25,550 [d]	25,550[d]

PATHWAY-SPECIFIC INTAKES:

Inhalation of Fugitive Dust (future):

DEH Yard Worker (Noncarcinogens):	C (mg/kg)	*	5.99E-10 day^{-1}
DEH Yard Worker (Carcinogens):	C (mg/kg)	*	2.14E-10 day^{-1}
Utility Worker (Noncarcinogens):	C (mg/kg)	*	2.68E-12 day^{-1}
Utility Worker (Carcinogens):	C (mg/kg)	*	9.71E-13 day^{-1}
Landscaper (Noncarcinogens):	C (mg/kg)	*	2.40E-12 day^{-1}
Landscaper (Carcinogens):	C (mg/kg)	*	8.55E-13 day^{-1}
Construction Worker (Noncarcinogens):	C (mg/kg)	*	2.87E-10 day^{-1}
Construction Worker (Carcinogens):	C (mg/kg)	*	4.11E-12 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) Cowherd et al, 1985
(c) DEH, 1993n; DEH, 1993o
(d) USEPA, 1991
(e) USEPA, 1989b
(f) Riley County Extension Service, 1992
(g) DOC, 1993
(h) DEH, 1993l; DEH, 1993m

TABLE 6-14
CURRENT & FUTURE RECREATIONAL EXPOSURE:
INHALATION OF FUGITIVE DUST
INHALATION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{INHALATION INTAKE (a)} = \frac{C * IR * ET * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in soil, mg/kg
IR	=	Inhalation Rate, m^3/hour
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor from Cowherd Model[b], kg/m^3
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Inhalation of Fugitive Dust Recreational Child
IR	0.83 [c,d]
EF	7 [d]
ET	2.6 [d,e]
ED	6 [c]
CF [b]	3.06E-09
BW	15 [c]
AT (Noncarcinogen)	2,190 [c]
AT (Carcinogen)	NA

PATHWAY-SPECIFIC INTAKES:
Inhalation of Fugitive Dust (current & future):

Recreational Child (Noncarcinogens): C (mg/kg) * 8.44E-12 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) Cowherd et al, 1985
(c) USEPA, 1991
(d) USEPA, 1989a
(e) USEPA, 1993a

TABLE 6-15a
CURRENT OCCUPATIONAL EXPOSURE:
DERMAL EXPOSURE TO SOILS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in soil, mg/kg
SA	=	Surface Area of exposed skin, cm^2/hour
AF	=	Soil to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Soil: DEH Yard Worker	Utility Worker	Landscaper
SA	3,600 [b]	3,600 [b]	3,600 [b]
AF	1 [e]	.1 [e]	1 [e]
ABS	100% [f]	100% [f]	100% [f]
ET	6.25 [c]	8 [g]	1 [c]
EF	250 [c,d]	0.3 [g]	2 [c]
ED	25 [d]	25 [d]	25 [d]
CF	10^{-6}	10^{-6}	10^{-6}
BW	70 [d]	70 [d]	70 [d]
AT (Noncarcinogen)	9,125 [d]	9,125 [d]	9,125 [d]
AT (Carcinogen)	25,550 [d]	25,550 [d]	25,550 [d]

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Soil (current):

DEH Yard Worker (Noncarcinogens):	C (mg/kg) *	2.20E-04 day^{-1}
DEH Yard Worker (Carcinogens):	C (mg/kg) *	7.86E-05 day^{-1}
Utility Worker (Noncarcinogens):	C (mg/kg) *	3.38E-07 day^{-1}
Utility Worker (Carcinogens):	C (mg/kg) *	1.21E-07 day^{-1}
Landscaper (Noncarcinogens):	C (mg/kg) *	2.82E-07 day^{-1}
Landscaper (Carcinogens):	C (mg/kg) *	1.01E-07 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (adult male's forearms, hands, head)
(c) DEH, 1993c
(d) USEPA, 1991
(e) USEPA, 1992
(f) USEPA, 1992e
(g) DEH, 1992a

TABLE 6-15b
FUTURE OCCUPATIONAL EXPOSURE:
DERMAL EXPOSURE TO SOILS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

DERMAL INTAKE (a) = $\frac{C * SA * AF * ABS * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in soil, mg/kg
SA	=	Surface Area of exposed skin, cm^2/hour
AF	=	Soil to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Soil: DEH Yard Worker	Utility Worker	Landscaper	Construction Worker
SA	3,600 [b]	3,600 [b]	3,600 [b]	3,600 [b]
AF	1 [c]	1 [c]	1 [c]	1 [c]
ABS	100% [f]	100% [f]	100% [f]	100% [f]
ET	8 [h,d]	8 [d]	1 [j]	8 [d]
EF	250 [h,d]	1.12 [e]	8 [j,g]	120 [i]
ED	25 [d]	25 [d]	25 [d]	1 [i]
CF	10^{-6}	10^{-6}	10^{-6}	10^{-6}
BW	70 [d]	70 [d]	70 [d]	70 [d]
AT (Noncarcinogen)	9,125 [d]	9,125 [d]	9,125 [d]	365 [i]
AT (Carcinogen)	25,550 [d]	25,550 [d]	25,550 [d]	25,550 [d]

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Soil (future):

DEH Yard Worker (Noncarcinogens):	C (mg/kg) *	2.82E-04 day^{-1}
DEH Yard Worker (Carcinogens):	C (mg/kg) *	1.01E-04 day^{-1}
Utility Worker (Noncarcinogens):	C (mg/kg) *	1.26E-06 day^{-1}
Utility Worker (Carcinogens):	C (mg/kg) *	4.51E-07 day^{-1}
Landscaper (Noncarcinogens):	C (mg/kg) *	1.13E-06 day^{-1}
Landscaper (Carcinogens):	C (mg/kg) *	4.03E-07 day^{-1}
Construction Worker (Noncarcinogens):	C (mg/kg) *	1.35E-04 day^{-1}
Construction Worker (Carcinogens):	C (mg/kg) *	1.93E-06 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (adult male's forearms, hands, head)
(c) USEPA, 1992
(d) USEPA, 1991
(e) DEH, 1993n; DEH, 1993o
(f) USEPA, 1992e
(g) Riley County Extension Service, 1992
(h) DEH, 1993f; DEH, 1993e
(i) DEH, 1993l; DEH, 1993m
(j) DOC, 1993

TABLE 6-16
CURRENT & FUTURE "RECREATIONAL" EXPOSURE:
DERMAL EXPOSURE TO SOILS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in soil, mg/kg
SA	=	Surface Area of exposed skin, cm^2/hour
AF	=	Soil to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Soil Recreational Child
SA	5,025 [b]
AF	1 [c]
ABS	100% [d]
ET	2.6 [e]
EF	7 [f,g]
ED	6 [f,g]
CF	10^{-6}
BW	15 [e]
AT (Noncarcinogen)	2,190 [e]
AT (Carcinogen)	NA

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Soil (current & future):

Recreational Child (Noncarcinogens): C (mg/kg) * 1.67E-05 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (child's head, hands, arms, legs)
(c) USEPA, 1992
(d) USEPA, 1992e
(e) USEPA, 1991
(f) USEPA, 1989a
(g) USEPA, 1993a

TABLE 6-17
FUTURE RESIDENTIAL EXPOSURE:
INGESTION OF GROUND WATER
INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

INGESTION INTAKE (a) $= \frac{C * IR * EF * ED}{BW * AT}$

Where:

C	=	Concentration of constituent in ground water, mg/L
IR	=	Ingestion Rate, L/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Ingestion of Ground Water: Adult	Ingestion of Ground Water: Child
IR	2 [b]	2 [b,c]
EF	350 [b]	350 [b]
ED	30 [b]	6 [b]
BW	70 [b]	15 [b]
AT (Noncarcinogen)	10,950 [b]	2,190 [b]
AT (Carcinogen)	25,550 [b]	NA

PATHWAY-SPECIFIC INTAKES:
Ingestion of Ground Water (future):

Residential Adult (Noncarcinogens):	C (mg/L) *	2.74E-02 day^{-1}
Residential Adult (Carcinogens):	C (mg/L) *	1.17E-02 day^{-1}
Residential Child (Noncarcinogens):	C (mg/L) *	1.28E-01 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1991
(c) USEPA, 1989b

TABLE 6-18
FUTURE RESIDENTIAL EXPOSURE:
DERMAL EXPOSURE TO GROUND WATER
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in ground water, mg/L
SA	=	Surface Area of exposed skin, cm^2
PC	=	Permeability Constant, cm/hour
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, $1L/10^3\ cm^3$
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Ground Water Adult	Child
SA	19,400 [b]	8,660 [b]
PC	***** 0.001 (metals) [e]	*****
ET	0.2 [c]	0.2 [c]
EF	350 [d]	350 [d]
ED	30 [d]	6 [d]
CF	10^{-3}	10^{-3}
BW	70 [d]	15 [d]
AT (Noncarcinogen)	10,950 [d]	2,190 [d]
AT (Carcinogen)	25,550 [d]	NA

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Ground Water (future):

Residential Adult (Noncarcinogens):	C (mg/L) * 5.32E-05 day^{-1}
Residential Adult (Carcinogens):	C (mg/L) * 2.28E-05 day^{-1}
Residential Child (Noncarcinogens):	C (mg/L) * 1.11E-04 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (total body surface area)
(c) USEPA, 1992
(d) USEPA, 1991
(e) The only constituents of concern in ground water are metals. Of these metals, only two (cadmium and chromium) have chemical specific PC values. Since both cadmium and chromium have the same PC value as the default value for metals (0.001 cm/hr), the default value is used for all constituents detected in ground water (source – default value USEPA, 1992)

TABLE 6-19a
CURRENT OCCUPATIONAL EXPOSURE:
DERMAL EXPOSURE TO SURFACE WATER
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in surface water, mg/L
SA	=	Surface Area of exposed skin, cm^2
PC	=	Permeability Constant, cm/hour
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, $1L/10^3\ cm^3$
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Surface Water
SA	6,170 [b]
PC	0.000004 (lead); 0.001 (other metals) [f]
ET	8 [e]
EF	0.3 [d]
ED	25 [e]
CF	10^{-3}
BW	70 [e]
AT (Noncarcinogen)	9,125 [e]
AT (Carcinogen)	25,550 [e]

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Surface Water (current):	lead intakes	other metals' intakes
Occupational Adult (Noncarcinogens):	C (mg/L) * 2.32E-09 day^{-1}	C (mg/L) * 5.80E-07 day^{-1}
Occupational Adult (Carcinogens):	C (mg/L) * 8.28E-10 day^{-1}	C (mg/L) * 2.07E-07 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (adult male's lower arms, lower legs, hands, and feet).
(c) USEPA, 1992
(d) DEH, 1992a
(e) USEPA, 1991
(f) Of the metals detected in site surface water, only cadmium, chromium, and lead have chemical specific PC values. Chromium and cadmium compounds have the same PC value as the default PC value for metals (0.001 cm/hr), while lead's PC value is 0.000004 cm/hr. For this reason, intakes are calculated separately for lead (source PC values: USEPA, 1992)

TABLE 6-19b
FUTURE OCCUPATIONAL EXPOSURE:
DERMAL EXPOSURE TO SURFACE WATER
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

DERMAL INTAKE (a) = $\frac{C * SA * PC * ET * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in surface water, mg/L
SA	=	Surface Area of exposed skin, cm^2
PC	=	Permeability Constant, cm/hour
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, $1L/10^3 cm^3$
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Surface Water
SA	6,170 [b]
PC	0.000004 (lead); 0.001 (other metals) [d]
ET	8 [c]
EF	2
ED	25 [c]
CF	10^{-3}
BW	70 [c]
AT (Noncarcinogen)	9,125 [c]
AT (Carcinogen)	25,550 [c]

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Surface Water (future):	lead intakes	other metals' intakes
Occupational Adult (Noncarcinogens):	C (mg/L) * 1.55E-08 day^{-1}	C (mg/L) * 3.86E-06 day^{-1}
Occupational Adult (Carcinogens):	C (mg/L) * 5.52E-09 day^{-1}	C (mg/L) * 1.38E-06 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (adult male's lower arms, lower legs, hands, and feet)
(c) USEPA, 1992
(d) Of the metals detected in site surface water, only cadmium, chromium, and lead have chemical specific PC values. Chromium and cadmium compounds have the same PC value as the default PC for metals (0.001cm/hr), while lead's PC value is 0.000004 cm/hr. Therefore, lead intakes are calculated separately (source PC values: USEPA, 1992)
(e) USEPA, 1991

TABLE 6-20
CURRENT & FUTURE "RECREATIONAL" EXPOSURE:
DERMAL EXPOSURE TO SURFACE WATER
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in surface water, mg/L
SA	=	Surface Area of exposed skin, cm^2
PC	=	Permeability Constant, cm/hour
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, $1L/10^3$ cm^3
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Surface Water Recreational Child
SA	4,490 [b]
PC	0.000004 (lead); 0.001 (other metals) [e]
ET	2.6 [c]
EF	7 [c]
ED	6 [d]
CF	10^{-3}
BW	15 [d]
AT (Noncarcinogen)	2,190 [d]
AT (Carcinogen)	NA

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Surface Water (current & future):

	lead intakes	other metals' intakes
Recreational Child (Noncarcinogens):	C (mg/L) * 5.97E-08 day^{-1}	C (mg/L) * 1.49E-05 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (child's arms,legs,hands, and feet)
(c) USEPA, 1992
(d) USEPA, 1991
(e) Of the metals detected in site surface water, only cadmium, chromium, and lead have chemical specific PC values. Chromium and cadmium compounds have the same PC value as the default PC value for metals (0.001 cm/hr), while lead's PC value is 0.000004 cm/hr. Therefore, lead intakes are calculated separately. (source – PC values: USEPA, 1992)

TABLE 6-21a
CURRENT OCCUPATIONAL EXPOSURE:
DERMAL EXPOSURE TO SEDIMENTS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

DERMAL INTAKE (a) = $\frac{C * SA * AF * ABS * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in sediment, mg/kg
SA	=	Surface Area of exposed skin, cm^2/hour
AF	=	Sediment to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Sediment
SA	1,980 [b]
AF	1 [c]
ABS	100% [e]
ET	8 [e]
EF	0.3 [f]
ED	25 [e]
CF	10^{-6}
BW	70 [e]
AT (Noncarcinogen)	9,125 [e]
AT (Carcinogen)	25,550 [e]

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Sediment (current):

Occupational Adult (Noncarcinogens): C (mg/kg) * 1.86E-07 day^{-1}

Occupational Adult (Carcinogens): C (mg/kg) * 6.64E-08 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (adult male's hands and forearms)
(c) USEPA, 1992
(d) USEPA, 1992e
(e) USEPA, 1991
(f) DEH, 1992a

TABLE 6-21b
FUTURE OCCUPATIONAL EXPOSURE:
DERMAL EXPOSURE TO SEDIMENTS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in sediment, mg/kg
SA	=	Surface Area of exposed skin, cm^2/hour
AF	=	Sediment to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Sediment
SA	1,980 [b]
AF	1 [c]
ABS	100% [d]
ET	8 [e]
EF	2
ED	25 [e]
CF	10^{-6}
BW	70 [e]
AT (Noncarcinogen)	9,125 [e]
AT (Carcinogen)	25,550 [e]

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Sediment (future):

Occupational Adult (Noncarcinogens):	C (mg/kg) *	1.24E-06 day^{-1}
Occupational Adult (Carcinogens):	C (mg/kg) *	4.43E-07 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (adult male's hands and forearms)
(c) USEPA, 1992
(d) USEPA, 1992e
(e) USEPA, 1991

TABLE 6-22
CURRENT & FUTURE "RECREATIONAL" EXPOSURE:
DERMAL EXPOSURE TO SEDIMENTS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in sediment, mg/kg
SA	=	Surface Area of exposed skin, cm^2
AF	=	Sediment to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, $kg/10^6$ mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Sediment Recreational Child
SA	4,490 [b]
AF	1 [c]
ABS	100% [d]
ET	2.6 [c]
EF	7 [c]
ED	6 [e]
CF	10^{-6}
BW	15 [e]
AT (Noncarcinogen)	2,190 [e]
AT (Carcinogen)	NA

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Sediment (current & future):
Recreational Child (Noncarcinogens): C (mg/kg) * 1.49E-05 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (child's arms, legs, hands, and feet)
(c) USEPA, 1992
(d) USEPA, 1992e
(e) USEPA, 1991

TABLE 6-23a
CURRENT OCCUPATIONAL EXPOSURE:
INCIDENTAL INGESTION OF SEDIMENTS
INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

DERMAL INTAKE (a) = $\frac{C * SA * AF * ABS * EF * ED * CF}{BW * AT}$

Where:	C	=	Concentration of constituent in sediment, mg/kg
	FI	=	Fraction Ingested from source, unitless
	IR	=	Ingestion Rate, mg/day
	EF	=	Exposure Frequency, days/year
	ED	=	Exposure Duration, years
	CF	=	Conversion Factor, kg/10^6 mg
	BW	=	Body Weight, kg
	AT	=	Averaging Time, days

Exposure Variable	Incidental Ingestion of Sediment
FI	100%
IR	480 [b,d]
EF	0.3 [c]
ED	25 [d]
CF	10^{-6}
BW	70 [d]
AT (Noncarcinogen)	9,125 [d]
AT (Carcinogen)	25,550 [d]

PATHWAY-SPECIFIC INTAKES:

Incidental Ingestion of Sediment (current):

Occupational Adult (Noncarcinogens): C (mg/kg) * 5.64E-09 day^{-1}

Occupational Adult (Carcinogens): C (mg/kg) * 2.01E-09 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b
(c) DEH, 1992a
(d) USEPA, 1991

TABLE 6-23b
FUTURE OCCUPATIONAL EXPOSURE:
INCIDENTAL INGESTION OF SEDIMENTS
INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{INGESTION INTAKE (a)} = \frac{C * FI * IR * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in sediment, mg/kg
FI	=	Fraction Ingested from source, unitless
IR	=	Ingestion Rate, mg/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Incidental Ingestion of Sediment
FI	100%
IR	480 [b,d]
EF	2
ED	25 [d]
CF	10^{-6}
BW	70 [d]
AT (Noncarcinogen)	9,125 [d]
AT (Carcinogen)	25,550 [d]

PATHWAY-SPECIFIC INTAKES:

Incidental Ingestion of Sediment (future):

Occupational Adult (Noncarcinogens):	C (mg/kg) * 3.76E-08 day^{-1}
Occupational Adult (Carcinogens):	C (mg/kg) * 1.34E-08 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b
(c) USEPA, 1992b
(d) USEPA, 1991

TABLE 6-24
CURRENT & FUTURE "RECREATIONAL" EXPOSURE:
INCIDENTAL INGESTION OF SEDIMENTS
INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

INGESTION INTAKE (a) = $\frac{C * FI * IR * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in sediment, mg/kg
FI	=	Fraction Ingested from source, unitless
IR	=	Ingestion Rate, mg/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Incidental Ingestion of Sediment Recreational Child
FI	100%
IR	200 [c]
EF	7 [b]
ED	6 [c]
CF	10^{-6}
BW	15 [c]
AT (Noncarcinogen)	2,190 [c]
AT (Carcinogen)	NA

PATHWAY-SPECIFIC INTAKES:

Incidental Ingestion of Sediment (current & future):
Recreational Child (Noncarcinogens): C (mg/kg) * 2.56E-07 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N).
(b) USEPA, 1992
(c) USEPA, 1991

TABLE 6-25

EVALUATION OF UNCERTAINTIES
Pesticide Storage Facility
Fort Riley, Kansas

Assumption	Potential Effect on Exposure: May Overestimate	Potential Effect on Exposure: May Underestimate
Environmental Sampling and Analysis:		
Exposure point concentration based on one round of sampling	X	X
Probability of insufficient samples taken to characterize the environmental media being evaluated especially with respect to currently available surface soil data	X	X
Systematic or random errors in chemical analysis may yield erroneous data	X	X
Proxy concentrations assigned as one-half the method detection limit	X	X
Use of surface soil sample SS-04 as proxy for identification of constituents and their concentrations in "exposed" surface soil	X	X
Fate and Transport of Constituents:		
Use of a box model to estimate concentrations of contaminants in fugitive dust	X	
No degradation or dispersion of contaminants assumed for estimating future exposure point concentrations	X	
Constituents detected in ground water at site will not impact existing potable water wells in vicinity		X
Exposure Pathways and Parameters:		
Future residential well development on Pesticide Storage Facility site	X	
Standard exposure parameters may not be representative of the actual exposed population	X	X
Future use of aquifer beneath PSF as drinking water source	X	
Use of lined channel and grassy areas adjacent to the site as recreational areas by children	X	
Modified occupational exposure scenarios are more conservative than actual exposure currently described at the site	X	
Intake by all pathways is assumed to be constant over the exposure duration	X	
Current and future workers exposed on a daily basis	X	

TABLE 6-26

REGULATORY AND GUIDANCE CRITERIA FOR GROUNDWATER
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Maximum Detected Concentration (mg/L)	Exposure Point Concentration [a] (mg/L)	Federal Maximum Contaminant Level [b] (mg/L)	Federal Maximum Contaminant Level Goal [b] (mg/L)	Kansas Maximum Contaminant Level [c] (mg/L)	Kansas Action Level [d] (mg/L)	Kansas Notification Level [d] (mg/L)	Alternate Kansas Action Level [d] (mg/L)	Alternate Kansas Notification Level [d] (mg/L)
Aluminum	0.30	0.44	0.05 - 0.2 S	--	--	5	--	0.75	0.087
Arsenic	0.016	0.004	0.05	0	0.05	0.05	--	--	--
Barium	0.13	0.105	2 e	2 e	1	1	--	--	--
Beryllium	0.005	0.003	0.004	0.004 *	--	0.00013	--	--	--
Chromium	0.014	0.007	0.1 e	0.1 e	0.05	0.05	--	--	--
Manganese	0.091	0.057	0.05 S	--	--	0.05	--	--	--
Nitrate	165 (36 as N)	165 (36 as N) f	10 (as N)	10 (as N)	10 (as N)	10 (as N)	--	--	--
Thallium	0.0029	0.0029	0.002	0.005	--	0.013	--	--	--
Vanadium	0.027	0.0097	--	--	--	--	--	--	--

P - Proposed MCL/MCLG S - Secondary MCL Boxed areas indicate exceedence of regulatory or guidance criteria

a - The 95% UCL (or maximum detected concentration if 95 % UCL > maximum concentration) of concentrations detected in ground water samples.
b - Maximum Contaminant Levels and Maximum Contaminant Level Goals (40 CFR 141 Subpart B)
c - Kansas Drinking Water Rules (KAR 28.15), last amended 1 May, 1988.
d - KDHE Memorandum, dated 5 December, 1988; Revised Groundwater Contaminant Cleanup Target Concentrations for Aluminum and Selenium.
e - National Public Drinking Water Rules for 38 Inorganic and Synthetic Organic Chemicals (January, 1991), Phase II Fact Sheet
f - 165 mg/L of nitrate is approximately equivalent to 36 mg/L nitrate as N (because the molecular weight of N[14] is approximately 22% of the molecular weight of nitrate [62]).
* Effective date 01-17-94 (final MCL)

TABLE 6-27

REGULATORY AND GUIDANCE CRITERIA FOR SURFACE WATER
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Maximum Concentration Detected (mg/L)	FEDERAL AMBIENT WATER QUALITY CRITERIA (mg/L)* For the Protection of Aquatic Life: Acute	Chronic	For the Protection of Human Health: (consumption of) Water & Fish	Fish only	KANSAS STATE WATER QUALITY STANDARDS** [c] For the Protection of Aquatic Life: (mg/L)
Aluminum	12	--	--	--	--	--
Arsenic, pentavalent	0.0044 [T]	0.85 [a]	0.048 [a]	0.0000022 [b]	0.0000175 [b]	--
Arsenic, trivalent	0.0044 [T]	0.36	0.19	0.0000022 [b]	0.0000175 [b]	--
Barium	0.29	--	--	1	--	--
Bicarbonate	290	--	--	--	--	--
Cadmium	0.0045	0.0039 [d]	0.0011 [d]	0.01	--	--
Chloride, inorganic	65	0.019	0.011	--	--	--
Chromium, hexavalent	0.024 [T]	0.016	0.011	0.05	--	--
Chromium, trivalent	0.024 [T]	1.7 [d]	0.21 [d]	170	3,433	--
Copper	0.013	0.018 [d]	0.012 [d]	--	--	--
Lead	0.0042	0.082 [d]	0.0032 [d]	0.05	--	--
Manganese	0.19	--	--	0.05	0.1	--
Sulfate	106	--	--	--	--	--
Vanadium	0.026	--	--	--	--	--

Boxed areas indicate exceedence of regulatory or guidance criteria
a – Insufficient data to develop criteria. Value presented is lowest observed effect level.
b – Human health criteria for carcinogens reported for three risk levels. Value presented in this table is the 10^{-6} risk level.
c – The State of Kansas has incorporated the Federal AWQC for the protection of aquatic life as the State Water Quality Standards by reference.
d – Hardness Dependent Criteria (100 mg/l used).
T – Valence of metal was not established; concentration listed in table is for total metal(s).

Sources: *Quality Criteria for Water – 1986. EPA 440/5-86.001, 1 May, 1987.
**Kansas Water Quality Standards (KAR 28.16.28), 1 May, 1987.

TABLE 6-28

COMPARISON OF CONSTITUENTS DETECTED IN SURFACE AND SUBSURFACE SOIL SAMPLES TO RCRA SOIL ACTION LEVELS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Exposure Point Concentration [a] (Surface Soils) (mg/kg)	Exposure Point Concentration [a] (Subsurface Soils) (mg/kg)	RCRA Soil Action Level [b] (mg/kg)
alpha-Chlordane	1.6	0.6	0.5 [T]
gamma-Chlordane	1.6	0.57	0.5 [T]
4,4'-DDD	-- [c]	0.085	3
4,4'-DDE	1.8	0.33	2
4,4'-DDT	1	3.9	2
Dieldrin	0.094	0.057	0.04
Endrin aldehyde	-- [c]	0.014	20 [g]
Heptachlor	0.3	0.043	0.2
Heptachlor epoxide	-- [c]	0.0054	0.08
Malathion	0.419	-- [c]	NA
Methoxychlor	2.4	0.49	NA
Anthracene	-- [c]	0.15	NA
Benzo[a]anthracene	0.16	0.32	NA
Benzo[a]pyrene	-- [c]	0.26	NA
Benzo[b]fluoranthene	-- [c]	0.31	NA
Benzo[k]fluoranthene	-- [c]	0.29	NA
Chrysene	0.45	0.33	NA
Dibenzofuran	-- [c]	0.065	NA
Indeno[1,2,3-cd]pyrene	-- [c]	0.21	NA
2-Methylnaphthalene	-- [c]	0.08	NA
Phenanthrene	0.78	0.37	NA
Arsenic	16	6.4	80
Barium	130	108 [d]	4,000
Cadmium	-- [c]	0.49	40
Chromium	15	9.7	400 [e]
Lead	540	149	500 - 1000 [f]
Mercury	--	0.13	200

Boxed areas indicate exceedence of guidance criteria

NA Not available

a The 95% UCL (or maximum detected concentration if the 95% UCL > maximum concentration) of concentrations detected in the site samples.

b RCRA Action Levels - Federal Register, Vol. 55, No. 145, 27 July, 1990. Pages 30798-30884. Corrective Action for Solid Waste Management Facilities, Proposed Rule.

c Not detected in this medium; therefore, not a chemical of concern in this medium.

d Not selected as a chemical of concern in this medium; constituent failed to pass the concentration toxicity screen (See Section 6.1.1)

e Value is for hexavalent chromium.

f Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites. Memorandum from H. Longest and B. Diamond to EPA Regions. OSWER Directive No. 9355.4-02.

g Value is for endrin

T Value is for total chlordane.

TABLE 6-29

TOXICITY VALUES FOR CHRONIC NONCARCINOGENIC EFFECTS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Chronic RfD [(a)] (mg/kg-day)	Confidence Level [(b)]	Critical Effect	Uncertainty Factor [(c)]	Source
Oral Route:					
Chlordane	6.0E-05	low	Regional liver hypertrophy in females	1000	IRIS
4,4'-DDD	no data				
4,4'-DDE	no data				
4,4'-DDT	5.0E-04	medium	Liver lesions	100	IRIS
Dieldrin	5.0E-05	medium	Liver lesions	100	IRIS
Endrin aldehyde	3.0E-04 [f]	medium	Mild histological lesions in liver, occasional convulsions	100	IRIS
Heptachlor	5.0E-04	low	Liver weight increases (male animals only)	300	IRIS
Heptachlor epoxide	1.3E-05	low	Increased liver-to-body weight ratio	1000	IRIS
Malathion	2.0E-02	medium	Red blood cell cholinesterase depression	10	IRIS
Methoxychlor	5.0E-03	low	Excessive loss of litters	1000	IRIS
Anthracene	3.0E-01	low	No observed effects	3000	IRIS
Benzo[a]anthracene	no data				IRIS
Benzo[a]pyrene	no data				IRIS
Benzo[b]fluoranthene	no data				IRIS
Benzo[k]fluoranthene	no data				IRIS
Chrysene	no data				IRIS
Dibenzofuran	no data				IRIS
Indeno[1,2,3-cd]pyrene	no data				IRIS
2-Methylnaphthalene [(e)]					
Phenanthrene	no data				IRIS
Aluminum [(e)]					IRIS
Arsenic	3.0E-04	medium	Hyperpigmentation, keratosis, vascular complications	3	IRIS
Barium	7.0E-02	medium	Increased blood pressure	3	IRIS
Beryllium	5.0E-03	low	No adverse effects	100	IRIS
Cadmium	1.0E-03 (food) 5.0E-04 (water)	high	Significant proteinuria	10	IRIS
Chromium [(d)]	5.0E-03	low	No effects reported	500	IRIS
Copper	no data				IRIS
Lead	no data				IRIS
Manganese	1.0E-01 (food) 5.0E-03 (water)		CNS effects	1	IRIS
Mercury	pending (3.0E-04)		Kidney effects	1000	HEAST
Nitrate	1.6E+00	high	Infantile methemoglobinemia	1	IRIS
Thallium	8.0E-05	low	Alopecia, lacrimation, and exophthalmos	3000	IRIS
Vanadium	pending (7.0E-03)		None observed	100	HEAST

TABLE 6-29

TOXICITY VALUES FOR CHRONIC NONCARCINOGENIC EFFECTS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Chronic RfD [a] (mg/kg-day)	Confidence Level [b]	Critical Effect	Uncertainty Factor [c]	Source
Inhalation Route:					
Chlordane	pending				IRIS
4,4'-DDD	no data				
4,4'-DDE	no data				
4,4'-DDT	no data				IRIS
Dieldrin	no data				IRIS
Endrin aldehyde	no data				
Heptachlor	no data				
Heptachlor epoxide	no data				
Malathion	pending				IRIS
Methoxychlor	no data				
Anthracene	no data				IRIS
Benzo[a]anthracene	no data				IRIS
Benzo[a]pyrene	no data				IRIS
Benzo[b]fluoranthene	no data				IRIS
Benzo[k]fluoranthene	no data				IRIS
Chrysene	no data				IRIS
Dibenzofuran	pending				IRIS
Indeno[1,2,3-cd]pyrene	no data				IRIS
2-Methylnaphthalene [e]					
Phenanthrene	no data				IRIS
Aluminum [e]					
Arsenic	no data				IRIS
Barium	pending (1.4E-04)		Fetotoxicity	1000	HEAST
Beryllium	no data				IRIS
Cadmium	pending				IRIS
Chromium [d]	pending				IRIS
Copper	no data				IRIS
Lead	no data				IRIS
Manganese	1.1E-04	medium	Increased prevalence of respiratory symptoms and psychomotor disturbances	300	IRIS
Mercury	8.6E-05				HEAST
Vanadium	no data				IRIS

TABLE 6-29

TOXICITY VALUES FOR CHRONIC NONCARCINOGENIC EFFECTS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Chronic RfD [(a)] (mg/kg-day)	Confidence Level [(b)]	Critical Effect	Uncertainty Factor [(c)]	Source

(Values in parentheses are from HEAST, and are used in the absence of a current IRIS value)
Withdrawn - Withdrawn (from IRIS) as a result of further review
Pending - Under review by an EPA work group

(a) Inhalation RfCs are converted to RfDs using the following equation:
$RfC\ (mg/m^3) * 20\ m^3/day * 1/70\ kg = RfD\ (mg/kg-day)$
(b) Confidence Level (i.e., high, medium, or low) as reported in IRIS
(c) Uncertainty Factors (UF) are assigned by USEPA in multiples of 10 based on the following limitations in the database used to develop the RfC/RfD:
A - Animal to human extrapolation (UF of 10)
H - Variations in human sensitivity (UF of 10)
S - Extrapolation from a subchronic NOAEL instead of a chronic NOAEL (UF of 10)
L - Extrapolation from a LOAEL to a NOAEL (UF of 10)
(d) Value is for hexavalent chromium
(e) IRIS or HEAST listing not available for this chemical
(f) Value is for endrin

Source: IRIS = Integrated Risk Information System (10/92)
HEAST = Health Effects Assessment Summary Tables (FY-1992 Annual)

TABLE 6-30

TOXICITY VALUES FOR POTENTIAL CARCINOGENIC EFFECTS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Slope Factor [a] (kg-day/mg)	Weight of Evidence Classification [d]	Type of Cancer	Source
Oral Route:				
Chlordane	1.3E+00	B2	Liver tumors	IRIS
4,4'-DDD	2.4E-01	B2	Lung, liver, and thyroid tumors in rodents	IRIS
4,4'-DDE	3.4E-01	B2	Liver tumors, liver cancer, and thyroid tumors	IRIS
4,4'-DDT	3.4E-01	B2	Liver tumors	IRIS
Dieldrin	1.6E+01	B2	Liver cancer	IRIS
Endrin aldehyde	no data	D		
Heptachlor	4.5E+00	B2	Liver tumors	IRIS
Heptachlor epoxide	9.1E+00	B2	Liver cancer	IRIS
Malathion	no data			
Methoxychlor	no data	D		IRIS
Anthracene	no data	D		IRIS
Benzo[a]anthracene	1.1E+00 *	B2	Tumors in mice via various routes	IRIS
Benzo[a]pyrene	7.3E+00	B2	Carcinogenic by various routes	IRIS
Benzo[b]fluoranthene	1.0E+00 *	B2	Tumors in mice via various routes	IRIS
Benzo[k]fluoranthene	4.8E-01 *	B2	Tumors in mice via various routes, bacterial mutagen	IRIS
Chrysene	2.9E-02 *	B2	Malignant lymphoma, skin cancers, in mice	IRIS
Dibenzofuran	no data	D		IRIS
Indeno[1,2,3-cd]pyrene	1.7E+00 *	B2	Tumors, positive bacterial gene mutations	IRIS
2-Methylnaphthalene [b]				
Phenanthrene	no data	D		IRIS
Aluminum [b]				
Arsenic	1.8E+00	A	Skin cancer	EPA
Barium	no data			IRIS
Beryllium	4.3E+00	B2	Lung cancer in rats/monkeys via inhalation	IRIS
Cadmium	no data	B2	Carcinogenic in mice by varoius routes	IRIS
Chromium [c]	no data			IRIS
Copper	no data	D		IRIS
Lead	no data	B2	Renal tumors, affects gene expression	IRIS
Manganese	no data	D		IRIS
Mercury	no data	D		IRIS
Nitrates	no data	D		IRIS
Thallium	no data	D		IRIS
Vanadium	no data			IRIS

TABLE 6-30

TOXICITY VALUES FOR POTENTIAL CARCINOGENIC EFFECTS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Slope Factor [a] (kg-day/mg)	Weight of Evidence Classification [d]	Type of Cancer	Source
Inhalation Route:				
Chlordane	1.3E+00	B2	Liver tumors	IRIS
4,4'-DDD	no data			IRIS
4,4'-DDE	no data			IRIS
4,4'-DDT	3.4E-01	B2	Liver tumors	IRIS
Dieldrin	1.6E+01	B2	Liver cancer	IRIS
Endrin aldehyde	no data			
Heptachlor	4.6E+00	B2	Liver tumors	IRIS
Heptachlor epoxide	9.1E+00	B2	Liver cancer	IRIS
Malathion	no data			
Methoxychlor	no data			IRIS
Anthracene	no data	D		IRIS
Benzo[a]anthracene	no data	B2	Tumors in mice via various routes	IRIS
Benzo[a]pyrene	no data	B2	Carcinogenic by various routes	IRIS
Benzo[b]fluoranthene	no data	B2	Tumors in mice via various routes	IRIS
Benzo[k]fluoranthene	no data	B2	Tumors in mice via various routes, bacterial mutagen	IRIS
Chrysene	no data	B2	Malignant lymphoma, skin cancers, in mice	IRIS
Dibenzofuran	no data	D		IRIS
Indeno[1,2,3-cd]pyrene	no data	B2	Tumors, positive bacterial gene mutations	IRIS
2-Methylnaphthalene [b]				
Phenanthrene	no data	D		IRIS
Aluminum [b]				
Arsenic	1.5E+01	A	Lung cancer	IRIS
Barium	no data			IRIS
Beryllium	8.4E+00	B2	Lung cancer in rats/monkeys (inh)	IRIS
Cadmium	6.1E+00	B2	Carcinogenic in mice by various routes	IRIS
Chromium [c]	4.1E+01	A	Lung cancer	IRIS
Copper	no data	D		IRIS
Lead	no data	B2	Renal tumors, affects gene expression	IRIS
Manganese	no data	D		IRIS
Mercury	no data	D		IRIS
Nitrates	no data	D		IRIS
Thallium	no data	D		IRIS
Vanadium	no data			IRIS

TABLE 6-30

TOXICITY VALUES FOR POTENTIAL CARCINOGENIC EFFECTS
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Parameter	Slope Factor [a] (kg-day/mg)	Weight of Evidence Classification [d]	Type of Cancer	Source

NOTES:

No Data - No value listed in reference
(Values listed in parentheses are from HEAST, and are used in the absence of current IRIS values)
* CSF generated using toxicity equivalency factors, based on benzo[a]pyrene toxicity (see text)
(a) Slope factors provided in terms of unit risk are converted prior to input on this table as follows:
for oral route: UNIT RISK (L/ug) * 1,000 ug/mg * day/2 L * 70 kg = CSF (kg-day/mg)
for inhalation route: UNIT RISK (m^3/ug) * 1,000 ug/mg * day/20 m^3 * 70 kg = CSF (kg-day/mg)
(b) IRIS or HEAST listing not available for this chemical
(c) Value is for hexavalent chromium
(d) Weight of Evidence Classification:
A - Human Carcinogen
B1 - Probable human carcinogen; limited human data available
B2 - Probable human carcinogen; inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as to human carcinogenicity

Source: IRIS = Integrated Risk Information System (11/91)
HEAST = Health Effects Assessment Summary Tables (FY-1992 Annual)
EPA = Memorandum to Assistant Administrators. Recommended Agency Policy on the Carcinogenicity Risk Associated with the Ingestion of Inorganic Arsenic. USEPA, Office of the Administrator, Washington, D.C. June 21, 1988.

TABLE 6-31

SUMMARY OF NONCARCINOGENIC RISKS, CURRENT AND FUTURE
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Receptors	Surface Soil Exposures			Subsurface Soil Exposures			Ground Water Exposures			Surface Water Exposures	Sediment Exposures		Totals for Each Receptor (a)
	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Dermal	Ingestion	Dermal	
Current Population:													
on-site worker	0.02	<0.01	9.2	NA	NA	NA	NA	NA	NA	<0.01	<0.01	<0.01	9.2
landscaper	<0.01	<0.01	0.01	<0.01	<0.01	0.02	NA	NA	NA	NA	NA	NA	0.03
utility worker	<0.01	<0.01	0.04	<0.01	<0.01	0.02	NA	NA	NA	NA	NA	NA	0.06
trespassing child	0.01	<0.01	0.66	0.01	<0.01	0.87	NA	NA	NA	<0.01	<0.01	0.25	1.1
Future Population:													
(off-site) residential adult	NA	NA	NA	NA	NA	NA	2.2	NA*	<0.01	NA	NA	NA	2.2
(off-site) residential child	NA	NA	NA	NA	NA	NA	10	NA*	0.01	NA	NA	NA	10
on-site worker	0.06	<0.01	33	NA	NA	NA	NA	NA	NA	<0.01	<0.01	0.02	33
landscaper	<0.01	<0.01	0.13	<0.01	<0.01	0.1	NA	NA	NA	NA	NA	NA	0.23
utility worker	<0.01	<0.01	0.15	<0.01	<0.01	0.07	NA	NA	NA	NA	NA	NA	0.22
construction worker	0.26	<0.01	16	0.12	<0.01	7.3	NA	NA	NA	NA	NA	NA	24
trespassing child	0.03	<0.01	1.9	0.01	<0.01	0.87	NA	NA	NA	<0.01	<0.01	0.25	2.2

-- Inhalation toxicity values are not available for the constituents of concern in this medium; therefore, the risk cannot be quantified.

NA – Not applicable; pathway not evaluated.

NA* – Pathway was considered, but there were no constituents of concern that could contribute a potential risk via this pathway.

(a) – The risk contributed from subsurface soil exposures to the on-site worker, the landscaper, or the trespassing child will only occur if subsurface soils are exposed during intrusive activities and the exposed soil generates fugitive dust. Therefore, the risk contributed from subsurface soil exposures are not summed with the risk for surface soils exposures to arrive at the total risk for these three receptors. Rather, the respective risks via each pathway were compared and the greater risk was included in the total risk for each receptor. Risks for receptors having "routine" contact with both surface and subsurface soils do sum the exposures for both media.

(b) – The potential risks due to off-site residential users of on-site ground water is evaluated for potable water use. Residential risks due to other media of concern at the site are evaluated and included in Appendix P for comparison purposes, and are not included as RME for the baseline risk assessment.

Boxed values indicate an exceedance of acceptable risk levels.

TABLE 6-31

SUMMARY OF NONCARCINOGENIC RISKS, CURRENT AND FUTURE
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Exposure assumptions used in calculating risk[b]:

occupational receptors	on-site worker (soil ingestion)	on-site worker (soil inhalation)	on-site worker (dermal-soil)	on-site worker (surface water dermal)	on-site worker (ingestion of sediments)	on-site worker (sediments - dermal)	utility worker (soil ingestion)	utility worker (soil inhalation)	utility worker (dermal-soil)
Fraction from source (%)	78[c] / 100[c,f]	--	--	--	100	--	100	--	--
Ingestion Rate of soil (mg/day)	50[f]	--	--	--	480[f]	--	480[f]	--	--
Inhalation Rate (m^3/hr)	--	2.5[j]	--	--	--	--	--	2.5[j]	--
Surface Area (cm^2)	--	--	3,600[j]	6,170[j]	--	1,980[j]	--	--	3,600[j]
Soil to Skin Adherence Factor (mg/cm^2)	--	--	1[k]	--	--	1[k]	--	--	1[k]
Exposure Frequency (days/year)	250[c]	250[c]	250[c]	0.3[d] / 2	0.3[d] / 2	0.3[d] / 2	0.3[d] / 1.12[h]	0.3[d] / 1.12[h]	0.3[d] / 1.12[h]
Exposure Time (hrs/day)	--	6.25[c] / 8[c]	6.25[c] / 8[c]	8[d,f]	8[d,f]	8[d,f]	--	8[d,h]	8[d,h]
Exposure Duration (years)	25[f]	25[f]	25[f]	25[f]	25[f]	25[f]	25[f]	25[f]	25[f]
Body Weight (kg)	70[f]	70[f]	70[f]	70[f]	70[f]	70[f]	70[f]	70[f]	70[f]
Averaging Time (days)	9,125[f]	9,125[f]	9,125[f]	9,125[f]	9,125[f]	9,125[f]	9,125[f]	9,125[f]	9,125[f]

	landscape worker (soil ingestion)	landscape worker (soil inhalation)	landscape worker (dermal-soil)	(future) construction worker (soil ingestion)	(future) construction worker (soil inhalation)	(future) construction worker (dermal-soil)
Fraction from source (%)	12.5[e]	--	--	100[f]	--	--
Ingestion Rate of soil (mg/day)	480[f]	--	--	480[f]	--	--
Inhalation Rate (m^3/hr)	--	2.5[j]	--	--	2.5[j]	--
Surface Area (cm^2)	--	--	3,600[j]	--	--	3,600[j]
Soil to Skin Adherence Factor (mg/cm^2)	--	--	1[k]	--	--	1[k]
Exposure Frequency (days/year)	2[d,e] / 8[g,i]	2[d,e] / 8[g,i]	2[d,e] / 8[g,i]	120[l]	120[l]	120[l]
Exposure Time (hrs/day)	--	1[e]	1[e]	--	8[l]	8[l]
Exposure Duration (years)	25[f]	25[f]	25[f]	1[l]	1[l]	1[l]
Body Weight (kg)	70[f]	70[f]	70[f]	70[f]	70[f]	70[f]
Averaging Time (days)	9,125[f]	9,125[f]	9,125[f]	365[l]	365[l]	365[l]

(b) – When two values are listed in a single cell, the first value represents current exposure, while the second value represents possible future exposure.
(c) – DEH, 1993c
(d) – DEH, 1992a
(e) – DEH, 1993d
(f) – USEPA, 1991
(g) – DOC, 1993
(h) – DEH, 1993n; DEH, 1993o
(i) – Riley County Extension Service, 1992
(j) – USEPA, 1989b
(k) – USEPA, 1992
(l) – DEH, 1993l; DEH, 1993m

TABLE 6-31

SUMMARY OF NONCARCINOGENIC RISKS, CURRENT AND FUTURE
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

residential receptors	(groundwater ingestion)	(groundwater dermal)	(soil ingestion)	(soil inhalation)	(dermal-soil)	(surface water dermal)	(ingestion of sediments)	(sediments - dermal)
Fraction from source (%)	100[m]	--	100	--	--	--	100	--
Ingestion Rate (mg/day or L/day) - Adult	2[m]	--	--	--	--	--	--	--
Ingestion Rate (mg/day or L/day) - Child	2[m,n]	--	200[m]	--	--	--	200[m]	--
Inhalation Rate (m^3/day)	--	--	--	0.83[m,p]	--	--	--	--
Surface Area (cm^2) - Adult	--	19,400[n]	--	--	--	--	--	--
Surface Area (cm^2) - Child	--	8,660[n]	--	--	5,025[n]	4,490[n]	--	4,490[n]
Soil to Skin Adherence Factor (mg/cm^2)	--	--	--	--	1[o]	--	--	--
Exposure Frequency (days/year) - Adult	350[m]	350[m]	--	--	--	--	--	--
Exposure Frequency (days/year) - Child	350[m]	350[m]	7[p,q]	7[p,q]	7[p,q]	7[o]	7[o]	7[o]
Exposure Time (hrs/day) - Adult	--	0.2[o]	--	--	--	--	--	--
Exposure Time (hrs/day) - Child	--	0.2[o]	--	2.6[p,q]	2.6[p,q]	2.6[o]	2.6[o]	2.6[o]
Exposure Duration (years) - Adult	30[m]	30[m]	--	--	--	--	--	--
Exposure Duration (years) - Child	6[m]	6[m]	6[m]	6[m]	6[m]	6[m]	6[m]	6[m]
Body Weight (kg) - Adult	70[m]	70[m]	--	--	--	--	--	--
Body Weight (kg) - Child	15[m]	15[m]	15[m]	15[m]	15[m]	15[m]	15[m]	15[m]
Averaging Time (days) - Adult	10,950[m]	10,950[m]	--	--	--	--	--	--
Averaging Time (days) - Child	2,190[m]	2,190[m]	2,190[m]	2,190[m]	2,190[m]	2,190[m]	2,190[m]	2,190[m]

(m) - USEPA, 1991
(n) - USEPA, 1989b
(o) - USEPA, 1992
(p) - USEPA, 1989a
(q) - USEPA, 1993a

TABLE 6-32

SUMMARY OF CARCINOGENIC RISKS, CURRENT AND FUTURE
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Receptors	Surface Soil Exposures			Subsurface Soil Exposures			Ground Water Exposures			Surface Water Exposures	Sediment Exposures		Totals for Each Receptor (a)
	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Dermal	Ingestion	Dermal	
Current Population:													
on-site worker	$1.4x10^{-6}$	$1.1x10^{-7}$	$8.3x10^{-4}$	NA	NA	NA	NA	NA	NA	$1.6x10^{-9}$	$1.1x10^{-8}$	$3.6x10^{-7}$	$8 x10^{-4}$
landscaper	$1.8x10^{-8}$	$1.5x10^{-10}$	$1.1x10^{-6}$	$3.1x10^{-8}$	$1.1x10^{-10}$	$1.9x10^{-6}$	NA	NA	NA	NA	NA	NA	$2x10^{-6}$
utility worker	$7.3x10^{-8}$	$2.2x10^{-10}$	$4.4x10^{-6}$	$3.7x10^{-8}$	$1.3x10^{-10}$	$2.3x10^{-6}$	NA	NA	NA	NA	NA	NA	$7x10^{-6}$
Future Population:													
(off-site) residential adult [b]	NA	NA	NA	NA	NA	NA	$2.2 x 10^{-4}$	NA*	$4.3 x 10^{-7}$	NA	NA	NA	$2 x 10^{-4}$
on-site worker	$6.3x10^{-6}$	$1.8x10^{-7}$	$3.7x10^{-3}$	NA	NA	NA	NA	NA	NA	$1.1x10^{-8}$	$7.5x10^{-8}$	$2.5x10^{-6}$	$4x10^{-3}$
landscaper	$2.4x10^{-7}$	$7.4x10^{-10}$	$1.2x10^{-5}$	$1.3x10^{-7}$	$4.3x10^{-10}$	$7.4x10^{-6}$	NA	NA	NA	NA	NA	NA	$1x10^{-5}$
utility worker	$2.7x10^{-7}$	$8.4x10^{-10}$	$1.6x10^{-5}$	$1.4x10^{-7}$	$4.9x10^{-10}$	$8.3x10^{-6}$	NA	NA	NA	NA	NA	NA	$2x10^{-5}$
construction worker	$1.2x10^{-6}$	$3.6x10^{-9}$	$7x10^{-5}$	$5.9x10^{-7}$	$2.1x10^{-9}$	$3.6x10^{-5}$	NA	NA	NA	NA	NA	NA	$1x10^{-4}$

-- Inhalation toxicity values are not available for the constituents of concern in this medium; therefore, the risk cannot be quantified.

NA - Not applicable; pathway not evaluated.

NA* - Pathway was considered, but there were no constituents of concern that could contribute a potential risk via this pathway.

(a) - The risk contributed from subsurface soil exposures to the on-site worker or the landscaper will only occur if subsurface soils are exposed during intrusive activities and the exposed soil generates fugitive dust. Therefore, the risk contributed from subsurface soil is not summed with the risk for surface soil exposures to arrive at the total risk for these two receptors. Rather, the respective risks via each pathway were compared, and the greater risk was included in the total risk for each receptor. Respective risks for receptors having contact with surface and subsurface soils (utility & construction workers) are summed to yield the total risk.

(b) - The potential risks due to off-site residential users of on-site ground water is evaluated for potable use. Residential risks due to other media of concern at the site are evaluated and included in Appendix P for comparison purposes, and are not included as RME in the baseline risk assessment.

Double boxed values indicate an exceedance of acceptable carcinogenic risk (cancer risk > $1 x10^{-4}$); single boxed values indicate carcinogenic risk within the acceptable risk range ($1 x 10^{-6}$ to $1 x 10^{-4}$).

TABLE 6-32

SUMMARY OF CARCINOGENIC RISKS, CURRENT AND FUTURE
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Exposure assumptions used in calculating risk [b]:

occupational receptors	on-site worker (soil ingestion)	on-site worker (soil inhalation)	on-site worker (dermal-soil)	on-site worker (surface water dermal)	on-site worker (ingestion of sediments)	on-site worker (sediments - dermal)	utility worker (soil ingestion)	utility worker (soil inhalation)	utility worker (dermal-soil)
Fraction from source (%)	78[c] / 100[c,f]	--	--	--	100	--	100	--	--
Ingestion Rate of soil (mg/day)	50[f]	--	--	--	480[f]	--	480[f]	--	--
Inhalation Rate (m^3/hr)	--	2.5[j]	--	--	--	--	--	2.5[j]	--
Surface Area (cm^2)	--	--	3,600[j]	6,170[j]	--	1,980[j]	--	--	3,600[j]
Soil to Skin Adherence Factor (mg/cm^2)	--	--	1[k]	--	--	1[k]	--	--	1[k]
Exposure Frequency (days/year)	250[c]	250[c]	250[c]	0.3[d] / 2	0.3[d] / 2	0.3[d] / 2	0.3[d] / 1.12[h]	0.3[d] / 1.12[h]	0.3[d] / 1.12[h]
Exposure Time (hrs/day)	--	6.25[c] / 8[c]	6.25[c] / 8[c]	8[d,f]	8[d,f]	8[d,f]	--	8[d,h]	8[d,h]
Exposure Duration (years)	25[f]	25[f]	25[f]	25[f]	25[f]	25[f]	25[f]	25[f]	25[f]
Body Weight (kg)	70[f]	70[f]	70[f]	70[f]	70[f]	70[f]	70[f]	70[f]	70[f]
Averaging Time (days)	25,550[f]	25,550[f]	25,550[f]	25,550[f]	25,550[f]	25,550[f]	25,550[f]	25,550[f]	25,550[f]

	landscape worker (soil ingestion)	landscape worker (soil inhalation)	landscape worker (dermal-soil)	future construction worker (soil ingestion)	future construction worker (soil inhalation)	future construction worker (dermal-soil)
Fraction from source (%)	12.5[e]	--	--	100[f]	--	--
Ingestion Rate of soil (mg/day)	480[f]	--	--	480[f]	--	--
Inhalation Rate (m^3/hr)	--	2.5[j]	--	--	2.5[j]	--
Surface Area (cm^2)	--	--	3,600[j]	--	--	3,600[j]
Soil to Skin Adherence Factor (mg/cm^2)	--	--	1[k]	--	--	1[k]
Exposure Frequency (days/year)	2[d,e] / 8[g,i]	2[d,e] / 8[g,i]	2[d,e] / 8[g,i]	120[f]	120[f]	120[f]
Exposure Time (hrs/day)	--	1[e]	1[e]	--	8[l]	8[l]
Exposure Duration (years)	25[f]	25[f]	25[f]	1[l]	1[l]	1[l]
Body Weight (kg)	70[f]	70[f]	70[f]	70[f]	70[f]	70[f]
Averaging Time (days)	25,550[f]	25,550[f]	25,550[f]	25,550[f]	25,550[f]	25,550[f]

(b) – When two values are listed in a single cell, the first value represents current site expsoure, while the second represent possible future exposure.
(c) – DEH, 1993c
(d) – DEH, 1992a
(e) – DEH, 1993d
(f) – USEPA, 1991
(g) – DOC, 1993
(h) – DEH, 1993n; DEH, 1993o
(i) – Riley County Extension Service, 1992
(j) – USEPA, 1989b
(k) – USEPA, 1992
(l) – DEH, 1993l; DEH, 1993m

TABLE 6-32

SUMMARY OF CARCINOGENIC RISKS, CURRENT AND FUTURE
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Exposure assumptions used in calculating risk [b]:

residential receptors	(groundwater ingestion)	(groundwater dermal)
Fraction from source (%)	100 [m]	--
Ingestion Rate (mg/day or L/day) - Adult	2 [m]	--
Inhalation Rate (m^3/day)	--	--
Surface Area (cm^2) - Adult	--	19,400 [n]
Soil to Skin Adherence Factor (mg/cm^2)	--	--
Exposure Frequency (days/year) - Adult	350 [m]	350 [m]
Exposure Time (hrs/day) - Adult	--	0.2 [o]
Exposure Duration (years) - Adult	30 [m]	30 [m]
Body Weight (kg) - Adult	70 [m]	70 [m]
Averaging Time (days) - Adult	25,550 [m]	25,550 [m]

(m) - USEPA, 1991
(n) - USEPA, 1989b
(o) - USEPA, 1992

TABLE 6-33

SUMMARY OF NONCARCINOGENIC RISKS DUE TO BACKGROUND, CURRENT AND FUTURE
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Receptors	Surface Soil Exposures			Subsurface Soil Exposures			Ground Water Exposures			Surface Water Exposures	Sediment Exposures		Totals for Each Receptor (a)
	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Dermal	Ingestion	Dermal	
Current Population:													
on-site worker	<0.01	<0.01	2.5	NA	NA	NA	NA	NA	NA	<0.01	<0.01	<0.01	2.5
landscaper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	<0.06
utility worker	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	<0.06
trespassing child	<0.01	<0.01	0.2	NA	NA	NA	NA	NA	NA	<0.01	<0.01	0.17	0.4
Future Population:													
(off-site) residential adult [b]	NA	NA	NA	NA	NA	NA	0.37	NA*	<0.01	NA	NA	NA	0.37
(off-site) residential child [b]	NA	NA	NA	NA	NA	NA	1.6	NA*	<0.01	NA	NA	NA	1.6
on-site worker	0.01	<0.01	3.2	NA	NA	NA	NA	NA	NA	<0.01	<0.01	0.02	3.2
landscaper	<0.01	<0.01	0.01	<0.01	<0.01	0.01	NA	NA	NA	NA	NA	NA	0.02
utility worker	<0.01	<0.01	0.01	<0.01	<0.01	0.01	NA	NA	NA	NA	NA	NA	0.02
construction worker	0.03	<0.01	1.5	0.02	<0.01	1.04	NA	NA	NA	NA	NA	NA	2.6
trespassing child	<0.01	<0.01	0.2	NA	NA	NA	NA	NA	NA	<0.01	<0.01	0.17	0.4

NA - Not applicable; pathway not evaluated.
NA* - Pathway was considered, but there were no constituents of concern that could contribute a potential risk via this pathway.
(a) - The risk contributed from subsurface soil exposures to the trespassing child, the landscaper, and the on-site worker will only occur if subsurface soils are exposed during intrusive activities and the exposed soil generates fugitive dust. Therefore, the risk contributed from subsurface soil is not summed with the risk for surface soil exposures to arrive at the total risk for these three receptors. Rather, the respective risks via each pathway were compared and the greater risk was included in the total risk for each receptor. Respective risks for receptors having contact with both surface and subsurface soils (utility & construction workers) are summed to yield the total risk.
(b) - The potential risks due to off-site residential users of on-site ground water are evaluated in the unlikely event of future potable water use. Residential risks due to other media of concenr at the site are evalauated and included in Appendix P for comparison purposes, and are not included as RME in the baseline risk assessment.

Boxed values indicate an exceedance of acceptable risk levels.

TABLE 6-33

SUMMARY OF NONCARCINOGENIC RISKS DUE TO BACKGROUND, CURRENT AND FUTURE
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Receptors	Surface Soil Exposures			Subsurface Soil Exposures			Ground Water Exposures			Surface Water Exposures	Sediment Exposures		Totals for Each Receptor (a)
	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Dermal	Ingestion	Dermal	
Current Population:													
on-site worker	5.9×10^{-7}	6.7×10^{-8}	3.3×10^{-4}	NA	NA	NA	NA	NA	NA	1.4×10^{-9}	8.0×10^{-9}	2.6×10^{-7}	3×10^{-4}
landscaper	7.3×10^{-9}	8.9×10^{-11}	4.4×10^{-7}	4.1×10^{-9}	7.6×10^{-11}	2.5×10^{-7}	NA	NA	NA	NA	NA	NA	4×10^{-7}
utility worker	8.7×10^{-9}	1.1×10^{-10}	5.2×10^{-7}	4.9×10^{-9}	9.2×10^{-11}	3×10^{-7}	NA	NA	NA	NA	NA	NA	8×10^{-7}
Future Population:													
(off-site) residential adult [b]	NA	NA	NA	NA	NA	NA	1.0×10^{-4}	NA*	2.0×10^{-7}	NA	NA	NA	1×10^{-4}
on-site worker	7.6×10^{-7}	9.0×10^{-8}	4.4×10^{-4}	NA	NA	NA	NA	NA	NA	9.9×10^{-9}	5.2×10^{-8}	1.7×10^{-6}	4×10^{-4}
landscaper	2.8×10^{-8}	3.6×10^{-10}	1.7×10^{-6}	1.6×10^{-8}	3.1×10^{-10}	1.0×10^{-6}	NA	NA	NA	NA	NA	NA	2×10^{-6}
utility worker	3.2×10^{-8}	4.1×10^{-10}	1.9×10^{-6}	1.8×10^{-8}	3.5×10^{-10}	1.1×10^{-6}	NA	NA	NA	NA	NA	NA	3×10^{-6}
construction worker	1.4×10^{-7}	1.7×10^{-9}	8.3×10^{-6}	8.1×10^{-8}	1.5×10^{-9}	4.9×10^{-6}	NA	NA	NA	NA	NA	NA	1×10^{-5}

NA – Not applicable; pathway not evaluated.
NA* – Pathway was considered, but there were no constituents of concern that could contribute a potential risk via this pathway.
(a) – The risk contributed from subsurface soil exposures to the trespassing child, the landscaper, and the on-site worker will only occur if subsurface soils are exposed during intrusive activities and the exposed soil generates fugitive dust. Therefore, the risk contributed from subsurface soil is not summed with the risk for surface soil exposures to arrive at the total risk for these three receptors. Rather, the respective risks via each pathway were compared and the greater risk was included in the total risk for each receptor. Respective risks for receptors having contact with both surface and subsurface soils (utility & construction workers) are summed to yield the total risk.
(b) – The potential risks due to off-site residential users of on-site ground water are evaluated in the unlikely event of future potable water use. Residential risks due to other media of concenr at the site are evalauated and included in Appendix P for comparison purposes, and are not included as RME in the baseline risk assessment.

Double boxed values indicate an exceedance of acceptable risk levels (cancer risk > 1×10^{-4}) ; single boxed values indicate carcinogenic risk within the acceptable risk range (1×10^{-6} to 1×10^{-4}).
Exposure parameters used in developing background risks are included in Tables 6-31 and 6-32

TABLE 6-34

ENDANGERED AND THREATENED SPECIES
(AND ASSOCIATED HABITATS) COMMON TO FORT RILEY AREA
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

SPECIES	HABITAT
Piping Plover	Open unvegetated beach or sandbar
Least Tern	Sparsely vegetated sandbars in a wide channel with good visibility
Bald Eagle	Near water bodies (rivers, lakes, etc.) utilizing riparian forest
Peregrine Falcon	Large river or waterfowl management areas, cropland, meadows and prairies, river bottoms, marshes, and lakes
Whooping Crane	Wetland, riverine base sandbars, shallow water, slow river flow
Eskimo Curlew	Wet meadows, fields, pastures, drier parts of salt and brackish marshes
Western Prairie Fringed Orchid	Tallgrass prairie and sedge meadow (fire adapted)
Prairie Mole Cricket*	Tallgrass prairie, ungrazed or unmowed native tallgrass with silt-sandy loam soils
Regal Fritillary Butterfly*	Prairie meadows (wet), moist tallgrass prairie, virgin grassland where violets act as host plants
Sturgeon Chub*	Areas of shallow strong currents and gravel bottoms, turbulent areas where shallow water flows across sandbars
Texas Horned Lizard*	Dry-flat areas with sandy, loamy, or rocky surfaces with little vegetation
Loggerhead Shrike*	Grassland or shrubby fields with scattered woody vegetation for perching and nesting
White-faced Ibis*	Small ponds with stands of cattail or bulrush
Western Snowy Plover*	Unvegetated riverine
Eastern Spotted Skunk*	Open level cultivated farmland, upland sites with preference for fallen logs and brushpiles
Topeka Shiner*	Turbulent areas in rivers where shallow water flows across sand bars
American Burying Beetle	Tallgrass prairie, ungrazed or unmowed native tallgrass with silt-sandy loam soils
Black Tern*	Wetland areas
Henslow's Sparrow*	Native grassland with few trees
Hairy False Mallow*	Rocky outcrops and dry areas in prairies

Source: Fort Riley, 1992
Underlined species are known to occur on Fort Riley.
* Candidate species for endangered and threatened status.

TABLE 6-35
NOAA CRITERIA FOR SEDIMENTS
PESTICIDE STORAGE FACILITY AREA
Fort Riley, Kansas

Chemical	Maximum Detected Concentration	ER-L Concentration	ER-M Concentration	Overall Apparent Effects Threshold	Degree of Confidence
PESTICIDES (ug/kg):					
Chlordane	67	0.5	6	2	Low / Low
DDD	100	2	20	NSD	Moderate / Low
DDE	280	2	15	NSD	Low / Low
DDT	480	1	7	6	Low / Low
Dieldrin	56	0.02	8	No	Low / Low
SEMI-VOLATILES (ug/kg):					
Benzo[a]anthracene	160	230	1600	550	Low/Moderate
Chrysene	240	400	2800	900	Moderate/Moderate
Phenanthrene	360	225	1380	260	Moderate/Moderate
METALS (mg/kg):					
Arsenic	3.8	33	85	50	Low/Moderate
Barium	150	NA	NA	NA	NA
Cadmium	3.3	5	9	5	High/High
Chromium	25	80	145	No	Moderate/Moderate
Lead	210	35	110	300	Moderate/High
Mercury	0.4	0.15	1.3	1	Moderate/High

NSD – Not sufficient data
NA – Not available
Boxed areas indicate exceedence of guidance value by the maximum detected concentration of the constituent.

Source: National Oceanic and Atmospheric Administration, Technical Memorandum, NOS OMA 52, 1990.

APPENDIX A

Aa - PESTICIDE MONITORING STUDY, NO.17-44-1356-88, PESTICIDE RESIDUE SAMPLING IN THE VICINITY OF THE PESTICIDE STORAGE SITE, FORT RILEY, KANSAS, MAY 1986

Ab - ENTOMOLOGICAL SPECIAL STUDY, NO. 44-015-75/76, MONITORING OF PESTICIDE CONTAMINATION, FORT RILEY, KANSAS, 23 NOVEMBER 1974 TO 12 AUGUST 1975

Ac - GROUNDWATER CHEMICAL ANALYSES - MULTIPLE COUNTY AREAS BORDERING THE KANSAS RIVER FROM JUNCTION CITY TO KANSAS CITY

Pesticide Storage Facility
Fort Riley, Kansas

APPENDIX Aa

PESTICIDE MONITORING STUDY, NO. 17-44-1356-88,
PESTICIDE RESIDUE SAMPLING IN THE VICINITY OF THE
PESTICIDE STORAGE SITE, FORT RILEY, KANSAS, MAY 1986

Pesticide Storage Facility
Fort Riley, Kansas

OATF PSF

DEPARTMENT OF THE ARMY
U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010-5422

REPLY TO ATTENTION OF

22 April 1988

HSHB-MR-PMO

MEMORANDUM FOR: Commander in Chief, USA Forces Command, ATTN: FCMD, Fort McPherson, GA 30330-6000

SUBJECT: Pesticide Monitoring Study No. 17-44-1356-88, Pesticide Residue Sampling in the Vicinity of a Pesticide Storage Site, Fort Riley, Kansas, May 1986

1. AUTHORITY. Letter, Installation Personnel Service Center, Fort Riley, 13 March 1986, subject: Request for Support for Analyzing Soil Samples from the Vicinity of a Pesticide Storage Site.

2. PURPOSE. This study was performed to fulfill a requirement for issuing a permit to Fort Riley under Part B of the Resource Conservation and Recovery Act (RCRA).

3. GENERAL.

a. This study was requested to satisfy a state regulatory requirement to demonstrate that soil in the vicinity of the pesticide storage facility is not contaminated with pesticides or, if it is, to develop an installation restoration plan for clean-up of pesticide contamination.

b. Technical instructions and sampling materials were provided to Mr. Charles Harris, Environmental Coordinator, DEH, Fort Riley by Dr. Joseph Vorgetts, Jr., Pest Management and Pesticide Monitoring Division, this Agency.

c. A total of six soil samples was collected. All sampling was conducted by Mr. Charles Harris, Environmental Coordinator, DEH during the period 1-12 May 1986.

d. Results of this study were transmitted telephonically to Mr. Charles Harris on 29 September 1986. This report was prepared to provide documentation for an installation review to identify and delineate sites for inclusion on the National Priorities List for Uncontrolled Hazardous Waste Sites discussed in telephone conversation of 7 April 1988 between Dr. Joseph Vorgetts, Jr. and Mr. Charles Harris.

Distribution limited to US Government agencies only; protection of privileged information evaluating another command; Apr 88. Requests for this document must be referred to Commander in Chief, USA Forces Command, ATTN: FCMD, Fort McPherson, GA 30330-6000

RECEIVED
19 MAY 1988
19 MAY

DESTRUCTION NOTICE-Destroy by any method that will prevent disclosure of contents or reconstruction of the document.

HSHB-MR-PMO
SUBJECT: Pesticide Monitoring Study No. 17-44-1356-88, Pesticide Residue Sampling in the Vicinity of a Pesticide Storage Site, Fort Riley, Kansas, May 1986

8. REFERENCE.

a. AR 40-5, 1 June 1985, Preventive Medicine.

b. Code of Federal Regulations, 40, Protection of Environment, Paragraph 261.33 (e) and (f).

FOR THE COMMANDER:

2 Encls

MARVIN A. LAWSON
LTC, MS
Chief, Pest Management and
Pesticide Monitoring Division

CF:
HQDA (DAEN-ZCF-B)
HQDA (DASG-PSP)
CINC, FORSCOM, ATTN: FCEN (2 cys)
Cdr, Ft Riley (2 cys)
✓Cdr, MEDDAC, Ft Riley, ATTN: PVNTMED Svc (2 cys)
Cdr, USAEHA Fld Spt Actv, FAMC

BUILDING 292 SOIL SAMPLES, 13 MAY 1986

1. Sample 1. Soil from dry puddle areas on right and left by drainage way from yard (beside fence)

2. Sample 2. Soil from drainage way beside and outside fence.

3. Sample 3. Soil from constructed drainage way above inflow from pesticide building.

4. Sample 4. Soil from the drainage terrace below the fence but above the constructed drainage way.

5. Sample 5. Soil from constructed drainage way below pesticide area inflow

6. Sample 6. Soil from constructed drainage way immediately above box culvert under railroad track.

C. Harris

HSHB-MR-PMO
SUBJECT: Pesticide Monitoring Study No. 17-44-1356-88, Pesticide Residue Sampling in the Vicinity of a Pesticide Storage Site, Fort Riley, Kansas, May 1986

(concentrations in [mg/kg])

TABLE 1. RESULTS FROM ENVIRONMENTAL (SOIL) SAMPLES 1-3 SUBMITTED FOR ANALYSIS

FIELD SAMPLE NO.	1	2	3
USAEHA NO.	6110	6111	6112
COMPOUND			
BHC (Alpha)	ND	ND	ND
BHC (Beta)	ND	ND	ND
BHC (Delta)	ND	ND	ND
o,p'-DDD	ND	ND	ND
p,p'-DDD	0.42	0.42	ND
o,p'-DDE	ND	ND	ND
p,p'-DDE	0.56	0.78	ND
o,p'-DDT	0.42	0.86	ND
p,p'-DDT	2.04	3.01	ND
aldrin	ND	ND	ND
dieldrin	0.23	0.04	ND
chlordane	ND	ND	ND
chlordane metab./ total constituents	4.35	3.30	ND
heptachlor	ND	ND	ND
heptachlor epoxide	ND	ND	ND
cis-chlordane	*	*	ND
trans-chlordane	*	*	ND
oxychlordane	ND	ND	ND
methoxychlor	0.69	0.26	ND
mirex	ND	ND	ND
toxaphene	ND	ND	ND
Aroclor 1242	ND	ND	ND
Aroclor 1248	ND	ND	ND
Aroclor 1254	ND	ND	ND
Aroclor 1260	ND	ND	ND
chlorpyrifos	ND	ND	ND
ronnel	ND	ND	ND
diazinon	ND	ND	ND
methyl parathion	ND	ND	ND
parathion	ND	ND	ND
malathion	ND	ND	ND
HCB	ND	ND	ND
TOTAL PESTICIDES	8.71	8.67	ND

ND: None Detected.
*Included in metabolites of chlordane/total constituents.

HSHB-MR-PMO
SUBJECT: Pesticide Monitoring Study No. 17-44-1356-88, Pesticide Residue Sampling in the Vicinity of a Pesticide Storage Site, Fort Riley, Kansas, May 1986

TABLE 1. Continuation. RESULTS FROM ENVIRONMENTAL (SOIL) SAMPLES 4-6 SUBMITTED FOR ANALYSIS

FIELD SAMPLE NO.	4	5	6
USAEHA NO.	6113	6114	6115
COMPOUND			
BHC (Alpha)	ND	ND	ND
BHC (Beta)	ND	ND	ND
BHC (Delta)	ND	ND	ND
lindane	ND	ND	ND
o,p'-DDD	ND	ND	ND
p,p'-DDD	0.20	ND	ND
o,p'-DDE	ND	ND	ND
p,p'-DDE	0.63	ND	0.03
o,p'-DDT	0.80	ND	ND
p,p'-DDT	5.96	ND	0.05
aldrin	ND	ND	ND
dieldrin	0.05	ND	0.06
endrin	ND	ND	ND
chlordane	ND	ND	ND
chlordane metab./ total constituents	2.15	ND	ND
heptachlor	ND	ND	ND
heptachlor epoxide	ND	ND	ND
cis-chlordane	*	ND	0.01**
trans-chlordane	*	ND	0.01**
oxychlordane	ND	ND	ND
methoxychlor	0.18	ND	ND
mirex	ND	ND	ND
toxaphene	ND	ND	ND
Aroclor 1242	ND	ND	ND
Aroclor 1248	ND	ND	ND
Aroclor 1254	ND	ND	ND
Aroclor 1260	ND	ND	ND
chlorpyrifos	ND	ND	ND
ronnel	ND	ND	ND
diazinon	ND	ND	ND
methyl parathion	ND	ND	ND
parathion	ND	ND	ND
malathion	ND	ND	ND
HCB	ND	ND	ND
TOTAL PESTICIDES	9.96	ND	0.16

ND: None Detected.
*Included in metabolites of chlordane/total constituents.
**Only individual isomers found.

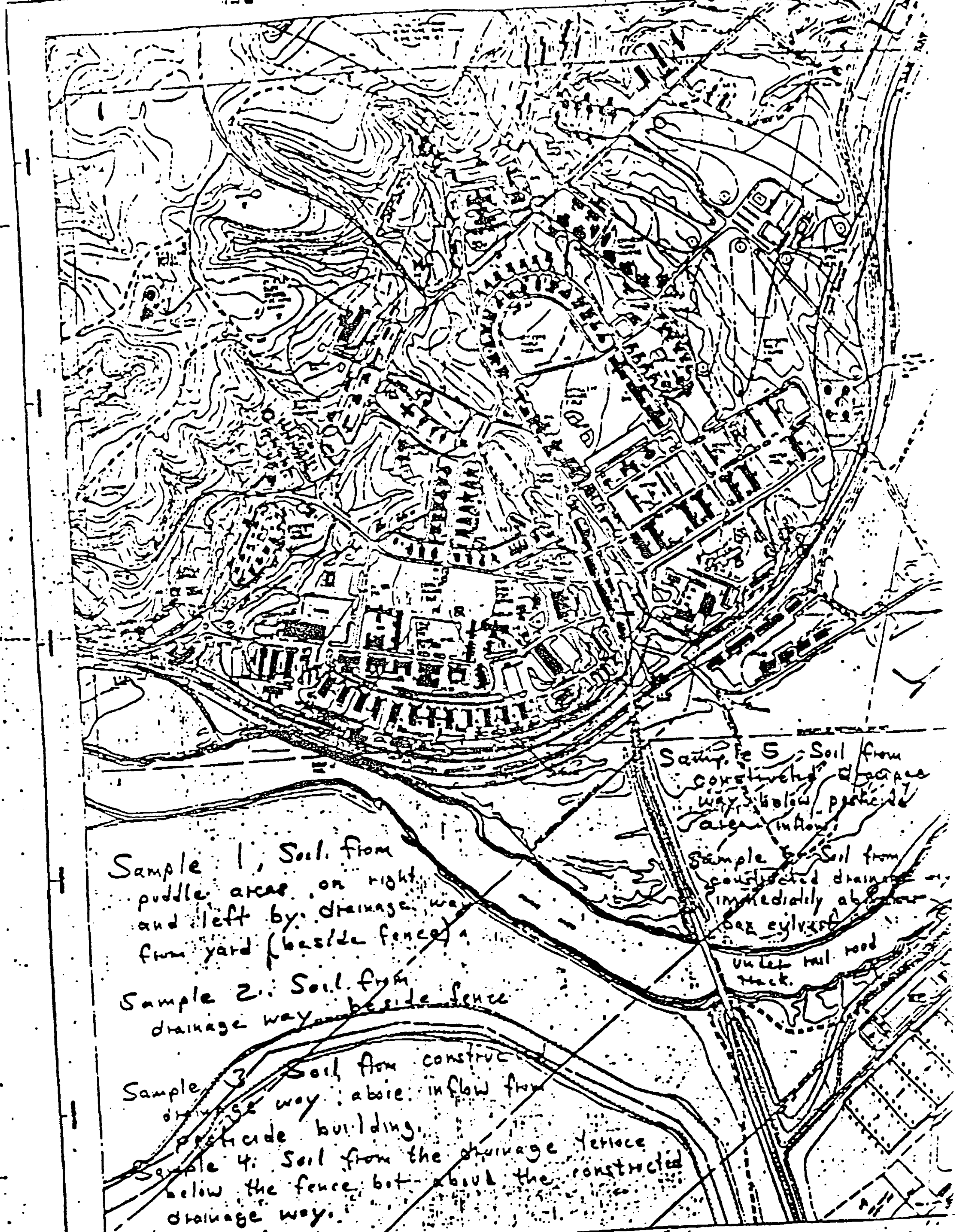
HSHB-MR-PMO
SUBJECT: Pesticide Monitoring Study No. 17-44-1356-88, Pesticide Residue Sampling in the Vicinity of a Pesticide Storage Site, Fort Riley, Kansas, May, 1986

TABLE 2. ANALYTICAL LIMITS OF DETECTION FOR PRIMARY PESTICIDES, PESTICIDE METABOLITES AND PCB IN SOIL

COMPOUND	DETECTION LIMIT*
BHC (alpha)	0.03
BHC (beta)	0.10
BHC (delta)	0.10
lindane	0.04
o,p'-DDD	0.20
p,p'-DDD	0.16
o,p'-DDE	0.20
p,p'-DDE	0.16
o,p'-DDT	0.20
p,p'-DDT	0.30
aldrin	0.08
dieldrin	0.02
endrin	0.04
chlordane	0.60
chlordane metab/ total constituents	0.60
heptachlor	0.03
heptachlor epoxide	0.08
cis-chlordane	0.08
trans-chlordane	0.08
oxychlordane	0.08
methoxychlor	0.80
mirex	0.20
toxaphene	8.00
HCB	0.03
Aroclor 1242/1248/1254/1260	2.00
chlorpyrifos	0.10
ronnel	0.10
diazinon	0.052
methyl parathion	0.030
parathion	0.020
malathion	0.010

*mg/kg

Encl



Sample 5 Soil from constructed drainage way below pesticide area inflow.
Sample 6 Soil from constructed drainage immediately above box culvert under rail road track.
Sample 1, Soil from puddle areas on right and left by drainage way from yard (beside fence).
Sample 2. Soil from drainage way beside fence
Sample 3 Soil from construc drainage way above inflow from pesticide building.
Sample 4. Soil from the drainage terrace below the fence but above the constructed drainage way.

4. FINDINGS AND DISCUSSION.

a. Pesticide residue concentrations detected in laboratory analyses of samples were summarized (Table 1). The analytical detection limits are listed in Table 2.

b. No pesticide was detected in two samples. A third sample contained only 0.16 milligrams per kilogram (mg/kg) of chlordane and /or chlordane constituents (metabolites). The remaining three samples contained residues of pesticides from the organochlorine group, including DDT and its metabolites, chlordane and its metabolites, methoxychlor and dieldrin. The pesticide concentration in each of these samples was between 8.71 and 9.96 mg/kg which was higher than the level (5.0 mg/kg) used as an indicator for a need for remedial clean-up action. However, evidence of a significant health and/or environmental hazard was insufficient because the highest pesticide concentrations found were only slightly higher than the action level and pesticide residues in the remaining three samples were negligible or not detectable.

5. CONCLUSION. Results indicated that a serious safety and/or health hazard probably was not present in the vicinity of the pesticide storage building when samples were collected, but this conclusion should not be regarded as final until more data about the extent of pesticide contamination in the area can be gathered.

6. RECOMMENDATIONS. The following recommendations are based on good preventive medicine practices:

a. Ensure that entry into the area sampled in the vicinity of the pesticide storage area is limited to personnel accessing stored pesticides.

b. Submit a request for services for a pesticide monitoring study to the supporting Medical Department Preventive Medicine Service during FY 88.

7. TECHNICAL ASSISTANCE. Technical advice and/or consultation may be obtained by telephone from your major Army command professional pest management personnel. Technical advice and/or consultation concerning the findings and recommendations of this report can be obtained by telephone from this Agency, AUTOVON 584-3015. Questions regarding the use and disposition of pesticides that are not related to this report may be addressed to the USAEHA "Pesticide Hotline" at AUTOVON 584-3773. Additional assistance should be requested in writing through appropriate channels to Commander, US Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD 21010-5422. Forward an information copy of the request to Commander, US Army Health Services Command, ATTN: HSCL-P, Fort Sam Houston, TX 78234-6000.

APPENDIX Ab

ENTOMOLOGICAL SPECIAL STUDY NO. 44-015-75/76
MONITORING OF PESTICIDE CONTAMINATION, FORT RILEY, KANSAS
23 NOVEMBER 1974 TO 21 AUGUST 1975

Pesticide Storage Facility
Fort Riley, Kansas

ENTOMOLOGICAL SPECIAL STUDY NO. 44-015-75/76
MONITORING OF PESTICIDE CONTAMINATION
FORT RILEY, KANSAS
23 NOVEMBER 1974 - 21 AUGUST 1975

US ARMY
ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MD 21010

449

DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010

HSE-RE/WP

24 OCT 1975

ENTOMOLOGICAL SPECIAL STUDY NO. 44-015-75/76
MONITORING OF PESTICIDE CONTAMINATION
FORT RILEY, KANSAS
23 NOVEMBER 1974 - 21 AUGUST 1975

ABSTRACT

The pesticide storage and formulating facility at Fort Riley, Kansas, was monitored to determine residue levels in the area and ascertain the possibility for their spread. The area behind this facility was found to be substantially contaminated with several pesticides. The presence of a water filled ditch below the contaminated area is a possible route for transport of pesticides into the Kansas River approximately 1 mile away. The detection of pesticides residues in the sediment taken from this ditch help substantiate this hypothesis. The contaminated section is essentially void of ground cover. It is recommended the area be grassed if possible or covered with a permanent surface to prevent continued transport of pesticides into the aquatic environment.

450

DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND MARYLAND 21010

HSE-RE/WP

ENTOMOLOGICAL SPECIAL STUDY NO. 44-015-75/76
MONITORING OF PESTICIDE CONTAMINATION
FORT RILEY, KANSAS
23 NOVEMBER 1974 - 21 AUGUST 1975

1. REFERENCES.

a. AR 40-5, Health and Environment, 25 September 1974.

b. USAEHA Entomological Special Study No. 44-004-74/75, Revised Department of the Army Pesticide Monitoring Program, 1 April 1975.

c. Letter, HSE-RE, this Agency, 14 November 1974, subject: USAEHA Special Study No. 44-015-75, Monitoring of Pesticide Contamination at Fort Riley.

2. PURPOSE. To survey the pesticide formulation, storage, and shop area at Fort Riley, KS in order to confirm the presence of excessive levels of pesticide, delineate its distribution and ascertain the possibility of its translocation via wind and water to sensitive areas of the environment.

3. BACKGROUND. Analysis of routine soil samples received from Fort Riley, KS, for the Department of the Army Pesticide Monitoring Program, showed very high levels of several pesticides to be present in the area of the pesticide formulation and storage facility. These pesticides included chlordane, methoxychlor, diazinon, malathion and DDT and its metabolites.

4. FINDINGS.

a. Description of the Sampled Area. The area under study consisted of the pesticide formulation and storage area and its immediate vicinity (i.e. within 100 meters). Samples collected in this area are listed in Appendix A. The rear of the pesticide formulation and storage facility (Building 292) is a fenced area approximately 75 x 150 feet (see Appendices B and C). It is bare ground and slopes away from the formulation and storage area. Approximately 75 feet from the storage area, beyond the chain-link fence, there is an area of trees and brush. A concrete-lined ditch, containing several inches of flowing water, is located approximately 10-15 feet beyond the fence in the wooded area. This ditch leads to an unlined ditch a short distance away and this unlined ditch leads to the Kansas River approximately 1 mile away. The unlined ditch was dry approximately 80 percent of the way to the Kansas River. Samples of water and sediment were taken at two points along the unlined ditch.

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

451

b. Summary of Pesticide Analyses.

(1) Appendix D is a summary of results from the samples that prompted the visit to Fort Riley. Sample No. 760 in particular was the cause for concern. Appendix A contains results from samples taken during the survey. Appendix E is a comparison of mean pesticide levels found in soil and sediment from other installations in the midwest with those found in soil and sediment from the survey at Fort Riley. Appendix F is a list of the pesticides analyzed for and their lower limits of detection in soil, sediment and water.

(2) The concentrations of pesticides in samples SP-224 and SP-225, taken in the immediate vicinity of the pesticide formulating and storage area, ranged from 0.41 ppm diazinon to 544.6 ppm chlordane. Soil samples taken in the wooded area, beyond the chain-link fence, contained much lower levels of pesticide. The highest concentration found in these samples was 8.6 ppm chlordane. Levels of pesticide detected in sediment were quite low when compared with levels found in soil from adjacent areas. All previous sediment samples from Fort Riley have contained no detectable quantities of pesticide (see Appendix D). When compared with levels of pesticide found in sediment from other installations in 1974, the Fort Riley survey sediment contained considerably higher levels of several pesticides (see Appendix E). The two water samples analyzed contained no detectable quantities of pesticide.

c. Cause of Pesticide Contamination. Contamination of the area behind the pesticide formulation and storage facility may have originated from one of two possible sources:

(1) Deliberate application for the control of pest species.

(2) Inadvertent, but careless, spills when formulating pesticide solutions for subsequent use.

Alternative one seems quite unlikely when the data are examined carefully. It is unlikely that such a wide range of pesticides, at these excessive levels, would be used to control insect pests in such a limited area. Alternative two seems the most probable cause of contamination in this area.

5. DISCUSSION AND CONCLUSIONS. The contamination of surface waters by pesticides or pesticide metabolites originating from the contaminated area behind the pesticide storage facility is probable. This statement can be substantiated by examining levels of pesticide found in sediments near the pesticide formulating and storage area or that are directly linked to this area by a continuous ditch. Water samples taken during the survey at Fort Riley contained no detectable quantities of pesticide. However, if water samples were taken in the vicinity of the pesticide storage area following a

heavy rain where substantial run-off from the contaminated area occurred, these samples would probably contain detectable quantities of pesticide. Also note that all previous sediment samples taken at Fort Riley contained no detectable quantities of pesticide.

6. RECOMMENDATIONS.

a. The heavily contaminated area should be managed so as to minimize continuing transport of pesticides into the sensitive aquatic environment.

(1) The environmentally most sound method would be the incorporation of organic matter (manure) into this soil followed by the establishment of a continuously maintained grass cover.

(2) A less desirable procedure, that may be required for certain uses of part or all of the area, is an impermeable surface area such as asphalt or cement. Only minimum areas, consistent with storage, should be hard surfaced, the balance being converted to grass areas.

b. Pesticide handling and storage practices should be reviewed and revised to minimize inadvertent "spills" associated with transfer and mixing operations.

JACK M. HELLER, Ph.D.
Entomologist
Pest Management and Pesticide
Monitoring Division

APPROVED:

LINNAEUS B. SAVAGE
MAJ, MSC
Chief, Pest Management and Pesticide
Monitoring Division

WILLIAM G. PEARSON
COL, MSC
Director, Radiation and
Environmental Sciences

APPENDIX A

RESULTS OF SAMPLES COLLECTED

USAEHA Sample No.	Substrate	Date of Collection	Place of Collection	Pesticides Found and Quantity (ppm)*										
				Dursban	Diazinon	Malathion	Chlordane	Methoxychlor	Dieldrin	p,p'-DDT	o,p'-DDT	p,p'-DDE	p,p'-DDD	o,p'-DDD
SP-224	Soil	23 Nov 74	75' from rear of formulating and storage area	0.67	0.41	0.29	544.6	110.5	9.2	159.5	50.0	12.5	—	--
SP-225	Soil	do	Bulk storage area in rear of formulating area	—	—	0.58	12.8	370.0	0.51	30.0	8.8	2.0		
SP-226	Water	do	Unlined ditch in rear of formulating area	--	--	--	--	--	--	--	--	—	—	--
SP-227†	Sediment	do	Unlined ditch in rear of formulating area	—	--	--	0.28	0.36	—	0.10	0.02	0.015	0.03	--
SP-228	Soil	do	Outside fence in rear of formulating area	—	—	0.50	8.6	1.5	0.15	4.5	0.76	0.26	--	--
SP-229	Soil	do	Outside fence in rear of formulating area across concrete lined ditch	--	—	--	—	--	--	--	—	—	--	—
SP-230†	Sediment	do	Unlined ditch where it flows into Kansas River	—	--	--	0.18	0.98	—	0.13	0.04	0.02	0.05	0.01
SP-231	Water	do	Unlined ditch where it flows into Kansas River	—	—	—	--	—	—	—	—	—	—	—

* All samples were also analyzed for 2,4-D, 2,4,5-T and silvex. Sample No. SP-225 contained 1.72 ppm 2,4,5-T, 0.19 ppm silvex, and 0.14 ppm 2,4-D. All other samples contained less than 0.1 ppm of these compounds.

† Data are the mean of four replicates for sample Nos. SP-227 and SP-230.

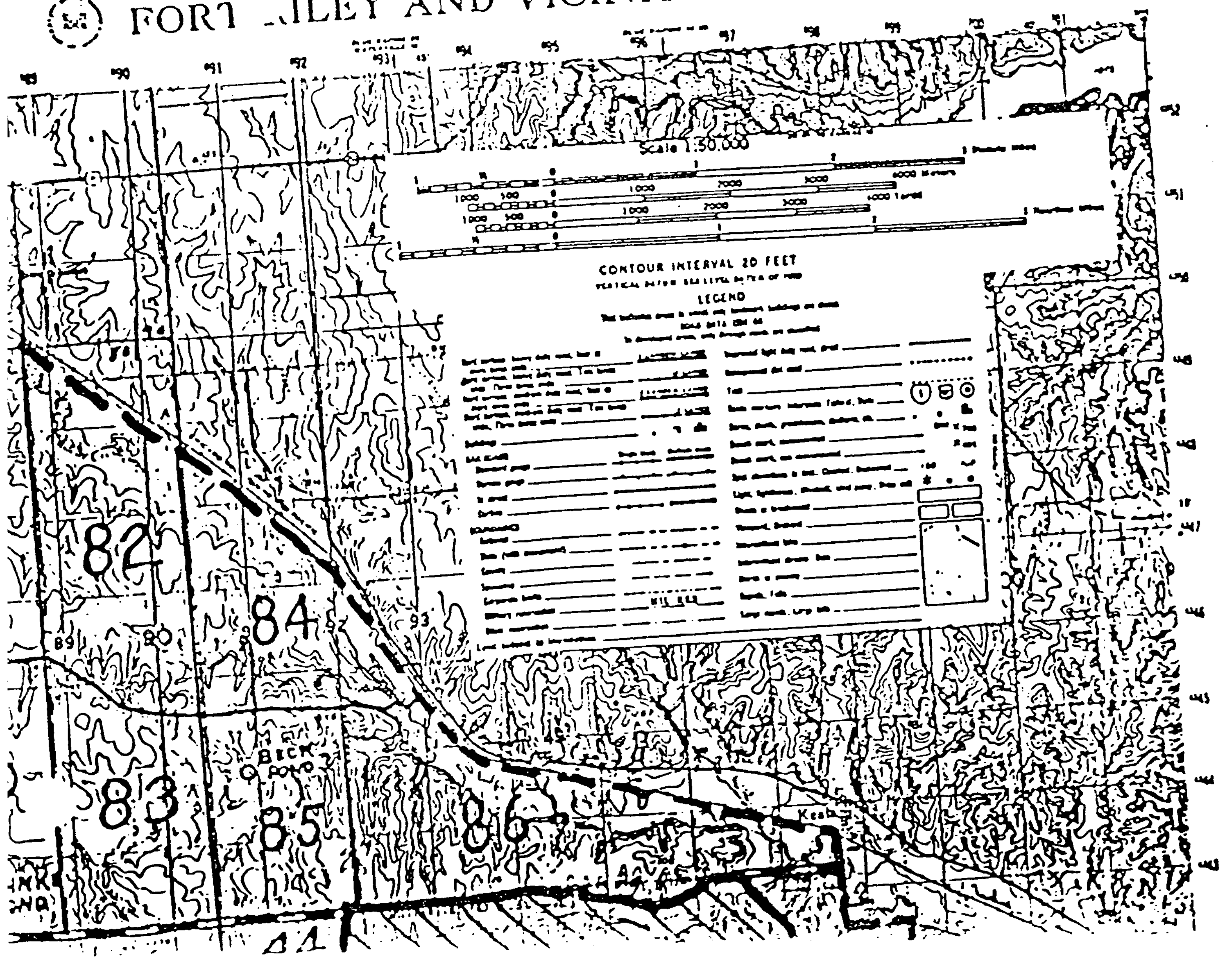
— = not detected

Ento Sp Study No. 44-015-75/76, 23 Nov 74 - 21 Aug 75

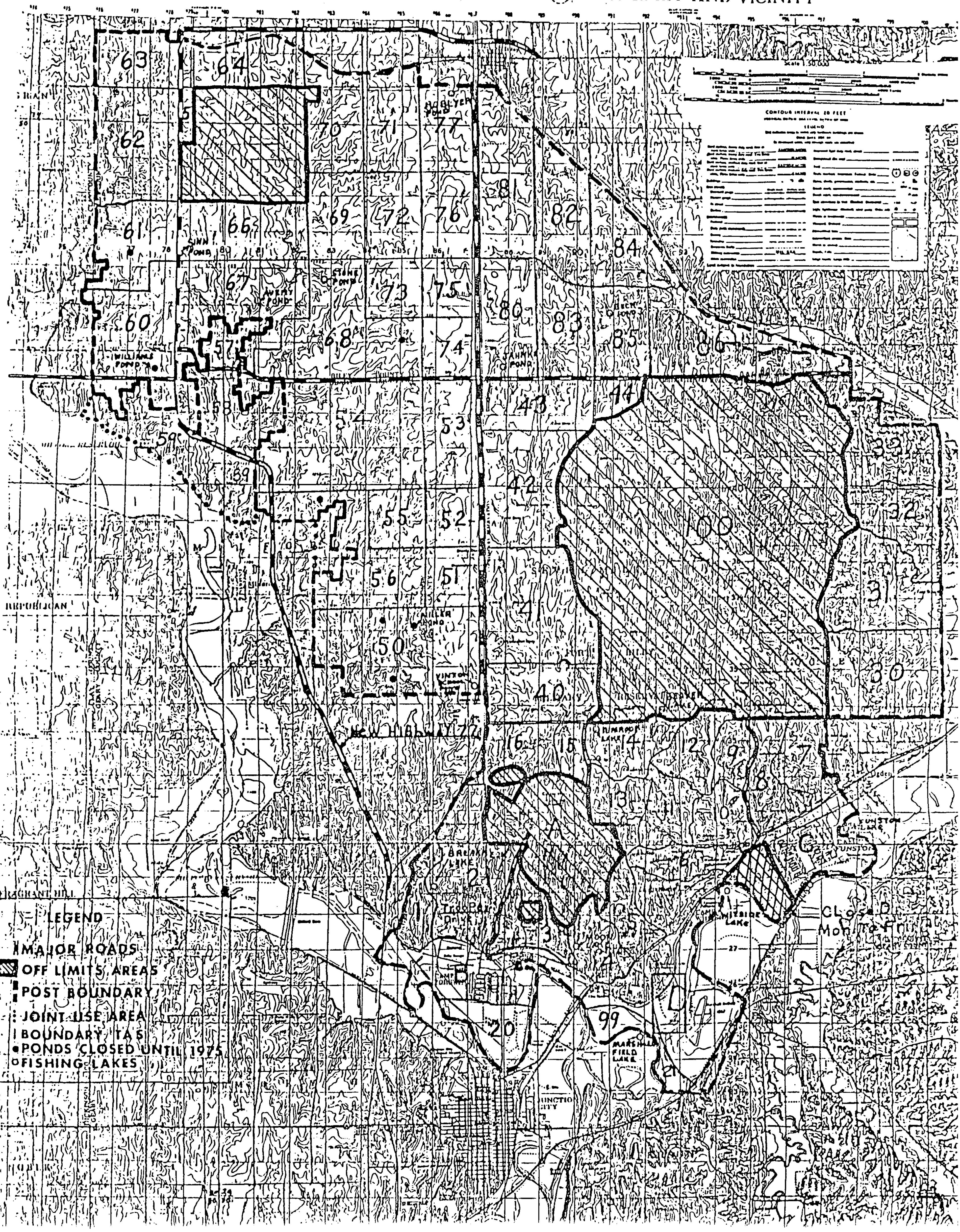
APPENDIX B

Map Showing Relationship of Sampled Area
To Overall Layout of Fort Riley, KS

FORT RILEY AND VICINITY



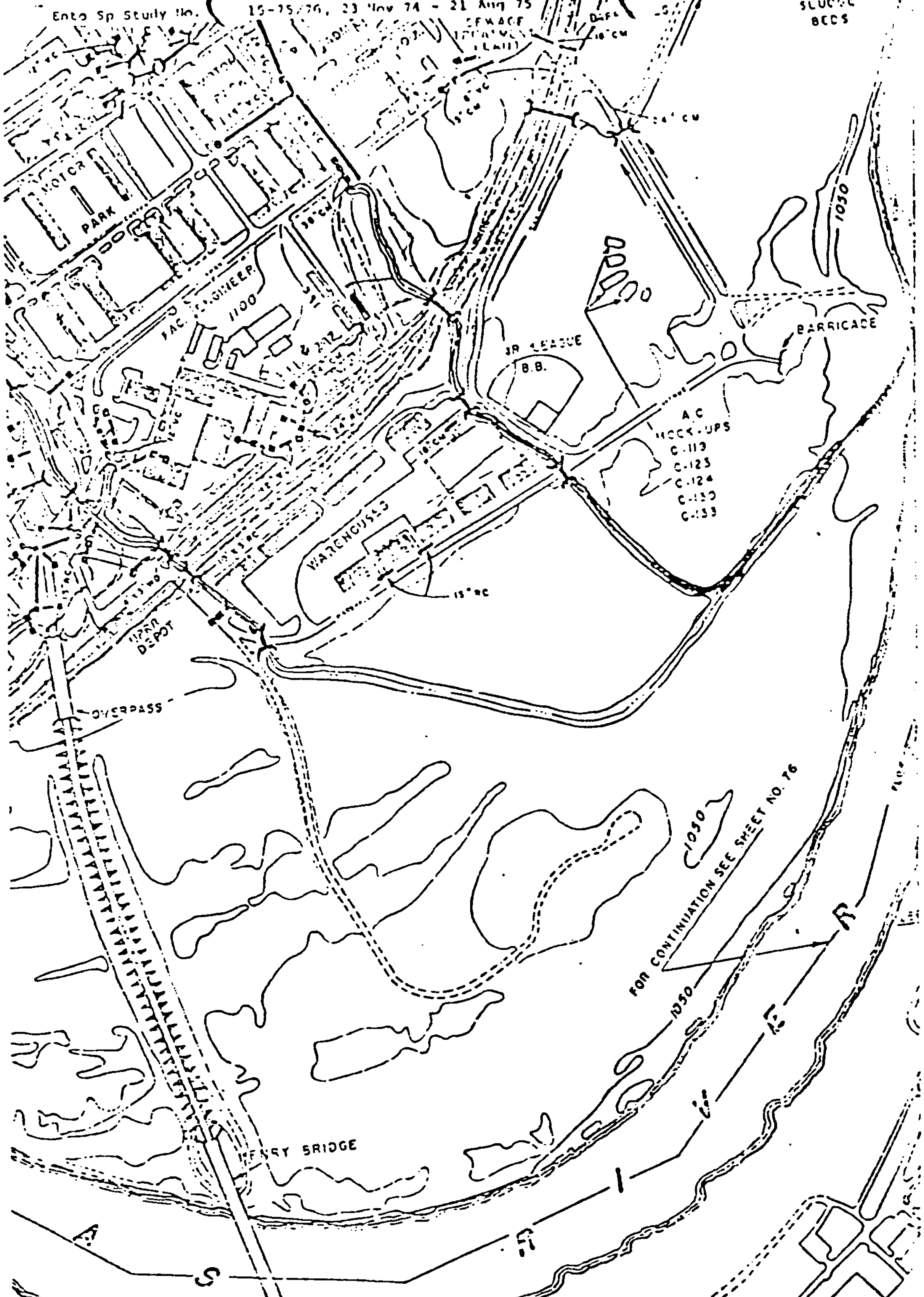
(M) FORT RILEY AND VICINITY



APPENDIX C

Map of Area Sampled During Survey At Fort Riley, KS
Samples Were Taken in the Shaded Area
Which Represents Probable Route of Movement
of Pesticides into The Kansas River

Ento Sp Study No. 15-75/76, 23 Nov 74 - 21 Aug 75



Ento Sp Study No. 44-015-75/76, 23 Nov 74 - 21 Aug 75

APPENDIX D

RESULTS, FORT RILEY, KS, DEPARTMENT OF THE ARMY PESTICIDE MONITORING PROGRAM

USAEHA Sample No.	Substrate	Date of Collection	Place of Collection	Pesticides Found and Quantity (ppm)											
				Malathion	Diazinon	Methoxychlor	Mirex	Chlordane	Dieldrin	Aldrin	p,p'-DDT	o,p'-DDT	p,p'-DDE	p,p'-DDD	o,p'-DDD
00224	Soil	15 May 73	Cantonment Area	—	—	—	—	—	—	—	0.033	—	0.023	0.018	—
00409	Soil	18 Sep 73	do	—	—	—	—	0.60	—	—	0.08	—	0.24	—	—
00411	Sediment	do	Moon Lake	—	—	—	—	—	—	—	—	—	—	—	—
00742	do	26 Jun 74	Republican River	—	—	—	—	—	—	—	—	—	—	—	—
00743	do	do	Miller Pond	—	—	—	—	—	—	—	—	—	—	—	—
00744	do	do	Kansas River Outflow	—	—	—	—	—	—	—	—	—	—	—	—
00754	Soil	1 Jul 74	Disposal Land Fill	—	—	—	—	—	—	—	—	—	—	—	—
00755	do	do	Recreational	—	—	—	—	—	—	0.01	0.03	—	0.07	—	—
00760	do	do	Pesticide Storage	87.70	29.85	824.04	3.72	423.53	4.98	—	53.78	47.75	1.30	37.87	16.98
00761	do	do	Family Gardens	—	—	0.17	—	0.18	—	—	0.02	—	0.03	—	—
00762	do	do	Housing Area	—	—	—	—	—	—	—	0.03	—	0.05	—	—
00775	do	15 Jul 74	Range and Training	—	—	—	—	—	—	—	—	—	—	—	—

— = not detected

459

APPENDIX E

Comparison of Levels of Pesticide Found in Soil and Sediment From Installations in the Midwestern United States By Department of the Army Pesticide Monitoring Programs in 1974 With Levels Found in Soil and Sediment from the Survey at Ft Riley, KS

	Soil		Sediment	
Pesticide	Mean ppm St Louis Region	Mean ppm Ft Riley Survey	Mean ppm St Louis Region	Mean ppm Ft Riley Survey
Diazinon	0.0004	0.10	--	--
Malathion	0.0004	0.34	--	--
Dursban	0.04	0.17	--	--
Methoxychlor	0.006	122.5	--	0.67
Chlordane	0.15	141.5	0.11	0.23
Dieldrin	0.03	2.47	--	--
p,p'-DDT	0.18	48.5	0.019	0.12
o,p'-DDT	0.05	14.89	0.0016	0.03
p,p'-DDE	0.06	3.69	0.016	0.018
p,p'-DDD	--	--	0.022	0.04
o,p'-DDD	--	--	--	0.005

-- = not detected in these samples

APPENDIX F

US ARMY PESTICIDE MONITORING PROGRAM

Limits of Detectability of Primary Pesticides In Water, Soil and Sediment

	Limits of Detectability (ppm)	
Pesticide	Water	Soil & Sediment
α - BHC	0.00003	0.003
β - BHC	0.00010	0.010
Aldrin	0.00008	0.008
Chlordane	0.00060	0.060
o,p'-DDD	0.00020	0.020
p,p'-DDD	0.00016	0.016
o,p'-DDE	0.00020	0.020
p,p'-DDE	0.00016	0.016
o,p'-DDT	0.00020	0.020
p,p'-DDT	0.00030	0.030
Dieldrin	0.00012	0.012
Emdrin	0.00021	0.021
Heptachlor	0.00003	0.003
Heptachlor epoxide	0.00008	0.008
Lindane	0.00004	0.004
Methoxychlor	0.00080	0.080
Urirex	0.00020	0.020
Toxaphene	0.00800	0.800
Chlorpyrifos (Dursban)	0.00012	0.012
Diazinon	0.00052	0.052
Malathion	0.00080	0.010 (FPD)
Methyl Parathion	0.00030	0.030
Parathion	0.00020	0.020
Cis-chlordane	0.00008	0.008
Trans-chlordane	0.00008	0.008
Oxychlordane	0.00008	0.008
2,4-D (methyl ester)	0.00010	0.010
2,4,5-T (methyl ester)	0.00004	0.004
Silvex (methyl ester)	0.00004	0.004

461

APPENDIX Ac

GROUNDWATER CHEMICAL ANALYSES - MULTIPLE COUNTY AREAS BORDERING THE KANSAS RIVER FROM JUNCTION CITY TO KANSAS CITY

Pesticide Storage Facility
Fort Riley, Kansas

Dec 1993

TABLE 5.—Chemical analysis of water from selected wells.
[Analyses given in milligrams per liter, except as indicated. Analyses by Kansas State Department of Health.]

Well number	Depth (feet)	Geologic source[1]	Date of collection	Temperature (°C)	Dissolved solids (evaporated at 180° C)	Silica (SiO_2)	Total iron (Fe)	Total manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate[2] (NO_3)	Hardness[3] as $CaCO_3$: Calcium, magnesium	Hardness[3] as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH
Douglas County																				
12-19E-13dda	52	Qal	5-23-66	14.5	446	30	14	1.6	110	19	34	420	12	34	0.2	3.5	340	1	730	8.0
12-20E- 8bcb	82	Qn	4-25-66	14.0	340	24	2.6	.61	93	13	14	332	26	5.0	.1	1.3	290	14	550	7.4
29aad	56	Qal	11-15-66	14.5	360	31	5.9	.27	100	9.7	16	322	25	18	.3	.4	290	28	560	7.4
Geary County																				
11- 6E-30caa	70	Qal	1- 9-68	12.0	383	26	.22	......	70	----	....	277	60	23	.5	.6	240	13	620	7.6
12- 5E- 1bba	67	Qal	4- 1-60	24.0	452	27	.16	.2	90	17	37	285	35	29	----	27	290	190	450	7.7
Jefferson County																				
11-17E-20cac	70	Qn	4- 8-66	14.0	576	26	2.3	.87	150	20	22	376	140	30	.2	.9	470	160	880	7.6
11-18E-26ccd	57	Qal	5-26-66	14.5	389	32	8.0	1.0	110	15	11	376	28	6.0	.2	2.7	330	26	600	7.9
11-19E-27bcc	33	Qb	12- 2-50	14.0	230	12	.35	......	61	5.4	11	181	12	9.0	.1	30	170	26	......	----
Johnson County																				
11-23E-33acc	51	Qal	7- 1-44	15.0	365	....	10	......	100	14	6.7	265	82	16	.1	1.3	310	94	......	----
12-22E-29bbd	46	Qal	5-11-67	14.5	480	26	12	.61	140	11	16	407	70	11	.2	4.2	400	63	730	7.6
Leavenworth County																				
12-22E-20cad	48	Qal	5-16-67	14.5	460	23	3.9	.20	140	11	9.6	420	56	8.0	.2	1.3	400	60	730	7.6
28aaa	62	Qal	5-15-67	15.0	461	24	11	.41	130	9.1	26	356	59	39	.2	1.5	350	60	730	7.8
Pottawatomie County																				
9-11E-30bbd	90	Qn	5- 5-66	14.0	612	28	8.7	.58	140	25	50	568	74	13	.1	1.8	460	0	910	7.4
10- 8E-13aad	50	Qn	8-19-67	15.0	471	27	4.5	.62	120	19	33	425	34	31	.1	1.3	370	22	770	7.5
14cba	69	Qn	3-29-67	18.5	536	16	4.3	.86	110	19	63	285	89	100	.1	1.5	340	110	900	7.5
10- 9E-14dcb	65	Qn	6-23-66	......	376	63	.03	.31	110	12	16	339	41	10	.2	1.3	310	36	600	7.6
Riley County																				
9- 8E-30dac	79	Qn	3-30-67	15.0	469	19	2.7	1.6	120	21	19	425	54	19	.2	1.5	400	50	770	7.5
10- 7E-35aad	46	Qal	7- 5-66	16.5	618	26	4.3	2.0	110	16	99	383	84	97	.3	1.5	330	16	1,010	7.8
Shawnee County																				
11-14E- 9cad	47	Qn	9- 7-67	......	384	30	.01	.00	100	8.8	20	307	40	13	.1	20	290	36	590	7.5
11-15E-13cbc	77	Qn	4- 8-66	14.0	480	26	3.8	.57	130	17	23	368	80	26	.2	.9	280	82	740	7.6
24bdd	53	Qal	4- 8-66	14.5	684	23	1.1	.66	180	20	29	420	190	28	.2	6.2	530	180	1,020	7.4
Wabaunsee County																				
10-10E-16abb	43	Qal	3-24-67	15.0	354	23	3.5	1.2	93	16	15	312	30	22	.2	.4	300	42	580	7.5
Wyandotte County																				
11-24E-13bad	75	Qal	7-29-68	15.5	710	25	21	2.8	180	18	26	393	180	55	.2	1.1	530	210	1,050	7.6
22caa	64	Qal	4- 4-67	15.0	639	26	.00	.15	170	12	39	381	130	65	.1	6.2	480	160	1,020	7.4
11-25E-11ccc	80	Qal	11-23-43	16.0	4,120	....	10	......	170	25	1,400	786	170	1,900	.2	42	520	0	......	----
11ccc2	80	Qal	11- 4-66	16.0	3,730	25	12	.00	280	24	1,000	649	430	1,500	.3	13	800	260	6,210	7.3
15aba	71	Qal	11- 4-66	15.5	3,720	33	30	1.5	330	57	1,000	742	310	1,600	.2	1.5	1,100	460	6,210	7.5
15ccc	57	Qal	9-22-69	15.5	1,050	23	1.4	.35	220	19	110	417	290	150	.2	.7	620	280	1,640	7.6
U.S. Public Health Service (1962) recommended maximum concentrations for drinking water					500		.3	.05					250	250		45				

[1] Qal, alluvium; Qb, Buck Creek terrace deposits; Qn, Newman terrace deposits.
[2] In areas where the nitrate content of water is known to exceed 45 mg/l, the public should be warned of the potential dangers of using the water for infant feeding (U.S. Public Health Service, 1962, p. 7).
[3] The U.S. Geological Survey uses the following classification for hardness: 0-60, soft; 61-120, moderately hard; 121-180, hard; more than 180, very hard.

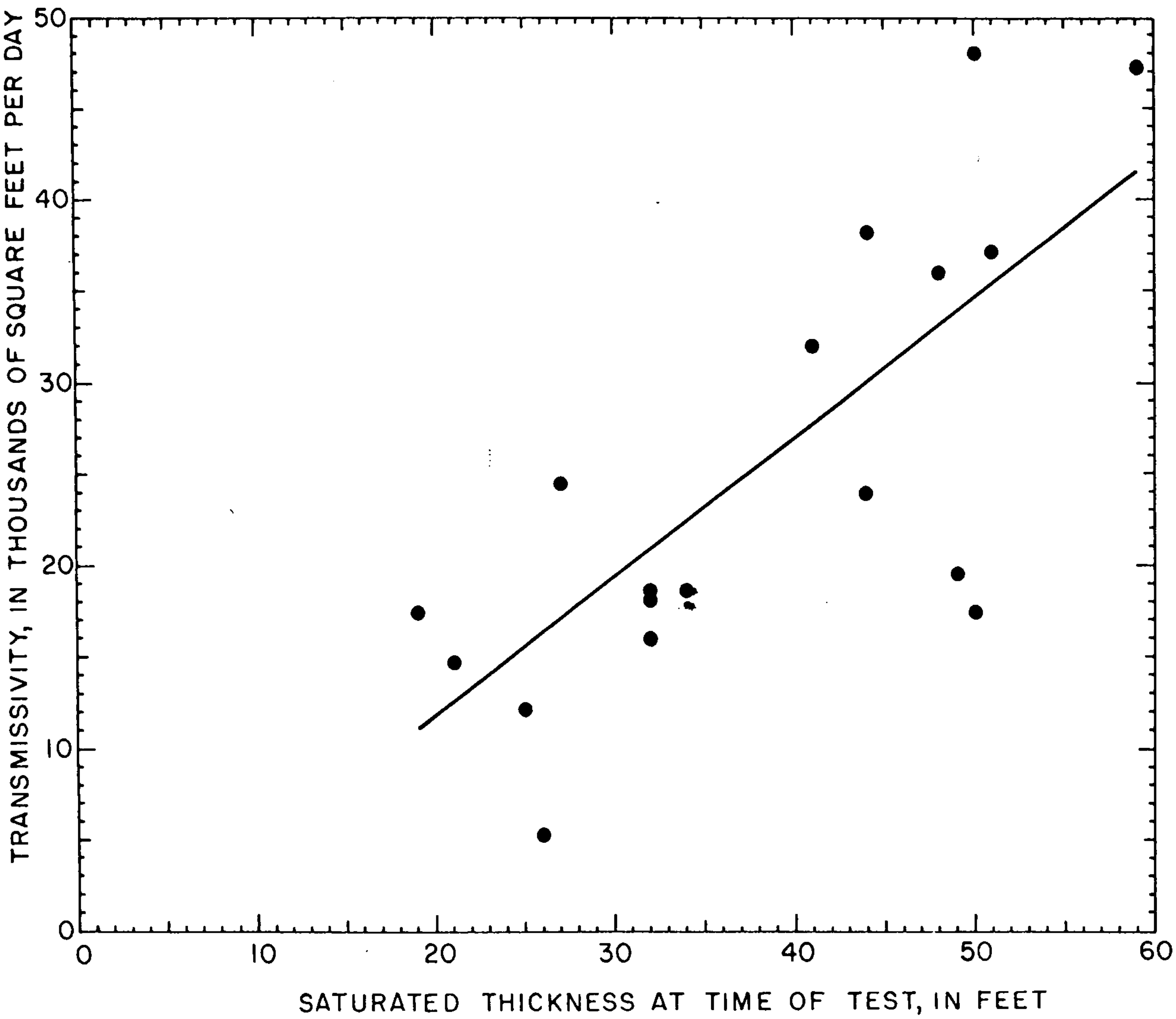


FIGURE 7.—Relation of transmissivity to saturated thickness.

Bridge (23rd Street) in Kansas City, Wyandotte County, where the water contains a concentration of chloride as great as 4,000 mg/l. Maximum and minimum concentrations of selected constituents for all samples of water collected from the valley-fill deposits since 1940 are given (by county) in table 4.

Water samples for chemical analysis have been collected from 359 wells and test holes in the study area since 1940. Selected analyses are given in table 5.

TABLE 4.—Maximum and minimum concentrations, in milligrams, per liter, of selected chemical constituents by county for all samples of water collected from valley-fill deposits since 1940.

County	Dissolved solids			Calcium and magnesium hardness			Chloride			Total iron		
	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.
Douglas	990	318	551	740	220	460	150	1.5	29	49	0.00	4.4
Geary	709	324	470	470	170	340	84	3.0	28	2.9	.00	.40
Jefferson	576	230	385	470	190	310	30	5.0	14	21	.00	4.8
Johnson	553	365	463	450	260	410	66	7.0	17	25	.00	7.2
Leavenworth	549	155	450	480	280	370	74	6.0	21	18	.00	6.0
Pottawatomie	790	307	483	590	160	360	160	8.0	47	23	.00	4.1
Riley	704	360	515	630	200	410	110	6.0	33	38	.00	3.6
Shawnee	1,070	353	457	660	170	370	110	5.0	26	11	.00	5.9
Wabaunsee	599	354	485	500	270	360	86	10	29	12	.00	2.9
Wyandotte	7,270	353	1,050	1,500	210	560	4,000	7.0	250	58	.00	12

APPENDIX B

CLOSURE PLAN FOR HAZARDOUS WASTE STORAGE FACILITIES, BUILDING 292
AND TWO CONEXS, FORT RILEY, KANSAS
USAEHA PROJECT NO. 37-26-0153-87

Pesticide Storage Facility
Fort Riley, Kansas

CONSERVARE SALUTEM

AEHA

UNITED STATES ARMY ENVIRONMENTAL HYGIENE AGENCY

ABERDEEN PROVING GROUND, MD 21010-5422

CLOSURE PLAN FOR HAZARDOUS WASTE STORAGE FACILITIES
BUILDING 292 AND TWO CONEX'S
FORT RILEY, KANSAS
USAEHA PROJECT NO. 37-26-0153-87

Distribution limited to US Government agencies only; protection of privileged information evaluating another command; Mar 87. Requests for this document must be referred to Commander, US Army Forces Command, Fort McPherson, GA 30330-6000.

DEPARTMENT OF THE ARMY
U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010-5422

REPLY TO
ATTENTION OF:

HSHB-ME-SH

SUBJECT: Closure Plan for Hazardous Waste Storage Facilities, Building 292 and Two CONEX's, Fort Riley, Kansas, USAEHA Project No. 37-26-0153-87, February 1987

Commander
US Army Forces Command
ATTN: AFEN-FDE
Fort Gillem
Forest Park, GA 30305-6000

1. Letter, Fort Riley, AFZN-DE-EN, 20 October 1986, subject: Request for USAEHA Assistance with Hazardous Waste Storage Closure Plan, with endorsement thereto.

2. Subject closure plan was prepared for the closure of the hazardous waste storage facilities at Building 292 and two CONEX's at Fort Riley in accordance with Federal and Kansas State hazardous waste management regulations.

3. Subject plan is enclosed. This plan should be submitted to regulatory agencies for approval in order to conduct the closure of the subject facilities. The point of contact at this Agency is Dr. Ching-San Huang or Chief, Waste Disposal Engineering Division, AUTOVON 584-3651.

FOR THE COMMANDER:

Encl

KARL J. DAUBEL
Colonel, MS
Director, Environmental Quality

CF:
Cdr, Ft Riley (DEH) (2 cy)
Cdr, FORSCOM (AFMD-PC) (4 cy)
DIVENGR, Huntsville (HNDED-PM)

CLOSURE PLAN
FOR
HAZARDOUS WASTE STORAGE FACILITIES
BUILDING NO. 292 AND TWO CONEX'S
FORT RILEY, KANSAS
EPA ID NO. KS6214020756
FEBRUARY 1987

TABLE OF CONTENTS

1. INTRODUCTION. This closure plan was prepared for two CONEX hazardous waste (HW) containers with a total capacity of 5,000 gallons and one HW storage building (Bldg 292) with a total capacity of 300 cubic yards listed in a Resource Conservation and Recovery Act (RCRA) Part A permit application on 18 November 1980 (See Appendix A). These HW storage facilities were taken out of service in 1983 and replaced with two new storage buildings in the Defense Reutilization and Marketing Office (DRMO) storage yard at Fort Riley. This action was reflected in the revised RCRA Part A permit application submitted on 19 April 1983 (See Appendix B). The closure action of the two CONEX's and Bldg 292, however, was not official since no closure plan had been submitted for approval to the regulatory agencies as required per 40 Code of Federal Regulations (CFR) Part 265 Subpart G (See Appendix C, reference 2) and Kansas Administrative Regulations Title 28, Article 31, Hazardous Waste Management, paragraph 28-31-8 (See Appendix C, reference 3). This Closure Plan is prepared to serve this purpose.

2. GENERAL. Appendix C lists the references for this closure plan. Kansas Administrative Regulations have adopted the Federal Regulations, 40 CFR 265, by reference. Therefore, the regulations cited in the specific areas in this closure plan are Federal Regulations only.

3. DESCRIPTION OF THE STORAGE FACILITIES. The HW storage facilities listed in the US Environmental Protection Agency (EPA) Form 3510-3, Page 1 of 5, Item III-C, Line Nos. 6 and 7 of the RCRA Part A permit application submitted on 18 November 1980 are described as follows (See Figure 1, Hazardous Waste Storage Facilities Location Map, and Figure 2, Floor Plan for Bldg 292 and Two CONEX's):

a. Line No. 6, S01: The process design capacity of 5,000 gallons in this Line consists of two 8 feet 6 inches long, 6 feet 3 inches wide, and 6 feet 10 1/2 inches high CONEX cargo containers. The CONEX is made of corrugated steel with tare weight of 1,500 pounds and has a weight holding capacity of 9,000 pounds. Each CONEX is totally enclosed and has steel doors which can be locked (See Figure 3). The floor of each CONEX has a removable steel pan with a 6-inch high steel curbing around the four sides of the pan. Therefore, each CONEX has an impervious, continuously bermed flooring structure (See Figure 4). The two CONEX's are located behind Bldg 292.

b. Line No. 7, S03: Building 292 is a storage facility 25-feet wide by 108-feet long with steel frame, sheet metal sides, and concrete floor and is bermed (See Figures 5 and 6). By assuming the HW storage height of 3 feet, the total storage capacity is 300 cubic yards. The actual storage area ever used for HW storage during the 1980-1983 period, however, was only approximately 4-feet wide by 8-feet long area at the north-west corner of the building as shown in the shaded area in Bldg 292 in Figure 2.

4. CLOSURE.

a. Closure Performance Standard (40 CFR 265.111). This closure plan is designed to ensure that both the CONEX's and the HW storage area in Bldg 292 will not require further maintenance, and control, to minimize or

CORPS OF ENGINEERS

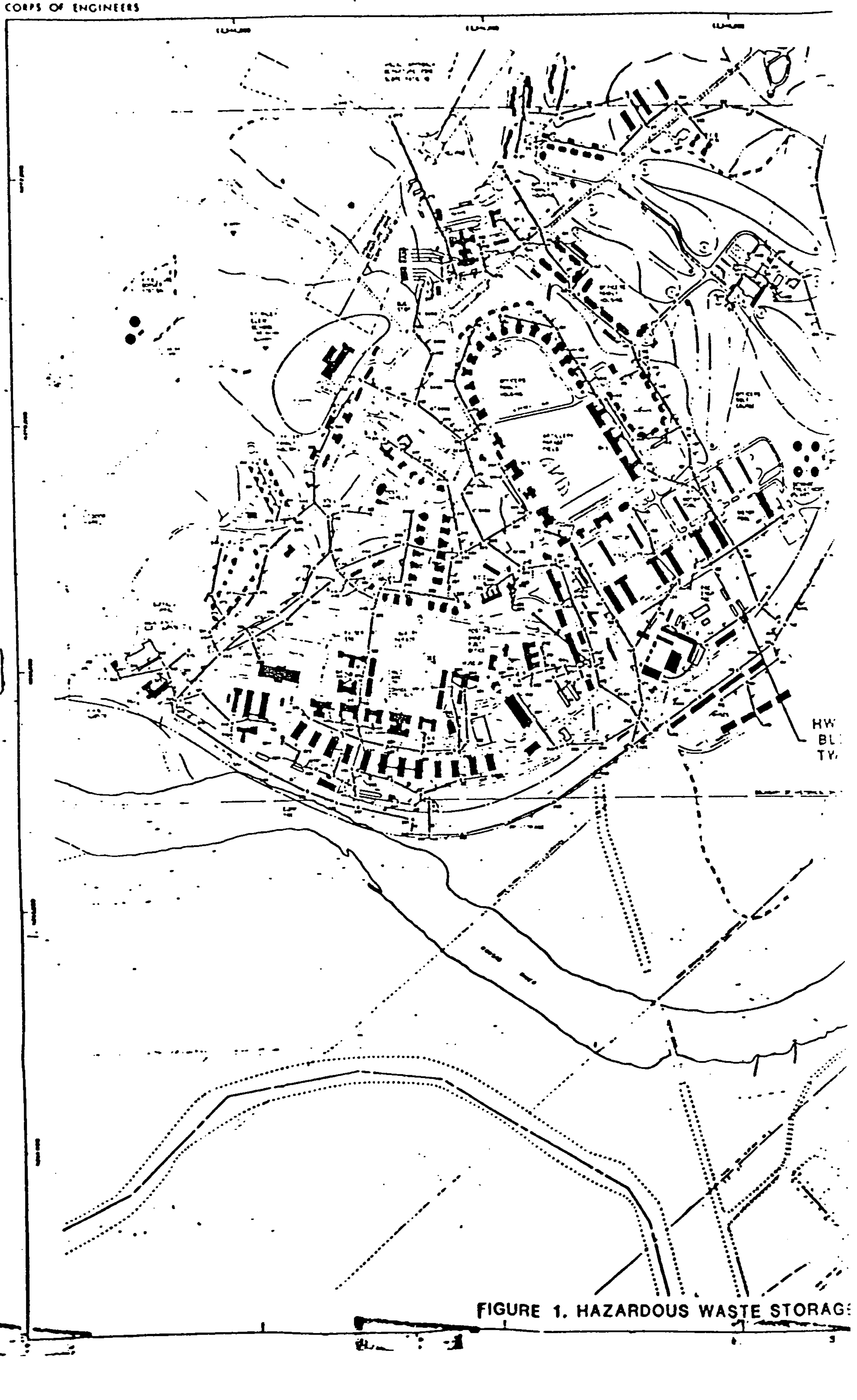
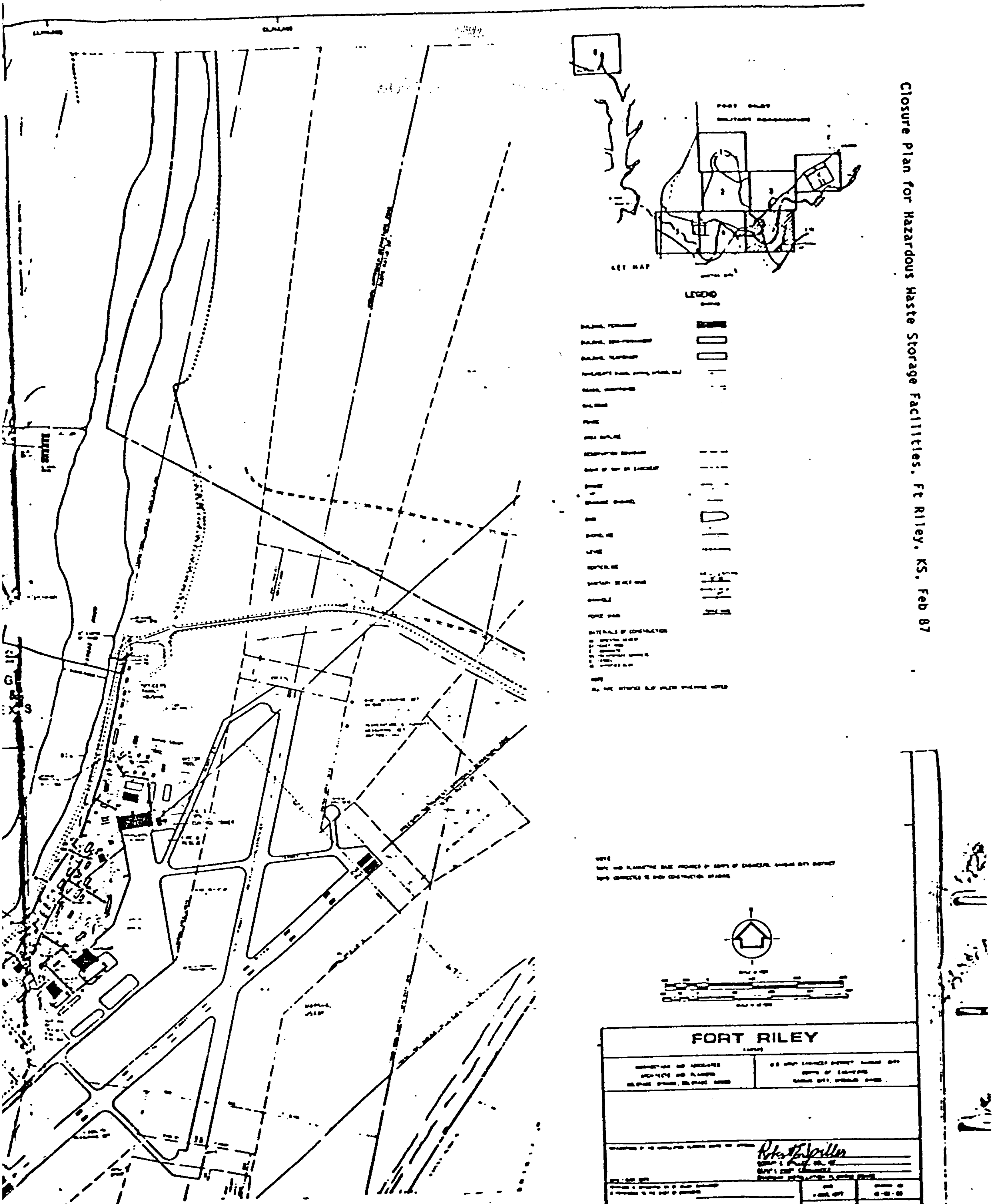


FIGURE 1. HAZARDOUS WASTE STORAG

Closure Plan for Hazardous Waste Storage Facilities, Ft Riley, KS, Feb 87



ILITIES LOCATION MAP

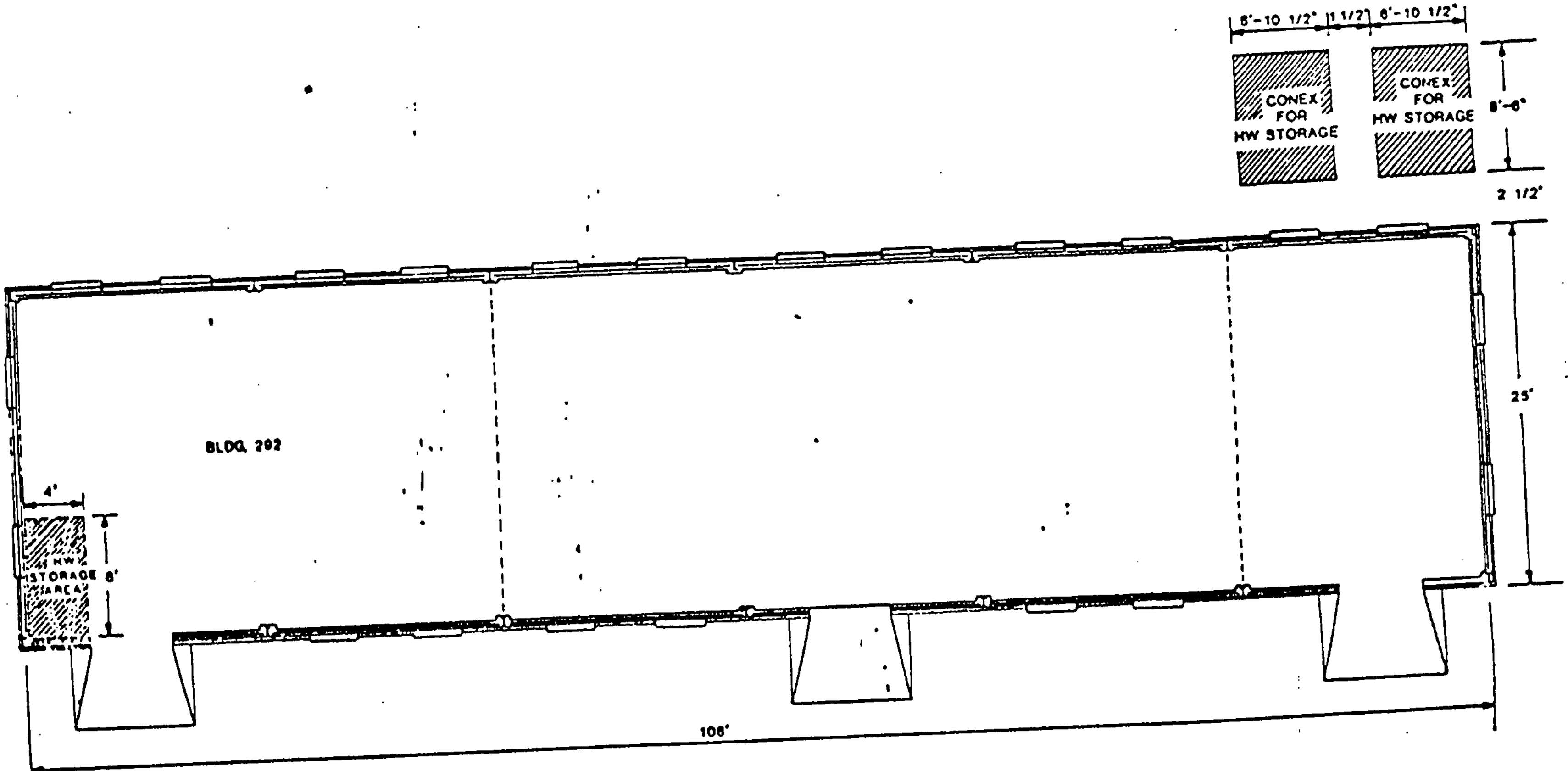


FIGURE 2 - FLOOR PLAN BLDG. 292 AND TWO CONEX'S

NOT TO SCALE

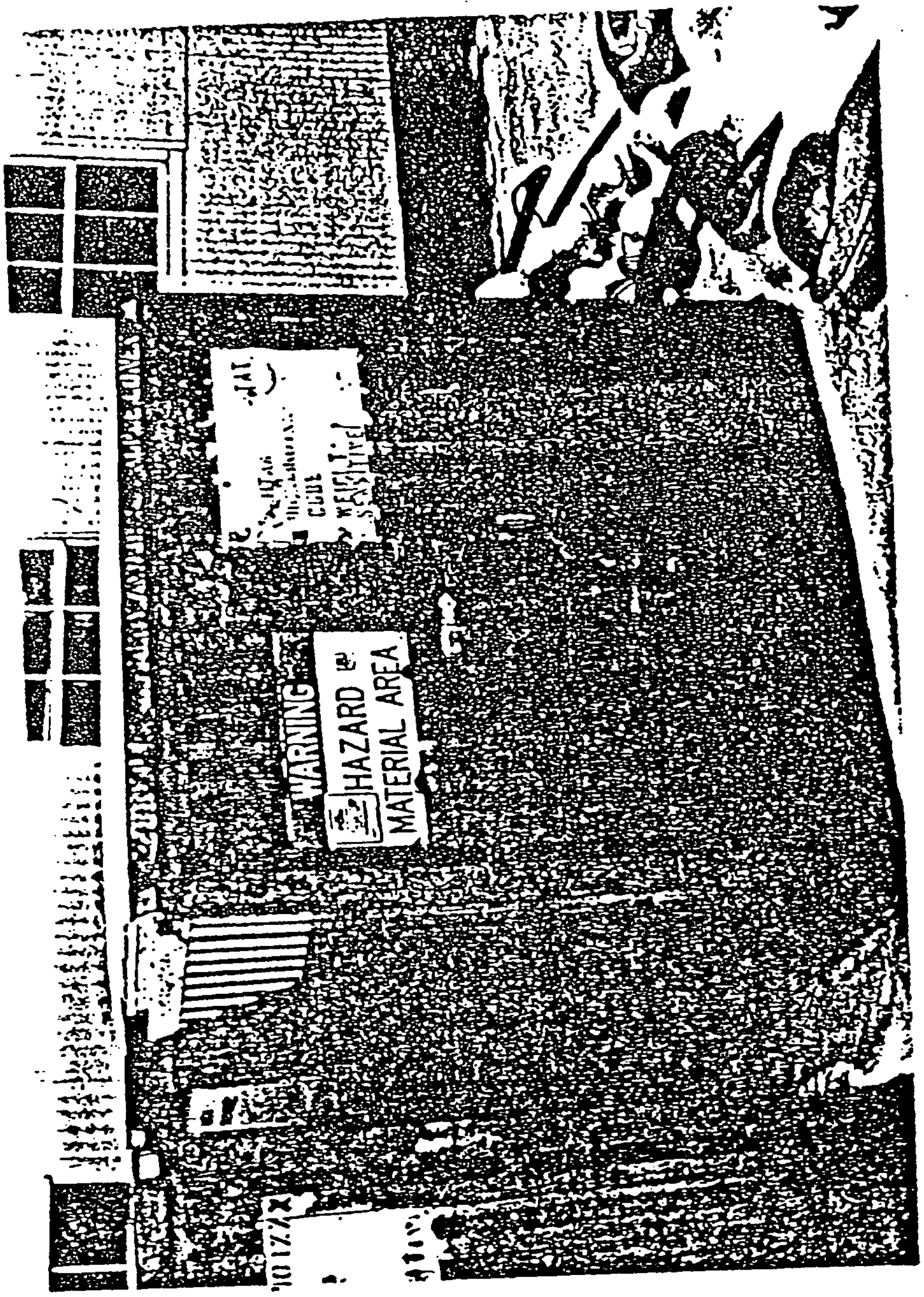


FIGURE 3. THE FRONT VIEW OF THE CONEX CARGO CONTAINER

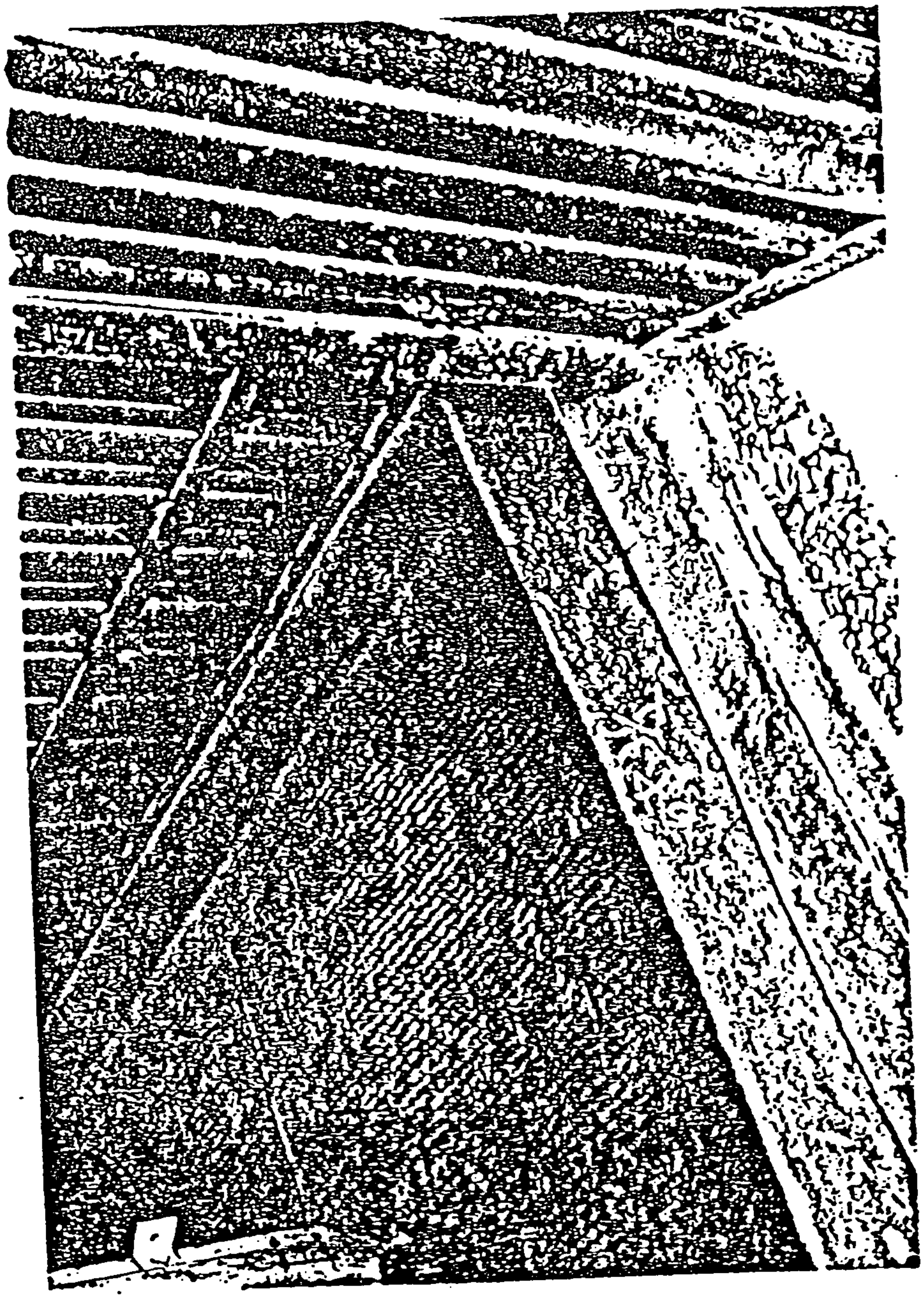


FIGURE 4. THE INTERIOR OF THE CONEX WITH STEEL PAN

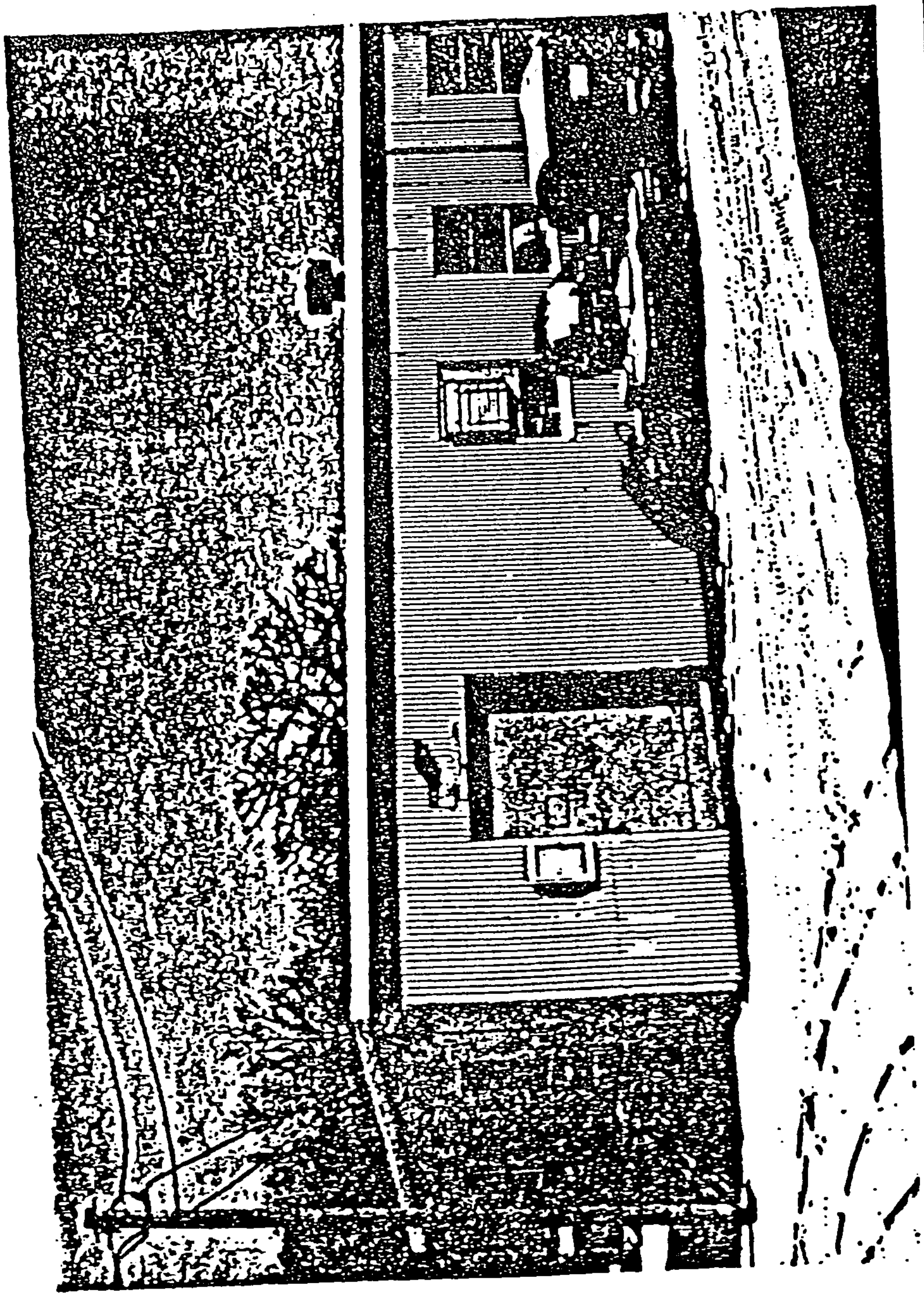


FIGURE 5. THE FRONT VIEW OF THE NORTH-WEST CORNER OF BLDG 292

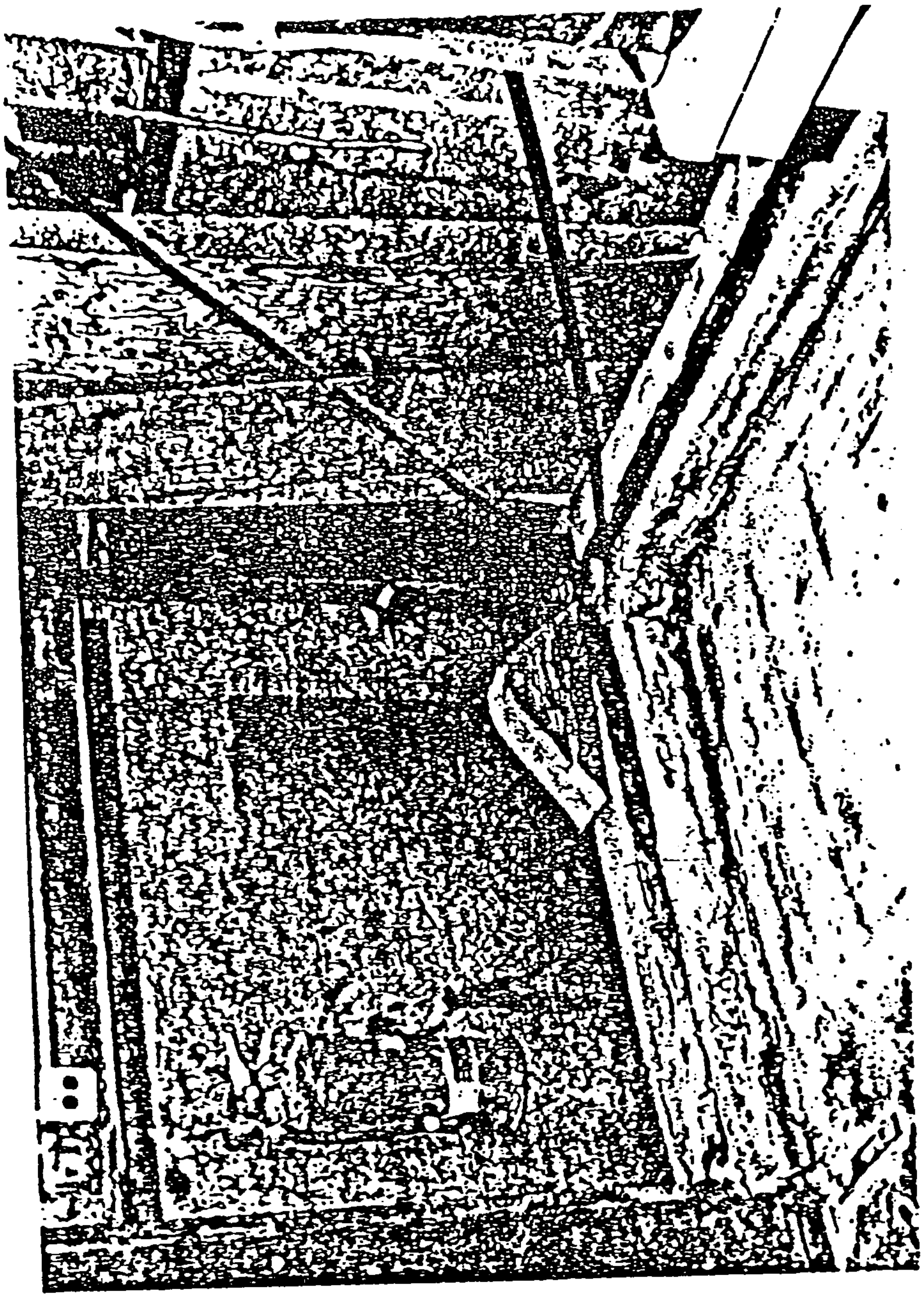


FIGURE 6. THE INTERIOR OF THE NORTH-WEST CORNER OF BLDG 292

eliminate threats to human health and the environment. If there is evidence of any spills or leaks, samples will be taken and analyzed to determine the extent of contamination in the soil. Any contaminated soil will be excavated, removed, and disposed of at a proper disposal facility. Because these facilities are only storage facilities, not disposal facilities, no post-closure requirement is expected. The following sections discuss in detail the efforts to be made at these storage facilities to satisfy the closure performance standard.

b. Closure Plan (40 CFR 265.112).

(1) Final Closure Activities [40 CFR 265.112(b)(1), (2) and 112(e)]. The two CONEX's and the entire Bldg 292 will be closed for HW storage. All the HW's stored in these facilities were shipped to the DRMO at Fort Riley for offsite disposal in 1983, and these HW storage facilities have not been used for HW storage since then.

(2) Maximum Waste Inventory [40 CFR 265.112(b)(3)]. The maximum inventory of HW ever onsite over the active life of these facilities were listed as follows:

(a) Decontamination Agent DS-2, three 5-gallon cans (D002, Corrosivity);

(b) Fungicide, mercury powder, one 2-pound bag [D009, Extraction Procedure (EP) Toxicity-mercury];

(c) Metallic mercury spill cleanup residual, one 20-pound box with polyethylene liner (D009, EP Toxicity-mercury);

(d) SEVIN® pesticide, two 1-quart bottles (SEVIN Pesticide);

(e) Calcium hypochloride, two 1-gallon jars (D002, Corrosivity);

(f) Methanol, one 1-gallon bottle (D001, Ignitability);

(g) Miscellaneous pharmaceutical items, such as skin cream, shampoo, medication, lindane pesticide, etc., 50 tubes and/or small bottles in a box (D004-D017, EP Toxicity-heavy metals and pesticides).

The HW's listed above were first stored at Bldg 292 between 1981-1982, and on/about October 1982, all of those HW's were transferred to the two CONEX's. By the first quarter of 1983, all HW's were removed from the two CONEX's and transported and disposed of by licensed transporters and disposal facilities through the DRMO's contractors.

® SEVIN is a registered trademark of the Union Carbide Corp., Salinas, California. Use of trademarked name does not imply endorsement by the US Army but is intended only to assist in identification of a specific product.

(3) Decontamination Procedures for the Storage Facilities [40 CFR 265.112(b)(4) and (5)]. As described previously, all the HW's were removed from the storage facilities. Decontamination will be required for the structures of the facilities and the equipment used for decontamination. Since there were no spills nor leaks during the active life of the facilities, no soil sampling/analysis nor ground-water monitoring is planned. The decontamination procedures will be conducted either within a concrete paved and bermed area with wastewater collection provision or in a building. Therefore, no run-on or run-off control is necessary.

(a) The Two CONEX's. The two CONEX's will be moved to a paved and bermed area where the wash waters can be contained and then a 20-30 gallon per hour steam cleaning unit will be used to decontaminate the CONEX's. First, the steel pans from the bottoms of the CONEX's will be removed. Hot water with detergent will be used to steam clean the inside of the CONEX's and the steel pans. The outside of the CONEX's will also be steam cleaned once with hot water to wash away any possible contamination from the active life of service. The detergent wash wastewater from inside and the wash wastewater from outside of the CONEX's will be collected separately with 55-gallon drums. The inside of the CONEX's and the steel pans will then be steam cleaned once more with cold water and this rinse wastewater will be collected separately in 55-gallon drums in order to test the completion of the decontamination process. After both CONEX's are decontaminated, the paved and bermed area will also be steam cleaned once with clean water. This wash water will also be collected in 55-gallon drums. These four kinds of wastewaters (i.e., detergent wastewater from inside and steel pan wash, wastewater from outside cleaning, wastewater from inside and steel pan rinse, and the wastewater from concrete paved area wash) will be sampled and analyzed for HW characteristics for ignitability, corrosivity, EP toxicity (heavy metals and pesticides), SEVIN pesticide, and organic bulk ID (reference 3) by a Kansas State certified laboratory. If the outside cleaning wastewater and the rinse wastewater from inside and steel pan indicate any HW characteristics or constituent exceeding the HW criteria (40 CFR 261), the CONEX's will be washed again with the same procedures outlined above. The analytical results will also be used to determine the disposal requirements of the wash wastewaters. The wastewaters generated from this operation are estimated to be 150 gallons.

(b) Bldg 292: The HW storage area will be bermed with absorbents and the concrete floor and the walls next to the HW storage area will be decontaminated with a series of detergent wash, mop dry, second detergent wash, mop dry and then clean water rinse for three times. The detergent wash wastewater and the first two rinse wastewaters will be collected in 55-gallon drums. The last (third) rinse wastewater will be collected separately. The absorbents and the mops used will also be collected in 55-gallon drums. The wastewater collected and the absorbent/mops will be sampled and analyzed for the same parameters as for the CONEX's described above. If the last rinse wastewater contains HW exceeding the HW criteria, the HW storage area in Bldg 292 will be washed again with the same procedures. The waste analytical results will also be used to determine the disposal requirements of wastewater and absorbent/mops. The wastewaters and absorbent/mops generated from this operation are estimated to be 55 gallons each.

(c) Personnel Protection and Decontamination. The HW storage area and CONEX's decontamination will be supervised and performed by qualified in-house hazardous waste personnel. Rubber or vinyl personnel protection suit, gloves and boots shall be worn. Both the wrists and ankles will be taped (electrical tape) to protect against upward and inward splash. Full facepiece gas mask equipped with organic vapor filter cartridge will be used for respiratory protection. Prior to leaving the area, decontamination of personnel protection clothing will be conducted by spraying, washing, and scrubbing with detergent solution all outside protective clothing materials as well as exposed skin surfaces (i.e., facial area). The steam cleaning unit and other equipment used for decontamination will also be decontaminated with spraying, washing and scrubbing with detergent solution. The wastewater generated will be sampled and analyzed to determine the proper disposal method.

(4) Final Closure Schedule [40 CFR 265.112(b)(6)]. The final closure of the two CONEX's and the HW storage area in Bldg 292, to include the contracting procedures for soliciting contractor(s) to perform the required waste analyses and HW (wastewater) disposal, will be initiated when this closure plan is approved by the regulatory agencies. The decontamination work will be completed within 180 days after initiation of the plan.

(5) Amendment of Closure Plan [40 CFR 265.112(c)]. If amendment of the closure plan is deemed necessary, Fort Riley will submit a written request with the amended closure plan to the regulatory agencies for approval.

(6) Extension for Closure Time (40 CFR 265.113). Fort Riley will not require an extension of closure time.

(7) Certification of Closure (40 CFR 265.115). Within 60 days of completion of final closure, the owner/operator of the HW storage facilities will submit to the regulatory agencies, by registered mail, a certification that the facilities have been closed in accordance with the specifications in the approved closure plan. The certification will be signed by the owner/operator of the facilities and by an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification will be furnished to the regulatory agencies upon request. See Figure 7 for a sample closure certification.

(8) Post-closure Care and Use of Property (40 CFR 265.117). The facilities to be closed are only for hazardous waste storage. After proper decontamination, no post-closure care should be needed and no use restriction of the property should be imposed.

CERTIFICATION OF CLOSURE

I, ____,
(Owner or Operator)

of ____,
(Name and Address of Hazardous Waste Storage Facilities)

and I, ____________________________________, a
(Name of Professional Engineer)

registered professional engineer, hereby certify that to the best of our knowledge and belief, and that we have made visual inspection(s) of the aforementioned facilities, the closure of the facilities have been closed in accordance with the facilities' closure plan. The closure was completed on the ________ day of ____________________, 19____.

______________________________________ ____________________
Signature of Owner or Operator Date

AND

______________________________________ ____________________
Signature of Professional Engineer Date

______________________________________ ____________________
Professional Engineer License No. For State of

____
Business Address

____
Business Telephone (with Area Code)

FIGURE 7. SAMPLE CERTIFICATION OF CLOSURE

(9) Post-closure Plan (40 CFR 265.118). Since post-closure care will not be needed for these HW storage facilities, the post-closure plan is not required.

(10) Survey Plat, Notice in Deed and Notice to Local Land Authority (40 CFR 265.116 and 119). Because the closed facilities are only for HW storage and not for HW disposal, survey plat is not needed and notation is not necessary in the deed informing potential purchasers of restrictions associated with disposal site(s).

(11) Financial Requirements (40 CFR 265 Subpart H). These HW storage facilities are owned by the United States Government and, as such, are exempt from the financial requirement statements, such as closure cost estimate, financial assurance for closure, and liability requirements.

APPENDIX A

RCRA PART A PERMIT APPLICATION SUBMITTED ON 18 NOVEMBER 1980

...for elite type, i.e., 12 characters/inch). Form Approved OMB No. 158 S80004

RCRA **EPA** U.S. ENVIRONMENTAL PROTECTION AGENCY

HAZARDOUS WASTE PERMIT APPLICATION

Consolidated Permits Program

(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER F

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

[X] 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

[ ] 2. NEW FACILITY *(Complete item below.)*

C	YR.	MO.	DAY	
8	41	01	01	FOR EXISTING FACILITIES, PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

YR.	MO.	DAY	
			FOR NEW FACILITIES, PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR IS EXPECTED TO BEGIN

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

[ ] 1. FACILITY HAS INTERIM STATUS [ ] 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.

1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER *(barrel, drum, etc.)*	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D79	GALLONS OR LITERS
LANDFILL	D80	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)*	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE	UNIT OF MEASURE	UNIT OF MEASURE CODE	UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G	LITERS PER DAY	V	ACRE-FEET	A
LITERS	L	TONS PER HOUR	D	HECTARE-METER	F
CUBIC YARDS	Y	METRIC TONS PER HOUR	W	ACRES	B
CUBIC METERS	C	GALLONS PER HOUR	E	HECTARES	Q
GALLONS PER DAY	U	LITERS PER HOUR	H		

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C DUP 1

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY	LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT	2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S 0 2	600	G		5				
X-2	T 0 3	20	E		6	S 0 1	5,000	G	
1	D 8 1	9000	B		7	S 0 3	300	Y	
	S 0 3	32	Y		8	T 0 3	0.01	E	
3	T 0 4	0.75	D		9				
4	T 0 1	50	U						

A-2 REPRODUCED AT GOVERNMENT EXPENSE

NCLUDE DESIGN CAPACITY.

ine Number 1: Incendiary and explosive ordnance strikes the earth in a 16,000 acre target impact area as a result of artillery and other major weapons training. For projectiles which fail to function, placement in the 9000 acre center area constitutes disposal.

ine Number 3: Ordnance which has lost its usefulness for its originally intended purpose is made safe by physical, chemical and thermal processes carried out separately or in combination. Military personnel with specialized training disassemble, explode, burn, and/or dissolve ordnance.

ine Number 4: Sulfuric acid from batteries is neutralized with liquid ammonia.

ine Number 6: Polychlorinated biphenyl is included in anticipation of listing as a hazardous waste. The volume given represents the total volume of the storage containers. Actual volume is subject to change due to the unknown volumes occupied by transformers, capacitors, etc.

ine Number 8: 60 gallons/year (0.16 gallons/day) of xylene from Irwin Army Hospital mixed with fuel oil and burned at the Custer Hill Boiler Plant.

ine Number 5 has been omitted during the revision process (June 1981).

V. DESCRIPTION OF HAZARDOUS WASTES

A. EPA HAZARDOUS WASTE NUMBER — Enter the four-digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If you handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four-digit number(s) from 40 CFR, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. ESTIMATED ANNUAL QUANTITY — For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.

C. UNIT OF MEASURE — For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:

For listed hazardous waste: For each listed hazardous waste entered in column A select the code(s) from the list of process codes contained in Item III to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non-listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, select the code(s) from the list of process codes contained in Item III to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed hazardous wastes that possess that characteristic or toxic contaminant.

Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code(s).

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER — Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B, C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

EXAMPLE FOR COMPLETING ITEM IV (*shown in line numbers X-1, X-2, X-3, and X-4 below*) — A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
X-1	K 0 5 4	900	P	T 0 3, D 8 0	
X-2	D 0 0 2	400	P	T 0 3, D 8 0	
X-3	D 0 0 1	100	P	T 0 3, D 8 0	
X-4	D 0 0 2				included with above

CONTINUE ON PAGE

W DUP 1 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	D003	18,600	K	D81	
2	D001	750	K	D81	
3	D003				Included with above.
4	D003	14,100	K	S03 T04	
5	D001	6,350	K	S03 T04	
6	D003				Included with above.
7	D002	9,400	K	T01	
8	D008	9,400	K	S01	
9		1,200	K	S01	This is polychlorinated biphenyl
10	U239	175	K	T04	
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					

CONTINUE ON REVERSE

EPA Form 3510-3 (6-80)

(enter "A", "B", "C", etc. behind the page number to identify photocopied pages)

EPA I.D. NO. (enter from page 1)

F | | | | | | | | | | | | | - | 6

V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail)*.

VI. PHOTOGRAPHS

All existing facilities must include photographs *(aerial or ground–level)* that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail)*.

VII. FACILITY GEOGRAPHIC LOCATION

LATITUDE (degrees, minutes, & seconds)	LONGITUDE (degrees, minutes, & seconds)
39 03 00N	096 46 00W

VIII. FACILITY OWNER

☒ A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. (area code & no.)
E	

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE
F	G		

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents; and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME (print or type)	B. SIGNATURE	C. DATE SIGNED
E. A. PARTAIN Major General, U. S. Army, Commanding	E A Partain	18 Nov 1980

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME (print or type)	B. SIGNATURE	C. DATE SIGNED

CONTINUE ON

APPENDIX B

REVISED RCRA PART A PERMIT APPLICATION
SUBMITTED ON 19 APRIL 1983

DEPARTMENT OF THE ARMY

HEADQUARTERS 1ST INFANTRY DIVISION (MECH) AND FORT RILEY
FORT RILEY KANSAS 66442

April 16, 1983

Directorate of Facilities Engineering

Mr. Vivek Kamath
Hazardous Waste Management Section
Kansas Department of Health and Environment
Forbes Field, Building 321
Topeka, Kansas 66620

Dear Mr. Kamath:

Enclosed is a revised "Part A" hazardous waste permit application as requested in your letter dated August 10, 1982. The revised permit application is intended to replace in total the initial permit application forwarded November 18, 1980.

The revised application reflects a total Defense Property Disposal Office storage capacity of 170 cubic yards. This storage capacity is to be provided by the proposed construction of two metal buildings (85 cubic yards each).

The establishment of a major storage facility at the Defense Property Disposal Office serves to simplify the storage function. It represents a change in function assignment and location, but not a change in intensity or scale.

The storage capacity to be provided by the buildings would replace existing capacity located in the Directorate of Facilities Engineering and Defense Property Disposal Office functional areas. The specific restructuring is as follows:

Defense Property Disposal Office

New Capacity:	Form 3, Page 1 of 5, Line 1:	S03, 170	Y
Old Capacity:	Form 3, Page 1 of 5, Line 1:	S01, 100	G
	Form 3, Page 1 of 5, Line 2:	S02, 100	G

Directorate of Facilities Engineering

New Capacity:	None.		
Old Capacity:	Form 3, Page 1 of 5, Line 6:	S01, 24	Y
	Form 3, Page 1 of 5, Line 7:	S03, 300	Y

If you have any questions or comments concerning the application, please contact Mr. Jim Day or Mr. Charles Harris at (913) 239-2630.

Respectfully submitted,

Richard D. Carlisle
Lieutenant Colonel, Engineer
Director of Facilities Engineering

Enclosures

3 RCRA EPA

Consolidated Permits Program
(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER: F K S 6 2 1 4 0 2 0 7 5 6

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your fac[ility] or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your fa[cility's] EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

☐ 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

C 8 — FOR EXISTING FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

☐ 2. NEW FACILITY *(Complete item below.)*

FOR NEW FACILITI[ES], PROVIDE THE DAT[E] *(yr., mo., & day)* OPE[RA]TION BEGAN OR IS EXPECTED TO BEG[IN]

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

☒ 1. FACILITY HAS INTERIM STATUS

☐ 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided f[or] entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, th[en] describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.
1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PRO-CESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER *(barrel, drum, etc.)*	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D79	GALLONS OR LITERS
LANDFILL	D80	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS

PROCESS	PRO-CESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)*	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G
LITERS	L
CUBIC YARDS	Y
CUBIC METERS	C
GALLONS PER DAY	U
LITERS PER DAY	V
TONS PER HOUR	D
METRIC TONS PER HOUR	W
GALLONS PER HOUR	E
LITERS PER HOUR	H
ACRE-FEET	A
HECTARE-METER	F
ACRES	B
HECTARES	Q

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and t[he] other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C DUP — T/A C: 1

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S 0 2	600	G	
X-2	T 0 3	20	E	
1	D 8 1	9000	B	
2	S 0 3	32	Y	
3	T 0 4	30	U	
4	T 0 1	80	U	
5	T 0 3	0.01	E	
6	T 0 4	26	U	
7				
8				
9				
10				

CONTINUE ON RE[VERSE]

I. PROCESSES *(continued)*

SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES (code "T04"). FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

Line Number 1: Incendiary and explosive ordnance strikes the earth in a 16,000 acre target impact area as a result of artillery and other major weapons training. For projectiles which fail to function, placement in the 9000 acre center area constitutes disposal.
Line Number 3: Ordnance which has lost its usefulness for its originally intended purpose is safe by physical, chemical and thermal processes carried out separately or in combination. Military personnel with specialized training disassemble, explode, burn, and/or dissolve the ordnance.
Line Number 4: Sulfuric acid from vehicle batteries is neutralized with aqueous ammonia.
Line Number 5: Waste xylene from a medical labratory is mixed with fuel oil and incinerated in a heating plant boiler.
Line Number 6: Neutralized sulfuric acid bearing lead and cadmium is given biological treatment in the installation's sewage treatment plant.

IV. DESCRIPTION OF HAZARDOUS WASTES

A. EPA HAZARDOUS WASTE NUMBER — Enter the four–digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If you handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four–digit number*(s)* from 40 CFR, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. ESTIMATED ANNUAL QUANTITY — For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non–listed waste*(s)* that will be handled which possess that characteristic or contaminant.

C. UNIT OF MEASURE — For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

[F]acility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:
For listed hazardous waste: For each listed hazardous waste entered in column A select the code*(s)* from the list of process codes contained in Item III to indicate how the waste will be stored, treated, and/or disposed of at the facility.
For non–listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, select the code*(s)* from the list of process codes contained in Item III to indicate all the processes that will be used to store, treat, and/or dispose of all the non–listed hazardous wastes that possess that characteristic or toxic contaminant.
Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code*(s)*.

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER — Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B,C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

EXAMPLE FOR COMPLETING ITEM IV *(shown in line numbers X-1, X-2, X-3, and X-4 below)* — A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non–listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

LINE NO.	A. EPA HAZARD. WASTE NO *(enter code)*	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE *(enter code)*	D. PROCESSES 1. PROCESS CODES *(enter)*				D. PROCESSES 2. PROCESS DESCRIPTION *(if a code is not entered in D(1))*
X-1	K 0 5 4	900	P	T 0 3	D 8 0			
X-2	D 0 0 2	400	P	T 0 3	D 8 0			
X-3	D 0 0 1	100	P	T 0 3	D 8 0			
X-4	D 0 0 2							included with above

CONTINUE ON PA[GE]

EPA I.D. NUMBER (enter from page 1): W K S 6 2 1 4 0 2 0 7 5 6 | T/A C: 1 | W DUP | T/A C: 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	D003	7,100	K	D81				
2	D001	1,100	K	D81				
3	D003							Included with above.
4	D003	4,600	K	S03	T04			
5	D001	735	K	S03	T04			
6	D003							Included with above.
7	D002	14,800	K	T01				
8	D008	24,050	K	T04				
9	D006	24,050	K	T04				
10	U239	195	K	T04				
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

EPA Form 3510-3 (6-80) DFAE

CONTINUE ON REV

(enter "A", "B", "C", etc. behind the "5" to identify photocopied pages)

DESCRIPTION OF HAZARDOUS WASTES (continued)
USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

EPA I.D. NO. (enter from page 1)

K	S	6	2	1	4	0	2	0	7	5	6	T/A	C
K	S	6	2	1	4	0	2	0	7	5	6		6

V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility (*see instructions for more detail*).

VI. PHOTOGRAPHS

All existing facilities must include photographs (*aerial or ground–level*) that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas (*see instructions for more detail*).

VII. FACILITY GEOGRAPHIC LOCATION

LATITUDE (degrees, minutes, & seconds)	LONGITUDE (degrees, minutes, & seconds)
39 03 00N	096 46 00W

VIII. FACILITY OWNER

[X] A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. (area code & no.)
E	

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE
F	G		

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME (print or type)	B. SIGNATURE	C. DATE SIGNED
NEAL CREIGHTON Major General, U.S. Army Commanding	[signature]	

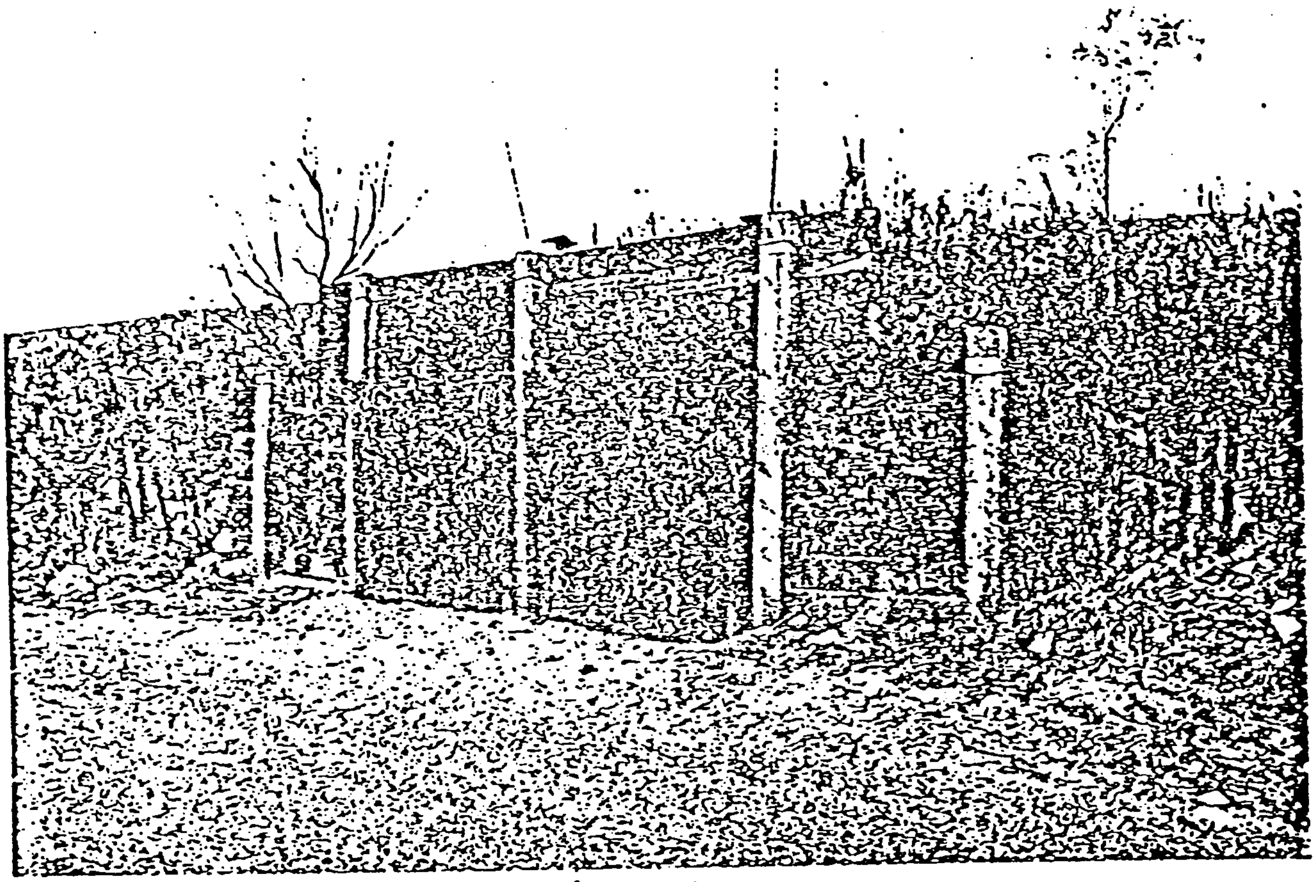
X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME (print or type)	B. SIGNATURE	C. DATE SIGNED
RICHARD D. CARLISLE Lieutenant Colonel, Engineers	Richard D. Carlisle	19 Apr 1983

CONTINUE ON PAGE

SECTION VI PHOTOGRAPHS



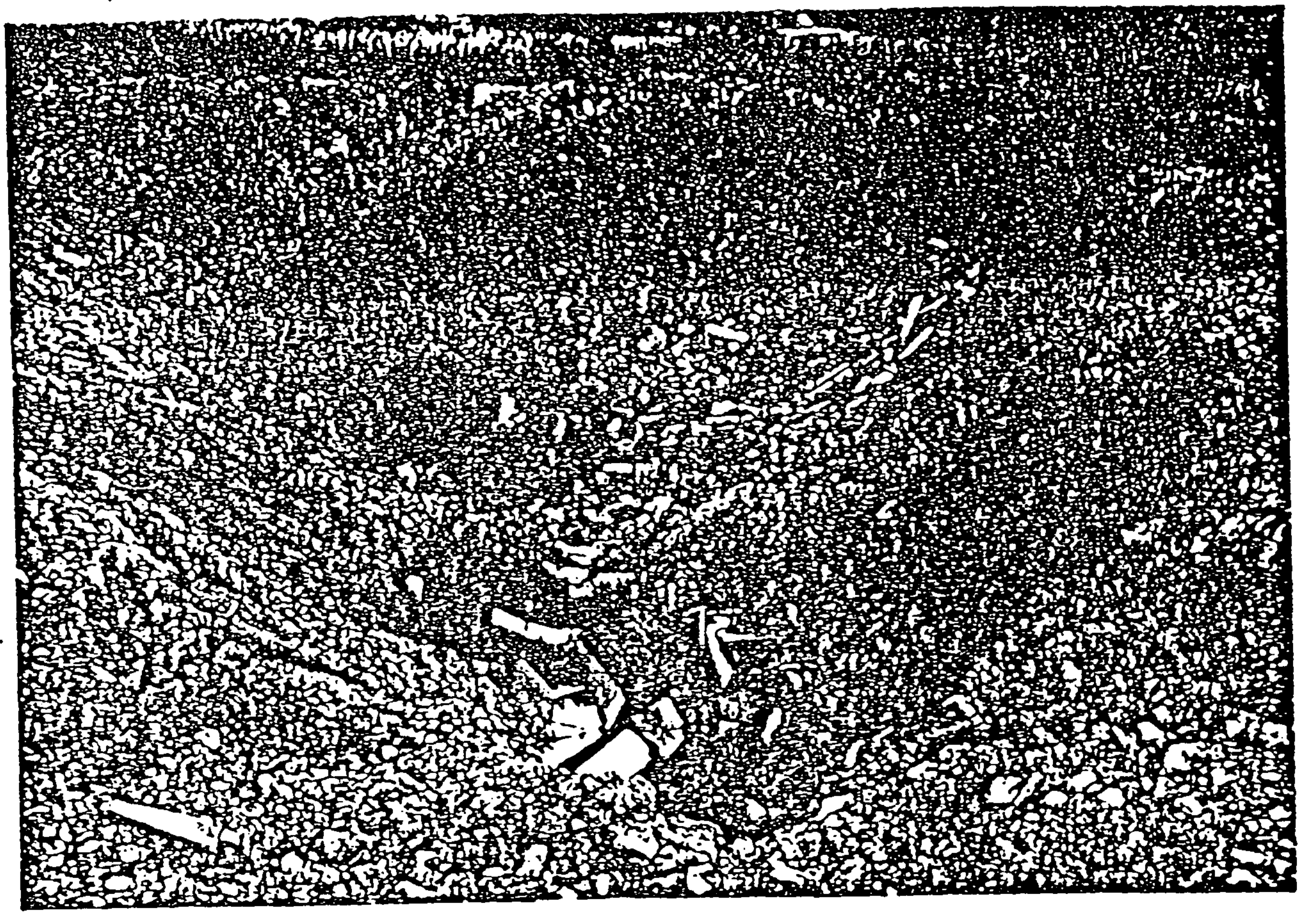
Directorate of Facilities Engineering
Container Storage for Explosives
Area Number 1
November 14, 1980

Continuation Sheet to EPA From 3510-3 (6-80) (Consolidated Permits Program, Form 3, Hazardous Waste Permit Application) KS6214020756

SECTION VI PHOTOGRAPHS

Directorate of Facilities Engineering
Treatment for Neutralized Acid
Custer Hill Sewage Treatment Plant
Photograph not Available

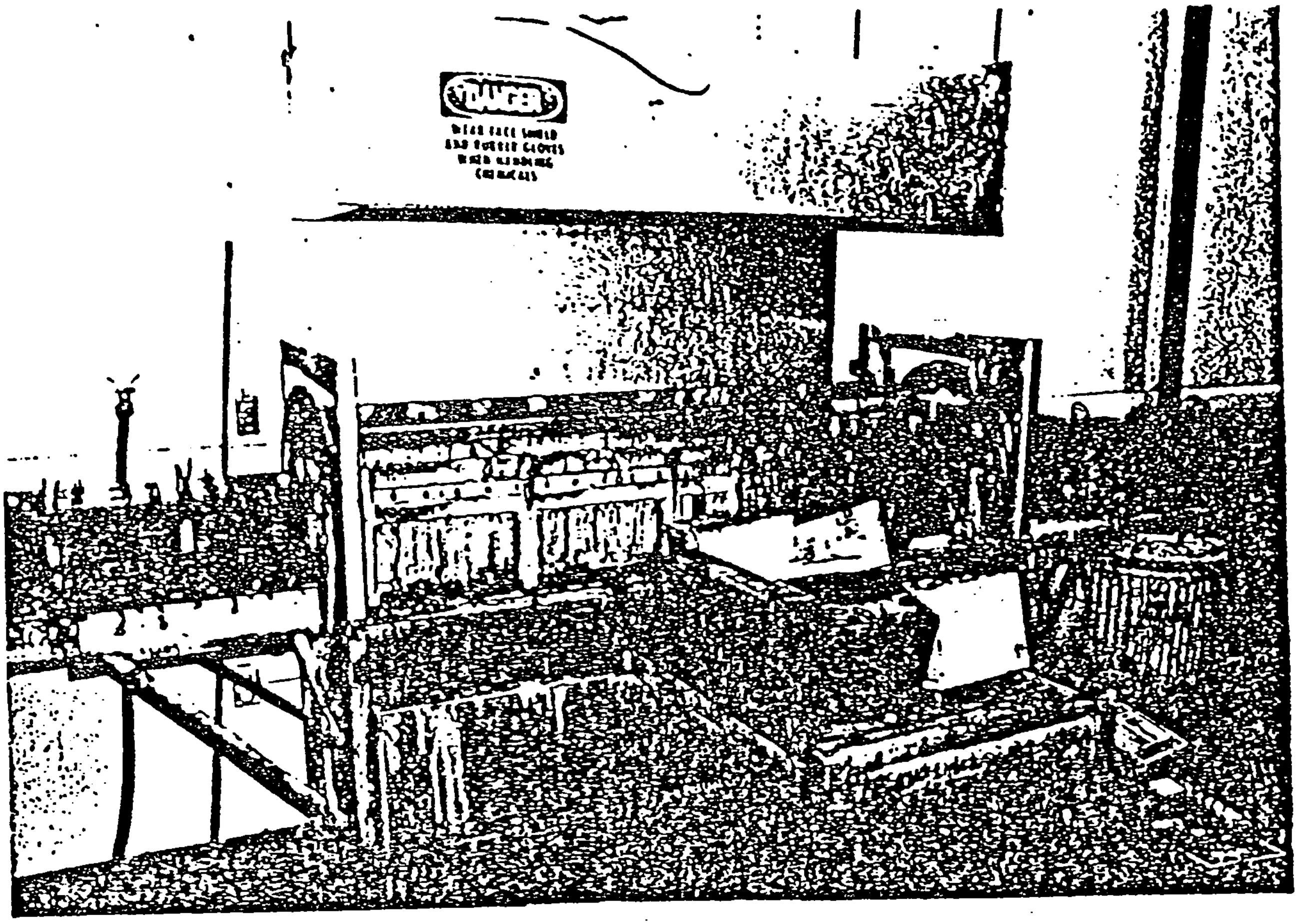
SECTION VI PHOTOGRAPHS



Directorate of Facilities Engineering
Treatment for Explosives
November 14, 1980

Continuation Sheet to EPA From 3510-3 (6-80) (Consolidated Permits Program, Form 3, Hazardous Waste Permit Application) KS6214020756

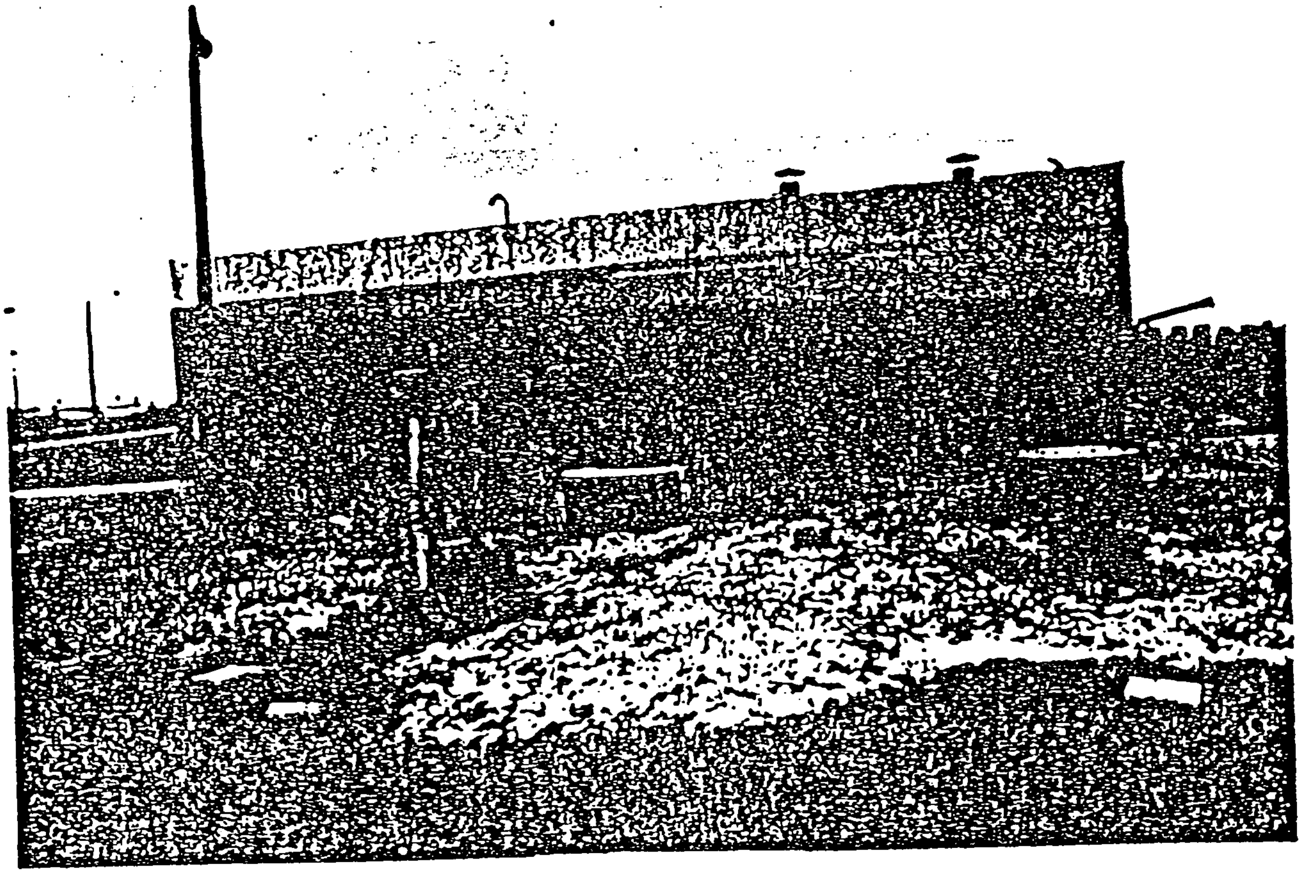
SECTION VI PHOTOGRAPHS



Directorate of Facilities Engineering
Treatment for Sulfuric Acid
Custer Hill Battery Shop

Continuation Sheet to EPA From 3510-3 (6-80) (Consolidated Permits Program, Form 3, Hazardous Waste Permit Application) KS6214020756

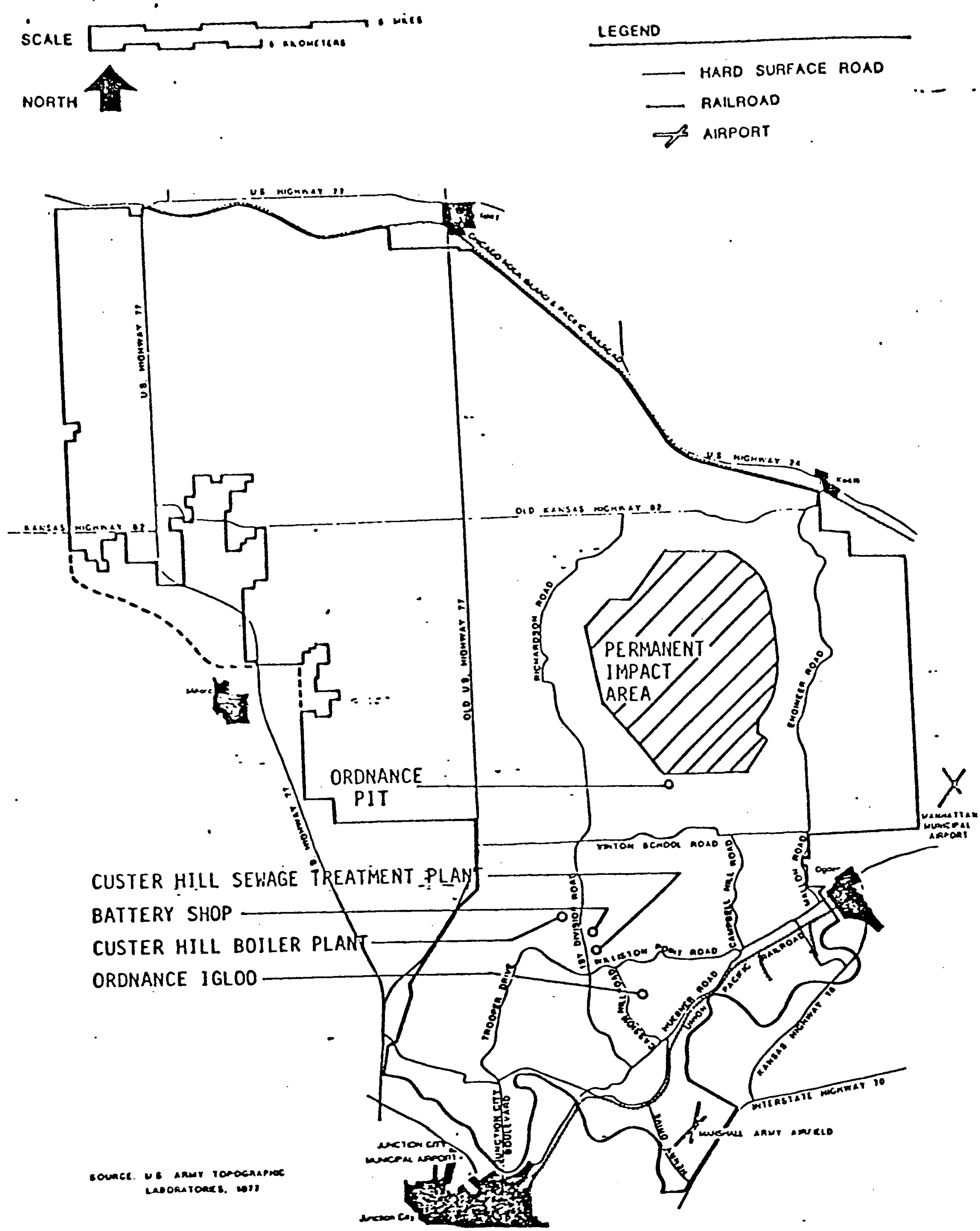
SECTION VI PHOTOGRAPHS



Directorate of Facilities Engineering
Treatment for Xylene
Custer Hill Heating Plant
March 18, 1983

SECTION VI PHOTOGRAPHS

Directorate of Facilities Engineering
Disposal for Unexploded Ordnance
Permanent Impact Area
Photograph not Available


SCALE
NORTH
LEGEND
HARD SURFACE ROAD
RAILROAD
AIRPORT
PERMANENT IMPACT AREA
ORDNANCE PIT
CUSTER HILL SEWAGE TREATMENT PLANT
BATTERY SHOP
CUSTER HILL BOILER PLANT
ORDNANCE IGLOO
OLD KANSAS HIGHWAY 82
KANSAS HIGHWAY 82
U.S. HIGHWAY 77
OLD U.S. HIGHWAY 77
U.S. HIGHWAY 24
RICHARDSON ROAD
ENGINEER ROAD
VINTON SCHOOL ROAD
CAMPBELL HILL ROAD
1ST DIVISION ROAD
HUEBNER ROAD
TROOPER DRIVE
JUNCTION CITY BOULEVARD
INTERSTATE HIGHWAY 70
KANSAS HIGHWAY 18
UNION PACIFIC RAILROAD
MARSHALL ARMY AIRFIELD
MANHATTAN MUNICIPAL AIRPORT
JUNCTION CITY MUNICIPAL AIRPORT
Junction City
SOURCE: U.S. ARMY TOPOGRAPHIC LABORATORIES, 1977

APPENDIX C

REFERENCES

1. Title 40, Code of Federal Regulations (CFR), 1986 rev, Part 261, Identification and Listing of Hazardous Waste.

2. Title 40, CFR, 1986 rev, Part 265, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

3. Kansas Administrative Regulations, Title 28, Article 31, Hazardous Waste Management, Section 28-31-8, Standards for Hazardous Waste Storage, Treatment, and Disposal facilities.

4. EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2d ed, 1982.

RECEIVED 10 DEC 1990

State of Kansas

Mike Hayden, Governor

Department of Health and Environment
Division of Environment

Forbes Field, Bldg. 740, Topeka, KS 66620-0002

Stanley C. Grant, Ph.D., Secretary

Respond to: (913) 296-1613
FAX (913) 296-6247

December 3, 1990

Col. Steven Whitfield
Director of Engineering and Housing
Headquarters, 1st Infantry Division
and Fort Riley
Fort Riley, Kansas 66442-5000

Re: Building 348 and CONEX Closure
EPA I.D. Number KS6214020756

Dear Col. Whitfield:

We have received the closure report dated October 23, 1990 for Building 348 and the CONEXs. Based upon the information contained in this report, the additional information submitted on November 27, 1990 by the Corps of Engineers, and my closure inspection conducted on February 21, 1989 we consider the closure to be complete.

If you have any questions, please feel free to call me at (913) 296-1613.

Sincerely yours,

Martin L. West

Martin L. West
Environmental Engineer
Hazardous Waste Section
Bureau of Air and Waste Management

c. Wes Bartley
Ken Gilman
Missy Anderson

mlw/ftrlcpa.let

PRINTED ON RECYCLED PAPER

Charles Konigsberg, Jr., M.D., M.P.H., Director of Health (913) 296-1343

James Power, P.E., Director of Environment (913) 296-1535

Lorne Phillips, Ph.D., Director of Information Systems (913) 296-1415

Roger Carlson, Ph.D., Director of the Kansas Health and Environmental Laboratory (913) 296-1619

File

DEPARTMENT OF THE ARMY
KANSAS CITY DISTRICT, CORPS OF ENGINEERS
700 FEDERAL BUILDING
KANSAS CITY, MISSOURI 64106-2896

REPLY TO
ATTENTION OF:

November 27, 1990

RECEIVED
30 NOV 1990

Construction Management Branch
Construction Division

SUBJECT: Additional Information Concerning Traces of Pesticide in Test Results in Final Report for Contract Number DACA41-88-C-0068, Hazardous Waste Storage Facility, Building 292 (348) and CONEX Containers, Fort Riley, Kansas

Kansas Department of Health and Environment
Hazardous Waste Section
Bureau of Air and Waste Management
ATTN: Mr. John Paul Goetz
Forbes Field, Building 740
Topeka, Kansas 66620-0002

Dear Mr. Goetz:

Enclosed please find additional explanation of the traces of pesticide shown in the test results contained in the final report for the subject project. This additional information was requested by Martin West of your staff and he indicated that the closure could be finalized upon receipt of this information.

It is hoped that upon review of the additional information the closure certification for the subject project will be accepted by your organization and this phase of environmental cleanup at Fort Riley will reach a conclusion.

Sincerely,

Glen E. Davis

Glen E. Davis
Chief, Construction Division

Enclosure

CF:
R/E, FM-RI
DEH, Ft. Riley, (Greg Sinton)
Kansas Department of Health and
Environment, (Martin WEst)

CEMRK-ED-GE (200-1c)

20 November 1990

MEMORANDUM THRU Chief, Toxic & Hazardous Waste Management Branch, ATTN: ED-TP (M. Anderson)

FOR Chief, Construction Division, ATTN: CD-MQ (K. Leutkemeyer)

SUBJECT: Updated Results of Pesticide Analysis for the Fort Riley Conex Closure

1. The purpose of this memorandum is to provide clarification in answer to a request by the Kansas Department of Health and Environment on the results reported by the United States Army Corps of Engineers (USACE) for the Fort Riley Conex Closure Project. The USACE report was found to be in error since it was based upon preliminary analytical data provided by the Environmental Protection Inspection and Consulting (EPIC) Company, Inc., and will need to be corrected to reflect the findings of the final analytical data report.

2. As requested, the ED-GE staff completed a review of the EPIC raw data packet. The ED-GE chemists were unable to confirm the reported results. In an attempt to clarify the conflicting EPIC reports (i.e., preliminary data reporting positive pesticide contamination; subsequent data reporting negative pesticide contamination), a member of the ED-GE technical staff conducted a telephone conversation with the EPIC Quality Control officer and Pesticide Residue Chemist. During the course of the telephone conversation, it was determined that EPIC had failed to update the preliminary analytical report (positive values reported were the result of conex sample peaks being identified within the same retention window as pesticide standards - this "preliminary data" was reported to the USACE as the project was designated at "time critical") after conducting the required subsequent gas chromatographic electron capture detector second column confirmational analysis (previously reported pesticides for the conex sample were determined to be caused by matrix effects, since the peaks of interest were not found to be within the same retention widow as the pesticide standards on the second column - positive pesticide report updated to report no pesticide contamination, but not forwarded to the USACE as a result of EPIC oversight). The subsequent analysis demonstrates the sample to be free of pesticide contamination at-or-above the minimum detection levels for low environmental samples as analyzed by the United States Environmental Protection Agency (USEPA) Solid Waste Method 8080 and are the analytical data which should be reported.

Therefore, the USACE analytical report for the Fort Riley Conex Closure Project should be updated to show verification of removal of pesticide residues from the previously contaminated conex.

3. Enclosed is the final pesticide report from EPIC.

4. Point of contact for this matter is Mr. Jerry A. Montgomery at extension 7882.

PAUL D. BARBER
Chief, Engineering Division

Encl

CF:
CEMRD-ED-G through CEMRK-ED
CEMRD-ED-GL
CEMRD-ED-GC
ED-X (wo/encl)

November 01, 1990

Mr. Jerry Montgomery
US Army Corps of Engineers
700 Federal Building
601 East 12th Street
Kansas City, Missouri 64106

RE: Conex Decontamination - Ft.Riley, Kansas

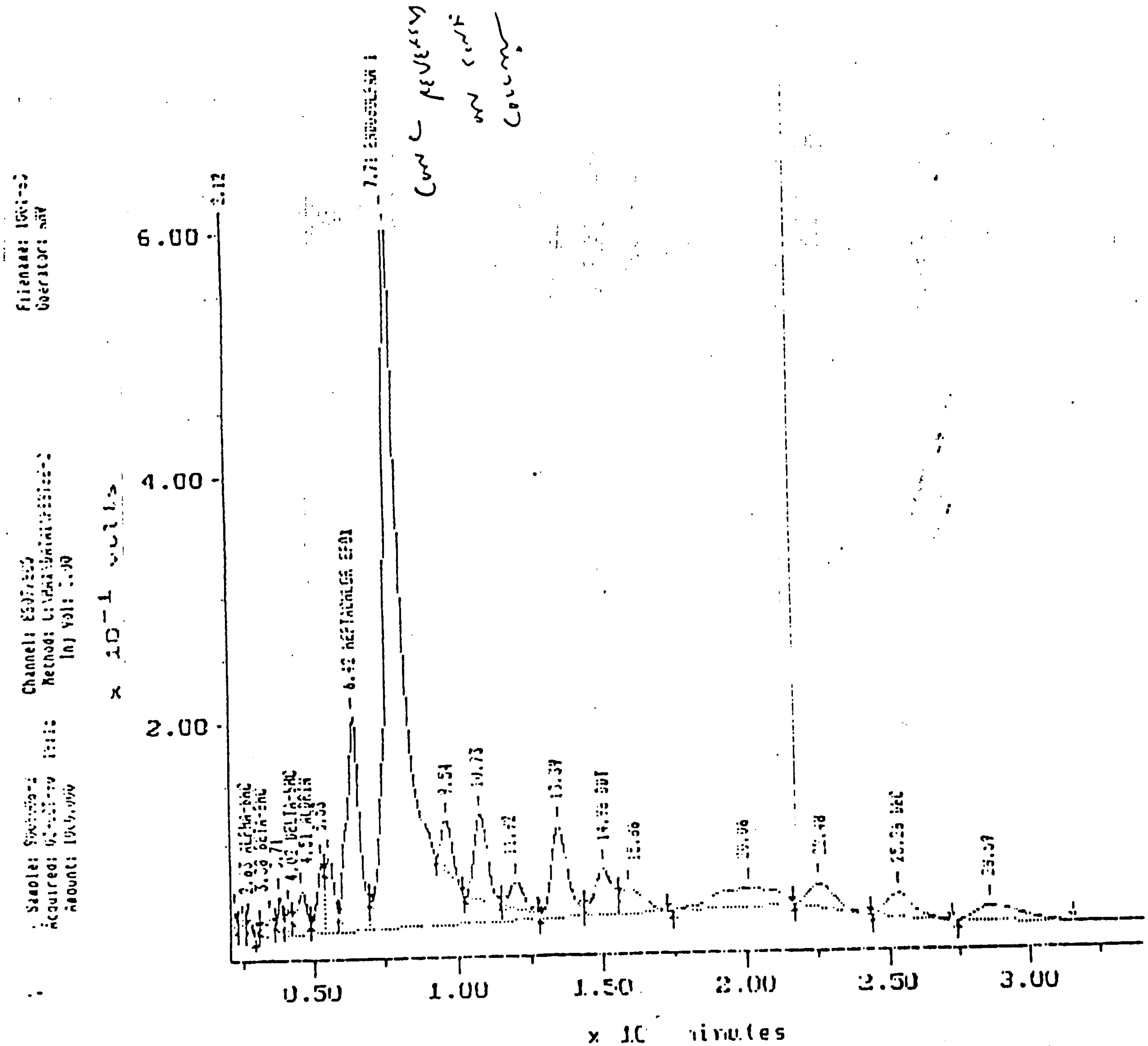
Dear Mr. Montgomery,

Please find enclosed the QA package and chromatograms from Eagle-Pitcher.

Sincerely,

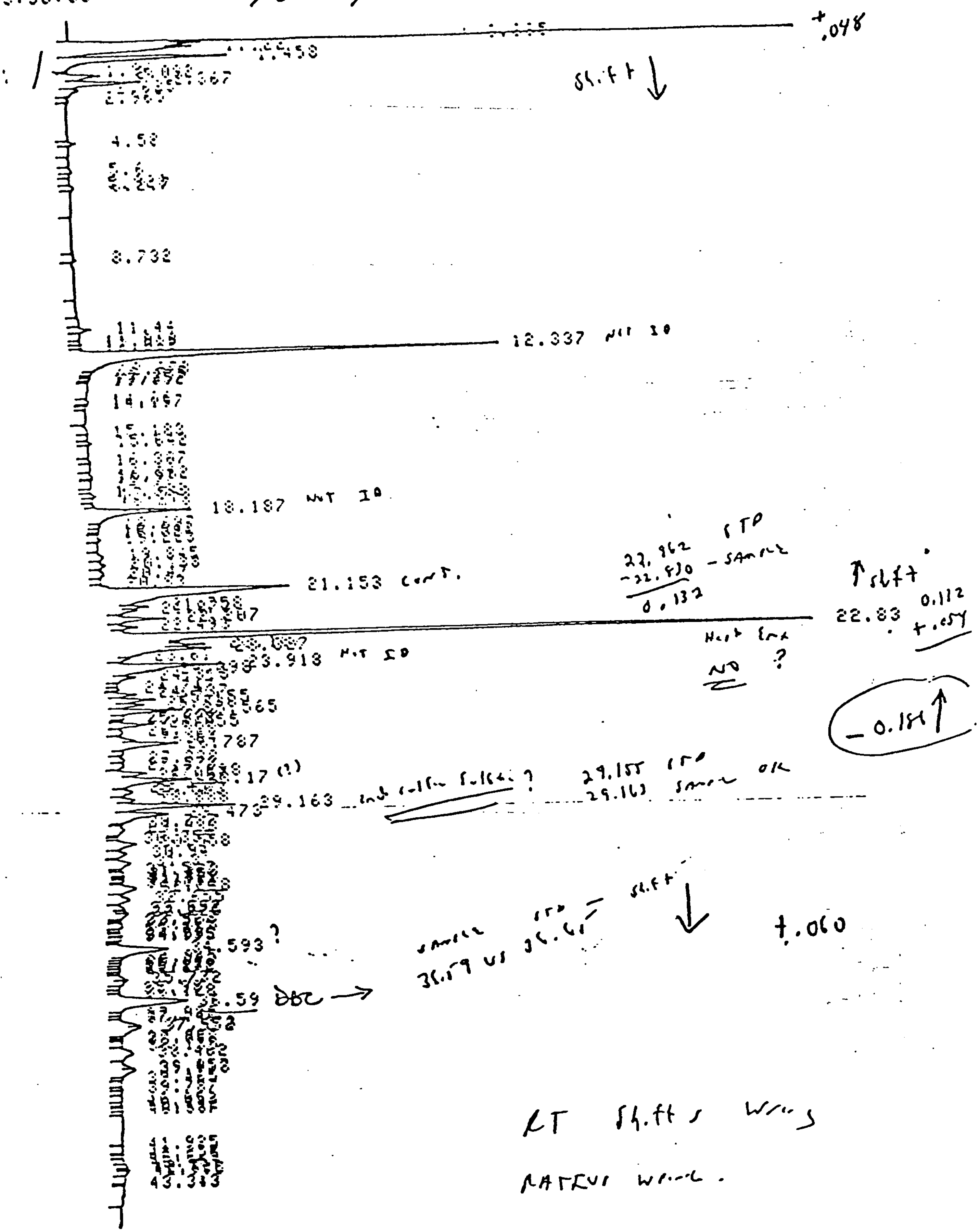
Conny J. Todd
President
E.P.I.C. Company, Inc.

450 DAINS • LIBERTY, MO 64068 • (816) 781-7755



6.00
4.00
2.00
x 10⁻¹ volts
0.50
1.00
1.50
2.00
2.50
3.00
x 10 minutes

83:30:33



CHROMATOPAC C-R3A
SAMPLE NO 8
REPORT NO 3563

FILE 4
METHOD 0021

PKNO TIME AREA MK IDNO CONC NAME

WATER MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

PARAMETER: PESTICIDES/PCB'S
METHOD: EPA 8080
CLIENT: EPIC
CLIENT SAMPLE ID: FORT RILEY CONEX BLDG. 348
EP-ES SAMPLE ID: 90-09-006-02A
DM FILE ID: 9006.QA

COMPOUND	SPIKE ADDED UG/L	SAMPLE CONCENTRATION UG/L	MS CONCENTRATION UG/L	MS % REC
GAMMA-BHC (LINDANE)	0.4	<.04	0.96	240
HEPTACHLOR	0.4	<.03	1.25	313
ALDRIN	0.4	<.04	0.89	223
DIELDRIN	1.0	<.02	<.02	0
ENDRIN	1.0	<.06	<.06	0
4,4-DDT	1.0	<.12	4.72	472

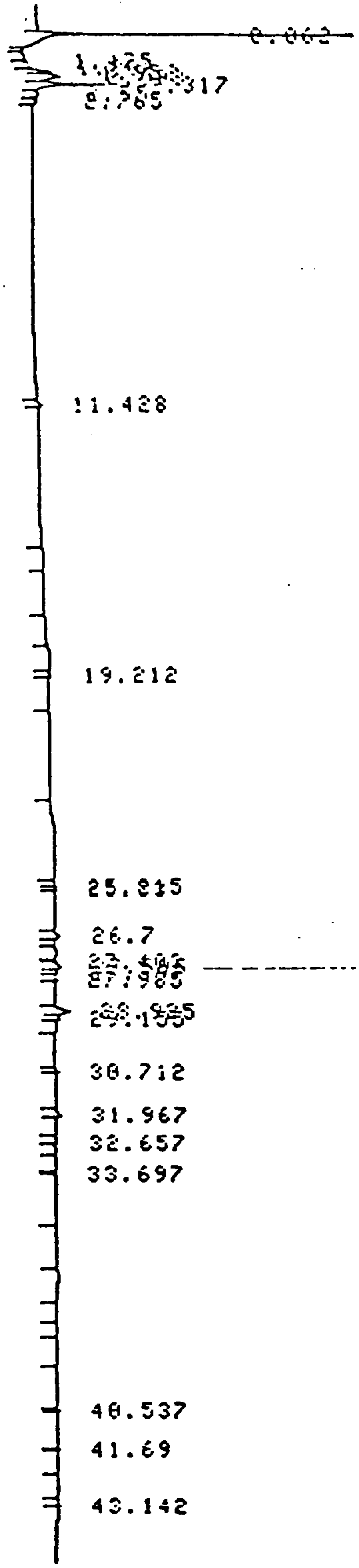
OUT-OF-CONTROL

COMPOUND	SPIKE ADDED UG/L	SAMPLE CONCENTRATION UG/L	MSD CONCENTRATION UG/L	MSD % REC	% RPD
GAMMA-BHC (LINDANE)	0.4	<.04	0.91	228	5
HEPTACHLOR	0.4	<.03	1.15	288	8
ALDRIN	0.4	<.04	.81	203	9
DIELDRIN	1.0	<.02	<.02	0	------
ENDRIN	1.0	<.06	<.06	0	------
4,4-DDT	1.0	<.12	3.45	345	31

OUT-OF-CONTROL

ERROR 10:NOT OPEN'D PORT IN/T 0.01
30/06/03
01:35:30

Blank



CHROMATOPAC C-R3A FILE 4
SAMPLE NO 0 METHOD 8021

MAXIMA (C) 1990 Dynamic Solutions, Division of Millipore

MAXIMA 820 CUSTOM REPORT

Printed: 5-OCT-1990 14:42:12

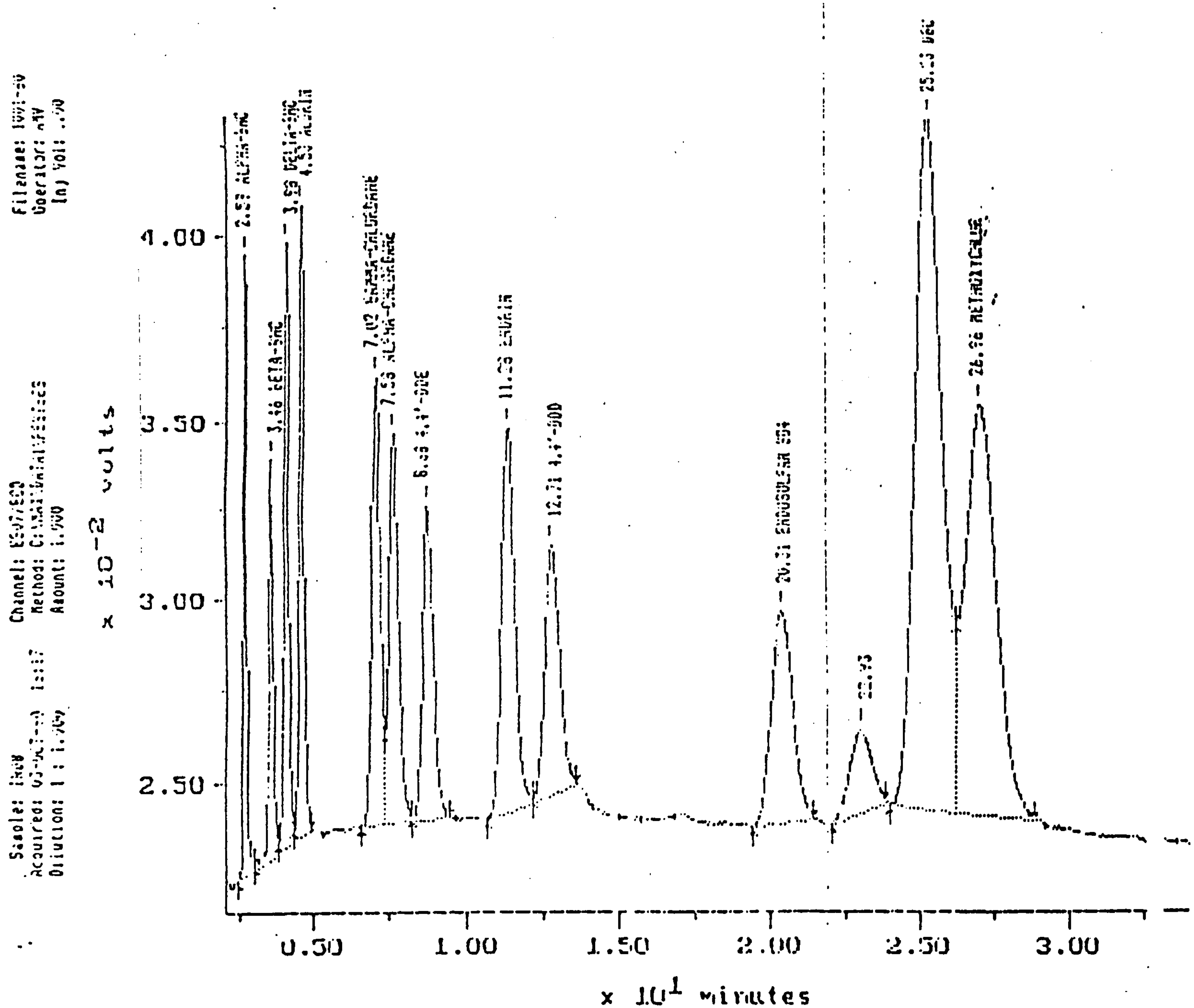
SAMPLE: 1MDA

Used in Method: 8080/CLP PESTICIDES
Acquired: 3-OCT-1990 15:40
Rate: 2.0 points/sec
Duration: 34.000 minutes
Operator: AAV

Type: Unkn
Instrument: E597
Filename: 1001-79
Index: Disk
Injection Volume: 2.0
Dilution: 1.000
Amount: 1.000

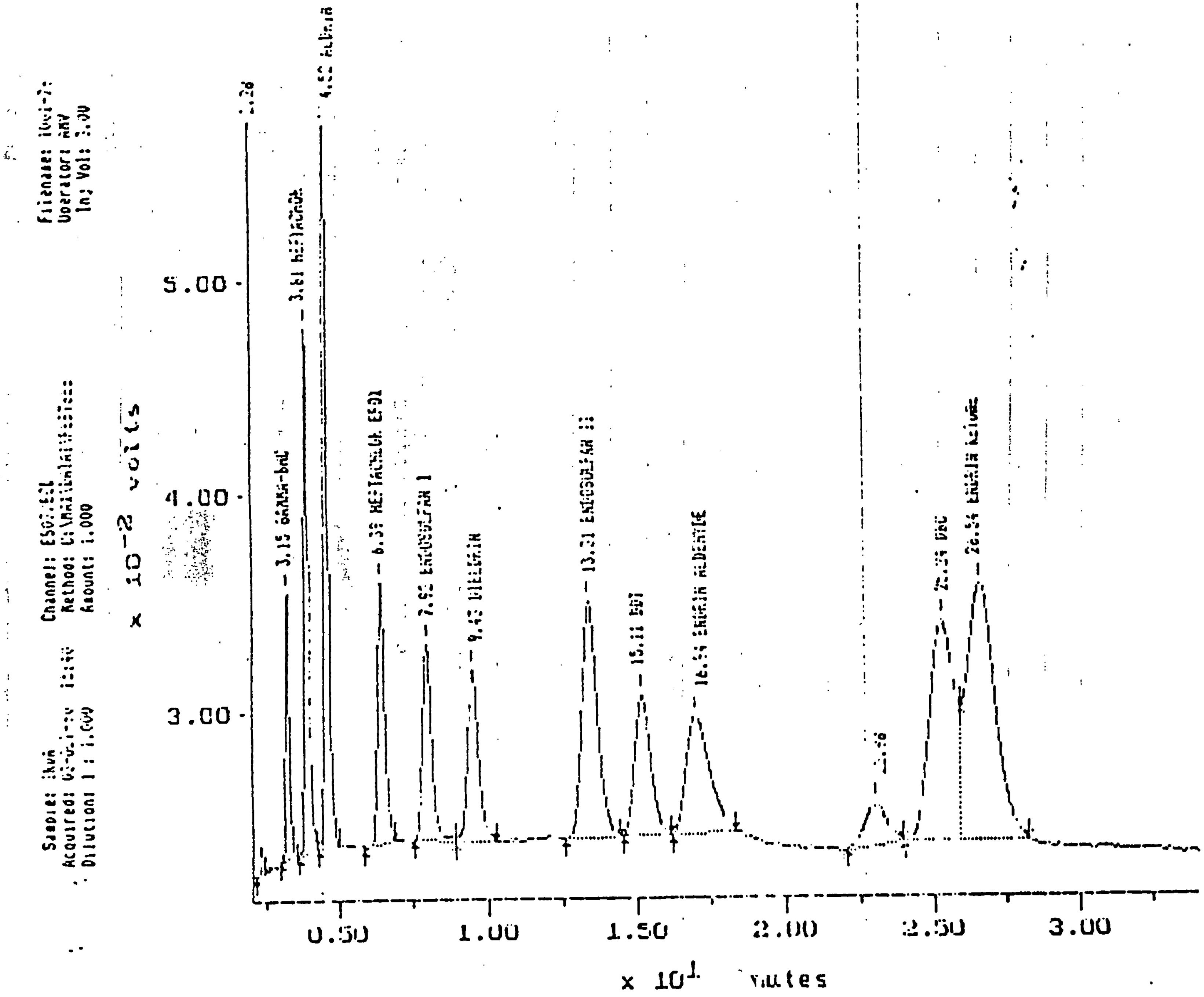
DETECTOR: ESCI.ECD

PK#	ID#	Retention Time (minutes)	Component Name	Type	Peak Area	Peak Response	Response Factor (NG/ML/AREA)	Solution Conc (NG/ML)	Original Conc (UG/L)
1		2.253		BB	2174				
2	4	3.150	GAMMA-BHC	BB	101951	101950.7225	0.000	9.21	92.05
3	6	3.805	HEPTACHLOR	BB	244291	244291.4656	0.000	20.69	206.90
4	8	4.517	ALDRIN	BB	297433	297433.4325	0.000	26.95	269.50
5	9	6.392	HEPTACHLOR EPOX	BB	172961	172961.4706	0.000	17.63	176.25
	12	7.917	ENDOSULFAN I	BP	167125	167125.1157	0.000	20.30	202.98
	14	9.425	DIELDRIN	PB	196212	196212.5297	0.000	21.70	206.99
6	17	10.506	ENDOSULFAN II	BB	364640	364634.6652	0.000	40.32	403.18
7	18	11.195	DDT	BB	229163	229162.6025	0.000	39.32	393.47
10	19	16.942	ENDRIN ALDEHYDE	BB	293064	293064.4332	0.000	46.06	460.77
11		22.975		BB	69570				
12	21	23.242	DBC	BP	579368	579368.1317	0.000	90.59	905.88
13	22	26.242	ENDRIN KETONE	PB	602272	602271.9504	0.001	249.77	2497.67
TOTAL					3713689			556.25	5562.79


4.00
3.50
3.00
2.50
x 10^-2 volts
0.50
1.00
1.50
2.00
2.50
3.00
x 10^1 minutes

5	2.145	91474	V	0.6857
6	2.49	21577	V	0.1617
7	2.577	12551	V	0.0941
8	2.677	18489	V	0.1386
9	2.935	3850	V	0.0289
10	5.492	3051		0.0229
11	5.862	5185	V	0.0389
12	5.98	1155	V	0.0087
13	6.38	1326		0.0099
14	8.967	2675		0.0201
15	11.053	1440		0.0108
16	11.38	8682	V	0.0651
17	11.663	4059		0.0304
18	11.792	258	V	0.0019
19	12.277	1010		0.0076
20	12.787	10828		0.0812
21	13.043	1125	V	0.0084
22	13.217	1628	V	0.0122
23	13.478	576		0.0043
24	13.837	605		0.0045
25	13.983	293		0.0022
26	14.002	697	V	0.0052
27	14.062	189	V	0.0014
28	15.583	3106		0.0233
29	16.263	340342	S	2.5513
30	16.613	188	T	0.0014
31	17.105	287		0.0022
32	17.307	127622	V	0.9567
33	17.533	353616	SV	2.6508
34	17.957	768	T	0.0058
35	18.128	459	TV	0.0034
36	18.415	305671	V	2.2914
37	19.167	41192	V	0.3088
38	19.6	663		0.005
39	20.003	981		0.0074
40	20.283	317849	V	2.3827
41	20.558	999	V	0.0075
42	21.107	303958		2.2785
43	21.553	352348	SV	2.6413
44	21.892	412	T	0.0031
45	22.582	7533		0.0565
46	22.962	298755	V	2.2395
47	23.798	12502		0.0937
48	23.972	1602	V	0.012
49	24.27	301784		2.2622
50	24.585	843	V	0.0063
51	24.8	478		0.0036
52	24.955	662	V	0.005
53	25.155	482518		3.617
54	25.3	549278	SV	4.1175
55	25.488	2093	T	0.0157
56	25.677	441	T	0.0033
57	25.805	1541	TV	0.0116
58	25.835	596	TV	0.0045
59	25.925	302	TV	0.0023
60	26.262	504269	V	3.7801
61	26.65	338889	V	2.5404
62	27.052	1106183	V	8.2921
63	27.563	103683	V	0.7772

62	[illegible]	1106193	V	8.2921
63	27.563	103683	V	0.7772
64	27.757	36876	V	0.2764
65	28.012	3564	V	0.0267
66	28.142	11259	V	0.0844
67	28.308	3713	V	0.0278
68	28.355	2875	V	0.0215
69	28.585	30680	V	0.23
70	28.923	1006566	V	7.5454
71	29.155	1217798	SV	9.1288
72	29.543	106	T	0.0008
73	29.595	581	T	0.0044
74	29.67	665	T	0.005
75	29.79	7104	TV	0.0532
76	30.405	446		0.0033
77	30.735	860564	SV	6.4509
78	31.042	218	T	0.0016
79	31.107	1047	TV	0.0078
80	31.243	176	T	0.0013
81	31.272	234	TV	0.0018
82	31.303	380	TV	0.0028
83	31.355	124		0.0009
84	31.388	528	V	0.004
85	31.658	706		0.0053
86	31.963	530371	SV	3.9758
87	32.355	293	T	0.0022
88	32.443	249	T	0.0019
89	32.615	758	T	0.0057
90	32.75	725	TV	0.0054
91	33.3	573927		4.3023
92	34.27	741		0.0056
93	34.355	1343		0.0101
94	34.533	528		0.004
95	34.948	1398		0.0105
96	35.02	2789	V	0.0209
97	35.165	538	V	0.004
98	35.79	182392	S	1.3672
99	36.102	325	T	0.0024
100	36.178	1133		0.0085
101	36.65	991049	V	7.4291
102	37.658	283		0.0021
103	39.062	469		0.0035
104	39.127	232	V	0.0017
105	39.187	474	V	0.0036
106	39.222	285	V	0.0021
107	39.253	162	V	0.0012
108	39.44	401		0.003
109	39.507	792		0.0059
110	40.01	307		0.0023
111	40.158	64	V	0.0005
112	40.505	229		0.0017
113	40.858	495		0.0037
114	40.937	1341		0.0101
115	41.13	703		0.0053
116	41.242	141		0.0011
117	41.623	1590		0.0119
118	41.792	1440	V	0.0108
119	41.94	1623	V	0.0122
120	42.028	489		0.0037
[illegible]	[illegible]			



Amount: 1.000
5.00
4.00
3.00
x 10-2 volts
3.15 GAMMA-BHC
3.81 HEPTACHLOR
6.39 HEPTACHLOR EPOX
7.92 ENDOSULFAN I
9.43 DIELDRIN
13.31 ENDOSULFAN II
15.11 DDT
16.94 ENDRIN ALDEHYDE
26.54 ENDRIN KETONE
0.50
1.00
1.50
2.00
2.50
3.00
x 10¹ minutes

Con firmation Run

DAILY INSTRUMENT WORK LOG

Date: 10-15-90
Analyst(s): [illegible]
Start Time: 1230
Stop Time: ~~[illegible]~~ 1700

Instrument No: ES06
Detector Type: ECD
Method Number: 8080

Column: Length 30M
Body: Glass
I.D. 0.53
Silica ✓
Other
Packing/Phase DB-5

Temp. Program:
T-int. 120 °C
T-fin. 250 °C
H-int. 2 min.
H-fin. 20 min.
ΔT/Δm 6 °C
Total Run Time 45
Inj. Quant. (ul) 3.0
Area System Standard:

Run Number	Sample Description	Dilution
3560	Cap. Pest 3-132-4	
3561	Hexane Blank	
3562	9009006-2	1000
3563	9009006-2 Confirming	100
3564	Cap Pest 3-132-5	
	Not confirmed this day pesticide!!	

ROUTINE MAINTENANCE:

(c:\wp\forms\worklog.frm)

EAGLE PICHER

MAXIMA (C)1990 Dynamic Solutions, Division of Millipore

MAXIMA 820 CUSTOM REPORT

Printed: 5-OCT-1990 14:52:53

SAMPLE: [illegible]
608 IN Method: 8080/CLP PESTICIDES
Acquired: 3-OCT-1990 15:15
Rate: 2.0 points/sec
Duration: 34.000 minutes
Operator: ARV

Type: UNKN
Instrument: [illegible]
Filename: 1001-02
Inject: Disk
Injection Volume: 2.0
Amount: 1000.000

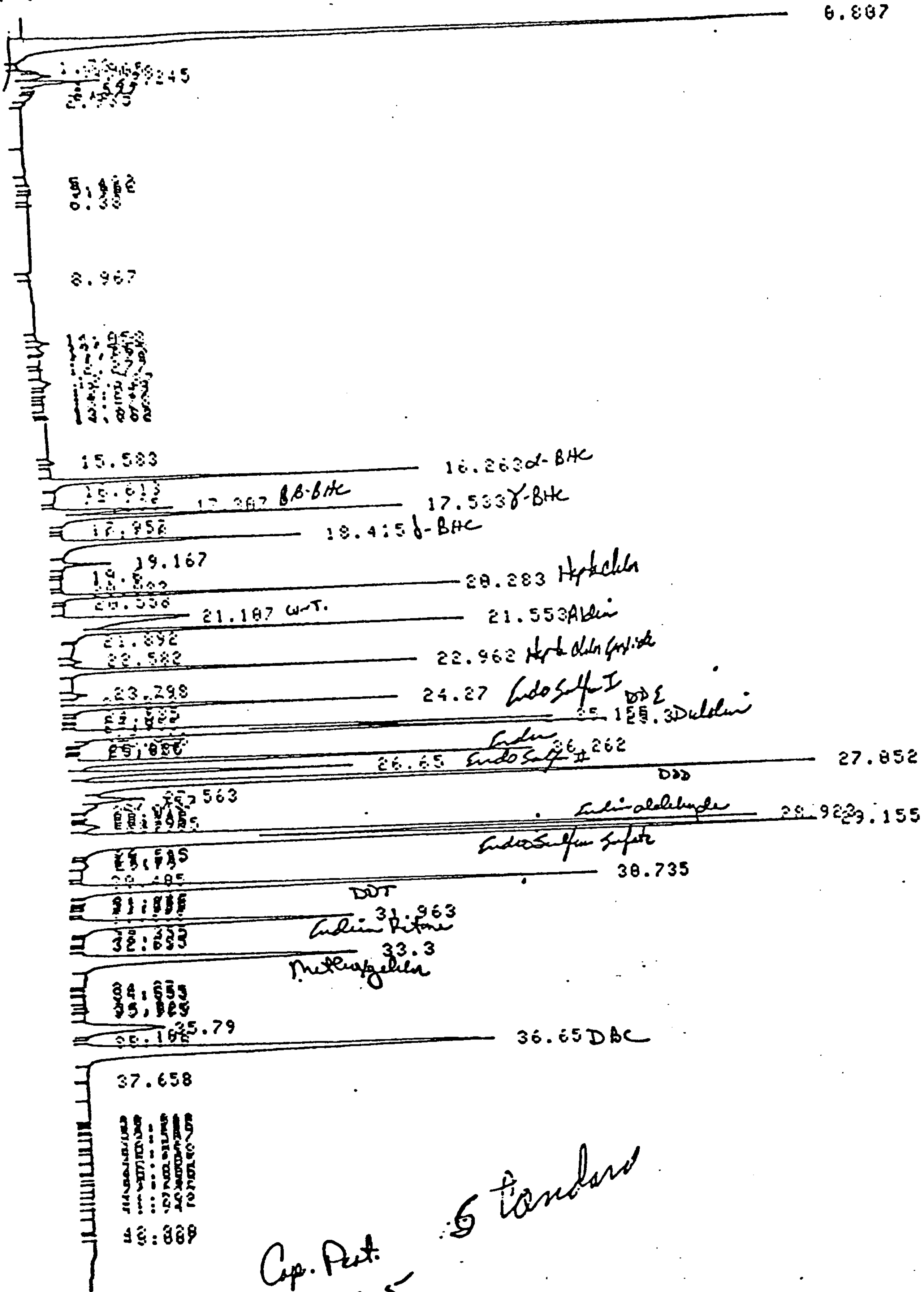
DETECTOR: [illegible]

Pk#	ID#	Retention Time (minutes)	Component Name	Type	Peak Area	Peak Response	Response Factor (RU/RL/AREA)	Solution Conc (Ng/ML)	Original Conc (UG/L)
1		[illegible]		BP	[illegible]				
2		[illegible]		PP	43/ve				
3	3	[illegible]	ALPHA-BHC	PP	57011	57010.6974	0.000	6.37	0.06
4	4	[illegible]	GAMMA-BHC	PP	40470	40470.0	0.000	4.01	0.04
5	5	[illegible]	BETA-BHC	PP	[illegible]	[illegible]!	0.000	[illegible]!	0.42:
6		[illegible]		PP	[illegible]				
7	7	4.017	DELTA-BHC	PP	257665	257664.6666	0.000	25.7	0.29
8	8	[illegible]	ALDRIN	PP	646574	[illegible]!!	0.000	64.67!!	0.61!!
9		5.[illegible]		PP	1103603				
10		[illegible]		PP	1066920				
11	9	6.417	HEPTACHLOR EPOX	PP	5313529	5313529.4422!!	0.000	530.67!:	5.31!!
12	12	7.702	ENDOSULFAN I	PP	29006732	29006732.1893!!	0.000	3109.27!!	31.09!!
13		9.542		SS	1004514				
14		10.725		SP	2119639				
15		11.917		VS	714344				
16		13.372		PP	2210022				
17	16	14.936	DDT	PP	1544310	1544310.1191!!	0.000	241.34!!	2.41!!
18		15.606		PB	946347				
19		20.056		BB	2117012				
20		22.475		BB	1113623				
21	21	25.256	DBC	BB	1091665	1091665.4550	0.000	163.33	1.60
22		26.592		BB	1190564				
TOTAL					53253667			4160.67!!	41.61!!

!! Result calculation based on peak response more than 10% outside of calibration range.
: Result calculation based on peak response ratio outside of calibration range.

67	27.383	42514		0.6318
68	28.007	5724	V	0.0851
69	28.17	155564	SV	2.3119
70	28.457	111	T	0.0016
71	28.573	30645	V	0.4554
72	28.888	29075	V	0.4321
73	29.163	186388	V	2.77
74	29.473	109692	SV	1.6302
75	29.787	292	T	0.0043
76	29.983	11699	V	0.1739
77	30.355	535		0.0079
78	30.558	31816	V	0.4728
79	30.94	13953		0.2074
80	31.3	28937		0.43
81	31.587	3327	V	0.0494
82	31.673	11449	V	0.1701
83	31.79	2625	V	0.039
84	31.85	3330	V	0.0495
85	31.898	4139	V	0.0615
86	31.962	6063	V	0.0901
87	32.072	2336	V	0.0347
88	32.238	41475	V	0.6164
89	32.655	29416	V	0.4372
90	33.032	11275	V	0.1676
91	33.092	2004	V	0.0298
92	33.175	8612	V	0.128
93	33.22	16756	V	0.249
94	33.472	1449	V	0.0215
95	33.5	2044	V	0.0304
96	33.56	605	V	0.009
97	33.628	7602	V	0.113
98	33.837	1381		0.0205
99	33.91	1635	V	0.0243
100	34.03	4272	V	0.0635
101	34.092	1751	V	0.026
102	34.135	3294	V	0.049
103	34.593	129056	S	1.9179
104	34.945	694	T	0.0103
105	35.093	396	T	0.0059
106	35.19	824	T	0.0122
107	35.282	960	TV	0.0143
108	35.373	555	T	0.0082
109	35.73	7990		0.1187
110	35.772	8041	V	0.1195
111	35.98	1392		0.0207
112	36.128	1640		0.0244
113	36.59	184156	V	2.7368
114	37.002	2217	V	0.0329
115	37.143	1536	V	0.0228
116	37.473	32756	V	0.4868
117	37.552	41100	V	0.6108
118	37.927	1809	V	0.0269
119	38.008	1633	V	0.0243
120	38.135	4186	V	0.0622
121	38.462	34745	V	0.5164
122	39.057	18025	V	0.2679
123	39.113	24512	V	0.3643
124	39.465	901	V	0.0134

06/06/83
08:29:34



Standard

Cap. Pest.
3-132-5

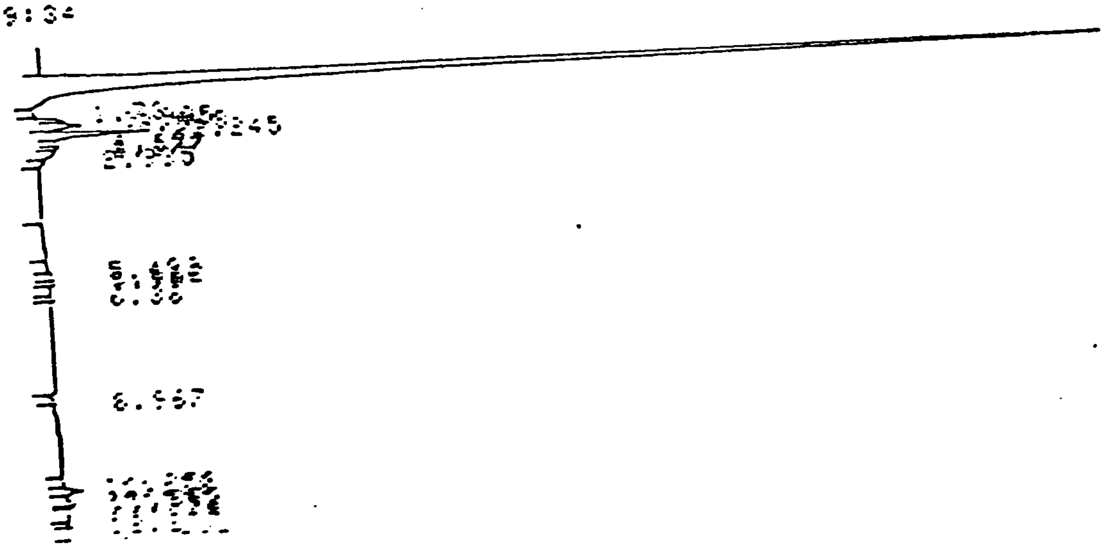
CHROMATOPAC C-R3A
SAMPLE NO 0
REPORT NO 3564

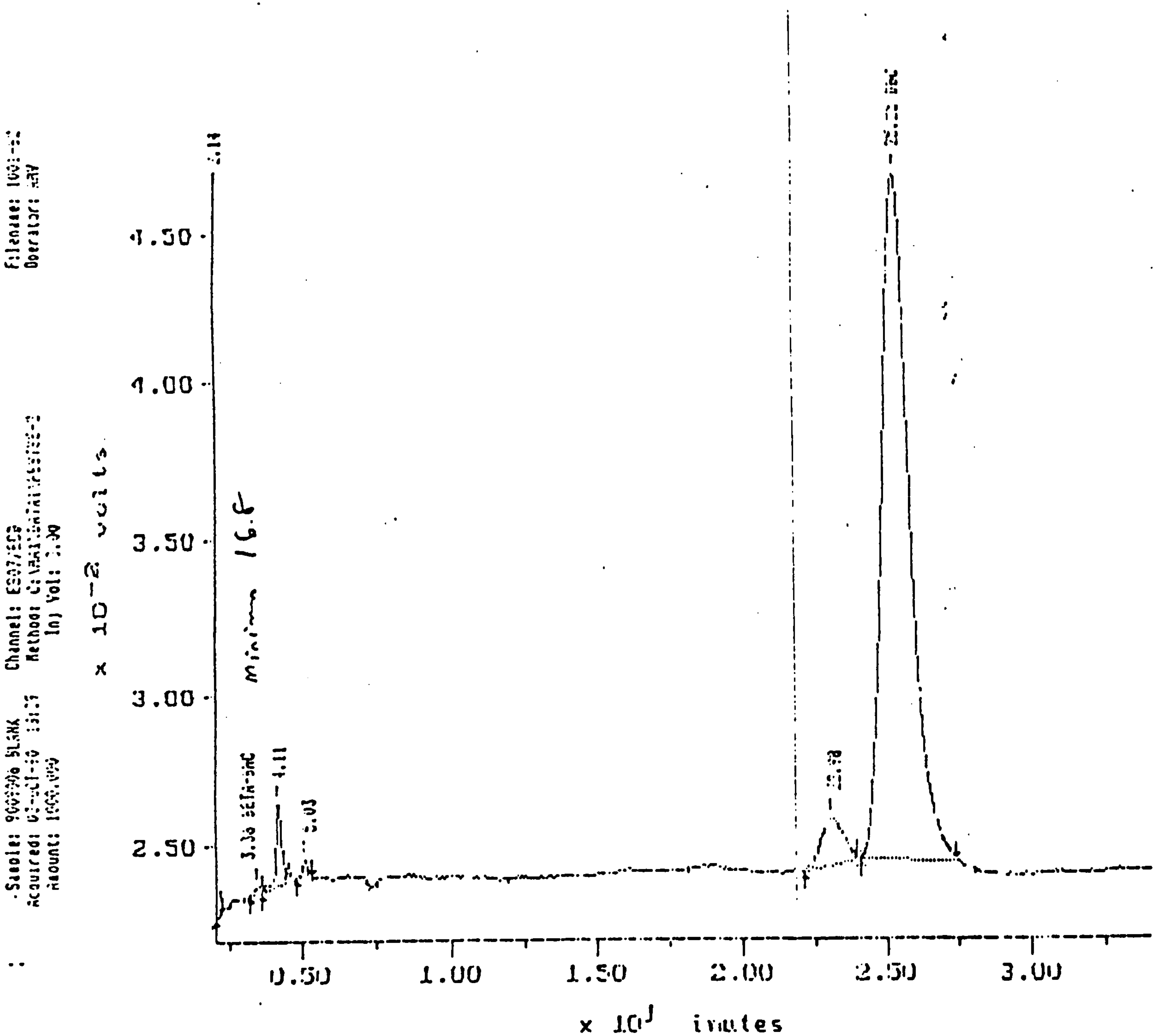
FILE 4
METHOD 0021

118	37.927	[illegible]		0.0[illegible]
119	38.008	1632	V	0.0622
120	38.135	4186	V	0.5164
121	38.462	34745	V	0.2679
122	39.057	18025	V	0.3643
123	39.113	24512	V	0.6134
124	39.465	901	V	0.0122
125	39.787	824		0.0294
126	40.053	1980		0.0165
127	40.29	1110		0.0104
128	40.442	700	V	0.0167
129	40.587	726	V	0.004
130	41.925	268		0.0036
131	42.258	243		0.0094
132	42.325	631	V	0.0371
133	42.45	2493		0.1036
134	42.71	6974	V	0.0743
135	42.822	4998	V	0.0539
136	42.905	3627	V	0.0021
137	43.313	139		0.006
138	43.343	537	V	
	TOTAL	6728905		100

START
ERROR 10:NOT OPEN'D PORT IN,T 0.01
05/08/03
08:29:34

6.367





[illegible] Waters Dynamic Solutions, Division of Millipore

MAXIMA 820 CUSTOM REPORT

Printed: [illegible]-OCT-1990 [illegible]

SAMPLE: [illegible] BLANK
Acq in Method: [illegible] PESTICIDES
Acquired: [illegible]-OCT-1990 [illegible]
Rate: 2.0 points/sec
Duration: [illegible] minutes
Operator: AHV

Type: UNKN
Instrument: [illegible]
Filename: [illegible]
Index: DISK
Injection Volume: [illegible]
Amount: 1000.000

DETECTOR: [illegible]

Pk#	ID#	Retention Time (minutes)	Component Name	Type	Peak Area	Peak Response	Response Factor (NG/ML/AREA)	Solution Conc (NG/ML)	Original Conc (UG/L)
1		1.142		BB	1201				
2	5	3.35[illegible]	BETA-BHC	BP	2464	2464.1160!!	0.001	0.7[illegible]!!	0.01!!
3		4.108		PB	35[illegible]91				
4		5.[illegible]		BB	7165				
5		21.963		BB	73478				
6	21	25.250	DBC	BB	1466769	1466768.5943!!	0.000	224.24!! 112%	2.24!!
					1609066			225.13!!	2.25!!

!! Result calculation based on peak response more than 10% outside of calibration range.

4	1.96	3589		0.0533
5	2.092	58516	V	0.8696
6	2.367	110270	V	1.6387
7	2.625	22444	V	0.3335
8	2.965	3282	V	0.0488
9	4.58	5705		0.0848
10	5.6	2964		0.044
11	5.920	1031		0.0153
12	6.217	3915		0.0582
13	8.732	6003		0.0892
14	11.44	10292		0.153
15	11.918	1362		0.0202
16	12.082	924		0.0137
17	12.337	793167	S	11.7875
18	12.978	187	T	0.0028
19	13.135	212	T	0.0031
20	13.257	583	TV	0.0087
21	13.352	151	T	0.0022
22	14.06	2582		0.0384
23	14.197	146	V	0.0022
24	15.183	7219		0.1073
25	15.642	3900		0.058
26	16.307	2009		0.0299
27	16.862	3313		0.0492
28	16.97	302	V	0.0045
29	17.382	848		0.0126
30	17.598	3746	V	0.0557
31	18.018	2339		0.0348
32	18.187	209939	SV	3.12
33	18.697	1358	T	0.0202
34	18.942	357	T	0.0053
35	19.02	403	T	0.006
36	19.223	4787	T	0.0711
37	19.845	12711		0.1889
38	20.188	12322	V	0.1831
39	20.47	11238	V	0.167
40	20.83	1372	V	0.0204
41	21.153	604759		8.9875
42	21.758	52863	V	0.7856
43	21.873	50231	V	0.7465
44	22.207	101043	V	1.5016
45	22.493	42770	V	0.6356
46	22.83	1371441	V	20.3813
47	23.167	174388	V	2.5916
48	23.327	185077	V	2.7505
49	23.61	24341	V	0.3617
50	23.918	184407	V	2.7405
51	24.098	38623	V	0.574
52	24.313	24750	V	0.3678
53	24.747	1549		0.023
54	24.937	20410		0.3033
55	25.155	49086	V	0.7295
56	25.338	30733	V	0.4567
57	25.565	81861	V	1.2166
58	25.778	9366	V	0.1392
59	25.892	2414	V	0.0359
60	25.922	2004	V	0.0298
61	26.055	34960	V	0.5195

PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT: EPIC
DATA FILE ID: 9006-MB.PT
CLIENT SAMPLE ID: FT RILEY CONEX BLDG. 348 METHOD BLANK
LAB SAMPLE ID: 90-09-006-MB
LAB FILE ID: 1001-82
DATE RECEIVED: 9/4/90
DATE ANALYZED: 10/1/90
DILUTION FACTOR: 1.0
MATRIX: WATER

COMPOUND	CAS. NUMBER	CONCENTRATION UNITS UG/L	DETECTION LIMIT UG/L
ALDRIN	309-00-2	< DL	0.04
ALPHA-BHC	319-84-6	< DL	0.03
BETA-BHC	319-85-7	< DL	0.06
DELTA-BHC	319-86-8	< DL	0.09
GAMMA-BHC (LINDANE)	58-89-9	< DL	0.04
CHLORDANE	57-74-9	< DL	0.14
4,4'-DDD	72-54-8	< DL	0.11
4,4'-DDE	72-55-9	< DL	0.04
4,4'-DDT	50-29-3	< DL	0.12
DIELDRIN	60-57-1	< DL	0.02
ENDOSULFAN I	959-98-8	< DL	0.14
ENDOSULFAN II	33212-65-9	< DL	0.04
ENDOSULFAN SULFATE	1031-07-8	< DL	0.66
ENDRIN	72-20-8	< DL	0.06
ENDRIN ALDEHYDE	7421-93-4	< DL	0.23
HEPTACHLOR	76-44-8	< DL	0.03
HEPTACHLOR EPOXIDE	1024-57-3	< DL	0.83
METHOXY CHLOR	72-43-5	< DL	1.76
TOXAPHENE	8001-35-2	< DL	2.4
PCB-1016	12674-11-2	< DL	1.0
PCB-1221	1104-28-2	< DL	1.0
PCB-1232	11141-16-5	< DL	1.0
PCB-1242	53469-21-9	< DL	1.0
PCB-1248	12672-29-6	< DL	1.0
PCB-1254	11097-69-1	< DL	1.0
PCB-1260	11096-82-5	< DL	1.0

ok

SURROGATE	% RECOVERY
DBC	112

WATER METHOD SPIKE RECOVERY

METHOD: EPA 8080
CLIENT: EPIC
CLIENT SAMPLE ID: METHOD SPIKE
EP-ES SAMPLE ID: 090590 BLANK SPIKE
DM FILE ID: 9006RE.MS

COMPOUND	SPIKE ADDED UG/L	SAMPLE CONCENTRATION UG/L	MS CONCENTRATION UG/L	MS % REC
GAMMA-BHC	.20	<.04	.22	110
HEPTACHLOR	.20	<.03	.16	80
ALDRIN	.20	<.04	.14	70
DIELDRIN	.50	<.02	.70	140
ENDRIN	.50	<.06	.24	48
DDT	.50	<.12	.55	110

PRIMARY Column

63	[illegible]	UNKN; DISK	1001-[illegible]		[illegible]	1.000E+[illegible]	1.000E+[illegible]
64	[illegible]	UNKN; DISK	1001-[illegible]		[illegible]	1.000E+00	1.000E+[illegible]
65	[illegible]	UNKN; DISK	1001-[illegible]		[illegible]E+00	1.000E+00	1.000E+00
66	900900 BLANK	UNKN; DISK	1001-[illegible]		[illegible]	1.000E+0[illegible]	
67	900900-2	UNKN; DISK	1001-[illegible]		[illegible].000E+00	1.000E+0[illegible]	
68	BLANK SPIKE	UNKN; DISK	1001-[illegible]		[illegible]	1.000E+0[illegible]	
69	900900-2 MS	UNKN; DISK	1001-[illegible]		[illegible].000E+00	[illegible].000E+0[illegible]	
70	900900-2 MSD	UNKN; DISK	1001-[illegible]		[illegible].000E+00	5.000E+0[illegible]	
71	BLANK [illegible]	UNKN; DISK	1001-[illegible]		[illegible].000E+00		
72	901003-1	UNKN; DISK	1001-[illegible]		[illegible].000E+00		
73	90100[illegible]	UNKN; DISK	1001-[illegible]		[illegible].000E+00		
74	901003[illegible]	UNKN; DISK	1001-[illegible]		[illegible].000E+00		
75	901003[illegible]	UNKN; DISK	1001-[illegible]		[illegible].000E+00		
76	901003 MS	UNKN; DISK	1001-[illegible]		[illegible].000E+00		
77	901003 MSD	UNKN; DISK	1001-[illegible]		[illegible].000E+00		
78	[illegible]	UNKN; DISK	1001-[illegible]		[illegible].000E+00		
79	[illegible]	UNKN; DISK	1001-[illegible]		[illegible].000E+00		

Standard Concentrations

Compound	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HEX-CYCLOHEXANE	ignore	ignore	ignore	ignore	ignore	ignore	ignore
TCMX	ignore	ignore	ignore	ignore	ignore	ignore	ignore
ALPHA-BHC	ignore	ignore	ignore	ignore	ignore	1.000E+00	[illegible]
GAMMA-BHC	1.000E+00	2.000E+00	5.000E+00	1.000E+01	2.000E+01	ignore	ignore
BETA-BHC	ignore	ignore	ignore	ignore	ignore	[illegible]	[illegible]
HEPTACHLOR	[illegible].000E+00	4.000E+00	1.000E+01	2.000E+01	4.000E+01	ignore	ignore
DELTA-BHC	ignore	ignore	ignore	ignore	ignore	2.000E+00	4.0[illegible]
ALDRIN	ignore	ignore	ignore	ignore	ignore	2.000E+00	4.0[illegible]
HEPTACHLOR EPOX	[illegible].000E+00	4.000E+00	1.000E+01	2.000E+01	4.000E+01	ignore	ignore
GAMMA-CHLORDANE	ignore	ignore	ignore	ignore	ignore	2.000E+00	4.0[illegible]
ALPHA-CHLORDANE	ignore	ignore	ignore	ignore	ignore	2.000E+00	4.0[illegible]
ENDOSULFAN I	2.000E+00	4.000E+00	1.000E+01	2.000E+01	4.000E+01	ignore	ignore
4,4'-DDE	ignore	ignore	ignore	ignore	ignore	2.000E+00	4.0[illegible]
DIELDRIN	2.000E+00	4.000E+00	1.000E+01	2.000E+01	4.000E+01	ignore	ignore
ENDRIN	ignore	ignore	ignore	ignore	ignore	2.000E+00	4.0[illegible]
4,4'-DDD	ignore	ignore	ignore	ignore	ignore	4.000E+00	8.0[illegible]
ENDOSULFAN II	4.000E+00	8.000E+00	2.000E+01	4.000E+01	8.000E+01	ignore	ignore
DDT	4.000E+00	8.000E+00	2.000E+01	4.000E+01	8.000E+01	ignore	ignore
ENDRIN ALDEHYDE	[illegible]	1.000E+01	[illegible]	[illegible]	[illegible]	ignore	ignore
ENDOSULFAN [illegible]	ignore	ignore	ignore	ignore	ignore	[illegible]	[illegible]
[illegible]	1.000E+01	[illegible]	[illegible]	[illegible]	[illegible]	ignore	ignore
ENDRIN KETONE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ignore	ignore

MAXIMA (c)1990 Dynamic Solutions, Division of Millipore

MAXIMA 820 CUSTOM REPORT

Printed: 5-OCT-1990 14:46:04

SAMPLE: INDE

ESD in Method 8080/CLP PESTICIDES
Acquired: 3-OCT-1990 16:17
Rate: 2.0 points/sec
Duration: 34.000 minutes
Operator: AHV

Type: UNKN
Instrument: E507
Filename: 1001-50
Index: DISK
Injection Volume: 3.0
Dilution: 1.000
Amount: 1.000

DETECTION: E507/ECD

PK#	ID#	Retention Time (minutes)	Component Name	Type	Peak Area	Peak Response	Response Factor (NG/ML/AREA)	Solution Conc (NG/ML)	Original Conc (UG/L)
1	3	2.292	ALPHA-BHC	BF	121519	121519.4070	0.000	7.66	76.63
2	5	3.426	BETA-BHC	FF	114374	114373.7035	0.000	16.65	166.45
3	7	3.982	DELTA-BHC	FF	161555	161554.5670	0.000	14.55	145.54
4	8	4.522	ALDRIN	FB	206027	206027.3047	0.000	15.42	154.24
5	10	7.017	GAMMA-CHLORDANE	BF	222674	222674.4412	0.000	15.66	156.77
6	11	7.575	ALPHA-CHLORDANE	FF	224673	224673.4587	0.000	16.21	162.10
7	13	8.673	4,4'-DDE	FE	200160	200159.8224	0.000	16.23	162.29
8	15	11.275	ENDRIN	BF	303928	303927.9505	0.000	21.31	213.06
9	16	12.796	4,4'-DDD	FS	218644	218644.4513	0.000	22.62	226.16
10	20	20.306	ENDOSULFAN SO4	BB	273572	273572.0746	0.000	32.09	320.64
11		22.925		BE	109674				
12	21	25.225	DBC	BF	1204034	1204034.0580	0.000	162.46	1624.60
13	22	26.956	METHOXYCHLOR	FS	804607	804606.6948	0.000	79.99	709.90
TOTAL					4165042			441.56	4415.79

PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT: EPIC
DATA FILE ID: 90062RE.PT
CLIENT SAMPLE ID: FT RILEY CONEX BLDG. 348
LAB SAMPLE ID: 90-09-006-02A
LAB FILE ID: 1001-83
DATE RECEIVED: 9/4/90
DATE ANALYZED: 10/1/90
DILUTION FACTOR: 1.0
MATRIX: WATER

COMPOUND	CAS. NUMBER	CONCENTRATION UNITS UG/L	DETECTION LIMIT UG/L
ALDRIN	309-00-2	< DL	0.04
ALPHA-BHC	319-84-6	< DL	0.03
BETA-BHC	319-85-7	< DL	0.06
DELTA-BHC	319-86-8	< DL	0.09
GAMMA-BHC (LINDANE)	58-89-9	< DL	0.04
CHLORDANE	57-74-9	< DL	0.14
4,4'-DDD	72-54-8	< DL	0.11
4,4'-DDE	72-55-9	< DL	0.04
4,4'-DDT	50-29-3	< DL	0.12
DIELDRIN	60-57-1	< DL	0.02
ENDOSULFAN I	959-98-8	< DL	0.14
ENDOSULFAN II	33212-65-9	< DL	0.04
ENDOSULFAN SULFATE	1031-07-8	< DL	0.66
ENDRIN	72-20-8	< DL	0.06
ENDRIN ALDEHYDE	7421-93-4	< DL	0.23
HEPTACHLOR	76-44-8	< DL	0.03
HEPTACHLOR EPOXIDE	1024-57-3	< DL	0.83
METHOXYCHLOR	72-43-5	< DL	1.76
TOXAPHENE	8001-35-2	< DL	2.4
PCB-1016	12674-11-2	< DL	1.0
PCB-1221	1104-28-2	< DL	1.0
PCB-1232	11141-16-5	< DL	1.0
PCB-1242	53469-21-9	< DL	1.0
PCB-1248	12672-29-6	< DL	1.0
PCB-1254	11097-69-1	< DL	1.0
PCB-1260	11096-82-5	< DL	1.0

SURROGATE	% RECOVERY
DBC	83

DEPARTMENT OF THE ARMY
HEADQUARTERS, 1ST INFANTRY DIVISION (MECH) AND FORT RILEY
FORT RILEY, KANSAS 66442-5000

23 OCT 1990

REPLY TO
ATTENTION OF
Directorate of Engineering and Housing

Kansas Department of Health and Environment
Hazardous Waste Section, Bureau of Air & Waste Management
Attn: John Paul Goetz
Bldg 740 Forbes Field
Topeka, Kansas 66620-0002

Dear Mr. Goetz:

This letter is in response to your July, 20 1990 letter of warning concerning the CONEX /Bldg 348 Closure project. Enclosed please find the final closure report that provides the confirmation sampling data.

I hope the attached report will provide adequate information to allow final resolution of this project. If other information or actions are required contact Mr. Greg Sinton, DEH Environmental Branch, Phone 239-2195.

Encl.

Steven Whitfield
Col, Corps of Engineers
Director of Engineering and Housing

Copies Furnished:
Robert Avery, Resident Engineer, Fort Riley Resident office, U.S. Army Corps of Engineers, P.O. Box 2189, Fort Riley, KS 66442
Environmental protection Inspection & Consulting, Inc., 450 Dains, Liberty, MO 64068
Kansas City District, Corps of Engineers, ATTN:CEMRK-CD-MQ (Ken Luetkemeyer) 700 Federal Bldg, Kansas City, MO 64106-2896

ENVIRONMENTAL PROTECTION
INSPECTION AND CONSULTING, INC.

CONEX CLOSURE
BUILDING 348
FORT RILEY, KANSAS

AUGUST 31, 1990

submitted to:

KANSAS CITY DISTRICT CORPS OF ENGINEERS

submitted by:

ENVIRONMENTAL PROTECTION, INSPECTION & CONSULTING, INC.

On August 31, 1990, representatives of E.P.I.C. Company, Inc. conducted sampling of a Conex located outside Building 348 at Fort Riley, Kansas. This sampling was conducted to comply with the procedures specified in the approved closure plan as referenced in correspondence from K.D.H.E. of March 12, 1990 (attached).

SUMMARY OF WORK

Prior to collecting samples, the Conex was opened and visually inspected for physical hazards. No hazards were identified. The door to the Conex was secured in an open position using a latching strap.

A 9' x 12' piece of polyethylene sheeting was placed on the ground in front of the Conex and sampling equipment previously decontaminated using a wash in non phosphate detergent and rinsing in tap water followed by a distilled water rinse and wrapping in foil was placed on the plastic. Protective clothing consisting of TYVEK coveralls, nitrile gloves, chemical resistant steel toed boots, safety goggles, hard hat and ½ face respirators equipped with H.E.P.A./O.V./A.G. cartridges were also placed on the plastic sheeting. A decontamination line was set up consisting of three (3) metal tubs and brushes for decontamination of personnel and sampling equipment. The first tub contained tap water with non-phosophate detergent, the second tap water for rinsing, the third was empty and designed to contain distilled water used for final decontamination rinse. The final preparatory step involved placing a barrier of caution tape around the Conex at a distance of 20 feet.

After preparation was complete, sampling personnel removed street shoes, stepped onto the prepared plastic sheeting and donned protective clothing consisting of chemical resistant boots, TYVEK coveralls, half face respirators with H.E.P.A./A.G./O.V. cartridges, safety goggles, nitrile gloves and hard hat. The sleeves and legs of the TYVEK coveralls were placed over the gloves and boots and sealed by wrapping with duct tape.

A combustible gas/O2 meter (MSA Model 260) was calibrated according to manufacturers recommendations and the Conex was sampled. Results showed <1% L.E.L. and 21% O2 to be present in the Conex. The Conex was judged by the S.S.O. to be safe for entry and sampling commenced.

The previously decontaminated sprayer was opened and 2 gallons of distilled water was added. The sampler entered the Conex and a direct low pressure stream of water was directed toward the Conex pan. When empty, an additional gallon of distilled water was added to the sprayer and the process repeated. Approximately ½ gallon of additional water was directed at the Conex pan. The sprayer was handed to the sampler assistant who was also wearing protective equipment of the same type as the sampler. The water was moved over the entire surface of the pan with a squeegee making sure that the entire surface of the pan was contacted. The physical placement of the Conex was such that sampling water collected in one corner of the Conex. The sampler, utilizing previously decontaminated plastic scoop and funnel, collected the following samples: 1x2 liter for B/N/A., 1x2 liter for pesticide/PCB and 1x1 liter for metals. The first two samples were collected in precleaned amber glass bottles. The metal sample was collected in a plastic bottle (precleaned) to which nitric acid had been added. The sample was swirled and a small portion checked using p Hydrion paper. Results showed a pH of approximately 1.0. After sampling was complete, the empty metal tub was brought to the Conex and all remaining water was placed in the tub. The sampling assistant then proceeded to decontaminate the sampling equipment (scoop, funnel, squeegee, and sprayer) by triple washing in water with non phosphate detergent and tap water rinse. Personal protective equipment (i.e., boots, gloves, respirator) were decontaminated using the same procedure. This equipment was removed and the gloves, disposable coveralls and respirator cartridges were placed in a plastic bag for subsequent disposal. The sampler exited the Conex and decontaminated his personal protective equipment using the same procedure outlined above. Disposable items were placed into the plastic bag for disposal. The sampling equipment was removed from the tub containing tap water and rinsed with distilled water. At the completion of equipment decontamination, all decon solutions were placed into a metal drum along with the removed personal protective equipment and the plastic sheeting. Sampling personnel washed with soap and rinsed with distilled water with the water being placed directly into the drum containing decontamination water. The drum was closed, marked with a paint pen as to its contents and placed beside the Conex, awaiting final disposition based on sampling results.

The labels on the collected samples were completed and the containers sealed and placed in an insulated cooler containing ice. A chain of custody form was completed and the samples returned to Kansas City and sent for analysis via Federal Express on the afternoon of August 31, 1990.

Sample Results:

The three samples collected from the Conex were analyzed by Eagle Pitcher Environmental Services utilizing the following methods:

<u>Analyte</u>	Method (SW-846)
Semi volatiles (B/N/A)	8270

Pesticides/PCB	8080
Metals	
As	7061
Ba	3050/6010
Cd	3050/6010
Cr	3050/6010
Pb	3050/6010
Hg	7470
Se	7741
Ag	3050/6010

The results of these analysis attached as Appendix I shows no detectable PCB or semi volatile (B/N/A) contamination. Minimal levels of several pesticides and heavy metals were detected. These pose no threat to human health or the environment at the observed levels. The low level of contamination detected during this sampling was not detected or reported in prior sampling since these earlier samples had been taken after the wash water from the cleaning operations had been added. This resulted in a large scale dilution placing any low level contamination which existed below instrument detection limits (BDL).

Based on these sample results, the Conex decontamination has been completed.

Torres

Consulting Engineers, Inc.

1104 East 11th Street
Kansas City, MO 64106
(816) 474-3238

Closure plan for Hazardous Waste Storage Facilities, Ft. Riley, KS
Conex Container at Building 338

CERTIFICATION OF CLOSURE

I, William Torres, P.E., a registered professional engineer, hereby certify that to the best of my knowledge and belief, and that based on my visual inspection(s) of the aforementioned facilities, and based upon the analytical results performed by Eagle Pitcher Environmental Services, dated September 27 and 29, 1990, the closure of the facilities have been closed in accordance with the approved closure plan. The closure was completed on the 31st day of August, 1990.

William Torres	October 10, 1990
Signature of Professional Engineer	Date
8526	Kansas
Professional Engineer License No.	For the State of

1104 East 11th Street, Kansas City, Missouri 64106 (816)474-3238
Business Address & Telephone (with Area Code)

WILLIAM TORRES
LICENSED
8526
KANSAS
PROFESSIONAL ENGINEER

APPENDIX I

Sample Results

Conex Closure - Building 348

Fort Riley, KS.

1 EPES Laboratory REPORT Work Order # 90-09-006

ived: 09/04/90 10/02/90 11:10:06

ORT TO EPIC
450 Dains Street
P.O. Box 541
Liberty, MO 64068
TEN Connie Todd

PREPARED BY EAGLE-PICHER ENVIRONMENTAL SERVICES

CERTIFIED BY

ATTEN Nancy Magness
PHONE 800-331-7425 or 918-540-1507

CONTACT H HIGMAN

IENT EPIC SAMPLES 7
PANY EPIC
ITY Liberty, MO

ID Ft. Riley Conex
KEN 9/4/90
ANS Federal Express
TYPE Liquid
O. # Proj. 222
OICE under separate cover

AMPLE IDENTIFICATION
t Riley Conex Bldg. 348
t Riley Conex Bldg. 348
t Riley Conex Bldg. 348
ethod Blank
atrix Spike
atrix Spike Duplicate
S/MSD RPD%

TEST CODES and NAMES used on this workorder

8270LS	Semi-Volatiles by 8270
AG QA	Total Silver QA Data
AG	Silver by FAA
AS QA	Total Arsenic QA Data
AS	Arsenic by GFAA
BA QA	Total Barium QA Data
BA	Barium by FAA
CD QA	Total Cadmium QA Data
CD	Cadmium by GFAA
CR QA	Total Chromium QA Data
CR	Chromium by FAA
HG	Total Mercury by CVAA
HG QA	Total Mercury by CVAA QA
PB QA	Total Lead QA Data
PB	Lead by GFAA
PCB	Polychlorinated biphenyls
PEST	Pest
PREPP	PCB Preparation
PREPPT	Pesticide Preparation
PREPSV	Semi-Volatile Preparation
SE QA	Total Selenium QA Data
SE	Selenium by GFAA

EAGLE PICHER

MPLE ID Ft Riley Conex Bldg. 348 SAMPLE # 01 FRACTIONS: A
Date & Time Collected 08/31/90 10:15:00 Category

`DC `9/04/90

EAGLE PICHER

3 EPES Laboratory REPORT Work Order # 90-09-006
ved: 09/04/90 Results by Sample

E ID Ft Riley Conex Bldg. 348 FRACTION 01A TEST CODE 8270LS NAME Semi-Volatiles by 8270
Date & Time Collected 08/31/90 10:15:00 Category ________

DATE RUN	09/29/90	VER	1110
ANALYST	REC		
INSTRUMENT	ES01		
FILE ID	SS09299002		
UNITS	UG/L		
MATRIX	WATER		
METHOD	EPA 8270		

ANALYTE	RESULT	CAS NO
PHENOL-D5		4165-62-2
PHENOL	<20	108-95-2
BIS (2-CHLOROETHYL) ETHER	<20	111-44-4
2-CHLOROPHENOL	<20	95-57-8
1,3-DICHLOROBENZENE	<20	541-73-1
1,4-DICHLOROBENZENE	<20	106-46-7
BENZYL ALCOHOL	<40	100-51-6
1,2-DICHLOROBENZENE	<20	95-50-1
2-METHYLPHENOL	<20	95-48-7
BIS (2-CHLOROISOPROPYL) ETHER	<20	39638-32-9
4-METHYLPHENOL	<20	106-44-5
HEXACHLOROETHANE	<20	67-72-1
N-NITROSO-DI-N-PROPYLAMINE	<20	621-64-7
NITROBENZENE	<20	98-95-3
ISOPHORONE	<20	78-59-1
2-NITROPHENOL	<20	88-75-5
2,4-DIMETHYLPHENOL	<20	105-67-9
BIS (2-CHLOROETHOXY) METHANE	<20	111-91-1
BENZOIC ACID	<100	65-85-0
2,4-DICHLOROPHENOL	<20	120-83-2
1,2,4-TRICHLOROBENZENE	<20	120-82-1
NAPTHALENE	<20	91-20-3
4-CHLOROANILINE	<40	106-47-8
HEXACHLOROBUTADIENE	<20	87-68-3
4-CHLORO-3-METHYLPHENOL	<40	59-50-7
2-METHYLNAPHTHALENE	<20	91-57-6
HEXACHLOROCYCLOPENTADIENE	<20	77-47-4
2,4,6-TRICHLOROPHENOL	<20	88-06-2
2,4,5-TRICHLOROPHENOL	<20	95-95-4
2-CHLORONAPHTHALENE	<20	91-58-7
2-NITROANILINE	<100	88-74-4
DIMETHYLPHTHALATE	<20	131-11-3
ACENAPHTHYLENE	<20	208-96-8
2,6-DINITROTOLUENE	<20	606-20-2
3-NITROANILINE	<100	99-09-2
ACENAPHTHENE	<20	83-32-9
2,4-DINITROPHENOL	<100	51-28-5
4-NITROPHENOL	<100	100-02-7
DIBENZOFURAN	<20	132-64-9
2,4-DINITROTOLUENE	<20	121-14-2
DIETHYLPHTHALATE	<20	84-66-2
FLUORENE	<20	86-73-7
4-CHLOROPHENYL-PHENYLETHER	<20	7005-72-3

E ID Ft Riley Conex Bldg. 348 FRACTION 01A TEST CODE 8270LS NAME Semi-Volatiles by 8270
Date & Time Collected 08/31/90 10:15:00 Category ________

4-NITROANILINE	<100	100-01-6
4,6-DINITRO-2-METHYLPHENOL	<100	534-52-1
N-NITROSODIPHENYLAMINE (1)	<20	86-30-6
4-BROMOPHENYL-PHENYLETHER	<20	101-55-3
HEXACHLOROBENZENE	<20	118-74-1
PENTACHLOROPHENOL	<100	87-86-5
PHENANTHRENE	<20	85-01-8
ANTHRACENE	<20	120-12-7
DI-N-BUTYLPHTHALATE	<20	84-74-2
FLUORANTHENE	<20	206-44-0
PYRENE	<20	129-00-0
BUTYLBENZYLPHTHALATE	<20	85-68-7
BENZO (A) ANTHRACENE	<20	56-55-3
3,3-DICHLOROBENZIDINE	<40	91-94-1
CHRYSENE	<20	218-01-9
BIS (2-ETHYLHEXYL) PHTHALATE	<20	117-81-7
DI-N-OCTYLPHTHALATE	<20	117-84-0
BENZO (B) FLUORANTHENE	<20	205-99-2
BENZO (K) FLUORANTHENE	<20	207-08-9
BENZO (A) PYRENE	<20	50-32-8
INDENO (1,2,3-CD) PYRENE	<20	193-39-5
DIBENZ (A,H) ANTHRACENE	<20	53-70-3
BENZO (G,H,I) PERYLENE	<20	191-24-2

SURROGATE	%RECOVERY	CAS NO
NITROBENZENE-D5	67	4165-60-0
2-FLUOROBIPHENYL	63	321-60-8
TERPHENYL-D-14	93	171-85-10
PHENOL-D5	21	4165-62-2
2-FLUOROPHENOL	33	367-12-4
2,4,6-TRIBROMOPHENOL	78	118-79-6

AMPLE ID Ft Riley Conex Bldg. 348 SAMPLE # 02 FRACTIONS: A
Date & Time Collected 08/31/90 10:18:00 Category

..B See Attch mg/L	PEST See Attch	PREPP 09/05/90	PREPPT 09/05/90

AMPLE ID Ft Riley Conex Bldg. 348 SAMPLE # 03 FRACTIONS: A
Date & Time Collected 08/31/90 10:20:00 Category

G <.01 mg/L	AS .008 mg/L	BA .23 mg/L	CD <.005 mg/L	CR .038 mg/L	HG .0007 mg/L
B .187 mg/L	SE <.005 mg/L				

SAMPLE ID Method Blank SAMPLE # 04 FRACTIONS: A
Date & Time Collected not specified Category

G_QA <.01 mg/L	AS_QA <.005 mg/L	BA_QA <.1 mg/L	CD_QA <.005 mg/L	CR_QA <.01 mg/L	HG_QA <.0002 mg/L
PB_QA <.005 mg/L	SE_QA <.005 mg/L				

6
ived: 09/04/90

EPES Laboratory REPORT
Results by Sample

Work Order # 90-09-006

LE ID Method Blank   FRACTION 04A   TEST CODE 8270LS   NAME Semi-Volatiles by 8270
Date & Time Collected not specified   Category ______

DATE RUN 09/29/90   VER HHQ
ANALYST REC
INSTRUMENT ES01
FILE ID SV09299001
UNITS ug/L
MATRIX WATER
METHOD EPA 8270

ANALYTE	RESULT	CAS NO
PHENOL-D5		4165-62-2
PHENOL	<10	108-95-2
BIS (2-CHLOROETHYL) ETHER	<10	111-44-4
2-CHLOROPHENOL	<10	95-57-8
1,3-DICHLOROBENZENE	<10	541-73-1
1,4-DICHLOROBENZENE	<10	106-46-7
BENZYL ALCOHOL	<20	100-51-6
1,2-DICHLOROBENZENE	<10	95-50-1
2-METHYLPHENOL	<10	95-48-7
BIS (2-CHLOROISOPROPYL) ETHER	<10	39638-32-9
4-METHYLPHENOL	<10	106-44-5
HEXACHLOROETHANE	<10	67-72-1
N-NITROSO-DI-N-PROPYLAMINE	<10	621-64-7
NITROBENZENE	<10	98-95-3
ISOPHORONE	<10	78-59-1
2-NITROPHENOL	<10	88-75-5
2,4-DIMETHYLPHENOL	<10	105-67-9
BIS (2-CHLOROETHOXY) METHANE	<10	111-91-1
BENZOIC ACID	<50	65-85-0
2,4-DICHLOROPHENOL	<10	120-83-2
1,2,4-TRICHLOROBENZENE	<10	120-82-1
NAPTHALENE	<10	91-20-3
4-CHLOROANILINE	<20	106-47-8
HEXACHLOROBUTADIENE	<10	87-68-3
4-CHLORO-3-METHYLPHENOL	<20	59-50-7
2-METHYLNAPHTHALENE	<10	91-57-6
HEXACHLOROCYCLOPENTADIENE	<10	77-47-4
2,4,6-TRICHLOROPHENOL	<10	88-06-2
2,4,5-TRICHLOROPHENOL	<10	95-95-4
2-CHLORONAPHTHALENE	<10	91-58-7
2-NITROANILINE	<50	88-74-4
DIMETHYLPHTHALATE	<10	131-11-3
ACENAPHTHYLENE	<10	208-96-8
2,6-DINITROTOLUENE	<10	606-20-2
3-NITROANILINE	<50	99-09-2
ACENAPHTHENE	<10	83-32-9
2,4-DINITROPHENOL	<50	51-28-5
4-NITROPHENOL	<50	100-02-7
DIBENZOFURAN	<10	132-64-9
2,4-DINITROTOLUENE	<10	121-14-2
DIETHYLPHTHALATE	<10	84-66-2
FLUORENE	<10	86-73-7
4-CHLOROPHENYL-PHENYLETHER	<10	7005-72-3

IPLE ID Method Blank FRACTION 04A TEST CODE 8270LS NAME Semi-Volatiles by 8270
Date & Time Collected not specified Category

4-NITROANILINE	<50	100-01-6
4,6-DINITRO-2-METHYLPHENOL	<50	534-52-1
N-NITROSODIPHENYLAMINE (1)	<10	86-30-6
4-BROMOPHENYL-PHENYLETHER	<10	101-55-3
HEXACHLOROBENZENE	<10	118-74-1
PENTACHLOROPHENOL	<50	87-86-5
PHENANTHRENE	<10	85-01-8
ANTHRACENE	<10	120-12-7
DI-N-BUTYLPHTHALATE	<10	84-74-2
FLUORANTHENE	<10	206-44-0
PYRENE	<10	129-00-0
BUTYLBENZYLPHTHALATE	<10	85-68-7
BENZO (A) ANTHRACENE	<10	56-55-3
3,3-DICHLOROBENZIDINE	<20	91-94-1
CHRYSENE	<10	218-01-9
BIS (2-ETHYLHEXYL) PHTHALATE	<10	117-81-7
DI-N-OCTYLPHTHALATE	<10	117-84-0
BENZO (B) FLUORANTHENE	<10	205-99-2
BENZO (K) FLUORANTHENE	<10	207-08-9
BENZO (A) PYRENE	<10	50-32-8
INDENO (1,2,3-CD) PYRENE	<10	193-39-5
DIBENZ (A,H) ANTHRACENE	<10	53-70-3
BENZO (G,H,I) PERYLENE	<10	191-24-2

SURROGATE	%RECOVERY	CAS NO
NITROBENZENE-D5	57	4165-60-0
2-FLUOROBIPHENYL	57	321-60-8
TERPHENYL-D-14	94	171-85-10
PHENOL-D5	18	4165-62-2
2-FLUOROPHENOL	31	367-12-4
2,4,6-TRIBROMOPHENOL	54	118-79-6

SAMPLE ID Matrix Spike SAMPLE # 05 FRACTIONS: A
Date & Time Collected not specified Category

_A 97.2 %	AS_QA 69.5 %	BA_QA 84.0 %	CD_QA 97.6 %	CR_QA 104 %	HG_QA 96.8 %
PB_QA 93.0 %	SE_QA 90.5 %				

Received: 09/04/90 Results by Sample

SAMPLE ID Matrix Spike FRACTION 05A TEST CODE 8270LS NAME Semi-Volatiles by 8270
Date & Time Collected not specified Category

DATE RUN 09/29/90 VER 1.0
ANALYST REC
INSTRUMENT ES01
FILE ID SV09299003
UNITS ug/L
MATRIX WATER
METHOD EPA 8270

ANALYTE	RESULT	CAS NO
PHENOL-D5		4165-62-2
PHENOL	76	108-95-2
BIS (2-CHLOROETHYL) ETHER	<40	111-44-4
2-CHLOROPHENOL	155	95-57-8
1,3-DICHLOROBENZENE	<40	541-73-1
1,4-DICHLOROBENZENE	72	106-46-7
BENZYL ALCOHOL	<80	100-51-6
1,2-DICHLOROBENZENE	<40	95-50-1
2-METHYLPHENOL	<40	95-48-7
BIS (2-CHLOROISOPROPYL) ETHER	<40	39638-32-9
4-METHYLPHENOL	<40	106-44-5
HEXACHLOROETHANE	<40	67-72-1
N-NITROSO-DI-N-PROPYLAMINE	92	621-64-7
NITROBENZENE	<40	98-95-3
ISOPHORONE	<40	78-59-1
2-NITROPHENOL	<40	88-75-5
2,4-DIMETHYLPHENOL	<40	105-67-9
BIS (2-CHLOROETHOXY) METHANE	<40	111-91-1
BENZOIC ACID	<200	65-85-0
2,4-DICHLOROPHENOL	<40	120-83-2
1,2,4-TRICHLOROBENZENE	76	120-82-1
NAPTHALENE	<40	91-20-3
4-CHLOROANILINE	<80	106-47-8
HEXACHLOROBUTADIENE	<40	87-68-3
4-CHLORO-3-METHYLPHENOL	250	59-50-7
2-METHYLNAPHTHALENE	<40	91-57-6
HEXACHLOROCYCLOPENTADIENE	<40	77-47-4
2,4,6-TRICHLOROPHENOL	<40	88-06-2
2,4,5-TRICHLOROPHENOL	<40	95-95-4
2-CHLORONAPHTHALENE	<40	91-58-7
2-NITROANILINE	<200	88-74-4
DIMETHYLPHTHALATE	<40	131-11-3
ACENAPHTHYLENE	<40	208-96-8
2,6-DINITROTOLUENE	<40	606-20-2
3-NITROANILINE	<200	99-09-2
ACENAPHTHENE	116	83-32-9
2,4-DINITROPHENOL	<200	51-28-5
4-NITROPHENOL	81	100-02-7
DIBENZOFURAN	<40	132-64-9
2,4-DINITROTOLUENE	138	121-14-2
DIETHYLPHTHALATE	<40	84-66-2
FLUORENE	<40	86-73-7
4-CHLOROPHENYL-PHENYLETHER	<40	7005-72-3

LE ID Matrix Spike FRACTION 05A TEST CODE 8270LS NAME Semi-Volatiles by 8270
Date & Time Collected not specified Category

4-NITROANILINE	<200	100-01-6
4,6-DINITRO-2-METHYLPHENOL	<200	534-52-1
N-NITROSODIPHENYLAMINE (1)	<40	86-30-6
4-BROMOPHENYL-PHENYLETHER	<40	101-55-3
HEXACHLOROBENZENE	<40	118-74-1
PENTACHLOROPHENOL	276	87-86-5
PHENANTHRENE	<40	85-01-8
ANTHRACENE	<40	120-12-7
DI-N-BUTYLPHTHALATE	<40	84-74-2
FLUORANTHENE	<40	206-44-0
PYRENE	142	129-00-0
BUTYLBENZYLPHTHALATE	<40	85-68-7
BENZO (A) ANTHRACENE	<40	56-55-3
3,3-DICHLOROBENZIDINE	<80	91-94-1
CHRYSENE	<40	218-01-9
BIS (2-ETHYLHEXYL) PHTHALATE	<40	117-81-7
DI-N-OCTYLPHTHALATE	<40	117-84-0
BENZO (B) FLUORANTHENE	<40	205-99-2
BENZO (K) FLUORANTHENE	<40	207-08-9
BENZO (A) PYRENE	<40	50-32-8
INDENO (1,2,3-CD) PYRENE	<40	193-39-5
DIBENZ (A,H) ANTHRACENE	<40	53-70-3
BENZO (G,H,I) PERYLENE	<40	191-24-2

SURROGATE	%RECOVERY	CAS NO
NITROBENZENE-D5	45	4165-60-0
2-FLUOROBIPHENYL	48	321-60-8
TERPHENYL-D-14	79	171-85-10
PHENOL-D5	17	4165-62-2
2-FLUOROPHENOL	26	367-12-4
2,4,6-TRIBROMOPHENOL	78	118-79-6

Received: 09/04/90 Results by Sample

SAMPLE ID Matrix Spike Duplicate SAMPLE # 06 FRACTIONS: A
Date & Time Collected not specified Category

G_QA 97.2 %	AS_QA 161 %	BA_QA 94.0 %	CD_QA 93.8 %	CR_QA 98.0 %	HG_QA 100.0 %
PB_QA 95.0 %	SE_QA 72.5 %				

EPES Laboratory REPORT Work Order # 90-09-006
Results by Sample

'LE ID Matrix Spike Duplicate FRACTION OGA TEST CODE 8270LS NAME Semi-Volatiles by 8270
Date & Time Collected not specified Category

DATE RUN 09/29/90 VER 1111Q
ANALYST REC
INSTRUMENT ES01
FILE ID SV09299004
UNITS ug/L
MATRIX WATER
METHOD EPA 8270

ANALYTE	RESULT	CAS NO
PHENOL-D5		4165-62-2
PHENOL	114	108-95-2
BIS (2-CHLOROETHYL) ETHER	<40	111-44-4
2-CHLOROPHENOL	235	95-57-8
1,3-DICHLOROBENZENE	<40	541-73-1
1,4-DICHLOROBENZENE	102	106-46-7
BENZYL ALCOHOL	<80	100-51-6
1,2-DICHLOROBENZENE	<40	95-50-1
2-METHYLPHENOL	<40	95-48-7
BIS (2-CHLOROISOPROPYL) ETHER	<40	39638-32-9
4-METHYLPHENOL	<40	106-44-5
HEXACHLOROETHANE	<40	67-72-1
N-NITROSO-DI-N-PROPYLAMINE	135	621-64-7
NITROBENZENE	<40	98-95-3
ISOPHORONE	<40	78-59-1
2-NITROPHENOL	<40	88-75-5
2,4-DIMETHYLPHENOL	<40	105-67-9
BIS (2-CHLOROETHOXY) METHANE	<40	111-91-1
BENZOIC ACID	<200	65-85-0
2,4-DICHLOROPHENOL	<40	120-83-2
1,2,4-TRICHLOROBENZENE	111	120-82-1
NAPTHALENE	<40	91-20-3
4-CHLOROANILINE	<80	106-47-8
HEXACHLOROBUTADIENE	<40	87-68-3
4-CHLORO-3-METHYLPHENOL	394	59-50-7
2-METHYLNAPHTHALENE	<40	91-57-6
HEXACHLOROCYCLOPENTADIENE	<40	77-47-4
2,4,6-TRICHLOROPHENOL	<40	88-06-2
2,4,5-TRICHLOROPHENOL	<40	95-95-4
2-CHLORONAPHTHALENE	<40	91-58-7
2-NITROANILINE	<200	88-74-4
DIMETHYLPHTHALATE	<40	131-11-3
ACENAPHTHYLENE	<40	208-96-8
2,6-DINITROTOLUENE	<40	606-20-2
3-NITROANILINE	<200	99-09-2
ACENAPHTHENE	167	83-32-9
2,4-DINITROPHENOL	<200	51-28-5
4-NITROPHENOL	179	100-02-7
DIBENZOFURAN	<40	132-64-9
2,4-DINITROTOLUENE	209	121-14-2
DIETHYLPHTHALATE	<40	84-66-2
FLUORENE	<40	86-73-7
4-CHLOROPHENYL-PHENYLETHER	<40	7005-72-3

PLE ID Matrix Spike Duplicate FRACTION OGA TEST CODE 8270LS NAME Semi-Volatiles by 8270
Date & Time Collected not specified Category .

4-NITROANILINE	<200	100-01-6
4,6-DINITRO-2-METHYLPHENOL	<200	534-52-1
N-NITROSODIPHENYLAMINE (1)	<40	86-30-6
4-BROMOPHENYL-PHENYLETHER	<40	101-55-3
HEXACHLOROBENZENE	<40	118-74-1
PENTACHLOROPHENOL	294	87-86-5
PHENANTHRENE	<40	85-01-8
ANTHRACENE	<40	120-12-7
DI-N-BUTYLPHTHALATE	<40	84-74-2
FLUORANTHENE	<40	206-44-0
PYRENE	204	129-00-0
BUTYLBENZYLPHTHALATE	<40	85-68-7
BENZO (A) ANTHRACENE	<40	56-55-3
3,3-DICHLOROBENZIDINE	<80	91-94-1
CHRYSENE	<40	218-01-9
BIS (2-ETHYLHEXYL) PHTHALATE	<40	117-81-7
DI-N-OCTYLPHTHALATE	<40	117-84-0
BENZO (B) FLUORANTHENE	<40	205-99-2
BENZO (K) FLUORANTHENE	<40	207-08-9
BENZO (A) PYRENE	<40	50-32-8
INDENO (1,2,3-CD) PYRENE	<40	193-39-5
DIBENZ (A,H) ANTHRACENE	<40	53-70-3
BENZO (G,H,I) PERYLENE	<40	191-24-2

SURROGATE	%RECOVERY	CAS NO
NITROBENZENE-D5	68	4165-60-0
2-FLUOROBIPHENYL	70	321-60-8
TERPHENYL-D-14	112	171-85-10
PHENOL-D5	26	4165-62-2
2-FLUOROPHENOL	36	367-12-4
2,4,6-TRIBROMOPHENOL	110	118-79-6

EPES Laboratory REPORT
Results by Sample

Work Order # 90-09-006

SAMPLE ID MS/MSD RIX%   SAMPLE # 07 FRACTIONS: A
Date & Time Collected not specified   Category

_QA .0 %	AS_QA 79 %	BA_QA 11 %	CD_QA 4.0 %	CR_QA 5.9 %	HG_QA 3.2 %
PB_QA 2.1 %	SE_QA 22 %				

EAGLE PICHER

PESTICIDE ORGANICS ANALYSIS DATA SHEET (8080)

CLIENT: EPIC
DATA FILE ID: 9006-2.PT
CLIENT SAMPLE ID: FT.RILEY CONEX BLDG. 348
LAB SAMPLE ID: 90-09-006-02A
LAB FILE ID: 0924-58
DATE RECEIVED: 9/4/90
DATE ANALYZED: 9/27/90
DILUTION FACTOR: 1
MATRIX: WATER

COMPOUND	CAS. NUMBER	CONCENTRATION UNITS UG/L	DETECTION LIMIT UG/L
ALDRIN	309-00-2	0.23	.04
ALPHA-BHC	319-84-6	< DL	.03
BETA-BHC	319-85-7	< DL	.06
DELTA-BHC	319-86-8	0.17	.09
GAMMA-BHC (LINDANE)	58-89-9	0.14	.04
CHLORDANE	57-74-9	< DL	.14
4,4'-DDD	72-54-8	< DL	.11
4,4'-DDE	72-55-9	< DL	.04
4,4'-DDT	50-29-3	< DL	.12
DIELDRIN	60-57-1	< DL	.02
ENDOSULFAN I	959-98-8	< DL	.14
ENDOSULFAN II	33212-65-9	< DL	.04
ENDOSULFAN SULFATE	1031-07-8	< DL	.66
ENDRIN	72-20-8	1.45	.06
ENDRIN ALDEHYDE	7421-93-4	< DL	.23
HEPTACHLOR	76-44-8	0.10	.03
HEPTACHLOR EPOXIDE	1024-57-3	5.72	.83
METHOXYCHLOR	72-43-5	< DL	1.76
TOXAPHENE	8001-35-2	< DL	2.4
PCB-1016	12674-11-2	< DL	1.0
PCB-1221	1104-28-2	< DL	1.0
PCB-1232	11141-16-5	< DL	1.0
PCB-1242	53469-21-9	< DL	1.0
PCB-1248	12672-29-6	< DL	1.0
PCB-1254	11097-69-1	< DL	1.0
PCB-1260	11096-82-5	< DL	1.0

SURROGATE	% RECOVERY
DIBUTYLCHLORENDATE	235

EAGLE EP PICHER

PESTICIDE ORGANICS ANALYSIS DATA SHEET (DOOC)

CLIENT: EPIC
DATA FILE ID: 9006-2.PIR
CLIENT SAMPLE ID: FT.RILEY CONEX BLDG. 348
LAB SAMPLE ID: 90-09-006-02AR
LAB FILE ID: 1001-83
DATE RECEIVED: 9/4/90
DATE ANALYZED: 10/01/90
DILUTION FACTOR: 1
MATRIX: WATER

COMPOUND	CAS. NUMBER	CONCENTRATION UNITS UG/L	DETECTION LIMIT UG/L
ALDRIN	309-00-2	0.61	.04
ALPHA-BHC	319-84-6	0.09	.03
BETA-BHC	319-85-7	< DL	.06
DELTA-BHC	319-86-8	0.20	.09
GAMMA-BHC (LINDANE)	58-89-9	0.91	.04
CHLORDANE	57-74-9	< DL	.14
4,4'-DDD	72-54-8	< DL	.11
4,4'-DDE	72-55-9	< DL	.04
4,4'-DDT	50-29-3	< DL	.12
DIELDRIN	60-57-1	2.4	.02
ENDOSULFAN I	959-98-8	34.0	.14
ENDOSULFAN II	33212-65-9	< DL	.04
ENDOSULFAN SULFATE	1031-07-8	< DL	.66
ENDRIN	72-20-8	1.45	.06
ENDRIN ALDEHYDE	7421-93-4	< DL	.23
HEPTACHLOR	76-44-8	1.15	.03
HEPTACHLOR EPOXIDE	1024-57-3	5.30	.83
METHOXYCHLOR	72-43-5	< DL	1.76
TOXAPHENE	8001-35-2	< DL	2.4
PCB-1016	12674-11-2	< DL	1.0
PCB-1221	1104-28-2	< DL	1.0
PCB-1232	11141-16-5	< DL	1.0
PCB-1242	53469-21-9	< DL	1.0
PCB-1248	12672-29-6	< DL	1.0
PCB-1254	11097-69-1	< DL	1.0
PCB-1260	11096-82-5	< DL	1.0

SURROGATE	% RECOVERY
DIBUTYLCHLORENDATE	83

EAGLE EP PICHER

PROJ. NO.	PROJECT NAME
222	Ft Riley Conex

SAMPLERS: (Signature) Eric W Davis

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	BNA (Semi Volatile)	Pesticide/PCB	Heavy Metals			REMARKS
Conex	8/31/90	10:15		X	Ft Riley Conex Bldg 348	1		✓				Sent by Federal Express
Conex	8/31/90	10:18		X	Ft Riley Conex Bldg 348	1	✓					Airbill No 2303991
Conex	8/31/90	10:20		X	Ft Riley Conex Bldg 348	1			✓			

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Eric W Davis	8/31/90 2:30 PM				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
		Lean McCoy	9-4-90 9:15		

61

State of Kansas
Mike Hayden, Governor

Department of Health and Environment
Division of Environment
Forbes Field, Bldg. 740, Topeka, KS 66620-0002
(913) 296-1535
FAX (913) 296-6247

:. Grant, Ph.D., Secretary

March 12, 1990

RECEIVED 16 MAY 1990

LETTER OF WARNING

Col. Steven Whitfield
Director of Engineering and Housing
Headquarters, 1st Infantry Division
and Fort Riley
Fort Riley, Kansas 66442-5000

Re: Closure Certification for CONNEX's and Building 348
EPA I.D. Number KS6214020756

Dear Col. Whitfield:

We have reviewed the certification of closure submitted on February 13, 1990 for the two CONNEX's and Building 348. This closure certification is unacceptable. The following information and revisions must be provided before we can accept the certification:

1. Certification of Closure

The Certification of Closure must include the Kansas Registered Professional Engineer's stamp. The Certification must also state whether any deviation from the specifications in the closure plan occurred. Several of these deviations are discussed below.

2. Page 1, Project Summary

The use of barbecue lighter fluid as a solvent during the decontamination of the CONNEX's was not authorized in the approved closure plan dated August 1987. Please explain why this procedure was used.

Also, please provide an analytical breakdown of the barbecue lighter fluid. The analyses submitted with the certification suggest that it is possible the barbecue lighter fluid may be considered a F-listed solvent. Disposal of the wastes from the closure cannot be authorized until we can determine if the barbecue lighter fluid meets the criteria for a F-listed solvent.

Charles Konigsberg, Jr., M.D., M.P.H.
Director of Health
(913) 296-1343

James Power, P.E.,
Director of Environment
(913) 296-1535

Lorne Phillips, Ph.D.,
Director of Information Systems

Roger Carlson, Ph.D.,
Director of the Kansas Health and Environmental Laboratory

3. Page 6, Sample Collection Data

The table indicates that the sampling procedures specified in the approved closure plan were not followed. The CONNEX's and Building 348 were to be rinsed a second time after the decontamination procedures were completed. The analysis of this second rinse was to be used to verify that the decontamination was successful. The second rinse was either not performed or the analysis was not submitted with the certification. With the sampling data provided, we cannot determine if the structures were adequately decontaminated. We must have the data from the second rinse in order to approve the closure. Please submit this data or re-sample the CONNEX's and Building 348 in accordance with the closure plan to verify that the closure was successful.

Please submit the requested information to us by April 16, 1990. If you have any questions, please contact me at (913) 296-1607. You should also contact Martin West of my staff at (913) 296-1613 for additional information.

Sincerely,

John Paul Goetz, P.E., Chief
Hazardous Waste Section
Bureau of Air and Waste Management

c. Wes Bartley
Ken Gilman
Martin West
Greg Sinton

mlw/ftrilcls.let

DEPARTMENT OF THE ARMY
KANSAS CITY DISTRICT, CORPS OF ENGINEERS
700 FEDERAL BUILDING
KANSAS CITY, MISSOURI 64106-2896

RECEIVED
30 NOV 1990

REPLY TO
ATTENTION OF:

November 27, 1990

Construction Management Branch
Construction Division

SUBJECT: Additional Information Concerning Traces of Pesticide in Test Results in Final Report for Contract Number DACA41-88-C-0068, Hazardous Waste Storage Facility, Building 292 (348) and CONEX Containers, Fort Riley, Kansas

Kansas Department of Health and Environment
Hazardous Waste Section
Bureau of Air and Waste Management
ATTN: Mr. John Paul Goetz
Forbes Field, Building 740
Topeka, Kansas 66620-0002

Dear Mr. Goetz:

Enclosed please find additional explanation of the traces of pesticide shown in the test results contained in the final report for the subject project. This additional information was requested by Martin West of your staff and he indicated that the closure could be finalized upon receipt of this information.

It is hoped that upon review of the additional information the closure certification for the subject project will be accepted by your organization and this phase of environmental cleanup at Fort Riley will reach a conclusion.

Sincerely,

Glen E. Davis
Chief, Construction Division

Enclosure

CF:
R/E, FM-RI
DEH, Ft. Riley, (Greg Sinton)
Kansas Department of Health and
Environment, (Martin WEst)

20 November 1990

CEMRK-ED-GE (200-1c)

MEMORANDUM THRU Chief, Toxic & Hazardous Waste Management Branch, ATTN: ED-TP (M. Anderson)

FOR Chief, Construction Division, ATTN: CD-MQ (K. Leutkemeyer)

SUBJECT: Updated Results of Pesticide Analysis for the Fort Riley Conex Closure

1. The purpose of this memorandum is to provide clarification in answer to a request by the Kansas Department of Health and Environment on the results reported by the United States Army Corps of Engineers (USACE) for the Fort Riley Conex Closure Project. The USACE report was found to be in error since it was based upon preliminary analytical data provided by the Environmental Protection Inspection and Consulting (EPIC) Company, Inc., and will need to be corrected to reflect the findings of the final analytical data report.

2. As requested, the ED-GE staff completed a review of the EPIC raw data packet. The ED-GE chemists were unable to confirm the reported results. In an attempt to clarify the conflicting EPIC reports (i.e., preliminary data reporting positive pesticide contamination; subsequent data reporting negative pesticide contamination), a member of the ED-GE technical staff conducted a telephone conversation with the EPIC Quality Control officer and Pesticide Residue Chemist. During the course of the telephone conversation, it was determined that EPIC had failed to update the preliminary analytical report (positive values reported were the result of conex sample peaks being identified within the same retention window as pesticide standards - this "preliminary data" was reported to the USACE as the project was designated at "time critical") after conducting the required subsequent gas chromatographic electron capture detector second column confirmational analysis (previously reported pesticides for the conex sample were determined to be caused by matrix effects, since the peaks of interest were not found to be within the same retention widow as the pesticide standards on the second column - positive pesticide report updated to report no pesticide contamination, but not forwarded to the USACE as a result of EPIC oversight). The subsequent analysis demonstrates the sample to be free of pesticide contamination at-or-above the minimum detection levels for low environmental samples as analyzed by the United States Environmental Protection Agency (USEPA) Solid Waste Method 8080 and are the analytical data which should be reported.

Therefore, the USACE analytical report for the Fort Riley Conex Closure Project should be updated to show verification of removal of pesticide residues from the previously contaminated conex.

3. Enclosed is the final pesticide report from EPIC.

4. Point of contact for this matter is Mr. Jerry A. Montgomery at extension 7882.

PAUL D. BARBER
Chief, Engineering Division

Encl

CF:
CEMRD-ED-G through CEMRK-ED
CEMRD-ED-GL
CEMRD-ED-GC
ED-X (wo/encl)

EPIC

November 01, 1990

Mr. Jerry Montgomery
US Army Corps of Engineers
700 Federal Building
601 East 12th Street
Kansas City, Missouri 64106

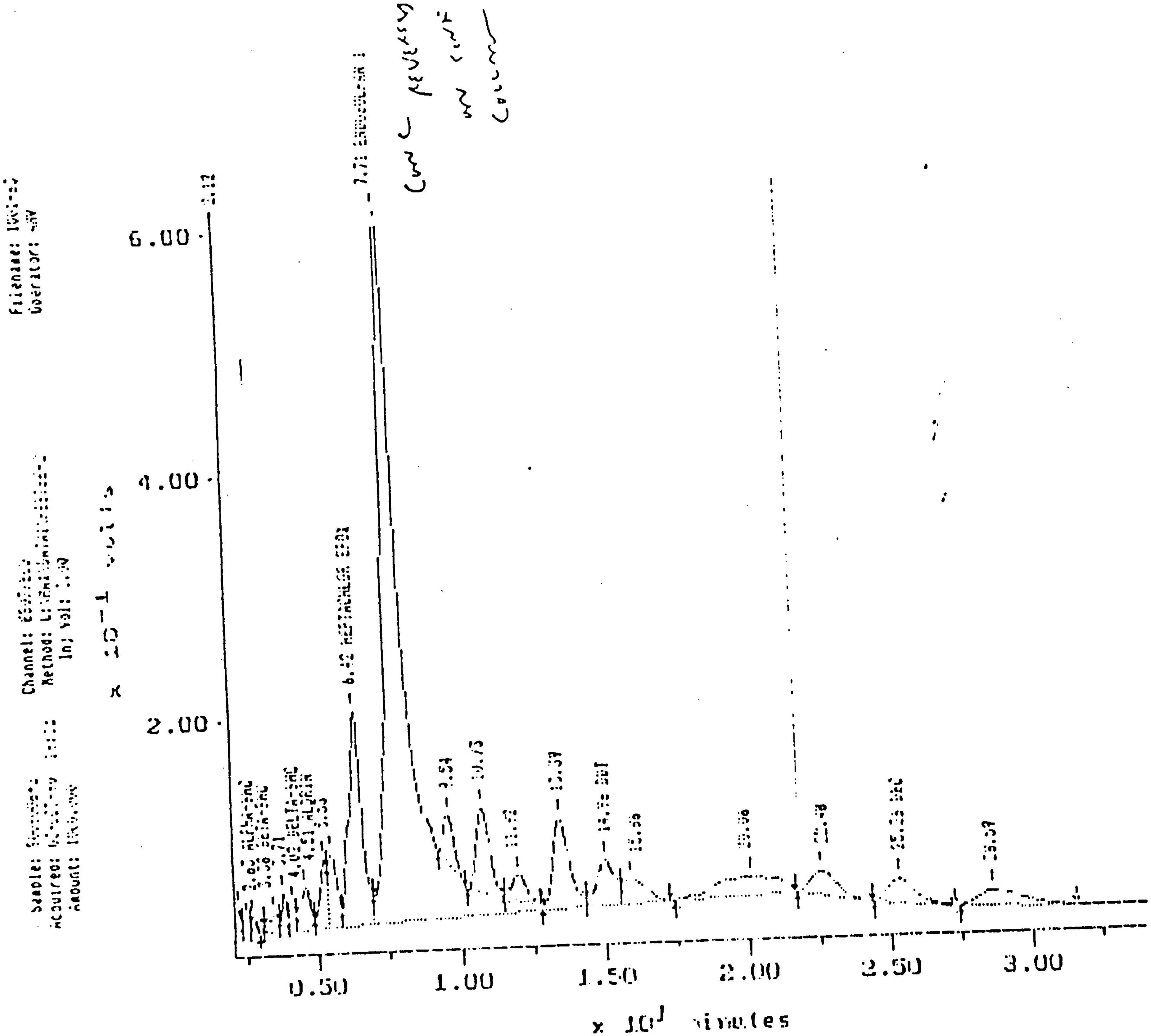
RE: Conex Decontamination - Ft.Riley, Kansas

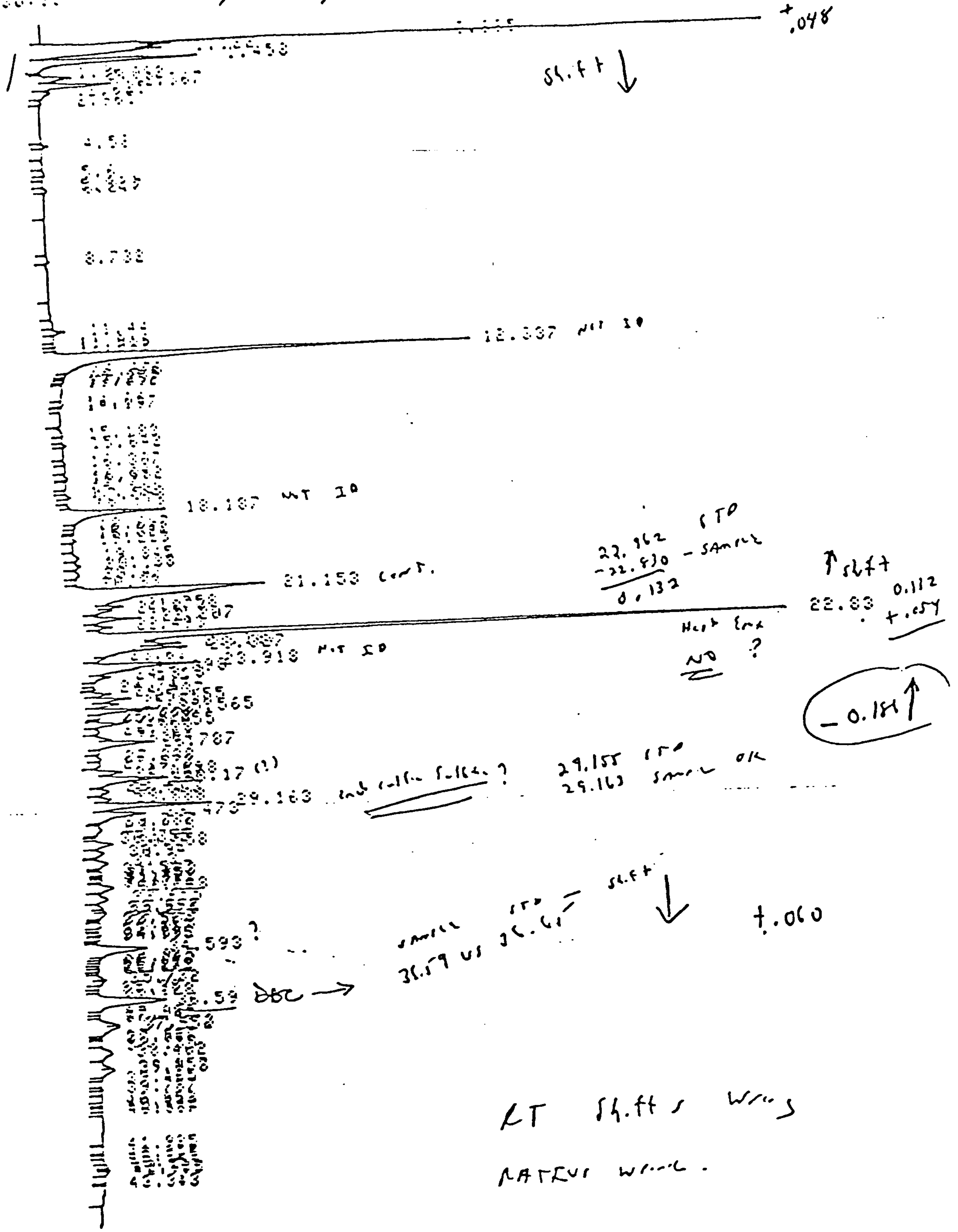
Dear Mr. Montgomery,

Please find enclosed the QA package and chromatograms from Eagle-Pitcher.

Sincerely,

Conny J. Todd
President
E.P.I.C. Company, Inc.


6.00
4.00
2.00
x 10^-1 volts
0.50
1.00
1.50
2.00
2.50
3.00
x 10^1 minutes



CHROMATOPAC C-R3A
SAMPLE NO 6
REPORT NO 3563

FILE 4
METHOD 6921

NAME

WATER MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

PARAMETER: PESTICIDES/PCB'S
METHOD: EPA 8080
CLIENT: EPIC
CLIENT SAMPLE ID: FORT RILEY CONEX BLDG. 348
EP-ES SAMPLE ID: 90-09-006-02A
DM FILE ID: 9006.QA

COMPOUND	SPIKE ADDED UG/L	SAMPLE CONCENTRATION UG/L	MS CONCENTRATION UG/L	MS % REC
GAMMA-BHC (LINDANE)	0.4	<.04	0.96	240
HEPTACHLOR	0.4	<.03	1.25	313
ALDRIN	0.4	<.04	0.89	223
DIELDRIN	1.0	<.02	<.02	0
ENDRIN	1.0	<.06	<.06	0
4,4-DDT	1.0	<.12	4.72	472

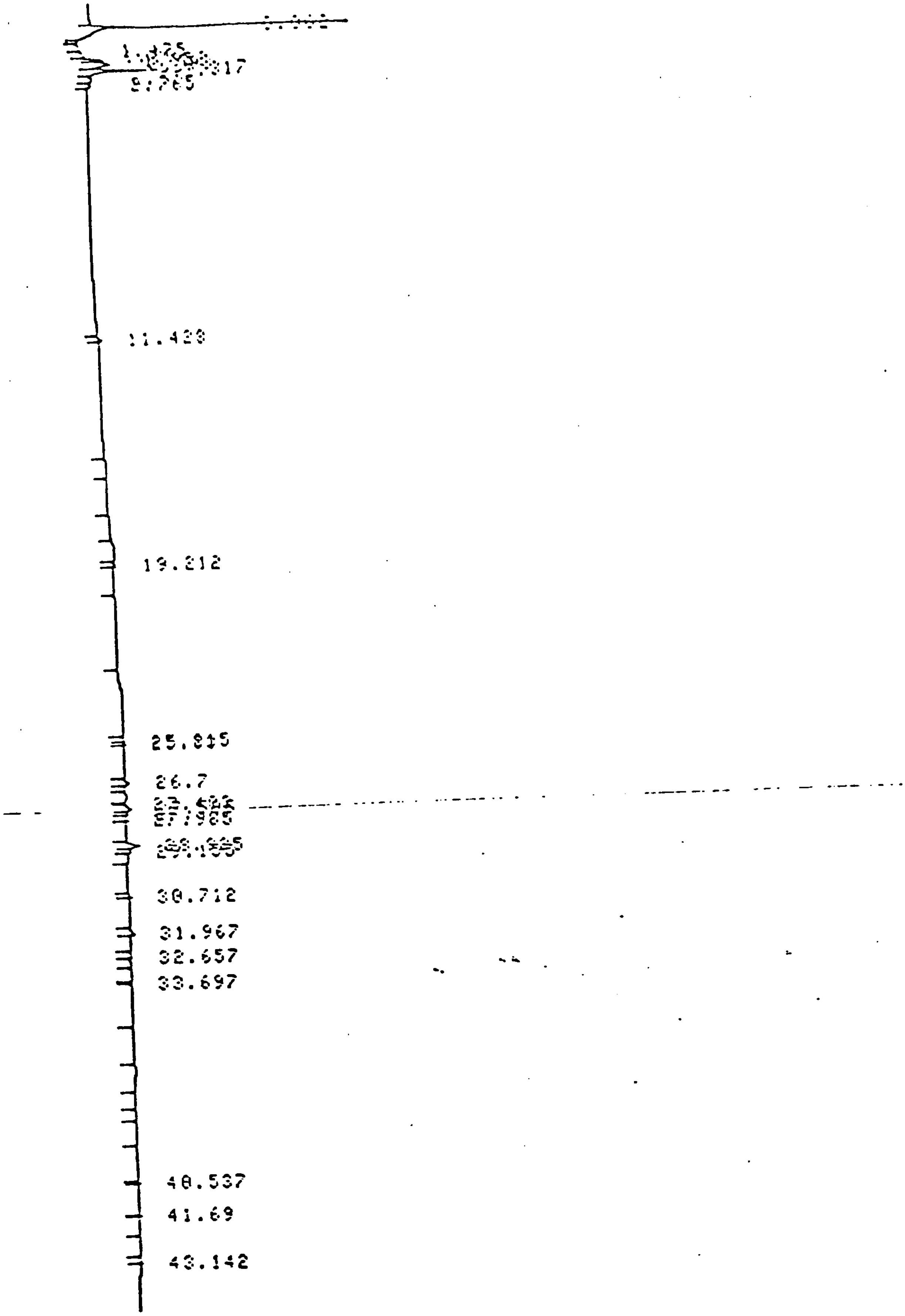
OUT-OF-CONTROL

COMPOUND	SPIKE ADDED UG/L	SAMPLE CONCENTRATION UG/L	MSD CONCENTRATION UG/L	MSD % REC	% RPD
GAMMA-BHC (LINDANE)	0.4	<.04	0.91	228	5
HEPTACHLOR	0.4	<.03	1.15	288	8
ALDRIN	0.4	<.04	.81	203	9
DIELDRIN	1.0	<.02	<.02	0	------
ENDRIN	1.0	<.06	<.06	0	------
4,4-DDT	1.0	<.12	3.45	345	31

OUT-OF-CONTROL

ERROR 10:NOT OPEN'D PORT IN/T 0.01
00/06/03
01:35:30

Blank



CHROMATOPAC C-R3A
SAMPLE NO 0

FILE 4
METHOD 0021

MAXIMA [illegible] DIVISION OF MILLIPORE

MAXIMA 820 CUSTOM REPORT

Printed: [illegible]

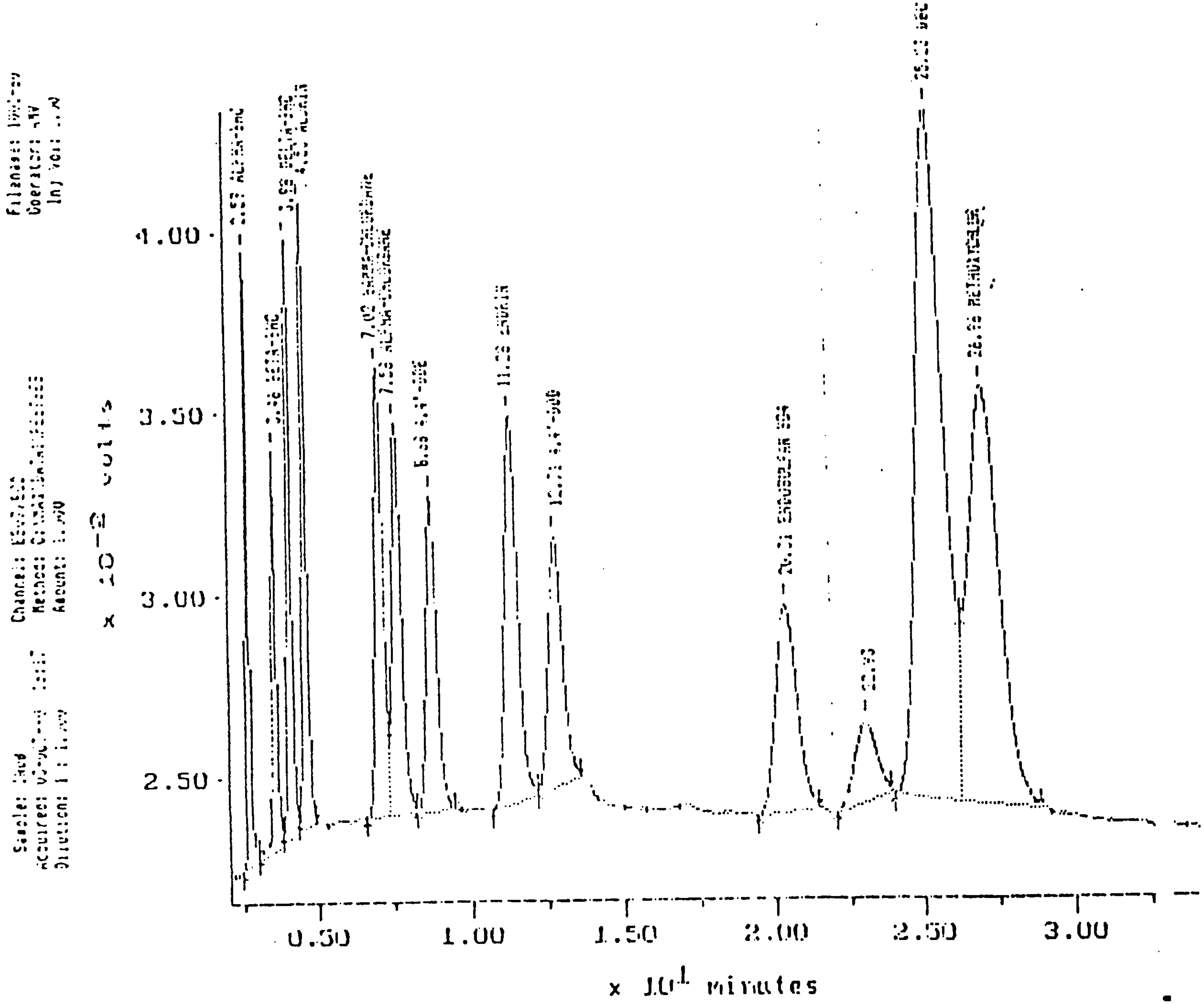
SAMPLE: [illegible]

Used in Method: 8080/CLP PESTICIDES
Acquired: 3-OCT-1990 15:40
Rate: 1.0 points/sec
Duration: 24.000 minutes
Operator: ARV

Type: Unkn
Instrument: E597
Filename: [illegible]
Index: Disk
Injection Volume: 1.0
Dilution: 1.000
Amount: 1.000

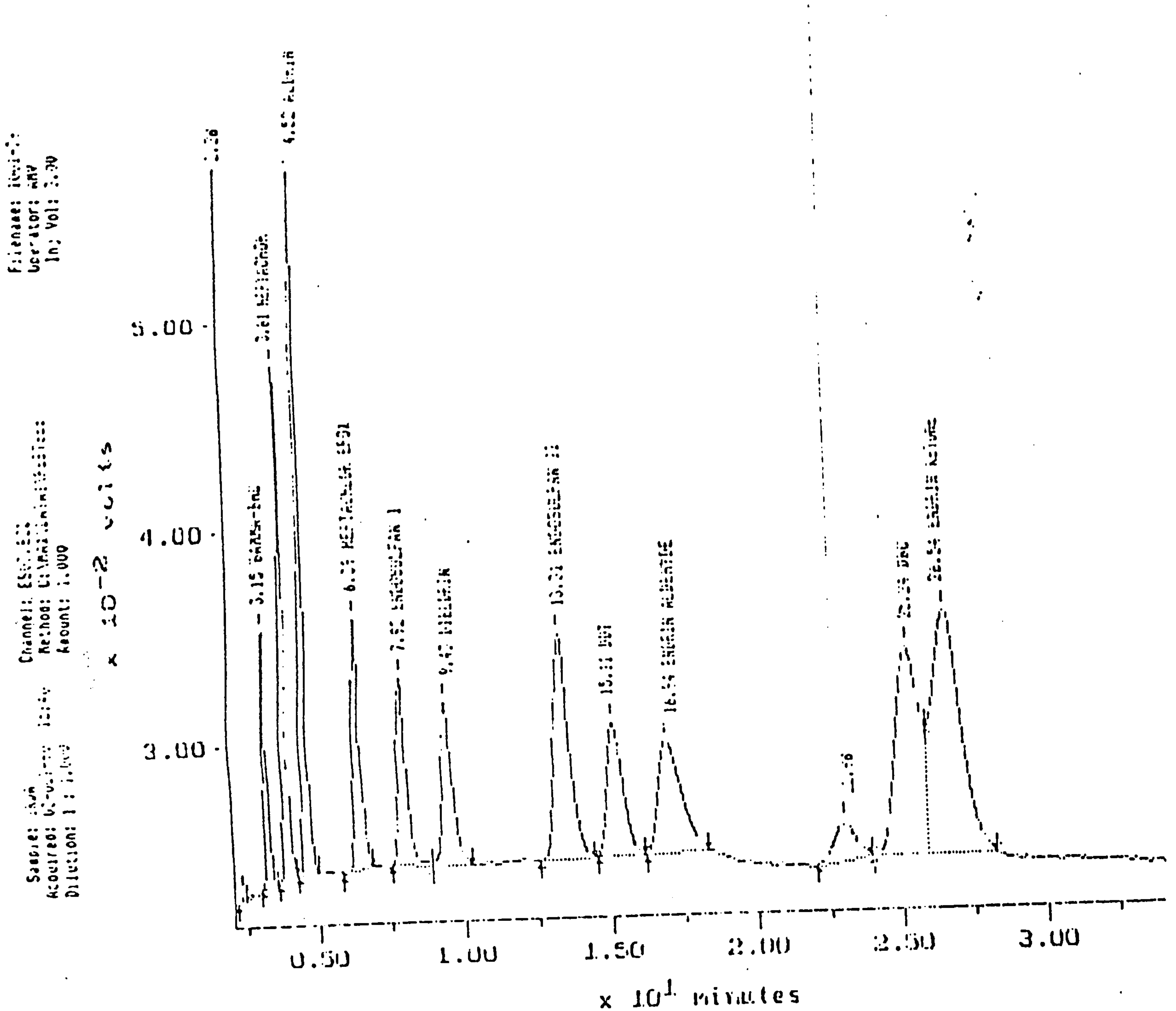
DETECTOR: [illegible]

PK#	ID#	Retention Time (minutes)	Component Name	Type	Peak Area	Peak Response	Response Factor (NG/ML/AREA)	Solution Conc (NG/ML)	Original Conc (UG/L)
1		[illegible]		BB	[illegible]				
2	4	[illegible]	GAMMA-BHC	BB	101551	101550.[illegible]	0.000	9.21	[illegible]
3	6	[illegible]	HEPTACHLOR	BB	[illegible]	[illegible]	0.000	[illegible]	[illegible]
4	8	4.517	ALDRIN	BB	[illegible]	[illegible]	0.000	[illegible]	[illegible]
5	9	[illegible]	HEPTACHLOR EPOX	BB	[illegible]	[illegible].4706	0.000	20.30	[illegible]
6	12	7.917	ENDOSULFAN I	BB	[illegible]	[illegible]	0.000	21.79	[illegible]
7	14	[illegible]	DIELDRIN	BB	[illegible]	[illegible]	0.000	[illegible]	[illegible]
8	17	[illegible]	ENDOSULFAN II	BB	[illegible]	[illegible]	0.000	[illegible]	[illegible]
9	18	[illegible]	DDT	BB	[illegible]	[illegible]	0.000	[illegible]	[illegible]
10	19	[illegible]	ENDRIN ALDEHYDE	BB	[illegible]	[illegible]	0.000		
11		[illegible]		BB	[illegible]			90.[illegible]	[illegible]
12	21	[illegible]	TCX	BB	[illegible]	[illegible]	0.000	[illegible]	[illegible]
13	22	[illegible]	ENDRIN KETONE	BB	[illegible]	[illegible]	0.001		
TOTAL					[illegible]			[illegible]	[illegible]


4.00
3.50
3.00
2.50
x 10^-2 volts
0.50
1.00
1.50
2.00
2.50
3.00
x 10^1 minutes

5	2.245	[illegible] V	0.6457
6	2.45	21577 V	0.1617
7	2.577	12551 V	0.0941
8	2.677	18489 V	0.1386
9	2.935	3850 V	0.0289
10	5.492	3051	0.0229
11	5.862	5105 V	0.0383
12	5.98	1155 V	0.0087
13	6.38	1326	0.0099
14	8.967	2675	0.0281
15	11.053	1440	0.0109
16	11.38	8682 V	0.0651
17	11.663	4059	0.0304
18	11.792	250 V	0.0019
19	12.277	1010	0.0076
20	12.787	10828	0.0812
21	13.043	1125 V	0.0084
22	13.217	1628 V	0.0122
23	13.478	576	0.0043
24	13.837	605	0.0045
25	13.983	293	0.0022
26	14.002	697 V	0.0052
27	14.062	189 V	0.0014
28	15.583	3106	0.0233
29	16.263	340342 S	2.5513
30	16.613	188 T	0.0014
31	17.105	287	0.0022
32	17.387	127622 V	0.9567
33	17.533	353616 SV	2.6503
34	17.957	768 T	0.0058
35	18.128	459 TV	0.0034
36	18.415	305671 V	2.2914
37	19.167	41192 V	0.3088
38	19.6	663	0.005
39	20.003	981	0.0074
40	20.283	317849 V	2.3827
41	20.553	999 V	0.0075
42	21.187	303950	2.2785
43	21.553	352348 SV	2.6413
44	21.892	412 T	0.0031
45	22.582	7533	0.0565
46	22.962	298755 V	2.2395
47	23.798	12502	0.0937
48	23.972	1602 V	0.012
49	24.27	301784	2.2622
50	24.585	843 V	0.0063
51	24.8	478	0.0036
52	24.955	662 V	0.005
53	25.155	482518	3.617
54	25.3	549278 SV	4.1175
55	25.488	2093 T	0.0157
56	25.677	441 T	0.0033
57	25.805	1541 TV	0.0116
58	25.835	596 TV	0.0045
59	25.925	302 TV	0.0023
60	26.262	504269 V	3.7801
61	26.65	338889 V	2.5404
62	27.052	1106183 V	8.2921
63	27.563	103683 V	0.7772

62	[illegible]	[illegible]		[illegible]
63	27.563	163683	V	1.2272
64	27.757	36878	V	0.2764
65	28.012	3564	V	0.0267
66	28.142	11259	V	0.0844
67	28.308	3713	V	0.0278
68	28.355	2875	V	0.0215
69	28.565	30680	V	0.23
70	28.923	1006566	V	7.5454
71	29.155	1217798	SV	9.1288
72	29.543	106	T	0.0008
73	29.595	581	T	0.0044
74	29.67	665	T	0.005
75	29.79	7104	TV	0.0532
76	30.405	446		0.0033
77	30.735	860564	SV	6.4509
78	31.042	210	T	0.0016
79	31.187	1047	TV	0.0078
80	31.243	176	T	0.0013
81	31.272	234	TV	0.0018
82	31.303	380	TV	0.0028
83	31.355	124		0.0009
84	31.388	528	V	0.004
85	31.658	706		0.0053
86	31.963	530371	SV	3.9758
87	32.355	293	T	0.0022
88	32.443	249	T	0.0019
89	32.615	758	T	0.0057
90	32.75	725	TV	0.0054
91	33.3	573927		4.3023
92	34.27	741		0.0056
93	34.355	1343		0.0101
94	34.533	528		0.004
95	34.948	1398		0.0105
96	35.02	2789	V	0.0209
97	35.165	530	V	0.004
98	35.79	182392	S	1.3672
99	36.102	325	T	0.0024
100	36.178	1133		0.0085
101	36.65	991049	V	7.4291
102	37.658	283		0.0021
103	39.062	469		0.0035
104	39.127	232	V	0.0017
105	39.187	474	V	0.0036
106	39.222	285	V	0.0021
107	39.253	162	V	0.0012
108	39.44	401		0.003
109	39.507	792		0.0059
110	40.01	307		0.0023
111	40.158	64	V	0.0005
112	40.505	229		0.0017
113	40.858	495		0.0037
114	40.937	1341		0.0101
115	41.13	703		0.0053
116	41.242	141		0.0011
117	41.623	1590		0.0119
118	41.792	1440	V	0.0108
119	41.94	1623	V	0.0122
120	42.928	489		0.0037


x 10^-2 volts
5.00
4.00
3.00
0.50
1.00
1.50
2.00
2.50
3.00
x 10^1 minutes

Con fi ... Run

DAILY INSTRUMENT WORK LOG

Date: 10-15-90
Analyst(s): pmw
Start Time: 1230
Stop Time: [illegible] 1700

Instrument No: ES05
Detector Type: ECD
Method Number: 8080

Column: Length 30m
Body: Glass
I.D. 0.53
Silica ✓
Packing/Phase DB-5
Other

Temp. Program:
T-int. 120 °C
T-fin. 280 °C
H-int. 2 min.
H-fin. 20 min.
ΔT/Δm 6 °C
Total Run Time 45
Inj. Quant. (ul) 3.0
Area System Standard:

Run Number	Sample Description	Diluti
3560	Cus. Rat 3-132-#4	
3561	Hexane Blank	1000
3562	9009006-2	100
3563	9009006-2 Contaminated	
3564	Cus Rat 3-132-5	
	Not continued long day	
	... !!	

ROUTINE MAINTENANCE:

(c:\wp\forms\worklog.frm)

EAGLE EP PICHER

MAXIMA [illegible] Dynamic Solutions, Division of Millipore

MAXIMA 820 CUSTOM REPORT

Printed: 5-OCT-1990 [illegible]

SAMPLE: [illegible]
Method: [illegible] PESTICIDES
Acquired: 3-OCT-1990 [illegible]
Rate: 1.0 points/sec
Duration: [illegible] minutes
Operator: ARV

Type: [illegible]
Instrument: [illegible]
Filename: [illegible]
Inject: DISK
Injection Volume: [illegible]
Amount: [illegible]

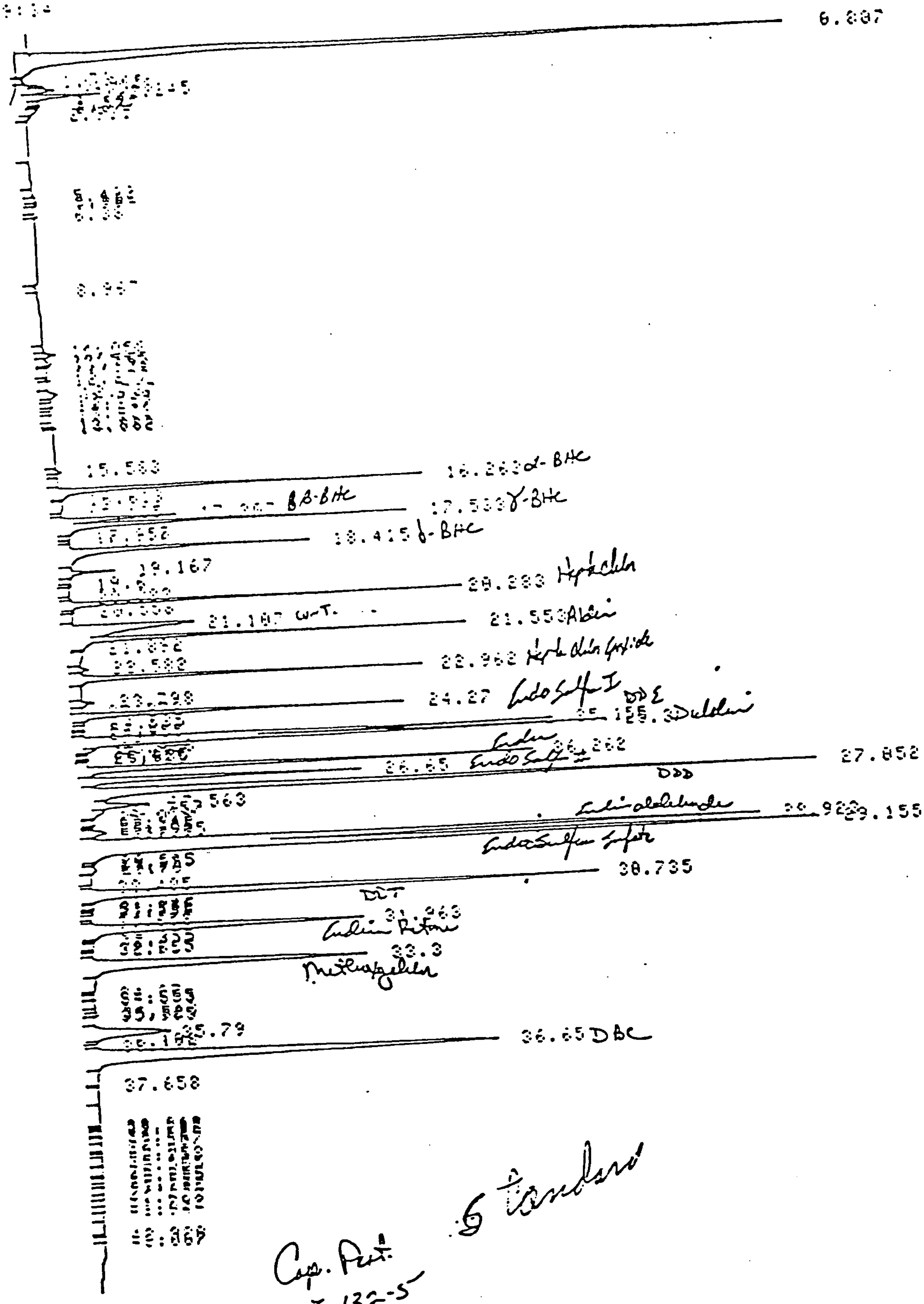
DETECTOR: [illegible]

Pk#	ID#	Retention Time (minutes)	Component Name	Type	Peak Area	Peak Response	Response Factor (Ng/ML/ANCH)	Solution Conc (Ng/ML)	Original Conc (Ug/L)
1		[illegible]		BV	112[illegible]				
2		[illegible]		VV	[illegible]				
3	3	[illegible]	ALPHA-BHC	VV	[illegible]	[illegible]	0.000	[illegible]	[illegible]
4	4	[illegible]	GAMMA-BHC	VV	[illegible]	[illegible]	0.000	[illegible]	[illegible]
5	5	[illegible]	BETA-BHC	VV	[illegible]	[illegible]	0.000	[illegible]	[illegible]
6		[illegible]		VV	[illegible]				
7	7	4.017	DELTA-BHC	VV	[illegible]	[illegible]	0.000	[illegible]	[illegible]
8	6	[illegible]	ALDRIN	VV	[illegible]	[illegible]!!!	0.000	[illegible]!	[illegible]!!
9		5.[illegible]		VV	1[illegible]				
10		[illegible]		VV	1[illegible]20				
11	9	6.417	HEPTACHLOR EPOX	VV	[illegible]	[illegible]!!	0.000	530.[illegible]	5.[illegible]!!
12	12	7.79[illegible]	ENDOSULFAN I	VV	[illegible]	[illegible]!!	0.000	[illegible]!!	31.0[illegible]!!
13		9.[illegible]		VB	1004[illegible]				
14		10.725		BV	[illegible]				
15		11.917		VB	714[illegible]				
16		[illegible]		VV	[illegible]				
17	16	14.[illegible]	DDT	VV	15[illegible]	154[illegible]!!!	0.000	2[illegible]!!	2.[illegible]!!
18		[illegible]		VB	[illegible]				
19		20.[illegible]		BB	[illegible]				
20		[illegible]		BV	[illegible]				
21	21	[illegible]	DBC	VB	[illegible]	[illegible].4550	0.000	1[illegible] 93%	1.[illegible]
22		[illegible]		BB	[illegible]				
TOTAL					[illegible]			[illegible]!!	[illegible]!!

!! Result calculation based on peak response more than 10% outside of calibration range.
! Result calculation based on peak response ratio outside of calibration range.

DBC=200

67	27.888	42514		0.6318
68	28.007	5724	V	0.0851
69	28.17	155564	SV	2.3119
70	28.457	111	T	0.0016
71	28.573	30645	V	0.4554
72	28.808	29075	V	0.4321
73	29.163	186388	V	2.77
74	29.473	109692	SV	1.6302
75	29.787	292	T	0.0043
76	29.983	11699	V	0.1739
77	30.355	535		0.0079
78	30.558	31816	V	0.4728
79	30.94	13953		0.2074
80	31.3	28937		0.43
81	31.587	3327	V	0.0494
82	31.673	11449	V	0.1701
83	31.79	2625	V	0.039
84	31.85	3330	V	0.0495
85	31.898	4139	V	0.0615
86	31.962	6063	V	0.0901
87	32.072	2336	V	0.0347
88	32.238	41475	V	0.6164
89	32.655	29416	V	0.4372
90	33.032	11275	V	0.1676
91	33.092	2004	V	0.0298
92	33.175	8612	V	0.128
93	33.22	16756	V	0.249
94	33.472	1449	V	0.0215
95	33.5	2044	V	0.0304
96	33.56	605	V	0.009
97	33.628	7602	V	0.113
98	33.837	1381		0.0205
99	33.91	1635	V	0.0243
100	34.03	4272	V	0.0635
101	34.092	1751	V	0.026
102	34.135	3294	V	0.049
103	34.593	129056	S	1.9179
104	34.945	694	T	0.0103
105	35.093	396	T	0.0059
106	35.19	824	T	0.0122
107	35.282	960	TV	0.0143
108	35.373	555	T	0.0082
109	35.73	7990		0.1187
110	35.772	8041	V	0.1195
111	35.98	1392		0.0207
112	36.128	1640		0.0244
113	36.59	184156	V	2.7368
114	37.002	2217	V	0.0329
115	37.143	1536	V	0.0228
116	37.473	32756	V	0.4868
117	37.552	41100	V	0.6108
118	37.927	1809	V	0.0269
119	38.008	1633	V	0.0243
120	38.135	4186	V	0.0622
121	38.462	34745	V	0.5164
122	39.057	18025	V	0.2679
123	39.113	24512	V	0.3643
124	39.465	901	V	0.0134



Cap. Pest.
3-132-5

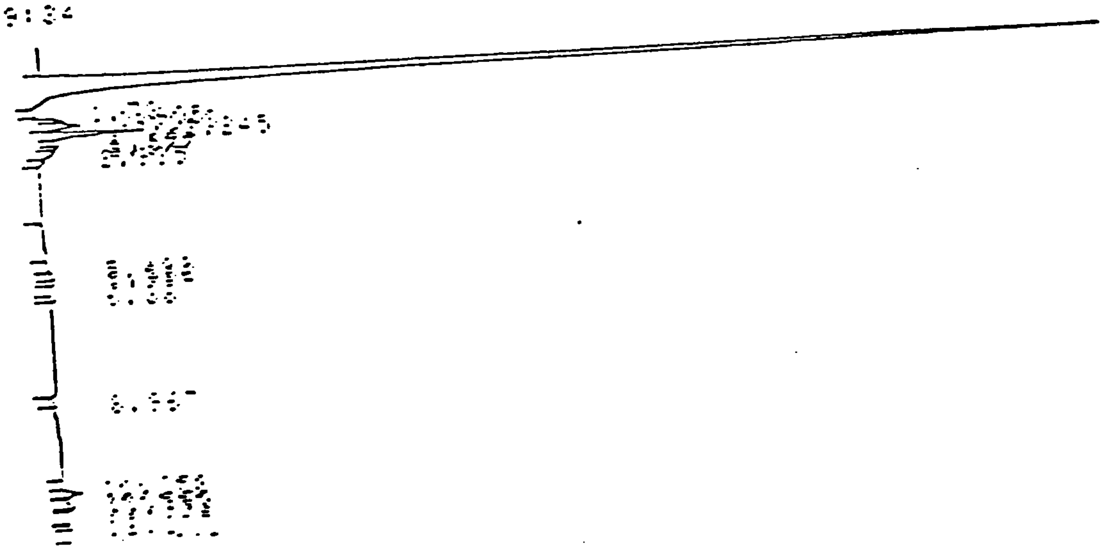
Standard

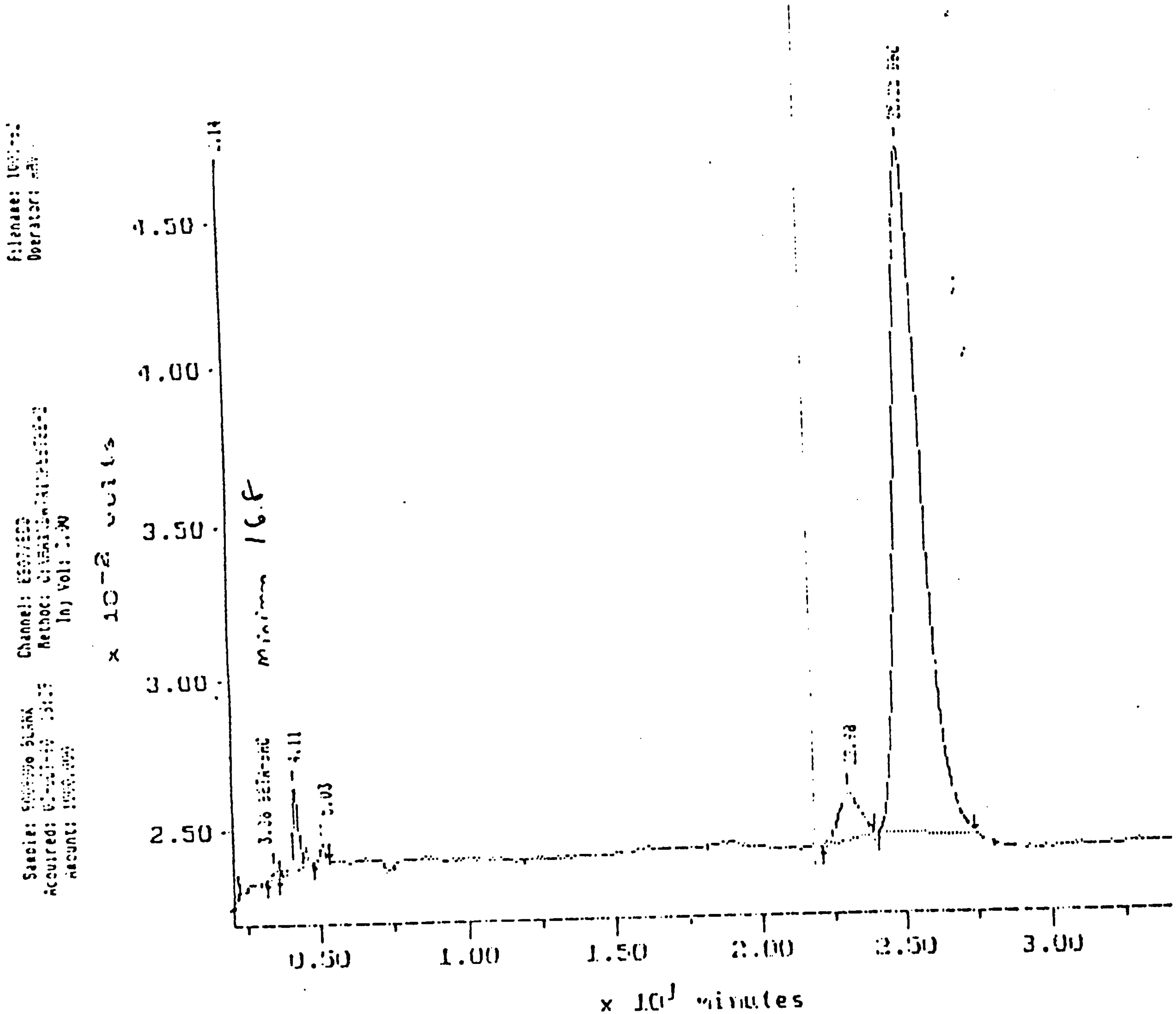
CHROMATOPAC C-R3A
SAMPLE NO 0
REPORT NO 3564

FILE 4
METHOD 8081

118	37.927	[illegible]		0.02[illegible]
119	38.008	1833	V	0.0622
120	38.125	4186	V	0.5164
121	38.461	14747	V	0.2679
122	39.057	18025	V	0.3643
123	39.113	14518	V	0.0134
124	39.465	901	V	0.0132
125	39.787	824		0.0294
126	40.053	1988		0.0165
127	40.29	1116		0.0104
128	40.442	708	V	0.0167
129	40.587	726	V	0.004
130	41.925	268		0.0036
131	42.258	143		0.0094
132	42.325	631	V	0.0071
133	42.45	2493		0.1036
134	42.71	6674	V	0.0743
135	42.822	4998	V	0.0539
136	42.905	3627	V	0.0021
137	43.313	139		0.008
138	43.343	537	V	
	TOTAL	6728905		100

START
ERROR 10:NOT OPEN'D PORT IN,T   0.01
05/00/83
08:29:34




x 10⁻² volts
4.50
4.00
3.50
3.00
2.50
0.50
1.00
1.50
2.00
2.50
3.00
x 10¹ minutes

Maxima [illegible] Dynamic Solutions, Division of Millipore

MAXIMA 820 CUSTOM REPORT

Printed: [illegible]

SAMPLE: [illegible]
[illegible] Method: [illegible] Pesticides
Acquired: [illegible]
Rate: [illegible] points/sec
Duration: [illegible] minutes
Operator: [illegible]

Type: UNKN
Instrument: [illegible]
Filename: [illegible]
Index: [illegible]
Injection Volume: [illegible]
Amount: [illegible]

DETECTOR: [illegible]

Pk#	ID#	Retention Time (minutes)	Component Name	Type	Peak Area	Peak Response	Response Factor (NG/ML/AREA)	Solution Conc (NG/ML)	Original Conc (UG/L)
1		1.142		BB	1201				
2	5	3.[illegible]	BETA-BHC	BF	2464	3464.116011	0.001	0.7311	0.0111
3		4.196		FB	35771				
4		5.[illegible]		BB	7165				
5		21.963		BB	73478				
6	21	25.250	DBC	BB	1466709	1486728.594311	0.000	224.2411 112%	2.2411
TOTAL					1609066			225.1311	2.2511

:: Result calculation based on peak response more than 10% outside of calibration range.

3	1.458	254275		3.7788
4	1.94	3589		0.0533
5	2.092	58516	V	0.8696
6	2.367	110276	V	1.6387
7	2.625	22444	V	0.3335
8	2.965	3282	V	0.0488
9	4.53	5705		0.0848
10	5.6	2964		0.044
11	5.928	1031		0.0153
12	6.217	3915		0.0582
13	8.732	6003		0.0892
14	11.44	10292		0.153
15	11.918	1362		0.0202
16	12.082	924		0.0137
17	12.337	793167	S	11.7875
18	12.978	187	T	0.0028
19	13.135	212	T	0.0031
20	13.257	583	TV	0.0087
21	13.352	151	T	0.0022
22	14.06	2582		0.0384
23	14.197	146	V	0.0022
24	15.183	7219		0.1073
25	15.642	3900		0.058
26	16.307	2009		0.0299
27	16.862	3313		0.0492
28	16.97	302	V	0.0045
29	17.382	848		0.0126
30	17.598	3746	V	0.0557
31	18.018	2339		0.0348
32	18.187	209939	SV	3.12
33	18.697	1358	T	0.0202
34	18.942	357	T	0.0053
35	19.02	403	T	0.006
36	19.223	4787	T	0.0711
37	19.845	12711		0.1889
38	20.188	12322	V	0.1831
39	20.47	11238	V	0.167
40	20.83	1372	V	0.0204
41	21.153	604759		8.9875
42	21.758	52863	V	0.7856
43	21.873	50231	V	0.7465
44	22.207	101043	V	1.5016
45	22.493	42770	V	0.6356
46	22.83	1371441	V	20.3813
47	23.187	174388	V	2.5916
48	23.327	185077	V	2.7505
49	23.61	24341	V	0.3617
50	23.918	184407	V	2.7405
51	24.098	38623	V	0.574
52	24.313	24750	V	0.3678
53	24.747	1549		0.023
54	24.937	20418		0.3033
55	25.155	49086	V	0.7295
56	25.338	30733	V	0.4567
57	25.565	81861	V	1.2166
58	25.778	9366	V	0.1392
59	25.892	2414	V	0.0359
60	25.922	2004	V	0.0298
61	26.055	34969	V	0.5196

PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT: EPIC
DATA FILE ID: 9006-MB.PT
CLIENT SAMPLE ID: FT RILEY CONEX BLDG. 348 METHOD BLANK
LAB SAMPLE ID: 90-09-006-MB
LAB FILE ID: 1001-82
DATE RECEIVED: 9/4/90
DATE ANALYZED: 1C/1/90
DILUTION FACTOR: 1.0
MATRIX: WATER

COMPOUND	CAS. NUMBER	CONCENTRATION UNITS UG/L	DETECTION LIMIT UG/L
ALDRIN	309-00-2	< DL	0.04
ALPHA-BHC	319-84-6	< DL	0.03
BETA-BHC	319-85-7	< DL	0.06
DELTA-BHC	319-86-8	< DL	0.09
GAMMA-BHC (LINDANE)	58-89-9	< DL	0.04
CHLORDANE	57-74-9	< DL	0.14
4,4'-DDD	72-54-8	< DL	0.11
4,4'-DDE	72-55-9	< DL	0.04
4,4'-DDT	50-29-3	< DL	0.12
DIELDRIN	60-57-1	< DL	0.02
ENDOSULFAN I	959-98-8	< DL	0.14
ENDOSULFAN II	33212-65-9	< DL	0.04
ENDOSULFAN SULFATE	1031-07-8	< DL	0.66
ENDRIN	72-20-8	< DL	0.06
ENDRIN ALDEHYDE	7421-93-4	< DL	0.23
HEPTACHLOR	76-44-8	< DL	0.03
HEPTACHLOR EPOXIDE	1024-57-3	< DL	0.83
METHOXY CHLOR	72-43-5	< DL	1.76
TOXAPHENE	8001-35-2	< DL	2.4
PCB-1016	12674-11-2	< DL	1.0
PCB-1221	1104-28-2	< DL	1.0
PCB-1232	11141-16-5	< DL	1.0
PCB-1242	53469-21-9	< DL	1.0
PCB-1248	12672-29-6	< DL	1.0
PCB-1254	11097-69-1	< DL	1.0
PCB-1260	11096-82-5	< DL	1.0

SURROGATE		% RECOVERY
DBC	ok	112

WATER METHOD SPIKE RECOVERY

METHOD: EPA 8080
CLIENT: EPIC
CLIENT SAMPLE ID: METHOD SPIKE
EP-ES SAMPLE ID: 09[illegible]590 BLANK SPIKE
DM FILE ID: 9006RE.MS

COMPOUND	SPIKE ADDED UG/L	SAMPLE CONCENTRATION UG/L	MS CONCENTRATION UG/L	MS % REC
GAMMA-BHC	.20	<.04	.22	110
HEPTACHLOR	.20	<.03	.16	80
ALDRIN	.20	<.04	.14	70
DIELDRIN	.50	<.02	.70	140
ENDRIN	.50	<.06	.24	48
DDT	.50	<.12	.55	110

PRIMARY Column

63	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
64	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
65	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
66	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
67	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
68	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
69	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
70	[illegible]	[illegible]	[illegible]	[illegible]		
71	[illegible]	[illegible]	[illegible]	[illegible]		
72	[illegible]	[illegible]	[illegible]	[illegible]		
73	[illegible]	[illegible]	[illegible]	[illegible]		
74	[illegible]	[illegible]	[illegible]	[illegible]		
75	[illegible]	[illegible]	[illegible]	[illegible]		
76	[illegible]	[illegible]	[illegible]	[illegible]		
77	[illegible]	[illegible]	[illegible]	[illegible]		
78	[illegible]	[illegible]	[illegible]	[illegible]		
79	[illegible]	[illegible]	[illegible]	[illegible]		

Standard Concentrations

Component	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	ignore	ignore	ignore	ignore	ignore	ignore	ignore
TCMX	ignore	ignore	ignore	ignore	ignore	[illegible]	[illegible]
ALPHA-BHC	ignore	ignore	ignore	ignore	[illegible]	ignore	ignore
GAMMA-BHC	[illegible]	[illegible]	[illegible]	[illegible]	ignore	[illegible]	[illegible]
BETA-BHC	ignore	ignore	ignore	[illegible]	[illegible]	ignore	ignore
HEPTACHLOR	[illegible]	4.000E+00	[illegible]	ignore	ignore	2.000E+00	4.000E+00
DELTA-BHC	ignore	ignore	ignore	ignore	ignore	2.000E+00	4.000E+00
ALDRIN	ignore	ignore	ignore	[illegible]	[illegible]	ignore	ignore
HEPTACHLOR EPOX	[illegible]	[illegible]	[illegible]	ignore	ignore	2.000E+00	4.000E+00
GAMMA-CHLORDANE	ignore	ignore	ignore	ignore	ignore	2.000E+00	4.000E+00
ALPHA-CHLORDANE	ignore	ignore	ignore	ignore	[illegible]	ignore	ignore
ENDOSULFAN I	[illegible]	[illegible]	[illegible]	ignore	ignore	[illegible]	[illegible]
4,4'-DDE	ignore	ignore	ignore	[illegible]	[illegible]	ignore	ignore
DIELDRIN	[illegible]	[illegible]	ignore	ignore	ignore	[illegible]	[illegible]
ENDRIN	ignore	ignore	ignore	ignore	ignore	[illegible]	[illegible]
4,4'-DDD	ignore	ignore	[illegible]	[illegible]	[illegible]	ignore	[illegible]
ENDOSULFAN II	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ignore	[illegible]
DDT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ignore	[illegible]
ENDRIN ALDEHYDE	[illegible]	[illegible]	ignore	ignore	ignore	[illegible]	[illegible]
ENDOSULFAN SU	ignore	ignore	ignore	[illegible]	[illegible]	ignore	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ignore	[illegible]
ENDRIN KETONE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Maxima (c)1990 Dynamic Solutions, Division of Millipore

MAXIMA 820 CUSTOM REPORT

Printed: 2-OCT-1990 14:46:04

SAMPLE: 1N0E

Type: UNKN
Instrument: 2507
Filename: 1001-60
Index: 0.58
Injection Volume: 3.0
Dilution: 1.000
Amount: 1.000

Used in Method: 8080/CLP PESTICIDES
Acquired: 2-OCT-1990 1:17
Rate: 1.0 points/sec
Duration: 34.000 minutes
Operator: MHV

DETECTOR: ECD/ECD

PK#	ID#	Retention Time (minutes)	Component Name	Type	Peak Area	Peak Response	Response Factor (NG/ML/AREA)	Solution Conc (NG/ML)	Original Conc (UG/L)
1	3	1.591	ALPHA-BHC	BF	121519	121519.4076	0.0[illegible]	7.65	76.53
2	5	3.436	BETA-BHC	FF	114374	114373.7035	0.0[illegible]	16.65	166.48
3	7	3.981	DELTA-BHC	FF	161555	161554.5670	0.0[illegible]	14.55	145.54
4	8	4.533	ALDRIN	FB	205027	205027.3047	0.0[illegible]	15.42	154.24
5	10	7.017	GAMMA-CHLORDANE	BF	222674	222674.4412	0.0[illegible]	15.66	156.77
6	11	7.575	ALPHA-CHLORDANE	FF	224672	224672.4587	0.0[illegible]	16.21	162.10
7	13	8.673	4,4'-DDE	FB	290160	290159.8224	0.0[illegible]	16.33	163.29
8	15	11.275	ENDRIN	BF	303928	303927.5505	0.0[illegible]	21.31	213.06
9	16	12.798	4,4'-DDD	FB	218644	218644.4513	0.0[illegible]	32.32	323.16
10	20	20.308	ENDOSULFAN SO4	BB	273572	273572.0796	0.0[illegible]	32.00	320.04
11		22.935		BB	109874				
12	21	25.225	DBC	BF	1204024	1204024.0580	0.0[illegible]	162.46	1624.60
13	22	26.958	METHOXYCHLOR	FB	894607	894606.8948	0.0[illegible]	70.99	709.90
TOTAL					4188042			451.96	4519.79

PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT: EPIC
DATA FILE ID: 90062RE.PT
CLIENT SAMPLE ID: FT RILEY CONEX BLDG. 348
LAB SAMPLE ID: 90-09-006-02A
LAB FILE ID: 1001-83
DATE RECEIVED: 9/4/90
DATE ANALYZED: 10/1/90
DILUTION FACTOR: 1.0
MATRIX: WATER

COMPOUND	CAS. NUMBER	CONCENTRATION UNITS UG/L	DETECTION LIMIT UG/L
ALDRIN	309-00-2	< DL	0.04
ALPHA-BHC	319-84-6	< DL	0.03
BETA-BHC	319-85-7	< DL	0.06
DELTA-BHC	319-86-8	< DL	0.09
GAMMA-BHC (LINDANE)	58-89-9	< DL	0.04
CHLORDANE	57-74-9	< DL	0.14
4,4'-DDD	72-54-8	< DL	0.11
4,4'-DDE	72-55-9	< DL	0.04
4,4'-DDT	50-29-3	< DL	0.12
DIELDRIN	60-57-1	< DL	0.02
ENDOSULFAN I	959-98-8	< DL	0.14
ENDOSULFAN II	33212-65-9	< DL	0.04
ENDOSULFAN SULFATE	1031-07-8	< DL	0.66
ENDRIN	72-20-8	< DL	0.06
ENDRIN ALDEHYDE	7421-93-4	< DL	0.23
HEPTACHLOR	76-44-8	< DL	0.03
HEPTACHLOR EPOXIDE	1024-57-3	< DL	0.83
METHOXYCHLOR	72-43-5	< DL	1.76
TOXAPHENE	8001-35-2	< DL	2.4
PCB-1016	12674-11-2	< DL	1.0
PCB-1221	1104-28-2	< DL	1.0
PCB-1232	11141-16-5	< DL	1.0
PCB-1242	53469-21-9	< DL	1.0
PCB-1248	12672-29-6	< DL	1.0
PCB-1254	11097-69-1	< DL	1.0
PCB-1260	11096-82-5	< DL	1.0

SURROGATE	% RECOVERY
DBC	83

DEPARTMENT OF THE ARMY
HEADQUARTERS, 1ST INFANTRY DIVISION (MECH) AND FORT RILEY
FORT RILEY, KANSAS 66442-5000
23 Oct 1990

REPLY TO
ATTENTION OF

Directorate of Engineering and Housing

Kansas Department of Health and Environment
Hazardous Waste Section, Bureau of Air & Waste Management
Attn: John Paul Goetz
Bldg 740 Forbes Field
Topeka, Kansas 66620-0002

Dear Mr. Goetz:

This letter is in response to your July, 20 1990 letter of warning concerning the CONEX /Bldg 348 Closure project. Enclosed please find the final closure report that provides the confirmation sampling data.

I hope the attached report will provide adequate information to allow final resolution of this project. If other information or actions are required contact Mr. Greg Sinton, DEH Environmental Branch, Phone 239-2195.

Encl.

Steven Whitfield
Col, Corps of Engineers
Director of Engineering and Housing

Copies Furnished:
Robert Avery, Resident Engineer, Fort Riley Resident office, U.S. Army Corps of Engineers, P.O. Box 2189, Fort Riley, KS 66442
Environmental protection Inspection & Consulting, Inc., 450 Dains, Liberty, MO 64068
Kansas City District, Corps of Engineers, ATTN:CEMRK-CD-MQ (Ken Luetkemeyer) 700 Federal Bldg, Kansas City, MO 64106-2896

ENVIRONMENTAL PROTECTION
INSPECTION AND CONSULTING, INC.

CONEX CLOSURE

BUILDING 348

FORT RILEY, KANSAS

AUGUST 31, 1990

submitted to:

KANSAS CITY DISTRICT CORPS OF ENGINEERS

submitted by:

ENVIRONMENTAL PROTECTION, INSPECTION & CONSULTING, INC.

On August 31, 1990, representatives of E.P.I.C. Company, Inc. conducted sampling of a Conex located outside Building 348 at Fort Riley, Kansas. This sampling was conducted to comply with the procedures specified in the approved closure plan as referenced in correspondence from K.D.H.E. of March 12, 1990 (attached).

SUMMARY OF WORK

Prior to collecting samples, the Conex was opened and visually inspected for physical hazards. No hazards were identified. The door to the Conex was secured in an open position using a latching strap.

A 9' x 12' piece of polyethylene sheeting was placed on the ground in front of the Conex and sampling equipment previously decontaminated using a wash in non phosphate detergent and rinsing in tap water followed by a distilled water rinse and wrapping in foil was placed on the plastic. Protective clothing consisting of TYVEK coveralls, nitrile gloves, chemical resistant steel toed boots, safety goggles, hard hat and ½ face respirators equipped with H.E.P.A./O.V./A.G. cartridges were also placed on the plastic sheeting. A decontamination line was set up consisting of three (3) metal tubs and brushes for decontamination of personnel and sampling equipment. The first tub contained tap water with non-phosophate detergent, the second tap water for rinsing, the third was empty and designed to contain distilled water used for final decontamination rinse. The final preparatory step involved placing a barrier of caution tape around the Conex at a distance of 20 feet.

After preparation was complete, sampling personnel removed street shoes, stepped onto the prepared plastic sheeting and donned protective clothing consisting of chemical resistant boots, TYVEK coveralls, half face respirators with H.E.P.A./A.G./O.V. cartridges, safety goggles, nitrile gloves and hard hat. The sleeves and legs of the TYVEK coveralls were placed over the gloves and boots and sealed by wrapping with duct tape.

A combustible gas/O2 meter (MSA Model 260) was calibrated according to manufacturers recommendations and the Conex was sampled. Results showed <1% L.E.L. and 21% O2 to be present in the Conex. The Conex was judged by the S.S.O. to be safe for entry and sampling commenced.

The previously decontaminated sprayer was opened and 2 gallons of distilled water was added. The sampler entered the Conex and a direct low pressure stream of water was directed toward the Conex pan. When empty, an additional gallon of distilled water was added to the sprayer and the process repeated. Approximately ½ gallon of additional water was directed at the Conex pan. The sprayer was handed to the sampler assistant who was also wearing protective equipment of the same type as the sampler. The water was moved over the entire surface of the pan with a squeegee making sure that the entire surface of the pan was contacted. The physical placement of the Conex was such that sampling water collected in one corner of the Conex. The sampler, utilizing previously decontaminated plastic scoop and funnel, collected the following samples: 1x2 liter for B/N/A., 1x2 liter for pesticide/PCB and 1x1 liter for metals. The first two samples were collected in precleaned amber glass bottles. The metal sample was collected in a plastic bottle (precleaned) to which nitric acid had been added. The sample was swirled and a small portion checked using p Hydrion paper. Results showed a pH of approximately 1.0. After sampling was complete, the empty metal tub was brought to the Conex and all remaining water was placed in the tub. The sampling assistant then proceeded to decontaminate the sampling equipment (scoop, funnel, squeegee, and sprayer) by triple washing in water with non phosphate detergent and tap water rinse. Personal protective equipment (i.e., boots, gloves, respirator) were decontaminated using the same procedure. This equipment was removed and the gloves, disposable coveralls and respirator cartridges were placed in a plastic bag for subsequent disposal. The sampler exited the Conex and decontaminated his personal protective equipment using the same procedure outlined above. Disposable items were placed into the plastic bag for disposal. The sampling equipment was removed from the tub containing tap water and rinsed with distilled water. At the completion of equipment decontamination, all decon solutions were placed into a metal drum along with the removed personal protective equipment and the plastic sheeting. Sampling personnel washed with soap and rinsed with distilled water with the water being placed directly into the drum containing decontamination water. The drum was closed, marked with a paint pen as to its contents and placed beside the Conex, awaiting final disposition based on sampling results.

The labels on the collected samples were completed and the containers sealed and placed in an insulated cooler containing ice. A chain of custody form was completed and the samples returned to Kansas City and sent for analysis via Federal Express on the afternoon of August 31, 1990.

Sample Results:

The three samples collected from the Conex were analyzed by Eagle Pitcher Environmental Services utilizing the following methods:

Analyte	Method (SW-846)
Semi volatiles (B/N/A)	8270

Pesticides/PCB	8080
Metals	
As	7061
Ba	3050/6010
Cd	3050/6010
Cr	3050/6010
Pb	3050/6010
Hg	7470
Se	7741
Ag	3050/6010

The results of these analysis attached as Appendix I shows no detectable PCB or semi volatile (B/N/A) contamination. Minimal levels of several pesticides and heavy metals were detected. These pose no threat to human health or the environment at the observed levels. The low level of contamination detected during this sampling was not detected or reported in prior sampling since these earlier samples had been taken after the wash water from the cleaning operations had been added. This resulted in a large scale dilution placing any low level contamination which existed below instrument detection limits (BDL).

Based on these sample results, the Conex decontamination has been completed.

Torres

Consulting Engineers, Inc.

1104 East 11th Street
Kansas City, MO 64106
(816) 474-3238

Closure plan for Hazardous Waste Storage Facilities, Ft. Riley, KS
Conex Container at Building 338

CERTIFICATION OF CLOSURE

I, William Torres, P.E., a registered professional engineer, hereby certify that to the best of my knowledge and belief, and that based on my visual inspection(s) of the aforementioned facilities, and based upon the analytical results performed by Eagle Pitcher Environmental Services, dated September 27 and 29, 1990, the closure of the facilities have been closed in accordance with the approved closure plan. The closure was completed on the 31st day of August, 1990.

William Torres
Signature of Professional Engineer

October 10, 1990
Date

8526
Professional Engineer License No.

Kansas
For the State of

1104 East 11th Street, Kansas City, Missouri 64106 (816)474-3238
Business Address & Telephone (with Area Code)

WILLIAM TORRES LICENSED 8526 KANSAS PROFESSIONAL ENGINEER

APPENDIX C

TECHNICAL MEMORANDA

Ca - CHEMICAL PROFILE SAMPLING OF PSF92-02 MONITORING WELL BORING, MARCH 30, 1992

Cb - SAMPLING PROCEDURES FOR MONITORING WELLS AT THE PESTICIDE STORAGE FACILITY, JULY 10, 1992, TECH MEMO #PSF-001

Pesticide Storage Facility
Fort Riley, Kansas

APPENDIX Ca

CHEMICAL PROFILE SAMPLING OF PSF92-02 MONITORING WELL BORING
MARCH 30, 1992

Pesticide Storage Facility
Fort Riley, Kansas

March 30, 1992

Scott Young, CEMRK-MD-H
United States Army Corps of Engineers
647 Federal Building
601 East 12th Street
Kansas City, MO 64106

Subject: Pesticide Storge Facility - Chemical Sampling at PSF92-02
Technical Memorandum

Dear Sir:

Pursuant to the requirements as noted in section XV, paragraph E of the Federal Facilities Agreement (IAG), Law Environment, Inc., Government Services Division, respectfully submits for your inspection the attached written notice for modifications and/or changes in field work for the referenced project. The changes and technical rationale for these modifications are presented in the attached site specific technical memorandum.

If you should have concerns or questions with regard to this site, feel free to contact this office during normal business hours. In the meantime, thank you for your understanding and cooperation.

Sincerely,

LAW ENVIRONMENTAL, INC.

Clark H. Gunion
Project Manager

Arthur J. Whallon
Principal

CHG/AJW:pm

Attachment

cc: Scott Marquess, Region VII EPA
Rachel Miller, KDHE - BER
Janet Wade, DEH, Fort Riley

TECHNICAL MEMORANDUM

Pesticide Storage Facility
Fort Riley, Kansas
March 30, 1992

In response to a comment made by a Technical Review Committee (TRC) member (TRC meeting, February 25, 1992) Law Environmental Government Services submits this technical memorandum which changes the scope of work to be performed at the Pesticide Storage Facility, Fort Riley, Kansas.

The change affects the chemical sampling intervals for the soil(s) at sample location PSF92-02. The TRC member noted that this sampling point is centrally located at the washing/rinsing area on site and reasoned that continuous chemical sampling (with analyses) should be performed in order to more thoroughly characterize the soil profile.

Originally, two soil samples were to be collected from the borehole at PSF92-02. However, after discussions with the Corps and the Department of the Army, Fort Riley, soil samples will be collected at the surface and every five feet there after until the water table is first encountered. Ground water was encountered at approximately thirty-three (33) feet in pilot borings advanced at this site. Therefore, a total of seven (7) soils samples will be collected (surface, 5, 10, 15, 20, 25 and 30 feet). These samples will be analyzed for volatile organic and semi-volatile organic compounds, pesticides/PCBs, organophosphorus pesticides, herbicides and metals.

APPENDIX Cb

SAMPLING PROCEDURES FOR MONITORING WELLS AT THE PESTICIDE STORAGE FACILITY, JULY 10, 1992
TECH MEMO #PSF-001

Pesticide Storage Facility
Fort Riley, Kansas

2, 11 pages

LAW ENVIRONMENTAL INC.

GOVERNMENT SERVICES BRANCH
114 TOWNPARK DRIVE, 4TH FLOOR
KENNESAW, GEORGIA 30144-5508
404-499-6800

July 10, 1992

Memorandum for: Commander Engineer District Kansas City
Attn: CEMRK-MD-H, Cpt. Carol Ann Charette
Kansas City, MO 64106

Subject: Technical Memorandum DCF-002, PSF-001, SFL-004: Sampling Procedure for Monitoring Wells at Southwest Funston Landfill (SFL), Pesticide Storage Facility (PSF) and the former Dry Cleaning Facility (DCF), Ft. Riley, Kansas. The sample collection procedure described below replaces the equipment and procedural descriptions in the following documents:

	SFL	PSF	DCF
Draft Modified Field Sampling Plan	Section 5.3, pg.5-28	Section 5.3 pg. 5-26	
Draft Modified Quality Assurance Plan	Section 4.1, pg.4-6	Section 4.1	
Draft Modified Chemical Data Aquisition Plan			Section 4.4 pg. 4-29

1. Purpose: The purpose of this memorandum is to describe the change in sampling procedure for the monitoring wells. Pursuant to the requirements as noted in Section XV, Paragraph E of the Federal Facilities Agreement (IAG), this memorandum was prepared for the EPA, KDHE and the administrative record to document the following modifications and/or changes in field work for the Southwest Funston Landfill, the Pesticide Storage Facility and the former Dry Cleaning Facility. These changes were agreed upon by the following Project Managers from the Corps of Engineers, Ft. Riley, KDHE, Law Environmental, and EPA Region 7:

1530.50

Corps of Engineers:	Cpt. Carol Ann Charette
Ft. Riley:	Ms. Janet Wade
KDHE:	Ms. Rachel Miller
Law Environmental:	Mr. John Cook
EPA:	Mr. Scott Marquess

2. Issue/Background/Rationale: In an effort to collect less turbid samples from the ground-water monitoring wells at the above mentioned sites, a dedicated bladder pump system will be employed. The bladder pump is designed to deliver a flow stream of 100 mls/minute to help insure volatile organic compound integrity as well as maintaining a constant flow rate throughout the sampling process.

3. Action: The bladder pumps are manufactured by QED, Inc. model numbers T1200 and T1500; the bladder pump body will be constructed of Teflon/316 stainless steel and contain a teflon bladder. Each pump will be connected to polyethylene tubing with an inner teflon lining.

Installation

- The bladder pump will be placed in each well to optimize sampling volume and best represent aquifer conditions.

- For wells containing less than 5 feet of water, bladder pumps will be placed 1 foot above the bottom of screened interval. Bladder pumps will be placed 2 feet from the bottom of the screened interval in wells which contain less than 8 feet of water. In wells that contain 8 or more feet of water, the bladder pump will be placed at 5 feet above the bottom of the screened interval.

WELL TYPE	SITE	# OF PUMPS	AVG. WATER CLMN HEIGHT	PLACEMENT OF BLADDER PUMP FROM BOTTOM OF SCREENED INTERVAL
Shallow	DCF	6*	7 feet	2 feet
Shallow	PSF	5*	5 feet	2 feet
Shallow	SFL	8	7 feet	2 feet
Intermediate	SFL	4	20 feet	5 feet
Deep	SFL	8	40 feet	5 feet

* DCF-04, PSF-03 and PSF-04 wells will have bladder pumps placed at 1 foot above the screened interval.

- The bladder pumps will be placed well above the bottom of the screened interval to prevent possible interferences from fine particles and below the top of the water column to allow sufficient volume during sampling and purging. Eachbladder pump will have a protective screen to resist clogging or pump failure due to particulates.

- The bladder pump will be used to purge the well. Five casing volumes of water will be removed. Flow can be adjusted to yield up to a maximum of 1 gallon per minute (gpm) depending on water column height and well recharge. For example, a deep monitoring well at Southwest Funston Landfill with 40 feet of water would require 33 gallons (5 casing volumes) to be removed. If a maximum purge rate of 1 gpm could be established, this well would take 33 minutes to purge the required amount. However, due to slow recharge at the Pesticide Storage Facility and the Dry Cleaning Facility, a maximum gpm of 0.25 has been established. These wells typically have 7 feet of water which would require approximately 6 gallons of water (5 casing volumes) to be removed. At a gpm of 0.25 this would take 24 minutes to purge the required amount.

- After purging, each well will be sampled immediately providing parameters have stabilized (+/- 10% between two successive readings) and turbidity levels have reached 30 NTUS. If 30 NTUS cannot be reached the well will be allowed to stabilize. This would allow fine soil particles and silts to settle and would allow sufficient time for ground water to recharge to volumes required for sampling. The well will be checked periodically for water "clarity". All wells will be sampled within 5 hours after purging regardless of turbidity levels.

- If a well contains insufficient volume to meet the 5 casing volume purge criteria, the well will be purged dry three times and sampled when sufficient recharge has occurred.

- Sample collection occurs when the teflon bladders are inflated with air and ground-water is discharged. The sample does not come in contact with the air used to inflate the bladder; therefore, no contamination is introduced into the system via air.

4. Impacts/Conclusion: The proposed modification to the Sampling Procedure will impact the schedule for the projects. Ground-water sampling for the Pesticide Storage Facility will begin approximately July 14 and end July 16, 1992. Sampling at the Dry Cleaning Facility will begin approximately July 17 to July 20, 1992. Ground water sampling for Southwest Funston Landfill will begin approximately July 21 and end by July 30, 1992.

Sincerely,

Law Environmental, Inc.

Judith A. Hartness
Project Chemist

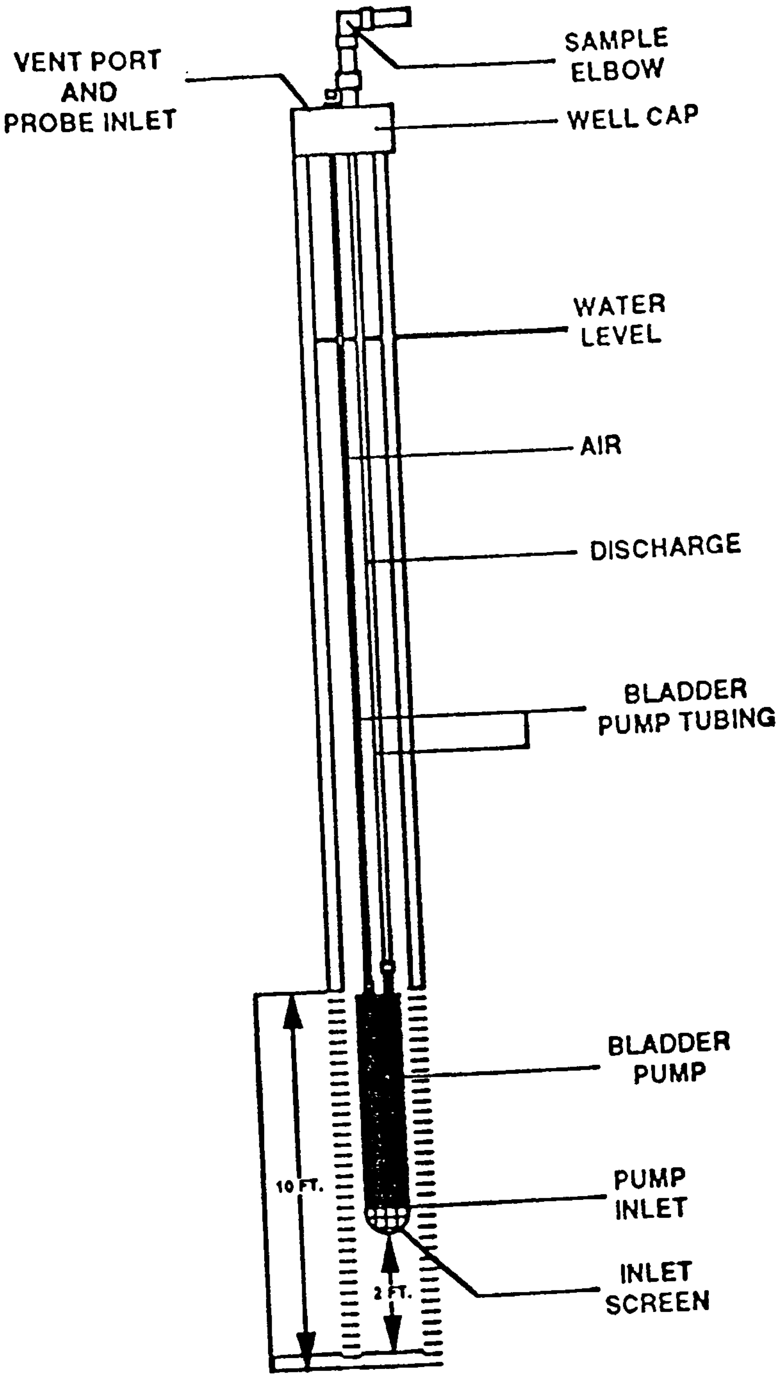
for Gregory P. Myers, P.G.
Project Principal

JAH/dsl

Attachments

cc: Scott Marquess, Region VII, EPA
Janet Wade, DEH, Ft. Riley
Cpt. Carol Ann Charette, COE

DEDICATED WELL SYSTEM BLADDER PUMP
DRY CLEANING FACILITY
FT. RILEY, KANSAS



NOT TO SCALE

WELL WIZARD

WELL SYSTEM BLADDER PUMP

INSTRUCTIONS

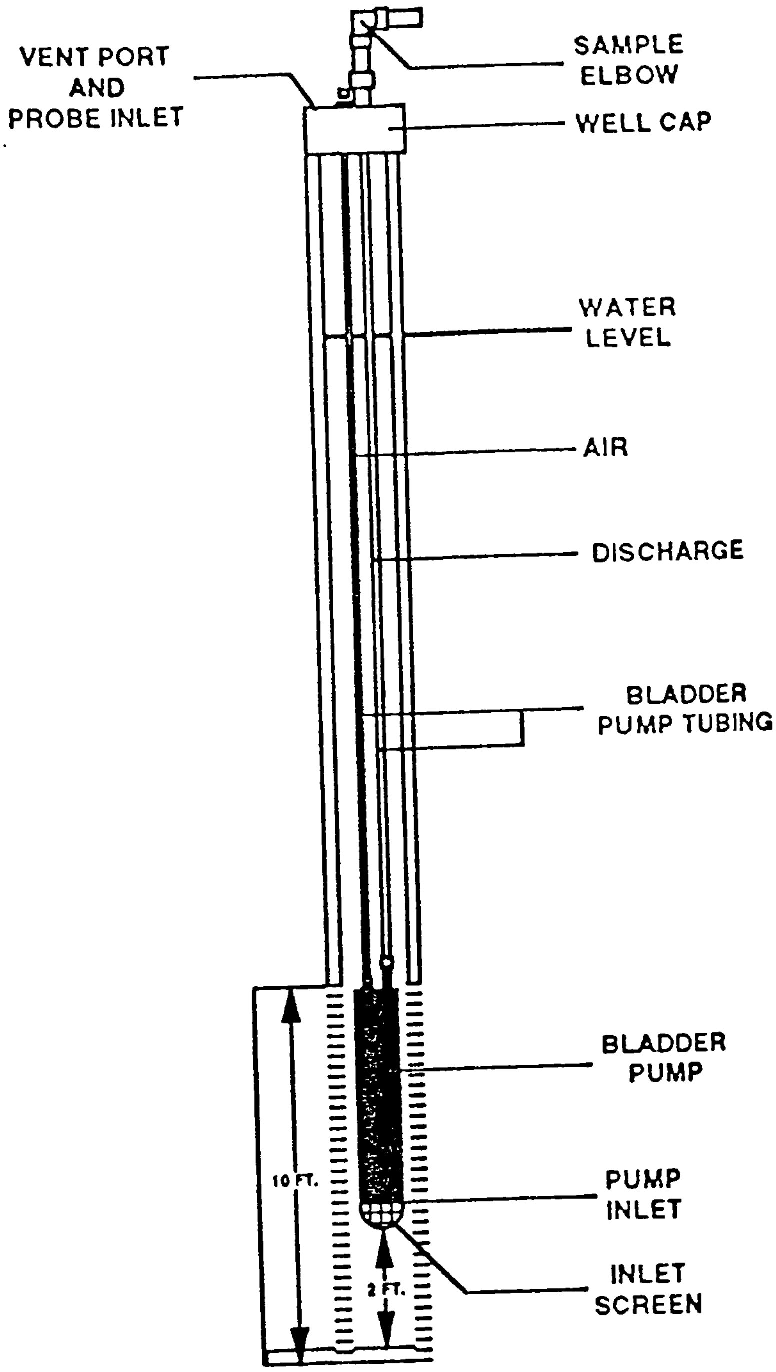
1. ATTACH INLET SCREEN TO BLADDER PUMP (IF APPLICABLE).
2. ATTACH BLADDER PUMP TUBING TO PUMP.
3. LOWER PUMP TO DESIRED DEPTH.
4. PASS DISCHARGE TUBE THROUGH CAP AND ATTACH AIR LINE UNDER CAP.

SOURCE: SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

MFJH

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES BRANCH

DEDICATED WELL SYSTEM BLADDER PUMP
PESTICIDE STORAGE FACILITY
FT. RILEY, KANSAS



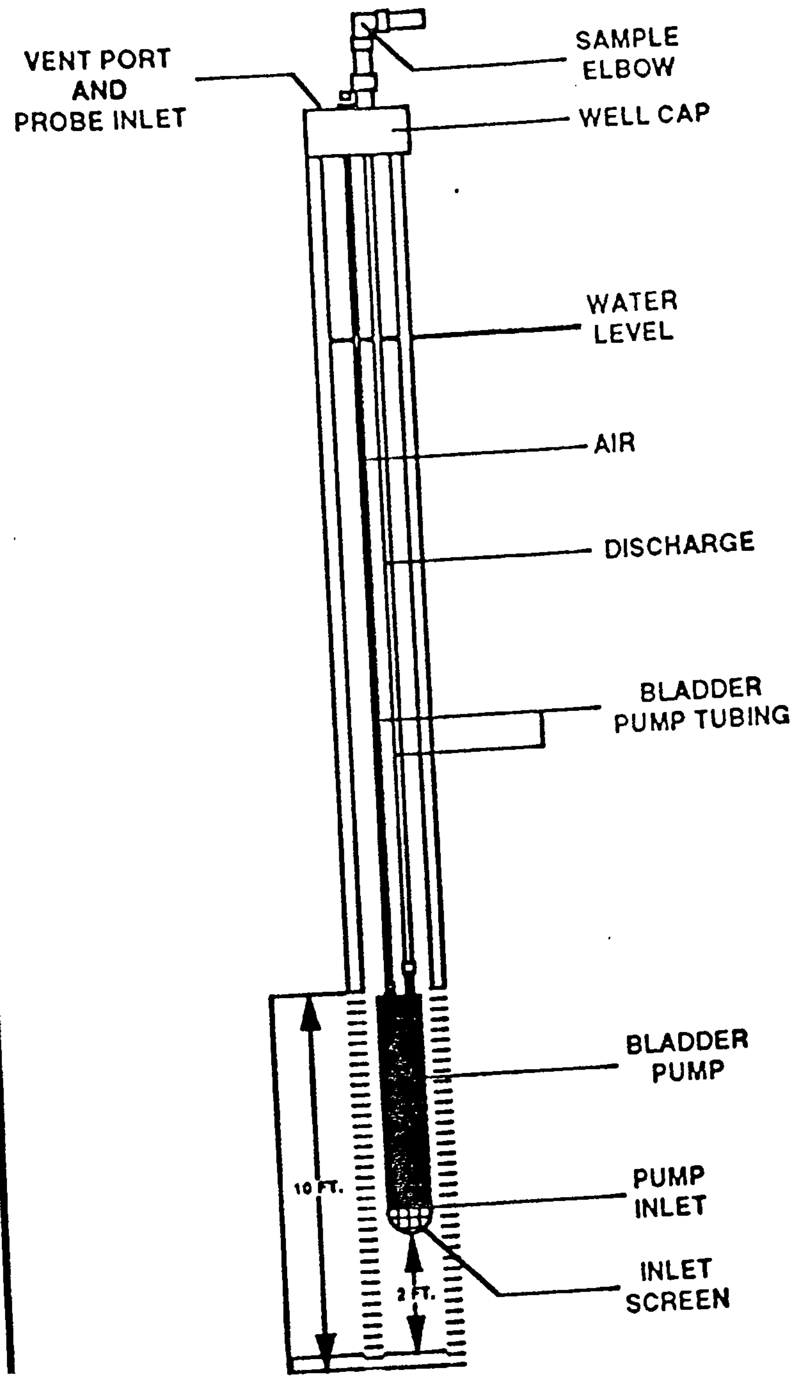
NOT TO SCALE

WELL WIZARD
WELL SYSTEM BLADDER PUMP
INSTRUCTIONS
1. ATTACH INLET SCREEN TO BLADDER PUMP (IF APPLICABLE). 2. ATTACH BLADDER PUMP TUBING TO PUMP. 3. LOWER PUMP TO DESIRED DEPTH. 4. PASS DISCHARGE TUBE THROUGH CAP AND ATTACH AIR LINE UNDER CAP. SOURCE: SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

MFJH

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES BRANCH

DEDICATED WELL SYSTEM
BLADDER PUMP
SOUTHWEST FUNSTON LANDFILL
SHALLOW WELLS
FT. RILEY, KANSAS



NOT TO SCALE

WELL WIZARD

WELL SYSTEM
BLADDER PUMP

INSTRUCTIONS

1. ATTACH INLET SCREEN TO BLADDER PUMP (IF APPLICABLE).
2. ATTACH BLADDER PUMP TUBING TO PUMP.
3. LOWER PUMP TO DESIRED DEPTH.
4. PASS DISCHARGE TUBE THROUGH CAP AND ATTACH AIR LINE UNDER CAP.

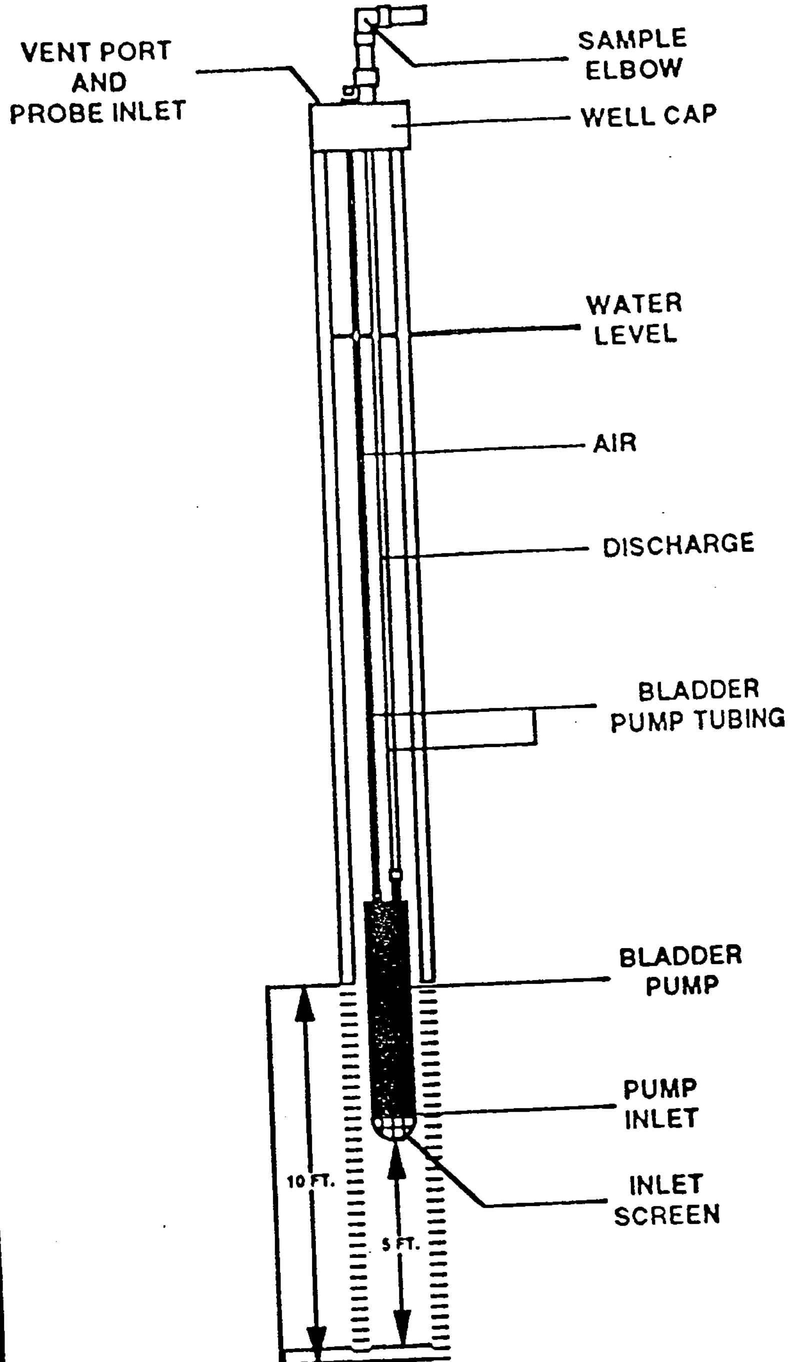
SOURCE: SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

MFJH

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES BRANCH

DEDICATED WELL SYSTEM
BLADDER PUMP

SOUTHWEST FUNSTON LANDFILL
INTERMEDIATE AND DEEP WELLS
FT. RILEY, KANSAS



NOT TO SCALE

WELL WIZARD

WELL SYSTEM
BLADDER PUMP

INSTRUCTIONS

1. ATTACH INLET SCREEN TO BLADDER PUMP (IF APPLICABLE).
2. ATTACH BLADDER PUMP TUBING TO PUMP.
3. LOWER PUMP TO DESIRED DEPTH.
4. PASS DISCHARGE TUBE THROUGH CAP AND ATTACH AIR LINE UNDER CAP.

SOURCE: SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

MFJH

APPENDIX D

TOPOGRAPHICAL SURVEY DATA

Pesticide Storage Facility
Fort Riley, Kansas

PESTICIDE AREA
BORE HOLES

POINT NO.	NORTH	EAST	ELEVATION
SB - 1	268,200.11	2,348,511.01	1082.9
SB - 2	268,208.91	2,348,484.74	1082.53
SB - 3	268,175.18	2,348,511.20	1082.1
SB - 4	268,165.85	2,348.403.36	1080.11
SB - 5	268,169.73	2,348,504.88	1081.9
SB - 6	268,127.77	2,348,467.13	1078.9
SB - 7	268,139.00	2,348,442.25	1080.1
SB - 8	268,134.18	2,348,432.65	1079.9
SB - 9	268,129.79	2,348,533.85	1078.3
SB - 10	268,098.20	2,348,518.83	1076.2
SB - 11	268,126.78	2,348,524.72	1078.2
SB - 12	268,093.39	2,348,498.50	1076.6
SB - 13	268,072.29	2,348,456.52	1076.4
SB - 14	268,053.48	2,348,460.85	1072.0
SB - 15	268,059.49	2,348,540.38	1067.1
SB - 16	268,050.16	2,348,556.55	1066.7
SB - 17	268,054.90	2,348,519.88	1066.8
SB - 18	268,035.01	2,348,521.88	1066.4
SB - 19	268,051.64	2,348,510.24	1066.7
SB - 20	268,024.27	2,348,489.75	1066.6

PESTICIDE AREA
SOIL SAMPLES

POINT NO.	NORTH	EAST	ELEVATION
SS - 1	268,200.11	2,348,511.01	1082.9
SS - 2	268,208.91	2,348,484.74	1082.53
SS - 3	268,139.00	2,348,442.25	1080.1
SS - 4	268,054.90	2,348,519.88	1066.8

PESTICIDE AREA
SEDIMENT SAMPLES

POINT NO.	NORTH	EAST	ELEVATION
SD - 1	268,098.38	2,348,837.46	1066.6
SD - 2	268,015.50	2,348,545.49	1063.8
SD - 4	267,945.60	2,348,454.91	1062.4
SD - 5	267,996.14	2,348,419.54	1071.5
SD - 6	267,856.26	2,348,375.01	1060.6
SD - 7	267,834.91	2,348,327.87	1060.2
SD - 9	267,841.15	2,348,245.68	1060.5

PESTICIDE AREA
SURFACE WATER POINTS

POINT NO.	NORTH	EAST	ELEVATION
SW - 1	268,093.73	2,348,842.12	1066.6
SW - 2	268,020.69	2,348,549.44	1063.3
SW - 3	267,976.61	2,348,475.18	1062.8
SW - 4	267,942.89	2,348,448.39	1062.0
SW - 6	267,849.39	2,348,369.15	1060.4
SW - 7	267,834.08	2,348,323.74	1060.3

PESTICIDE AREA
MONITOR WELLS

POINT NO.	NORTH	EAST	GROUND ELEVATION	TOP OF CASING ELEVATION
MW - 1	268,367.45	2,348,874.86	1088.3	1090.01
MW - 2	268,116.60	2,348,518.00	1077.8	1079.64
MW - 3	268,095.02	2,348,442.92	1077.5	1079.35
MW - 4	268,096.13	2,348,330.71	1078.59	1079.82
MW - 5	267,906.61	2,348,260.06	1062.0	1063.76

APPENDIX E

HTW DRILLING LOGS - COE FORMAT

Pesticide Storage Facility
Fort Riley, Kansas

FIGURE 5-1

HTW DRILLING LOG

HOLE No.	PSF92-01
SHEET 1 OF 4 SHEETS	
1. COMPANY NAME	LAW ENVIRONMENTAL, INC.
2. DRILLING SUBCONTRACTOR	LAYNE WESTERN
3. PROJECT	PESTICIDE STORAGE FACILITY 11-1531
4. LOCATION	NORTH-WESTERN CORNER
5. NAME OF DRILLER	RANDY CROWL, KEVIN SANTOYO
6. MANUFACTURER'S DESIGNATION OF DRILL	MOBILE DRILL, B-57
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	10" AUGERS; 2" & 3" SPLIT SPOONS; 5 7/8" DRILL BIT
8. HOLE LOCATION	FRONT OF BUILDING 378
9. SURFACE ELEVATION	
10. DATE STARTED	4-28-92
11. DATE COMPLETED	4-28-92
12. OVERBURDEN THICKNESS	32.5 FT.
13. DEPTH DRILLED INTO ROCK	
14. TOTAL DEPTH OF HOLE	32.5 FT.
15. DEPTH GROUNDWATER ENCOUNTERED	≈ 20 FT.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	26.3 FT. - 24 HRS.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES	25 - 27 FT., 27 - 29 FT.
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
15 - 17 FT. & 21 - 23 FT & 25-27 FT.	2 - 2 oz.	1 - 8 oz.	PCB/Pest. 1 - 8 oz.	Herbicide 1 - 8 oz.	Organophosphoris pest. 1 - 8 oz.	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
MONITORING WELL				THOMAS MATHEW

24. CHECKED BY:

25. NAME OF INSPECTOR

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Fill material Organic Clayey SILT Black Dry Fine					Hand Auger
	1.0						
	2.0	Same					Hand Auger
	3.0						
	4.0	Same					Hand Auger

MRK FORM JUN 89 55

PROJECT NAME & NO.

HOLE No.

HTW DRILLING LOG

HOLE No.	PSF92-01
SHEET	2
OF	4 SHEETS

PROJECT: PESTICIDE STORAGE FACILITY

INSPECTOR: THOMAS MATHEW

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Same					Hand Auger
	5.0	Fill Material Organic Clayey SILT Black Dry Stiff Fine				7-6 7-7	18" Rec.
	6.0						
	7.0	Clayey SILT Reddish-Brown Damp Stiff Fine		Geotech Sample (7'-9')		5-5 8-7	17" Rec.
	8.0						
	9.0	Clayey SILT Reddish-Brown Damp Stiff Fine				3-4 4-5	HNu in Auger 0 ppm 18" REC.
	10.0		HNu 0 ppm Dust Monitor 1-2				
	11.0	Same				3-4 4-5	20" Rec.
	12.0						
	13.0						

HTW DRILLING LOG

HOLE No. PSF92-01

SHEET 3 OF 4 SHEETS

PROJECT: PESTICIDE STORAGE FACILITY

INSPECTOR: THOMAS MATHEW

a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Same				4-4 5-4	17" Rec.
	14.0	Clayey SILT Reddish Brown Damp Stiff Fine					
	15.0	Same Very Stiff			PSF SB-01A	5-8 8-8	3" S.S Sample 22" Rec.
	16.0						
	17.0	Same Stiff					5-5-7-9 Rec.
	18.0						
	19.0	Clayey SILT Light Brown Damp Plastic (sticky) Fine Med. Stiff					2-2-3-2 23" Rec.
	20.0		HNu 0 ppm Dust Monitor 1-2				
	21.0	Clayey SILT Reddish-Brown Wet Plastic (sticky) Stiff Fine			PSF SB-01 B		3-5-7-8 23" Rec.
	22.0						

PROJECT

HOLE No.

MRK FORM JUN 89 55-2

HTW DRILLING LOG

HOLE No.	SHEET	OF
PSF92-01	4	4 SHEETS

PROJECT	INSPECTOR
PESTICIDE STORAGE FACILITY	THOMAS MATHEW

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Same Clayey SILT			PSFS B-01B		3" S.S Sample
	23.0	Reddish Brown Wet Plastic Stiff					3" S.S Sample
	24.0	Same Very Stiff			PSFSB-01B		11-12-14-16 23" Rec.
	25.0	Same Saturated Stiff		PSF92-01 25 - 27 FT.			3-;4-4-3 22" Rec.
	26.0						
	27.0	Same Saturated Stiff	HNu 0 ppm Dust Monitor 1-2	PSF92-01 27 - 29 FT.			2-3-6-8 20.5" Rec.
	28.0	Terminated Boring					
	29.0	Drilled further to 33.0 ft/. because stablized water was at 26.3 ft.					
	30.0	Lost 35 gallons to tremie sand					
	31.0						

HTW DRILLING LOG

HOLE No. PSF92-02

SHEET 1 OF 4 SHEETS

1. COMPANY NAME: LAW ENVIRONMENTAL, INC.
2. DRILLING SUBCONTRACTOR: LAYNE WESTERN
3. PROJECT: PESTICIDE STORAGE FACILITY 11-1531
4. LOCATION: FT. RILEY, KANSAS
5. …E OF DRILLER: RANDY CROWL, KEVIN SANTOYO
6. MANUFACTURER'S DESIGNATION OF DRILL: MOBILE DRILL, B-57
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 10" AUGERS; 5 7/8" DRILL BITS; 2" & 3" SPLIT SPOONS
8. HOLE LOCATION: BEHIND BUILDING 348
9. SURFACE ELEVATION:
10. DATE STARTED: 5-5-92
11. DATE COMPLETED: 5-5-92
12. OVERBURDEN THICKNESS: 28 FT.
13. DEPTH DRILLED INTO ROCK:
14. TOTAL DEPTH OF HOLE: 28 FT.
15. DEPTH GROUNDWATER ENCOUNTERED: ≃ 22 FT.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 24 HRS. - 22.3 FT.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
22 - 24 FT., 24 - 26 FT.			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
4-6 FT., 8-12 FT., 14-16 FT., 20-22 FT.	2 - 2 oz.	1 - 8 oz.	Herbicide 1 - 8 oz.	Organophosphoris Pest. 1 - 8 oz.	Pesticide 1 - 8 oz.	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
MONITORING WELL				THOMAS MATHEW

24. CHECKED BY:

25. NAME OF INSPECTOR:

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Crusher Run					
	1.0	Fill material Organic Dry Clayey SILT Black	HNu 0.5 ppm Dust Monitor 0				
	2.0					7-7 3-4	15" Rec.
	3.0	SAND Dry Light Brown Loose Fine					
	4.0	Same				4-6 7-9	3" S.S taken 18" Rec.

MRK FORM JUN 89 55 PROJECT NAME & NO. HOLE No.

1531.37

HTW DRILLING LOG

HOLE No. PSF92-02

PROJECT: PESTICIDE STORAGE FACILITY

INSPECTOR: THOMAS MATHEW

SHEET 2 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		SAND Light Brown Dry Loose Fine					
	6.0	Same Firm				6-10 15-12	3" S.S Sample 18" Rec.
	7.0						
	8.0	Same	HNu 0.5 ppm Dust Monitor			13-11 13-14	3" S.S Sample 18" Rec.
	9.0						
	10.0	Same Dense				15-19 23-17	3" S.S Sample 18" Rec.
	11.0						
	12.0	Clayey SAND Light Brown Damp Fine Firm				5-10 15-16	2" S.S 12" Rec.
	13.0						
	14.0						

MRK FORM JUN 89 55-2 | PROJECT | HOLE No.

1531.37

HTW DRILLING LOG

HOLE No. PSF92-02

SHEET 3 OF 4 SHEETS

PROJECT: PESTICIDE STORAGE FACILITY

INSPECTOR: THOMAS MATHEW

a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Clayey SAND Light Brown Damp Firm Fine				9-10 11-12	3" S.S 14" Rec.
	15.0		HNu 0 ppm Dust Monitor				
	16.0	Clayey SAND Light Brown Damp Fine to Med. Coarse Firm				5-7 7-7	2" S.S 22" Rec.
	17.0						
	18.0					6-9 9-10	2" S.S 20" Rec.
	19.0						
		SAND Yellowish Brown Damp Med. Coarse Firm					
	20.0						
		Clayey SAND Light Brown Moist Med. Coarse Firm	HNu 0 ppm Dust Monitor 0			5-7 17-23	3" S.S 18" Rec.
	21.0						
	22.0						Hit Water ≃ 22 ft.
						8-8 8-8	2" S.S 23" Rec.
	23.0						

PROJECT

HOLE No.

MRK FORM JUN 89 55-2

1531.37

HTW DRILLING LOG

HOLE No.	SHEET	OF	SHEETS
PSF92-02	4	4	

PROJECT	INSPECTOR
PESTICIDE STORAGE FACILITY	THOMAS MATHEW

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		SAND Light Brown Saturated Med. Coarse Firm	HNu 0 ppm Dust Monitor 1-2				
	24.0						
		Same				20-41 50 5"	5" Rec.
	25.0						
	26.0						
		Weathered Limestone Gray Moderately Hard					
	27.0						
		Competent Bedrock					
	28.0	Boring Terminated Lost 30 gallons to tremie sand					
	29.0						
	30.0						
	31.0						
	32.0						

HTW DRILLING LOG

1. COMPANY NAME LAW ENVIRONMENTAL, INC.	2. DRILLING SUBCONTRACTOR LAYNE WESTERN	HOLE No. PSF92-03 SHEET 1 OF 4 SHEETS
3. PROJECT PESTICIDE STORAGE FACILITY 11-1531	4. LOCATION FT. RILEY, KANSAS	
NAME OF DRILLER RANDY CROWL, KEVIN SANTOYO	6. MANUFACTURER'S DESIGNATION OF DRILL MOBILE DRILL, B-57	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 10" AUGERS; 2" & 3" SPLIT SPOONS; 5 7/8" DRILL BITS	8. HOLE LOCATION BEHIND BUILDING 348	
	9. SURFACE ELEVATION	
	10. DATE STARTED 5-2-92	11. DATE COMPLETED 5-2-92
12. OVERBURDEN THICKNESS 28 FT.	15. DEPTH GROUNDWATER ENCOUNTERED ≅ 22 FT.	
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 1 HR. - 22.3 FT.	
14. TOTAL DEPTH OF HOLE 28 FT.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) 24 HR. - 22.4 FT.	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES		
22 - 24 FT., 24 - 26 FT.					

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
10 - 14 FT. & 20 - 22 FT.	2 - 2 oz.	1 - 8 oz.	PCB/Pest. 1 - 8 oz.	Organophosphoris Pest. 1 - 8 oz.	Herbicide 1 - 8 oz.	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
MONITORING WELL				THOMAS MATHEW

24. CHECKED BY:	25. NAME OF INSPECTOR

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Crusher Run					
	1.0	Clayey SILT Black Dry Fine Hard				39-14 29-22	15" Rec.
	2.0	Same Very Stiff				10-11 13-14	15" Rec.
	3.0						
	4.0	Clayey Sand Black Damp Fine Firm	HNu 0 ppm			11-13 10-8	10" Rec.

HTW DRILLING LOG

HOLE No. PSF92-03

SHEET 2 OF 4 SHEETS

PROJECT: PESTICIDE STORAGE FACILITY

INSPECTOR: THOMAS MATHEW

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Clayey SAND Black Damp Fine Firm					
	6.0	Same Firm				6-6 7-8	8" Rec.
	7.0						
	8.0					4-5 5-6	18" Rec.
	9.0	SAND Black Damp Fine Loose			PSF92 -03A	14-8 7-10	18" Rec.
	10.0	Same (SAND) Light Brown Damp Fine Firm	Dust Monitor 0.1				
	11.0						
	12.0	Same			PSF92 -03A	8-7 8-8	22" Rec.
	13.0						
	14.0						

HTW DRILLING LOG

HOLE No. PSF92-03

SHEET 3 OF 4 SHEETS

PROJECT: PESTICIDE STORAGE FACILITY

INSPECTOR: THOMAS MATHEW

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Clayey SAND Light Brown Damp Fine Firm	HNu 0 ppm			3-5 6-6	15" Rec. 3" S.S HNu 0 ppm
	15.0						
	16.0	Same				8-8 20-21	12" Rec.
	17.0						
	18.0	Clayey SILT Light Brown Moist Fine Very Stiff				5-13 16-14	16" Rec.
	19.0						
	20.0	Silty SAND (with Clayey Seams) Light Brown Saturated Fine Dense			PSF92 -03B	8-14 17-26	Dust Monitor 0.1 3" S.S Sample
	21.0						
	22.0	Same Firm				8-13 14-16	
	23.0						

MRK FORM JUN 89 55-2 PROJECT HOLE No.

HTW DRILLING LOG

HOLE No. PSF92-03

PROJECT: PESTICIDE STORAGE FACILITY

INSPECTOR: THOMAS MATHEW

SHEET 4 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Silty SAND (with Clayey Seams) Light Brown Moist Fine Firm					
	24.0						
	25.0	Silty SAND Yellowish-Orange Very Saturated Fine to Med. Coarse Dense	HNu 0 ppm			8-21 22-35	16" Rec.
	26.0	Shale and interbedded Limestone (weathered rock zone) soft				56"-50 Blows	
	27.0	Weathered Shale (Bedrock) Black Wet Soft Competent Bedrock				48-35 1" Refusal	12" Rec.
	28.0	Lost 35 gallons to tremie sand					
	29.0						
	30.0						
	31.0						
	32.0						

HTW DRILLING LOG

HOLE No.	PSF92-04
SHEET 1 OF 4 SHEETS	
1. COMPANY NAME	LAW ENVIRONMENTAL, INC.
2. DRILLING SUBCONTRACTOR	LAYNE WESTERN
3. PROJECT	PESTICIDE STORAGE FACILITY 11-1531
4. LOCATION	FT. RILEY, KANSAS
5. NAME OF DRILLER	RANDY CROWL, KEVIN SANTOYO
6. MANUFACTURER'S DESIGNATION OF DRILL	MOBILE DRILL, B-57
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	10" AUGERS 2" & 3" SPLIT SPOONS 5 7/8" DRILL BITS
8. HOLE LOCATION	NEAR BUILDING 348 (By Dumpsters)
9. SURFACE ELEVATION	
10. DATE STARTED	5-4-92
11. DATE COMPLETED	5-4-92
12. OVERBURDEN THICKNESS	29.5 FT.
13. DEPTH DRILLED INTO ROCK	
14. TOTAL DEPTH OF HOLE	29.5 FT.
15. DEPTH GROUNDWATER ENCOUNTERED	≈ 22 FT.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	1 HR. - 22.3 FT.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	24.2 FT. - 24 HRS.
18. GEOTECHNICAL SAMPLES	22 - 24 FT., 24 - 26 FT.
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
12-14 FT., 22-24 FT.	2 - 2 oz.	1 - 8 oz.	PCB/Pest. 1 - 8 oz.	Herbicide 1 - 8 oz.	Organophosphoris Pest. 1 - 8 oz.	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
MONITORING WELL				THOMAS MATHEW

24. CHECKED BY:

25. NAME OF INSPECTOR

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Asphalt (4")	HNu 0 ppm				
	1.0	Fill Material Organic Silty Sand Light Brown Dry					
	2.0	SAND Light Brown Dry Firm Fine to Med. Coarse				15-10 11-11	
	3.0						
	4.0	Same				5-6 6-4	

HTW DRILLING LOG

HOLE No.	SHEET	OF
PSF92-04	2	4 SHEETS

PROJECT: PESTICIDE STORAGE FACILITY

INSPECTOR: THOMAS MATHEW

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Sand Light Brown Dry Firm Fine to Med. Coarse					
	6.0	SAND Yellowish Orange Dry Loose Med. Coarse	HNU 4 ppm Dust Monitor 0			3-3 4-3	
	7.0						
	8.0						
		Clayey SILT Dark Brown Damp Stiff Fine				5-6 6-5	
	9.0						
	10.0	Silty SAND Dark Brown Damp Firm Fine	HNU 2.5 ppm Dust Monitor 0			5-6 5-3	
	11.0						
	12.0	Same				6-6 8-35	3' S.S Sample
	13.0						
	14.0						

HTW DRILLING LOG

HOLE No. PSF92-04

SHEET 3 OF 4 SHEETS

PROJECT: PESTICIDE STORAGE FACILITY

INSPECTOR: THOMAS MATHEW

DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
	SAND Yellowish Orange Damp Firm Fine	Dust Monitor 0.06 HNu 2 ppm			14-15 14-15	
15.0						
16.0	SAND (with Rust Stain) Light Brown Damp Firm Fine				4-8 15-14	
17.0						
18.0	Clayey SILT (with Rust Stains) Light Brown Moist Very Stiff Fine	Dust Monitor 0.04 HNu 2 ppm WBGT 68.9°F			8-12 15-14	
19.0						
20.0	Same				3-8 15-14	
21.0						Hit Water ≃ 22 ft.
22.0	Silty SAND Light Brown Saturated Firm Fine				5-9 10-13	5-9 10-13
23.0						

HTW DRILLING LOG

HOLE No. PSF92-04

PROJECT: PESTICIDE STORAGE FACILITY

INSPECTOR: THOMAS MATHEW

SHEET 4 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
	24.0	Silty SAND Light Brown Saturated Firm Fine		Geotech Sample 22-24 ft.			3" S.S Sample
	25.0 26.0	SAND Light Brown Saturated Loose Fine	Dust Monitor 0 HNu 2 ppm WRGT 69.8°F	Geotech Sample 24-26 ft.		4-5 6-9	
	27.0	SAND Yellowish Orange Saturated Firm Med. Coarse				5-7 9-18	
	28.0 29.0	Weathered Limestone Moderately Hard Gray Saturated Competent Bedrock Boring Terminated @ 29.5					
	30.0 31.0 32.0	Lost 30 gallons to tremie sand					

MRK FORM JUN 89 55-2 | PROJECT | HOLE No.

1531.37

HTW DRILLING LOG

HOLE No.	PSF92-05
SHEET 1 OF 4 SHEETS	

1. COMPANY NAME: LAW ENVIRONMENTAL, INC.	2. DRILLING SUBCONTRACTOR: LAYNE WESTERN
3. PROJECT: PESTICIDE STORAGE FACILITY 11-1531	4. LOCATION: SOUTHERN CORNER, FT. RILEY, KANSAS
NAME OF DRILLER: RANDY CROWL, KEVIN SANTOYO	6. MANUFACTURER'S DESIGNATION OF DRILL: MOBILE DRILL, B-57
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 10" AUGERS; 2" & 3" SPLIT SPOONS; 5 7/8" DRILL BIT	8. HOLE LOCATION: SOUTHERN CORNER
	9. SURFACE ELEVATION:
	10. DATE STARTED: 4-29-92
	11. DATE COMPLETED: 4-29-92
12. OVERBURDEN THICKNESS: 29.5 FT.	15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 19 FT.
13. DEPTH DRILLED INTO ROCK:	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 21.0 FT. - 24 HRS.
14. TOTAL DEPTH OF HOLE: 28.0 FT.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES		
19 - 21 FT.					

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
9 - 11 FT., 17 - 19 FT.	2 - 2 oz.	1 - 8 oz.	PCB/Pest. 1 - 8 oz.	Herbicide 1 - 8 oz.	Organophosphoris Pest. 1 - 8 oz.	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
MONITORING HOLE				THOMAS MATHEW

24. CHECKED BY:	25. NAME OF INSPECTOR:

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Fill Material Organic Clayey SILT Dark Brown Dry					Hand Auger
	1.0						
	2.0						
	3.0						3-5-6-6 16.5" Rec.
		SILT Light Brown Dry Fine					
	4.0						
		SAND Light Brown Dry Fine					

MRK FORM JUN 89 55 | PROJECT NAME & NO. | HOLE No. 1531.37

HTW DRILLING LOG

HOLE No. PSF92-05

PROJECT: PESTICIDE STORAGE FACILITY

INSPECTOR: THOMAS MATHEW

SHEET 2 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		SAND Light Brown Dry Fine Med. Dense					5-7-6-10 18" Rec.
	6.0						
	7.0	SILT Light Brown Fine Dry					6-8-7-7 17" Rec.
	8.0	SAND Light Brown Fine Dry Med. Dense					
	9.0				PSFSB -05A		9-15 20-21 18" Rec. 3" S.S. taken
	10.0	Clayey SILT Black Dry Fine	HNU 0 ppm Dust Monitor 1.1				
	11.0	SAND Light Brown Dry Fine Med. Dense					10-6 7-8 22" Rec.
	12.0						
	13.0	Same					5-10 15-14
	14.0						

MRK FORM 55-2 JUN 89 | PROJECT | HOLE No.

1531.37

HTW DRILLING LOG

HOLE No. PSF92-05

PROJECT: PESTICIDE STORAGE FACILITY

INSPECTOR: THOMAS MATHEW

SHEET 3 OF 4 SHEETS

a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
	15.0	SAND Light Brown Dry Fine Med. Dense					5-6-7-7 13" Rec.
	16.0	Clayey SAND Light brown Moist Fine to Med. Coarse Med. Dense					
	17.0 18.0 19.0	SAND Light Brown Wet Fine to Med. Coarse Med. Dense		GeoTech Sample to lab 19-21 ft.	PSFSB-05B		4-8-10-11 15" Rec. 3' S.S. Sample Hit Water Table ≃ 19 ft.
	20.0 21.0	SAND Yellowish-Brown Wet Fine to Med. Coarse Med. Dense	HNu 0 ppm Dust Monitor 1.1				6-10-4-12 22" Rec.
		Weathered Rock (Limestone) Gray					6-10-12-15 6" Rec.
	22.0 23.0	Weathered Shale Greenish Gray Saturated Soft					

HTW DRILLING LOG

HOLE No.
PSF92-05

PROJECT	INSPECTOR	SHEET 4 OF 4 SHEETS
PESTICIDE STORAGE FACILITY	THOMAS MATHEW	

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX No. e	ANALYTICAL SAMPLE No. f	BLOW COUNTS g	REMARKS h
		Weathered Shale (Clayey) Saturated Greenish Gray Soft				50-4" Auger Refusal	No Split Spoon taken
	24.0						
	25.0	Same				40-39 41-42	40-39 41-42 18" Rec.
	26.0		HNu 0 ppm Dust Monitor 1.1				
	27.0	Competent Bedrock Boring Terminated @ 28.0					
	28.0	Lost 30 gallons to tremie sand					
	29.0						
	30.0						
	31.0						
	32.0						

MRK FORM 55-2 JUN 89 | PROJECT | HOLE No.

APPENDIX F

TEST BORING RECORDS - LEGS FORMAT

Pesticide Storage Facility
Fort Riley, Kansas

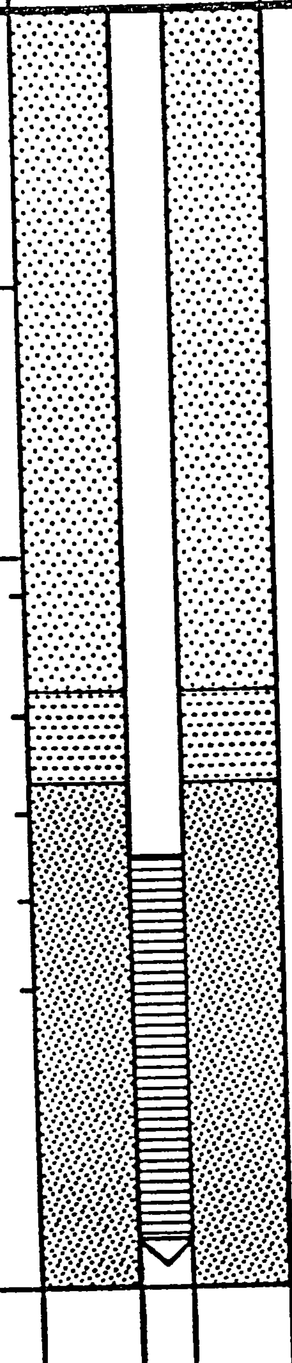
LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION
TEST BORING RECORD

- BORING NUMBER: PSF92-01
- JOB NUMBER: 11-1531
- DATE STARTED: 4-28-92
- DATE COMPLETED: 4-28-92
- DRILLED BY: LAYNE WESTERN
- LOGGED BY: TM
- CHECKED BY: JOHN COOK

REMARKS:

○ Geotechnical soil sample
□ Geochemical soil sample
Hollow stem augered from 0.90' to 33.0'

ELEV. IN FEET	DEPTH IN FEET	DESCRIPTION		MONITORING WELL CONSTRUCTION	SYMBOLS	LAB TESTS	SPT N VALUE
		Fill material, organic, loose black fine dry clayey SILT	ML				Hand Augered 7-6-7-7 5-5-8-7
	7.0	Stiff reddish-brown damp fine grained clayey SILT	ML ML				3-4-4-5 3-4-4-5 4-4-5-4
	14.0	Very stiff reddish brown damp fine grained clayey SILT	ML			□	5-8-8-8
	15.0	Stiff reddish brown damp fine grained clayey SILT	ML				5-5-7-9
	18.3	Medium stiff light brown plastic damp fine grained clayey SILT	ML				2-2-3-2
	20.5	Stiff reddish brown plastic wet fine grained clayey SILT	ML			□	3-5-7-8
	23.0	Very stiff reddish brown plastic wet fine grained clayey SILT	ML			□ ○	11-12-14-16
	25.2	Stiff reddish brown plastic saturated fine grained clayey SILT	ML		▽	○	3-4-4-3 2-3-6-8
	33.0	Boring Terminated					1531.37



LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

TEST BORING RECORD

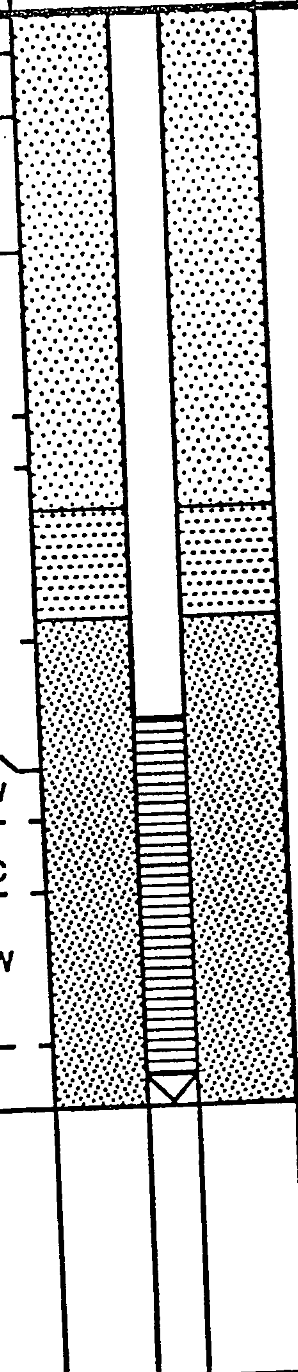
BORING NUMBER	PSF92-02
JOB NUMBER	11-1531
DATE STARTED	5-5-92
DATE COMPLETED	5-5-92
DRILLED BY	LAYNE WESTERN
LOGGED BY	TM
CHECKED BY	JOHN COOK

REMARKS:

○ Geotechnical soil sample
□ Geochemical sample
Hollow stem augered from 0.0' to 28.0'

ELEV. IN FEET	DEPTH IN FEET	DESCRIPTION	
		Crusher Run	
	0.5	Fill material organic dry black clayey SILT	ML
	2.5	Loose light brown fine grained dry SAND	SW
	6.0	Med. dense light brown fine grained dry SAND	SW
	10.2	Dense light brown fine grained dry SAND	SW
	11.5	Med. dense light brown fine grained damp SAND	SW
	16.0	Med. dense light brown fine to medium grained damp clayey SAND	GC
	19.2	Med. dense yellowish brown medium grained damp SAND	SW
	20.3	Med. dense light brown medium grained moist clayey SAND	GC
	22.4	Med. dense light brown medium grained saturated SAND	SW
	26.5	Moderately hard gray weathered Limestone	
	28.0	Auger Refusal: Top of rock Boring Terminated	

MONITORING WELL CONSTRUCTION



SYMBOLS	LAB TESTS	SPT N VALUE
		7-7-3-4
		4-6-7-9
	□	6-10-15-12
		13-11-13-14
		15-19-23-17
	□	5-10-15-16
		7-10-11-12
	□	5-7-7-7
▽	○	6-9-9-10
	○	5-7-17-23
		20-41-50 refusal

1531.37

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

TEST BORING RECORD

BORING NUMBER PSF92-03
JOB NUMBER 11-1531
DATE STARTED 5-2-92
DATE COMPLETED 5-2-92
DRILLED BY LAYNE WESTERN
LOGGED BY TM
CHECKED BY JOHN COOK

REMARKS: PAGE 1 OF 1

O Geotechnical soil sample
☐ Geochemical sample
Hollow stem augered from 0.0' to 28.0'

ELEV. IN FEET	DEPTH IN FEET	DESCRIPTION		MONITORING WELL CONSTRUCTION	SYMBOLS	LAB TESTS	SPT N VALUE
		Crusher Run					39-14-29-22
	0.3	Hard black fine grained dry clayey SILT	ML				10-11-13-14
	2.3	Very stiff black fine grained dry clayey SILT	ML				
	4.0	Med. dense black fine grained damp clayey SAND	SC				11-13-10-8 6-6-7-8 4-5-5-6
	8.4	Loose black fine grained damp SAND	SW				
	9.8	Med. dense light brown fine grained damp SAND	SW			☐	14-8-7-1? 8-7-8-8 3-5-6-6
	14.0	Med. dense light brown fine grained damp clayey SAND	SL	10 ft. screen ?			8-8-20-21
	18.0	Very stiff light brown fine grained moist clayey SILT	ML				5-13-16-14
	19.5	Dense light brown fine grained saturated silty SAND with clayey seams	SW			☐	8-14-17-26
	21.0 / 22.0	Med. dense light brown fine grained moist silty SAND with clayey seams	SM		▽	O	8-13-14-16
?		Dense yellowish orange fine to medium grained very saturated silty SAND	SM			O	8-21-22-35
	24.8						5"-50 blows
	26.0	Soft black shale with interbedded Limestone					48-35 refusal
	27.0	Soft black wet weathered shale					
	28.0	Auger Refusal: Top of rock Boring Terminated					

1531.37

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

TEST BORING RECORD

BORING NUMBER: PSF92-04
JOB NUMBER: 11-1531
DATE STARTED: 5-4-92
DATE COMPLETED: 5-4-92
DRILLED BY: LAYNE WESTERN
LOGGED BY: TM
CHECKED BY: JOHN COOK

REMARKS:

PAGE 1 OF 1

O Geotechnical soil sample
☐ Geochemical sample
Hollow stem augered from 0.0' to 29.5'

ELEV. IN FEET	DEPTH IN FEET	DESCRIPTION		MONITORING WELL CONSTRUCTION	SYMBOLS	LAB TESTS	SPT N VALUE
		Asphalt					
	0.3	Fill material organic light brown dry silty SAND	SM				15-10-11-11
	2.0	Med. dense light brown fine to medium grained dry SAND	SP				5-6-6-4
	6.0	Loose yellowish orange medium grained dry SAND	SP				3-3-4-3
	8.4	Stiff dark brown fine grained dry clayey SILT	ML				5-6-6-5
	10.0	Med. dense dark brown fine grained damp silty SAND	SM			☐	5-6-5-3
	14.2	Med. dense yellowish orange fine grained damp SAND	SP				19-15-14-15
	16.3	Med. dense light brown fine grained damp SAND with rust stains	SP				4-8-15-14
	17.8	Very stiff light brown fine grained moist clayey SILT with rust stains				O ☐	8-12-15-14; 3-8-15-14
	21.5	Med. dense light brown fine grained saturated SAND	ML		▽	O	5-9-10-13
	24.3	Loose light brown fine grained saturated SAND	SM				4-5-6-9
	26.8	Med. dense yellowish orange medium grained saturated SAND	SP				5-7-9-18
	28.0	Moderately hard gray saturated weathered limestone					
	29.5	Auger Refusal: Top of rock Boring Terminated					

1531.37

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

TEST BORING RECORD

BORING NUMBER: PSF92-05
JOB NUMBER: 11-1531
DATE STARTED: 4-29-92
DATE COMPLETED: 4-29-92
DRILLED BY: LAYNE WESTERN
LOGGED BY: TM
CHECKED BY: JOHN COOK

REMARKS:

PAGE 1 OF 1

○ Geotechnical soil sample
□ Geochemical soil sample
Hollow stem augered from 0.0' to 28.0'

ELEV. IN FEET	DEPTH IN FEET	DESCRIPTION	MONITORING WELL CONSTRUCTION	SYMBOLS	LAB TESTS	SPT N VALUE
		Fill material organic dark brown dry clayey SILT				Hand Augered
	3.5	Stiff light brown fine grained dry SILT				3-5-6-6
	4.3	Medium dense light brown fine grained dry SAND				
	5.0	Medium dense light brown fine grained dry SAND				5-7-6-10
	7.0	Stiff light brown fine grained dry SILT				6-8-7-7
	7.9	Medium dense light brown fine grained dry SAND			□	9-15-20-21
	10.3	Stiff black fine grained dry clayey SILT				
	11.3	Medium dense light brown fine grained dry SAND				10-6-7-8 5-10-15-14
	15.5	Medium dense light brown fine to medium grained moist clayey SAND				5-6-7-7
	17.0	Medium dense light brown fine to medium grained wet SAND			□	4-8-10-11
	20.5	Medium dense yellowish-brown fine to medium grained wet SAND		▽	○	6-10-4-12
	21.5	Gray weathered rock Limestone				50-4" Auger refusal
	21.9	Soft greenish gray saturated weathered clayey SHALE				
	23.7	Soft greenish gray saturated weathered clayey SHALE				40-39-41-42
	28.0	Auger Refusal: Top of rock Boring Terminated				

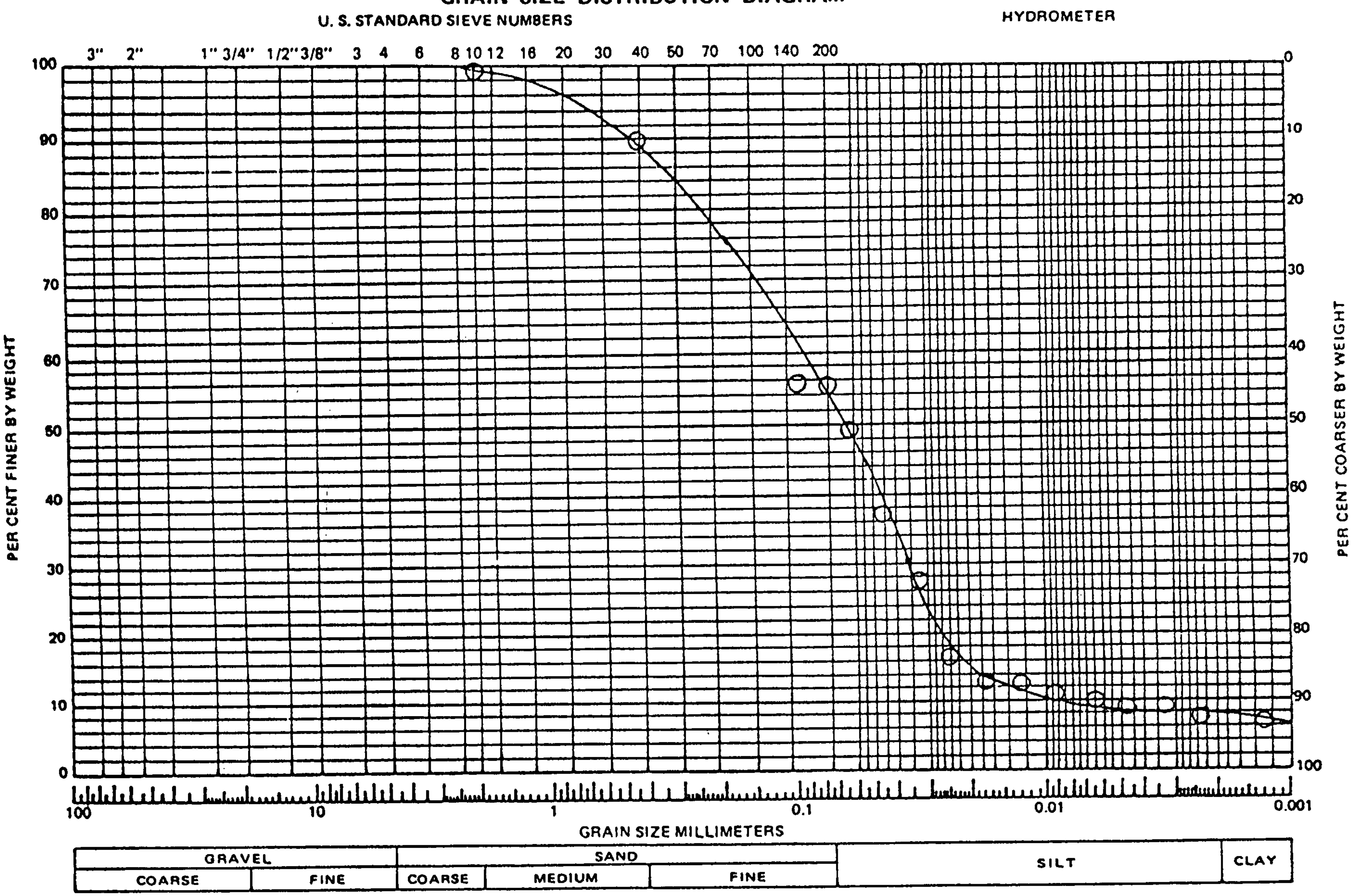
1531.37

APPENDIX G

GEOTECHNICAL RESULTS:
GRAIN SIZE DISTRIBUTION CURVES
ANALYSIS OF AGGREGATE REPORTS

Pesticide Storage Facility
Fort Riley, Kansas

GRAIN SIZE DISTRIBUTION DIAGRAM



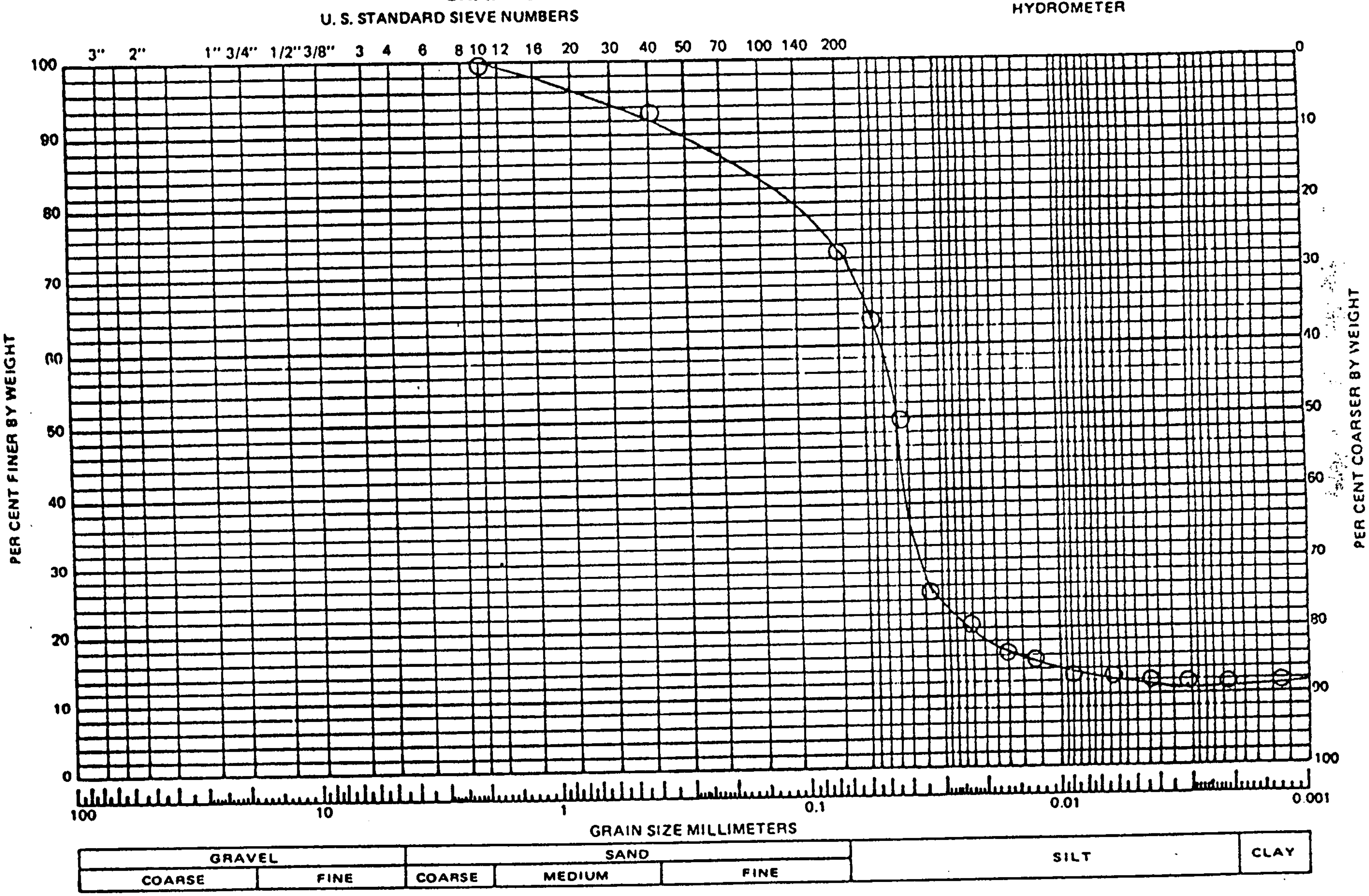
% Sand = 46.0
% Silt = 46.0
% Clay = 8.0

Liquid Limit = 26
Plastic Limit = 18
Plasticity Index = 8

Unified Soil Classification
CL

PROJECT: Law Environmental - Pesticide Storage Fac.
IDENTIFICATION: PSF92-01GT 7'-9'

GRAIN SIZE DISTRIBUTION DIAGRAM



% Sand = 27.0
% Silt = 62.0
% Clay = 11.0

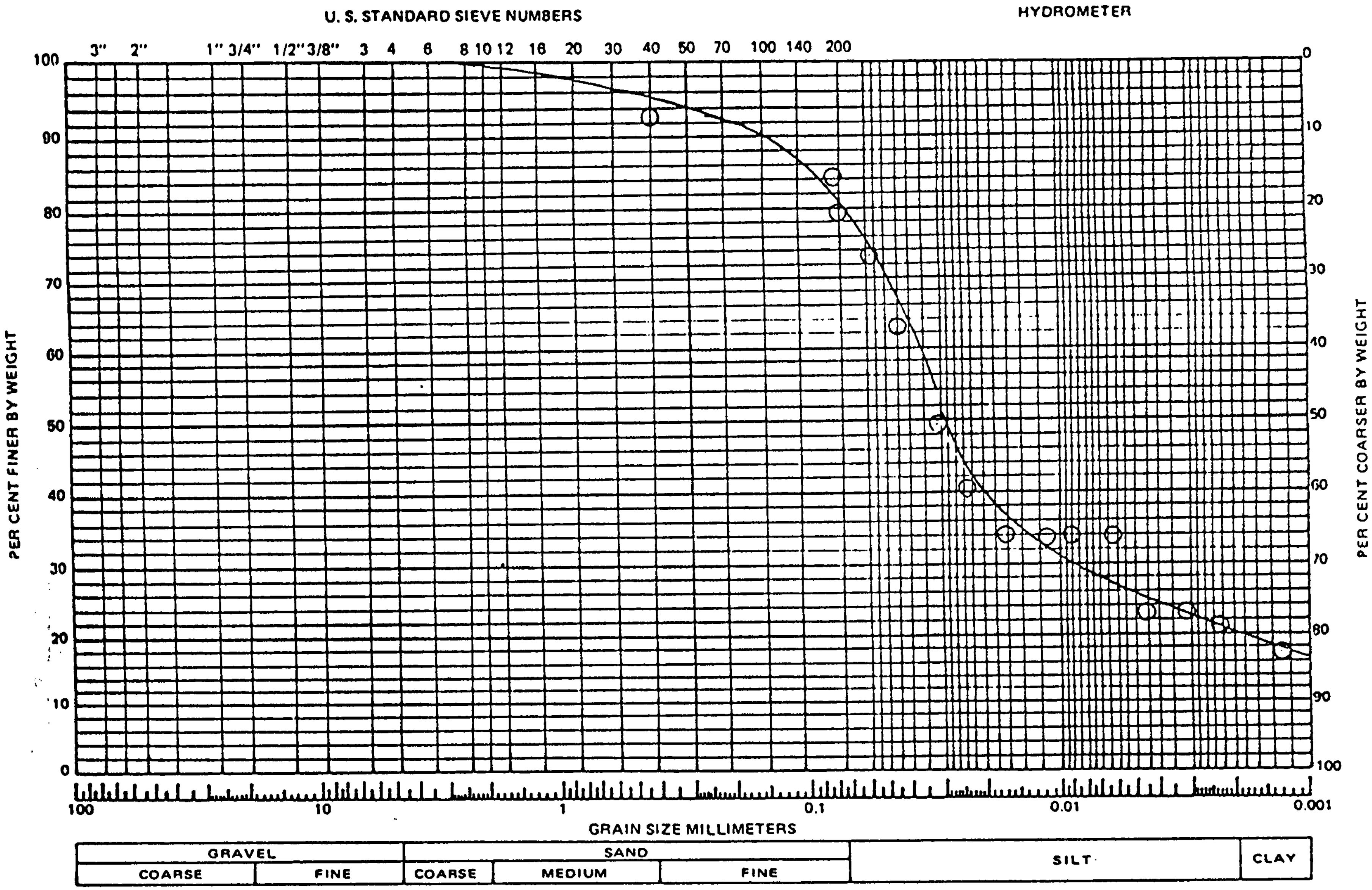
Liquid Limit = 27
Plastic Limit = 18
Plasticity Index = 9

Unified Soil Classification
CL

PROJECT: Law Environmental - Pesticide Storage Fa

IDENTIFICATION: PSF92-01GT 19'-21'

GRAIN SIZE DISTRIBUTION DIAGRAM



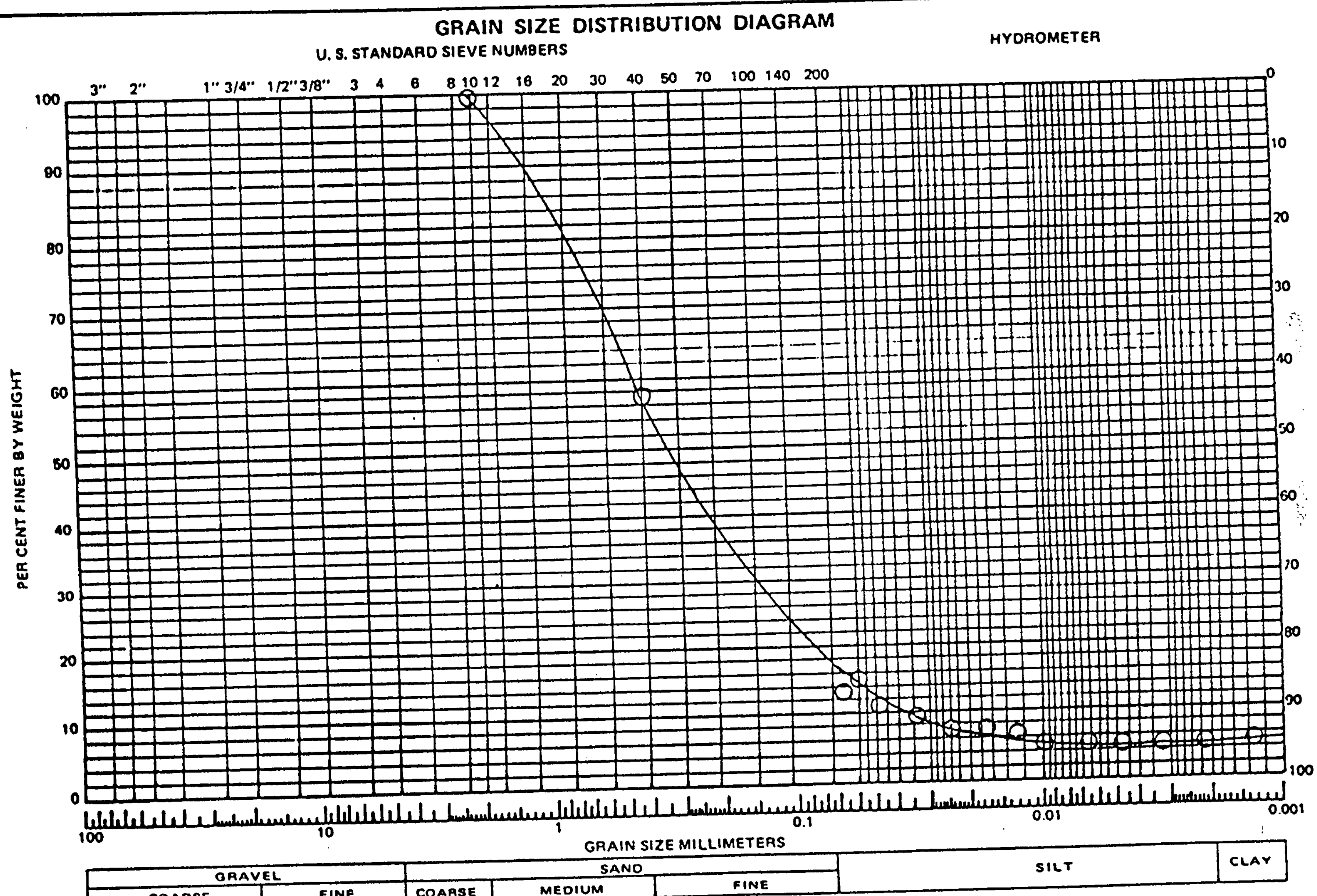
% Sand = 19.5
% Silt = 60.0
% Clay = 20.5

Liquid Limit = 19
Plastic Limit = 19
Plasticity Index = N.P.

Unified Soil Classification
ML

PROJECT: Law Environmental - Pesticide Storage Fa

IDENTIFICATION: PSF92-02GT 2'-4'



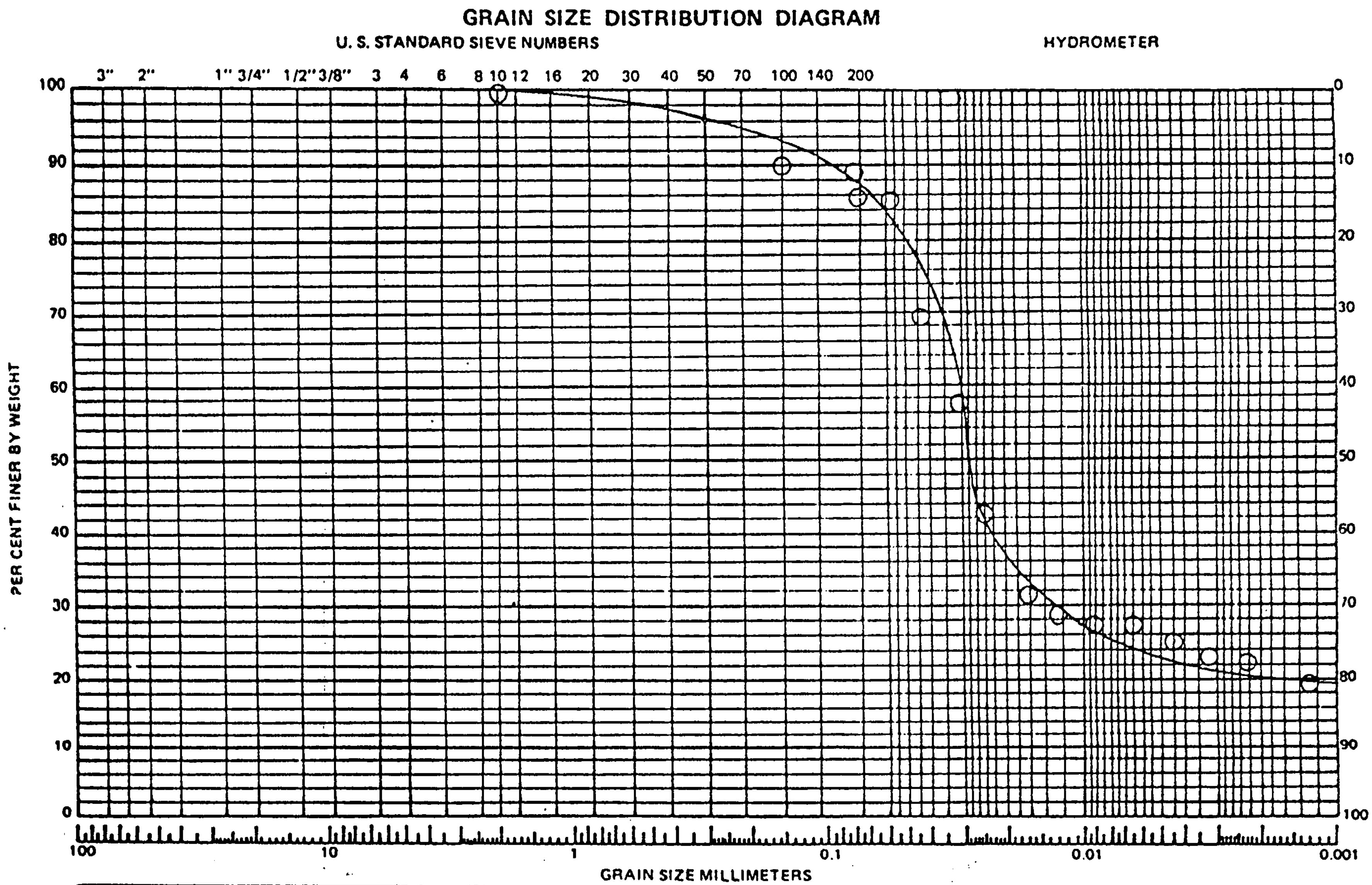
% Sand - 82.5
% Silt - 13.0
% Clay - 4.5

Liquid Limit -
Plastic Limit -
Plasticity Index - N.P.

Unified Soil Classification
SM

PROJECT: Law Environmental - Pesticide Storage F

IDENTIFICATION: PSF92-02GT 22'-24'



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

% Sand = 12.5
% Silt = 67.5
% Clay = 20.0

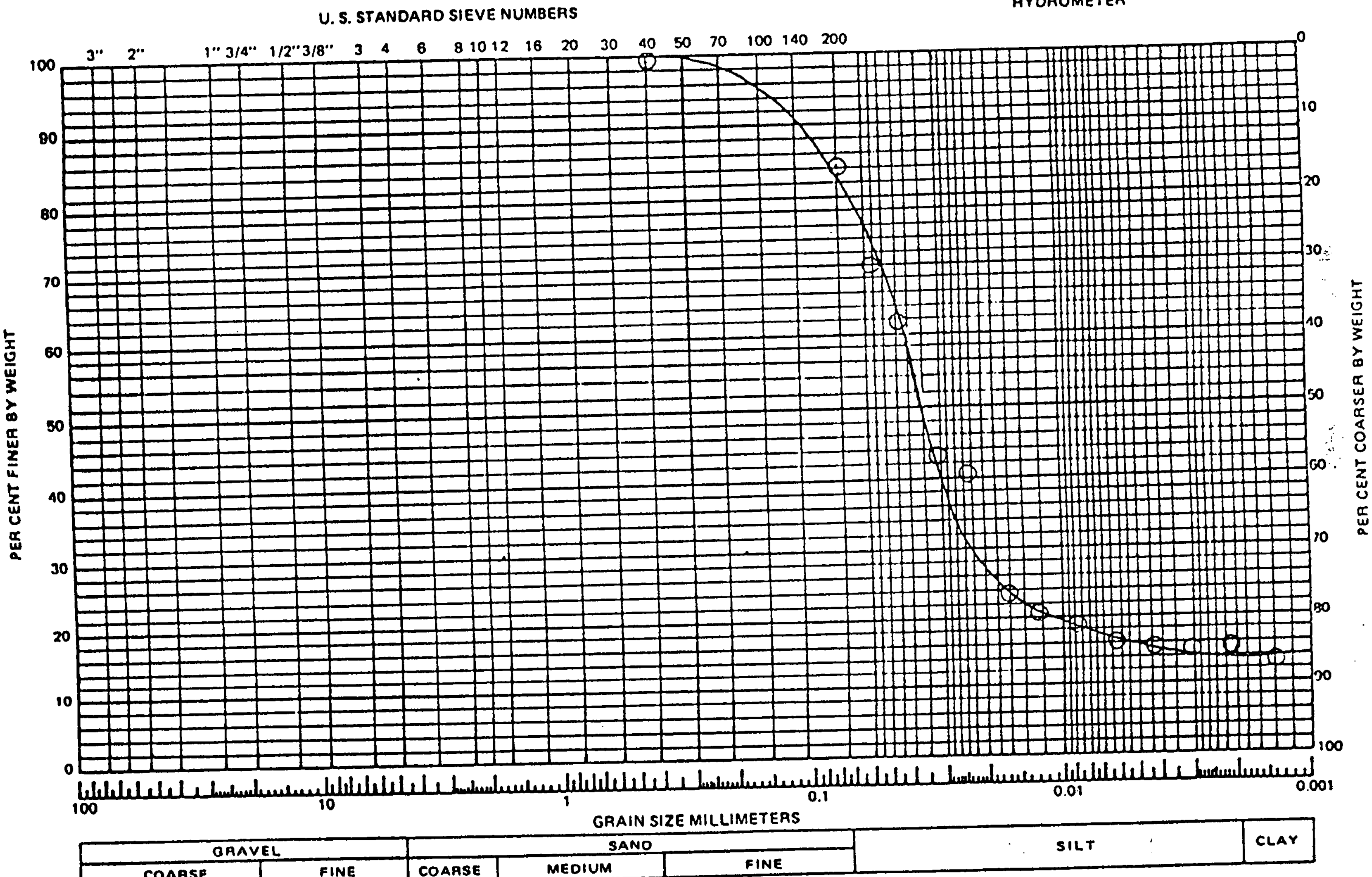
Liquid Limit = 35
Plastic Limit = 22
Plasticity Index = 13

Unified Soil Classification
CL

PROJECT: Law Environmental - Pesticide Storage

IDENTIFICATION: PSF92-03GT 2'-4'

GRAIN SIZE DISTRIBUTION DIAGRAM



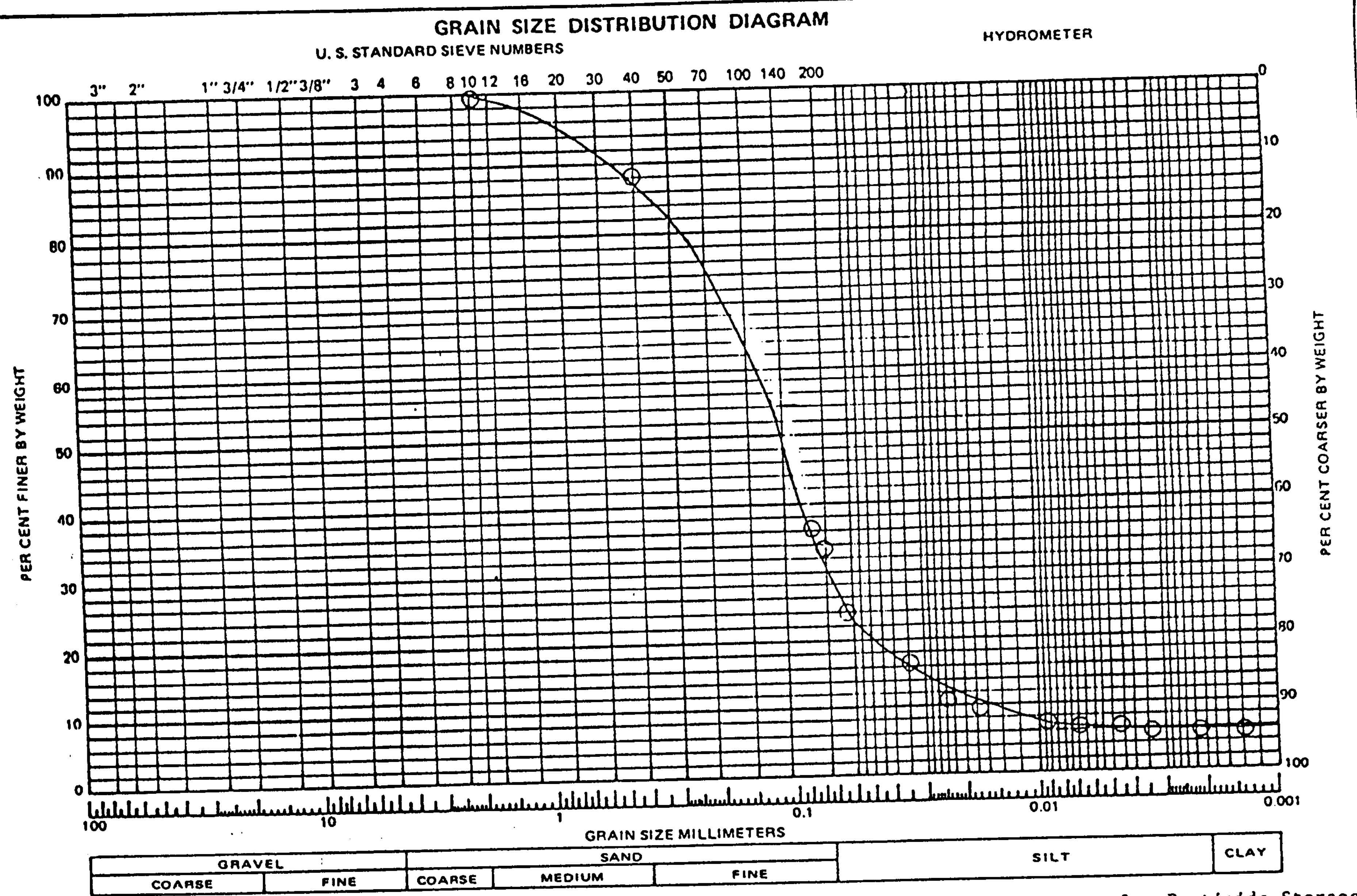
% Sand = 17.0
% Silt = 69.5
% Clay = 13.5

Liquid Limit = 24
Plastic Limit = 18
Plasticity Index = 6

Unified Soil Classification
CL-ML

PROJECT: Law Environmental - Pesticide Storage Fa

IDENTIFICATION: PSF92-03GT 20'-22'



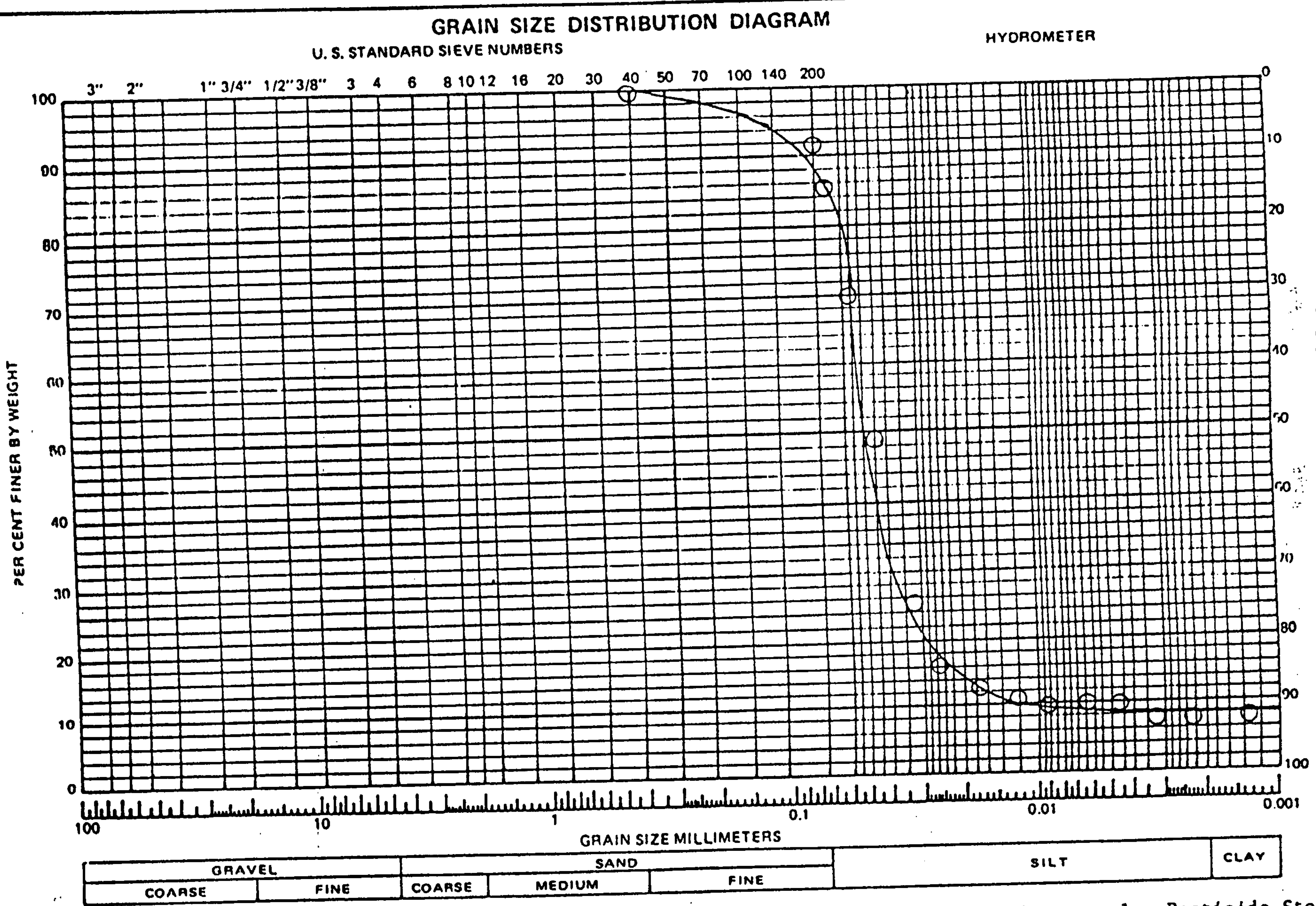
% Sand = 69.5
% Silt = 25.0
% Clay = 5.5

Liquid Limit = 15
Plastic Limit = 15
Plasticity Index = N.P.

Unified Soil Classification
SM

PROJECT: Law Environmental - Pesticide Storage F.

IDENTIFICATION: PSF92-04GT 2'-4'



% Sand = 12.0
% Silt = 80.0
% Clay = 8.0

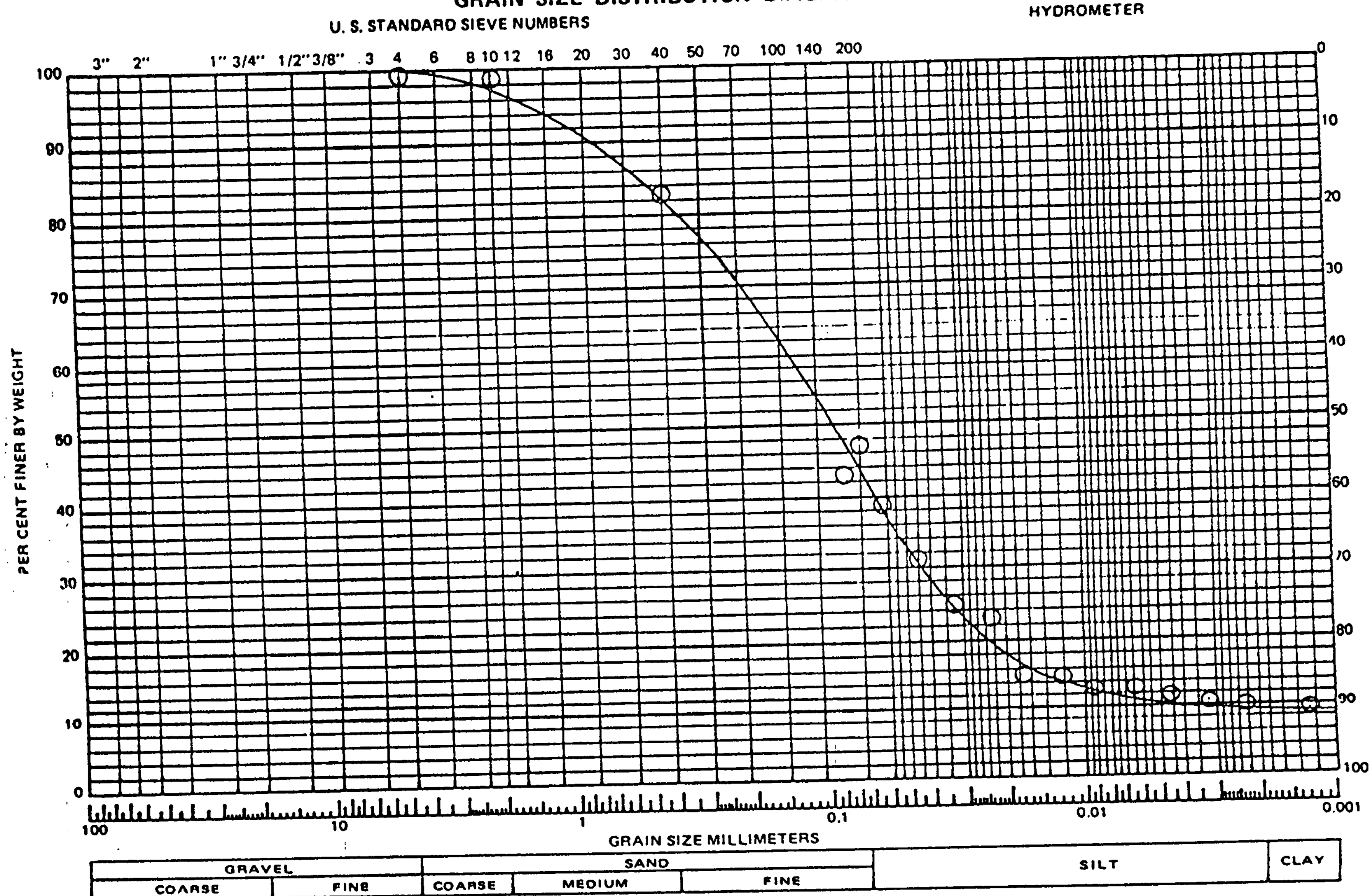
Liquid Limit = 24
Plastic Limit = 21
Plasticity Index = 3

Unified Soil Classification
ML

PROJECT: Law Environmental - Pesticide Storage F

IDENTIFICATION: PSF92-04GT 22'-24'

GRAIN SIZE DISTRIBUTION DIAGRAM



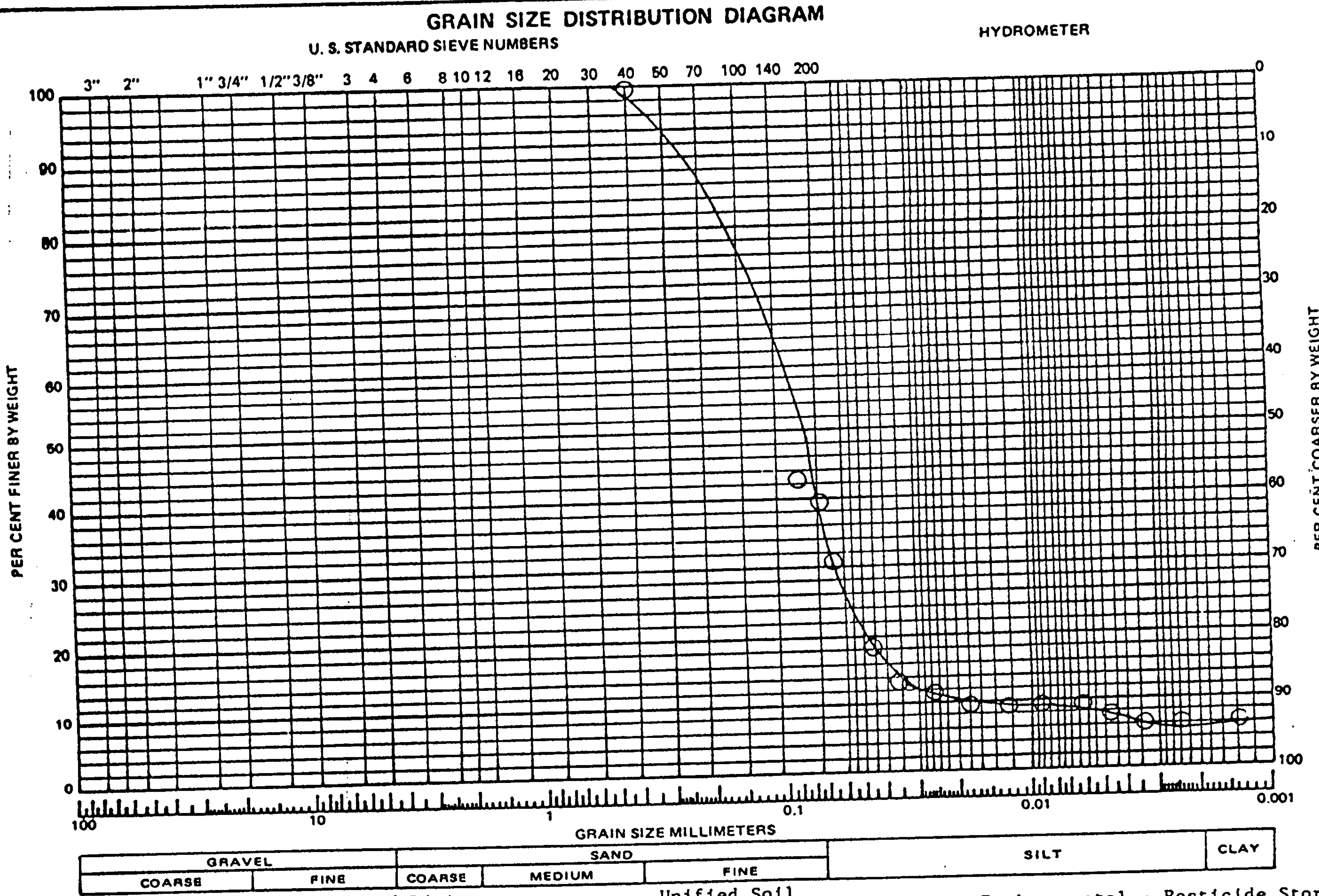
% Sand = 56.0
% Silt = 35.0
% Clay = 9.0

Liquid Limit - 22
Plastic Limit = 18
Plasticity Index = 4

Unified Soil Classification
SM-SC

PROJECT: Law Environmental - Pesticide Storage F

IDENTIFICATION: PSF92-05GT 3'-5'



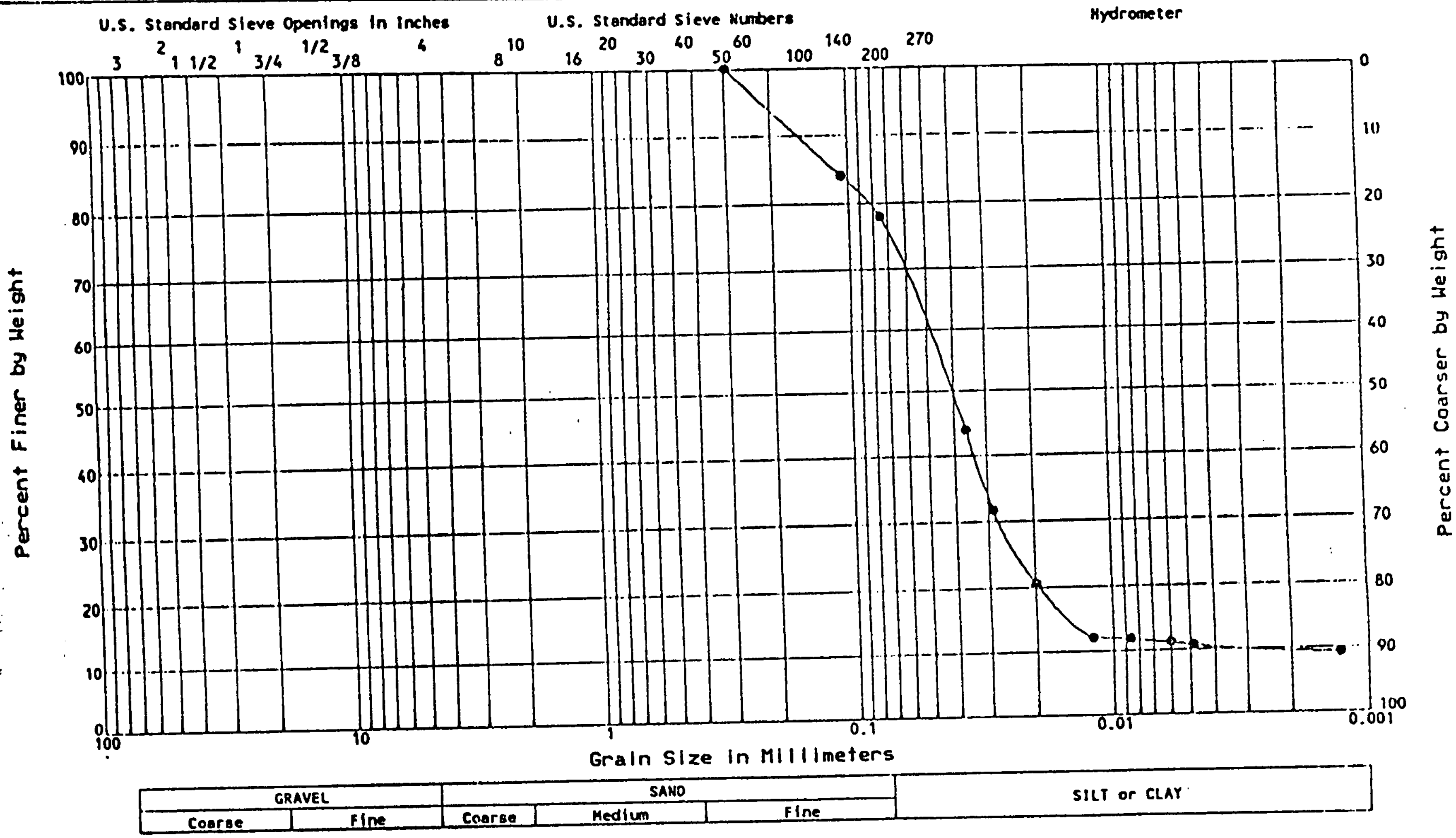
% Sand = 61.0
% Silt = 33.5
% Clay = 5.5

Liquid Limit =
Plastic Limit =
Plasticity Index = N.P.

Unified Soil Classification
SM

PROJECT: Law Environmental - Pesticide Storage Fac

IDENTIFICATION: PSF92-05GT 17'-19'



GRAIN SIZE DISTRIBUTION CURVE

Boring No.	Sample No.	Depth	Description	Unified Symbol	Natural WC	LL	PL	PI
● A		25.0	Sandy silt, light brown	ML				

Project PSF 92-01A, 25 - 27 ft., 4/28/92, Law Environmental

Location Ft. Riley, Kansas Job No. 921139 Date 4/30/92

GeoSystems Engineering, Inc.

ANALYSIS OF AGGREGATES REPORT

Job No 91137
Date 4/30/92

Architect or Engineer Law Environmental Contractor
Project Ft. Riley, PSF Source A
REPORT OF TESTS OF DSE 92-01 A, 25-27 ft.

Sieve Size or No.	Weight Retained	% Retained	% Passing	Specifications
2½-Inch				
2-Inch				
1½-Inch				
1-Inch				
¾-Inch				
½-Inch				
⅜-Inch				
No. 4				
No. 8				
No. 10				
No. 16				
No. 30	0			
No. 40				
No. 50	0.04g		100.0	
No. 80				
No. 100 140	65.67		84.2	
No. 200	82.09		77.9	
Pan	92.09			
Fineness Modulus				

Received at Laboratory 4/29/92
Quantity Represented
Submitted by
Sampled from
Identification
Date Sampled 4/28/92
Intended Use

Remarks:
Organic matter, colorimetric ø
Coal & Lignite ø
Clay Lumps ø
Chert ø
Soft Particles ø
Percent Absorption
Specific Gravity
Dry Rodded Weight
Weight Before Washing 416.73g
Weight After Washing 92.09g

tw
x-1

Remarks.

GeoSystems Engineering, Inc.

Sample No. PSF-92-01A
Horizon 7/16/92 Depth 25-27
H_2O_2 Treatment ________ ml.

Date 4/30/9
Tested by DY

Og retained on #10

Wt. of air-dry soil 107.08 gms. — 34 -
Hygros. moisture, % 0.58% — 52.41
Wt. of dry soil, W_1 106.46 gms. — 52.20
Specific gravity ———— 15.70
Method of dispersion: SDT - 5 min., 10 lb. ---- 25 lb.
Dispersion agent: 40 ml. Sod. Metaphosphate - type II

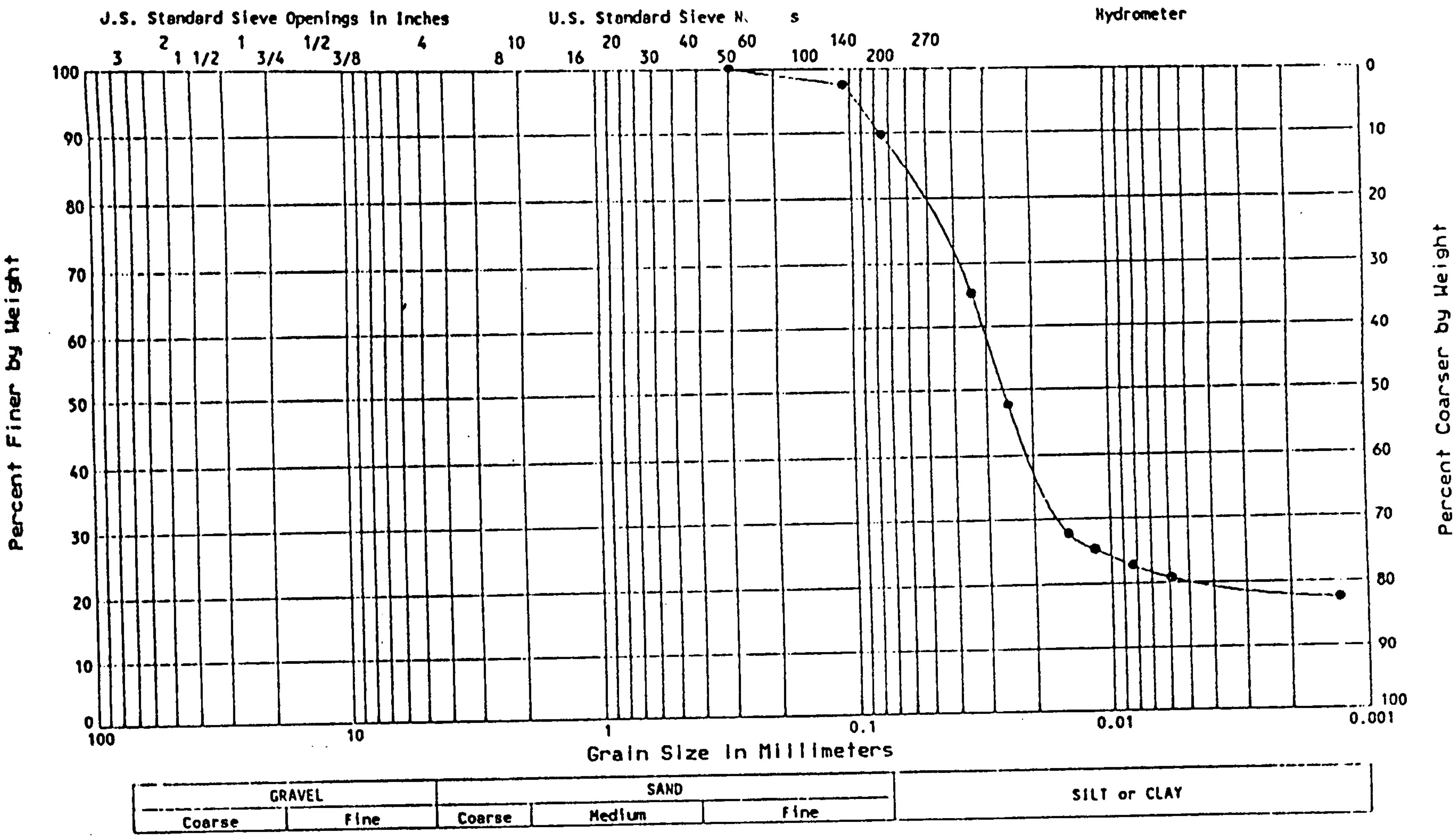
Sieve Analysis

Passing sieve No.	Retained on sieve No.	Weight gms.	Percent of Dispersed sample, W_1	Accumulative Sieve No.	Accumulative Size mm	Accumulative Percent pass
10	20			20	0.84	
20	40			40	0.42	
40	60			60	0.25	
60	140			140	0.105	
140	200			200	0.074	

Hydrometer Analysis

Clock time	Elapsed time min.	Hydrometer	Temp. (°F) °C	Temp. correction	Corr. due to i.a.	Corrected Reading R	Particle Diam in mm.	Percent of finer
10:40	0							
10:41	1	50	25					43.7
	2	37	25					31.6
	5	25	25					20.5
10:55	15	16	25					12.1
11:10	30	15 3/4	25					11.8
11:40	60	15	26					11.2
12:10	90	14.5	26					10.7
	1440							

Pan No. R-11
Wt. retained on # 200 ________ gms. ________ sand. ________



GRAIN SIZE DISTRIBUTION CURVE

Boring No.	Sample No.	Depth	Description	Unified Symbol	Natural WC	LL	PL	PI
● 8		27.0	Clayey silt, trace sand, light brown	ML				

Project PSF 92-01B, 27 - 29 ft., 4/28/92, Law Environmental

Location Ft. Riley, Kansas Job No. 921139 Date 4/30/92

GeoSystems Engineering, Inc.

ANALYSIS OF AGGREGATES REPORT

Job No. 921139
Date 1/30/92

Architect or Engineer: Law Enviro
Contractor:
Project: Ft Riley PSC
Source: B
REPORT OF TESTS OF: PSC 92-01 B 27-29 ft. 1/28/92

Sieve Size or No.	Weight Retained	% Retained	% Passing	Specifications
2½-inch				
2-inch				
1½ inch				
1-inch				
¾-inch				
½-inch				
⅜-inch				
No. 4				
No. 8				
No. 10				
No. 16	0			
No. 30	0			
No. 40				
No. 50	0.13		100%	
No. 80				
No. 100 140	12.67		97.4%	
No. 200	50.00		89.6%	
Pan	112.92			
Fineness Modulus				

Received at Laboratory:
Quantity Represented:
Submitted by:
Sampled from:
Identification:
Date Sampled: 1/28/92
Intended Use:

Remarks:

- Organic matter colorimetric: ø
- Coal & Lignite: ø
- Clay Lumps: ø
- Chert: ø
- Soft Particles: ø
- Percent Absorption:
- Specific Gravity:
- Dry Rodded Weight:
- Weight Before Washing: 479.41
- Weight After Washing: 112.92

tare
X-6

Remarks:

GeoSystems Engineering, Inc.

Engineering, Inc.

B

Sample No. FSF-92-01B
Sorted 4/28/92 Depth 27-29
H_2O_2 Treatment ________ ml.

Date 4/30/92
Tested by WTR

0% retained on #10

C-25
40.69
40.20
16.10
2.03% H_2O

Wt. of air-dry soil 80.58 gms.
Hygros. moisture, % 2.03
Wt. of dry soil, W_1 78.98 gms.
Specific gravity ------------
Method of dispersion: SDT - 5 min., 10 lb. ---- 25 lb. ----
Dispersion agent: 40 ml. Sod. Metaphosphate - Type II

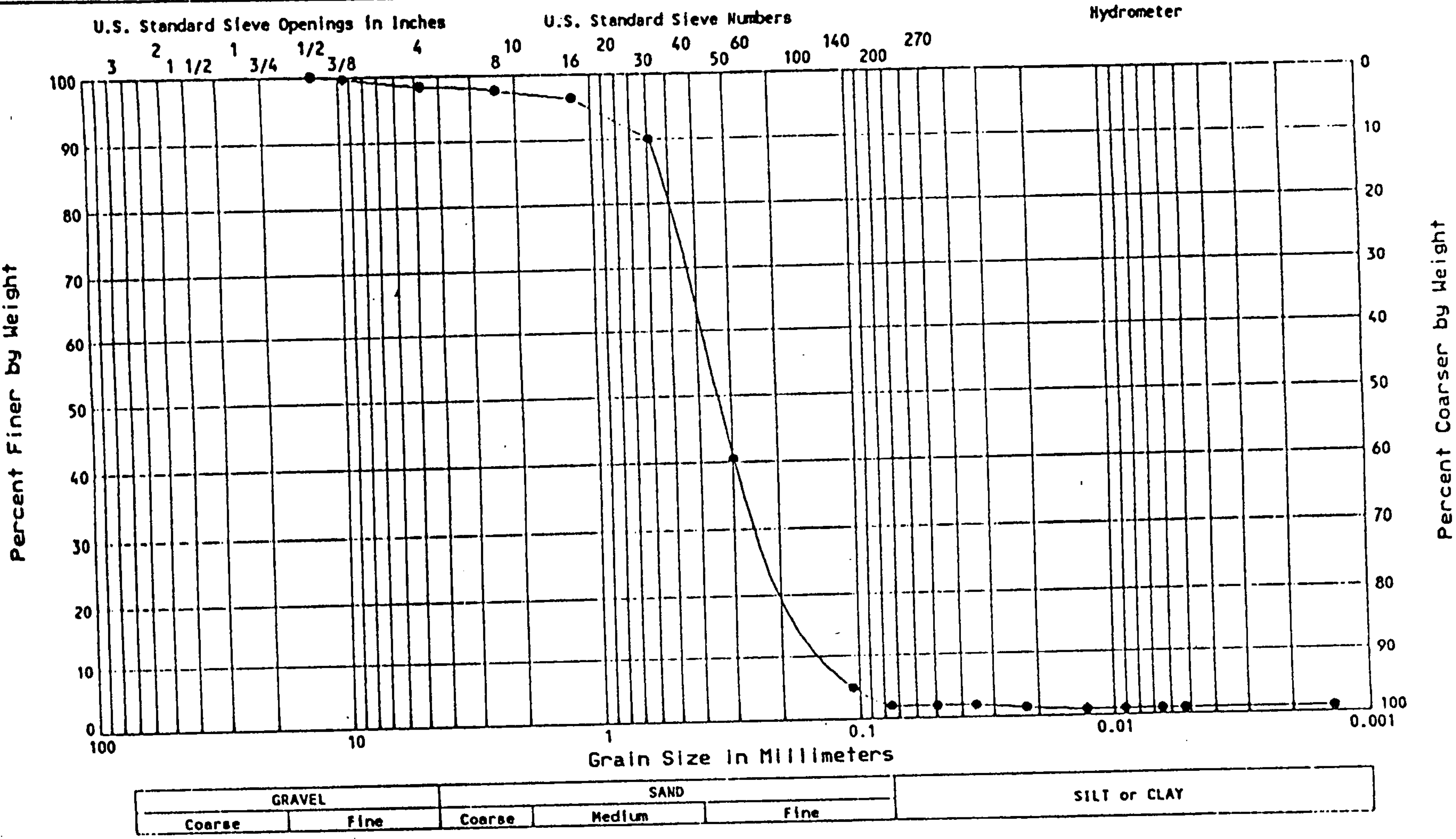
Sieve Analysis

Passing sieve No.	Retained on sieve No.	Weight gms.	Percent of Dispersed sample, W_1	Accumulative Sieve No.	Size mm	Percent passing
10	20			20	0.84	
20	40			40	0.42	
40	60			60	0.25	
60	140			140	0.105	
140	200			200	0.074	

Hydrometer Analysis

Clock time	Elapsed time min.	Hydrometer	Temp. (of) C°	Temp. correction	Corr. due to D.A.	Corrected Reading R	Particle Diam in mm.	Percent of W_1 finer
11:18 AM	0							
	1	55	25					65.2
	2.5	41	25					47.6
	5	25	25					27.6
	15	23	25					25.1
11:48	30	21	26					22.6
12:18	60	19.5	26					20.7
	1440							

Pan No. P-12
Wt. retained on # 200 ________ gms. ________ sand % ________



GRAIN SIZE DISTRIBUTION CURVE

Boring No.	Sample No.	Depth	Description	Unified Symbol	Natural WC	LL	PL	PI
● C		19.0	Fine to medium sand, gray brown	SP				

Project PSF 92-05A, 19 - 21 ft., 4/29/92, Law Environmental

Location Ft. Riley, Kansas Job No. 921139 Date 4/30/92

GeoSystems Engineering, Inc.

ANALYSIS OF AGGREGATES REPORT

Job No. 92.113 ?
Date 4/30/92

Architect or Engineer: Law Enviro — Contractor:

Project: Ft. Riley, PSF — Source: C

REPORT OF TESTS OF: PSF 92-05 A 19 - 21 ft. 4/29/92

Sieve Size or No.	Weight Retained	% Retained	% Passing	Specifications
2½-inch				
2-inch				
1½-inch				
1-inch				
¾-inch				
½-inch				
⅜-inch	2.02 g		99.6	
No. 4	8.58 g		98.4	
No. 8	12.1 g		97.7	
No. 10				
No. 16	18.79 g		96.4	
No. 30	52.76 g		89.9	
No. 40				
No. 50	309.93 g		40.4	
No. 80				
No. 100 140	494.4 g		4.9	
No. 200	509.5		2.0	
Pan	520.1			
Fineness Modulus				

Received at Laboratory: 4/29/92
Quantity Represented:
Submitted by:
Sampled from:
Identification:
Date Sampled: 4/29/92
Intended Use:

Remarks:

Organic matter colorimetric: Ø
Coal & Lignite: Ø
Clay Lumps: Ø
Chert: Ø
Soft Particles: Ø
Percent Absorption:
Specific Gravity:
Dry Rodded Weight:
Weight Before Washing: 530 g
Weight After Washing: dry sieved

Remarks:

GeoSystems Engineering, Inc.

GeoSystems
Engineering, Inc.

Sample No. PSF 92-05A C Date 9/30/92
Horizon 9/29/92 Depth 19-21 Tested by DLA
H_2O_2 Treatment ________ ml.

Wt. of air-dry soil ---100.00--- gms.
Hygros. moisture, % ---0---
Wt. of dry soil, W_1 ---100.00--- gms.
Specific gravity ------------
Method of dispersion: SDT - 5 min., 10 lb. ---- 25 lb.----
Dispersion agent: 40 ml. Sod. Metaphosphate - type II

3% retained on #10

Sieve Analysis

Passing sieve No.	Retained on sieve No.	Weight gms.	Percent of Dispersed sample, W_1	Accumulative Sieve No.	Size mm	Percent passing
10	20			20	0.84	
20	40			40	0.42	
40	60			60	0.25	
60	140			140	0.105	
140	200			200	0.074	

Hydrometer Analysis

Clock time	Elapsed time min.	Hydrometer	Temp. (oF) C°	Temp. correction	Corr. due to d.a.	Corrected Reading R	Particle Diam in mm.	Percent of W_1 finer
9:41am	0							
	1	5	25					1.9
	2	5	25					1.9
9:46	5	4.5	25					1.4
9:56	15	4.0	25					1.0
10:11	30	4.0	25					1.0
10:41	60	4.0	25					1.0
11:41	120	4.0	26					1.0
	1440							

Pan No. ________
Wt. retained on # 200 ________ gms. ________ sand % ________

APPENDIX H

TYPE II MONITORING WELL INSTALLATION DIAGRAMS

Pesticide Storage Facility
Fort Riley, Kansas

TYPE II MONITORING WELL INSTALLATION DIAGRAM

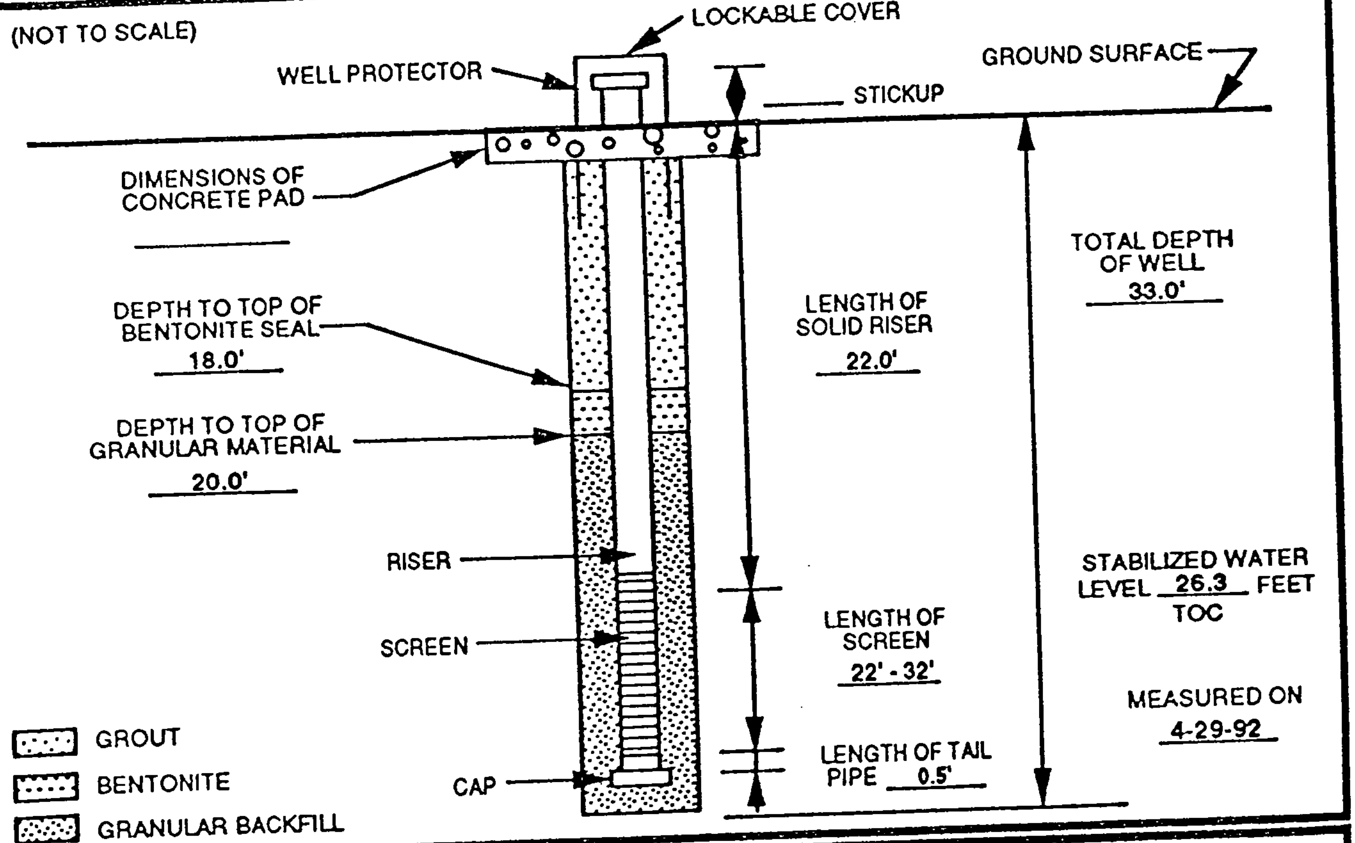
LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION
KENNESAW, GEORGIA

JOB NAME: PESTICIDE STORAGE FACILITY
WELL NO.: PSF92-01 JOB NO.: 11-1531
DATE: 5-01-92 TIME: 1340
WELL LOCATION: FRONT OF BUILDING 378

GROUND SURFACE ELEVATION: ______
TOP OF SCREEN ELEVATION: ______
REFERENCE POINT ELEVATION: ______
TYPE SAND PACK: Silica Sand GRADATION: 20/40
SAND PACK MANUFACTURER: CSSI
SCREEN MATERIAL: ASTM F 480-88A
MANUFACTURER: Monoflex
RISER MATERIAL: ASTM 480-90A
MANUFACTURER: Monoflex
RISER DIAMETER: 2"
DRILLING TECHNIQUE: HSA
AUGUR SIZE AND TYPE: 10" & 5 7/8"

BENTONITE TYPE: Hole Plug
MANUFACTURER: Barold
CEMENT TYPE: Portland Type I
MANUFACTURER: Lonestar Ind.
BOREHOLE DIAMETER: 10"
SCREEN DIAMETER: 2" SLOT SIZE: 0.010
LAW ENVIRONMENTAL, INC. FIELD REPRESENTATIVE: Thomas Mathew
DRILLING CONTRACTOR: Layne Western
AMOUNT BENTONITE USED: 1 bag
AMOUNT CEMENT USED: 6 bags
AMOUNT SAND USED: 5 bags
STATIC WATER DEPTH (after dev.): ______

REMARKS: 35 gallons to tremie sand



QA / QC	INSTALLED BY: Layne Western INSTALLATION OBSERVED BY: Thomas Mathew DISCREPANCIES: Drilled further from 29 ft. to 33 ft.

1531.37

TYPE II MONITORING WELL INSTALLATION DIAGRAM

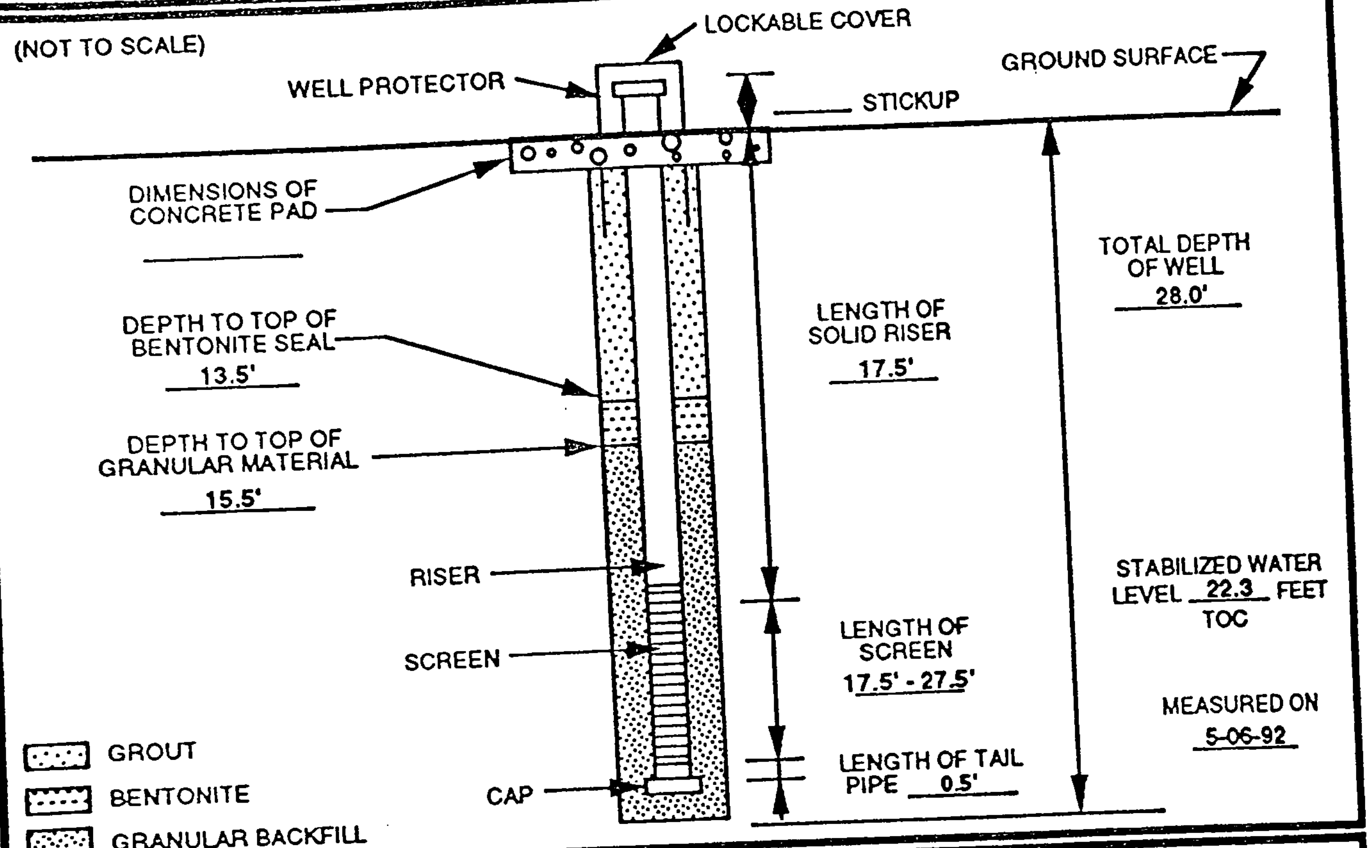
LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION
KENNESAW, GEORGIA

JOB NAME: PESTICIDE STORAGE FACILITY
WELL NO.: PSF92-02 JOB NO.: 11-1531
DATE: 5-05-92 TIME: 1535
WELL LOCATION: BEHIND BUILDING 348

GROUND SURFACE ELEVATION:
TOP OF SCREEN ELEVATION:
REFERENCE POINT ELEVATION:
TYPE SAND PACK: Silica Sand GRADATION: 20/40
SAND PACK MANUFACTURER: CSSI
SCREEN MATERIAL: Sch-40 PVC
MANUFACTURER: Monoflex
RISER MATERIAL: Sch-40 PVC
MANUFACTURER: Monoflex
RISER DIAMETER: 2"
DRILLING TECHNIQUE: HSA
AUGUR SIZE AND TYPE: 10" & 5 7/8"

BENTONITE TYPE: Hole Plug
MANUFACTURER: Barold
CEMENT TYPE: Portland Type I
MANUFACTURER: Lonestar Ind.
BOREHOLE DIAMETER: 10"
SCREEN DIAMETER: 2" SLOT SIZE: 0.010
LAW ENVIRONMENTAL, INC. FIELD REPRESENTATIVE: Thomas Mathew
DRILLING CONTRACTOR: Layne Western
AMOUNT BENTONITE USED: 1 bag
AMOUNT CEMENT USED: 3 bags
AMOUNT SAND USED: 6 bags
STATIC WATER DEPTH (after dev.):

REMARKS: 30 gallons used to tremle sand



QA / QC

INSTALLED BY: Layne Western INSTALLATION OBSERVED BY: Thomas Mathew
DISCREPANCIES: Drilled further from 29 ft. to 33 ft.

1531.37

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

TYPE II MONITORING WELL INSTALLATION DIAGRAM

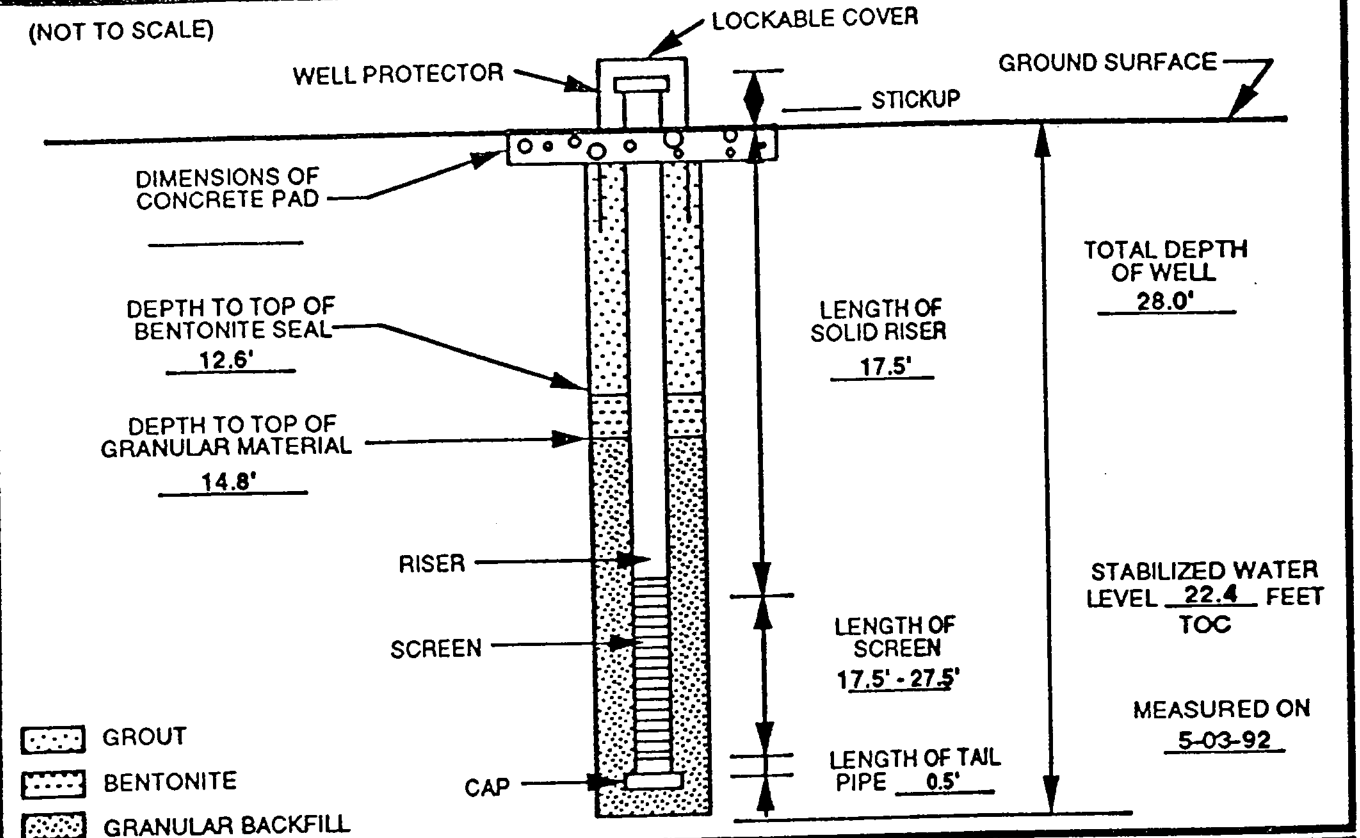
LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION
KENNESAW, GEORGIA

JOB NAME: PESTICIDE STORAGE FACILITY
WELL NO.: PSF92-03 JOB NO.: 11-1531
DATE: 5-02-92 TIME: 1345
WELL LOCATION: BEHIND BUILDING 346

GROUND SURFACE ELEVATION:
TOP OF SCREEN ELEVATION:
REFERENCE POINT ELEVATION:
TYPE SAND PACK: Silica Sand GRADATION: 20/40
SAND PACK MANUFACTURER: CSSI
SCREEN MATERIAL: ASTM F 480-88A
MANUFACTURER: Monoflex
RISER MATERIAL: ASTM 480-90A
MANUFACTURER: Monoflex
RISER DIAMETER: 2"
DRILLING TECHNIQUE: HSA
AUGUR SIZE AND TYPE: 10" & 5 7/8"

BENTONITE TYPE: Hole Plug
MANUFACTURER: Barold
CEMENT TYPE: Portland Type I
MANUFACTURER: Lonestar Ind.
BOREHOLE DIAMETER: 10"
SCREEN DIAMETER: 2" SLOT SIZE: 0.010
LAW ENVIRONMENTAL, INC. FIELD REPRESENTATIVE: Thomas Mathew
DRILLING CONTRACTOR: Layne Western
AMOUNT BENTONITE USED: 1 1/2 bags
AMOUNT CEMENT USED: 4 bags
AMOUNT SAND USED: 6 bags
STATIC WATER DEPTH (after dev.):

REMARKS: 35 gallons used to tremie sand



QA / QC

INSTALLED BY: Layne Western INSTALLATION OBSERVED BY: Thomas Mathew
DISCREPANCIES:

1531.37

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

TYPE II MONITORING WELL INSTALLATION DIAGRAM

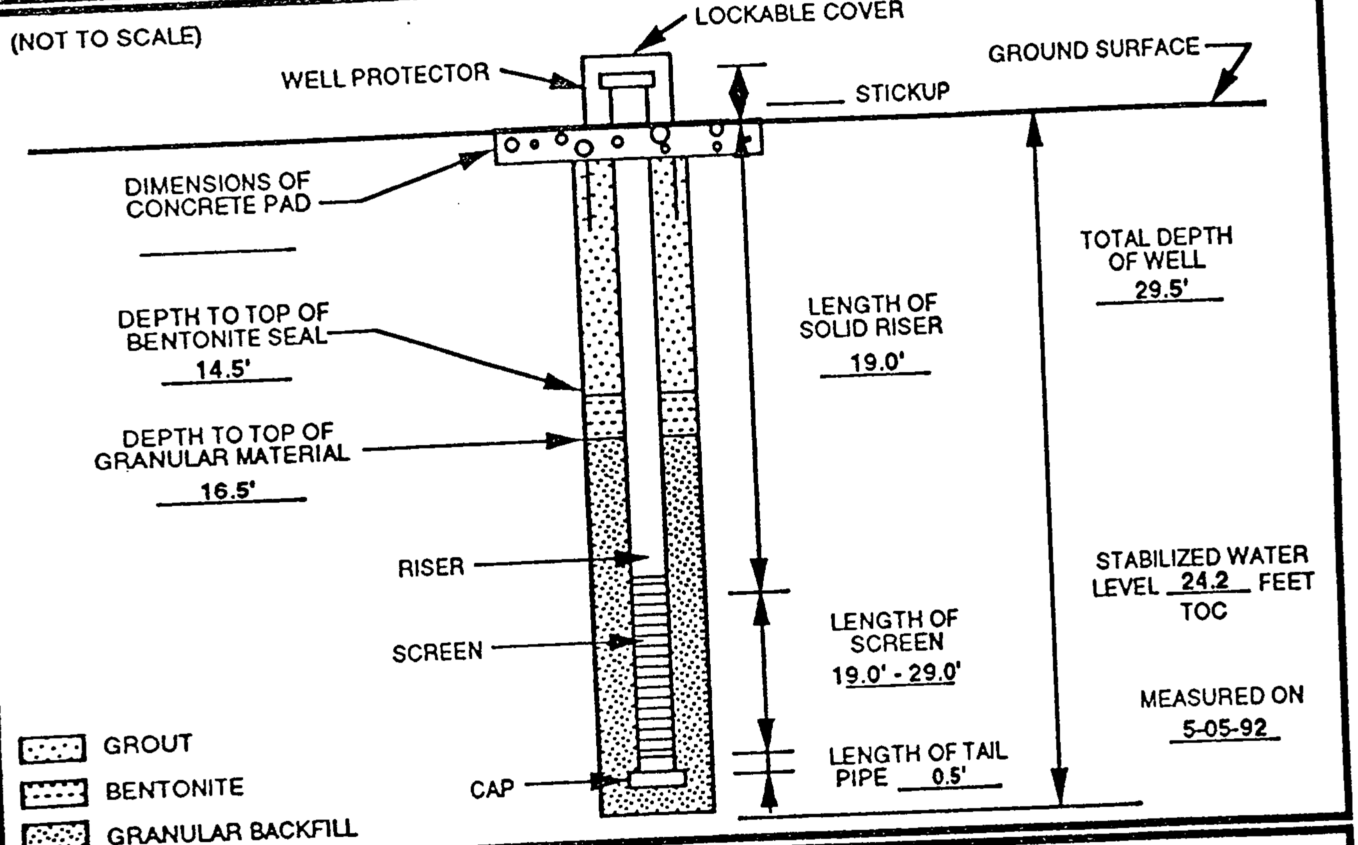
LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION
KENNESAW, GEORGIA

JOB NAME: PESTICIDE STORAGE FACILITY
WELL NO.: PSF92-04 JOB NO.: 11-1531
DATE: 5-04-92 TIME: 1430
WELL LOCATION: NEAR BUILDING 348

GROUND SURFACE ELEVATION:
TOP OF SCREEN ELEVATION:
REFERENCE POINT ELEVATION:
TYPE SAND PACK: Silica Sand GRADATION: 20/40
SAND PACK MANUFACTURER: CSSI
SCREEN MATERIAL: ASTM F 480-88A
MANUFACTURER: Monoflex
RISER MATERIAL: ASTM 480-90A
MANUFACTURER: Monoflex
RISER DIAMETER: 2"
DRILLING TECHNIQUE: HSA
AUGUR SIZE AND TYPE: 10" & 5 7/8"

BENTONITE TYPE: Hole Plug
MANUFACTURER: Barold
CEMENT TYPE: Portland Type I
MANUFACTURER: Lonestar Ind.
BOREHOLE DIAMETER: 10"
SCREEN DIAMETER: 2" SLOT SIZE: 0.010
LAW ENVIRONMENTAL, INC. FIELD REPRESENTATIVE: Thomas Mathew
DRILLING CONTRACTOR: Layne Western
AMOUNT BENTONITE USED: 1 bag
AMOUNT CEMENT USED: 4 bags
AMOUNT SAND USED: 8 1/2 bags
STATIC WATER DEPTH (after dev.):

REMARKS: 30 gallons used to tremie sand



QA / QC

INSTALLED BY: Layne Western INSTALLATION OBSERVED BY: Thomas Mathew
DISCREPANCIES:

1531.37

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

TYPE II MONITORING WELL INSTALLATION DIAGRAM

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION
KENNESAW, GEORGIA

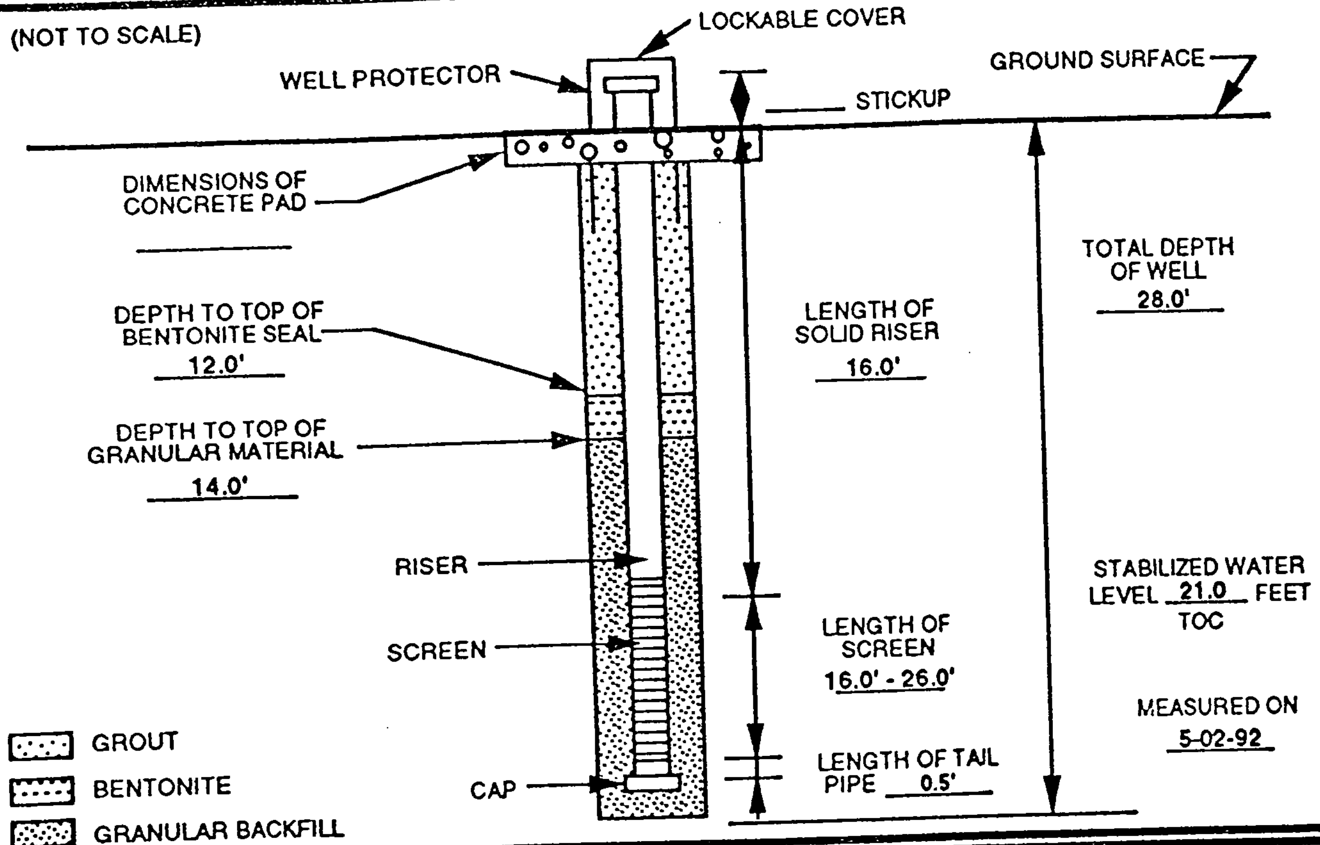
JOB NAME: PESTICIDE STORAGE FACILITY
WELL NO.: PSF92-05 JOB NO.: 11-1531
DATE: 5-01-92 TIME: 0850
WELL LOCATION: SOUTHERN CORNER

GROUND SURFACE ELEVATION:
TOP OF SCREEN ELEVATION:
REFERENCE POINT ELEVATION:
TYPE SAND PACK: Silica Sand/CSSI GRADATION: 10/20
SAND PACK MANUFACTURER: CSSI
SCREEN MATERIAL: ASTM F 480-88A
MANUFACTURER: Monoflex
RISER MATERIAL: ASTM 480-90A
MANUFACTURER: Monoflex
RISER DIAMETER: 2"
DRILLING TECHNIQUE: HSA
AUGUR SIZE AND TYPE: 10" & 5 7/8"

BENTONITE TYPE: Hole Plug
MANUFACTURER: Barold
CEMENT TYPE: Portland Type I
MANUFACTURER: Lonestar Ind.
BOREHOLE DIAMETER: 10"
SCREEN DIAMETER: 2" SLOT SIZE: 0.035
LAW ENVIRONMENTAL, INC. FIELD REPRESENTATIVE: Thomas Mathew
DRILLING CONTRACTOR: Layne Western
AMOUNT BENTONITE USED: 2 bags
AMOUNT CEMENT USED: 5 bags
AMOUNT SAND USED: 7 1/2 bags
STATIC WATER DEPTH (after dev.):

REMARKS: 30 gallons used to tremle sand

(NOT TO SCALE)



QA / QC

INSTALLED BY: Layne Western INSTALLATION OBSERVED BY: Thomas Mathew
DISCREPANCIES:

1531.37

APPENDIX I

WELL DEVELOPMENT DATA: INITIAL AND ADDITIONAL

Pesticide Storage Facility
Fort Riley, Kansas

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

SHEET 1 OF 1

JOB NAME Ft. Riley, Kansas JOB NO. 11-1531

BY MW/JMB DATE 5/14/92 CHECKED ______ DATE ______

WELL DEVELOPMENT DATA

1. Well No. PSF92-01
2. Date of Installation : 5/5/92
3. Date of Development : 5/13-14/92
4. Static Water Level (TOC): Before Development 29.23 ft.: 24 Hours After 27.98 ft
5. Quantity of Water Loss During Drilling, If Used 0 Gal.
6. Quantity of Water Loss During Installation, If Used 30 Gal.

	Start	During	During	End
7. Physical Appearence	Cloudy	Cloudy	Cloudy	Clear
Specific Conductance (umhos/cm)	700	800	850	850
Temperature (C°)	20.5	20.0	20.0	20.5
Turbidity (NTU)	off scale	off scale	41.9	5.8
pH (s.u.)	7.8	7.2	7.2	7.2

8. Screen Length 10 ft.
9. Depth of Well (TOC): Before Development 34.80 ft.; After Development 33.88 ft.
10. Type and Size of Well Development Equipment : QED mont. well wizard; air compressor model SGN-E1010; well controller No. 3013 w/ a PVC development pump
11. Type of Surge Equipment: Two-inch surge rings attached to development pump
12. Height of Well Casing Above Ground Surface : ______ ft. (From Survey Data)
13. Quantity of Water Removed : 90 Gal. Total Time for Development : 10 Hr./Min.
14. Date & Time Water Sample Collected : 5/14/92 1125

REMARKS: ______

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

SHEET 1 OF 1

JOB NAME Ft. Riley, Kansas JOB NO. 11-1531

BY JMB/BC DATE 5/16/92 CHECKED ________ DATE ________

WELL DEVELOPMENT DATA

1. Well No. PSF92-02
2. Date of Installation : 5/5/92
3. Date of Development : 5/16/92
4. Static Water Level (TOC): Before Development 24.25 ft.: 24 Hours After 24.31 ft
5. Quantity of Water Loss During Drilling, If Used 0 Gal.
6. Quantity of Water Loss During Installation, If Used 30 Gal.

7.	Start		During	End
Physical Appearence	Sandy brown	Sandy brown	Slightly cloudy	Clear
Specific Conductance (umhos/cm)	1114	1230	1340	1264
Temperature (C°)	68.5	74.4	74.5	73.9
Turbidity (NTU)	>200	>200	66.5	16.5
pH (s.u.)	7.7	7.6	7.8	7.8

8. Screen Length 10 ft.
9. Depth of Well (TOC): Before Development 29.88 ft.; After Development 29.91 ft.
10. Type and Size of Well Development Equipment : QED mont. well wizard; air compressor model GGH-E1010; well controller No. 3013 w/ a PVC development pump
11. Type of Surge Equipment: Two-inch surge rings attached to development pump
12. Height of Well Casing Above Ground Surface : ________ ft. (From Survey Data)
13. Quantity of Water Removed : 140 Gal. Total Time for Development : 7.25 Hr./Min.
14. Date & Time Water Sample Collected : 5/16/92 1700

REMARKS:

1531.37

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

SHEET 1 OF 1

JOB NAME Ft. Riley, Kansas JOB NO. 11-1531

BY REJ/CDK DATE 5/16/92 CHECKED ________ DATE ________

WELL DEVELOPMENT DATA

1. Well No. PSF92-03
2. Date of Installation : ________
3. Date of Development : 5/14-16/92
4. Static Water Level (TOC): Before Development 29.39 ft.: 24 Hours After 24.80 ft
5. Quantity of Water Loss During Drilling, If Used 0 Gal.
6. Quantity of Water Loss During Installation, If Used 30 Gal.

7.	Start	During		End
Physical Appearence	Very turbid	Clear	Clear	Clear
Specific Conductance (umhos/cm)	1100	1200	1175	1100
Temperature (C°)	20	21	22	21
Turbidity (NTU)	>200	36	30.6	8.0
pH (s.u.)	7.0	7.3	7.3	7.3

8. Screen Length 10 ft.
9. Depth of Well (TOC): Before Development 30.64 ft.; After Development 30.13 ft.
10. Type and Size of Well Development Equipment : QED mont. well wizard; air compressor model SGH-E1010; well controller No. 3013 w/ a PVC development pump
11. Type of Surge Equipment: Two-inch surge rings attached to development pump
12. Height of Well Casing Above Ground Surface : ________ ft. (From Survey Data)
13. Quantity of Water Removed : 95 Gal. Total Time for Development : 18/25 Hr./Min.
14. Date & Time Water Sample Collected : 5/16/92 1800

REMARKS:

1531.37

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

SHEET 1 OF 1

JOB NAME Ft. Riley, Kansas JOB NO. 11-1531

BY JMB DATE 5/15/92 CHECKED ________ DATE ________

WELL DEVELOPMENT DATA

1. Well No. PSF92-04
2. Date of Installation : 5/5/92
3. Date of Development : 5/14-15/92
4. Static Water Level (TOC): Before Development 25.31 ft.; 24 Hours After 25.28 ft
5. Quantity of Water Loss During Drilling, If Used 0 Gal.
6. Quantity of Water Loss During Installation, If Used 30 Gal.

	Start	During		End
7. Physical Appearence	Cloudy	Clear	Slightly cloudy	Clear
Specific Conductance (umhos/cm)	910	859	882	883
Temperature (C°)	67.8	70.3	73.9	72.9
Turbidity (NTU)	off scale	17.2	28.3	15.6
pH (s.u.)	7.8	7.8	7.9	7.9

8. Screen Length 10 ft.
9. Depth of Well (TOC): Before Development 31.11 ft.; After Development 30.68 ft.
10. Type and Size of Well Development Equipment : QED mont. well wizard; air compressor model SGH-E1010; well controller No. 3013 w/ a PVC development pump
11. Type of Surge Equipment: Two-inch surge rings attached to development pump
12. Height of Well Casing Above Ground Surface : ________ ft. (From Survey Data)
13. Quantity of Water Removed : 111 Gal. Total Time for Development : 5/0 Hr./Min.
14. Date & Time Water Sample Collected : 5/15/92 1440

REMARKS:

1531.37

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

SHEET 1 OF 1

JOB NAME Ft. Riley, Kansas JOB NO. 11-1531

BY REJ/COK DATE 5/13-14/92 CHECKED ______ DATE ______

WELL DEVELOPMENT DATA

1. Well No. PSF92-05
2. Date of Installation : ______
3. Date of Development : 5/13-14/92
4. Static Water Level (TOC): Before Development 24.37 ft.: 24 Hours After 22.77 ft
5. Quantity of Water Loss During Drilling, If Used 0 Gal.
6. Quantity of Water Loss During Installation, If Used 30 Gal.

7.	Start	During		End
Physical Appearence	Very turbid	Clear	Clear	Clear
Specific Conductance (umhos/cm)	1000	950	1000	1000
Temperature (C°)	18	17	18.5	18
Turbidity (NTU)	>200	>200	82	68
pH (s.u.)	6.8	6.8	6.8	6.8

8. Screen Length 10 ft.
9. Depth of Well (TOC): Before Development 29.94 ft.; After Development 28.53 ft.
10. Type and Size of Well Development Equipment : QED mont. well wizard; air compressor model SGH-E1010; well controller No. 3013 w/ a PVC development pump
11. Type of Surge Equipment: Two-inch surge rings attached to development pump
12. Height of Well Casing Above Ground Surface : ______ ft. (From Survey Data)
13. Quantity of Water Removed : 189 Gal. Total Time for Development : 7/45 Hr./Min.
14. Date & Time Water Sample Collected : 5/14/92 1400

REMARKS: ______

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

SHEET 1 OF 1

JOB NAME Ft Riley, Kansas JOB NO. 11-1531

BY MW / JMB DATE 5/14/92 CHECKED ______ DATE ______

WELL DEVELOPMENT DATA

1. Well No. ~~PSF 92-01~~
2. Date of Installation : ~~5/5/92~~
3. Date of Development : 5/13/92 - 5/14/92
4. Static Water Level (TOC): Before Development 29.73 ft.: 24 Hours After 27.98 ft
5. Quantity of Water Loss During Drilling, If Used 0 Gal.
6. Quantity of Water Loss During Installation, If Used 30 Gal.
7.

	Start	During		End
Physical Appearence	cloudy	cloudy	cloudy	Clear
Specific Conductance (umhos/cm)	700	800	850	850
Temperature (C°)	20.5	20.0	20.0	20.5
Turbidity (NTU)	off scale	off scale	41.9	5.8
pH (s.u.)	7.8	7.2	7.2	7.2

8. Screen Length 10 ft.
9. Depth of Well (TOC): Before Development 34.80 ft.; After Development 33.58 ft. (after stickup was cut off.)
10. Type and Size of Well Development Equipment : QED Manf. well wizard: air compressor model SGN-E1010, well controller 3013 w/ 2 PVC Dev. Pump.
11. Type of Surge Equipment: 2 Surge Rings attached to Development Pump.
12. Height of Well Casing Above Ground Surface : ______ ft. (From Survey Data)
13. Quantity of Water Removed : 90 Gal. Total Time for Development : 10 (Hr)/Min.
14. Date & Time Water Sample Collected : 5/14/92 1125

REMARKS:

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

SHEET ______ OF ______

JOB NAME Ft Riley JOB NO. 11-1531

BY JMB / EC DATE 5/16/92 CHECKED ______ DATE ______

WELL DEVELOPMENT DATA

1. Well No. FSF 92-02
2. Date of Installation : 5/5/92
3. Date of Development : 5/16/92
4. Static Water Level (TOC): Before Development 24.25 ft.: 24 Hours After 24.31 ft
5. Quantity of Water Loss During Drilling, If Used 0 Gal.
6. Quantity of Water Loss During Installation, If Used 30 Gal.

	Start	During		End
7. Physical Appearence	Sandy brown	Sandy brown	Slightly cloudy	Clear
Specific Conductance (umhos/cm)	1114	1230	1340	1264
Temperature (C°)	68.5	74.4	74.5	73.9
Turbidity (NTU)	> 200	> 200	66.5	16.5
pH (s.u.)	7.2	7.6	7.8	7.8

8. Screen Length 10 ft.
9. Depth of Well (TOC): Before Development 29.88 ft.: After Development 29.91 ft.
10. Type and Size of Well Development Equipment : QED multi-well wizard: air compressor Model EGH-E010, well controller #03013 w/ A PVC Development Pump.
11. Type of Surge Equipment: 2" Surge Rings attached to Dev. Pump.
12. Height of Well Casing Above Ground Surface : ______ ft. (From Survey Data)
13. Quantity of Water Removed : 140 Gal. Total Time for Development : 7.25 Hr/Min.
14. Date & Time Water Sample Collected : 5/16/92 1700

REMARKS: ______

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

SHEET 1 OF 1

JOB NAME Ft. Riley JOB NO. 11-1531

BY REJ / CDK DATE 5/16/92 CHECKED ________ DATE ________

WELL DEVELOPMENT DATA

1. Well No. PSF92-03
2. Date of Installation : ________
3. Date of Development : 5/14,15,16/92
4. Static Water Level (TOC): Before Development 29.39 ft.: 24 Hours After 24.80 ft
5. Quantity of Water Loss During Drilling, If Used 0 Gal.
6. Quantity of Water Loss During Installation, If Used 30 Gal.

	Start		During	End
7. Physical Appearence	very Turbid	clear	clear	clear
Specific Conductance (umhos/cm)	1100	1200	1175	1100
Temperature (C°)	20°	21°	22°	21°
Turbidity (NTU)	> 200	36	30.6	8.0
pH (s.u.)	7.0	7.3	7.3	7.3

8. Screen Length 10 ft. before pad was installed. (stick up was cut off) after pad was installed
9. Depth of Well (TOC): Before Development 30.64 ft.; After Development 30.13 ft.
10. Type and Size of Well Development Equipment : QED mod. wellwizard: air compressor model NO. SGH-E1010, well controller model 3013, w/ 4 PVC Dev. Pump
11. Type of Surge Equipment: 2" surge rings attached to the development pump.
12. Height of Well Casing Above Ground Surface : ________ ft. (From Survey Data)
13. Quantity of Water Removed : 95 Gal. Total Time for Development : 18/25 Hr./Min.
14. Date & Time Water Sample Collected : 5/16/92 1200

REMARKS: ________

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

SHEET 1 OF 1

JOB NAME Ft. Riley Pesticide Facility JOB NO. 11-1531

BY JMB DATE 5/15/92 CHECKED ______ DATE ______

WELL DEVELOPMENT DATA

1. Well No. PSF 92-04
2. Date of Installation : 5/5/92
3. Date of Development : 5/14,15/92
4. Static Water Level (TOC): Before Development 25.31 ft.: 24 Hours After 25.23 ft
5. Quantity of Water Loss During Drilling, If Used 0 Gal.
6. Quantity of Water Loss During Installation, If Used 30 Gal.

7.	Start	During	During	End
Physical Appearence	Cloudy	Clear	Slightly cloudy	Clear
Specific Conductance (umhos/cm)	910	859	882	883
Temperature (C°)	67.8	70.3	73.9	72.9
Turbidity (NTU) 0-200	off scale	17.2	28.3	15.6
pH (s.u.)	7.8	7.8	7.9	7.9

8. Screen Length 10 ft.
9. Depth of Well (TOC): Before Development (Before stickup was cut off) 31.11 ft.; After Development (After stickup was cut off.) (Pad constructed) 30.68 ft.
10. Type and Size of Well Development Equipment : QED mfg. well wizard & air compressor model No SG4-E1010 & well controller No. 3013 w/a PVC Ded. Pump.
11. Type of Surge Equipment: 2" Surge rings attached to Ded. Pump.
12. Height of Well Casing Above Ground Surface : ______ ft. (From Survey Data)
13. Quantity of Water Removed : 111 Gal. Total Time for Development : 5/0 Hr./Min.
14. Date & Time Water Sample Collected : 1440 5/15/92

REMARKS:

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES DIVISION

SHEET 1 OF 1

JOB NAME FT. Riley JOB NO. 11-1531

BY KEJ/COK DATE 5/13-14/92 CHECKED ______ DATE ______

WELL DEVELOPMENT DATA

1. Well No. PSF9205
2. Date of Installation : ______
3. Date of Development : 5/13-14/92
4. Static Water Level (TOC): Before Development 24.37 ft.: 24 Hours After 22.77 ~~24.37~~ ft
5. Quantity of Water Loss During Drilling, If Used 0 Gal.
6. Quantity of Water Loss During Installation, If Used 30 Gal.

	Start	During		End
7. Physical Appearence	very Turbid	Clear	Clear	clear
Specific Conductance (umhos/cm)	1000	950	1000	1000
Temperature (C°)	18°	17°	18.5	18°
Turbidity (NTU)	>200	>200	82	6.8
pH (s.u.)	6.8	6.8	6.6	6.8

8. Screen Length 10 ft.

Total depths are before cut off, during pad: installation 5/13/92

9. Depth of Well (TOC): Before Development 29.94 ft.; After Development 28.53 ~~24.87~~ ft.
10. Type and Size of Well Development Equipment : QED mod. well wizard: air compressor model SGH-E10.0, well controller No. 3013 w/ a PVC Development pump.
11. Type of Surge Equipment: 2" surge rings attached to development pump.
12. Height of Well Casing Above Ground Surface : ______ ft. (From Survey Data)
13. Quantity of Water Removed : 189 Gal. Total Time for Development : 7/45 Hr./Min.
14. Date & Time Water Sample Collected : 5/14/92 1400

REMARKS: ______

ADDITIONAL DEVELOPMENT FORMS

SHEET 1 of 1

JOB NAME: FT. Riley (PSF) JOB NUMBER: 11-1531

WORK PERFORMED BY: R. Jones D. Gray DATE: CHECKED BY:

WEATHER: LOW: 65° HIGH: 80° RAIN (Inches): OTHER: P. Cloudy LT. Showers

MONITORING WELL No.: PSF92-01 DATE OF DEVELOPMENT: 6/27/92

STATIC WATER LEVEL: BEFORE DEV.(TOC) 27.42' 24 HRS. AFTER DEV. 27.44'

TOTAL DEPTH: BEFORE DEV.(TOC) 33.84' AFTER DEV. (TOC) 33.80'

LENGTH OF WATER COLUMN: 6.42'

SURGE/PURGE CYCLE #	TIME TO TRANSLUCENCE STATE	PH	COND.	TEMP. °F	NTU	TOTAL GALS. REMOVED
1	65min 0sec	7.86	519	65	69	65
2	43min 30sec	7.93	610	67	70	↓
3	51 min 10sec	7.67	741	67	75.5	
4	41min 45sec	7.62	749	66	64	
5	24min 45sec	7.64	756	65.3	78	
6	35min 0sec	7.54	818	68.5	97	
7	2min 30sec	7.57	824	67.8	80	
End Bottom pumping		7.52	828	67.2	16	

REMARKS:

ADDITIONAL DEVELOPMENT FORMS

SHEET 1 of 1

JOB NAME: FT. Riley (PSF) JOB NUMBER: 11-1531

WORK PERFORMED BY: R. Jones D. Gray DATE: ______ CHECKED BY: ______

WEATHER: LOW: 65° HIGH: 80° RAIN (inches): ______ OTHER: P. Cloudy

MONITORING WELL No.: PSF92-03 DATE OF DEVELOPMENT: 6/29-30/92

STATIC WATER LEVEL: BEFORE DEV.(TOC) 24.22' 24 HRS. AFTER DEV. ______

TOTAL DEPTH: BEFORE DEV.(TOC) 30.07' AFTER DEV. (TOC) 30.04'

LENGTH OF WATER COLUMN: 5.85'

SURGE/PURGE CYCLE #	TIME TO TRANSLUCENCE STATE	PH	COND.	TEMP.	NTU	TOTAL GALS. REMOVED
1	55min osce	7.84	1290	71	110	91
2	58min osce	7.86	1359	78.5	115	↓
3	1hr. 35min	7.85	14.59	77.6	75	
4	1hr. 27min	7.74	1517	78.6	82	
5	1hr. 20min	7.88	1099	71.7	54	
6	1hr. 9min	7.84	1130	74.7	53	
Field pumping Bottom		7.72	1264	81.2	12	↓

REMARKS: Development did not continue due to the results of the first 6 cycle & the amount of time it was taking to reach a Translucent state.

ADDITIONAL DEVELOPMENT FORMS

SHEET 1 of 1

JOB NAME: FT. Riley (PSF) JOB NUMBER: 11-1531

WORK PERFORMED BY: S. Ruth T. Mathew DATE: ________ CHECKED BY: ________

WEATHER: LOW: ________ HIGH: ________ RAIN (inches): ________ OTHER: ________

MONITORING WELL No.: PSF92-04 DATE OF DEVELOPMENT: 6/30/92

STATIC WATER LEVEL: BEFORE DEV.(TOC) 24.90' 24 HRS. AFTER DEV. —

TOTAL DEPTH: BEFORE DEV.(TOC) 30.53' AFTER DEV. (TOC) 30.40'

LENGTH OF WATER COLUMN: 5.40'

SURGE/PURGE CYCLE #	TIME TO TRANSLUCENCE STATE	PH	COND.	TEMP.	NTU	TOTAL GALS. REMOVED
1	19min 00sec	6.81	920	20.1	92	52
2	19min 42sec	7.03	920	20.9	100	↓
3	19min 35sec	6.94	1010	21.4	96	
4	19min 51sec	6.96	1030	22.3	90	
Final pumping (Top)		7.05	1080	21.7	24	
↓ middle		—	—	—	—	
Bottom		6.99	1020	22.0	24	↓

REMARKS: ________

ADDITIONAL DEVELOPMENT FORMS

SHEET 1 of 1

JOB NAME: Ft. Riley (PSF) JOB NUMBER: 11-1531

WORK PERFORMED BY: S. Ruth T. Mathew DATE: ______ CHECKED BY: ______

WEATHER: LOW: ______ HIGH: ______ RAIN (inches): ______ OTHER: ______

MONITORING WELL No.: PSF92-05 DATE OF DEVELOPMENT: 6/29/92

STATIC WATER LEVEL: BEFORE DEV.(TOC) 21.81' 24 HRS. AFTER DEV. 21.89'

TOTAL DEPTH: BEFORE DEV.(TOC) 28.41' AFTER DEV. (TOC) 28.23'

LENGTH OF WATER COLUMN: 6.60'

SURGE/PURGE CYCLE #	TIME TO TRANSLUCENCE STATE	PH	COND.	TEMP.	NTU	TOTAL GALS. REMOVED
1	25min 33sec	6.68	1180	17.5	80	220
2	22min 20sec	6.57	1140	17.6	113	↓
3	17min 34sec	6.70	1100	17.7	112	
4	17min 34sec	6.72	1150	19.4	112	
5	15min 35sec	6.99	1180	18.1	111	
6	15min 50sec	7.04	1230	19.4	96	
7	15min 27sec	6.98	1200	18.2	96	
Final Pumping (Top)		6.98	1120	18.5	21	
↓ middle		7.10	1150	18.1	26	
Bottom		6.94	1150	17.3	15	↓

REMARKS: ______

APPENDIX J

UN-PROCESSED INSITU PERMEABILITY TEST RESULTS/DATA

Pesticide Storage Facility
Fort Riley, Kansas

SLUG TEST DATA
PSF01 Slug Out

SE1000C
Environmental Logger
08/19 15:09

Unit# 00851 Test 0

INPUT 1: Level (F) TOC
Reference 0.000
Scale factor 10.050
Offset 0.010

Step 0 08/19 08:48:17

TIME (min.)	CHANGE IN HEAD (ft.)	TIME (min.)	CHANGE IN HEAD (ft.)
0.0000	1.782	0.8333	0.458
0.0033	2.177	0.9166	0.410
0.0066	2.014	1.0000	0.375
0.0100	1.976	1.0833	0.340
0.0133	1.970	1.1666	0.315
0.0166	1.932	1.2500	0.296
0.0200	1.941	1.3333	0.276
0.0233	1.938	1.4166	0.261
0.0266	1.922	1.5000	0.248
0.0300	1.909	1.5833	0.235
0.0333	1.884	1.6666	0.226
0.0500	1.808	1.7500	0.216
0.0666	1.747	1.8333	0.210
0.0833	1.683	1.9166	0.203
0.1000	1.617	2.0000	0.194
0.1166	0.569	2.5000	0.165
0.1333	0.521	3.0000	0.146
0.1500	0.473	3.5000	0.130
0.1666	0.432	4.0000	0.114
0.1833	0.387	4.5000	0.105
0.2000	0.346	5.0000	0.095
0.2166	0.308	5.5000	0.092
0.2333	1.270	6.0000	0.082
0.2500	1.235	6.5000	0.076
0.2666	1.193	7.0000	0.073
0.2833	1.158	7.5000	0.070
0.3000	1.123	8.0000	0.063
0.3166	1.091	8.5000	0.063
0.3333	1.063	9.0000	0.057
0.4166	0.907	9.5000	0.054
0.5000	0.783	10.0000	0.050
0.5833	0.671	12.0000	0.044
0.6666	0.585	14.0000	0.034
0.7500	0.515		

SLUG TEST DATA
PSF02 Slug Out

SE1000C
Environmental Logger
08/19 15:10

Unit# 00851 Test 1

INPUT 1: Level (F) TOC
Reference 0.000
Scale factor 10.050
Offset 0.010

Step 0 08/19 09:37:44

TIME (min.)	CHANGE IN HEAD (ft.)	TIME (min.)	CHANGE IN HEAD (ft.)
0.0000	1.040	0.7500	0.143
0.0033	0.687	0.8333	0.124
0.0066	1.562	0.9166	0.111
0.0100	1.368	1.0000	0.098
0.0133	1.164	1.0833	0.089
0.0166	1.355	1.1666	0.079
0.0200	1.193	1.2500	0.073
0.0233	1.231	1.3333	0.066
0.0266	1.199	1.4166	0.063
0.0300	1.161	1.5000	0.057
0.0333	1.155	1.5833	0.054
0.0500	1.059	1.6666	0.050
0.0666	0.958	1.7500	0.047
0.0833	0.875	1.8333	0.044
0.1000	0.802	1.9166	0.041
0.1166	0.735	2.0000	0.038
0.1333	0.678	2.5000	0.028
0.1500	0.630	3.0000	0.022
0.1666	0.588	3.5000	0.015
0.1833	0.547	4.0000	0.009
0.2000	0.515	4.5000	0.006
0.2166	0.487	5.0000	0.009
0.2333	0.458	5.5000	0.009
0.2500	0.436	6.0000	0.012
0.2666	0.413	6.5000	0.009
0.2833	0.394	7.0000	0.009
0.3000	0.375	7.5000	0.012
0.3166	0.356	8.0000	0.009
0.3333	0.340	8.5000	0.006
0.4166	0.283	9.0000	0.009
0.5000	0.232	9.5000	0.009
0.5833	0.194	10.0000	0.009
0.6666	0.165		

SLUG TEST DATA
PSF03 Slug Out

SE1000C
Environmental Logger
08/19 15:12

Unit# 00851 Test 2

INPUT 1: Level (F) TOC
Reference 0.000
Scale factor 10.050
Offset 0.010

Step 0 08/19 10:14:04

TIME (min.)	CHANGE IN HEAD (ft.)	TIME (min.)	CHANGE IN HEAD (ft.)
0.0000	0.961	0.7500	0.133
0.0033	0.531	0.8333	0.124
0.0066	1.069	0.9166	0.117
0.0100	1.610	1.0000	0.108
0.0133	2.052	1.0833	0.105
0.0166	1.680	1.1666	0.098
0.0200	1.699	1.2500	0.095
0.0233	1.648	1.3333	0.092
0.0266	1.635	1.4166	0.089
0.0300	1.597	1.5000	0.085
0.0333	1.578	1.5833	0.082
0.0500	1.451	1.6666	0.079
0.0666	1.330	1.7500	0.079
0.0833	1.206	1.8333	0.076
0.1000	1.101	1.9166	0.076
0.1166	1.012	2.0000	0.073
0.1333	0.926	2.5000	0.063
0.1500	0.846	3.0000	0.054
0.1666	0.773	3.5000	0.047
0.1833	0.700	4.0000	0.044
0.2000	0.633	4.5000	0.038
0.2166	0.572	5.0000	0.031
0.2333	0.522	5.5000	0.028
0.2500	0.477	6.0000	0.028
0.2666	0.436	6.5000	0.025
0.2833	0.394	7.0000	0.022
0.3000	0.366	7.5000	0.015
0.3166	0.340	8.0000	0.012
0.3333	0.318	8.5000	0.015
0.4166	0.241	9.0000	0.012
0.5000	0.190	9.5000	0.012
0.5833	0.149	10.0000	0.009
0.6666	0.143	12.0000	0.003

SLUG TEST DATA
PSF04 Slug Out

SE1000C
Environmental Logger
08/19 15:13

Unit# 00851 Test 3

INPUT 1: Level (F) TOC
Reference 0.000
Scale factor 10.050
Offset 0.010

Step 0 08/19 11:06:19

TIME (min.)	CHANGE IN HEAD (ft.)	TIME (min.)	CHANGE IN HEAD (ft.)
0.0000	2.685	0.7500	0.254
0.0033	2.322	0.8333	0.235
0.0066	0.655	0.9166	0.222
0.0100	0.782	1.0000	0.210
0.0133	1.772	1.0833	0.197
0.0166	1.689	1.1666	0.190
0.0200	1.702	1.2500	0.181
0.0233	1.686	1.3333	0.175
0.0266	1.654	1.4166	0.168
0.0300	1.616	1.5000	0.162
0.0333	1.594	1.5833	0.159
0.0500	1.473	1.6666	0.152
0.0666	1.358	1.7500	0.149
0.0833	1.272	1.8333	0.146
0.1000	1.193	1.9166	0.143
0.1166	1.117	2.0000	0.143
0.1333	1.047	2.5000	0.124
0.1500	0.986	3.0000	0.108
0.1666	0.929	3.5000	0.101
0.1833	0.878	4.0000	0.095
0.2000	0.830	4.5000	0.089
0.2166	0.782	5.0000	0.082
0.2333	0.741	5.5000	0.070
0.2500	0.703	6.0000	0.070
0.2666	0.668	6.5000	0.066
0.2833	0.636	7.0000	0.063
0.3000	0.604	7.5000	0.060
0.3166	0.579	8.0000	0.057
0.3333	0.553	8.5000	0.050
0.4166	0.448	9.0000	0.054
0.5000	0.375	9.5000	0.050
0.5833	0.318	10.0000	0.047
0.6666	0.283		

SLUG TEST DATA
PSF05 Slug Out

SE1000C
Environmental Logger
08/19 15:19

Unit# 00851 Test 5

INPUT 1: Level (F) TOC
Reference 0.000
Scale factor 10.050
Offset 0.010

Step 0 08/19 13:59:16

TIME (min.)	CHANGE IN HEAD (ft.)	TIME (min.)	CHANGE IN HEAD (ft.)
0.0000	1.130	0.7500	0.019
0.0033	0.885	0.8333	0.015
0.0066	1.783	0.9166	0.015
0.0100	1.200	1.0000	0.012
0.0133	1.006	1.0833	0.009
0.0166	0.837	1.1666	0.009
0.0200	0.761	1.2500	0.009
0.0233	0.681	1.3333	0.006
0.0266	0.636	1.4166	0.006
0.0300	0.592	1.5000	0.006
0.0333	0.544	1.5833	0.006
0.0500	0.410	1.6666	0.006
0.0666	0.312	1.7500	0.006
0.0833	0.264	1.8333	0.006
0.1000	0.229	1.9166	0.006
0.1166	0.197	2.0000	0.003
0.1333	0.171	2.5000	0.003
0.1500	0.152	3.0000	0.006
0.1666	0.136	3.5000	0.006
0.1833	0.121	4.0000	0.006
0.2000	0.111	4.5000	0.009
0.2166	0.101	5.0000	0.006
0.2333	0.095	5.5000	0.009
0.2500	0.089	6.0000	0.015
0.2666	0.082	6.5000	0.015
0.2833	0.079	7.0000	0.012
0.3000	0.073	7.5000	0.012
0.3166	0.073	8.0000	0.012
0.3333	0.070	8.5000	0.009
0.4166	0.060	9.0000	0.009
0.5000	0.054	9.5000	0.009
0.5833	0.025	10.0000	0.009
0.6666	0.022		

SLUG TEST DATA
PSF05 Slug In

SE1000C
Environmental Logger
08/19 15:14

Unit# 00851 Test 4

INPUT 1: Level (F) TOC

Reference 0.000
Scale factor 10.050
Offset 0.010

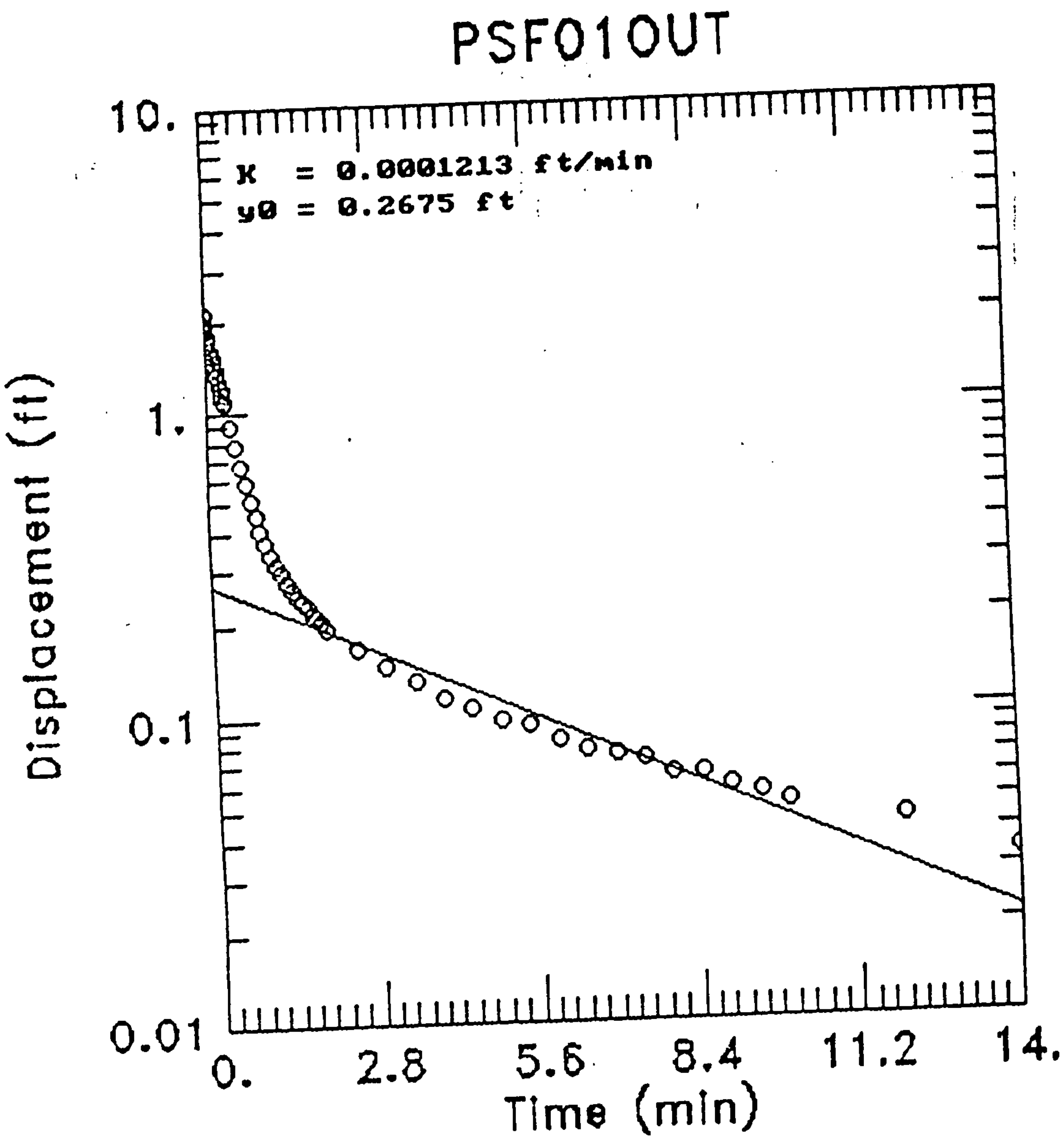
Step 0 08/19 13:19:29

TIME (min.)	CHANGE IN HEAD (ft.)	TIME (min.)	CHANGE IN HEAD (ft.)
0.0000	0.015	0.7500	-0.054
0.0033	0.006	0.8333	-0.050
0.0066	-0.003	0.9166	-0.050
0.0100	-0.006	1.0000	-0.047
0.0133	-0.015	1.0833	-0.047
0.0166	-1.407	1.1666	-0.044
0.0200	-2.841	1.2500	-0.044
0.0233	-2.749	1.3333	-0.041
0.0266	-1.729	1.4166	-0.041
0.0300	-1.124	1.5000	-0.038
0.0333	-0.621	1.5833	-0.050
0.0500	-0.614	1.6666	-0.035
0.0666	-0.414	1.7500	-0.035
0.0833	-0.334	1.8333	-0.031
0.1000	-0.280	1.9166	-0.031
0.1166	-0.242	2.0000	-0.031
0.1333	-0.216	2.5000	-0.022
0.1500	-0.194	3.0000	-0.019
0.1666	-0.175	3.5000	-0.015
0.1833	-0.159	4.0000	-0.015
0.2000	-0.143	4.5000	-0.009
0.2166	-0.136	5.0000	-0.009
0.2333	-0.130	5.5000	-0.006
0.2500	-0.121	6.0000	-0.009
0.2666	-0.114	6.5000	-0.009
0.2833	-0.101	7.0000	-0.009
0.3000	-0.095	7.5000	-0.006
0.3166	-0.089	8.0000	-0.009
0.3333	-0.089	8.5000	-0.009
0.4166	-0.070	9.0000	-0.009
0.5000	-0.066	9.5000	-0.006
0.5833	-0.057	10.0000	-0.009
0.6666	-0.057	12.0000	0.006

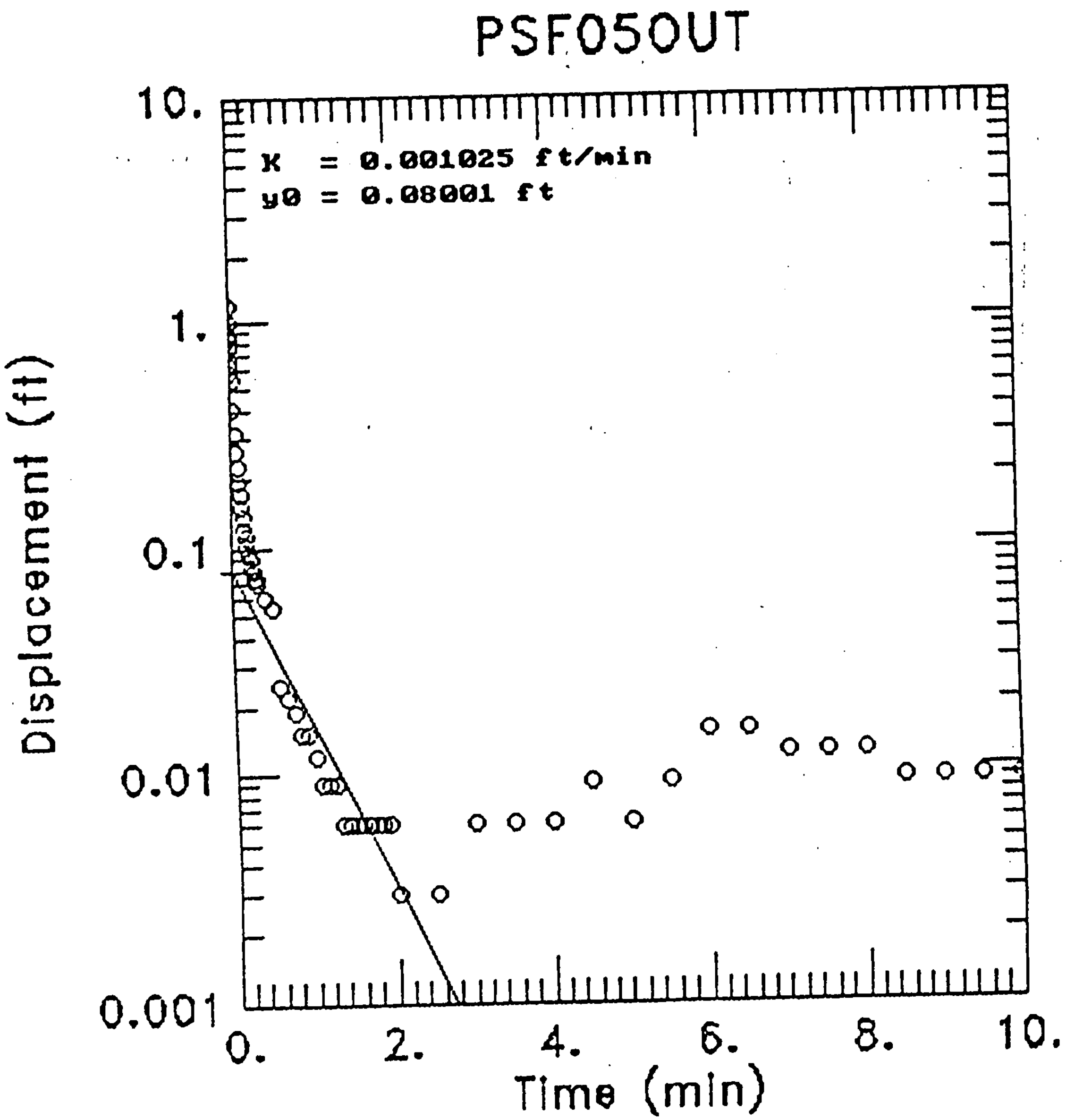
APPENDIX K

PROCESSED INSITU PERMEABILITY TEST RESULTS/DATA

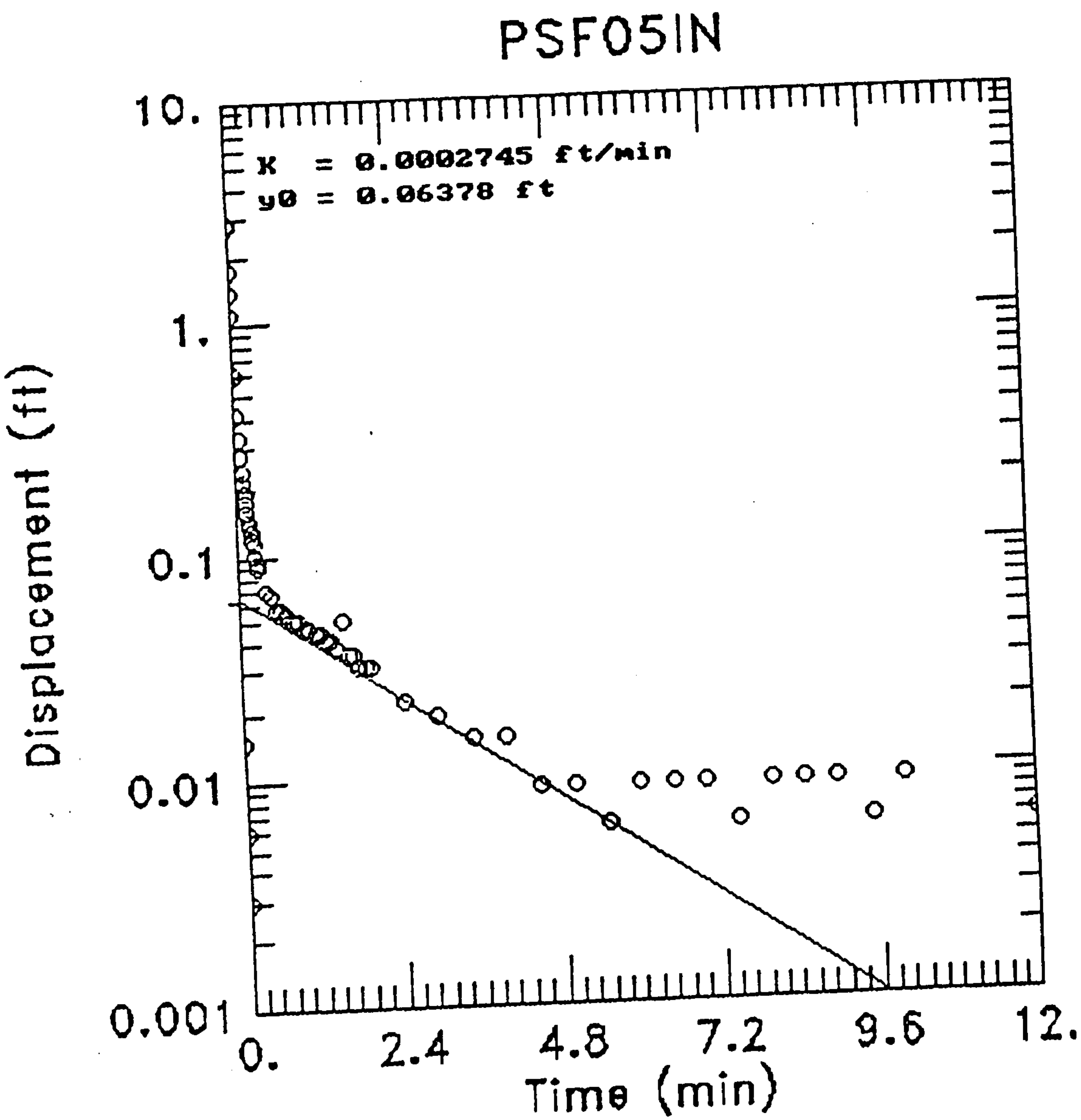
Pesticide Storage Facility
Fort Riley, Kansas



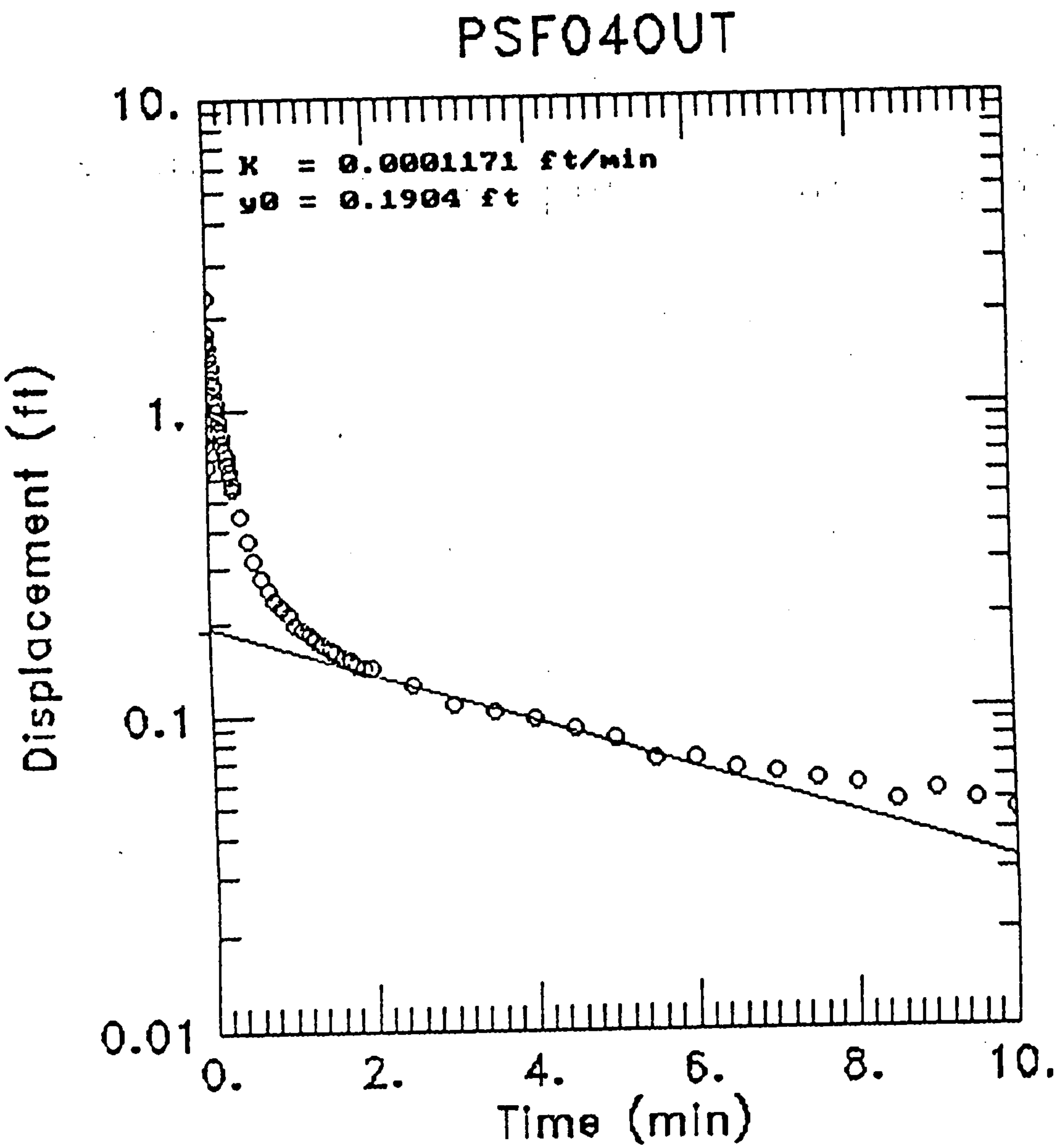
PSF01OUT
K = 0.0001213 ft/min
y0 = 0.2675 ft
Displacement (ft)
10.
1.
0.1
0.01
0.
2.8
5.6
8.4
11.2
14.
Time (min)



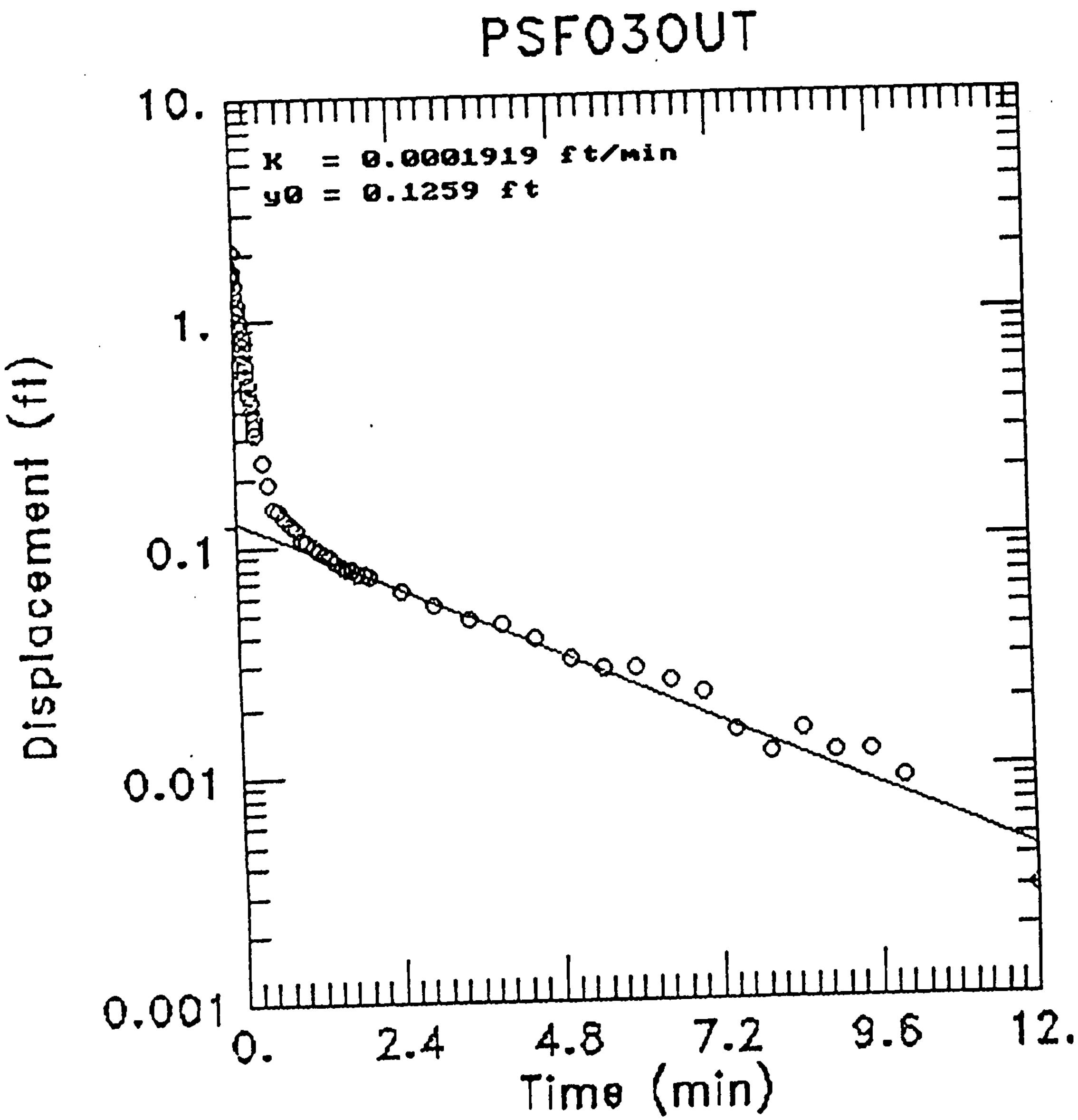
PSF05OUT
K = 0.001025 ft/min
y0 = 0.08001 ft
10.
1.
0.1
0.01
0.001
Displacement (ft)
0.
2.
4.
6.
8.
10.
Time (min)

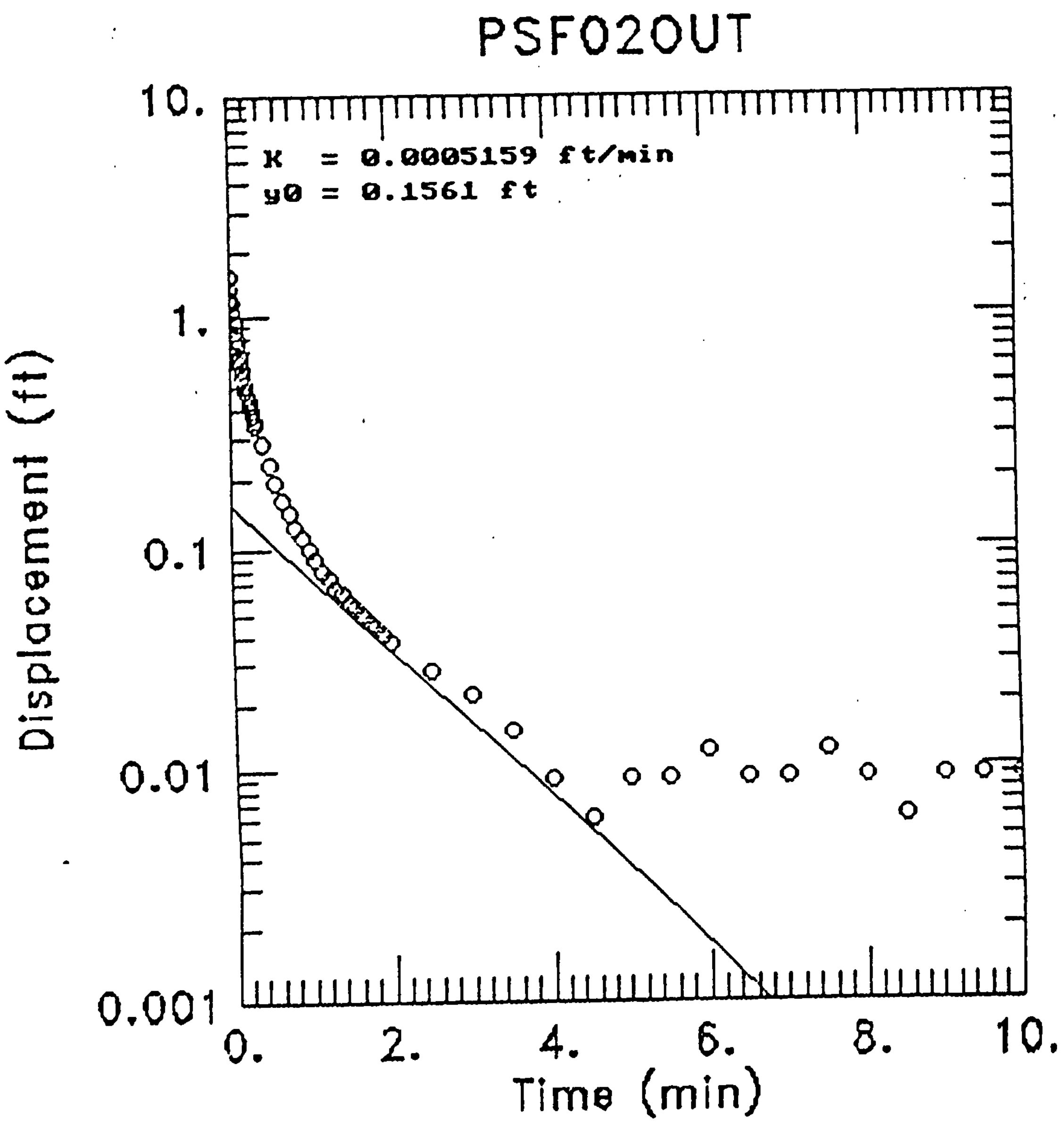


PSF05IN
K = 0.0002745 ft/min
y0 = 0.06378 ft
10.
1.
0.1
0.01
0.001
Displacement (ft)
0.
2.4
4.8
7.2
9.6
12.
Time (min)



PSF04OUT
K = 0.0001171 ft/min
y0 = 0.1904 ft
Displacement (ft)
10.
1.
0.1
0.01
0.
2.
4.
6.
8.
10.
Time (min)


PSF03OUT
K = 0.0001919 ft/min
y0 = 0.1259 ft
Displacement (ft)
10.
1.
0.1
0.01
0.001
0.
2.4
4.8
7.2
9.6
12.
Time (min)


PSF02OUT
K = 0.0005159 ft/min
y0 = 0.1561 ft
Displacement (ft)
10.
1.
0.1
0.01
0.001
0.
2.
4.
6.
8.
10.
Time (min)

APPENDIX L

POSITIVE DETECTION LIST FOR ANALYTICAL RESULTS FOR SOIL, SURFACE WATER/SEDIMENT AND GROUND WATER-PSF

Pesticide Storage Facility
Fort Riley, Kansas

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PILOT HOLE PSF92SB01A (5') 1-24-92	PILOT HOLE PSF92SB01B (38') 1-24-92	PSFSB01A (2-2.5') 4-8-92	PSFSB01B (4-4.5') 4-8-92	PSFSB02A (2-2.5') 4-7-92	PSFSB02B (4-4.5') 4-7-92	PSFSB03A (2-2.5') 4-5-92
PESTICIDES/PCBs:							
4,4'-DDD, ug/Kg	<7.8	<8.1	<7.7 (S)	<7.5 (H)	<39	<37	<390 (D1)
4,4'-DDE, ug/Kg	<7.8	<8.1	<7.7 (S)	24 (H)	<39	<37	<390 (D1)
4,4'-DDT, ug/Kg	<7.8	<8.1	16 (S)	87 (H)	42	<37	7700 (D1)
Aldrin, ug/Kg	<3.9	<4.1	<3.8 (S)	<3.7 (H)	<19	<19	<200 (D1)
Aroclor-1016, ug/Kg	<78	<81	<77 (S)	<75 (H)	<390	<370	<3900 (D1)
Aroclor-1221, ug/Kg	<78	<81	<77 (S)	<75 (H)	<390	<370	<3900 (D1)
Aroclor-1232, ug/Kg	<160	<160	<150 (S)	<150 (H)	<770	<750	<7800 (D1)
Aroclor-1242, ug/Kg	<78	<81	<77 (S)	<75 (H)	<390	<370	<3900 (D1)
Aroclor-1248, ug/Kg	<78	<81	<77 (S)	<75 (H)	<390	<370	<3900 (D1)
Aroclor-1254, ug/Kg	<78	<81	<77 (S)	<75 (H)	<390	<370	<3900 (D1)
Aroclor-1260, ug/Kg	<78	<81	<77 (S)	<75 (H)	<390	<370	<3900 (D1)
Dieldrin, ug/Kg	<7.8	<8.1	<7.7 (S)	27 (H)	<39	<37	<390 (D1)
Endosulfan I, ug/Kg	<3.9	<4.1	<3.8 (S)	<3.7 (H)	<19	<19	<200 (D1)
Endosulfan II, ug/Kg	<7.8	<8.1	<7.7 (S)	<7.5 (H)	<39	<37	<390 (D1)
Endosulfan sulfate, ug/Kg	<7.8	<8.1	<7.7 (S)	<7.5 (H)	<39	<37	<390 (D1)
Endrin, ug/Kg	<7.8	<8.1	<7.7 (S)	<7.5 (H)	<39	<37	<390 (D1)
Endrin aldehyde, ug/Kg	<7.8	<8.1	<7.7 (S)	<7.5 (H)	<39	<37	<390 (D1)
Heptachlor, ug/Kg	<3.9	<4.1	<3.8 (S)	<3.7 (H)	45	28	<200 (D1)
Heptachlor epoxide, ug/Kg	<3.9	<4.1	<3.8 (S)	4.3 (H)	<19	<19	<200 (D1)
Methoxychlor, ug/Kg	<39	<41	56 (S)	530 (H)	<190	<190	<2000 (D1)
Toxaphene, ug/Kg	<390	<410	<380 (S)	<370 (H)	<1900	<1900	<2000 (D1)
alpha-BHC, ug/Kg	<3.9	<4.1	<3.8 (S)	<3.7 (H)	<19	<19	<200 (D1)
alpha-Chlordane, ug/Kg	<3.9	<4.1	22 (S)	84 (H)	210	160	<200 (D1)
beta-BHC, ug/Kg	<3.9	<4.1	<3.8 (S)	<3.7 (H)	<19	<19	<200 (D1)
delta-BHC, ug/Kg	<3.9	<4.1	<3.8 (S)	<3.7 (H)	<19	<19	<200 (D1)
gamma-BHC, ug/Kg	<3.9	<4.1	<3.8 (S)	<3.7 (H)	<19	<19	<200 (D1)
gamma-Chlordane, ug/Kg	<3.9	<4.1	24 (S)	82 (H)	210	160	210 (D1)

D1 – 100x dilution factor. Result is estimated.
H – Holding time exceeded. Results are biased low.
S – Low surrogate recovery. Results are biased low.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB03B (4-4.5') 4-5-92	DUPLICATE PSFSB03C (4-4.5') 4-5-92	PSFSB04A (2-2.5') 4-7-92	PSFSB04B (4-4.5') 4-7-92	PSFSB05A (2-2.5') 4-5-92	PSFSB05B (3.5-4.5') 4-5-92	PSFSB06A (2-2.5') 4-7-92	PSFSB06B (4-4.5') 4-7-92
PESTICIDES/PCBs:								
4,4'-DDD, ug/Kg	<370 (D1)	<1500 (D2)	<16	<16	<39	<7.6	<7.3	<7.0
4,4'-DDE, ug/Kg	<370 (D1)	<1500 (D2)	31	21	110	8.3	<7.3	<7.0
4,4'-DDT, ug/Kg	4500 (D1)	33000 (D2)	140	96	850	53	<7.3	14
Aldrin, ug/Kg	<180 (D1)	<740 (D2)	<7.8	<7.8	<19	<3.8	<3.7	<3.5
Aroclor-1016, ug/Kg	<3700 (D1)	<15000 (D2)	<160	<160	<390	<76	<73	<70
Aroclor-1221, ug/Kg	<3700 (D1)	<15000 (D2)	<160	<160	<390	<76	<73	<70
Aroclor-1232, ug/Kg	<7400 (D1)	<30000 (D2)	<310	<310	<770	<150	<150	<140
Aroclor-1242, ug/Kg	<3700 (D1)	<15000 (D2)	<160	<160	<390	<76	<73	<70
Aroclor-1248, ug/Kg	<3700 (D1)	<15000 (D2)	<160	<160	<390	<76	<73	<70
Aroclor-1254, ug/Kg	<3700 (D1)	<15000 (D2)	<160	<160	<390	<76	<73	<70
Aroclor-1260, ug/Kg	<3700 (D1)	<15000 (D2)	<160	<160	<390	<76	<73	<70
Dieldrin, ug/Kg	<370 (D1)	<1500 (D2)	<16	<16	200	10	<7.3	<7.0
Endosulfan I, ug/Kg	<180 (D1)	<740 (D2)	<7.8	<7.8	<19	<3.8	<3.7	<3.5
Endosulfan II, ug/Kg	<370 (D1)	<1500 (D2)	<16	<16	<39	<7.6	<7.3	<7.0
Endosulfan sulfate, ug/Kg	<370 (D1)	<1500 (D2)	<16	<16	<39	<7.6	<7.3	<7.0
Endrin, ug/Kg	<370 (D1)	<1500 (D2)	<16	<16	<39	<7.6	<7.3	<7.0
Endrin aldehyde, ug/Kg	<370 (D1)	<1500 (D2)	<16	<16	140	<7.6	<7.3	<7.0
Heptachlor, ug/Kg	<180 (D1)	<740 (D2)	<7.8	<7.8	230	17	<3.7	<3.5
Heptachlor epoxide, ug/Kg	<180 (D1)	<740 (D2)	<7.8	<7.8	<19	5.4	<3.7	<3.5
Methoxychlor, ug/Kg	10000 (D1)	<7400 (D2)	<78	<78	<190	<38	<37	<35
Toxaphene, ug/Kg	<18000 (D1)	<74000 (D2)	<780	<780	<1900	<380	<370	<350
alpha-BHC, ug/Kg	<180 (D1)	<740 (D2)	<7.8	<7.8	<19	<3.8	<3.7	<3.5
alpha-Chlordane, ug/Kg	<180 (D1)	1500 (D2)	90	62	790	71	<3.7	3.7
beta-BHC, ug/Kg	<180 (D1)	<740 (D2)	<7.8	<7.8	<19	<3.8	<3.7	<3.5
delta-BHC, ug/Kg	<180 (D1)	<740 (D2)	<7.8	<7.8	<19	<3.8	<3.7	<3.5
gamma-BHC, ug/Kg	<180 (D1)	<740 (D2)	<7.8	<7.8	<19	<3.8	<3.7	<3.5
gamma-Chlordane, ug/Kg	<180 (D1)	1600 (D2)	91	63	790	71	<3.7	4.0

D1 - 100x dilution factor. Result is estimated.
D2 - 400x dilution factor. Result is estimated.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB7A (2.5-3') 4-7-92	PSFSB7B (4-4.5') 4-7-92	PSFSB8A (2-2.5') 4-7-92	PSFSB8B (4-4.5') 4-7-92	PSFSB9A (1.5-2.5') 4-7-92	PSFSB9B (4-4.5') 4-7-92	PSFSB10A (1.5-2.5') 4-4-92
PESTICIDES/PCBs:							
4,4'-DDD, ug/Kg	<70 (S)	<150 (H)	<43	<7.8 (S)	<380 (S)	<370 (S)	360
4,4'-DDE, ug/Kg	160 (S)	240 (H)	110	20 (S)	870 (S)	420 (S)	180
4,4'-DDT, ug/Kg	750 (S)	2800 (H)	440	150 (S)	5700 (S)	2600 (S)	<71
Aldrin, ug/Kg	<35 (S)	<77 (H)	<21	<3.9 (S)	<190 (S)	<190 (S)	<35
Aroclor-1016, ug/Kg	<700 (S)	<1500 (H)	<430	<78 (S)	<3800 (S)	<3700 (S)	<710
Aroclor-1221, ug/Kg	<700 (S)	<1500 (H)	<430	<78 (S)	<3800 (S)	<3700 (S)	<710
Aroclor-1232, ug/Kg	<1400 (S)	<3100 (H)	<850	<160 (S)	<7600 (S)	<7500 (S)	<1400
Aroclor-1242, ug/Kg	<700 (S)	<1500 (H)	<430	<78 (S)	<3800 (S)	<3700 (S)	<710
Aroclor-1248, ug/Kg	<700 (S)	<1500 (H)	<430	<78 (S)	<3800 (S)	<3700 (S)	<710
Aroclor-1254, ug/Kg	<700 (S)	<1500 (H)	<430	<78 (S)	<3800 (S)	<3700 (S)	<710
Aroclor-1260, ug/Kg	<700 (S)	<1500 (H)	<430	<78 (S)	<3800 (S)	<3700 (S)	<710
Dieldrin, ug/Kg	<70 (S)	<150 (H)	<43	<7.8 (S)	<380 (S)	<370 (S)	<71
Endosulfan I, ug/Kg	<35 (S)	<77 (H)	<21	<3.9 (S)	<190 (S)	<190 (S)	<35
Endosulfan II, ug/Kg	<70 (S)	<150 (H)	<43	<7.8 (S)	<380 (S)	<370 (S)	<71
Endosulfan sulfate, ug/Kg	<70 (S)	<150 (H)	<43	<7.8 (S)	<380 (S)	<370 (S)	<71
Endrin, ug/Kg	<70 (S)	<150 (H)	<43	<7.8 (S)	<380 (S)	<370 (S)	<71
Endrin aldehyde, ug/Kg	<70 (S)	<150 (H)	<43	<7.8 (S)	<380 (S)	<370 (S)	<71
Heptachlor, ug/Kg	<35 (S)	<77 (H)	<21	<3.9 (S)	<190 (S)	<190 (S)	<35
Heptachlor epoxide, ug/Kg	<35 (S)	<77 (H)	<21	<3.9 (S)	<190 (S)	<190 (S)	<35
Methoxychlor, ug/Kg	<350 (S)	<770 (H)	<210	<39 (S)	<1900 (S)	<1900 (S)	<350
Toxaphene, ug/Kg	<3500 (S)	<7700 (H)	<2100	<390 (S)	<19000 (S)	<19000 (S)	<3500
alpha-BHC, ug/Kg	<35 (S)	<77 (H)	<21	<3.9 (S)	<190 (S)	<190 (S)	<35
alpha-Chlordane, ug/Kg	58 (S)	95 (H)	32	5.3 (S)	370 (S)	190 (S)	440
beta-BHC, ug/Kg	<35 (S)	<77 (H)	<21	<3.9 (S)	<190 (S)	<190 (S)	<35
delta-BHC, ug/Kg	<35 (S)	<77 (H)	<21	<3.9 (S)	<190 (S)	<190 (S)	<35
gamma-BHC, ug/Kg	<35 (S)	<77 (H)	<21	<3.9 (S)	<190 (S)	<190 (S)	<35
gamma-Chlordane, ug/Kg	65 (S)	99 (H)	38	6.3 (S)	410 (S)	220 (S)	450

H – Holding time exceeded. Results are biased low.
S – Low surrogate recovery. Results are biased low.

H:\LTSUSERS\1113\RILEY\PS1531\LENL\SBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER	SAMPLE PSFSB10B	DUPLICATE PSFSB10C	PSFSB11A	PSFSB11B	PSFSB12A	PSFSB12B	SAMPLE PSFSB13A	DUPLICATE PSFSB13C
Sample Depth	(3.5-4.5')	(3.5-4.5')	(2-2.5')	(4-4.5')	(2-2.5')	(4-4.5')	(1.5-2.5')	(1.5-2.5')
Date Collected	4-4-92	4-4-92	4-7-92	4-7-92	4-8-92	4-8-92	4-6-92	4-6-92
PESTICIDES/PCBs:								
4,4'-DDD, ug/Kg	<8.5	25	<7.6 (S)	<67 (H)	430 (H)	<69	<8.8	<42
4,4'-DDE, ug/Kg	36	52	26 (S)	110 (H)	190 (H)	170	52	150
4,4'-DDT, ug/Kg	57	83	32 (S)	150 (H)	150 (H)	100	49	190
Aldrin, ug/Kg	<4.3	<8.2	<3.8 (S)	<34 (H)	<20 (H)	<34	<4.4	<21
Aroclor-1016, ug/Kg	<85	<160	<76 (S)	<670 (H)	<390 (H)	<690	<88	<420
Aroclor-1221, ug/Kg	<85	<160	<76 (S)	<670 (H)	<390 (H)	<690	<88	<420
Aroclor-1232, ug/Kg	<170	<320	<150 (S)	<1300 (H)	<780 (H)	<1400	<180	<840
Aroclor-1242, ug/Kg	<85	<160	<76 (S)	<670 (H)	<390 (H)	<690	<88	<420
Aroclor-1248, ug/Kg	<85	<160	<76 (S)	<670 (H)	<390 (H)	<690	<88	<420
Aroclor-1254, ug/Kg	<85	<160	<76 (S)	<670 (H)	<390 (H)	<690	<88	<420
Aroclor-1260, ug/Kg	<85	<160	<76 (S)	<670 (H)	<390 (H)	<690	<88	<420
Dieldrin, ug/Kg	<8.5	<16	<7.6 (S)	<67 (H)	<39 (H)	<69	<8.8	<42
Endosulfan I, ug/Kg	<4.3	<8.2	<3.8 (S)	<34 (H)	<20 (H)	<34	<4.4	<21
Endosulfan II, ug/Kg	<8.5	<16	<7.6 (S)	<67 (H)	<39 (H)	<69	<8.8	<42
Endosulfan sulfate, ug/Kg	<8.5	<16	<7.6 (S)	<67 (H)	<39 (H)	<69	<8.8	<42
Endrin, ug/Kg	<8.5	<16	<7.6 (S)	<67 (H)	<39 (H)	<69	<8.8	<42
Endrin aldehyde, ug/Kg	<8.5	<16	<7.6 (S)	<67 (H)	<39 (H)	<69	<8.8	<42
Heptachlor, ug/Kg	<4.3	<8.2	4.7 (S)	<34 (H)	<20 (H)	<34	<4.4	<21
Heptachlor epoxide, ug/Kg	<4.3	<8.2	<3.8 (S)	<34 (H)	<20 (H)	<34	<4.4	<21
Methoxychlor, ug/Kg	<43	<82	80 (S)	390 (H)	<200 (H)	<340	<44	<210
Toxaphene, ug/Kg	<430	<820	<380 (S)	<3400 (H)	<2000 (H)	<3400	<440	<2100
alpha-BHC, ug/Kg	<4.3	<8.2	<3.8 (S)	<34 (H)	<20 (H)	<34	<4.4	<21
alpha-Chlordane, ug/Kg	62	75	57 (S)	210 (H)	370 (H)	790	52	180
beta-BHC, ug/Kg	<4.3	<8.2	<3.8 (S)	<34 (H)	<20 (H)	<34	<4.4	<21
delta-BHC, ug/Kg	<4.3	<8.2	<3.8 (S)	<34 (H)	<20 (H)	<34	<4.4	<21
gamma-BHC, ug/Kg	<4.3	<8.2	<3.8 (S)	<34 (H)	<20 (H)	<34	<4.4	<21
gamma-Chlordane, ug/Kg	60	73	65 (S)	220 (H)	390 (H)	910	44	160

H - Holding time exceeded. Results are biased low.
S - Low surrogate recovery. Results are biased low.

H:\LTSUSERS\1113\RILEY\PS1531\LENL\SBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB13B (4-4.5') 4-6-92	PSFSB14A (2-2.5') 4-4-92	PSFSB14B (4-4.5') 4-4-92	PSFSB15A (2-2.5') 4-4-92	PSFSB15B (4-4.5') 4-4-92	PSFSB16A (1.5-2.5') 4-4-92	PSFSB16B (3.5-4.5') 4-4-92
PESTICIDES/PCBs:							
4,4'-DDD, ug/Kg	<9.5	<9.2	<8.2	<7.5	<8.2	<37	<8.1
4,4'-DDE, ug/Kg	<9.5	53	<8.2	<7.5	<8.2	<37	<8.1
4,4'-DDT, ug/Kg	12	130	12	<7.5	<8.2	310	25
Aldrin, ug/Kg	<4.8	<4.6	<4.1	<3.8	<4.1	<19	<4.1
Aroclor-1016, ug/Kg	<95	<92	<82	<75	<82	<370	<81
Aroclor-1221, ug/Kg	<95	<92	<82	<75	<82	<370	<81
Aroclor-1232, ug/Kg	<190	<180	<160	<150	<160	<740	<160
Aroclor-1242, ug/Kg	<95	<92	<82	<75	<82	<370	<81
Aroclor-1248, ug/Kg	<95	<92	<82	<75	<82	<370	<81
Aroclor-1254, ug/Kg	<95	<92	<82	<75	<82	<370	<81
Aroclor-1260, ug/Kg	<95	<92	<82	<75	<82	<370	<81
Dieldrin, ug/Kg	<9.5	<9.2	<8.2	<7.5	<8.2	<37	<8.1
Endosulfan I, ug/Kg	<4.8	<4.6	<4.1	<3.8	<4.1	<19	<4.1
Endosulfan II, ug/Kg	<9.5	<9.2	<8.2	<7.5	<8.2	<37	<8.1
Endosulfan sulfate, ug/Kg	<9.5	<9.2	<8.2	<7.5	<8.2	<37	<8.1
Endrin, ug/Kg	<9.5	<9.2	<8.2	<7.5	<8.2	<37	<8.1
Endrin aldehyde, ug/Kg	<9.5	<9.2	<8.2	<7.5	<8.2	<37	<8.1
Heptachlor, ug/Kg	<4.8	<4.6	<4.1	<3.8	<4.1	<19	<4.1
Heptachlor epoxide, ug/Kg	<4.8	<4.6	<4.1	<3.8	<4.1	<19	<4.1
Methoxychlor, ug/Kg	<48	<46	<41	<38	<41	<190	<41
Toxaphene, ug/Kg	<480	<460	<410	<380	<410	<1900	<410
alpha-BHC, ug/Kg	<4.8	<4.6	<4.1	<3.8	<4.1	<19	<4.1
alpha-Chlordane, ug/Kg	11	69	4.7	4.7	<4.1	68	6.1
beta-BHC, ug/Kg	<4.8	<4.6	<4.1	<3.8	<4.1	<19	<4.1
delta-BHC, ug/Kg	<4.8	<4.6	<4.1	<3.8	<4.1	<19	<4.1
gamma-BHC, ug/Kg	<4.8	<4.6	<4.1	<3.8	<4.1	<19	<4.1
gamma-Chlordane, ug/Kg	9.4	66	5.5	4.0	<4.1	70	7.0

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB17A (1.5-2.5') 4-6-92	DUPLICATE PSFSB17C (1.5-2.5') 4-6-92	PSFSB17B (4-4.5') 4-6-92	PSFSB18A (2-2.5') 4-5-92	PSFSB18B (4-4.5') 4-5-92	PSFSB19A (2-2.5') 4-4-92	PSFSB19B (4-4.5') 4-4-92	PSFSB20A (2-2.5') 4-8-92	PSFSB20B (4-4.5') 4-8-92
PESTICIDES/PCBs:									
4,4'-DDD, ug/Kg	<41	<40	<7.4	<7.7	<7.8	<8.1	<7.9	<7.8 (S)	<7.8 (H)
4,4'-DDE, ug/Kg	370	750	<7.4	110	22	26	22	<7.8 (S)	11 (H)
4,4'-DDT, ug/Kg	610	1300	25	170	82	50	36	<7.8 (S)	25 (H)
Aldrin, ug/Kg	<20	<20	<3.7	<3.8	<3.9	<4.1	<4.0	<3.9 (S)	<3.9 (H)
Aroclor-1016, ug/Kg	<410	<400	<74	<77	<78	<81	<79	<78 (S)	<78 (H)
Aroclor-1221, ug/Kg	<410	<400	<74	<77	<78	<81	<79	<78 (S)	<78 (H)
Aroclor-1232, ug/Kg	<810	<790	<150	<150	<160	<160	<160	<160 (S)	<160 (H)
Aroclor-1242, ug/Kg	<410	<400	<74	<77	<78	<81	<79	<78 (S)	<78 (H)
Aroclor-1248, ug/Kg	<410	<400	<74	<77	<78	<81	<79	<78 (S)	<78 (H)
Aroclor-1254, ug/Kg	<410	<400	<74	<77	<78	<81	<79	<78 (S)	<78 (H)
Aroclor-1260, ug/Kg	<410	<400	<74	<77	<78	<81	<79	<78 (S)	<78 (H)
Dieldrin, ug/Kg	<41	<40	<7.4	<7.7	<7.8	<8.1	<7.9	<7.8 (S)	<7.8 (H)
Endosulfan I, ug/Kg	<20	<20	<3.7	<3.8	<3.9	<4.1	<4.0	<3.9 (S)	<3.9 (H)
Endosulfan II, ug/Kg	<41	<40	<7.4	<7.7	<7.8	<8.1	<7.9	<7.8 (S)	<7.8 (H)
Endosulfan sulfate, ug/Kg	<41	<40	<7.4	<7.7	<7.8	<8.1	<7.9	<7.8 (S)	<7.8 (H)
Endrin, ug/Kg	<41	<40	<7.4	<7.7	<7.8	<8.1	<7.9	<7.8 (S)	<7.8 (H)
Endrin aldehyde, ug/Kg	<41	<40	<7.4	<7.7	<7.8	<8.1	<7.9	<7.8 (S)	<7.8 (H)
Heptachlor, ug/Kg	<20	<20	<3.7	<3.8	<3.9	<4.1	<4.0	<3.9 (S)	<3.9 (H)
Heptachlor epoxide, ug/Kg	<20	<20	<3.7	<3.8	<3.9	<4.1	<4.0	<3.9 (S)	<3.9 (H)
Methoxychlor, ug/Kg	<200	<200	<37	<38	<39	<41	<40	<39 (S)	<39 (H)
Toxaphene, ug/Kg	<2000	<2000	<370	<380	<390	<410	<400	<390 (S)	<390 (H)
alpha-BHC, ug/Kg	<20	<20	<3.7	<3.8	<3.9	<4.1	<4.0	<3.9 (S)	<3.9 (H)
alpha-Chlordane, ug/Kg	280	470	7.9	42	18	16	13	5.6 (S)	14 (H)
beta-BHC, ug/Kg	<20	<20	<3.7	<3.8	<3.9	<4.1	<4.0	<3.9 (S)	<3.9 (H)
delta-BHC, ug/Kg	<20	<20	<3.7	<3.8	<3.9	<4.1	<4.0	<3.9 (S)	<3.9 (H)
gamma-BHC, ug/Kg	<20	<20	<3.7	<3.8	<3.9	<4.1	<4.0	<3.9 (S)	<3.9 (H)
gamma-Chlordane, ug/Kg	280	470	8.2	36	18	15	12	5.4 (S)	12 (H)

H – Holding time exceeded. Results are biased low.
S – Low surrogate recovery. Results are biased low.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PILOT HOLE PSF92SB01A (5') 1-24-92	 PSF92SB01B (38') 1-24-92	PSFSB01A (2-2.5') 4-8-92	PSFSB01B (4-4.5') 4-8-92	PSFSB02A (2-2.5') 4-7-92	PSFSB02B (4-4.5') 4-7-92	PSFSB03A (2-2.5') 4-5-92
SEMI-VOLATILE ORGANICS:							
1,2,4-Trichlorobenzene, ug/Kg	<270	<280	<270	<260	<270	<270	<270
1,2-Dichlorobenzene, ug/Kg	<190	<200	<190	<180	<190	<200	<200
1,3-Dichlorobenzene, ug/Kg	<270	<280	<270	<260	<270	<270	<270
1,4-Dichlorobenzene, ug/Kg	<230	<240	<230	<220	<230	<230	<230
2,4,5-Trichlorophenol, ug/Kg	<340	<360	<340	<330	<340	<350	<350
2,4,6-Trichlorophenol, ug/Kg	<300	<320	<300	<300	<300	<310	<310
2,4-Dichlorophenol, ug/Kg	<230	<240	<230	<220	<230	<230	<230
2,4-Dimethylphenol, ug/Kg	<380	<400	<380	<370	<380	<390	<390
2,4-Dinitrophenol, ug/Kg	<1600	<1700	<1600	<1600	<1600	<1700	<1700
2,4-Dinitrotoluene, ug/Kg	<270	<280	<270	<260	<270	<270	<270
2,6-Dinitrotoluene, ug/Kg	<270	<280	<270	<260	<270	<270	<270
2-Chloronaphthalene, ug/Kg	<230	<240	<230	<220	<230	<230	<230
2-Chlorophenol, ug/Kg	<150	<160	<150	<150	<150	<160	<160
2-Methylnaphthalene, ug/Kg	<150	<160	<150	<150	<150	<160	<160
2-Methylphenol, ug/Kg	<150	<160	<150	<150	<150	<160	<160
2-Nitroaniline, ug/Kg	<190	<200	<190	<180	<190	<200	<200
2-Nitrophenol, ug/Kg	<380	<400	<380	<370	<380	<390	<390
3,3'-Dichlorobenzidine, ug/Kg	<760	<800	<760 (I)	<740	<760 (I)	<780 (I)	<780
3-Nitroaniline, ug/Kg	<490	<520	<490	<480	<490	<510	<510
4,6-Dinitro-2-methylphenol, ug/Kg	<950	<1000	<950 (I)	<920	<950	<980	<980
4-Bromophenyl phenyl ether, ug/Kg	<230	<240	<230 (I)	<220	<230	<230	<230
4-Chloro-3-methylphenol, ug/Kg	<270	<280	<270	<260	<270	<270	<270
4-Chloroaniline, ug/Kg	<150	<160	<150	<150	<150	<160	<160
4-Chlorophenyl phenyl ether, ug/Kg	<230	<240	<230	<220	<230	<230	<230
4-Methylphenol, ug/Kg	<270	<280	<270	<260	<270	<270	<270
4-Nitroaniline, ug/Kg	<610	<540	<610	<590	<610	<620	<620
4-Nitrophenol, ug/Kg	<460	<480	<460	<440	<460	<470	<470
Acenaphthene, ug/Kg	<190	<200	<190	<180	<190	<200	<200
Acenaphthylene, ug/Kg	<190	<200	<190	<180	<190	<200	<200
Anthracene, ug/Kg	<190	<200	<190 (I)	<180	<190	<200	<200

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB03B (4-4.5') 4-5-92	DUPLICATE PSFSB03C (4-4.5') 4-5-92	PSFSB04A (2-2.5') 4-7-92	PSFSB04B (4-4.5') 4-7-92	PSFSB05A (2-2.5') 4-5-92	PSFSB05B (3.5-4.5') 4-5-92	PSFSB06A (2-2.5') 4-7-92	PSFSB06B (4-4.5') 4-7-92
SEMI-VOLATILE ORGANICS:								
1,2,4-Trichlorobenzene, ug/Kg	<260	<260	<270	<270	<270	<260	<260	<240
1,2-Dichlorobenzene, ug/Kg	<180	<180	<200	<200	<190	<180	<180	<180
1,3-Dichlorobenzene, ug/Kg	<260	<260	<270	<270	<270	<260	<260	<240
1,4-Dichlorobenzene, ug/Kg	<220	<220	<230	<230	<230	<220	<220	<210
2,4,5-Trichlorophenol, ug/Kg	<330	<330	<350	<350	<340	<330	<330	<320
2,4,6-Trichlorophenol, ug/Kg	<300	330	<310	<310	<300	<300	<300	<280
2,4-Dichlorophenol, ug/Kg	<220	2300	<230	<230	<230	<220	<220	<210
2,4-Dimethylphenol, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<350
2,4-Dinitrophenol, ug/Kg	<1600	<1600	<1700	<1700	<1600	<1600	<1600	<1500
2,4-Dinitrotoluene, ug/Kg	<260	<260	<270	<270	<270	<260	<260	<240
2,6-Dinitrotoluene, ug/Kg	<260	<260	<270	<270	<270	<260	<260	<240
2-Chloronaphthalene, ug/Kg	<220	<220	<230	<230	<230	<220	<220	<210
2-Chlorophenol, ug/Kg	<150	<150	<160	<160	<150	<150	<150	<140
2-Methylnaphthalene, ug/Kg	<150	<150	<160	<160	<150	<150	<150	<140
2-Methylphenol, ug/Kg	<150	<150	<160	<160	<150	<150	<150	<140
2-Nitroaniline, ug/Kg	<180	<180	<200	<200	<190	<180	<180	<180
2-Nitrophenol, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<350
3,3'-Dichlorobenzidine, ug/Kg	<740	<740	<780	<780	<760	<740	<740	<700
3-Nitroaniline, ug/Kg	<480	<480	<510	<510	<490	<480	<480	<460
4,6-Dinitro-2-methylphenol, ug/Kg	<920	<920	<980	<980	<950	<920	<920	<880
4-Bromophenyl phenyl ether, ug/Kg	<220	<220	<230	<230	<230	<220	<220	<210
4-Chloro-3-methylphenol, ug/Kg	<260	<260	<270	<270	<270	<260	<260	<240
4-Chloroaniline, ug/Kg	<150	<150	<160	<160	<150	<150	<150	<140
4-Chlorophenyl phenyl ether, ug/Kg	<220	<220	<230	<230	<230	<220	<220	<210
4-Methylphenol, ug/Kg	<260	<260	<270	<270	<270	<260	<260	<240
4-Nitroaniline, ug/Kg	<590	<590	<620	<620	<610	<590	<590	<560
4-Nitrophenol, ug/Kg	<440	<440	<470	<470	<460	<440	<440	<420
Acenaphthene, ug/Kg	<180	<180	<200	<200	<190	<180	<180	<180
Acenaphthylene, ug/Kg	<180	<180	<200	<200	<190	<180	<180	<180
Anthracene, ug/Kg	<180	<180	<200	<200	<190	<180	<180	<180

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB7A (2.5-3') 4-7-92	PSFSB7B (4-4.5') 4-7-92	PSFSB8A (2-2.5') 4-7-92	PSFSB8B (4-4.5') 4-7-92	PSFSB9A (1.5-2.5') 4-7-92	PSFSB9B (4-4.5') 4-7-92	PSFSB10A (1.5-2.5') 4-4-92
SEMI-VOLATILE ORGANICS:							
1,2,4-Trichlorobenzene, ug/Kg	<270	<270	<290	<270	<270	<260	<550
1,2-Dichlorobenzene, ug/Kg	<200	<190	<210	<200	<190	<180	<390
1,3-Dichlorobenzene, ug/Kg	<270	<270	<290	<270	<270	<260	<550
1,4-Dichlorobenzene, ug/Kg	<230	<230	<250	<230	<230	<220	<470
2,4,5-Trichlorophenol, ug/Kg	<350	<340	<380	<350	<340	<330	<700
2,4,6-Trichlorophenol, ug/Kg	<310	<300	<340	<310	<300	<300	<620
2,4-Dichlorophenol, ug/Kg	<230	<230	<250	<230	<230	<220	<470
2,4-Dimethylphenol, ug/Kg	<390	<380	<420	<390	<380	<370	<780
2,4-Dinitrophenol, ug/Kg	<1700	<1600	<1800	<1700	<1600	<1600	<3400
2,4-Dinitrotoluene, ug/Kg	<270	<270	<290	<270	<270	<260	<550
2,6-Dinitrotoluene, ug/Kg	<270	<270	<290	<270	<270	<260	<550
2-Chloronaphthalene, ug/Kg	<230	<230	<250	<230	<230	<220	<470
2-Chlorophenol, ug/Kg	<160	<150	<170	<160	<150	<150	<310
2-Methylnaphthalene, ug/Kg	<160	<150	<170	<160	<150	<150	<310
2-Methylphenol, ug/Kg	<160	<150	<170	<160	<150	<150	<310
2-Nitroaniline, ug/Kg	<200	<190	<210	<200	<190	<180	<390
2-Nitrophenol, ug/Kg	<390	<380	<420	<390	<380	<370	<780
3,3'-Dichlorobenzidine, ug/Kg	<780	<760 (I)	<840 (I)	<780	<760	<740	<1600
3-Nitroaniline, ug/Kg	<510	<490	<550	<510	<490	<480	<1000
4,6-Dinitro-2-methylphenol, ug/Kg	<980	<950	<1000	<980	<950	<920	<2000
4-Bromophenyl phenyl ether, ug/Kg	<230	<230	<250	<230	<230	<220	<470
4-Chloro-3-methylphenol, ug/Kg	<270	<270	<290	<270	<270	<260	<550
4-Chloroaniline, ug/Kg	<160	<150	<170	<160	<150	<150	<310
4-Chlorophenyl phenyl ether, ug/Kg	<230	<230	<250	<230	<230	<220	<470
4-Methylphenol, ug/Kg	<270	<270	<290	<270	<270	<260	<550
4-Nitroaniline, ug/Kg	<620	<610	<670	<620	<610	<590	<1200
4-Nitrophenol, ug/Kg	<470	<160	<500	<470	<460	<440	<940
Acenaphthene, ug/Kg	<200	230	<210	<200	<190	<180	<390
Acenaphthylene, ug/Kg	<200	<90	<210	<200	<190	<180	<390
Anthracene, ug/Kg	<200	760	<210	<200	300	<180	<390

H:\L‾ 'SERS\1113\RILEY\PS1531\LENL\SBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB10B (3.5-4.5') 4-4-92	DUPLICATE PSFSB10C (3.5-4.5') 4-4-92	PSFSB11A (2-2.5') 4-7-92	PSFSB11B (4-4.5') 4-7-92	PSFSB12A (2-2.5') 4-8-92	PSFSB12B (4-4.5') 4-8-92	SAMPLE PSFSB13A (1.5-2.5') 4-6-92	DUPLICATE PSFSB13C (1.5-2.5') 4-6-92
SEMI-VOLATILE ORGANICS:								
1,2,4-Trichlorobenzene, ug/Kg	<290	<290	<260	<260	<270	<270	<300	<290
1,2-Dichlorobenzene, ug/Kg	<210	<200	<180	<180	<200	<190	<220	<210
1,3-Dichlorobenzene, ug/Kg	<290	<290	<260	<260	<270	<270	<300	<290
1,4-Dichlorobenzene, ug/Kg	<250	<250	<220	<220	<230	<230	<260	<250
2,4,5-Trichlorophenol, ug/Kg	<380	<270	<330	<330	<350	<340	<390	<380
2,4,6-Trichlorophenol, ug/Kg	<340	<330	<300	<300	<310	<300	<340	<340
2,4-Dichlorophenol, ug/Kg	<250	<250	<220	<220	<230	<230	<260	<250
2,4-Dimethylphenol, ug/Kg	<420	<410	<370	<370	<390	<380	<430	<420
2,4-Dinitrophenol, ug/Kg	<1800	<1800	<1600	<1600	<1700	<1600	<1800	<1800
2,4-Dinitrotoluene, ug/Kg	<290	<290	<260	<260	<270	<270	<300	<290
2,6-Dinitrotoluene, ug/Kg	<290	<290	<260	<260	<270	<270	<300	<290
2-Chloronaphthalene, ug/Kg	<250	<250	<220	<220	<230	<230	<260	<250
2-Chlorophenol, ug/Kg	<170	<160	<150	<150	<160	<150	<170	<170
2-Methylnaphthalene, ug/Kg	170	200	<150	<150	<160	<150	<170	<170
2-Methylphenol, ug/Kg	<170	<160	<150	<150	<160	<150	<170	<170
2-Nitroaniline, ug/Kg	<210	<200	<180	<180	<200	<190	<220	<210
2-Nitrophenol, ug/Kg	<420	<410	<370	<370	<390	<380	<430	<420
3,3'-Dichlorobenzidine, ug/Kg	<840	<820	<740	<740	<780	<760	<860	<840
3-Nitroaniline, ug/Kg	<550	<530	<480	<480	<210	<490	<560	<550
4,6-Dinitro-2-methylphenol, ug/Kg	<1000	<1000	<920	<920	<980	<950	<1100	<1000
4-Bromophenyl phenyl ether, ug/Kg	<250	<250	<220	<220	<230	<230	<260	<250
4-Chloro-3-methylphenol, ug/Kg	<290	<290	<260	<260	<270	<270	<300	<290
4-Chloroaniline, ug/Kg	<170	<160	<150	<150	<160	<150	<170	<170
4-Chlorophenyl phenyl ether, ug/Kg	<250	<250	<220	<220	<230	<230	<260	<280
4-Methylphenol, ug/Kg	<290	<290	<260	<260	<270	<270	<300	<290
4-Nitroaniline, ug/Kg	<370	<660	<590	<590	<620	<610	<690	<670
4-Nitrophenol, ug/Kg	<500	<490	<440	<440	<470	<460	<520	<500
Acenaphthene, ug/Kg	<210	<200	<180	<180	<200	<190	<220	<210
Acenaphthylene, ug/Kg	<210	<200	<180	<180	<200	<190	<220	<210
Anthracene, ug/Kg	<210	<200	<180	<180	<200	250	<220	<210

H:\LTSUSERS\1113\RILEY\PS1531\LENL\SBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB13B (4-4.5') 4-6-92	PSFSB14A (2-2.5') 4-4-92	PSFSB14B (4-4.5') 4-4-92	PSFSB15A (2-2.5') 4-4-92	PSFSB15B (4-4.5') 4-4-92	PSFSB16A (1.5-2.5') 4-4-92	PSFSB16B (3.5-4.5') 4-4-92
SEMI-VOLATILE ORGANICS:							
1,2,4-Trichlorobenzene, ug/Kg	<330	<320	<290	<260	<270	<260	<280
1,2-Dichlorobenzene, ug/Kg	<240	<230	<200	<180	<200	<180	<200
1,3-Dichlorobenzene, ug/Kg	<330	<320	<290	<260	<270	<260	<280
1,4-Dichlorobenzene, ug/Kg	<280	<280	<250	<220	<230	<220	<240
2,4,5-Trichlorophenol, ug/Kg	<420	<410	<370	<330	<350	<330	<360
2,4,6-Trichlorophenol, ug/Kg	<380	<370	<330	<300	<310	<300	<320
2,4-Dichlorophenol, ug/Kg	<280	<280	<250	<220	<230	<220	<240
2,4-Dimethylphenol, ug/Kg	<470	<460	<410	<370	<390	<370	<400
2,4-Dinitrophenol, ug/Kg	<2000	<2000	<1800	<1600	<1700	<1600	<1700
2,4-Dinitrotoluene, ug/Kg	<330	<320	<290	<260	<270	<260	<280
2,6-Dinitrotoluene, ug/Kg	<330	<320	<290	<260	<270	<260	<280
2-Chloronaphthalene, ug/Kg	<280	<280	<250	<220	<230	<220	<240
2-Chlorophenol, ug/Kg	<190	<180	<160	<150	<160	<150	<160
2-Methylnaphthalene, ug/Kg	<190	<180	<160	<150	<160	<150	<160
2-Methylphenol, ug/Kg	<190	<180	<160	<150	<160	<150	<160
2-Nitroaniline, ug/Kg	<240	<230	<200	<180	<200	<180	<200
2-Nitrophenol, ug/Kg	<470	<460	<410	<370	<390	<370	<400
3,3'-Dichlorobenzidine, ug/Kg	<940	<920	<820	<740	<780	<740	<800 (I)
3-Nitroaniline, ug/Kg	<610	<600	<530	<480	<510	<480	<520
4,6-Dinitro-2-methylphenol, ug/Kg	<1200	<1200	<1000	<920	<980	<920	<1000
4-Bromophenyl phenyl ether, ug/Kg	<280	<280	<250	<220	<230	<220	<240
4-Chloro-3-methylphenol, ug/Kg	<330	<320	<290	<260	<270	<260	<280
4-Chloroaniline, ug/Kg	<190	<180	<160	<150	<160	<150	<160
4-Chlorophenyl phenyl ether, ug/Kg	<280	<280	<250	<220	<230	<220	<240
4-Methylphenol, ug/Kg	<330	<320	<290	<260	<270	<260	<280
4-Nitroaniline, ug/Kg	<750	<740	<660	<590	<620	<590	<640
4-Nitrophenol, ug/Kg	<560	<550	<490	<440	<470	<440	<480
Acenaphthene, ug/Kg	<240	<230	<200	<180	<200	<180	<200
Acenaphthylene, ug/Kg	<240	<230	<200	<180	<200	<180	<200
Anthracene, ug/Kg	<240	410	<200	<180	<200	<180	<200

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB17A (1.5-2.5') 4-6-92	DUPLICATE PSFSB17C (1.5-2.5') 4-6-92	PSFSB17B (4-4.5') 4-6-92	PSFSB18A (2-2.5') 4-5-92	PSFSB18B (4-4.5') 4-5-92	PSFSB19A (2-2.5') 4-4-92	PSFSB19B (4-4.5') 4-4-92	PSFSB20A (2-2.5') 4-8-92	PSFSB20B (4-4.5') 4-8-92
SEMI-VOLATILE ORGANICS:									
1,2,4-Trichlorobenzene, ug/Kg	<280	<270	<260	<280	<270	<280	<270	<270	<270
1,2-Dichlorobenzene, ug/Kg	<200	<200	<180	<200	<200	<200	<200	<200	<200
1,3-Dichlorobenzene, ug/Kg	<280	<270	<260	<280	<270	<280	<270	<270	<270
1,4-Dichlorobenzene, ug/Kg	<240	<230	<220	<240	<230	<240	<230	<230	<230
2,4,5-Trichlorophenol, ug/Kg	<360	<350	<330	<360	<350	<360	<350	<350	<350
2,4,6-Trichlorophenol, ug/Kg	<320	<310	<300	<320	<310	<320	<310	<310	<310
2,4-Dichlorophenol, ug/Kg	<240	<230	<220	<240	<230	<240	<230	<230	<230
2,4-Dimethylphenol, ug/Kg	<400	<390	<370	<400	<390	<400	<390	<390	<390
2,4-Dinitrophenol, ug/Kg	<1700	<1700	<1600	<1700	<1700	<1700	<1700	<1700	<1700
2,4-Dinitrotoluene, ug/Kg	<280	<270	<260	<280	<270	<280	<270	<270	<270
2,6-Dinitrotoluene, ug/Kg	<280	<270	<260	<280	<270	<280	<270	<270	<270
2-Chloronaphthalene, ug/Kg	<240	<230	<220	<240	<230	<240	<230	<230	<230
2-Chlorophenol, ug/Kg	<160	<160	<150	<160	<160	<160	<160	<160	<160
2-Methylnaphthalene, ug/Kg	<160	<160	<150	<160	<160	<160	<160	<160	<160
2-Methylphenol, ug/Kg	<160	<160	<150	<160	<160	<160	<160	<160	<160
2-Nitroaniline, ug/Kg	<200	<200	<180	<200	<200	<200	<200	<200	<200
2-Nitrophenol, ug/Kg	<400	<390	<370	<400	<390	<400	<390	<390	<390
3,3'-Dichlorobenzidine, ug/Kg	<800	<780	<740	<800	<780	<800	<780	<780	<780
3-Nitroaniline, ug/Kg	<520	<510	<480	<520	<510	<520	<510	<510	<510
4,6-Dinitro-2-methylphenol, ug/Kg	<1000	<980	<920	<1000	<980	<1000	<980	<980	<980
4-Bromophenyl phenyl ether, ug/Kg	<240	<230	<220	<240	<230	<240	<230	<230	<230
4-Chloro-3-methylphenol, ug/Kg	<280	<270	<260	<280	<270	<280	<270	<270	<270
4-Chloroaniline, ug/Kg	<160	<160	<150	<160	<160	<160	<160	<160	<160
4-Chlorophenyl phenyl ether, ug/Kg	<240	<230	<220	<240	<230	<240	<230	<230	<230
4-Methylphenol, ug/Kg	<280	<270	<260	<280	<270	<280	<270	<270	<270
4-Nitroaniline, ug/Kg	<640	<620	<590	<640	<620	<640	<620	<620	<620
4-Nitrophenol, ug/Kg	<480	<470	<440	<480	<470	<480	<470	<470	<470
Acenaphthene, ug/Kg	<200	<200	<180	<200	<200	<200	<200	<200	<200
Acenaphthylene, ug/Kg	<200	<200	<180	<200	<200	<200	<200	<200	<200
Anthracene, ug/Kg	<200	<200	<180	<200	<200	<200	<200	<200	<200

H:\LTSUSERS\1113\RILEY\PS1531\LENL\SBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PILOT HOLE PSF92SB01A (5') 1-24-92	PILOT HOLE PSF92SB01B (38') 1-24-92	PSFSB01A (2-2.5') 4-8-92	PSFSB01B (4-4.5') 4-8-92	PSFSB02A (2-2.5') 4-7-92	PSFSB02B (4-4.5') 4-7-92	PSFSB03A (2-2.5') 4-5-92
SEMI-VOLATILE ORGANICS (CONT'D):							
Benzo[a]anthracene, ug/Kg	<110	<120	<110 (I)	<110	<110 (I)	<120 (I)	<120
Benzo[a]pyrene, ug/Kg	<270	<280	<270	<260	<270 (I)	<270 (I)	<270
Benzo[b]fluoranthene, ug/Kg	<380	<400	<380	<370	<380 (I)	<390 (I)	<390
Benzo[ghi]perylene, ug/Kg	<380	<400	<380	<370	<380 (I)	<390 (I)	<390
Benzo[k]fluoranthene, ug/Kg	<380	<400	<380	<370	<380 (I)	<390 (I)	<390
Benzoic acid, ug/Kg	<1000	<1100	<1000	<1000	<1000	<1000	<1100
Benzyl alcohol, ug/Kg	<230	<240	<230	<220	<230	<230	<230
Butyl benzyl phthalate, ug/Kg	<380	<400	<380 (I)	<370	<380 (I)	<390 (I)	<390
Chrysene, ug/Kg	<110	<120	<110 (I)	<110	<110 (I)	<120 (I)	<120
Di-n-butylphthalate, ug/Kg	<380	<400	<380 (I)	<370	<380	<390	<390
Di-n-octylphthalate, ug/Kg	<380	<400	<380	<370	<380 (I)	<390 (I)	<390
Dibenz[a,h]anthracene, ug/Kg	<380	<400	<380	<370	<380 (I)	<390 (I)	<390
Dibenzofuran, ug/Kg	<110	<120	<110	<110	<110	<120	<120
Diethylphthalate, ug/Kg	<380	<400	<380	<370	<380	<390	<390
Dimethylphthalate, ug/Kg	<380	<400	<380	<370	<380	<390	<390
Fluoranthene, ug/Kg	<150	<160	<150 (I)	<150	<150	<160	<160
Fluorene, ug/Kg	<270	<280	<270	<260	<270	<270	<270
Hexachlorobenzene, ug/Kg	<230	<240	<230 (I)	<220	<230	<230	<230
Hexachlorobutadiene, ug/Kg	<230	<240	<230	<220	<230	<230	<230
Hexachlorocyclopentadiene, ug/Kg	<380	<400	<380	<370	<380	<390	<390
Hexachloroethane, ug/Kg	<270	<280	<270	<260	<270	<270	<270
Indeno[1,2,3-cd]pyrene, ug/Kg	<380	<400	<380	<370	<380 (I)	<390 (I)	<390
Isophorone, ug/Kg	<270	<280	<270	<260	<270	<270	<270
N-Nitrosodi-n-propylamine, ug/Kg	<230	<240	<230	<220	<230	<230	<230
N-Nitrosodiphenylamine, ug/Kg	<190	<200	<190 (I)	<180	<190	<200	<200
Naphthalene, ug/Kg	<110	<120	<110	<110	<110	<120	<120
Nitrobenzene, ug/Kg	<380	<400	<380	<370	<380	<390	<390
Pentachlorophenol, ug/Kg	<610	<640	<610 (I)	<290	<610	<620	<620

I - Low internal standard response. Result is an estimated quantitation.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB03B (4-4.5') 4-5-92	DUPLICATE PSFSB03C (4-4.5') 4-5-92	PSFSB04A (2-2.5') 4-7-92	PSFSB04B (4-4.5') 4-7-92	PSFSB05A (2-2.5') 4-5-92	PSFSB05B (3.5-4.5') 4-5-92	PSFSB06A (2-2.5') 4-7-92	PSFSB06B (4-4.5') 4-7-92
SEMI-VOLATILE ORGANICS (CONT'D):								
Benzo[a]anthracene, ug/Kg	<110	<110	<120	<120	<110	<110	<110	<100
Benzo[a]pyrene, ug/Kg	<260	<260	<270	<270	<270	<260	<260	<240
Benzo[b]fluoranthene, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<350
Benzo[ghi]perylene, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<340
Benzo[k]fluoranthene, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<350
Benzoic acid, ug/Kg	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<940
Benzyl alcohol, ug/Kg	<220	<220	<230	<230	<230	<220	<220	<210
Butyl benzyl phthalate, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<350
Chrysene, ug/Kg	<110	<110	<120	<120	<110	<110	<110	<100
Di-n-butylphthalate, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<350
Di-n-octylphthalate, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<350
Dibenz[a,h]anthracene, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<350
Dibenzofuran, ug/Kg	<110	<110	<120	<120	<110	<110	<110	<100
Diethylphthalate, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<350
Dimethylphthalate, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<350
Fluoranthene, ug/Kg	<150	<150	<160	<160	<150	<150	<150	<140
Fluorene, ug/Kg	<260	<260	<270	<270	<270	<260	<260	<240
Hexachlorobenzene, ug/Kg	<220	<220	<230	<230	<230	<220	<220	<210
Hexachlorobutadiene, ug/Kg	<220	<220	<230	<230	<230	<220	<220	<210
Hexachlorocyclopentadiene, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<350
Hexachloroethane, ug/Kg	<260	<260	<270	<270	<270	<260	<260	<240
Indeno[1,2,3-cd]pyrene, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<350
Isophorone, ug/Kg	<260	<260	<270	<270	<270	<260	<260	<245
N-Nitrosodi-n-propylamine, ug/Kg	<220	<220	<230	<230	<230	<220	<220	<210
N-Nitrosodiphenylamine, ug/Kg	<180	<180	<200	<200	<190	<180	<180	<180
Naphthalene, ug/Kg	<110	<110	<120	<120	<110	<110	<110	<100
Nitrobenzene, ug/Kg	<370	<370	<390	<390	<380	<370	<370	<350
Pentachlorophenol, ug/Kg	<590	<590	<620	<620	<610	<590	<590	<560

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB7A (2.5-3') 4-7-92	PSFSB7B (4-4.5') 4-7-92	PSFSB8A (2-2.5') 4-7-92	PSFSB8B (4-4.5') 4-7-92	PSFSB9A (1.5-2.5') 4-7-92	PSFSB9B (4-4.5') 4-7-92	PSFSB10A (1.5-2.5') 4-4-92
SEMI-VOLATILE ORGANICS (CONT'D):							
Benzo[a]anthracene, ug/Kg	390	1800 (I)	<130 (I)	<120	570	180	620
Benzo[a]pyrene, ug/Kg	300 (I)	1200 (I)	<290 (I)	<270	340	<260	<550
Benzo[b]fluoranthene, ug/Kg	<390 (I)	1400 (I)	<420 (I)	<390	380	<370	<780
Benzo[ghi]perylene, ug/Kg	<390 (I)	<380 (I)	<420 (I)	<390	<380	<370	<780
Benzo[k]fluoranthene, ug/Kg	<390 (I)	950 (I)	<420 (I)	<390	<380	<370	<780
Benzoic acid, ug/Kg	<1000	<1000	<1100	<1000	<1000	<1000	<2100
Benzyl alcohol, ug/Kg	<230	<230	<250	<230	<230	<220	<470
Butyl benzyl phthalate, ug/Kg	<390	<380 (I)	<420 (I)	<390	<380	<370	<780
Chrysene, ug/Kg	430	1700 (I)	<130 (I)	<120	420	110	620
Di-n-butylphthalate, ug/Kg	<390	<380	<420	<390	<380	<370	<780
Di-n-octylphthalate, ug/Kg	<390 (I)	<380 (I)	<420 (I)	<390	<380	<370	<780
Dibenz[a,h]anthracene, ug/Kg	<390 (I)	<380 (I)	<420 (I)	<390	<380	<370	<780
Dibenzofuran, ug/Kg	<120	<110	<130	<120	<110	<110	<230
Diethylphthalate, ug/Kg	<390	<380	<420	<390	<380	<370	<780
Dimethylphthalate, ug/Kg	<390	<380	<420	<390	<380	<370	<780
Fluoranthene, ug/Kg	740	3400	<170	<160	990	180	1200
Fluorene, ug/Kg	<270	270	<290	<270	<270	<260	<550
Hexachlorobenzene, ug/Kg	<230	<230	<250	<230	<230	<220	<470
Hexachlorobutadiene, ug/Kg	<230	<230	<250	<230	<230	<220	<470
Hexachlorocyclopentadiene, ug/Kg	<390	<380	<420	<390	<380	<370	<780
Hexachloroethane, ug/Kg	<270	<270	<290	<270	<270	<260	<550
Indeno[1,2,3-cd]pyrene, ug/Kg	<390 (I)	<380 (I)	<420 (I)	<390	<380	<370	<780
Isophorone, ug/Kg	<270	<270	<290	<270	<270	<260	<550
N-Nitrosodi-n-propylamine, ug/Kg	<230	<230	<250	<230	<230	<220	<470
N-Nitrosodiphenylamine, ug/Kg	<200	<190	<210	<200	<190	<180	<390
Naphthalene, ug/Kg	<120	<110	<130	<120	<110	<110	<230
Nitrobenzene, ug/Kg	<390	<380	<420	<390	<380	<370	<780
Pentachlorophenol, ug/Kg	<620	<610	<670	<620	<610	<590	<1200

I - Low internal standard response. Result is an estimated quantitation.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB10B (3.5-4.5') 4-4-92	DUPLICATE PSFSB10C (3.5-4.5') 4-4-92	PSFSB11A (2-2.5') 4-7-92	PSFSB11B (4-4.5') 4-7-92	PSFSB12A (2-2.5') 4-8-92	PSFSB12B (4-4.5') 4-8-92	SAMPLE PSFSB13A (1.5-2.5') 4-6-92	DUPLICATE PSFSB13C (1.5-2.5') 4-6-92
SEMI-VOLATILE ORGANICS (CONT'D):								
Benzo[a]anthracene, ug/Kg	500	290	<110	110	430	950 (I2)	<130	170
Benzo[a]pyrene, ug/Kg	550 (I)	<290	<260	<260	270 (I)	680 (I)	<300	<290
Benzo[b]fluoranthene, ug/Kg	460 (I)	<410	<370	<370	<390 (I)	840 (I)	<430	<420
Benzo[ghi]perylene, ug/Kg	<420 (I)	<410	<370	<370	<390 (I)	<380 (IR)	<430	<420
Benzo[k]fluoranthene, ug/Kg	460 (I)	<410	<370	<370	<390 (I)	680 (I)	<430	<420
Benzoic acid, ug/Kg	<1100	<1100	<1000	<1000	<1000	<1000	<1200	<1100
Benzyl alcohol, ug/Kg	<250	<250	<220	<220	<230	<230	<260	<250
Butyl benzyl phthalate, ug/Kg	<420	<410	<370	<370	<390	<380 (I)	<430	<420
Chrysene, ug/Kg	500	330	<110	110	740	1200 (I2)	130	210
Di-n-butylphthalate, ug/Kg	<420	<410	<370	<370	<390	<380	<430	<420
Di-n-octylphthalate, ug/Kg	<420 (I)	<410	<370	<370	<390 (I)	<380 (IR)	<430	<420
Dibenz[a,h]anthracene, ug/Kg	<420 (I)	<410	<370	<370	<390 (I)	<380 (IR)	<430	<420
Dibenzofuran, ug/Kg	<130	<120	<110	<110	<120	<110	<130	130
Diethylphthalate, ug/Kg	<420	<410	<370	<370	700	<380	<430	<420
Dimethylphthalate, ug/Kg	<420	<410	<370	<370	<390	<380	<430	<420
Fluoranthene, ug/Kg	500	330	<150	180	430	1100	<170	250
Fluorene, ug/Kg	<290	<290	<260	<260	<270	<270	<300	<290
Hexachlorobenzene, ug/Kg	<250	<250	<220	<220	<230	<230	<260	<250
Hexachlorobutadiene, ug/Kg	<250	<250	<220	<220	<230	<230	<260	<250
Hexachlorocyclopentadiene, ug/Kg	<420	<410	<370	<370	<390	<380	<430	<420
Hexachloroethane, ug/Kg	<290	<290	<260	<260	<270	<270	<300	<290
Indeno[1,2,3-cd]pyrene, ug/Kg	<420 (I)	<410	<370	<370	<390 (I)	<380 (IR)	<430	<420
Isophorone, ug/Kg	<290	<290	<260	<260	<270	<270	<300	<290
N-Nitrosodi-n-propylamine, ug/Kg	<250	<250	<220	<220	<230	<230	<260	<250
N-Nitrosodiphenylamine, ug/Kg	<210	<200	<180	<180	<200	<190	<220	<210
Naphthalene, ug/Kg	<130	<120	<110	<110	<120	<110	<130	<130
Nitrobenzene, ug/Kg	<420	<410	<370	<370	<390	<380	<430	<420
Pentachlorophenol, ug/Kg	<370	<660	<590	<590	<620	<610	<690	<670

I – Low internal standard response. Result is an estimated quantitation.
I2 – Low internal standard response and high surrogate recovery. Result is biased high.
IR – The internal standard response is less than 10% of the internal standard area. Result is rejected.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB13B (4-4.5') 4-6-92	PSFSB14A (2-2.5') 4-4-92	PSFSB14B (4-4.5') 4-4-92	PSFSB15A (2-2.5') 4-4-92	PSFSB15B (4-4.5') 4-4-92	PSFSB16A (1.5-2.5') 4-4-92	PSFSB16B (3.5-4.5') 4-4-92
SEMI-VOLATILE ORGANICS (CONT'D):							
Benzo[a]anthracene, ug/Kg	<140	1700	330	<110	<120	<110	<120 (I)
Benzo[a]pyrene, ug/Kg	<330	1300 (I)	<290	<260	<270	<260 (I)	<280 (I)
Benzo[b]fluoranthene, ug/Kg	<470	1100 (I)	<410	<370	<390	<370 (I)	<400 (I)
Benzo[ghi]perylene, ug/Kg	<470	<460 (I)	<410	<370	<390	<370 (I)	<400 (I)
Benzo[k]fluoranthene, ug/Kg	<470	1200 (I)	<410	<370	<390	<370 (I)	<400 (I)
Benzoic acid, ug/Kg	<1300	<1200	<1100	<1000	<1000	<1000	<1100
Benzyl alcohol, ug/Kg	<280	<280	<250	<220	<230	<220	<240
Butyl benzyl phthalate, ug/Kg	<470	<460	<410	<370	<390	<370	<400 (I)
Chrysene, ug/Kg	<140	1600	290	<110	<120	<110	<120 (I)
Di-n-butylphthalate, ug/Kg	<470	<460	<410	<370	<390	<370	<400
Di-n-octylphthalate, ug/Kg	<470	<460 (I)	<410	<370	<390	<370 (I)	<400 (I)
Dibenz[a,h]anthracene, ug/Kg	<470	<460 (I)	<410	<370	<390	<370 (I)	<400 (I)
Dibenzofuran, ug/Kg	<140	<140	<120	<110	<120	<110	<120
Diethylphthalate, ug/Kg	<470	<460	<410	<370	<390	<370	<400
Dimethylphthalate, ug/Kg	<470	<460	<410	<370	<390	<370	<400
Fluoranthene, ug/Kg	<190	2700	530	<150	<160	<150	<160
Fluorene, ug/Kg	<330	<320	<290	<260	<270	<260	<280
Hexachlorobenzene, ug/Kg	<280	<280	<250	<220	<230	<220	<240
Hexachlorobutadiene, ug/Kg	<280	<280	<250	<220	<230	<220	<240
Hexachlorocyclopentadiene, ug/Kg	<470	<460	<410	<370	<390	<370	<400
Hexachloroethane, ug/Kg	<330	<320	<290	<260	<270	<260	<280
Indeno[1,2,3-cd]pyrene, ug/Kg	<470	<460 (I)	<410	<370	<390	<370 (I)	<400 (I)
Isophorone, ug/Kg	<330	<320	<290	<260	<270	<260	<280
N-Nitrosodi-n-propylamine, ug/Kg	<280	<280	<250	<220	<230	<220	<240
N-Nitrosodiphenylamine, ug/Kg	<240	<230	<200	<180	<200	<180	<200
Naphthalene, ug/Kg	<140	<140	<120	<110	<120	<110	<120
Nitrobenzene, ug/Kg	<470	<460	<410	<370	<390	<370	<400
Pentachlorophenol, ug/Kg	<750	<740	<660	<590	<620	<590	<640

I - Low internal standard response. Result is an estimated quantitation.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB17A (1.5-2.5') 4-6-92	DUPLICATE PSFSB17C (1.5-2.5') 4-6-92	PSFSB17B (4-4.5') 4-6-92	PSFSB18A (2-2.5') 4-5-92	PSFSB18B (4-4.5') 4-5-92	PSFSB19A (2-2.5') 4-4-92	PSFSB19B (4-4.5') 4-4-92	PSFSB20A (2-2.5') 4-8-92	PSFSB20B (4-4.5') 4-8-92
SEMI-VOLATILE ORGANICS (CONT'D):									
Benzo[a]anthracene, ug/Kg	200	230	<110	160	<120	<120	<120	160	160
Benzo[a]pyrene, ug/Kg	<280 (I)	<270	<260	<280	<270	<280	<270	<270	<270
Benzo[b]fluoranthene, ug/Kg	<400 (I)	<390	<370	<400	<390	<400	<390	<390	<390
Benzo[ghi]perylene, ug/Kg	<400 (I)	<390	<370	<400	<390	<400	<390	<390	<390
Benzo[k]fluoranthene, ug/Kg	<400 (I)	<390	<370	<400	<390	<400	<390	<390	<390
Benzoic acid, ug/Kg	<1100	<1100	<1000	<1100	<1000	<1100	<1000	<1000	<1000
Benzyl alcohol, ug/Kg	<240	<230	<220	<240	<230	<240	<230	<230	<230
Butyl benzyl phthalate, ug/Kg	<400	<390	<370	<400	<390	<400	<390	<390	<390
Chrysene, ug/Kg	200	230	<110	160	<120	120	<120	200	200
Di-n-butylphthalate, ug/Kg	<400	<390	<370	<400	<390	<400	<390	<390	<390
Di-n-octylphthalate, ug/Kg	<400 (I)	<390	<370	<400	<390	<400	<390	<390	<390
Dibenz[a,h]anthracene, ug/Kg	<400 (I)	<390	<370	<400	<390	<400	<390	<390	<390
Dibenzofuran, ug/Kg	<120	<120	<110	<120	<120	<120	<120	<120	<120
Diethylphthalate, ug/Kg	<400	<390	<370	<400	<390	<400	<390	510	430
Dimethylphthalate, ug/Kg	<400	<390	<370	<400	<390	<400	<390	<390	<390
Fluoranthene, ug/Kg	280	310	<150	160	<160	200	<160	310	310
Fluorene, ug/Kg	<280	<270	<260	<280	<270	<280	<270	<270	<270
Hexachlorobenzene, ug/Kg	<240	<230	<220	<240	<230	<240	<230	<230	<230
Hexachlorobutadiene, ug/Kg	<240	<230	<220	<240	<230	<240	<230	<230	<230
Hexachlorocyclopentadiene, ug/Kg	<400	<390	<370	<400	<390	<400	<390	<390	<390
Hexachloroethane, ug/Kg	<280	<270	<260	<280	<270	<280	<270	<270	<270
Indeno[1,2,3-cd]pyrene, ug/Kg	<400 (I)	<390	<370	<400	<390	<400	<390	<390	<390
Isophorone, ug/Kg	<280	<270	<260	<280	<270	<280	<270	<270	<270
N-Nitrosodi-n-propylamine, ug/Kg	<240	<230	<220	<240	<230	<240	<230	<230	<230
N-Nitrosodiphenylamine, ug/Kg	<200	<200	<180	<200	<200	<200	<200	<200	<200
Naphthalene, ug/Kg	<120	<120	<110	<120	<120	<120	<120	<120	<120
Nitrobenzene, ug/Kg	<400	<390	<370	<400	<390	<400	<390	<390	<390
Pentachlorophenol, ug/Kg	<640	<620	<590	<640	<620	<640	<620	<320	<620

I – Low internal standard response. Result is an estimated quantitation.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PILOT HOLE PSF92SB01A (5') 1-24-92	 PSF92SB01B (38') 1-24-92	PSFSB01A (2-2.5') 4-8-92	PSFSB01B (4-4.5') 4-8-92	PSFSB02A (2-2.5') 4-7-92	PSFSB02B (4-4.5') 4-7-92	PSFSB03A (2-2.5') 4-5-92
SEMI-VOLATILE ORGANICS (CONT'D):							
Phenanthrene, ug/Kg	<150	<160	<150 (I)	<150	<150	<160	<160
Phenol, ug/Kg	<190	<200	<190	<180	<190	<200	<200
Pyrene, ug/Kg	<110	<120	<110 (I)	<110	<110 (I)	<120 (I)	<120
bis(2-Chloroethoxy)methane, ug/Kg	<230	<240	<230	<220	<230	<230	<230
bis(2-Chloroethyl)ether, ug/Kg	<230	<240	<230	<220	<230	<230	<230
bis(2-Chloroisopropyl)ether, ug/Kg	<190	<200	<190	<180	<190	<200	<200
bis(2-Ethylhexyl)phthalate, ug/Kg	<380	<400	<380 (I)	890	<380 (I)	<390 (I)	<390
TOTAL MERCURY:							
Mercury, mg/kg	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1
VOLATILE ORGANICS:							
1,1,1-Trichloroethane, ug/Kg	<5.6	<6.0	<5.7	<5.5	<6.0	<5.5	<5.8
1,1,2,2-Tetrachloroethane, ug/Kg	<5.6	<6.0	<5.7	<5.5	<6.0	<5.5	<5.8
1,1,2-Trichloroethane, ug/Kg	<5.6	<6.0	<5.7	<5.5	<6.0	<5.5	<5.8
1,1-Dichloroethane, ug/Kg	<5.6	<6.0	<5.7	<5.5	<6.0	<5.5	<5.8
1,1-Dichloroethene, ug/Kg	<3.3	<3.6	<3.4	<3.3	<3.6	<3.3	<3.4
1,2-Dichloroethane, ug/Kg	<5.6	<6.0	<5.7	<5.5	<6.0	<5.5	<5.8
1,2-Dichloroethene (total), ug/Kg	<5.6	<6.0	<5.7	<5.5	<6.0	<5.5	<5.8
1,2-Dichloropropane, ug/Kg	<3.3	<3.6	<3.4	<3.3	<3.6	<3.3	<3.4
2-Butanone, ug/Kg	<110	<120	<110	<110	<120	<110	<120
2-Hexanone, ug/Kg	<11	<12	<11	<11	<12	<11	<12
4-Methyl-2-pentanone, ug/Kg	<11	<12	<11	<11	<12	<11	<12
Acetone, ug/Kg	<110	<120	<110	<110	<120	<110	<120
Benzene, ug/Kg	<3.3	<3.6	<3.4	<3.3	<3.6	<3.3	<3.4
Bromodichloromethane, ug/Kg	<5.6	<6.0	<5.7	<5.5	<6.0	<5.5	<5.8
Bromoform, ug/Kg	<5.6	<6.0	<5.7	<5.5	<6.0	<5.5	<5.8
Bromomethane, ug/Kg	<11	<12	<11	<11	<12	<11	<12
Carbon disulfide, ug/Kg	<3.3	<3.6	<3.4	<3.3	<3.6	<3.3	<3.4

I - Low internal standard response. Result is an estimated quantitation.

H:\LTSUSERS\1113\RILEY\PS1531\LENL\SBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB03B (4-4.5') 4-5-92	DUPLICATE PSFSB03C (4-4.5') 4-5-92	PSFSB04A (2-2.5') 4-7-92	PSFSB04B (4-4.5') 4-7-92	PSFSB05A (2-2.5') 4-5-92	PSFSB05B (3.5-4.5') 4-5-92	PSFSB06A (2-2.5') 4-7-92	PSFSB06B (4-4.5') 4-7-92
SEMI-VOLATILE ORGANICS (CONT'D):								
Phenanthrene, ug/Kg	<150	<150	<160	<160	<150	<150	<150	<140
Phenol, ug/Kg	<180	<180	<200	<200	<190	<180	<180	<180
Pyrene, ug/Kg	<110	<110	<120	<120	<110	<110	<110	<100
bis(2-Chloroethoxy)methane, ug/Kg	<220	<220	<230	<230	<230	<220	<220	<210
bis(2-Chloroethyl)ether, ug/Kg	<220	<220	<230	<230	<230	<220	<220	<210
bis(2-Chloroisopropyl)ether, ug/Kg	<180	<180	<200	<200	<190	<180	<180	<180
bis(2-Ethylhexyl)phthalate, ug/Kg	920	1000	<390	<390	<380	<370	<370	1200
TOTAL MERCURY:								
Mercury, mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VOLATILE ORGANICS:								
1,1,1-Trichloroethane, ug/Kg	<5.6	<5.5	<5.8	<5.8	<5.8	<5.5	<5.4	<5.3
1,1,2,2-Tetrachloroethane, ug/Kg	<5.6	<5.5	<5.8	<5.8	<5.8	<5.5	<5.4	<5.3
1,1,2-Trichloroethane, ug/Kg	<5.6	<5.5	<5.8	<5.8	<5.8	<5.5	<5.4	<5.3
1,1-Dichloroethane, ug/Kg	<5.6	<5.5	<5.8	<5.8	<5.8	<5.5	<5.4	<5.3
1,1-Dichloroethene, ug/Kg	<3.4	<3.3	<3.5	<3.5	<3.5	<3.3	<3.3	<3.2
1,2-Dichloroethane, ug/Kg	<5.6	<5.5	<5.8	<5.8	<5.8	<5.5	<5.4	<5.3
1,2-Dichloroethene (total), ug/Kg	<5.6	<5.5	<5.8	<5.8	<5.8	<5.5	<5.4	<5.3
1,2-Dichloropropane, ug/Kg	<3.4	<3.3	<3.5	<3.5	<3.5	<3.3	<3.3	<3.2
2-Butanone, ug/Kg	<110	<110	<120	<120	<120	<110	<110	<110
2-Hexanone, ug/Kg	<11	<11	<12	<12	<12	<11	<11	<11
4-Methyl-2-pentanone, ug/Kg	<11	<11	<12	<12	<12	<11	<11	<11
Acetone, ug/Kg	<110	<110	<120	<120	<120	<110	<110	<110
Benzene, ug/Kg	<3.4	<3.3	<3.5	<3.5	<3.5	<3.3	<3.3	<3.2
Bromodichloromethane, ug/Kg	<5.6	<5.5	<5.8	<5.8	<5.8	<5.5	<5.4	<5.3
Bromoform, ug/Kg	<5.6	<5.5	<5.8	<5.8	<5.8	<5.5	<5.4	<5.3
Bromomethane, ug/Kg	<11	<11	<12	<12	<12	<11	<11	<11
Carbon disulfide, ug/Kg	<3.4	<3.3	<3.5	<3.5	<3.5	<3.3	<3.3	<3.2

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB7A (2.5-3') 4-7-92	PSFSB7B (4-4.5') 4-7-92	PSFSB8A (2-2.5') 4-7-92	PSFSB8B (4-4.5') 4-7-92	PSFSB9A (1.5-2.5') 4-7-92	PSFSB9B (4-4.5') 4-7-92	PSFSB10A (1.5-2.5') 4-4-92
SEMI-VOLATILE ORGANICS (CONT'D):							
Phenanthrene, ug/Kg	370	2700	<170	<160	990	150	940
Phenol, ug/Kg	<200	<190	<210	<200	<190	<180	<390
Pyrene, ug/Kg	860	4100 (I)	170 (I2)	<120	870	180	1400
bis(2-Chloroethoxy)methane, ug/Kg	<230	<230	<250	<230	<230	<220	<470
bis(2-Chloroethyl)ether, ug/Kg	<230	<230	<250	<230	<230	<220	<470
bis(2-Chloroisopropyl)ether, ug/Kg	<200	<190	<210	<200	<190	<180	<390
bis(2-Ethylhexyl)phthalate, ug/Kg	<390	<380 (I)	<420 (I)	<390	420	<370	<780
TOTAL MERCURY:							
Mercury, mg/kg	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VOLATILE ORGANICS:							
1,1,1-Trichloroethane, ug/Kg	<5.8	<5.6	<5.8	<5.9	<5.8	<5.5	<5.9
1,1,2,2-Tetrachloroethane, ug/Kg	<5.8	<5.6	<5.8	<5.9	<5.8	<5.5	<5.9
1,1,2-Trichloroethane, ug/Kg	<5.8	<5.6	<5.8	<5.9	<5.8	<5.5	<5.9
1,1-Dichloroethane, ug/Kg	<5.8	<5.6	<5.8	<5.9	<5.8	<5.5	<5.9
1,1-Dichloroethene, ug/Kg	<3.5	<3.4	<3.4	<3.5	<3.4	<3.3	<3.5
1,2-Dichloroethane, ug/Kg	<5.8	<5.6	<5.8	<5.9	<5.8	<5.5	<5.9
1,2-Dichloroethene (total), ug/Kg	<5.8	<5.6	<5.8	<5.9	<5.8	<5.5	<5.9
1,2-Dichloropropane, ug/Kg	<3.5	<3.4	<3.4	<3.5	<3.4	<3.3	<3.5
2-Butanone, ug/Kg	<120	<110	<120	<120	<120	<110	<120
2-Hexanone, ug/Kg	<12	<11	<12	<12	<12	<11	<12
4-Methyl-2-pentanone, ug/Kg	<12	<11	<12	<12	<12	<11	<12
Acetone, ug/Kg	<120	<110	<120	<120	<120	<110	<120
Benzene, ug/Kg	<3.5	<3.4	<3.4	<3.5	<3.4	<3.3	<3.5
Bromodichloromethane, ug/Kg	<5.8	<5.6	<5.8	<5.9	<5.8	<5.5	<5.9
Bromoform, ug/Kg	<5.8	<5.6	<5.8	<5.9	<5.8	<5.5	<5.9
Bromomethane, ug/Kg	<12	<11	<12	<12	<12	<11	<12
Carbon disulfide, ug/Kg	<3.5	<3.4	<3.4	<3.5	<3.4	<3.3	<3.5

I - Low internal standard response. Result is an estimated quantitation.
I2 - Low internal standard response and high surrogate recovery. Result is biased high.

H:\LTSUSERS\1113\RILEY\PS1531\LENL\SBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB10B (3.5-4.5') 4-4-92	DUPLICATE PSFSB10C (3.5-4.5') 4-4-92	PSFSB11A (2-2.5') 4-7-92	PSFSB11B (4-4.5') 4-7-92	PSFSB12A (2-2.5') 4-8-92	PSFSB12B (4-4.5') 4-8-92	SAMPLE PSFSB13A (1.5-2.5') 4-6-92	DUPLICATE PSFSB13C (1.5-2.5') 4-6-92
SEMI-VOLATILE ORGANICS (CONT'D):								
Phenanthrene, ug/Kg	420	410	<150	<150	230	990	260	500
Phenol, ug/Kg	<210	<200	<180	<180	<200	<190	<220	<210
Pyrene, ug/Kg	630	330	<110	150	940	2700 (I2)	170	290
bis(2-Chloroethoxy)methane, ug/Kg	<250	<250	<220	<220	<230	<230	<260	<250
bis(2-Chloroethyl)ether, ug/Kg	<250	<250	<220	<220	<230	<230	<260	<250
bis(2-Chloroisopropyl)ether, ug/Kg	<210	<200	<180	<180	<200	<190	<220	<210
bis(2-Ethylhexyl)phthalate, ug/Kg	1400	490	<370	<370	<390	<380 (I)	<430	<420
TOTAL MERCURY:								
Mercury, mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.2
VOLATILE ORGANICS:								
1,1,1-Trichloroethane, ug/Kg	<6.4 (I)	<6.2 (I)	<5.6	<5.6	<6.1	<5.6	<6.4 (I)	<6.2
1,1,2,2-Tetrachloroethane, ug/Kg	<6.4 (I)	<6.2 (I)	<5.6	<5.6	<6.1	<5.6	<6.4 (I)	<6.2
1,1,2-Trichloroethane, ug/Kg	<6.4 (I)	<6.2 (I)	<5.6	<5.6	<6.1	<5.6	<6.4 (I)	<6.2
1,1-Dichloroethane, ug/Kg	<6.4 (I)	<6.2	<5.6	<5.6	<6.1	<5.6	<6.4	<6.2
1,1-Dichloroethene, ug/Kg	<3.8 (I)	<3.7	<3.4	<3.3	<3.7	<3.4	<3.8	<6.7
1,2-Dichloroethane, ug/Kg	<6.4 (I)	<6.2	<5.6	<5.6	<6.1	<5.6	<6.4	<6.2
1,2-Dichloroethene (total), ug/Kg	<6.4 (I)	<6.2	<5.6	<5.6	<6.1	<5.6	<6.4	<6.2
1,2-Dichloropropane, ug/Kg	<3.8 (I)	<3.7 (I)	<3.4	<3.3	<3.7	<3.4	<3.8 (I)	<3.7
2-Butanone, ug/Kg	<130 (I)	<120 (I)	<110	<110	<120	<110	<130 (I)	<120
2-Hexanone, ug/Kg	<13 (I)	<12 (I)	<11	<11	<12	<11	<13 (I)	<12
4-Methyl-2-pentanone, ug/Kg	<13 (I)	<12 (I)	<11	<11	<12	<11	<13 (I)	<12
Acetone, ug/Kg	<130 (I)	<120	<110	<110	<120	<110	<130	<120
Benzene, ug/Kg	<3.8 (I)	<3.7 (I)	<3.4	<3.3	<3.7	<3.4	<3.8 (I)	<3.7
Bromodichloromethane, ug/Kg	<6.4 (I)	<6.2 (I)	<5.6	<5.6	<6.1	<5.6	<6.4 (I)	<6.2
Bromoform, ug/Kg	<6.4 (I)	<6.2 (I)	<5.6	<5.6	<6.1	<5.6	<6.4 (I)	<6.2
Bromomethane, ug/Kg	<13 (I)	<12	<11	<11	<12	<11	<13	<12
Carbon disulfide, ug/Kg	<3.8 (I)	<3.7	<3.4	<3.3	<3.7	<3.4	<3.8	<3.7

I – Low internal standard response. Result is an estimated quantitation.
I2 – Low internal standard response and high surrogate recovery. Result is biased high.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB13B (4-4.5') 4-6-92	PSFSB14A (2-2.5') 4-4-92	PSFSB14B (4-4.5') 4-4-92	PSFSB15A (2-2.5') 4-4-92	PSFSB15B (4-4.5') 4-4-92	PSFSB16A (1.5-2.5') 4-4-92	PSFSB16B (3.5-4.5') 4-4-92
SEMI-VOLATILE ORGANICS (CONT'D):							
Phenanthrene, ug/Kg	<190	1600	250	<150	<160	<150	<160
Phenol, ug/Kg	<230	<230	<200	<180	<200	<180	<200
Pyrene, ug/Kg	140	3400	570	<110	<120	110	<120 (I)
bis(2-Chloroethoxy)methane, ug/Kg	<280	<280	<250	<220	<230	<220	<240
bis(2-Chloroethyl)ether, ug/Kg	<280	<280	<250	<220	<230	<220	<240
bis(2-Chloroisopropyl)ether, ug/Kg	<240	<230	<200	<180	<200	<180	<200
bis(2-Ethylhexyl)phthalate, ug/Kg	<470	<460	410	<370	<370	960	<400 (I)
TOTAL MERCURY:							
Mercury, mg/kg	0.6	0.2	<0.1	<0.1	<0.1	<0.1	<0.1
VOLATILE ORGANICS:							
1,1,1-Trichloroethane, ug/Kg	<7.2 (I)	<6.9 (I)	<6.2	<5.5	<6.0	<5.4	<6.0
1,1,2,2-Tetrachloroethane, ug/Kg	<7.2 (I)	<6.9 (I)	<6.2 (I)	<5.5	<6.0 (I)	<5.4	<6.0
1,1,2-Trichloroethane, ug/Kg	<7.2 (I)	<6.9 (I)	<6.2	<5.5	<6.0	<5.4	<6.0
1,1-Dichloroethane, ug/Kg	<7.2 (I)	<6.9	<6.2	<5.5	<6.0	<5.4	<6.0
1,1-Dichloroethene, ug/Kg	<4.3 (I)	<4.1	<3.8	<3.3	<3.6	<3.2	<3.6
1,2-Dichloroethane, ug/Kg	<7.2 (I)	<6.9	<6.2	<5.5	<6.0	<5.4	<6.0
1,2-Dichloroethene (total), ug/Kg	<7.2 (I)	<6.9	<6.2	<5.5	<6.0	<5.4	<6.0
1,2-Dichloropropane, ug/Kg	<4.3 (I)	<4.1 (I)	<3.8	<3.3	<3.6	<3.2	<3.6
2-Butanone, ug/Kg	<140 (I)	<140 (I)	<120	<110	<120	<110	<120
2-Hexanone, ug/Kg	<14 (I)	<14 (I)	<12 (I)	<11	<12 (I)	<11	<12
4-Methyl-2-pentanone, ug/Kg	<14 (I)	<14 (I)	<12 (I)	<11	<12 (I)	<11	<12
Acetone, ug/Kg	<140 (I)	<140	<120	<110	<120	<110	<120
Benzene, ug/Kg	<4.3 (I)	<4.1 (I)	<3.8	<3.3	<3.6	<3.2	<3.6
Bromodichloromethane, ug/Kg	<7.2 (I)	<6.9 (I)	<6.2	<5.5	<6.0	<5.4	<6.0
Bromoform, ug/Kg	<7.2 (I)	<6.9 (I)	<6.2	<5.5	<6.0	<5.4	<6.0
Bromomethane, ug/Kg	<14 (I)	<14	<12	<11	<12	<11	<12
Carbon disulfide, ug/Kg	<4.3 (I)	<4.1	<3.8	<3.3	<3.6	<3.2	<3.6

I - Low internal standard response. Result is an estimated quantitation.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB17A (1.5-2.5') 4-6-92	DUPLICATE PSFSB17C (1.5-2.5') 4-6-92	PSFSB17B (4-4.5') 4-6-92	PSFSB18A (2-2.5') 4-5-92	PSFSB18B (4-4.5') 4-5-92	PSFSB19A (2-2.5') 4-4-92	PSFSB19B (4-4.5') 4-4-92	PSFSB20A (2-2.5') 4-8-92	PSFSB20B (4-4.5') 4-8-92
SEMI-VOLATILE ORGANICS (CONT'D):									
Phenanthrene, ug/Kg	240	230	<150	<160	<160	<160	<160	270	230
Phenol, ug/Kg	<200	<200	<180	<200	<200	<200	<200	<200	<200
Pyrene, ug/Kg	360	270	<110	200	<120	200	<120	310	310
bis(2-Chloroethoxy)methane, ug/Kg	<240	<230	<220	<240	<230	<240	<230	<230	<230
bis(2-Chloroethyl)ether, ug/Kg	<240	<230	<220	<240	<230	<240	<230	<230	<230
bis(2-Chloroisopropyl)ether, ug/Kg	<200	<200	<180	<200	<200	<200	<200	<200	<200
bis(2-Ethylhexyl)phthalate, ug/Kg	<400	<390	<370	<400	<390	400	<390	<390	<390
TOTAL MERCURY:									
Mercury, mg/kg	0.3	0.3	<0.1	<0.1	<0.1	1.3	<0.1	0.2	<0.1
VOLATILE ORGANICS:									
1,1,1-Trichloroethane, ug/Kg	<6.3 (I)	<5.8	<5.6	<5.6	<5.7	<6.1 (I)	<5.9	<5.9	<5.8
1,1,2,2-Tetrachloroethane, ug/Kg	<6.3 (I)	<5.8	<5.6	<5.6	<5.7	<6.1 (I)	<5.9	<5.9	<5.8
1,1,2-Trichloroethane, ug/Kg	<6.3 (I)	<5.8	<5.6	<5.6	<5.7	<6.1 (I)	<5.9	<5.9	<5.8
1,1-Dichloroethane, ug/Kg	<6.3	<5.8	<5.6	<5.6	<5.7	<6.1	<5.9	<5.9	<5.8
1,1-Dichloroethene, ug/Kg	<3.8	<3.5	<3.3	<3.3	<3.4	<3.7	<3.5	<3.5	<3.5
1,2-Dichloroethane, ug/Kg	<6.3	<5.8	<5.6	<5.6	<5.7	<6.1	<5.9	<5.9	<5.8
1,2-Dichloroethene (total), ug/Kg	<6.3	<5.8	<5.6	<5.6	<5.7	<6.1	<5.9	<5.9	<5.8
1,2-Dichloropropane, ug/Kg	<3.8 (I)	<3.5	<3.3	<3.3	<3.4	<3.7 (I)	<3.5	<3.5	<3.5
2-Butanone, ug/Kg	<130 (I)	<120	<110	<110	<110	<120 (I)	<120	<120	<120
2-Hexanone, ug/Kg	<13 (I)	<12	<11	<11	<11	<12 (I)	<12	<12	<12
4-Methyl-2-pentanone, ug/Kg	<13 (I)	<12	<11	<11	<11	<12 (I)	<12	<12	<12
Acetone, ug/Kg	<130	<120	<110	<110	<110	<120	<120	<120	<120
Benzene, ug/Kg	<3.8 (I)	<3.5	<3.3	<3.3	<3.4	<3.7 (I)	<3.5	<3.5	<3.5
Bromodichloromethane, ug/Kg	<6.3 (I)	<5.8	<5.6	<5.6	<5.7	<6.1 (I)	<5.9	<5.9	<5.8
Bromoform, ug/Kg	<6.3 (I)	<5.8	<5.6	<5.6	<5.7	<6.1 (I)	<5.9	<5.9	<5.8
Bromomethane, ug/Kg	<13	<12	<110	<11	<11	<12	<12	<12	<12
Carbon disulfide, ug/Kg	<3.8	<3.5	<3.3	<3.3	<3.4	<3.7	<3.5	<3.5	<3.5

I - Low internal standard response. Result is an estimated quantitation.

H:\LTSUSERS\1113\RILEY\PS1531\LENL\SBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PILOT HOLE PSF92SB01A (5') 1-24-92	PILOT HOLE PSF92SB01B (38') 1-24-92	PSFSB01A (2-2.5') 4-8-92	PSFSB01B (4-4.5') 4-8-92	PSFSB02A (2-2.5') 4-7-92	PSFSB02B (4-4.5') 4-7-92	PSFSB03A (2-2.5') 4-5-92
VOLATILE ORGANICS (CONT'D):							
Carbon tetrachloride, ug/Kg	<3.3	<3.6	<3.4	<3.3	<3.6	<3.3	<3.4
Chlorobenzene, ug/Kg	<3.3	<3.6	<3.4	<3.3	<3.6	<3.3	<3.4
Chloroethane, ug/Kg	<11	<12	<11	<11	<12	<11	<12
Chloroform, ug/Kg	<3.3	<3.6	<3.4	<3.3	<3.6	<3.3	<3.4
Chloromethane, ug/Kg	<11	<12	<11	<11	<12	<11	<12
Dibromochloromethane, ug/Kg	<5.6	<6.0	<5.7	<5.5	<6.0	<5.5	<5.8
Ethylbenzene, ug/Kg	<3.3	<3.6	<3.4	<3.3	<3.6	<3.3	<3.4
Methylene chloride, ug/Kg	21 (T)	18 (T)	17 (B2)	14 (B2)	19 (B2)	16 (B2)	29 (B2)
Styrene, ug/Kg	<3.3	<3.6	<3.4	<3.3	<3.6	<3.3	<3.4
Tetrachloroethene, ug/Kg	<3.3	<3.6	<3.4	<3.3	<3.6	<3.3	<3.4
Toluene, ug/Kg	<5.6	<6.0	<5.7	<5.5	<6.0	<5.5	<5.8
Trichloroethene, ug/Kg	<3.3	<3.6	<3.4	<3.3	<3.6	<3.3	<3.4
Vinyl acetate, ug/Kg	<11	<12	<11	<11	<12	<11	<12
Vinyl chloride, ug/Kg	<11	<12	<11	<11	<12	<11	<12
Xylenes (total), ug/Kg	<5.6	<6.0	<5.7	<5.5	<6.0	<5.5	<5.8
cis-1,3-Dichloropropene, ug/Kg	<3.3	<3.6	<3.4	<3.3	<3.6	<3.3	<3.4
trans-1,3-Dichloropropene, ug/Kg	<3.3	<3.6	<3.4	<3.3	<3.6	<3.3	<3.4
TOTAL ICP METALS:							
Aluminum, mg/Kg	5800	3900	NS	NS	NS	NS	NS
Antimony, mg/Kg	<5.6 (M2)	<6.1 (M2)	NS	NS	NS	NS	NS
Barium, mg/Kg	66	75	99	73	97	82	89
Beryllium, mg/Kg	<0.3	<0.4	NS	NS	NS	NS	NS
Cadmium, mg/Kg	<0.6	<0.7	<0.6	<0.7	<0.7	<0.7	<0.7
Calcium, mg/Kg	1600	2400	NS	NS	NS	NS	NS
Chromium, mg/Kg	5.2	5.4	8.2	6.7	6.5	8.3	6.9

B2 – Sample results are less than 10 times the amount detected in the method blank. Result is estimated.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
T – Sample results are less than 10 times the amount detected in the trip blank. Result is estimated.
NS – Not sampled

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB03B (4-4.5') 4-5-92	DUPLICATE PSFSB03C (4-4.5') 4-5-92	PSFSB04A (2-2.5') 4-7-92	PSFSB04B (4-4.5') 4-7-92	PSFSB05A (2-2.5') 4-5-92	PSFSB05B (3.5-4.5') 4-5-92	PSFSB06A (2-2.5') 4-7-92	PSFSB06B (4-4.5') 4-7-92
VOLATILE ORGANICS (CONT'D):								
Carbon tetrachloride, ug/Kg	<3.4	<3.3	<3.5	<3.5	<3.5	<3.3	<3.3	<3.2
Chlorobenzene, ug/Kg	<3.4	<3.3	<3.5	<3.5	<3.5	<3.3	<3.3	<3.2
Chloroethane, ug/Kg	<11	<11	<12	<12	<12	<11	<11	<11
Chloroform, ug/Kg	<3.4	<3.3	<3.5	<3.5	<3.5	<3.3	<3.3	<3.2
Chloromethane, ug/Kg	<11	<11	<12	<12	<12	<11	<11	<11
Dibromochloromethane, ug/Kg	<5.6	<5.5	<5.8	<5.8	<5.8	<5.5	<5.4	<5.3
Ethylbenzene, ug/Kg	<3.4	<3.3	<3.5	<3.5	<3.5	<3.3	<3.3	<3.2
Methylene chloride, ug/Kg	22 (B2)	23 (B2)	19 (B2)	22	23 (B2)	14	18 (B2)	17
Styrene, ug/Kg	<3.4	<3.3	<3.5	<3.5	<3.5	<3.3	<3.3	<3.2
Tetrachloroethene, ug/Kg	<3.4	<3.3	<3.5	<3.5	<3.5	<3.3	<3.3	<3.2
Toluene, ug/Kg	<5.6	<5.5	<5.8	9.5	<5.8	<5.5	<5.4	<5.3
Trichloroethene, ug/Kg	<3.4	<3.3	<3.5	<3.5	<3.5	<3.3	<3.3	<3.2
Vinyl acetate, ug/Kg	<11	<11	<12	<12	<12	<11	<11	<11
Vinyl chloride, ug/Kg	<11	<11	<12	<12	<12	<11	<11	<11
Xylenes (total), ug/Kg	<5.6	<5.5	<5.8	<5.8	<5.8	<5.5	<5.4	<5.3
cis-1,3-Dichloropropene, ug/Kg	<3.4	<3.3	<3.5	<3.5	<3.5	<3.3	<3.3	<3.2
trans-1,3-Dichloropropene, ug/Kg	<3.4	<3.3	<3.5	<3.5	<3.5	<3.3	<3.3	<3.2
TOTAL ICP METALS:								
Aluminum, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Antimony, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Barium, mg/Kg	66	58	100	98	100	71	77	39
Beryllium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Cadmium, mg/Kg	<0.6	<0.7	<0.7	<0.8	<0.7	<0.6	<0.6	<0.6
Calcium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Chromium, mg/Kg	6.4	5.3	11	6.3	8.3	6.6	5.3	4.6

B2 – Sample results are less than 10 times the amount detected in the method blank. Result is estimated.
NS – Not sampled

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB7A (2.5-3') 4-7-92	PSFSB7B (4-4.5') 4-7-92	PSFSB8A (2-2.5') 4-7-92	PSFSB8B (4-4.5') 4-7-92	PSFSB9A (1.5-2.5') 4-7-92	PSFSB9B (4-4.5') 4-7-92	PSFSB10A (1.5-2.5') 4-4-92
VOLATILE ORGANICS (CONT'D):							
Carbon tetrachloride, ug/Kg	<3.5	<3.4	<3.4	<3.5	<3.4	<3.3	<3.5
Chlorobenzene, ug/Kg	<3.5	<3.4	<3.4	<3.5	<3.4	<3.3	<3.5
Chloroethane, ug/Kg	<12	<11	<12	<12	<12	<11	<12
Chloroform, ug/Kg	<3.5	<3.4	<3.4	<3.5	<3.4	<3.3	<3.5
Chloromethane, ug/Kg	<12	<11	<12	<12	<12	<11	<12
Dibromochloromethane, ug/Kg	<5.8	<5.6	<5.8	<5.9	<5.8	<5.5	<5.9
Ethylbenzene, ug/Kg	<3.5	<3.4	<3.4	<3.5	<3.4	<3.3	<3.5
Methylene chloride, ug/Kg	<5.8	<5.6	9.5 (B2)	13 (B2)	15 (B2)	14 (B2)	31 (B2)
Styrene, ug/Kg	<3.5	<3.4	<3.4	<3.5	<3.4	<3.3	<3.5
Tetrachloroethene, ug/Kg	<3.5	<3.4	<3.4	<3.5	<3.4	<3.3	<3.5
Toluene, ug/Kg	<5.8	<5.6	<5.8	<5.9	<5.8	<5.5	<5.9
Trichloroethene, ug/Kg	<3.5	<3.4	<3.4	<3.5	<3.4	<3.3	<3.5
Vinyl acetate, ug/Kg	<12	<11	<12	<12	<12	<11	<12
Vinyl chloride, ug/Kg	<12	<11	<12	<12	<12	<11	<12
Xylenes (total), ug/Kg	<5.8	<5.6	<5.8	<5.9	<5.8	<5.5	<5.9
cis-1,3-Dichloropropene, ug/Kg	<3.5	<3.4	<3.4	<3.5	<3.4	<3.3	<3.5
trans-1,3-Dichloropropene, ug/Kg	<3.5	<3.4	<3.4	<3.5	<3.4	<3.3	<3.5
TOTAL ICP METALS:							
Aluminum, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Antimony, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Barium, mg/Kg	81	120	160	130	94	67	84
Beryllium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Cadmium, mg/Kg	<0.7	<0.6	<0.6	<0.7	0.7	<0.7	<0.7
Calcium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Chromium, mg/Kg	6.4	8.0	4.8	6.5	41	5.8	15

B2 – Sample results are less than 10 times the amount detected in the method blank. Result is estimated.
NS – Not sampled

H:\LTS' 'SERS\1113\RILEY\PS1531\LENL\SBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB13B (4-4.5') 4-6-92	PSFSB14A (2-2.5') 4-4-92	PSFSB14B (4-4.5') 4-4-92	PSFSB15A (2-2.5') 4-4-92	PSFSB15B (4-4.5') 4-4-92	PSFSB16A (1.5-2.5') 4-4-92	PSFSB16B (3.5-4.5') 4-4-92
VOLATILE ORGANICS (CONT'D):							
Carbon tetrachloride, ug/Kg	<4.3 (I)	<4.1 (I)	<3.8	<3.3	<3.6	<3.2	<3.6
Chlorobenzene, ug/Kg	<4.3 (I)	<4.1 (I)	<3.8 (I)	<3.3	<3.6 (I)	<3.2	<3.6
Chloroethane, ug/Kg	<14 (I)	<14	<12	<11	<12	<11	<12
Chloroform, ug/Kg	<4.3 (I)	<4.1	<3.8	<3.3	<3.6	<3.2	<3.6
Chloromethane, ug/Kg	<14 (I)	<14	<12	<11	<12	<11	<12
Dibromochloromethane, ug/Kg	<7.2 (I)	<6.9	<6.2	<5.5	<6.0	<5.4	<6.0
Ethylbenzene, ug/Kg	<4.3 (I)	<4.1 (I)	<3.8 (I)	<3.3	<3.6 (I)	<3.2	<3.6
Methylene chloride, ug/Kg	74 (I)	43 (B2)	38 (B2)	28	35 (B2)	28 (B2)	34 (B2)
Styrene, ug/Kg	<4.3 (I)	<4.1 (I)	<3.8 (I)	<3.3	<3.6 (I)	<3.2	<3.6
Tetrachloroethene, ug/Kg	<4.3 (I)	<4.1 (I)	<3.8 (I)	<3.3	<3.6 (I)	<3.2	<3.6
Toluene, ug/Kg	<7.2 (I)	<6.9 (I)	<6.2 (I)	19	38 (I2)	8.9	18
Trichloroethene, ug/Kg	<4.3 (I)	<4.1 (I)	<3.8	<3.3	<3.6	<3.2	<3.6
Vinyl acetate, ug/Kg	<14 (I)	<14 (I)	<12	<11	<12	<11	<12
Vinyl chloride, ug/Kg	<14 (I)	<14	<12	<11	<12	<11	<12
Xylenes (total), ug/Kg	<7.2 (I)	<6.9 (I)	<6.2 (I)	<5.5	<6.0 (I)	<5.4	<6.0
cis-1,3-Dichloropropene, ug/Kg	<4.3 (I)	<4.1 (I)	<3.8	<3.3	<3.6	<3.2	<3.6
trans-1,3-Dichloropropene, ug/Kg	<4.3 (I)	<4.1 (I)	<3.8	<3.3	<3.6	<3.2	<3.6
TOTAL ICP METALS:							
Aluminum, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Antimony, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Barium, mg/Kg	130	140	100	50	130	47	120
Beryllium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Cadmium, mg/Kg	<0.8	<0.7	<0.7	<0.7	<0.7	<0.6	<0.7
Calcium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Chromium, mg/Kg	8.0	12	8.3	4.5	5.5	4.7	8.7

B2 – Sample results are less than 10 times the amount detected in the method blank. Result is estimated.
I – Low internal standard response. Result is an estimated quantitation.
I2 – Low internal standard response and high surrogate recovery. Result is biased high.
NS – Not sampled

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB10B (3.5-4.5') 4-4-92	DUPLICATE PSFSB10C (3.5-4.5') 4-4-92	PSFSB11A (2-2.5') 4-7-92	PSFSB11B (4-4.5') 4-7-92	PSFSB12A (2-2.5') 4-8-92	PSFSB12B (4-4.5') 4-8-92	SAMPLE PSFSB13A (1.5-2.5') 4-6-92	DUPLICATE PSFSB13C (1.5-2.5') 4-6-92
VOLATILE ORGANICS (CONT'D):								
Carbon tetrachloride, ug/Kg	<3.8 (I)	<3.7 (I)	<3.4	<3.3	<3.7	<3.4	<3.8 (I)	<3.7
Chlorobenzene, ug/Kg	<3.8 (I)	<3.7 (I)	<3.4	<3.3	<3.7	<3.4	<3.8 (I)	<3.7
Chloroethane, ug/Kg	<13 (I)	<12	<11	<11	<12	<11	<13	<12
Chloroform, ug/Kg	<3.8 (I)	<3.7	<3.4	<3.3	<3.7	<3.4	<3.8	<3.7
Chloromethane, ug/Kg	<13 (I)	<12	<11	<11	<12	<11	<13	<12
Dibromochloromethane, ug/Kg	<6.4 (I)	<6.2	<5.6	<5.6	<6.1	<5.6	<6.4	<6.2
Ethylbenzene, ug/Kg	<3.8 (I)	<3.7 (I)	<3.4	<3.3	<3.7	<3.4	<3.8 (I)	<3.7
Methylene chloride, ug/Kg	75 (I)	50 (B2)	15 (B2)	16 (B2)	28 (B2)	25 (B2)	55 (B2)	47 (B2)
Styrene, ug/Kg	<3.8 (I)	<3.7 (I)	<3.4	<3.3	<3.7	<3.4	<3.8 (I)	<3.7
Tetrachloroethene, ug/Kg	<3.8 (I)	<3.7 (I)	<3.4	<3.3	<3.7	<3.4	<3.8 (I)	<3.7
Toluene, ug/Kg	33 (I2)	30 (I2)	<5.6	<5.6	8.9	19	<6.4 (I)	<6.2
Trichloroethene, ug/Kg	<3.8 (I)	<3.7 (I)	<3.4	<3.3	<3.7	<3.4	<3.8 (I)	<3.7
Vinyl acetate, ug/Kg	<13 (I)	<12 (I)	<11	<11	<12	<11	<13 (I)	<12
Vinyl chloride, ug/Kg	<13 (I)	<12	<11	<11	<12	<11	<13	<12
Xylenes (total), ug/Kg	<6.4 (I)	<6.2 (I)	<5.6	<5.6	<6.1	<5.6	<6.4 (I)	<6.2
cis-1,3-Dichloropropene, ug/Kg	<3.8 (I)	<3.7 (I)	<3.4	<3.3	<3.7	<3.4	<3.8 (I)	<3.7
trans-1,3-Dichloropropene, ug/Kg	<3.8 (I)	<3.7 (I)	<3.4	<3.3	<3.7	<3.4	<3.8 (I)	<3.7
TOTAL ICP METALS:								
Aluminum, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Antimony, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Barium, mg/Kg	87	120	68	68	100	66	140	160
Beryllium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Cadmium, mg/Kg	5.0	3.2	<0.6	<0.7	<0.7	0.7	<0.7	<0.8
Calcium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Chromium, mg/Kg	8.8	8.6	6.4	6.1	11	15	10	12

B2 – Sample results are less than 10 times the amount detected in the method blank. Result is estimated.
I – Low internal standard response. Result is an estimated quantitation.
I2 – Low internal standard response and high surrogate recovery. Result is biased high.
NS – Not sampled

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB17A (1.5-2.5') 4-6-92	DUPLICATE PSFSB17C (1.5-2.5') 4-6-92	PSFSB17B (4-4.5') 4-6-92	PSFSB18A (2-2.5') 4-5-92	PSFSB18B (4-4.5') 4-5-92	PSFSB19A (2-2.5') 4-4-92	PSFSB19B (4-4.5') 4-4-92	PSFSB20A (2-2.5') 4-8-92	PSFSB20B (4-4.5') 4-8-92
VOLATILE ORGANICS (CONT'D):									
Carbon tetrachloride, ug/Kg	<3.8 (I)	<3.5	<3.3	<3.3	<3.4	<3.7 (I)	<3.5	<3.5	<3.5
Chlorobenzene, ug/Kg	<3.8 (I)	<3.5	<3.3	<3.3	<3.4	<3.7 (I)	<3.5	<3.5	<3.5
Chloroethane, ug/Kg	<13	<12	<11	<11	<11	<12	<12	<12	<12
Chloroform, ug/Kg	<3.8	<3.5	<3.3	<3.3	<3.4	<3.7	<3.5	<3.5	<3.5
Chloromethane, ug/Kg	<13	<12	<11	<11	<11	<12	<12	<12	<12
Dibromochloromethane, ug/Kg	<6.3	<5.8	<5.6	<5.6	<5.7	<6.1	<5.9	<5.9	<5.8
Ethylbenzene, ug/Kg	<3.8 (I)	<3.5	<3.3	<3.3	<3.4	<3.7 (I)	<3.5	<3.5	<3.5
Methylene chloride, ug/Kg	71	41 (B2)	29	31	31	44	31 (B2)	26	15 (B2)
Styrene, ug/Kg	<3.8 (I)	<3.5	<3.3	<3.3	<3.4	<3.7 (I)	<3.5	<3.5	<3.5
Tetrachloroethene, ug/Kg	<3.8 (I)	<3.5	<3.3	<3.3	<3.4	<3.7 (I)	<3.5	<3.5	<3.5
Toluene, ug/Kg	12 (I2)	7.8	5.9	<5.6	9.8	34 (I2)	<5.9	14	<5.8
Trichloroethene, ug/Kg	<3.8 (I)	<3.5	<3.3	<3.3	<3.4	<3.7 (I)	<3.5	<3.5	<3.5
Vinyl acetate, ug/Kg	<13 (I)	<12	<11	<11	<11	<12 (I)	<12	<12	<12
Vinyl chloride, ug/Kg	<13	<12	<11	<11	<11	<12	<12	<12	<12
Xylenes (total), ug/Kg	<6.3 (I)	<5.8	<5.6	<5.6	<5.7	<6.1 (I)	<5.9	<5.9	<5.8
cis-1,3-Dichloropropene, ug/Kg	<3.8 (I)	<3.5	<3.3	<3.3	<3.4	<3.7 (I)	<3.5	<3.5	<3.5
trans-1,3-Dichloropropene, ug/Kg	<3.8 (I)	<3.5	<3.3	<3.3	<3.4	<3.7 (I)	<3.5	<3.5	<3.5
TOTAL ICP METALS:									
Aluminum, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Antimony, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Barium, mg/Kg	150	120	71	62	110	160	100	89	88
Beryllium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Cadmium, mg/Kg	<0.7	<0.7	<0.6	<0.7	<0.8	<0.9	<0.7	<0.7	<0.7
Calcium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Chromium, mg/Kg	11	10	5.7	5.5	6.8	14	6.9	5.6	6.9

B2 – Sample results are less than 10 times the amount detected in the method blank. Result is estimated.
I – Low internal standard response. Result is an estimated quantitation.
I2 – Low internal standard response and high surrogate recovery. Result is biased high.
NS – Not sampled

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PILOT HOLE PSF92SB01A (5') 1-24-92	PILOT HOLE PSF92SB01B (38') 1-24-92	PSFSB01A (2-2.5') 4-8-92	PSFSB01B (4-4.5') 4-8-92	PSFSB02A (2-2.5') 4-7-92	PSFSB02B (4-4.5') 4-7-92	PSFSB03A (2-2.5') 4-5-92
TOTAL ICP METALS (CONT'D):							
Cobalt, mg/Kg	3.6	3.4	NS	NS	NS	NS	NS
Copper, mg/Kg	3.5	3.6	NS	NS	NS	NS	NS
Iron, mg/Kg	5300	5600	NS	NS	NS	NS	NS
Lead, mg/Kg	<3.4	<3.7	4.3	11	13	11	10
Magnesium, mg/Kg	970	1400	NS	NS	NS	NS	NS
Manganese, mg/Kg	120	130	NS	NS	NS	NS	NS
Nickel, mg/Kg	6.5	7.6	NS	NS	NS	NS	NS
Potassium, mg/Kg	940	820	NS	NS	NS	NS	NS
Silver, mg/Kg	<0.6	<0.7	<0.6	<0.7	<0.7	<0.7	0.8
Sodium, mg/Kg	45	57	NS	NS	NS	NS	NS
Thallium, mg/Kg	<12	<13	NS	NS	NS	NS	NS
Vanadium, mg/Kg	13	15	NS	NS	NS	NS	NS
Zinc, mg/Kg	14	16	NS	NS	NS	NS	NS
TOTAL FURNACE METALS:							
Arsenic, mg/Kg	1.6	1.2	1.4	1.2	20	4.3	0.8
Selenium, mg/Kg	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)
ORGANOPHOSPHORUS PESTICIDES:							
AZINPHOS METHYL (GUTHION), ug/kg	NS	NS	<50	<50	<50	<50	<50
BOLSTAR, ug/kg	NS	NS	<5	<5	<5	<5	<5
CHLORPYRIFOS (DURSBAN), ug/kg	NS	NS	<10	<10	<10	<10	<10
COUMAPHOS (CO-RAL), ug/kg	NS	NS	<50	<50	<50	<50	<50
DEMETON-S (MERCAPTOPHOS), ug/kg	NS	NS	<8.3	<8.3	<8.3	<8.3	<8.3
DIAZINON, ug/kg	NS	NS	<20	<20	<20	<20	<20

M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
NS – Not sampled

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB03B (4-4.5') 4-5-92	DUPLICATE PSFSB03C (4-4.5') 4-5-92	PSFSB04A (2-2.5') 4-7-92	PSFSB04B (4-4.5') 4-7-92	PSFSB05A (2-2.5') 4-5-92	PSFSB05B (3.5-4.5') 4-5-92	PSFSB06A (2-2.5') 4-7-92	PSFSB06B (4-4.5') 4-7-92
TOTAL ICP METALS (CONT'D):								
Cobalt, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Copper, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Iron, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Lead, mg/Kg	4.4 (R2)	14	12	9.9	13	7.5	4.7	4.7
Magnesium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Manganese, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Nickel, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Potassium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Silver, mg/Kg	<0.6	<0.7	<0.7	<0.8	<0.7	<0.6	<0.6	<0.6
Sodium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Thallium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Vanadium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Zinc, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
TOTAL FURNACE METALS:								
Arsenic, mg/Kg	1.0	1.2	6.2	1.9	1.9	1.5	1.6	1.1
Selenium, mg/Kg	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)
ORGANOPHOSPHORUS PESTICIDES:								
AZINPHOS METHYL (GUTHION), ug/kg	<50	<50	<50	<50	<50	<50	<50	<50
BOLSTAR, ug/kg	<5	<5	<5	<5	<5	<5	<5	<5
CHLORPYRIFOS (DURSBAN), ug/kg	<10	<10	<10	<10	<10	<10	<10	<10
COUMAPHOS (CO-RAL), ug/kg	<50	<50	<50	<50	<50	<50	<50	<50
DEMETON-S (MERCAPTOPHOS), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
DIAZINON, ug/kg	<20	<20	<20	<20	<20	<20	<20	<20

M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
R2 – Sample result is less than 5 times the amount detected in the rinsate. Result is estimated.
NS – Not sampled

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB7A (2.5-3') 4-7-92	PSFSB7B (4-4.5') 4-7-92	PSFSB8A (2-2.5') 4-7-92	PSFSB8B (4-4.5') 4-7-92	PSFSB9A (1.5-2.5') 4-7-92	PSFSB9B (4-4.5') 4-7-92	PSFSB10A (1.5-2.5') 4-4-92
TOTAL ICP METALS (CONT'D):							
Cobalt, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Copper, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Iron, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Lead, mg/Kg	220	310	770	270	240	25	100
Magnesium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Manganese, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Nickel, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Potassium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Silver, mg/Kg	<0.7	<0.6	<0.6	<0.7	<0.7	<0.7	<0.7
Sodium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Thallium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Vanadium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Zinc, mg/Kg	NS	NS	NS	NS	NS	NS	NS
TOTAL FURNACE METALS:							
Arsenic, mg/Kg	4.2	3.2	3.3	2.5	2.3	1.9	5.5
Selenium, mg/Kg	0.3 (M2)	0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)
ORGANOPHOSPHORUS PESTICIDES:							
AZINPHOS METHYL (GUTHION), ug/kg	<50	<50.	<50.	<50.	<50.	<50.	<50
BOLSTAR, ug/kg	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5
CHLORPYRIFOS (DURSBAN), ug/kg	<10	<10	<10	<10	<10	<10	<10
COUMAPHOS (CO-RAL), ug/kg	<50	<50	<50	<50	<50	<50	<50
DEMETON-S (MERCAPTOPHOS), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
DIAZINON, ug/kg	<20	<20	<20	<20	<20	<20	<20

M2 - Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
NS - Not sampled

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER	SAMPLE PSFSB10B	DUPLICATE PSFSB10C	PSFSB11A	PSFSB11B	PSFSB12A	PSFSB12B	SAMPLE PSFSB13A	DUPLICATE PSFSB13C
Sample Depth	(3.5-4.5')	(3.5-4.5')	(2-2.5')	(4-4.5')	(2-2.5')	(4-4.5')	(1.5-2.5')	(1.5-2.5')
Date Collected	4-4-92	4-4-92	4-7-92	4-7-92	4-8-92	4-8-92	4-6-92	4-6-92
TOTAL ICP METALS (CONT'D):								
Cobalt, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Copper, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Iron, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Lead, mg/Kg	91	120	9.8	14	87	110	63	110
Magnesium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Manganese, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Nickel, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Potassium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Silver, mg/Kg	<0.7	1.1	<0.6	<0.7	<0.7	<0.6	<0.7	1.2
Sodium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Thallium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Vanadium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
Zinc, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS
TOTAL FURNACE METALS:								
Arsenic, mg/Kg	66	120	1.4	1.6	6.1	6.0	12	14
Selenium, mg/Kg	0.8 (M2)	0.8 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	0.4 (M2)	0.3 (M2)
ORGANOPHOSPHORUS PESTICIDES:								
AZINPHOS METHYL (GUTHION), ug/kg	<50	<50	<50.	<50.	<50	<50	<50	<50
BOLSTAR, ug/kg	<5	<5	<5.00	<5.00	<5	<5	<5.0	<5.0
CHLORPYRIFOS (DURSBAN), ug/kg	<10	<10	<10	<10	<10	<10	<10	<10
COUMAPHOS (CO-RAL), ug/kg	<50	<50	<50	<50	<50	<50	<50	<50
DEMETON-S (MERCAPTOPHOS), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
DIAZINON, ug/kg	<20	<20	<20	<20	<20	<20	<20	<20

M2 - Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
NS - Not sampled

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB13B (4-4.5') 4-6-92	PSFSB14A (2-2.5') 4-4-92	PSFSB14B (4-4.5') 4-4-92	PSFSB15A (2-2.5') 4-4-92	PSFSB15B (4-4.5') 4-4-92	PSFSB16A (1.5-2.5') 4-4-92	PSFSB16B (3.5-4.5') 4-4-92
TOTAL ICP METALS (CONT'D):							
Cobalt, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Copper, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Iron, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Lead, mg/Kg	36	39	140	7.0	7.6	18	12
Magnesium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Manganese, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Nickel, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Potassium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Silver, mg/Kg	<0.8	<0.7	<0.7	<0.7	<0.7	<0.6	<0.7
Sodium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Thallium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Vanadium, mg/Kg	NS	NS	NS	NS	NS	NS	NS
Zinc, mg/Kg	NS	NS	NS	NS	NS	NS	NS
TOTAL FURNACE METALS:							
Arsenic, mg/Kg	3.6	5.2	3.0	1.8	1.8	1.9	1.6
Selenium, mg/Kg	<0.2 (M2)	0.4 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)
ORGANOPHOSPHORUS PESTICIDES:							
AZINPHOS METHYL (GUTHION), ug/kg	<50	<50	<50	<50	<50	<50	<50
BOLSTAR, ug/kg	<5.0	<5	<5	<5	<5	<5	<5
CHLORPYRIFOS (DURSBAN), ug/kg	<10	<10	<10	<10	<10	<10	<10
COUMAPHOS (CO-RAL), ug/kg	<50	<50	<50	<50	<50	<50	<50
DEMETON-S (MERCAPTOPHOS), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
DIAZINON, ug/kg	<20	<20	<20	<20	<20	<20	<20

M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
NS – Not sampled

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB17A (1.5-2.5') 4-6-92	DUPLICATE PSFSB17C (1.5-2.5') 4-6-92	PSFSB17B (4-4.5') 4-6-92	PSFSB18A (2-2.5') 4-5-92	PSFSB18B (4-4.5') 4-5-92	PSFSB19A (2-2.5') 4-4-92	PSFSB19B (4-4.5') 4-4-92	PSFSB20A (2-2.5') 4-8-92	PSFSB20B (4-4.5') 4-8-92
TOTAL ICP METALS (CONT'D):									
Cobalt, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Copper, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Iron, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Lead, mg/Kg	110	80	8.0	30	15	38	12	75	89
Magnesium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Manganese, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Nickel, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Potassium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Silver, mg/Kg	<0.7	<0.7	<0.6	<0.7	<0.8	1.1	<0.7	<0.7	<0.7
Sodium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Thallium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Vanadium, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
Zinc, mg/Kg	NS	NS	NS	NS	NS	NS	NS	NS	NS
TOTAL FURNACE METALS:									
Arsenic, mg/Kg	4.1	4.0	0.9	2.0	1.6	4.0	1.4	3.1	1.9
Selenium, mg/Kg	0.2 (M2)	0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	0.2 (M2)	<0.2 (M2)
ORGANOPHOSPHORUS PESTICIDES:									
AZINPHOS METHYL (GUTHION), ug/kg	<50	<50	<50	<50	<50	<50	<50	<50	<50
BOLSTAR, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	<5	<5	<5	<5
CHLORPYRIFOS (DURSBAN), ug/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10
COUMAPHOS (CO-RAL), ug/kg	<50	<50	<50	<50	<50	<50	<50	<50	<50
DEMETON-S (MERCAPTOPHOS), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
DIAZINON, ug/kg	<20	<20	<20	<20	<20	<20	<20	<20	<20

M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
NS – Not sampled

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PILOT HOLE PSF92SB01A (5') 1-24-92	PILOT HOLE PSF92SB01B (38') 1-24-92	PSFSB01A (2-2.5') 4-8-92	PSFSB01B (4-4.5') 4-8-92	PSFSB02A (2-2.5') 4-7-92	PSFSB02B (4-4.5') 4-7-92	PSFSB03A (2-2.5') 4-5-92
ORGANOPHOSPHORUS PESTICIDES (CONT'D):							
DICHLORVOS (DDVP), ug/kg	NS	NS	<3.3	<3.3	<3.3	<3.3	<3.3
DISULFOTON (DI-SYSTON), ug/kg	NS	NS	<6.7	<6.7	<6.7	<6.7	<6.7
ETHOPROP (MOCAP), ug/kg	NS	NS	<8.3	<8.3	<8.3	<8.3	<8.3
FENSULFOTHION (DASANIT), ug/kg	NS	NS	<50	<50	<50	<50	<50
FENTHION (BAYCID), ug/kg	NS	NS	<3.3	<3.3	<3.3	<3.3	<3.3
MALATHION, ug/kg	NS	NS	<170	<170	<170	<170	<170
MERPHOS, ug/kg	NS	NS	<8.3	<8.3	<8.3	<8.3	<8.3
METHYL PARATHION, ug/kg	NS	NS	<1	<1	<1	<1	<1
MEVINPHOS (PHOSDRIN), ug/kg	NS	NS	<10	<10	<10	<10	<10
NALED, ug/kg	NS	NS	<3.3	<3.3	<3.3	<3.3	<3.3
PHORATE, ug/kg	NS	NS	<5	<5	<5	<5	<5
RONNEL (FENCHLORPHOS), ug/kg	NS	NS	<10	<10	<10	<10	<10
STIROPHOS (TETRACHLORVINPHOS), ug/kg	NS	NS	<170	<170	<170	<170	<170
ACID HERBICIDES:							
2,4,5-T, ug/kg	NS	NS	<161	<155	<165	<155	<163
2,4,5-TP (SILVEX), ug/kg	NS	NS	<138	<133	<141	<133	<140
2,4-D, ug/kg	NS	NS	<930	<900	<954	<899	<943
2,4-DB, ug/kg	NS	NS	<700	<677	<719	<677	<710
DALAPON, ug/kg	NS	NS	<4477	<4331	<4595	<4327	<4542
DICAMBA, ug/kg	NS	NS	<218	<211	<224	<211	<221
DICHLOROPROP, ug/kg	NS	NS	<505	<489	<518	<488	<512
DINOSEB, ug/kg	NS	NS	<57	<56	<59	<55	<58
MCPA, ug/kg	NS	NS	<191690	<185453	<196772	<185288	<194480
MCPP, ug/kg	NS	NS	<148072	<143254	<151997	<143127	<150227
2,3,7,8-TCDD (DIOXIN ISOMER), ppt	NS	NS	NA	NA	NA	NA	NA

NS – Not sampled
NA – Not analyzed

H:\LT ERS\1113\RILEY\PS1531\LENL\SBTBL.WK1

PESTICI[illegible] TORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB03B (4-4.5') 4-5-92	DUPLICATE PSFSB03C (4-4.5') 4-5-92	PSFSB04A (2-2.5') 4-7-92	PSFSB04B (4-4.5') 4-7-92	PSFSB05A (2-2.5') 4-5-92	PSFSB05B (3.5-4.5') 4-5-92	PSFSB06A (2-2.5') 4-7-92	PSFSB06B (4-4.5') 4-7-92
ORGANOPHOSPHORUS PESTICIDES (CONT'D):								
DICHLORVOS (DDVP), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
DISULFOTON (DI-SYSTON), ug/kg	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7
ETHOPROP (MOCAP), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
FENSULFOTHION (DASANIT), ug/kg	<50	<50	<50	<50	<50	<50	<50	<50
FENTHION (BAYCID), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
MALATHION, ug/kg	<170	<170	<170	<170	<170	<170	<170	<170
MERPHOS, ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
METHYL PARATHION, ug/kg	<1	<1	<1	<1	<1	<1	<1	<1
MEVINPHOS (PHOSDRIN), ug/kg	<10	<10	<10	<10	<10	<10	<10	<10
NALED, ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
PHORATE, ug/kg	<5	<5	<5	<5	<5	<5	<5	<5
RONNEL (FENCHLORPHOS), ug/kg	<10	<10	<10	<10	<10	<10	<10	<10
STIROPHOS (TETRACHLORVINPHOS), ug/kg	<170	<170	<170	<170	<170	<170	<170	<170
ACID HERBICIDES:								
2,4,5-T, ug/kg	<158	<157	<162	<164	<163	<159	<153	<148
2,4,5-TP (SILVEX), ug/kg	<135	<134	<139	<141	<140	<137	<131	<127
2,4-D, ug/kg	<912	<907	<939	<949	<944	<922	<887	<857
2,4-DB, ug/kg	<686	<683	<707	<714	<711	<694	<668	<645
DALAPON, ug/kg	<4389	<4366	<4520	<4567	<4543	<4439	<4268	<4124
DICAMBA, ug/kg	<214	<213	<220	<223	<221	<216	<208	<201
DICHLOROPROP, ug/kg	<495	<493	<510	<515	<513	<501	<482	<465
DINOSEB, ug/kg	<56	<56	<58	<59	<58	<57	<55	<53
MCPA, ug/kg	<187936	<186947	<193533	<195573	<194525	<190075	<182773	<176589
MCPP, ug/kg	<145172	<144408	<149496	<151072	<150262	<146824	<141184	<136407
2,3,7,8-TCDD (DIOXIN ISOMER), ppt	<238.5	NA	NA	NA	<143.7	NA	NA	NA

NA – Not analyzed

H:\LTSUSERS\1113\RILEY\PS1531\LENL\SBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB7A (2.5-3') 4-7-92	PSFSB7B (4-4.5') 4-7-92	PSFSB8A (2-2.5') 4-7-92	PSFSB8B (4-4.5') 4-7-92	PSFSB9A (1.5-2.5') 4-7-92	PSFSB9B (4-4.5') 4-7-92	PSFSB10A (1.5-2.5') 4-4-92
ORGANOPHOSPHORUS PESTICIDES (CONT'D):							
DICHLORVOS (DDVP), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
DISULFOTON (DI-SYSTON), ug/kg	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7
ETHOPROP (MOCAP), ug/kg	<8.30	<8.30	<8.30	<8.30	<8.30	<8.30	<8.3
FENSULFOTHION (DASANIT), ug/kg	<50	<50	<50.	<50.	<50.	<50	<50
FENTHION (BAYCID), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
MALATHION, ug/kg	<170	<170	<170	<170	<170	<170	<170
MERPHOS, ug/kg	<8.30	<8.30	<8.30	<8.30	<8.30	<8.30	<8.3
METHYL PARATHION, ug/kg	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1
MEVINPHOS (PHOSDRIN), ug/kg	<10	<10.	<10.	<10	<10.	<10.	<10
NALED, ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
PHORATE, ug/kg	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5
RONNEL (FENCHLORPHOS), ug/kg	<10.	<10.	<10.	<10.	<10.	<10.	<10
STIROPHOS (TETRACHLORVINPHOS), ug/kg	<170	<170	<170	<170	<170	<170	<170
ACID HERBICIDES:							
2,4,5-T, ug/kg	<164	<160	<162	<164	<161	<157	<139
2,4,5-TP (SILVEX), ug/kg	<140	<137	<139	<141	<138	<135	<139
2,4-D, ug/kg	<947	<924	<937	<949	<930	<909	<941
2,4-DB, ug/kg	<713	<696	<706	<714	<700	<685	<708
DALAPON, ug/kg	<4560	<4450	<4511	<4568	<4477	<4379	<4530
DICAMBA, ug/kg	<222	<217	<220	<223	<218	<213	<221
DICHLOROPROP, ug/kg	<514	<502	<509	<515	<505	<494	<511
DINOSEB, ug/kg	<58	<57	<58	<59	<57	<56	<58
MCPA, ug/kg	<195253	<190531	<193175	<195596	<191712	<187493	<193961
MCPP, ug/kg	<150824	<147176	<149219	<151089	<148089	<144830	<149826
2,3,7,8-TCDD (DIOXIN ISOMER), ppt	NA	<158.9	NA	NA	<209.3	NA	<168

NA - Not analyzed

H:\LT⁻ ⁻ERS\1113\RILEY\PS1531\LENL\SBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER	Sample Depth Date Collected	MWSB01A (15-17') 4-28-92	MWSB01B (21-25') 4-28-92	MWSB02A (1-2') 5-5-92	SAMPLE MWSB02B (4-8') 5-5-92	DUPLICATE MWSB02F (4-8') 5-5-92	MWSB02C (8-12') 5-5-92	MWSB02D (14-16') 5-5-92
PESTICIDES/PCBs:								
4,4'-DDD, ug/Kg		<7.4	<8.4	<8.1	<7.4	<7.3	<7.7	<7.5
4,4'-DDE, ug/Kg		<7.4	<8.4	<8.1	<7.4	<7.3	<7.7	<7.5
4,4'-DDT, ug/Kg		<7.4	<8.4	<8.1	<7.4	<7.3	<7.7	<7.5
Aldrin, ug/Kg		<3.7	<4.2	<4.1	<3.7	<3.7	<3.9	<3.7
Aroclor-1016, ug/Kg		<74	<84	<81	<74	<73	<77	<75
Aroclor-1221, ug/Kg		<74	<84	<81	<74	<73	<77	<75
Aroclor-1232, ug/Kg		<150	<170	<160	<150	<150	<150	<150
Aroclor-1242, ug/Kg		<74	<84	<81	<74	<73	<77	<75
Aroclor-1248, ug/Kg		<74	<84	<81	<74	<73	<77	<75
Aroclor-1254, ug/Kg		<74	<84	<81	<74	<73	<77	<75
Aroclor-1260, ug/Kg		<74	<84	<81	<74	<73	<77	<75
Dieldrin, ug/Kg		<7.4	<8.4	<8.1	<7.4	<7.3	<7.7	<7.5
Endosulfan I, ug/Kg		<3.7	<4.2	<4.1	<3.7	<3.7	<3.9	<3.7
Endosulfan II, ug/Kg		<7.4	<8.4	<8.1	<7.4	<7.3	<7.7	<7.5
Endosulfan sulfate, ug/Kg		<7.4	<8.4	<8.1	<7.4	<7.3	<7.7	<7.5
Endrin, ug/Kg		<7.4	<8.4	<8.1	<7.4	<7.3	<7.7	<7.5
Endrin aldehyde, ug/Kg		<7.4	<8.4	<8.1	<7.4	<7.3	<7.7	<7.5
Heptachlor, ug/Kg		<3.7	<4.2	<4.1	<3.7	<3.7	<3.9	<3.7
Heptachlor epoxide, ug/Kg		<3.7	<4.2	<4.1	<3.7	<3.7	<3.9	<3.7
Methoxychlor, ug/Kg		<37	<42	<41	<37	<37	<39	<37
Toxaphene, ug/Kg		<370	<420	<410	<370	<370	<390	<370
alpha-BHC, ug/Kg		<3.7	<4.2	<4.1	<3.7	<3.7	<3.9	<3.7
alpha-Chlordane, ug/Kg		<3.7	<4.2	73	<3.7	<3.7	<3.9	<3.7
beta-BHC, ug/Kg		<3.7	<4.2	<4.1	<3.7	<3.7	<3.9	<3.7
delta-BHC, ug/Kg		<3.7	<4.2	<4.1	<3.7	<3.7	<3.9	<3.7
gamma-BHC, ug/Kg		<3.7	<4.2	<4.1	<3.7	<3.7	<3.9	<3.7
gamma-Chlordane, ug/Kg		<3.7	<4.2	71	<3.7	<3.7	<3.9	<3.7

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SEDIMENTS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSD05B (1-2') 4-1-92	PSFSD06A (0-1') 3-31-92	PSFSD06B (1-2') 3-31-92	PSFSD07 (0-1') 3-31-92	PSFSD07B (1-2') 3-31-92	PSFSD09A (0-1') 7-16-92	PSFSD09B (1-2') 7-16-92
PHORATE, ug/kg	<5.00	<5.0	<5.0	<5.0	<5.0	<5.00	<5.00
RONNEL (FENCHLORPHOS), ug/kg	<10	<10	<10	<10	<10	<10.0	<10.0
STIROPHOS (TETRACHLORVINPHOS), ug/kg	<170	<170	<170	<170	<170	<170.0	<170
2,3,7,8-TCDD (DIOXIN ISOMER), ppt:	NA	NA	NA	NA	NA	NA	NA
ACID HERBICIDES:							
2,4,5-T, ug/kg	<166	<164	<198	<165	<168	<173.0	<177.0
2,4,5-TP (SILVEX), ug/kg	<142	<141	<169	<142	<144	<148.0	<152.0
2,4-D, ug/kg	<959	<948	<1144	<957	<973	<1002.0	<1026.0
2,4-DB, ug/kg	<722	<714	<861	<721	<733	<754.0	<772.0
DALAPON, ug/kg	<4617	<4567	<5508	<4609	<4686	<4824	<4939.0
DICAMBA, ug/kg	<225	<222	<268	<225	<228	<235.0	<241.0
DICHLOROPROP, ug/kg	<521	<515	<621	<520	<529	<544.0	<557.0
DINOSEB, ug/kg	<59	<59	<71	<59	<60	<62.0000	<63.0000
MCPA, ug/kg	<197703	<195550	<235842	<197353	<200649	<206555	<211473
MCPP, ug/kg	<152717	<151054	<182178	<152446	<154992	<159555	<163353

NA – Not analyzed

PRINTED: 22-Sep-92

H:\L[illegible]SERS\1113\RILEY\PS1531\LENL\SDTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER / Sample Depth / Date Collected	MWSB01A (15-17') 4-28-92	MWSB01B (21-25') 4-28-92	MWSB02A (1-2') 5-5-92	SAMPLE MWSB02B (4-8') 5-5-92	DUPLICATE MWSB02F (4-8') 5-5-92	MWSB02C (8-12') 5-5-92	MWSB02D (14-16') 5-5-92
SEMI-VOLATILE ORGANICS (CONT'D):							
Acenaphthene, ug/Kg	<180	<210	<200	<180	<180	<190	<180
Acenaphthylene, ug/Kg	<180	<210	<200	<180	<180	<190	<180
Anthracene, ug/Kg	<180	<210	<200	<180	<180	<190	<180
Benzo[a]anthracene, ug/Kg	<110	<130	600	<110	<110	<110	<110
Benzo[a]pyrene, ug/Kg	<260	<290	680	<260	<250	<270	<260
Benzo[b]fluoranthene, ug/Kg	<370	<420	1000	<370	<360	<380	<370
Benzo[ghi]perylene, ug/Kg	<370	<420	400	<370	<360	<380	<370
Benzo[k]fluoranthene, ug/Kg	<370	<420	<400	<370	<360	<380	<370
Benzoic acid, ug/Kg	<1000	<1100	<1100	<1000	<970	<1000	<1000
Benzyl alcohol, ug/Kg	<220	<250	<240	<220	<220	<230	<220
Butyl benzyl phthalate, ug/Kg	<370	<420	<400	<370	<360	<380	<370
Chrysene, ug/Kg	<110	<130	640	<110	<110	<110	<110
Di-n-butylphthalate, ug/Kg	<370	<420	<400	<370	<360	<380	<370
Di-n-octylphthalate, ug/Kg	<370	<420	<400	<370	<360	<380	<370
Dibenz[a,h]anthracene, ug/Kg	<370	<420	<400	<370	<360	<380	<370
Dibenzofuran, ug/Kg	<110	<130	<120	<110	<110	<110	<110
Diethylphthalate, ug/Kg	<370	<420	<400	<370	<360	<380	<370
Dimethylphthalate, ug/Kg	<370	<420	<400	<370	<360	<380	<370
Fluoranthene, ug/Kg	<150	<170	1000	<150	<140	<150	<150
Fluorene, ug/Kg	<260	<290	<280	<260	<250	<270	<260
Hexachlorobenzene, ug/Kg	<220	<250	<240	<220	<220	<230	<220
Hexachlorobutadiene, ug/Kg	<220	<250	<240	<220	<220	<230	<220
Hexachlorocyclopentadiene, ug/Kg	<370	<420	<400	<370	<360	<380	<370
Hexachloroethane, ug/Kg	<260	<290	<280	<260	<250	<270	<260
Indeno[1,2,3-cd]pyrene, ug/Kg	<370	<420	480	<370	<360	<380	<370
Isophorone, ug/Kg	<260	<290	<280	<260	<250	<270	<260
N-Nitrosodi-n-propylamine, ug/Kg	<220	<250	<240	<220	<220	<230	<220

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER	MWSB01A	MWSB01B	MWSB02A	SAMPLE MWSB02B	DUPLICATE MWSB02F	MWSB02C	MWSB02D
Sample Depth	(15-17')	(21-25')	(1-2')	(4-8')	(4-8')	(8-12')	(14-16')
Date Collected	4-28-92	4-28-92	5-5-92	5-5-92	5-5-92	5-5-92	5-5-92
SEMI-VOLATILE ORGANICS:							
1,2,4-Trichlorobenzene, ug/Kg	<260	<290	<280	<260	<250	<270	<260
1,2-Dichlorobenzene, ug/Kg	<180	<210	<200	<180	<180	<190	<180
1,3-Dichlorobenzene, ug/Kg	<260	<290	<280	<260	<250	<270	<260
1,4-Dichlorobenzene, ug/Kg	<220	<250	<240	<220	<220	<230	<220
2,4,5-Trichlorophenol, ug/Kg	<330	<380	<360	<330	<320	<340	<330
2,4,6-Trichlorophenol, ug/Kg	<300	<340	<320	<300	<290	<300	<300
2,4-Dichlorophenol, ug/Kg	<220	<250	<240	<220	<220	<230	<220
2,4-Dimethylphenol, ug/Kg	<370	<420	<400	<370	<360	<380	<370
2,4-Dinitrophenol, ug/Kg	<1600	<1800	<1700	<1600	<1500	<1600	<1600
2,4-Dinitrotoluene, ug/Kg	<260	<290	<280	<260	<250	<270	<260
2,6-Dinitrotoluene, ug/Kg	<260	<290	<280	<260	<250	<270	<260
2-Chloronaphthalene, ug/Kg	<220	<250	<240	<220	<220	<230	<220
2-Chlorophenol, ug/Kg	<150	<170	<160	<150	<140	<150	<150
2-Methylnaphthalene, ug/Kg	<150	<170	<160	<150	<140	<150	<150
2-Methylphenol, ug/Kg	<150	<170	<160	<150	<140	<150	<150
2-Nitroaniline, ug/Kg	<180	<210	<200	<180	<180	<190	<180
2-Nitrophenol, ug/Kg	<370	<420	<400	<370	<360	<380	<370
3,3'-Dichlorobenzidine, ug/Kg	<740	<840	<800	<740	<720	<760	<740
3-Nitroaniline, ug/Kg	<480	<550	<520	<480	<470	<490	<480
4,6-Dinitro-2-methylphenol, ug/Kg	<920	<1000	<1000	<920	<900	<950	<920
4-Bromophenyl phenyl ether, ug/Kg	<220	<250	<240	<220	<220	<230	<220
4-Chloro-3-methylphenol, ug/Kg	<260	<290	<280	<260	<250	<270	<260
4-Chloroaniline, ug/Kg	<150	<170	<160	<150	<140	<150	<150
4-Chlorophenyl phenyl ether, ug/Kg	<220	<250	<240	<220	<220	<230	<220
4-Methylphenol, ug/Kg	<260	<290	<280	<260	<250	<270	<260
4-Nitroaniline, ug/Kg	<590	<670	<640	<590	<580	<610	<590
4-Nitrophenol, ug/Kg	<440	<500	<480	<440	<430	<460	<440

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SEDIMENTS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSD05B (1-2') 4-1-92	PSFSD06A (0-1') 3-31-92	PSFSD06B (1-2') 3-31-92	PSFSD07 (0-1') 3-31-92	PSFSD07B (1-2') 3-31-92	PSFSD09A (0-1') 7-16-92	PSFSD09B (1-2') 7-16-92
TOTAL FURNACE METALS:							
Arsenic, mg/Kg	3.8	1.7	1.8	1.4	1.4	2.6	2.5
Selenium, mg/Kg	<0.2 (M2)	0.3 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	0.2 (M2)	0.3 (M2)
TOTAL MERCURY:							
Mercury, mg/kg	<0.1	0.4 (B1)	0.2 (B1)	0.1 (B1)	<0.1	<0.1	0.4
TOTAL ICP METALS:							
Barium, mg/Kg	74	44	110	76	52	97	130
Cadmium, mg/Kg	<0.7	1.3	<0.8	<0.8	<0.7	1.9	3.3
Chromium, mg/Kg	8.0	7.7	8.4	9.4	6.1	14	17
Lead, mg/Kg	56	66	61	24	15	88	140
Silver, mg/Kg	<0.7	<0.7	<0.8	<0.8	<0.7	<0.7	<0.7
ORGANOPHOSPHORUS PESTICIDES:							
AZINPHOS METHYL (GUTHION), ug/kg	<50	<50	<50	<50	<50	<50.0	<50.0
BOLSTAR (SULPROFOS), ug/kg	<5.00	<5.0	<5.0	<5.0	<5.0	<5.00	<5.00
CHLORPYRIFOS (DURSBAN), ug/kg	<10	<10	<10	<10	<10	<10.0	<10.0
COUMAPHOS (CO-RAL), ug/kg	<50	<50	<50	<50	<50	<50.0	<50.0
DEMETON-S (MERCAPTOPHOS), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.30	<8.30
DIAZINON, ug/kg	<20	<20	<20	<20	<20	<20.0	<20.0
DICHLORVOS (DDVP), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
DISULFOTON (DI-SYSTON), ug/kg	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7
ETHOPROP (MOCAP), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.30	<8.30
FENSULFOTHION (DASANIT), ug/kg	<50	<50	<50	<50	<50	<50.0	<50.0
FENTHION (BAYCID), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
MALATHION, ug/kg	<170	<170	<170	<170	<170	<170	<170
MERPHOS, ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.30	<8.30
METHYL PARATHION, ug/kg	<1.00	<1.0	<1.0	<1.0	<1.0	<1.00	<1.00
MEVINPHOS (PHOSDRIN), ug/kg	<10	<10	<10	<10	<10	<10.0	<10.0
NALED, ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3

B1 – Sample results are less than 5 times the amount detected in the method blank. Result is estimated.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
-- Not detected

ORGANOPHOSPHORUS PESTICIDES (CONT'D):

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SEDIMENTS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSD05B (1-2') 4-1-92	PSFSD06A (0-1') 3-31-92	PSFSD06B (1-2') 3-31-92	PSFSD07 (0-1') 3-31-92	PSFSD07B (1-2') 3-31-92	PSFSD09A (0-1') 7-16-92	PSFSD09B (1-2') 7-16-92
VOLATILE ORGANICS (CONT'D):							
1,1-Dichloroethane, ug/Kg	<6.2	<6.2	<7.1	<6.2	<6.2	<6.0	<6.4
1,1-Dichloroethene, ug/Kg	<3.7	<3.7	<4.2	<3.7	<3.7	<3.6	<3.8
1,2-Dichloroethane, ug/Kg	<6.2	<6.2	<7.1	<6.2	<6.2	<6.0	<6.4
1,2-Dichloroethene (total), ug/Kg	<6.2	<6.2	<7.1	<6.2	<6.2	<6.0	<6.4
1,2-Dichloropropane, ug/Kg	<3.7 (I)	<3.7	<4.2	<3.7	<3.7	<3.6	<3.8
2-Butanone, ug/Kg	<120 (I)	<120	<140	<120	<120	<120	<130
2-Hexanone, ug/Kg	<12 (I)	<12	<14	<12	<12	<12	<13
4-Methyl-2-pentanone, ug/Kg	<12 (I)	<12	<14	<12	<12	<12	<13
Acetone, ug/Kg	<120	<120	<140	<120	<120	<120	<130
Benzene, ug/Kg	<3.7 (I)	<3.7	<4.2	<3.7	<3.7	<3.6	<3.8
Bromodichloromethane, ug/Kg	<6.2 (I)	<6.2	<7.1	<6.2	<6.2	<6.0	<6.4
Bromoform, ug/Kg	<6.2 (I)	<6.2	<7.1	<6.2	<6.2	<6.0	<6.4
Bromomethane, ug/Kg	<12	<12	<140	<12	<12	<12	<13
Carbon disulfide, ug/Kg	<3.7	<3.7	<4.2	<3.7	<3.7	<3.6	<3.8
Carbon tetrachloride, ug/Kg	<3.7 (I)	<3.7	<4.2	<3.7	<3.7	<3.6	<3.8
Chlorobenzene, ug/Kg	<3.7(I)	<3.7	<4.2	<3.7	<3.7	<3.6	<3.8
Chloroethane, ug/Kg	<12	<12	<14	<12	<12	<12	<13
Chloroform, ug/Kg	<3.7	<3.7	<4.2	<3.7	<3.7	<3.6	<3.8
Chloromethane, ug/Kg	<12	<12	<14	<12	<12	<12	<13
Dibromochloromethane, ug/Kg	<6.2 (I)	<6.2	<7.1	<6.2	<6.2	<6.0	<6.4
Ethylbenzene, ug/Kg	<3.7 (I)	<3.7	<4.2	<3.7	<3.7	<3.6	<3.8
Methylene chloride, ug/Kg	86	12 (B2)(T)	30 (B2)(T)	27 (B2)(T)	21 (B2)(T)	21 (B2)	23 (B2)
Styrene, ug/Kg	<3.7 (I)	<3.7	<4.2	<3.7	<3.7	<3.6	<3.8
Tetrachloroethene, ug/Kg	<3.7 (I)	<3.7	<4.2	<3.7	<3.7	<3.6	<3.8
Toluene, ug/Kg	7.4 (I)	<6.2	<7.1	<6.2	<6.2	<6.0	<6.4
Trichloroethene, ug/Kg	<3.7 (I)	<3.7	<4.2	<3.7	<3.7	<3.6	<3.8
Vinyl acetate, ug/Kg	<12 (I)	<12	<14	<12	<12	<12	<13
Vinyl chloride, ug/Kg	<12	<12	<14	<12	<12	<12	<13
Xylenes (total), ug/Kg	<6.0 (I)	<6.2	<7.1	<6.2	<6.2	<6.0	<6.4
cis-1,3-Dichloropropene, ug/Kg	<3.7 (I)	<3.7	<4.2	<3.7	<3.7	<3.6	<3.8
trans-1,3-Dichloropropene, ug/Kg	<3.7 (I)	<3.7	<4.2	<3.7	<3.7	<3.6	<3.8

B2 – Sample results are less than 10 times the amount detected in the method blank. Result is estimated.
I – Low internal standard response. Result is an estimated quantitation.
T – Sample results are less than 10 times the amount detected in the trip blank. Result is estimated.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SEDIMENTS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSD05B (1-2') 4-1-92	PSFSD06A (0-1') 3-31-92	PSFSD06B (1-2') 3-31-92	PSFSD07 (0-1') 3-31-92	PSFSD07B (1-2') 3-31-92	PSFSD09A (0-1') 7-16-92	PSFSD09B (1-2') 7-16-92
<u>SEMI-VOLATILE ORGANICS (CONT'D):</u>							
2,4-Dichlorophenol, ug/Kg	<230	<280	<280	<250	<230	<240	<250
2,4-Dimethylphenol, ug/Kg	<390	<460	<470	<410	<390	<400	<420
2,4-Dinitrophenol, ug/Kg	<1700	<2000	<2000	<1800	<1700	<1700	<1800
2,4-Dinitrotoluene, ug/Kg	<270	<320	<330	<290	<270	<280	<290
2,6-Dinitrotoluene, ug/Kg	<270	<320	<330	<290	<270	<280	<290
2-Chloronaphthalene, ug/Kg	<230	<280	<280	<250	<230	<240	<250
2-Chlorophenol, ug/Kg	<160	<180	<190	<160	<160	<160	<170
2-Methylnaphthalene, ug/Kg	<160	<180	<190	<160	<160	<160	<170
2-Methylphenol, ug/Kg	<160	<180	<190	<160	<160	<160	<170
2-Nitroaniline, ug/Kg	<200	<230	<240	<210	<200	<200	<210
2-Nitrophenol, ug/Kg	<390	<460	<470	<410	<390	<400	<420
3,3'-Dichlorobenzidine, ug/Kg	<780	<920	<940	<820	<780	<800	<840
3-Nitroaniline, ug/Kg	<510	<600	<610	<530	<510	<520	<550
4,6-Dinitro-2-methylphenol, ug/Kg	<980	<1200	<1200	<1000	<980	<1000	<1000
4-Bromophenyl phenyl ether, ug/Kg	<230	<280	<280	<250	<230	<240	<250
4-Chloro-3-methylphenol, ug/Kg	<270	<320	<330	<290	<270	<280	<290
4-Chloroaniline, ug/Kg	<160	<180	<190	<160	<160	<160	<170
4-Chlorophenyl phenyl ether, ug/Kg	<230	<280	<280	<250	<230	<240	<250
4-Methylphenol, ug/Kg	<270	<320	<330	<290	<270	<280	<290
4-Nitroaniline, ug/Kg	<620	<740	<750	<660	<620	<640	<670
4-Nitrophenol, ug/Kg	<470	<550	<560	<490	<470	<480	<500
Acenaphthene, ug/Kg	<200	<230	<240	<210	<200	<200	<210
Acenaphthylene, ug/Kg	<200	<230	<240	<210	<200	<200	<210
Anthracene, ug/Kg	<200	<230	<240	<210	<200	<200	<210
Benzo[a]anthracene, ug/Kg	160	<140	<140	<120	<120	160	130
Benzo[a]pyrene, ug/Kg	<270	<320	<330	<290	<270	<280	<290 (I)
Benzo[b]fluoranthene, ug/Kg	<390	<460	<470	<410	<390	<400	<420 (I)
Benzo[ghi]perylene, ug/Kg	<390	<460	<470	<410	<390	<400	<420 (I)
Benzo[k]fluoranthene, ug/Kg	<390	<460	<470	<410	<390	<400	<420 (I)
Benzoic acid, ug/Kg	<1100	<1200	<1300	<1100	<1100	<1100	<1100
Benzyl alcohol, ug/Kg	<230	<280	<280	<250	<230	<240	<250
Butyl benzyl phthalate, ug/Kg	<390	<460	<470	<410	<390	<400	<420

I – Low internal standard response. Result is an estimated quantitation.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SEDIMENTS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSD05B (1-2') 4-1-92	PSFSD06A (0-1') 3-31-92	PSFSD06B (1-2') 3-31-92	PSFSD07 (0-1') 3-31-92	PSFSD07B (1-2') 3-31-92	PSFSD09A (0-1') 7-16-92	PSFSD09B (1-2') 7-16-92
SEMI-VOLATILE ORGANICS (CONT'D):							
Chrysene, ug/Kg	160	<140	<140	120	120	240	130
Di-n-butylphthalate, ug/Kg	<390	<460	<470	<410	<390	<400	<420
Di-n-octylphthalate, ug/Kg	<390	<460	<470	<410	<390	<400	<420 (I)
Dibenz[a,h]anthracene, ug/Kg	<390	<460	<470	<410	<390	<400	<420 (I)
Dibenzofuran, ug/Kg	<120	<140	<140	<120	<120	<120	<130
Diethylphthalate, ug/Kg	<390	<460	<470	<410	<390	<400	<420
Dimethylphthalate, ug/Kg	<390	<460	<470	<410	<390	<400	<420
Fluoranthene, ug/Kg	270	<180	190	<160	<160	360	290
Fluorene, ug/Kg	<270	<320	<330	<290	<270	<280	<290
Hexachlorobenzene, ug/Kg	<230	<280	<280	<250	<230	<240	<250
Hexachlorobutadiene, ug/Kg	<230	<280	<280	<250	<230	<240	<250
Hexachlorocyclopentadiene, ug/Kg	<390	<460	<470	<410	<390	<400	<420
Hexachloroethane, ug/Kg	<270	<320	<330	<290	<270	<280	<290
Indeno[1,2,3-cd]pyrene, ug/Kg	<390	<460	<470	<410	<390	<400	<420 (I)
Isophorone, ug/Kg	<270	<320	<330	<290	<270	<280	<290
N-Nitrosodi-n-propylamine, ug/Kg	<230	<280	<280	<250	<230	<240	<250
N-Nitrosodiphenylamine, ug/Kg	<200	<230	<240	<210	<200	<200	<210
Naphthalene, ug/Kg	<120	<140	<140	<120	<120	<120	<130
Nitrobenzene, ug/Kg	<390	<460	<470	<410	<390	<400	<420
Pentachlorophenol, ug/Kg	<620	<740	<750	<660	<620	<640	<670
Phenanthrene, ug/Kg	200	<180	<190	<160	<160	360	210
Phenol, ug/Kg	<200	<230	<240	<210	<200	<200	<210
Pyrene, ug/Kg	310	<140	140	160	120	440	380
bis(2-Chloroethoxy)methane, ug/Kg	<230	<280	<280	<250	<230	<240	<250
bis(2-Chloroethyl)ether, ug/Kg	<230	<280	<280	<250	<230	<240	<250
bis(2-Chloroisopropyl)ether, ug/Kg	<200	<230	<240	<210	<200	<200	<210
bis(2-Ethylhexyl)phthalate, ug/Kg	<390	<460	<470	<410	470	<400	<420
VOLATILE ORGANICS:							
1,1,1-Trichloroethane, ug/Kg	<6.2 (I)	<6.2	<7.1	<6.2	<6.2	<6.0	<6.4
1,1,2,2-Tetrachloroethane, ug/Kg	<6.2 (I)	<6.2	<7.1	<6.2	<6.2	<6.0	<6.4
1,1,2-Trichloroethane, ug/Kg	<6.2 (I)	<6.2	<7.1	<6.2	<6.2	<6.0	<6.4

I - Low internal standard response. Result is an estimated quantitation.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER	MWSB01A	MWSB01B	MWSB02A	SAMPLE MWSB02B	DUPLICATE MWSB02F	MWSB02C	MWSB02D
Sample Depth	(15–17')	(21–25')	(1–2')	(4–8')	(4–8')	(8–12')	(14–16')
Date Collected	4-28-92	4-28-92	5-5-92	5-5-92	5-5-92	5-5-92	5-5-92
VOLATILE ORGANICS (CONT'D):							
Bromoform, ug/Kg	<7.5	<6.4	<6.0	<5.2	<5.4	<5.6	<5.2
Bromomethane, ug/Kg	<15	<13	<12	<10	<11	<11	<10
Carbon disulfide, ug/Kg	<4.5	<3.9	<3.6	<3.1	<3.2	<3.4	<3.1
Carbon tetrachloride, ug/Kg	<4.5	<3.9	<3.6	<3.1	<3.2	<3.4	<3.1
Chlorobenzene, ug/Kg	<4.5	<3.9	<3.6 (I)	<3.1	<3.2	<3.4	<3.1
Chloroethane, ug/Kg	<15	<13	<12	<10	<11	<11	<10
Chloroform, ug/Kg	<4.5	<3.9	<3.6	<3.1	<3.2	<3.4	<3.1
Chloromethane, ug/Kg	<15	<13	<12	<10	<11	<11	<10
Dibromochloromethane, ug/Kg	<7.5	<6.4	<6.0	<5.2	<5.4	<5.6	<5.2
Ethylbenzene, ug/Kg	<4.5	<3.9	<3.6 (I)	<3.1	<3.2	<3.4	<3.1
Methylene chloride, ug/Kg	62 (B2)	46 (B2)	30	18	17	19	17
Styrene, ug/Kg	<4.5	<3.9	<3.6 (I)	<3.1	<3.2	<3.4	<3.1
Tetrachloroethene, ug/Kg	<4.5	<3.9	<3.6 (I)	<3.1	<3.2	<3.4	<3.1
Toluene, ug/Kg	<7.5	<6.4	<6.0 (I)	<5.2	<5.4	<5.6	<5.2
Trichloroethene, ug/Kg	<4.5	<3.9	<3.6	<3.1	<3.2	<3.4	<3.1
Vinyl acetate, ug/Kg	<15	<13	<12	<10	<11	<11	<10
Vinyl chloride, ug/Kg	<15	<13	<12	<10	<11	<11	<10
Xylenes (total), ug/Kg	<7.5	<6.4	<6.0 (I)	<5.2	<5.4	<5.6	<5.2
cis-1,3-Dichloropropene, ug/Kg	<4.5	<3.9	<3.6	<3.1	<3.2	<3.4	<3.1
trans-1,3-Dichloropropene, ug/Kg	<4.5	<3.9	<3.6	<3.1	<3.2	<3.4	<3.1
TOTAL FURNACE METALS:							
Arsenic, mg/Kg	1.0	2.5	3.7	1.7	1.6	1.7	2.4
Selenium, mg/Kg	<0.2 (M2)	<0.2 (M2)	0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)

B2 – Sample results are less than 10 times the amount detected in the method blank. Result is estimated.
I – Low internal standard response. Result is an estimated quantitation.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER	MWSB01A	MWSB01B	MWSB02A	SAMPLE MWSB02B	DUPLICATE MWSB02F	MWSB02C	MWSB02D
Sample Depth	(15-17')	(21-25')	(1-2')	(4-8')	(4-8')	(8-12')	(14-16')
Date Collected	4-28-92	4-28-92	5-5-92	5-5-92	5-5-92	5-5-92	5-5-92
SEMI-VOLATILE ORGANICS (CONT'D):							
N-Nitrosodiphenylamine, ug/Kg	<180	<210	<200	<180	<180	<190	<180
Naphthalene, ug/Kg	<110	<130	<120	<110	<110	<110	<110
Nitrobenzene, ug/Kg	<370	<420	<400	<370	<360	<380	<370
Pentachlorophenol, ug/Kg	<590	<670	<640	<590	<580	<610	<590
Phenanthrene, ug/Kg	<150	<170	560	<150	<140	<150	<150
Phenol, ug/Kg	<180	<210	<200	<180	<180	<190	<180
Pyrene, ug/Kg	<110	<130	800	<110	<110	<110	<110
bis(2-Chloroethoxy)methane, ug/Kg	<220	<250	<240	<220	<220	<230	<220
bis(2-Chloroethyl)ether, ug/Kg	<220	<250	<240	<220	<220	<230	<220
bis(2-Chloroisopropyl)ether, ug/Kg	<180	<210	<200	<180	<180	<190	<180
bis(2-Ethylhexyl)phthalate, ug/Kg	<370	<420	480	<370	<360	<380	<370
VOLATILE ORGANICS:							
1,1,1-Trichloroethane, ug/Kg	<7.5	<6.4	<6.0	<5.2	<5.4	<5.6	<5.2
1,1,2,2-Tetrachloroethane, ug/Kg	<7.5	<6.4	<6.0 (I)	<5.2	<5.4	<5.6	<5.2
1,1,2-Trichloroethane, ug/Kg	<7.5	<6.4	<6.0	<5.2	<5.4	<5.6	<5.2
1,1-Dichloroethane, ug/Kg	<7.5	<6.4	<6.0	<5.2	<5.4	<5.6	<5.2
1,1-Dichloroethene, ug/Kg	<4.5	<3.9	<3.6	<3.1	<3.2	<3.4	<3.1
1,2-Dichloroethane, ug/Kg	<7.5	<6.4	<6.0	<5.2	<5.4	<5.6	<5.2
1,2-Dichloroethene (total), ug/Kg	<7.5	<6.4	<6.0	<5.2	<5.4	<5.6	<5.2
1,2-Dichloropropane, ug/Kg	<4.5	<3.9	<3.6	<3.1	<3.2	<3.4	<3.1
2-Butanone, ug/Kg	<150	<130	<120	<100	<110	<110	<100
2-Hexanone, ug/Kg	<15	<13	<12 (I)	<10	<11	<11	<10
4-Methyl-2-pentanone, ug/Kg	<15	<13	<12 (I)	<10	<11	<11	<10
Acetone, ug/Kg	<150	<130	<120	<100	<110	<110	<100
Benzene, ug/Kg	6.6	5.9	<3.6	<3.1	<3.2	<3.4	<3.1
Bromodichloromethane, ug/Kg	<7.5	<6.4	<6.0	<5.2	<5.4	<5.6	<5.2

I - Low internal standard response. Result is an estimated quantitation.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER	Sample Depth / Date Collected	MWSB01A (15-17') 4-28-92	MWSB01B (21-25') 4-28-92	MWSB02A (1-2') 5-5-92	SAMPLE MWSB02B (4-8') 5-5-92	DUPLICATE MWSB02F (4-8') 5-5-92	MWSB02C (8-12') 5-5-92	MWSB02D (14-16') 5-5-92
ACID HERBICIDES:								
2,4,5-T, ug/kg		<154	<178	<164	<155	<152	<156	<157
2,4,5-TP (SILVEX), ug/kg		<132	<153	<141	<133	<130	<134	<135
2,4-D, ug/kg		<892	<1032	<949	<895	<880	<904	<911
2,4-DB, ug/kg		<672	<777	<714	<674	<663	<681	<686
DALAPON, ug/kg		<4295	<4968	<4568	<4309	<4236	<4355	<4386
DICAMBA, ug/kg		<209	<242	<223	<210	<206	<212	<214
DICHLOROPROP, ug/kg		<485	<560	<515	<486	<478	<491	<495
DINOSEB, ug/kg		<55	<64	<59	<55	<54	<56	<56
MCPA, ug/kg		<183900	<212712	<195596	<184510	<181384	<186467	<187809
MCPP, ug/kg		<142055	<164310	<151089	<142526	<140111	<144038	<145074

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER				SAMPLE	DUPLICATE		
	MWSB01A	MWSB01B	MWSB02A	MWSB02B	MWSB02F	MWSB02C	MWSB02D
Sample Depth	(15-17')	(21-25')	(1-2')	(4-8')	(4-8')	(8-12')	(14-16')
Date Collected	4-28-92	4-28-92	5-5-92	5-5-92	5-5-92	5-5-92	5-5-92
TOTAL ICP METALS:							
Barium, mg/Kg	61	120	130	53	60	83	100
Cadmium, mg/Kg	<0.8	<1.0	<0.8	<0.8	<0.8	<0.8	<0.9
Chromium, mg/Kg	6.8	8.7	10	11	7.9	4.8	6.4
Lead, mg/Kg	5.1	10	56	<3.7	4.7	<3.8	<4.3
Silver, mg/Kg	<0.6	<0.8	1.0	0.9	<0.6	<0.7	1.1
TOTAL MERCURY:							
Mercury, mg/kg	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1
ORGANOPHOSPHORUS PESTICIDES:							
AZINPHOS METHYL (GUTHION), ug/kg	<50	<50	<50	<50	<50	<50	<50
BOLSTAR, ug/kg	<5	<5	<5	<5	<5	<5	<5
CHLORPYRIFOS (DURSBAN), ug/kg	<10	<10	<10	<10	<10	<10	<10
COUMAPHOS (CO-RAL), ug/kg	<50	<50	<50	<50	<50	<50	<50
DEMETON-S (MERCAPTOPHOS), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
DIAZINON, ug/kg	<20	<20	<20	<20	<20	<20	<20
DICHLORVOS (DDVP), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
DISULFOTON (DI-SYSTON), ug/kg	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7
ETHOPROP (MOCAP), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
FENSULFOTHION (DASANIT), ug/kg	<50	<50	<50	<50	<50	<50	<50
FENTHION (BAYCID), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
MALATHION, ug/kg	<170	<170	<170	<170	<170	<170	<170
MERPHOS, ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
METHYL PARATHION, ug/kg	<1	<1	<1	<1	<1	<1	<1
MEVINPHOS (PHOSDRIN), ug/kg	<10	<10	<10	<10	<10	<10	<10
NALED, ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
PHORATE, ug/kg	<5	<5	<5	<5	<5	<5	<5
RONNEL (FENCHLORPHOS), ug/kg	<10	<10	<10	<10	<10	<10	<10
STIROPHOS (TETRACHLORVINPHOS), ug/kg	<170	<170	<170	<170	<170	<170	<170

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER	MWSB02E	MWSB03A	MWSB03B	MWSB04A	MWSB04B	MWSB05A	MWSB05B
Sample Depth	(20-22')	(10-14')	(20-22')	(12-14')	(22-24')	(9-11')	(17-19')
Date Collected	5-5-92	5-2-92	5-2-92	5-4-92	5-4-92	4-29-92	4-29-92
SEMI-VOLATILE ORGANICS (CONT'D):							
N-Nitrosodiphenylamine, ug/Kg	<180	<210	<200	<180	<200	<180	<180
Naphthalene, ug/Kg	<110	<130	<120	<110	<120	<110	<110
Nitrobenzene, ug/Kg	<370	<420	<400	<360	<410	<370	<370
Pentachlorophenol, ug/Kg	<590	<670	<640	<580	<660	<590	<590
Phenanthrene, ug/Kg	<150	<170	<160	<140	<160	<150	<150
Phenol, ug/Kg	<180	<210	<200	<180	<200	<180	<180
Pyrene, ug/Kg	<110	<130	<120	<110	<120	180	<110
bis(2-Chloroethoxy)methane, ug/Kg	<220	<250	<240	<220	<250	<220	<220
bis(2-Chloroethyl)ether, ug/Kg	<220	<250	<240	<220	<250	<220	<220
bis(2-Chloroisopropyl)ether, ug/Kg	<180	<210	<200	<180	<200	<180	<180
bis(2-Ethylhexyl)phthalate, ug/Kg	<370	<420	<400	<360	<410	<370	<370
VOLATILE ORGANICS:							
1,1,1-Trichloroethane, ug/Kg	<2.6	<5.6	<5.9	<5.4	<6.0	<5.8	<5.8
1,1,2,2-Tetrachloroethane, ug/Kg	<5.6	<5.6	<5.9	<5.4	<6.0	<5.8	<5.8
1,1,2-Trichloroethane, ug/Kg	<5.6	<5.6	<5.9	<5.4	<6.0	<5.8	<5.8
1,1-Dichloroethane, ug/Kg	<5.6	<5.6	<5.9	<5.4	<6.0	<5.8	<5.8
1,1-Dichloroethene, ug/Kg	<3.4	<3.3	<3.5	<3.3	<3.6	<3.4	<3.4
1,2-Dichloroethane, ug/Kg	<5.6	<5.6	<5.9	<5.4	<6.0	<5.8	<5.8
1,2-Dichloroethene (total), ug/Kg	<5.6	<5.6	<5.9	<5.4	<6.0	<5.8	<5.8
1,2-Dichloropropane, ug/Kg	<3.4	<3.3	<3.5	<3.3	<3.6	<3.4	<3.4
2-Butanone, ug/Kg	<110	<110	<120	<110	<120	<120	<120
2-Hexanone, ug/Kg	<11	<11	<12	<11	<12	<12	<12
4-Methyl-2-pentanone, ug/Kg	<11	<11	<12	<11	<120	<12	<12
Acetone, ug/Kg	<110	<110	<120	<110	<120	<120	<120
Benzene, ug/Kg	<3.4	<3.3	<3.5	<3.3	<3.6	<3.4	<3.4
Bromodichloromethane, ug/Kg	<5.6	<5.6	<5.9	<5.4	<6.0	<5.8	<5.8

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER	MWSB02E	MWSB03A	MWSB03B	MWSB04A	MWSB04B	MWSB05A	MWSB05B
Sample Depth	(20-22')	(10-14')	(20-22')	(12-14')	(22-24')	(9-11')	(17-19')
Date Collected	5-5-92	5-2-92	5-2-92	5-4-92	5-4-92	4-29-92	4-29-92
SEMI-VOLATILE ORGANICS (CONT'D):							
Acenaphthene, ug/Kg	<180	<210	<200	<180	<200	<180	<180
Acenaphthylene, ug/Kg	<180	<210	<200	<180	<200	<180	<180
Anthracene, ug/Kg	<180	<210	<200	<180	<200	<180	<180
Benzo[a]anthracene, ug/Kg	<110	<130	<120	<110	<120	110	<110
Benzo[a]pyrene, ug/Kg	<260	<290	<280	<250 (I)	<290	<260	<260
Benzo[b]fluoranthene, ug/Kg	<370	<420	<400	<360 (I)	<410	<370	<370
Benzo[ghi]perylene, ug/Kg	<370	<420	<400	<360 (I)	<410	<370	<370
Benzo[k]fluoranthene, ug/Kg	<370	<420	<400	<360 (I)	<410	<370	<370
Benzoic acid, ug/Kg	<1000	<1100	<1100	<970	<1100	<1000	<1000
Benzyl alcohol, ug/Kg	<220	<250	<240	<220	<250	<220	<220
Butyl benzyl phthalate, ug/Kg	<370	<420	<400	<360	<410	<370	<370
Chrysene, ug/Kg	<110	<130	<120	<110	<120	110	<110
Di-n-butylphthalate, ug/Kg	<370	<420	<400	<360	<410	<370	<370
Di-n-octylphthalate, ug/Kg	<370	<420	<400	<360 (I)	<410	<370	<370
Dibenz[a,h]anthracene, ug/Kg	<370	<420	<400	<360 (I)	<410	<370	<370
Dibenzofuran, ug/Kg	<110	<130	<120	<110	<120	<110	<110
Diethylphthalate, ug/Kg	<370	<420	<400	<360	<410	<370	<370
Dimethylphthalate, ug/Kg	<370	<420	<400	<360	<410	<370	<370
Fluoranthene, ug/Kg	<150	<170	<160	<140	<160	180	<150
Fluorene, ug/Kg	<260	<290	<280	<250	<290	<260	<260
Hexachlorobenzene, ug/Kg	<220	<250	<240	<220	<250	<220	<220
Hexachlorobutadiene, ug/Kg	<220	<250	<240	<220	<250	<220	<220
Hexachlorocyclopentadiene, ug/Kg	<370	<420	<400	<360	<410	<370	<370
Hexachloroethane, ug/Kg	<260	<290	<280	<250	<290	<260	<260
Indeno[1,2,3-cd]pyrene, ug/Kg	<370	<420	<400	<360 (I)	<410	<370	<370
Isophorone, ug/Kg	<260	<290	<280	<250	<290	<260	<260
N-Nitrosodi-n-propylamine, ug/Kg	<220	<250	<240	<220	<250	<220	<220

I - Low internal standard response. Result is an estimated quantitation.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER	Sample Depth / Date Collected	MWSB02E (20-22') 5-5-92	MWSB03A (10-14') 5-2-92	MWSB03B (20-22') 5-2-92	MWSB04A (12-14') 5-4-92	MWSB04B (22-24') 5-4-92	MWSB05A (9-11') 4-29-92	MWSB05B (17-19') 4-29-92
PESTICIDES/PCBs:								
4,4'-DDD, ug/Kg		<7.5	<8.4	<8.0	<7.2	<8.3	<7.6	<7.6
4,4'-DDE, ug/Kg		<7.5	<8.4	<8.0	12	<8.3	<7.6	<7.6
4,4'-DDT, ug/Kg		<7.5	<8.4	<8.0	<7.2	<8.3	<7.6	<7.6
Aldrin, ug/Kg		<3.7	<4.2	<4.0	<3.6	<4.2	<3.8	<3.8
Aroclor-1016, ug/Kg		<75	<84	<80	<72	<83	<76	<76
Aroclor-1221, ug/Kg		<75	<84	<80	<72	<83	<76	<76
Aroclor-1232, ug/Kg		<150	<170	<160	<140	<170	<150	<150
Aroclor-1242, ug/Kg		<75	<84	<80	<72	<83	<76	<76
Aroclor-1248, ug/Kg		<75	<84	<80	<72	<83	<76	<76
Aroclor-1254, ug/Kg		<75	<84	<80	<72	<83	<76	<76
Aroclor-1260, ug/Kg		<75	<84	<80	<72	<83	<76	<76
Dieldrin, ug/Kg		<7.5	8.7	<8.0	13	<8.3	<7.6	<7.6
Endosulfan I, ug/Kg		<3.7	<4.2	<4.0	<3.6	<4.2	<3.8	<3.8
Endosulfan II, ug/Kg		<7.5	<8.4	<8.0	<7.2	<8.3	<7.6	<7.6
Endosulfan sulfate, ug/Kg		<7.5	<8.4	<8.0	<7.2	<8.3	<7.6	<7.6
Endrin, ug/Kg		<7.5	<8.4	<8.0	<7.2	<8.3	<7.6	<7.6
Endrin aldehyde, ug/Kg		<7.5	<8.4	<8.0	<7.2	<8.3	<7.6	<7.6
Heptachlor, ug/Kg		<3.7	<4.2	<4.0	<3.6	<4.2	<3.8	<3.8
Heptachlor epoxide, ug/Kg		<3.7	<4.2	<4.0	<3.6	<4.2	<3.8	<3.8
Methoxychlor, ug/Kg		<37	<42	<40	<36	<42	<38	<38
Toxaphene, ug/Kg		<370	<420	<400	<360	<420	<380	<380
alpha-BHC, ug/Kg		<3.7	<4.2	<4.0	<3.6	<4.2	<3.8	<3.8
alpha-Chlordane, ug/Kg		<3.7	<4.2	<4.0	15	<4.2	<3.8	<3.8
beta-BHC, ug/Kg		<3.7	<4.2	<4.0	<3.6	<4.2	<3.8	<3.8
delta-BHC, ug/Kg		<3.7	<4.2	<4.0	<3.6	<4.2	<3.8	<3.8
gamma-BHC, ug/Kg		<3.7	<4.2	<4.0	<3.6	<4.2	<3.8	<3.8
gamma-Chlordane, ug/Kg		<3.7	5.1	<4.0	18	<4.2	<3.8	<3.8

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	MWSB02E (20-22') 5-5-92	MWSB03A (10-14') 5-2-92	MWSB03B (20-22') 5-2-92	MWSB04A (12-14') 5-4-92	MWSB04B (22-24') 5-4-92	MWSB05A (9-11') 4-29-92	MWSB05B (17-19') 4-29-92
SEMI-VOLATILE ORGANICS:							
1,2,4-Trichlorobenzene, ug/Kg	<260	<290	<280	<250	<290	<260	<260
1,2-Dichlorobenzene, ug/Kg	<180	<210	<200	<180	<200	<180	<180
1,3-Dichlorobenzene, ug/Kg	<260	<290	<280	<250	<290	<260	<260
1,4-Dichlorobenzene, ug/Kg	<220	<250	<240	<220	<250	<220	<220
2,4,5-Trichlorophenol, ug/Kg	<330	<380	<360	<320	<370	<330	<330
2,4,6-Trichlorophenol, ug/Kg	<300	<340	<320	<290	<330	<300	<300
2,4-Dichlorophenol, ug/Kg	<220	<250	<240	<220	<250	<220	<220
2,4-Dimethylphenol, ug/Kg	<370	<420	<400	<360	<410	<370	<370
2,4-Dinitrophenol, ug/Kg	<1600	<1800	<1700	<1500	<1800	<1600	<1600
2,4-Dinitrotoluene, ug/Kg	<260	<290	<280	<250	<290	<260	<260
2,6-Dinitrotoluene, ug/Kg	<260	<290	<280	<250	<290	<260	<260
2-Chloronaphthalene, ug/Kg	<220	<250	<240	<220	<250	<220	<220
2-Chlorophenol, ug/Kg	<150	<170	<160	<140	<160	<150	<150
2-Methylnaphthalene, ug/Kg	<150	<170	<160	<140	<160	<150	<150
2-Methylphenol, ug/Kg	<150	<170	<160	<140	<160	<150	<150
2-Nitroaniline, ug/Kg	<180	<210	<200	<180	<200	<180	<180
2-Nitrophenol, ug/Kg	<370	<420	<400	<360	<410	<370	<370
3,3'-Dichlorobenzidine, ug/Kg	<740	<840	<800	<720	<820	<740	<740
3-Nitroaniline, ug/Kg	<480	<550	<520	<470	<530	<480	<480
4,6-Dinitro-2-methylphenol, ug/Kg	<920	<1000	<1000	<900	<1000	<920	<920
4-Bromophenyl phenyl ether, ug/Kg	<220	<250	<240	<220	<250	<220	<220
4-Chloro-3-methylphenol, ug/Kg	<260	<290	<280	<250	<290	<260	<260
4-Chloroaniline, ug/Kg	<150	<170	<160	<140	<160	<150	<150
4-Chlorophenyl phenyl ether, ug/Kg	<220	<250	<240	<220	<250	<220	<220
4-Methylphenol, ug/Kg	<260	<290	<280	<250	<290	<260	<260
4-Nitroaniline, ug/Kg	<590	<670	<640	<580	<660	<590	<590
4-Nitrophenol, ug/Kg	<440	<500	<480	<430	<490	<440	<440

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER	Sample Depth / Date Collected	MWSB02E (20-22') 5-5-92	MWSB03A (10-14') 5-2-92	MWSB03B (20-22') 5-2-92	MWSB04A (12-14') 5-4-92	MWSB04B (22-24') 5-4-92	MWSB05A (9-11') 4-29-92	MWSB05B (17-19') 4-29-92
TOTAL ICP METALS:								
Barium, mg/Kg		72	190	68	60	70	96	44
Cadmium, mg/Kg		<0.8	<0.8	<0.8	<0.8	<1.0	<0.8	<0.8
Chromium, mg/Kg		7.1	11	6.1	20	6.0	10	6.6
Lead, mg/Kg		<3.5	8.5	5.9	58	<4.4	30	5.9
Silver, mg/Kg		1.2	<0.5	<0.7	<0.6	<0.8	<0.6	<0.6
TOTAL MERCURY:								
Mercury, mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
ORGANOPHOSPHORUS PESTICIDES:								
AZINPHOS METHYL (GUTHION), ug/kg		<50	<50	<50	<50	<50	<50	<50
BOLSTAR, ug/kg		<5	<5	<5	<5	<5	<5	<5
CHLORPYRIFOS (DURSBAN), ug/kg		<10	<10	<10	<10	<10	<10	<10
COUMAPHOS (CO-RAL), ug/kg		<50	<50	<50	<50	<50	<50	<50
DEMETON-S (MERCAPTOPHOS), ug/kg		<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
DIAZINON, ug/kg		<20	<20	<20	<20	<20	<20	<20
DICHLORVOS (DDVP), ug/kg		<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
DISULFOTON (DI-SYSTON), ug/kg		<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7
ETHOPROP (MOCAP), ug/kg		<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
FENSULFOTHION (DASANIT), ug/kg		<50	<50	<50	<50	<50	<50	<50
FENTHION (BAYCID), ug/kg		<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
MALATHION, ug/kg		<170	<170	<170	<170	<170	<170	<170
MERPHOS, ug/kg		<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
METHYL PARATHION, ug/kg		<1	<1	<1	<1	<1	<1	<1
MEVINPHOS (PHOSDRIN), ug/kg		<10	<10	<10	<10	<10	<10	<10
NALED, ug/kg		<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
PHORATE, ug/kg		<5	<5	<5	<5	<5	<5	<5
RONNEL (FENCHLORPHOS), ug/kg		<10	<10	<10	<10	<10	<10	<10
STIROPHOS (TETRACHLORVINPHOS), ug/kg		<170	<170	<170	<170	<170	<170	<170

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER	MWSB02E	MWSB03A	MWSB03B	MWSB04A	MWSB04B	MWSB05A	MWSB05B
Sample Depth	(20-22')	(10-14')	(20-22')	(12-14')	(22-24')	(9-11')	(17-19')
Date Collected	5-5-92	5-2-92	5-2-92	5-4-92	5-4-92	4-29-92	4-29-92
VOLATILE ORGANICS (CONT'D):							
Bromoform, ug/Kg	<5.6	<5.6	<5.9	<5.4	<6.0	<5.8	<5.8
Bromomethane, ug/Kg	<11	<11	<12	<11	<12	<12	<12
Carbon disulfide, ug/Kg	<3.4	<3.3	<3.5	<3.3	<3.6	<3.4	<3.4
Carbon tetrachloride, ug/Kg	<3.4	<3.3	<3.5	<3.3	<3.6	<3.4	<3.4
Chlorobenzene, ug/Kg	<3.4	<3.3	<3.5	<3.3	<3.6	<3.4	<3.4
Chloroethane, ug/Kg	<11	<11	<12	<11	<12	<12	<12
Chloroform, ug/Kg	<3.4	<3.3	<3.5	<3.3	<3.6	<3.4	<3.4
Chloromethane, ug/Kg	<11	<11	<12	<11	<12	<12	<12
Dibromochloromethane, ug/Kg	<5.6	<5.6	<5.9	<5.4	<6.0	<5.8	<5.8
Ethylbenzene, ug/Kg	<3.4	<3.3	<3.5	<3.3	<3.6	<3.4	<3.4
Methylene chloride, ug/Kg	11	19	22	21	20	70 (B2)	36 (B2)
Styrene, ug/Kg	<3.4	<3.3	<3.5	<3.3	<3.6	<3.4	<3.4
Tetrachloroethene, ug/Kg	<3.4	<3.3	<3.5	<3.3	<3.6	<3..4	<3.4
Toluene, ug/Kg	<2.6	<5.6	<5.9	<5.4	<6.0	<5.8	<5.8
Trichloroethene, ug/Kg	<3.4	<3.3	<3.5	<3.3	<3.6	<3.4	<3.4
Vinyl acetate, ug/Kg	<11	<11	<12	<11	<12	<12	<12
Vinyl chloride, ug/Kg	<11	<11	<12	<11	<12	<12	<12
Xylenes (total), ug/Kg	<5.6	<5.6	<5.9	<5.4	<6.0	<5.8	<5.8
cis-1,3-Dichloropropene, ug/Kg	<3.4	<3.3	<3.5	<3.3	<3.6	<3.4	<3.4
trans-1,3-Dichloropropene, ug/Kg	<3.4	<3.3	<3.5	<3.3	<3.6	<3.4	<3.4
TOTAL FURNACE METALS:							
Arsenic, mg/Kg	1.4	2.0	0.5	3.1	0.4	2.9	0.6
Selenium, mg/Kg	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)

B2 – Sample results are less than 10 times the amount detected in the method blank. Result is estimated.

M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
GROUNDWATERS
FORT RILEY

PARAMETER Date Collected	PSF9201 7-16-92	SAMPLE PSF9202 7-14-92	DUPLICATE PSF9206 7-14-92	PSF9203 7-16-92	PSF9204 7-23-92	PSF9205 7-16-92
PESTICIDES/PCBs:						
4,4'-DDD, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4,4'-DDE, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4,4'-DDT, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin, ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor-1016, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor-1221, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor-1232, ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Aroclor-1242, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor-1248, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor-1254, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor-1260, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dieldrin, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I, ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan II, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulfate, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin aldehyde, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor, ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide, ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor, ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toxaphene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
alpha-BHC, ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Chlordane, ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC, ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC, ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC, ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-Chlordane, ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
SEMI-VOLATILE ORGANICS:						
1,2,4-Trichlorobenzene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
1,2-Dichlorobenzene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Dichlorobenzene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
1,4-Dichlorobenzene, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
2,4,5-Trichlorophenol, ug/L	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0
2,4,6-Trichlorophenol, ug/L	<8.0	<8.0	<8.0	<8.0	<8.0	<8.0
2,4-Dichlorophenol, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
2,4-Dimethylphenol, ug/L	<10	<10	<10	<10	<10	<10
2,4-Dinitrophenol, ug/L	<43	<43	<43	<43	<43	<43
2,4-Dinitrotoluene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
2,6-Dinitrotoluene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
2-Chloronaphthalene, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
2-Chlorophenol, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
2-Methylnaphthalene, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
2-Methylphenol, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
2-Nitroaniline, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Nitrophenol, ug/L	<10	<10	<10	<10	<10	<10
3,3'-Dichlorobenzidene, ug/L	<20	<20	<20	<20	<20	<20
3-Nitroaniline, ug/L	<13	<13	<13	<13	<13	<13
4,6-Dinitro-2-methylphenol, ug/L	<25	<25	<25	<25	<25	<25
4-Bromophenyl phenyl ether, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
4-Chloro-3-methylphenol, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
4-Chloroaniline, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
4-Chlorophenyl phenyl ether, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
MONITORING WELL SOIL BORINGS
FORT RILEY

PARAMETER		MWSB02E	MWSB03A	MWSB03B	MWSB04A	MWSB04B	MWSB05A	MWSB05B
	Sample Depth	(20-22')	(10-14')	(20-22')	(12-14')	(22-24')	(9-11')	(17-19')
	Date Collected	5-5-92	5-2-92	5-2-92	5-4-92	5-4-92	4-29-92	4-29-92
ACID HERBICIDES:								
2,4,5-T, ug/kg		<157	<166	<168	<153	<167	<156	<160
2,4,5-TP (SILVEX), ug/kg		<134	<142	<144	<131	<143	<134	<137
2,4-D, ug/kg		<906	<960	<972	<885	<965	<901	<926
2,4-DB, ug/kg		<682	<723	<732	<667	<727	<679	<697
DALAPON, ug/kg		<4360	<4624	<4680	<4263	<4646	<4340	<4458
DICAMBA, ug/kg		<212	<225	<228	<208	<226	<211	<217
DICHLOROPROP, ug/kg		<492	<522	<528	<481	<524	<490	<503
DINOSEB, ug/kg		<56	<59	<60	<55	<60	<56	<57
MCPA, ug/kg		<186696	<198008	<200408	<182554	<198952	<185485	<190901
MCPP, ug/kg		<144215	<152952	<154806	<141014	<153681	<143557	<147462

PARAMETER Sample Depth Date Collected	PSFSD01A (0-1') 4-2-92	PSFSD01B (1-2') 4-2-92	SAMPLE PSFSD02A (0-1') 4-1-92	DUPLICATE PSFSD08 (0-1') 4-1-92	PSFSD02B (1-2') 4-1-92	PSFSD04A (0-1') 4-1-92	PSFSD04B (1-2') 4-1-92	PSFSD05A (0-1') 4-1-92
VOLATILE ORGANICS (CONT'D):								
1,1-Dichloroethane, ug/Kg	<5.6	<6.3	<6.1	<5.8	<6.2	<5.8	<6.6	<6.1
1,1-Dichloroethene, ug/Kg	<3.3	<3.8	<3.6	<3.5	<3.7	<3.5	<4.0	<3.6
1,2-Dichloroethane, ug/Kg	<5.6	<6.3	<6.1	<5.8	<6.2	<5.8	<6.6	<6.1
1,2-Dichloroethene (total), ug/Kg	<5.6	<6.3	<6.1	<5.8	<6.2	<5.8	<6.6	<6.1
1,2-Dichloropropane, ug/Kg	<3.3	<3.8	<3.6	<3.5	<3.7	<3.5	<4.0	<3.6
2-Butanone, ug/Kg	<110	<130	<120	<120	<120	<120	<130	<120
2-Hexanone, ug/Kg	<11	<13 (I)	<12 (I)	<12	<12	<12 (I)	<13 (I)	<12 (I)
4-Methyl-2-pentanone, ug/Kg	<11	<13 (I)	<12 (I)	<12	<12	<12 (I)	<13 (I)	<12 (I)
Acetone, ug/Kg	<110	<130	<120	<120	<120	<120	<130	<120
Benzene, ug/Kg	<3.3	<3.8	<3.6	<3.5	<6.7	<3.5	<4.0	<3.6
Bromodichloromethane, ug/Kg	<5.6	<6.3	<6.1	<5.8	<6.2	<5.8	<6.6	<6.1
Bromoform, ug/Kg	<5.6	<6.3	<6.1	<5.8	<6.2	<5.8	<6.6	<6.1
Bromomethane, ug/Kg	<11	<13	<12	<12	<12	<12	<13	<12
Carbon disulfide, ug/Kg	<3.3	<3.8	<3.6	<3.5	<3.7	<3.5	6.9	<3.6
Carbon tetrachloride, ug/Kg	<3.3	<3.8	<3.6	<3.5	<3.7	<3.5	<4.0	<3.6
Chlorobenzene, ug/Kg	<3.3	<3.8 (I)	<3.6 (I)	<3.5	<3.7	<3.5 (I)	<4.0 (I)	<3.6 (I)
Chloroethane, ug/Kg	<11	<13	<12	<12	<12	<12	<13	<12
Chloroform, ug/Kg	<3.3	<3.8	<3.6	<3.5	<3.7	<3.5	<4.0	<3.6
Chloromethane, ug/Kg	<11	<13	<12	<12	<12	<12	<13	<12
Dibromochloromethane, ug/Kg	<5.6	<6.3	<6.1	<5.8	<6.2	<5.8	<6.6	<6.1
Ethylbenzene, ug/Kg	<3.3	<3.8 (I)	<3.6 (I)	<3.5	<3.7	<3.5 (I)	<4.0 (I)	<3.6 (I)
Methylene chloride, ug/Kg	49 (B2)	47 (B2)	55 (B2)	55 (B2)	66 (B2)	38 (B2)	77 (B2)	82 (B2)
Styrene, ug/Kg	<3.3	<3.8 (I)	<3.6 (I)	<3.5	<3.7	<3.5 (I)	<4.0 (I)	<3.6 (I)
Tetrachloroethene, ug/Kg	<3.3	<3.8 (I)	<3.6 (I)	<3.5	<3.7	<3.5 (I)	<4.0 (I)	<3.6 (I)
Toluene, ug/Kg	6.0	8.7 (I)	5.6 (I)	9.8	7.1	13 (I)	12 (I2)	13 (I)
Trichloroethene, ug/Kg	<3.3	<3.8	<3.6	<3.5	<3.7	<3.5	<4.0	<3.6
Vinyl acetate, ug/Kg	<11	<13	<12	<12	<12	<12	<13	<12
Vinyl chloride, ug/Kg	<11	<13	<12	<12	<12	<12	<13	<12
Xylenes (total), ug/Kg	<5.6	<6.3 (I)	<6.1 (I)	<5.8	<6.2	<5.8 (I)	<6.6 (I)	<6.1 (I)
cis-1,3-Dichloropropene, ug/Kg	<3.3	<3.8	<3.6	<3.5	<3.7	<3.5	<4.0	<3.6
trans-1,3-Dichloropropene, ug/Kg	<3.3	<3.8	<3.6	<3.5	<3.7	<3.5	<4.0	<3.6

B2 - Sample results are less than 10 times the amount detected in the method blank. Result is estimated.
I - Low internal standard response. Result is an estimated quantitation.
I2 - Low internal standard response and high surrogate recovery. Result is biased high.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SEDIMENTS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSD01A (0-1') 4-2-92	PSFSD01B (1-2') 4-2-92	SAMPLE PSFSD02A (0-1') 4-1-92	DUPLICATE PSFSD08 (0-1') 4-1-92	PSFSD02B (1-2') 4-1-92	PSFSD04A (0-1') 4-1-92	PSFSD04B (1-2') 4-1-92	PSFSD05A (0-1') 4-1-92
TOTAL FURNACE METALS:								
Arsenic, mg/Kg	2.2	1.4	1.1	1.5	0.8	0.9	2.7	3.4
Selenium, mg/Kg	0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)
TOTAL MERCURY:								
Mercury, mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	0.1 (B1)	<0.1	<0.1
TOTAL ICP METALS:								
Barium, mg/Kg	88	74	95	110	55	110	150	93
Cadmium, mg/Kg	2.1	<0.8	1.3	0.9	<0.7	1.2	<0.9	<0.8
Chromium, mg/Kg	13	7.6	19	16	4.2	25	14	10
Lead, mg/Kg	60	10	130	110	24	210	64	72
Silver, mg/Kg	<0.7	<0.8	<0.7	<0.7	<0.7	0.8	<0.9	<0.8
ORGANOPHOSPHORUS PESTICIDES:								
AZINPHOS METHYL (GUTHION), ug/kg	<50	<50	<50	<50	<50	<50	<50	<50.
BOLSTAR (SULPROFOS), ug/kg	<5.0	<5.0	<5.0	<5.00	<5.00	<5.00	<5.00	<5.00
CHLORPYRIFOS (DURSBAN), ug/kg	<10	<10	<10	<10	<10	<10.	<10	<10
COUMAPHOS (CO-RAL), ug/kg	<50	<50	<50	<50	<50	<50	<50	<50.
DEMETON-S (MERCAPTOPHOS), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.30	<8.3	<8.3	<8.30
DIAZINON, ug/kg	<20	<20	<20	<20	<20	<20	<20	<20.
DICHLORVOS (DDVP), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
DISULFOTON (DI-SYSTON), ug/kg	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7
ETHOPROP (MOCAP), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.30
FENSULFOTHION (DASANIT), ug/kg	<50	<50	<50	<50	<50	<50	<50	<50.
FENTHION (BAYCID), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
MALATHION, ug/kg	<170	<170	<170	<170	<170	<170	<170	<170
MERPHOS, ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.30
METHYL PARATHION, ug/kg	<1.0	<1.0	<1.00	<1.00	<1.00	<1.0	<1.0	<1.00
MEVINPHOS (PHOSDRIN), ug/kg	<10	<10	<10	<10	<10	<10	<10	<10.
NALED, ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3

B1 – Sample results are less than 5 times the amount detected in the method blank. Result is estimated.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.

ORGANOPHOSPHORUS PESTICIDES (CONT'D):

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SEDIMENTS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSD01A (0-1') 4-2-92	PSFSD01B (1-2') 4-2-92	SAMPLE PSFSD02A (0-1') 4-1-92	DUPLICATE PSFSD08 (0-1') 4-1-92	PSFSD02B (1-2') 4-1-92	PSFSD04A (0-1') 4-1-92	PSFSD04B (1-2') 4-1-92	PSFSD05A (0-1') 4-1-92
SEMI-VOLATILE ORGANICS (CONT'D):								
Chrysene, ug/Kg	<660	<140	170	<120	<120	120	<120	160
Di-n-butylphthalate, ug/Kg	<2200	<450	<420	<400	<400	<410	<410	<410
Di-n-octylphthalate, ug/Kg	<2200	<450	<420 (I)	<400	<400	<410 (I)	<410 (IR)	<410
Dibenz[a,h]anthracene, ug/Kg	<2200	<450	<420 (I)	<400	<400	<410 (I)	<410 (IR)	<410
Dibenzofuran, ug/Kg	<660	<140	<130	<120	<120	<120	<120	<120
Diethylphthalate, ug/Kg	<2200	<450	<420	<400	<400	<410	<410	<410
Dimethylphthalate, ug/Kg	<2200	<450	<420	<400	<400	<410	<410	<410
Fluoranthene, ug/Kg	<880	<180	170	<160	<160	210	<160	250
Fluorene, ug/Kg	<1500	<320	<290	<280	<280	<290	<290	<290
Hexachlorobenzene, ug/Kg	<1300	<270	<250	<240	<240	<250	<250	<250
Hexachlorobutadiene, ug/Kg	<1300	<270	<250	<240	<240	<250	<250	<250
Hexachlorocyclopentadiene, ug/Kg	<2200	<450	<420	<400	<400	<410	<410	<410
Hexachloroethane, ug/Kg	<1500	<320	<290	<280	<280	<290	<290	<290
Indeno[1,2,3-cd]pyrene, ug/Kg	<2200	<450	<420 (I)	<400	<400	<410 (I)	<410 (IR)	<410
Isophorone, ug/Kg	<1500	<320	<290	<280	<280	<290	<290	<290
N-Nitrosodi-n-propylamine, ug/Kg	<1300	<270	<250	<240	<240	<250	<250	<250
N-Nitrosodiphenylamine, ug/Kg	<1100	<220	<210	<200	<200	<210	<210	<210
Naphthalene, ug/Kg	<660	<140	<130	<120	<120	<120	<120	<120
Nitrobenzene, ug/Kg	<2200	<450	<420	<400	<400	<410	<410	<410
Pentachlorophenol, ug/Kg	<3500	<720	<670	<640	<640	<660	<660	<660
Phenanthrene, ug/Kg	<880	<180	<170	<160	<160	<160	<160	<160
Phenol, ug/Kg	<1100	<220	<210	<200	<200	<210	<210	<210
Pyrene, ug/Kg	880	<140	340	120	120	250	<120	290
bis(2-Chloroethoxy)methane, ug/Kg	<1300	<270	<250	<240	<240	<250	<250	<250
bis(2-Chloroethyl)ether, ug/Kg	<1300	<270	<250	<240	<240	<250	<250	<250
bis(2-Chloroisopropyl)ether, ug/Kg	<1100	<220	<210	<200	<200	<210	<210	<210
bis(2-Ethylhexyl)phthalate, ug/Kg	<2200	<450	550	640	<400	450	570	<410
VOLATILE ORGANICS:								
1,1,1-Trichloroethane, ug/Kg	<5.6	<6.3	<6.1	<5.8	<6.2	<5.8	<6.6	<6.1
1,1,2,2-Tetrachloroethane, ug/Kg	<5.6	<6.3 (I)	<6.1 (I)	<5.8	<6.2	<5.8 (I)	<6.6 (I)	<6.1 (I)
1,1,2-Trichloroethane, ug/Kg	<5.6	<6.3	<6.1	<5.8	<6.2	<5.8	<6.6	<6.1

I - Low internal standard response. Result is an estimated quantitation.
IR - The internal standard response is less than 10% of the internal standard area. Result is rejected.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SEDIMENTS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSD01A (0-1') 4-2-92	PSFSD01B (1-2') 4-2-92	SAMPLE PSFSD02A (0-1') 4-1-92	DUPLICATE PSFSD08 (0-1') 4-1-92	PSFSD02B (1-2') 4-1-92	PSFSD04A (0-1') 4-1-92	PSFSD04B (1-2') 4-1-92	PSFSD05A (0-1') 4-1-92
SEMI-VOLATILE ORGANICS (CONT'D):								
2,4-Dichlorophenol, ug/Kg	<1300	<270	<250	<240	<240	<250	<250	<250
2,4-Dimethylphenol, ug/Kg	<2200	<450	<420	<400	<400	<410	<410	<410
2,4-Dinitrophenol, ug/Kg	<9500	<1900	<1800	<1700	<1700	<1800	<1800	<1800
2,4-Dinitrotoluene, ug/Kg	<1500	<320	<290	<280	<280	<290	<290	<290
2,6-Dinitrotoluene, ug/Kg	<1500	<320	<290	<280	<280	<290	<290	<290
2-Chloronaphthalene, ug/Kg	<1300	<270	<250	<240	<240	<250	<250	<250
2-Chlorophenol, ug/Kg	<880	<180	<170	<160	<160	<160	<160	<160
2-Methylnaphthalene, ug/Kg	<880	<180	<170	<160	<160	<160	<160	<160
2-Methylphenol, ug/Kg	<880	<180	<170	<160	<160	<160	<160	<160
2-Nitroaniline, ug/Kg	<1100	<220	<210	<200	<200	<210	<210	<210
2-Nitrophenol, ug/Kg	<2200	<450	<420	<400	<400	<410	<410	<410
3,3'-Dichlorobenzidine, ug/Kg	<4400	<900	<840	<800	<800	<820	<820	<820
3-Nitroaniline, ug/Kg	<2900	<580	<550	<520	<520	<530	<530	<530
4,6-Dinitro-2-methylphenol, ug/Kg	<5500	<1100	<1000	<1000	<1000	<1000	<1000	<1000
4-Bromophenyl phenyl ether, ug/Kg	<1300	<270	<250	<240	<240	<250	<250	<250
4-Chloro-3-methylphenol, ug/Kg	<1500	<320	<290	<280	<280	<290	<290	<290
4-Chloroaniline, ug/Kg	<880	<180	<170	<160	<160	<160	<160	<160
4-Chlorophenyl phenyl ether, ug/Kg	<1300	<270	<250	<240	<240	<250	<250	<250
4-Methylphenol, ug/Kg	<1500	<320	<290	<280	<280	<290	<290	<290
4-Nitroaniline, ug/Kg	<3500	<720	<670	<640	<640	<660	<660	<660
4-Nitrophenol, ug/Kg	<2600	<540	<500	<480	<480	<490	<490	<490
Acenaphthene, ug/Kg	<1100	<220	<210	<200	<200	<210	<210	<210
Acenaphthylene, ug/Kg	<1100	<220	<210	<200	<200	<210	<210	<210
Anthracene, ug/Kg	<1100	<220	<210	<200	<200	<210	<210	<210
Benzo[a]anthracene, ug/Kg	<660	<140	130	<120	<120	<120	<120	120
Benzo[a]pyrene, ug/Kg	<1500	<320	<290 (I)	<280	<280	<290 (I)	<290 (IR)	<290
Benzo[b]fluoranthene, ug/Kg	<2200	<450	<420 (I)	<400	<400	<410 (I)	<410 (IR)	<410
Benzo[ghi]perylene, ug/Kg	<2200	<450	<420 (I)	<400	<400	<410 (I)	<410 (IR)	<410
Benzo[k]fluoranthene, ug/Kg	<2200	<450	<420 (I)	<400	<400	<410 (I)	<410 (IR)	<410
Benzoic acid, ug/Kg	<5900	<1200	<1100	<1100	<1100	<1100	<1000	<1100
Benzyl alcohol, ug/Kg	<1300	<270	<360	<240	<240	<250	<250	<250
Butyl benzyl phthalate, ug/Kg	<2200	<450	<420	<400	<400	<410	<410	<410

I - Low internal standard response. Result is an estimated quantitation.
IR - The internal standard response is less than 10% of the internal standard area. Result is rejected.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SEDIMENTS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSD05B (1-2') 4-1-92	PSFSD06A (0-1') 3-31-92	PSFSD06B (1-2') 3-31-92	PSFSD07 (0-1') 3-31-92	PSFSD07B (1-2') 3-31-92	PSFSD09A (0-1') 7-16-92	PSFSD09B (1-2') 7-16-92
PESTICIDES/PCBs:							
4,4'-DDD, ug/Kg	<7.9	15	31	24	<7.8	<8.0	<8.4
4,4'-DDE, ug/Kg	46	<9.2	<9.4	11	<7.8	<8.0	<8.4
4,4'-DDT, ug/Kg	37	<9.2	<9.4	17	8.6	40	17
Aldrin, ug/Kg	<4.0	<4.6	<4.7	<4.1	<3.9	<4.0	<4.2
Aroclor-1016, ug/Kg	<79	<92	<94	<82	<78	<80	<84
Aroclor-1221, ug/Kg	<79	<92	<94	<82	<78	<80	<84
Aroclor-1232, ug/Kg	<160	<180	<190	<160	<160	<160	<170
Aroclor-1242, ug/Kg	<79	<92	<94	<82	<78	<80	<84
Aroclor-1248, ug/Kg	<79	<92	<94	<82	<78	<80	<84
Aroclor-1254, ug/Kg	<79	<92	<94	<82	<78	<80	<84
Aroclor-1260, ug/Kg	<79	<92	<94	<82	<78	<80	<84
Dieldrin, ug/Kg	<7.9	<9.2	<9.4	<8.2	<7.8	<8.0	<8.4
Endosulfan I, ug/Kg	<4.0	<4.6	<4.7	<4.1	<3.9	<4.0	<4.2
Endosulfan II, ug/Kg	<7.9	<9.2	<9.4	<8.2	<7.8	<8.0	<8.4
Endosulfan sulfate, ug/Kg	<7.9	<9.2	<9.4	<8.2	<7.8	<8.0	<8.4
Endrin, ug/Kg	<7.9	<9.2	<9.4	<8.2	<7.8	<8.0	<8.4
Endrin aldehyde, ug/Kg	<7.9	<9.2	<9.4	<8.2	<7.8	<8.0	<8.4
Heptachlor, ug/Kg	<4.0	<4.6	<4.7	<4.1	<3.9	<4.0	<4.2
Heptachlor epoxide, ug/Kg	<4.0	<4.6	<4.7	<4.1	<3.9	<4.0	<4.2
Methoxychlor, ug/Kg	<40	<46	<47	<41	<39	<40	<42
Toxaphene, ug/Kg	<400	<460	<470	<410	<390	<400	<420
alpha-BHC, ug/Kg	<4.0	<4.6	<4.7	<4.1	<3.9	<4.0	<4.2
alpha-Chlordane, ug/Kg	<4.0	7.1	9.6	22	9.5	11	10
beta-BHC, ug/Kg	<4.0	<4.6	<4.7	<4.1	<3.9	<4.0	<4.2
delta-BHC, ug/Kg	<4.0	<4.6	<4.7	<4.1	<3.9	<4.0	<4.2
gamma-BHC, ug/Kg	<4.0	<4.6	<4.7	<4.1	<3.9	<4.0	<4.2
gamma-Chlordane, ug/Kg	<4.0	8.5	12	28	12	24	21
SEMI-VOLATILE ORGANICS:							
1,2,4-Trichlorobenzene, ug/Kg	<270	<320	<330	<290	<270	<280	<290
1,2-Dichlorobenzene, ug/Kg	<200	<230	<240	<210	<200	<200	<210
1,3-Dichlorobenzene, ug/Kg	<270	<320	<330	<290	<270	<280	<290
1,4-Dichlorobenzene, ug/Kg	<230	<280	<280	<250	<230	<240	<250
2,4,5-Trichlorophenol, ug/Kg	<350	<410	<420	<37	<350	<360	<380
2,4,6-Trichlorophenol, ug/Kg	<310	<370	<380	<330	<310	<320	<340

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SEDIMENTS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSD01A (0-1') 4-2-92	PSFSD01B (1-2') 4-2-92	SAMPLE PSFSD02A (0-1') 4-1-92	DUPLICATE PSFSD08 (0-1') 4-1-92	PSFSD02B (1-2') 4-1-92	PSFSD04A (0-1') 4-1-92	PSFSD04B (1-2') 4-1-92	PSFSD05A (0-1') 4-1-92
PHORATE, ug/kg	<5.0	<5.0	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
RONNEL (FENCHLORPHOS), ug/kg	<10	<10	<10	<10	<10	<10	<10	<10
STIROPHOS (TETRACHLORVINPHOS), ug/kg	<170	<170	<170	<170	<170	<170	<170	<170
2,3,7,8-TCDD (DIOXIN ISOMER), ppt:	NA	NA	NA	NA	NA	<0.132	NA	NA
ACID HERBICIDES:								
2,4,5-T, ug/kg	<164	<184	<171	<172	<168	<165	<184	<173
2,4,5-TP (SILVEX), ug/kg	<141	<158	<147	<147	<144	<141	<158	<148
2,4-D, ug/kg	<950	<1064	<991	<993	<971	<955	<1064	<999
2,4-DB, ug/kg	<715	<801	<747	<748	<731	<719	<801	<752
DALAPON, ug/kg	<4573	<5124	<4774	<4781	<4674	<4596	<5122	<4808
DICAMBA, ug/kg	<223	<250	<233	<233	<228	<224	<250	<234
DICHLOROPROP, ug/kg	<516	<578	<539	<539	<527	<519	<578	<542
DINOSEB, ug/kg	<59	<66	<61	<61	<60	<59	<66	<62
MCPA, ug/kg	<195803	<219419	<204406	<204707	<200144	<196795	<219333	<205868
MCPP, ug/kg	<151249	<169492	<157895	<158127	<154602	<152015	<169425	<159024

NA – Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
GROUNDWATERS
FORT RILEY

PARAMETER Date Collected	PSF9201 7-16-92	SAMPLE PSF9202 7-14-92	DUPLICATE PSF9206 7-14-92	PSF9203 7-16-92	PSF9204 7-23-92	PSF9205 7-16-92
SEMI-VOLATILE ORGANICS (CONT'D):						
4-Methylphenol, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
4-Nitroaniline, ug/L	<16	<16	<16	<16	<16	<16
4-Nitrophenol, ug/L	<12	<12	<12	<12	<12	<12
Acenaphthene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acenaphthylene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Anthracene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benz[a]anthracene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Benzo[a]pyrene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
Benzo[b]fluoranthene, ug/L	<10	<10	<10	<10	<10	<10
Benzo[ghi]perylene, ug/L	<10	<10	<10	<10	<10	<10
Benzo[k]fluoranthene, ug/L	<10	<10	<10	<10	<10	<10
Benzoic acid, ug/L	<27	<27	<27	<27	<27	<27
Benzyl alcohol, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
Butyl benzyl phthalate, ug/L	<10	<10	<10	<10	<10	<10
Chrysene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Di-n-butylphthalate, ug/L	<10	<10	<10	<10	<10	<10
Di-n-octylphthalate, ug/L	<10	<10	<10	<10	<10	<10
Dibenz[a,h]anthracene, ug/L	<10	<10	<10	<10	<10	<10
Dibenzofuran, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Diethylphthalate, ug/L	<10	<10	<10	<10	<10	<10
Dimethylphthalate, ug/L	<10	<10	<10	<10	<10	<10
Fluoranthene, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Fluorene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
Hexachlorobenzene, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
Hexachlorobutadiene, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
Hexachlorocyclopentadiene, ug/L	<10	<10	<10	<10	<10	<10
Hexachloroethane, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
Indeno[1,2,3-cd]pyrene, ug/L	<10	<10	<10	<10	<10	<10
Isophorone, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
N-Nitrosodi-n-propylamine, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
N-Nitrosodiphenylamine, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Naphthalene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Nitrobenzene, ug/L	<10	<10	<10	<10	<10	<10
Pentachlorophenol, ug/L	<16	<16	<16	<16	<16	<16
Phenanthrene, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Phenol, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Pyrene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
bis(2-Chloroethoxy)methane, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
bis(2-Chloroethyl)ether, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
bis(2-Chloroisopropyl)ether, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
bis(2-Ethylhexyl)phthalate, ug/L	<10	<10	<10	<10	<10	<10
VOLATILE ORGANICS:						
1,1,1-Trichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2-Trichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
1,2-Dichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloroethene (total), ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
2-Butanone, ug/L	<100	<100	<100	<100	<100	<100
2-Hexanone, ug/L	<10	<10	<10	<10	<10	<10

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
GROUNDWATERS
FORT RILEY

PARAMETER Date Collected	PSF9201 7-16-92	SAMPLE PSF9202 7-14-92	DUPLICATE PSF9206 7-14-92	PSF9203 7-16-92	PSF9204 7-23-92	PSF9205 7-16-92
VOLATILE ORGANICS (CONT'D):						
4-Methyl-2-pentanone, ug/L	<10	<10	<10	<10	<10	<10
Acetone, ug/L	<100	<100	<100	<100	<100	<100
Benzene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Bromodichloromethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromoform, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane, ug/L	<10	<10	<10	<10	<10	<10
Carbon disulfide, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Carbon tetrachloride, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Chlorobenzene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Chloroethane, ug/L	<10	<10	<10	<10	<10	<10
Chloroform, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Chloromethane, ug/L	<10	<10	<10	<10	<10	<10
Dibromochloromethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Methylene chloride, ug/L	9.3 (T)	<5.0	<5.0	21 (T)	5.4 (T)	18 (T)
Styrene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Tetrachloroethene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Toluene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichloroethene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	3.0
Vinyl acetate, ug/L	<10	<10	<10	<10	<10	<10
Vinyl chloride, ug/L	<10	<10	<10	<10	<10	<10
Xylenes (total), ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,3-Dichloropropene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
trans-1,3-Dichloropropene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
DISSOLVED FURNACE METALS:						
Arsenic, ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	15
Lead, ug/L	<5.0 (M2)	<5.0 (M2)	<5.0 (M2)	<5.0 (M2)	<1.0 (M2)	<5.0 (M2)
Selenium, ug/L	1.1	2.2	2.1	1.5	1.2	2.6
DISSOLVED ICP METALS:						
Aluminum, ug/L	<110	284	<110	<110	<110	170
Antimony, ug/L	<31	<31	<31	<31	<31	<31
Barium, ug/L	88	100	83	92	84	120
Beryllium, ug/L	<1.0	3.0	2.9	1.6	1.6	1.5
Cadmium, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Calcium, ug/L	88000	340000	340000	180000	140000	170000
Chromium, ug/L	<10	<10	<10	<10	<10	<10
Cobalt, ug/L	<10	<10	<10	<10	<10	<10
Copper, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Iron, ug/L	<45	<45	<45	<45	78	<45
Magnesium, ug/L	14000	55000	55000	29000	18000	27000
Manganese, ug/L	24	54	52	83	31	40
Nickel, ug/L	<18	<18	<18	<18	<18	<18
Potassium, ug/L	3300	6100	6200	5700	3800	19000
Silver, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Sodium, ug/L	11000	89000	90000	47000	25000	41000
Thallium, ug/L	<110	<110	<110	<110	<110	<110
Vanadium, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	24

M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
T – Sample results are less than 10 times the amount detected in the trip blank. Result is estimated.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SEDIMENTS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSD01A (0-1') 4-2-92	PSFSD01B (1-2') 4-2-92	SAMPLE PSFSD02A (0-1') 4-1-92	DUPLICATE PSFSD08 (0-1') 4-1-92	PSFSD02B (1-2') 4-1-92	PSFSD04A (0-1') 4-1-92	PSFSD04B (1-2') 4-1-92	PSFSD05A (0-1') 4-1-92
PESTICIDES/PCBs:								
4,4'-DDD, ug/Kg	<8.9	<9.1	8.7	<8.1	<8.1	91	13	100
4,4'-DDE, ug/Kg	<8.9	<9.1	<8.5	<8.1	<8.1	21	<8.8	280
4,4'-DDT, ug/Kg	11	<9.1	<8.5	<8.1	<8.1	16	<8.8	480
Aldrin, ug/Kg	<4.4	<4.5	<4.3	<4.1	<4.0	<4.0	<4.4	<21
Aroclor-1016, ug/Kg	<89	<91	<85	<81	<81	<80	<88	<420
Aroclor-1221, ug/Kg	<89	<91	<85	<81	<81	<80	<88	<420
Aroclor-1232, ug/Kg	<180	<180	<170	<160	<160	<160	<180	<830
Aroclor-1242, ug/Kg	<89	<91	<85	<81	<81	<80	<88	<420
Aroclor-1248, ug/Kg	<89	<91	<85	<81	<81	<80	<88	<420
Aroclor-1254, ug/Kg	<89	<91	<85	<81	<81	<80	<88	<420
Aroclor-1260, ug/Kg	<89	<91	<85	<81	<81	<80	<88	<420
Dieldrin, ug/Kg	<8.9	<9.1	<8.5	<8.1	<8.1	20	<8.8	56
Endosulfan I, ug/Kg	<4.4	<4.5	<4.3	<4.1	<4.0	<4.0	<4.4	<21
Endosulfan II, ug/Kg	<8.9	<9.1	<8.5	<8.1	<8.1	<8.0	<8.8	<42
Endosulfan sulfate, ug/Kg	<8.9	<9.1	<8.5	<8.1	<8.1	<8.0	<8.8	<42
Endrin, ug/Kg	<8.9	<9.1	<8.5	<8.1	<8.1	<8.0	<8.8	<42
Endrin aldehyde, ug/Kg	<8.9	<9.1	<8.5	<8.1	<8.1	<8.0	<8.8	<42
Heptachlor, ug/Kg	<4.4	<4.5	<4.3	<4.1	<4.0	<4.0	<4.4	<21
Heptachlor epoxide, ug/Kg	<4.4	<4.5	<4.3	<4.1	<4.0	<4.0	<4.4	<21
Methoxychlor, ug/Kg	<44	<45	<43	<41	<40	<40	<44	<210
Toxaphene, ug/Kg	<440	<450	<430	<410	<400	<400	<440	<2100
alpha-BHC, ug/Kg	<4.4	<4.5	<4.3	<4.1	<4.0	<4.0	<4.4	<21
alpha-Chlordane, ug/Kg	9.4	<4.5	4.7	5.8	<4.0	33	<4.4	67
beta-BHC, ug/Kg	<4.4	<4.5	<4.3	<4.1	<4.0	<4.0	<4.4	<21
delta-BHC, ug/Kg	<4.4	<4.5	<4.3	<4.1	<4.0	<4.0	<4.4	<21
gamma-BHC, ug/Kg	<4.4	<4.5	<4.3	<4.1	<4.0	<4.0	<4.4	<21
gamma-Chlordane, ug/Kg	14	<4.5	7.0	7.6	<4.0	37	<4.4	65
SEMI-VOLATILE ORGANICS:								
1,2,4-Trichlorobenzene, ug/Kg	<1500	<320	<290	<280	<280	<290	<290	<290
1,2-Dichlorobenzene, ug/Kg	<1100	<220	<210	<200	<200	<210	<210	<210
1,3-Dichlorobenzene, ug/Kg	<1500	<320	<290	<280	<280	<290	<290	<290
1,4-Dichlorobenzene, ug/Kg	<1300	<270	<250	<240	<240	<250	<250	<250
2,4,5-Trichlorophenol, ug/Kg	<2000	<410	<380	<360	<360	<370	<370	<370
2,4,6-Trichlorophenol, ug/Kg	<1800	<360	<340	<320	<320	<330	<330	<330

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SURFACE SOILS
FORT RILEY

PARAMETER	Sample Depth / Date Collected	PSFSS01 (1-2') 4-8-92	PSFSS02 (6-18") 4-7-92	PSFSS03 (3-12") 4-5-92	PSFSS04 (1-12") 4-6-92
<u>ACID HERBICIDES:</u>					
2,4,5-T, ug/kg		<159	<145	<159	<176
2,4,5-TP (SILVEX), ug/kg		<136	<124	<137	<151
2,4-D, ug/kg		<919	<839	<922	<1020
2,4-DB, ug/kg		<692	<632	<694	<768
DALAPON, ug/kg		<4423	<4041	<4437	<4910
DICAMBA, ug/kg		<215	<197	<216	<239
DICHLOROPROP, ug/kg		<499	<456	<501	<554
DINOSEB, ug/kg		<57	<52	<57	<63
MCPA, ug/kg		<189385	<173039	<190010	<210248
MCPP, ug/kg		<146292	<133665	<146774	<162407
2,3,7,8-TCDD (DIOXIN ISOMER), ppt		<456	<232.9	NA	<267

NA – Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SURFACE SOILS
FORT RILEY

PARAMETER	PSFSS01	PSFSS02	PSFSS03	PSFSS04
Sample Depth	(1-2')	(6-18")	(3-12")	(1-12")
Date Collected	4-8-92	4-7-92	4-5-92	4-6-92
SEMI-VOLATILE ORGANICS (CONT'D):				
Naphthalene, ug/Kg	<120	<520	<1100	<120
Nitrobenzene, ug/Kg	<390	<1700	<3800	<410
Pentachlorophenol, ug/Kg	<620	<2800	<6000	<660
Phenanthrene, ug/Kg	<160	<690	<1500	780
Phenol, ug/Kg	<200	<860	<1900	<200
Pyrene, ug/Kg	<120	<520 (I)	<1100	1000
bis(2-Chloroethoxy)methane, ug/Kg	<230	<1000	<2200	<250
bis(2-Chloroethyl)ether, ug/Kg	<230	<1000	<2200	<250
bis(2-Chloroisopropyl)ether, ug/Kg	<200	<860	<1900	<200
bis(2-Ethylhexyl)phthalate, ug/Kg	620	<1700 (I)	<3800	<410
VOLATILE ORGANICS:				
1,1,1-Trichloroethane, ug/Kg	<5.8	<5.1	<5.8 (I)	<6.2
1,1,2,2-Tetrachloroethane, ug/Kg	<5.8	<5.1 (I)	<5.8 (I)	<6.2
1,1,2-Trichloroethane, ug/Kg	<5.8	<5.1	<5.8 (I)	<6.2
1,1-Dichloroethane, ug/Kg	<5.8	<5.1	<5.8	<6.2
1,1-Dichloroethene, ug/Kg	<3.4	<3.1	<3.4	<3.7
1,2-Dichloroethane, ug/Kg	<5.8	<5.1	<5.8	<6.2
1,2-Dichloroethene (total), ug/Kg	<5.8	<5.1	<5.8	<6.2
1,2-Dichloropropane, ug/Kg	<3.5	<3.1	<3.4 (I)	<3.7
2-Butanone, ug/Kg	<120	<100	<120 (I)	<120
2-Hexanone, ug/Kg	<12	<10 (I)	<12 (I)	<12
4-Methyl-2-pentanone, ug/Kg	<12	<10 (I)	<12 (I)	<12
Acetone, ug/Kg	<120	<100	<120	<120
Benzene, ug/Kg	<3.4	<3.1	<3.4 (I)	<3.7
Bromodichloromethane, ug/Kg	<5.8	<5.1	<5.8 (I)	<6.2
Bromoform, ug/Kg	<5.8	<5.1	<5.8 (I)	<6.2
Bromomethane, ug/Kg	<12	<10	<12	<12
Carbon disulfide, ug/Kg	<3.4	<3.1	<3.4	<3.7
Carbon tetrachloride, ug/Kg	<3.4	<3.1	<3.4 (I)	<3.7
Chlorobenzene, ug/Kg	<3.4	<3.1 (I)	<3.4 (I)	<3.7
Chloroethane, ug/Kg	<12	<10	<12	<12
Chloroform, ug/Kg	<3.4	<3.1	<3.4	<3.7
Chloromethane, ug/Kg	<12	<10	<12	<12
Dibromochloromethane, ug/Kg	<5.8	<5.1	<5.8	<6.2
Ethylbenzene, ug/Kg	<3.5	<3.1 (I)	<3.4 (I)	<3.7
Methylene chloride, ug/Kg	16 (B2)	24	39 (B2)	35 (B2)
Styrene, ug/Kg	<3.4	<3.1 (I)	<3.4 (I)	<3.7
Tetrachloroethene, ug/Kg	<3.4	<3.1 (I)	<3.4 (I)	<3.7
Toluene, ug/Kg	<5.8	6.0 (I2)	<5.8 (I)	7.3

B2 – Sample results are less than 10 times the amount detected in the method blank. Result is estimated.
I – Low internal standard response. Result is an estimated quantitation.
I2 – Low internal standard response and high surrogate recovery. Result is biased high.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SURFACE SOILS
FORT RILEY

PARAMETER	PSFSS01	PSFSS02	PSFSS03	PSFSS04
Sample Depth	(1-2')	(6-18")	(3-12")	(1-12")
Date Collected	4-8-92	4-7-92	4-5-92	4-6-92
VOLATILE ORGANICS (CONT'D):				
Trichloroethene, ug/Kg	<3.4	<3.1	<3.4 (I)	<3.7
Vinyl acetate, ug/Kg	<12	<10	<12 (I)	<12
Vinyl chloride, ug/Kg	<12	<10	<12	<12
Xylenes (total), ug/Kg	<5.8	<5.1 (I)	<5.8 (I)	<6.2
cis-1,3-Dichloropropene, ug/Kg	<3.5	<3.1	<3.4 (I)	<3.7
trans-1,3-Dichloropropene, ug/Kg	<3.5	<3.1	<3.4 (I)	<3.7
TOTAL FURNACE METALS:				
Arsenic, mg/Kg	2.4	16	4.2	4.6
Selenium, mg/Kg	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)	<0.2 (M2)
TOTAL MERCURY:				
Mercury, mg/kg	<0.1	<0.1	<0.1	<0.1
TOTAL ICP METALS:				
Barium, mg/Kg	99	35	130	120
Cadmium, mg/Kg	<0.7	<0.6	<0.6	<0.7
Chromium, mg/Kg	9.3	6.9	7.5	15
Lead, mg/Kg	46	32	540	60
Silver, mg/Kg	<0.7	<0.6	<0.6	0.8
ORGANOPHOSPHORUS PESTICIDES:				
AZINPHOS METHYL (GUTHION), ug/kg	<50	<50	<50	<50
BOLSTAR, ug/kg	<5	<5	<5.0	<5.0
CHLORPYRIFOS (DURSBAN), ug/kg	<10	<10	<10	<10
COUMAPHOS (CO-RAL), ug/kg	<50	<50	<50	<50
DEMETON-S (MERCAPTOPHOS), ug/kg	<8.3	<8.3	<8.3	<8.3
DIAZINON, ug/kg	<20	<20	<20	<20
DICHLORVOS (DDVP), ug/kg	<3.3	<3.3	<3.3	<3.3
DISULFOTON (DI-SYSTON), ug/kg	<6.7	<6.7	<6.7	<6.7
ETHOPROP (MOCAP), ug/kg	<8.3	<8.3	<8.3	<8.3
FENSULFOTHION (DASANIT), ug/kg	<50	<50	<50	<50
FENTHION (BAYCID), ug/kg	<3.3	<3.3	<3.3	<3.3
MALATHION, ug/kg	419.00	<170	<170	<170
MERPHOS, ug/kg	<8.3	<8.3	<8.3	<8.3
METHYL PARATHION, ug/kg	<1	<1	<1.0	<1.0
MEVINPHOS (PHOSDRIN), ug/kg	<10	<10	<10	<10
NALED, ug/kg	<3.3	<3.3	<3.3	<3.3
PHORATE, ug/kg	<5	<5	<5.0	<5.0
RONNEL (FENCHLORPHOS), ug/kg	<10	<10	<10	<10
STIROPHOS (TETRACHLORVINPHOS), ug/kg	<170	<170	<170	<170

I – Low internal standard response. Result is an estimated quantitation.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SURFACE SOILS
FORT RILEY

PARAMETER	Sample Depth / Date Collected	PSFSS01 (1-2') 4-8-92	PSFSS02 (6-18") 4-7-92	PSFSS03 (3-12") 4-5-92	PSFSS04 (1-12") 4-6-92
PESTICIDES/PCBs:					
4,4'-DDD, ug/Kg		<71	<62	<7.6	<74
4,4'-DDE, ug/Kg		180	270	94	1800
4,4'-DDT, ug/Kg		670	1000	450	<74
Aldrin, ug/Kg		<35	<31	<3.8	<37
Aroclor-1016, ug/Kg		<710	<620	<76	<740
Aroclor-1221, ug/Kg		<710	<620	<76	<740
Aroclor-1232, ug/Kg		<1400	<1200	<150	<1500
Aroclor-1242, ug/Kg		<710	<620	<76	<740
Aroclor-1248, ug/Kg		<710	<620	<76	<740
Aroclor-1254, ug/Kg		<710	<620	<76	<740
Aroclor-1260, ug/Kg		<710	<620	<76	<740
Dieldrin, ug/Kg		94	77	<7.6	<74
Endosulfan I, ug/Kg		<35	<31	<3.8	<37
Endosulfan II, ug/Kg		<71	<62	<7.6	<74
Endosulfan sulfate, ug/Kg		<71	<62	<7.6	<74
Endrin, ug/Kg		<71	<62	<7.6	<74
Endrin aldehyde, ug/Kg		<71	<62	<7.6	<74
Heptachlor, ug/Kg		<35	300	<3.8	<37
Heptachlor epoxide, ug/Kg		<35	<31	<3.8	<37
Methoxychlor, ug/Kg		2400	<310	<38	<370
Toxaphene, ug/Kg		<3500	<3100	<380	<3700
alpha-BHC, ug/Kg		<35	<31	<3.8	<37
alpha-Chlordane, ug/Kg		370	1600	29	660
beta-BHC, ug/Kg		<35	<31	<3.8	<37
delta-BHC, ug/Kg		<35	<31	<3.8	<37
gamma-BHC, ug/Kg		<35	<31	<3.8	<37
gamma-Chlordane, ug/Kg		380	1600	30	640
SEMI-VOLATILE ORGANICS:					
1,2,4-Trichlorobenzene, ug/Kg		<270	<1200	<2600	<290
1,2-Dichlorobenzene, ug/Kg		<200	<860	<1900	<200
1,3-Dichlorobenzene, ug/Kg		<270	<1200	<2600	<290
1,4-Dichlorobenzene, ug/Kg		<230	<1000	<2200	<250
2,4,5-Trichlorophenol, ug/Kg		<350	<1600	<3400	<370
2,4,6-Trichlorophenol, ug/Kg		<310	<1400	<3000	<330
2,4-Dichlorophenol, ug/Kg		<230	<1000	<2200	<250
2,4-Dimethylphenol, ug/Kg		<390	<1700	<3800	<410
2,4-Dinitrophenol, ug/Kg		<1700	<7400	<16000	<1800
2,4-Dinitrotoluene, ug/Kg		<270	<1200	<2600	<290
2,6-Dinitrotoluene, ug/Kg		<270	<1200	<2600	<290
2-Chloronaphthalene, ug/Kg		<230	<1000	<2200	<250
2-Chlorophenol, ug/Kg		<160	<690	<1500	<160

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SURFACE SOILS
FORT RILEY

PARAMETER	PSFSS01	PSFSS02	PSFSS03	PSFSS04
Sample Depth	(1-2')	(6-18")	(3-12")	(1-12")
Date Collected	4-8-92	4-7-92	4-5-92	4-6-92
SEMI-VOLATILE ORGANICS (CONT'D):				
2-Methylnaphthalene, ug/Kg	<160	<690	<1500	<160
2-Methylphenol, ug/Kg	<160	<690	<1500	<160
2-Nitroaniline, ug/Kg	<200	<860	<1900	<200
2-Nitrophenol, ug/Kg	<390	<1700	<3800	<410
3,3'-Dichlorobenzidine, ug/Kg	<780	<3400 (I)	<7500	<820
3-Nitroaniline, ug/Kg	<510	<2200	<4900	<530
4,6-Dinitro-2-methylphenol, ug/Kg	<980	<4300	<9400	<1000
4-Bromophenyl phenyl ether, ug/Kg	<230	<1000	<2200	<250
4-Chloro-3-methylphenol, ug/Kg	<270	<1200	<2600	<290
4-Chloroaniline, ug/Kg	<160	<690	<1500	<160
4-Chlorophenyl phenyl ether, ug/Kg	<230	<1000	<2200	<250
4-Methylphenol, ug/Kg	<270	<1200	<2600	<290
4-Nitroaniline, ug/Kg	<620	<2800	<6000	<660
4-Nitrophenol, ug/Kg	<470	<2100	<4500	<490
Acenaphthene, ug/Kg	<200	<860	<1900	<200
Acenaphthylene, ug/Kg	<200	<860	<1900	<200
Anthracene, ug/Kg	<200	<860	<1900	<200
Benzo[a]anthracene, ug/Kg	<120	<520 (I)	<1100	160
Benzo[a]pyrene, ug/Kg	<270	<1200 (I)	<2600	<290
Benzo[b]fluoranthene, ug/Kg	<390	<1700 (I)	<3800	<410
Benzo[ghi]perylene, ug/Kg	<390	<1700 (I)	<3800	<410
Benzo[k]fluoranthene, ug/Kg	<390	<1700 (I)	<3800	<410
Benzoic acid, ug/Kg	<1000	<4600	<10000	<1100
Benzyl alcohol, ug/Kg	<230	<1000	<2200	<250
Butyl benzyl phthalate, ug/Kg	<390	<1700 (I)	<3800	<410
Chrysene, ug/Kg	<120	<520 (I)	<1100	450
Di-n-butylphthalate, ug/Kg	<390	<1700	<3800	<410
Di-n-octylphthalate, ug/Kg	<390	<1700 (I)	<3800	<410
Dibenz[a,h]anthracene, ug/Kg	<390	<1700 (I)	<3800	<410
Dibenzofuran, ug/Kg	<120	<520	<1100	<120
Diethylphthalate, ug/Kg	<390	<1700	<3800	<410
Dimethylphthalate, ug/Kg	<390	<1700	<3800	<410
Fluoranthene, ug/Kg	<160	<690	<1500	1300
Fluorene, ug/Kg	<270	<1200	<2600	<290
Hexachlorobenzene, ug/Kg	<230	<1000	<2200	<250
Hexachlorobutadiene, ug/Kg	<230	<1000	<2200	<250
Hexachlorocyclopentadiene, ug/Kg	<390	<1700	<3800	<410
Hexachloroethane, ug/Kg	<270	<1200	<2600	<290
Indeno[1,2,3-cd]pyrene, ug/Kg	<390	<1700 (I)	<3800	<410
Isophorone, ug/Kg	<270	<1200	<2600	<290
N-Nitrosodi-n-propylamine, ug/Kg	<230	<1000	<2200	<250
N-Nitrosodiphenylamine, ug/Kg	<200	<860	<1900	<200

I - Low internal standard response. Result is an estimated quantitation.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SURFACE WATERS
FORT RILEY

PARAMETER Date Collected	PSFSW01 4-2-92	SAMPLE PSFSW02 4-1-92	DUPLICATE PSFSW08 4-1-92	PSFSW03 4-1-92	PSFSW04 4-1-92	PSFSW06 3-31-92	PSFSW07 3-31-92
WET CHEMICAL INORGANICS:							
INORGANIC CHLORIDE, mg/l	71.30	65.40	65.40	65.00	61.10	50.00	37.60
NITRATE, mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
SULFATE, mg/l	84.30	104.00	105.00	106.00	105.00	81.00	73.50
BICARBONATE as CaCO3, mg/l	310.00	240.00	248.00	234.00	292.00	194.00	172.00
ORGANOPHOSPHOROUS PESTICIDES:							
AZINPHOS METHYL (GUTHION), ug/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
BOLSTAR, ug/L	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
CHLORPYRIFOS (DURSBAN), ug/L	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
COUMAPHOS (CO-RAL), ug/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
DEMETON-S (MERCAPTOPHOS), ug/L	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
DIAZINON, ug/L	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
DICHLORVOS (DDVP), ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DISULFOTON (DI-SYSTON), ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
ETHOPROP (MOCAP), ug/L	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
FENSULFOTHION (DASANIT), ug/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
FENTHION (BAYCID), ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MALATHION, ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MERPHOS, ug/L	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
METHYL PARATHION, ug/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
MEVINPHOS (PHOSDRIN), ug/L	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
NALED, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PHORATE, ug/L	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
RONNEL (FENCHLORPHOS), ug/L	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
STIROPHOS (TETRACHLORVINPHOS), ug/L	<5	<5	<5	<5	<5	<5	<5
.CID HERBICIDES:							
2,4,5-T, ug/l	<2.0 (S1)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2,4,5-TP (SILVEX), ug/l	<1.7 (S1)	<1.7	<1.7	<1.7	<1.7	<1.8	<1.7
2,4-D, ug/l	<12 (S1)	<12	<12	<12	<12	<12	<12
2,4-DB, ug/l	<9.1 (S1)	<9.1	<9.1	<9.1	<9.1	<9.1	<9.1
DALAPON, ug/l	<58 (S1)	<58.0	<58	<58	<58	<58	<58.0
DICAMBA, ug/l	<2.7 (S1)	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7
DICHLOROPROP, ug/l	<6.5 (S1)	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5
DINOSEB, ug/l	<0.7 (S1)	<0.7	<0.7	<0.7	<0.7	<.7	<6.5
MCPA, ug/l	<2500 (S1)	<2500	<2500	<2500	<2500	<2500	<2500
MCPP, ug/l	<1900 (S1)	<1900	<1900	<1900	<1900	<1900	<1900

S1 – Surrogate recovery is unknown. Result is estimated.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SURFACE WATERS
FORT RILEY

PARAMETER Date Collected	PSFSW01 4-2-92	SAMPLE PSFSW02 4-1-92	DUPLICATE PSFSW08 4-1-92	PSFSW03 4-1-92	PSFSW04 4-1-92	PSFSW06 3-31-92	PSFSW07 3-31-92
VOLATILE ORGANICS (CONT'D):							
Bromoform, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane, ug/L	<10	<10	<10	<10	<10	<10	<10
Carbon disulfide, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Carbon tetrachloride, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Chlorobenzene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Chloroethane, ug/L	<10	<10	<10	<10	<10	<10	<10
Chloroform, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Chloromethane, ug/L	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Methylene chloride, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	30 (T)	30 (T)
Styrene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Tetrachloroethene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Toluene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichloroethene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Vinyl acetate, ug/L	<10	<10	<10	<10	<10	<10	<10
Vinyl chloride, ug/L	<10	<10	<10	<10	<10	<10	<10
Xylenes (total), ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,3-Dichloropropene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
trans-1,3-Dichloropropene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
TOTAL FURNACE METALS:							
Arsenic, ug/L	4.0	<4.0	4.1	4.0	4.4	<4.0	<4.0
Lead, ug/L	<2.0 (M2)	<10 (M2)	<10 (M2)	4.2 (M2)	<10 (M2)	<2.0 (M2)	<2.0 (M2)
Selenium, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TOTAL ICP METALS:							
Aluminum, ug/L	3900	5700	6700	8900	12000	600 (B1)	620 (B1)
Antimony, ug/L	<35	<35	<35	<35	<35	<35	<35
Barium, ug/L	250	260	260	250	290	180	140
Beryllium, ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Cadmium, ug/L	<4.0	<4.0	4.5	<4.0	<4.0	<4.0	<4.0
Calcium, ug/L	110000	100000	100000	100000	110000	79000	70000
Chromium, ug/L	18	10	24	10	13	<10	<10
Cobalt, ug/L	<8.0	<8.0	<8.0	<8.0	<8.0	<8.0	<8.0
Copper, ug/L	10	7.2	10	12	13	6.4	8.0
Iron, ug/L	2800 (M1)	4200 (M1)	5100 (M1)	6500 (M1)	9400 (M1)	410 (M1)	410 (M1)
Magnesium, ug/L	20000	22000	22000	22000	23000	14000	12000
Manganese, ug/L	100	92	110	120	190	110	63
Nickel, ug/L	<16	<16	<16	<16	<16	<16	<16
Potassium, ug/L	9600	10000	10000	10000	11000	7300	6200
Silver, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Sodium, ug/L	45000	49000	49000	47000	45000	42000	35000
Thallium, ug/L	<77	<77	<77	<77	<77	<77	<77
Vanadium, ug/L	15	15	20	20	26	6.4	7.0
Zinc, ug/L	27	28	34	45	70	18	13
TOTAL MERCURY, ug/L:	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

B1 – Sample results are less than 5 times the amount detected in the method blank. Result is estimated.
M1 – Matrix spike recovery is high due to sample matrix effect. Sample result is a false positive or biased high.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
T – Sample results are less than 10 times the amount detected in the trip blank. Result is estimated.

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SURFACE WATERS
FORT RILEY

PARAMETER		SAMPLE	DUPLICATE				
	PSFSW01	PSFSW02	PSFSW08	PSFSW03	PSFSW04	PSFSW06	PSFSW07
Date Collected	4-2-92	4-1-92	4-1-92	4-1-92	4-1-92	3-31-92	3-31-92
SEMI-VOLATILE ORGANICS (CONT'D):							
4-Nitrophenol, ug/L	<12	<12	<12	<12	<12	<12	<12
Acenaphthene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acenaphthylene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Anthracene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benz[a]anthracene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Benzo[a]pyrene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
Benzo[b]fluoranthene, ug/L	<10	<10	<10	<10	<10	<10	<10
Benzo[ghi]perylene, ug/L	<10	<10	<10	<10	<10	<10	<10
Benzo[k]fluoranthene, ug/L	<10	<10	<10	<10	<10	<10	<10
Benzoic acid, ug/L	<27	<27	<27	<27	<27	<27	<27
Benzyl alcohol, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
Butyl benzyl phthalate, ug/L	<10	<10	<10	<10	<10	<10	<10
Chrysene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Di-n-butylphthalate, ug/L	<10	<10	<10	<10	<10	<10	<10
Di-n-octylphthalate, ug/L	<10	<10	<10	<10	<10	<10	<10
Dibenz[a,h]anthracene, ug/L	<10	<10	<10	<10	<10	<10	<10
Dibenzofuran, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Diethylphthalate, ug/L	<10	<10	<10	<10	<10	<10	<10
Dimethylphthalate, ug/L	<10	<10	<10	<10	<10	<10	<10
Fluoranthene, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Fluorene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
Hexachlorobenzene, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
Hexachlorobutadiene, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
Hexachlorocyclopentadiene, ug/L	<10	<10	<10	<10	<10	<10	<10
Hexachloroethane, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
Indeno[1,2,3-cd]pyrene, ug/L	<10	<10	<10	<10	<10	<10	<10
Isophorone, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
N-Nitrosodi-n-propylamine, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
N-Nitrosodiphenylamine, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Naphthalene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Nitrobenzene, ug/L	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol, ug/L	<16	<16	<16	<16	<16	<16	<16
Phenanthrene, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Phenol, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Pyrene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
bis(2-Chloroethoxy)methane, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
bis(2-Chloroethyl)ether, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
bis(2-Chloroisopropyl)ether, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
bis(2-Ethylhexyl)phthalate, ug/L	<10	<10	<10	<10	<10	<10	<10
VOLATILE ORGANICS:							
1,1,1-Trichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2-Trichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
1,2-Dichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloroethene (total), ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
2-Butanone, ug/L	<100	<100	<100	<100	<100	<100	<100
2-Hexanone, ug/L	<10	<10	<10	<10	<10	<10	<10
4-Methyl-2-pentanone, ug/L	<10	<10	<10	<10	<10	<10	<10
Acetone, ug/L	<100	<100	<100	<100	<100	<100	<100
Benzene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Bromodichloromethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SURFACE WATERS
FORT RILEY

PARAMETER Date Collected	PSFSW01 4-2-92	SAMPLE PSFSW02 4-1-92	DUPLICATE PSFSW08 4-1-92	PSFSW03 4-1-92	PSFSW04 4-1-92	PSFSW06 3-31-92	PSFSW0' 3-31-92
PESTICIDES/PCBs:							
4,4'-DDD, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4,4'-DDE, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4,4'-DDT, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor-1016, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor-1221, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor-1232, ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Aroclor-1242, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor-1248, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor-1254, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aroclor-1260, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dieldrin, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulfate, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin aldehyde, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor, ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toxaphene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.1	<5.1
alpha-BHC, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-Chlordane, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SEMI-VOLATILE ORGANICS:							
1,2,4-Trichlorobenzene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
1,2-Dichlorobenzene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Dichlorobenzene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
1,4-Dichlorobenzene, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
2,4,5-Trichlorophenol, ug/L	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0
2,4,6-Trichlorophenol, ug/L	<8.0	<8.0	<8.0	<8.0	<8.0	<8.0	<8.0
2,4-Dichlorophenol, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
2,4-Dimethylphenol, ug/L	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrophenol, ug/L	<43	<43	<43	<43	<43	<43	<43
2,4-Dinitrotoluene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
2,6-Dinitrotoluene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
2-Chloronaphthalene, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
2-Chlorophenol, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
2-Methylnaphthalene, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
2-Methylphenol, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
2-Nitroaniline, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Nitrophenol, ug/L	<10	<10	<10	<10	<10	<10	<10
3,3'-Dichlorobenzidene, ug/L	<20	<20	<20	<20	<20	<20	<20
3-Nitroaniline, ug/L	<13	<13	<13	<13	<13	<13	<13
4,6-Dinitro-2-methylphenol, ug/L	<25	<25	<25	<25	<25	<25	<25
4-Bromophenyl phenyl ether, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
4-Chloro-3-methylphenol, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
4-Chloroaniline, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
4-Chlorophenyl phenyl ether, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
4-Methylphenol, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0
4-Nitroaniline, ug/L	<16	<16	<16	<16	<16	<16	<16

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB6067 04-07-92	TB6071 04-08-92	TB61756178 04-02-92	TB6525 05-02-92	TB6528 04-29-92	TB6532 05-05-92	TB6540 05-04-92	TB6947 07-14-92
<u>ACID HERBICIDES:</u>								
2,4,5-T, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-TP (SILVEX), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
2,4-D, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
2,4-DB, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DALAPON, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DICAMBA, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DICHLOROPROP, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DINOSEB, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
MCPA, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
MCPP, ug/l	NA	NA	NA	NA	NA	NA	NA	NA

NA – Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB6067 04-07-92	TB6071 04-08-92	TB61756178 04-02-92	TB6525 05-02-92	TB6528 04-29-92	TB6532 05-05-92	TB6540 05-04-92	TB6947 07-14-92
TOTAL ICP METALS (CONT'D):								
Sodium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
DISSOLVED MERCURY, ug/L:	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL MERCURY, ug/L:	NA	NA	NA	NA	NA	NA	NA	NA
WET CHEMICAL INORGANICS:								
INORGANIC CHLORIDE, mg/l	NA	NA	NA	NA	NA	NA	NA	NA
NITRATE, mg/l	NA	NA	NA	NA	NA	NA	NA	NA
SULFATE, mg/l	NA	NA	NA	NA	NA	NA	NA	NA
BICARBONATE as CaCO3, mg/l	NA	NA	NA	NA	NA	NA	NA	NA
ORGANOPHOSPHORUS PESTICIDES:								
AZINPHOS METHYL (GUTHION), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
BOLSTAR, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
CHLORPYRIFOS (DURSBAN), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
COUMAPHOS (CO-RAL), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DEMETON-S (MERCAPTOPHOS), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DIAZINON, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DICHLORVOS (DDVP), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DISULFOTON (DI-SYSTON), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
ETHOPROP (MOCAP), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
FENSULFOTHION (DASANIT), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
FENTHION (BAYCID), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
MALATHION, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
MERPHOS, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
METHYL PARATHION, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
MEVINPHOS (PHOSDRIN), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
NALED, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
PHORATE, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
RONNEL (FENCHLORPHOS), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
STIROPHOS (TETRACHLORVINPHOS), ug/l	NA	NA	NA	NA	NA	NA	NA	NA

NA – Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB6067 04-07-92	TB6071 04-08-92	TB61756178 04-02-92	TB6525 05-02-92	TB6528 04-29-92	TB6532 05-05-92	TB6540 05-04-92	TB6947 07-14-92
DISSOLVED ICP METALS (CONT'D):								
Chromium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Copper, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Iron, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Silver, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL FURNACE METALS:								
Arsenic, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Lead, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL ICP METALS:								
Aluminum, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Barium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Copper, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Iron, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Silver, ug/L	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB6067 04-07-92	TB6071 04-08-92	TB61756178 04-02-92	TB6525 05-02-92	TB6528 04-29-92	TB6532 05-05-92	TB6540 05-04-92	TB6947 07-14-92
VOLATILE ORGANICS (CONT'D):								
Benzene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Bromodichloromethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromoform, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
Carbon disulfide, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Carbon tetrachloride, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Chlorobenzene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Chloroethane, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Chloromethane, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Methylene chloride, ug/L	<5.0	<5.0	<5.0	8.0 (B2)	9.1 (B2)	<5.0	9.5 (B2)	6.0
Styrene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Tetrachloroethene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Toluene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichloroethene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Vinyl acetate, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl chloride, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
Xylenes (total), ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,3-Dichloropropene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
trans-1,3-Dichloropropene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
DISSOLVED FURNACE METALS:								
Arsenic, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Lead, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
DISSOLVED ICP METALS:								
Aluminum, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Barium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA

B2 – Sample results are less than 10 times the amount detected in the method blank. Result is estimated.
NA – Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB6067 04-07-92	TB6071 04-08-92	TB61756178 04-02-92	TB6525 05-02-92	TB6528 04-29-92	TB6532 05-05-92	TB6540 05-04-92	TB6947 07-14-92
SEMI-VOLATILE ORGANICS (CONT'D):								
2,4-Dimethylphenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benz[a]anthracene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]pyrene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[b]fluoranthene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[ghi]perylene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[k]fluoranthene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic acid, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl alcohol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz[a,h]anthracene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran, ug/L	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB6067 04-07-92	TB6071 04-08-92	TB61756178 04-02-92	TB6525 05-02-92	TB6528 04-29-92	TB6532 05-05-92	TB6540 05-04-92	TB6947 07-14-92
SEMI-VOLATILE ORGANICS (CONT'D):								
Diethylphthalate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Dimethylphthalate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-propylamine, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Phenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl)ether, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
VOLATILE ORGANICS:								
1,1,1-Trichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2-Trichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
1,2-Dichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloroethene (total), ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
2-Butanone, ug/L	<100	<100	<100	<100	<100	<100	<100	<100
2-Hexanone, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
4-Methyl-2-pentanone, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
Acetone, ug/L	<100	<100	<100	<100	<100	<100	<100	<100

NA - Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB6067 04-07-92	TB6071 04-08-92	TB61756178 04-02-92	TB6525 05-02-92	TB6528 04-29-92	TB6532 05-05-92	TB6540 05-04-92	TB6947 07-14-92
PESTICIDES/PCBs:								
4,4'-DDD, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1016, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1221, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1232, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1242, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1248, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1254, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1260, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Endrin, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
SEMI-VOLATILE ORGANICS:								
1,2,4-Trichlorobenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB5689 01-24-92	TB5884 04-06-92	TB5950 04-05-92	TB5991 03-31-92	TB59955951 04-04-92	TB6050 04-28-92	TB6059 05-01-92	TB6064 04-07-92
ACID HERBICIDES:								
2,4,5-T, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-TP (SILVEX), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
2,4-D, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
2,4-DB, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DALAPON, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DICAMBA, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DICHLOROPROP, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DINOSEB, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
MCPA, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
MCPP, ug/l	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB5689 01-24-92	TB5884 04-06-92	TB5950 04-05-92	TB5991 03-31-92	TB59955951 04-04-92	TB6050 04-28-92	TB6059 05-01-92	TB6064 04-07-92
TOTAL ICP METALS (CONT'D):								
Sodium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
DISSOLVED MERCURY, ug/L:	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL MERCURY, ug/L:	NA	NA	NA	NA	NA	NA	NA	NA
WET CHEMICAL INORGANICS:								
INORGANIC CHLORIDE, mg/l	NA	NA	NA	NA	NA	NA	NA	NA
NITRATE, mg/l	NA	NA	NA	NA	NA	NA	NA	NA
SULFATE, mg/l	NA	NA	NA	NA	NA	NA	NA	NA
BICARBONATE as CaCO3, mg/l	NA	NA	NA	NA	NA	NA	NA	NA
ORGANOPHOSPHORUS PESTICIDES:								
AZINPHOS METHYL (GUTHION), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
BOLSTAR, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
CHLORPYRIFOS (DURSBAN), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
COUMAPHOS (CO-RAL), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DEMETON-S (MERCAPTOPHOS), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DIAZINON, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DICHLORVOS (DDVP), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
DISULFOTON (DI-SYSTON), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
ETHOPROP (MOCAP), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
FENSULFOTHION (DASANIT), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
FENTHION (BAYCID), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
MALATHION, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
MERPHOS, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
METHYL PARATHION, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
MEVINPHOS (PHOSDRIN), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
NALED, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
PHORATE, ug/l	NA	NA	NA	NA	NA	NA	NA	NA
RONNEL (FENCHLORPHOS), ug/l	NA	NA	NA	NA	NA	NA	NA	NA
STIROPHOS (TETRACHLORVINPHOS), ug/l	NA	NA	NA	NA	NA	NA	NA	NA

NA – Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB5689 01-24-92	TB5884 04-06-92	TB5950 04-05-92	TB5991 03-31-92	TB59955951 04-04-92	TB6050 04-28-92	TB6059 05-01-92	TB6064 04-07-92
DISSOLVED ICP METALS (CONT'D):								
Chromium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Copper, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Iron, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Silver, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Thallium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL FURNACE METALS:								
Arsenic, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Lead, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL ICP METALS:								
Aluminum, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Barium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Copper, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Iron, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Silver, ug/L	NA	NA	NA	NA	NA	NA	NA	NA

NA – Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB5689 01-24-92	TB5884 04-06-92	TB5950 04-05-92	TB5991 03-31-92	TB59955951 04-04-92	TB6050 04-28-92	TB6059 05-01-92	TB6064 04-07-92
<u>VOLATILE ORGANICS (CONT'D):</u>								
Benzene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Bromodichloromethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromoform, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
Carbon disulfide, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Carbon tetrachloride, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Chlorobenzene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Chloroethane, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Chloromethane, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Methylene chloride, ug/L	17	<5.0	<5.0	33	<5.0	<5.0	5.8 (B2)	<5.0
Styrene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Tetrachloroethene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Toluene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichloroethene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Vinyl acetate, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl chloride, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
Xylenes (total), ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
cis-1,3-Dichloropropene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
trans-1,3-Dichloropropene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
<u>DISSOLVED FURNACE METALS:</u>								
Arsenic, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Lead, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
<u>DISSOLVED ICP METALS:</u>								
Aluminum, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Antimony, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Barium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, ug/L	NA	NA	NA	NA	NA	NA	NA	NA

B2 – Sample results are less than 10 times the amount detected in the method blank. Result is estimated.
NA – Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB5689 01-24-92	TB5884 04-06-92	TB5950 04-05-92	TB5991 03-31-92	TB59955951 04-04-92	TB6050 04-28-92	TB6059 05-01-92	TB6064 04-07-92
SEMI-VOLATILE ORGANICS (CONT'D):								
Diethylphthalate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Dimethylphthalate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-propylamine, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Phenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl)ether, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
VOLATILE ORGANICS:								
1,1,1-Trichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2-Trichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
1,2-Dichloroethane, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloroethene (total), ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloropropane, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
2-Butanone, ug/L	<100	<100	<100	<100	<100	<100	<100	<100
2-Hexanone, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
4-Methyl-2-pentanone, ug/L	<10	<10	<10	<10	<10	<10	<10	<10
Acetone, ug/L	<100	<100	<100	<100	<100	<100	<100	<100

NA - Not analyzed

H:\' 'SERS\1113\RILEY\PS1531\LENL\TBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB5689 01-24-92	TB5884 04-06-92	TB5950 04-05-92	TB5991 03-31-92	TB59955951 04-04-92	TB6050 04-28-92	TB6059 05-01-92	TB6064 04-07-92
SEMI-VOLATILE ORGANICS (CONT'D):								
2,4-Dimethylphenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benz[a]anthracene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]pyrene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[b]fluoranthene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[ghi]perylene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[k]fluoranthene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic acid, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl alcohol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz[a,h]anthracene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran, ug/L	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	TB5689 01-24-92	TB5884 04-06-92	TB5950 04-05-92	TB5991 03-31-92	TB59955951 04-04-92	TB6050 04-28-92	TB6059 05-01-92	TB6064 04-07-92
PESTICIDES/PCBs:								
4,4'-DDD, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1016, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1221, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1232, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1242, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1248, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1254, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Arodor-1260, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Endrin, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
SEMI-VOLATILE ORGANICS:								
1,2,4-Trichlorobenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol, ug/L	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	MWSB04ARN 05-04-92	PSF9204R 07-14-92	PSFSB03BR 04-05-92	PSFSB13AR 04-06-92	PSFSB18BR 04-05-92	PSFSD05R 04-01-92	PSFSS03R 04-05-92	TB101 07-23-92	TB1567 07-16-92
ACID HERBICIDES:									
2,4,5-T, ug/l	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	NA	NA
2,4,5-TP (SILVEX), ug/l	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	NA	NA
2,4-D, ug/l	<12	<12	<12	<12	<12	<12	<12	NA	NA
2,4-DB, ug/l	<9.1	<9.1	<9.1	<9.1	<9.1	<9.1	<9.1	NA	NA
DALAPON, ug/l	<58.0	<58	<58	<58	<58	<58	<58	NA	NA
DICAMBA, ug/l	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	NA	NA
DICHLOROPROP, ug/l	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5	NA	NA
DINOSEB, ug/l	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	NA	NA
MCPA, ug/l	<2500	<2500	<2500	<2500	<2500	<2500	<2500	NA	NA
MCPP, ug/l	<1900	<1900	<1900	<1900	<1900	<1900	<1900	NA	NA

NA – Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	MWSB04ARN 05-04-92	PSF9204R 07-14-92	PSFSB03BR 04-05-92	PSFSB13AR 04-06-92	PSFSB18BR 04-05-92	PSFSD05R 04-01-92	PSFSS03R 04-05-92	TB101 07-23-92	TB1567 07-16-92
TOTAL ICP METALS (CONT'D):									
Sodium, ug/L	400	460	<210	<210	<210	220	<210	NA	NA
Thallium, ug/L	<100	<100	<77	<77	<77	<77	<77	NA	NA
Vanadium, ug/L	<7.0	<7.0	<5.0	<5.0	<5.0	5.0	<5.0	NA	NA
Zinc, ug/L	23(B1)	19(B1)	6.6	<3.0	3.1	<3.0	16	NA	NA
DISSOLVED MERCURY, ug/L:	NA	<.2	NA	NA	NA	NA	NA	NA	NA
TOTAL MERCURY, ug/L:	<.2	<.2	<.2	<.2	<.2	<.2	<.2	NA	NA
WET CHEMICAL INORGANICS:									
INORGANIC CHLORIDE, mg/l	--	<0.2	--	--	--	--	--	NA	NA
NITRATE, mg/l	--	<0.2	--	--	--	--	--	NA	NA
SULFATE, mg/l	--	<0.2	--	--	--	--	--	NA	NA
BICARBONATE as CaCO3, mg/l	--	2.00	--	--	--	--	--	NA	NA
ORGANOPHOSPHORUS PESTICIDES:									
AZINPHOS METHYL (GUTHION), ug/l	<1.50	<1.5	<1.5	<1.50	<1.5	<1.5	<1.5	NA	NA
BOLSTAR, ug/l	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	NA	NA
CHLORPYRIFOS (DURSBAN), ug/l	<0.30	<0.3	<0.30	<0.30	<0.3	<0.3	<0.3	NA	NA
COUMAPHOS (CO-RAL), ug/l	<1.50	<1.5	<1.50	<1.50	<1.5	<1.5	<1.5	NA	NA
DEMETON-S (MERCAPTOPHOS), ug/l	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	NA	NA
DIAZINON, ug/l	<0.60	<0.6	<0.60	<0.60	<0.6	<0.6	<0.6	NA	NA
DICHLORVOS (DDVP), ug/l	<0.10	<0.1	<0.10	<0.10	<0.1	<0.1	<0.1	NA	NA
DISULFOTON (DI-SYSTON), ug/l	<0.20	<0.2	<0.2	<0.20	<0.2	<0.2	<0.2	NA	NA
ETHOPROP (MOCAP), ug/l	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	NA	NA
FENSULFOTHION (DASANIT), ug/l	<1.50	<1.5	<1.50	<1.50	<1.5	<1.5	<1.5	NA	NA
FENTHION (BAYCID), ug/l	<0.10	<0.1	<0.1	<0.10	<0.1	<0.1	<0.1	NA	NA
MALATHION, ug/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA
MERPHOS, ug/l	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	NA	NA
METHYL PARATHION, ug/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	NA	NA
MEVINPHOS (PHOSDRIN), ug/l	<0.30	<0.3	<0.3	<0.30	<0.3	<0.3	<0.3	NA	NA
NALED, ug/l	<0.10	<0.1	<0.1	<0.10	<0.1	<0.1	<0.1	NA	NA
PHORATE, ug/l	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	NA	NA
RONNEL (FENCHLORPHOS), ug/l	<0.30	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	NA	NA
STIROPHOS (TETRACHLORVINPHOS), ug/l	<5.00	<5	<5.0	<5	<5	<5	<5	NA	NA

B1 - Sample results are less than 5 times the amount detected in the method blank. Result is estimated.
NA - Not analyzed

H:\LTSUSERS\1113\RILEY\PS1531\LENL\TBTBL.WK1

PESTICIDE STORAGE FACILITY / 11–1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	MWSB04ARN 05–04–92	PSF9204R 07–14–92	PSFSB03BR 04–05–92	PSFSB13AR 04–06–92	PSFSB18BR 04–05–92	PSFSD05R 04–01–92	PSFSS03R 04–05–92	TB101 07–23–92	TB1567 07–16–92
DISSOLVED ICP METALS (CONT'D):									
Chromium, ug/L	NA	<10	NA	NA	NA	NA	NA	NA	NA
Cobalt, ug/L	NA	<10	NA	NA	NA	NA	NA	NA	NA
Copper, ug/L	NA	<5.0	NA	NA	NA	NA	NA	NA	NA
Iron, ug/L	NA	<45	NA	NA	NA	NA	NA	NA	NA
Magnesium, ug/L	NA	<81	NA	NA	NA	NA	NA	NA	NA
Manganese, ug/L	NA	<3.0	NA	NA	NA	NA	NA	NA	NA
Nickel, ug/L	NA	<18	NA	NA	NA	NA	NA	NA	NA
Potassium, ug/L	NA	170	NA	NA	NA	NA	NA	NA	NA
Silver, ug/L	NA	<4.0	NA	NA	NA	NA	NA	NA	NA
Sodium, ug/L	NA	710	NA	NA	NA	NA	NA	NA	NA
Thallium, ug/L	NA	<110	NA	NA	NA	NA	NA	NA	NA
Vanadium, ug/L	NA	<7.0	NA	NA	NA	NA	NA	NA	NA
Zinc, ug/L	NA	28 (B2)	NA	NA	NA	NA	NA	NA	NA
TOTAL FURNACE METALS:									
Arsenic, ug/L	<2.0	<2.0	<4.0	<4.0	<4.0	<4.0	<4.0	NA	NA
Lead, ug/L	<1.0	<5.0	7.2	<2.0	<2.0	<2.0	<2.0	NA	NA
Selenium, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA
TOTAL ICP METALS:									
Aluminum, ug/L	<110	<110	120 (B1)	73 (B1)	<69	<69	81 (B1)	NA	NA
Antimony, ug/L	<31	<31	<35	<35	<35	<35	<35	NA	NA
Barium, ug/L	<20	<20	<39	<39	<39	<39	<39	NA	NA
Beryllium, ug/L	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0	<2.0	NA	NA
Cadmium, ug/L	<5.0	<5.0	<4.0	<4.0	<4.0	<4.0	<4.0	NA	NA
Calcium, ug/L	310 (B1)	400	240	<200	<200	<200	230	NA	NA
Chromium, ug/L	<10	12	<10	<10	<10	<10	<10	NA	NA
Cobalt, ug/L	<10	<10	<8.0	<8.0	<8.0	<8.0	<8.0	NA	NA
Copper, ug/L	<5.0	<5.0	<3.0	<3.0	<3.0	3.3	<3.0	NA	NA
Iron, ug/L	220	<45	<18	<18	<18	<18	<18	NA	NA
Magnesium, ug/L	96 (B1)	<81	<170	<170	<170	<170	<170	NA	NA
Manganese, ug/L	4.2	<3.0	3.8	<3.0	<3.0	<3.0	<3.0	NA	NA
Nickel, ug/L	<18	<18	<16	<16	<16	<16	<16	NA	NA
Potassium, ug/L	<130	<130	<210	<210	<210	<210	<210	NA	NA
Silver, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	NA	NA

B1 – Sample results are less than 5 times the amount detected in the method blank. Result is estimated.
NA – Not analyzed

H:\LTSUSERS\1113\RILEY\PS1531\LENL\TBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	MWSB04ARN 05-04-92	PSF9204R 07-14-92	PSFSB03BR 04-05-92	PSFSB13AR 04-06-92	PSFSB18BR 04-05-92	PSFSD05R 04-01-92	PSFSS03R 04-05-92	TB101 07-23-92	TB1567 07-16-92
VOLATILE ORGANICS (CONT'D):									
Benzene, ug/L	NA	NA	NA	NA	NA	NA	NA	<3.0	<3.0
Bromodichloromethane, ug/L	NA	NA	NA	NA	NA	NA	NA	<5.0	<5.0
Bromoform, ug/L	NA	NA	NA	NA	NA	NA	NA	<5.0	<5.0
Bromomethane, ug/L	NA	NA	NA	NA	NA	NA	NA	<10	<10
Carbon disulfide, ug/L	NA	NA	NA	NA	NA	NA	NA	<3.0	<3.0
Carbon tetrachloride, ug/L	NA	NA	NA	NA	NA	NA	NA	<3.0	<3.0
Chlorobenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	<3.0	<3.0
Chloroethane, ug/L	NA	NA	NA	NA	NA	NA	NA	<10	<10
Chloroform, ug/L	NA	NA	NA	NA	NA	NA	NA	<3.0	<3.0
Chloromethane, ug/L	NA	NA	NA	NA	NA	NA	NA	<10	<10
Dibromochloromethane, ug/L	NA	NA	NA	NA	NA	NA	NA	<5.0	<5.0
Ethylbenzene, ug/L	NA	NA	NA	NA	NA	NA	NA	<3.0	<3.0
Methylene chloride, ug/L	NA	NA	NA	NA	NA	NA	NA	6.8	17
Styrene, ug/L	NA	NA	NA	NA	NA	NA	NA	<3.0	<3.0
Tetrachloroethene, ug/L	NA	NA	NA	NA	NA	NA	NA	<3.0	<3.0
Toluene, ug/L	NA	NA	NA	NA	NA	NA	NA	<5.0	<5.0
Trichloroethene, ug/L	NA	NA	NA	NA	NA	NA	NA	<3.0	<3.0
Vinyl acetate, ug/L	NA	NA	NA	NA	NA	NA	NA	<10	<10
Vinyl chloride, ug/L	NA	NA	NA	NA	NA	NA	NA	<10	<10
Xylenes (total), ug/L	NA	NA	NA	NA	NA	NA	NA	<5.0	<5.0
cis-1,3-Dichloropropene, ug/L	NA	NA	NA	NA	NA	NA	NA	<3.0	<3.0
trans-1,3-Dichloropropene, ug/L	NA	NA	NA	NA	NA	NA	NA	<3.0	<3.0
DISSOLVED FURNACE METALS:									
Arsenic, ug/L	NA	<2.0	NA	NA	NA	NA	NA	NA	NA
Lead, ug/L	NA	<1.0	NA	NA	NA	NA	NA	NA	NA
Selenium, ug/L	NA	<1.0	NA	NA	NA	NA	NA	NA	NA
DISSOLVED ICP METALS:									
Aluminum, ug/L	NA	130	NA	NA	NA	NA	NA	NA	NA
Antimony, ug/L	NA	<31	NA	NA	NA	NA	NA	NA	NA
Barium, ug/L	NA	<20	NA	NA	NA	NA	NA	NA	NA
Beryllium, ug/L	NA	<1.0	NA	NA	NA	NA	NA	NA	NA
Cadmium, ug/L	NA	<5.0	NA	NA	NA	NA	NA	NA	NA
Calcium, ug/L	NA	560	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	MWSB04ARN 05-04-92	PSF9204R 07-14-92	PSFSB03BR 04-05-92	PSFSB13AR 04-06-92	PSFSB18BR 04-05-92	PSFSD05R 04-01-92	PSFSS03R 04-05-92	TB101 07-23-92	TB1567 07-16-92
SEMI-VOLATILE ORGANICS (CONT'D):									
2,4-Dimethylphenol, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
2,4-Dinitrophenol, ug/L	<43	<43	<43	<43	<43	<43	<43	NA	NA
2,4-Dinitrotoluene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	NA	NA
2,6-Dinitrotoluene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	NA	NA
2-Chloronaphthalene, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	NA	NA
2-Chlorophenol, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	NA	NA
2-Methylnaphthalene, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	NA	NA
2-Methylphenol, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	NA	NA
2-Nitroaniline, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	NA	NA
2-Nitrophenol, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
3,3'-Dichlorobenzidene, ug/L	<20	<20	<20	<20	<20	<20	<20	NA	NA
3-Nitroaniline, ug/L	<13	<13	<13	<13	<13	<13	<13	NA	NA
4,6-Dinitro-2-methylphenol, ug/L	<25	<25	<25	<25	<25	<25	<25	NA	NA
4-Bromophenyl phenyl ether, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	NA	NA
4-Chloro-3-methylphenol, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	NA	NA
4-Chloroaniline, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	NA	NA
4-Chlorophenyl phenyl ether, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	NA	NA
4-Methylphenol, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	NA	NA
4-Nitroaniline, ug/L	<16	<16	<16	<16	<16	<16	<16	NA	NA
4-Nitrophenol, ug/L	<12	<12	<12	<12	<12	<12	<12	NA	NA
Acenaphthene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	NA	NA
Acenaphthylene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	NA	NA
Anthracene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	NA	NA
Benz[a]anthracene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	NA	NA
Benzo[a]pyrene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	NA	NA
Benzo[b]fluoranthene, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
Benzo[ghi]perylene, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
Benzo[k]fluoranthene, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
Benzoic acid, ug/L	<27	<27	<27	<27	<27	<27	<27	NA	NA
Benzyl alcohol, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	NA	NA
Butyl benzyl phthalate, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
Chrysene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	NA	NA
Di-n-butylphthalate, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
Di-n-octylphthalate, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
Dibenz[a,h]anthracene, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
Dibenzofuran, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	NA	NA

NA – Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	MWSB04ARN 05-04-92	PSF9204R 07-14-92	PSFSB03BR 04-05-92	PSFSB13AR 04-06-92	PSFSB18BR 04-05-92	PSFSD05R 04-01-92	PSFSS03R 04-05-92	TB101 07-23-92	TB1567 07-16-92
SEMI-VOLATILE ORGANICS (CONT'D):									
Diethylphthalate, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
Dimethylphthalate, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
Fluoranthene, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	NA	NA
Fluorene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	NA	NA
Hexachlorobenzene, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	NA	NA
Hexachlorobutadiene, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	NA	NA
Hexachlorocyclopentadiene, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
Hexachloroethane, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	NA	NA
Indeno[1,2,3-cd]pyrene, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
Isophorone, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	NA	NA
N-Nitrosodi-n-propylamine, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	NA	NA
N-Nitrosodiphenylamine, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	NA	NA
Naphthalene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	NA	NA
Nitrobenzene, ug/L	<10	<10	<10	<10	<10	<10	<10	NA	NA
Pentachlorophenol, ug/L	<16	<16	<16	<16	<16	<16	<16	NA	NA
Phenanthrene, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	NA	NA
Phenol, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	NA	NA
Pyrene, ug/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	NA	NA
bis(2-Chloroethoxy)methane, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	NA	NA
bis(2-Chloroethyl)ether, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	NA	NA
bis(2-Chloroisopropyl)ether, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	NA	NA
bis(2-Ethylhexyl)phthalate, ug/L	<10	<10	<10	<10	16	<10	<10	NA	NA
VOLATILE ORGANICS:									
1,1,1-Trichloroethane, ug/L	NA	NA	NA	NA	NA	NA	NA	<5.0	<5.0
1,1,2,2-Tetrachloroethane, ug/L	NA	NA	NA	NA	NA	NA	NA	<5.0	<5.0
1,1,2-Trichloroethane, ug/L	NA	NA	NA	NA	NA	NA	NA	<5.0	<5.0
1,1-Dichloroethane, ug/L	NA	NA	NA	NA	NA	NA	NA	<5.0	<5.0
1,1-Dichloroethene, ug/L	NA	NA	NA	NA	NA	NA	NA	<3.0	<3.0
1,2-Dichloroethane, ug/L	NA	NA	NA	NA	NA	NA	NA	<5.0	<5.0
1,2-Dichloroethene (total), ug/L	NA	NA	NA	NA	NA	NA	NA	<5.0	<5.0
1,2-Dichloropropane, ug/L	NA	NA	NA	NA	NA	NA	NA	<3.0	<3.0
2-Butanone, ug/L	NA	NA	NA	NA	NA	NA	NA	<100	<100
2-Hexanone, ug/L	NA	NA	NA	NA	NA	NA	NA	<10	<10
4-Methyl-2-pentanone, ug/L	NA	NA	NA	NA	NA	NA	NA	<10	<10
Acetone, ug/L	NA	NA	NA	NA	NA	NA	NA	<100	<100

NA - Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
RINSATES & TRIP BLANKS
FORT RILEY

PARAMETER	MWSB04ARN 05-04-92	PSF9204R 07-14-92	PSFSB03BR 04-05-92	PSFSB13AR 04-06-92	PSFSB18BR 04-05-92	PSFSD05R 04-01-92	PSFSS03R 04-05-92	TB101 07-23-92	TB1567 07-16-92
PESTICIDES/PCBs:									
4,4'-DDD, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
4,4'-DDE, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
4,4'-DDT, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
Aldrin, ug/L	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
Aroclor-1016, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA
Aroclor-1221, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA
Aroclor-1232, ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	NA	NA
Aroclor-1242, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA
Aroclor-1248, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA
Aroclor-1254, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA
Aroclor-1260, ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA
Dieldrin, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
Endosulfan I, ug/L	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
Endosulfan II, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
Endosulfan sulfate, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
Endrin, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
Endrin aldehyde, ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
Heptachlor, ug/L	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
Heptachlor epoxide, ug/L	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
Methoxychlor, ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA
Toxaphene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	NA	NA
alpha-BHC, ug/L	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
alpha-Chlordane, ug/L	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
beta-BHC, ug/L	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
delta-BHC, ug/L	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
gamma-BHC, ug/L	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
gamma-Chlordane, ug/L	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
SEMI-VOLATILE ORGANICS:									
1,2,4-Trichlorobenzene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	NA	NA
1,2-Dichlorobenzene, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	NA	NA
1,3-Dichlorobenzene, ug/L	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	NA	NA
1,4-Dichlorobenzene, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	NA	NA
2,4,5-Trichlorophenol, ug/L	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0	<9.0	NA	NA
2,4,6-Trichlorophenol, ug/L	<8.0	<8.0	<8.0	<8.0	<8.0	<8.0	<8.0	NA	NA
2,4-Dichlorophenol, ug/L	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	NA	NA

NA - Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB17A (1.5-2.5') 4-6-92	DUPLICATE PSFSB17C (1.5-2.5') 4-6-92	PSFSB17B (4-4.5') 4-6-92	PSFSB18A (2-2.5') 4-5-92	PSFSB18B (4-4.5') 4-5-92	PSFSB19A (2-2.5') 4-4-92	PSFSB19B (4-4.5') 4-4-92	PSFSB20A (2-2.5') 4-8-92	PSFSB20B (4-4.5') 4-8-92
ORGANOPHOSPHORUS PESTICIDES (CONT'D):									
DICHLORVOS (DDVP), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
DISULFOTON (DI-SYSTON), ug/kg	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7
ETHOPROP (MOCAP), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
FENSULFOTHION (DASANIT), ug/kg	<50	<50	<50	<50	<50	<50	<50	<50	<50
FENTHION (BAYCID), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
MALATHION, ug/kg	<170	<170	<170	<170	<170	<170	<170	<170	<170
MERPHOS, ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
METHYL PARATHION, ug/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1	<1	<1	<1
MEVINPHOS (PHOSDRIN), ug/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10
NALED, ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
PHORATE, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	<5	<5	<5	<5
RONNEL (FENCHLORPHOS), ug/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10
STIROPHOS (TETRACHLORVINPHOS), ug/kg	<170	<170	<170	<170	<170	<170	<170	<170	<170
ACID HERBICIDES:									
2,4,5-T, ug/kg	<170	<170	<158	<161	<166	<173	<167	<164	<161
2,4,5-TP (SILVEX), ug/kg	<146	<146	<136	<138	<142	<148	<143	<140	<138
2,4-D, ug/kg	<984	<982	<915	<932	<960	<1002	<967	<947	<930
2,4-DB, ug/kg	<741	<740	<689	<702	<723	<754	<728	<714	<700
DALAPON, ug/kg	<4737	<4730	<4404	<4489	<4623	<4823	<4656	<4562	<4478
DICAMBA, ug/kg	<231	<230	<215	<219	<225	<235	<227	<222	<218
DICHLOROPROP, ug/kg	<534	<534	<497	<506	<522	<544	<525	<515	<505
DINOSEB, ug/kg	<61	<61	<56	<58	<59	<62	<60	<58	<57
MCPA, ug/kg	<202842	<202522	<188594	<192219	<197961	<206504	<199379	<195344	<191756
MCPP, ug/kg	<156687	<156439	<145680	<148481	<152916	<159515	<154011	<150895	<148123
2,3,7,8-TCDD (DIOXIN ISOMER), ppt	<185.9	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	SAMPLE PSFSB10B (3.5-4.5') 4-4-92	DUPLICATE PSFSB10C (3.5-4.5') 4-4-92	PSFSB11A (2-2.5') 4-7-92	PSFSB11B (4-4.5') 4-7-92	PSFSB12A (2-2.5') 4-8-92	PSFSB12B (4-4.5') 4-8-92	SAMPLE PSFSB13A (1.5-2.5') 4-6-92	DUPLICATE PSFSB13C (1.5-2.5') 4-6-92
ORGANOPHOSPHORUS PESTICIDES (CONT'D):								
DICHLORVOS (DDVP), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
DISULFOTON (DI-SYSTON), ug/kg	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7
ETHOPROP (MOCAP), ug/kg	<8.3	<8.3	<8.30	<8.30	<8.3	<8.3	<8.3	<8.3
FENSULFOTHION (DASANIT), ug/kg	<50	<50	<50.	<50.	<50	<50	<50	<50
FENTHION (BAYCID), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
MALATHION, ug/kg	<170	<170	<170	<170	<170	<170	<170	<170
MERPHOS, ug/kg	<8.3	<8.3	<8.30	<8.30	<8.3	<8.3	<8.3	<8.3
METHYL PARATHION, ug/kg	<1	<1	<1.00	<1.00	<1	<1	<1.0	<1.0
MEVINPHOS (PHOSDRIN), ug/kg	<10	<10	<10.	<10.	<10	<10	<10	<10
NALED, ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
PHORATE, ug/kg	<5	<5	<5.00	<5.00	<5	<5	<5.0	<5.0
RONNEL (FENCHLORPHOS), ug/kg	<10	<10	<10.	<10.	<10	43.80	<10	<10
STIROPHOS (TETRACHLORVINPHOS), ug/kg	<170	<170	<170	<170	<170	<170	<170	<170
ACID HERBICIDES:								
2,4,5-T, ug/kg	<183	<178	<158	<158	<171	<168	<186	<178
2,4,5-TP (SILVEX), ug/kg	<157	<153	<136	<135	<147	<144	<160	<153
2,4-D, ug/kg	<1060	<1033	<916	<913	<992	<973	<1077	<1031
2,4-DB, ug/kg	<798	<778	<690	<688	<747	<733	<811	<776
DALAPON, ug/kg	<5105	<4971	<4411	<4396	<4775	<4685	<5186	<4962
DICAMBA, ug/kg	<249	<242	<215	<214	<233	<228	<253	<242
DICHLOROPROP, ug/kg	<576	<561	<498	<496	<539	<529	<585	<560
DINOSEB, ug/kg	<65	<64	<57	<56	<61	<60	<66	<64
MCPA, ug/kg	<218586	<212874	<188893	<188254	<204481	<200625	<222074	<212495
MCPP, ug/kg	<168848	<164436	<145911	<145418	<157953	<154974	<171543	<164143
2,3,7,8-TCDD (DIOXIN ISOMER), ppt	NA	NA	NA	NA	NA	<322.2	NA	NA

NA - Not analyzed

H:\LTSUSERS\1113\RILEY\PS1531\LENL\SBTBL.WK1

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
SOIL BORINGS
FORT RILEY

PARAMETER Sample Depth Date Collected	PSFSB13B (4-4.5') 4-6-92	PSFSB14A (2-2.5') 4-4-92	PSFSB14B (4-4.5') 4-4-92	PSFSB15A (2-2.5') 4-4-92	PSFSB15B (4-4.5') 4-4-92	PSFSB16A (1.5-2.5') 4-4-92	PSFSB16B (3.5-4.5') 4-4-92
ORGANOPHOSPHORUS PESTICIDES (CONT'D):							
DICHLORVOS (DDVP), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
DISULFOTON (DI-SYSTON), ug/kg	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7	<6.7
ETHOPROP (MOCAP), ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
FENSULFOTHION (DASANIT), ug/kg	<50	<50	<50	<50	<50	<50	<50
FENTHION (BAYCID), ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
MALATHION, ug/kg	<170	<170	<170	<170	<170	<170	<170
MERPHOS, ug/kg	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3	<8.3
METHYL PARATHION, ug/kg	<1.0	<1	<1	<1	<1	<1	<1
MEVINPHOS (PHOSDRIN), ug/kg	<10	<10	<10	<10	<10	<10	<10
NALED, ug/kg	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
PHORATE, ug/kg	<5.0	<5	<5	<5	<5	<5	<5
RONNEL (FENCHLORPHOS), ug/kg	<10	<10	<10	<10	<10	<10	<10
STIROPHOS (TETRACHLORVINPHOS), ug/kg	<170	<170	<170	<170	<170	<170	<170
ACID HERBICIDES:							
2,4,5-T, ug/kg	<204	<182	<176	<157	<168	<162	<171
2,4,5-TP (SILVEX), ug/kg	<175	<156	<151	<135	<144	<139	<147
2,4-D, ug/kg	<1183	<1052	<1017	<910	<972	<935	<991
2,4-DB, ug/kg	<891	<793	<766	<686	<732	<704	<747
DALAPON, ug/kg	<5695	<5067	<4898	<4383	<4680	<4503	<4773
DICAMBA, ug/kg	<277	<247	<239	<214	<228	<219	<233
DICHLOROPROP, ug/kg	<188376	<572	<553	<494	<528	<508	<538
DINOSEB, ug/kg	<73	<65	<63	<56	<60	<58	<61
MCPA, ug/kg	<243867	<216968	<209720	<187683	<200408	<192818	<204381
MCPP, ug/kg	<188376	<167598	<161999	<144976	<154806	<148944	<157875
2,3,7,8-TCDD (DIOXIN ISOMER), ppt	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed

PESTICIDE STORAGE FACILITY / 11-1531
ANALYTICAL DATA SUMMARY TABLES
GROUNDWATERS
FORT RILEY

PARAMETER		SAMPLE	DUPLICATE			
	PSF9201	PSF9202	PSF9206	PSF9203	PSF9204	PSF9205
Date Collected	7-16-92	7-14-92	7-14-92	7-16-92	7-23-92	7-16-92
DISSOLVED ICP METALS (CONT'D):						
Zinc, ug/L	13 (B1)	16 (B1)	14 (B1)	11 (B1)	11 (B1)	15 (B1)
TOTAL FURNACE METALS:						
Arsenic, ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	16
Lead, ug/L	<5.0 (M2)	<5.0 (M2)	<5.0 (M2)	<5.0 (M2)	<1.0 (M2)	<5.0 (M2)
Selenium, ug/L	1.6	2.2	2.2	1.7	2.1	2.7
TOTAL ICP METALS:						
Aluminum, ug/L	<110	<110	<110	270	160	210
Antimony, ug/L	<31	<31	<31	<31	<31	<31
Barium, ug/L	100	84	82	81	85	130
Beryllium, ug/L	1.4	3.0	2.8	1.5	1.4	1.6
Cadmium, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Calcium, ug/L	89000	350000	330000	180000	140000	180000
Chromium, ug/L	10	<10	12	<10	<10	<10
Cobalt, ug/L	<10	<10	<10	<10	<10	<10
Copper, ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Iron, ug/L	52	68	<45	290	90	230
Magnesium, ug/L	14000	56000	54000	29000	19000	28000
Manganese, ug/L	26	56	50	91	36	43
Nickel, ug/L	<18	<18	<18	<18	<18	<18
Potassium, ug/L	3400	6300	6000	5900	3900	20000
Silver, ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Sodium, ug/L	11000	90000	87000	47000	25000	42000
Thallium, ug/L	<100	<100	<100	<100	<100	<100
Vanadium, ug/L	8.3	<7.0	<7.0	<7.0	<7.0	27
Zinc, ug/L	12 (B1)	98	16 (B1)	13 (B1)	7.8 (B1)	9.7 (B1)
DISSOLVED MERCURY, ug/L:	<.2	<.2	<.2	<.2	0.4 R	<.2
TOTAL MERCURY, ug/L:	<.2	<.2	<.2	<.2	<.2	<.2
WET CHEMICAL INORGANICS:						
INORGANIC CHLORIDE, mg/l	10.30	267.00	272.00	70.40	139.00	56.70
NITRATE, mg/l	4.50	32.60	33.00	11.60	<0.2	18.40
SULFATE, mg/l	84.70	380.00	386.00	171.00	125.00	119.00
TOTAL SULFIDE, mg/l	<1.0	<1.0	<1.0	<1.0	52.50	<1.0
BICARBONATE, mg/l	239.00	466.00	466.00	421.00	236.00	493.00
ORGANOPHOSPHORUS PESTICIDES:						
AZINPHOS METHYL (GUTHION), ug/l	<1.52	<1.5	<1.53	<1.53	<1.73	<1.5
BOLSTAR (SULPROFOS), ug/l	<0.15	<0.15	<0.15	<0.15	<0.17	<0.15
CHLORPYRIFOS (DURSBAN), ug/l	<0.3	<0.3	<0.31	<0.31	<0.35	<0.3
COUMAPHOS (CO-RAL), ug/l	<1.52	<1.5	<1.53	<1.53	<1.73	<1.5
DEMETON-S (MERCAPTOPHOS), ug/l	<0.25	<0.25	<0.26	<0.26	<0.29	<0.25
DIAZINON, ug/l	<0.61	<0.6	<0.61	<0.61	<0.69	<0.6
DICHLORVOS (DDVP), ug/l	<0.1	<0.1	<0.1	<0.1	<0.12	<0.1
DISULFOTON (DI-SYSTON), ug/l	<0.2	<0.2	<0.2	<0.2	<0.23	<0.2
ETHOPROP (MOCAP), ug/l	<0.25	<0.25	<0.26	<0.26	<0.29	<0.25

B1 – Sample results are less than 5 times the amount detected in the method blank. Result is estimated.
M2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.
R – Rejected; Dissolved mercury result exceeds total mercury result.

PARAMETER	PSF9201	SAMPLE PSF9202	DUPLICATE PSF9206	PSF9203	PSF9204	PSF9205
Date Collected	7-16-92	7-14-92	7-14-92	7-16-92	7-23-92	7-16-92
ORGANOPHOSPHORUS PESTICIDES (CONT'D):						
FENSULFOTHION (DASANIT), ug/l	<1.52	<1.5	<1.53	<1.53	<1.73	<1.5
FENTHION (BAYCID), ug/l	<0.1	<0.1	<0.1	<0.1	<0.12	<0.1
MALATHION, ug/l	<0.51	<0.5	<0.51	<0.51	<0.58	<0.5
MERPHOS, ug/l	<0.25	<0.25	<0.26	<0.26	<0.29	<0.25
METHYL PARATHION, ug/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
MEVINPHOS (PHOSDRIN), ug/l	<0.3	<0.3	<0.31	<0.31	<0.35	<0.3
NALED (DIBROM), ug/l	<0.1	<0.1	<0.1	<0.1	<0.12	<0.1
PHORATE, ug/l	<0.15	<0.15	<0.15	<0.15	<0.17	<0.15
RONNEL (FENCHLORPHOS), ug/l	<0.3	<0.3	<0.31	<0.31	<0.35	<0.3
STIROPHOS (TETRACHLORVINPHOS), ug/l	<5.05	<5	<5.1	<5.1	<5.75	<5
ACID HERBICIDES:						
2,4,5-T, ug/l	<2.00	<2.00	<2.00	<2.00	<2	<2.00
2,4,5-TP (SILVEX), ug/l	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
2,4-D, ug/l	<12.0	<12.0	<12.0	<12.0	<12	<12.0
2,4-DB, ug/l	<9.1	<9.1	<9.1	<9.1	<9.1	<9.1
DALAPON, ug/l	<58	<58.0	<58	<58	<58	<58.0
DICAMBA, ug/l	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7
DICHLOROPROP, ug/l	<6.5	<6.5	<6.5	<6.5	<6.5	<6.5
DINOSEB, ug/l	<0.70000	<0.70000	<0.70000	<0.70000	<0.7	<0.70000
MCPA, ug/l	<2500	<2500	<2500.00	<2500	<2500	<2500
MCPP, ug/l	<1900	<1900	<1900	<1900	<1900	<1900

PESTICIDE STORAGE FACILITY/11-1531
ANALYTICAL DATA SUMMARY TABLES
BACKGROUND GROUNDWATER CONCENTRATIONS (Well PSF92-01)
FORT RILEY

Chemical of Concern	Baseline	First Quarter	Second Quarter	Third Quarter
Aluminum	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND
Barium	0.1	0.12	0.16	0.2
Beryllium	0.0014	0.002	0.002	0.002
Chromium	0.01	ND	ND	ND
Manganese	0.026	0.024	0.022	0.034
Nitrate	4.5	3.8	6.4	2.2
Thallium	ND	ND	ND	ND
Vanadium	0.0083	0.011	0.006	ND

Note all units in mg/L
ND - Not detected

LAW ENVIRONMENTAL, INC.

NATIONAL LABORATORIES DIVISION
7215 PINE FOREST ROAD
PENSACOLA, FLORIDA 32526
904-944-9772
FAX 904-944-9463

September 10, 1993

Dave Gray
Law Environmental
10100 N. Executive Hills Blvd., Ste. 350
Kansas City, MO 64153

Dear Mr. Gray:

In response to your request to confirm previous analytical results for Thallium on Ft. Riley - Pesticide Storage Facility samples PSF9203 - AA35658, PSF9206 - AA35659 and PSF9202 - AA35660, please note the following results:

Ft. Riley - Thallium Re-runs

Sample no.	Initial result 05/27/93 ug/L	Re-anal. result 08/31/93 ug/L
AA35658	ND	ND
AA35658 MSA	2.5	1.3

Comments: On initial analysis, the analytical spike recovery for this sample was within acceptable limits (87%). Thallium was undetected in the sample. Because the Matrix Spike/Matrix Spike Duplicate associated with the digestion batch exceeded quality control limits for percent recovery, the sample was then analyzed by Method of Standard Addition and the MSA result was reported as 2.5. On re-analysis of the digestate, the analytical spike recovery was 50%. The sample was diluted 2X which resulted in an analytical spike recovery of 84% but Thallium was still undetected in the sample. The sample was then analyzed by Method of Standard Addition and the MSA result was 1.3 ug/L.

Ft. Riley
Case Narrative
Page 2

Sample no.	Initial result 05/27/93 ug/L	Re-anal. result 08/31/93 ug/L
AA35659	ND	ND
AA35659 MSA	ND	1.6

Comments: On initial analysis, the analytical spike recovery for this sample was below acceptable limits (16%). Thallium was undetected in the sample. The sample was then analyzed by Method of Standard Addition and the MSA result was undetected. On re-analysis, the analytical spike recovery was 34% and Thallium was undetected in the sample. The sample was diluted 2X which resulted in an analytical spike recovery of 52% and Thallium was undetected in the sample. The sample was then analyzed by Method of Standard Additions and the MSA result was 1.6 ug/L.

Sample no.	Initial result 05/27/93 ug/L	Re-anal. result 08/31/93 ug/L
AA35660	ND	ND
AA35660 MSA	1.7	2.9

Comments: On initial analysis, the analytical spike recovery for this sample was below acceptable limits (28%). Thallium was undetected in the sample. The sample was then analyzed by Method of Standard Addition and the MSA result was reported as 17 ug/L. This was the result of an isolated calculation error. The actual initial MSA result was 1.7 ug/L. On re-analysis of the digestate, the analytical spike recovery was also low (36%). The sample was diluted 2X which produced a better analytical spike recovery (52%) but Thallium was still undetected in the sample. The sample was then analyzed by Method of Standard Addition and the MSA result was 2.9 ug/L.

Ft. Riley
Case Narrative
Page 3

The low analytical spike recoveries of the samples listed above can be attributed to interference caused by high background levels of Calcium (180,00 - 300,000 ug/L), Magnesium (28,000 - 50,000 ug/L) and Sodium (52,000 - 130,000 ug/L). This background interference, in addition to the inherent limitations of the Method of Standard Additions for Furnace analysis, should be taken into account when using this data.

Sincerely,

LAW ENVIRONMENTAL, INC.

D. Abbott

D. Abbott
MIS Manager

APPENDIX M

METHOD DETECTION LIMITS, HOLDING TIME CRITERIA AND ARAR COMPARISON

Pesticide Storage Facility
Fort Riley, Kansas

TABLE 2-1

SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES
Remedial Investigation/Feasibility Study
Fort Riley, Kansas

Matrix	Parameter	Container [b]	Preservation [c]	Maximum Holding Times [d]	
				Extraction	Analysis
Water	Volatiles	5 x 40 mL G, Septa vial	HCL to pH <2/ Ice to 4°C	-	14 d
Water	B/N/A[a]	2 x 1 L amber G	Ice to 4° C	7 d	40 d
Water	Herbicides	2 x 1 L amber G	Ice to 4° C	7 d	40 d
Water	Pesticides PCBs	2 x 1 L amber G	Ice to 4° C	7 d	40 d
Water	Organo-phosphorous Pesticides	2 x 1 L amber G	Ice to 4° C	7 d	40 d
Water	Dissolved Metals	1 x 1 L P	Filter/HNO_3 to pH <2	-	6 mo
Water	Total Recoverable Metals[e]	1 x 1 L P	HNO3 to pH <2	-	6 mo[e]
Water	Sulfate Nitrate Chloride Bicarbonate	1 x 1 L P	Ice to 4° C	-	28 d 48 hrs 28 d 14 d
Soils	Volatiles	2 x 2 oz wide mouth G, Septa vial	Ice to 4° C	-	14 d
Soils/ Sediments	B/N/A/ Pesticides/ PCBs	1 x 8 oz G	Ice to 4° C	7 d	40 d
Soils/ Sediments	Metals	1 x 8 oz G	Ice to 4° C	-	6 mo[e]
Soils/ Sediments	Organo-phosphorous Pesticides	1 x 8 oz G	Ice to 4° C	14 d	40 d
Soils/ Sediments	Herbicides	1 x 8 oz G	Ice to 4° C	14 d	40 d
Soils/ Sediments	Dioxins	1 x 8 oz G	Ice to 4° C	14 d	40 d

(a) B/N/A = Base/Neutral/Acid Extractables

(b) All containers must have teflon-lined seals (teflon lined septa for VOA vials). G = Glass; P = High density polyethylene.

(c) Bottles will be pre-preserved except for dissolved metals. Dissolved metal samples will be filtered prior to shipment on all samples.

(d) When only one holding time is given, it implies total holding time from sampling until analysis. d = days, mo = months

(e) Total Recoverable Metals for water samples. Holding time for Hg is 28 days.

TABLE 2-2

LABORATORY-ESTABLISHED DETECTION AND QUANTITATION LIMITS
Fort Riley, Kansas

Parameter	Method	Units	Matrix	MDL	Precision Max RPD	Accuracy % R. Range
Aluminum	EPA 6010	ug/L	Water	27	20	75-125
		mg/kg	Soil	5.4	20	75-125
Antimony	EPA 6010	ug/L	Water	23	20	75-125
		mg/kg	Soil	4.6	20	75-125
Antimony	EPA 7041	ug/L	Water	1.68	20	75-125
		mg/kg	Soil	0.336	wo	75-125
Arsenic	EPA 7060	ug/L	Water	1.7	20	75-125
		mg/kg	Soil	0.34	20	75-125
Barium	EPA 6010	ug/L	Water	5	20	75-125
		mg/kg	Soil	1	20	75-125
Beryllium	EPA 6010	ug/L	Water	0.1	20	75-125
		mg/kg	Soil	0.02	20	75-125
Beryllium	EPA 7091	ug/L	Water	NA	20	75-125
		mg/kg	Soil	NA	20	75-125
Cadmium	EPA 6010	ug/L	Water	4	20	75-125
		mg/kg	Soil	0.8	20	75-125
Cadmium	EPA 7131	ug/L	Water	NA	20	75-125
		mg/kg	Soil	NA	20	75-125
Calcium	EPA 6010	ug/L	Water	93	20	75-125
		mg/kg	Soil	18.6	20	75-125
Chromium	EPA 6010	ug/L	Water	6	20	75-125
		mg/kg	Soil	1.2	20	75-125
Chromium	EPA 7191	ug/L	Water	NA	20	75-125
		mg/kg	Soil	NA	20	75-125
Cobalt	EPA 6010	ug/L	Water	5	20	75-125
		mg/kg	Soil	1	20	75-125
Cobalt	EPA 7201	ug/L	Water	NA	20	75-125
		mg/kg	Soil	NA	20	75-125
Copper	EPA 6010	ug/L	Water	1	20	75-125
		mg/kg	Soil	0.2	20	75-125
Iron	EPA 6010	ug/L	Water	11	20	75-125
		mg/kg	Soil	2.2	20	75-125
Lead	EPA 6010	ug/L	Water	17	20	75-125
		mg/kg	Soil	3.4	20	75-125
Lead	EPA 7421	ug/L	Water	1.41	20	75-125
		mg/kg	Soil	0.282	20	75-125
Magnesium	EPA 6010	ug/L	Water	171	20	75-125
		mg/kg	Soil	34.2	20	75-125
Manganese	EPA 6010	ug/L	Water	1	20	75-125
		mg/kg	Soil	0.2	20	75-125
Mercury	EPA 6010	ug/L	Water	NA	20	750-125
		mg/kg	Soil	NA	20	75-125
Mercury (cold vapor)	EPA 7470	ug/L	Water	0.2	20	75-125
	EPA 7471	mg/kg	Soil	NA	20	75-125

TABLE 2-2

LABORATORY-ESTABLISHED DETECTION AND QUANTITATION LIMITS
Fort Riley, Kansas

Parameter	Method	Units	Matrix	MDL	Precision Max RPD	Accuracy % R. Range
Molybdenum	EPA 6010	ug/L	Water	NR	20	75-125
		mg/kg	Soil	NA	20	75-125
Molybdenum	EPA 7481	ug/L	Water	NR	20	75-125
		mg/kg	Soil	NA	20	75-125
Nickel	EPA 6010	ug/L	Water	9	20	75-125
		mg/kg	Soil	1.8	20	75-125
Potassium	EPA 6010	ug/L	Water	216	20	75-125
		mg/kg	Soil	43.2	20	75-125
Selenium	EPA 6010	ug/L	Water	52	10	75-125
		mg/kg	Soil	10.4	20	75-125
Selenium	EPA 7740	ug/L	Water	1.16	20	75-125
		mg/kg	Soil	0.232	20	75-125
Silver	EPA 6010	ug/L	Water	2	20	75-125
		mg/kg	Soil	0.4	20	75-125
Sodium	EPA 6010	ug/L	Water	289	20	75-125
		mg/kg	Soil	57.8	20	75-125
Thallium	EPA 6010	ug/L	Water	22	20	75-125
		mg/kg	Soil	4.4	20	75-125
Thallium	EPA 7841	ug/L	Water	1.76	20	75-125
		mg/kg	Soil	0.352	20	75-125
Vanadium	EPA 6010	ug/L	Water	3	20	75-125
		mg/kg	Soil	0.6	20	75-125
Vanadium	EPA 7911	ug/L	Water	NA	20	75-125
		mg/kg	Soil	NA	20	75-125
Zinc	EPA 6010	ug/L	Water	2	20	75-125
		mg/kg	Soil	0.4	20	75-125

* – These values were determined by graphite furnace.
NA – Not Available; detection limits vary on percent solid calculations.
NR – Not Run; detection limits not established at this time.

1. If sample or duplicate result is <5 x MDL, then the difference between the sample and duplicate must be ± MDL.
2. If the original sample result is 4x the spike solution added prior to digestion, percent recovery will be flagged as Not Applicable.
3. Precision and accuracy values are based on CLP guidelines.

Source – Test Methods for Evaluating Solid Waste, Volume 1A, SW-846, 3rd Editiion, November 1986.

TABLE 2-2

LABORATORY-ESTABLISHED DETECTION AND QUANTITATION LIMITS
Fort Riley, Kansas

Parameter	Method	Units	Matrix	MDL	Precision Max RPD	Accuracy % R. Range
Aldrin	EPA 8080	ug/L	Water	0.04	20	42-122
		ug/kg	Soil	1.33	20	42-122
alpha-BHC	EPA 8080	ug/L	Water	0.03	23	37-134
		ug/kg	Soil	1	23	37-134
beta-BHC	EPA 8080	ug/L	Water	0.05	33	17-147
		ug/kg	Soil	2	33	17-147
delta-BHC	EPA 8080	ug/L	Water	0.05	25	19-140
		ug/kg	Soil	3	25	19-140
gamma-BHC (Lindane)	EPA 8080	ug/L	Water	0.04	22	32-127
		ug/kg	Soil	1.33	22	32-127
Chlordane (technical)	EPA 8080	ug/L	Water	0.05	18	45-119
		ug/kg	Soil	4.67	18	45-119
4,4'-DDD	EPA 8080	ug/L	Water	0.1	27	31-141
		ug/kg	Soil	3.67	27	31-141
4,4'-DDE	EPA 8080	ug/L	Water	0.04	28	30-145
		ug/kg	Soil	1.33	28	30-145
4,4'-DDT	EPA 8080	ug/L	Water	0.1	31	25-160
		ug/kg	Soil	4	31	25-160
Dieldrin	EPA 8080	ug/L	Water	0.02	16	36-146
		ug/kg	Soil	0.67	16	36-146
Endosulfan I	EPA 8080	ug/L	Water	0.05	18	45-153
		ug/kg	Soil	4.67	18	45-153
Endosulfan II	EPA 8080	ug/L	Water	0.04	47	D-202
		ug/kg	Soil	1.33	47	D-202
Endosulfan sulfate	EPA 8080	ug/L	Water	0.1	24	26-144
		ug/kg	Soil	20	24	26-144
Endrin	EPA 8080	ug/L	Water	0.06	24	30-147
		ug/kg	Soil	2	24	30-147
Endrin aldehyde	EPA 8080	ug/L	Water	0.1	NA	NA
		ug/kg	Soil	7.67	NA	NA
Heptachlor	EPA 8080	ug/L	Water	0.02	16	34-111
		ug/kg	Soil	1	16	34-111
Heptachlor epoxide	EPA 8080	ug/L	Water	0.05	25	37-142
		ug/kg	Soil	10	25	37-142
Methoxychlor	EPA 8080	ug/L	Water	0.5	NA	NA
		ug/kg	Soil	58.67	NA	NA
Toxaphene	EPA 8080	ug/L	Water	1	20	41-126
		ug/kg	Soil	80	20	41-126
PCB-1016	EPA 8080	ug/L	Water	0.5	15	50-114
		ug/kg	Soil	21.67	15	50-114
PCB-1221	EPA 8080	ug/L	Water	0.5	35	15-178
		ug/kg	Soil	21.67	35	15-178
PCB-1232	EPA 8080	ug/L	Water	NA	31	10-215
		ug/kg	Soil	NA	31	10-215

TABLE 2-2

LABORATORY-ESTABLISHED DETECTION AND QUANTITATION LIMITS
Fort Riley, Kansas

Parameter	Method	Units	Matrix	MDL	Precision Max RPD	Accuracy % R. Range
PCB-1242	EPA 8080	ug/L	Water	0.5	21	39-150
		ug/kg	Soil	21.67	21	39-150
PCB-1248	EPA 8080	ug/L	Water	0.5	25	38-158
		ug/kg	Soil	21.67	25	38-158
PCB-1254	EPA 8080	ug/L	Water	0.8	17	29-131
		ug/kg	Soil	26.67	17	29-131
PCB-1260	EPA 8080	ug/L	Water	0.8	39	8-127
		ug/kg	Soil	26.67	39	8-127

NA - Not Available presently. Values will be updated for water and soil when sufficient data is obtained for LENL analyses.

Determination of Method Detection Limits (MDL) for various matrices:(a)

MATRIX:	FACTOR:
Low-level soil by sonication with GPC cleanup	2
High-level soil & sludge by sonication	30
Non-aqueous organic liquid	600

(a) Sample MDLs are highly matrix dependent. The MDLs listed herein are provided for guidance and may not always be achievable. For non-aqueous samples, the factor is on a wet weight basis.

MDL = (MDL for soil) x (Factor)

Source - Test Methods for Evaluating Solid Waste, Volume 1B, SW-846, 3rd Edition, November 1986.

2,4-D	EPA 8150	ug/L	Water	1.2	20	50-150
		mg/kg	Soil	80	35	50-150
2,4-DB	EPA 8150	ug/L	Water	0.91	20	50-150
		mg/kg	Soil	0.60	35	50-150
2,4,5-T	EPA 8150	ug/L	Water	0.20	20	50-150
		mg/kg	Soil	0.12	35	50-150
2,4,5-TP	EPA 8150	ug/L	Water	0.20	20	50-150
		mg/kg	Soil	0.14	35	50-150
Dalapon	EPA 8150	ug/L	Water	30	20	50-150
		mg/kg	Soil	4	35	50-150
Dicamba	EPA 8150	ug/L	Water	0.28	20	50-150
		mg/kg	Soil	0.19	35	50-150
Dichloroprop	EPA 8150	ug/L	Water	0.66	20	50-150
		mg/kg	Soil	0.44	35	50-150
Dinoseb	EPA 8150	ug/L	Water	0.1	20	50-150
		mg/kg	Soil	0.50	35	50-150

TABLE 2-2

LABORATORY-ESTABLISHED DETECTION AND QUANTITATION LIMITS
Fort Riley, Kansas

Parameter	Method	Units	Matrix	MDL	Precision Max RPD	Accuracy % R. Range
MCPA	EPA 8150	ug/L	Water	1000	20	50-150
		mg/kg	Soil	170	35	50-150
MCPP	EPA 8150	ug/L	Water	1000	20	50-150
		mg/kg	Soil	130	35	50-150

NA = Not Available presently - Values will be updated by July 31, 1991
D = Detected: must be greater than zero
MDL = Method Detection Limit

Source - Test Methods for Evaluating Solid Waste, Volume 1B, SW-846, 3rd Edition, November 1986.

Acetone	EPA 8240	ug/L	Water	10	NA	NA
		ug/kg	Soil	10	NA	NA
Benzene	EPA 8240	ug/L	Water	2	25	37-151
		ug/kg	Soil	2	25	37-151
Bromodichloromethane	EPA 8240	ug/L	Water	2	20	35-155
		ug/kg	Soil	2	20	35-155
Bromoform	EPA 8240	ug/L	Water	2	17	45-169
		ug/kg	Soil	2	17	45-169
Bromomethane	EPA 8240	ug/L	Water	5	58	D-242
		ug/kg	Soil	5	58	D-242
2-Butanone	EPA 8240	ug/L	Water	50	27	31-183
		ug/kg	Soil	50	27	31-18
Carbon disulfide	EPA 8240	ug/L	Water	5	NA	NA
		ug/kg	Soil	5	NA	NA
Carbon tetrachloride	EPA 8240	ug/L	Water	2	11	70-140
		ug/kg	Soil	2	11	70-140
Chlorobenzene	EPA 8240	ug/L	Water	2	26	37-160
		ug/kg	Soil	2	26	37-160
Chloroethane	EPA 8240	ug/L	Water	6	29	14-230
		ug/kg	Soil	6	29	14-230
2-Chloroethyl vinyl ether	EPA 8240	ug/L	Water	10	84	D-305
		ug/kg	Soil	1	84	D-305
Chloroform	EPA 8240	ug/L	Water	1	18	51-138
		ug/kg	Soil	1	18	51-138
Chloromethane	EPA 8240	ug/L	Water	10	58	D-273
		ug/kg	Soil	10	58	D-273
Dibromochloromethane	EPA 8240	ug/L	Water	2	17	53-149
		ug/kg	Soil	2	17	53-149
1,1-Dichloroethane	EPA 8240	ug/L	Water	2	13	73-120
		ug/kg	Soil	2	16	59-155

TABLE 2-2

LABORATORY-ESTABLISHED DETECTION AND QUANTITATION LIMITS
Fort Riley, Kansas

Parameter	Method	Units	Matrix	MDL	Precision Max RPD	Accuracy % R. Range
1,2-Dichloroethane	EPA 8240	ug/L ug/kg	Water Soil	2 2	10 21	82-122 49-155
1,1-Dichloroethene	EPA 8240	ug/L ug/kg	Water Soil	3 3	20 24	52-123 48-105
cis-1,2-Dichloroethene	EPA 8240	ug/L ug/kg	Water Soil	5 5	NA NA	NA NA
trans-1,2-Dichloroethene	EPA 8240	ug/L ug/kg	Water Soil	4 4	19 19	54-156 54-156
1,2-Dichloropropane	EPA 8240	ug/L ug/kg	Water Soil	2 2	10 45	79-112 D-210
cis-1,3-Dichloropropene	EPA 8240	ug/L ug/kg	Water Soil	1 1	10 52	75-124 D-227
trans-1,3-Dichloropropene	EPA 8240	ug/L ug/kg	Water Soil	2 2	11 34	65-110 17-183
Ethylbenzene	EPA 8240	ug/L ug/kg	Water Soil	2 2	26 26	37-162 37-162
2-Hexanone	EPA 8240	ug/L ug/kg	Water Soil	3 3	31 31	40-167 40-167
Methylene chloride	EPA 8240	ug/L ug/kg	Water Soil	5 5	16 16	61-110 61-110
4-Methyl-2-pentanone	EPA 8240	ug/L ug/kg	Water Soil	3 3	NA NA	NA NA
Styrene	EPA 8240	ug/L ug/kg	Water Soil	2 2	10 NA	63-115 NA
1,1,2,2-Tetrachloroethane	EPA 8240	ug/L ug/kg	Water Soil	3 3	16 20	79-127 46-157
Tetrachloroethene	EPA 8240	ug/L ug/kg	Water Soil	3 3	16 16	64-148 64-148
Toluene	EPA 8240	ug/L ug/kg	Water Soil	2 2	10 18	70-120 66-132
1,1,1-Trichloroethane	EPA 8240	ug/L ug/kg	Water Soil	3 3	11 21	67-121 52-162
1,1,2-Trichloroethane	EPA 8240	ug/L ug/kg	Water Soil	2 2	16 18	79-121 52-150
Trichloroethene	EPA 8240	ug/L ug/kg	Water Soil	3 3	11 17	79-115 76-134
Vinyl acetate	EPA 8240	ug/L ug/kg	Water Soil	10 10	17 NA	10-146 NA

TABLE 2-2

LABORATORY-ESTABLISHED DETECTION AND QUANTITATION LIMITS
Fort Riley, Kansas

Parameter	Method	Units	Matrix	MDL	Precision Max RPD	Accuracy % R. Range
Vinyl chloride	EPA 8240	ug/L	Water	2	15	26-110
		ug/kg	Soil	2	65	D-251
Xylenes (total)	EPA 8240	ug/L	Water	1	10	82-121
		ug/kg	Soil	1	NA	NA

NA - Not available presently. Values will be updated for water and soil when sufficient data is obtained from LENL analyses.
D - Detected; must be greater than zero.
MDL - Method Detection Limit

Sample MDLs are highly matrix-dependent. The MDLs listed herein are provided for guidance and may not always be achievable.

MDLs listed for soil/sediment are based on wet weight. Normally data is reported on a dry weight basis; therefore PQLs will be higher, based on the percent moisture in each sample.

MDLs FOR OTHER MATRICES:	FACTOR:	
Water miscible liquid waste	50	MDL = (MDL for water) x (Factor)
High-level soil & sludges	50-500	
Non-aqueous organic liquid	5000	

Source - Test Methods for Evaluating Solid Waste, Volume 1B, SW-846, 3rd Edition, November 1986.

TABLE 2-2

LABORATORY-ESTABLISHED DETECTION AND QUANTITATION LIMITS
Fort Riley, Kansas

Parameter	Method	Units	Matrix	MDL	Precision Max RPD	Accuracy % R. Range
Acenaphthene	EPA 8270	ug/L	Water	5	26	51-99
		mg/kg	Soil	0.14	38	12-108
Acenaphthylene	EPA 8270	ug/L	Water	5	40	36-140
		mg/kg	Soil	0.15	30	13-100
Acetophenone	EPA 8270	ug/L	Water	10	NA	NA
		mg/kg	Soil	0.33	NA	NA
Anthracene	EPA 8270	ug/L	Water	5	26	31-128
		mg/kg	Soil	0.15	30	12-114
Benz[a]anthracene	EPA 8270	ug/L	Water	3	26	33-143
		mg/kg	Soil	0.09	26	33-143
Benz[b]fluoranthene	EPA 8270	ug/L	Water	10	56	34-136
		mg/kg	Soil	0.33	35	12-107
Benz[k]fluoranthene	EPA 8270	ug/L	Water	10	26	45-135
		mg/kg	Soil	0.33	34	15-118
Benzoic acid	EPA 8270	ug/L	Water	27	35	D-83
		mg/kg	Soil	0.88	57	5-66
Benz[ghi]perylene	EPA 8270	ug/L	Water	10	51	12-153
		mg/kg	Soil	0.32	36	11-111
Benzo[a]pyrene	EPA 8270	ug/L	Water	7	42	34-128
		mg/kg	Soil	0.22	27	13-106
Benzyl alcohol	EPA 8270	ug/L	Water	6	56	2-112
		mg/kg	Soil	0.18	91	D-62
Bis(2-chloroethoxy)methane	EPA 8270	ug/L	Water	6	38	27-108
		mg/kg	Soil	0.2	35	11-95
Bis(2-chloroethyl)ether	EPA 8270	ug/L	Water	6	42	32-96
		mg/kg	Soil	0.2	21	10-80
Bis(2-chloroisopropyl)ether	EPA 8270	ug/L	Water	6	41	33-112
		mg/kg	Soil	0.2	45	5-92
Bis(2-ethylhexyl)phthalate	EPA 8270	ug/L	Water	5	36	41-126
		mg/kg	Soil	0.14	30	11-117
4-Bromophenyl phenyl ether	EPA 8270	ug/L	Water	5	36	51-114
		mg/kg	Soil	0.14	29	15-107
Butyl benzyl phthalate	EPA 8270	ug/L	Water	3	42	42-125
		mg/kg	Soil	0.1	26	11-115
p-Chloroaniline	EPA 8270	ug/L	Water	4	31	41-78
		mg/kg	Soil	0.12	61	1-60
p-Chloro-m-cresol	EPA 8270	ug/L	Water	7	39	21-125
		mg/kg	Soil	0.22	43	10-98
2-Chloronaphthalene	EPA 8270	ug/L	Water	6	13	60-118
		mg/kg	Soil	0.18	13	60-118
2-Chlorophenol	EPA 8270	ug/L	Water	4	50	20-105
		mg/kg	Soil	0.12	33	11-81
4-Chlorophenyl phenyl ether	EPA 8270	ug/L	Water	6	27	53-110
		mg/kg	Soil	0.19	35	11-105

TABLE 2-2

LABORATORY-ESTABLISHED DETECTION AND QUANTITATION LIMITS
Fort Riley, Kansas

Parameter	Method	Units	Matrix	MDL	Precision Max RPD	Accuracy % R. Range
Chrysene	EPA 8270	ug/L mg/kg	Water Soil	3 0.1	39 29	45-116 65-125
Dibenz[a,h]anthracene	EPA 8270	ug/L mg/kg	Water Soil	10 0.33	56 35	6-58 1-109
Dibenzofuran	EPA 8270	ug/L mg/kg	Water Soil	10 0.09	42 34	46-103 12-102
Di-n-butylphthalate	EPA 8270	ug/L mg/kg	Water Soil	4 0.12	40 34	29-121 12-115
1,2-Dichlorobenzene	EPA 8270	ug/L mg/kg	Water Soil	5 0.17	50 27	31-85 10-79
1,3-Dichlorobenzene	EPA 8270	ug/L mg/kg	Water Soil	5 0.23	53 23	21-74 9-81
1,4-Dichlorobenzene	EPA 8270	ug/L mg/kg	Water Soil	5 0.18	45 30	22-84 9-81
3,3'-Dichlorobenzidine	EPA 8270	ug/L mg/kg	Water Soil	20 0.67	47 56	D-185 1-160
2,4-Dichlorophenol	EPA 8270	ug/L mg/kg	Water Soil	6 0.2	39 34	36-127 11-93
Diethylphthalate	EPA 8270	ug/L mg/kg	Water Soil	5 0.15	56 30	36-130 14-122
2,4-Dimethylphenol	EPA 8270	ug/L mg/kg	Water Soil	10 0.33	40 26	31-131 7-89
Dimethylphthalate	EPA 8270	ug/L mg/kg	Water Soil	4 0.13	105 105	D-112 D-112
4,6-Dinitro-o-cresol	EPA 8270	ug/L mg/kg	Water Soil	25 0.81	53 27	D-146 6-102
2,4-Dinitrophenol	EPA 8270	ug/L mg/kg	Water Soil	43 1.41	55 42	D-149 1-75
2,4-Dinitrotoluene	EPA 8270	ug/L mg/kg	Water Soil	7 0.23	61 31	33-125 13-117
2,6-Dinitrotoluene	EPA 8270	ug/L mg/kg	Water Soil	7 0.21	25 37	50-141 11-116
Di-n-octylphthalate	EPA 8270	ug/L mg/kg	Water Soil	9 0.3	21 19	39-139 16-132
Fluoranthene	EPA 8270	ug/L mg/kg	Water Soil	4 0.13	28 34	26-137 12-107
Fluorene	EPA 8270	ug/L mg/kg	Water Soil	7 0.21	35 31	59-115 13-111
Hexachlorobenzene	EPA 8270	ug/L mg/kg	Water Soil	6 0.2	43 28	48-111 16-113
Hexachlorobutadiene	EPA 8270	ug/L mg/kg	Water Soil	6 0.19	48 40	23-78 10-91
Hexachlorocyclopentadiene	EPA 8270	ug/L mg/kg	Water Soil	10 0.33	52 40	19-68 9-92

TABLE 2-2

LABORATORY-ESTABLISHED DETECTION AND QUANTITATION LIMITS
Fort Riley, Kansas

Parameter	Method	Units	Matrix	MDL	Precision Max RPD	Accuracy % R. Range
Hexachloroethane	EPA 8270	ug/L mg/kg	Water Soil	7 0.22	58 21	38-64 10-76
Indeno[1,2,3-cd]pyrene	EPA 8270	ug/L mg/kg	Water Soil	10 0.33	50 42	7-157 11-111
Isophorone	EPA 8270	ug/L mg/kg	Water Soil	7 0.22	35 36	23-123 10-90
Naphthalene	EPA 8270	ug/L mg/kg	Water Soil	3 0.08	30 30	21-133 21-133
2-Nitroaniline	EPA 8270	ug/L mg/kg	Water Soil	5 0.17	NA NA	NA NA
3-Nitroaniline	EPA 8270	ug/L mg/kg	Water Soil	13 0.41	NA NA	NA NA
4-Nitroaniline	EPA 8270	ug/L mg/kg	Water Soil	16 0.54	NA NA	NA NA
Nitrobenzene	EPA 8270	ug/L mg/kg	Water Soil	10 0.33	27 27	35-180 35-180
2-Nitrophenol	EPA 8270	ug/L mg/kg	Water Soil	10 0.33	46 39	D-129 10-84
4-Nitrophenol	EPA 8270	ug/L mg/kg	Water Soil	12 0.4	36 44	D-122 1-94
N-Nitrosodiphenylamine	EPA 8270	ug/L mg/kg	Water Soil	5 0.15	NA NA	NA NA
N-Nitrosodi-n-propylamine	EPA 8270	ug/L mg/kg	Water Soil	6 0.19	44 44	D-230 D-230
Pentachlorophenol	EPA 8270	ug/L mg/kg	Water Soil	16 0.54	30 38	5-120 6-99
Phenanthrene	EPA 8270	ug/L mg/kg	Water Soil	4 0.12	15 15	54-120 54-120
Phenol	EPA 8270	ug/L mg/kg	Water Soil	5 0.14	35 22	4-87 10-84
1,2,4-Trichlorobenzene	EPA 8270	ug/L mg/kg	Water Soil	7 0.22	21 21	44-142 44-142
2,4,5-Trichlorophenol	EPA 8270	ug/L mg/kg	Water Soil	9 0.28	43 26	11-140 11-101
2,4,6-Trichlorophenol	EPA 8270	ug/L mg/kg	Water Soil	8 0.24	42 28	33-138 12-98

TABLE 2-2

LABORATORY-ESTABLISHED DETECTION AND QUANTITATION LIMITS
Fort Riley, Kansas

Parameter	Method	Units	Matrix	MDL	Precision Max RPD	Accuracy % R. Range
Azinphos methyl (Guthion)	EPA 8140	ug/L	Water	1.50	20	50-150
		mg/kg	Soil	500	35	50-150
Bolstar	EPA 8140	ug/L	Water	0.15	20	50-150
		mg/kg	Soil	50	35	50-150
Chlorpyrifos (Dursban)	EPA 8140	ug/L	Water	0.30	20	50-150
		mg/kg	Soil	99	35	50-150
Coumaphos (Co-ral)	EPA 8140	ug/L	Water	1.50	20	50-150
		mg/kg	Soil	500	35	50-150
Demeton-s (Mercaptophos)	EPA 8140	ug/L	Water	0.25	20	50-150
		mg/kg	Soil	83	35	50-150
Diazinon	EPA 8140	ug/L	Water	0.60	20	50-150
		mg/kg	Soil	200	35	50-150
Dichlorvos (DDVP)	EPA 8140	ug/L	Water	0.10	20	50-150
		mg/kg	Soil	33	35	50-150
Disulfoton (Di-syston)	EPA 8140	ug/L	Water	0.20	20	50-150
		mg/kg	Soil	66	35	50-150
Ethoprop (Mocap)	EPA 8140	ug/L	Water	0.25	20	50-150
		mg/kg	Soil	83	35	50-150
Fensulfothion (Dasanit)	EPA 8140	ug/L	Water	1.50	20	50-150
		mg/kg	Soil	500	35	50-150
Fenthion (Baycid)	EPA 8140	ug/L	Water	0.10	20	50-150
		mg/kg	Soil	33	35	50-150
Merphos	EPA 8140	ug/L	Water	0.25	20	50-150
		mg/kg	Soil	83	35	50-150
Mevinphos (Phosdrin)	EPA 8140	ug/L	Water	0.30	20	50-150
		mg/kg	Soil	99	35	50-150
Naled	EPA 8140	ug/L	Water	0.10	20	50-150
		mg/kg	Soil	33	35	50-150
Methyl parathion	EPA 8140	ug/L	Water	0.03	20	50-150
		mg/kg	Soil	9.9	35	50-150
Malathion	EPA 8140	ug/L	Water	0.05 (a)	20	50-150
		mg/kg	Soil	170 (a)	35	50-150
Phorate	EPA 8140	ug/L	Water	0.15	20	50-150
		mg/kg	Soil	50	35	50-150
Ronnel (Fenchlorphos)	EPA 8140	ug/L	Water	0.3	20	50-150
		mg/kg	Soil	99	35	50-150
Stirophos (Tetrachlorvinphos)	EPA 8140	ug/L	Water	5.00	20	50-150
		mg/kg	Soil	1700	35	50-150

MDLS listed per SW-846, 3rd Edition, November 1986.

(a) No detection limit established, value given at the quantitation limit.

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND TO BE CONSIDERED (TBC) REQUIREMENTS FOR GROUND WATER

Pesticide Storage Facility Area
Fort Riley, Kansas

CHEMICAL	METHOD	MDL (mg/L)	FEDERAL MCL (mg/L)	FEDERAL MCLG (mg/L)	KANSAS MCL (mg/L)	KAL (mg/L)	KNL (mg/L)	RCRA ACTION LEVELS * GROUND WATER (mg/L)
Pesticides:								
Aldrin	8080	.00005	NA	NA	NA	0.000031	0.0000031	0.000002
Chlordane	8080	.00005	0.002	0	NA	0.00027	0.000027	0.00003
DDD	8080	.0001	NA	NA	NA	2.4E-08	2.4E-09	0.0001
DDE	8080	.0001	NA	NA	NA	2.4E-08	2.4E-09	0.0001
DDT	8080	.0001	NA	NA	NA	0.00042	0.000042	0.0001
Total DDT	8080	.0001	NA	NA	NA	NA	NA	0.0001
Dieldrin	8080	.0001	NA	NA	NA	0.000219	0.00000219	0.000002
Endrin aldehyde	8080	.0001	NA	NA	NA	0.0002	0.00002	NA
Fenchlorphos	8140	.0003	NA	NA	NA	NA	NE	NA
Heptachlor	8080	.00005	0.0004	0	NA	0.00076	0.000076	0.000008
Heptachlor epoxide	8080	.00005	0.0002	0	NA	0.00038	0.000038	0.000004
Methoxychlor	8080	.0005	0.04	0.04	0.1	0.1	0.01	NA
Volatiles:								
Benzene	8240	.003	0.005	0	NA	0.005	0.0005	NA
Carbon Disulfide	8240	.003	NA	NA	NA	NA	NA	4
Methylene Chloride	8240	.005	0.005 *	NA	NA	0.05	0.005	0.005
Toluene	8240	.005	1	1	NA	2	0.2	10
Trichloroethene	8240	.003	.005	0	NA	0.005	0.0005	.005°
Semi-Volatiles:								
Acenaphthene	8270	.005	NA	NA	NA	NA	NA	NA
Anthracene	8270	.005	NA	NA	NA	0.000029	0.0000029	NA
Benzo[a]anthracene	8270	.003	NA	0	NA	0.000029	0.0000029	NA

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND TO BE CONSIDERED (TBC) REQUIREMENTS FOR GROUND WATER

Pesticide Storage Facility Area
Fort Riley, Kansas

CHEMICAL	METHOD	MDL (mg/L)	FEDERAL MCL (mg/L)		FEDERAL MCLG (mg/L)	KANSAS MCL (mg/L)	KAL (mg/L)	KNL (mg/L)	RCRA ACTION LEVELS * GROUND WATER (mg/L)
Benzo[a]pyrene	8270	.007	0.0002	*	0	NA	0.00003	0.000003	NA
Benzo[b]fluoranthene	8270	.010	NA		0	NA	0.000029	0.0000029	NA
Benzo[k]fluoranthene	8270	.010	NA		0	NA	0.000029	0.0000029	NA
Bis(2-ethylhexyl)phthalate	8270	.005	0.006	*	0	NA	4.2	0.42	0.003
Chrysene	8270	.003	NA		0	NA	0.000029	0.0000029	NA
Dibenzofuran	8270	.010	NA		NA	NA	NA	NA	0.1
2,4-Dichlorophenol	8270	.006	NA		NA	NA	NA	NA	0.1
Diethylphthalate	8270	.005	NA		0	NA	350	35	30
Fluoranthene	8270	.004	NA		NA	NA	0.000029	0.0000029	NA
Fluorene	8270	.007	NA		0	NA	0.000029	0.0000029	NA
Indeno[1,2,3-cd]pyrene	8270	.010	NA		0	NA	0.000029	0.0000029	NA
2-Methylnaphthalene	8270	.004	NA		NA	NA	NA	NA	NA
Phenanthrene	8270	.004	NA		0	NA	0.000029	0.0000029	NA
Pyrene	8270	.003	NA		0	NA	0.000029	0.0000029	NA
2,4,6-Trichlorophenol	8270	.008	NA		NA	NA	0.017	0.0017	0.002
Metals:									
Aluminum	6010	.100	NA		NA	NA	5	NA	NA
Arsenic	7060	.002	0.05		0	0.05	0.05	NA	0.05 [c]
Barium	6010	.005	2		2	1	1	NA	2 [c]
Cadmium	6010	.005	0.005		0.005	0.01	0.005	NA	0.005 [c]
Chromium	6010	.010	0.1		0.1	0.05	0.05	NA	0.1 [c]
Cobalt	6010	.010	NA		NA	NA	NA	NA	NA
Copper	6010	.005	1.3		1.3	NA	1	NA	NA
Iron	6010	.045	0.3	(S)	NA	NA	0.3	NA	NA

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND TO BE CONSIDERED (TBC) REQUIREMENTS FOR GROUND WATER

Pesticide Storage Facility Area
Fort Riley, Kansas

CHEMICAL	METHOD	MDL (mg/L)	FEDERAL MCL (mg/L)		FEDERAL MCLG (mg/L)	KANSAS MCL (mg/L)	KAL (mg/L)	KNL (mg/L)	RCRA ACTION LEVELS [a] GROUND WATER (mg/L)
Lead	7421	.001	T T		0	0.05	0.05	NA	0.05 [e]
Magnesium	6010	.171	NA		NA	NA	NA	NA	NA
Manganese	6010	.015	0.05	(S)	NA	NA	0.05	NA	NA
Mercury	7470	.0002	0.002		0.002	0.002	0.002	NA	0.002 [c]
Nickel	6010	.018	0.1	*	NA	NA	0.15	NA	.7
Potassium	6010	.216	NA		NA	NA	NA	NA	NA
Selenium	7740	.0012	0.05		0.05	0.01	0.045	NA	NA
Silver	6010	.004	0.05		NA	0.05	0.05	NA	0.05 [c]
Sodium	6010	.289	NA		NA	NA	100	NA	NA
Thallium	6010	.100	0.002	*	NA	NA	0.013	NA	0.003 [f]
Vanadium	6010	.007	NA		NA	NA	NA	NA	NA
Zinc	6010	.004	NA		NA	NA	5	NA	NA

NA – Not available S – Secondary MCL T T – Treatment Technique (0.015 mg/L at tap)

(a) RCRA Action Levels – Federal Register, Vol. 55, No. 145, July 27, 1990. Pages 30798–30884. Corrective Action for Solid Waste Management Facilities, Proposed Rule.
(b) Value is for Endrin.
(c) Value listed is Maximum Contaminant Level (MCL).
(d) Value is for hexavalent chromium.
(e) Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites. Memorandum from H. Longest and B. Diamond to EPA Regions. OSWER Directive 9355.4–02
(f) Value is for Thallium Acetate.

Sources: Maximum Contaminant Levels (40 CFR 141 Subpart B); Kansas Drinking Water Rules (KAR 28.15)
* USEPA (57 FR 31776), 17 July, 1992

MDL: Method Detection Limit

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND TO BE CONSIDERED (TBC) REQUIREMENTS
FOR SOILS
Pesticide Storage Facility Area
Fort Riley, Kansas

CHEMICAL	METHOD	MDL mg/kg	RCRA ACTION LEVELS [a] SOILS (mg/kg)
Pesticides:			
Aldrin	8080	.0013	0.04
Chlordane	8080	.0047	0.5
DDD	8080	.0037	3
DDE	8080	.0013	2
DDT	8080	.004	2
Total DDT	8080	.004	2
Dieldrin	8080	.00067	0.04
Endrin aldehyde	8080	.0077	20 [b]
Fenchlorphos	8140	99	NA
Heptachlor	8080	.001	0.2
Heptachlor epoxide	8080	.010	0.08
Methoxychlor	8080	.059	NA
Volatiles:			
Benzene	8240	.002	NA
Carbon Disulfide	8240	.005	8,000
Methylene Chloride	8240	.005	90
Toluene	8240	.002	20,000
Trichloroethene	8240	.003	60
Semi-Volatiles:			
Acenaphthene	8270	0.14	NA
Anthracene	8270	0.15	NA
Benzo[a]anthracene	8270	0.09	NA
Benzo[a]pyrene	8270	0.22	NA
Benzo[b]fluoranthene	8270	0.33	NA
Benzo[k]fluoranthene	8270	0.33	NA
Bis(2-ethylhexyl)phthalate	8270	0.14	50
Chrysene	8270	0.1	NA
Dibenzofuran	8270	0.09	NA
2,4-Dichlorophenol	8270	0.2	200
Diethylphthalate	8270	0.15	60,000
Fluoranthene	8270	0.13	NA
Fluorene	8270	0.21	NA
Indeno[1,2,3-cd]pyrene	8270	0.33	NA
2-Methylnaphthalene	8270	0.12	NA
Phenanthrene	8270	0.12	NA
Pyrene	8270	0.08	NA
2,4,6-Trichlorophenol	8270	0.24	40

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
(ARARs) REQUIREMENTS FOR SURFACE WATER
AMBIENT WATER QUALITY CRITERIA (AWQC)
Pesticide Storage Facility Area
Fort Riley, Kansas

Method	Chemical	MDL	Maximum Concentration Detected	FEDERAL AMBIENT WATER QUALITY CRITERIA For the Protection of Aquatic Life:		For the Protection of Human Health: (consumption of)		KANSAS STATE WATER QUALITY STANDARDS [c] For the Protection of Aquatic Life:
				Acute	Chronic	Water & Fish	Fish only	
8240	Methylene Chloride	5	33	11,000 [a,d]	NA	0.19 [b,d]	15.7 [b,d]	NA
6010	Aluminum	100	12,000	NA	NA	NA	NA	NA
7060	Arsenic, pentavalent	2	4.4 [T]	850 [a]	48 [a]	2.2 [b]	17.5 [b]	NA
7060	Arsenic, trivalent	2	4.4 [T]	360	190	2.2 [b]	17.5 [b]	NA
6010	Barium	5	290	NA	NA	1 mg	NA	NA
310.1	Bicarbonate	500	310,000	NA	NA	NA	NA	NA
6010	Cadmium	5	4.5	3.9 [e]	1.1 [e]	10	NA	NA
6010	Calcium	1000	110,000	NA	NA	NA	NA	NA
300	Chloride, inorganic	500	71,300	19	11	NA	NA	NA
--	Chromium, hexavalent	NR	24 [T]	16	11	50	NA	NA
6010	Chromium, trivalent	10	24 [T]	1,700 [e]	210 [e]	170	3,433 mg	NA
6010	Copper	5	13	18 [e]	12 [e]	NA	NA	NA
6010	Iron	45	9,400 [M1]	NA	1,000	0.3 mg	NA	NA
7421	Lead	1	4.2 [M2]	82 [e]	3.2 [e]	50	NA	NA
6010	Magnesium	171	23,000	NA	NA	NA	NA	NA
6010	Manganese	15	190	NA	NA	50	100	NA
300	Nitrate	500	ND	NA	NA	10 mg	NA	NA
6010	Potassium	216	11,000	NA	NA	NA	NA	NA
6010	Sodium	289	49,000	NA	NA	NA	NA	NA
300	Sulfate	500	106,000	NA	NA	NA	NA	NA
6010	Vanadium	7	26	NA	NA	NA	NA	NA
6010	Zinc	4	70	120 [e]	110 [e]	NA	NA	47

All concentrations are in ug/L (ppb), unless indicated otherwise.

NA – Not available ND – Not Detected NR – Not Run

a – Insufficient data to develop criteria. Value presented is lowest observed effect level.
b – Human health criteria for carcinogens reported for three risk levels. Value presented in this table is the 10^{-6} risk level.
c – The State of Kansas has incorporated the Federal AWQC for the protection of aquatic life as the State Water Quality Standards by reference.
d – Value is for Halomethanes.
e – Hardness Dependent Criteria (100 mg/l used).
T – Valence of metal was not established; concentration listed in table is for total metal(s).
M_1 – Matrix spike recovery is high due to sample matrix effect. Sample result is a false positive or biased high.
M_2 – Matrix spike recovery is low due to sample matrix effect. Sample result is biased low.

Sources: RCRA Facility Investigation Guidance, Interim Final. Health-Based Criteria Tables, Section 8.0. EPA 530/SW-89-031, 1989.
Kansas Water Quality Standards (KAR 28.16.28), 1 May, 1987.

MDL – Method Detection Limit

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND TO BE CONSIDERED (TBC) REQUIREMENTS FOR SOILS

Pesticide Storage Facility Area
Fort Riley, Kansas

CHEMICAL	METHOD	MDL mg/kg	RCRA ACTION LEVELS [a] SOILS (mg/kg)
Metals:			
Aluminum	6010	5.4	NA
Arsenic	7060	0.34	80
Barium	6010	1.0	4,000
Cadmium	6010	0.8	40
Chromium	6010	1.2	400 [d]
Cobalt	6010	1.0	NA
Copper	6010	0.2	NA
Iron	6010	2.2	NA
Lead	6010	3.4	500 [e]
Magnesium	6010	34.2	NA
Manganese	6010	0.2	NA
Mercury	7471	0.04	20
Nickel	6010	1.8	2,000
Potassium	6010	43.2	NA
Selenium	7740	0.232	NA
Silver	6010	0.4	200
Sodium	6010	57.8	NA
Thallium	6010	4.4	7 [f]
Vanadium	6010	0.6	NA
Zinc	6010	0.4	NA

NA – Not available

(a) RCRA Action Levels – Federal Register, Vol. 55, No. 145, July 27, 1990. Pages 30798–30884. Corrective Action for Solid Waste Management Facilities, Propose
(b) Value is for Endrin.
(c) Value listed is Maximum Contaminant Level (MCL).
(d) Value is for hexavalent chromium.
(e) Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites. Memorandum from H. Longest and B. Diamond to EPA Regions Oswer Direc
(f) Value is for Thallium Acetate.

Sources: Maximum Contaminant Levels (40 CFR 141 Subpart B); Kansas Drinking Water Rules (KAR 28.16) * USEPA (57 FR 31776), 17 July, 1992

MDL: Method Detection Limit

POTENTIAL TO BE CONSIDERED (TBC) REQUIREMENTS FOR SEDIMENTS
Pesticide Storage Facility Area
Fort Riley, Kansas

Method	Chemical	MDL	Maximum Detected Concentration	ER-L Concentration	ER-M Concentration	ER-L : ER-M Ratio	Overall Apparent Effects Threshold	Degree of Confidence
	PESTICIDES (ug/kg):							
8080	Chlordane	4.0	67	0.5	6	12	2	Low / Low
8080	DDD	8.0	100	2	20	10	NSD	Moderate / Low
8080	DDE	8.0	280	2	15	7.5	NSD	Low / Low
8080	DDT	8.0	480	1	7	7	6	Low / Low
8080	Total DDT	8.0	--	3	350	117	No	Moderate / Moderate
8080	Dieldrin	8.0	56	0.02	8	400	No	Low / Low
	SEMI-VOLATILES (ug/kg):							
8270	Benzo[a]anthracene	120	160	230	1600	7	550	Low/Moderate
8270	Chrysene	120	170	400	2800	7	900	Moderate/Moderate
8270	bis(2-Ethylhexyl)phthalate	410	640	NA	NA	NA	NA	NA
8270	Fluoranthene	160	270	600	3600	6	1000	High/High
8270	Phenanthrene	160	200	225	1380	6.1	260	Moderate/Moderate
8270	Pyrene	120	880	350	2200	6.3	1000	Moderate/Moderate
	VOLATILES (ug/kg):							
8240	Carbon Disulfide	5.0	6.9	NA	NA	NA	NA	NA
8240	1,2-Dichloropropane	3.0	84	NA	NA	NA	NA	NA
8240	Methylene Chloride	5.0	82 (B2)	NA	NA	NA	NA	NA
8240	1,1,2,2-Tetrachloroethane	5.0	39	NA	NA	NA	NA	NA
8240	Toluene	2.0	13 (I)	NA	NA	NA	NA	NA
	METALS (mg/kg):							
7060	Arsenic	2.0	3.8	33	85	2.6	50	Low/Moderate
6010	Barium	7.8	150	NA	NA	NA	NA	NA
6010	Cadmium	0.7	2.1	5	9	1.8	5	High/High
6010	Chromium	2.0	25	80	145	1.8	No	Moderate/Moderate
6010	Lead	4.0	210	35	110	3.1	300	Moderate/High
7470	Mercury	0.1	0.4	0.15	1.3	8.7	1	Moderate/High
7740	Selenium	0.2	0.3 (M2)	NA	NA	NA	NA	NA
6010	Silver	0.7	0.8	1	2.2	2.2	1.7	Moderate/Moderate

NSD – Not sufficient data NA – Not available

B2 – Sample is less than 10 times amount detected in method blank. Result is estimated.

M2 – Matrix spike recovery is low due to sample matrix effect. Result is biased low.

I – Low internal standard recoveries. Results are biased high.

Source: National Oceanic and Atmospheric Administration, Technical Memorandum, NOS OMA 52, 1990.

MDL – Method Detection Limit

APPENDIX N

RISK ASSESSMENT CALCULATIONS

Pesticide Storage Facility
Fort Riley, Kansas

APPENDIX Na

SCREENING FOR CHEMICALS OF CONCERN/
95 PERCENT UCL CALCULATIONS

Pesticide Storage Facility
Fort Riley, Kansas

TABLE N-1

SOIL AND SEDIMENT SAMPLES EXHIBITING ATYPICAL INTERNAL STANDARD RESPONSES OR SURROGATE RECOVERIES
Pesticide Storage Facility
Fort Riley, Kansas

The following samples exhibited Internal Standard (IS) response below the Quality Control Limit for volatiles and semi-volatiles:

SEDIMENT	SOIL		
PSFSD01B	PSFSB10B *	PSFSS03	PSFSB12A
PSFSD04A	PSFSB10C	PSFMWSB02A	PSFSB07A
PSFSD04B	PSFSB14A	PSFSB02A *	PSFSB07B
PSFSD05A	PSFSB17A *	PSFSB02B *	PSFSB08A *
PSFSD05B	PSFSB13A	PSFSB12B *	PSFMWSB04A
PSFSD02A	PSFSB14B	PSFSB16A	
	PSFSB15B *	PSFSB16B	
	PSFSB19A	PSFSB14A	
	PSFSB13B	PSFSB01A	
	PSFSS02 *	PSFSB12A	

* THESE SAMPLES ALSO EXHIBITED HIGH SURROGATE RECOVERIES, WHICH CAN BE ATTRIBUTED TO LOW IS RESPONSE

The following samples exhibited low surrogate recoveries for pesticides/PCBs:

SOIL
PSFSB01AMS
PSFSB01A
PSFSB20A
PSFSB07A
PSFSB08B
PSFSB09A
PSFSB09B
PSFSB11A

Surrogate recoveries were below the Quality Control limits for pesticides/PCBs in the following samples:

SOIL
PSFSB01B
PSFSB07B
PSFSB11B
PSFSB12A
PSFSB20B

SCREENING FOR CHEMICALS OF CONCERN – SURFACE SOILS
Pesticide Storage Facility
Fort Riley, Kansas

Constituent	Maximum Detected Concentration	Reference Dose	Cancer Slope Factor	Non–cancer Risk	Non–cancer Risk (% Total risk)	Cancer Risk	Cancer Risk (% Total risk)	Cancer Risk (without Cr^{6+})	Cancer Risk (% Total risk) (without Cr^{6+})
Chlordane	1.6	6.00E–05	1.30E+00	2.67E+04	22.15	2.08E+00	0.031	2.08E+00	0.833
4,4'–DDE	1.8		3.40E–01			6.12E–01	0.009	6.12E–01	0.245
4,4'–DDT	1		3.40E–01			3.40E–01	0.005	3.40E–01	0.136
Dieldrin	0.3	5.00E–05	1.60E+01	6.00E+03	4.98	4.80E+00	0.071	4.80E+00	1.923
Heptachlor	0.3	5.00E–04		6.00E+02	0.50				
Methoxychlor	2.4	5.00E–03		4.80E+02	0.40				
Malathion	0.419	2.00E–02		2.10E+01	0.02				
Toluene	0.0073	1.14E–01		6.39E–02	0.00				
Benzo[a]anthracene	0.16		1.06E+00 *			1.70E–01	0.002	1.70E–01	0.068
Chrysene	0.45		2.90E–02 *			1.31E–02	0.000	1.31E–02	0.005
Fluoranthene	1.3	4.00E–02		3.25E+01	0.03				
Phenanthrene	0.78								
Pyrene	1	3.00E–02		3.33E+01	0.03				
bis(2–Ethylhexyl)phthalate	0.62	2.00E–01	1.40E–02	3.10E+00	0.00	8.68E–03	0.000	8.68E–03	0.003
Arsenic	16	3.00E–04	1.51E+01	5.33E+04	44.30	2.42E+02	3.552	2.42E+02	96.786
Barium	130	7.00E–02		1.86E+03	1.54				
Chromium III	156	1.00E+00		1.56E+02	0.13				
Chromium VI	156	5.00E–03	4.20E+01	3.12E+04	25.92	6.55E+03	96.330		0.000
Lead	540								
				1.20E+05	100.00	6.80E+03	100	2.50E+02	100

* Toxicity based on Toxicity Equivalency Factors, based on benzo[a]pyrene

SCREENING FOR CHEMICALS OF CONCERN – SUBSURFACE SOILS
Pesticide Storage Facility
Fort Riley, Kansas

Parameter	Maximum Detected Concentration	Reference Dose	Cancer Slope Factor	Non-cancer Risk	Non-cancer Risk (% of total risk)	Cancer Risk	Cancer Risk (% of total risk)	Cancer Risk (without Cr^{6+})	Cancer Risk (% of total risk) (without Cr^{6+})
Pesticides:									
alpha-Chlordane	1.5	6.00E-05	1.30E+00	2.50E+04	4.57	1.95E+00	0.05	1.95E+00	0.10
gamma-Chlordane	1.6	6.00E-05	1.30E+00	2.67E+04	4.88	2.08E+00	0.06	2.08E+00	0.11
4,4'-DDD	0.436		2.40E-01			1.05E-01	0.00	1.05E-01	0.01
4,4'-DDE	0.87		3.40E-01			2.96E-01	0.01	2.96E-01	0.02
4,4'-DDT	33	5.00E-04	3.40E-01	6.60E+04	12.08	1.12E+01	0.31	1.12E+01	0.60
Dieldrin	0.2	5.00E-05	1.60E+01	4.00E+03	0.73	3.20E+00	0.09	3.20E+00	0.17
Endrin aldehyde	0.014	3.00E-04 a		4.67E+01	0.01				
Heptachlor	0.23	5.00E-04		4.60E+02	0.08				
Heptachlor epoxide	0.0054	1.30E-05	9.10E+00	4.15E+02	0.08	4.91E-02	0.00	4.91E-02	0.00
Methoxychlor	10	5.00E-03		2.00E+03	0.37				
Volatile Organics:									
Methylene Chloride	0.075 T	6.00E-02	7.50E-03	1.25E+00	0.00	5.63E-04	0.00	5.63E-04	0.00
Toluene	0.034	1.14E-01		2.98E-01	0.00				
Semi-Volatile Organics:									
Acenapthene	0.23	6.00E-02		3.83E+00	0.00				
Anthracene	0.76								
Benzo[a]anthracene	1.8		1.06E+00 *			1.91E+00 *	0.05 *	1.91E+00	0.10
Benzo[a]pyrene	1.3		7.30E+00			9.49E+00	0.26	9.49E+00	0.51
Benzo[b]fluoranthene	1.4		1.02E+00 *			1.43E+00 *	0.04 *	1.43E+00	0.08
Benzo[k]fluoranthene	1.2		4.80E-01 *			5.76E-01 *	0.02 *	5.76E-01	0.03
Chrysene	1.7		2.90E-02 *			4.93E-02 *	0.00 *	4.93E-02	0.00
Dibenzofuran	0.13								
2,4-Dichlorophenol	2.3	3.00E-03		7.67E+02	0.14				
Diethylphthalate	0.7	8.00E-01		8.75E-01	0.00				
bis(2-Ethylhexyl)phthalate	1.4	2.00E-02	1.40E-02	7.00E+01	0.01	1.96E-02	0.00	1.96E-02	0.00
Fluoranthene	3.4	4.00E-02		8.50E+01	0.02				
Fluorene	0.27	4.00E-02		6.75E+00	0.00				
Indeno[1,2,3-cd]pyrene	0.38		1.70E+00 *			6.46E-01 *	0.02 *	6.46E-01	0.03
2-Methylnaphthalene	0.2								
Phenanthrene	2.7								
Pyrene	4.1	3.00E-02		1.37E+02	0.03				
2,4,6-Trichlorophenol	0.33								
Metals:									
Arsenic	120	3.00E-04	1.51E+01	4.00E+05	73.19	1.81E+03	50.35	1.81E+03	96.56
Barium	160	7.00E-02		2.29E+03	0.42				
Cadmium	5	5.00E-04	6.30E+00	1.00E+04	1.83	3.15E+01	0.88	3.15E+01	1.68
Chromium	41	5.00E-03	4.20E+01	8.20E+03	1.50	1.72E+03	47.85		
Lead	770								
Mercury	1.3								
Silver	1.2	5.00E-03		2.40E+02	0.04				
Selenium	0.8	5.00E-03		1.60E+02	0.03				
			TOTAL	5.47E+05	100	3.60E+03	100	1.88E+03	100

a – Value is for endrin aldehyde
* = PAHs based on Toxicity Equivalent Factors from Region III, based on Benzo[a]pyrene = 1.

SCREENING FOR CHEMICALS OF CONCERN – GROUND WATER
Pesticide Storage Facility
Fort Riley, Kansas

Constituent	Maximum Detected Concentration	Reference Dose	Cancer Slope Factor	Non-cancer Risk	Non-cancer Risk (% Total risk)	Cancer Risk	Non-cancer Risk (% Total risk)
Trichloroethene	0.003		1.70E-02			5.10E-05	0.12
Arsenic	0.016	3.00E-04	1.75E+00	5.33E+01	83.56	2.80E-02	68.37
Aluminum	0.27						
Barium	0.13	7.00E-02		1.86E+00	2.91		
Beryllium	0.003	5.00E-03	4.30E+00	6.00E-01	0.94	1.29E-02	31.50
Calcium	350						
Chromium	0.012	5.00E-03		2.40E+00	3.76		
Iron	0.29						
Magnesium	56						
Manganese	0.091	1.00E-01		9.10E-01	1.43		
Potassium	20						
Selenium	0.0027	5.00E-03		5.40E-01	0.85		
Sodium	920						
Vanadium	0.027	7.00E-03		3.86E+00	6.04		
Zinc	0.098	3.00E-01		3.27E-01	0.51		
				6.38E+01	100	4.10E-02	100

SCREENING FOR CHEMICALS OF CONCERN – SEDIMENTS
Pesticide Storage Facility
Fort Riley, Kansas

Constituent	Maximum Detected Concentration	Reference Dose	Cancer Slope Factor	Non-cancer Risk	Non-cancer Risk (% Total risk)	Cancer Risk	Non-cancer Risk (% Total risk)
Arsenic	3.8	3.00E-04	1.75E+00	1.27E+04	40.79	6.65E+00	81.27
Barium	150	7.00E-02		2.14E+03	6.90		
Cadmium	3.3	5.00E-04		6.60E+03	21.25		
Chromium	25	5.00E-03		5.00E+03	16.10		
Lead	210						
Mercury	0.4						
Selenium	0.3	5.00E-03		6.00E+01	0.19		
Silver	0.8	5.00E-03		1.60E+02	0.52		
Chlordane, alpha-	0.067	6.00E-05	1.30E+00	1.12E+03	3.60	8.71E-02	1.06
Chlordane, gamma-	0.065	6.00E-05	1.30E+00	1.08E+03	3.49	8.45E-02	1.03
DDD	0.1		2.40E-01			2.40E-02	0.29
DDE	0.28		3.00E-01			8.40E-02	1.03
DDT	0.48	5.00E-04	3.40E-01	9.60E+02	3.09	1.63E-01	1.99
1,2-Dichloropropane	0.084 I	1.10E-03		7.64E+01	0.25		
Dieldrin	0.056	5.00E-05	1.60E+01	1.12E+03	3.61	8.96E-01	10.95
Carbon Disulfide	0.006	1.00E-01		6.00E-02	0.00		
1,1,2,2-Tetrachloroethane	0.039		2.00E-01			7.80E-03	0.10
Toluene	0.013	2.00E-01		6.50E-02	0.00		
Benzo[a]anthracene	0.16		1.06E+00 *			1.70E-01	2.07
Chrysene	0.24		2.90E-02 *			6.96E-03	0.09
Fluoranthene	0.36	4.00E-02		9.00E+00	0.03		
Phenanthrene	0.36						
Pyrene	0.88	3.00E-02		2.93E+01	0.09		
bis(2-Eth/hex)phthalate	0.64	2.00E-02	1.40E-02	3.20E+01	0.10	8.96E-03	0.11
				3.11E+04	100.00	8.18E+00	100.00

* Derived from Toxicity Equivalency Factors (TEFs), based on benzo[a]pyrene.

SCREENING FOR CHEMICALS OF CONCERN – SURFACE WATER
Pesticide Storage Facility
Fort Riley, Kansas

Constituent	Maximum Detected Concentration	Reference Dose	Cancer Slope Factor	Non–cancer Risk	Non–cancer Risk (% Total risk)	Cancer Risk	Non–cancer Risk (% Total risk)
Arsenic	0.0044	3.00E–04	1.75E+00	1.47E+01	40.45	7.70E–03	28.47
Aluminum	12						
Barium	0.29	7.00E–02		4.14E+00	11.43		
Cadmium	0.0045	5.00E–04	4.30E+00	9.00E+00	24.82	1.94E–02	71.53
Calcium	110						
Copper	0.024						
Chromium	0.013	5.00E–03		2.60E+00	7.17		
Iron	9.4						
Lead	0.0042						
Magnesium	22						
Manganese	0.19	1.00E–01		1.90E+00	5.24		
Potassium	11						
Sodium	49						
Vanadium	0.026	7.00E–03		3.71E+00	10.24		
Zinc	0.07	3.00E–01		2.33E–01	0.64		
				3.63E+01	100	2.71E–02	100

PESTICIDE STORAGE FACILITY – FT RILEY
SURFACE SOIL SAMPLES
Gilbert's method for lognormal distributions

n= @COUNT(list)
s2y= @COUNT(list)/(@COUNT(list)-1)*@VAR(list)
sy= @SQRT(@COUNT(list)/(@COUNT(list)-1)*@VAR(list))
ybar= @AVG(list)
H(0.95)= From Table A12
95%UCL= @EXP(ybar+(0.5*s2y)+((sy*H)/@SQRT(N-1)))
First column is surface soil sample data in mg/kg
Second column is natural log-transformed data

	4,4'-DDE		4,4'-DDT		Dieldrin		Heptachlor		Methoxychlor		alpha-Chlordane		gamma-Chlordane	
SS01	0.18	-1.71479	0.67	-0.40047	0.094	-2.36446	0.0175	-4.04555	2.4	0.875468	0.37	-0.99425	0.38	-0.96758
SS02	0.27	-1.30933	1	0	0.077	-2.56394	0.3	-1.20397	0.155	-1.86433	1.6	0.470003	1.6	0.470003
SS03	0.094	-2.36446	0.45	-0.79850	0.0038	-5.57275	0.0019	-6.26590	0.019	-3.96331	0.029	-3.54045	0.03	-3.50655
SS04	1.8	0.587786	0.037	-3.29683	0.037	-3.29683	0.0185	-3.98998	0.185	-1.68739	0.66	-0.41551	0.64	-0.44628
mean=	0.586		0.53925		0.05295		0.084475		0.68975		0.66475		0.6625	
n=	4		4		4		4		4		4		4	
s2y=	1.609706		2.204676		2.164341		4.297699		3.925456		2.966282		2.900223	
sy=	1.268742 *		1.484815 *		1.471170 *		2.073089 *		1.981276 *		1.722289 *		1.703004 *	
ybar=	-1.20020		-1.12395		-3.44950		-3.87635		-1.65989		-1.12005		-1.11260	
H(0.95)=	6.001		7.12		7.12		9.387		9.387		8.25		8.25	
95%UCL=	54.62198		437.9314		39.65665		13464.13		62350.93		5253.197		4671.114	

	Benzo[a]anthracene		Chysene		Fluoranthene		Phenanthrene		Pyrene		bis-2(Ethylhexyl) phthalate		Malathion	
SS01	0.06	-2.81341	0.06	-2.81341	0.08	-2.52572	0.08	-2.52572	0.06	-2.81341	0.62	-0.47803	0.419	-0.86988
SS02	0.26	-1.34707	0.26	-1.34707	0.345	-1.06421	0.345	-1.06421	0.26	-1.34707	0.85	-0.16251	0.085	-2.46510
SS03	0.55	-0.59783	0.55	-0.59783	0.75	-0.28768	0.75	-0.28768	0.55	-0.59783	1.9	0.641853	0.085	-2.46510
SS04	0.16	-1.83258	0.45	-0.79850	1.3	0.262364	0.78	-0.24846	1	0	0.205	-1.58474	0.085	-2.46510
mean=	0.2575		0.33		0.61875		0.48875		0.4675		0.89375		0.1685	
n=	4		4		4		4		4		4		4	
s2y=	0.861883		1.001774		1.465308		1.133401		1.475630		0.850499		0.636181	
sy=	0.928376 *		1.000886 *		1.210499 *		1.064613 *		1.214755 *		0.922225 *		0.797609 *	
ybar=	-1.64772		-1.38920		-0.90381		-1.03152		-1.18958		-0.39586		-2.06629	
H(0.95)=	4.478		4.905		6.001		4.905		6.001		4.478		4.062	
95%UCL=	3.265517		7.001291		55.85900		12.80788		42.81856		11.17508		1.130142	

	Methylene Chloride		Toluene		Arsenic		Barium		Chromium		Lead	
SS01	0.016	-4.13516	0.0029	-5.84304	2.4	0.875468	99	4.595119	9.3	2.230014	46	3.828641
SS02	0.024	-3.72970	0.006	-5.11599	16	2.772588	35	3.555348	6.9	1.931521	32	3.465735
SS03	0.039	-3.24419	0.0029	-5.84304	4.2	1.435084	130	4.867534	7.5	2.014903	540	6.291569
SS04	0.035	-3.35240	0.0073	-4.91988	4.6	1.526056	120	4.787491	15	2.708050	60	4.094344
mean=	0.0285		0.004775		8.266666		95		9.8		210.6666	
n=	4		4		3		3		3		3	
s2y=	0.163393		0.233343		0.558506		0.541069		0.181733		2.201379	
sy=	0.404220 *		0.483056 *		0.747332 *		0.735574 *		0.426302 *		1.483704 *	
ybar=	-3.61536		-5.43049		1.911243		4.403458		2.218158		4.617216	
H(0.95)=	2.651		2.947		9.12		9.12		5.22		19.6	
95%UCL=	0.054204		0.011199		1107.549		12302.71		48.54779		2.6E+11	

Fort Riley Soil UCL's Pest. & Metals	Pesticides 4,4" – DDD		4,4" – DDE		4,4" – DDT		Dieldrin	
SB1A	0.00385	−5.5596	0.00385	−5.5596	0.016	−4.1351	0.00385	−5.5596
SB1B	0.00375	−5.5859	0.024	−3.7297	0.087	−2.4418	0.027	−3.6119
SB2A	0.0195	−3.9373	0.0195	−3.9373	0.042	−3.1700	0.0195	−3.9373
SB2B	0.0185	−3.9899	0.0185	−3.9899	0.0185	−3.9899	0.0185	−3.9899
SB3A	0.195	−1.6347	0.195	−1.6347	7.7	2.04122	0.195	−1.6347
SB3B	0.185	−1.6873	0.185	−1.6873	33	3.49650	0.185	−1.6873
SB4A	0.008	−4.8283	0.031	−3.4737	0.14	−1.9661	0.008	−4.8283
SB4B	0.008	−4.8283	0.021	−3.8632	0.096	−2.3434	0.008	−4.8283
SB5A	0.0195	−3.9373	0.11	−2.2072	0.85	−0.1625	0.2	−1.6094
SB5B	0.0038	−5.5727	0.0083	−4.7914	0.053	−2.9374	0.01	−4.6051
SB6A	0.00365	−5.6130	0.00365	−5.6130	0.00365	−5.6130	0.00365	−5.6130
SB6B	0.0035	−5.6549	0.0035	−5.6549	0.014	−4.2686	0.0035	−5.6549
SB7A	0.035	−3.3524	0.16	−1.8325	0.75	−0.2876	0.035	−3.3524
SB7B	0.075	−2.5902	0.24	−1.4271	2.8	1.02961	0.075	−2.5902
SB8A	0.0215	−3.8397	0.11	−2.2072	0.44	−0.8209	0.0215	−3.8397
SB8B	0.0039	−5.5467	0.02	−3.9120	0.15	−1.8971	0.0039	−5.5467
SB9A	0.19	−1.6607	0.87	−0.1392	5.7	1.74046	0.19	−1.6607
SB9B	0.185	−1.6873	0.42	−0.8675	2.6	0.95551	0.185	−1.6873
SB10A	0.36	−1.0216	0.18	−1.7147	0.0355	−3.3382	0.0355	−3.3382
SB10B	0.025	−3.6888	0.052	−2.9565	0.083	−2.4889	0.00425	−5.4608
SB11A	0.0038	−5.5727	0.026	−3.6496	0.032	−3.4420	0.008	−4.8283
SB11B	0.0335	−3.3962	0.11	−2.2072	0.15	−1.8971	0.0355	−3.3382
SB12A	0.43	−0.8439	0.19	−1.6607	0.15	−1.8971	0.0195	−3.9373
SB12B	0.0345	−3.3667	0.17	−1.7719	0.1	−2.3025	0.0345	−3.3667
SB13A	0.0044	−5.4261	0.15	−1.8971	0.19	−1.6607	0.0044	−5.4261
SB13B	0.00475	−5.3496	0.00475	−5.3496	0.012	−4.4228	0.00475	−5.3496
SB14A	0.0046	−5.3816	0.053	−2.9374	0.13	−2.0402	0.0046	−5.3816
SB14B	0.0041	−5.4967	0.0041	−5.4967	0.012	−4.4228	0.0041	−5.4967
SB15A	0.00375	−5.5859	0.00375	−5.5859	0.00375	−5.5859	0.00375	−5.5859
SB15B	0.0041	−5.4967	0.0041	−5.4967	0.0041	−5.4967	0.0041	−5.4967
SB16A	0.0185	−3.9899	0.0185	−3.9899	0.31	−1.1711	0.0185	−3.9899
SB16B	0.00405	−5.5090	0.00405	−5.5090	0.025	−3.6888	0.00405	−5.5090
SB17A	0.0205	−3.8873	0.75	−0.2876	1.3	0.26236	0.0205	−3.8873
SB17B	0.0037	−5.5994	0.0037	−5.5994	0.025	−3.6888	0.0037	−5.5994
SB18A	0.00385	−5.5596	0.11	−2.2072	0.17	−1.7719	0.00385	−5.5596
SB18B	0.0039	−5.5467	0.022	−3.8167	0.082	−2.5010	0.0039	−5.5467
SB19A	0.00405	−5.5090	0.026	−3.6496	0.05	−2.9957	0.00405	−5.5090
SB19B	0.00395	−5.5340	0.022	−3.8167	0.036	−3.3242	0.00395	−5.5340
SB20A	0.0039	−5.5467	0.0039	−5.5467	0.0039	−5.5467	0.0039	−5.5467
SB20B	0.0039	−5.5467	0.011	−4.5098	0.025	−3.6888	0.0039	−5.5467
n=		40		40		40		40
s2y=		2.2972		2.7470		4.6940		1.8445
sy=		1.5156		1.6574		2.1666		1.3581
ybar=		−4.3591		−3.4047		−2.2970		−4.3868
H(0.95)=		3.077		3.437		3.812		2.737
95%UCL=		0.08511		0.32661		3.94500		0.05673
mean conc=	0.04913		0.10905		1.43473		0.03564	
min conc=	0.0035		0.0035		0.00365		0.0035	
max conc=	0.43		0.87		33		0.2	
exp value=	95% UCL	0.08511	95% UCL	0.32661	95% UCL	3.94500	95% UCL	0.05673

Fort Riley Soil UCL's Pest. & Metals	Endrin Aldehyde		Heptachlor		Heptachlor epoxide		Methoxychlor	
SB1A	0.00385	−5.5596	0.019	−3.9633	0.0019	−6.2659	0.056	−2.8824
SB1B	0.00375	−5.5859	0.00185	−6.2925	0.0043	−5.4491	0.53	−0.6348
SB2A	0.0195	−3.9373	0.045	−3.1010	0.0095	−4.6564	0.095	−2.3538
SB2B	0.0185	−3.9899	0.028	−3.5755	0.0095	−4.6564	0.095	−2.3538
SB3A	0.195	−1.6347	0.1	−2.3025	0.1	−2.3025	1	0
SB3B	0.185	−1.6873	0.09	−2.4079	0.09	−2.4079	10	2.30258
SB4A	0.008	−4.8283	0.0039	−5.5467	0.0039	−5.5467	0.039	−3.2441
SB4B	0.008	−4.8283	0.0039	−5.5467	0.0039	−5.5467	0.39	−0.9416
SB5A	0.14	−1.9661	0.23	−1.4696	0.0095	−4.6564	0.095	−2.3538
SB5B	0.0038	−5.5727	0.017	−4.0745	0.0054	−5.2213	0.019	−3.9633
SB6A	0.00365	−5.6130	0.00185	−6.2925	0.00185	−6.2925	0.0185	−3.9899
SB6B	0.0035	−5.6549	0.00175	−6.3481	0.00175	−6.3481	0.0175	−4.0455
SB7A	0.035	−3.3524	0.0175	−4.0455	0.0175	−4.0455	0.175	−1.7429
SB7B	0.075	−2.5902	0.0385	−3.2570	0.0385	−3.2570	0.385	−0.9545
SB8A	0.0215	−3.8397	0.0105	−4.5563	0.0105	−4.5563	0.105	−2.2537
SB8B	0.0039	−5.5467	0.00195	−6.2399	0.0195	−3.9373	0.0195	−3.9373
SB9A	0.19	−1.6607	0.095	−2.3538	0.9	−0.1053	0.95	−0.0512
SB9B	0.185	−1.6873	0.095	−2.3538	0.095	−2.3538	0.95	−0.0512
SB10A	0.0355	−3.3382	0.0175	−4.0455	0.0175	−4.0455	0.175	−1.7429
SB10B	0.00425	−5.4608	0.00215	−6.1422	0.00215	−6.1422	0.0215	−3.8397
SB11A	0.0038	−5.5727	0.0047	−5.3601	0.0019	−6.2659	0.08	−2.5257
SB11B	0.0335	−3.3962	0.017	−4.0745	0.017	−4.0745	0.39	−0.9416
SB12A	0.0195	−3.9373	0.01	−4.6051	0.01	−4.6051	0.1	−2.3025
SB12B	0.0345	−3.3667	0.017	−4.0745	0.017	−4.0745	0.17	−1.7719
SB13A	0.0044	−5.4261	0.0022	−6.1192	0.0022	−6.1192	0.022	−3.8167
SB13B	0.00475	−5.3496	0.0024	−6.0322	0.0024	−6.0322	0.024	−3.7297
SB14A	0.0046	−5.3816	0.0023	−6.0748	0.0023	−6.0748	0.023	−3.7722
SB14B	0.0041	−5.4967	0.00205	−6.1899	0.00205	−6.1899	0.0205	−3.8873
SB15A	0.00375	−5.5859	0.0019	−6.2659	0.0019	−6.2659	0.019	−3.9633
SB15B	0.0041	−5.4967	0.00205	−6.1899	0.00205	−6.1899	0.0205	−3.8873
SB16A	0.0185	−3.9899	0.0095	−4.6564	0.0095	−4.6564	0.095	−2.3538
SB16B	0.00405	−5.5090	0.00205	−6.1899	0.00205	−6.1899	0.0205	−3.8873
SB17A	0.0205	−3.8873	0.01	−4.6051	0.01	−4.6051	0.1	−2.3025
SB17B	0.0037	−5.5994	0.00185	−6.2925	0.00185	−6.2925	0.0185	−3.9899
SB18A	0.00385	−5.5596	0.0019	−6.2659	0.0019	−6.2659	0.019	−3.9633
SB18B	0.0039	−5.5467	0.00195	−6.2399	0.00195	−6.2399	0.0195	−3.9373
SB19A	0.00405	−5.5090	0.00205	−6.1899	0.00205	−6.1899	0.0205	−3.8873
SB19B	0.00395	−5.5340	0.002	−6.2146	0.002	−6.2146	0.02	−3.9120
SB20A	0.0039	−5.5467	0.00195	−6.2399	0.00195	−6.2399	0.0195	−3.9373
SB20B	0.0039	−5.5467	0.00195	−6.2399	0.00195	−6.2399	0.0195	−3.9373
n=		40		40		40		40
s2y=		1.8705		2.1528		2.1124		2.3507
sy=		1.3677		1.4673		1.4534		1.5332
ybar=		−4.4893		−4.9509		−5.0705		−2.6435
H(0.95)=		2.737		3.077		3.077		3.077
95%UCL=		0.05209		0.04278		0.03695		0.49028
mean conc=	0.03325		0.02292		0.03590		0.40892	
min conc=	0.0035		0.00175		0.00175		0.0175	
max conc=	0.195		0.23		0.9		10	
exp value=	95% UCL	0.05209	95% UCL	0.04278	95% UCL	0.03695	95% UCL	0.49028

Fort Riley Soil UCL's Pest. & Metals	alpha-Chlordane		gamma-Chlordane		Metals Arsenic		Barium	
SB1A	0.022	-3.8167	0.024	-3.7297	1.4	Background	99	Background
SB1B	0.084	-2.4769	0.082	-2.5010	1.2	Background	73	Background
SB2A	0.21	-1.5606	0.21	-1.5606	20	2.99573	97	4.57471
SB2B	0.16	-1.8325	0.16	-1.8325	4.3	1.45861	82	4.40671
SB3A	0.1	-2.3025	0.21	-1.5606	0.8	-0.2231	89	4.48863
SB3B	1.5	0.40546	1.6	0.47000	1.2	0.18232	66	4.18965
SB4A	0.09	-2.4079	0.091	-2.3968	6.2	1.82454	100	4.60517
SB4B	0.062	-2.7806	0.063	-2.7646	1.9	0.64185	98	4.58496
SB5A	0.79	-0.2357	0.79	-0.2357	1.9	0.64185	100	4.60517
SB5B	0.071	-2.6450	0.071	-2.6450	1.5	0.40546	71	4.26267
SB6A	0.00185	-6.2925	0.00185	-6.2925	1.6	0.47000	77	4.34380
SB6B	0.0037	-5.5994	0.004	-5.5214	1.1	0.09531	39	3.66356
SB7A	0.058	-2.8473	0.065	-2.7333	4.2	1.43508	81	4.39444
SB7B	0.095	-2.3538	0.099	-2.3126	3.2	1.16315	120	4.78749
SB8A	0.032	-3.4420	0.038	-3.2701	3.3	1.19392	160	5.07517
SB8B	0.0053	-5.2400	0.0063	-5.0672	2.5	0.91629	130	4.86753
SB9A	0.37	-0.9942	0.41	-0.8915	2.3	0.83290	94	4.54329
SB9B	0.19	-1.6607	0.22	-1.5141	1.9	0.64185	67	4.20469
SB10A	0.44	-0.8209	0.045	-3.1010	5.5	1.70474	84	4.43081
SB10B	0.075	-2.5902	0.073	-2.6172	120	4.78749	120	4.78749
SB11A	0.057	-2.8647	0.065	-2.7333	1.4	0.33647	68	4.21950
SB11B	0.21	-1.5606	0.22	-1.5141	1.6	0.47000	68	4.21950
SB12A	0.37	-0.9942	0.39	-0.9416	6.1	1.80828	100	4.60517
SB12B	0.79	-0.2357	0.91	-0.0943	6	1.79175	66	4.18965
SB13A	0.18	-1.7147	0.16	-1.8325	14	2.63905	160	5.07517
SB13B	0.011	-4.5098	0.0094	-4.6670	3.6	1.28093	130	4.86753
SB14A	0.069	-2.6736	0.066	-2.7181	5.2	1.64865	140	4.94164
SB14B	0.0047	-5.3601	0.0055	-5.2030	3	1.09861	100	4.60517
SB15A	0.0047	-5.3601	0.004	-5.5214	1.8	0.58778	50	3.91202
SB15B	0.00205	-6.1899	0.00205	-6.1899	1.8	0.58778	130	4.86753
SB16A	0.068	-2.6882	0.07	-2.6592	1.9	0.64185	47	3.85014
SB16B	0.0061	-5.0994	0.007	-4.9618	1.6	0.47000	120	4.78749
SB17A	0.47	-0.7550	0.47	-0.7550	4.1	1.41098	150	5.01063
SB17B	0.0079	-4.8408	0.0082	-4.8036	0.9	-0.1053	71	4.26267
SB18A	0.042	-3.1700	0.036	-3.3242	2	0.69314	62	4.12713
SB18B	0.018	-4.0173	0.018	-4.0173	1.6	0.47000	110	4.70048
SB19A	0.016	-4.1351	0.015	-4.1997	4	1.38629	160	5.07517
SB19B	0.013	-4.3428	0.012	-4.4228	1.4	0.33647	100	4.60517
SB20A	0.0056	-5.1849	0.0054	-5.2213	3.1	1.13140	89	4.48863
SB20B	0.014	-4.2686	0.012	-4.4228	1.9	0.64185	88	4.47733
n=		40		40	*	38	*	38
s2y=		3.1061		3.0685		0.8727		0.1191
sy=		1.7624		1.7517		0.9342		0.3450
ybar=		-3.0365		-3.0571		1.0656		4.5185
H(0.95)=		3.437		3.437		2.31		1.793
95%UCL=		0.59838		0.57193		6.40279		107.743
mean conc=	0.16797		0.16871		6.58947		96.9473	
min conc=	0.00185		0.00185		0.8		39	
max conc=	1.5		1.6		120		160	
exp value=	95% UCL	0.59838	95% UCL	0.57193	95% UCL	6.40279	95% UCL	107.743

Fort Riley Soil UCL's Pest. & Metals	Cadmium		Chromium		Lead		Mercury	
SB1A	< 0.6 Background		8.2 Background		4.3 Background		< 0.1 Background	
SB1B	< 0.7 Background		6.7 Background		11 Background		< 0.1 Background	
SB2A	0.35	−1.0498	6.5	1.87180	13	2.56494	0.05	−2.9957
SB2B	0.35	−1.0498	8.3	2.11625	11	2.39789	0.05	−2.9957
SB3A	0.35	−1.0498	6.9	1.93152	10	2.30258	0.05	−2.9957
SB3B	0.3	−1.2039	6.4	1.85629	14	2.63905	0.05	−2.9957
SB4A	0.35	−1.0498	11	2.39789	12	2.48490	0.05	−2.9957
SB4B	0.4	−0.9162	6.3	1.84054	9.9	2.29253	0.05	−2.9957
SB5A	0.35	−1.0498	8.3	2.11625	13	2.56494	0.05	−2.9957
SB5B	0.3	−1.2039	6.6	1.88706	7.5	2.01490	0.05	−2.9957
SB6A	0.3	−1.2039	5.3	1.66770	4.7	1.54756	0.05	−2.9957
SB6B	0.3	−1.2039	4.6	1.52605	4.7	1.54756	0.05	−2.9957
SB7A	0.35	−1.0498	6.4	1.85629	220	5.39362	0.1	−2.3025
SB7B	0.3	−1.2039	8	2.07944	310	5.73657	0.1	−2.3025
SB8A	0.3	−1.2039	4.8	1.56861	770	6.64639	0.05	−2.9957
SB8B	0.35	−1.0498	6.5	1.87180	270	5.59842	0.05	−2.9957
SB9A	0.7	−0.3566	41	3.71357	240	5.48063	0.05	−2.9957
SB9B	0.35	−1.0498	5.8	1.75785	25	3.21887	0.05	−2.9957
SB10A	0.35	−1.0498	15	2.70805	100	4.60517	0.05	−2.9957
SB10B	5	1.60943	8.8	2.17475	120	4.78749	0.05	−2.9957
SB11A	0.3	−1.2039	6.4	1.85629	9.8	2.28238	0.05	−2.9957
SB11B	0.35	−1.0498	6.1	1.80828	14	2.63905	0.05	−2.9957
SB12A	0.35	−1.0498	11	2.39789	87	4.46590	0.05	−2.9957
SB12B	0.7	−0.3566	15	2.70805	110	4.70048	0.05	−2.9957
SB13A	0.35	−1.0498	12	2.48490	110	4.70048	0.2	−1.6094
SB13B	0.4	−0.9162	8	2.07944	36	3.58351	0.6	−0.5108
SB14A	0.35	−1.0498	12	2.48490	39	3.66356	0.2	−1.6094
SB14B	0.35	−1.0498	8.3	2.11625	140	4.94164	0.05	−2.9957
SB15A	0.35	−1.0498	4.5	1.50407	7	1.94591	0.05	−2.9957
SB15B	0.35	−1.0498	5.5	1.70474	7.6	2.02814	0.05	−2.9957
SB16A	0.3	−1.2039	4.7	1.54756	18	2.89037	0.05	−2.9957
SB16B	0.35	−1.0498	8.7	2.16332	12	2.48490	0.05	−2.9957
SB17A	0.35	−1.0498	11	2.39789	110	4.70048	0.3	−1.2039
SB17B	0.3	−1.2039	5.7	1.74046	8	2.07944	0.05	−2.9957
SB18A	0.35	−1.0498	5.5	1.70474	30	3.40119	0.05	−2.9957
SB18B	0.4	−0.9162	6.8	1.91692	15	2.70805	0.05	−2.9957
SB19A	0.45	−0.7985	14	2.63905	38	3.63758	1.3	0.26236
SB19B	0.35	−1.0498	6.9	1.93152	12	2.48490	0.05	−2.9957
SB20A	0.35	−1.0498	5.6	1.72276	75	4.31748	0.2	−1.6094
SB20B	0.35	−1.0498	6.9	1.93152	89	4.48863	0.05	−2.9957
n=	*	38	*	38	*	38	*	38
s2y=		0.2182		0.1854		1.8413		0.6007
sy=		0.4672		0.4306		1.3569		0.7750
ybar=		−0.9627		2.0469		3.4728		−2.6515
H(0.95)=		1.928		1.856		2.737		2.202
95%UCL=		0.49384		9.68880		149.013		0.12610
mean conc=	0.48552		8.71315		82.1631		0.11842	
min conc=	0.3		4.5		4.7		0.05	
max conc=	5		41		770		1.3	
exp value=	95% UCL	0.49384	95% UCL	9.68880	95% UCL	149.013	95% UCL	0.12610

Fort Riley Soil UCL's Pest. & Metals	Selenium		Silver	
SB1A	< 0.2 Background		< 0.6 Background	
SB1B	< 0.2 Background		< 0.7 Background	
SB2A	0.1	−2.3025	0.35	−1.0498
SB2B	0.1	−2.3025	0.35	−1.0498
SB3A	0.1	−2.3025	0.8	−0.2231
SB3B	0.1	−2.3025	0.3	−1.2039
SB4A	0.1	−2.3025	0.35	−1.0498
SB4B	0.1	−2.3025	0.4	−0.9162
SB5A	0.1	−2.3025	0.35	−1.0498
SB5B	0.1	−2.3025	0.3	−1.2039
SB6A	0.1	−2.3025	0.3	−1.2039
SB6B	0.1	−2.3025	0.3	−1.2039
SB7A	0.3	−1.2039	0.35	−1.0498
SB7B	0.2	−1.6094	0.3	−1.2039
SB8A	0.1	−2.3025	0.3	−1.2039
SB8B	0.1	−2.3025	0.35	−1.0498
SB9A	0.1	−2.3025	0.35	−1.0498
SB9B	0.1	−2.3025	0.35	−1.0498
SB10A	0.1	−2.3025	0.35	−1.0498
SB10B	0.8	−0.2231	1.1	0.09531
SB11A	0.1	−2.3025	0.3	−1.2039
SB11B	0.1	−2.3025	0.35	−1.0498
SB12A	0.1	−2.3025	0.35	−1.0498
SB12B	0.1	−2.3025	0.3	−1.2039
SB13A	0.4	−0.9162	1.2	0.18232
SB13B	0.1	−2.3025	0.4	−0.9162
SB14A	0.4	−0.9162	0.35	−1.0498
SB14B	0.1	−2.3025	0.35	−1.0498
SB15A	0.1	−2.3025	0.35	−1.0498
SB15B	0.1	−2.3025	0.35	−1.0498
SB16A	0.1	−2.3025	0.3	−1.2039
SB16B	0.1	−2.3025	0.35	−1.0498
SB17A	0.2	−1.6094	0.35	−1.0498
SB17B	0.1	−2.3025	0.3	−1.2039
SB18A	0.1	−2.3025	0.35	−1.0498
SB18B	0.1	−2.3025	0.4	−0.9162
SB19A	0.1	−2.3025	1.1	0.09531
SB19B	0.1	−2.3025	0.35	−1.0498
SB20A	0.1	−2.3025	0.35	−1.0498
SB20B	0.1	−2.3025	0.35	−1.0498
n=	*	38	*	38
s2y=		0.2411		0.1309
sy=		0.4910		0.3618
ybar=		−2.1095		−0.9654
H(0.95)=		1.928		1.856
95%UCL=		0.15987		0.45406
mean conc=	0.14473		0.41447	
min conc=	0.1		0.3	
max conc=	0.8		1.2	
exp value=	95% UCL	0.15987	95% UCL	0.45406

Fort Riley Soils UCL's	Volatiles				Semi-Volatiles			
Volatile & Semi-volatile	Methylene Chloride		Toluene		Acenaphthene		Anthracene	
SB1A	0.017	-4.0745	0.00285	-5.8604	0.095	-2.3538	0.095	-2.3538
SB1B	0.014	-4.2686	0.00275	-5.8961	0.09	-2.4079	0.09	-2.4079
SB2A	0.019	-3.9633	0.003	-5.8091	0.095	-2.3538	0.095	-2.3538
SB2B	0.016	-4.1351	0.00275	-5.8961	0.1	-2.3025	0.1	-2.3025
SB3A	0.029	-3.5404	0.0029	-5.8430	0.1	-2.3025	0.1	-2.3025
SB3B	0.023	-3.7722	0.0028	-5.8781	0.09	-2.4079	0.09	-2.4079
SB4A	0.019	-3.9633	0.0029	-5.8430	0.1	-2.3025	0.1	-2.3025
SB4B	0.022	-3.8167	0.0095	-4.6564	0.1	-2.3025	0.1	-2.3025
SB5A	0.023	-3.7722	0.0029	-5.8430	0.095	-2.3538	0.095	-2.3538
SB5B	0.014	-4.2686	0.00275	-5.8961	0.09	-2.4079	0.09	-2.4079
SB6A	0.018	-4.0173	0.0027	-5.9145	0.09	-2.4079	0.09	-2.4079
SB6B	0.017	-4.0745	0.00265	-5.9331	0.09	-2.4079	0.09	-2.4079
SB7A	0.0029	-5.8430	0.0029	-5.8430	0.1	-2.3025	0.1	-2.3025
SB7B	0.0028	-5.8781	0.0028	-5.8781	0.23	-1.4696	0.76	-0.2744
SB8A	0.0095	-4.6564	0.0029	-5.8430	0.105	-2.2537	0.105	-2.2537
SB8B	0.013	-4.3428	0.00295	-5.8259	0.1	-2.3025	0.1	-2.3025
SB9A	0.015	-4.1997	0.0029	-5.8430	0.095	-2.3538	0.3	-1.2039
SB9B	0.014	-4.2686	0.00275	-5.8961	0.09	-2.4079	0.09	-2.4079
SB10A	0.031	-3.4737	0.00295	-5.8259	0.195	-1.6347	0.195	-1.6347
SB10B	0.075	-2.5902	0.033	-3.4112	0.105	-2.2537	0.105	-2.2537
SB11A	0.015	-4.1997	0.0028	-5.8781	0.09	-2.4079	0.09	-2.4079
SB11B	0.016	-4.1351	0.0028	-5.8781	0.09	-2.4079	0.09	-2.4079
SB12A	0.028	-3.5755	0.0089	-4.7217	0.1	-2.3025	0.1	-2.3025
SB12B	0.025	-3.6888	0.019	-3.9633	0.095	-2.3538	0.25	-1.3862
SB13A	0.055	-2.9004	0.0032	-5.7446	0.11	-2.2072	0.11	-2.2072
SB13B	0.074	-2.6036	0.0036	-5.6268	0.12	-2.1202	0.12	-2.1202
SB14A	0.043	-3.1465	0.00345	-5.6693	0.115	-2.1628	0.41	-0.8915
SB14B	0.038	-3.2701	0.0031	-5.7763	0.1	-2.3025	0.1	-2.3025
SB15A	0.028	-3.5755	0.019	-3.9633	0.09	-2.4079	0.09	-2.4079
SB15B	0.035	-3.3524	0.038	-3.2701	0.1	-2.3025	0.1	-2.3025
SB16A	0.028	-3.5755	0.0089	-4.7217	0.09	-2.4079	0.09	-2.4079
SB16B	0.034	-3.3813	0.018	-4.0173	0.1	-2.3025	0.1	-2.3025
SB17A	0.071	-2.6450	0.012	-4.4228	0.1	-2.3025	0.1	-2.3025
SB17B	0.029	-3.5404	0.0059	-5.1328	0.09	-2.4079	0.09	-2.4079
SB18A	0.031	-3.4737	0.0028	-5.8781	0.1	-2.3025	0.1	-2.3025
SB18B	0.031	-3.4737	0.0098	-4.6253	0.1	-2.3025	0.1	-2.3025
SB19A	0.044	-3.1235	0.034	-3.3813	0.1	-2.3025	0.1	-2.3025
SB19B	0.031	-3.4737	0.00295	-5.8259	0.1	-2.3025	0.1	-2.3025
SB20A	0.026	-3.6496	0.014	-4.2686	0.1	-2.3025	0.1	-2.3025
SB20B	0.015	-4.1997	0.0029	-5.8430	0.1	-2.3025	0.1	-2.3025
n=		40		40		40		40
s2y=		0.4734		0.7177		0.0342		0.2077
sy=		0.6880		0.8472		0.1848		0.4558
ybar=		-3.7976		-5.3061		-2.2876		-2.1730
H(0.95)=		2.102		2.202		1.742		1.928
95%UCL=		0.03581		0.00957		0.10872		0.14538
mean conc=	0.02728		0.00771		0.10362		0.13325	
min conc=	0.0028		0.00265		0.09		0.09	
max conc=	0.075		0.038		0.23		0.76	
exp value=	95% UCL	0.03581	95% UCL	0.00957	95% UCL	0.10872	95% UCL	0.14538

Fort Riley Soils UCL's

Volatile & Semi-volatile	Benzo[a]anthracene		Benzo[a]pyrene		Benzo[b]fluoranthene		Benzo[k]fluoranthene	
SB1A	0.055	-2.9004	0.135	-2.0024	0.19	-1.6607	0.19	-1.6607
SB1B	0.055	-2.9004	0.13	-2.0402	0.185	-1.6873	0.185	-1.6873
SB2A	0.055	-2.9004	0.135	-2.0024	0.19	-1.6607	0.19	-1.6607
SB2B	0.06	-2.8134	0.135	-2.0024	0.195	-1.6347	0.195	-1.6347
SB3A	0.06	-2.8134	0.135	-2.0024	0.195	-1.6347	0.195	-1.6347
SB3B	0.055	-2.9004	0.13	-2.0402	0.185	-1.6873	0.185	-1.6873
SB4A	0.06	-2.8134	0.135	-2.0024	0.195	-1.6347	0.195	-1.6347
SB4B	0.06	-2.8134	0.135	-2.0024	0.195	-1.6347	0.195	-1.6347
SB5A	0.055	-2.9004	0.135	-2.0024	0.19	-1.6607	0.19	-1.6607
SB5B	0.055	-2.9004	0.13	-2.0402	0.185	-1.6873	0.185	-1.6873
SB6A	0.055	-2.9004	0.13	-2.0402	0.185	-1.6873	0.185	-1.6873
SB6B	0.05	-2.9957	0.12	-2.1202	0.175	-1.7429	0.175	-1.7429
SB7A	0.39	-0.9416	0.3	-1.2039	0.195	-1.6347	0.195	-1.6347
SB7B	1.8	0.58778	1.2	0.18232	1.4	0.33647	0.95	-0.0512
SB8A	0.065	-2.7333	0.145	-1.9310	0.21	-1.5606	0.21	-1.5606
SB8B	0.06	-2.8134	0.135	-2.0024	0.195	-1.6347	0.195	-1.6347
SB9A	0.57	-0.5621	0.34	-1.0788	0.38	-0.9675	0.19	-1.6607
SB9B	0.18	-1.7147	0.13	-2.0402	0.185	-1.6873	0.185	-1.6873
SB10A	0.62	-0.4780	0.275	-1.2909	0.39	-0.9416	0.39	-0.9416
SB10B	0.5	-0.6931	0.55	-0.5978	0.46	-0.7765	0.46	-0.7765
SB11A	0.055	-2.9004	0.13	-2.0402	0.185	-1.6873	0.185	-1.6873
SB11B	0.11	-2.2072	0.13	-2.0402	0.185	-1.6873	0.185	-1.6873
SB12A	0.43	-0.8439	0.27	-1.3093	0.195	-1.6347	0.195	-1.6347
SB12B	0.95	-0.0512	0.68	-0.3856	0.84	-0.1743	0.68	-0.3856
SB13A	0.17	-1.7719	0.15	-1.8971	0.215	-1.5371	0.215	-1.5371
SB13B	0.07	-2.6592	0.165	-1.8018	0.235	-1.4481	0.235	-1.4481
SB14A	1.7	0.53062	1.3	0.26236	1.1	0.09531	1.2	0.18232
SB14B	0.33	-1.1086	0.145	-1.9310	0.205	-1.5847	0.205	-1.5847
SB15A	0.055	-2.9004	0.13	-2.0402	0.185	-1.6873	0.185	-1.6873
SB15B	0.06	-2.8134	0.135	-2.0024	0.195	-1.6347	0.195	-1.6347
SB16A	0.055	-2.9004	0.13	-2.0402	0.185	-1.6873	0.185	-1.6873
SB16B	0.06	-2.8134	0.14	-1.9661	0.2	-1.6094	0.2	-1.6094
SB17A	0.23	-1.4696	0.14	-1.9661	0.2	-1.6094	0.2	-1.6094
SB17B	0.055	-2.9004	0.13	-2.0402	0.185	-1.6873	0.185	-1.6873
SB18A	0.16	-1.8325	0.14	-1.9661	0.2	-1.6094	0.2	-1.6094
SB18B	0.06	-2.8134	0.135	-2.0024	0.195	-1.6347	0.195	-1.6347
SB19A	0.06	-2.8134	0.14	-1.9661	0.2	-1.6094	0.2	-1.6094
SB19B	0.06	-2.8134	0.135	-2.0024	0.195	-1.6347	0.195	-1.6347
SB20A	0.16	-1.8325	0.135	-2.0024	0.195	-1.6347	0.195	-1.6347
SB20B	0.16	-1.8325	0.135	-2.0024	0.195	-1.6347	0.195	-1.6347
n=		40		40		40		40
s2y=		1.1216		0.3641		0.2431		0.1998
sy=		1.0590		0.6034		0.4931		0.4470
ybar=		-2.1162		-1.7351		-1.4553		-1.4855
H(0.95)=		2.423		2.01		1.928		1.856
95%UCL=		0.31836		0.25698		0.30681		0.28572
mean conc=	0.24625		0.23137		0.27925		0.26175	
min conc=	0.05		0.12		0.175		0.175	
max conc=	1.8		1.3		1.4		1.2	
exp value=	95% UCL	0.31836	95% UCL	0.25698	95% UCL	0.30681	95% UCL	0.28572

Fort Riley Soils UCL's Volatile & Semi-volatile	Chrysene		Dibenzofuran		2,4-Dichlorophenol		Diethylphthalate	
SB1A	0.055	-2.9004	0.055	-2.9004	0.115	-2.1628	0.19	-1.6607
SB1B	0.055	-2.9004	0.055	-2.9004	0.11	-2.2072	0.185	-1.6873
SB2A	0.055	-2.9004	0.055	-2.9004	0.115	-2.1628	0.19	-1.6607
SB2B	0.06	-2.8134	0.06	-2.8134	0.115	-2.1628	0.195	-1.6347
SB3A	0.06	-2.8134	0.06	-2.8134	0.115	-2.1628	0.195	-1.6347
SB3B	0.055	-2.9004	0.055	-2.9004	0.11	-2.2072	0.185	-1.6873
SB4A	0.06	-2.8134	0.06	-2.8134	0.115	-2.1628	0.195	-1.6347
SB4B	0.06	-2.8134	0.06	-2.8134	0.115	-2.1628	0.195	-1.6347
SB5A	0.055	-2.9004	0.055	-2.9004	0.115	-2.1628	0.19	-1.6607
SB5B	0.055	-2.9004	0.055	-2.9004	0.11	-2.2072	0.185	-1.6873
SB6A	0.055	-2.9004	0.055	-2.9004	0.11	-2.2072	0.185	-1.6873
SB6B	0.05	-2.9957	0.05	-2.9957	0.105	-2.2537	0.175	-1.7429
SB7A	0.43	-0.8439	0.06	-2.8134	0.115	-2.1628	0.195	-1.6347
SB7B	1.7	0.53062	0.055	-2.9004	0.115	-2.1628	0.19	-1.6607
SB8A	0.065	-2.7333	0.065	-2.7333	0.125	-2.0794	0.21	-1.5606
SB8B	0.06	-2.8134	0.06	-2.8134	0.115	-2.1628	0.195	-1.6347
SB9A	0.42	-0.8675	0.055	-2.9004	0.115	-2.1628	0.19	-1.6607
SB9B	0.11	-2.2072	0.055	-2.9004	0.11	-2.2072	0.185	-1.6873
SB10A	0.62	-0.4780	0.115	-2.1628	0.235	-1.4481	0.39	-0.9416
SB10B	0.5	-0.6931	0.065	-2.7333	0.125	-2.0794	0.21	-1.5606
SB11A	0.055	-2.9004	0.055	-2.9004	0.11	-2.2072	0.185	-1.6873
SB11B	0.11	-2.2072	0.055	-2.9004	0.11	-2.2072	0.185	-1.6873
SB12A	0.74	-0.3011	0.06	-2.8134	0.115	-2.1628	0.7	-0.3566
SB12B	1.2	0.18232	0.055	-2.9004	0.115	-2.1628	0.19	-1.6607
SB13A	0.21	-1.5606	0.13	-2.0402	0.13	-2.0402	0.21	-1.5606
SB13B	0.07	-2.6592	0.07	-2.6592	0.14	-1.9661	0.235	-1.4481
SB14A	1.6	0.47000	0.07	-2.6592	0.14	-1.9661	0.23	-1.4696
SB14B	0.29	-1.2378	0.06	-2.8134	0.125	-2.0794	0.205	-1.5847
SB15A	0.055	-2.9004	0.055	-2.9004	0.11	-2.2072	0.185	-1.6873
SB15B	0.06	-2.8134	0.06	-2.8134	0.115	-2.1628	0.195	-1.6347
SB16A	0.055	-2.9004	0.055	-2.9004	0.11	-2.2072	0.185	-1.6873
SB16B	0.06	-2.8134	0.06	-2.8134	0.12	-2.1202	0.2	-1.6094
SB17A	0.23	-1.4696	0.06	-2.8134	0.12	-2.1202	0.2	-1.6094
SB17B	0.055	-2.9004	0.055	-2.9004	0.11	-2.2072	0.185	-1.6873
SB18A	0.16	-1.8325	0.06	-2.8134	0.12	-2.1202	0.2	-1.6094
SB18B	0.06	-2.8134	0.06	-2.8134	0.115	-2.1628	0.195	-1.6347
SB19A	0.12	-2.1202	0.06	-2.8134	0.12	-2.1202	0.2	-1.6094
SB19B	0.06	-2.8134	0.06	-2.8134	0.115	-2.1628	0.195	-1.6347
SB20A	0.2	-1.6094	0.06	-2.8134	0.115	-2.1628	0.51	-0.6733
SB20B	0.2	-1.6094	0.06	-2.8134	0.115	-2.1628	0.43	-0.8439
n=		40		40		40		40
s2y=		1.1493		0.0316		0.0161		0.0886
sy=		1.0720		0.1778		0.1269		0.2977
ybar=		-2.0867		-2.8055		-2.1349		-1.5433
H(0.95)=		2.423		1.742		1.701		1.793
95%UCL=		0.33415		0.06456		0.12340		0.24328
mean conc=	0.25425		0.06162		0.11937		0.22625	
min conc=	0.05		0.05		0.105		0.175	
max conc=	1.7		0.13		0.235		0.7	
exp value=	95% UCL	0.33415	95% UCL	0.06456	95% UCL	0.12340	95% UCL	0.24328

Fort Riley Soils UCL's Volatile & Semi-volatile	bis[2-Ethylhexyl]phthala		Fluoranthene		Fluorene		Indeno[1,2,3-cd]pyrene	
SB1A	0.19	-1.6607	0.075	-2.5902	0.135	-2.0024	0.19	-1.6607
SB1B	0.89	-0.1165	0.075	-2.5902	0.13	-2.0402	0.185	-1.6873
SB2A	0.19	-1.6607	0.075	-2.5902	0.135	-2.0024	0.19	-1.6607
SB2B	0.195	-1.6347	0.08	-2.5257	0.135	-2.0024	0.195	-1.6347
SB3A	0.195	-1.6347	0.08	-2.5257	0.135	-2.0024	0.195	-1.6347
SB3B	1	0	0.075	-2.5902	0.13	-2.0402	0.185	-1.6873
SB4A	0.195	-1.6347	0.08	-2.5257	0.135	-2.0024	0.195	-1.6347
SB4B	0.195	-1.6347	0.08	-2.5257	0.135	-2.0024	0.195	-1.6347
SB5A	0.19	-1.6607	0.075	-2.5902	0.135	-2.0024	0.19	-1.6607
SB5B	0.185	-1.6873	0.075	-2.5902	0.13	-2.0402	0.185	-1.6873
SB6A	0.185	-1.6873	0.075	-2.5902	0.13	-2.0402	0.185	-1.6873
SB6B	1.2	0.18232	0.07	-2.6592	0.12	-2.1202	0.175	-1.7429
SB7A	0.195	-1.6347	0.74	-0.3011	0.135	-2.0024	0.195	-1.6347
SB7B	0.19	-1.6607	3.4	1.22377	0.27	-1.3093	0.38	-0.9675
SB8A	0.21	-1.5606	0.085	-2.4651	0.145	-1.9310	0.21	-1.5606
SB8B	0.195	-1.6347	0.08	-2.5257	0.135	-2.0024	0.195	-1.6347
SB9A	0.42	-0.8675	0.99	-0.0100	0.135	-2.0024	0.19	-1.6607
SB9B	0.185	-1.6873	0.18	-1.7147	0.13	-2.0402	0.185	-1.6873
SB10A	0.39	-0.9416	1.2	0.18232	0.275	-1.2909	0.39	-0.9416
SB10B	1.4	0.33647	0.5	-0.6931	0.145	-1.9310	0.21	-1.5606
SB11A	0.185	-1.6873	0.075	-2.5902	0.13	-2.0402	0.185	-1.6873
SB11B	0.185	-1.6873	0.18	-1.7147	0.13	-2.0402	0.185	-1.6873
SB12A	0.195	-1.6347	0.43	-0.8439	0.135	-2.0024	0.195	-1.6347
SB12B	0.19	-1.6607	1.1	0.09531	0.135	-2.0024	0.19	-1.6607
SB13A	0.215	-1.5371	0.25	-1.3862	0.15	-1.8971	0.215	-1.5371
SB13B	0.235	-1.4481	0.095	-2.3538	0.165	-1.8018	0.235	-1.4481
SB14A	0.23	-1.4696	2.7	0.99325	0.16	-1.8325	0.23	-1.4696
SB14B	0.41	-0.8915	0.53	-0.6348	0.145	-1.9310	0.205	-1.5847
SB15A	0.185	-1.6873	0.075	-2.5902	0.13	-2.0402	0.185	-1.6873
SB15B	0.185	-1.6873	0.08	-2.5257	0.135	-2.0024	0.195	-1.6347
SB16A	0.96	-0.0408	0.075	-2.5902	0.13	-2.0402	0.185	-1.6873
SB16B	0.2	-1.6094	0.08	-2.5257	0.14	-1.9661	0.2	-1.6094
SB17A	0.2	-1.6094	0.31	-1.1711	0.14	-1.9661	0.2	-1.6094
SB17B	0.185	-1.6873	0.075	-2.5902	0.13	-2.0402	0.185	-1.6873
SB18A	0.2	-1.6094	0.16	-1.8325	0.14	-1.9661	0.2	-1.6094
SB18B	0.195	-1.6347	0.08	-2.5257	0.135	-2.0024	0.195	-1.6347
SB19A	0.4	-0.9162	0.2	-1.6094	0.14	-1.9661	0.2	-1.6094
SB19B	0.195	-1.6347	0.08	-2.5257	0.135	-2.0024	0.195	-1.6347
SB20A	0.195	-1.6347	0.31	-1.1711	0.135	-2.0024	0.195	-1.6347
SB20B	0.195	-1.6347	0.31	-1.1711	0.135	-2.0024	0.195	-1.6347
n=		40		40		40		40
s2y=		0.3497		1.2272		0.0267		0.0259
sy=		0.5914		1.1078		0.1633		0.1610
ybar=		-1.3471		-1.7616		-1.9588		-1.6011
H(0.95)=		2.01		2.423		1.742		1.742
95%UCL=		0.37458		0.48766		0.14957		0.21368
mean conc=	0.32837		0.38212		0.14325		0.20475	
min conc=	0.185		0.07		0.12		0.175	
max conc=	1.4		3.4		0.275		0.39	
exp value=	95% UCL	0.37458	95% UCL	0.48766	95% UCL	0.14957	95% UCL	0.21368

Fort Riley Soils UCL's Volatile & Semi-volatile	2-Methylnaphthalene		Phenanthrene		Pyrene		2,4,6-Trichlorophenol	
SB1A	0.075	-2.5902	0.075	-2.5902	0.055	-2.9004	0.15	-1.8971
SB1B	0.075	-2.5902	0.075	-2.5902	0.055	-2.9004	0.15	-1.8971
SB2A	0.075	-2.5902	0.075	-2.5902	0.055	-2.9004	0.15	-1.8971
SB2B	0.08	-2.5257	0.08	-2.5257	0.06	-2.8134	0.155	-1.8643
SB3A	0.08	-2.5257	0.08	-2.5257	0.06	-2.8134	0.155	-1.8643
SB3B	0.075	-2.5902	0.075	-2.5902	0.055	-2.9004	0.33	-1.1086
SB4A	0.08	-2.5257	0.08	-2.5257	0.06	-2.8134	0.155	-1.8643
SB4B	0.08	-2.5257	0.08	-2.5257	0.06	-2.8134	0.155	-1.8643
SB5A	0.075	-2.5902	0.075	-2.5902	0.055	-2.9004	0.15	-1.8971
SB5B	0.075	-2.5902	0.075	-2.5902	0.055	-2.9004	0.15	-1.8971
SB6A	0.075	-2.5902	0.075	-2.5902	0.055	-2.9004	0.15	-1.8971
SB6B	0.07	-2.6592	0.07	-2.6592	0.05	-2.9957	0.14	-1.9661
SB7A	0.08	-2.5257	0.37	-0.9942	0.86	-0.1508	0.155	-1.8643
SB7B	0.075	-2.5902	2.7	0.99325	4.1	1.41098	0.15	-1.8971
SB8A	0.085	-2.4651	0.085	-2.4651	0.17	-1.7719	0.17	-1.7719
SB8B	0.08	-2.5257	0.08	-2.5257	0.06	-2.8134	0.155	-1.8643
SB9A	0.075	-2.5902	0.99	-0.0100	0.87	-0.1392	0.15	-1.8971
SB9B	0.075	-2.5902	0.15	-1.8971	0.18	-1.7147	0.15	-1.8971
SB10A	0.155	-1.8643	0.94	-0.0618	1.4	0.33647	0.31	-1.1711
SB10B	0.2	-1.6094	0.42	-0.8675	0.63	-0.4620	0.17	-1.7719
SB11A	0.075	-2.5902	0.075	-2.5902	0.055	-2.9004	0.15	-1.8971
SB11B	0.075	-2.5902	0.075	-2.5902	0.15	-1.8971	0.15	-1.8971
SB12A	0.08	-2.5257	0.23	-1.4696	0.94	-0.0618	0.155	-1.8643
SB12B	0.075	-2.5902	0.99	-0.0100	2.7	0.99325	0.15	-1.8971
SB13A	0.085	-2.4651	0.5	-0.6931	0.29	-1.2378	0.17	-1.7719
SB13B	0.095	-2.3538	0.095	-2.3538	0.14	-1.9661	0.19	-1.6607
SB14A	0.09	-2.4079	1.6	0.47000	3.4	1.22377	0.185	-1.6873
SB14B	0.08	-2.5257	0.25	-1.3862	0.57	-0.5621	0.165	-1.8018
SB15A	0.075	-2.5902	0.075	-2.5902	0.055	-2.9004	0.15	-1.8971
SB15B	0.08	-2.5257	0.08	-2.5257	0.06	-2.8134	0.155	-1.8643
SB16A	0.075	-2.5902	0.075	-2.5902	0.11	-2.2072	0.15	-1.8971
SB16B	0.08	-2.5257	0.08	-2.5257	0.06	-2.8134	0.16	-1.8325
SB17A	0.08	-2.5257	0.24	-1.4271	0.36	-1.0216	0.16	-1.8325
SB17B	0.075	-2.5902	0.075	-2.5902	0.055	-2.9004	0.15	-1.8971
SB18A	0.08	-2.5257	0.08	-2.5257	0.2	-1.6094	0.16	-1.8325
SB18B	0.08	-2.5257	0.08	-2.5257	0.06	-2.8134	0.155	-1.8643
SB19A	0.08	-2.5257	0.08	-2.5257	0.2	-1.6094	0.16	-1.8325
SB19B	0.08	-2.5257	0.08	-2.5257	0.06	-2.8134	0.155	-1.8643
SB20A	0.08	-2.5257	0.27	-1.3093	0.31	-1.1711	0.155	-1.8643
SB20B	0.08	-2.5257	0.23	-1.4696	0.31	-1.1711	0.155	-1.8643
n=		40		40		40		40
s2y=		0.0358		1.0303		1.7544		0.0285
sy=		0.1892		1.0150		1.3245		0.1688
ybar=		-2.5052		-1.9119		-1.8028		-1.8218
H(0.95)=		1.742		2.423		2.737		1.742
95%UCL=		0.08764		0.36678		0.70816		0.17197
mean conc=	0.0835		0.29775		0.47575		0.1645	
min conc=	0.07		0.07		0.05		0.14	
max conc=	0.2		2.7		4.1		0.33	
exp value=	95% UCL	0.08764	95% UCL	0.36678	95% UCL	0.70816	95% UCL	0.17197

PESTICIDE STORAGE FACILITY – FT RILEY
MONITORING WELL SOIL BORING SAMPLES
Gilbert's method for lognormal distributions

n= @COUNT(list)
s2y= @COUNT(list)/(@COUNT(list)-1)*@VAR(list)
sy= @SQRT(@COUNT(list)/(@COUNT(list)-1)*@VAR(list))
ybar= @AVG(list)
H(0.95)= From Table A12
95%UCL= @EXP(ybar+(0.5*s2y)+((sy*H)/@SQRT(N-1)))
First column is surface soil sample data in mg/kg
Second column is natural log-transformed data

	4,4'-DDE		Dieldrin		alpha-Chlordane		gamma-Chlordane		Benzo[a]anthracene		Benzo[a]pyrene		Benzo[b]fluoranthene	
MWSB01A	0.0037	-5.59942	0.0037	-5.59942	0.00185	-6.29256	0.00185	-6.29256	0.055	-2.90042	0.13	-2.04022	0.185	-1.687399
MWSB01B	0.0042	-5.47267	0.0042	-5.47267	0.0021	-6.16581	0.0021	-6.16581	0.065	-2.73336	0.145	-1.93102	0.21	-1.560647
MWSB02A	0.00405	-5.50903	0.00405	-5.50903	0.073	-2.61729	0.071	-2.64507	0.6	-0.51082	0.68	-0.38566	1	0
MWSB02B	0.0037	-5.59942	0.0037	-5.59942	0.00185	-6.29256	0.00185	-6.29256	0.055	-2.90042	0.13	-2.04022	0.185	-1.687399
MWSB02C	0.00385	-5.55968	0.00385	-5.55968	0.00195	-6.23992	0.00195	-6.23992	0.055	-2.90042	0.135	-2.00248	0.19	-1.660731
MWSB02D	0.00375	-5.58599	0.00375	-5.58599	0.00185	-6.29256	0.00185	-6.29256	0.055	-2.90042	0.13	-2.04022	0.185	-1.687399
MWSB02E	0.00375	-5.58599	0.00375	-5.58599	0.00185	-6.29256	0.00185	-6.29256	0.055	-2.90042	0.13	-2.04022	0.185	-1.687399
MWSB03A	0.0042	-5.47267	0.0087	-4.74443	0.0021	-6.16581	0.0051	-5.27851	0.065	-2.73336	0.145	-1.93102	0.21	-1.560647
MWSB03B	0.004	-5.52146	0.004	-5.52146	0.002	-6.21460	0.002	-6.21460	0.06	-2.81341	0.14	-1.96611	0.2	-1.609437
MWSB04A	0.012	-4.42284	0.013	-4.34280	0.015	-4.19970	0.018	-4.01738	0.055	-2.90042	0.125	-2.07944	0.18	-1.714798
MWSB04B	0.00415	-5.48464	0.00415	-5.48464	0.0021	-6.16581	0.0021	-6.16581	0.06	-2.81341	0.145	-1.93102	0.205	-1.584745
MWSB05A	0.0038	-5.57275	0.0038	-5.57275	0.0019	-6.26590	0.0019	-6.26590	0.11	-2.20727	0.13	-2.04022	0.185	-1.687399
MWSB05B	0.0038	-5.57275	0.0038	-5.57275	0.0019	-6.26590	0.0019	-6.26590	0.055	-2.90042	0.13	-2.04022	0.185	-1.687399
mean=	0.004534		0.004957		0.008419		0.008726		0.103461		0.176538		0.254230	
n=	13		13		13		13		13		13		13	
s2y=	0.099062		0.151687		1.238474		1.280702		0.439142		0.204750		0.212628	
sy=	0.314742 *		0.389470 *		1.112867 *		1.131681 *		0.662677 *		0.452494 *		0.461116 *	
ybar=	-5.45841		-5.39623		-5.80546		-5.72532		-2.62420		-1.88216		-1.52426	
H(0.95)=	1.977		2.026		2.915		3.389		2.414		2.141		2.141	
95%UCL=	0.005357		0.006141		0.014267		0.018726		0.143297		0.223103		0.322080	

	Benzo[g,h,i]perylene		Chrysene		Fluoranthene		Indeno[1,2,3-cd]-pyrene		Phenanthrene		Pyrene		bis(2-Ethylhexyl)-phthalate	
MWSB01A	0.185	-1.68739	0.055	-2.90042	0.075	-2.59026	0.185	-1.68739	0.075	-2.59026	0.055	-2.90042	0.185	-1.687399
MWSB01B	0.21	-1.56064	0.065	-2.73336	0.085	-2.46510	0.21	-1.56064	0.085	-2.46510	0.065	-2.73336	0.21	-1.560647
MWSB02A	0.4	-0.91629	0.64	-0.44628	1	0	0.48	-0.73396	0.56	-0.57981	0.8	-0.22314	0.48	-0.733969
MWSB02B	0.185	-1.68739	0.055	-2.90042	0.075	-2.59026	0.185	-1.68739	0.075	-2.59026	0.055	-2.90042	0.185	-1.687399
MWSB02C	0.19	-1.66073	0.055	-2.90042	0.075	-2.59026	0.19	-1.66073	0.075	-2.59026	0.055	-2.90042	0.19	-1.660731
MWSB02D	0.185	-1.68739	0.055	-2.90042	0.075	-2.59026	0.185	-1.68739	0.075	-2.59026	0.055	-2.90042	0.185	-1.687399
MWSB02E	0.185	-1.68739	0.055	-2.90042	0.075	-2.59026	0.185	-1.68739	0.075	-2.59026	0.055	-2.90042	0.185	-1.687399
MWSB03A	0.21	-1.56064	0.065	-2.73336	0.085	-2.46510	0.21	-1.56064	0.085	-2.46510	0.065	-2.73336	0.21	-1.560647
MWSB03B	0.2	-1.60943	0.06	-2.81341	0.08	-2.52572	0.2	-1.60943	0.08	-2.52572	0.06	-2.81341	0.2	-1.609437
MWSB04A	0.18	-1.71479	0.055	-2.90042	0.07	-2.65926	0.18	-1.71479	0.07	-2.65926	0.055	-2.90042	0.18	-1.714798
MWSB04B	0.205	-1.58474	0.06	-2.81341	0.08	-2.52572	0.205	-1.58474	0.08	-2.52572	0.06	-2.81341	0.205	-1.584745
MWSB05A	0.185	-1.68739	0.11	-2.20727	0.18	-1.71479	0.185	-1.68739	0.075	-2.59026	0.18	-1.71479	0.185	-1.687399
MWSB05B	0.185	-1.68739	0.055	-2.90042	0.075	-2.59026	0.185	-1.68739	0.075	-2.59026	0.055	-2.90042	0.185	-1.687399
mean=	0.208076		0.106538		0.156153		0.214230		0.114230		0.124230		0.214230	
n=	13		13		13		13		13		13		13	
s2y=	0.044434		0.462194		0.535290		0.067607		0.305999		0.597899		0.067607	
sy=	0.210795 *		0.679849 *		0.731635 *		0.260015 *		0.553171 *		0.773239 *		0.260015 *	
ybar=	-1.59474		-2.61923		-2.29979		-1.58072		-2.41173		-2.56418		-1.58072	
H(0.95)=	1.843		2.414		2.414		1.927		2.271		2.57		1.927	
95%UCL=	0.232148		0.147433		0.218209		0.246036		0.150154		0.184228		0.246036	

	Benzene		Methylene Chloride		Arsenic		Barium		Chromium		Lead		Silver	
MWSB01A	0.0066	−5.02068	0.031	−3.47376 B	1	0	61	4.110873	6.8	1.916922	5.1	1.629240	0.3	−1.203972
MWSB01B	0.0059	−5.13280	0.023	−3.77226 B	2.5	0.916290	120	4.787491	8.7	2.163323	10	2.302585	0.4	−0.916290
MWSB02A	0.0018	−6.31996	0.03	−3.50655	3.7	1.308332	130	4.867534	10	2.302585	56	4.025351	1	0
MWSB02B	0.00155	−6.46950	0.018	−4.01738	1.7	0.530628	60	4.094344	11	2.397895	4.7	1.547562	0.9	−0.105360
MWSB02C	0.0017	−6.37712	0.019	−3.96331	1.7	0.530628	83	4.418840	4.8	1.568615	1.9	0.641853	0.3	−1.203972
MWSB02D	0.00155	−6.46950	0.017	−4.07454	2.4	0.875468	100	4.605170	6.4	1.856297	2.15	0.765467	1.1	0.0953101
MWSB02E	0.0017	−6.37712	0.011	−4.50986	1.4	0.336472	72	4.276666	7.1	1.960094	1.75	0.559615	1.2	0.1823215
MWSB03A	0.00165	−6.40697	0.019	−3.96331	2	0.693147	190	5.247024	11	2.397895	8.5	2.140066	0.25	−1.386294
MWSB03B	0.00175	−6.34813	0.022	−3.81671	0.5	−0.69314	68	4.219507	6.1	1.808288	5.9	1.774952	0.35	−1.049822
MWSB04A	0.00165	−6.40697	0.021	−3.86323	3.1	1.131402	60	4.094344	20	2.995732	58	4.060443	0.3	−1.203972
MWSB04B	0.0018	−6.31996	0.02	−3.91202	0.4	−0.91629	70	4.248495	6	1.791759	2.2	0.788457	0.4	−0.916290
MWSB05A	0.0017	−6.37712	0.035	−3.35240 B	2.9	1.064710	96	4.564348	10	2.302585	30	3.401197	0.3	−1.203972
MWSB05B	0.0017	−6.37712	0.018	−4.01738 B	0.6	−0.51082	44	3.784189	6.6	1.887069	5.9	1.774952	0.3	−1.203972
mean=	0.002388		0.021846		1.854545		88.45454		9		16.09090		0.581818	
n=	13		13		11		11		11		11		11	
s2y=	0.244489		0.090247		0.590899		0.164227		0.164609		1.752302		0.390275	
sy=	0.494458 *		0.300411 *		0.768700 *		0.405249 *		0.405720 *		1.323745 *		0.624719 *	
ybar=	−6.18484		−3.86482		0.395502		4.401860		2.115347		1.952720		−0.72691	
H(0.95)=	2.141		1.927		2.71		2.089		2.089		3.639		2.368	
95%UCL=	0.003160		0.025923		3.856310		115.7788		11.77137		77.64717		0.938036	

	Mercury	
MWSB01A	0.05	−2.99573
MWSB01B	0.05	−2.99573
MWSB02A	0.3	−1.20397
MWSB02B	0.05	−2.99573
MWSB02C	0.05	−2.99573
MWSB02D	0.05	−2.99573
MWSB02E	0.05	−2.99573
MWSB03A	0.05	−2.99573
MWSB03B	0.05	−2.99573
MWSB04A	0.05	−2.99573
MWSB04B	0.05	−2.99573
MWSB05A	0.1	−2.30258
MWSB05B	0.05	−2.99573
mean=	0.077272	
n=	11	
s2y=	0.312951	
sy=	0.559420 *	
ybar=	−2.76983	
H(0.95)=	2.368	
95%UCL=	0.111420	

PESTICIDE S[illegible]AGE FACILITY
GROUND WA[illegible]R SAMPLES
Gilbert's method for lognormal distributions

Fort Riley – PSF Groundwater – Metals		Total Metals Arsenic		Total Metals Aluminum		Total Metals Barium		Total Metals Beryllium		Total Metals Cadmium		Total Metals Calcium	
Sample ID		Background = < 1		Background =< 50		Background = 200		Background = 2		Background = 4		Background = 150000	
		Sample	ln	Sample	ln	Sample	ln	Sample	ln	Sample	ln	Sample	ln
PSF9202/9206	BL	< 1	0.0000	< 55 *	4.0073	84	4.4308	3 *	1.0986	< 2.5	0.9163	350000 *	12.7657
PSF9203		< 1	0.0000	270 *	5.5984	81	4.3944	1.5	0.4055	< 2.5	0.9163	180000 *	12.1007
PSF9204		< 1	0.0000	160 *	5.0752	85	4.4427	1.4	0.3365	< 2.5	0.9163	140000	11.8494
PSF9205		16 *	2.7726	210 *	5.3471	130	4.8675	1.6	0.4700	< 2.5	0.9163	180000 *	12.1007
PSF9202/9206	FQ	< 1	0.0000	190 *	5.2470	68	4.2195	3 *	1.0986	< 2	0.6931	240000 *	12.3884
PSF9203		< 1	0.0000	550 *	6.3099	94	4.5433	2	0.6931	< 2	0.6931	160000 *	11.9829
PSF9204		< 1	0.0000	< 50	3.9120	100	4.6052	1	0.0000	< 2	0.6931	150000	11.9184
PSF9205		4.4 *	1.4816	550 *	6.3099	130	4.8675	2	0.6931	< 2	0.6931	150000	11.9184
PSF9202/9206	SQ	2.7 *	0.9933	< 50	3.9120	60	4.0943	5 *	1.6094	< 2	0.6931	290000 *	12.5776
PSF9203		< 1	0.0000	800 *	6.6846	63	4.1431	2	0.6931	< 2	0.6931	170000 *	12.0436
PSF9204		< 1	0.0000	< 50	3.9120	93	4.5326	2	0.6931	< 2	0.6931	150000	11.9184
PSF9205		3.8 *	1.3350	110 *	4.7005	110	4.7005	3 *	1.0986	< 2	0.6931	150000	11.9184
PSF9202/9206	TQ	< 1	0.0000	170 *	5.1358	100	4.6052	3 *	1.0986	< 2	0.6931	280000 *	12.5425
PSF9203		< 1	0.0000	180 *	5.1930	68	4.2195	2	0.6931	< 2	0.6931	170000 *	12.0436
PSF9204		< 1	0.0000	< 50	3.9120	91	4.5109	< 1	0.0000	< 2	0.6931	130000	11.7753
PSF9205		3.8 *	1.3350	< 50	3.9120	130	4.8675	2	0.6931	< 2	0.6931	150000	11.9184

< Not Detected – value used is 1/2 reported detection limit
* above background
All concentrations are in ug/L.

Fort Riley Groundwater	Total Metals Arsenic		Total Metals Aluminum		Total Metals Barium		Total Metals Beryllium		Total Metals Cadmium		Total Metals Calcium	
FD – Frequency of Detection	FD 5 /	16	FD 10 /	16	FD 16 /	16	FD 15 /	16	FD 0 /	16	FD 16 /	16
	# above Backg.	5	# above Backg.	11	# above Backg.	0	# above Backg.	5	# above Backg.	0	# above Backg.	9
n=		16		16		16		16		16		16
s2y=		0.7010		0.9214		0.0626		0.1809		0.0100		0.0868
sy=		0.8373		0.9599		0.2502		0.4253		0.0998		0.2946
ybar=		0.4948		4.9481		4.5028		0.7109		0.7489		12.1101
H(0.95)=		2.443		2.744		1.809		1.968		1.749		1.882
95%UCL=		3.9491		440.9092		104.6841		2.7661		2.2233		218972.3389
mean conc=	2.60625		218.437		92.9375		2.21875		2.125		190000	
min conc=	1		50		60		1		2		130000	
max conc=	16		800		130		5		2.5		350000	
Exposure value=	95% UCL	3.9491	95% UCL	440.90	95% UCL	104.68	95% UCL	2.76610	95% UCL	2.2232	95% UCL	218972.3

PESTICIDE STORAGE FACILITY
GROUND WATER SAMPLES
Gilbert's method for lognormal distributions

Fort Riley – PSF Groundwater – Metals		Total Metals **Chromium**		Total Metals **Iron**		Total Metals **Lead**	
Sample ID		Background = 10		Background = 71		Background =< 2.5	
		Sample	ln	Sample	ln	Sample	ln
PSF9202/9206	BL	12 *	2.4849	68	4.2195	< 2.5	0.9163
PSF9203		< 5	1.6094	290 *	5.6699	< 2.5	0.9163
PSF9204		< 5	1.6094	90 *	4.4998	< 0.5	−0.6931
PSF9205		< 5	1.6094	230 *	5.4381	< 2.5	0.9163
PSF9202/9206	FQ	< 5	1.6094	290 *	5.6699	< 0.5	−0.6931
PSF9203		< 5	1.6094	990 *	6.8977	< 0.5	−0.6931
PSF9204		< 5	1.6094	< 25	3.2189	< 0.5	−0.6931
PSF9205		< 5	1.6094	910 *	6.8134	< 0.5	−0.6931
PSF9202/9206	SQ	< 5	1.6094	66	4.1897	< 0.5	−0.6931
PSF9203		< 5	1.6094	1500 *	7.3132	< 0.5	−0.6931
PSF9204		< 5	1.6094	< 25	3.2189	< 0.5	−0.6931
PSF9205		< 5	1.6094	84 *	4.4308	< 0.5	−0.6931
PSF9202/9206	TQ	14 *	2.6391	190 *	5.2470	< 0.5	−0.6931
PSF9203		< 5	1.6094	330 *	5.7991	2.1	0.7419
PSF9204		< 5	1.6094	< 25	3.2189	2	0.6931
PSF9205		< 5	1.6094	< 25	3.2189	< 0.5	−0.6931

Fort Riley – PSF Groundwater – Metals		Total Metals **Magnesium**		Total Metals **Manganese**		Total Metals **Potassium**	
Sample ID		Background = 26000		Background = 34		Background = 5300	
		Sample	ln	Sample		Sample	
PSF9202/9206	BL	56000 *	10.9331	56 *	4.0254	6300 *	8.7483
PSF9203		29000 *	10.2751	91 *	4.5109	5900 *	8.6827
PSF9204		19000	9.8522	36 *	3.5835	3900	8.2687
PSF9205		28000 *	10.2400	43 *	3.7612	20000 *	9.9035
PSF9202/9206	FQ	40000 *	10.5966	41 *	3.7136	4800	8.4764
PSF9203		25000	10.1266	71 *	4.2627	50000 *	10.8198
PSF9204		21000	9.9523	26	3.2581	3700	8.2161
PSF9205		23000	10.0432	47 *	3.8501	11000 *	9.3057
PSF9202/9206	SQ	49000 *	10.7996	34	3.5264	6800 *	8.8247
PSF9203		27000 *	10.2036	77 *	4.3438	6500 *	8.7796
PSF9204		20000	9.9035	24	3.1781	4000	8.2940
PSF9205		22000	9.9988	23	3.1355	12000 *	9.3927
PSF9202/9206	TQ	51000 *	10.8396	53 *	3.9703	6200 *	8.7323
PSF9203		28000 *	10.2400	50 *	3.9120	5700 *	8.6482
PSF9204		18000	9.7981	26	3.2581	4000	8.2940
PSF9205		23000	10.0432	32	3.4657	9900 *	9.2003

< Not Detected – value used is 1/2 reported detection limit
* above background
All concentrations are in ug/L.

Fort Riley Groundwater	Total Metals **Chromium**	Total Metals **Iron**	Total Metals **Lead**	Total Metals **Magnesium**	Total Metals **Manganese**	Total Metals **Potassium**
FD – Frequency of Detection	FD 2 / 16	FD 12 / 16	FD 2 / 16	FD 16 / 16	FD 16 / 16	FD 16 / 16
	# above Backg. 2	# above Backg. 10	# above Backg. 0	# above Backg. 8	# above Backg. 10	# above Backg. 11
n=	16	16	16	16	16	16
s2y=	0.1066	1.9003	0.5397	0.1315	0.1800	0.4767
sy=	0.3266	1.3785	0.7346	0.3627	0.4243	0.6904
ybar=	1.7285	4.9415	−0.2150	10.2403	3.7347	8.9117
H(0.95)=	1.882	3.612	2.306	1.968	1.968	2.306
95%UCL=	6.9624	1309.3087	1.6359	35968.0956	56.8424	14201.1319
mean conc=	6	321.125	1.06875	29937.5	45.625	10043.7
min conc=	5	25	0.5	18000	23	3700
max conc=	14	1500	2.5	56000	91	50000
Exposure value=	**95% UCL** 6.9623	**95% UCL** 1309.30	**95% UCL** 1.63587	**95% UCL** 35968.0	**95% UCL** 56.8423	**95% UCL** 14201.1

PESTICIDE [illegible]AGE FACILITY
GROUND WA[illegible]R SAMPLES
Gilbert's method for lognormal distributions

Fort Riley – PSF Groundwater – Metals		Total Metals **Selenium**		Total Metals **Sodium**		Total Metals **Thallium**		Total Metals **Vanadium**		Total Metals **Zinc**	
Sample ID		Background = 2.9		Background = 22000		Background = < 0.5		Background = 11		Background = 13	
		Sample		Sample		Sample		Sample		Sample	
PSF9202/9206	BL	2.2	0.7885	90000 *	11.4076	< 50 *	3.9120	< 3.5	1.2528	98 *	4.5850
PSF9203		1.7	0.5306	47000 *	10.7579	< 50 *	3.9120	< 3.5	1.2528	< 3.5	1.2528
PSF9204		2.1	0.7419	25000 *	10.1266	< 50 *	3.9120	< 3.5	1.2528	< 3.5	1.2528
PSF9205		2.7	0.9933	42000 *	10.6454	< 50 *	3.9120	27 *	3.2958	< 3.5	1.2528
PSF9202/9206	FQ	2.2	0.7885	57000 *	10.9508	< 31.5 *	3.4500	< 5	1.6094	16 *	2.7726
PSF9203		1.2	0.1823	37000 *	10.5187	< 31.5 *	3.4500	8	2.0794	21 *	3.0445
PSF9204		1.1	0.0953	31000 *	10.3417	< 31.5 *	3.4500	< 5	1.6094	15 *	2.7081
PSF9205		1.7	0.5306	31000 *	10.3417	< 31.5 *	3.4500	12 *	2.4849	13	2.5649
PSF9202/9206	SQ	3 *	1.0986	100000 *	11.5129	< 31.5 *	3.4500	< 5	1.6094	7	1.9459
PSF9203		1.7	0.5306	44000 *	10.6919	< 31.5 *	3.4500	< 5	1.6094	14 *	2.6391
PSF9204		1.4	0.3365	30000 *	10.3090	< 31.5 *	3.4500	< 5	1.6094	< 3.5	1.2528
PSF9205		1.9	0.6419	32000 *	10.3735	< 31.5 *	3.4500	14 *	2.6391	4	1.3863
PSF9202/9206	TQ	3.6 *	1.2809	130000 *	11.7753	2.9 *	1.0647	< 5	1.6094	< 3.5	1.2528
PSF9203		2.2	0.7885	54000 *	10.8967	2.5 *	0.9163	< 5	1.6094	< 3.5	1.2528
PSF9204		1.3	0.2624	28000 *	10.2400	< 0.5	-0.6931	< 5	1.6094	< 3.5	1.2528
PSF9205		2.3	0.8329	29000 *	10.2751	< 0.5	-0.6931	< 5	1.6094	< 3.5	1.2528
< Not Detected – value used is 1/2 reported detection limit * above background All concentrations are in ug/L.						Due to large DLs & large number of NDs, a calculation of the UCL was not performed for thallium.					
Fort Riley Groundwater		Total Metals **Selenium**		Total Metals **Sodium**		Total Metals **Thallium**		Total Metals **Vanadium**		Total Metals **Zinc**	
FD – Frequency of Detection		FD 16 / 16		FD 16 / 16		FD 2 / 16		FD 4 / 16		FD 8 / 16	
		# above Backg. 2		# above Backg. 16		# above Backg. 14		# above Backg. 3		# above Backg. 5	
n=			16		16		4		16		16
s2y=			0.1090		0.2464		0.9486		0.3143		0.9626
sy=			0.3301		0.4964		0.9739		0.5606		0.9811
ybar=			0.6515		10.6978		0.1487		1.7964		1.9793
H(0.95)=			1.882		2.068		13.05		2.181		2.744
95%UCL=			2.3782		65253.4063		NA		9.6718		23.4688
mean conc=		2.01875		50437.5		28.65		7.28125		13.5	
min conc=		1.1		25000		0.5		3.5		3.5	
max conc=		3.6		130000		50		27		98	
Exposure value=		**95% UCL**	2.37815	**95% UCL**	65253.4	**Conc.**	2.9	**95% UCL**	9.67175	**95% UCL**	23.4687

PESTICIDE STORAGE FACILITY
GROUND WATER SAMPLES
Gilbert's method for lognormal distributions

Fort Riley – PSF Groundwater		Total Metals Antimony			Total Metals Cobalt			Total Metals Copper			Total Metals Nickel		
Sample ID		Background =		22	Background =	<	5	Background =		11	Background =		19
			Sample	ln		Sample	ln		Sample	ln		Sample	ln
PSF9202/9206	BL	<	15.5	2.7408	<	5	1.6094	<	2.5	0.9163	<	9	2.1972
PSF9203		<	15.5	2.7408	<	5	1.6094	<	2.5	0.9163	<	9	2.1972
PSF9204		<	15.5	2.7408	<	5	1.6094	<	2.5	0.9163	<	9	2.1972
PSF9205		<	15.5	2.7408	<	5	1.6094	<	2.5	0.9163	<	9	2.1972
PSF9202/9206	FQ	<	15.5	2.7408	<	5	1.6094	<	2.5	0.9163	<	9	2.1972
PSF9203		<	15.5	2.7408	<	5	1.6094	<	2.5	0.9163	<	9	2.1972
PSF9204		<	15.5	2.7408	<	5	1.6094	<	2.5	0.9163		24 *	3.1781
PSF9205		<	15.5	2.7408	<	5	1.6094	<	2.5	0.9163	<	9	2.1972
PSF9202/9206	SQ	<	15.5	2.7408	<	5	1.6094		4	1.3863		22 *	3.0910
PSF9203		<	15.5	2.7408	<	5	1.6094	<	2.5	0.9163		13	2.5649
PSF9204		<	15.5	2.7408	<	5	1.6094	<	2.5	0.9163	<	9	2.1972
PSF9205			32 *	3.4657		9 *	2.1972		6	1.7918		17	2.8332
PSF9202/9206	TQ	<	15.5	2.7408	<	5	1.6094		12 *	2.4849	<	9	2.1972
PSF9203		<	15.5	2.7408	<	5	1.6094		9	2.1972	<	9	2.1972
PSF9204		<	15.5	2.7408	<	5	1.6094		8	2.0794	<	9	2.1972
PSF9205		<	15.5	2.7408	<	5	1.6094		10	2.3026	<	9	2.1972

< Not Detected – value used is 1/2 reported detection limit
* above background
Inorganics are in mg/L.
Metals are in ug/L.

Fort Riley Groundwater	Total Metals Antimony		Total Metals Cobalt		Total Metals Copper		Total Metals Nickel	
FD – Frequency of Detection	FD 1 /	16	FD 1 /	16	FD 6 /	16	FD 4 /	16
	# above Backg.	1	# above Backg.	1	# above Backg.	1	# above Backg.	2
n=		16		16		16		16
s2y=		0.0328		0.0216		0.3680		0.1189
sy=		0.1812		0.1469		0.6067		0.3448
ybar=		2.7861		1.6462		1.3378		2.3771
H(0.95)=		1.809		1.749		2.181		1.882
95%UCL=		17.9432		5.6032		6.4460		13.5187
mean conc=	16.5312		5.25		4.625		11.5	
min conc=	15.5		5		2.5		9	
max conc=	32		9		12		24	
Exposure value=	**95% UCL**	17.94324	**95% UCL**	5.6031	**95% UCL**	6.44600	**95% UCL**	13.5187

PESTICIDE S RAGE FACILITY
GROUND W R SAMPLES
Gilbert's method for
lognormal distributions

Fort Riley – PSF Groundwater		Wet Inorganics Inorganic Chloride		Wet Inorganics Nitrate		Wet Inorganics Sulfate		Wet Inorganics Total Sulfide		Wet Inorganics Bicarbonate	
Sample ID		Background =	147	Background =	6.4	Background =	84.7	Background = <	0.5	Background =	249
		Sample	ln	Sample	ln	Sample	ln	Sample	ln	Sample	ln
PSF9202/9206	BL	272 *	5.6058	33 *	3.4965	386 *	5.9558	< 0.5	−0.6931	466 *	6.1442
PSF9203		70.4	4.2542	11.6 *	2.4510	171 *	5.1417	< 0.5	−0.6931	421 *	6.0426
PSF9204		139	4.9345	< 0.1	−2.3026	125 *	4.8283	52.5 *	3.9608	236	5.4638
PSF9205		56.7	4.0378	18.4 *	2.9124	119 *	4.7791	< 0.5	−0.6931	493 *	6.2005
PSF9202/9206	FQ	122	4.8040	20.3 *	3.0106	336 *	5.8171	< 0.5	−0.6931	< 0.5	−0.6931
PSF9203		55.3	4.0128	11.1 *	2.4069	197 *	5.2832	< 0.5	−0.6931	< 0.5	−0.6931
PSF9204		41.5	3.7257	13.8 *	2.6247	142 *	4.9558	< 0.5	−0.6931	< 0.5	−0.6931
PSF9205		48.6	3.8836	10.7 *	2.3702	108 *	4.6821	< 0.5	−0.6931	< 0.5	−0.6931
PSF9202/9206	SQ	262 *	5.5683	165 *	5.1059	326 *	5.7869	< 0.5	−0.6931	331 *	5.8021
PSF9203		76.5	4.3373	50.6 *	3.9240	188 *	5.2364	< 0.5	−0.6931	315 *	5.7526
PSF9204		40.1	3.6914	65.6 *	4.1836	131 *	4.8752	< 0.5	−0.6931	300 *	5.7038
PSF9205		47.7	3.8649	45.9 *	3.8265	109 *	4.6913	< 0.5	−0.6931	348 *	5.8522
PSF9202/9206	TQ	399 *	5.9890	25 *	3.2189	199 *	5.2933	< 0.5	−0.6931	416 *	6.0307
PSF9203		76.4	4.3360	15.5 *	2.7408	148 *	4.9972	< 0.5	−0.6931	376 *	5.9296
PSF9204		38.5	3.6507	12.2 *	2.5014	111 *	4.7095	< 0.5	−0.6931	293 *	5.6802
PSF9205		46.9	3.8480	10.6 *	2.3609	109 *	4.6913	< 0.5	−0.6931	327 *	5.7900

< Not Detected – value used is 1/2 reported detection limit
* above background
Inorganics are in mg/L.
Metals are in ug/L.

Fort Riley Groundwater	Wet Inorganics Inorganic Chloride		Wet Inorganics Nitrate		Wet Inorganics Sulfate		Wet Inorganics Total Sulfide		Wet Inorganics Bicarbonate	
FD – Frequency of Detection	FD 16 /	16	FD 15 /	16	FD 16 /	16	FD 1 /	16	FD 12 /	16
	# above Backg.	3	# above Backg.	15	# above Backg.	16	# above Backg.	1	# above Backg.	11
n=		16		16		16		16		16
s2y=		0.5652		2.4720		0.1819		1.3537		8.6377
sy=		0.7518		1.5723		0.4265		1.1635		2.9390
ybar=		4.4090		2.8020		5.1078		−0.4023		4.2262
H(0.95)=		2.443		3.612		1.968		3.163		6.57
95%UCL=		175.1779		245.7401		224.8549		3.4034		752139.73
mean conc=	112.037		31.8375		181.562		3.75		270.25	
min conc=	38.5		0.1		108		0.5		0.5	
max conc=	399		165		386		52.5		493	
Exposure value=	95% UCL	175.17	Conc.	165	95% UCL	224.85	95% UCL	3.40342	Conc.	493

PESTICIDE STORAGE FACILITY – FT RILEY
SURFACE WATER SAMPLES
Gilbert's method for lognormal distributions

n= @COUNT(list)
s2y= @COUNT(list)/(@COUNT(list)–1)*@VAR(list)
sy= @SQRT(@COUNT(list)/(@COUNT(list)–1)*@VAR(list))
ybar= @AVG(list)
H(0.95) = From Table A12
95%UCL= @EXP(ybar+(0.5*s2y)+((sy*H)/@SQRT(N–1)))
First column is surface water sample data in mg/L
Second column is natural log–transformed data

	Methylene Chloride		Aluminum		Arsenic		Barium		Cadmium		Calcium		Chromium	
SW01	0.0025	–5.99146	3.9	1.360976	0.004	–5.52146	0.25	–1.38629	0.002	–6.21460	110	4.700480	0.018	–4.01738
SW02	0.0025	–5.99146	6.7	1.902107	0.0041	–5.49676	0.26	–1.34707	0.0045	–5.40367	100	4.605170	0.024	–3.72970
SW03	0.0025	–5.99146	8.9	2.186051	0.004	–5.52146	0.25	–1.38629	0.002	–6.21460	100	4.605170	0.01	–4.60517
SW04	0.0025	–5.99146	12	2.484906	0.0044	–5.42615	0.29	–1.23787	0.002	–6.21460	110	4.700480	0.013	–4.34280
SW06	0.03	–3.50655	0.3	–1.20397	0.002	–6.21460	0.18	–1.71479	0.002	–6.21460	79	4.369447	0.005	–5.29831
SW07	0.03	–3.50655	0.31	–1.17118	0.002	–6.21460	0.14	–1.96611	0.002	–6.21460	70	4.248495	0.005	–5.29831
mean=	0.0135		5.642		0.0033		0.224		0.0025		91.8		0.0114	
n=	5		5		5		5		5		5		5	
s2y=	1.852428		3.467081		0.162475		0.090948		0.131521		0.035611		0.445959	
sy=	1.361039 *		1.862010 *		0.403082 *		0.301576 *		0.362659 *		0.188710 *		0.667802 *	
ybar=	–4.99750		0.839581		–5.77471		–1.53043		–6.05242		4.505752		–4.65486	
H(0.95) =	6.001		8.25		2.651		2.402		2.651		2.198		3.662	
95%UCL=	1.012589		28393.45		0.005746		0.325379		0.004062		113.4034		0.040391	

	Copper		Iron		Lead		Magnesium		Manganese		Potassium		Sodium	
SW01	0.01	–4.60517	2.8	1.029619	0.001	–6.90775	20	2.995732	0.1	–2.30258	9.6	2.261763	45	3.806662
SW02	0.01	–4.60517	5.1	1.629240	0.005	–5.29831	22	3.091042	0.11	–2.20727	10	2.302585	49	3.891820
SW03	0.012	–4.42284	6.5	1.871802	0.0042	–5.47267	22	3.091042	0.12	–2.12026	10	2.302585	47	3.850147
SW04	0.013	–4.34280	9.4	2.240709	0.005	–5.29831	23	3.135494	0.19	–1.66073	11	2.397895	45	3.806662
SW06	0.0064	–5.05145	0.41	–0.89159	0.001	–6.90775	14	2.639057	0.11	–2.20727	7.3	1.987874	42	3.737669
SW07	0.008	–4.82831	0.41	–0.89159	0.001	–6.90775	12	2.484906	0.063	–2.76462	6.2	1.824549	35	3.555348
mean=	0.00988		4.364		0.00324		18.6		0.1186		8.9		43.6	
n=	5		5		5		5		5		5		5	
s2y=	0.085234		2.408677		0.727044		0.092040		0.153938		0.059840		0.017428	
sy=	0.291950 *		1.551991 *		0.852669 *		0.303381 *		0.392349 *		0.244622 *		0.132017 *	
ybar=	–4.65011		0.791711		–5.97696		2.888308		–2.19203		2.163097		3.768329	
H(0.95) =	2.402		7.12		4.062		2.402		2.651		2.198		2.035	
95%UCL=	0.014166		1846.669		0.020616		27.07715		0.202907		11.72658		49.96745	

	Vanadium		Zinc		Inorganic Chloride		Sulfate		Bicarbonate (as $CaCO_3$)	
SW01	0.015	–4.19970	0.027	–3.61191	71.3	4.266896	84.3	4.434381	310	5.736572
SW02	0.02	–3.91202	0.034	–3.38139	65.4	4.180522	105	4.653960	248	5.513428
SW03	0.02	–3.91202	0.045	–3.10109	65	4.174387	106	4.663439	234	5.455321
SW04	0.026	–3.64965	0.07	–2.65926	61.1	4.112511	105	4.653960	292	5.676753
SW06	0.0064	–5.05145	0.018	–4.01738	50	3.912023	81	4.394449	194	5.267858
SW07	0.007	–4.96184	0.013	–4.34280	37.6	3.627004	73.5	4.297285	172	5.147494
mean=	0.01588		0.036		55.82		94.1		228	
n=	5		5		5		5		5	
s2y=	0.431672		0.464511		0.055628		0.030258		0.043249	
sy=	0.657017 *		0.681550 *		0.235857 *		0.173949 *		0.207965 *	
ybar=	–4.29740		–3.50038		4.001289		4.532618		5.412171	
H(0.95) =	3.662		3.662		2.198		2.198		2.198	
95%UCL=	0.056215		0.132627		72.84340		114.3105		287.8243	

PESTICIDE STORAGE FACILITY – FT RILEY
SEDIMENT SAMPLES
Gilbert's method for lognormal distributions

n= @COUNT(list)
s2y= @COUNT(list)/(@COUNT(list)-1)*@VAR(list)
sy= @SQRT(@COUNT(list)/(@COUNT(list)-1)*@VAR(list))
ybar= @AVG(list)
H(0.95)= From Table A12
95%UCL= @EXP(ybar+(0.5*s2y)+((sy*H)/@SQRT(N-1)))
First column is sediment sample data in mg/kg
Second column is natural log-transformed data

	4,4'-DDD		4,4'-DDE		4,4'-DDT		Dieldrin	
SD01A	0.00445	-5.41485	0.00445	-5.41485	0.011	-4.50986	0.00445	-5.41485
SD01B	0.00455	-5.39262	0.00455	-5.39262	0.00455	-5.39262	0.00455	-5.39262
SD02A	0.0087	-4.74443	0.00425	-5.46083	0.00425	-5.46083	0.00425	-5.46083
SD02B	0.00405	-5.50903	0.00405	-5.50903	0.00405	-5.50903	0.00405	-5.50903
SD04A	0.091	-2.39689	0.021	-3.86323	0.016	-4.13516	0.02	-3.91202
SD04B	0.013	-4.34280	0.0044	-5.42615	0.0044	-5.42615	0.0044	-5.42615
SD05A	0.1	-2.30258	0.28	-1.27296	0.48	-0.73396	0.056	-2.88240
SD05B	0.00395	-5.53403	0.046	-3.07911	0.037	-3.29683	0.00395	-5.53403
SD06A	0.015	-4.19970	0.0046	-5.38169	0.0046	-5.38169	0.0046	-5.38169
SD06B	0.031	-3.47376	0.0047	-5.36019	0.0047	-5.36019	0.0047	-5.36019
SD07A	0.024	-3.72970	0.011	-4.50986	0.017	-4.07454	0.0041	-5.49676
SD07B	0.0039	-5.54677	0.0039	-5.54677	0.0086	-4.75599	0.0039	-5.54677
SD09A	0.004	-5.52146	0.004	-5.52146	0.04	-3.21887	0.004	-5.52146
SD09B	0.0042	-5.47267	0.0042	-5.47267	0.017	-4.07454	0.0042	-5.47267
mean=	0.022271		0.02865		0.046653		0.009082	
n=	14		14		14		14	
s2y=	1.373464		1.585133		1.749748		0.605178	
sy=	1.171948 *		1.259020 *		1.322780 *		0.777932 *	
ybar=	-4.54152		-4.80081		-4.38073		-5.16511	
H(0.95)=	3.165		3.163		3.163		2.443	
95%UCL=	0.059246		0.054816		0.095804		0.013096	

	alpha-Chlordane		gamma-Chlordane		Benzo[a]anthracene	
SD01A	0.0094	-4.66704	0.014	-4.26869	0.33	-1.10866
SD01B	0.00225	-6.09682	0.00225	-6.09682	0.07	-2.65926
SD02A	0.0058	-5.14989	0.0076	-4.87960	0.13	-2.04022
SD02B	0.002	-6.21460	0.002	-6.21460	0.06	-2.81341
SD04A	0.033	-3.41124	0.037	-3.29683	0.06	-2.81341
SD04B	0.0022	-6.11929	0.0022	-6.11929	0.06	-2.81341
SD05A	0.067	-2.70306	0.065	-2.73336	0.12	-2.12026
SD05B	0.002	-6.21460	0.002	-6.21460	0.16	-1.83258
SD06A	0.0071	-4.94766	0.0085	-4.76768	0.07	-2.65926
SD06B	0.0096	-4.64599	0.012	-4.42284	0.07	-2.65926
SD07A	0.022	-3.81671	0.028	-3.57555	0.06	-2.81341
SD07B	0.0095	-4.65646	0.012	-4.42284	0.06	-2.81341
SD09A	0.011	-4.50986	0.024	-3.72970	0.16	-1.83258
SD09B	0.01	-4.60517	0.021	-3.86323	0.13	-2.04022
mean=	0.013775		0.016967		0.11	
n=	14		14		14	
s2y=	1.155635		1.351597		0.283132	
sy=	1.075004 *		1.162582 *		0.532101 *	
ybar=	-4.83988		-4.61469		-2.35852	
H(0.95)=	2.744		3.163		2.068	
95%UCL=	0.031938		0.053987		0.147818	

	Chysene		Fluoranthene		Phenanthrene		Pyrene		bis-2(Ethylhexyl)phthalate	
SD01A	0.33	-1.10866	0.44	-0.82098	0.44	-0.82098	0.88	-0.12783	1.1	0.095310
SD01B	0.07	-2.65926	0.09	-2.40794	0.09	-2.40794	0.07	-2.65926	0.225	-1.49165
SD02A	0.17	-1.77195	0.17	-1.77195	0.085	-2.46510	0.34	-1.07880	0.64	-0.44628
SD02B	0.06	-2.81341	0.08	-2.52572	0.08	-2.52572	0.12	-2.12026	0.2	-1.60943
SD04A	0.12	-2.12026	0.21	-1.56064	0.08	-2.52572	0.25	-1.38629	0.45	-0.79850
SD04B	0.06	-2.81341	0.08	-2.52572	0.08	-2.52572	0.06	-2.81341	0.57	-0.56211
SD05A	0.16	-1.83258	0.25	-1.38629	0.08	-2.52572	0.29	-1.23787	0.205	-1.58474
SD05B	0.16	-1.83258	0.27	-1.30933	0.2	-1.60943	0.31	-1.17118	0.195	-1.63475
SD06A	0.07	-2.65926	0.09	-2.40794	0.09	-2.40794	0.07	-2.65926	0.23	-1.46967
SD06B	0.07	-2.65926	0.19	-1.66073	0.095	-2.35387	0.14	-1.96611	0.235	-1.44816
SD07A	0.12	-2.12026	0.08	-2.52572	0.08	-2.52572	0.16	-1.83258	0.205	-1.58474
SD07B	0.12	-2.12026	0.08	-2.52572	0.08	-2.52572	0.12	-2.12026	0.47	-0.75502
SD09A	0.24	-1.42711	0.36	-1.02165	0.36	-1.02165	0.44	-0.82098	0.2	-1.60943
SD09B	0.13	-2.04022	0.29	-1.23787	0.21	-1.56064	0.38	-0.96758	0.21	-1.56064
mean=	0.134285		0.191428		0.146428		0.259285		0.366785	
n=	14		14		14		14		14	
s2y=	0.278714		0.399889		0.368740		0.633061		0.321041	
sy=	0.527933 *		0.632368 *		0.607239 *		0.795651 *		0.566604 *	
ybar=	-2.14132		-1.83487		-2.12871		-1.64012		-1.17570	
H(0.95)=	2.068		2.181		2.181		2.443		2.181	
95%UCL=	0.182836		0.285814		0.206589		0.456354		0.510458	

	Carbon Disulfide		Toluene		Methylene Chloride		Arsenic		Selenium		Barium		Cadmium	
SD01A	0.00165	-6.40697	0.006	-5.11599	0.049	-3.01593	2.2	0.788457	0.2	-1.60943	88	4.477336	2.1	0.741937
SD01B	0.0019	-6.26590	0.0087	-4.74443	0.047	-3.05760	1.4	0.336472	0.1	-2.30258	74	4.304065	0.4	-0.91629
SD02A	0.0018	-6.31996	0.0098	-4.62537	0.055	-2.90042	1.5	0.405465	0.1	-2.30258	110	4.700480	1.3	0.262364
SD02B	0.00185	-6.29256	0.0071	-4.94766	0.066	-2.71810	0.8	-0.22314	0.1	-2.30258	55	4.007333	0.35	-1.04982
SD04A	0.00175	-6.34813	0.013	-4.34280	0.038	-3.27016	0.9	-0.10536	0.1	-2.30258	110	4.700480	1.2	0.182321
SD04B	0.0069	-4.97623	0.012	-4.42284	0.077	-2.56394	2.7	0.993251	0.1	-2.30258	150	5.010635	0.45	-0.79850
SD05A	0.0018	-6.31996	0.013	-4.34280	0.082	-2.50103	3.4	1.223775	0.1	-2.30258	93	4.532599	0.4	-0.91629
SD05B	0.00185	-6.29256	0.0074	-4.90627	0.086	-2.45340	3.8	1.335001	0.1	-2.30258	74	4.304065	0.35	-1.04982
SD06A	0.00185	-6.29256	0.0031	-5.77635	0.012	-4.42284	1.7	0.530628	0.3	-1.20397	44	3.784189	1.3	0.262364
SD06B	0.0021	-6.16581	0.00355	-5.64080	0.03	-3.50655	1.8	0.587786	0.1	-2.30258	110	4.700480	0.4	-0.91629
SD07A	0.00185	-6.29256	0.0031	-5.77635	0.027	-3.61191	1.4	0.336472	0.1	-2.30258	76	4.330733	0.4	-0.91629
SD07B	0.00185	-6.29256	0.0031	-5.77635	0.021	-3.86323	1.4	0.336472	0.1	-2.30258	52	3.951243	0.35	-1.04982
SD09A	0.0018	-6.31996	0.003	-5.80914	0.021	-3.86323	2.6	0.955511	0.2	-1.60943	97	4.574710	1.9	0.641853
SD09B	0.0019	-6.26590	0.0032	-5.74460	0.023	-3.77226	2.5	0.916290	0.3	-1.20397	130	4.867534	3.3	1.193922
mean=	0.002203		0.006860		0.045285		2.041666		0.141666		91.75		0.975	
n=	14		14		14		12		12		12		12	
s2y=	0.127544		0.352137		0.366208		0.242407		0.199833		0.147493		0.639373	
sy=	0.357133 *		0.593411 *		0.605152 *		0.492349 *		0.447026 *		0.384049 *		0.799608 *	
ybar=	-6.20369		-5.14084		-3.25147		0.607679		-2.06172		4.455373		-0.34616	
H(0.95)=	1.968		2.181		2.181		2.141		2.026		2.026		2.57	
95%UCL=	0.002618		0.009993		0.067050		2.848271		0.184753		117.1812		1.809629	

	Chromium		Lead		Silver		Mercury		1,2-Dichloropropane		1,1,2,2-Tetrachloroethane	
SD01A	13	2.564949	60	4.094344	0.35	-1.04982	0.05	-2.99573	0.00165	-6.40697	0.0028	-5.87813
SD01B	7.6	2.028148	10	2.302585	0.4	-0.91629	0.05	-2.99573	0.0019	-6.26590	0.00315	-5.76035
SD02A	19	2.944438	130	4.867534	0.35	-1.04982	0.05	-2.99573	0.084	-2.47693	0.039	-3.24419
SD02B	4.2	1.435084	24	3.178053	0.35	-1.04982	0.05	-2.99573	0.00185	-6.29256	0.0031	-5.77635
SD04A	25	3.218875	210	5.347107	0.8	-0.22314	0.1	-2.30258	0.00175	-6.34813	0.0029	-5.84304
SD04B	14	2.639057	64	4.158883	0.45	-0.79850	0.05	-2.99573	0.002	-6.21460	0.0033	-5.71383
SD05A	10	2.302585	72	4.276666	0.4	-0.91629	0.05	-2.99573	0.0018	-6.31996	0.00305	-5.79261
SD05B	8	2.079441	56	4.025351	0.35	-1.04982	0.05	-2.99573	0.00185	-6.29256	0.0031	-5.77635
SD06A	7.7	2.041220	66	4.189654	0.35	-1.04982	0.4	-0.91629	0.00185	-6.29256	0.0031	-5.77635
SD06B	8.4	2.128231	61	4.110873	0.4	-0.91629	0.2	-1.60943	0.0021	-6.16581	0.00355	-5.64080
SD07A	9.4	2.240709	24	3.178053	0.4	-0.91629	0.1	-2.30258	0.00185	-6.29256	0.0031	-5.77635
SD07B	6.1	1.808288	15	2.708050	0.35	-1.04982	0.05	-2.99573	0.00185	-6.29256	0.0031	-5.77635
SD09A	14	2.639057	88	4.477336	0.35	-1.04982	0.05	-2.99573	0.0018	-6.31996	0.003	-5.80914
SD09B	17	2.833213	140	4.941642	0.35	-1.04982	0.4	-0.91629	0.0019	-6.26590	0.0032	-5.74460
mean=	11.9		79.16666		0.408333		0.129166		0.008716		0.006125	
n=	12		12		12		12		12		12	
s2y=	0.260939		0.606857		0.056169		0.684281		1.208641		0.532487	
sy=	0.510822 *		0.779010 *		0.237000 *		0.827213 *		1.099382 *		0.729717 *	
ybar=	2.359183		4.121600		-0.92660		-2.41810		-5.96451		-5.55583	
H(0.95)=	2.141		2.57		1.843		2.57		2.915		2.414	
95%UCL=	16.76691		152.7301		0.464485		0.238121		0.012351		0.008578	

APPENDIX Nb

COWHERD CALCULATION, WINDROSE DIAGRAM

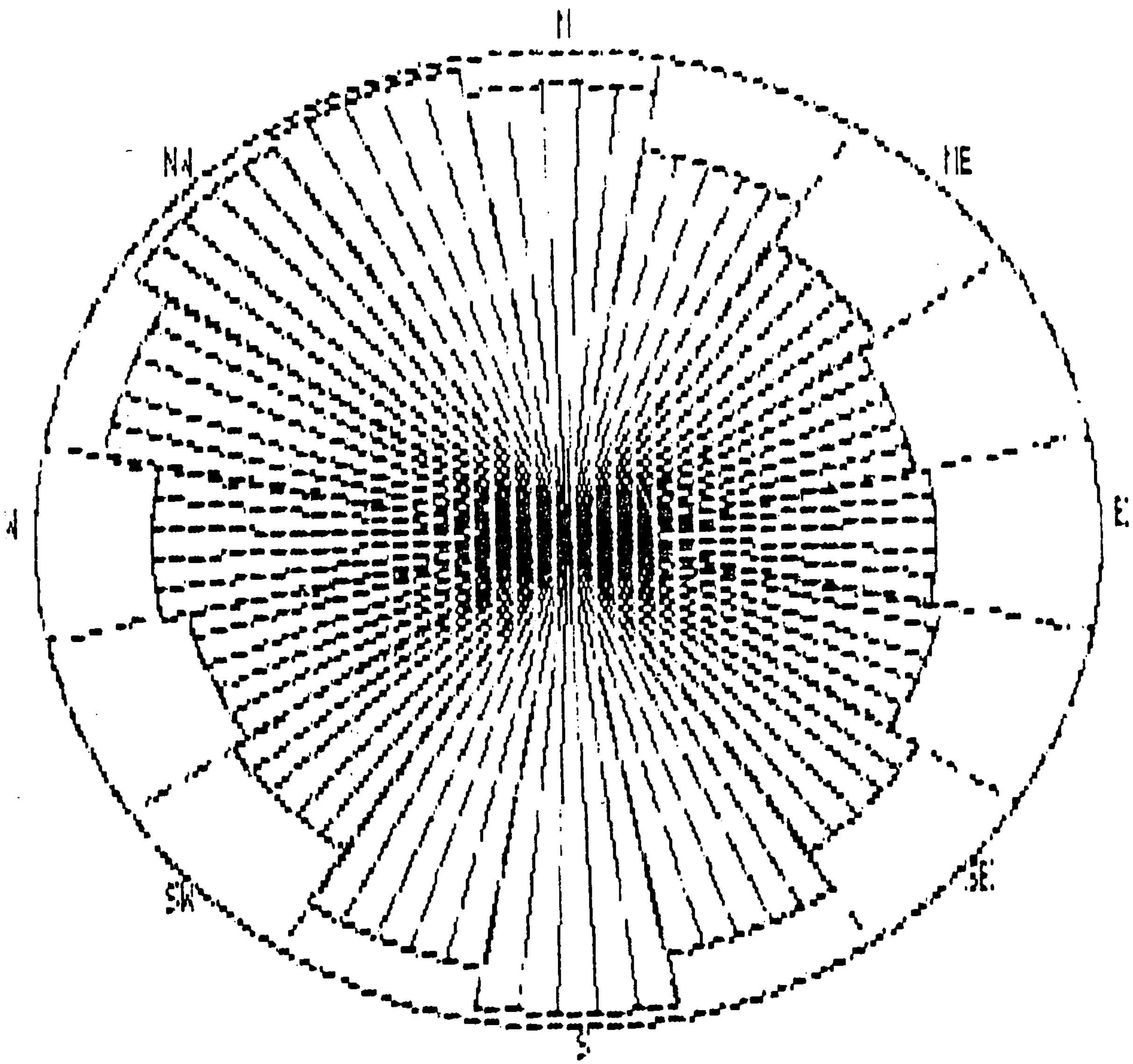
Pesticide Storage Facility
Fort Riley, Kansas

STATION 13999 TOPEKA/BILLARD KS 197_ -75

PLOT TYPE = AVERAGE WIND SPEED

SECTOR (METERS/SEC)

N	4.689E+00
NNE	4.049E+00
NE	3.572E+00
ENE	3.352E+00
E	3.499E+00
ESE	3.612E+00
SE	3.555E+00
SSE	4.381E+00
S	4.899E+00
SSW	4.509E+00
SW	3.863E+00
WSW	3.671E+00
W	3.935E+00
WNW	4.473E+00
NW	4.872E+00
NNW	4.949E+00

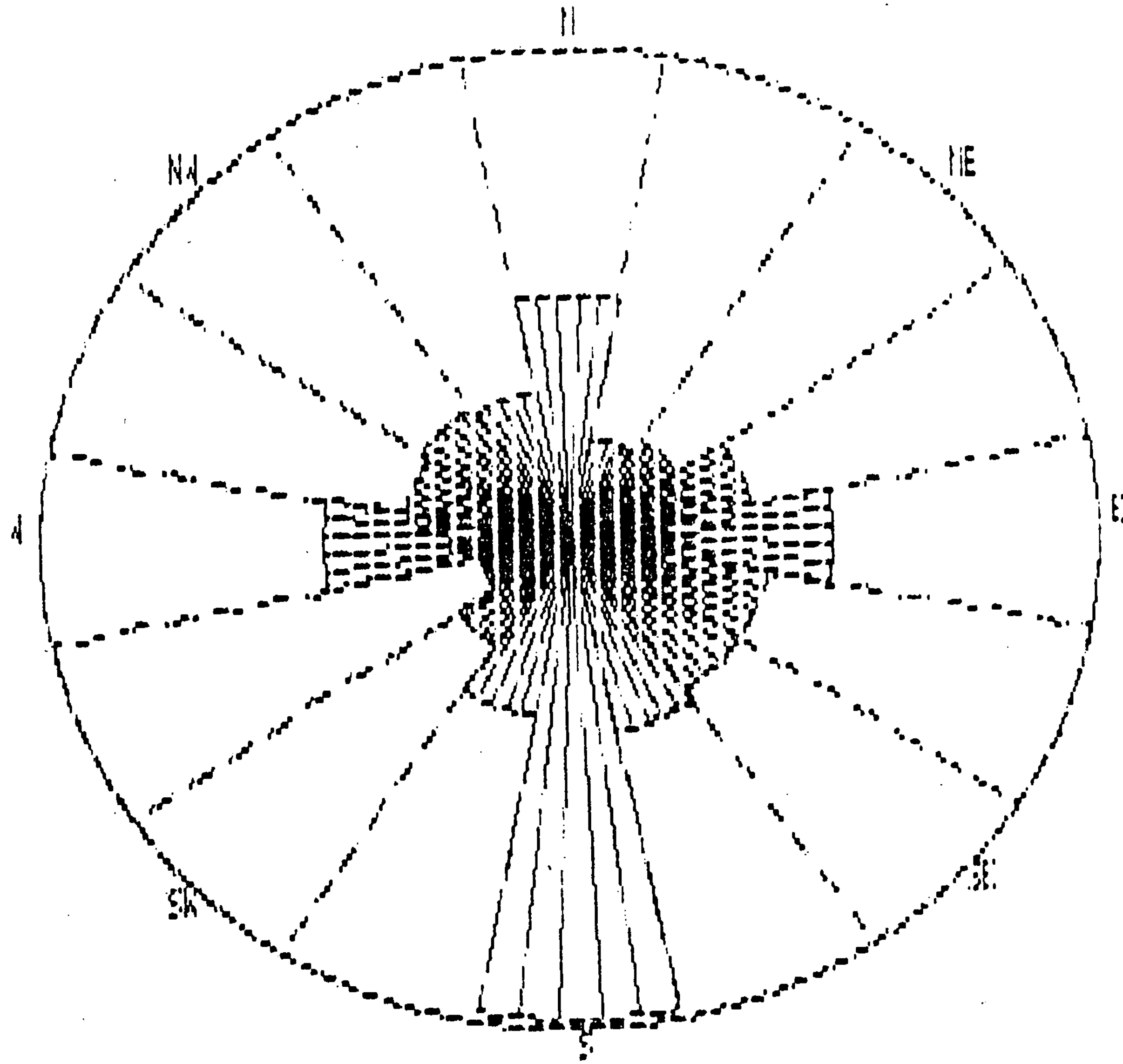


STAR STATION 13997 TOPEKA/BILLARD KS 1970-1975

PLOT TYPE = WIND DIRECTION

SECTOR FREQUENCY

N	3.179E-02
NNE	3.479E-02
NE	3.959E-02
ENE	5.639E-02
E	7.983E-02
ESE	6.111E-02
SE	6.109E-02
SSE	6.559E-02
S	1.599E-01
SSW	6.008E-02
SW	4.159E-02
WSW	2.808E-02
W	7.474E-02
WNW	5.119E-02
NW	5.377E-02
NNW	5.132E-02



Cowherd calculation - Cowherd et. al., 1985 EPA / 600/8-85/002 2/85

$$N_{10} = 0.036(1-G)\left(\frac{[U]}{U_t}\right)^3 F(x) = 0.036(1-0.75)\left(\frac{4.896\ m/s}{8.25\ m/s}\right)^3 0.92 = 1.73\times10^{-3}\ g/m^2\cdot hr$$

(0.036 = respirable fraction)

where		value
N_{10} =	annual average flux rate g/m²-hr	
G =	vegetative cover	0.75 (site specific)
U =	mean annual windspeed (m/s)	4.896 m/s (PCGEMS - see attached)
U_t =	threshold velocity of windspeed (m/s)	calculated below
F(x) =	function dependent upon U_m/U_t	see below

- find U_t - assume particle size = 500 µm (default)
  using Figure 3-4, erosion threshold velocity = 50 cm/s
  find z_0 - roughness height - Figure 3-6 - use plowed field 1.0 cm
  using Figure 4-1, find ratio of windspeed to friction velocity = 16.5

$$U_t = 16.5(50\ cm/s) = 825\ cm/s = 8.25\ m/s$$

use figure 4-3 to find F(x) $\frac{U_t}{U_m}(0.886) = \frac{8.25\ m/s}{4.896\ m/s}(0.886) = 1.49 \therefore F(x) = 0.92$

Box Model

area = 225 ft × 125 ft = 28,125 ft² (0.3048 m/ft)² = 2613 m²
width = 269 ft (0.3048 m/ft) = 82 m

$$PM_{10} = (N_{10} * A)/(LS * V * MH * 3600\ s/hr) = 1.73\times10^{-3}\ g/m^2/hr * 2613\ m^2 / (82\ m * 2.5\ m/s * 2\ m * 3600\ s/hr)$$

$$PM_{10} = 3.06\times10^{-6}\ g/m^3 \times 0.001\ kg/g = 3.06\times10^{-9}\ kg/m^3$$

where N_{10} = annual average flux rate (see above calculation) (g/m²-hr)
A = area of contamination = area of soil samples (m²)
LS = length of contaminated area ⊥ to predominate wind direction (m)
V = velocity of wind (= ½ average wind speed) = 2.5 m/s
MH = mixing height (height of average man = 2m)
3600 seconds/hr - conversion factor

LAW ENVIRONMENTAL, INC.
GOVERNMENT SERVICES BRANCH

PROJECT NO. 11-1531 T08 SHEET 1 OF 1
PROJECT NAME Ft Riley PSF
BY PG DATE 10/21/92
CHECKED BY COK DATE 10/22/92

APPENDIX Nc

EXPOSURES INTERVIEWS

Pesticide Storage Facility
Fort Riley, Kansas

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: JC

Date/time: May, 1993 AM PM

Name: ______

Circle one: (Civilian) Military

Phone: (913) 239–8180

Left message – will call back
Unable to reach

Position (title): Mobile Equipment Operator, General Foreman

Brief description of DEH–related work duties: (if not readily apparent from title) Equipment maintenance

Years employed by DEH: (dates) ___ / ___ to ___ / ___

By Ft. Riley: (dates) ___ / ___ to ___ / ___

Time spent in DEH yard daily: see add. information Work day = 8 hrs? (circle one) Yes (No) if no, 0.25 hrs

Days per week (or year) spent in DEH yard: 3 visits/week

Are these work exposure patterns consistent? (circle one) Yes (No)

If no, how do they vary (seasonally), monthly, with work assignment? 15 min during summer not in fall or winter
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) Inside (Outside)

Do work duties require contact with environmental media? (circle one) Yes (No)

For instance, exposure to: surface water, sediment, surface soil [< 1 ft in depth], or subsurface soil [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION:

DEH workers have been told to avoid the PSF area; they can enter only to retrieve supplies. Building 348 (PSF) is used for storage of road strippings and paint materials, troop construction materials, and pesticides. A person enters the road strippings and paint storage area every other day for 15 min in the summer (almost never in the fall and winter). The time cards for the warehouse are not maintained.

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: JC   Date/time: May, 1993   AM PM

Name: ______   Circle one: **Civilian** Military

Phone: (913) 239–3889   Left message – will call back
Unable to reach

Position (title): Materials Coordinator, Holdings Area

Brief description of DEH–related work duties:
(if not readily apparent from title)
Gathers materials for work orders; oversees middle part of building 348 (PSF)*, DEH buildings 347 and 375, and one building outside the DEH yard

Years employed by DEH: 8   By Ft. Riley: 9
(dates) 1985 to present   (dates) 1984 to present

Time spent in DEH yard daily: 15–25 visits (no routine activity at site)   Work day = 8 hrs? (circle one) Yes **No**
if no, 0.25–0.5 hrs (total, 3.75–6.25 hrs/day)

Days per week (or year) spent in DEH yard: 250/yr

Are these work exposure patterns consistent? (circle one) Yes **No**

If no, how do they vary (seasonally, monthly, with work assignment?) ______
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) Inside Outside

Do work duties require contact with environmental media? (circle one) **Yes** No

For instance, exposure to: surface water, sediment, **surface soil** [< 1 ft in depth], or subsurface soil [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION:

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: JC

Date/time: May, 1993 AM PM

Name: ______

Circle one: (Civilian) Military

Phone: (913) 239–8216

Left message – will call back
Unable to reach

Position (title): Supervisor, Supply Section

Brief description of DEH–related work duties:
(if not readily apparent from title)
Responsible for storage of supplies in DEH area including warehouse and lumber yard

Years employed by DEH: 0.5
(dates) 10/92 to present

By Ft. Riley: 9
(dates) 1984 to present

Time spent in DEH yard daily: 0

Work day = 8 hrs? (circle one) (Yes) No
if no, ____ hrs

Days per week (or year) spent in DEH yard: 2 visits/yr (for 1–1.5 hrs)

Are these work exposure patterns consistent? (circle one) (Yes) No

If no, how do they vary (seasonally, monthly, with work assignment?) visits are only as needed
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) Inside Outside

Do work duties require contact with environmental media? (circle one) (Yes) No

For instance, exposure to: surface water, sediment, (surface soil) [< 1 ft in depth], or subsurface soil [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION:

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: JC

Date/time: May, 1993 AM PM

Name: ______

Circle one: (Civilian) Military

Phone: (913) 239-3271

Left message – will call back
Unable to reach

Position (title): Grounds Foreman (mowing)

Brief description of DEH-related work duties:
(if not readily apparent from title)

Makes mowing assignments (fills out time cards which are not saved)

Mower 1969-1972; Tractor leader 1972-1980

Years employed by DEH: 24
(dates) 1969 to present

By Ft Riley: same
(dates) / to /

Time spent in DEH yard daily: ______

Work day = 8 hrs? (circle one) Yes (No)
if no, 1 hr
(per mowing event)

Days per week (or year) spent in DEH yard: 2/yr

Are these work exposure patterns consistent? (circle one) (Yes) No

If no, how do they vary (seasonally, monthly, with work assignment?)
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) Inside (Outside)

Do work duties require contact with environmental media? (circle one) (Yes) No

For instance, exposure to: surface water, sediment, (surface soil) [< 1 ft in depth], or subsurface soil [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION:

Mowing outside the east fence at PSF occurs no more than two times a year (usually only once a year). One hour per mowing event is required. It is always done on a tractor mounted with a mowing platform over an area of 1320' by 10' (1/4 acre). The mowing is not preformed by the same person and no weed eating is done along the fence. The purpose of the mowing is to provide a line of site (security) for DEH yard.

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: COK

Date/time: 7 May, 1993 2:11 PM

Name: ______

Circle one: (Civilian) Military

Phone: (913) 238-8761

Left message – will call back
Unable to reach

Position (title): Heavy Equipment Operator – – Roads Foreman

Brief description of DEH–related work duties:
(if not readily apparent from title)
Uses heavy equipment, loaded gravel, road building, maintained ranges, and removed snow and ice

Years employed by DEH: 13
(dates) 9 / 77 11 / 90

By Ft. Riley:
(dates) / to /

Time spent in DEH yard daily: 0.5 hr

Work day = 8 hrs? (circle one) (Yes) No
if no, ____ hrs

Days per week (or year) spent in DEH yard: 250/yr

Are these work exposure patterns consistent? (circle one) (Yes) No

If no, how do they vary (seasonally, monthly, with work assignment?) ______
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) Inside (Outside)

Do work duties require contact with environmental media? (circle one) (Yes) No

For instance, exposure to: surface water, sediment, surface soil [< 1 ft in depth], or subsurface soil [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION:

Did 1/2 a days work (4 hrs) in a culvert when it washed out last spring

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: COK

Date/time: 7 May, 1993 2:25 PM

Name: ______________

Circle one: (Civilian) Military

Phone: (913) 239-2508

Left message – will call back
Unable to reach

Position (title): Cheif, Engineering Plans and Services (Engineering Design 10-12 yrs)

Brief description of DEH-related work duties:
(if not readily apparent from title)

Deputy DEH 1 yr / Contracting 2 yrs
Supervised carpenters, painters, and welders

Years employed by DEH: 10-12
(dates) 1962 to 1990
('85-'88 in Germany)

By Ft. Riley: ______
(dates) / to /

Time spent in DEH yard daily: ______

Work day = 8 hrs? (circle one) (Yes) No
if no, 8-10 hrs

Days per week (or year) spent in DEH yard: 250/yr

Are these work exposure patterns consistent? (circle one) (Yes) No

If no, how do they vary (seasonally, monthly, with work assignment?) ______
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) (Inside) (Outside (2 hrs/wk))

Do work duties require contact with environmental media? (circle one) Yes (No)

For instance, exposure to: surface water, sediment, surface soil [< 1 ft in depth], or subsurface soil [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION:

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: LMB

Date/time: May, 1993 AM PM

Name: ______

Circle one: Civilian Military

Phone: ( ) -

Left message – will call back
Unable to reach

Position (title): Former pesticide worker

Brief description of DEH-related work duties:
(if not readily apparent from title)
Denies working there

Years employed by DEH: ______
(dates) / to /

By Ft. Riley: ______
(dates) / to /

Time spent in DEH yard daily: ______

Work day = 8 hrs? (circle one) Yes No
if no, ____hrs

Days per week (or year) spent in DEH yard: ______

Are these work exposure patterns consistent? (circle one) Yes No

If no, how do they vary (seasonally, monthly, with work assignment?) ______
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) Inside Outside

Do work duties require contact with environmental media? (circle one) Yes No

For instance, exposure to: surface water, sediment, surface soil [< 1 ft in depth], or subsurface soil [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION:

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: COK

Date/time: 7 May, 1993 AM PM

Name: ____________

Circle one: (Civilian) Military

Phone: (913) 537-0957

Left message – will call back
Unable to reach

Position (title): Buildings And Structures Chief

Brief description of DEH–related work duties:
(if not readily apparent from title)
Supervised buildings and structure activities. The cabinet makers spend 90–95% of time outside of shop; carpenters and foremen spend 50% of time outside shop.

Years employed by DEH: ________
(dates) / to /

By Ft. Riley: 35
(dates) 1949 to 1984

Time spent in DEH yard daily: ________

Work day = 8 hrs? (circle one) (Yes) No
if no, ____ hrs

Days per week (or year) spent in DEH yard: 250/yr

Are these work exposure patterns consistent? (circle one) Yes No

If no, how do they vary (seasonally, monthly, with work assignment?) ________
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) (Inside) (Outside)

Do work duties require contact with environmental media? (circle one) Yes No

For instance, exposure to: surface water, sediment, surface soil [< 1 ft in depth], or subsurface soil [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION:

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: LMB

Date/time: 10 May, 1993 AM PM

Name: ______

Circle one: (Civilian) Military

Phone: (913) 239-2644

Left message – will call back
Unable to reach

Position (title): ______

Brief description of DEH-related work duties:
(if not readily apparent from title)
Spray pesticide applicator (works under Ralph Morton)

Years employed by DEH: 2
(dates) / to /

By Ft. Riley: 4
(dates) '84–'87 (range control) to '87–'88 (reservoir)

Time spent in DEH yard daily: 1–3 visits (< 15 min/visit)

Work day = 8 hrs? (circle one) (Yes) No
if no, ______ hrs

Days per week (or year) spent in DEH yard: ______

Are these work exposure patterns consistent? (circle one) Yes (No)

If no, how do they vary (seasonally) monthly, with work assignment?) 1 visit/month in winter
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) Inside (Outside)

Do work duties require contact with environmental media? (circle one) Yes (No)

For instance, exposure to: surface water, sediment, surface soil [< 1 ft in depth], or subsurface soil [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION:

works in the feilds and loads chemicals in a truck which holds 400 gallons. He is on-site 2–3 times a day for 15– 30 min total.

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: LMB

Date/time: 10 May, 1993 9:40 AM

Name: ______ (Mr. Depew was mentioned as another paint leader)

Circle one: **(Civilian)** Military

Phone: (913) 239-2773

Left message – will call back
Unable to reach

Position (title): Paint Leader

Brief description of DEH-related work duties:
(if not readily apparent from title)

Paint leader for road sections (90% of time spent placing signs around Fort, not in DEH yard)

Mr. Depew is in DEH yard 8 hrs./day (on vacation)

Years employed by DEH: ______
(dates) ___/___ to ___/___

By Ft. Riley: ______
(dates) ______ to ______

Time spent in DEH yard daily: 8 hrs

Work day = 8 hrs? (circle one) **(Yes)** No
if no, ____ hrs
(see above)

Days per week (or year) spent in DEH yard: 250/yr

Are these work exposure patterns consistent? (circle one) **(Yes)** No

If no, how do they vary (seasonally, monthly, with work assignment?) ______
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) **(Inside)** Outside

Do work duties require contact with environmental media? (circle one) Yes **(No)**

For instance, exposure to: surface water, sediment, surface soil [< 1 ft in depth], or subsurface soil [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION:

Two G.I.s help each man do his work (rotate new men every 90 days)

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: LMB

Date/time: 10 May, 1993 10 AM

Name: ____________________

Circle one: (Civilian) Military

Phone: (913) 482–3269

Left message – will call back
✓Unable to reach 5/10 10am, 2:20pm EST
5/11 10:45am EST

Position (title): Heat Shop Foreman (retired)

Brief description of DEH–related work duties:
(if not readily apparent from title)

Years employed by DEH: ______ to ______
(dates) ___/___ to ___/___

By Ft. Riley: ______
(dates) ___/___ to ___/___

Time spent in DEH yard daily: ______

Work day = 8 hrs? (circle one) Yes No
if no, ______ hrs

Days per week (or year) spent in DEH yard: ______

Are these work exposure patterns consistent? (circle one) Yes No

If no, how do they vary (seasonally, monthly, with work assignment?) ______
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) Inside Outside

Do work duties require contact with environmental media? (circle one) Yes No

For instance, exposure to: surface water, sediment, surface soil [< 1 ft in depth], or subsurface soil [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION: ______

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: LMB

Date/time: 10 May, 1993 10 AM

Name: ______

Circle one: (Civilian) Military

Phone: (913) 539-7008

Left message – will call back
✓Unable to reach 5/10 10am, 2:30pm

Position (title): Airconditioning (A/C) Worker

Brief description of DEH-related work duties:
(if not readily apparent from title)
A/C Worker (retired); last few years Lead Foreman

Years employed by DEH: ______
(dates) / to /

By Ft. Riley: 29
(dates) 1956 to 1985

Time spent in DEH yard daily: as a worker in and out all day; as forman in shop bldg. 6-8 hrs/day

Work day = 8 hrs? (circle one) Yes No
if no, ______ hrs

Days per week (or year) spent in DEH yard: ______

Are these work exposure patterns consistent? (circle one) Yes (No)

If no, how do they vary (seasonally, monthly, with work assignment?) ______
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) Inside Outside

Do work duties require contact with environmental media? (circle one) Yes No

For instance, exposure to: surface water, sediment, surface soil [< 1 ft in depth], or subsurface soil [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION:

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: LMB

Date/time: 10 May, 1993 10 AM

Name: ______

Circle one: (Civilian) Military

Phone: (913) 537-0983

✓ Left message – will call back
Unable to reach

Position (title): Exterior Plumber (retired)

Brief description of DEH-related work duties:
(if not readily apparent from title)
Plumbing

Years employed by DEH: 30
(dates) ______ to ______

By Ft. Riley: ______
(dates) / to /

Time spent in DEH yard daily: 0.5 hrs (at most)
(Emergency equipment stored in yard)

Work day = 8 hrs? (circle one) (Yes) No
if no, ______ hrs

Days per week (or year) spent in DEH yard: 0.5 hrs (once a week)

Are these work exposure patterns consistent? (circle one) (Yes) No

If no, how do they vary (seasonally, monthly, with work assignment?) ______
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) Inside Outside (2 hrs/wk)

Do work duties require contact with environmental media? (circle one) (Yes) No

For instance, exposure to: surface water, sediment, (surface soil) [< 1 ft in depth], or (subsurface soil) [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION: ______

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: LMB

Date/time: 11 May, 1993 10:55 AM

Name: ____________

Circle one: Civilian (Military) [circled]

Phone: (913) 239–8305

Left message – will call back
✓ Unable to reach 5/10 9:50 am, 2:20 pm EST

Position (title): Troop Construction –– Supervisor

Brief description of DEH–related work duties:
(if not readily apparent from title) ____________

Years employed by DEH: ________ to present
(dates) 2 / 93 to present

By Ft. Riley: 1
(dates) 2 / 92 to 2 / 93

Time spent in DEH yard daily: ____________

Work day = 8 hrs? (circle one) (Yes) [circled] No
if no, ____ hrs

Days per week (or year) spent in DEH yard: ____________

Are these work exposure patterns consistent? (circle one) Yes (No) [circled]

If no, how do they vary (seasonally, monthly, with work assignment?) ____________
(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) (Inside) [circled] (Outside) [circled]

Do work duties require contact with environmental media? (circle one) Yes No

For instance, exposure to: surface water, sediment, surface soil [< 1 ft in depth], or subsurface soil [> 1 ft in depth]?
(circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION:

uses the PSF building to store large items which are not needed on a daily basis.
He does not enter the building fequently.

EXPOSURE ASSESSMENT – INTERVIEW SHEET
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Interviewer: COK

Date/time: 7 May, 1993 11:15 AM

Name: ______

Circle one: Civilian Military

Phone: (913) 239–2644

Left message – will call back

Unable to reach

Position (title): Senior Pest Controller

Brief description of DEH–related work duties: (if not readily apparent from title) Supervisor; Officer for entomology contract; Weed control

Years employed by DEH: ______ (dates) ___/___ to ___/___

By Ft. Riley: ______ (dates) ___/___ to ___/___

Time spent in DEH yard daily: see add. information Work day = 8 hrs? (circle one) Yes No

if no, ______hrs

Days per week (or year) spent in DEH yard: ______

Are these work exposure patterns consistent? (circle one) Yes No

If no, how do they vary (seasonally, monthly, with work assignment?) ______

(Please include exposure variables associated with additional work duties on the bottom of this sheet)

Are work duties performed inside or outside (a building)? (circle one) Inside Outside

Do work duties require contact with environmental media? (circle one) Yes No

For instance, exposure to: surface water, sediment, surface soil [< 1 ft in depth], or subsurface soil [> 1 ft in depth]? (circle one or more of the above if it applies; if needed, record details on back of sheet)

ADDITIONAL INFORMATION:

checks the building once a week for 10 min only from April to October or November (spring and Fall) to Inspect supply conditions. He also checks once a month or every two weeks to see if the heating and ventillation system is working.

Additional Interviews For PSF RME Development

✓ - DEH, Engineering Plans & Services, Job Order Contracting Branch DEH, 1993l

How long have you been with DEH and in what capacity? Been in DEH since 1974. Started out in the electric shop - worked there for 6 years. In 1980, I became an estimator and served in that position until 1990. Moved to JOC branch (current position) in 1990. Current job description includes ordering officer and project manager.

What is your responsibility for the new PSF construction? I am the JOC manager of the project. Am responsible for proper contract development, and ensuring contract is fulfilled according to its terms.

What is the expected project duration, start to finish, after the contract is awarded? That depends, but after notice to proceed it shouldn't take very long, maybe 90 to 120 days?

Can you show me how you determined that? Yes. (See the duration estimation worksheet he completed.) After the worksheet determined 130 days, he said the contract would be written for 120 days.

Of that 120 days, how much of it will require workers on site doing construction activities? Well the building still has to be ordered, but they could be putting in the slab and utilities, etc., so I would say anywhere from 80 - 90 days. To be conservative I'd say 90 days.

✓ P.E. (Civil Eng.) - DEH, Engineering Plans & Services, Design Branch DEH, 1993m

How long have you been with DEH and in what capacity? Been in current position in DEH (EP&S, Design Branch) for 9 yrs. Responsible for many designs and other engineer work done in-house at Fort Riley. Prior to working for DEH, I had 20 years of experience working as a civil engineer for other firms.

What is your role in the past and ongoing demolition projects at Fort Riley? Am the engineer responsible for overseeing the planning and execution of the demoltion projects that have occured and that are planned at both Camp Funston and Camp Forsythe on Fort Riley.

Based on your experience and your knowledge of the size and construction of building 348, what is the maximum amount of time needed to demolish and remove the building? I'd say 2 weeks (10 working days)

With what size crew? 6-8 workers, (Foreman, bucket-loader and dozer operators, truck drivers, etc.)

✓ - DEH, Maintenance Division, Structures Branch, Exterior Utilities Section. DEH, 1993n

How long have you been with DEH and in what capacity? Been in DEH for 16 years. Started out as a high voltage electrician, then became high voltage foreman. Have been the exterior utility foreman for the past 2-1/2 years, responsible for the maintenance of all gas, water, and electrical lines at Fort Riley.

What does your job entail? Manage the exterior utility crews and oversee their workload and daily duties. I could get you a job description, but it is outdated.

Are you familiar with the size and location of the contaminated area east of the PSF? Yes, very.

How many lines are in the ground in that area? Two, a water and gas line, both of which we've done work on in the last year or so.

How long would it take to completely replace the lines where they are right now? It would probably take a crew of four 2 days.

What is the expected life of new gas/water lines? That's hard to say - it really depends on a lot of things like the soil, pressure in the lines - stuff like that.

What would be a reasonable life expectancy for these lines? Probably 20 - 30 years.

In that time frame how many breaks/leaks would you expect? That depends too, but I would say no more than 1 or 2.

If you had two breaks in the same line in the same year would you replace the line? Again, that depends, but I would say we probably would depending on the type and location of the breaks.

What is the average time to repair a break or leak that is reported? On average, it takes two guys a few hours to make a repair (fix a leak).

How much time do your exterior utility workers spend working outside in the DEH yard? None they travel all over post to do their work.

What about the time it takes to fix/clean their equipment, get their vehicles, etc.? Maybe 1 hour a day, but no more.

From what you've seen occuring in the DEH yard, what section or worker spends the most time working outdoors in the DEH yard? Warehouse guys are always out going to and from their supplies, and Gene Traxel's guys that work on the rock pile are out a lot. The lumber yard guys are out a lot too, but most of their stuff is indoors.

What about Richard Striggow? Oh yeah, I forgot about him, he spends most of his time down in the yard. He's got about three buildings with stuff in. I would say he's down there the most.

Do you have any documents that contain standard planning factors for utility placement, repair times, or projected design life? I don't think so, but I'll look. (Came out with a catalog with none of the information).

Who else in exterior utilities knows a lot about utility lines and their placement, repairs, and estimated life expectancy? Well Rod Erickson is one of my plumbers who's around here somewhere close, and he's had probably 20 years or so of experience.

✓ DEH, 19930

\- DEH, Maintenance Division, Structures Branch, Exterior Utilities Section

How long have you been with DEH and in what capacity? Been in DEH 9-1/2 yrs working as an exterior plumber. Before that I worked for the City of Herington as an exterior plumber as well.

How long would it take to completely replace the utility lines in the vicinity of the contaminated area near Bldg 348? Probably a couple of days for 2 or 3 guys.

How long does a typical utility line break/leak take to repair? About a half a day, depending on the problem.

What is the length of time you would reasonably expect a gas or water line to last before needing replaced? That depends on a lot of things. Tough to say.

Considering everything, what is your estimate? 30 years, maybe more, maybe less.

And how many breaks/leaks would you expect in that time frame? I wouldn't expect any, but you never know. Maybe a couple at most.

✓ - DEH, Maintenance Division, Engineering Support Section, Material Coordinator, Holding Area.

How long have you worked in DEH and in what capacity? See Law interview.

In a previous interview by Law Environmental, you stated you visit the DEH yard 15 - 25 times per day for about 15 minutes each time, can you explain that in more detail? Well, that is just an average. Sometimes I spend 5 minutes in the yard and sometimes I spend 30 minutes or more down there. It is just an average. And each day I make anywhere from 15 to 25 trips down there.

Does that time include travel time to and from the yard? I guess so, but I'd still say on average I spend 15 minutes each time I go down there working in that area. And normally I drive down there, which doesn't take very long.

If you calculate 25 trips at 15 minutes each trip, that comes out to about 6-1/4 hrs/day, do you really spend that much time in the yard each day? Some days I do. I'm usually down there 5-6 hrs a day.

Since you spend that much time in the yard on a daily basis, you must see a lot of what occurs in the yard. Is there any other section or worker that spends more time than you do outdoors in the DEH yard? Not that I can think of, I'm down there most of the day.

How much of all the supplies you are responsible for are located outside? Probably 30-35%, the rest of the stuff is stored in one of my warehouses.

So, of all the time you are in the DEH yard doing your warehousing activities, you are not always outside? No most of my stuff is indoors, but I still spend a lot of time outside down there.

✓ DOC, 1993

- Directorate of Contracting (DOC), Contract Admin Division, Contract Administrator

What is your position in DOC? Contract administrator for the Range Mowing Contract. (This response was with the knowledge that I was inquiring about mowing issues.)

So you have access to the actual range mowing contract? Yes.

What does it specify regarding mowing frequencies for various mowing areas (ie. areas requiring more mowing than others)? There are three types according to the contract.

Type B: Mow 1 time per 23 days at 3-1/2 inches (Lone exception on the contract here is the Infantry Parade Field which must be mowed 1 time per 14 days)

Type C: Mow 1 time per 23 days at 4-1/2 inches (Most weapons

DELIVERY ORDER ESTIMATED CONSTRUCTION TIME

Date: 20 MAY 93

Project No: ____________

Project Title: PSF

Formula for calandar days permitted:
Days Max = 5 + (0.000273*A) + B + C + D + E + F

			5
A	Delivery Order price = .000273 * $ 100 K	=	27
B	Number of Unit Price Book Divisions used	=	16
C	New concrete or masonry construction or new plaster or drywall installation: Add 14	=	14
D	Advance construction notice for Family Housing occupants is required: Add 10	=	0
E	Extra days as determined by the Government X Testing and evaluation of site conditions. - Unavailability of materials or equipment. - Compliance with laws, regs., safety, etc. -X Extensive utilities coordination. -X Best interest of the Government.	=	48
F	Coordination for Land Excavation: Add 10	=	10
			==========
	Total Estimated Construction Time in Days:		130

ranges)
Type D: Mow 1 time per 30 days at 6 inches (Demo Range)
The contracting officer's representative (COR - Arnie Bowen) may adjust mowing rates, if necessary, based on needs according to rainfall (excess or minimal).

APPENDIX Nd

RISK CALCULATIONS/INTAKE TABLES

Pesticide Storage Facility
Fort Riley, Kansas

TABLE 6-11a
CURRENT OCCUPATIONAL EXPOSURE:
INCIDENTAL INGESTION OF SOILS
INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{INGESTION INTAKE (a)} = \frac{C * FI * IR * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in soil, mg/kg
FI	=	Fraction Ingested from source, unitless
IR	=	Ingestion Rate, mg/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Incidental Ingestion of Soil DEH Yard Worker	Utility Worker	Landscaper
FI	78% [b]	100%	12.5% [d]
IR	50 [e]	480 [e]	480 [e]
EF	250 [b,d]	0.3 [c]	2 [c,d]
ED	25 [e]	25 [e]	25 [e]
CF	10^{-6}	10^{-6}	10^{-6}
BW	70 [e]	70 [e]	70 [e]
AT (Noncarcinogen)	9,125 [e]	9,125 [e]	9,125 [e]
AT (Carcinogen)	25,550 [e]	25,550 [e]	25,550 [e]

PATHWAY-SPECIFIC INTAKES:

Incidental Ingestion of Soil (current):

DEH Yard Worker (Noncarcinogens):	C (mg/kg) *	3.82E-07 day^{-1}
DEH Yard Worker (Carcinogens):	C (mg/kg) *	1.36E-07 day^{-1}
Utility Worker (Noncarcinogens):	C (mg/kg) *	5.64E-09 day^{-1}
Utility Worker (Carcinogens):	C (mg/kg) *	2.01E-09 day^{-1}
Landscaper (Noncarcinogens):	C (mg/kg) *	4.70E-09 day^{-1}
Landscaper (Carcinogens):	C (mg/kg) *	1.68E-09 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) DEH, 1993c
(c) DEH, 1992a
(d) DEH, 1993d
(e) USEPA, 1991

TABLE 6-11b
FUTURE OCCUPATIONAL EXPOSURE:
INCIDENTAL INGESTION OF SOILS
INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

INGESTION INTAKE (a) = $\frac{C * FI * IR * EF * ED * CF}{BW * AT}$

Where:
C = Concentration of constituent in soil, mg/kg
FI = Fraction Ingested from source, unitless
IR = Ingestion Rate, mg/day
EF = Exposure Frequency, days/year
ED = Exposure Duration, years
CF = Conversion Factor, kg/10^6 mg
BW = Body Weight, kg
AT = Averaging Time, days

Exposure Variable	Incidental Ingestion of Soil DEH Yard Worker	Utility Worker	Landscaper	Construction Worker
FI	100%	100%	12.5% [g]	100%
IR	50 [d]	480 [d]	480 [d]	480 [d]
EF	250 [c,d]	1.12 [b]	8 [b,e]	120 [f]
ED	25 [c,d]	25 [d]	25 [d]	1
CF	10^{-6}	10^{-6}	10^{-6}	10^{-6}
BW	70 [d]	70 [d]	70 [d]	70 [d]
AT (Noncarcinogen)	9,125 [d]	9,125 [d]	9,125 [d]	365 [f]
AT (Carcinogen)	25,550 [d]	25,550 [d]	25,550 [d]	25,550 [d]

PATHWAY-SPECIFIC INTAKES:

Incidental Ingestion of Soil (future):

DEH Yard Worker (Noncarcinogens): C (mg/kg) * 4.89E-07 day^{-1}

DEH Yard Worker (Carcinogens): C (mg/kg) * 1.75E-07 day^{-1}

Utility Worker (Noncarcinogens): C (mg/kg) * 2.10E-08 day^{-1}

Utility Worker (Carcinogens): C (mg/kg) * 7.51E-09 day^{-1}

Landscaper (Noncarcinogens): C (mg/kg) * 1.88E-08 day^{-1}

Landscaper (Carcinogens): C (mg/kg) * 6.71E-09 day^{-1}

Construction (Noncarcinogens): C (mg/kg) * 2.25E-06 day^{-1}

Construction (Carcinogens): C (mg/kg) * 3.22E-08 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) DEH, 1993n; DEH, 1993o
(c) DEH, 1993e; DEH, 1993f
(d) USEPA, 1991
(e) Riley County Extension Service, 1992
(f) DEH, 1993l; DEH, 1993m
(g) DOC, 1993

TABLE 6-12
CURRENT & FUTURE "RECREATIONAL" EXPOSURE:
INCIDENTAL INGESTION OF SOILS
INGESTION INTAKE
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{INGESTION INTAKE (a)} = \frac{C * FI * IR * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in soil, mg/kg
FI	=	Fraction Ingested from source, unitless
IR	=	Ingestion Rate, mg/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Incidental Ingestion of Soil Recreational Child
FI	100%
IR	200 [b]
EF	7 [c]
ED	6 [b]
CF	10^{-6}
BW	15 [b]
AT (Noncarcinogen)	2,190 [b]
AT (Carcinogen)	NA

PATHWAY-SPECIFIC INTAKES:
Incidental Ingestion of Soil (current & future):

Recreational Child (Noncarcinogens): C (mg/kg) * 2.56E-07 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1991
(c) USEPA, 1989a; USEPA, 1993a

TABLE 6–13a
CURRENT OCCUPATIONAL EXPOSURE:
INHALATION OF FUGITIVE DUST
INHALATION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

INHALATION INTAKE (a) = $\frac{C * IR * ET * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in soil, mg/kg
IR	=	Inhalation Rate, m^3/hr
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor from Cowherd Model(b), kg/m^3
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Inhalation of Fugitive Dust: DEH Worker	Utility Worker	Landscaper
IR	2.5 [e]	2.5 [e]	2.5 [e]
ET	6.25 [c]	8 [d,f]	1 [g]
EF	250 [c,d]	0.3 [f]	2 [g]
ED	25 [d]	25 [d]	25 [d]
CF	3.06E–09	3.06E–09	3.06E–09
BW	70 [d]	70 [d]	70 [d]
AT (Noncarcinogen)	9,125 [d]	9,125 [d]	9,125 [d]
AT (Carcinogen)	25,550 [d]	25,550 [d]	25,550 [d]

PATHWAY–SPECIFIC INTAKES:
Inhalation of Fugitive Dust (current):

DEH Yard Worker (Noncarcinogens):	C (mg/kg)	*	4.68E–10 day^{-1}
DEH Yard Worker (Carcinogens):	C (mg/kg)	*	1.60E–10 day^{-1}
Utility Worker (Noncarcinogens):	C (mg/kg)	*	7.19E–13 day^{-1}
Utility Worker (Carcinogens):	C (mg/kg)	*	2.57E–13 day^{-1}
Landscaper (Noncarcinogens):	C (mg/kg)	*	5.99E–13 day^{-1}
Landscaper (Carcinogens):	C (mg/kg)	*	2.14E–13 day^{-1}

(a) Chemical–specific intakes are calculated in the risk calculation tables (Appendix N)
(b) Cowherd et al, 1985
(c) DEH, 1993c
(d) USEPA, 1991
(e) USEPA, 1989b
(f) DEH, 1992a
(g) DEH, 1993a

TABLE 6–13b
FUTURE OCCUPATIONAL EXPOSURE:
INHALATION OF FUGITIVE DUST
INHALATION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{INHALATION INTAKE (a)} = \frac{C * IR * ET * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in soil, mg/kg
IR	=	Inhalation Rate, m^3/hr
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor from Cowherd Model[b], kg/m^3
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Inhalation of Fugitive Dust: DEH Worker	Utility Worker	Landscaper	Construction Worker
IR	2.5 [e]	2.5 [e]	2.5 [e]	2.5[e]
ET	8 [c,d]	8 [c]	1 [g]	8[d]
EF	250 [d,g]	1.12 [c]	8 [c,f]	120[h]
ED	25 [d]	25 [d]	25 [d]	1
CF [b]	3.06E−09	3.06E−09	3.06E−09	3.06E−09
BW	70 [d]	70 [d]	70 [d]	70[d]
AT (Noncarcinogen)	9,125 [d]	9,125 [d]	9,125 [d]	365[h]
AT (Carcinogen)	25,550 [d]	25,550 [d]	25,550 [d]	25,550[d]

PATHWAY–SPECIFIC INTAKES:

Inhalation of Fugitive Dust (future):

DEH Yard Worker (Noncarcinogens):	C (mg/kg)	*	5.99E−10 day^{-1}
DEH Yard Worker (Carcinogens):	C (mg/kg)	*	2.14E−10 day^{-1}
Utility Worker (Noncarcinogens):	C (mg/kg)	*	2.68E−12 day^{-1}
Utility Worker (Carcinogens):	C (mg/kg)	*	9.71E−13 day^{-1}
Landscaper (Noncarcinogens):	C (mg/kg)	*	2.40E−12 day^{-1}
Landscaper (Carcinogens):	C (mg/kg)	*	8.55E−13 day^{-1}
Construction Worker (Noncarcinogens):	C (mg/kg)	*	2.87E−10 day^{-1}
Construction Worker (Carcinogens):	C (mg/kg)	*	4.11E−12 day^{-1}

(a) Chemical–specific intakes are calculated in the risk calculation tables (Appendix N)
(b) Cowherd et al, 1985
(c) DEH, 1993n; DEH, 1993o
(d) USEPA, 1991
(e) USEPA, 1989b
(f) Riley County Extension Service, 1992
(g) DOC, 1993
(h) DEH, 1993l; DEH, 1993m

TABLE 6-14
CURRENT & FUTURE RECREATIONAL EXPOSURE:
INHALATION OF FUGITIVE DUST
INHALATION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

INHALATION INTAKE (a) = $\frac{C * IR * ET * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in soil, mg/kg
IR	=	Inhalation Rate, m^3/hour
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor from Cowherd Model[(b)], kg/m^3
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Inhalation of Fugitive Dust Recreational Child
IR	0.83 [c,d]
EF	7 [d]
ET	2.6 [d,e]
ED	6 [c]
CF [b]	3.06E-09
BW	15 [c]
AT (Noncarcinogen)	2,190 [c]
AT (Carcinogen)	NA

PATHWAY-SPECIFIC INTAKES:
Inhalation of Fugitive Dust (current & future):

Recreational Child (Noncarcinogens): C (mg/kg) * 8.44E-12 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) Cowherd et al, 1985
(c) USEPA, 1991
(d) USEPA, 1989a
(e) USEPA, 1993a

TABLE 6-15a
CURRENT OCCUPATIONAL EXPOSURE:
DERMAL EXPOSURE TO SOILS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

DERMAL INTAKE (a) = $\frac{C * SA * AF * ABS * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in soil, mg/kg
SA	=	Surface Area of exposed skin, cm^2/hour
AF	=	Soil to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Soil: DEH Yard Worker	Utility Worker	Landscaper
SA	3,600 [b]	3,600 [b]	3,600 [b]
AF	1 [e]	1 [e]	1 [e]
ABS	100% [f]	100% [f]	100% [f]
ET	6.25 [c]	8 [g]	1 [c]
EF	250 [c,d]	0.3 [g]	2 [c]
ED	25 [d]	25 [d]	25 [d]
CF	10^{-6}	10^{-6}	10^{-6}
BW	70 [d]	70 [d]	70 [d]
AT (Noncarcinogen)	9,125 [d]	9,125 [d]	9,125 [d]
AT (Carcinogen)	25,550 [d]	25,550 [d]	25,550 [d]

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Soil (current):

DEH Yard Worker (Noncarcinogens):	C (mg/kg) *	2.20E-04 day^{-1}
DEH Yard Worker (Carcinogens):	C (mg/kg) *	7.86E-05 day^{-1}
Utility Worker (Noncarcinogens):	C (mg/kg) *	3.38E-07 day^{-1}
Utility Worker (Carcinogens):	C (mg/kg) *	1.21E-07 day^{-1}
Landscaper (Noncarcinogens):	C (mg/kg) *	2.82E-07 day^{-1}
Landscaper (Carcinogens):	C (mg/kg) *	1.01E-07 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (adult male's forearms, hands, head)
(c) DEH, 1993c
(d) USEPA, 1991
(e) USEPA, 1992
(f) USEPA, 1992e
(g) DEH, 1992a

TABLE 6-15b
FUTURE OCCUPATIONAL EXPOSURE:
DERMAL EXPOSURE TO SOILS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

DERMAL INTAKE (a) = $\frac{C * SA * AF * ABS * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in soil, mg/kg
SA	=	Surface Area of exposed skin, cm^2/hour
AF	=	Soil to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Soil			
	DEH Yard Worker	Utility Worker	Landscaper	Construction Worker
SA	3,600 [b]	3,600 [b]	3,600 [b]	3,600 [b]
AF	1 [c]	1 [c]	1 [c]	1 [c]
ABS	100% [f]	100% [f]	100% [f]	100% [f]
ET	8 [h,d]	8 [d]	1 [j]	8 [d]
EF	250 [h,d]	1,12 [e]	8 [j,g]	120 [i]
ED	25 [d]	25 [d]	25 [d]	1 [i]
CF	10^{-6}	10^{-6}	10^{-6}	10^{-6}
BW	70 [d]	70 [d]	70 [d]	70 [d]
AT (Noncarcinogen)	9,125 [d]	9,125 [d]	9,125 [d]	365 [i]
AT (Carcinogen)	25,550 [d]	25,550 [d]	25,550 [d]	25,550 [d]

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Soil (future):

DEH Yard Worker (Noncarcinogens):	C (mg/kg) * 2.82E-04 day^{-1}
DEH Yard Worker (Carcinogens):	C (mg/kg) * 1.01E-04 day^{-1}
Utility Worker (Noncarcinogens):	C (mg/kg) * 1.26E-06 day^{-1}
Utility Worker (Carcinogens):	C (mg/kg) * 4.51E-07 day^{-1}
Landscaper (Noncarcinogens):	C (mg/kg) * 1.13E-06 day^{-1}
Landscaper (Carcinogens):	C (mg/kg) * 4.03E-07 day^{-1}
Construction Worker (Noncarcinogens):	C (mg/kg) * 1.35E-04 day^{-1}
Construction Worker (Carcinogens):	C (mg/kg) * 1.93E-06 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (adult male's forearms, hands, head)
(c) USEPA, 1992
(d) USEPA, 1991
(e) DEH, 1993n; DEH, 1993o
(f) USEPA, 1992e
(g) Riley County Extension Service, 1992
(h) DEH, 1993f; DEH, 1993e
(i) DEH, 1993l; DEH, 1993m
(j) DOC, 1993

TABLE 6-16
CURRENT & FUTURE "RECREATIONAL" EXPOSURE:
DERMAL EXPOSURE TO SOILS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in soil, mg/kg
SA	=	Surface Area of exposed skin, cm^2/hour
AF	=	Soil to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Soil Recreational Child
SA	5,025 [b]
AF	1 [c]
ABS	100% [d]
ET	2.6 [e]
EF	7 [f,g]
ED	6 [f,g]
CF	10^{-6}
BW	15 [e]
AT (Noncarcinogen)	2,190 [e]
AT (Carcinogen)	NA

PATHWAY-SPECIFIC INTAKES:
Dermal Exposure to Soil (current & future):

Recreational Child (Noncarcinogens): C (mg/kg) * 1.67E-05 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (child's head, hands, arms, legs)
(c) USEPA, 1992
(d) USEPA, 1992e
(e) USEPA, 1991
(f) USEPA, 1989a
(g) USEPA, 1993a

TABLE 6-17
FUTURE RESIDENTIAL EXPOSURE:
INGESTION OF GROUND WATER
INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

INGESTION INTAKE (a) $= \frac{C * IR * EF * ED}{BW * AT}$

Where:

C	=	Concentration of constituent in ground water, mg/L
IR	=	Ingestion Rate, L/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Ingestion of Ground Water Adult	Child
IR	2 [b]	2 [b,c]
EF	350 [b]	350 [b]
ED	30 [b]	6 [b]
BW	70 [b]	15 [b]
AT (Noncarcinogen)	10,950 [b]	2,190 [b]
AT (Carcinogen)	25,550 [b]	NA

PATHWAY-SPECIFIC INTAKES:

Ingestion of Ground Water (future):

Residential Adult (Noncarcinogens):	C (mg/L) *	2.74E-02 day^{-1}
Residential Adult (Carcinogens):	C (mg/L) *	1.17E-02 day^{-1}
Residential Child (Noncarcinogens):	C (mg/L) *	1.28E-01 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1991
(c) USEPA, 1989b

TABLE 6-18
FUTURE RESIDENTIAL EXPOSURE:
DERMAL EXPOSURE TO GROUND WATER
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in ground water, mg/L
SA	=	Surface Area of exposed skin, cm^2
PC	=	Permeability Constant, cm/hour
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, $1L/10^3\ cm^3$
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Ground Water Adult	Child
SA	19,400 [b]	8,660 [b]
PC	***** 0.001 (metals) [e]	*****
ET	0.2 [c]	0.2 [c]
EF	350 [d]	350 [d]
ED	30 [d]	6 [d]
CF	10^{-3}	10^{-3}
BW	70 [d]	15 [d]
AT (Noncarcinogen)	10,950 [d]	2,190 [d]
AT (Carcinogen)	25,550 [d]	NA

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Ground Water (future):

Residential Adult (Noncarcinogens):	C (mg/L) * 5.32E-05 day^{-1}
Residential Adult (Carcinogens):	C (mg/L) * 2.28E-05 day^{-1}
Residential Child (Noncarcinogens):	C (mg/L) * 1.11E-04 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (total body surface area)
(c) USEPA, 1992
(d) USEPA, 1991
(e) The only constituents of concern in ground water are metals. Of these metals, only two (cadmium and chromium) have chemical specific PC values. Since both cadmium and chromium have the same PC value as the default value for metals (0.001 cm/hr), the default value is used for all constituents detected in ground water (source – default value USEPA, 1992)

TABLE 6-19a
CURRENT OCCUPATIONAL EXPOSURE:
DERMAL EXPOSURE TO SURFACE WATER
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

DERMAL INTAKE (a) = $\frac{C * SA * PC * ET * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in surface water, mg/L
SA	=	Surface Area of exposed skin, cm^2
PC	=	Permeability Constant, cm/hour
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, $1L/10^3 cm^3$
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Surface Water
SA	6,170 [b]
PC	0.000004 (lead); 0.001 (other metals) [f]
ET	8 [e]
EF	0.3 [d]
ED	25 [e]
CF	10^{-3}
BW	70 [e]
AT (Noncarcinogen)	9,125 [e]
AT (Carcinogen)	25,550 [e]

PATHWAY-SPECIFIC INTAKES:
Dermal Exposure to Surface Water (current):

	lead intakes	other metals' intakes
Occupational Adult (Noncarcinogens):	C (mg/L) * 2.32E-09 day^{-1}	C (mg/L) * 5.80E-07 day^{-1}
Occupational Adult (Carcinogens):	C (mg/L) * 8.28E-10 day^{-1}	C (mg/L) * 2.07E-07 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (adult male's lower arms, lower legs, hands, and feet).
(c) USEPA, 1992
(d) DEH, 1992a
(e) USEPA, 1991
(f) Of the metals detected in site surface water, only cadmium, chromium, and lead have chemical specific PC values. Chromium and cadmium compounds have the same PC value as the default PC value for metals (0.001 cm/hr), while lead's PC value is 0.000004 cm/hr. For this reason, intakes are calculated separately for lead (source PC values: USEPA, 1992)

TABLE 6-19b
FUTURE OCCUPATIONAL EXPOSURE:
DERMAL EXPOSURE TO SURFACE WATER
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in surface water, mg/L
SA	=	Surface Area of exposed skin, cm^2
PC	=	Permeability Constant, cm/hour
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, $1L/10^3\ cm^3$
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Surface Water
SA	6,170 [b]
PC	0.000004 (lead); 0.001 (other metals) [d]
ET	8 [c]
EF	2
ED	25 [c]
CF	10^{-3}
BW	70 [c]
AT (Noncarcinogen)	9,125 [c]
AT (Carcinogen)	25,550 [c]

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Surface Water (future):	lead intakes	other metals' intakes
Occupational Adult (Noncarcinogens):	C (mg/L) * 1.55E-08 day^{-1}	C (mg/L) * 3.86E-06 day^{-1}
Occupational Adult (Carcinogens):	C (mg/L) * 5.52E-09 day^{-1}	C (mg/L) * 1.38E-06 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (adult male's lower arms, lower legs, hands, and feet)
(c) USEPA, 1992
(d) Of the metals detected in site surface water, only cadmium, chromium, and lead have chemical specific PC values. Chromium and cadmium compounds have the same PC value as the default PC for metals (0.001cm/hr), while lead's PC value is 0.000004 cm/hr. Therefore, lead intakes are calculated separately (source PC values: USEPA, 1992)
(e) USEPA, 1991

TABLE 6-20
CURRENT & FUTURE "RECREATIONAL" EXPOSURE:
DERMAL EXPOSURE TO SURFACE WATER
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in surface water, mg/L
SA	=	Surface Area of exposed skin, cm^2
PC	=	Permeability Constant, cm/hour
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, $1L/10^3\ cm^3$
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Surface Water Recreational Child
SA	4,490 [b]
PC	0.000004 (lead); 0.001 (other metals) [e]
ET	2.6 [c]
EF	7 [c]
ED	6 [d]
CF	10^{-3}
BW	15 [d]
AT (Noncarcinogen)	2,190 [d]
AT (Carcinogen)	NA

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Surface Water (current & future):

	lead intakes	other metals' intakes
Recreational Child (Noncarcinogens):	C (mg/L) * 5.97E-08 day^{-1}	C (mg/L) * 1.49E-05 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (child's arms,legs,hands, and feet)
(c) USEPA, 1992
(d) USEPA, 1991
(e) Of the metals detected in site surface water, only cadmium, chromium, and lead have chemical specific PC values. Chromium and cadmium compounds have the same PC value as the default PC value for metals (0.001 cm/hr), while lead's PC value is 0.000004 cm/hr. Therefore, lead intakes are calculated separately. (source – PC values: USEPA, 1992)

TABLE 6-21a
CURRENT OCCUPATIONAL EXPOSURE:
DERMAL EXPOSURE TO SEDIMENTS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in sediment, mg/kg
SA	=	Surface Area of exposed skin, cm^2/hour
AF	=	Sediment to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Sediment
SA	1,980 [b]
AF	1 [c]
ABS	100% [e]
ET	8 [e]
EF	0.3 [f]
ED	25 [e]
CF	10^{-6}
BW	70 [e]
AT (Noncarcinogen)	9,125 [e]
AT (Carcinogen)	25,550 [e]

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Sediment (current):

Occupational Adult (Noncarcinogens): C (mg/kg) * 1.86E-07 day^{-1}

Occupational Adult (Carcinogens): C (mg/kg) * 6.64E-08 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (adult male's hands and forearms)
(c) USEPA, 1992
(d) USEPA, 1992e
(e) USEPA, 1991
(f) DEH, 1992a

TABLE 6-21b
FUTURE OCCUPATIONAL EXPOSURE:
DERMAL EXPOSURE TO SEDIMENTS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in sediment, mg/kg
SA	=	Surface Area of exposed skin, cm^2/hour
AF	=	Sediment to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Sediment
SA	1,980 [b]
AF	1 [c]
ABS	100% [d]
ET	8 [e]
EF	2
ED	25 [e]
CF	10^{-6}
BW	70 [e]
AT (Noncarcinogen)	9,125 [e]
AT (Carcinogen)	25,550 [e]

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Sediment (future):

Occupational Adult (Noncarcinogens):	C (mg/kg) *	1.24E-06 day^{-1}
Occupational Adult (Carcinogens):	C (mg/kg) *	4.43E-07 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (adult male's hands and forearms)
(c) USEPA, 1992
(d) USEPA, 1992e
(e) USEPA, 1991

TABLE 6-22
CURRENT & FUTURE "RECREATIONAL" EXPOSURE:
DERMAL EXPOSURE TO SEDIMENTS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in sediment, mg/kg
SA	=	Surface Area of exposed skin, cm^2
AF	=	Sediment to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Sediment Recreational Child
SA	4,490 [b]
AF	1 [c]
ABS	100% [d]
ET	2.6 [c]
EF	7 [c]
ED	6 [e]
CF	10^{-6}
BW	15 [e]
AT (Noncarcinogen)	2,190 [e]
AT (Carcinogen)	NA

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Sediment (current & future):
Recreational Child (Noncarcinogens): C (mg/kg) * 1.49E-05 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b (child's arms, legs, hands, and feet)
(c) USEPA, 1992
(d) USEPA, 1992e
(e) USEPA, 1991

TABLE 6-23a
CURRENT OCCUPATIONAL EXPOSURE:
INCIDENTAL INGESTION OF SEDIMENTS
INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

DERMAL INTAKE (a) = $\frac{C * SA * AF * ABS * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in sediment, mg/kg
FI	=	Fraction Ingested from source, unitless
IR	=	Ingestion Rate, mg/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Incidental Ingestion of Sediment
FI	100%
IR	480 [b,d]
EF	0.3 [c]
ED	25 [d]
CF	10^{-6}
BW	70 [d]
AT (Noncarcinogen)	9,125 [d]
AT (Carcinogen)	25,550 [d]

PATHWAY-SPECIFIC INTAKES:

Incidental Ingestion of Sediment (current):

Occupational Adult (Noncarcinogens): C (mg/kg) * 5.64E-09 day^{-1}

Occupational Adult (Carcinogens): C (mg/kg) * 2.01E-09 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b
(c) DEH, 1992a
(d) USEPA, 1991

TABLE 6-23b
FUTURE OCCUPATIONAL EXPOSURE:
INCIDENTAL INGESTION OF SEDIMENTS
INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{INGESTION INTAKE (a)} = \frac{C * FI * IR * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in sediment, mg/kg
FI	=	Fraction Ingested from source, unitless
IR	=	Ingestion Rate, mg/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Incidental Ingestion of Sediment
FI	100%
IR	480 [b,d]
EF	2
ED	25 [d]
CF	10^{-6}
BW	70 [d]
AT (Noncarcinogen)	9,125 [d]
AT (Carcinogen)	25,550 [d]

PATHWAY-SPECIFIC INTAKES:
Incidental Ingestion of Sediment (future):

Occupational Adult (Noncarcinogens):	C (mg/kg) * 3.76E-08 day^{-1}
Occupational Adult (Carcinogens):	C (mg/kg) * 1.34E-08 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N)
(b) USEPA, 1989b
(c) USEPA, 1992b
(d) USEPA, 1991

TABLE 6-24
CURRENT & FUTURE "RECREATIONAL" EXPOSURE:
INCIDENTAL INGESTION OF SEDIMENTS
INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{INGESTION INTAKE (a)} = \frac{C * FI * IR * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in sediment, mg/kg
FI	=	Fraction Ingested from source, unitless
IR	=	Ingestion Rate, mg/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Incidental Ingestion of Sediment Recreational Child
FI	100%
IR	200 [c]
EF	7 [b]
ED	6 [c]
CF	10^{-6}
BW	15 [c]
AT (Noncarcinogen)	2,190 [c]
AT (Carcinogen)	NA

PATHWAY-SPECIFIC INTAKES:

Incidental Ingestion of Sediment (current & future):
Recreational Child (Noncarcinogens): C (mg/kg) * 2.56E-07 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables (Appendix N).
(b) USEPA, 1992
(c) USEPA, 1991

FUTURE CONSTRUCTION WORKER: Incidental Ingestion of Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	2.25E-06	3.22E-08	1.35E-06	1.93E-08	6.0E-05	1.3E+00	2.3E-02	2.5E-08
gamma-Chlordane	5.70E-01	2.25E-06	3.22E-08	1.28E-06	1.84E-08	6.0E-05	1.3E+00	2.1E-02	2.4E-08
4,4'-DDD	8.50E-02	2.25E-06	3.22E-08	1.91E-07	2.74E-09	--	2.4E-01	--	6.6E-10
4,4'-DDE	3.30E-01	2.25E-06	3.22E-08	7.43E-07	1.06E-08	--	3.4E-01	--	3.6E-09
4,4'-DDT	3.90E+00	2.25E-06	3.22E-08	8.78E-06	1.26E-07	5.0E-04	3.4E-01	1.8E-02	4.3E-08
Dieldrin	5.70E-02	2.25E-06	3.22E-08	1.28E-07	1.84E-09	5.0E-05	1.6E+01	2.6E-03	2.9E-08
Endrin aldehyde	1.40E-02	2.25E-06	3.22E-08	3.15E-08	4.51E-10	3.0E-04 (a)	--	1.1E-04	--
Heptachlor	4.30E-02	2.25E-06	3.22E-08	9.68E-08	1.38E-09	5.0E-04	4.5E+00	1.9E-04	6.2E-09
Heptachlor epoxide	5.40E-03	2.25E-06	3.22E-08	1.22E-08	1.74E-10	1.3E-05	9.1E+00	9.3E-04	1.6E-09
Methoxychlor	4.90E-01	2.25E-06	3.22E-08	1.10E-06	1.58E-08	5.0E-03	--	2.2E-04	--
Anthracene	1.50E-01	2.25E-06	3.22E-08	3.38E-07	4.83E-09	3.0E-01	--	1.1E-06	--
Benzo[a]anthracene	3.20E-01	2.25E-06	3.22E-08	7.20E-07	1.03E-08	--	1.1E+00 *	--	1.1E-08
Benzo[a]pyrene	2.60E-01	2.25E-06	3.22E-08	5.85E-07	8.37E-09	--	7.3E+00	--	6.1E-08
Benzo[b]fluoranthene	3.10E-01	2.25E-06	3.22E-08	6.98E-07	9.98E-09	--	1.0E+00 *	--	1.0E-08
Benzo[k]fluoranthene	2.90E-01	2.25E-06	3.22E-08	6.53E-07	9.34E-09	--	4.8E-01 *	--	4.5E-09
Chrysene	3.30E-01	2.25E-06	3.22E-08	7.43E-07	1.06E-08	--	2.9E-02 *	--	3.1E-10
Dibenzofuran	6.50E-02	2.25E-06	3.22E-08	1.46E-07	2.09E-09	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	2.25E-06	3.22E-08	4.73E-07	6.76E-09	--	1.7E+00 *	--	1.1E-08
2-Methylnaphthalene	8.00E-02	2.25E-06	3.22E-08	1.80E-07	2.58E-09	--	--	--	--
Phenanthrene	3.70E-01	2.25E-06	3.22E-08	8.33E-07	1.19E-08	--	--	--	--
Arsenic	6.40E+00	2.25E-06	3.22E-08	1.44E-05	2.06E-07	3.0E-04	1.8E+00	4.8E-02	3.6E-07
Cadmium	4.90E-01	2.25E-06	3.22E-08	1.10E-06	1.58E-08	1.0E-03 (f)	--	1.1E-03	--
Chromium	9.70E+00	2.25E-06	3.22E-08	2.18E-05	3.12E-07	5.0E-03	--	4.4E-03	--
Lead	1.49E+02	2.25E-06	3.22E-08	3.35E-04	4.80E-06	--	--	--	--
Mercury	1.30E-01	2.25E-06	3.22E-08	2.93E-07	4.19E-09	3.00E-04 (H)	--	9.8E-04	--
							TOTAL:	0.12	5.9E-07

* - CSF is based on TEF, using B[a]P toxicity
a - Value is for endrin
f - Value is for cadmium in food
H - Value obtained from HEAST

FUTURE CONSTRUCTION WORKER: Inhalation of Fugitive Dusts from Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	2.87E-10	4.11E-12	1.72E-10	2.47E-12	--	1.3E+00	--	3.2E-12
gamma-Chlordane	5.70E-01	2.87E-10	4.11E-12	1.64E-10	2.34E-12	--	1.3E+00	--	3.0E-12
4,4'-DDD	8.50E-02	2.87E-10	4.11E-12	2.44E-11	3.49E-13	--	--	--	--
4,4'-DDE	3.30E-01	2.87E-10	4.11E-12	9.47E-11	1.36E-12	--	--	--	--
4,4'-DDT	3.90E+00	2.87E-10	4.11E-12	1.12E-09	1.60E-11	--	3.4E-01	--	5.4E-12
Dieldrin	5.70E-02	2.87E-10	4.11E-12	1.64E-11	2.34E-13	--	1.6E+01	--	3.7E-12
Endrin aldehyde	1.40E-02	2.87E-10	4.11E-12	4.02E-12	5.75E-14	--	--	--	--
Heptachlor	4.30E-02	2.87E-10	4.11E-12	1.23E-11	1.77E-13	--	4.6E+00	--	8.1E-13
Heptachlor epoxide	5.40E-03	2.87E-10	4.11E-12	1.55E-12	2.22E-14	--	9.1E+00	--	2.0E-13
Methoxychlor	4.90E-01	2.87E-10	4.11E-12	1.41E-10	2.01E-12	--	--	--	--
Anthracene	1.50E-01	2.87E-10	4.11E-12	4.31E-11	6.17E-13	--	--	--	--
Benzo[a]anthracene	3.20E-01	2.87E-10	4.11E-12	9.18E-11	1.32E-12	--	--	--	--
Benzo[a]pyrene	2.60E-01	2.87E-10	4.11E-12	7.46E-11	1.07E-12	--	--	--	--
Benzo[b]fluoranthene	3.10E-01	2.87E-10	4.11E-12	8.90E-11	1.27E-12	--	--	--	--
Benzo[k]fluoranthene	2.90E-01	2.87E-10	4.11E-12	8.32E-11	1.19E-12	--	--	--	--
Chrysene	3.30E-01	2.87E-10	4.11E-12	9.47E-11	1.36E-12	--	--	--	--
Dibenzofuran	6.50E-02	2.87E-10	4.11E-12	1.87E-11	2.67E-13	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	2.87E-10	4.11E-12	6.03E-11	8.63E-13	--	--	--	--
2-Methylnaphthalene	8.00E-02	2.87E-10	4.11E-12	2.30E-11	3.29E-13	--	--	--	--
Phenanthrene	3.70E-01	2.87E-10	4.11E-12	1.06E-10	1.52E-12	--	--	--	--
Arsenic	6.40E+00	2.87E-10	4.11E-12	1.84E-09	2.63E-11	--	1.5E+01	--	4.0E-10
Cadmium	4.90E-01	2.87E-10	4.11E-12	1.41E-10	2.01E-12	--	6.1E+00	--	1.2E-11
Chromium	9.70E+00	2.87E-10	4.11E-12	2.78E-09	3.99E-11	--	4.1E+01	--	1.6E-09
Lead	1.49E+02	2.87E-10	4.11E-12	4.28E-08	6.12E-10	--	--	--	--
Mercury	1.30E-01	2.87E-10	4.11E-12	3.73E-11	5.34E-13	8.6E-05 (H)	--	4.3E-07	--
							TOTAL:	< 0.01	2.1E-09

* -- CSF is based on TEF, using B[a]P toxicity
H - Value obtained from HEAST

FUTURE CONSTRUCTION WORKER: Dermal Contact with Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	1.35E-04	1.93E-06	8.10E-05	1.16E-06	6.0E-05	1.3E+00	1.4E+00	1.5E-06
gamma-Chlordane	5.70E-01	1.35E-04	1.93E-06	7.70E-05	1.10E-06	6.0E-05	1.3E+00	1.3E+00	1.4E-06
4,4'-DDD	8.50E-02	1.35E-04	1.93E-06	1.15E-05	1.64E-07	--	2.4E-01	--	3.9E-08
4,4'-DDE	3.30E-01	1.35E-04	1.93E-06	4.46E-05	6.37E-07	--	3.4E-01	--	2.2E-07
4,4'-DDT	3.90E+00	1.35E-04	1.93E-06	5.27E-04	7.53E-06	5.0E-04	3.4E-01	1.1E+00	2.6E-06
Dieldrin	5.70E-02	1.35E-04	1.93E-06	7.70E-06	1.10E-07	5.0E-05	1.6E+01	1.5E-01	1.8E-06
Endrin aldehyde	1.40E-02	1.35E-04	1.93E-06	1.89E-06	2.70E-08	3.0E-04 (a)	--	6.3E-03	--
Heptachlor	4.30E-02	1.35E-04	1.93E-06	5.81E-06	8.30E-08	5.0E-04	4.5E+00	1.2E-02	3.7E-07
Heptachlor epoxide	5.40E-03	1.35E-04	1.93E-06	7.29E-07	1.04E-08	1.3E-05	9.1E+00	5.6E-02	9.5E-08
Methoxychlor	4.90E-01	1.35E-04	1.93E-06	6.62E-05	9.46E-07	5.0E-03	--	1.3E-02	--
Anthracene	1.50E-01	1.35E-04	1.93E-06	2.03E-05	2.90E-07	3.0E-01	--	6.8E-05	--
Benzo[a]anthracene	3.20E-01	1.35E-04	1.93E-06	4.32E-05	6.18E-07	--	1.1E+00 *	--	6.8E-07
Benzo[a]pyrene	2.60E-01	1.35E-04	1.93E-06	3.51E-05	5.02E-07	--	7.3E+00	--	3.7E-06
Benzo[b]fluoranthene	3.10E-01	1.35E-04	1.93E-06	4.19E-05	5.98E-07	--	1.0E+00 *	--	6.1E-07
Benzo[k]fluoranthene	2.90E-01	1.35E-04	1.93E-06	3.92E-05	5.60E-07	--	4.8E-01 *	--	2.7E-07
Chrysene	3.30E-01	1.35E-04	1.93E-06	4.46E-05	6.37E-07	--	2.9E-02 *	--	1.8E-08
Dibenzofuran	6.50E-02	1.35E-04	1.93E-06	8.78E-06	1.25E-07	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	1.35E-04	1.93E-06	2.84E-05	4.05E-07	--	1.7E+00 *	--	6.9E-07
2-Methylnaphthalene	8.00E-02	1.35E-04	1.93E-06	1.08E-05	1.54E-07	--	--	--	--
Phenanthrene	3.70E-01	1.35E-04	1.93E-06	5.00E-05	7.14E-07	--	--	--	--
Arsenic	6.40E+00	1.35E-04	1.93E-06	8.64E-04	1.24E-05	3.0E-04	1.8E+00	2.9E+00	2.2E-05
Cadmium	4.90E-01	1.35E-04	1.93E-06	6.62E-05	9.46E-07	1.0E-03 (f)	--	6.6E-02	--
Chromium	9.70E+00	1.35E-04	1.93E-06	1.31E-03	1.87E-05	5.0E-03	--	2.6E-01	--
Lead	1.49E+02	1.35E-04	1.93E-06	2.01E-02	2.88E-04	--	--	--	--
Mercury	1.30E-01	1.35E-04	1.93E-06	1.76E-05	2.51E-07	3.0E-04 (H)	--	5.9E-02	--
							TOTAL:	7.32	3.6E-05

* - CSF is based on TEF, using B[a]P toxicity
a - Value is for endrin
f - Value is for cadmium in food
H - Value obtained from HEAST

CURRENT & FUTURE "RECREATIONAL" CHILD (Child Trespasser): Incidental Ingestion of Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Subchronic Intake (mg/kg-day) Noncarcinogen	Subchronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD_{sc}** (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	2.56E-07	--	1.54E-07	--	6.0E-05 (H)	1.3E+00	2.6E-03	--
gamma-Chlordane	5.70E-01	2.56E-07	--	1.46E-07	--	6.0E-05 (H)	1.3E+00	2.4E-03	--
4,4'-DDD	8.50E-02	2.56E-07	--	2.18E-08	--	--	2.4E-01	--	--
4,4'-DDE	3.30E-01	2.56E-07	--	8.45E-08	--	--	3.4E-01	--	--
4,4'-DDT	3.90E+00	2.56E-07	--	9.98E-07	--	5.0E-04 (H)	3.4E-01	2.0E-03	--
Dieldrin	5.70E-02	2.56E-07	--	1.46E-08	--	5.0E-05 (H)	1.6E+01	2.9E-04	--
Endrin aldehyde	1.40E-02	2.56E-07	--	3.58E-09	--	3.0E-04 (a)(H)	--	1.2E-05	--
Heptachlor	4.30E-02	2.56E-07	--	1.10E-08	--	5.0E-04 (H)	4.5E+00	2.2E-05	--
Heptachlor epoxide	5.40E-03	2.56E-07	--	1.38E-09	--	1.3E-05 (H)	9.1E+00	1.1E-04	--
Methoxychlor	4.90E-01	2.56E-07	--	1.25E-07	--	5.0E-03 (H)	--	2.5E-05	--
Anthracene	1.50E-01	2.56E-07	--	3.84E-08	--	3.0E+00 (H)	--	1.3E-08	--
Benzo[a]anthracene	3.20E-01	2.56E-07	--	8.19E-08	--	--	1.1E+00 *	--	--
Benzo[a] pyrene	2.60E-01	2.56E-07	--	6.66E-08	--	--	7.3E+00	--	--
Benzo[b]fluoranthene	3.10E-01	2.56E-07	--	7.94E-08	--	--	1.0E+00 *	--	--
Benzo[k]fluoranthene	2.90E-01	2.56E-07	--	7.42E-08	--	--	4.8E-01 *	--	--
Chrysene	3.30E-01	2.56E-07	--	8.45E-08	--	--	2.9E-02 *	--	--
Dibenzofuran	6.50E-02	2.56E-07	--	1.66E-08	--	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	2.56E-07	--	5.38E-08	--	--	1.7E+00 *	--	--
2-Methylnaphthalene	8.00E-02	2.56E-07	--	2.05E-08	--	--	--	--	--
Phenanthrene	3.70E-01	2.56E-07	--	9.47E-08	--	--	--	--	--
Arsenic	6.40E+00	2.56E-07	--	1.64E-06	--	3.0E-04 (H)	1.8E+00	5.5E-03	--
Cadmium	4.90E-01	2.56E-07	--	1.25E-07	--	1.0E-03 (F)(b)	--	1.3E-04	--
Chromium	9.70E+00	2.56E-07	--	2.48E-06	--	2.0E-02 (H)	--	1.2E-04	--
Lead	1.49E+02	2.56E-07	--	3.81E-05	--	--	--	--	--
Mercury	1.30E-01	2.56E-07	--	3.33E-08	--	3.0E-04 (H)	--	1.1E-04	--
							TOTAL:	0.01	--

* - CSF is based on TEF, using B[a]P toxicity

CURRENT & FUTURE "RECREATIONAL" CHILD (Child Trespasser): Inhalation of Fugitive Dusts from Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Subchronic Intake (mg/kg-day) Noncarcinogen	Subchronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD_{sc}** (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	8.44E-12	--	5.06E-12	--	--	1.3E+00	--	--
gamma-Chlordane	5.70E-01	8.44E-12	--	4.81E-12	--	--	1.3E+00	--	--
4,4'-DDD	8.50E-02	8.44E-12	--	7.17E-13	--	--	--	--	--
4,4'-DDE	3.30E-01	8.44E-12	--	2.79E-12	--	--	--	--	--
4,4'-DDT	3.90E+00	8.44E-12	--	3.29E-11	--	--	3.4E-01	--	--
Dieldrin	5.70E-02	8.44E-12	--	4.81E-13	--	--	1.6E+01	--	--
Endrin aldehyde	1.40E-02	8.44E-12	--	1.18E-13	--	--	--	--	--
Heptachlor	4.30E-02	8.44E-12	--	3.63E-13	--	--	4.6E+00	--	--
Heptachlor epoxide	5.40E-03	8.44E-12	--	4.56E-14	--	--	9.1E+00	--	--
Methoxychlor	4.90E-01	8.44E-12	--	4.14E-12	--	--	--	--	--
Anthracene	1.50E-01	8.44E-12	--	1.27E-12	--	--	--	--	--
Benzo[a]anthracene	3.20E-01	8.44E-12	--	2.70E-12	--	--	--	--	--
Benzo[a] pyrene	2.60E-01	8.44E-12	--	2.19E-12	--	--	--	--	--
Benzo[b]fluoranthene	3.10E-01	8.44E-12	--	2.62E-12	--	--	--	--	--
Benzo[k]fluoranthene	2.90E-01	8.44E-12	--	2.45E-12	--	--	--	--	--
Chrysene	3.30E-01	8.44E-12	--	2.79E-12	--	--	--	--	--
Dibenzofuran	6.50E-02	8.44E-12	--	5.49E-13	--	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	8.44E-12	--	1.77E-12	--	--	--	--	--
2-Methylnaphthalene	8.00E-02	8.44E-12	--	6.75E-13	--	--	--	--	--
Phenanthrene	3.70E-01	8.44E-12	--	3.12E-12	--	--	--	--	--
Arsenic	6.40E+00	8.44E-12	--	5.40E-11	--	--	1.5E+01	--	--
Cadmium	4.90E-01	8.44E-12	--	4.14E-12	--	--	6.1E+00	--	--
Chromium	9.70E+00	8.44E-12	--	8.19E-11	--	--	4.1E+01	--	--
Lead	1.49E+02	8.44E-12	--	1.26E-09	--	--	--	--	--
Mercury	1.30E-01	8.44E-12	--	1.10E-12	--	8.6E-05 (H)	--	1.3E-08	--
							TOTAL:	< 0.01	--

* - CSF is based on TEF, using B[a]P toxicity

CURRENT & FUTURE "RECREATIONAL" CHILD (Child Trespasser): Dermal Contact with Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Subchronic Intake (mg/kg-day) Noncarcinogen	Subchronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD_{sc}** (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	1.67E-05	--	1.00E-05	--	6.0E-05 (H)	1.3E+00	1.7E-01	--
gamma-Chlordane	5.70E-01	1.67E-05	--	9.52E-06	--	6.0E-05 (H)	1.3E+00	1.6E-01	--
4,4'-DDD	8.50E-02	1.67E-05	--	1.42E-06	--	--	2.4E-01	--	--
4,4'-DDE	3.30E-01	1.67E-05	--	5.51E-06	--	--	3.4E-01	--	--
4,4'-DDT	3.90E+00	1.67E-05	--	6.51E-05	--	5.0E-04 (H)	3.4E-01	1.3E-01	--
Dieldrin	5.70E-02	1.67E-05	--	9.52E-07	--	5.0E-05 (H)	1.6E+01	1.9E-02	--
Endrin aldehyde	1.40E-02	1.67E-05	--	2.34E-07	--	3.0E-04 (a)(H)	--	7.8E-04	--
Heptachlor	4.30E-02	1.67E-05	--	7.18E-07	--	5.0E-04 (H)	4.5E+00	1.4E-03	--
Heptachlor epoxide	5.40E-03	1.67E-05	--	9.02E-08	--	1.3E-05 (H)	9.1E+00	6.9E-03	--
Methoxychlor	4.90E-01	1.67E-05	--	8.18E-06	--	5.0E-03 (H)	--	1.6E-03	--
Anthracene	1.50E-01	1.67E-05	--	2.51E-06	--	3.0E+00 (H)	--	8.4E-07	--
Benzo[a]anthracene	3.20E-01	1.67E-05	--	5.34E-06	--	--	1.1E+00 *	--	--
Benzo[a] pyrene	2.60E-01	1.67E-05	--	4.34E-06	--	--	7.3E+00	--	--
Benzo[b]fluoranthene	3.10E-01	1.67E-05	--	5.18E-06	--	--	1.0E+00 *	--	--
Benzo[k]fluoranthene	2.90E-01	1.67E-05	--	4.84E-06	--	--	4.8E-01 *	--	--
Chrysene	3.30E-01	1.67E-05	--	5.51E-06	--	--	2.9E-02 *	--	--
Dibenzofuran	6.50E-02	1.67E-05	--	1.09E-06	--	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	1.67E-05	--	3.51E-06	--	--	1.7E+00 *	--	--
2-Methylnaphthalene	8.00E-02	1.67E-05	--	1.34E-06	--	--	--	--	--
Phenanthrene	3.70E-01	1.67E-05	--	6.18E-06	--	--	--	--	--
Arsenic	6.40E+00	1.67E-05	--	1.07E-04	--	3.0E-04 (H)	1.8E+00	3.6E-01	--
Cadmium	4.90E-01	1.67E-05	--	8.18E-06	--	1.0E-03 (F)(b)	--	8.2E-03	--
Chromium	9.70E+00	1.67E-05	--	1.62E-04	--	2.0E-02 (H)	--	8.1E-03	--
Lead	1.49E+02	1.67E-05	--	2.49E-03	--	--	--	--	--
Mercury	1.30E-01	1.67E-05	--	2.17E-06	--	3.0E-04 (H)	--	7.2E-03	--
							TOTAL:	0.87	--

* – CSF is based on TEF, using B[a]P toxicity

** – Subchronic RfDs (RfD_{sc}) are obtained from HEAST (anthracene and chromium are the only constituents for which the subchronic RfD_{sc}'s differ from the chronic RfDs)

a – Value is for endrin

b – No subchronic RfD available for this constituent (due to background dietary exposure); chronic RfD is used

CURRENT OCCUPATIONAL ADULT (DEH Yard Worker): Incidental Ingestion of Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.60E-01	3.82E-07	1.36E-07	2.52E-07	8.98E-08	6.0E-05	1.3E+00	4.2E-03	1.2E-07
gamma-Chlordane	6.40E-01	3.82E-07	1.36E-07	2.44E-07	8.70E-08	6.0E-05	1.3E+00	4.1E-03	1.1E-07
4,4'-DDE	1.80E+00	3.82E-07	1.36E-07	6.88E-07	2.45E-07	--	3.4E-01	--	8.3E-08
Benzo[a]anthracene	1.60E-01	3.82E-07	1.36E-07	6.11E-08	2.18E-08	--	1.1E+00 *	--	2.3E-08
Chrysene	4.50E-01	3.82E-07	1.36E-07	1.72E-07	6.12E-08	--	2.9E-02 *	--	1.8E-09
Phenanthrene	7.80E-01	3.82E-07	1.36E-07	2.98E-07	1.06E-07	--	--	--	--
Arsenic	4.60E+00	3.82E-07	1.36E-07	1.76E-06	6.26E-07	3.0E-04	1.8E+00	5.9E-03	1.1E-06
Barium	1.20E+02	3.82E-07	1.36E-07	4.58E-05	1.63E-05	7.0E-02	--	6.5E-04	--
Chromium	1.50E+01	3.82E-07	1.36E-07	5.73E-06	2.04E-06	5.0E-03	--	1.1E-03	--
Lead	6.00E+01	3.82E-07	1.36E-07	2.29E-05	8.16E-06	--	--	--	--
							TOTAL:	0.02	1.4E-06

FUTURE OCCUPATIONAL ADULT (DEH Yard Worker): Incidental Ingestion of Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	4.89E-07	1.75E-07	7.82E-07	2.80E-07	6.0E-05	1.3E+00	1.3E-02	3.6E-07
gamma-Chlordane	1.60E+00	4.89E-07	1.75E-07	7.82E-07	2.80E-07	6.0E-05	1.3E+00	1.3E-02	3.6E-07
4,4'-DDE	1.80E+00	4.89E-07	1.75E-07	8.80E-07	3.15E-07	--	3.4E-01	--	1.1E-07
4,4'-DDT	1.00E+00	4.89E-07	1.75E-07	4.89E-07	1.75E-07	5.0E-04	3.4E-01	9.8E-04	6.0E-08
Dieldrin	9.40E-02	4.89E-07	1.75E-07	4.60E-08	1.64E-08	5.0E-05	1.6E+01	9.2E-04	2.6E-07
Heptachlor	3.00E-01	4.89E-07	1.75E-07	1.47E-07	5.25E-08	5.0E-04	4.5E+00	2.9E-04	2.4E-07
Malathion	4.19E-01	4.89E-07	1.75E-07	2.05E-07	7.33E-08	2.0E-02	--	1.0E-05	--
Methoxychlor	2.40E+00	4.89E-07	1.75E-07	1.17E-06	4.20E-07	5.0E-03	--	2.3E-04	--
Benzo[a]anthracene	1.60E-01	4.89E-07	1.75E-07	7.82E-08	2.80E-08	--	1.1E+00 *	--	3.0E-08
Chrysene	4.50E-01	4.89E-07	1.75E-07	2.20E-07	7.88E-08	--	2.9E-02 *	--	2.3E-09
Phenanthrene	7.80E-01	4.89E-07	1.75E-07	3.81E-07	1.37E-07	--	--	--	--
Arsenic	1.60E+01	4.89E-07	1.75E-07	7.82E-06	2.80E-06	3.0E-04	1.8E+00	2.6E-02	4.9E-06
Barium	1.30E+02	4.89E-07	1.75E-07	6.36E-05	2.27E-05	7.0E-02	--	9.1E-04	--
Chromium	1.50E+01	4.89E-07	1.75E-07	7.34E-06	2.62E-06	5.0E-03	--	1.5E-03	--
Lead	5.40E+02	4.89E-07	1.75E-07	2.64E-04	9.45E-05	--	--	--	--
							TOTAL:	0.06	6.3E-06

* -- CSF is based on TEF, using B[a]P toxicity

CURRENT OCCUPATIONAL ADULT (DEH Yard Worker): Inhalation of Fugitive Dusts from Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)$^{-1}$		
alpha-Chlordane	6.60E-01	4.68E-10	1.60E-10	3.09E-10	1.06E-10	--	1.3E+00	--	1.4E-10
gamma-Chlordane	6.40E-01	4.68E-10	1.60E-10	3.00E-10	1.02E-10	--	1.3E+00	--	1.3E-10
4,4'-DDE	1.80E+00	4.68E-10	1.60E-10	8.42E-10	2.88E-10	--	1.3E+00	--	3.7E-10
Benzo[a]anthracene	1.60E-01	4.68E-10	1.60E-10	7.49E-11	2.56E-11	--	--	--	--
Chrysene	4.50E-01	4.68E-10	1.60E-10	2.11E-10	7.20E-11	--	--	--	--
Phenanthrene	7.80E-01	4.68E-10	1.60E-10	3.65E-10	1.25E-10	--	--	--	--
Arsenic	4.60E+00	4.68E-10	1.60E-10	2.15E-09	7.36E-10	--	1.5E+01	--	1.1E-08
Barium	1.20E+02	4.68E-10	1.60E-10	5.62E-08	1.92E-08	1.4E-04	--	4.0E-04	--
Chromium	1.50E+01	4.68E-10	1.60E-10	7.02E-09	2.40E-09	--	4.1E+01	--	9.8E-08
Lead	6.00E+01	4.68E-10	1.60E-10	2.81E-08	9.60E-09	--	--	--	--
							TOTAL:	< 0.01	1.1E-07

FUTURE OCCUPATIONAL ADULT (DEH Yard Worker): Inhalation of Fugitive Dusts from Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)$^{-1}$		
alpha-Chlordane	1.60E+00	5.99E-10	2.14E-10	9.58E-10	3.42E-10	--	1.3E+00	--	4.5E-10
gamma-Chlordane	1.60E+00	5.99E-10	2.14E-10	9.58E-10	3.42E-10	--	1.3E+00	--	4.5E-10
4,4'-DDE	1.80E+00	5.99E-10	2.14E-10	1.08E-09	3.85E-10	--	--	--	--
4,4'-DDT	1.00E+00	5.99E-10	2.14E-10	5.99E-10	2.14E-10	--	3.4E-01	--	7.3E-11
Dieldrin	9.40E-02	5.99E-10	2.14E-10	5.63E-11	2.01E-11	--	1.6E+01	--	3.2E-10
Heptachlor	3.00E-01	5.99E-10	2.14E-10	1.80E-10	6.42E-11	--	4.6E+00	--	3.0E-10
Malathion	4.19E-01	5.99E-10	2.14E-10	2.51E-10	8.97E-11	--	--	--	--
Methoxychlor	2.40E+00	5.99E-10	2.14E-10	1.44E-09	5.14E-10	--	--	--	--
Benzo[a]anthracene	1.60E-01	5.99E-10	2.14E-10	9.58E-11	3.42E-11	--	--	--	--
Chrysene	4.50E-01	5.99E-10	2.14E-10	2.70E-10	9.63E-11	--	--	--	--
Phenanthrene	7.80E-01	5.99E-10	2.14E-10	4.67E-10	1.67E-10	--	--	--	--
Arsenic	1.60E+01	5.99E-10	2.14E-10	9.58E-09	3.42E-09	--	1.5E+01	--	5.2E-08
Barium	1.30E+02	5.99E-10	2.14E-10	7.79E-08	2.78E-08	1.4E-04	--	5.6E-04	--
Chromium	1.50E+01	5.99E-10	2.14E-10	8.99E-09	3.21E-09	--	4.1E+01	--	1.3E-07
Lead	5.40E+02	5.99E-10	2.14E-10	3.23E-07	1.16E-07	--	--	--	--
							TOTAL:	< 0.01	1.8E-07

CURRENT OCCUPATIONAL ADULT (DEH Yard Worker): Dermal Exposure to Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg\text{-}day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.60E-01	2.20E-04	7.86E-05	1.45E-04	5.19E-05	6.0E-05	1.3E+00	2.4E+00	6.7E-05
gamma-Chlordane	6.40E-01	2.20E-04	7.86E-05	1.41E-04	5.03E-05	6.0E-05	1.3E+00	2.3E+00	6.5E-05
4,4'-DDE	1.80E+00	2.20E-04	7.86E-05	3.96E-04	1.41E-04	--	3.4E-01	--	4.8E-05
Benzo[a]anthracene	1.60E-01	2.20E-04	7.86E-05	3.52E-05	1.26E-05	--	1.1E+00 *	--	1.4E-05
Chrysene	4.50E-01	2.20E-04	7.86E-05	9.90E-05	3.54E-05	--	2.9E-02 *	--	1.0E-06
Phenanthrene	7.80E-01	2.20E-04	7.86E-05	1.72E-04	6.13E-05	--	--	--	--
Arsenic	4.60E+00	2.20E-04	7.86E-05	1.01E-03	3.62E-04	3.0E-04	1.8E+00	3.4E+00	6.3E-04
Barium	1.20E+02	2.20E-04	7.86E-05	2.64E-02	9.43E-03	7.0E-02	--	3.8E-01	--
Chromium	1.50E+01	2.20E-04	7.86E-05	3.30E-03	1.18E-03	5.0E-03	--	6.6E-01	--
Lead	6.00E+01	2.20E-04	7.86E-05	1.32E-02	4.72E-03	--	--	--	--
							TOTAL:	9.2	8.3E-04

FUTURE OCCUPATIONAL ADULT (DEH Yard Worker): Dermal Exposure to Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg\text{-}day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	2.82E-04	1.01E-04	4.51E-04	1.62E-04	6.0E-05	1.3E+00	7.5E+00	2.1E-04
gamma-Chlordane	1.60E+00	2.82E-04	1.01E-04	4.51E-04	1.62E-04	6.0E-05	1.3E+00	7.5E+00	2.1E-04
4,4'-DDE	1.80E+00	2.82E-04	1.01E-04	5.08E-04	1.82E-04	--	3.4E-01	--	6.2E-05
4,4'-DDT	1.00E+00	2.82E-04	1.01E-04	2.82E-04	1.01E-04	5.0E-04	3.4E-01	5.6E-01	3.4E-05
Dieldrin	9.40E-02	2.82E-04	1.01E-04	2.65E-05	9.49E-06	5.0E-05	1.6E+01	5.3E-01	1.5E-04
Heptachlor	3.00E-01	2.82E-04	1.01E-04	8.46E-05	3.03E-05	5.0E-04	4.5E+00	1.7E-01	1.4E-04
Malathion	4.19E-01	2.82E-04	1.01E-04	1.18E-04	4.23E-05	2.0E-02	--	5.9E-03	--
Methoxychlor	2.40E+00	2.82E-04	1.01E-04	6.77E-04	2.42E-04	5.0E-03	--	1.4E-01	--
Benzo[a]anthracene	1.60E-01	2.82E-04	1.01E-04	4.51E-05	1.62E-05	--	1.1E+00 *	--	1.8E-05
Chrysene	4.50E-01	2.82E-04	1.01E-04	1.27E-04	4.55E-05	--	2.9E-02 *	--	1.3E-06
Phenanthrene	7.80E-01	2.82E-04	1.01E-04	2.20E-04	7.88E-05	--	--	--	--
Arsenic	1.60E+01	2.82E-04	1.01E-04	4.51E-03	1.62E-03	3.0E-04	1.8E+00	1.5E+01	2.9E-03
Barium	1.30E+02	2.82E-04	1.01E-04	3.67E-02	1.31E-02	7.0E-02	--	5.2E-01	--
Chromium	1.50E+01	2.82E-04	1.01E-04	4.23E-03	1.52E-03	5.0E-03	--	8.5E-01	--
Lead	5.40E+02	2.82E-04	1.01E-04	1.52E-01	5.45E-02	--	--	--	--
							TOTAL:	32.78	3.7E-03

* -- CSF is based on TEF, using B[a]P toxicity

CURRENT OCCUPATIONAL ADULT (Landscaper): Incidental Ingestion of Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.60E-01	4.70E-09	1.68E-09	3.10E-09	1.11E-09	6.0E-05	1.3E+00	5.2E-05	1.4E-09
gamma-Chlordane	6.40E-01	4.70E-09	1.68E-09	3.01E-09	1.08E-09	6.0E-05	1.3E+00	5.0E-05	1.4E-09
4,4'-DDE	1.80E+00	4.70E-09	1.68E-09	8.46E-09	3.02E-09	--	3.4E-01	--	1.0E-09
Benzo[a]anthracene	1.60E-01	4.70E-09	1.68E-09	7.52E-10	2.69E-10	--	1.1E+00 *	--	2.8E-10
Chrysene	4.50E-01	4.70E-09	1.68E-09	2.12E-09	7.56E-10	--	2.9E-02 *	--	2.2E-11
Phenanthrene	7.80E-01	4.70E-09	1.68E-09	3.67E-09	1.31E-09	--	--	--	--
Arsenic	4.60E+00	4.70E-09	1.68E-09	2.16E-08	7.73E-09	3.0E-04	1.8E+00	7.2E-05	1.4E-08
Barium	1.20E+02	4.70E-09	1.68E-09	5.64E-07	2.02E-07	7.0E-02	--	8.1E-06	--
Chromium	1.50E+01	4.70E-09	1.68E-09	7.05E-08	2.52E-08	5.0E-03	--	1.4E-05	--
Lead	6.00E+01	4.70E-09	1.68E-09	2.82E-07	1.01E-07	--	--	--	--
							TOTAL:	< 0.01	1.8E-08

CURRENT OCCUPATIONAL ADULT (Landscaper): Inhalation of Fugitive Dusts from Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.60E-01	5.99E-13	2.14E-13	3.95E-13	1.41E-13	--	1.3E+00	--	1.8E-13
gamma-Chlordane	6.40E-01	5.99E-13	2.14E-13	3.83E-13	1.37E-13	--	1.3E+00	--	1.8E-13
4,4'-DDE	1.80E+00	5.99E-13	2.14E-13	1.08E-12	3.85E-13	--	--	--	--
Benzo[a]anthracene	1.60E-01	5.99E-13	2.14E-13	9.58E-14	3.42E-14	--	--	--	--
Chrysene	4.50E-01	5.99E-13	2.14E-13	2.70E-13	9.63E-14	--	--	--	--
Phenanthrene	7.80E-01	5.99E-13	2.14E-13	4.67E-13	1.67E-13	--	--	--	--
Arsenic	4.60E+00	5.99E-13	2.14E-13	2.76E-12	9.84E-13	--	1.5E+01	--	1.5E-11
Barium	1.20E+02	5.99E-13	2.14E-13	7.19E-11	2.57E-11	1.4E-04	--	5.1E-07	--
Chromium	1.50E+01	5.99E-13	2.14E-13	8.99E-12	3.21E-12	--	4.1E+01	--	1.3E-10
Lead	6.00E+01	5.99E-13	2.14E-13	3.59E-11	1.28E-11	--	--	--	--
							TOTAL:	< 0.01	1.5E-10

* - CSF is based on TEF, using B[a]P toxicity

CURRENT OCCUPATIONAL ADULT (Landscaper): Dermal Contact with Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.60E-01	2.82E-07	1.01E-07	1.86E-07	6.67E-08	6.0E-05	1.3E+00	3.1E-03	8.7E-08
gamma-Chlordane	6.40E-01	2.82E-07	1.01E-07	1.80E-07	6.46E-08	6.0E-05	1.3E+00	3.0E-03	8.4E-08
4,4'-DDE	1.80E+00	2.82E-07	1.01E-07	5.08E-07	1.82E-07	--	3.4E-01	--	6.2E-08
Benzo[a]anthracene	1.60E-01	2.82E-07	1.01E-07	4.51E-08	1.62E-08	--	1.1E+00 *	--	1.7E-08
Chrysene	4.50E-01	2.82E-07	1.01E-07	1.27E-07	4.55E-08	--	2.9E-02 *	--	1.3E-09
Phenanthrene	7.80E-01	2.82E-07	1.01E-07	2.20E-07	7.88E-08	--	--	--	--
Arsenic	4.60E+00	2.82E-07	1.01E-07	1.30E-06	4.65E-07	3.0E-04	1.8E+00	4.3E-03	8.4E-07
Barium	1.20E+02	2.82E-07	1.01E-07	3.38E-05	1.21E-05	7.0E-02	--	4.8E-04	--
Chromium	1.50E+01	2.82E-07	1.01E-07	4.23E-06	1.52E-06	5.0E-03	--	8.5E-04	--
Lead	6.00E+01	2.82E-07	1.01E-07	1.69E-05	6.06E-06	--	--	--	--

TOTAL: 0.01 [1.1E-06]

* - CSF is based on TEF, using B[a]P toxicity

FUTURE OCCUPATIONAL ADULT (Landscaper): Incidental Ingestion of Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	1.88E-08	6.71E-09	3.01E-08	1.07E-08	6.0E-05	1.3E+00	5.0E-04	1.4E-08
gamma-Chlordane	1.60E+00	1.88E-08	6.71E-09	3.01E-08	1.07E-08	6.0E-05	1.3E+00	5.0E-04	1.4E-08
4,4'-DDE	1.80E+00	1.88E-08	6.71E-09	3.38E-08	1.21E-08	--	3.4E-01	--	4.1E-09
4,4'-DDT	1.00E+00	1.88E-08	6.71E-09	1.88E-08	6.71E-09	5.0E-04	3.4E-01	3.8E-05	2.3E-09
Dieldrin	9.40E-02	1.88E-08	6.71E-09	1.77E-09	6.31E-10	5.0E-05	1.6E+01	3.5E-05	1.0E-08
Heptachlor	3.00E-01	1.88E-08	6.71E-09	5.64E-09	2.01E-09	5.0E-04	4.5E+00	1.1E-05	9.1E-09
Malathion	4.19E-01	1.88E-08	6.71E-09	7.88E-09	2.81E-09	2.0E-02	--	3.9E-07	--
Methoxychlor	2.40E+00	1.88E-08	6.71E-09	4.51E-08	1.61E-08	5.0E-03	--	9.0E-06	--
Benzo[a]anthracene	1.60E-01	1.88E-08	6.71E-09	3.01E-09	1.07E-09	--	1.1E+00 *	--	1.1E-09
Chrysene	4.50E-01	1.88E-08	6.71E-09	8.46E-09	3.02E-09	--	2.9E-02 *	--	8.8E-11
Phenanthrene	7.80E-01	1.88E-08	6.71E-09	1.47E-08	5.23E-09	--	--	--	--
Arsenic	1.60E+01	1.88E-08	6.71E-09	3.01E-07	1.07E-07	3.0E-04	1.8E+00	1.0E-03	1.9E-07
Barium	1.30E+02	1.88E-08	6.71E-09	2.44E-06	8.72E-07	7.0E-02	--	3.5E-05	--
Chromium	1.50E+01	1.88E-08	6.71E-09	2.82E-07	1.01E-07	5.0E-03	--	5.6E-05	--
Lead	5.40E+02	1.88E-08	6.71E-09	1.02E-05	3.62E-06	--	--	--	--
							TOTAL:	<0.01	2.4E-07

FUTURE OCCUPATIONAL ADULT (Landscaper): Inhalation of Fugitive Dusts from Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	2.40E-12	8.55E-13	3.84E-12	1.37E-12	--	1.3E+00	--	1.8E-12
gamma-Chlordane	1.60E+00	2.40E-12	8.55E-13	3.84E-12	1.37E-12	--	1.3E+00	--	1.8E-12
4,4'-DDE	1.80E+00	2.40E-12	8.55E-13	4.32E-12	1.54E-12	--	--	--	--
4,4'-DDT	1.00E+00	2.40E-12	8.55E-13	2.40E-12	8.55E-13	--	3.4E-01	--	2.9E-13
Dieldrin	9.40E-02	2.40E-12	8.55E-13	2.26E-13	8.04E-14	--	1.6E+01	--	1.3E-12
Heptachlor	3.00E-01	2.40E-12	8.55E-13	7.20E-13	2.57E-13	--	4.6E+00	--	1.2E-12
Malathion	4.19E-01	2.40E-12	8.55E-13	1.01E-12	3.58E-13	--	--	--	--
Methoxychlor	2.40E+00	2.40E-12	8.55E-13	5.76E-12	2.05E-12	--	--	--	--
Benzo[a]anthracene	1.60E-01	2.40E-12	8.55E-13	3.84E-13	1.37E-13	--	--	--	--
Chrysene	4.50E-01	2.40E-12	8.55E-13	1.08E-12	3.85E-13	--	--	--	--
Phenanthrene	7.80E-01	2.40E-12	8.55E-13	1.87E-12	6.67E-13	--	--	--	--
Arsenic	1.60E+01	2.40E-12	8.55E-13	3.84E-11	1.37E-11	--	1.5E+01	--	2.1E-10
Barium	1.30E+02	2.40E-12	8.55E-13	3.12E-10	1.11E-10	1.4E-04	--	2.2E-06	--
Chromium	1.50E+01	2.40E-12	8.55E-13	3.60E-11	1.28E-11	--	4.1E+01	--	5.3E-10
Lead	5.40E+02	2.40E-12	8.55E-13	1.30E-09	4.62E-10	--	--	--	--
							TOTAL:	< 0.01	7.4E-10

* - CSF is based on TEF, using B[a]P toxicity

FUTURE OCCUPATIONAL ADULT (Landscaper): Dermal Contact with Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	1.13E-06	4.03E-07	1.81E-06	6.45E-07	6.0E-05	1.3E+00	3.0E-02	8.4E-07
gamma-Chlordane	1.60E+00	1.13E-06	4.03E-07	1.81E-06	6.45E-07	6.0E-05	1.3E+00	3.0E-02	8.4E-07
4,4'-DDE	1.80E+00	1.13E-06	4.03E-07	2.03E-06	7.25E-07	--	3.4E-01	--	2.5E-07
4,4'-DDT	1.00E+00	1.13E-06	4.03E-07	1.13E-06	4.03E-07	5.0E-04	3.4E-01	2.3E-03	1.4E-07
Dieldrin	9.40E-02	1.13E-06	4.03E-07	1.06E-07	3.79E-08	5.0E-05	1.6E+01	2.1E-03	6.1E-07
Heptachlor	3.00E-01	1.13E-06	4.03E-07	3.39E-07	1.21E-07	5.0E-04	4.5E+00	6.8E-04	5.4E-07
Malathion	4.19E-01	1.13E-06	4.03E-07	4.73E-07	1.69E-07	2.0E-02	--	2.4E-05	--
Methoxychlor	2.40E+00	1.13E-06	4.03E-07	2.71E-06	9.67E-07	5.0E-03	--	5.4E-04	--
Benzo[a]anthracene	1.60E-01	1.13E-06	4.03E-07	1.81E-07	6.45E-08	--	1.1E+00 *	--	7.1E-08
Chrysene	4.50E-01	1.13E-06	4.03E-07	5.09E-07	1.81E-07	--	2.9E-02 *	--	5.3E-09
Phenanthrene	7.80E-01	1.13E-06	4.03E-07	8.81E-07	3.14E-07	--	--	--	--
Arsenic	1.60E+01	1.13E-06	4.03E-07	1.81E-05	6.45E-06	3.0E-04	1.8E+00	6.0E-02	1.2E-05
Barium	1.30E+02	1.13E-06	4.03E-07	1.47E-04	5.24E-05	7.0E-02	--	2.1E-03	--
Chromium	1.50E+01	1.13E-06	4.03E-07	1.70E-05	6.05E-06	5.0E-03	--	3.4E-03	--
Lead	5.40E+02	1.13E-06	4.03E-07	6.10E-04	2.18E-04	--	--	--	--
							TOTAL:	0.13	1.2E-05

* CSF is based on TEF, using B[a]P toxicity

CURRENT OCCUPATIONAL ADULT (Utility Worker): Incidental Ingestion of Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	5.64E-09	2.01E-09	9.02E-09	3.22E-09	6.0E-05	1.3E+00	1.5E-04	4.2E-09
gamma-Chlordane	1.60E+00	5.64E-09	2.01E-09	9.02E-09	3.22E-09	6.0E-05	1.3E+00	1.5E-04	4.2E-09
4,4'-DDE	1.80E+00	5.64E-09	2.01E-09	1.02E-08	3.62E-09	--	3.4E-01	--	1.2E-09
4,4'-DDT	1.00E+00	5.64E-09	2.01E-09	5.64E-09	2.01E-09	5.0E-04	3.4E-01	1.1E-05	6.8E-10
Dieldrin	9.40E-02	5.64E-09	2.01E-09	5.30E-10	1.89E-10	5.0E-05	1.6E+01	1.1E-05	3.0E-09
Heptachlor	3.00E-01	5.64E-09	2.01E-09	1.69E-09	6.03E-10	5.0E-04	4.5E+00	3.4E-06	2.7E-09
Malathion	4.19E-01	5.64E-09	2.01E-09	2.36E-09	8.42E-10	2.0E-02	--	1.2E-07	--
Methoxychlor	2.40E+00	5.64E-09	2.01E-09	1.35E-08	4.82E-09	5.0E-03	--	2.7E-06	--
Benzo[a]anthracene	1.60E-01	5.64E-09	2.01E-09	9.02E-10	3.22E-10	--	1.1E+00 *	--	3.4E-10
Chrysene	4.50E-01	5.64E-09	2.01E-09	2.54E-09	9.05E-10	--	2.9E-02 *	--	2.6E-11
Phenanthrene	7.80E-01	5.64E-09	2.01E-09	4.40E-09	1.57E-09	--	--	--	--
Arsenic	1.60E+01	5.64E-09	2.01E-09	9.02E-08	3.22E-08	3.0E-04	1.8E+00	3.0E-04	5.6E-08
Barium	1.30E+02	5.64E-09	2.01E-09	7.33E-07	2.61E-07	7.0E-02	--	1.0E-05	--
Chromium	1.50E+01	5.64E-09	2.01E-09	8.46E-08	3.02E-08	5.0E-03	--	1.7E-05	--
Lead	5.40E+02	5.64E-09	2.01E-09	3.05E-06	1.09E-06	--	--	--	--
							TOTAL:	< 0.01	7.3E-08

CURRENT OCCUPATIONAL ADULT (Utility Worker): Inhalation of Fugitive Dusts from Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	7.19E-13	2.57E-13	1.15E-12	4.11E-13	--	1.3E+00	--	5.3E-13
gamma-Chlordane	1.60E+00	7.19E-13	2.57E-13	1.15E-12	4.11E-13	--	1.3E+00	--	5.3E-13
4,4'-DDE	1.80E+00	7.19E-13	2.57E-13	1.29E-12	4.63E-13	--	--	--	--
4,4'-DDT	1.00E+00	7.19E-13	2.57E-13	7.19E-13	2.57E-13	--	3.4E-01	--	8.7E-14
Dieldrin	9.40E-02	7.19E-13	2.57E-13	6.76E-14	2.42E-14	--	1.6E+01	--	3.9E-13
Heptachlor	3.00E-01	7.19E-13	2.57E-13	2.16E-13	7.71E-14	--	4.6E+00	--	3.5E-13
Malathion	4.19E-01	7.19E-13	2.57E-13	3.01E-13	1.08E-13	--	--	--	--
Methoxychlor	2.40E+00	7.19E-13	2.57E-13	1.73E-12	6.17E-13	--	--	--	--
Benzo[a]anthracene	1.60E-01	7.19E-13	2.57E-13	1.15E-13	4.11E-14	--	--	--	--
Chrysene	4.50E-01	7.19E-13	2.57E-13	3.24E-13	1.16E-13	--	--	--	--
Phenanthrene	7.80E-01	7.19E-13	2.57E-13	5.61E-13	2.00E-13	--	--	--	--
Arsenic	1.60E+01	7.19E-13	2.57E-13	1.15E-11	4.11E-12	--	1.5E+01	--	6.2E-11
Barium	1.30E+02	7.19E-13	2.57E-13	9.35E-11	3.34E-11	1.4E-04	--	6.7E-07	--
Chromium	1.50E+01	7.19E-13	2.57E-13	1.08E-11	3.86E-12	--	4.1E+01	--	1.6E-10
Lead	5.40E+02	7.19E-13	2.57E-13	3.88E-10	1.39E-10	--	--	--	--
							TOTAL:	< 0.01	2.2E-10

* - CSF is based on TEF, using B[a]P toxicity

CURRENT OCCUPATIONAL ADULT (Utility Worker): Dermal Contact with Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)⁻¹		
alpha-Chlordane	1.60E+00	3.38E-07	1.21E-07	5.41E-07	1.94E-07	6.0E-05	1.3E+00	9.0E-03	2.5E-07
gamma-Chlordane	1.60E+00	3.38E-07	1.21E-07	5.41E-07	1.94E-07	6.0E-05	1.3E+00	9.0E-03	2.5E-07
4,4'-DDE	1.80E+00	3.38E-07	1.21E-07	6.08E-07	2.18E-07	--	3.4E-01	--	7.4E-08
4,4'-DDT	1.00E+00	3.38E-07	1.21E-07	3.38E-07	1.21E-07	5.0E-04	3.4E-01	6.8E-04	4.1E-08
Dieldrin	9.40E-02	3.38E-07	1.21E-07	3.18E-08	1.14E-08	5.0E-05	1.6E+01	6.4E-04	1.8E-07
Heptachlor	3.00E-01	3.38E-07	1.21E-07	1.01E-07	3.63E-08	5.0E-04	4.5E+00	2.0E-04	1.6E-07
Malathion	4.19E-01	3.38E-07	1.21E-07	1.42E-07	5.07E-08	2.0E-02	--	7.1E-06	--
Methoxychlor	2.40E+00	3.38E-07	1.21E-07	8.11E-07	2.90E-07	5.0E-03	--	1.6E-04	--
Benzo[a]anthracene	1.60E-01	3.38E-07	1.21E-07	5.41E-08	1.94E-08	--	1.1E+00 *	--	2.1E-08
Chrysene	4.50E-01	3.38E-07	1.21E-07	1.52E-07	5.45E-08	--	2.9E-02 *	--	1.6E-09
Phenanthrene	7.80E-01	3.38E-07	1.21E-07	2.64E-07	9.44E-08	--	--	--	--
Arsenic	1.60E+01	3.38E-07	1.21E-07	5.41E-06	1.94E-06	3.0E-04	1.8E+00	1.8E-02	3.4E-06
Barium	1.30E+02	3.38E-07	1.21E-07	4.39E-05	1.57E-05	7.0E-02	--	6.3E-04	--
Chromium	1.50E+01	3.38E-07	1.21E-07	5.07E-06	1.82E-06	5.0E-03	--	1.0E-03	--
Lead	5.40E+02	3.38E-07	1.21E-07	1.83E-04	6.53E-05	--	--	--	--
							TOTAL:	0.04	4.4E-06

* - CSF is based on TEF, using B[a]P toxicity

FUTURE OCCUPATIONAL ADULT (Utility Worker): Incidental Ingestion of Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	2.10E-08	7.51E-09	3.36E-08	1.20E-08	6.0E-05	1.3E+00	5.6E-04	1.6E-08
gamma-Chlordane	1.60E+00	2.10E-08	7.51E-09	3.36E-08	1.20E-08	6.0E-05	1.3E+00	5.6E-04	1.6E-08
4,4'-DDE	1.80E+00	2.10E-08	7.51E-09	3.78E-08	1.35E-08	--	3.4E-01	--	4.6E-09
4,4'-DDT	1.00E+00	2.10E-08	7.51E-09	2.10E-08	7.51E-09	5.0E-04	3.4E-01	4.2E-05	2.6E-09
Dieldrin	9.40E-02	2.10E-08	7.51E-09	1.97E-09	7.06E-10	5.0E-05	1.6E+01	3.9E-05	1.1E-08
Heptachlor	3.00E-01	2.10E-08	7.51E-09	6.30E-09	2.25E-09	5.0E-04	4.5E+00	1.3E-05	1.0E-08
Malathion	4.19E-01	2.10E-08	7.51E-09	8.80E-09	3.15E-09	2.0E-02	--	4.4E-07	--
Methoxychlor	2.40E+00	2.10E-08	7.51E-09	5.04E-08	1.80E-08	5.0E-03	--	1.0E-05	--
Benzo[a]anthracene	1.60E-01	2.10E-08	7.51E-09	3.36E-09	1.20E-09	--	1.1E+00 *	--	1.3E-09
Chrysene	4.50E-01	2.10E-08	7.51E-09	9.45E-09	3.38E-09	--	2.9E-02 *	--	9.8E-11
Phenanthrene	7.80E-01	2.10E-08	7.51E-09	1.64E-08	5.86E-09	--	--	--	--
Arsenic	1.60E+01	2.10E-08	7.51E-09	3.36E-07	1.20E-07	3.0E-04	1.8E+00	1.1E-03	2.1E-07
Barium	1.30E+02	2.10E-08	7.51E-09	2.73E-06	9.76E-07	7.0E-02	--	3.9E-05	--
Chromium	1.50E+01	2.10E-08	7.51E-09	3.15E-07	1.13E-07	5.0E-03	--	6.3E-05	--
Lead	5.40E+02	2.10E-08	7.51E-09	1.13E-05	4.06E-06	--	--	--	--
							TOTAL:	< 0.01	2.7E-07

FUTURE OCCUPATIONAL ADULT (Utility Worker): Inhalation of Fugitive Dusts from Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	2.68E-12	9.71E-13	4.29E-12	1.55E-12	--	1.3E+00	--	2.0E-12
gamma-Chlordane	1.60E+00	2.68E-12	9.71E-13	4.29E-12	1.55E-12	--	1.3E+00	--	2.0E-12
4,4'-DDE	1.80E+00	2.68E-12	9.71E-13	4.82E-12	1.75E-12	--	--	--	--
4,4'-DDT	1.00E+00	2.68E-12	9.71E-13	2.68E-12	9.71E-13	--	3.4E-01	--	3.3E-13
Dieldrin	9.40E-02	2.68E-12	9.71E-13	2.52E-13	9.13E-14	--	1.6E+01	--	1.5E-12
Heptachlor	3.00E-01	2.68E-12	9.71E-13	8.04E-13	2.91E-13	--	4.6E+00	--	1.3E-12
Malathion	4.19E-01	2.68E-12	9.71E-13	1.12E-12	4.07E-13	--	--	--	--
Methoxychlor	2.40E+00	2.68E-12	9.71E-13	6.43E-12	2.33E-12	--	--	--	--
Benzo[a]anthracene	1.60E-01	2.68E-12	9.71E-13	4.29E-13	1.55E-13	--	--	--	--
Chrysene	4.50E-01	2.68E-12	9.71E-13	1.21E-12	4.37E-13	--	--	--	--
Phenanthrene	7.80E-01	2.68E-12	9.71E-13	2.09E-12	7.57E-13	--	--	--	--
Arsenic	1.60E+01	2.68E-12	9.71E-13	4.29E-11	1.55E-11	--	1.5E+01	--	2.3E-10
Barium	1.30E+02	2.68E-12	9.71E-13	3.48E-10	1.26E-10	1.4E-04	--	2.5E-06	--
Chromium	1.50E+01	2.68E-12	9.71E-13	4.02E-11	1.46E-11	--	4.1E+01	--	6.0E-10
Lead	5.40E+02	2.68E-12	9.71E-13	1.45E-09	5.24E-10	--	--	--	--
							TOTAL:	< 0.01	8.4E-10

* - CSF is based on TEF, using B[a]P toxicity

FUTURE OCCUPATIONAL ADULT (Utility Worker): Dermal Contact with Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)⁻¹		
alpha-Chlordane	1.60E+00	1.26E-06	4.51E-07	2.02E-06	7.22E-07	6.0E-05	1.3E+00	3.4E-02	9.4E-07
gamma-Chlordane	1.60E+00	1.26E-06	4.51E-07	2.02E-06	7.22E-07	6.0E-05	1.3E+00	3.4E-02	9.4E-07
4,4'-DDE	1.80E+00	1.26E-06	4.51E-07	2.27E-06	8.12E-07	--	3.4E-01	--	2.8E-07
4,4'-DDT	1.00E+00	1.26E-06	4.51E-07	1.26E-06	4.51E-07	5.0E-04	3.4E-01	2.5E-03	1.5E-07
Dieldrin	9.40E-02	1.26E-06	4.51E-07	1.18E-07	4.24E-08	5.0E-05	1.6E+01	2.4E-03	6.8E-07
Heptachlor	3.00E-01	1.26E-06	4.51E-07	3.78E-07	1.35E-07	5.0E-04	4.5E+00	7.6E-04	6.1E-07
Malathion	4.19E-01	1.26E-06	4.51E-07	5.28E-07	1.89E-07	2.0E-02	--	2.6E-05	--
Methoxychlor	2.40E+00	1.26E-06	4.51E-07	3.02E-06	1.08E-06	5.0E-03	--	6.0E-04	--
Benzo[a]anthracene	1.60E-01	1.26E-06	4.51E-07	2.02E-07	7.22E-08	--	1.1E+00 *	--	7.6E-08
Chrysene	4.50E-01	1.26E-06	4.51E-07	5.67E-07	2.03E-07	--	2.9E-02 *	--	5.9E-09
Phenanthrene	7.80E-01	1.26E-06	4.51E-07	9.83E-07	3.52E-07	--	--	--	--
Arsenic	1.60E+01	1.26E-06	4.51E-07	2.02E-05	7.22E-06	3.0E-04	1.8E+00	6.7E-02	1.3E-05
Barium	1.30E+02	1.26E-06	4.51E-07	1.64E-04	5.86E-05	7.0E-02	--	2.3E-03	--
Chromium	1.50E+01	1.26E-06	4.51E-07	1.89E-05	6.77E-06	5.0E-03	--	3.8E-03	--
Lead	5.40E+02	1.26E-06	4.51E-07	6.80E-04	2.44E-04	--	--	--	--
							TOTAL:	0.15	1.6E-05

1531.XX

* - CSF is based on TEF, using B[a]P toxicity

b:\risktbl\utlss-fu

FUTURE CONSTRUCTION WORKER: Incidental Ingestion of Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF $(mg/kg-day)^{-1}$		
alpha-Chlordane	1.60E+00	2.25E-06	3.22E-08	3.60E-06	5.15E-08	6.0E-05	1.3E+00	6.0E-02	6.7E-08
gamma-Chlordane	1.60E+00	2.25E-06	3.22E-08	3.60E-06	5.15E-08	6.0E-05	1.3E+00	6.0E-02	6.7E-08
4,4'-DDE	1.80E+00	2.25E-06	3.22E-08	4.05E-06	5.80E-08	--	3.4E-01	--	2.0E-08
4,4'-DDT	1.00E+00	2.25E-06	3.22E-08	2.25E-06	3.22E-08	5.0E-04	3.4E-01	4.5E-03	1.1E-08
Dieldrin	9.40E-02	2.25E-06	3.22E-08	2.12E-07	3.03E-09	5.0E-05	1.6E+01	4.2E-03	4.8E-08
Heptachlor	3.00E-01	2.25E-06	3.22E-08	6.75E-07	9.66E-09	5.0E-04	4.5E+00	1.4E-03	4.3E-08
Malathion	4.19E-01	2.25E-06	3.22E-08	9.43E-07	1.35E-08	2.0E-02	--	4.7E-05	--
Methoxychlor	2.40E+00	2.25E-06	3.22E-08	5.40E-06	7.73E-08	5.0E-03	--	1.1E-03	--
Benzo[a]anthracene	1.60E-01	2.25E-06	3.22E-08	3.60E-07	5.15E-09	--	1.1E+00 *	--	5.5E-09
Chrysene	4.50E-01	2.25E-06	3.22E-08	1.01E-06	1.45E-08	--	2.9E-02 *	--	4.2E-10
Phenanthrene	7.80E-01	2.25E-06	3.22E-08	1.76E-06	2.51E-08	--	--	--	--
Arsenic	1.60E+01	2.25E-06	3.22E-08	3.60E-05	5.15E-07	3.0E-04	1.8E+00	1.2E-01	9.0E-07
Barium	1.30E+02	2.25E-06	3.22E-08	2.93E-04	4.19E-06	7.0E-02	--	4.2E-03	--
Chromium	1.50E+01	2.25E-06	3.22E-08	3.38E-05	4.83E-07	5.0E-03	--	6.8E-03	--
Lead	5.40E+02	2.25E-06	3.22E-08	1.22E-03	1.74E-05	--	--	--	--
							TOTAL:	0.26	1.2E-06

FUTURE CONSTRUCTION WORKER: Inhalation of Fugitive Dusts from Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF $(mg/kg-day)^{-1}$		
alpha-Chlordane	1.60E+00	2.87E-10	4.11E-12	4.59E-10	6.58E-12	--	1.3E+00	--	8.5E-12
gamma-Chlordane	1.60E+00	2.87E-10	4.11E-12	4.59E-10	6.58E-12	--	1.3E+00	--	8.5E-12
4,4'-DDE	1.80E+00	2.87E-10	4.11E-12	5.17E-10	7.40E-12	--	--	--	--
4,4'-DDT	1.00E+00	2.87E-10	4.11E-12	2.87E-10	4.11E-12	--	3.4E-01	--	1.4E-12
Dieldrin	9.40E-02	2.87E-10	4.11E-12	2.70E-11	3.86E-13	--	1.6E+01	--	6.2E-12
Heptachlor	3.00E-01	2.87E-10	4.11E-12	8.61E-11	1.23E-12	--	4.6E+00	--	5.7E-12
Malathion	4.19E-01	2.87E-10	4.11E-12	1.20E-10	1.72E-12	--	--	--	--
Methoxychlor	2.40E+00	2.87E-10	4.11E-12	6.89E-10	9.86E-12	--	--	--	--
Benzo[a]anthracene	1.60E-01	2.87E-10	4.11E-12	4.59E-11	6.58E-13	--	--	--	--
Chrysene	4.50E-01	2.87E-10	4.11E-12	1.29E-10	1.85E-12	--	--	--	--
Phenanthrene	7.80E-01	2.87E-10	4.11E-12	2.24E-10	3.21E-12	--	--	--	--
Arsenic	1.60E+01	2.87E-10	4.11E-12	4.59E-09	6.58E-11	--	1.5E+01	--	9.9E-10
Barium	1.30E+02	2.87E-10	4.11E-12	3.73E-08	5.34E-10	1.4E-04	--	2.7E-04	--
Chromium	1.50E+01	2.87E-10	4.11E-12	4.31E-09	6.17E-11	--	4.1E+01	--	2.5E-09
Lead	5.40E+02	2.87E-10	4.11E-12	1.55E-07	2.22E-09	--	--	--	--
							TOTAL:	< 0.01	3.6E-09

* - CSF is based on TEF, using B[a]P toxicity

FUTURE CONSTRUCTION WORKER: Dermal Contact with Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	1.35E-04	1.93E-06	2.16E-04	3.09E-06	6.0E-05	1.3E+00	3.6E+00	4.0E-06
gamma-Chlordane	1.60E+00	1.35E-04	1.93E-06	2.16E-04	3.09E-06	6.0E-05	1.3E+00	3.6E+00	4.0E-06
4,4'-DDE	1.80E+00	1.35E-04	1.93E-06	2.43E-04	3.47E-06	--	3.4E-01	--	1.2E-06
4,4'-DDT	1.00E+00	1.35E-04	1.93E-06	1.35E-04	1.93E-06	5.0E-04	3.4E-01	2.7E-01	6.6E-07
Dieldrin	9.40E-02	1.35E-04	1.93E-06	1.27E-05	1.81E-07	5.0E-05	1.6E+01	2.5E-01	2.9E-06
Heptachlor	3.00E-01	1.35E-04	1.93E-06	4.05E-05	5.79E-07	5.0E-04	4.5E+00	8.1E-02	2.6E-06
Malathion	4.19E-01	1.35E-04	1.93E-06	5.66E-05	8.09E-07	2.0E-02	--	2.8E-03	--
Methoxychlor	2.40E+00	1.35E-04	1.93E-06	3.24E-04	4.63E-06	5.0E-03	--	6.5E-02	--
Benzo[a]anthracene	1.60E-01	1.35E-04	1.93E-06	2.16E-05	3.09E-07	--	1.1E+00 *	--	3.3E-07
Chrysene	4.50E-01	1.35E-04	1.93E-06	6.08E-05	8.69E-07	--	2.9E-02 *	--	2.5E-08
Phenanthrene	7.80E-01	1.35E-04	1.93E-06	1.05E-04	1.51E-06	--	--	--	--
Arsenic	1.60E+01	1.35E-04	1.93E-06	2.16E-03	3.09E-05	3.0E-04	1.8E+00	7.2E+00	5.4E-05
Barium	1.30E+02	1.35E-04	1.93E-06	1.76E-02	2.51E-04	7.0E-02	--	2.5E-01	--
Chromium	1.50E+01	1.35E-04	1.93E-06	2.03E-03	2.90E-05	5.0E-03	--	4.1E-01	--
Lead	5.40E+02	1.35E-04	1.93E-06	7.29E-02	1.04E-03	--	--	--	--
TOTAL:								15.73	7.0E-05

* – CSF is based on TEF, using B[a]P toxicity

CURRENT "RECREATIONAL" CHILD (Child Trespasser): Incidental Ingestion of Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Subchronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD_{sc} ** (mg/kg-day)	CSF $(mg/kg-day)^{-1}$		
alpha-Chlordane	6.60E-01	2.56E-07	--	1.69E-07	--	6.0E-05 (H)	1.3E+00	2.8E-03	--
gamma-Chlordane	6.40E-01	2.56E-07	--	1.64E-07	--	6.0E-05 (H)	1.3E+00	2.7E-03	--
4,4'-DDE	1.80E+00	2.56E-07	--	4.61E-07	--	--	3.4E-01	--	--
Benzo[a]anthracene	1.60E-01	2.56E-07	--	4.10E-08	--	--	1.1E+00 *	--	--
Chrysene	4.50E-01	2.56E-07	--	1.15E-07	--	--	2.9E-02 *	--	--
Phenanthrene	7.80E-01	2.56E-07	--	2.00E-07	--	--	--	--	--
Arsenic	4.60E+00	2.56E-07	--	1.18E-06	--	3.0E-04 (H)	1.8E+00	3.9E-03	--
Barium	1.20E+02	2.56E-07	--	3.07E-05	--	7.0E-02 (H)	--	4.4E-04	--
Chromium	1.50E+01	2.56E-07	--	3.84E-06	--	2.0E-02 (H)	--	1.9E-04	--
Lead	6.00E+01	2.56E-07	--	1.54E-05	--	--	--	--	--

TOTAL: 0.01 --

CURRENT "RECREATIONAL" CHILD (Child Trespasser): Inhalation of Fugitive Dusts from Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Subchronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD_{sc} ** (mg/kg-day)	CSF $(mg/kg-day)^{-1}$		
alpha-Chlordane	6.60E-01	8.44E-12	--	5.57E-12	--	--	1.3E+00	--	--
gamma-Chlordane	6.40E-01	8.44E-12	--	5.40E-12	--	--	1.3E+00	--	--
4,4'-DDE	1.80E+00	8.44E-12	--	1.52E-11	--	--	--	--	--
Benzo[a]anthracene	1.60E-01	8.44E-12	--	1.35E-12	--	--	--	--	--
Chrysene	4.50E-01	8.44E-12	--	3.80E-12	--	--	--	--	--
Phenanthrene	7.80E-01	8.44E-12	--	6.58E-12	--	--	--	--	--
Arsenic	4.60E+00	8.44E-12	--	3.88E-11	--	--	1.5E+01	--	--
Barium	1.20E+02	8.44E-12	--	1.01E-09	--	1.4E-03 (H)	--	7.2E-07	--
Chromium	1.50E+01	8.44E-12	--	1.27E-10	--	--	4.1E+01	--	--
Lead	6.00E+01	8.44E-12	--	5.06E-10	--	--	--	--	--

TOTAL: < 0.01 --

* - CSF is based on TEF, using B[a]P toxicity

CURRENT "RECREATIONAL" CHILD (Child Trespasser): Dermal Contact with Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Subchronic Intake (mg/kg-day) Noncarcinogen	Subchronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD_{sc} ** (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.60E-01	1.67E-05	--	1.10E-05	--	6.0E-05 (H)	1.3E+00	1.8E-01	--
gamma-Chlordane	6.40E-01	1.67E-05	--	1.07E-05	--	6.0E-05 (H)	1.3E+00	1.8E-01	--
4,4'-DDE	1.80E+00	1.67E-05	--	3.01E-05	--	--	3.4E-01	--	--
Benzo[a]anthracene	1.60E-01	1.67E-05	--	2.67E-06	--	--	1.1E+00 *	--	--
Chrysene	4.50E-01	1.67E-05	--	7.52E-06	--	--	2.9E-02 *	--	--
Phenanthrene	7.80E-01	1.67E-05	--	1.30E-05	--	--	--	--	--
Arsenic	4.60E+00	1.67E-05	--	7.68E-05	--	3.0E-04 (H)	1.8E+00	2.6E-01	--
Barium	1.20E+02	1.67E-05	--	2.00E-03	--	7.0E-02 (H)	--	2.9E-02	--
Chromium	1.50E+01	1.67E-05	--	2.51E-04	--	2.0E-02 (H)	--	1.3E-02	--
Lead	6.00E+01	1.67E-05	--	1.00E-03	--	--	--	--	--
							TOTAL:	0.66	--

* – CSF is based on TEF, using B[a]P toxicity

** – Subchronic RfDs (RfD_{sc}) are obtained from HEAST (the oral RfD_{sc} for chromium and the inhalation RfD_{sc} for barium are the only values that differ from the chronic RfD values)

* – CSF is based on TEF, using B[a]P toxicity

FUTURE *RECREATIONAL CHILD (Child Trespasser): Dermal Contact with Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	1.67E-05	--	2.67E-05	--	6.0E-05 (H)	1.3E+00	4.5E-01	--
gamma-Chlordane	1.60E+00	1.67E-05	--	2.67E-05	--	6.0E-05 (H)	1.3E+00	4.5E-01	--
4,4'-DDE	1.80E+00	1.67E-05	--	3.01E-05	--	--	3.4E-01	--	--
4,4'-DDT	1.00E+00	1.67E-05	--	1.67E-05	--	5.0E-04 (H)	3.4E-01	3.3E-02	--
Dieldrin	9.40E-02	1.67E-05	--	1.57E-06	--	5.0E-05 (H)	1.6E+01	3.1E-02	--
Heptachlor	3.00E-01	1.67E-05	--	5.01E-06	--	5.0E-04 (H)	4.5E+00	1.0E-02	--
Malathion	4.19E-01	1.67E-05	--	7.00E-06	--	2.0E-02 (H)	--	3.5E-04	--
Methoxychlor	2.40E+00	1.67E-05	--	4.01E-05	--	5.0E-03 (H)	--	8.0E-03	--
Benzo[a]anthracene	1.60E-01	1.67E-05	--	2.67E-06	--	--	1.1E+00 *	--	--
Chrysene	4.50E-01	1.67E-05	--	7.52E-06	--	--	2.9E-02 *	--	--
Phenanthrene	7.80E-01	1.67E-05	--	1.30E-05	--	--	--	--	--
Arsenic	1.60E+01	1.67E-05	--	2.67E-04	--	3.0E-04 (H)	1.8E+00	8.9E-01	--
Barium	1.30E+02	1.67E-05	--	2.17E-03	--	7.0E-02 (H)	--	3.1E-02	--
Chromium	1.50E+01	1.67E-05	--	2.51E-04	--	2.0E-02 (H)	--	1.3E-02	--
Lead	5.40E+02	1.67E-05	--	9.02E-03	--	--	--	--	--
							TOTAL:	1.91	--

* – CSF is based on TEF, using B[a]P toxicity

** – Subchronic RfDs (RfD_{sc}) are obtained from HEAST (chromium is the only constituents for which the subchronic RfD_{sc}'s differ from the chronic RfDs)

CURRENT OCCUPATIONAL ADULT (Landscaper): Incidental Ingestion of Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	4.70E-09	1.68E-09	2.82E-09	1.01E-09	6.0E-05	1.3E+00	4.7E-05	1.3E-09
gamma-Chlordane	5.70E-01	4.70E-09	1.68E-09	2.68E-09	9.58E-10	6.0E-05	1.3E+00	4.5E-05	1.2E-09
4,4'-DDD	8.50E-02	4.70E-09	1.68E-09	4.00E-10	1.43E-10	--	2.4E-01	--	3.4E-11
4,4'-DDE	3.30E-01	4.70E-09	1.68E-09	1.55E-09	5.54E-10	--	3.4E-01	--	1.9E-10
4,4'-DDT	3.90E+00	4.70E-09	1.68E-09	1.83E-08	6.55E-09	5.0E-04	3.4E-01	3.7E-05	2.2E-09
Dieldrin	5.70E-02	4.70E-09	1.68E-09	2.68E-10	9.58E-11	5.0E-05	1.6E+01	5.4E-06	1.5E-09
Endrin aldehyde	1.40E-02	4.70E-09	1.68E-09	6.58E-11	2.35E-11	3.0E-04 (a)	--	2.2E-07	--
Heptachlor	4.30E-02	4.70E-09	1.68E-09	2.02E-10	7.22E-11	5.0E-04	4.5E+00	4.0E-07	3.3E-10
Heptachlor epoxide	5.40E-03	4.70E-09	1.68E-09	2.54E-11	9.07E-12	1.3E-05	9.1E+00	2.0E-06	8.3E-11
Methoxychlor	4.90E-01	4.70E-09	1.68E-09	2.30E-09	8.23E-10	5.0E-03	--	4.6E-07	--
Anthracene	1.50E-01	4.70E-09	1.68E-09	7.05E-10	2.52E-10	3.0E-01	--	2.4E-09	--
Benzo[a]anthracene	3.20E-01	4.70E-09	1.68E-09	1.50E-09	5.38E-10	--	1.1E+00 *	--	5.7E-10
Benzo[a] pyrene	2.60E-01	4.70E-09	1.68E-09	1.22E-09	4.37E-10	--	7.3E+00	--	3.2E-09
Benzo[b]fluoranthene	3.10E-01	4.70E-09	1.68E-09	1.46E-09	5.21E-10	--	1.0E+00 *	--	5.2E-10
Benzo[k]fluoranthene	2.90E-01	4.70E-09	1.68E-09	1.36E-09	4.87E-10	--	4.8E-01 *	--	2.3E-10
Chrysene	3.30E-01	4.70E-09	1.68E-09	1.55E-09	5.54E-10	--	2.9E-02 *	--	1.6E-11
Dibenzofuran	6.50E-02	4.70E-09	1.68E-09	3.06E-10	1.09E-10	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	4.70E-09	1.68E-09	9.87E-10	3.53E-10	--	1.7E+00 *	--	6.0E-10
2-Methylnaphthalene	8.00E-02	4.70E-09	1.68E-09	3.76E-10	1.34E-10	--	--	--	--
Phenanthrene	3.70E-01	4.70E-09	1.68E-09	1.74E-09	6.22E-10	--	--	--	--
Arsenic	6.40E+00	4.70E-09	1.68E-09	3.01E-08	1.08E-08	3.0E-04	1.8E+00	1.0E-04	1.9E-08
Cadmium	4.90E-01	4.70E-09	1.68E-09	2.30E-09	8.23E-10	1.0E-03 (f)	--	2.3E-06	--
Chromium	9.70E+00	4.70E-09	1.68E-09	4.56E-08	1.63E-08	5.0E-03	--	9.1E-06	--
Lead	1.49E+02	4.70E-09	1.68E-09	7.00E-07	2.50E-07	--	--	--	--
Mercury	1.30E-01	4.70E-09	1.68E-09	6.11E-10	2.18E-10	3.0E-04 (H)	--	2.0E-06	--
							TOTAL:	<0.01	3.1E-08

* - CSF is based on TEF, using B[a]P toxicity
a - Value is for endrin
f - Value is for cadmium in food
H - Value obtained from HEAST

CURRENT OCCUPATIONAL ADULT (Landscaper): Inhalation of Fugitive Dusts from Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	5.99E-13	2.14E-13	3.59E-13	1.28E-13	--	1.3E+00	--	1.7E-13
gamma-Chlordane	5.70E-01	5.99E-13	2.14E-13	3.41E-13	1.22E-13	--	1.3E+00	--	1.6E-13
4,4'-DDD	8.50E-02	5.99E-13	2.14E-13	5.09E-14	1.82E-14	--	--	--	--
4,4'-DDE	3.30E-01	5.99E-13	2.14E-13	1.98E-13	7.06E-14	--	--	--	--
4,4'-DDT	3.90E+00	5.99E-13	2.14E-13	2.34E-12	8.35E-13	--	3.4E-01	--	2.8E-13
Dieldrin	5.70E-02	5.99E-13	2.14E-13	3.41E-14	1.22E-14	--	1.6E+01	--	2.0E-13
Endrin aldehyde	1.40E-02	5.99E-13	2.14E-13	8.39E-15	3.00E-15	--	--	--	--
Heptachlor	4.30E-02	5.99E-13	2.14E-13	2.58E-14	9.20E-15	--	4.6E+00	--	4.2E-14
Heptachlor epoxide	5.40E-03	5.99E-13	2.14E-13	3.23E-15	1.16E-15	--	9.1E+00	--	1.1E-14
Methoxychlor	4.90E-01	5.99E-13	2.14E-13	2.94E-13	1.05E-13	--	--	--	--
Anthracene	1.50E-01	5.99E-13	2.14E-13	8.99E-14	3.21E-14	--	--	--	--
Benzo[a]anthracene	3.20E-01	5.99E-13	2.14E-13	1.92E-13	6.85E-14	--	--	--	--
Benzo[a] pyrene	2.60E-01	5.99E-13	2.14E-13	1.56E-13	5.56E-14	--	--	--	--
Benzo[b]fluoranthene	3.10E-01	5.99E-13	2.14E-13	1.86E-13	6.63E-14	--	--	--	--
Benzo[k]fluoranthene	2.90E-01	5.99E-13	2.14E-13	1.74E-13	6.21E-14	--	--	--	--
Chrysene	3.30E-01	5.99E-13	2.14E-13	1.98E-13	7.06E-14	--	--	--	--
Dibenzofuran	6.50E-02	5.99E-13	2.14E-13	3.89E-14	1.39E-14	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	5.99E-13	2.14E-13	1.26E-13	4.49E-14	--	--	--	--
2-Methylnaphthalene	8.00E-02	5.99E-13	2.14E-13	4.79E-14	1.71E-14	--	--	--	--
Phenanthrene	3.70E-01	5.99E-13	2.14E-13	2.22E-13	7.92E-14	--	--	--	--
Arsenic	6.40E+00	5.99E-13	2.14E-13	3.83E-12	1.37E-12	--	1.5E+01	--	2.1E-11
Cadmium	4.90E-01	5.99E-13	2.14E-13	2.94E-13	1.05E-13	--	6.1E+00	--	6.4E-13
Chromium	9.70E+00	5.99E-13	2.14E-13	5.81E-12	2.08E-12	--	4.1E+01	--	8.5E-11
Lead	1.49E+02	5.99E-13	2.14E-13	8.93E-11	3.19E-11	--	--	--	--
Mercury	1.30E-01	5.99E-13	2.14E-13	7.79E-14	2.78E-14	8.6E-05 (H)	--	9.1E-10	--
							TOTAL:	<0.01	1.1E-10

* -- CSF is based on TEF, using B[a]P toxicity
H -- Value obtained from HEAST

CURRENT OCCUPATIONAL ADULT (Landscaper): Dermal Contact with Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	2.82E-07	1.01E-07	1.69E-07	6.06E-08	6.0E-05	1.3E+00	2.8E-03	7.9E-08
gamma-Chlordane	5.70E-01	2.82E-07	1.01E-07	1.61E-07	5.76E-08	6.0E-05	1.3E+00	2.7E-03	7.5E-08
4,4'-DDD	8.50E-02	2.82E-07	1.01E-07	2.40E-08	8.59E-09	--	2.4E-01	--	2.1E-09
4,4'-DDE	3.30E-01	2.82E-07	1.01E-07	9.31E-08	3.33E-08	--	3.4E-01	--	1.1E-08
4,4'-DDT	3.90E+00	2.82E-07	1.01E-07	1.10E-06	3.94E-07	5.0E-04	3.4E-01	2.2E-03	1.3E-07
Dieldrin	5.70E-02	2.82E-07	1.01E-07	1.61E-08	5.76E-09	5.0E-05	1.6E+01	3.2E-04	9.2E-08
Endrin aldehyde	1.40E-02	2.82E-07	1.01E-07	3.95E-09	1.41E-09	3.0E-04 (a)	--	1.3E-05	--
Heptachlor	4.30E-02	2.82E-07	1.01E-07	1.21E-08	4.34E-09	5.0E-04	4.5E+00	2.4E-05	2.0E-08
Heptachlor epoxide	5.40E-03	2.82E-07	1.01E-07	1.52E-09	5.45E-10	1.3E-05	9.1E+00	1.2E-04	5.0E-09
Methoxychlor	4.90E-01	2.82E-07	1.01E-07	1.38E-07	4.95E-08	5.0E-03	--	2.8E-05	--
Anthracene	1.50E-01	2.82E-07	1.01E-07	4.23E-08	1.52E-08	3.0E-01	--	1.4E-07	--
Benzo[a]anthracene	3.20E-01	2.82E-07	1.01E-07	9.02E-08	3.23E-08	--	1.1E+00 *	--	3.4E-08
Benzo[a]pyrene	2.60E-01	2.82E-07	1.01E-07	7.33E-08	2.63E-08	--	7.3E+00	--	1.9E-07
Benzo[b]fluoranthene	3.10E-01	2.82E-07	1.01E-07	8.74E-08	3.13E-08	--	1.0E+00 *	--	3.2E-08
Benzo[k]fluoranthene	2.90E-01	2.82E-07	1.01E-07	8.18E-08	2.93E-08	--	4.8E-01 *	--	1.4E-08
Chrysene	3.30E-01	2.82E-07	1.01E-07	9.31E-08	3.33E-08	--	2.9E-02 *	--	9.7E-10
Dibenzofuran	6.50E-02	2.82E-07	1.01E-07	1.83E-08	6.57E-09	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	2.82E-07	1.01E-07	5.92E-08	2.12E-08	--	1.7E+00 *	--	3.6E-08
2-Methylnaphthalene	8.00E-02	2.82E-07	1.01E-07	2.26E-08	8.08E-09	--	--	--	--
Phenanthrene	3.70E-01	2.82E-07	1.01E-07	1.04E-07	3.74E-08	--	--	--	--
Arsenic	6.40E+00	2.82E-07	1.01E-07	1.80E-06	6.46E-07	3.0E-04	1.8E+00	6.0E-03	1.1E-06
Cadmium	4.90E-01	2.82E-07	1.01E-07	1.38E-07	4.95E-08	1.0E-03 (f)	--	1.4E-04	--
Chromium	9.70E+00	2.82E-07	1.01E-07	2.74E-06	9.80E-07	5.0E-03	--	5.5E-04	--
Lead	1.49E+02	2.82E-07	1.01E-07	4.20E-05	1.50E-05	--	--	--	--
Mercury	1.30E-01	2.82E-07	1.01E-07	3.67E-08	1.31E-08	3.0E-04 (H)	--	1.2E-04	--
							TOTAL:	0.02	1.9E-06

* - CSF is based on TEF, using B[a]P toxicity

FUTURE OCCUPATIONAL ADULT (Landscaper): Incidental Ingestion of Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha Chlordane	6.00E-01	1.88E-08	6.71E-09	1.13E-08	4.03E-09	6.0E-05	1.3E+00	1.9E-04	5.2E-09
gamma-Chlordane	5.70E-01	1.88E-08	6.71E-09	1.07E-08	3.82E-09	6.0E-05	1.3E+00	1.8E-04	5.0E-09
4,4'-DDD	8.50E-02	1.88E-08	6.71E-09	1.60E-09	5.70E-10	--	2.4E-01	--	1.4E-10
4,4'-DDE	3.30E-01	1.88E-08	6.71E-09	6.20E-09	2.21E-09	--	3.4E-01	--	7.5E-10
4,4'-DDT	3.90E+00	1.88E-08	6.71E-09	7.33E-08	2.62E-08	5.0E-04	3.4E-01	1.5E-04	8.9E-09
Dieldrin	5.70E-02	1.88E-08	6.71E-09	1.07E-09	3.82E-10	5.0E-05	1.6E+01	2.1E-05	6.1E-09
Endrin aldehyde	1.40E-02	1.88E-08	6.71E-09	2.63E-10	9.39E-11	3.0E-04 (a)	--	8.8E-07	--
Heptachlor	4.30E-02	1.88E-08	6.71E-09	8.08E-10	2.89E-10	5.0E-04	4.5E+00	1.6E-06	1.3E-09
Heptachlor epoxide	5.40E-03	1.88E-08	6.71E-09	1.02E-10	3.62E-11	1.3E-05	9.1E+00	7.8E-06	3.3E-10
Methoxychlor	4.90E-01	1.88E-08	6.71E-09	9.21E-09	3.29E-09	5.0E-03	--	1.8E-06	--
Anthracene	1.50E-01	1.88E-08	6.71E-09	2.82E-09	1.01E-09	3.0E-01	--	9.4E-09	--
Benzo[a]anthracene	3.20E-01	1.88E-08	6.71E-09	6.02E-09	2.15E-09	--	1.1E+00 *	--	2.3E-09
Benzo[a] pyrene	2.60E-01	1.88E-08	6.71E-09	4.89E-09	1.74E-09	--	7.3E+00	--	1.3E-08
Benzo[b]fluoranthene	3.10E-01	1.88E-08	6.71E-09	5.83E-09	2.08E-09	--	1.0E+00 *	--	2.1E-09
Benzo[k]fluoranthene	2.90E-01	1.88E-08	6.71E-09	5.45E-09	1.95E-09	--	4.8E-01 *	--	9.3E-10
Chrysene	3.30E-01	1.88E-08	6.71E-09	6.20E-09	2.21E-09	--	2.9E-02 *	--	6.4E-11
Dibenzofuran	6.50E-02	1.88E-08	6.71E-09	1.22E-09	4.36E-10	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	1.88E-08	6.71E-09	3.95E-09	1.41E-09	--	1.7E+00 *	--	2.4E-09
2-Methylnaphthalene	8.00E-02	1.88E-08	6.71E-09	1.50E-09	5.37E-10	--	--	--	--
Phenanthrene	3.70E-01	1.88E-08	6.71E-09	6.96E-09	2.48E-09	--	--	--	--
Arsenic	6.40E+00	1.88E-08	6.71E-09	1.20E-07	4.29E-08	3.0E-04	1.8E+00	4.0E-04	7.7E-08
Cadmium	4.90E-01	1.88E-08	6.71E-09	9.21E-09	3.29E-09	1.0E-03 (f)	--	9.2E-06	--
Chromium	9.70E+00	1.88E-08	6.71E-09	1.82E-07	6.51E-08	5.0E-03	--	3.6E-05	--
Lead	1.49E+02	1.88E-08	6.71E-09	2.80E-06	1.00E-06	--	--	--	--
Mercury	1.30E-01	1.88E-08	6.71E-09	2.44E-09	8.72E-10	3.0E-04 (H)	--	8.1E-06	--
TOTAL:								< 0.01	1.3E-07

* -- CSF is based on TEF, using B[a]P toxicity
a - Value is for endrin
f - Value is for cadmium in food
H - Value obtained from HEAST

FUTURE OCCUPATIONAL ADULT (Landscaper): Inhalation of Fugitive Dusts from Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	2.40E-12	8.55E-13	1.44E-12	5.13E-13	--	1.3E+00	--	6.7E-13
gamma-Chlordane	5.70E-01	2.40E-12	8.55E-13	1.37E-12	4.87E-13	--	1.3E+00	--	6.3E-13
4,4'-DDD	8.50E-02	2.40E-12	8.55E-13	2.04E-13	7.27E-14	--	--	--	--
4,4'-DDE	3.30E-01	2.40E-12	8.55E-13	7.92E-13	2.82E-13	--	--	--	--
4,4'-DDT	3.90E+00	2.40E-12	8.55E-13	9.36E-12	3.33E-12	--	3.4E-01	--	1.1E-12
Dieldrin	5.70E-02	2.40E-12	8.55E-13	1.37E-13	4.87E-14	--	1.6E+01	--	7.8E-13
Endrin aldehyde	1.40E-02	2.40E-12	8.55E-13	3.36E-14	1.20E-14	--	--	--	--
Heptachlor	4.30E-02	2.40E-12	8.55E-13	1.03E-13	3.68E-14	--	4.6E+00	--	1.7E-13
Heptachlor epoxide	5.40E-03	2.40E-12	8.55E-13	1.30E-14	4.62E-15	--	9.1E+00	--	4.2E-14
Methoxychlor	4.90E-01	2.40E-12	8.55E-13	1.18E-12	4.19E-13	--	--	--	--
Anthracene	1.50E-01	2.40E-12	8.55E-13	3.60E-13	1.28E-13	--	--	--	--
Benzo[a]anthracene	3.20E-01	2.40E-12	8.55E-13	7.68E-13	2.74E-13	--	--	--	--
Benzo[a] pyrene	2.60E-01	2.40E-12	8.55E-13	6.24E-13	2.22E-13	--	--	--	--
Benzo[b]fluoranthene	3.10E-01	2.40E-12	8.55E-13	7.44E-13	2.65E-13	--	--	--	--
Benzo[k]fluoranthene	2.90E-01	2.40E-12	8.55E-13	6.96E-13	2.48E-13	--	--	--	--
Chrysene	3.30E-01	2.40E-12	8.55E-13	7.92E-13	2.82E-13	--	--	--	--
Dibenzofuran	6.50E-02	2.40E-12	8.55E-13	1.56E-13	5.56E-14	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	2.40E-12	8.55E-13	5.04E-13	1.80E-13	--	--	--	--
2-Methylnaphthalene	8.00E-02	2.40E-12	8.55E-13	1.92E-13	6.84E-14	--	--	--	--
Phenanthrene	3.70E-01	2.40E-12	8.55E-13	8.88E-13	3.16E-13	--	--	--	--
Arsenic	6.40E+00	2.40E-12	8.55E-13	1.54E-11	5.47E-12	--	1.5E+01	--	8.3E-11
Cadmium	4.90E-01	2.40E-12	8.55E-13	1.18E-12	4.19E-13	--	6.1E+00	--	2.6E-12
Chromium	9.70E+00	2.40E-12	8.55E-13	2.33E-11	8.29E-12	--	4.1E+01	--	3.4E-10
Lead	1.49E+02	2.40E-12	8.55E-13	3.58E-10	1.27E-10	--	--	--	--
Mercury	1.30E-01	2.40E-12	8.55E-13	3.12E-13	1.11E-13	8.6E-05 (H)	--	3.6E-09	--
							TOTAL:	<0.01	4.3E-10

* -- CSF is based on TEF, using B[a]P toxicity
H -- Value obtained from HEAST

FUTURE OCCUPATIONAL ADULT (Landscaper): Dermal Contact with Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	1.13E-06	4.03E-07	6.78E-07	2.42E-07	6.0E-05	1.3E+00	1.1E-02	3.1E-07
gamma-Chlordane	5.70E-01	1.13E-06	4.03E-07	6.44E-07	2.30E-07	6.0E-05	1.3E+00	1.1E-02	3.0E-07
4,4'-DDD	8.50E-02	1.13E-06	4.03E-07	9.61E-08	3.43E-08	--	2.4E-01	--	8.2E-09
4,4'-DDE	3.30E-01	1.13E-06	4.03E-07	3.73E-07	1.33E-07	--	3.4E-01	--	4.5E-08
4,4'-DDT	3.90E+00	1.13E-06	4.03E-07	4.41E-06	1.57E-06	5.0E-04	3.4E-01	8.8E-03	5.3E-07
Dieldrin	5.70E-02	1.13E-06	4.03E-07	6.44E-08	2.30E-08	5.0E-05	1.6E+01	1.3E-03	3.7E-07
Endrin aldehyde	1.40E-02	1.13E-06	4.03E-07	1.58E-08	5.64E-09	3.0E-04 (a)	--	5.3E-05	--
Heptachlor	4.30E-02	1.13E-06	4.03E-07	4.86E-08	1.73E-08	5.0E-04	4.5E+00	9.7E-05	7.8E-08
Heptachlor epoxide	5.40E-03	1.13E-06	4.03E-07	6.10E-09	2.18E-09	1.3E-05	9.1E+00	4.7E-04	2.0E-08
Methoxychlor	4.90E-01	1.13E-06	4.03E-07	5.54E-07	1.97E-07	5.0E-03	--	1.1E-04	--
Anthracene	1.50E-01	1.13E-06	4.03E-07	1.70E-07	6.05E-08	3.0E-01	--	5.7E-07	--
Benzo[a]anthracene	3.20E-01	1.13E-06	4.03E-07	3.62E-07	1.29E-07	--	1.1E+00 *	--	1.4E-07
Benzo[a] pyrene	2.60E-01	1.13E-06	4.03E-07	2.94E-07	1.05E-07	--	7.3E+00	--	7.6E-07
Benzo[b]fluoranthene	3.10E-01	1.13E-06	4.03E-07	3.50E-07	1.25E-07	--	1.0E+00 *	--	1.3E-07
Benzo[k]fluoranthene	2.90E-01	1.13E-06	4.03E-07	3.28E-07	1.17E-07	--	4.8E-01 *	--	5.6E-08
Chrysene	3.30E-01	1.13E-06	4.03E-07	3.73E-07	1.33E-07	--	2.9E-02 *	--	3.9E-09
Dibenzofuran	6.50E-02	1.13E-06	4.03E-07	7.35E-08	2.62E-08	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	1.13E-06	4.03E-07	2.37E-07	8.46E-08	--	1.7E+00 *	--	1.4E-07
2-Methylnaphthalene	8.00E-02	1.13E-06	4.03E-07	9.04E-08	3.22E-08	--	--	--	--
Phenanthrene	3.70E-01	1.13E-06	4.03E-07	4.18E-07	1.49E-07	--	--	--	--
Arsenic	6.40E+00	1.13E-06	4.03E-07	7.23E-06	2.58E-06	3.0E-04	1.8E+00	2.4E-02	4.5E-06
Cadmium	4.90E-01	1.13E-06	4.03E-07	5.54E-07	1.97E-07	1.0E-03 (f)	--	5.5E-04	--
Chromium	9.70E+00	1.13E-06	4.03E-07	1.10E-05	3.91E-06	5.0E-03	--	2.2E-03	--
Lead	1.49E+02	1.13E-06	4.03E-07	1.68E-04	6.00E-05	--	--	--	--
Mercury	1.30E-01	1.13E-06	4.03E-07	1.47E-07	5.24E-08	3.0E-04 (H)	--	4.9E-04	--
							TOTAL:	0.1	7.4E-06

* -- CSF is based on TEF, using B[a]P toxicity

CURRENT OCCUPATIONAL ADULT (Utility Worker): Incidental Ingestion of Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	5.64E-09	2.01E-09	3.38E-09	1.21E-09	6.0E-05	1.3E+00	5.6E-05	1.6E-09
gamma-Chlordane	5.70E-01	5.64E-09	2.01E-09	3.21E-09	1.15E-09	6.0E-05	1.3E+00	5.4E-05	1.5E-09
4,4'-DDD	8.50E-02	5.64E-09	2.01E-09	4.79E-10	1.71E-10	--	2.4E-01	--	4.1E-11
4,4'-DDE	3.30E-01	5.64E-09	2.01E-09	1.86E-09	6.63E-10	--	3.4E-01	--	2.3E-10
4,4'-DDT	3.90E+00	5.64E-09	2.01E-09	2.20E-08	7.84E-09	5.0E-04	3.4E-01	4.4E-05	2.7E-09
Dieldrin	5.70E-02	5.64E-09	2.01E-09	3.21E-10	1.15E-10	5.0E-05	1.6E+01	6.4E-06	1.8E-09
Endrin Aldehyde	1.40E-02	5.64E-09	2.01E-09	7.90E-11	2.81E-11	3.0E-04 (a)	--	2.6E-07	--
Heptachlor	4.30E-02	5.64E-09	2.01E-09	2.43E-10	8.64E-11	5.0E-04	4.5E+00	4.9E-07	3.9E-10
Heptachlor epoxide	5.40E-03	5.64E-09	2.01E-09	3.05E-11	1.09E-11	1.3E-05	9.1E+00	2.3E-06	9.9E-11
Methoxychlor	4.90E-01	5.64E-09	2.01E-09	2.76E-09	9.85E-10	5.0E-03	--	5.5E-07	--
Anthracene	1.50E-01	5.64E-09	2.01E-09	8.46E-10	3.01E-10	3.0E-01	--	2.8E-09	--
Benzo[a]anthracene	3.20E-01	5.64E-09	2.01E-09	1.80E-09	6.43E-10	--	1.1E+00 *	--	7.0E-10
Benzo[a]pyrene	2.60E-01	5.64E-09	2.01E-09	1.47E-09	5.23E-10	--	7.3E+00	--	3.8E-09
Benzo[b]fluoranthene	3.10E-01	5.64E-09	2.01E-09	1.75E-09	6.23E-10	--	1.0E+00 *	--	6.2E-10
Benzo[k]fluoranthene	2.90E-01	5.64E-09	2.01E-09	1.64E-09	5.83E-10	--	4.8E-01 *	--	2.8E-10
Chrysene	3.30E-01	5.64E-09	2.01E-09	1.86E-09	6.63E-10	--	2.9E-02 *	--	1.9E-11
Dibenzofuran	6.50E-02	5.64E-09	2.01E-09	3.67E-10	1.31E-10	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	5.64E-09	2.01E-09	1.18E-09	4.22E-10	--	1.7E+00 *	--	7.2E-10
2-Methylnaphthalene	8.00E-02	5.64E-09	2.01E-09	4.51E-10	1.61E-10	--	--	--	--
Phenanthrene	3.70E-01	5.64E-09	2.01E-09	2.09E-09	7.44E-10	--	--	--	--
Arsenic	6.40E+00	5.64E-09	2.01E-09	3.61E-08	1.29E-08	3.0E-04	1.8E+00	1.2E-04	2.3E-08
Cadmium	4.90E-01	5.64E-09	2.01E-09	2.76E-09	9.85E-10	1.0E-03 (f)	--	2.8E-06	--
Chromium	9.70E+00	5.64E-09	2.01E-09	5.47E-08	1.95E-08	5.0E-03	--	1.1E-05	--
Lead	1.49E+02	5.64E-09	2.01E-09	8.40E-07	2.99E-07	--	--	--	--
Mercury	1.30E-01	5.64E-09	2.01E-09	7.33E-10	2.61E-10	3.0E-04 (H)	--	2.4E-06	--
							TOTAL:	< 0.01	3.7E-08

* - CSF is based on TEF, using B[a]P toxicity
a - Value is for endrin
f - Value is for cadmium in food
H - Value obtained from HEAST

CURRENT OCCUPATIONAL ADULT (Utility Worker): Inhalation of Fugitive Dusts from Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	7.19E-13	2.57E-13	4.31E-13	1.54E-13	--	1.3E+00	--	2.0E-13
gamma-Chlordane	5.70E-01	7.19E-13	2.57E-13	4.10E-13	1.46E-13	--	1.3E+00	--	1.9E-13
4,4'-DDD	8.50E-02	7.19E-13	2.57E-13	6.11E-14	2.18E-14	--	--	--	--
4,4'-DDE	3.30E-01	7.19E-13	2.57E-13	2.37E-13	8.48E-14	--	--	--	--
4,4'-DDT	3.90E+00	7.19E-13	2.57E-13	2.80E-12	1.00E-12	--	3.4E-01	--	3.4E-13
Dieldrin	5.70E-02	7.19E-13	2.57E-13	4.10E-14	1.46E-14	--	1.6E+01	--	2.3E-13
Endrin Aldehyde	1.40E-02	7.19E-13	2.57E-13	1.01E-14	3.60E-15	--	--	--	--
Heptachlor	4.30E-02	7.19E-13	2.57E-13	3.09E-14	1.11E-14	--	4.6E+00	--	5.1E-14
Heptachlor epoxide	5.40E-03	7.19E-13	2.57E-13	3.88E-15	1.39E-15	--	9.1E+00	--	1.3E-14
Methoxychlor	4.90E-01	7.19E-13	2.57E-13	3.52E-13	1.26E-13	--	--	--	--
Anthracene	1.50E-01	7.19E-13	2.57E-13	1.08E-13	3.86E-14	--	--	--	--
Benzo[a]anthracene	3.20E-01	7.19E-13	2.57E-13	2.30E-13	8.22E-14	--	--	--	--
Benzo[a]pyrene	2.60E-01	7.19E-13	2.57E-13	1.87E-13	6.68E-14	--	--	--	--
Benzo[b]fluoranthene	3.10E-01	7.19E-13	2.57E-13	2.23E-13	7.97E-14	--	--	--	--
Benzo[k]fluoranthene	2.90E-01	7.19E-13	2.57E-13	2.09E-13	7.45E-14	--	--	--	--
Chrysene	3.30E-01	7.19E-13	2.57E-13	2.37E-13	8.48E-14	--	--	--	--
Dibenzofuran	6.50E-02	7.19E-13	2.57E-13	4.67E-14	1.67E-14	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	7.19E-13	2.57E-13	1.51E-13	5.40E-14	--	--	--	--
2-Methylnaphthalene	8.00E-02	7.19E-13	2.57E-13	5.75E-14	2.06E-14	--	--	--	--
Phenanthrene	3.70E-01	7.19E-13	2.57E-13	2.66E-13	9.51E-14	--	--	--	--
Arsenic	6.40E+00	7.19E-13	2.57E-13	4.60E-12	1.64E-12	--	1.5E+01	--	2.5E-11
Cadmium	4.90E-01	7.19E-13	2.57E-13	3.52E-13	1.26E-13	--	6.1E+00	--	7.7E-13
Chromium	9.70E+00	7.19E-13	2.57E-13	6.97E-12	2.49E-12	--	4.1E+01	--	1.0E-10
Lead	1.49E+02	7.19E-13	2.57E-13	1.07E-10	3.83E-11	--	--	--	--
Mercury	1.30E-01	7.19E-13	2.57E-13	9.35E-14	3.34E-14	8.6E-05 (H)	--	1.1E-09	--
							TOTAL:	<0.01	1.3E-10

* CSF is based on TEF, using B[a]P toxicity
H - Value obtained from HEAST

CURRENT OCCUPATIONAL ADULT (Utility Worker): Dermal Contact with Subsurface Soils

Parameter	Exposure Point Concentration	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index	Cancer Risk
	(mg/kg)	Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF $(mg/kg-day)^{-1}$	(unitless)	(unitless)
alpha-Chlordane	6.00E-01	3.38E-07	1.21E-07	2.03E-07	7.26E-08	6.0E-05	1.3E+00	3.4E-03	9.4E-08
gamma-Chlordane	5.70E-01	3.38E-07	1.21E-07	1.93E-07	6.90E-08	6.0E-05	1.3E+00	3.2E-03	9.0E-08
4,4'-DDD	8.50E-02	3.38E-07	1.21E-07	2.87E-08	1.03E-08	--	2.4E-01	--	2.5E-09
4,4'-DDE	3.30E-01	3.38E-07	1.21E-07	1.12E-07	3.99E-08	--	3.4E-01	--	1.4E-08
4,4'-DDT	3.90E+00	3.38E-07	1.21E-07	1.32E-06	4.72E-07	5.0E-04	3.4E-01	2.6E-03	1.6E-07
Dieldrin	5.70E-02	3.38E-07	1.21E-07	1.93E-08	6.90E-09	5.0E-05	1.6E+01	3.9E-04	1.1E-07
Endrin Aldehyde	1.40E-02	3.38E-07	1.21E-07	4.73E-09	1.69E-09	3.0E-04 (a)	--	1.6E-05	--
Heptachlor	4.30E-02	3.38E-07	1.21E-07	1.45E-08	5.20E-09	5.0E-04	4.5E+00	2.9E-05	2.3E-08
Heptachlor epoxide	5.40E-03	3.38E-07	1.21E-07	1.83E-09	6.53E-10	1.3E-05	9.1E+00	1.4E-04	5.9E-09
Methoxychlor	4.90E-01	3.38E-07	1.21E-07	1.66E-07	5.93E-08	5.0E-03	--	3.3E-05	--
Anthracene	1.50E-01	3.38E-07	1.21E-07	5.07E-08	1.82E-08	3.0E-01	--	1.7E-07	--
Benzo[a]anthracene	3.20E-01	3.38E-07	1.21E-07	1.08E-07	3.87E-08	--	1.1E+00 *	--	4.1E-08
Benzo[a]pyrene	2.60E-01	3.38E-07	1.21E-07	8.79E-08	3.15E-08	--	7.3E+00	--	2.3E-07
Benzo[b]fluoranthene	3.10E-01	3.38E-07	1.21E-07	1.05E-07	3.75E-08	--	1.0E+00 *	--	3.8E-08
Benzo[k]fluoranthene	2.90E-01	3.38E-07	1.21E-07	9.80E-08	3.51E-08	--	4.8E-01 *	--	1.7E-08
Chrysene	3.30E-01	3.38E-07	1.21E-07	1.12E-07	3.99E-08	--	2.9E-02 *	--	1.2E-09
Dibenzofuran	6.50E-02	3.38E-07	1.21E-07	2.20E-08	7.87E-09	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	3.38E-07	1.21E-07	7.10E-08	2.54E-08	--	1.7E+00 *	--	4.3E-08
2-Methylnaphthalene	8.00E-02	3.38E-07	1.21E-07	2.70E-08	9.68E-09	--	--	--	--
Phenanthrene	3.70E-01	3.38E-07	1.21E-07	1.25E-07	4.48E-08	--	--	--	--
Arsenic	6.40E+00	3.38E-07	1.21E-07	2.16E-06	7.74E-07	3.0E-04	1.8E+00	7.2E-03	1.4E-06
Cadmium	4.90E-01	3.38E-07	1.21E-07	1.66E-07	5.93E-08	1.0E-03 (f)	--	1.7E-04	--
Chromium	9.70E+00	3.38E-07	1.21E-07	3.28E-06	1.17E-06	5.0E-03	--	6.6E-04	--
Lead	1.49E+02	3.38E-07	1.21E-07	5.04E-05	1.80E-05	--	--	--	--
Mercury	1.30E-01	3.38E-07	1.21E-07	4.39E-08	1.57E-08	3.0E-04 (H)	--	1.5E-04	--
							TOTAL:	0.02	2.3E-06

* - CSF is based on TEF, using B[a]P toxicity
a - Value is for endrin
f - Value is for cadmium in food
H - Value obtained from HEAST

FUTURE OCCUPATIONAL ADULT (Utility Worker): Incidental Ingestion of Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)⁻¹		
alpha-Chlordane	6.00E-01	2.10E-08	7.51E-09	1.26E-08	4.51E-09	6.0E-05	1.3E+00	2.1E-04	5.9E-09
gamma-Chlordane	5.70E-01	2.10E-08	7.51E-09	1.20E-08	4.28E-09	6.0E-05	1.3E+00	2.0E-04	5.6E-09
4,4'-DDD	8.50E-02	2.10E-08	7.51E-09	1.79E-09	6.38E-10	--	2.4E-01	--	1.5E-10
4,4'-DDE	3.30E-01	2.10E-08	7.51E-09	6.93E-09	2.48E-09	--	3.4E-01	--	8.4E-10
4,4'-DDT	3.90E+00	2.10E-08	7.51E-09	8.19E-08	2.93E-08	5.0E-04	3.4E-01	1.6E-04	1.0E-08
Dieldrin	5.70E-02	2.10E-08	7.51E-09	1.20E-09	4.28E-10	5.0E-05	1.6E+01	2.4E-05	6.8E-09
Endrin aldehyde	1.40E-02	2.10E-08	7.51E-09	2.94E-10	1.05E-10	3.0E-04 (a)	--	9.8E-07	--
Heptachlor	4.30E-02	2.10E-08	7.51E-09	9.03E-10	3.23E-10	5.0E-04	4.5E+00	1.8E-06	1.5E-09
Heptachlor epoxide	5.40E-03	2.10E-08	7.51E-09	1.13E-10	4.06E-11	1.3E-05	9.1E+00	8.7E-06	3.7E-10
Methoxychlor	4.90E-01	2.10E-08	7.51E-09	1.03E-08	3.68E-09	5.0E-03	--	2.1E-06	--
Anthracene	1.50E-01	2.10E-08	7.51E-09	3.15E-09	1.13E-09	3.0E-01	--	1.1E-08	--
Benzo[a]anthracene	3.20E-01	2.10E-08	7.51E-09	6.72E-09	2.40E-09	--	1.1E+00 *	--	2.5E-09
Benzo[a]pyrene	2.60E-01	2.10E-08	7.51E-09	5.46E-09	1.95E-09	--	7.3E+00	--	1.4E-08
Benzo[b]fluoranthene	3.10E-01	2.10E-08	7.51E-09	6.51E-09	2.33E-09	--	1.0E+00 *	--	2.4E-09
Benzo[k]fluoranthene	2.90E-01	2.10E-08	7.51E-09	6.09E-09	2.18E-09	--	4.8E-01 *	--	1.0E-09
Chrysene	3.30E-01	2.10E-08	7.51E-09	6.93E-09	2.48E-09	--	2.9E-02 *	--	7.2E-11
Dibenzofuran	6.50E-02	2.10E-08	7.51E-09	1.37E-09	4.88E-10	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	2.10E-08	7.51E-09	4.41E-09	1.58E-09	--	1.7E+00 *	--	2.7E-09
2-Methylnaphthalene	8.00E-02	2.10E-08	7.51E-09	1.68E-09	6.01E-10	--	--	--	--
Phenanthrene	3.70E-01	2.10E-08	7.51E-09	7.77E-09	2.78E-09	--	--	--	--
Arsenic	6.40E+00	2.10E-08	7.51E-09	1.34E-07	4.81E-08	3.0E-04	1.8E+00	4.5E-04	8.4E-08
Cadmium	4.90E-01	2.10E-08	7.51E-09	1.03E-08	3.68E-09	1.0E-03 (f)	--	1.0E-05	--
Chromium	9.70E+00	2.10E-08	7.51E-09	2.04E-07	7.28E-08	5.0E-03	--	4.1E-05	--
Lead	1.49E+02	2.10E-08	7.51E-09	3.13E-06	1.12E-06	--	--	--	--
Mercury	1.30E-01	2.10E-08	7.51E-09	2.73E-09	9.76E-10	3.0E-04 (H)	--	9.1E-06	--
							TOTAL:	< 0.01	1.4E-07

* - CSF is based on TEF, using B[a]P toxicity
a - Value is for endrin
f - Value is for cadmium in food
H - Value obtained from HEAST

FUTURE OCCUPATIONAL ADULT (Utility Worker): Inhalation of Fugitive Dusts from Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	2.68E-12	9.71E-13	1.61E-12	5.83E-13	--	1.3E+00	--	7.6E-13
gamma-Chlordane	5.70E-01	2.68E-12	9.71E-13	1.53E-12	5.53E-13	--	1.3E+00	--	7.2E-13
4,4'-DDD	8.50E-02	2.68E-12	9.71E-13	2.28E-13	8.25E-14	--	--	--	--
4,4'-DDE	3.30E-01	2.68E-12	9.71E-13	8.84E-13	3.20E-13	--	--	--	--
4,4'-DDT	3.90E+00	2.68E-12	9.71E-13	1.05E-11	3.79E-12	--	3.4E-01	--	1.3E-12
Dieldrin	5.70E-02	2.68E-12	9.71E-13	1.53E-13	5.53E-14	--	1.6E+01	--	8.9E-13
Endrin aldehyde	1.40E-02	2.68E-12	9.71E-13	3.75E-14	1.36E-14	--	--	--	--
Heptachlor	4.30E-02	2.68E-12	9.71E-13	1.15E-13	4.18E-14	--	4.6E+00	--	1.9E-13
Heptachlor epoxide	5.40E-03	2.68E-12	9.71E-13	1.45E-14	5.24E-15	--	9.1E+00	--	4.8E-14
Methoxychlor	4.90E-01	2.68E-12	9.71E-13	1.31E-12	4.76E-13	--	--	--	--
Anthracene	1.50E-01	2.68E-12	9.71E-13	4.02E-13	1.46E-13	--	--	--	--
Benzo[a]anthracene	3.20E-01	2.68E-12	9.71E-13	8.58E-13	3.11E-13	--	--	--	--
Benzo[a]pyrene	2.60E-01	2.68E-12	9.71E-13	6.97E-13	2.52E-13	--	--	--	--
Benzo[b]fluoranthene	3.10E-01	2.68E-12	9.71E-13	8.31E-13	3.01E-13	--	--	--	--
Benzo[k]fluoranthene	2.90E-01	2.68E-12	9.71E-13	7.77E-13	2.82E-13	--	--	--	--
Chrysene	3.30E-01	2.68E-12	9.71E-13	8.84E-13	3.20E-13	--	--	--	--
Dibenzofuran	6.50E-02	2.68E-12	9.71E-13	1.74E-13	6.31E-14	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	2.68E-12	9.71E-13	5.63E-13	2.04E-13	--	--	--	--
2-Methylnaphthalene	8.00E-02	2.68E-12	9.71E-13	2.14E-13	7.77E-14	--	--	--	--
Phenanthrene	3.70E-01	2.68E-12	9.71E-13	9.92E-13	3.59E-13	--	--	--	--
Arsenic	6.40E+00	2.68E-12	9.71E-13	1.72E-11	6.21E-12	--	1.5E+01	--	9.4E-11
Cadmium	4.90E-01	2.68E-12	9.71E-13	1.31E-12	4.76E-13	--	6.1E+00	--	2.9E-12
Chromium	9.70E+00	2.68E-12	9.71E-13	2.60E-11	9.42E-12	--	4.1E+01	--	3.9E-10
Lead	1.49E+02	2.68E-12	9.71E-13	3.99E-10	1.45E-10	--	--	--	--
Mercury	1.30E-01	2.68E-12	9.71E-13	3.48E-13	1.26E-13	8.6E-05 (H)	--	4.1E-09	--
							TOTAL:	<0.01	4.9E-10

* -- CSF is based on TEF, using B[a]P toxicity
H -- Value obtained from HEAST

FUTURE OCCUPATIONAL ADULT (Utility Worker): Dermal Contact with Subsurface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	6.00E-01	1.26E-06	4.51E-07	7.56E-07	2.71E-07	6.0E-05	1.3E+00	1.3E-02	3.5E-07
gamma-Chlordane	5.70E-01	1.26E-06	4.51E-07	7.18E-07	2.57E-07	6.0E-05	1.3E+00	1.2E-02	3.3E-07
4,4'-DDD	8.50E-02	1.26E-06	4.51E-07	1.07E-07	3.83E-08	--	2.4E-01	--	9.2E-09
4,4'-DDE	3.30E-01	1.26E-06	4.51E-07	4.16E-07	1.49E-07	--	3.4E-01	--	5.1E-08
4,4'-DDT	3.90E+00	1.26E-06	4.51E-07	4.91E-06	1.76E-06	5.0E-04	3.4E-01	9.8E-03	6.0E-07
Dieldrin	5.70E-02	1.26E-06	4.51E-07	7.18E-08	2.57E-08	5.0E-05	1.6E+01	1.4E-03	4.1E-07
Endrin aldehyde	1.40E-02	1.26E-06	4.51E-07	1.76E-08	6.31E-09	3.0E-04 (a)	--	5.9E-05	--
Heptachlor	4.30E-02	1.26E-06	4.51E-07	5.42E-08	1.94E-08	5.0E-04	4.5E+00	1.1E-04	8.7E-08
Heptachlor epoxide	5.40E-03	1.26E-06	4.51E-07	6.80E-09	2.44E-09	1.3E-05	9.1E+00	5.2E-04	2.2E-08
Methoxychlor	4.90E-01	1.26E-06	4.51E-07	6.17E-07	2.21E-07	5.0E-03	--	1.2E-04	--
Anthracene	1.50E-01	1.26E-06	4.51E-07	1.89E-07	6.77E-08	3.0E-01	--	6.3E-07	--
Benzo[a]anthracene	3.20E-01	1.26E-06	4.51E-07	4.03E-07	1.44E-07	--	1.1E+00 *	--	1.5E-07
Benzo[a]pyrene	2.60E-01	1.26E-06	4.51E-07	3.28E-07	1.17E-07	--	7.3E+00	--	8.6E-07
Benzo[b]fluoranthene	3.10E-01	1.26E-06	4.51E-07	3.91E-07	1.40E-07	--	1.0E+00 *	--	1.4E-07
Benzo[k]fluoranthene	2.90E-01	1.26E-06	4.51E-07	3.65E-07	1.31E-07	--	4.8E-01 *	--	6.3E-08
Chrysene	3.30E-01	1.26E-06	4.51E-07	4.16E-07	1.49E-07	--	2.9E-02 *	--	4.3E-09
Dibenzofuran	6.50E-02	1.26E-06	4.51E-07	8.19E-08	2.93E-08	--	--	--	--
Indeno[1,2,3-cd]pyrene	2.10E-01	1.26E-06	4.51E-07	2.65E-07	9.47E-08	--	1.7E+00 *	--	1.6E-07
2-Methylnaphthalene	8.00E-02	1.26E-06	4.51E-07	1.01E-07	3.61E-08	--	--	--	--
Phenanthrene	3.70E-01	1.26E-06	4.51E-07	4.66E-07	1.67E-07	--	--	--	--
Arsenic	6.40E+00	1.26E-06	4.51E-07	8.06E-06	2.89E-06	3.0E-04	1.8E+00	2.7E-02	5.1E-06
Cadmium	4.90E-01	1.26E-06	4.51E-07	6.17E-07	2.21E-07	1.0E-03 (f)	--	6.2E-04	--
Chromium	9.70E+00	1.26E-06	4.51E-07	1.22E-05	4.37E-06	5.0E-03	--	2.4E-03	--
Lead	1.49E+02	1.26E-06	4.51E-07	1.88E-04	6.72E-05	--	--	--	--
Mercury	1.30E-01	1.26E-06	4.51E-07	1.64E-07	5.86E-08	3.0E-04 (H)	--	5.5E-04	--
							TOTAL:	0.07	8.3E-06

* -- CSF is based on TEF, using B[a]P toxicity
a -- Value is for endrin
f -- Value is for cadmium in food
H -- Value obtained from HEAST

FUTURE RESIDENTIAL ADULT: Ingestion of Ground Water

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	2.70E-01	2.74E-02	1.17E-02	7.40E-03	3.16E-03	--	--	--	--
Arsenic	1.60E-02	2.74E-02	1.17E-02	4.38E-04	1.87E-04	3.0E-04	1.8E+00	1.5E+00	3.3E-04
Barium	1.30E-01	2.74E-02	1.17E-02	3.56E-03	1.52E-03	7.0E-02	--	5.1E-02	--
Beryllium	3.00E-03	2.74E-02	1.17E-02	8.22E-05	3.51E-05	5.0E-03	4.3E+00	1.6E-02	1.5E-04
Chromium	1.20E-02	2.74E-02	1.17E-02	3.29E-04	1.40E-04	5.0E-03	--	6.6E-02	--
Manganese	9.10E-02	2.74E-02	1.17E-02	2.49E-03	1.06E-03	5.0E-03 (W)	--	5.0E-01	--
Vanadium	2.70E-02	2.74E-02	1.17E-02	7.40E-04	3.16E-04	7.0E-03 (H)	--	1.1E-01	--
Inorganic Chloride	2.70E+02	2.74E-02	1.17E-02	7.40E+00	3.16E+00	--	--	--	--
Nitrate	3.30E+01	2.74E-02	1.17E-02	9.04E-01	3.86E-01	--	--	--	--
Sulfate	3.90E+02	2.74E-02	1.17E-02	1.07E+01	4.56E+00	--	--	--	--
Bicarbonate, as $CaCO_3$	4.90E+02	2.74E-02	1.17E-02	1.34E+01	5.73E+00	--	--	--	--
							TOTAL:	2.24	4.8E-04

FUTURE RESIDENTIAL ADULT: Dermal Contact with Ground Water

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	2.70E-01	5.32E-05	2.28E-05	1.44E-05	6.16E-06	--	--	--	--
Arsenic	1.60E-02	5.32E-05	2.28E-05	8.51E-07	3.65E-07	3.0E-04	1.8E+00	2.8E-03	6.4E-07
Barium	1.30E-01	5.32E-05	2.28E-05	6.92E-06	2.96E-06	7.0E-02	--	9.9E-05	--
Beryllium	3.00E-03	5.32E-05	2.28E-05	1.60E-07	6.84E-08	5.0E-03	4.3E+00	3.2E-05	2.9E-07
Chromium	1.20E-02	5.32E-05	2.28E-05	6.38E-07	2.74E-07	5.0E-03	--	1.3E-04	--
Manganese	9.10E-02	5.32E-05	2.28E-05	4.84E-06	2.07E-06	5.0E-03 (W)	--	9.7E-04	--
Vanadium	2.70E-02	5.32E-05	2.28E-05	1.44E-06	6.16E-07	7.0E-03 (H)	--	2.1E-04	--
Inorganic Chloride	2.70E+02	5.32E-05	2.28E-05	1.44E-02	6.16E-03	--	--	--	--
Nitrate	3.30E+01	5.32E-05	2.28E-05	1.76E-03	7.52E-04	--	--	--	--
Sulfate	3.90E+02	5.32E-05	2.28E-05	2.07E-02	8.89E-03	--	--	--	--
Bicarbonate, as $CaCO_3$	4.90E+02	5.32E-05	2.28E-05	2.61E-02	1.12E-02	--	--	--	--
							TOTAL:	< 0.01	9.3E-07

W - RfD value is for manganese in water

FUTURE RESIDENTIAL CHILD: Ingestion of Ground Water – Risk

Parameter	Exposure Point Concentration (mg/L)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CFS $(mg/kg–day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	4.40E–01	1.28E–01	--	5.63E–02	--	--	--	--	--
Arsenic	3.95E–03	1.28E–01	--	5.06E–04	--	3.00E–04	1.80E+00	1.69E+00	--
Barium	1.05E–01	1.28E–01	--	1.34E–02	--	7.00E–02	--	1.91E–01	--
Beryllium	2.76E–03	1.28E–01	--	3.53E–04	--	5.00E–03	4.30E+00	7.07E–02	--
Chromium	6.96E–03	1.28E–01	--	8.91E–04	--	2.00E–02	--	4.45E–02	--
Manganese	5.68E–02	1.28E–01	--	7.28E–03	--	5.00E–03	--	1.46E+00	--
Nitrate	1.65E+02	1.28E–01	--	2.11E+01	--	1.60E+00	--	1.32E+01	--
Thallium	2.90E–03	1.28E–01	--	3.71E–04	--	8.00E–05	--	4.64E+00	--
Vanadium	9.67E–03	1.28E–01	--	1.24E–03	--	7.00E–03	--	1.77E–01	--
							TOTAL	2.15E+01	--

FUTURE RESIDENTIAL CHILD: Dermal Contact with Ground Water – Risk

Parameter	Exposure Point Concentration (mg/L)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CFS $(mg/kg–day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	4.40E–01	1.11E–04	--	4.88E–05	--	--	--	--	--
Arsenic	3.95E–03	1.11E–04	--	4.38E–07	--	3.00E–04	1.80E+00	1.46E–03	--
Barium	1.05E–01	1.11E–04	--	1.16E–05	--	7.00E–02	--	1.66E–04	--
Beryllium	2.76E–03	1.11E–04	--	3.06E–07	--	5.00E–03	4.30E+00	6.13E–05	--
Chromium	6.96E–03	1.11E–04	--	7.73E–07	--	2.00E–02	--	3.86E–05	--
Manganese	5.68E–02	1.11E–04	--	6.31E–06	--	5.00E–03	--	1.26E–03	--
Nitrate	1.65E+02	1.11E–04	--	1.83E–02	--	1.60E+00	--	1.14E–02	--
Thallium	2.90E–03	1.11E–04	--	3.22E–07	--	8.00E–05	--	4.02E–03	--
Vanadium	9.67E–03	1.11E–04	--	1.07E–06	--	7.00E–03	--	1.53E–04	--
							TOTAL	1.86E–02	--

FUTURE RESIDENTIAL ADULT: Ingestion of Ground Water – Risk

Parameter	Exposure Point Concentration (mg/L)	Intake (day^{-1})		Chronic Intake (mg/kg–day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg–day)	CFS $(mg/kg–day)^{-1}$		
Aluminum	4.40E–01	2.74E–02	1.17E–02	1.21E–02	5.15E–03	––	––	––	––
Arsenic	3.95E–03	2.74E–02	1.17E–02	1.08E–04	4.62E–05	3.00E–04	1.80E+00	3.61E–01	8.32E–05
Barium	1.05E–01	2.74E–02	1.17E–02	2.87E–03	1.22E–03	7.00E–02	––	4.10E–02	––
Beryllium	2.76E–03	2.74E–02	1.17E–02	7.56E–05	3.23E–05	5.00E–03	4.30E+00	1.51E–02	1.39E–04
Chromium	6.96E–03	2.74E–02	1.17E–02	1.91E–04	8.14E–05	5.00E–03	––	3.81E–02	––
Manganese	5.68E–02	2.74E–02	1.17E–02	1.56E–03	6.65E–04	5.00E–03	––	3.11E–01	––
Nitrate	1.65E+02	2.74E–02	1.17E–02	4.52E+00	1.93E+00	1.60E+00	––	2.83E+00	––
Thallium	2.90E–03	2.74E–02	1.17E–02	7.95E–05	3.39E–05	8.00E–05	––	9.93E–01	––
Vanadium	9.67E–03	2.74E–02	1.17E–02	2.65E–04	1.13E–04	7.00E–03	––	3.79E–02	––
							TOTAL	4.62E+00	2.22E–04

FUTURE RESIDENTIAL ADULT: Dermal Contact with Ground Water – Risk

Parameter	Exposure Point Concentration (mg/L)	Intake (day^{-1})		Chronic Intake (mg/kg–day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg–day)	CFS $(mg/kg–day)^{-1}$		
Aluminum	4.40E–01	5.32E–05	2.28E–05	2.34E–05	1.00E–05	––	––	––	––
Arsenic	3.95E–03	5.32E–05	2.28E–05	2.10E–07	9.01E–08	3.00E–04	1.80E+00	7.00E–04	1.62E–07
Barium	1.05E–01	5.32E–05	2.28E–05	5.57E–06	2.39E–06	7.00E–02	––	7.96E–05	––
Beryllium	2.76E–03	5.32E–05	2.28E–05	1.47E–07	6.29E–08	5.00E–03	4.30E+00	2.94E–05	2.71E–07
Chromium	6.96E–03	5.32E–05	2.28E–05	3.70E–07	1.59E–07	5.00E–03	––	7.41E–05	––
Manganese	5.68E–02	5.32E–05	2.28E–05	3.02E–06	1.30E–06	5.00E–03	––	6.05E–04	––
Nitrate	1.65E+02	5.32E–05	2.28E–05	8.78E–03	3.76E–03	1.60E+00	––	5.49E–03	––
Thallium	2.90E–03	5.32E–05	2.28E–05	1.54E–07	6.61E–08	8.00E–05	––	1.93E–03	––
Vanadium	9.67E–03	5.32E–05	2.28E–05	5.14E–07	2.20E–07	7.00E–03	––	7.35E–05	––
							TOTAL	8.98E–03	4.33E–07

CURRENT OCCUPATIONAL ADULT (DEH Yard Worker): Dermal Contact with Surface Water

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	1.20E+01	5.80E-07	2.07E-07	6.96E-06	2.48E-06	--	--	--	--
Arsenic	4.40E-03	5.80E-07	2.07E-07	2.55E-09	9.11E-10	3.0E-04	1.8E+00	8.5E-06	1.6E-09
Barium	2.90E-01	5.80E-07	2.07E-07	1.68E-07	6.00E-08	7.0E-02	--	2.4E-06	--
Cadmium	4.10E-03	5.80E-07	2.07E-07	2.38E-09	8.49E-10	5.0E-04 (w)	--	4.8E-06	--
Chromium	2.40E-02	5.80E-07	2.07E-07	1.39E-08	4.97E-09	5.0E-03	--	2.8E-06	--
Copper	1.30E-02	5.80E-07	2.07E-07	7.54E-09	2.69E-09	--	--	--	--
Lead	4.20E-03	2.32E-09 *	8.28E-10 *	9.74E-12	3.48E-12	--	--	--	--
Manganese	1.90E-01	5.80E-07	2.07E-07	1.10E-07	3.93E-08	5.0E-03 (W)	--	2.2E-05	--
Vanadium	2.60E-02	5.80E-07	2.07E-07	1.51E-08	5.38E-09	7.0E-03 (H)	--	2.2E-06	--
							TOTAL:	< 0.01	1.6E-09

FUTURE OCCUPATIONAL ADULT (DEH Yard Worker): Dermal Contact with Surface Water

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	1.20E+01	3.86E-06	1.38E-06	4.63E-05	1.66E-05	--	--	--	--
Arsenic	4.40E-03	3.86E-06	1.38E-06	1.70E-08	6.07E-09	3.0E-04	1.8E+00	5.7E-05	1.1E-08
Barium	2.90E-01	3.86E-06	1.38E-06	1.12E-06	4.00E-07	7.0E-02	--	1.6E-05	--
Cadmium	4.10E-03	3.86E-06	1.38E-06	1.58E-08	5.66E-09	5.0E-04 (w)	--	3.2E-05	--
Chromium	2.40E-02	3.86E-06	1.38E-06	9.26E-08	3.31E-08	5.0E-03	--	1.9E-05	--
Copper	1.30E-02	3.86E-06	1.38E-06	5.02E-08	1.79E-08	--	--	--	--
Lead	4.20E-03	1.55E-08 *	5.52E-09 *	6.51E-11	2.31E-11	--	--	--	--
Manganese	1.90E-01	3.86E-06	1.38E-06	7.33E-07	2.62E-07	5.0E-03 (W)	--	1.5E-04	--
Vanadium	2.60E-02	3.86E-06	1.38E-06	1.00E-07	3.59E-08	7.0E-03 (H)	--	1.4E-05	--
							TOTAL:	< 0.01	1.1E-08

* Intakes for lead are calculated separately, because the permeability constant (PC) value for lead does not equal the default value (see text).
W – RfD value is for cadmium/manganese in water.
H – Value is from HEAST

CURRENT & FUTURE "RECREATIONAL" CHILD (Child Trespasser): Dermal Contact with Surface Water

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Subchronic Intake (mg/kg-day) Noncarcinogen	Subchronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD_{sc}* (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	1.20E+01	1.49E-05	--	1.79E-04	--	--	--	--	--
Arsenic	4.40E-03	1.49E-05	--	6.56E-08	--	3.0E-04 (H)	1.8E+00	2.2E-04	--
Barium	2.90E-01	1.49E-05	--	4.32E-06	--	7.0E-02 (H)	--	6.2E-05	--
Cadmium	4.10E-03	1.49E-05	--	6.11E-08	--	5.0E-04 (H)(W)	--	1.2E-04	--
Chromium	2.40E-02	1.49E-05	--	3.58E-07	--	2.0E-02 (H)	--	1.8E-05	--
Copper	1.30E-02	1.49E-05	--	1.94E-07	--	--	--	--	--
Lead	4.20E-03	5.97E-08 **	--	2.51E-10	--	--	--	--	--
Manganese	1.90E-01	1.49E-05	--	2.83E-06	--	5.0E-03 (W)	--	5.7E-04	--
Vanadium	2.60E-02	1.49E-05	--	3.87E-07	--	7.0E-03 (H)	--	5.5E-05	--
							TOTAL:	< 0.01	--

* Subchronic RfDs (RfD_{sc}) are obtained from HEAST (chromium is the only constituent for which the subchronic RfD differs from the chronic RfD)

** Intakes for lead are calculated separately, because lead possesses a permeability constant different from the default value (see text)

W – RfD value is for cadmium/manganese in water

H -- Value taken from HEAST

CURRENT OCCUPATIONAL ADULT (DEH Yard Worker): Incidental Ingestion of Sediments

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	3.20E-02	5.64E-09	2.01E-09	1.80E-10	6.43E-11	6.0E-05	1.3E+00	3.0E-06	8.3E-11
gamma-Chlordane	5.40E-02	5.64E-09	2.01E-09	3.05E-10	1.09E-10	6.0E-05	1.3E+00	5.1E-06	1.4E-10
4,4'-DDD	5.90E-02	5.64E-09	2.01E-09	3.33E-10	1.19E-10	--	2.4E-01	--	2.8E-11
4,4'-DDE	5.50E-02	5.64E-09	2.01E-09	3.10E-10	1.11E-10	--	3.0E-01	--	3.3E-11
4,4'-DDT	9.60E-02	5.64E-09	2.01E-09	5.41E-10	1.93E-10	5.0E-04	3.4E-01	1.1E-06	6.5E-11
Dieldrin	1.30E-02	5.64E-09	2.01E-09	7.33E-11	2.61E-11	5.0E-05	1.6E+01	1.5E-06	4.2E-10
Benzo[a]anthracene	1.50E-01	5.64E-09	2.01E-09	8.46E-10	3.01E-10	--	1.1E+00 *	--	3.2E-10
Chrysene	1.80E-01	5.64E-09	2.01E-09	1.02E-09	3.62E-10	--	2.9E-02 *	--	1.0E-11
Phenanthrene	2.10E-01	5.64E-09	2.01E-09	1.18E-09	4.22E-10	--	--	--	--
Arsenic	2.80E+00	5.64E-09	2.01E-09	1.58E-08	5.63E-09	3.0E-04	1.8E+00	5.3E-05	1.0E-08
Barium	1.20E+02	5.64E-09	2.01E-09	6.77E-07	2.41E-07	7.0E-02	--	9.7E-06	--
Cadmium	1.80E+00	5.64E-09	2.01E-09	1.02E-08	3.62E-09	1.0E-03 (f)	--	1.0E-05	--
Chromium	1.70E+01	5.64E-09	2.01E-09	9.59E-08	3.42E-08	5.0E-03	--	1.9E-05	--
Lead	1.50E+02	5.64E-09	2.01E-09	8.46E-07	3.01E-07	--	--	--	--
Mercury	2.40E-01	5.64E-09	2.01E-09	1.35E-09	4.82E-10	3.0E-04	--	4.5E-06	--
							TOTAL:	**< 0.01**	**1.1E-08**

CURRENT OCCUPATIONAL ADULT (DEH Yard Worker): Dermal Contact with Sediments

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	3.20E-02	1.86E-07	6.64E-08	5.95E-09	2.12E-09	6.0E-05	1.3E+00	9.9E-05	2.8E-09
gamma-Chlordane	5.40E-02	1.86E-07	6.64E-08	1.00E-08	3.59E-09	6.0E-05	1.3E+00	1.7E-04	4.7E-09
4,4'-DDD	5.90E-02	1.86E-07	6.64E-08	1.10E-08	3.92E-09	--	2.4E-01	--	9.4E-10
4,4'-DDE	5.50E-02	1.86E-07	6.64E-08	1.02E-08	3.65E-09	--	3.0E-01	--	1.1E-09
4,4'-DDT	9.60E-02	1.86E-07	6.64E-08	1.79E-08	6.37E-09	5.0E-04	3.4E-01	3.6E-05	2.2E-09
Dieldrin	1.30E-02	1.86E-07	6.64E-08	2.42E-09	8.63E-10	5.0E-05	1.6E+01	4.8E-05	1.4E-08
Benzo[a]anthracene	1.50E-01	1.86E-07	6.64E-08	2.79E-08	9.96E-09	--	1.1E+00 *	--	1.1E-08
Chrysene	1.80E-01	1.86E-07	6.64E-08	3.35E-08	1.20E-08	--	2.9E-02 *	--	3.5E-10
Phenanthrene	2.10E-01	1.86E-07	6.64E-08	3.91E-08	1.39E-08	--	--	--	--
Arsenic	2.80E+00	1.86E-07	6.64E-08	5.21E-07	1.86E-07	3.0E-04	1.8E+00	1.7E-03	3.3E-07
Barium	1.20E+02	1.86E-07	6.64E-08	2.23E-05	7.97E-06	7.0E-02	--	3.2E-04	--
Cadmium	1.80E+00	1.86E-07	6.64E-08	3.35E-07	1.20E-07	1.0E-03 (f)	--	3.3E-04	--
Chromium	1.70E+01	1.86E-07	6.64E-08	3.16E-06	1.13E-06	5.0E-03	--	6.3E-04	--
Lead	1.50E+02	1.86E-07	6.64E-08	2.79E-05	9.96E-06	--	--	--	--
Mercury	2.40E-01	1.86E-07	6.64E-08	4.46E-08	1.59E-08	3.0E-04	--	1.5E-04	--
							TOTAL:	**< 0.01**	**3.6E-07**

* - CSF is based on TEF, using B[a]P toxicity

FUTURE OCCUPATIONAL ADULT: Incidental Ingestion of Sediments

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	3.20E-02	3.76E-08	1.34E-08	1.20E-09	4.3E-10	6.0E-05	1.3E+00	2.0E-05	5.6E-10
gamma-Chlordane	5.40E-02	3.76E-08	1.34E-08	2.03E-09	7.2E-10	6.0E-05	1.3E+00	3.4E-05	9.4E-10
4,4'-DDD	5.90E-02	3.76E-08	1.34E-08	2.22E-09	7.9E-10	--	2.4E-01	--	1.9E-10
4,4'-DDE	5.50E-02	3.76E-08	1.34E-08	2.07E-09	7.4E-10	--	3.0E-01	--	2.2E-10
4,4'-DDT	9.60E-02	3.76E-08	1.34E-08	3.61E-09	1.3E-09	5.0E-04	3.4E-01	7.2E-06	4.4E-10
Dieldrin	1.30E-02	3.76E-08	1.34E-08	4.89E-10	1.7E-10	5.0E-05	1.6E+01	9.8E-06	2.8E-09
Benzo[a]anthracene	1.50E-01	3.76E-08	1.34E-08	5.64E-09	2.0E-09	--	1.1E+00 *	--	2.1E-09
Chrysene	1.80E-01	3.76E-08	1.34E-08	6.77E-09	2.4E-09	--	2.9E-02 *	--	7.0E-11
Phenanthrene	2.10E-01	3.76E-08	1.34E-08	7.90E-09	2.8E-09	--	--	--	--
Arsenic	2.80E+00	3.76E-08	1.34E-08	1.05E-07	3.8E-08	3.0E-04	1.8E+00	3.5E-04	6.8E-08
Barium	1.20E+02	3.76E-08	1.34E-08	4.51E-06	1.6E-06	7.0E-02	--	6.4E-05	--
Cadmium	1.80E+00	3.76E-08	1.34E-08	6.77E-08	2.4E-08	1.0E-03 (f)	--	6.8E-05	--
Chromium	1.70E+01	3.76E-08	1.34E-08	6.39E-07	2.3E-07	5.0E-03	--	1.3E-04	--
Lead	1.50E+02	3.76E-08	1.34E-08	5.64E-06	2.0E-06	--	--	--	--
Mercury	2.40E-01	3.76E-08	1.34E-08	9.02E-09	3.2E-09	3.0E-04	--	3.0E-05	--
							TOTAL:	**< 0.01**	**7.5E-08**

FUTURE OCCUPATIONAL ADULT: Dermal Contact with Sediments

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	3.20E-02	1.24E-06	4.43E-07	3.97E-08	1.4E-08	6.0E-05	1.3E+00	6.6E-04	1.8E-08
gamma-Chlordane	5.40E-02	1.24E-06	4.43E-07	6.70E-08	2.4E-08	6.0E-05	1.3E+00	1.1E-03	3.1E-08
4,4'-DDD	5.90E-02	1.24E-06	4.43E-07	7.32E-08	2.6E-08	--	2.4E-01	--	6.3E-09
4,4'-DDE	5.50E-02	1.24E-06	4.43E-07	6.82E-08	2.4E-08	--	3.0E-01	--	7.2E-09
4,4'-DDT	9.60E-02	1.24E-06	4.43E-07	1.19E-07	4.3E-08	5.0E-04	3.4E-01	2.4E-04	1.4E-08
Dieldrin	1.30E-02	1.24E-06	4.43E-07	1.61E-08	5.8E-09	5.0E-05	1.6E+01	3.2E-04	9.3E-08
Benzo[a]anthracene	1.50E-01	1.24E-06	4.43E-07	1.86E-07	6.6E-08	--	1.1E+00 *	--	7.0E-08
Chrysene	1.80E-01	1.24E-06	4.43E-07	2.23E-07	8.0E-08	--	2.9E-02 *	--	2.3E-09
Phenanthrene	2.10E-01	1.24E-06	4.43E-07	2.60E-07	9.3E-08	--	--	--	--
Arsenic	2.80E+00	1.24E-06	4.43E-07	3.47E-06	1.2E-06	3.0E-04	1.8E+00	1.2E-02	2.3E-06
Barium	1.20E+02	1.24E-06	4.43E-07	1.49E-04	5.3E-05	7.0E-02	--	2.1E-03	--
Cadmium	1.80E+00	1.24E-06	4.43E-07	2.23E-06	8.0E-07	1.0E-03 (f)	--	2.2E-03	--
Chromium	1.70E+01	1.24E-06	4.43E-07	2.11E-05	7.5E-06	5.0E-03	--	4.2E-03	--
Lead	1.50E+02	1.24E-06	4.43E-07	1.86E-04	6.6E-05	--	--	--	--
Mercury	2.40E-01	1.24E-06	4.43E-07	2.98E-07	1.1E-07	3.0E-04	--	9.9E-04	--
							TOTAL:	**0.02**	**2.5E-06**

* - CSF is based on TEF, using B[a]P toxicity

CURRENT & FUTURE "RECREATIONAL" CHILD (Child Trespasser): Incidental Ingestion of Sediments

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Subchronic Intake (mg/kg-day) Noncarcinogen	Subchronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD_{sc}** (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	3.20E-02	2.56E-07	--	8.19E-09	--	6.0E-05 (H)	1.3E+00	1.4E-04	--
gamma-Chlordane	5.40E-02	2.56E-07	--	1.38E-08	--	6.0E-05 (H)	1.3E+00	2.3E-04	--
4,4'-DDD	5.90E-02	2.56E-07	--	1.51E-08	--	--	2.4E-01	--	--
4,4'-DDE	5.50E-02	2.56E-07	--	1.41E-08	--	--	3.0E-01	--	--
4,4'-DDT	9.60E-02	2.56E-07	--	2.46E-08	--	5.0E-04 (H)	3.4E-01	4.9E-05	--
Dieldrin	1.30E-02	2.56E-07	--	3.33E-09	--	5.0E-05 (H)	1.6E+01	6.7E-05	--
Benzo[a]anthracene	1.50E-01	2.56E-07	--	3.84E-08	--	--	1.1E+00 *	--	--
Chrysene	1.80E-01	2.56E-07	--	4.61E-08	--	--	2.9E-02 *	--	--
Phenanthrene	2.10E-01	2.56E-07	--	5.38E-08	--	--	--	--	--
Arsenic	2.80E+00	2.56E-07	--	7.17E-07	--	3.0E-04 (H)	1.8E+00	2.4E-03	--
Barium	1.20E+02	2.56E-07	--	3.07E-05	--	7.0E-02 (H)	--	4.4E-04	--
Cadmium	1.80E+00	2.56E-07	--	4.61E-07	--	1.0E-03 (H)(F)	--	4.6E-04	--
Chromium (VI)	1.70E+01	2.56E-07	--	4.35E-06	--	2.0E-02 (H)	--	2.2E-04	--
Lead	1.50E+02	2.56E-07	--	3.84E-05	--	--	--	--	--
Mercury	2.40E-01	2.56E-07	--	6.14E-08	--	3.0E-04 (H)	--	2.0E-04	--
							TOTAL:	< 0.01	--

CURRENT & FUTURE "RECREATIONAL" CHILD (Child Trespasser): Dermal Contact with Sediments

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Subchronic Intake (mg/kg-day) Noncarcinogen	Subchronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD_{sc}** (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	3.20E-02	1.49E-05	--	4.77E-07	--	6.0E-05 (H)	1.3E+00	7.9E-03	--
gamma-Chlordane	5.40E-02	1.49E-05	--	8.05E-07	--	6.0E-05 (H)	1.3E+00	1.3E-02	--
4,4'-DDD	5.90E-02	1.49E-05	--	8.79E-07	--	--	2.4E-01	--	--
4,4'-DDE	5.50E-02	1.49E-05	--	8.19E-07	--	--	3.0E-01	--	--
4,4'-DDT	9.60E-02	1.49E-05	--	1.43E-06	--	5.0E-04 (H)	3.4E-01	2.9E-03	--
Dieldrin	1.30E-02	1.49E-05	--	1.94E-07	--	5.0E-05 (H)	1.6E+01	3.9E-03	--
Benzo[a]anthracene	1.50E-01	1.49E-05	--	2.23E-06	--	--	1.1E+00 *	--	--
Chrysene	1.80E-01	1.49E-05	--	2.68E-06	--	--	2.9E-02 *	--	--
Phenanthrene	2.10E-01	1.49E-05	--	3.13E-06	--	--	--	--	--
Arsenic	2.80E+00	1.49E-05	--	4.17E-05	--	3.0E-04 (H)	1.8E+00	1.4E-01	--
Barium	1.20E+02	1.49E-05	--	1.79E-03	--	7.0E-02 (H)	--	2.6E-02	--
Cadmium	1.80E+00	1.49E-05	--	2.68E-05	--	1.0E-03 (H)(F)	--	2.7E-02	--
Chromium (VI)	1.70E+01	1.49E-05	--	2.53E-04	--	2.0E-02 (H)	--	1.3E-02	--
Lead	1.50E+02	1.49E-05	--	2.24E-03	--	--	--	--	--
Mercury	2.40E-01	1.49E-05	--	3.58E-06	--	3.0E-04 (H)	--	1.2E-02	--
							TOTAL:	0.25	--

* -- CSF is based on TEF, using B[a]P toxicity

** Subchronic RfD_{sc}'s are obtained from HEAST (chromium VI is the only constituent for which the RfD_{sc} differs from the chronic RfD)

H -- Value obtained from HEAST

F -- Value is for cadmium in food

APPENDIX Ne

RISK DUE TO BACKGROUND AND MCL CALCULATIONS

Pesticide Storage Facility
Fort Riley, Kansas

FUTURE OCCUPATIONAL ADULT (DEH Yard Worker): Incidental Ingestion of Sediments – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CSF (mg/kg–day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	2.20E+00	3.76E–08	1.34E–08	8.27E–08	2.9E–08	3.0E–04	1.8E+00	2.8E–04	5.2E–08
Barium	8.80E+01	3.76E–08	1.34E–08	3.31E–06	1.2E–06	7.0E–02	--	4.7E–05	--
Cadmium	2.10E+00	3.76E–08	1.34E–08	7.90E–08	2.8E–08	1.0E–03 (f)	--	7.9E–05	--
Chromium	1.30E+01	3.76E–08	1.34E–08	4.89E–07	1.7E–07	5.0E–03	--	9.8E–05	--
Lead	6.00E+01	3.76E–08	1.34E–08	2.26E–06	8.0E–07	--	--	--	--
							TOTAL:	< 0.01	5.2E–08

FUTURE OCCUPATIONAL ADULT (DEH Yard Worker): Dermal Contact with Sediments – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CSF (mg/kg–day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	2.20E+00	1.24E–06	4.43E–07	2.73E–06	9.75E–07	3.0E–04	1.8E+00	9.1E–03	1.7E–06
Barium	8.80E+01	1.24E–06	4.43E–07	1.09E–04	3.90E–05	7.0E–02	--	1.6E–03	--
Cadmium	2.10E+00	1.24E–06	4.43E–07	2.60E–06	9.30E–07	1.0E–03 (f)	--	2.6E–03	--
Chromium	1.30E+01	1.24E–06	4.43E–07	1.61E–05	5.76E–06	5.0E–03	--	3.2E–03	--
Lead	6.00E+01	1.24E–06	4.43E–07	7.44E–05	2.66E–05	--	--	--	--
							TOTAL:	0.02	1.7E–06

f – Value is for cadmium in food

CURRENT & FUTURE "RECREATIONAL" CHILD (Child Trespasser): Incidental Ingestion of Sediments – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD**$_{sc}$ (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	2.20E+00	2.56E-07	--	5.63E-07	--	3.0E-04 (H)	1.8E+00	1.9E-03	--
Barium	8.80E+01	2.56E-07	--	2.25E-05	--	7.0E-02 (H)	--	3.2E-04	--
Cadmium	2.10E+00	2.56E-07	--	5.38E-07	--	1.0E-03 (H)(f)	--	5.4E-04	--
Chromium	1.30E+01	2.56E-07	--	3.33E-06	--	2.0E-02 (H)	--	1.7E-04	--
Lead	6.00E+01	2.56E-07	--	1.54E-05	--	--	--	--	--
							TOTAL:	< 0.01	--

CURRENT & FUTURE "RECREATIONAL" CHILD (Child Trespasser): Dermal Contact with Sediments – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD**$_{sc}$ (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	2.20E+00	1.49E-05	--	3.28E-05	--	3.0E-04 (H)	1.8E+00	1.1E-01	--
Barium	8.80E+01	1.49E-05	--	1.31E-03	--	7.0E-02 (H)	--	1.9E-02	--
Cadmium	2.10E+00	1.49E-05	--	3.13E-05	--	1.0E-03 (H)(f)	--	3.1E-02	--
Chromium	1.30E+01	1.49E-05	--	1.94E-04	--	2.0E-02 (H)	--	9.7E-03	--
Lead	6.00E+01	1.49E-05	--	8.94E-04	--	--	--	--	--
							TOTAL:	0.17	--

f – Value is for cadmium in food

** – Subchronic RfD_{sc} are obtained from HEAST (designated with an "H")

CURRENT OCCUPATIONAL ADULT (DEH Yard Worker): Incidental Ingestion of Sediments – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	2.20E+00	5.64E-09	2.01E-09	1.24E-08	4.4E-09	3.0E-04	1.8E+00	4.1E-05	8.0E-09
Barium	8.80E+01	5.64E-09	2.01E-09	4.96E-07	1.8E-07	7.0E-02	--	7.1E-06	--
Cadmium	2.10E+00	5.64E-09	2.01E-09	1.18E-08	4.2E-09	1.0E-03 (f)	--	1.2E-05	--
Chromium	1.30E+01	5.64E-09	2.01E-09	7.33E-08	2.6E-08	5.0E-03	--	1.5E-05	--
Lead	6.00E+01	5.64E-09	2.01E-09	3.38E-07	1.2E-07	--	--	--	--
							TOTAL:	< 0.01	8.0E-09

CURRENT OCCUPATIONAL ADULT (DEH Yard Worker): Dermal Contact with Sediments – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	2.20E+00	1.86E-07	6.64E-08	4.09E-07	1.46E-07	3.0E-04	1.8E+00	1.4E-03	2.6E-07
Barium	8.80E+01	1.86E-07	6.64E-08	1.64E-05	5.84E-06	7.0E-02	--	2.3E-04	--
Cadmium	2.10E+00	1.86E-07	6.64E-08	3.91E-07	1.39E-07	1.0E-03 (f)	--	3.9E-04	--
Chromium	1.30E+01	1.86E-07	6.64E-08	2.42E-06	8.63E-07	5.0E-03	--	4.8E-04	--
Lead	6.00E+01	1.86E-07	6.64E-08	1.12E-05	3.98E-06	--	--	--	--
							TOTAL:	< 0.01	2.6E-07

f – Value is for cadmium in food

CURRENT & FUTURE "RECREATIONAL" CHILD (Child Trespasser): Dermal Contact with Surface Water – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD*$_{sc}$ (mg/kg–day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	3.90E+00	1.49E-05	--	5.81E-05	--	--	--	--	--
Arsenic	4.00E-03	1.49E-05	--	5.96E-08	--	3.0E-04 (H)	1.8E+00	2.0E-04	--
Barium	2.50E-01	1.49E-05	--	3.72E-06	--	7.0E-02 (H)	--	5.3E-05	--
Chromium	1.80E-02	1.49E-05	--	2.68E-07	--	2.0E-02 (H)	--	1.3E-05	--
Copper	1.00E-02	1.49E-05	--	1.49E-07	--	--	--	--	--
Manganese	1.00E-01	1.49E-05	--	1.49E-06	--	5.0E-03 (W)	--	3.0E-04	--
Vanadium	1.50E-02	1.49E-05	--	2.23E-07	--	7.0E-03 (H)	--	3.2E-05	--
							TOTAL:	< 0.01	--

*Subchronic RfDs are provided from HEAST

W – RfD value is for manganese in water

CURRENT OCCUPATIONAL ADULT (DEH Yard Worker): Dermal Contact with Surface Water – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg–day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg–day)	CSF (mg/kg–day)$^{-1}$		
Aluminum	3.90E+00	5.80E–07	2.07E–07	2.26E–06	8.07E–07	--	--	--	--
Arsenic	4.00E–03	5.80E–07	2.07E–07	2.32E–09	8.28E–10	3.0E–04	1.8E+00	7.7E–06	1.4E–09
Barium	2.50E–01	5.80E–07	2.07E–07	1.45E–07	5.17E–08	7.0E–02	--	2.1E–06	--
Chromium	1.80E–02	5.80E–07	2.07E–07	1.04E–08	3.73E–09	5.0E–03	--	2.1E–06	--
Copper	1.00E–02	5.80E–07	2.07E–07	5.80E–09	2.07E–09	--	--	--	--
Manganese	1.00E–01	5.80E–07	2.07E–07	5.80E–08	2.07E–08	5.0E–03 (W)	--	1.2E–05	--
Vanadium	1.50E–02	5.80E–07	2.07E–07	8.70E–09	3.10E–09	7.0E–03	--	1.2E–06	--
						TOTAL:		< 0.01	1.4E–09

FUTURE OCCUPATIONAL ADULT (DEH Yard Worker): Dermal Contact with Surface Water – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg–day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg–day)	CSF (mg/kg–day)$^{-1}$		
Aluminum	3.90E+00	3.86E–06	1.38E–06	1.51E–05	5.38E–06	--	--	--	--
Arsenic	4.00E–03	3.86E–06	1.38E–06	1.54E–08	5.52E–09	3.0E–04	1.8E+00	5.1E–05	9.9E–09
Barium	2.50E–01	3.86E–06	1.38E–06	9.65E–07	3.45E–07	7.0E–02	--	1.4E–05	--
Chromium	1.80E–02	3.86E–06	1.38E–06	6.95E–08	2.48E–08	5.0E–03	--	1.4E–05	--
Copper	1.00E–02	3.86E–06	1.38E–06	3.86E–08	1.38E–08	--	--	--	--
Manganese	1.00E–01	3.86E–06	1.38E–06	3.86E–07	1.38E–07	5.0E–03 (W)	--	7.7E–05	--
Vanadium	1.50E–02	3.86E–06	1.38E–06	5.79E–08	2.07E–08	7.0E–03	--	8.3E–06	--
						TOTAL:		< 0.01	9.9E–09

FUTURE RESIDENTIAL ADULT: Ingestion of Ground Water – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CSF (mg/kg–day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Barium	1.00E–01	2.74E–02	1.17E–02	2.74E–03	1.17E–03	7.0E–02	––	3.9E–02	––
Beryllium	1.40E–03	2.74E–02	1.17E–02	3.84E–05	1.64E–05	5.0E–03	4.3E+00	7.7E–03	7.0E–05
Chromium	1.00E–02	2.74E–02	1.17E–02	2.74E–04	1.17E–04	5.0E–03	––	5.5E–02	––
Manganese	2.60E–02	2.74E–02	1.17E–02	7.12E–04	3.04E–04	5.0E–03 (W)(H)	––	1.4E–01	––
Vanadium	8.30E–03	2.74E–02	1.17E–02	2.27E–04	9.71E–05	7.0E–03 (H)	––	3.2E–02	––
							TOTAL:	0.28	7.0E–05

FUTURE RESIDENTIAL ADULT: Dermal Contact with Ground Water – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CSF (mg/kg–day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Barium	1.00E–01	5.32E–05	2.28E–05	5.32E–06	2.28E–06	7.0E–02	––	7.6E–05	––
Beryllium	1.40E–03	5.32E–05	2.28E–05	7.45E–08	3.19E–08	5.0E–03	4.3E+00	1.5E–05	1.4E–07
Chromium	1.00E–02	5.32E–05	2.28E–05	5.32E–07	2.28E–07	5.0E–03	––	1.1E–04	––
Manganese	2.60E–02	5.32E–05	2.28E–05	1.38E–06	5.93E–07	5.0E–03 (W)(H)	––	2.8E–04	––
Vanadium	8.30E–03	5.32E–05	2.28E–05	4.42E–07	1.89E–07	7.0E–03 (H)	––	6.3E–05	––
							TOTAL:	< 0.01	1.4E–07

W – RfD value is for manganese in water

FUTURE RESIDENTIAL CHILD: Ingestion of Ground Water – Risk due to background

Parameter	Exposure Point Concentration (mg/L)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD$_{sc}$ (mg/kg–day)	Toxicity Value CFS (mg/kg–day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	ND	1.28E–01	--	--	--	--	--	--	--
Arsenic	ND	1.28E–01	--	--	--	3.00E–04	1.80E+00	--	--
Barium	2.00E–01	1.28E–01	--	2.56E–02	--	7.00E–02	--	3.66E–01	--
Beryllium	2.00E–03	1.28E–01	--	2.56E–04	--	5.00E–03	4.30E+00	5.12E–02	--
Chromium	1.00E–02	1.28E–01	--	1.28E–03	--	2.00E–02	--	6.40E–02	--
Manganese	3.40E–02	1.28E–01	--	4.35E–03	--	5.00E–03	--	8.70E–01	--
Nitrate	6.40E+00	1.28E–01	--	8.19E–01	--	1.60E+00	--	5.12E–01	--
Thallium	ND	1.28E–01	--	--	--	8.00E–05	--	--	--
Vanadium	1.10E–02	1.28E–01	--	1.41E–03	--	7.00E–03	--	2.01E–01	--
							TOTAL	2.06E+00	--

FUTURE RESIDENTIAL CHILD: Dermal Contact with Ground Water – Risk due to background

Parameter	Exposure Point Concentration (mg/L)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CFS (mg/kg–day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	ND	1.11E–04	--	--	--	--	--	--	--
Arsenic	ND	1.11E–04	--	--	--	3.00E–04	1.80E+00	--	--
Barium	2.00E–01	1.11E–04	--	2.22E–05	--	7.00E–02	--	3.17E–04	--
Beryllium	2.00E–03	1.11E–04	--	2.22E–07	--	5.00E–03	4.30E+00	4.44E–05	--
Chromium	1.00E–02	1.11E–04	--	1.11E–06	--	2.00E–02	--	5.55E–05	--
Manganese	3.40E–02	1.11E–04	--	3.77E–06	--	5.00E–03	--	7.55E–04	--
Nitrate	6.40E+00	1.11E–04	--	7.10E–04	--	1.60E+00	--	4.44E–04	--
Thallium	ND	1.11E–04	--	--	--	8.00E–05	--	--	--
Vanadium	1.10E–02	1.11E–04	--	1.22E–06	--	7.00E–03	--	1.74E–04	--
							TOTAL	1.79E–03	--

FUTURE RESIDENTIAL ADULT: Ingestion of Ground Water – Risk due to background

Parameter	Exposure Point Concentration (mg/L)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CFS (mg/kg–day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	ND	2.74E–02	1.17E–02	––	––	––	––	––	––
Arsenic	ND	2.74E–02	1.17E–02	––	––	3.00E–04	1.80E+00	––	––
Barium	2.00E–01	2.74E–02	1.17E–02	5.48E–03	2.34E–03	7.00E–02	––	7.83E–02	––
Beryllium	2.00E–03	2.74E–02	1.17E–02	5.48E–05	2.34E–05	5.00E–03	4.30E+00	1.10E–02	1.01E–04
Chromium	1.00E–02	2.74E–02	1.17E–02	2.74E–04	1.17E–04	5.00E–03	––	5.48E–02	––
Manganese	3.40E–02	2.74E–02	1.17E–02	9.32E–04	3.98E–04	5.00E–03	––	1.86E–01	––
Nitrate	6.40E+00	2.74E–02	1.17E–02	1.75E–01	7.49E–02	1.60E+00	––	1.10E–01	––
Thallium	ND	2.74E–02	1.17E–02	––	––	8.00E–05	––	––	––
Vanadium	1.10E–02	2.74E–02	1.17E–02	3.01E–04	1.29E–04	7.00E–03	––	4.31E–02	––
							TOTAL	4.83E–01	1.01E–04

FUTURE RESIDENTIAL ADULT: Dermal Contact with Ground Water – Risk due to background

Parameter	Exposure Point Concentration (mg/L)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CFS (mg/kg–day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	ND	5.32E–05	2.28E–05	––	––	––	––	––	––
Arsenic	ND	5.32E–05	2.28E–05	––	––	3.00E–04	1.80E+00	––	––
Barium	2.00E–01	5.32E–05	2.28E–05	1.06E–05	4.56E–06	7.00E–02	––	1.52E–04	––
Beryllium	2.00E–03	5.32E–05	2.28E–05	1.06E–07	4.56E–08	5.00E–03	4.30E+00	2.13E–05	1.96E–07
Chromium	1.00E–02	5.32E–05	2.28E–05	5.32E–07	2.28E–07	5.00E–03	––	1.06E–04	––
Manganese	3.40E–02	5.32E–05	2.28E–05	1.81E–06	7.75E–07	5.00E–03	––	3.62E–04	––
Nitrate	6.40E+00	5.32E–05	2.28E–05	3.40E–04	1.46E–04	1.60E+00	––	2.13E–04	––
Thallium	ND	5.32E–05	2.28E–05	––	––	8.00E–05	––	––	––
Vanadium	1.10E–02	5.32E–05	2.28E–05	5.85E–07	2.51E–07	7.00E–03	––	8.36E–05	––
							TOTAL	9.38E–04	1.96E–07

FUTURE RESIDENTIAL CHILD: Ingestion of Ground Water – Risk due to MCLs

Parameter	Exposure Point Concentration (mg/L)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CFS $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	5.00E–02 (S)	1.28E–01	––	––	––	––	––	NA	NA
Arsenic	5.00E–02	1.28E–01	––	6.40E–03	––	3.00E–04	1.80E+00	2.13E+01	––
Barium	2.00E+00	1.28E–01	––	2.56E–01	––	7.00E–02	––	3.66E+00	––
Beryllium	4.00E–03	1.28E–01	––	5.12E–04	––	5.00E–03	4.30E+00	1.02E–01	––
Chromium	1.00E–01	1.28E–01	––	1.28E–02	––	2.00E–02	––	6.40E–01	––
Manganese	5.00E–02 (S)	1.28E–01	––	6.40E–03	––	5.00E–03	––	1.28E+00	––
Nitrate *	4.50E+01	1.28E–01	––	5.76E+00	––	1.60E+00	––	3.60E+00	––
Thallium	2.00E–03	1.28E–01	––	2.56E–04	––	8.00E–05	––	3.20E+00	––
Vanadium	NA	1.28E–01	––	––	––	7.00E–03	––	NA	NA
							TOTAL	3.38E+01	––

FUTURE RESIDENTIAL CHILD: Dermal Contact with Ground Water – Risk due to MCLs

Parameter	Exposure Point Concentration (mg/L)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CFS $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	5.00E–02 (S)	1.11E–04	––	––	––	––	––	NA	NA
Arsenic	5.00E–02	1.11E–04	––	5.55E–06	––	3.00E–04	1.80E+00	1.85E–02	––
Barium	2.00E+00	1.11E–04	––	2.22E–04	––	7.00E–02	––	3.17E–03	––
Beryllium	4.00E–03	1.11E–04	––	4.44E–07	––	5.00E–03	4.30E+00	8.88E–05	––
Chromium	1.00E–01	1.11E–04	––	1.11E–05	––	2.00E–02	––	5.55E–04	––
Manganese	5.00E–02 (S)	1.11E–04	––	5.55E–06	––	5.00E–03	––	1.11E–03	––
Nitrate *	4.50E+01	1.11E–04	––	5.00E–03	––	1.60E+00	––	3.12E–03	––
Thallium	2.00E–03	1.11E–04	––	2.22E–07	––	8.00E–05	––	2.77E–03	––
Vanadium	NA	1.11E–04	––	––	––	7.00E–03	––	NA	NA
							TOTAL	2.93E–02	––

* 45 mg/L of nitrate is approximately equivalent to the MCL of 10 mg/L nitrate (plus nitrite) as N (because the molecular weight of N [14] is @ 22% of the molecular weight of nitrate [62]).

(S) Secondary MCL (the Secondary MCL for aluminum ranges from 5.00E–02 mg/L to 2.00E–01 mg/L).

FUTURE RESIDENTIAL ADULT: Ingestion of Ground Water – Risk due to MCLs

Parameter	Exposure Point Concentration (mg/L)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CFS (mg/kg–day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	5.00E–02 (S)	2.74E–02	1.17E–02	--	--	--	--	NA	NA
Arsenic	5.00E–02	2.74E–02	1.17E–02	1.37E–03	5.85E–04	3.00E–04	1.80E+00	4.57E+00	1.05E–03
Barium	2.00E+00	2.74E–02	1.17E–02	5.48E–02	2.34E–02	7.00E–02	--	7.83E–01	--
Beryllium	4.00E–03	2.74E–02	1.17E–02	1.10E–04	4.68E–05	5.00E–03	4.30E+00	2.19E–02	2.01E–04
Chromium	1.00E–01	2.74E–02	1.17E–02	2.74E–03	1.17E–03	5.00E–03	--	5.48E–01	--
Manganese	5.00E–02 (S)	2.74E–02	1.17E–02	1.37E–03	5.85E–04	5.00E–03	--	2.74E–01	--
Nitrate *	4.50E+01	2.74E–02	1.17E–02	1.23E+00	5.26E–01	1.60E+00	--	7.71E–01	--
Thallium	2.00E–03	2.74E–02	1.17E–02	5.48E–05	2.34E–05	8.00E–05	--	6.85E–01	--
Vanadium	NA	2.74E–02	1.17E–02	--	--	7.00E–03	--	NA	NA
							TOTAL	7.65E+00	1.25E–03

FUTURE RESIDENTIAL ADULT: Dermal Contact with Ground Water – Risk due to MCLs

Parameter	Exposure Point Concentration (mg/L)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CFS (mg/kg–day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	5.00E–02 (S)	5.32E–05	2.28E–05	--	--	--	--	NA	NA
Arsenic	5.00E–02	5.32E–05	2.28E–05	2.66E–06	1.14E–06	3.00E–04	1.80E+00	8.87E–03	2.05E–06
Barium	2.00E+00	5.32E–05	2.28E–05	1.06E–04	4.56E–05	7.00E–02	--	1.52E–03	--
Beryllium	4.00E–03	5.32E–05	2.28E–05	2.13E–07	9.12E–08	5.00E–03	4.30E+00	4.26E–05	3.92E–07
Chromium	1.00E–01	5.32E–05	2.28E–05	5.32E–06	2.28E–06	5.00E–03	--	1.06E–03	--
Manganese	5.00E–02 (S)	5.32E–05	2.28E–05	2.66E–06	1.14E–06	5.00E–03	--	5.32E–04	--
Nitrate *	4.50E+01	5.32E–05	2.28E–05	2.39E–03	1.03E–03	1.60E+00	--	1.50E–03	--
Thallium	2.00E–03	5.32E–05	2.28E–05	1.06E–07	4.56E–08	8.00E–05	--	1.33E–03	--
Vanadium	NA	5.32E–05	2.28E–05	--	--	7.00E–03	--	NA	NA
							TOTAL	1.49E–02	2.44E–06

* 45 mg/L of nitrate is approximately equivalent to the MCL of 10 mg/L nitrate (plus nitrite) as N (because the molecular weight of N [14] is @ 22% of the molecular weight of nitrate [62]).

(S) Secondary MCL (the Secondary MCL for aluminum ranges from 5.00E–02 mg/L to 2.00E–01 mg/L).

FUTURE OCCUPATIONAL ADULT (Utility Worker): Incidental Ingestion of Subsurface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	1.40E+00	2.10E-08	7.51E-09	2.94E-08	1.05E-08	3.0E-04	1.8E+00	9.8E-05	1.8E-08
Barium	9.90E+01	2.10E-08	7.51E-09	2.08E-06	7.43E-07	7.0E-02	--	3.0E-05	--
Chromium	8.20E+00	2.10E-08	7.51E-09	1.72E-07	6.16E-08	5.0E-03	--	3.4E-05	--
Lead	1.10E+01	2.10E-08	7.51E-09	2.31E-07	8.26E-08	--	--	--	--
							TOTAL:	< 0.01	1.8E-08

FUTURE OCCUPATIONAL ADULT (Utility Worker): Inhalation of Fugitive Dusts from Subsurface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	1.40E+00	2.68E-12	9.71E-13	3.75E-12	1.36E-12	--	1.5E+01	--	2.1E-11
Barium	9.90E+01	2.68E-12	9.71E-13	2.65E-10	9.61E-11	1.4E-04	--	1.9E-06	--
Chromium	8.20E+00	2.68E-12	9.71E-13	2.20E-11	7.96E-12	--	4.1E+01	--	3.3E-10
Lead	1.10E+01	2.68E-12	9.71E-13	2.95E-11	1.07E-11	--	--	--	--
							TOTAL:	< 0.01	3.5E-10

FUTURE OCCUPATIONAL ADULT (Utility Worker): Dermal Contact with Subsurface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	1.40E+00	1.26E-06	4.51E-07	1.76E-06	6.31E-07	3.0E-04	1.8E+00	5.9E-03	1.1E-06
Barium	9.90E+01	1.26E-06	4.51E-07	1.25E-04	4.46E-05	7.0E-02	--	1.8E-03	--
Chromium	8.20E+00	1.26E-06	4.51E-07	1.03E-05	3.70E-06	5.0E-03	--	2.1E-03	--
Lead	1.10E+01	1.26E-06	4.51E-07	1.39E-05	4.96E-06	--	--	--	--
							TOTAL:	0.01	1.1E-06

CURRENT OCCUPATIONAL ADULT (Utility Worker): Incidental Ingestion of Subsurface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	1.40E+00	5.64E-09	2.01E-09	7.90E-09	2.81E-09	3.0E-04	1.8E+00	2.6E-05	4.9E-09
Barium	9.90E+01	5.64E-09	2.01E-09	5.58E-07	1.99E-07	7.0E-02	--	8.0E-06	--
Chromium	8.20E+00	5.64E-09	2.01E-09	4.62E-08	1.65E-08	5.0E-03	--	9.2E-06	--
Lead	1.10E+01	5.64E-09	2.01E-09	6.20E-08	2.21E-08	--	--	--	--
							TOTAL:	< 0.01	4.9E-09

CURRENT OCCUPATIONAL ADULT (Utility Worker): Inhalation of Fugitive Dusts from Subsurface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	1.40E+00	7.19E-13	2.57E-13	1.01E-12	3.60E-13	--	1.5E+01	--	5.4E-12
Barium	9.90E+01	7.19E-13	2.57E-13	7.12E-11	2.54E-11	1.4E-04	--	5.1E-07	--
Chromium	8.20E+00	7.19E-13	2.57E-13	5.90E-12	2.11E-12	--	4.1E+01	--	8.6E-11
Lead	1.10E+01	7.19E-13	2.57E-13	7.91E-12	2.83E-12	--	--	--	--
							TOTAL:	< 0.01	9.2E-11

CURRENT OCCUPATIONAL ADULT (Utility Worker): Dermal Contact with Subsurface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	1.40E+00	3.38E-07	1.21E-07	4.73E-07	1.69E-07	3.0E-04	1.8E+00	1.6E-03	3.0E-07
Barium	9.90E+01	3.38E-07	1.21E-07	3.35E-05	1.20E-05	7.0E-02	--	4.8E-04	--
Chromium	8.20E+00	3.38E-07	1.21E-07	2.77E-06	9.92E-07	5.0E-03	--	5.5E-04	--
Lead	1.10E+01	3.38E-07	1.21E-07	3.72E-06	1.33E-06	--	--	--	--
							TOTAL:	< 0.01	3.0E-07

FUTURE OCCUPATIONAL ADULT (Landscaper): Incidental Ingestion of Subsurface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	1.40E+00	1.88E-08	6.71E-09	2.63E-08	9.39E-09	3.0E-04	1.8E+00	8.8E-05	1.6E-08
Barium	9.90E+01	1.88E-08	6.71E-09	1.86E-06	6.64E-07	7.0E-02	--	2.7E-05	--
Chromium	8.20E+00	1.88E-08	6.71E-09	1.54E-07	5.50E-08	5.0E-03	--	3.1E-05	--
Lead	1.10E+01	1.88E-08	6.71E-09	2.07E-07	7.38E-08	--	--	--	--
							TOTAL:	< 0.01	1.6E-08

FUTURE OCCUPATIONAL ADULT (Landscaper): Inhalation of Fugitive Dusts from Subsurface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	1.40E+00	2.40E-12	8.55E-13	3.36E-12	1.20E-12	--	1.5E+01	--	1.8E-11
Barium	9.90E+01	2.40E-12	8.55E-13	2.38E-10	8.46E-11	1.4E-04	--	1.7E-06	--
Chromium	8.20E+00	2.40E-12	8.55E-13	1.97E-11	7.01E-12	--	4.1E+01	--	2.9E-10
Lead	1.10E+01	2.40E-12	8.55E-13	2.64E-11	9.41E-12	--	--	--	--
							TOTAL:	< 0.01	3.1E-10

FUTURE OCCUPATIONAL ADULT (Landscaper): Dermal Contact with Subsurface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF $(mg/kg-day)^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	1.40E+00	1.13E-06	4.03E-07	1.58E-06	5.64E-07	3.0E-04	1.8E+00	5.3E-03	1.0E-06
Barium	9.90E+01	1.13E-06	4.03E-07	1.12E-04	3.99E-05	7.0E-02	--	1.6E-03	--
Chromium	8.20E+00	1.13E-06	4.03E-07	9.27E-06	3.30E-06	5.0E-03	--	1.9E-03	--
Lead	1.10E+01	1.13E-06	4.03E-07	1.24E-05	4.43E-06	--	--	--	--
							TOTAL:	0.01	1.0E-06

CURRENT OCCUPATIONAL ADULT (Landscaper): Incidental Ingestion of Subsurface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg–day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg–day)	CSF (mg/kg–day)⁻¹		
Arsenic	1.40E+00	4.70E–09	1.68E–09	6.58E–09	2.35E–09	3.0E–04	1.8E+00	2.2E–05	4.1E–09
Barium	9.90E+01	4.70E–09	1.68E–09	4.65E–07	1.66E–07	7.0E–02	––	6.6E–06	––
Chromium	8.20E+00	4.70E–09	1.68E–09	3.85E–08	1.38E–08	5.0E–03	––	7.7E–06	––
Lead	1.10E+01	4.70E–09	1.68E–09	5.17E–08	1.85E–08	––	––	––	––
							TOTAL:	< 0.01	4.1E–09

CURRENT OCCUPATIONAL ADULT (Landscaper): Inhalation of Fugitive Dusts from Subsurface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg–day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg–day)	CSF (mg/kg–day)⁻¹		
Arsenic	1.40E+00	5.99E–13	2.14E–13	8.39E–13	3.00E–13	––	1.5E+01	––	4.5E–12
Barium	9.90E+01	5.99E–13	2.14E–13	5.93E–11	2.12E–11	1.4E–04	––	4.2E–07	––
Chromium	8.20E+00	5.99E–13	2.14E–13	4.91E–12	1.75E–12	––	4.1E+01	––	7.2E–11
Lead	1.10E+01	5.99E–13	2.14E–13	6.59E–12	2.35E–12	––	––	––	––
							TOTAL:	< 0.01	7.6E–11

CURRENT OCCUPATIONAL ADULT (Landscaper): Dermal Contact with Subsurface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg–day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg–day)	CSF (mg/kg–day)⁻¹		
Arsenic	1.40E+00	2.82E–07	1.01E–07	3.95E–07	1.41E–07	3.0E–04	1.8E+00	1.3E–03	2.5E–07
Barium	9.90E+01	2.82E–07	1.01E–07	2.79E–05	1.00E–05	7.0E–02	––	4.0E–04	––
Chromium	8.20E+00	2.82E–07	1.01E–07	2.31E–06	8.28E–07	5.0E–03	––	4.6E–04	––
Lead	1.10E+01	2.82E–07	1.01E–07	3.10E–06	1.11E–06	––	––	––	––
							TOTAL:	< 0.01	2.5E–07

CURRENT & FUTURE "RECREATIONAL" CHILD (Child Trespasser): Incidental Ingestion of Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Subchronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD_{sc} (mg/kg-day)	CSF $(mg/kg-day)^{-1}$		
Arsenic	2.40E+00	2.56E-07	--	6.14E-07	--	3.0E-04 H	1.8E+00	2.0E-03	--
Barium	9.90E+01	2.56E-07	--	2.53E-05	--	7.0E-02 H	--	3.6E-04	--
Chromium	9.30E+00	2.56E-07	--	2.38E-06	--	2.0E-02 H	--	1.2E-04	--
Lead	4.60E+01	2.56E-07	--	1.18E-05	--	--	--	--	--
							TOTAL:	< 0.01	--

CURRENT & FUTURE "RECREATIONAL" CHILD (Child Trespasser): Inhalation of Fugitive Dusts from Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF $(mg/kg-day)^{-1}$		
Arsenic	2.40E+00	8.44E-12	--	2.03E-11	--	--	1.5E+01	--	--
Barium	9.90E+01	8.44E-12	--	8.36E-10	--	1.4E-03 H	--	6.0E-07	--
Chromium	9.30E+00	8.44E-12	--	7.85E-11	--	--	4.1E+01	--	--
Lead	4.60E+01	8.44E-12	--	3.88E-10	--	--	--	--	--
							TOTAL:	< 0.01	--

CURRENT & FUTURE "RECREATIONAL" CHILD (Child Trespasser): Dermal Contact with Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF $(mg/kg-day)^{-1}$		
Arsenic	2.40E+00	1.67E-05	--	4.01E-05	--	3.0E-04 H	1.8E+00	1.3E-01	--
Barium	9.90E+01	1.67E-05	--	1.65E-03	--	7.0E-02 H	--	2.4E-02	--
Chromium	9.30E+00	1.67E-05	--	1.55E-04	--	2.0E-02 H	--	7.8E-03	--
Lead	4.60E+01	1.67E-05	--	7.68E-04	--	--	--	--	--
							TOTAL:	0.2	--

H – Subchronic RfDs obtained from HEAST

FUTURE CONSTRUCTION WORKER: Incidental Ingestion of Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)⁻¹		
Arsenic	2.40E+00	2.25E-06	3.22E-08	5.40E-06	7.73E-08	3.0E-04	1.8E+00	1.8E-02	1.4E-07
Barium	9.90E+01	2.25E-06	3.22E-08	2.23E-04	3.19E-06	7.0E-02	--	3.2E-03	--
Chromium	9.30E+00	2.25E-06	3.22E-08	2.09E-05	2.99E-07	5.0E-03	--	4.2E-03	--
Lead	4.60E+01	2.25E-06	3.22E-08	1.04E-04	1.48E-06	--	--	--	--
							TOTAL:	0.03	1.4E-07

FUTURE CONSTRUCTION WORKER: Inhalation of Fugitive Dusts from Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)⁻¹		
Arsenic	2.40E+00	2.87E-10	4.11E-12	6.89E-10	9.86E-12	--	1.5E+01	--	1.5E-10
Barium	9.90E+01	2.87E-10	4.11E-12	2.84E-08	4.07E-10	1.4E-04	--	2.0E-04	--
Chromium	9.30E+00	2.87E-10	4.11E-12	2.67E-09	3.82E-11	--	4.1E+01	--	1.6E-09
Lead	4.60E+01	2.87E-10	4.11E-12	1.32E-08	1.89E-10	--	--	--	--
							TOTAL:	< 0.01	1.7E-09

FUTURE CONSTRUCTION WORKER: Dermal Contact with Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)⁻¹		
Arsenic	2.40E+00	1.35E-04	1.93E-06	3.24E-04	4.63E-06	3.0E-04	1.8E+00	1.1E+00	8.3E-06
Barium	9.90E+01	1.35E-04	1.93E-06	1.34E-02	1.91E-04	7.0E-02	--	1.9E-01	--
Chromium	9.30E+00	1.35E-04	1.93E-06	1.26E-03	1.79E-05	5.0E-03	--	2.5E-01	--
Lead	4.60E+01	1.35E-04	1.93E-06	6.21E-03	8.88E-05	--	--	--	--
							TOTAL:	1.54	8.3E-06

FUTURE OCCUPATIONAL ADULT (Utility Worker): Incidental Ingestion of Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CSF (mg/kg–day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	2.40E+00	2.10E–08	7.51E–09	5.04E–08	1.80E–08	3.0E–04	1.8E+00	1.7E–04	3.2E–08
Barium	9.90E+01	2.10E–08	7.51E–09	2.08E–06	7.43E–07	7.0E–02	––	3.0E–05	––
Chromium	9.30E+00	2.10E–08	7.51E–09	1.95E–07	6.98E–08	5.0E–03	––	3.9E–05	––
Lead	4.60E+01	2.10E–08	7.51E–09	9.66E–07	3.45E–07	––	––	––	––
							TOTAL:	< 0.01	3.2E–08

FUTURE OCCUPATIONAL ADULT (Utility Worker): Inhalation of Fugitive Dusts from Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CSF (mg/kg–day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	2.40E+00	2.68E–12	9.71E–13	6.43E–12	2.33E–12	––	1.5E+01	––	3.5E–11
Barium	9.90E+01	2.68E–12	9.71E–13	2.65E–10	9.61E–11	1.4E–04	––	1.9E–06	––
Chromium	9.30E+00	2.68E–12	9.71E–13	2.49E–11	9.03E–12	––	4.1E+01	––	3.7E–10
Lead	4.60E+01	2.68E–12	9.71E–13	1.23E–10	4.47E–11	––	––	––	––
							TOTAL:	< 0.01	4.1E–10

FUTURE OCCUPATIONAL ADULT (Utility Worker): Dermal Contact with Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CSF (mg/kg–day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	2.40E+00	1.26E–06	4.51E–07	3.02E–06	1.08E–06	3.0E–04	1.8E+00	1.0E–02	1.9E–06
Barium	9.90E+01	1.26E–06	4.51E–07	1.25E–04	4.46E–05	7.0E–02	––	1.8E–03	––
Chromium	9.30E+00	1.26E–06	4.51E–07	1.17E–05	4.19E–06	5.0E–03	––	2.3E–03	––
Lead	4.60E+01	1.26E–06	4.51E–07	5.80E–05	2.07E–05	––	––	––	––
							TOTAL:	0.01	1.9E–06

CURRENT OCCUPATIONAL ADULT (Utility Worker): Incidental Ingestion of Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)$^{-1}$		
Arsenic	2.40E+00	5.64E-09	2.01E-09	1.35E-08	4.82E-09	3.0E-04	1.8E+00	4.5E-05	8.7E-09
Barium	9.90E+01	5.64E-09	2.01E-09	5.58E-07	1.99E-07	7.0E-02	--	8.0E-06	--
Chromium	9.30E+00	5.64E-09	2.01E-09	5.25E-08	1.87E-08	5.0E-03	--	1.0E-05	--
Lead	4.60E+01	5.64E-09	2.01E-09	2.59E-07	9.25E-08	--	--	--	--
							TOTAL:	< 0.01	8.7E-09

CURRENT OCCUPATIONAL ADULT (Utility Worker): Inhalation of Fugitive Dusts from Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)$^{-1}$		
Arsenic	2.40E+00	7.19E-13	2.57E-13	1.73E-12	6.17E-13	--	1.5E+01	--	9.3E-12
Barium	9.90E+01	7.19E-13	2.57E-13	7.12E-11	2.54E-11	1.4E-04	--	5.1E-07	--
Chromium	9.30E+00	7.19E-13	2.57E-13	6.69E-12	2.39E-12	--	4.1E+01	--	9.8E-11
Lead	4.60E+01	7.19E-13	2.57E-13	3.31E-11	1.18E-11	--	--	--	--
							TOTAL:	< 0.01	1.1E-10

CURRENT OCCUPATIONAL ADULT (Utility Worker): Dermal Contact with Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)$^{-1}$		
Arsenic	2.40E+00	3.38E-07	1.21E-07	8.11E-07	2.90E-07	3.0E-04	1.8E+00	2.7E-03	5.2E-07
Barium	9.90E+01	3.38E-07	1.21E-07	3.35E-05	1.20E-05	7.0E-02	--	4.8E-04	--
Chromium	9.30E+00	3.38E-07	1.21E-07	3.14E-06	1.13E-06	5.0E-03	--	6.3E-04	--
Lead	4.60E+01	3.38E-07	1.21E-07	1.55E-05	5.57E-06	--	--	--	--
							TOTAL:	< 0.01	5.2E-07

FUTURE OCCUPATIONAL ADULT (Landscaper): Incidental Ingestion of Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg–day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg–day)	CSF $(mg/kg–day)^{-1}$		
Arsenic	2.40E+00	1.88E–08	6.71E–09	4.51E–08	1.61E–08	3.0E–04	1.8E+00	1.5E–04	2.8E–08
Barium	9.90E+01	1.88E–08	6.71E–09	1.86E–06	6.64E–07	7.0E–02	––	2.7E–05	––
Chromium	9.30E+00	1.88E–08	6.71E–09	1.75E–07	6.24E–08	5.0E–03	––	3.5E–05	––
Lead	4.60E+01	1.88E–08	6.71E–09	8.65E–07	3.09E–07	––	––	––	––
							TOTAL:	< 0.01	2.8E–08

FUTURE OCCUPATIONAL ADULT (Landscaper): Inhalation of Fugitive Dusts from Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg–day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg–day)	CSF $(mg/kg–day)^{-1}$		
Arsenic	2.40E+00	2.40E–12	8.55E–13	5.76E–12	2.05E–12	––	1.5E+01	––	3.1E–11
Barium	9.90E+01	2.40E–12	8.55E–13	2.38E–10	8.46E–11	1.4E–04	––	1.7E–06	––
Chromium	9.30E+00	2.40E–12	8.55E–13	2.23E–11	7.95E–12	––	4.1E+01	––	3.3E–10
Lead	4.60E+01	2.40E–12	8.55E–13	1.10E–10	3.93E–11	––	––	––	––
							TOTAL:	< 0.01	3.6E–10

FUTURE OCCUPATIONAL ADULT (Landscaper): Dermal Contact with Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg–day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg–day)	CSF $(mg/kg–day)^{-1}$		
Arsenic	2.40E+00	1.13E–06	4.03E–07	2.71E–06	9.67E–07	3.0E–04	1.8E+00	9.0E–03	1.7E–06
Barium	9.90E+01	1.13E–06	4.03E–07	1.12E–04	3.99E–05	7.0E–02	––	1.6E–03	––
Chromium	9.30E+00	1.13E–06	4.03E–07	1.05E–05	3.75E–06	5.0E–03	––	2.1E–03	––
Lead	4.60E+01	1.13E–06	4.03E–07	5.20E–05	1.85E–05	––	––	––	––
							TOTAL:	0.01	1.7E–06

CURRENT OCCUPATIONAL ADULT (Landscaper): Incidental Ingestion of Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)⁻¹		
Arsenic	2.40E+00	4.70E-09	1.68E-09	1.13E-08	4.03E-09	3.0E-04	1.8E+00	3.8E-05	7.3E-09
Barium	9.90E+01	4.70E-09	1.68E-09	4.65E-07	1.66E-07	7.0E-02	--	6.6E-06	--
Chromium	9.30E+00	4.70E-09	1.68E-09	4.37E-08	1.56E-08	5.0E-03	--	8.7E-06	--
Lead	4.60E+01	4.70E-09	1.68E-09	2.16E-07	7.73E-08	--	--	--	--
							TOTAL:	< 0.01	7.3E-09

CURRENT OCCUPATIONAL ADULT (Landscaper): Inhalation of Fugitive Dusts from Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)⁻¹		
Arsenic	2.40E+00	5.99E-13	2.14E-13	1.44E-12	5.14E-13	--	1.5E+01	--	7.8E-12
Barium	9.90E+01	5.99E-13	2.14E-13	5.93E-11	2.12E-11	1.4E-04	--	4.2E-07	--
Chromium	9.30E+00	5.99E-13	2.14E-13	5.57E-12	1.99E-12	--	4.1E+01	--	8.2E-11
Lead	4.60E+01	5.99E-13	2.14E-13	2.76E-11	9.84E-12	--	--	--	--
							TOTAL:	< 0.01	8.9E-11

CURRENT OCCUPATIONAL ADULT (Landscaper): Dermal Contact with Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹)		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)⁻¹		
Arsenic	2.40E+00	2.82E-07	1.01E-07	6.77E-07	2.42E-07	3.0E-04	1.8E+00	2.3E-03	4.4E-07
Barium	9.90E+01	2.82E-07	1.01E-07	2.79E-05	1.00E-05	7.0E-02	--	4.0E-04	--
Chromium	9.30E+00	2.82E-07	1.01E-07	2.62E-06	9.39E-07	5.0E-03	--	5.2E-04	--
Lead	4.60E+01	2.82E-07	1.01E-07	1.30E-05	4.65E-06	--	--	--	--
							TOTAL:	< 0.01	4.4E-07

FUTURE OCCUPATIONAL ADULT (DEH Worker): Incidental Ingestion of Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CSF (mg/kg–day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	2.40E+00	4.89E–07	1.75E–07	1.17E–06	4.20E–07	3.0E–04	1.8E+00	3.9E–03	7.6E–07
Barium	9.90E+01	4.89E–07	1.75E–07	4.84E–05	1.73E–05	7.0E–02	--	6.9E–04	--
Chromium	9.30E+00	4.89E–07	1.75E–07	4.55E–06	1.63E–06	5.0E–03	--	9.1E–04	--
Lead	4.60E+01	4.89E–07	1.75E–07	2.25E–05	8.05E–06	--	--	--	--
							TOTAL:	0.01	7.6E–07

FUTURE OCCUPATIONAL ADULT (DEH Worker): Inhalation of Fugitive Dusts from Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CSF (mg/kg–day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	2.40E+00	5.99E–10	2.14E–10	1.44E–09	5.14E–10	--	1.5E+01	--	7.8E–09
Barium	9.90E+01	5.99E–10	2.14E–10	5.93E–08	2.12E–08	1.4E–04	--	4.2E–04	--
Chromium	9.30E+00	5.99E–10	2.14E–10	5.57E–09	1.99E–09	--	4.1E+01	--	8.2E–08
Lead	4.60E+01	5.99E–10	2.14E–10	2.76E–08	9.84E–09	--	--	--	--
							TOTAL:	< 0.01	9.0E–08

FUTURE OCCUPATIONAL ADULT (DEH Worker): Dermal Contact with Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg–day) Noncarcinogen	Chronic Intake (mg/kg–day) Carcinogen	Toxicity Value RfD (mg/kg–day)	Toxicity Value CSF (mg/kg–day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Arsenic	2.40E+00	2.82E–04	1.01E–04	6.77E–04	2.42E–04	3.0E–04	1.8E+00	2.3E+00	4.4E–04
Barium	9.90E+01	2.82E–04	1.01E–04	2.79E–02	1.00E–02	7.0E–02	--	4.0E–01	--
Chromium	9.30E+00	2.82E–04	1.01E–04	2.62E–03	9.39E–04	5.0E–03	--	5.2E–01	--
Lead	4.60E+01	2.82E–04	1.01E–04	1.30E–02	4.65E–03	--	--	--	--
							TOTAL:	3.2	4.4E–04

CURRENT OCCUPATIONAL ADULT (DEH Worker): Incidental Ingestion of Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg–day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg–day)	CSF $(mg/kg-day)^{-1}$		
Arsenic	2.40E+00	3.82E–07	1.36E–07	9.17E–07	3.26E–07	3.0E–04	1.8E+00	3.1E–03	5.9E–07
Barium	9.90E+01	3.82E–07	1.36E–07	3.78E–05	1.35E–05	7.0E–02	--	5.4E–04	--
Chromium	9.30E+00	3.82E–07	1.36E–07	3.55E–06	1.26E–06	5.0E–03	--	7.1E–04	--
Lead	4.60E+01	3.82E–07	1.36E–07	1.76E–05	6.26E–06	--	--	--	--
							TOTAL:	< 0.01	5.9E–07

CURRENT OCCUPATIONAL ADULT (DEH Worker): Inhalation of Fugitive Dusts from Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg–day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg–day)	CSF $(mg/kg-day)^{-1}$		
Arsenic	2.40E+00	4.68E–10	1.60E–10	1.12E–09	3.84E–10	--	1.5E+01	--	5.8E–09
Barium	9.90E+01	4.68E–10	1.60E–10	4.63E–08	1.58E–08	1.4E–04	--	3.3E–04	--
Chromium	9.30E+00	4.68E–10	1.60E–10	4.35E–09	1.49E–09	--	4.1E+01	--	6.1E–08
Lead	4.60E+01	4.68E–10	1.60E–10	2.15E–08	7.36E–09	--	--	--	--
							TOTAL:	< 0.01	6.7E–08

CURRENT OCCUPATIONAL ADULT (DEH Worker): Dermal Contact with Surface Soils – Risk due to background

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg–day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg–day)	CSF $(mg/kg-day)^{-1}$		
Arsenic	2.40E+00	2.20E–04	7.86E–05	5.28E–04	1.89E–04	3.0E–04	1.8E+00	1.8E+00	3.3E–04
Barium	9.90E+01	2.20E–04	7.86E–05	2.18E–02	7.78E–03	7.0E–02	--	3.1E–01	--
Chromium	9.30E+00	2.20E–04	7.86E–05	2.05E–03	7.31E–04	5.0E–03	--	4.1E–01	--
Lead	4.60E+01	2.20E–04	7.86E–05	1.01E–02	3.62E–03	--	--	--	--
							TOTAL:	2.5	3.3E–04

APPENDIX O

TOXICOLOGICAL PROFILES

Pesticide Storage Facility
Fort Riley, Kansas

ALUMINUM

Aluminum is a silver-white flexible metal that occurs naturally combined with other elements as ore in the earth's crust. Aluminum is used in antacids and deodorants, and, as a metal, in cooking utensils, appliances, and building materials. The main route of absorption for aluminum is via ingestion. The extent of absorption is somewhat dependent on its chemical form. The trivalent form of aluminum is absorbed into intestinal mucosa to a minor extent and transferred into lungs, plasma, bone, and cells of various organs. Aluminum is excreted in feces and to a limited extent in the urine.

The acute toxicity of aluminum is not well defined. Possible target organs include the brain and bone, but this information is questionable because the people studied had underlying renal disease or Alzheimer's disease. Inhalation of aluminum dust causes an irritation of airways and possible fibrosis of the lungs (ATSDR, 1990).

Chronic aluminum toxicity has been associated with Alzheimer's disease in humans. At autopsy, neurofibrillary tangles containing aluminum are found in the cerebral cortex and hippocampus of these individuals. Aluminum toxicity has also been associated with renal dialysis patients manifesting a syndrome known as dialysis dementia. Symptoms include CNS disturbances such as altered speech, personality changes, seizures, and motor dysfunction. Aluminum is used in dialysis patients to control hyperphosphatemia (ATSDR, 1990).

Aluminum partitions into air, water, soil and plant material. It is transported in the atmosphere as a constituent of soil and other particulate matter. Transformation is not expected in the atmosphere. Aluminum partitions between the soil/sediment and aqueous phases by reacting and complexing with water molecules, anionic compounds and negatively charged functional groups on humic materials and clay. Bioaccumulation does not seem to be significant (ATSDR, 1990).

ARSENIC

Arsenic is a naturally occurring element and enters the environment as a result of natural forces (volcanoes, weathering) and human activities such as metal smelting, glass manufacturing, pesticide production and application, and fossil-fuel burning (ATSDR, 1987). In general, inorganic arsenic is more toxic than organic arsenic. The most common exposure route is ingestion of arsenic in food or water. Inhalation and skin contact are secondary routes of exposure. Arsenic is quickly absorbed through the lungs or digestive tract into the bloodstream. Within a few hours most of the absorbed arsenic is cleared from the blood and is excreted in the urine (ATSDR, 1987).

Large doses of inorganic arsenic induce death while smaller doses produce systemic effects such as irritation of the digestive tract, nausea, vomiting and diarrhea. In addition there are effects on cells that produce blood, abnormal heart function, blood vessel damage, liver or kidney injury and impaired nerve functioning. Epidemiological data demonstrate an association between occupational exposure to inhaled arsenic and lung cancer. The USEPA classifies arsenic as a group A carcinogen (sufficient evidence of carcinogenicity in humans).

Arsenic is a non-volatile solid. The mobility of arsenic in the environment depends on the solubility of the particular chemical form present. Most arsenic in the air is adsorbed to particulate matter and settles out according to particle size. Arsenic found in the soil is predominantly an insoluble, adsorbed form. Arsenic in soil and water may be reduced and methylated by soil organisms and the rate of volatilization to air may vary considerably (ATSDR, 1987).

BARIUM

Barium is a silvery-white metal often found in nature as ore deposits of barium sulfate and barium carbonate. Barium is used in drilling muds, paints and building materials, as fuel additives and in medicine. Barium enters the body primarily through ingestion and inhalation. Inhaled barium easily enters the bloodstream. Most adsorbed barium is quickly eliminated.

Barium hydroxide and barium carbonate may result in local irritation to the eyes, nose, throat and skin. Barium poisoning is virtually unknown in industry; however, when soluble, ionized barium compounds can be ingested and can exert an effect on muscles. Ingestion of large amounts of barium may cause paralysis and death. Lesser exposures produce labored breathing, increased blood pressure and systemic damage throughout the body. There is no evidence from animal studies that barium is associated with cancer or developmental effects (ATSDR, 1991). The USEPA has not evaluated barium for its carcinogenicity.

Barium sulfate and barium carbonate, the most common forms in the environment, are relatively insoluble and adsorb strongly to soil. Major features of the biogeochemical cycle of barium include wet and dry deposition to land and surface water, leaching from geological formations to ground water, adsorption to soil and sediment particulates and biomagnification (ATSDR, 1991).

BERYLLIUM

Beryllium is a naturally occurring dark gray metal of the alkaline earth family. Natural atmospheric emissions of beryllium originate from volcanic particles and windblown dusts. This source is very small compared to the anthropogenic sources such as ore processing and coal and fuel combustion. Bertrandite ore deposits are mined and processed to produce beryllium metal, alloys, and oxide. These forms of beryllium have commercial uses in items such as electrical components, tools, and structural components for aircraft, missiles and satellites (ATSDR, 1989).

Inhalation of beryllium is the major route of environmental exposure to the metal. Both oral and dermal exposure are secondary routes, due to the very poor absorption of this metal by either the gastrointestinal tract or the skin as noted in animal studies. When it is absorbed, beryllium appears to circulate in the blood stream as an orthophosphate colloid. Distribution favors the skeleton, liver and kidneys. Biotransformation of beryllium and its compounds does not occur, although the lungs partially convert soluble beryllium compounds to more insoluble forms. Following oral administration of beryllium in animals, excretion occurs primarily in the feces due to low absorption. Following inhalation exposure, most of the absorbed beryllium is excreted in the urine (ATSDR, 1989).

The lungs appear to be the primary target organ for toxicity due to beryllium exposure. Different studies show that acute exposure to an aerosol of soluble beryllium resulted in chemical pneumonitis in laboratory animals and in humans exposed in the workplace. It has also been noted for both humans and test animals that exposure to less soluble forms of beryllium may result in chronic beryllium disease (berylliosis) where the lungs develop granulomatous lesions (ATSDR, 1989). Acute dermal exposure to soluble beryllium compounds has been reported to cause contact dermatitis. It has also been reported that ulcerative granulomas can appear on the skin as a result of beryllium entering through cuts in the skin while handling beryllium metals and alloys (ATSDR, 1989).

There is no evidence to indicate that beryllium produces a carcinogenic response following oral or dermal exposure in animals or humans. However, there is strong evidence in both short- and long-term studies in monkeys and several strains of rats that various inhaled beryllium compounds can induce a variety of lung tumors (IRIS, 1989; ATSDR, 1988). The USEPA classifies beryllium as a B2 carcinogen (probable human carcinogen), although human epidemiology studies of workplace exposure are inadequate to clearly establish human carcinogenicity (USEPA, 1989).

Most atmospheric beryllium results from coal combustion, which likely forms beryllium oxide. Both wet and dry deposition remove beryllium from the atmosphere. Beryllium oxide is not expected to be mobilized in soil or surface water of normal pH (5 to 8) due to its low solubility. The soluble beryllium salts hydrolyze to form beryllium hydroxide which has a low solubility at the pH of most natural waters. It is anticipated that beryllium will be tightly adsorbed in most soil types because it displaces divalent cations (ATSDR, 1988). Due to these properties, it appears that environmental movement of beryllium via leaching from soil or solubilizing in the water column will be minimal. Bioconcentration factors have been reported to range from 19 to 100, a level which indicates that beryllium will not bioaccumulate significantly. In addition, there is no data suggesting that beryllium is biomagnified in food chains (ATSDR, 1988).

CADMIUM

Cadmium is a naturally occurring bluish-white metal that is usually found in combination with other elements (cadmium oxide, cadmium chloride, or cadmium sulfide). These compounds are stable solids. Because many edible plants and fish take up cadmium from soil or water sources, food is the primary exposure route for humans. Airborne exposures can also occur. Cadmium is poorly absorbed from the gastrointestinal tract after ingestion but relatively well absorbed from the lungs after inhalation. Smoking is an important source of cadmium. Tobacco smokers are exposed to an estimated 1.7 μg/cigarette.

Acute toxicity effects include severe irritation to the stomach after ingestion and lungs after inhalation exposure. Other tissues harmed by high doses include the testes and liver. Kidney damage accompanied with kidney stones occurs with chronic cadmium exposure by inhalation or ingestion. Chronic low dose exposure can build up to significant levels in the body. High blood pressure has been observed in animal tests. Other organ systems sustaining damage after cadmium exposure have been the liver, testes, immune system, nervous system and blood of test animals. Reproductive and developmental effects have also been observed in animals. Lung fibrosis, emphysema and lung cancer in humans are associated with chronic exposure to inhaled cadmium. The USEPA classifies cadmium as a group B1 carcinogen (Probable human carcinogen with limited human data available).

The largest source of cadmium release to the general environment is from the burning of fossil fuels or the incineration of municipal waste materials. In surface water and ground water, cadmium can exist as the hydrated ion, or as ionic complexes with organic or inorganic ligands. Cadmium may also exist in insoluble forms and adsorbed to particulate matter, soil and sediments. Cadmium is bioaccumulated in microorganisms through food and water exposures (ATSDR, 1987).

CHLORDANE

Chlordane is a manmade substance used as a pesticide from 1948 to 1988. After mixing with water, the chemical was used to stop termites and to treat corn and other crops. Routes of exposure include ingestion, dermal absorption and inhalation. Absorption following ingestion of or skin contact with chlordane can be fatal. Inhalation exposures are unlikely to cause death.

Gastrointestinal distress such as nausea, vomiting, diarrhea, and cramps are associated with oral exposures. Chlordane, like other organochlorine insecticides, functions as a potent inducer of hepatic microsomal enzymes. Animal studies suggest that subtle hepatic effects occur which would influence the metabolism of other substances in the body rather than damage hepatocytes directly.

Kidney congestion has been observed in rats and hamsters given large acute oral doses of chlordane. Skin contact may cause burning sensations, development of rash and pruritus. Eye contact can cause conjunctivitis. Neurological effects are the primary effects noted after acute oral, inhalation or dermal exposures and include headache, dizziness, tremors, confusion, convulsions and coma. These effects are not associated with occupational exposures. Male mice exposed to chlordane had testicular degeneration after chronic oral exposures for 10 days. Reduced fertility has also been reported in animal studies. Exposure to chlordane is believed to affect metabolism and circulating levels of steroid hormones. Chlordane has induced mitotic gene conversions and sister chromatid exchange in genotoxicity assays.

Chronic oral treatment resulted in significant increases in hepatocellular carcinomas in mice. Some researchers suggest that chlordane acts as a promoter of liver tumors.

Chlordane in water will both adsorb to sediments and volatilize. Chlordane will bioconcentrate in both marine and fresh water species as well as bacteria. In soil, chlordane will adsorb to the organic matter and volatilize slowly over time. It will not leach significantly and is usually found only in the top 20 centimeters of soil. Chlordane can persist in soils as long as twenty years (ATSDR, 1988).

CHROMIUM

Chromium is a naturally occurring steel-gray lustrous metal, used in metal alloys, chrome plating, and various other industrial processes. Chromium occurs naturally in foods and is considered vital to the metabolism of fats and sugars. Chromium appears in several different chemical states. Hexavalent chromium (chromium VI) is considered the most toxic state and is the form seen in most waste streams. The following discussion will be confined to hexavalent chromium unless otherwise noted. Absorption occurs through inhalation, ingestion and skin contact. While chromium accumulates in fat and lungs, the majority of absorbed chromium is quickly excreted via the urinary tract.

Acute inhalation of chromium may result in irritation of the mouth and throat causing sneezing, redness of the throat and generalized bronchial spasms. Dermal chromium exposures result in skin ulcers which may penetrate deeply into soft tissues. Acute exposure of ingested chromium may cause intense gastrointestinal effects, bleeding, circulatory collapse, unconsciousness and death.

Chronic exposures to chromium dust by inhalation have shown nasal perforation or ulceration, chronic respiratory irritation, emphysema, and chronic inflammation and congestion of the upper respiratory tract. In rats, chronic exposure to chromium in drinking water produced liver and kidney lesions. Impaired reproductive function and sterility were found in rats receiving chromium in feed. Epidemiological evidence indicates a strong relationship between occupational chromium exposure and lung cancer. Vegetables from gardens containing high levels of chromium in the soil were associated with an excess incidence of stomach and intestinal cancers. The USEPA classifies chromium as a group A carcinogen (human carcinogen).

Environmentally, airborne chromium is primarily removed from the atmosphere by fallout and precipitation and enters surface water and soil. Exposed plants show growth retardation, leaf rolling, wilting and discolorations. Chromium is mobile in ground water (HSDB, 1988; USEPA, 1988; Callahan et al., 1979).

COPPER

Copper is a naturally occurring reddish metal used in the manufacture of wire, pipe, and other materials, and as a preservative for wood, leather, and fabric products. It is an essential nutrient for all known living organisms. It can be adsorbed through the lungs or by ingestion at which time it rapidly enters the bloodstream.

The human body efficiently blocks toxicity in the gastrointestinal tract and excess copper is adsorbed into gastrointestinal cells and excreted when the cells are sloughed off. Large amounts of oral copper can saturate this mechanism, producing nausea, vomiting, diarrhea, and abdominal pain. Liver effects and death have also occurred as a result of oral copper toxicity. Airborne copper, usually in the form of copper sulfate, is a respiratory irritant. A self-limiting illness known as metal fume fever afflicts copper workers and is characterized by chills, fever, muscle aches, and dryness of the mouth and throat (ATSDR, 1989; Klaassen et al., 1986).

Copper is released to the atmosphere in the form of particulate matter or adsorbed to particulate matter. Atmospheric removal occurs via gravitational settling, dry deposition and wet deposition. Most of the copper deposited to the land will become strongly adsorbed to the soil. In aqueous systems, copper exists in particulate (i.e., copper precipitates, insoluble organic complexes, and copper adsorbed to mineral solids), colloidal (i.e., hydroxides and complexes with amino acids) and soluble (i.e., Cu(II) and soluble complexes) forms. The bioconcentration potential of copper may be significant in some aquatic organisms (i.e., mollusks); however, there is no evidence of biomagnification (ATSDR, 1990).

DDT

DDT, 1,1,1-trichloro-2,2-bis-(p-chlorophenyl)ethane, was one of the most widely used chemicals for the control of insect pests on agricultural crops and for control of insects which carry such diseases as malaria and typhus. Technical DDT is primarily composed of three forms (p,p'-DDT, o,p'-DDT, and o,o'-DDT), which are white, crystalline, tasteless, and almost odorless solids. In addition, DDE and DDD, 1,1-dichloro-2,2-bis(p-chlorophenyl)ethylene and 1,1-dichloro-2,2-bis(p-chlorophenyl)ethane, respectively, are found in small amounts as contaminants in technical DDT (ATSDR, 1987; USEPA, 1986).

DDT, DDE, or DDD enter the body primarily by eating foods contaminated with these compounds. DDT, DDE, and DDD may also be inhaled and absorbed through the lungs. These compounds are not readily absorbed by the skin (ATSDR, 1987; USEPA, 1986).

With acute exposure to high doses, the nervous system appears to be the major target in both human and experimental animals. Symptoms include hyperexcitability, tremors, and convulsions. The effects appear to be reversible once the exposure ceases. The liver has been shown to be the major target organ for DDT toxicity in animal studies, but no liver damage has been reported in humans following DDT ingestion.

Chronic exposure studies in both humans and experimental animals have reported that the liver is the major target organ. There is no evidence that liver function in humans occupationally exposed to DDT has been impaired; however, the data are limited. Carcinogenic effects have been reported in some animal studies, with liver and lung tumors being reported. It has been reported that exposure to DDT will enhance the carcinogenic effects of known carcinogens. The information available from animal studies indicates that DDT is not a structural teratogen. However, embryotoxicity and fetotoxicity including infertility have been reported in experimental animals in the absence of maternal toxicity (ATSDR, 1987).

Because of its persistence in nature, its hydrophobic properties and its solubility in lipids, DDT and its metabolites are concentrated by aquatic organisms at all trophic levels from water, enter the food web, and are bioaccumulated by organisms at higher trophic levels.

DIBENZOFURAN

Dibenzofuran is a solid used as a research chemical; it is derived from industrial and experimental coal gasification operations. Dibenzofuran is a common contaminant of polychlorinated biphenyls (PCBs), polychlorinated quinones (PCGs), and polychlorinated dibenzofurans (PCDFs).

There are no published data available on the toxicity of dibenzofuran alone. Dibenzofuran does not occur alone, but as a contaminant of polychlorinated compounds. There are some data available on the toxicity of polychlorinated dibenzofurans, which are chlorinated forms of this compound. However, because the biological activity of PCDFs varies greatly, the risk assessment of dibenzofuran by analogy is not recommended (IRIS, 1991). Dibenzofuran was not mutagenic with or without metabolic activation in several strains of Salmonella typhimurium assay (IRIS, 1991).

In the atmosphere, dibenzofuran is believed to undergo reaction with hydroxy free radicals, with an estimated half-life of 2 to 19 hours. In water, dibenzofuran has an estimated half-life of 1 to 4 weeks under aerobic conditions, and 1 to 4 months under anaerobic conditions.

DIELDRIN

Dieldrin (1,2,3,4,10,10-hexachloro-6,7-epoxy 1,4,4a,5,6,7,8,8a-octahydro-endo,exo-1,4,5,8-dimethanonaphthalene), a chlorinated hydrocarbon compound and member of a group of synthetic cyclic hydrocarbons called cyclodienes, has been widely used as a domestic pesticide. The primary use of the chemical in the past was for control of corn pests, although it was also used by the citrus industry. Current uses are restricted to those where there is no effluent discharge. Production in the United States has been restricted for all pesticide products containing dieldrin; however, formulated products containing dieldrin are imported each year from Europe for termite control by subsurface soil injection and for non-food seed and plant treatment (USEPA, 1986). Human exposure can result from inhalation and ingestion. Dermal exposure is limited to those involved in manufacturing or application of pesticides containing dieldrin. The potential for this exposure route has been reduced due to the bans on the manufacture and use of dieldrin (USEPA, 1986).

Dieldrin is absorbed into the bloodstream form the gastrointestinal tract after ingestion or the lungs after inhalation. It is quickly spread throughout the body after intake, but within hours is usually concentrated in the fat tissues due to its lipophilic nature. Other organs which tend to have high concentrations are the liver, kidneys, brain, and blood. Dieldrin is excreted, mainly in the feces, in the form of several metabolites that are more polar than the parent compounds (ATSDR, 1989).

The toxicity of dieldrin is highest by the intravenous route, followed by oral and then dermal. Toxicity appears to be related to the central nervous system with symptoms of headache, dizziness, nausea, general malaise,and vomiting, followed by muscle twitching, myoclonic jerks, and even convulsions. These symptoms are reversible with time after removal from the source of exposure. Death may result from anoxemia (ATSDR, 1989).

There are no demonstrated long-term toxic effects for humans chronically exposed to low levels of dieldrin in the workplace. Animal studies, however, have indicated a decrease in immune function and liver damage resulting from aldrin exposure. In addition, liver cancer has been found in mice (but not rats) chronically exposed to aldrin (ATSDR, 1989). Dieldrin has been classified by the USEPA as a probable human carcinogen. There is "sufficient" evidence that exposure to dieldrin has caused liver cancer in animal studies.

Dieldrin is extremely persistent in the environment. It has low volatility and low water solubility; therefore, dieldrin tends to adsorb to soil and sediments. Since dieldrin is extremely apolar, it is very fat soluble and is progressively accumulated in the food chain.

LEAD

Lead is a commonly used, naturally occurring metal which is ubiquitous throughout the environment. Lead is found in construction materials, leaded gasoline, radiation protection gear, paint, ceramics, plastics, antimonial lead storage batteries and ammunition. Lead is well absorbed from all portions of the respiratory tract including the nasal passages. Absorption from the gastrointestinal tract is less rapid and complete than from the respiratory tract. Dermal absorption is a much less significant route of lead absorption than inhalation or ingestion. Absorbed lead is distributed to the soft tissues of the body with the greatest distribution to the kidneys and the liver. Lead is eventually transferred to the skeleton where 90% of the body's long-term burden is stored. Approximately 70% of the absorbed lead dose is excreted.

Lead intoxication in humans can occur by ingestion and inhalation of dust or fumes. At blood levels of 30-50 μg/dL, lead interferes with the blood making process, production of energy and transmission of nerve impulses. Symptoms of lead intoxication include anorexia, malaise, headaches and intestinal spasms. The neuromuscular disease, lead palsy, is a result of advanced subacute poisoning (lead blood levels of 70 μg/dL and less), and is characterized by muscle weakness leading to paralysis. Lead encephalopathy is the term used for the central nervous system manifestation which is commonly seen in children when lead blood levels reach 90 μg/dL. Symptoms include clumsiness, dizziness, delirium, convulsions and coma. The mortality rate is 25% when the brain is involved, with survivors suffering long-term neurological problems.

Chronic low level lead exposure (lead blood levels of 30-50 μg/dL) is associated with learning disabilities. Lead toxicity is defined by the Centers for Disease Control as a blood level of 25 μg/dL or greater (child). Damage at lower levels has been reported and the blood level will be revised to approximately 10-15 μg/dL. Kidney damage occurs after prolonged exposures, and is apparently reversible. In epidemiological studies, lead intoxication is also associated with increased blood pressure which is symptomatic of kidney damage. Lead exposure is associated with reproductive effects such as miscarriages and temporary sterility. Lead readily crosses the placenta. In all systems, the concentrations of essential nutrients and elements have a significant impact on the degree of toxicity seen with lead exposures. Occupational exposure to airborne lead is associated with an increased incidence of total malignant neoplasms, cancers of the digestive tract and cancers of the respiratory tract. An increased incidence in kidney cancer was seen in lead smelter workers exposed by inhalation and in various animal species exposed by ingestion at levels of 500 ppm and above. The USEPA has classified lead as a group B2 carcinogen based on animal studies (probable human carcinogen with inadequate or no evidence in humans).

The mobility of lead in soil is dependent on the chemical properties of the soil. Lead can react with sulfates, carbonates and phosphates or combine with clays and organic matter which limits the further migration of lead through the soil matrix. Lead in surface waters is usually present as suspended solids. Atmospheric lead is removed by dry deposition and rainout. Lead does not significantly bioaccumulate in fish. Lead localizes in fish skin which serves to reduce human exposures by fish consumption. Lead is toxic to wildlife, particularly water fowl, through their consumption of lead shot. Tetraethyl lead is biodegradable, but inorganic lead concentrations above 5 $\mu g/L$ can be toxic to microorganisms. As water hardness increases, the acute toxicity of lead to freshwater aquatic species decreases (ATSDR, 1988; HDSB, 1988; USEPA, 1988; US Dept of Health and Human Services, 1991).

MANGANESE

Manganese is a naturally occurring metal that is mixed with iron to make steel. Manganese is also used in the production of batteries, and various other products. It is an essential nutrient for humans.

When inhaled as a dust, manganese is acutely toxic and results in an inflammatory response in the lungs leading to a cough that may develop into bronchitis. It has a low incidence of acute toxicity by other routes of exposure, except in the form of potassium permanganate ($KMnO_4$), an extremely caustic compound which is corrosive when in contact with tissue.

Chronic inhalation exposure to manganese dust in occupational settings has shown evidence of severe neurological damage in humans. A disease, known as manganism, typically begins with feelings of weakness and lethargy. As the disease progresses, effects to the central nervous system and psychological disturbances occur. In advanced cases, permanent muscle rigidity may develop. Results in both animal and human studies indicate that manganese toxicity may result in reproductive and birth defects, but these findings are inconclusive. Animals studies in rodents indicate manganese has some potential for carcinogenicity, but the data suggest that the potential for carcinogenic effects in humans is small (ATSDR, 1990; Klaassen et al., 1986). The USEPA classifies manganese as a group D carcinogen indicating that there is no conclusive evidence as to human carcinogenicity.

Manganese may occur in the air as suspended particles and will settle out according to the size of the particle. Manganese is soluble in water depending on its chemical form. It is often transported in rivers as suspended sediments. Lower organisms such as algae appear to bioconcentrate manganese, but higher organisms do not appear to bioconcentrate suggesting that biomagnification of manganese in the food chain may not be significant.

MERCURY

Mercury is an element that occurs naturally in the environment in several forms. "Metallic mercury" is used in thermometers and other consumer products. However, mercury can combine with other chemicals, such as chlorine, carbon or oxygen, to form other mercury compounds. Normally, air contains about 2.4 ppt (parts per trillion) of mercury; however, in certain industrial areas it can be 1800 ppt. The form found in air is thought to be mostly inorganic mercury. Concentrations in water are usually less than 25 ppt. One form of organic mercury, methylmercury, can build up in some fish. People who eat large amounts of these fish, such as tuna and swordfish, may be exposed to mercury through these foods. Mercury can enter the body by breathing air containing mercury vapor, by eating contaminated fish or other foods, or by drinking contaminated water. Mercury can also enter the body directly through the skin. Once mercury enters the body, it can remain in the body for long periods of time before it is excreted in the urine or feces.

Acute or short-term exposure to high levels of mercury have similar effects as long-term or chronic exposures except that the likelihood of recovery after short-term exposure is better. Chronic exposure to mercury can permanently damage the brain or kidneys. Mercury exposure to pregnant women can result in birth defects for the developing fetus. The form of mercury and route of exposure can determine which health effects will be seen. For example, organic mercury consumed in contaminated food is more likely to effect the brain or developing fetuses, inhaled metallic mercury vapor may damage the brain, and inorganic mercury salts that are ingested in food or water may effect the kidneys. Death has resulted from acute exposures to high doses of mercury. Mercury has not been shown to cause cancer in humans. The USEPA classifies mercury as a group D carcinogen (not classifiable as to human carcinogenicity).

Mercury has a tendency to bioaccumulate in aquatic life. It moves slowly through soils and readily precipitates out of leachate when the leachate is above pH 7.0. Aquatic plants (algae, etc.) tend to accumulate mercury relative to its concentration in water.

NITRATES

Nitrates are used in fertilizers for the agriculture industry and in the meat processing industry as a color enhancer and preserver of meat (Amdur, 1991). Nitrates are the final product of the biochemical oxidation of ammonia. Their presence may be due to nitrogenous waste from livestock, poultry and to some extent vegetables (Salvato, 1982). The treatment and discharge of sewage may also contribute to the nitrogenous waste in soil and water (Amdur, 1991).

Nitrate is a normal component in the human diet. Consumption of nitrate through vegetables provides the majority of nitrate intake, while a small amount (2-3%) of nitrate is obtained through drinking water (IRIS, 1993).

Nitrate toxicity is primarily due to the conversion of nitrate to nitrite which can be mediated by enteric bacteria or a stomach pH greater than 5. Nitrite oxidizes Fe^{+2} (hemoglobin state) to the Fe^{+3} (methemoglobin state). Methemoglobin cannot bind oxygen. This causes a reduction in the concentration of oxygen being carried from the lungs to the tissues. Normally, low levels (0.5-2.0%) of methemoglobin are present in the body. Levels greater than 10% may cause bluish skin and lips; greater than 25% may cause weakness, rapid pulse, and tachypnea, and levels around 50-60% may cause death (IRIS, 1993). The group most susceptible to methemoglobinemia are infants less than three months old ("blue babies"), but children up to six years old may also be affected (Salvato, 1982). In addition, nitrite may react with secondary amines, thereby creating nitrosamines. Nitrosamines have been found to cause liver damage, hemorrhagic lung lesions, convulsions and coma in rats. *N*-nitroso compounds are carcinogenic and mutagenic in animals and are suspected to have similar effects in humans (Toxicology).

POLYCYCLIC AROMATIC HYDROCARBONS

Polycyclic aromatic hydrocarbons (PAHs) are a diverse class of compounds formed as a result of incomplete combustion of organic compounds with insufficient oxygen. This leads to the formation of C-H free radicals which can polymerize to form various PAHs. Although the health effects of the individual PAHs are not exactly alike, the following PAHs are considered as a group in this profile (ATSDR, 1989):

- acenaphthene
- anthracene
- chrysene
- phenanthrene
- indeno(1,2,3-cd)pyrene (I[123cd]P)
- benzo(a)pyrene (B[a]P)
- benz(a)anthracene (B[a]A)
- benzo(b)fluoranthene (B[b]F)
- benzo(k)fluoranthene (B[k]F)
- benzo(g,h,i)perylene (B[ghi]P)

PAHs are present in the environment from both natural and anthropogenic sources. As a group, they are widely distributed in the environment. Humans may be exposed to PAHs in the environment, in tobacco smoke, in cooked food, and in the workplace. Typically, individuals are not exposed to a single PAH, but to a mixture of related chemicals (ATSDR, 1989). PAHs are readily absorbed into the bloodstream from the gastrointestinal tract after ingestion or the lungs after inhalation. PAHs are metabolized primarily in the liver and excreted in the feces.

Most of the information available for PAHs are from studies on experimental animals. Adverse effects in humans are generally not observed, but have been documented. Hematologic effects (myelosuppression) were produced in people after intravenous administration of anthracene-containing chemotherapeutic agents. Dermal effects have been documented. Regressive verrucae followed repeated topical application of B[a]P over a four-month period.

In animals, oral administration of PAHs affect proliferating organs and tissue such as bone marrow, lymphoid organs, and intestinal epithelium (ATSDR, 1989).

PAHs are well established as experimental carcinogens for all routes through which humans would normally be expected to be exposed. In human occupational studies, lung and skin cancer have been demonstrated after inhalation exposure to PAHs. These workers were employed in coke production plants as roofers and as oil refinery workers. In experimental animals, the site of tumor induction is generally the point of first contact with the PAHs (i.e., stomach tumors after ingestion, lung tumors after inhalation, etc.) (ATSDR, 1989). The following PAHs are classified as B2 carcinogens by the USEPA: B[a]A, B[a]P, B[b]F, B[k]F, chrysene and I[123cd]P; these PAHs are probable human carcinogens. Anthracene, B[ghi]P and phenanthrene are class D carcinogens (not classifiable as to human carcinogenicity). No data exist on the carcinogenicity of acenaphthene (IRIS, 1990-92).

The environmental fate of PAHs are determined largely by their low water solubilities and high propensity for binding to particulate or organic matter. In the atmosphere they are associated with particulate matter, especially soot. In aquatic environments, PAHs are usually bound to suspended particles or bed sediments. PAHs suspended in air are thought to undergo direct photolysis very quickly. The ultimate fate of PAHs in the sediment is believed to be biodegradation and biotransformation by microbes (USEPA, 1986). PAHs in the water column also accumulate in organisms, but most organisms metabolize and excrete PAHs rapidly, resulting in short-lived bioaccumulation (USEPA, 1986).

THALLIUM

Pure thallium is a soft, bluish-white metal that is widely distributed in trace amounts in the earth's crust. In its pure form, it is odorless and tasteless. Thallium exists in two states (thallous and thallic). The thallous state is the more common and stable form. Thallous compounds are the most likely form to which you would be exposed in the environment. Thallium is used most commonly in the manufacture of electronic devices, switches, and closures. It also has limited use in the manufacture of special glasses and for medical procedures that evaluate heart disease. Up until 1972 thallium was used as a rat poison, but was then banned because of its potential harm to man.

Thallium can enter the body when you eat food or drink water contaminated with thallium, breathe thallium in the air, and when your skin comes in contact with it. When thallium is swallowed most of it is absorbed and rapidly goes to various parts of the body, especially the kidney and the liver. Thallium is excreted slowly to the urine and to a lesser extent the feces.

Thallium can affect the nervous system, lung, heart, liver and kidney, if large amounts are ingested in a short period of time. Temporary hair loss, vomiting, and diarrhea can also occur and death may result after exposure to large amounts of thallium for longer periods. Thallium can be fatal from a dose as low as 1 gram. Animal reproductive organs, especially the testes, are damaged after drinking small amounts of thallium-contaminated water for 2 months. No studies were found on whether thallium can cause cancer to humans or animals.

Thallium is a nonvolatile heavy metal, and if released to the atmosphere by anthropogenic sources, may exist as an oxide (thallium oxide), hydroxide (TlOH), sulfate (thallium sulfate), or as the sulfide (Tl_2S). It has been speculated that thallium sulfate and TlOH will partition into water vapor (such as clouds and rain drops) because they are soluble in water and thus precipitation may remove these forms of thallium from the atmosphere. Thallium oxides are less soluble in water and may subject to only atmospheric dispersion, and gravitational settling. Thallium may partition from water to soils and sediments. Thallium may be bioconcentrated by organisms from water (ATSDR, 1990).

VANADIUM

Vanadium is a white to gray metal that occurs naturally in fuel oils and coal, and is released into the environment when these fuels are burned. Vanadium is used to make steel, rubber, plastics, ceramics, and certain other chemicals (ATSDR, 1990). Vanadium is poorly absorbed following ingestion. The majority taken into the body is excreted unchanged in the feces, and the little vanadium that is absorbed is excreted in the urine (ATSDR, 1990). Inhaled vanadium is more readily absorbed. Most of what is inhaled is eliminated with expired air; the fraction that enters the bloodstream is excreted in the urine (ATSDR, 1990). Vanadium is not metabolized in a true sense, but is interconverted between two oxidation states (valences 4+, 5+). The pentavalent (5+) form is generally thought to be more toxic, as it is more reactive with enzymes (ATSDR, 1990).

Because vanadium is poorly absorbed by the oral route, it is unlikely that any acute toxicity would result from ingestion other than possible GI effects. Inhaled vanadium, however, is associated with reversible respiratory distress. Symptoms include coughing, wheezing, chest pain, runny nose and sore throat. It is believed that vanadium interferes with the action of alveolar macrophages in the lung (ATSDR, 1990).

There is little documentation of chronic toxicity resulting from vanadium exposure. Workers exposed to vanadium dust by inhalation showed the reversible respiratory symptoms mentioned above. Mild eye irritation and a green discoloration of the tongue were also noted in some people (ATSDR, 1990). In addition, some workers reported slight neurological symptoms (dizziness, headache, tremor) after inhalation exposure to vanadium, but whether these effects were due solely to vanadium is unclear (ATSDR, 1990).

Literature Cited

Amdur, M.O., 1991. Casarett and Doull's Toxicology: The Basic Science of Poisons. Pergamon Press, New York.

ATSDR, 1987-1991. Toxicological Profile for "Constituents." Agency for Toxic Substances and Disease Registry, U.S. Public Health Service.

Callahan, M. et al. Water-related Environmental Fate of 129 Priority Pollutants. EPA-440/4-49-029. December 1979.

HEAST, 1991. Health Effects Assessment Summary Tables. USEPA Office of Research and Development. January 1991. NTIS No. PB91-921199.

Howard, Phillip A., 1990. Handbook of Environmental Fate and Exposure Data, Volume II. Lewis Publishers, Chelsea, MI.

HSDB, 1988. Hazardous Substances Database, National Library of Medicine, Bethesda, Maryland.

IRIS, 1993. Integrated Risk Information System. USEPA. Cincinnati, Ohio.

IRP, 1989. The Installation Restoration Program Toxicology Guide, under DOE Interagency Agreement No. 1891-A076-A1, Biomedical and Environmental Information Analysis, Oak Ridge, TN.

Klaassen, C.D., Amdur, M.O., and Doull, J. (editors), 1986. Toxicology: The Basic Science of Poisons, 3rd ed. Macmillan Publishing Company, New York, NY.

Salvato, P.E., 1982. Environmental Engineering and Sanitation. John Wiley & Sons, New York.

Sittig, M., 1985. Handbook of Toxic and Hazardous Chemicals and Carcinogens, Noyes Publications, Park Ridge, NJ.

US Department of Health and Human Services, 1991. Strategic Plan for the Elimination of Childhood Lead Poisoning, Public Health Service and Centers for Disease Control. February 1991.

USEPA, 1986. U.S. Environmental Protection Agency. Quality Criteria for Water. Atlanta, Georgia: USEPA.

USEPA, 1988. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS) Database. Cincinnati, Ohio: USEPA, Environmental Criteria and Assessment Office.

APPENDIX P

RESIDENTIAL RISK EVALUATION

Provided for Information Only

Pesticide Storage Facility
Fort Riley, Kansas

Table of Contents

List of Tables

P.0 RESIDENTIAL RISK EVALUATION -Provided for Information Only

The Army believes that future residential development of the PSF site is extremely unlikely, and, therefore, not appropriate for inclusion in the Reasonable Maximum Exposure (RME) on which the baseline risk assessment is required to be based. However, at the request of USEPA Region VII, future residential scenarios for the PSF site were developed, and are included here for reference. This information may be useful if the land should be considered for use other than as a military installation and/or if land use patterns should change drastically.

P.1 PATHWAY-SPECIFIC INTAKE ESTIMATES

Pathway-specific intakes are quantified by defining a series of variables that describe the exposed population, such as contact rate, exposure frequency and duration, and body weight. Residential intakes are developed in this appendix for informational purposes; occupational and recreational child scenarios and intakes are developed as RME's in the baseline risk assessment (see Section 6.0 of the RI report). The specific calculation procedures and variables used to determine residential intakes are described below. These exposure variables are multiplied by the exposure point concentrations shown in Table 6-8 of the RI report to yield estimates of the chemical-specific intakes for these pathways. The chemical-specific intakes are calculated individually in the Risk Calculation Tables included in this appendix.

Standard default body weights of 70 kg for an adult, and 15 kg for a child aged 6 years are used. Standard default exposure values were taken from the Supplemental Guidance to the Human Health Evaluation Manual (USEPA, 1991), unless otherwise noted.

P.1.1 Incidental Ingestion of Soil

The equations for determining chemical intakes from the incidental ingestion of soil are shown in Tables P-1. Based on the variables provided in the table, intakes are calculated for future residential adults and children.

For the adult residential scenarios, exposure duration and exposure frequency are assumed to be a total of 30 years (90th percentile average time at one residence) and 350 days/year, respectively. It is assumed that children one to six years old will ingest 200 mg soil per day for a duration of six years and 350 days/year. The equation for calculating an adult's incidental ingestion of soil is divided into two parts: (1) a six-year exposure duration for young children which accounts for the period of highest soil ingestion (200 mg/day) and lowest body weight (15 kg), and (2) a 24-year exposure duration for older children and adults which accounts for a lower ingestion rate (100 mg/day) and a higher body weight (70 kg) (USEPA, 1991). In this way, a time-weighted average for an adult's incidental soil ingestion is estimated.

P.1.5 Dermal Exposure to Surface Water

Residential surface water intakes are calculated in Table P-4. The surface water scenario assumes that an individual will wade and/or play in the water for 2.6 hours a day, seven days per year. This is the national average for time and frequency for swimming activities (USEPA, 1992). A fiftieth percentile surface area value of 6,170 cm^2 for adults (lower arms, lower legs, hands, and feet) and 4,490 cm^2 for children (arms, legs, hands, and feet) are used in the equation (USEPA, 1989b).

The dermal permeability constants (PC) are obtained from dermal guidance (USEPA, 1992). Metals were the only constituents of concern in site surface water (see Table 6-5 in the RI report). Of the metals detected, only cadmium, chromium, and lead have published chemical-specific PC values. Chromium and cadmium have the same PC value as the default PC for metals (0.001 cm/hour), while lead's PC value is 0.000004 cm/hr (USEPA, 1992). There fore, two intakes are calculated for each receptor listed in Table P-4: one based on the default permeability coefficient for metals (including chromium and cadmium) using a PC of 0.001 cm/hour, and one for lead, using a PC value of 0.000004 cm/hour.

P.1.6 Dermal Contact with Sediments

The equations for determining intakes from dermal contact with sediments are shown in Table P-5. A (50^{th} percentile) surface area of 6,170 cm^2 (lower arms, lower legs, hands, and feet) is assumed for residential adults, and 4,490 cm^2 (arms, legs, hands, and feet) is assumed for children (USEPA, 1989b). Exposure durations are assumed to be 30 years and 6 years for adults and children, respectively (USEPA, 1991), with an exposure frequency of 7 days/year at 2.6 hours/day for both adults and children (USEPA, 1989a; USEPA, 1992). A soil adherence factor of 1.0 mg/cm^3 (USEPA, 1992) and a conservative absorption factor of 100% (USEPA, 1992e) was also assumed for all receptors.

P.1.7 Incidental Ingestion of Sediments

The equations for determining chemical intakes from the incidental ingestion of sediment are shown in Tables P-6. Based on the variables provided in this table, intakes are calculated for residential adults and children. The exposure duration, frequency, and time are the same as described in the surface water scenario, above. The residential adult and child are assumed to ingest 100 mg and 200 mg, respectively, of sediments daily. The sediment intake value for residential adults is calculated in two parts (i.e., is a time-weighted average intake), as described earlier in this supplementary assessment (see Table P-1).

P.2 RISK CHARACTERIZATION FOR RESIDENTIAL SCENARIOS

A risk characterization integrates the results of the exposure and toxicity assessments into quantitative and qualitative expressions of risk. To characterize potential noncarcinogenic effects, comparisons are made between the estimated chemical intakes and the RfDs/RfCs for those chemicals; to characterize potential carcinogenic effects, estimated chemical intakes are multiplied by the chemical-specific slope factors to yield chemical-specific dose-response information.

P.2.1 Noncarcinogenic Effects Characterization

Noncarcinogenic effects are characterized by comparing the estimated chemical intakes to the appropriate RfD/RfC value. When the estimated chronic daily intake of a chemical exceeds the appropriate RfD/RfC, there may be a concern for potential noncancer effects from exposure to that chemical. The ratio of the chronic daily intake to the chronic RfD/RfC is referred to as the "hazard quotient"; the sum of the hazard quotients for each chemical in a specific pathway is termed the "hazard index." A hazard quotient greater than 1.0 indicates that the "threshold" for that chemical has been exceeded. The chemical-specific hazard quotient calculations for residential receptors are presented, by pathway, at the end of this appendix, in Exhibit P-1.

The USEPA assumes additivity of effects in evaluating noncarcinogenic effects from a mixture of chemicals. The chemical-specific hazard quotients are summed to yield an overall pathway hazard index; pathway hazard indices are then summed to yield a total risk for each relevant population. Table P-7 presents a summary of the hazard index estimates for exposed adults and children by pathway (page 1 of 2), and a summary of the exposure parameters used to derive the intakes and associated risks (page 2 of 2).

P.2.1.1 Surface Soils - The calculated hazard indices for noncarcinogenic effects of exposure of future residential adults and children to surface soil via inhalation of fugitive dust and for future residential adults for incidental ingestion of and dermal contact with surface soils are below the departure point of 1.0. Based on current site-specific data, and assuming no increase in constituent concentrations, there are no projected unacceptable systemic risks from exposure to surface soil via these pathways.

The hazard index for exposure of future residential children via dermal absorption (HI = 3) exceeds the departure point of 1.0. Additionally, the hazard index calculated for incidental ingestion of surface soils by future residential children slightly exceeds the departure point of 1.0 (HI = 1.5). The unacceptable noncarcinogenic risk is attributed to the presence of arsenic and the chlordanes detected in surface soil. As stated in the baseline risk assessment, the hazard indices for dermal exposure are calculated using conservative assumptions that may result in an overestimation of risk.

P.2.1.2 Subsurface Soils - Hazard indices for exposure to future residential receptors to constituents in subsurface soil via incidental ingestion, dermal contact, or inhalation of fugitive dust are not calculated because residential receptors do not usually contact subsurface soils located greater than two feet below the surface. Risks associated with subsurface soil exposures are calculated and presented in the baseline risk assessment for the pertinent occupational receptors on site.

P.2.1.3 Ground Water - The hazard indices for future exposure to ground water are calculated and presented as part of the baseline risk assessment. Please refer to the appropriate sections within the RI report for more information regarding the results for this pathway.

P.2.1.4 Surface Water - The hazard indices calculated for dermal exposure to surface water for recreational activities (while wading) for both residential adults and children are less than 1.0. Therefore, based on current site data, there is no evidence of potentially unacceptable systemic risks to persons who may be exposed to surface water during recreational (wading) activities in the channel adjacent to the PSF site. No volatile organics were detected in surface water samples collected from the site. Therefore, no hazard index was calculated for exposure via inhalation.

P.2.1.5 Sediments - The hazard indices for exposure of future residential adults and children to sediments via incidental ingestion and dermal contact fall below the departure point of 1.0. Therefore, there is no projected unacceptable systemic risk from dermal exposure to or incidental ingestion of on-site stream sediments.

P.2.1.6 Total Estimated Noncarcinogenic Risk - The total noncarcinogenic risk for each residential receptor is summed in the last column of Table P-7. Total risk for children is estimated at 15, while total risk for adults is estimated at 3.1. For both residential receptors, the majority of the risk is due to the consumption of on-site ground water as drinking water. A discussion of ground-water risks is presented in Section 6.1.4 of the baseline risk assessment, along with an evaluation of uncertainties associated with these exposures.

P.2.2 Carcinogenic Risk Characterization

Risks from potential carcinogens are estimated as probabilities of excess cancers as a result of exposure to chemicals from the site. The carcinogenic slope factor correlates estimated total chronic daily intake directly to incremental cancer risk. The results of the risk characterization are expressed as upper-bound estimates of the potential carcinogenic risk for each exposure point. Chemical-specific cancer risks are estimated by multiplying the slope factor by the chronic daily intake estimates. Chemical-specific risk calculations are presented by pathway at the end of this appendix, in Exhibit P-1.

To assess the overall potential for cancer effects posed by the mixture of chemicals present at the site, USEPA assumes additivity. Therefore, cancer risks are estimated for each chemical, then the chemical-specific risks are summed to yield an estimate of the overall pathway-specific cancer risk. The National Contingency Plan defines the range of acceptable risks for evaluating cancer risks as 1×10^{-4} to 1×10^{-6}. This corresponds to one excess cancer in a population of ten thousand to one excess cancer in a population of one million. Table P-8 provides a summary of the cancer risk estimates for residential adults by pathway (page 1 of 2), and the intake parameters used to derive the exposure scenarios assessed in this evaluation (page 2 of 2).

P.2.2.1 Surface Soils - The calculated carcinogenic risks for future exposure of residential adults to surface soil via incidental ingestion (cancer risk = 6 x 10^{-5}) and dermal contact (cancer risk = 5 x 10^{-5}) are within the acceptable risk range of 1 x 10^{-4} to 1 x 10^{-6}. In addition, the calculated carcinogenic risk to adult residents due to inhalation of fugitive dust generated from surface soils falls below the acceptable risk range. Based on current site-specific data, there is no unacceptable carcinogenic risk from exposure to surface soil via these pathways.

P.2.2.2 Subsurface Soils - The carcinogenic risks to future resident are not calculated because residential receptors do not usually contact subsurface soils located greater than two feet below the surface. Risks associated with subsurface soil exposures are calculated and presented in the baseline risk assessment for the pertinent occupational receptors on site.

P.2.2.3 Ground Water - The carcinogenic risk to residential adults from potential use of on-site ground water as drinking water are calculated as part of the baseline risk assessment. Please refer to appropriate sections in the RI document to find the results of this evaluation.

P.2.2.4 Surface Water - The carcinogenic risks to residential adults from exposure via dermal contact with surface water fall below the acceptable risk range. No volatile organics were detected in site surface water samples, so there is no quantitative estimate of carcinogenic risk from future exposure to surface water via inhalation. Based on current site-specific data, there is no unacceptable carcinogenic risk from exposure to surface water via this pathway.

P.2.2.5 Sediments - The calculated risks of exposure to future residential via incidental ingestion of and dermal contact with stream sediments fall below the acceptable cancer risk range, with a cancer risk of 2 x 10^{-7} and 4 x 10^{-7}, respectively. Therefore, based on current site data, there is no evidence of potentially unacceptable carcinogenic risks to residential adults who may be exposed to sediments during recreational (wading) activities in the channel adjacent to the PSF site.

P.2.2.6 Total Estimated Carcinogenic Risk - The total carcinogenic risk estimated for an adult on-site resident (cancer risk = 6 x 10^{-4}) exceeds the acceptable risk range of 1 x 10^{-4} to 1 x 10^{-6}. The majority of this risk is due to the use of on-site ground water as a potable water supply (cancer risk = 5 x 10^{-4}). For more information regarding the risks and uncertainties associated with residential ground-water scenarios, see Section 6.1.4 of the baseline risk assessment.

P.3 UNCERTAINTIES

Several caveats should be noted when evaluating a risk assessment. These caveats are based on the assumptions made during the exposure assessment and risk characterization, and may increase the uncertainties associated with the risk assessment results. A more detailed discussion and listing of uncertainties can be found in Table 6-25, and in Section 6.1.5 of the baseline risk assessment. Uncertainties pertaining only to the residential scenario follow.

- In evaluating risks from future exposures to site media, the assumption was made that future residential development of the site may occur. Given existing well-established land use patterns, there is no reason to expect that the PSF site will be developed for residential use in the future.

- The assumption that residential exposure to constituents occurs on a daily basis is conservative and results in overestimated risks due to exposure to surface soils. Residents may not be exposed to site constituents on a daily, continuous basis because of time spent away from home while at school, work, etc.

- The assumption that exposure to constituents in soils indoors (inside a house) equals that of outdoors is conservative and results in overestimated risks due to exposure to surface soils.

TABLE P-1
FUTURE RESIDENTIAL EXPOSURE: INCIDENTAL INGESTION OF SOILS INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

INGESTION INTAKE (a) = $\frac{C * FI * IR * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in soil, mg/kg
FI	=	Fraction Ingested from source, unitless
IR	=	Ingestion Rate, mg/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Incidental Ingestion of Soil Adult	Child
FI	100%	100%
IR	100 [b]	200 [b]
EF	350 [b]	350 [b]
ED	24 [b]	6 [b]
CF	10^{-6}	10^{-6}
BW	70 [b]	15 [b]
AT (Noncarcinogen)	10,950 [b]	2,190 [b]
AT (Carcinogen)	25,550[b]	NA

PATHWAY-SPECIFIC INTAKES:

Incidental Ingestion of Soil (future):

Residential Adult (Noncarcinogens) [c]: C (mg/kg) * 3.65E-06 day^{-1}

Residential Adult (Carcinogens) [c]: C (mg/kg) * 1.57E-06 day^{-1}

Residential Child (Noncarcinogens): C (mg/kg) * 1.28E-05 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables, at the end of this appendix
(b) USEPA, 1991 (Adult ED value of 24 years is for "adult" component of total ED, or 30 years [24 + 6 = 30])
(c) The equation for calculating an adult's incidental ingestion of soil is divided into two parts: (1) a six-year exposure duration for young children which accounts for the period of highest soil ingestion (200 mg/day) and lowest body weight (15 kg); and (2) a 24-year exposure for older children and adults which accounts for a lower ingestion rate (100 mg/day) and a higher body weight (70 kg). The equation used follows:

$$\text{Intake} = C * \frac{\frac{(FI * IR_{ADULT} * EF_{ADULT} * ED_{ADULT} * CF)}{BW_{ADULT}} + \frac{(FI * IR_{CHILD} * EF_{CHILD} * ED_{CHILD} * CF)}{BW_{CHILD}}}{AT_{ADULT}}$$

TABLE P-2
FUTURE RESIDENTIAL EXPOSURE:
INHALATION OF FUGITIVE DUST
INHALATION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

INHALATION INTAKE (a) = $\frac{C * IR * EF * ED * CF}{BW * AT}$

Where:

C	=	Concentration of constituent in soil, mg/kg
IR	=	Inhalation Rate, m^3/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor from Cowherd Model[(b)], kg/m^3
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Inhalation of Fugitive Dust Adult	Inhalation of Fugitive Dust Child
IR	20 [c]	20 [c,d]
EF	350 [c]	350 [c]
ED	30 [c]	6 [c]
CF [b]	3.06E-09	3.06E-09
BW	70 [c]	15 [c]
AT (Noncarcinogen)	10,950 [c]	2,190 [c]
AT (Carcinogen)	25,550 [c]	NA

PATHWAY-SPECIFIC INTAKES:

Inhalation of Fugitive Dust (future):

Residential Adult (Noncarcinogens):	C (mg/kg) * 8.38E-10 day^{-1}
Residential Adult (Carcinogens):	C (mg/kg) * 3.59E-10 day^{-1}
Residential Child (Noncarcinogens):	C (mg/kg) * 3.91E-09 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables found at the end of this appendix
(b) Cowherd et al, 1985
(c) USEPA, 1991
(d) USEPA, 1989b

TABLE P-3
FUTURE RESIDENTIAL EXPOSURE:
DERMAL EXPOSURE TO SOILS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * AF * ABS * EF * ED * ET * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in soil, mg/kg
SA	=	Surface Area of exposed skin, cm^2/event
AF	=	Soil to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day * 1 day/24 hrs
EF	=	Exposure Frequency, events/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Soil: Adult	Dermal Exposure to Soil: Child
SA	6,160 [b]	5,025 [b]
AF	1 [c]	1 [c]
ABS	100% [d]	100% [d]
ET	0.33 [c]	0.21 [c]
EF	43 [c]	130 [c]
ED	30 [e]	6 [e]
CF	10^{-6}	10^{-6}
BW	70 [e]	15 [e]
AT (Noncarcinogen)	10,950 [e]	2,190 [e]
AT (Carcinogen)	25,550 [e]	NA

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Soil (future):

Residential Adult (Noncarcinogens):	C (mg/kg) * 3.42E-06 day^{-1}
Residential Adult (Carcinogens):	C (mg/kg) * 1.47E-06 day^{-1}
Residential Child (Noncarcinogens):	C (mg/kg) * 2.51E-05 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables located at the end of this appendix
(b) USEPA, 1989b (adult male's head, hands, forearms, lower legs; child's head, hands, arms, legs)
(c) USEPA, 1992
(d) USEPA, 1992e
(e) USEPA, 1991

TABLE P-4
FUTURE RESIDENTIAL EXPOSURE:
DERMAL EXPOSURE TO SURFACE WATER
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * PC * ET * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in surface water, mg/L
SA	=	Surface Area of exposed skin, cm^2
PC	=	Permeability Constant, cm/hour
ET	=	Exposure Time, hours/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, $1L/10^3\ cm^3$
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Surface Water: Adult	Child
SA	6,170 [b]	4,490 [b]
PC	0.000004 (lead); 0.001 (other metals) [e]	
ET	2.6 [c]	2.6 [c]
EF	7 [c]	7 [c]
ED	30 [d]	6 [d]
CF	10^{-3}	10^{-3}
BW	70 [d]	15 [d]
AT (Noncarcinogen)	10,950 [d]	2,190 [d]
AT (Carcinogen)	25,550 [d]	NA

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Surface Water (future):	lead intakes	other metals' intakes
Residential Adult (Noncarcinogens):	C (mg/L) * 1.76E-08 day^{-1}	C (mg/L) * 4.40E-06 day^{-1}
Residential Adult (Carcinogens):	C (mg/L) * 7.53E-09 day^{-1}	C (mg/L) * 1.88E-06 day^{-1}
Residential Child (Noncarcinogens):	C (mg/L) * 5.97E-08 day^{-1}	C (mg/L) * 1.49E-05 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables located at the end of this appendix
(b) USEPA, 1989b (adult male's lower arms & legs,hands and feet; child's arms,legs,hands, and feet)
(c) USEPA, 1992
(d) USEPA, 1991
(e) Of the metals detected in site surface water, only cadmium, chromium, and lead have chemical specific PC values. Chromium and cadmium compounds have the same PC value as the default PC value for metals (0.001 cm/hr), while lead's PC value is 0.000004 cm/hr. Therefore, lead intakes are calculated separately. (source - PC values: USEPA, 1992)

TABLE P-5
FUTURE RESIDENTIAL EXPOSURE:
DERMAL EXPOSURE TO SEDIMENTS
DERMAL INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{DERMAL INTAKE (a)} = \frac{C * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in sediment, mg/kg
SA	=	Surface Area of exposed skin, cm^2/event
AF	=	Sediment to skin Adherence Factor, mg/cm^2
ABS	=	Absorption Factor, unitless
ET	=	Exposure Time, hours/day * 1 day/24 hrs
EF	=	Exposure Frequency, events/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Dermal Exposure to Sediment: Adult	Child
SA	6,170 [b]	4,490 [b]
AF	1 [c]	1 [c]
ABS	100% [d]	100% [d]
ET	0.11 [c]	0.11 [c]
EF	7 [c]	7 [c]
ED	30 [e]	6 [e]
CF	10^{-6}	10^{-6}
BW	70 [e]	15 [e]
AT (Noncarcinogen)	10,950 [e]	2,190 [e]
AT (Carcinogen)	25,550 [e]	NA

PATHWAY-SPECIFIC INTAKES:

Dermal Exposure to Sediment (future):

Residential Adult (Noncarcinogens):	C (mg/kg) * 1.86E-07 day^{-1}
Residential Adult (Carcinogens):	C (mg/kg) * 7.97E-08 day^{-1}
Residential Child (Noncarcinogens):	C (mg/kg) * 6.31E-07 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables located at the end of this appendix
(b) USEPA, 1989b (adult male's lower arms & legs,hands and feet; child's arms,legs,hands,and feet)
(c) USEPA, 1992
(d) USEPA, 1992e
(e) USEPA, 1991

TABLE P-6
FUTURE RESIDENTIAL EXPOSURE:
INCIDENTAL INGESTION OF SEDIMENTS
INGESTION INTAKES
Pesticide Storage Facility
Fort Riley, Kansas

$$\text{INGESTION INTAKE (a)} = \frac{C * FI * IR * EF * ED * CF}{BW * AT}$$

Where:

C	=	Concentration of constituent in sediment, mg/kg
FI	=	Fraction Ingested from source, unitless
IR	=	Ingestion Rate, mg/day
EF	=	Exposure Frequency, days/year
ED	=	Exposure Duration, years
CF	=	Conversion Factor, kg/10^6 mg
BW	=	Body Weight, kg
AT	=	Averaging Time, days

Exposure Variable	Incidental Ingestion of Sediment Adult	Child
FI	100%	100%
IR	100 [c]	200 [c]
EF	7 [b]	7 [b]
ED	24 [c]	6 [c]
CF	10^{-6}	10^{-6}
BW	70 [c]	15 [c]
AT (Noncarcinogen)	10,950 [c]	2,190 [c]
AT (Carcinogen)	25,550 [c]	NA

PATHWAY-SPECIFIC INTAKES:

Incidental Ingestion of Sediment (future):

Residential Adult (Noncarcinogens) [d]: C (mg/kg) * 7.31E-08 day^{-1}

Residential Adult (Carcinogens) [d]: C (mg/kg) * 3.13E-08 day^{-1}

Residential Child (Noncarcinogens): C (mg/kg) * 2.56E-07 day^{-1}

(a) Chemical-specific intakes are calculated in the risk calculation tables located at the end of this appendix
(b) USEPA, 1992
(c) USEPA, 1991 (Adult ED value of 24 years is for "adult" component of total ED, or 30 years [6 + 24 = 30]).
(d) The equation for estimating an adult's incidental ingestion of soil is divided in two parts: (1) a six-year exposure duration for young children which accounts for the period of highest soil ingestion (200 mg/day) and lowest body weight (15 kg); and (2) a 24-year exposure for older children and adults which accounts for a lower ingestion rate (100 mg/day) and a higher body weight (70 kg). The equation used follows:

$$\text{Intake} = C * \frac{\frac{(FI * IR_{ADULT} * EF_{ADULT} * ED_{ADULT} * CF)}{BW_{ADULT}} + \frac{(FI * IR_{CHILD} * EF_{CHILD} * ED_{CHILD} * CF)}{BW_{CHILD}}}{AT_{ADULT}}$$

TABLE P-7

SUMMARY OF NONCARCINOGENIC RISKS FOR RESIDENTIAL SCENARIO
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Receptors	Surface Soil Exposures			Subsurface Soil Exposures			Ground Water Exposures [a]			Surface Water Exposures	Sediment Exposures		Totals for Each Receptor (b)
	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Dermal	Ingestion	Dermal	
Future Population:													
residential adult	0.43	<0.01	0.4	NA	NA	NA	2.2	NA*	<0.01	<0.01	<0.01	<0.01	3.1
residential child	1.5	<0.01	3.0	NA	NA	NA	10	NA*	0.01	<0.01	<0.01	0.01	15

NA – Not applicable; pathway not evaluated.
NA* – Pathway was considered, but there were no constituents of concern that could contribute a potential risk via this pathway.

(a) – Ground water risks are calculated in the baseline risk assessment, and are included here to complete the residential scenario
(b) – Total risks include the ground water pathways developed in the baseline risk assessment

Boxed values indicate an exceedance of acceptable noncarcinogenic risk (HI > 1.0)

TABLE P-7

SUMMARY OF NONCARCINOGENIC RISKS FOR RESIDENTIAL SCENARIO
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Exposure assumptions used in calculating risk :	(soil ingestion) (b)	(soil inhalation)	(dermal–soil)	(groundwater ingestion) [c]	(groundwater dermal) [c]	(surface water dermal)	(ingestion of sediments)[b]	(sediments – dermal)
adult resident								
Fraction from source (%)	100	--	--	100[d]	--	--	100	--
Ingestion Rate (mg/day or L/day)	100[d]/ 200[d]	--	--	2[d]	--	--	100[d]/ 200[d]	--
Inhalation Rate (m^3/day)	--	20[d]	--	--	--	--	--	--
Surface Area (cm^2)	--	--	6,160[e]	--	19,400[e]	6,170[e]	--	6,170[e]
Soil to Skin Adherence Factor (mg/cm^2)	--	--	1[f]	--	--	--	--	1[f]
Exposure Frequency (days/year)	350[d]	350[d]	43[g]	350[d]	350[d]	7[f]	7[f]	7[f]
Exposure Time (hours/day)	--	--	0.33[g]	--	0.2[f]	2.6[f]	2.6[f]	0.11[f]
Exposure Duration (years)	24[d]/ 6[d]	30[d]	30[d]	30[d]	30[d]	30[d]	24[d]/ 6[d]	30[d]
Body Weight (kg)	70[d]	70[d]	70[d]	70[d]	70[d]	70[d]	70[d]	70[d]
Averaging Time (days)	10,950[d]	10,950[d]	10,950[d]	10,950[d]	10,950[d]	10,950[d]	10,950[d]	10,950[d]
child resident								
Fraction from source (%)	100	--	--	100[d]	--	--	100	--
Ingestion Rate (mg/day or L/day)	200[d]	--	--	2[d, e]	--	--	200[d]	--
Inhalation Rate (m^3/day)	--	20[d, e]	--	--	--	--	--	--
Surface Area (cm^2)	--	--	5,025[e]	--	8,660[e]	4,490[e]	--	4,490[e]
Soil to Skin Adherence Factor (mg/cm^2)	--	--	1[f]	--	--	--	--	1[f]
Exposure Frequency (days/year)	350[d]	350[d]	130[g]	350[d]	350[d]	7[f]	7[f]	7[f]
Exposure Time (hours/day)	--	--	0.21[g]	--	0.2[f]	2.6[f]	2.6[f]	0.11[f]
Exposure Duration (years)	6[d]	6[d]	6[d]	6[d]	6[d]	6[d]	6[d]	6[d]
Body Weight (kg)	15[d]	15[d]	15[d]	15[d]	15[d]	15[d]	15[d]	15[d]
Averaging Time (days)	2,190[d]	2,190[d]	2,190[d]	2,190[d]	2,190[d]	2,190[d]	2,190[d]	2,190[d]

(b) – Soil and sediment ingestion exposures are calculated in two parts: one which estimates adult exposure, and one which estimates childhood exposure
When two numbers are listed in a given cell, the first number represents the adult component of the calculation, while the second represents the childhood exposure.
(c) – Ground water risks are calculated in the baseline risk assessment, and are included here to complete the residential scenario
(d) – USEPA, 1991
(e) – USEPA, 1989b
(f) – USEPA, 1992
(g) – Hawley, 1985 as cited in USEPA, 1992

TABLE P-8

SUMMARY OF CARCINOGENIC RISKS FOR RESIDENTIAL SCENARIO
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Receptors	Surface Soil Exposures			Subsurface Soil Exposures			Ground Water Exposures [a]			Surface Water Exposures	Sediment Exposures		Totals for Each Receptor (b)
	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Dermal	Ingestion	Dermal	
Future Population:													
residential adult	5.7×10^{-5}	3.1×10^{-7}	5.3×10^{-5}	NA	NA	NA	4.8×10^{-4}	NA*	9.3×10^{-7}	1.4×10^{-8}	1.7×10^{-7}	4.4×10^{-7}	6×10^{-4}

NA – Not applicable; pathway not evaluated.
NA* – Pathway was considered, but there were no constituents of concern that could contribute a potential risk via this pathway.

(a) – Ground water risks are calculated in the baseline risk assessment, and are included here to complete the residential scenario
(b) – Total risks include the ground water pathways developed in the baseline risk assessment

Double boxed values indicate an exceedance of acceptable carcinogenic risk (cancer risk > 1×10^{-4}); single boxed values indicate carcinogenic risk within the acceptable risk range (1×10^{-6} to 1×10^{-4}).

TABLE P-8

SUMMARY OF CARCINOGENIC RISKS FOR RESIDENTIAL SCENARIO
PESTICIDE STORAGE FACILITY
Fort Riley, Kansas

Exposure assumptions used in calculating risk : adult resident	(soil ingestion) (b)	(soil inhalation)	(dermal–soil)	(groundwater ingestion) [c]	(groundwater dermal) [c]	(surface water dermal)	(ingestion of sediments)[b]	(sediments – dermal)
Fraction from source (%)	100	--	--	100 [d]	--	--	100	--
Ingestion Rate (mg/day or L/day)	100 [d]/ 200 [d]	--	--	2 [d]	--	--	100 [d]/ 200 [d]	--
Inhalation Rate (m^3/day)	--	20 [d]	--	--	--	--	--	--
Surface Area (cm^2)	--	--	6,160 [e]	--	19,400 [e]	6,170 [e]	--	6,170 [e]
Soil to Skin Adherence Factor (mg/cm^2)	--	--	1 [f]	--	--	--	--	1 [f]
Exposure Frequency (days/year)	350 [d]	350 [d]	43 [g]	350 [d]	350 [d]	7 [f]	7 [f]	7 [f]
Exposure Time (hours/day)	--	--	0.33 [g]	--	0.2 [f]	2.6 [f]	2.6 [f]	0.11 [f]
Exposure Duration (years)	24 [d]/ 6 [d]	30 [d]	30 [d]	30 [d]	30 [d]	30 [d]	24 [d]/ 6 [d]	30 [d]
Body Weight (kg)	70 [d]	70 [d]	70 [d]	70 [d]	70 [d]	70 [d]	70 [d]	70 [d]
Averaging Time (days)	25,550 [d]	25,550 [d]	25,550 [d]	25,550 [d]	25,550 [d]	25,550 [d]	25,550 [d]	25,550 [d]

(b) – Soil and sediment ingestion exposures are calculated in two parts: one which estimates adult exposure, and one which estimates childhood exposure
When two numbers are listed in a given cell, the first number represents the adult component of the calculation, while the second represents the childhood exposure.
(c) – Ground water risks are calculated in the baseline risk assessment, and are included here to complete the residential scenario
(d) – USEPA, 1991
(e) – USEPA, 1989b
(f) – USEPA, 1992
(g) – Hawley, 1985 as cited in USEPA, 1992

EXHIBIT P-1

RISK CALCULATION TABLES FOR RESIDENTIAL RISK EVALUATION
includes

Risks Due to Surface Soil

Future Residential Adult: Incidental Ingestion of Surface Soils
Future Residential Adult: Inhalation of Fugitive Dusts from Surface Soils
Future Residential Adult: Dermal Contact with Surface Soils

Future Residential Child: Incidental Ingestion of Surface Soils
Future Residential Child: Inhalation of Fugitive Dusts from Surface Soils
Future Residential Child: Dermal Contact with Surface Soils

Risks Due to Surface Water

Future Residential Adult: Dermal Contact with Surface Water
Future Residential Child: Dermal Contact with Surface Water

Risks Due to Sediments

Future Residential Adult: Incidental Ingestion of Sediments
Future Residential Adult: Dermal Contact with Sediments

Future Residential Child: Incidental Ingestion of Sediments
Future Residential Child: Dermal Contact with Sediments

FUTURE RESIDENTIAL ADULT: Incidental Ingestion of Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)$^{-1}$		
alpha-Chlordane	1.60E+00	3.65E-06	1.57E-06	5.84E-06	2.51E-06	6.0E-05	1.3E+00	9.7E-02	3.3E-06
gamma-Chlordane	1.60E+00	3.65E-06	1.57E-06	5.84E-06	2.51E-06	6.0E-05	1.3E+00	9.7E-02	3.3E-06
4,4'-DDE	1.80E+00	3.65E-06	1.57E-06	6.57E-06	2.83E-06	--	3.4E-01	--	9.6E-07
4,4'-DDT	1.00E+00	3.65E-06	1.57E-06	3.65E-06	1.57E-06	5.0E-04	3.4E-01	7.3E-03	5.3E-07
Dieldrin	9.40E-02	3.65E-06	1.57E-06	3.43E-07	1.48E-07	5.0E-05	1.6E+01	6.9E-03	2.4E-06
Heptachlor	3.00E-01	3.65E-06	1.57E-06	1.10E-06	4.71E-07	5.0E-04	4.5E+00	2.2E-03	2.1E-06
Malathion	4.19E-01	3.65E-06	1.57E-06	1.53E-06	6.58E-07	2.0E-02	--	7.6E-05	--
Methoxychlor	2.40E+00	3.65E-06	1.57E-06	8.76E-06	3.77E-06	5.0E-03	--	1.8E-03	--
Benzo[a]anthracene	1.60E-01	3.65E-06	1.57E-06	5.84E-07	2.51E-07	--	1.1E+00 *	--	2.7E-07
Chrysene	4.50E-01	3.65E-06	1.57E-06	1.64E-06	7.07E-07	--	2.9E-02 *	--	2.0E-08
Phenanthrene	7.80E-01	3.65E-06	1.57E-06	2.85E-06	1.22E-06	--	--	--	--
Arsenic	1.60E+01	3.65E-06	1.57E-06	5.84E-05	2.51E-05	3.0E-04	1.8E+00	1.9E-01	4.4E-05
Barium	1.30E+02	3.65E-06	1.57E-06	4.75E-04	2.04E-04	7.0E-02	--	6.8E-03	--
Chromium	1.50E+01	3.65E-06	1.57E-06	5.48E-05	2.36E-05	5.0E-03	--	1.1E-02	--
Lead	5.40E+02	3.65E-06	1.57E-06	1.97E-03	8.48E-04	--	--	--	--
							TOTAL:	0.43	5.7E-05

FUTURE RESIDENTIAL ADULT: Inhalation of Fugitive Dusts from Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD (mg/kg-day)	CSF (mg/kg-day)$^{-1}$		
alpha-Chlordane	1.60E+00	8.38E-10	3.59E-10	1.34E-09	5.74E-10	--	1.3E+00	--	7.5E-10
gamma-Chlordane	1.60E+00	8.38E-10	3.59E-10	1.34E-09	5.74E-10	--	1.3E+00	--	7.5E-10
4,4'-DDE	1.80E+00	8.38E-10	3.59E-10	1.51E-09	6.46E-10	--	--	--	--
4,4'-DDT	1.00E+00	8.38E-10	3.59E-10	8.38E-10	3.59E-10	--	3.4E-01	--	1.2E-10
Dieldrin	9.40E-02	8.38E-10	3.59E-10	7.88E-11	3.37E-11	--	1.6E+01	--	5.4E-10
Heptachlor	3.00E-01	8.38E-10	3.59E-10	2.51E-10	1.08E-10	--	4.6E+00	--	5.0E-10
Malathion	4.19E-01	8.38E-10	3.59E-10	3.51E-10	1.50E-10	--	--	--	--
Methoxychlor	2.40E+00	8.38E-10	3.59E-10	2.01E-09	8.62E-10	--	--	--	--
Benzo[a]anthracene	1.60E-01	8.38E-10	3.59E-10	1.34E-10	5.74E-11	--	--	--	--
Chrysene	4.50E-01	8.38E-10	3.59E-10	3.77E-10	1.62E-10	--	--	--	--
Phenanthrene	7.80E-01	8.38E-10	3.59E-10	6.54E-10	2.80E-10	--	--	--	--
Arsenic	1.60E+01	8.38E-10	3.59E-10	1.34E-08	5.74E-09	--	1.5E+01	--	8.7E-08
Barium	1.30E+02	8.38E-10	3.59E-10	1.09E-07	4.67E-08	1.4E-04	--	7.8E-04	--
Chromium	1.50E+01	8.38E-10	3.59E-10	1.26E-08	5.39E-09	--	4.1E+01	--	2.2E-07
Lead	5.40E+02	8.38E-10	3.59E-10	4.53E-07	1.94E-07	--	--	--	--
							TOTAL:	< 0.01	3.1E-07

* - CSF is based TEF, using B[a]P toxicity

FUTURE RESIDENTIAL ADULT: Dermal Contact with Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	3.42E-06	1.47E-06	5.47E-06	2.35E-06	6.0E-05	1.3E+00	9.1E-02	3.1E-06
gamma-Chlordane	1.60E+00	3.42E-06	1.47E-06	5.47E-06	2.35E-06	6.0E-05	1.3E+00	9.1E-02	3.1E-06
4,4'-DDE	1.80E+00	3.42E-06	1.47E-06	6.16E-06	2.65E-06	--	3.4E-01	--	9.0E-07
4,4'-DDT	1.00E+00	3.42E-06	1.47E-06	3.42E-06	1.47E-06	5.0E-04	3.4E-01	6.8E-03	5.0E-07
Dieldrin	9.40E-02	3.42E-06	1.47E-06	3.21E-07	1.38E-07	5.0E-05	1.6E+01	6.4E-03	2.2E-06
Heptachlor	3.00E-01	3.42E-06	1.47E-06	1.03E-06	4.41E-07	5.0E-04	4.5E+00	2.1E-03	2.0E-06
Malathion	4.19E-01	3.42E-06	1.47E-06	1.43E-06	6.16E-07	2.0E-02	--	7.2E-05	--
Methoxychlor	2.40E+00	3.42E-06	1.47E-06	8.21E-06	3.53E-06	5.0E-03	--	1.6E-03	--
Benzo[a]anthracene	1.60E-01	3.42E-06	1.47E-06	5.47E-07	2.35E-07	--	1.1E+00 *	--	2.5E-07
Chrysene	4.50E-01	3.42E-06	1.47E-06	1.54E-06	6.62E-07	--	2.9E-02 *	--	1.9E-08
Phenanthrene	7.80E-01	3.42E-06	1.47E-06	2.67E-06	1.15E-06	--	--	--	--
Arsenic	1.60E+01	3.42E-06	1.47E-06	5.47E-05	2.35E-05	3.0E-04	1.8E+00	1.8E-01	4.1E-05
Barium	1.30E+02	3.42E-06	1.47E-06	4.45E-04	1.91E-04	7.0E-02	--	6.4E-03	--
Chromium	1.50E+01	3.42E-06	1.47E-06	5.13E-05	2.21E-05	5.0E-03	--	1.0E-02	--
Lead	5.40E+02	3.42E-06	1.47E-06	1.85E-03	7.94E-04	--	--	--	--
							TOTAL:	0.40	5.3E-05

* – CSF is based on TEF, using B[a]P toxicity

FUTURE RESIDENTIAL CHILD: Incidental Ingestion of Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD**$_{sc}$ (mg/kg-day)	Toxicity Value CSF (mg/kg-day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	1.28E-05	--	2.05E-05	--	6.0E-05 (H)	1.3E+00	3.4E-01	--
gamma-Chlordane	1.60E+00	1.28E-05	--	2.05E-05	--	6.0E-05 (H)	1.3E+00	3.4E-01	--
4,4'-DDE	1.80E+00	1.28E-05	--	2.30E-05	--	--	3.4E-01	--	--
4,4'-DDT	1.00E+00	1.28E-05	--	1.28E-05	--	5.0E-04 (H)	3.4E-01	2.6E-02	--
Dieldrin	9.40E-02	1.28E-05	--	1.20E-06	--	5.0E-05 (H)	1.6E+01	2.4E-02	--
Heptachlor	3.00E-01	1.28E-05	--	3.84E-06	--	5.0E-04 (H)	4.5E+00	7.7E-03	--
Malathion	4.19E-01	1.28E-05	--	5.36E-06	--	2.0E-02 (H)	--	2.7E-04	--
Methoxychlor	2.40E+00	1.28E-05	--	3.07E-05	--	5.0E-03 (H)	--	6.1E-03	--
Benzo[a]anthracene	1.60E-01	1.28E-05	--	2.05E-06	--	--	1.1E+00 *	--	--
Chrysene	4.50E-01	1.28E-05	--	5.76E-06	--	--	2.9E-02 *	--	--
Phenanthrene	7.80E-01	1.28E-05	--	9.98E-06	--	--	--	--	--
Arsenic	1.60E+01	1.28E-05	--	2.05E-04	--	3.0E-04 (H)	1.8E+00	6.8E-01	--
Barium	1.30E+02	1.28E-05	--	1.66E-03	--	7.0E-02 (H)	--	2.4E-02	--
Chromium	1.50E+01	1.28E-05	--	1.92E-04	--	2.0E-02 (H)	--	9.6E-03	--
Lead	5.40E+02	1.28E-05	--	6.91E-03	--	--	--	--	--
							TOTAL:	1.5	--

FUTURE RESIDENTIAL CHILD: Inhalation of Fugitive Dusts from Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD**$_{sc}$ (mg/kg-day)	Toxicity Value CSF (mg/kg-day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	3.91E-09	--	6.26E-09	--	--	1.3E+00	--	--
gamma-Chlordane	1.60E+00	3.91E-09	--	6.26E-09	--	--	1.3E+00	--	--
4,4'-DDE	1.80E+00	3.91E-09	--	7.04E-09	--	--	--	--	--
4,4'-DDT	1.00E+00	3.91E-09	--	3.91E-09	--	--	3.4E-01	--	--
Dieldrin	9.40E-02	3.91E-09	--	3.68E-10	--	--	1.6E+01	--	--
Heptachlor	3.00E-01	3.91E-09	--	1.17E-09	--	--	4.6E+00	--	--
Malathion	4.19E-01	3.91E-09	--	1.64E-09	--	--	--	--	--
Methoxychlor	2.40E+00	3.91E-09	--	9.38E-09	--	--	--	--	--
Benzo[a]anthracene	1.60E-01	3.91E-09	--	6.26E-10	--	--	--	--	--
Chrysene	4.50E-01	3.91E-09	--	1.76E-09	--	--	--	--	--
Phenanthrene	7.80E-01	3.91E-09	--	3.05E-09	--	--	--	--	--
Arsenic	1.60E+01	3.91E-09	--	6.26E-08	--	--	1.5E+01	--	--
Barium	1.30E+02	3.91E-09	--	5.08E-07	--	1.4E-04 (H)	--	3.6E-03	--
Chromium	1.50E+01	3.91E-09	--	5.87E-08	--	--	4.1E+01	--	--
Lead	5.40E+02	3.91E-09	--	2.11E-06	--	--	--	--	--
							TOTAL:	< 0.01	--

FUTURE RESIDENTIAL CHILD: Dermal Contact with Surface Soils

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD**sc (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	1.60E+00	2.51E-05	--	4.02E-05	--	6.0E-05 (H)	1.3E+00	6.7E-01	--
gamma-Chlordane	1.60E+00	2.51E-05	--	4.02E-05	--	6.0E-05 (H)	1.3E+00	6.7E-01	--
4,4'-DDE	1.80E+00	2.51E-05	--	4.52E-05	--	--	3.4E-01	--	--
4,4'-DDT	1.00E+00	2.51E-05	--	2.51E-05	--	5.0E-04 (H)	3.4E-01	5.0E-02	--
Dieldrin	9.40E-02	2.51E-05	--	2.36E-06	--	5.0E-05 (H)	1.6E+01	4.7E-02	--
Heptachlor	3.00E-01	2.51E-05	--	7.53E-06	--	5.0E-04 (H)	4.5E+00	1.5E-02	--
Malathion	4.19E-01	2.51E-05	--	1.05E-05	--	2.0E-02 (H)	--	5.3E-04	--
Methoxychlor	2.40E+00	2.51E-05	--	6.02E-05	--	5.0E-03 (H)	--	1.2E-02	--
Benzo[a]anthracene	1.60E-01	2.51E-05	--	4.02E-06	--	--	1.1E+00 *	--	--
Chrysene	4.50E-01	2.51E-05	--	1.13E-05	--	--	2.9E-02 *	--	--
Phenanthrene	7.80E-01	2.51E-05	--	1.96E-05	--	--	--	--	--
Arsenic	1.60E+01	2.51E-05	--	4.02E-04	--	3.0E-04 (H)	1.8E+00	1.3E+00	--
Barium	1.30E+02	2.51E-05	--	3.26E-03	--	7.0E-02 (H)	--	4.7E-02	--
Chromium	1.50E+01	2.51E-05	--	3.77E-04	--	2.0E-02 (H)	--	1.9E-02	--
Lead	5.40E+02	2.51E-05	--	1.36E-02	--	--	--	--	--
							TOTAL:	3	--

* - CSF is based on TEF, using B[a]P toxicity
** - Subchronic RfDs are obtained from HEAST

FUTURE RESIDENTIAL ADULT: Incidental Ingestion of Sediments

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	3.20E-02	7.31E-08	3.13E-08	2.34E-09	1.0E-09	6.0E-05	1.3E+00	3.9E-05	1.3E-09
gamma-Chlordane	5.40E-02	7.31E-08	3.13E-08	3.95E-09	1.7E-09	6.0E-05	1.3E+00	6.6E-05	2.2E-09
4,4'-DDD	5.90E-02	7.31E-08	3.13E-08	4.31E-09	1.8E-09	--	2.4E-01	--	4.4E-10
4,4'-DDE	5.50E-02	7.31E-08	3.13E-08	4.02E-09	1.7E-09	--	3.4E-01	--	5.9E-10
4,4'-DDT	9.60E-02	7.31E-08	3.13E-08	7.02E-09	3.0E-09	5.0E-04	3.4E-01	1.4E-05	1.0E-09
Dieldrin	1.30E-02	7.31E-08	3.13E-08	9.50E-10	4.1E-10	5.0E-05	1.6E+01	1.9E-05	6.5E-09
Benzo[a]anthracene	1.50E-01	7.31E-08	3.13E-08	1.10E-08	4.7E-09	--	1.1E+00 *	--	5.0E-09
Chrysene	1.80E-01	7.31E-08	3.13E-08	1.32E-08	5.6E-09	--	2.9E-02 *	--	1.6E-10
Phenanthrene	2.10E-01	7.31E-08	3.13E-08	1.54E-08	6.6E-09	--	--	--	--
Arsenic	2.80E+00	7.31E-08	3.13E-08	2.05E-07	8.8E-08	3.0E-04	1.8E+00	6.8E-04	1.5E-07
Barium	1.20E+02	7.31E-08	3.13E-08	8.77E-06	3.8E-06	7.0E-02	--	1.3E-04	--
Cadmium	1.80E+00	7.31E-08	3.13E-08	1.32E-07	5.6E-08	1.0E-03 (f)	--	1.3E-04	--
Chromium	1.70E+01	7.31E-08	3.13E-08	1.24E-06	5.3E-07	5.0E-03	--	2.5E-04	--
Lead	1.50E+02	7.31E-08	3.13E-08	1.10E-05	4.7E-06	--	--	--	--
Mercury	2.40E-01	7.31E-08	3.13E-08	1.75E-08	7.5E-09	3.0E-04	--	5.8E-05	--
							TOTAL:	< 0.01	1.7E-07

FUTURE RESIDENTIAL ADULT: Dermal Contact with Sediments

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
alpha-Chlordane	3.20E-02	1.86E-07	8.00E-08	5.95E-09	2.56E-09	6.0E-05	1.3E+00	9.9E-05	3.3E-09
gamma-Chlordane	5.40E-02	1.86E-07	8.00E-08	1.00E-08	4.32E-09	6.0E-05	1.3E+00	1.7E-04	5.6E-09
4,4'-DDD	5.90E-02	1.86E-07	8.00E-08	1.10E-08	4.72E-09	--	2.4E-01	--	1.1E-09
4,4'-DDE	5.50E-02	1.86E-07	8.00E-08	1.02E-08	4.40E-09	--	3.4E-01	--	1.5E-09
4,4'-DDT	9.60E-02	1.86E-07	8.00E-08	1.79E-08	7.68E-09	5.0E-04	3.4E-01	3.6E-05	2.6E-09
Dieldrin	1.30E-02	1.86E-07	8.00E-08	2.42E-09	1.04E-09	5.0E-05	1.6E+01	4.8E-05	1.7E-08
Benzo[a]anthracene	1.50E-01	1.86E-07	8.00E-08	2.79E-08	1.20E-08	--	1.1E+00 *	--	1.3E-08
Chrysene	1.80E-01	1.86E-07	8.00E-08	3.35E-08	1.44E-08	--	2.9E-02 *	--	4.2E-10
Phenanthrene	2.10E-01	1.86E-07	8.00E-08	3.91E-08	1.68E-08	--	--	--	--
Arsenic	2.80E+00	1.86E-07	8.00E-08	5.21E-07	2.24E-07	3.0E-04	1.8E+00	1.7E-03	3.9E-07
Barium	1.20E+02	1.86E-07	8.00E-08	2.23E-05	9.60E-06	7.0E-02	--	3.2E-04	--
Cadmium	1.80E+00	1.86E-07	8.00E-08	3.35E-07	1.44E-07	1.0E-03 (f)	--	3.3E-04	--
Chromium	1.70E+01	1.86E-07	8.00E-08	3.16E-06	1.36E-06	5.0E-03	--	6.3E-04	--
Lead	1.50E+02	1.86E-07	8.00E-08	2.79E-05	1.20E-05	--	--	--	--
Mercury	2.40E-01	1.86E-07	8.00E-08	4.46E-08	1.92E-08	3.0E-04	--	1.5E-04	--
							TOTAL:	<0.01	4.4E-07

* -CSF is based on TEF, using B[a]P toxicity
f - RfD value is for cadmium in food

FUTURE RESIDENTIAL CHILD: Incidental Ingestion of Sediments

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD** $_{sc}$ (mg/kg-day)	CSF $(mg/kg-day)^{-1}$		
alpha-Chlordane	3.20E-02	2.56E-07	--	8.19E-09	--	6.0E-05 (H)	1.3E+00	1.4E-04	--
gamma-Chlordane	5.40E-02	2.56E-07	--	1.38E-08	--	6.0E-05 (H)	1.3E+00	2.3E-04	--
4,4'-DDD	5.90E-02	2.56E-07	--	1.51E-08	--	--	2.4E-01	--	--
4,4'-DDE	5.50E-02	2.56E-07	--	1.41E-08	--	--	3.4E-01	--	--
4,4'-DDT	9.60E-02	2.56E-07	--	2.46E-08	--	5.0E-04 (H)	3.4E-01	4.9E-05	--
Dieldrin	1.30E-02	2.56E-07	--	3.33E-09	--	5.0E-05 (H)	1.6E+01	6.7E-05	--
Benzo[a]anthracene	1.50E-01	2.56E-07	--	3.84E-08	--	--	1.1E+00 *	--	--
Chrysene	1.80E-01	2.56E-07	--	4.61E-08	--	--	2.9E-02 *	--	--
Phenanthrene	2.10E-01	2.56E-07	--	5.38E-08	--	--	--	--	--
Arsenic	2.80E+00	2.56E-07	--	7.17E-07	--	3.0E-04 (H)	1.8E+00	2.4E-03	--
Barium	1.20E+02	2.56E-07	--	3.07E-05	--	7.0E-02 (H)	--	4.4E-04	--
Cadmium	1.80E+00	2.56E-07	--	4.61E-07	--	1.0E-03 (H)(f)	--	4.6E-04	--
Chromium	1.70E+01	2.56E-07	--	4.35E-06	--	2.0E-02 (H)	--	2.2E-04	--
Lead	1.50E+02	2.56E-07	--	3.84E-05	--	--	--	--	--
Mercury	2.40E-01	2.56E-07	--	6.14E-08	--	3.0E-04 (H)	--	2.0E-04	--
							TOTAL:	< 0.01	--

FUTURE RESIDENTIAL CHILD: Dermal Contact with Sediments

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1})		Chronic Intake (mg/kg-day)		Toxicity Value		Hazard Index (unitless)	Cancer Risk (unitless)
		Noncarcinogen	Carcinogen	Noncarcinogen	Carcinogen	RfD** $_{sc}$ (mg/kg-day)	CSF $(mg/kg-day)^{-1}$		
alpha-Chlordane	3.20E-02	6.32E-07	--	2.02E-08	--	6.0E-05 (H)	1.3E+00	3.4E-04	--
gamma-Chlordane	5.40E-02	6.32E-07	--	3.41E-08	--	6.0E-05 (H)	1.3E+00	5.7E-04	--
4,4'-DDD	5.90E-02	6.32E-07	--	3.73E-08	--	--	2.4E-01	--	--
4,4'-DDE	5.50E-02	6.32E-07	--	3.48E-08	--	--	3.4E-01	--	--
4,4'-DDT	9.60E-02	6.32E-07	--	6.07E-08	--	5.0E-04 (H)	3.4E-01	1.2E-04	--
Dieldrin	1.30E-02	6.32E-07	--	8.22E-09	--	5.0E-05 (H)	1.6E+01	1.6E-04	--
Benzo[a]anthracene	1.50E-01	6.32E-07	--	9.48E-08	--	--	1.1E+00 *	--	--
Chrysene	1.80E-01	6.32E-07	--	1.14E-07	--	--	2.9E-02 *	--	--
Phenanthrene	2.10E-01	6.32E-07	--	1.33E-07	--	--	--	--	--
Arsenic	2.80E+00	6.32E-07	--	1.77E-06	--	3.0E-04 (H)	1.8E+00	5.9E-03	--
Barium	1.20E+02	6.32E-07	--	7.58E-05	--	7.0E-02 (H)	--	1.1E-03	--
Cadmium	1.80E+00	6.32E-07	--	1.14E-06	--	1.0E-03 (H)(f)	--	1.1E-03	--
Chromium	1.70E+01	6.32E-07	--	1.07E-05	--	2.0E-02 (H)	--	5.4E-04	--
Lead	1.50E+02	6.32E-07	--	9.48E-05	--	--	--	--	--
Mercury	2.40E-01	6.32E-07	--	1.52E-07	--	3.0E-04 (H)	--	5.1E-04	--
							TOTAL:	0.01	--

* – CSF is based on TEF, using B[a]P toxicity

** – Subchronic RfD_{sc} are obtained from HEAST

f – RfD value is for cadmium in food

FUTURE RESIDENTIAL CHILD: Ingestion of Ground Water

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Subchronic Intake (mg/kg-day) Noncarcinogen	Subchronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD*$_{sc}$ (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	2.70E-01	1.28E-01	--	3.46E-02	--	--	--	--	--
Arsenic	1.60E-02	1.28E-01	--	2.05E-03	--	3.0E-04 (H)	1.8E+00	6.8E+00	--
Barium	1.30E-01	1.28E-01	--	1.66E-02	--	7.0E-02 (H)	--	2.4E-01	--
Beryllium	3.00E-03	1.28E-01	--	3.84E-04	--	5.0E-03 (H)	4.3E+00	7.7E-02	--
Chromium (VI)	1.20E-02	1.28E-01	--	1.54E-03	--	2.0E-02 (H)	--	7.7E-02	--
Manganese	9.10E-02	1.28E-01	--	1.16E-02	--	5.0E-03 (W)	--	2.3E+00	--
Vanadium	2.70E-02	1.28E-01	--	3.46E-03	--	7.0E-03 (H)	--	4.9E-01	--
Inorganic Chloride	2.70E+02	1.28E-01	--	3.46E+01	--	--	--	--	--
Nitrate	3.30E+01	1.28E-01	--	4.22E+00	--	--	--	--	--
Sulfate	3.90E+02	1.28E-01	--	4.99E+01	--	--	--	--	--
Bicarbonate, as $CaCO_3$	4.90E+02	1.28E-01	--	6.27E+01	--	--	--	--	--
							TOTAL:	9.98	--

FUTURE RESIDENTIAL CHILD: Dermal Contact with Ground Water

Parameter	Exposure Point Concentration (mg/kg)	Intake (day⁻¹) Noncarcinogen	Intake (day⁻¹) Carcinogen	Subchronic Intake (mg/kg-day) Noncarcinogen	Subchronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD*$_{sc}$ (mg/kg-day)	Toxicity Value CSF (mg/kg-day)⁻¹	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	2.70E-01	1.11E-04	--	3.00E-05	--	--	--	--	--
Arsenic	1.60E-02	1.11E-04	--	1.78E-06	--	3.0E-04 (H)	1.8E+00	5.9E-03	--
Barium	1.30E-01	1.11E-04	--	1.44E-05	--	7.0E-02 (H)	--	2.1E-04	--
Beryllium	3.00E-03	1.11E-04	--	3.33E-07	--	5.0E-03 (H)	4.3E+00	6.7E-05	--
Chromium (VI)	1.20E-02	1.11E-04	--	1.33E-06	--	2.0E-02 (H)	--	6.7E-05	--
Manganese	9.10E-02	1.11E-04	--	1.01E-05	--	5.0E-03 (W)	--	2.0E-03	--
Vanadium	2.70E-02	1.11E-04	--	3.00E-06	--	7.0E-03 (H)	--	4.3E-04	--
Inorganic Chloride	2.70E+02	1.11E-04	--	3.00E-02	--	--	--	--	--
Nitrate	3.30E+01	1.11E-04	--	3.66E-03	--	--	--	--	--
Sulfate	3.90E+02	1.11E-04	--	4.33E-02	--	--	--	--	--
Bicarbonate, as $CaCO_3$	4.90E+02	1.11E-04	--	5.44E-02	--	--	--	--	--
							TOTAL:	0.01	--

* Subchronic RfD values obtained from HEAST (the RfD$_{sc}$ for chromium is the only value that differs from the chronic RfD value)
H – Value obtained from HEAST
W – RfD value is for manganese in water

b:\RC-GW

FUTURE RESIDENTIAL ADULT: Ingestion of Ground Water

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	2.70E-01	2.74E-02	1.17E-02	7.40E-03	3.16E-03	--	--	--	--
Arsenic	1.60E-02	2.74E-02	1.17E-02	4.38E-04	1.87E-04	3.0E-04	1.8E+00	1.5E+00	3.3E-04
Barium	1.30E-01	2.74E-02	1.17E-02	3.56E-03	1.52E-03	7.0E-02	--	5.1E-02	--
Beryllium	3.00E-03	2.74E-02	1.17E-02	8.22E-05	3.51E-05	5.0E-03	4.3E+00	1.6E-02	1.5E-04
Chromium	1.20E-02	2.74E-02	1.17E-02	3.29E-04	1.40E-04	5.0E-03	--	6.6E-02	--
Manganese	9.10E-02	2.74E-02	1.17E-02	2.49E-03	1.06E-03	5.0E-03 (W)	--	5.0E-01	--
Vanadium	2.70E-02	2.74E-02	1.17E-02	7.40E-04	3.16E-04	7.0E-03 (H)	--	1.1E-01	--
Inorganic Chloride	2.70E+02	2.74E-02	1.17E-02	7.40E+00	3.16E+00	--	--	--	--
Nitrate	3.30E+01	2.74E-02	1.17E-02	9.04E-01	3.86E-01	--	--	--	--
Sulfate	3.90E+02	2.74E-02	1.17E-02	1.07E+01	4.56E+00	--	--	--	--
Bicarbonate, as $CaCO_3$	4.90E+02	2.74E-02	1.17E-02	1.34E+01	5.73E+00	--	--	--	--
							TOTAL:	2.24	4.8E-04

FUTURE RESIDENTIAL ADULT: Dermal Contact with Ground Water

Parameter	Exposure Point Concentration (mg/kg)	Intake (day^{-1}) Noncarcinogen	Intake (day^{-1}) Carcinogen	Chronic Intake (mg/kg-day) Noncarcinogen	Chronic Intake (mg/kg-day) Carcinogen	Toxicity Value RfD (mg/kg-day)	Toxicity Value CSF (mg/kg-day)$^{-1}$	Hazard Index (unitless)	Cancer Risk (unitless)
Aluminum	2.70E-01	5.32E-05	2.28E-05	1.44E-05	6.16E-06	--	--	--	--
Arsenic	1.60E-02	5.32E-05	2.28E-05	8.51E-07	3.65E-07	3.0E-04	1.8E+00	2.8E-03	6.4E-07
Barium	1.30E-01	5.32E-05	2.28E-05	6.92E-06	2.96E-06	7.0E-02	--	9.9E-05	--
Beryllium	3.00E-03	5.32E-05	2.28E-05	1.60E-07	6.84E-08	5.0E-03	4.3E+00	3.2E-05	2.9E-07
Chromium	1.20E-02	5.32E-05	2.28E-05	6.38E-07	2.74E-07	5.0E-03	--	1.3E-04	--
Manganese	9.10E-02	5.32E-05	2.28E-05	4.84E-06	2.07E-06	5.0E-03 (W)	--	9.7E-04	--
Vanadium	2.70E-02	5.32E-05	2.28E-05	1.44E-06	6.16E-07	7.0E-03 (H)	--	2.1E-04	--
Inorganic Chloride	2.70E+02	5.32E-05	2.28E-05	1.44E-02	6.16E-03	--	--	--	--
Nitrate	3.30E+01	5.32E-05	2.28E-05	1.76E-03	7.52E-04	--	--	--	--
Sulfate	3.90E+02	5.32E-05	2.28E-05	2.07E-02	8.89E-03	--	--	--	--
Bicarbonate, as $CaCO_3$	4.90E+02	5.32E-05	2.28E-05	2.61E-02	1.12E-02	--	--	--	--
							TOTAL:	< 0.01	9.3E-07

W - RfD value is for manganese in water

South Plants Big Pond Subgrade Construction Area

PARAGON
LAND CONSULTANTS, INC.
Norfolk Park Centre II
416 Norfolk Street
Aurora, Colorado 80011
(720) 857-8800 Fax: (720) 857-8900

ROCKY MOUNTAIN ARSENAL

COMMERCE CITY, COLORADO

PROJECT NAME

ROCKY MOUNTAIN ARSENAL
INTEGRATED COVER SYSTEM CONSTRUCTION PROJECT

SOUTH PLANTS BIG POND AREA PRE-SUBGRADE CONSTRUCTION OG
(04/09/09)

Revisions

No.	Date	Description

Drawing File:	SP Big Pond SG OG
Issue Date:	04/09/09
Drawn By:	JVG
Checked By:	MJG
Sheet Number:	1 of 1