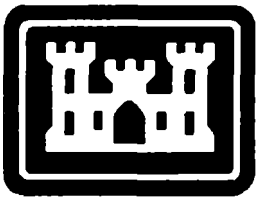
Draft RFI Report Addendum

RCRA Facility Investigation
Fort McCoy Military Reservation
Monroe County, Wisconsin

Contract DACW45-93-D-0007

Prepared for:



U.S. Army
Corps of Engineers

Department of Army
U.S. Army Engineer District
Omaha Corps of Engineers
Omaha, Nebraska

and

Fort McCoy Military Reservation

January 1995

DRAFT

RCRA FACILITY INVESTIGATION REPORT ADDENDUM
FORT MCCOY RFI/CMS
MONROE COUNTY, WISCONSIN

January 1995

Prepared for:

U.S. Army Engineer District
Omaha Corps of Engineers
Omaha, Nebraska
and
Fort McCoy Military Reservation

RUST Environment & Infrastructure
4738 N. 40th Street
Sheboygan, WI 53083

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LIST OF ACRONYMS/ABBREVIATIONS

ABS	Absorption Fraction
AEHA	U.S. Army Environmental Hygiene Agency
AEOD	Active Explosive Ordnance Disposal Site
AR	Army Regulation
ASTM	American Society for Testing and Materials
CAA	Clean Air Act
CAMU	Corrective Action Management Unit
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
CL	Closed Landfill
CLP	Contract Laboratory Program
CME	Central Mining Equipment
CMI	Corrective Measure Implementation
CMS	Corrective Measure Study
CoEC	Compound of Ecological Concern
COPC	Chemicals of Potential Concern
CRDL	Contract Required Detection Limit
CWA	Clean Water Act
CX	Categorical Exclusion
DCE	Dichloroethylene
DOI	Department of Interior
DQO	Data Quality Objectives
EA	Environmental Assessment
ECS	Equipment Concentration Site
EIS	Environmental Impact Statement
EM	Electromagnetic
EPC	Exposure Point Concentration
ES	Enforcement Standard
ESA	Endangered Species Act
FFCA	Federal Facilities Compliance Act
FID	Flame Ionization Detector
FNSI	Finding of No Significant Impact
FTBP	Fire Training Burn Pit
HI	Hazard Index
HIF	Human Intake Factor
HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HSWA	Hazardous and Solid Waste Amendment
ID	Inside Diameter
IEOD	Inactive Explosive Ordnance Disposal Site
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goals
mg/kg	Milligrams per kilogram (parts per million)
mg/l	Milligrams per liter (parts per million)

LIST OF ACRONYMS/ABBREVIATIONS
(Continued)

MSL	Mean Sea Level
NEPA	National Environmental Policy Act
NERI	Northeast Research Institute, Inc.
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
OD	Outside Diameter
PAL	Preventive Action Limit
PCE	Tetrachloroethylene
PDS	Pesticide Disposal Site
PID	Photoionization Detector
POL	Petroleum, Oil, and Lubricant
QA/QC	Quality Assurance/Quality Control
RAGS	Risk Assessment Guidance for Superfund
RBC	Risk-Based Concentration
RCL	Residual Contaminant Levels
RCLG	Residual Contaminant Level Goals
RCRA	Resource Conservation and Recovery Act
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
REC	Record of Environmental Consideration
RFA	RCRA Facility Assessment
RfD	Reference Dose
RFI	RCRA Facility Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
SDWA	Safe Drinking Water Act
SF	Slope Factor
SVOC	Semi-volatile Organic Compounds
SWMU	Solid Waste Management Unit
TCE	Trichloroethylene
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, and Disposal Facility
UBK	Uptake/Biokinetic
ug/kg	Micrograms per kilogram (parts per billion)
ug/l	Micrograms per liter (parts per billion)
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compound
WAC	Wisconsin Administrative Code
WDNR	Wisconsin Department of Natural Resources
WGNHS	Wisconsin Geological and Natural History Survey
WWTF	Wastewater Treatment Facility

1.0 ADDENDUM INTRODUCTION

In 1991, the U.S. Army Corps of Engineers (USACE), Omaha District, contracted SEC Donohue (now RUST Environment & Infrastructure) to conduct a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) and Corrective Measures Study (CMS) at Fort McCoy as a condition of Fort McCoy's RCRA Part B permit. For that RFI, 11 solid waste management units (SWMUs) were evaluated to determine if hazardous constituents had been released from each SWMU, and, if a release had occurred, to evaluate the nature and extent of such contamination. Data collected from the RFI are to be used to determine if a Corrective Measure Study (CMS) is necessary. The RFI was completed by SEC Donohue, Inc., under contract number DACA 45-91-C-0141 with the United States Army Corps of Engineers (USACE), Omaha District. The final report was issued in late 1994.

This report is an addendum to the RCRA Facility Investigation (RFI) Report completed for the RFI conducted at Fort McCoy by SEC Donohue, Inc. (1994). During the RFI process, four additional SWMUs (Figure 1-2 Addendum) were identified either during construction at Fort McCoy facilities (Landfill 7) or by concerned citizens (Landfills 8, 9, and 10). This addendum covers the investigation of these four additional SWMUs.

1.1 PROJECT HISTORY AND SCOPE

Fort McCoy is a U.S. Army installation located in Monroe County in the southwest portion of Wisconsin (Figure 1-1). The RFI covering the original 11 SWMUs at Fort McCoy, as described in the permit, was conducted from 1991 through 1993. A summary of the investigation is provided in Section 1.5 of the RFI report (SEC Donohue, 1994).

This addendum report is for four additional SWMUs identified later during the RFI process. The four sites are referred to as Landfills 7, 8, 9, and 10. Landfill 7 was uncovered during construction activities at the northwestern corner of the Consolidated Maintenance Facility (CMF). Landfills 8, 9, and 10 were identified by private citizens as former waste disposal areas. These three sites contained visible debris or had vegetation substantially different than the surroundings, and as a result, Fort McCoy investigated the sites by trenching to determine the presence and type of waste. This work was coordinated with the USACE and was conducted in July 1993 (USACE, 1993, included as Appendix R). The results demonstrated that Landfills 8, 9, and 10 were disposal sites of varying size and waste types. Since these sites could be classified as landfills, Fort McCoy requested the USACE to add these sites to the Corrective Action Program and execute an addendum RFI. This work is being performed by SEC Donohue, Inc. (now RUST Environment & Infrastructure) under contract number DACW45-93-D-0007 with the USACE, Omaha District.

The investigation performed at the four SWMUs was based on the type of waste disposed in each of the landfills. Each of the sites was visually characterized by test trenches excavated to determine the presence and type of wastes. Based on this information, the scope of the investigation differed from the original RFI, and was revised by the USACE to be limited to groundwater sampling,

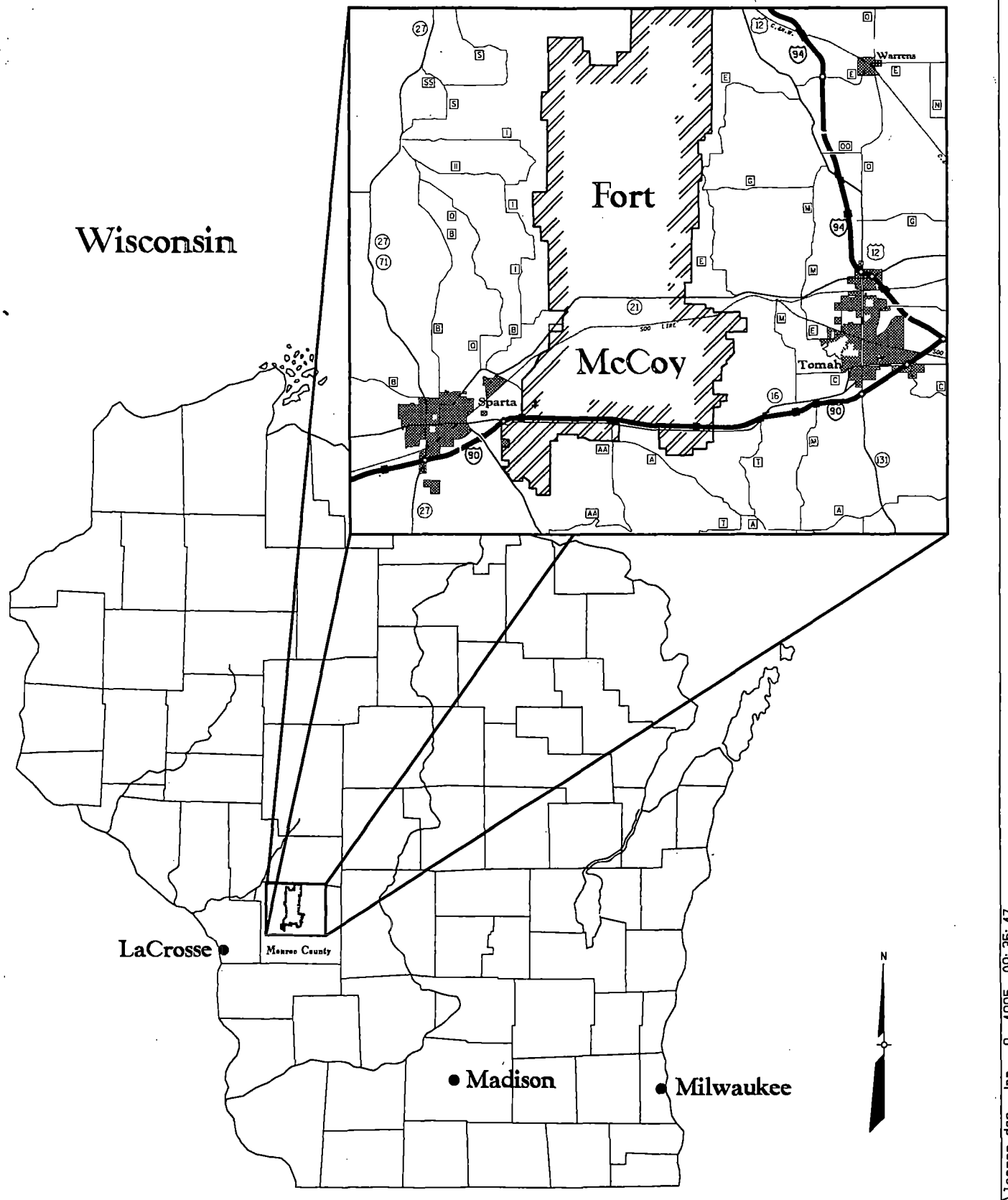

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FIGURE 1-1
FACILITY LOCATION MAP

FORT McCOY RFI
MONROE COUNTY, WISCONSIN

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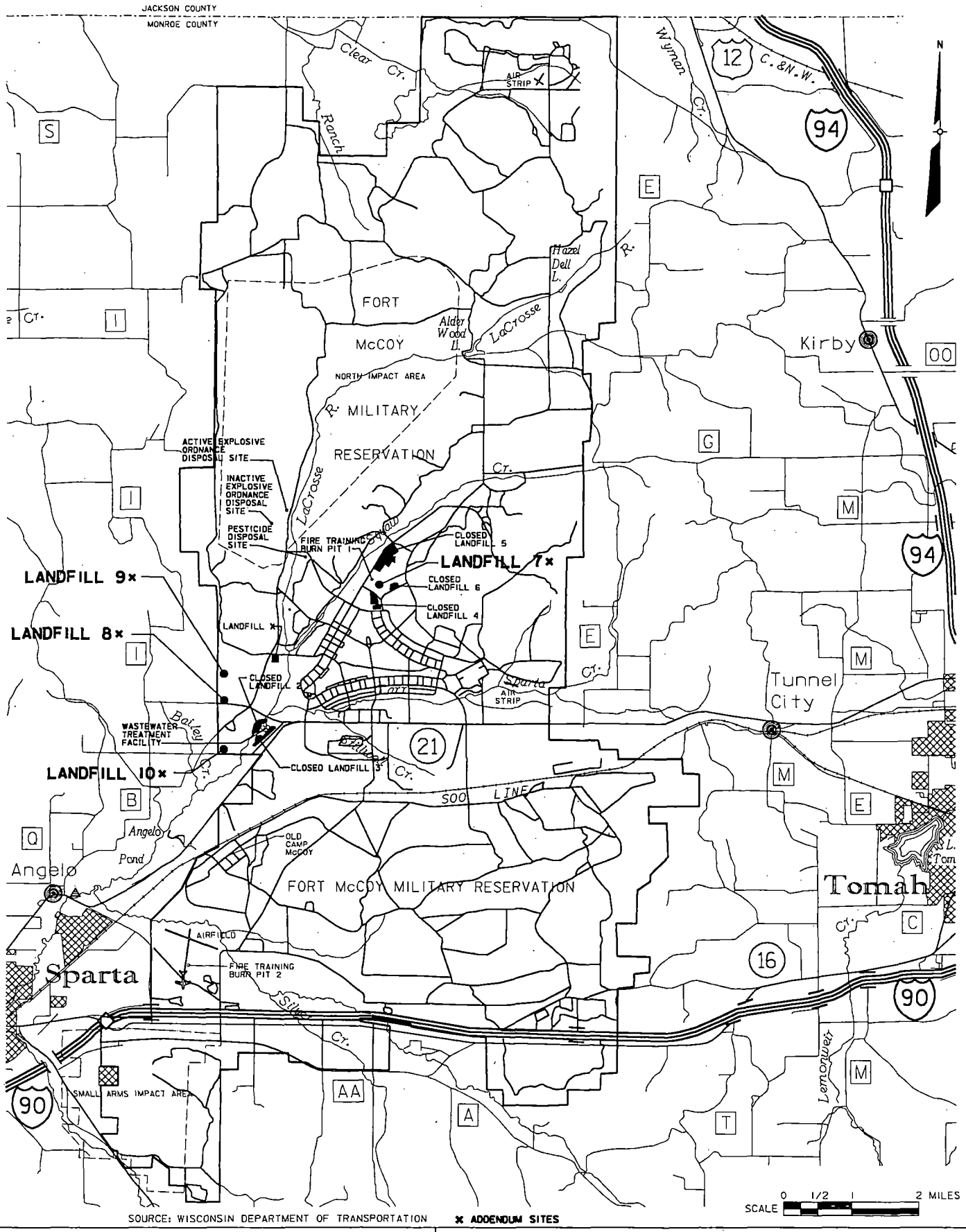

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FIGURE 1-2 ADDENDUM SWMU LOCATION MAP

FORT McCOY RFI
MONROE COUNTY, WISCONSIN

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analysis, and interpretation. The field investigation and Round 1 groundwater sampling were performed in November and December of 1993. Round 2 groundwater sampling was conducted in July 1994.

1.2 ADDENDUM ORGANIZATION

This report is written as an addendum to the RFI of the original 11 SWMUs investigated by SEC Donohue, Inc. (1994). Accordingly, the sections presented in this addendum report are successional to the sections in the RFI report. Chapters on regional physical features (Section 2.0), sampling procedures (Section 3.0), and general regulatory requirements (Section 5.0) of the SEC Donohue, Inc. (1994) RFI report remain valid for this report addendum, and only revised sections of text and figures are presented in this addendum report. Section 4.0 on human health assessment has been revised because of the nature of the data collected for this RFI Addendum.

Several sections of the RFI will not be included in this addendum, including Sections 6 through 16, which report on the investigations of the 11 individual SWMUs that were the focus of the initial RFI, as well as Section 17 on the data quality, Section 18 on the summary and recommendations, and Section 19 on the references for the investigation of these 11 SWMUs. These sections are presented in the RFI Report (SEC Donohue, Inc., 1994).

Reports on the four new SWMUs are numbered as additional sections to the RFI report. Sections 20 through 23 present the results of the RFI completed at Landfills 7, 8, 9, and 10, including evaluation and interpretation of the results.

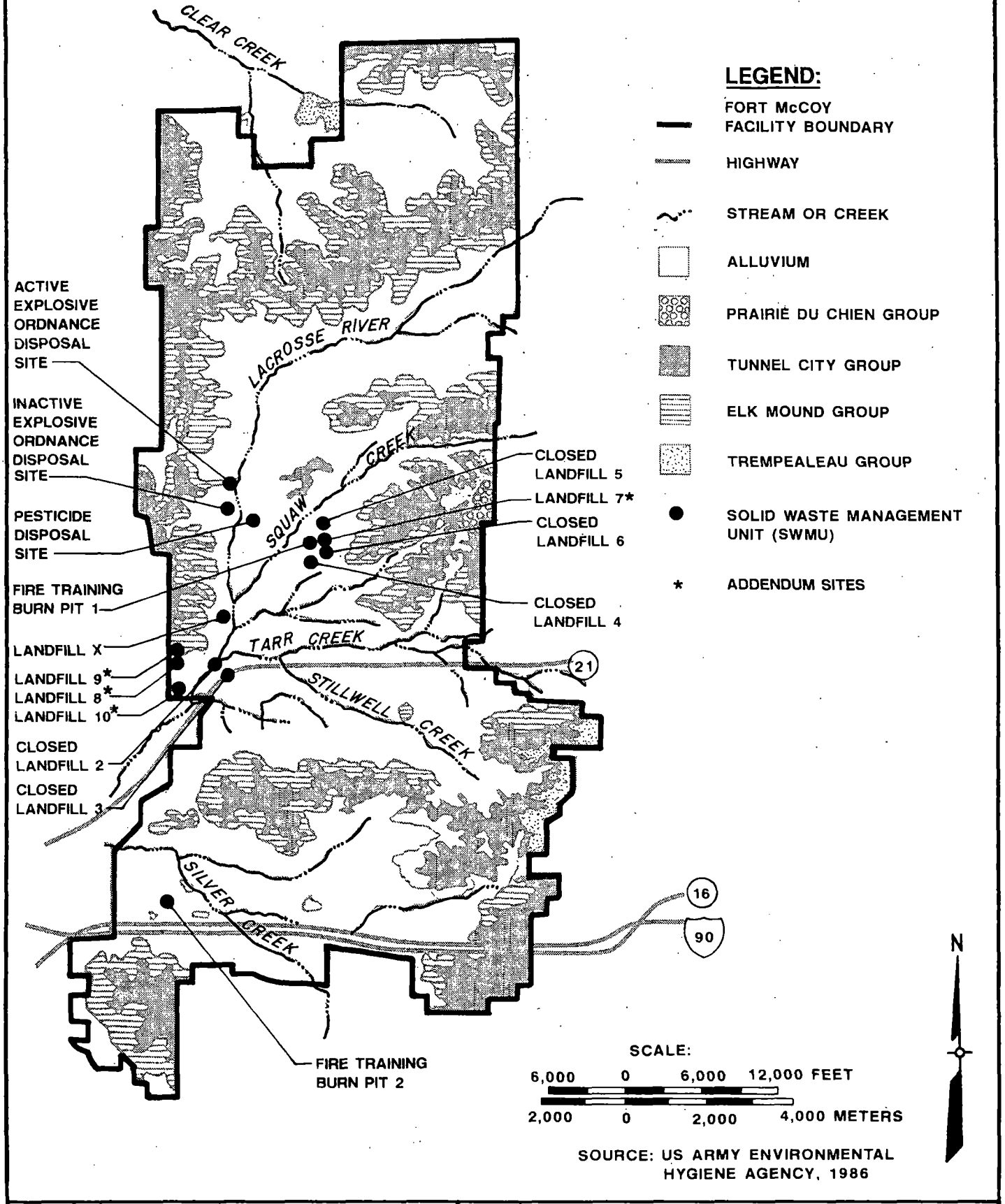
Section 24 provides a summary of data quality for sample analyses completed for the four SWMUs.

Section 25 provides a summary of the findings for the RFI of the four SWMUs and recommendations for the continuation of the corrective action process.

Applicable appendices of the original RFI have been amended with the information collected during the RFI of the four SWMUs. These appendice addenda are included at the end of the report and include field forms, well logs, complete data reports (all analytes), technical memoranda, and other necessary information from the investigation.

2.0 REGIONAL PHYSICAL FEATURES ADDENDUM

A discussion of the regional physical environment (geology, hydrogeology, etc.) is provided in Section 2.0 of the RFI report. Figures 2-1, 2-2, and 2-4 are updated in this addendum to show the location of the four additional SWMUs in relation to the physical environment at Fort McCoy.



SOURCE: US ARMY ENVIRONMENTAL HYGIENE AGENCY, 1986

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FIGURE 2-1 ADDENDUM

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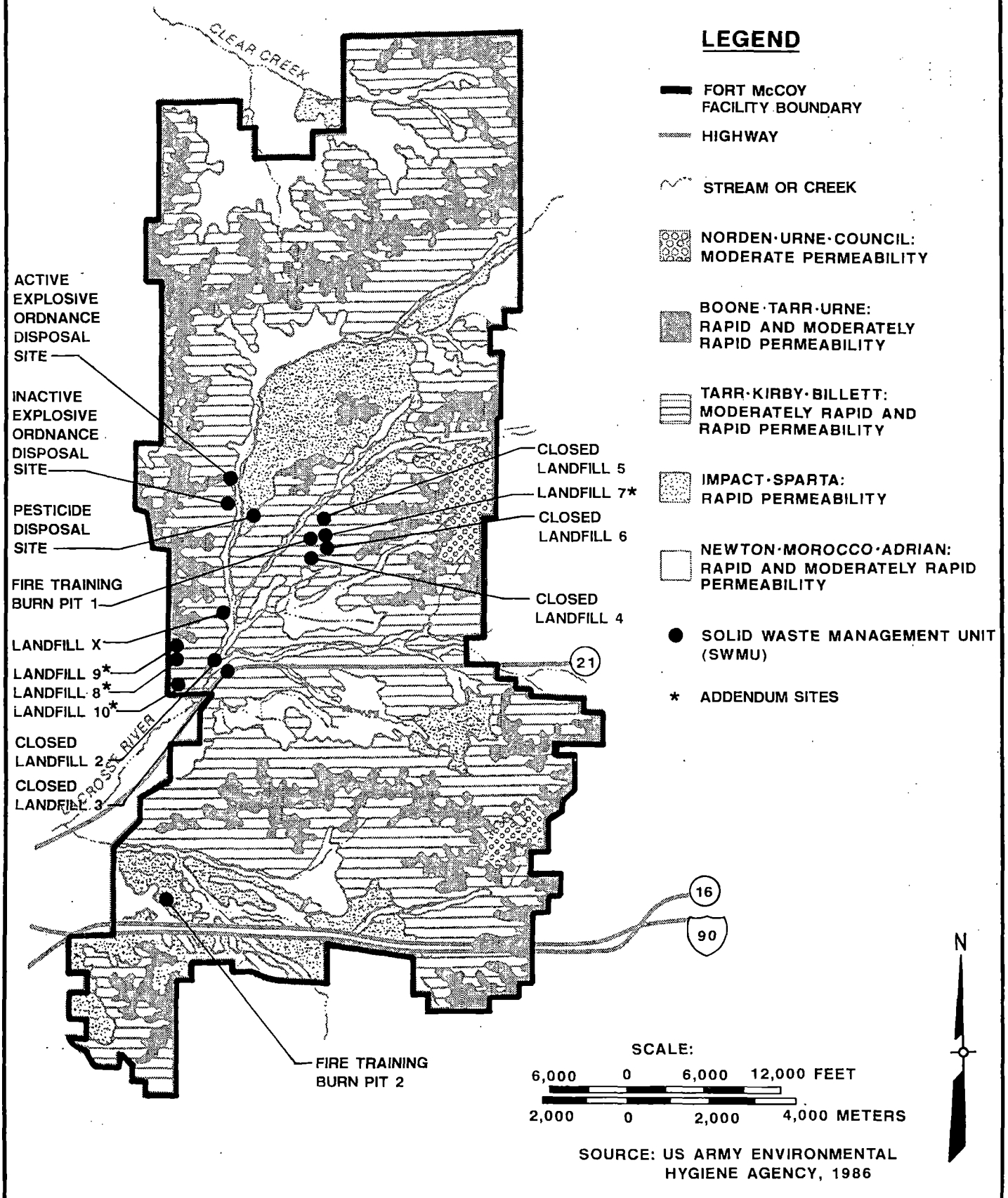
DRAINAGE NETWORK AT FORT McCOY

FORT McCOY RFI
MONROE COUNTY, WISCONSIN



SOURCE: US ARMY ENVIRONMENTAL HYGIENE AGENCY, 1986

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FIGURE 2-2 ADDENDUM

SOIL ASSOCIATIONS

FORT McCOY RFI
MONROE COUNTY, WISCONSIN

DUNCAN-PARNELL, INC. CHARLOTTE, NC 800-768-7788

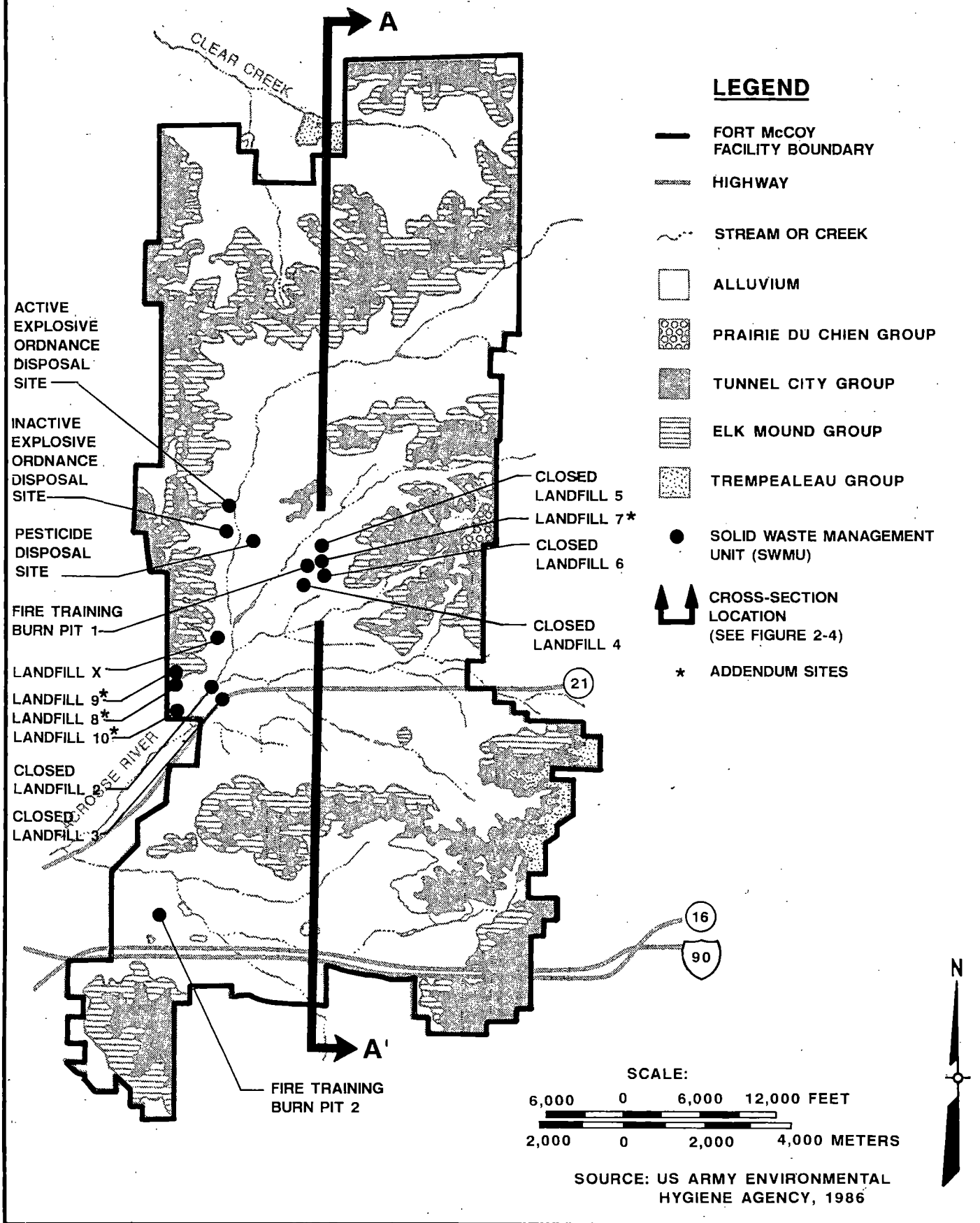

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FIGURE 2-4 ADDENDUM
GEOLOGIC MAP AND GEOLOGIC CROSS-SECTION LOCATION

FORT McCOY RFI
MONROE COUNTY, WISCONSIN

DUNCAN - PARNELL, INC. CHARLOTTE, NC 800-768-7788

3.0 SAMPLING PROCEDURES ADDENDUM

3.1 INTRODUCTION ADDENDUM

The investigation of Landfills 7, 8, 9, and 10 involved chemical characterization of groundwater from each SWMU. Groundwater samples were obtained from water table monitoring wells installed in the uppermost aquifer at each site, the unconsolidated aquifer.

Procedures for drilling, monitoring well installation, well development, hydraulic conductivity, and water level measurement at the 11 previously described SWMUs at Fort McCoy were described in the original RFI report. Procedures used for this addendum closely followed those procedures; any procedural differences are described in the following sections of this report addendum.

3.8 GROUNDWATER ADDENDUM

The groundwater investigation consisted of water table monitoring wells installed in boreholes followed by well development, hydraulic conductivity testing, water level measurement, and sampling. At each site, at least one well was installed upgradient of the landfill (in terms of groundwater flow direction) and the remainder were installed downgradient. Field forms and data are included in the appendices to this RFI Report Addendum.

3.8.1 Drilling

The boreholes were advanced using Diedrich D-50 and a Mobil B-57 drill rigs. Soils were continuously sampled at 2-foot intervals with a standard 2-inch diameter stainless steel split spoon advanced through 6 1/4-inch hollow stem augers. Procedures for soil description, sampling, and geotechnical analyses follow those presented in the RFI report. Drilling logs are included in Appendix E Addendum and geotechnical analyses are included in Appendix F Addendum.

A sample split from each interval was field screened for VOCs using a photoionization detector (PID). Because drilling occurred during cold weather in November and December, 1993, the samples were sealed in a plastic bag and placed in a heated truck for one-half hour to equilibrate to approximately 70 degrees Fahrenheit. The geologist then pierced the bag with a PID, agitated the sample, and recorded the maximum PID reading on the boring log.

3.8.2 Monitoring Well Installation

A total of 14 water table monitoring wells were installed at Landfills 7, 8, 9, and 10 (Table 3-4 Addendum). All of these wells were of the stick-up design and installed following procedures in accordance with Chapter NR 141 of the Wisconsin Administrative Code (WAC) as described in the RFI report. Detailed monitoring well construction logs (WDNR Form 4400-113A) are included in Appendix G Addendum and the well installations are summarized on Groundwater Monitoring Well Information Forms (WDNR Form 4400-89) included in Appendix H Addendum.

TABLE 3-4 ADDENDUM

GROUNDWATER MONITORING WELLS INSTALLED FOR FORT MCCOY RFI ADDENDUM MONROE COUNTY, WISCONSIN

LANDFILL 7		
Well	*Screen Interval*[1]	*Gradient*
OW-144	8.0 - 18.0	Upgradient
OW-145	9.0 - 19.0	Downgradient
OW-146	9.0 - 19.0	Downgradient
LANDFILL 8		
Well	*Screen Interval*[1]	*Gradient*
OW-147	12.0 - 22.0	Downgradient
OW-148	8.0 - 18.0	Upgradient
OW-149	8.0 - 18.0	Downgradient
OW-150	6.0 - 16.0	Sidegradient
LANDFILL 9		
Well	*Screen Interval*[1]	*Gradient*
OW-151	30.5 - 40.5	Upgradient
OW-152	24.5 - 34.5	Downgradient
LANDFILL 10		
Well	*Screen Interval*[1]	*Gradient*
OW-154	12.0 - 22.0	Sidegradient
OW-155	13.0 - 23.0	Upgradient
OW-156	12.0 - 22.0	Downgradient
OW-157	14.0 - 24.0	Downgradient
OW-158	12.0 - 22.0	Downgradient

NOTES:

OW = Observation Well (water table well)
[1]Screen intervals are indicated in feet below ground surface.

At least one well at each site was installed upgradient of the landfill (in terms of groundwater flow direction) and one downgradient. Well locations were determined based on topography or on available groundwater flow direction information, and revised as water table elevations were determined in the field as monitoring well installation progressed. Three wells were installed at Landfill 7. Well OW-144 was upgradient of the site, and wells OW-145 and OW-146 were downgradient. At Landfill 8, four wells were installed: OW-148 was upgradient, OW-150 was sidegradient, and wells OW-147 and OW-149 were downgradient. At Landfill 9, one well, OW-151, was installed upgradient of the site and one well, OW-152, was installed downgradient. At Landfill 10, groundwater gradients are low, and five wells were installed. Well OW-155 was installed upgradient, well OW-154 sidegradient, and wells OW-156, OW-157, and OW-158 were installed downgradient.

3.8.3 Well Development

All of the wells were developed a minimum of 24 hours after annular space seal installation. Development data were documented on WDNR Monitoring Well Development Forms (Form 4400-113B) and are included in Appendix I Addendum.

Development consisted of alternately surging and purging each well for a minimum of 15 minutes using a bailer, followed by removing five well volumes of water using an electric powered Keck pump or Grundfos submersible pump, and then repeating this procedure once.

Four wells were extremely slow to recharge and were purged dry during development. These wells were OW-147, OW-148, and OW-149 at Landfill 8, and OW-151 at Landfill 9. The lower recharge rates can be attributed to: finer grained alluvium that classifies as SP-SM, poorly graded sand with silt, in the screen intervals of OW-148 and OW-151; the presence of lean clays (CL) in portions of the screen intervals of OW-148 and OW-149; and the presence of partially cemented fine-grained sandstone in the screen interval of OW-147 and OW-149. These differences in the alluvium and bedrock are related to the fact that Landfills 8 and 9 are located near the edge of the LaCrosse River valley where the alluvium differs in texture from that in the central part of the valley, and the sandstone bedrock is shallower. These four wells were developed using a bailer instead of a pump. The wells were purged until a minimum of five well volumes had been removed and the conductivity, pH, and temperature had stabilized. The turbidity in these four wells was noticeably reduced, but the water was still slightly turbid when development ceased and when sampling occurred.

The initial and final well volume water samples from each well were photographed with suitable lighting to demonstrate the clarity of the water. White sheets of paper were used for background in these photographs, and the sheets included the following information: well designation, date, time, project number, and well volume purged. These photographs are part of the project file kept for the RFI/CMS. The nephelometric turbidity of the final development purge water was measured in accordance with ASTM D1889.

TABLE 3-5 ADDENDUM

SUMMARY OF GROUNDWATER SAMPLING ACTIVITIES
FORT MCCOY RFI
MONROE COUNTY, WISCONSIN

Wells Samples	Parameters	Methods	Sample Round
Landfill 7 OW-144 OW-145 OW-146	TCL VOA TCL BNA TAL Metals (total) PCB/Pesticides O-P Pesticides Herbicides Water Quality	SW-846 8260 SW-846 3510/8270 SW-846 6010/7041/7061/7421/7470/7741/7841 SW-846 3510/8080 SW-846 8140 SW-846 8150 EPA 340.2/365.2/410.1/353.3/310.1/375.4/325.3/160.1	1
Landfill 7 OW-144 OW-145 OW-146	TCL VOA TCL BNA TAL Metals (total) PCB/Pesticides O-P Pesticides Herbicides Water Quality	SW-846 8260 SW-846 3510/8270 SW-846 6010/7041/7060/7421/7470/7740/7841 SW-846 3510/8080 SW-846 8141 SW-846 8150 EPA 340.2/365.4/410.4/353.2/310.1/375.4/160.1 SW-846 9252	2
Landfill 8 OW-147 OW-148 OW-149	TCL VOA TCL BNA TAL Metals (total) PCB/Pesticides O-P Pesticides Herbicides Water Quality	SW-846 8260 SW-846 3510/8270 SW-846 6010/7041/7061/7421/7470/7741/7841 SW-846 3510/8080 SW-846 8140 SW-846 8150 EPA 340.2/365.2/410.1/353.3/310.1/375.4/325.3/160.1	1
Landfill 8 OW-147 OW-148 OW-149	TCL VOA TCL BNA TAL Metals (total) PCB/Pesticides O-P Pesticides Herbicides Water Quality	SW-846 8260 SW-846 3510/8270 SW-846 6010/7041/7060/7421/7470/7740/7841 SW-846 3510/8080 SW-846 8141 SW-846 8150 EPA 340.2/365.4/410.4/353.2/310.1/375.4/160.1 SW-846 9252	2
Landfill 9 OW-151 OW-152	TCL VOA TCL BNA TAL Metals (total) PCB/Pesticides O-P Pesticides Herbicides Water Quality	SW-846 8260 SW-846 3510/8270 SW-846 6010/7041/7061/7421/7470/7741/7841 SW-846 3510/8080 SW-846 8140 SW-846 8150 EPA 340.2/365.2/410.1/353.3/310.1/375.4/325.3/160.1	1

TABLE 3-5 ADDENDUM (Continued)

SUMMARY OF GROUNDWATER SAMPLING ACTIVITIES
FORT MCCOY RFI
MONROE COUNTY, WISCONSIN

Wells Samples	Parameters	Methods	Sample Round
Landfill 9	TCL VOA	SW-846 8260	2
	TCL BNA	SW-846 3510/8270	
OW-151	TAL Metals (total)	SW-846 6010/7041/7060/7421/7470/7740/7841	
OW-152	TAL Metals (dissolved)	SW-846 6010/7041/7060/7421/7470/7740/7841	
	PCB/Pesticides	SW-846 3510/8080	
	O-P Pesticides	SW-846 8141	
	Herbicides	SW-846 8150	
	Water Quality	EPA 340.2/365.4/410.4/353.2/310.1/375.4/160.1	
		SW-846 9252	
Landfill 10	TCL VOA	SW-846 8260	1
	TCL BNA	SW-846 3510/8270	
OW-155	TAL Metals (total)	SW-846 6010/7041/7061/7421/7470/7741/7841	
OW-156	PCB/Pesticides	SW-846 3510/8080	
OW-157	O-P Pesticides	SW-846 8140	
OW-158	Herbicides	SW-846 8150	
	Water Quality	EPA 340.2/365.2/410.1/353.3/310.1/375.4/325.3/160.1	
Landfill 10	TCL VOA	SW-846 8260	2
	TCL BNA	SW-846 3510/8270	
OW-154	TAL Metals (total)	SW-846 6010/7041/7060/7421/7470/7740/7841	
OW-155	PCB/Pesticides	SW-846 3510/8080	
OW-156	O-P Pesticides	SW-846 8141	
OW-157	Herbicides	SW-846 8150	
OW-158	Water Quality	EPA 340.2/365.4/410.4/353.2/310.1/375.4/160.1	
		SW-846 9252	

NOTES:

OW	Indicates a water table well (observation well).
TCL VOA	Target Compound List volatile organic analytes.
TCL BNA	Target Compound List base neutral-acid extractable compounds.
TAL Metals	Target Analyte List metals.
PCB/Pesticides	Polychlorinated biphenyls and organo-chlorine pesticides.
O-P Pesticides	Organo-phosphorus pesticides.
Water Quality	Fluoride, total phosphate, chemical oxygen demand, nitrate+nitrite, total alkalinity, sulfate, chloride, total dissolved solids.

3.8.4 Groundwater Sampling

Groundwater was sampled from twelve of the 14 new monitoring wells during the Round 1 sampling, and thirteen of the wells during the Round 2 sampling. Table 3-5 Addendum lists, by SWMU, the wells that were sampled and the parameters for which the samples were analyzed. The two wells that were not sampled during the Round 1 sampling were OW-150 at Landfill 8 and OW-154 at Landfill 10. OW-150 was not sampled during the Round 2 sampling. Evaluation of groundwater flow directions after well installation indicated these wells would not provide information on the landfills' potential impact on groundwater quality; OW-150 is located sidegradient of Landfill 8 and OW-154 is located sidegradient of Landfill 10. Because of the low groundwater gradients at Landfill 10, there was question whether OW-154 was truly sidegradient, so it was sampled during Round 2.

Prior to sampling each well, the well cap was removed and the well head monitored for organic vapors using a PID. There were no PID detections at the well heads during the investigations of Landfills 7, 8, 9, and 10.

Depth to water and depth to bottom of the well measurements were taken and used to calculate the volume of water in each well. When purging the well, at least five well volumes were removed from the well using a Keck pump, a Grundfos pump, or a stainless steel bailer. At the start of pumping and after each well volume, pH, conductivity, temperature, and turbidity of the water were measured and recorded. Purging was continued until three consecutive readings had stabilized to ± 0.1 pH, ± 10 percent conductivity, and ± 0.5 degrees C. The total volume of water removed during the purging process was recorded. A headspace analysis was also performed with the PID on the groundwater from each well and recorded. There were no PID detections from the groundwater sampled from wells at Landfills 7, 8, 9, and 10 during either the Round 1 or Round 2 sampling.

Following completion of the purging process, the groundwater was collected in appropriate sample bottles and preserved for the analyses as required in the Quality Assurance Project Plan. The samples were stored with ice in a cooler until relinquished to the sample coordinator.

After completion of groundwater sampling at each well, the pump or bailer was removed from the well and decontaminated. Pump decontamination was completed by pumping 10 gallons of tap water followed by 5 gallons of deionized water through the pump. The outer parts of the pump and the water level indicators were rinsed with tap water followed by rinsing with deionized water. Bailers were decontaminated by washing with a detergent, followed by a rinse with tap water, deionized water, isopropanol, and deionized water. The well purge water and decontamination water, except for the isopropanol and subsequent rinse, were allowed to drain into the soil downgradient of the well. The isopropanol and subsequent rinse were collected and turned over to Fort McCoy for disposal.

3.8.5 Hydraulic Conductivity

The hydraulic conductivity of the screened interval for each well installed at Landfills 7, 8, 9, and 10 was determined by the rising head slug test method described in the original RFI. In each well, three rising head tests were performed.

Drawdown versus time plots were produced by the Bouwer and Rice (1976) method using AQTESOLV computer software (Geraghty and Miller, 1991). Drawdown versus time was plotted on a semi-logarithmic graph for analysis. Selection of data to be used for each analysis was chosen by a geologist in order to disregard early or late time data that did not represent the true aquifer properties. The selection of the appropriate segment was done using the method of Bouwer and Rice (1976).

A straight line was fit to the selected data using the Marquardt nonlinear least-squares analysis provided in the computer software. Statistical parameters such as the correlation matrix, standard error of the estimated aquifer parameters, and evaluation of the residual statistics were used to judge the fit of the straight line to the field data. In most cases, these statistical factors suggest the field data closely approaches a linear plot, which indicates that the tests were performed correctly and the assumptions of the test method were met. AQTESOLV results and plots are provided in Appendix J Addendum.

3.8.6 Water Level Measurements

Water level measurements were taken in all of the wells installed at Landfills 7, 8, 9, and 10. The measurements were taken and recorded following procedures presented in the original RFI. Water level measurements for Landfills 7, 8, 9, and 10 are included in Appendix K Addendum.

4.0 HUMAN HEALTH ASSESSMENT ADDENDUM

Because the data collected for Landfills 7, 8, 9 and 10 are not sufficient to support a baseline risk assessment, the data are compared to risk-based concentrations (RBCs) developed by the USEPA, Region 3 as a means of assessing relative human health risks for sites not on the National Priority List. Use of this list has been permitted by USEPA for various entities to provide a means to determine if a site may require further investigation or evaluation for possible corrective measures (USEPA, Region 3, RBC Update memo, third quarter, 1994).

For purposes of this report, RBCs are used along with WAC NR140 standards to determine whether or not corrective action may be required for each SWMU. RBCs are environmental concentration limits for chemicals calculated to protect human populations against carcinogenic or noncarcinogenic effects under specified exposure conditions. For noncarcinogens, the RBCs are the concentrations which yield a Hazard Index (HI), the ratio between a calculated exposure level of a chemical and the established health criteria, of 1E+00 (1) for a future adult resident exposed under reasonable maximum exposure (RME) conditions, the maximum exposure that an individual would reasonably be expected to experience at the site. For carcinogens, the RBCs are equal to the concentrations which yield cancer risks of 1E-06 (1 in a million). For chemicals that are carcinogens and noncarcinogens, the RBCs are the lower of value of the carcinogenic and noncarcinogenic RBCs for a given risk level. These RBCs assume standard exposure levels, and take into account exposure through both ingestion as a drinking water source and through inhalation of VOCs released from groundwater during household uses. The RBCs assume no chemical additivity to the target risk. A copy of the USEPA Region 3 third-quarter 1994 RBC list is provided in Appendix S.

20.0 LANDFILL 7

20.1 SITE BACKGROUND

Landfill 7 is located in the SE 1/4 of the NW 1/4 of Section 13, T18N, R3W, Monroe County, Wisconsin. As shown on Figure 20-1, this area is located south of the closed main sanitary landfill (Closed Landfill 5), north of Closed Landfill 4, east of Fire Training Burn Pit 1, and west of former Closed Landfill 6. Landfill 7 is located approximately 1,800 feet east of Squaw Creek.

Landfill 7 was discovered during grading and earth moving work at the northwest corner of the Consolidated Maintenance Facility (CMF) in May 1993. Municipal-type refuse was observed, such as glass soda bottles and aluminum cans. Also exposed during a site visit by SEC Donohue, Inc. (now RUST E&I) personnel in October of 1993 were assorted electrical and transformer parts, five-gallon fuel cans and unknown chemical cans and drums, an automobile exhaust manifold, muffler, distributor, and spark plug wires, rubber inner tubes, one dummy rocket round, and animal bones. Test pits excavated during the grading and earth moving work in early 1993 indicated that the bottom of the municipal refuse occurred at depths up to 18 feet below the ground surface.

There are no records of when this landfill was operable. Aerial photographs suggest landfill activity took place sometime between 1950 and 1964. The area is shown in native vegetation on the 1939 and 1950 photographs. The next available aerial photograph, dated June 3, 1964, shows the area as bare, graded ground. The first landfill trench at Closed Landfill 5 is also evident on this photograph. Subsequent aerial photographs from 1970, 1978, 1987, and 1992 show the Landfill 7 area vegetated with grass and small trees.

Interviews with past and present Fort McCoy employees (personal communication to Tim Kemmis and Connie Kelly, RUST E&I, October, 1993) provided limited information about the site. One interviewee stated that the Landfill 7 area was used before his employment in 1960, a time period consistent with that interpreted from the aerial photographic information. Other interviewees recalled that waste disposal in the Landfill 7 area had consisted of general refuse, including food and animal carcasses, concrete, steel posts in concrete, and burned lumber.

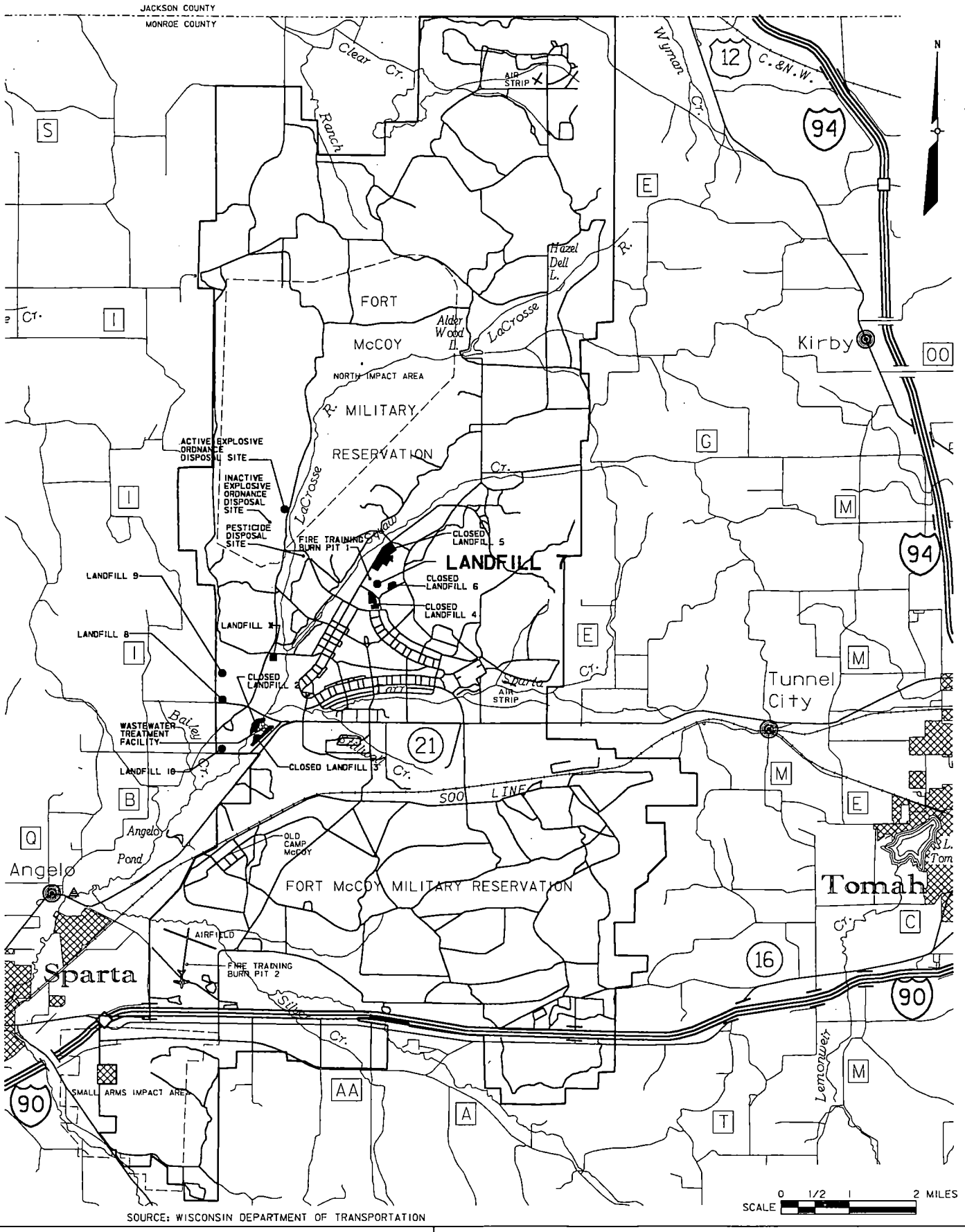
20.2 PHYSICAL FEATURES

20.2.1 Site Setting

Landfill 7 is located in a nearly level area at the northwestern corner of the CMF parking lot, directly east of the fence for the Equipment Concentration Site (ECS) parking lot and Fire Training Burn Pit 1. The site is vegetated with grasses and small herbaceous forbs. In places a few shallow, open trenches dug to investigate the landfill are present.

20.2.2 Topography and Drainage

The land surface of Landfill 7 is relatively flat with a slight slope west toward Squaw Creek, with less than 2.5 feet of relief from observation well OW-144, shown on Figure 20-2, to OW-146. The



SOURCE: WISCONSIN DEPARTMENT OF TRANSPORTATION

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FIGURE 20-1
LANDFILL 7
LOCATION MAP

FORT McCOY RFI
MONROE COUNTY, WISCONSIN

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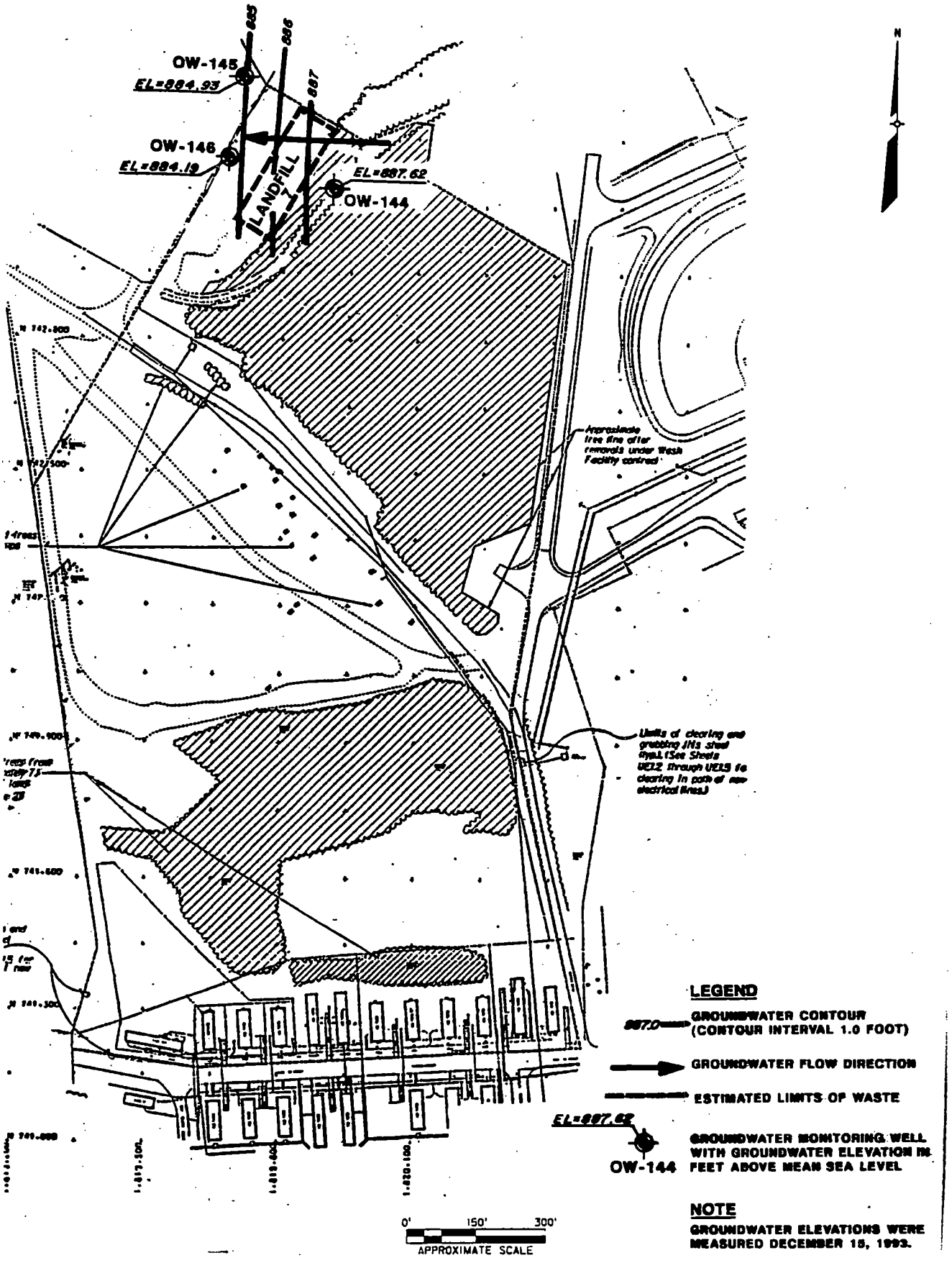

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FIGURE 20-2
LANDFILL 7
WATER TABLE MAP AND GROUNDWATER MONITORING WELL LOCATIONS

FORT McCOY RFI
MONROE COUNTY, WISCONSIN

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surficial materials are permeable sands, and infiltration of rainwater predominates over overland flow.

20.2.3 Surficial Soils

The Landfill 7 area is mapped as the Tarr series soil (USDA, 1984). The Tarr series generally occurs on stream terraces, such as this site on a terrace of Squaw Creek, and on valley slopes. The natural soils were likely excavated or disturbed where landfilling has occurred. Tarr series soils were described in Section 2.3 of the RFI report.

20.2.4 Geology

Only one stratigraphic unit, Quaternary alluvium, was encountered during installation of observation wells OW-144, OW-145, and OW-146 at Landfill 7. The alluvium was predominantly a fine-to-medium grained, poorly graded sand classified as SP in the Unified Soil Classification. Locally there were beds of slightly siltier sand that classified as poorly graded sand with silt (SP-SM) or silty sand (SM)(see boring logs presented in Appendix E Addendum).

20.2.5 Hydrogeology

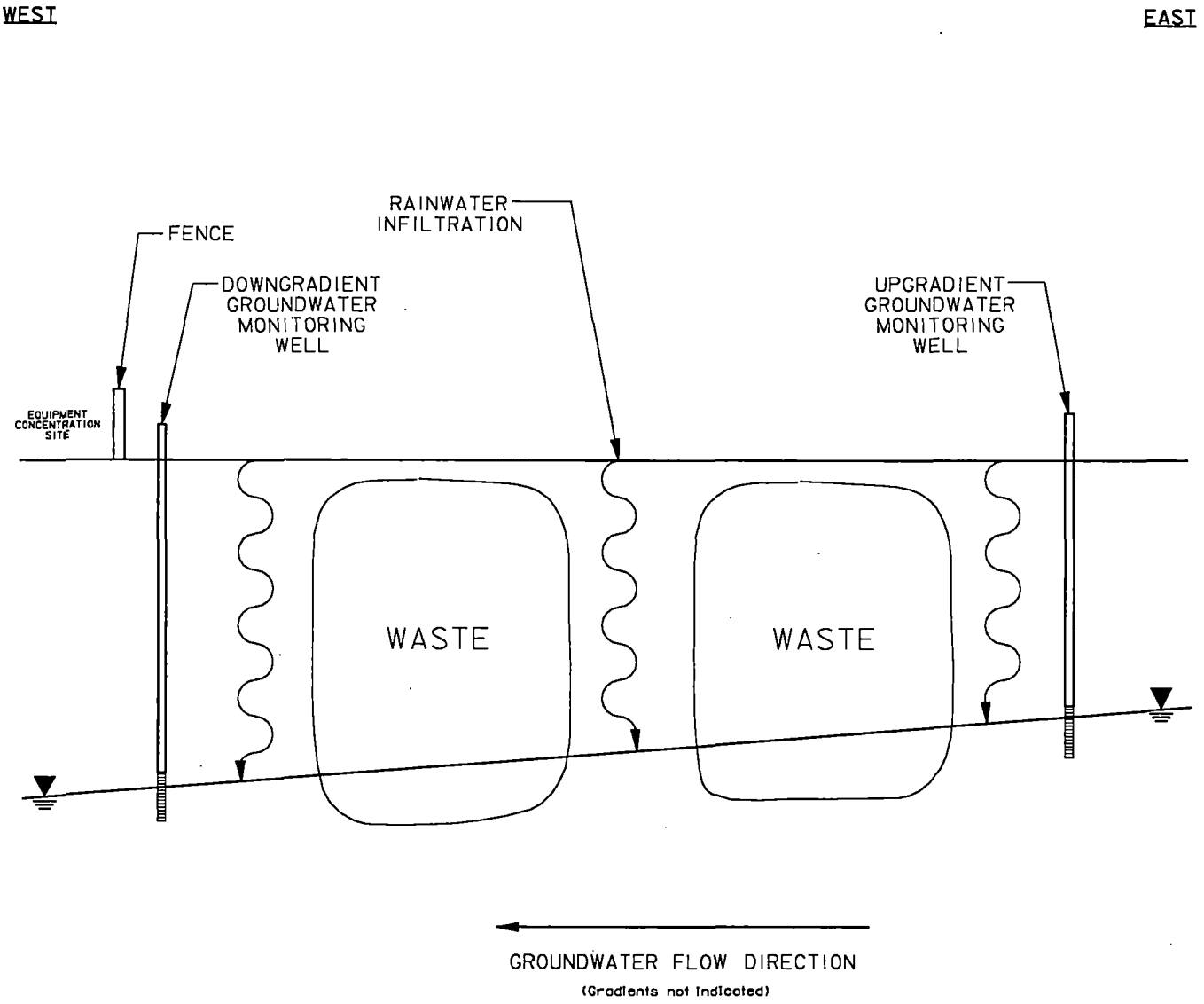
Three water table observation wells were installed at Landfill 7: OW-144, the upgradient well; and OW-145 and OW-146, the two downgradient wells (Figure 20-2). These three wells were installed to detect possible groundwater contamination associated with the landfill, to measure groundwater elevations to determine the groundwater gradient and flow direction, and to determine the aquifer hydraulic conductivity for a linear flow velocity calculation.

Landfill 7 is located in a groundwater recharge area. The water table is approximately 11 to 12 feet below the ground surface, and groundwater flow is west toward Squaw Creek (Figure 20-2).

The field hydraulic conductivity (K) for the alluvium ranges from 0.0075 to 0.0097 cm/sec with a geometric mean of 0.0084 cm/sec. The average linear flow velocity is 0.00042 cm/sec using a gradient of 0.01 ft/ft, an average K value of 0.0084 cm/sec, and a porosity of 0.2 cm^3/cm^3.

20.3 SITE CONCEPTUAL MODEL

The conceptual model for this site is shown on Figure 20-3. The primary contaminant source at Landfill 7 is assumed to be the buried waste. The ground surface is nearly level, the soil is sandy and permeable, and surface runoff is negligible. No landfill cap or liner appears to have been installed. The most likely release mechanism would, therefore, occur from vertical infiltration of precipitation through surface soils, leaching through the waste, and mixing of the leachate with groundwater flowing laterally beneath the site. The groundwater has a general flow west toward Squaw Creek approximately 1800 feet to the west where contaminants could be released to potential receptors. Because groundwater flow is the main transport mechanism, downgradient groundwater sampling provides an indication of contaminant migration from the site.



SCALE: NTS

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FIGURE 20-3
LANDFILL 7
SITE CONCEPTUAL MODEL

FORT McCOY RFI
MONROE COUNTY, WISCONSIN

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20.4 SAMPLING ACTIVITIES

Sampling at Landfill 7 consisted of collecting groundwater samples to determine if a release of contamination from the waste had impacted groundwater. One upgradient and two downgradient water table observation wells were installed at locations adjacent to and outside of the landfill area. The groundwater monitoring wells were installed, developed and sampled as described in Section 3 of the RFI report and Section 3 Addendum of this report. Groundwater samples were submitted for analyses of VOCs, SVOCs, TAL metals, PCBs, pesticides, herbicides, organophosphorus pesticides, and water quality parameters. The analytical results from groundwater sampling are described in Section 20.5.

20.5 GROUNDWATER ANALYTICAL RESULTS

This section summarizes groundwater analytical data collected from Landfill 7. Complete analytical data are included in Appendix Q-11. Samples were successfully analyzed and the data are acceptable. Detections of some inorganic and water quality parameters may be biased, either high or low, because the same compounds were detected in method and/or field blanks. Data quality of Landfill 7 groundwater samples is discussed in Section 24.

Landfill 7 groundwater sampling locations are shown on Figure 20-2. Monitoring Well OW-144 is upgradient and monitoring wells OW-145 and OW-146 are downgradient of the landfill. Table 20-1 summarizes the analytical data for these wells. Only detected parameters and corresponding values qualified as usable are included in the table.

Six VOCs, acetone, benzene, ethyl benzene, methylene chloride, toluene, and xylenes were detected in wells at the site. Acetone and methylene chloride are common laboratory contaminants, and their presence in field samples at concentrations less than 10 times that found in field and laboratory blanks is considered a false positive. This conclusion is supported by the fact that neither compound was detected during Round 2 sampling. Neither acetone nor methylene chloride will be considered further in the analysis of regulatory standards and human health assessment for this SWMU.

Benzene, ethyl benzene and xylene were only detected at downgradient well OW-145. Benzene was present at concentrations above the WAC NR 140 Public Health Preventive Action Limit (PAL) and Enforcement Standard (ES) (see Section 20.7 for a discussion of the WAC NR 140 groundwater standards). Ethyl benzene, xylene, and toluene were detected at concentrations less than the WAC NR 140 Public Health PALs.

Four SVOCs, 2-methylnaphthalene, acenaphthene, di-n-butylphthalate, and fluorene were also detected at downgradient well OW-145 during one of the sampling rounds at concentrations near the detection limit. None of these analytes have listed regulatory standards.

Thirteen metals were detected in downgradient wells OW-145 and OW-146. Only three of these metals, mercury, lead, and silver, were present at concentrations that exceed the concentration in upgradient well OW-144 and that exceed the WAC NR 140 Public Health PAL (mercury) or ES (lead and silver); the mercury and silver detections were qualified J (estimated), however. Two metals, iron and manganese, were present at concentrations that exceed the concentration in

TABLE 20-1

LANDFILL 7 GROUNDWATER
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

	OW145 (9-19 ft)[a]		OW146 (9-19 ft)						OW144 (Upgradient) (8-18 ft)		WAC NR 140 Public Health Standards		Risk-Based Concentrations (RBC)	
	Round 1	Round 2	Round 1	Round 2	Round 1 (Duplicate)	Round 2 (Duplicate)	Round 1 (Rinsate Blank)	Round 2 (Rinsate Blank)	Round 1	Round 2	PAL[b]	ES[b]	Non-C[c]	C[c]
VOLATILE ORGANIC COMPOUNDS (ug/l)														
Acetone	32B(10)[d]	ND(50)[e]	10B(10)	ND(50)	42B(10)	ND(50)	12B(10)	ND(50)	37B(10)	ND(50)	200	1,000	3,700	–[f]
Benzene	6.4(1.0)	3.8(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.5	5	–	0.36
Ethyl Benzene	ND(0.5)	7.6(1.0)	ND(0.5)	ND(1.0)	ND(0.5)	ND(1.0)	ND(0.5)	ND(1.0)	ND(0.5)	ND(1.0)	140	700	1,300	–
Methylene chloride	7.9BJ[g](8.0)	ND(5.0)	7.4BJ(8.0)	ND(5.0)	9.7B(8.0)	ND(5.0)	8.2B(8.0)	ND(5.0)	11B(8.0)	ND(5.0)	15	150	–	4.1
Toluene	3.8B(0.5)	ND(1.0)	3.2B(0.5)	ND(1.0)	2.8B(0.5)	ND(1.0)	3.0(0.5)	ND(1.0)	ND(0.5)	1.9(1.0)	68.6	343	750	–
Xylenes (total)	2.4(0.5)	14.(2.0)	ND(0.5)	ND(2.0)	ND(0.5)	ND(2.0)	ND(0.5)	ND(2.0)	ND(0.5)	ND(2.0)	124	620	12,000	–
SEMI-VOLATILE ORGANIC COMPOUNDS (ug/l)														
2-Methylnaphthalene	ND(10)	18(5.0)	ND(10)	ND(5.0)	ND(10)	ND(5.0)	ND(10)	ND(5.0)	ND(10)	ND(5.0)	–	–	–	–
Acenapthene	1.3J(10)	ND (5.0)	R[h]	ND(5.0)	ND(10)	ND(5.0)	R	ND(5.0)	ND(10)	ND(5.0)	–	–	2,200	–
Di-n-butylphthalate	1.6J(10)	ND(5.0)	ND(10)	ND(5.0)	ND(10)	ND(5.0)	ND(10)	ND(5.0)	ND(10)	ND(5.0)	–	–	–	–
Fluorene	1.9J(10)	ND(5.0)	ND(10)	ND(5.0)	ND(10)	ND(5.0)	ND(10)	ND(5.0)	ND(10)	ND(5.0)	–	–	1,500	–
METALS (ug/l)														
Aluminum	1,000(100)	100(100)	310(100)	ND(100)	200(100)	100(100)	ND(100)	ND(100)	620(100)	ND(100)	–	–	–	–
Barium	190(4.0)	ND(100)	200(4.0)	ND(100)	200(4.0)	ND(100)	ND(4.0)	ND(100)	45(4.0)	ND(100)	400	2,000	2,600	–
Chromium	5.0B(5.0)	ND(10)	5.0B(5.0)	ND(10)	7.0B(5.0)	ND(10)	12(5.0)	ND(10)	ND(5.0)	ND(10)	10	100	180	–
Cobalt	7.0B(3.0)	ND(50)	5.0B(3.0)	ND(50)	3.0B(3.0)	ND(50)	5.0(3.0)	ND(50)	7.0B(3.0)	ND(50)	–	–	2,200	–

TABLE 20-1 (Continued)

LANDFILL 7 GROUNDWATER
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

	OW145 (9-19 ft)[a]		OW146 (9-19 ft)						OW144 (Upgradient) (8-18 ft)		WAC NR 140 Public Health Standards		Risk-Based Concentrations (RBC)	
	Round 1	Round 2	Round 1	Round 2	Round 1 (Duplicate)	Round 2 (Duplicate)	Round 1 (Rinsate Blank)	Round 2 (Rinsate Blank)	Round 1	Round 2	PAL[b]	ES[b]	Non-C[c]	C[c]
Copper	ND(10)	ND(20)	23BJ(10)	ND(20)	ND(10)	ND(20)	44J(10)	ND(20)	ND(10)	ND(20)	130	1,300	1,400	–
Lead	12(2.0)	20(3)	4.6B(2.0)	4(3)	2.3B(2.0)	ND(3)	3.3(2.0)	ND(3)	3.3	ND(3)	1.5	15	0.00037	–
Mercury	0.23J(0.2)	1.1B(0.2)	ND(0.2)	1.3BJ(0.2)	0.36J(0.2)	1.3B(0.2)	ND(0.2)	0.9(0.2)	ND(0.2)	0.9B(0.2)	0.2	2	11	–
Selenium	ND(1.0)	7 (5)	ND(1.0)	ND(5)	ND(1.0)	ND(5)	ND(1.0)	ND(5)	ND(1.0)	ND(5)	10	50	180	–
Silver	ND(40)	ND(10)	190BJ(40)	ND(10)	ND(40)	ND(10)	370J(40)	ND(10)	ND(40)	ND(10)	10	50	180	–
Thallium	ND(50)	ND(2)	ND(50)	ND(2)	ND(50)	ND(2)	58(50)	ND(2)	ND(50)	ND(2)	–	–	–	–
Vanadium	ND(3.0)	ND(50)	3.0(3.0)	ND(50)	ND(3.0)	ND(50)	5.0(3.0)	ND(50)	ND(3.0)	ND(50)	–	–	260	–
WATER QUALITY PARAMETERS (mg/l)														
Nitrate/Nitrite	0.56(0.1)	1.4(0.1)	0.60(0.1)	15.2(0.1)	0.59(0.1)	15(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	0.3(0.1)	2	10	–	–

	OW145 (9-19 ft)[a]		OW146 (9-19 ft)						OW144 (Upgradient) (8-18 ft)		WAC NR 140 Public Welfare Standards		Risk-Based Concentrations (RBC)	
	Round 1	Round 2	Round 1	Round 2	Round 1 (Duplicate)	Round 2 (Duplicate)	Round 1 (Rinsate Blank)	Round 2 (Rinsate Blank)	Round 1	Round 2	PAL[b]	ES[b]	Non-C[c]	C[c]
METALS (ug/l)														
Iron	15,000(200)	32,500(100)	440(200)	3,200(100)	320(200)	3,300(100)	ND(200)	ND(100)	650(200)	300(100)	150	300	–	–
Manganese	1,400(3.0)	3,620(10)	210(3.0)	1,430(10)	220(3.0)	1,410(10)	ND(3.0)	ND(10)	340(3.0)	30(10)	25	50	180	–
Zinc	560(50)	490B(20)	590B(50)	560B(20)	300B(50)	490B(20)	310(50)	460(20)	550(50)	500B(20)	2,500	5,000	11,000	–

TABLE 20-1 (Continued)

LANDFILL 7 GROUNDWATER
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

	OW145 (9-19 ft)[a]		OW146 (9-19 ft)						OW144 (Upgradient) (8-18 ft)		WAC NR 140 Public Welfare Standards		Risk-Based Concentrations (RBC)	
	Round 1	Round 2	Round 1	Round 2	Round 1 (Duplicate)	Round 2 (Duplicate)	Round 1 (Rinsate Blank)	Round 2 (Rinsate Blank)	Round 1	Round 2	PAL[b]	ES[b]	Non-C[c]	C[c]
WATER QUALITY PARAMETERS (mg/l)														
Alkalinity	190(5.0)	146(2)	150(5.0)	98(2)	150(5.0)	93(2)	5(5.0)	ND(2)	46(5.0)	18(2)	–	–	–	–
Chemical Oxygen Demand	36(8)	38J(10)	16(8)	ND(10)	12(8)	ND(10)	ND(8)	ND(10)	9.5(8)	ND(10)	–	–	–	–
Chloride	5.1(1.0)	ND(2)	2.5(1.0)	ND(2)	3.0(1.0)	ND(2)	ND(1.0)	ND(2)	1.0(1.0)	ND(2)	125	250	–	–
Phosphate, total	0.1(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	0.1(0.1)	0.1(0.1)	ND(0.1)	ND(0.1)	0.2(0.1)	ND(0.1)	–	–	–	–
Total Dissolved Solids	320(10)	232(2)	180B(10)	180(2)	230B(10)	204J(2)	160(10)	8.J(2)	62(10)	60(2)	–	–	–	–
Sulfate	ND(1.0)	ND(10)	9.4B(1.0)	ND(10)	9.1B(1.0)	ND(10)	2.0(1.0)	ND(10)	4.1(1.0)	ND(10)	125	250	–	–

NOTES:

[a] Depth interval of well screen.
[b] PAL = Preventive Action Limit; ES = Enforcement Standard (effective March 1994).
[c] Non-C = Non-Carcinogenic Risk-Based Concentration; C = Carcinogenic Risk-Based Concentration (10^{-6} Risk).
[d] B indicates analyte detected in method or field blank; detection limit given in parentheses.
[e] ND indicates not detected; detection limit given in parentheses.
[f] – indicates no standard available.
[g] J indicates estimated value, see discussion in Section 24.0.
[h] R indicates data is unusable.

upgradient well OW-144 and that exceed the WAC NR 140 Public Welfare PAL and ES. In upgradient well OW-144, lead was present during the Round 1 sampling at a concentration that exceeded the WAC NR 140 Public Health PAL, and iron and manganese were present at concentrations that exceeded the WAC NR 140 Public Welfare PAL and ES, iron for both sampling rounds and manganese for Round 1 only. The standards for iron and manganese, however, are based on aesthetic characteristics of groundwater used for drinking and not on public health concerns. Mercury and zinc were detected in all samples during Round 2 sampling. Further investigation indicates that these are contaminants introduced in Round 2 sampling (see Section 24 and Appendix T).

Water quality parameters alkalinity, chemical oxygen demand, nitrate/nitrite nitrogen, chloride, total dissolved solids, and sulfate were detected at higher concentrations in the downgradient wells than in the upgradient well. The concentration of nitrate/nitrite nitrogen in well OW-146 during Round 2 sampling exceeded the WAC NR 140 Public Health PAL.

20.6 CONTAMINATION EVALUATION

20.6.1 Nature and Extent

Groundwater samples collected downgradient of Landfill 7 contained detectable levels of benzene, ethyl benzene, xylene, 2-methylnaphthalene, acenaphthalene, di-n-butylphthalate, fluorene, chromium, copper, selenium, vanadium, and silver which were not observed in the upgradient monitoring well samples. Most metals detected in the Landfill 7 samples are naturally occurring in groundwater. A concentration difference less than an order of magnitude (i.e., a ten-fold difference) between samples may not represent an appreciable increase relative to background concentrations. Slight variations may be due to natural groundwater fluctuations, or sampling and laboratory procedures. Thus, if downgradient metal concentrations are greater than, but within an order of magnitude of upgradient concentrations or quantitation limits, the increase may not be attributable to the SWMU being investigated at Landfill 7. The only metals for which the downgradient concentrations are more than an order of magnitude greater than either the upgradient concentration or the quantitation limit are iron and manganese. The data suggest, therefore, that while some migration of certain chemicals from Landfill 7 may be occurring, this migration is minimal relative to upgradient concentrations.

Five metals, iron, lead, manganese, mercury, and silver are present in downgradient wells at concentrations that exceed the concentration in upgradient well OW-144 and the WAC NR 140 Public Health PAL (mercury) and ES as well (lead and silver) or the Public Welfare PAL and ES (iron and manganese). Iron, lead, and manganese are also present in the upgradient well at concentrations that exceed the WAC NR 140 Public Health PAL (lead) and Public Welfare PAL and ES (iron and manganese).

20.6.2 Contaminant Fate and Transport

Transport of metals occurs primarily when metals are in solution. Metals can move as precipitated solids, but this migration is minimal under most environmental conditions. Once in solution, metals tend to migrate with groundwater flow or to migrate through groundwater in response to

concentration gradients. Soil properties, such as clay content, organic matter, and cation exchange capacity may retard metal migration. The sandy aquifer at Fort McCoy, however, has reduced capacity to retard contaminant migration.

Precipitation and adsorption of metals also depends on the pH and redox potential of the groundwater. Conditions favoring ionic reduction of chemical species (reduction of the compound's valence state) are generally found in low oxygen and acidic environments. Groundwater pH at Landfill 7, recorded after well development, is slightly acidic. Under reducing conditions, the more mobile and soluble form of iron dominates. Also, the more mobile and toxic forms of mercury, elemental and alkylated mercury, dominate under reducing conditions. Lead has a particularly strong affinity for cation exchange sites and most lead precipitates at pH values greater than 6 (USEPA, 1990). The low cation exchange capacity and groundwater pH near 6 at Fort McCoy favor increased lead mobility at the site. Metals present near the top of the water table may precipitate and redissolve with the changing wetness/dryness and oxidation potential as the water table fluctuates.

Benzene below the ground surface is highly soluble and will leach to groundwater. It may be subject to biodegradation in shallow groundwater under aerobic conditions, but probably not under anaerobic conditions (Howard, 1991). Xylene is moderately mobile and may also leach to groundwater. Retardation factors, such as organic matter, are not present at Fort McCoy to significantly limit migration. There is some evidence that xylene may biodegrade under aerobic and denitrifying conditions (Howard, 1991). The majority of benzene and xylene which leaches into groundwater is likely to migrate with the groundwater.

2-methylnaphthalene, di-n-butylphthalate, acenaphthene, and fluorene are polyaromatic hydrocarbons (PAHs). PAHs do not usually exhibit high subsurface mobility because of low water solubility and strong adsorption to organic matter. Di-n-butylphthate also has a low water solubility and strong affinity to organic matter. The low organic content in the Fort McCoy soil, however, minimizes potential adsorption of these SVOCs. Their low solubilities serve to minimize groundwater concentrations.

20.7 REGULATORY REQUIREMENTS

The primary regulatory considerations for groundwater at Landfill 7 are the WAC NR 140 Public Health and Public Welfare Preliminary Action Levels (PALs) and Enforcement Standards (ESs). The Public Health PALs and ESs set requirements regulating contaminants in groundwater, whereas, the Public Welfare PALs and ESs relate to noxious non-toxic constituents that affect such things as odor and color. The PALs provide points of standards application, indicating water quality criteria to be met at a facility if an aquifer is used for drinking or other purposes, or if groundwater contaminants migrate beyond the facility boundary. The ESs are set at higher concentrations than the PALs, and are indicative of more urgent contaminant concern and may provide a level at which the Wisconsin Department of Natural Resources (WDNR) requires immediate action.

Table 20-1 lists the PALs and ESs for parameters detected in groundwater. The WDNR may decide, on a case-by-case basis, to waive a PAL for a parameter if the ES is not exceeded. The parameters detected in groundwater at Landfill 7 at concentrations greater than the Public Health PAL or ES are

shown on Table 20-2, and the parameters detected at concentrations greater than the Public Welfare PAL or ES are shown on Table 20-3.

It should be noted iron and manganese are Public Welfare parameters. Benzene, lead, mercury, silver, and nitrate/nitrite are Public Health parameters.

20.8 HUMAN HEALTH ASSESSMENT

Table 20-1 lists the risk-based concentrations (RBCs) for parameters detected in Landfill 7 downgradient groundwater samples. Detected parameters are not included if no RBC was developed, either because toxicity information is not available or because the parameter is considered nontoxic. The carcinogenic or non-carcinogenic RBCs were exceeded for four compounds. Benzene was detected only at downgradient well OW-145, but at concentrations for both sampling rounds above the carcinogenic RBC. Lead was detected above the non-carcinogenic RBC at upgradient and downgradient wells for both sampling rounds. Manganese was detected at concentrations above the non-carcinogenic RBC at upgradient well OW-144 during Round 1 and at downgradient wells OW-145 and OW-146 for both sampling rounds. Silver was detected only at downgradient well OW-146 during Round 1 sampling and qualified as J (estimated), but the concentration exceeded the non-carcinogenic RBC.

20.9 CONCLUSIONS AND RECOMMENDATIONS

Groundwater samples were collected from two downgradient and one upgradient monitoring well at Landfill 7. Table 20-4 presents the chemicals of concern, based on analysis of the groundwater data. Downgradient concentrations of benzene, lead, mercury, silver, and nitrate/nitrite nitrogen exceed WAC NR 140 Public Health standards and are thus of concern. Iron is not considered a chemical of concern because the standard exceeded is a Public Welfare standard, which is based on aesthetic drinking water concerns rather than health concerns, and because the standard was exceeded in both upgradient and downgradient wells.

Manganese exceeds the noncarcinogenic RBC for that analyte and, therefore, is a chemical of concern. It should be noted that manganese was detected in the upgradient well and its source may not be Landfill 7, but may reflect natural conditions. Benzene, besides being detected above Public Health standards in downgradient well OW-145 during both sampling rounds, also exceeded the carcinogenic RBC. Lead concentrations in both the upgradient and downgradient wells exceeded the non-carcinogenic RBC. Silver, although only detected in downgradient well OW-146 during Round 1 sampling and qualified as J (estimated), was detected at a concentration above the non-carcinogenic RBC. Figure 20-4 shows the areal distribution of Landfill 7 chemicals of concern.

Consideration of long-term groundwater monitoring for Landfill 7 is recommended to track groundwater conditions. If groundwater conditions change, further evaluation may warrant future corrective action or result in a reduction of monitoring requirements. Additional action is not recommended because the area is not currently, nor is it anticipated to be, used for residential purposes. In addition, NR 812.08 prohibits the installation of water supply wells within 1,200 feet of a solid waste site. No residential populations are located nearby, and no such areas are planned. Furthermore, groundwater from Landfill 7 is not used for potable drinking water, and groundwater

TABLE 20-2

DETECTIONS IN GROUNDWATER EXCEEDING WAC NR 140 PUBLIC HEALTH STANDARDS LANDFILL 7 FORT MCCOY RFI ADDENDUM MONROE COUNTY, WISCONSIN

Parameter	Public Health PAL Exceeded	Public Health ES Exceeded
Benzene	Downgradient (OW-145 only)	Downgradient (OW-145 Round 1 only)
Lead	Upgradient (Round 1 only) and downgradient	Downgradient (OW-145 Round 2 only)
Mercury	Downgradient (Round 1; also in rinsate blank)	
Silver	Downgradient (OW-146 Round 1 only; also in rinsate blank)	Downgradient (OW-146 Round 1 only; also in rinsate blank)
Nitrate/Nitrite Nitrogen	Downgradient (OW-146 Round 2 only)	

TABLE 20-3

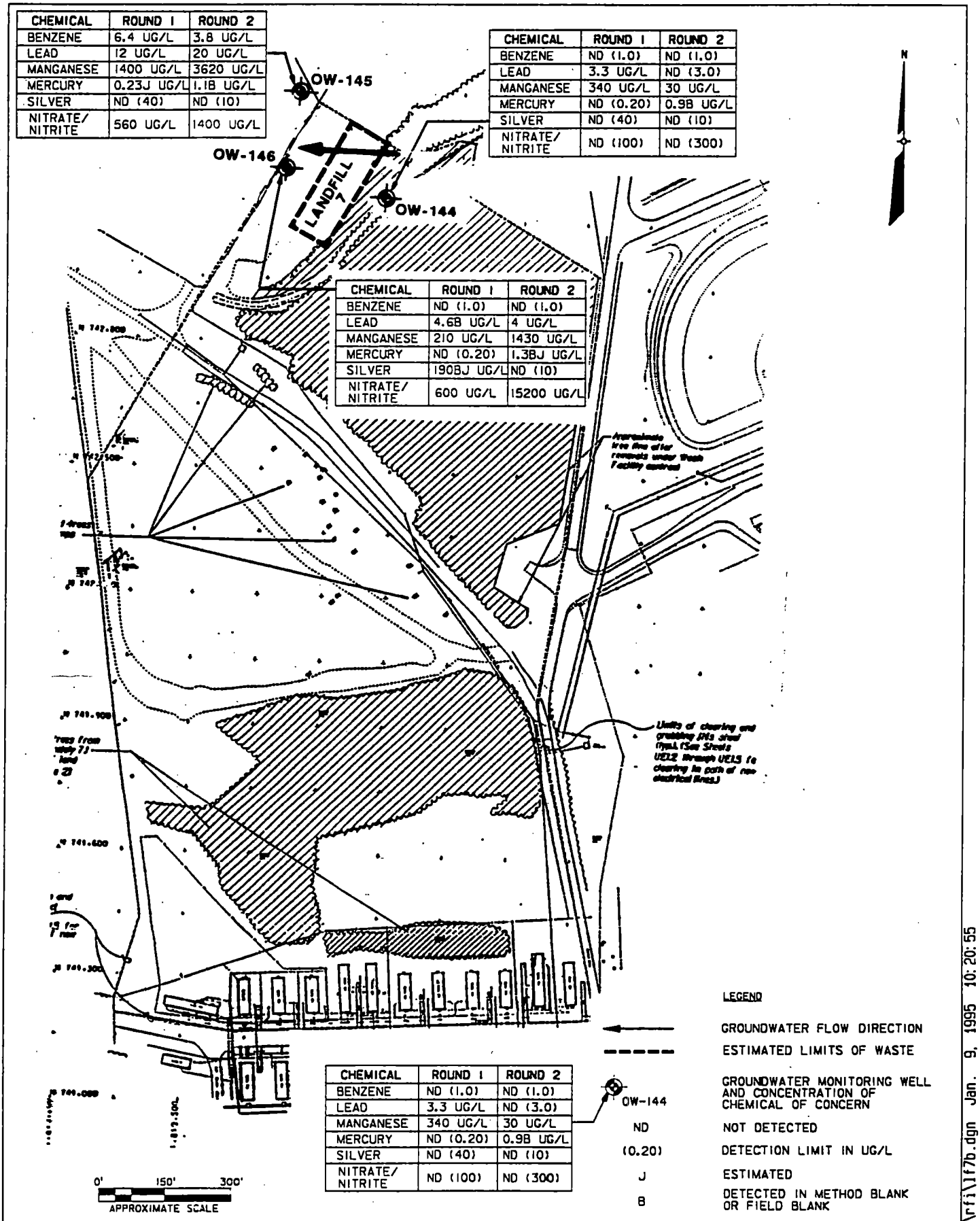
DETECTIONS IN GROUNDWATER EXCEEDING WAC NR 140 PUBLIC WELFARE STANDARDS LANDFILL 7 FORT MCCOY RFI ADDENDUM MONROE COUNTY, WISCONSIN

Parameter	Public Welfare PAL Exceeded	Public Welfare ES Exceeded
Iron	Upgradient and downgradient (all wells)	Upgradient and downgradient (all wells)
Manganese	Upgradient and downgradient (all wells)	Upgradient (Round 1 only) and downgradient

TABLE 20-4

CHEMICALS OF CONCERN
LANDFILL 7
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

Chemical	Reason for Concern
Benzene	Exceeds WAC NR 140 Public Health PAL and ES and carcinogenic RBC (downgradient well OW-145 only)
Lead	Exceeds WAC NR 140 Public Health PAL (all wells) and ES (downgradient well OW-145 only)
Manganese	Exceeds noncarcinogenic RBC (all wells except upgradient well OW-144 for Round 2)
Mercury	Exceeds WAC NR 140 Public Health PAL (downgradient wells OW-145 and OW-146 field duplicate Round 1 only, but also in rinsate blank)
Silver	Exceeds WAC NR 140 Public Health PAL and ES (downgradient well OW-145 Round 1 only and also in rinsate blank)
Nitrate/Nitrite Nitrogen	Exceeds WAC NR 140 Public Health PAL (downgradient well OW-146 Round 2 only)



CHEMICAL	ROUND 1	ROUND 2
BENZENE	6.4 UG/L	3.8 UG/L
LEAD	12 UG/L	20 UG/L
MANGANESE	1400 UG/L	3620 UG/L
MERCURY	0.23J UG/L	1.1B UG/L
SILVER	ND (40)	ND (10)
NITRATE/ NITRITE	560 UG/L	1400 UG/L

CHEMICAL	ROUND 1	ROUND 2
BENZENE	ND (1.0)	ND (1.0)
LEAD	3.3 UG/L	ND (3.0)
MANGANESE	340 UG/L	30 UG/L
MERCURY	ND (0.20)	0.9B UG/L
SILVER	ND (40)	ND (10)
NITRATE/ NITRITE	ND (100)	ND (300)

CHEMICAL	ROUND 1	ROUND 2
BENZENE	ND (1.0)	ND (1.0)
LEAD	4.6B UG/L	4 UG/L
MANGANESE	210 UG/L	1430 UG/L
MERCURY	ND (0.20)	1.3BJ UG/L
SILVER	190BJ UG/L	ND (10)
NITRATE/ NITRITE	600 UG/L	15200 UG/L

CHEMICAL	ROUND 1	ROUND 2
BENZENE	ND (1.0)	ND (1.0)
LEAD	3.3 UG/L	ND (3.0)
MANGANESE	340 UG/L	30 UG/L
MERCURY	ND (0.20)	0.9B UG/L
SILVER	ND (40)	ND (10)
NITRATE/ NITRITE	ND (100)	ND (300)

LEGEND

	GROUNDWATER FLOW DIRECTION
	ESTIMATED LIMITS OF WASTE
OW-144	GROUNDWATER MONITORING WELL AND CONCENTRATION OF CHEMICAL OF CONCERN
ND	NOT DETECTED
(0.20)	DETECTION LIMIT IN UG/L
J	ESTIMATED
B	DETECTED IN METHOD BLANK OR FIELD BLANK

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FIGURE 20-4
LANDFILL 7
DISTRIBUTION OF CHEMICALS OF CONCERN
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flow direction, as measured from two rounds of sampling, indicate that groundwater at Landfill 7 is not part of the zone of influence for Fort McCoy production wells, as the flow direction is away from the production wells. Based on the available information, Landfill 7 is recommended to not be included in the CMS at this time.

21.0 LANDFILL 8

21.1 SITE BACKGROUND

Landfill 8 is located in the NW 1/4 of the NW 1/4 of Section 27, T18N, R3W, Monroe County, Wisconsin. As shown on Figure 21-1, this area is located at the western edge of Fort McCoy, approximately 3,200 feet west of the La Crosse River. The site is a small opening bordered by woods.

After reports of isolated dumping along the western facility boundary and a field inspection with private citizen Bob Smith on April 20, 1993, Fort McCoy initiated a preliminary investigation to determine the presence and nature of potential suspected SWMUs (USACE, 1993; Appendix R), and Landfill 8 was verified adjacent to and north of Buckley Court Road.

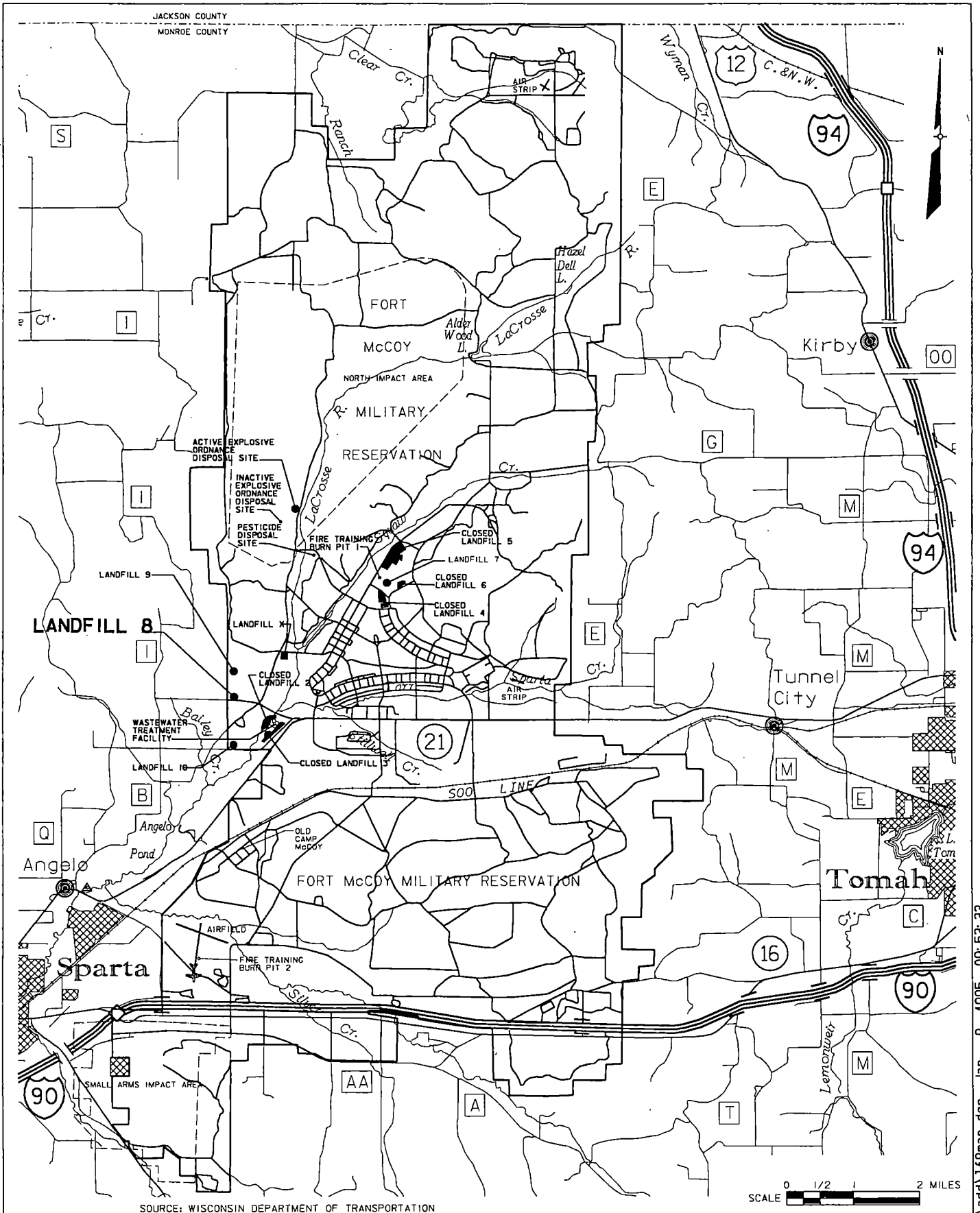
To determine the limits of waste and investigate this site, three trenches extending beyond the limits of waste were excavated by Fort McCoy on July 20, 1993 (Appendix R). The waste was determined to be covered by approximately 12 inches of topsoil and to extend up to 3.2 feet below the ground surface. Some of the waste identified during the trenching included glass jars and bottles, metal cans, wire, a rubber overshoe, concrete blocks, bones, wood fragments, porcelain fragments, and ash. In interviews with past and present Fort McCoy employees (personal communication to Tim Kemmis and Connie Kelly, RUST E&I, October, 1993), one interviewee recalled that discarded refrigerators and toys were cleaned up and removed from the site within the past 10 years.

There are no records of when this landfill was operable. The site does not appear to have been used by Fort McCoy personnel. Interviews with past and present Fort McCoy employees (personal communication to Tim Kemmis and Connie Kelly, RUST E&I, October, 1993) provided limited information. One interviewee recalled that private citizens living off post used the site area to dispose of household wastes until the mid-1960s when a sign was posted near this SWMU that dumping was not allowed. This time frame is consistent with aerial photographic information. The site is shown as bare, nonvegetated ground on aerial photographs from 1950 and 1964, and it is possible that the site was being used for waste disposal at these times.

21.2 PHYSICAL FEATURES

21.2.1 Site Setting

Landfill 8 is located near the western edge of Fort McCoy in a small, inconspicuous clearing in the woods bordering the north side of Buckley Court Road. The clearing, which is approximately 3,300 feet west of the La Crosse River, is approximately 80 feet long and 30 feet wide. The site is situated at the edge of the La Crosse River valley near the border with low-relief bedrock uplands to the west. The site is vegetated primarily with grasses.



SOURCE: WISCONSIN DEPARTMENT OF TRANSPORTATION

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FIGURE 21-1
LANDFILL 8
LOCATION MAP

FORT McCOY RFI
MONROE COUNTY, WISCONSIN

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21.2.2 Topography and Drainage

Landfill 8 is located just below a small rise at the edge of bedrock uplands at the western edge of Fort McCoy. The land surface at the site slopes gently east toward the La Crosse River. The surficial materials are permeable sands, and infiltration of rainwater predominates over overland flow.

21.2.3 Surficial Soils

The Landfill 8 area is mapped as the Impact sand series soil (USDA, 1984). The Impact sand series generally occurs on stream terraces, such as this site on a terrace of the La Crosse River, and on valley toe slopes. The natural soils were likely excavated or disturbed where landfilling has occurred. Impact series soils were described in Section 2.3 of the RFI report.

21.2.4 Geology

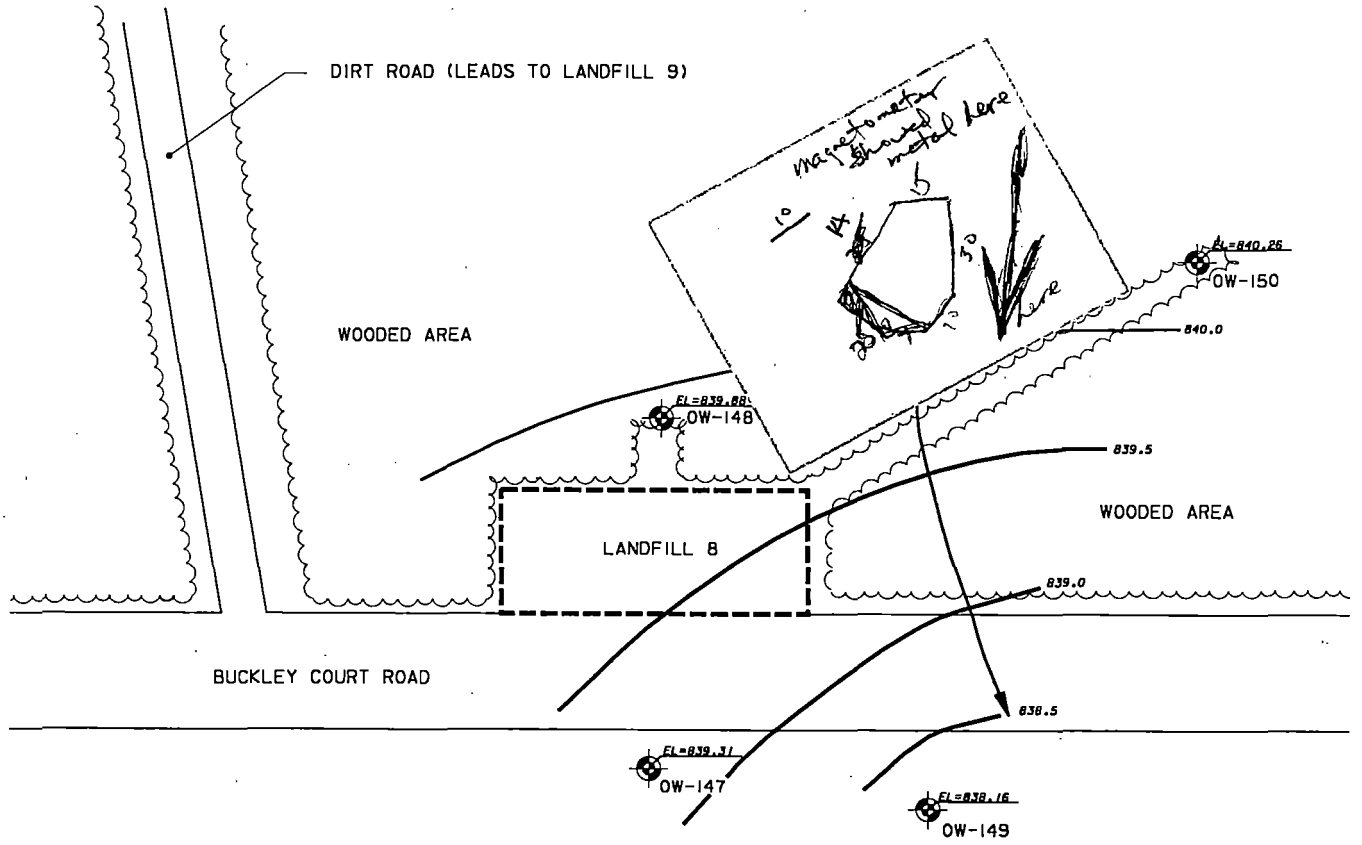
Two geologic units were investigated at Landfill 8: Quaternary alluvium and the Wonewoc Sandstone. The alluvium is stratified, consisting of beds of fine-to-medium grained, poorly graded sand and poorly graded sand with silt, classifying as SP and as SP-SM, respectively, in the Unified Soil Classification, interbedded with sandy lean clay classifying as CL (see boring logs presented in Appendix E Addendum). The alluvium is interpreted to overlie sandstone in two borings across Buckley Court Road south of the landfill: in boring OW-147 at a depth of 6 feet and boring OW-149 at a depth of 14 feet. This interpretation is based solely on a marked increase in blow count values that are interpreted to result from partial cementation of the sandstone. The sandstone samples were friable (very poorly cemented), and the sandstone was sampled using a standard split spoon sampler. Geotechnical analyses of the "sandstone" samples indicate the sand would classify as a poorly graded sand with silt, SP-SM, in the Unified Soil Classification, similar in particle-size distribution to the overlying sandy alluvium.

21.2.5 Hydrogeology

Four water table observation wells were installed at Landfill 8: OW-148 the upgradient well; OW-150 a sidegradient well; and OW-147 and OW-149 the two downgradient wells (Figure 21-2). These four wells were installed to detect possible groundwater contamination associated with the landfill, measure groundwater elevations to determine the groundwater gradient and flow direction, and determine the aquifer hydraulic conductivity for a linear flow velocity calculation.

Landfill 8 is located in a groundwater recharge area. The water table ranges from approximately 8 to 16 feet below the ground surface, and groundwater flow is southeast toward the La Crosse River (Figure 21-2).

The field hydraulic conductivity (K) for the alluvium and the sandstone bedrock are similar, ranging from 0.0011 to 0.0046 cm/sec with a geometric mean of 0.0020 cm/sec. Because the Quaternary alluvium directly overlies the sandstone bedrock and the field hydraulic conductivities and water table elevations are similar, the two aquifers are assumed to be hydraulically interconnected. The



LEGEND

- EDGE OF WOODED AREA
- 839.5 — GROUNDWATER CONTOUR (CONTOUR INTERVAL 0.5 FOOT)
- GROUNDWATER FLOW DIRECTION
- ESTIMATED LIMITS OF WASTE
- EL=850.74 / OW-149 — GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL

N

0' 25' 50'
APPROXIMATE SCALE

NOTE

GROUNDWATER ELEVATIONS WERE MEASURED DECEMBER 15, 1993.

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FIGURE 21-2
LANDFILL 8
WATER TABLE MAP AND GROUNDWATER MONITORING WELL LOCATIONS

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average linear flow velocity is calculated to be 0.00015 cm/sec using a gradient of 0.015 ft/ft, an average K value of 0.0020 cm/sec, and a porosity of 0.2 cm^3/cm^3.

21.3 SITE CONCEPTUAL MODEL

The conceptual model for this site is shown on Figure 21-3. The primary contaminant source at Landfill 8 is assumed to be the buried waste. The ground surface is nearly level, the soil is sandy and permeable, and surface runoff is negligible. No landfill cap or liner appears to have been installed. The most likely release mechanism would, therefore, occur from vertical infiltration of precipitation through surface soils, leaching through the waste, and mixing of the leachate with groundwater flowing laterally beneath the site. The groundwater has a general flow southeast toward the La Crosse River approximately 3,200 feet east where contaminants could be released to potential receptors. Because groundwater flow is the main transport mechanism, downgradient groundwater sampling provides an indication of contaminant migration from the site.

21.4 SAMPLING ACTIVITIES

Sampling at Landfill 8 consisted of collecting groundwater samples to determine if a release of contamination from the waste had impacted groundwater. Three water table observation wells were sampled: one upgradient (OW-148) and two downgradient (OW-147 and OW-149) wells located adjacent to and outside of the landfill area. Observation well OW-150 was located sidegradient of the landfill and was not sampled.

The groundwater monitoring wells were installed, developed and sampled as described in Section 3 of the RFI report and Section 3 Addendum of this report. Groundwater samples were submitted for analyses of VOCs, SVOCs, TAL metals, PCBs, pesticides, herbicides, organophosphorus pesticides, and water quality parameters. The analytical results from groundwater sampling are described in Section 21.5.

21.5 GROUNDWATER ANALYTICAL RESULTS

This section summarizes the groundwater analytical data collected from Landfill 8. Complete analytical data are included in Appendix Q-12. Data quality for this SWMU is acceptable. However, some of the organic and inorganic parameter values discussed in this section may be biased because the same parameter was detected in the method blanks for Landfill 8 samples. Data quality for this SWMU is further discussed in Section 24.

Landfill 8 groundwater monitoring well locations are shown on Figure 21-2. Monitoring Well OW-148 is upgradient and monitoring wells OW-147 and OW-149 are downgradient of this SWMU. Table 21-1 summarizes the data from these three wells. Only detected parameters and results qualified as usable are included in this table.

Three VOCs, acetone, methylene chloride, and toluene were detected in the three sampled wells at this site during the Round 1 sampling; toluene was also detected at OW-147 during Round 2. None of these analytes were present at concentrations above the WAC NR 140 Public Health Preventive Action Limit (PAL). Acetone and methylene chloride are common laboratory solvents; their

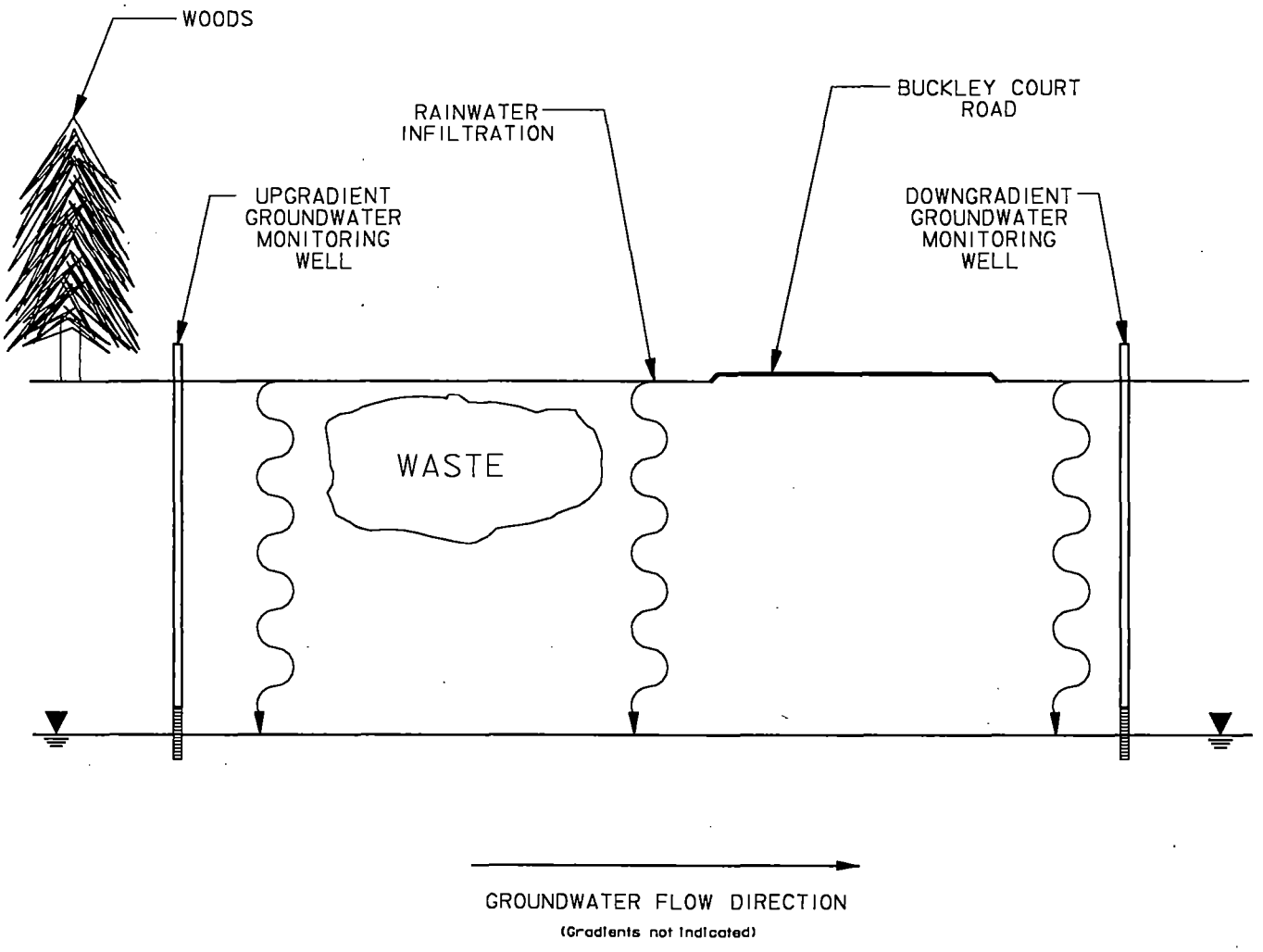

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FIGURE 21-3
LANDFILL 8
SITE CONCEPTUAL MODEL

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TABLE 21-1

LANDFILL 8 GROUNDWATER
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

	OW147 (12-22 ft)[a]		OW149 (8-18 ft)		OW148 (Upgradient) (8-18 ft)		WAC NR 140 Public Health Standards		Risk-Based Concentration	
	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	PAL[b]	ES[b]	Non-C[c]	C[c]
VOLATILE ORGANIC COMPOUNDS (ug/l)										
Acetone	33B(10)[d]	ND(50)[e]	15B(10)	ND(50)	17B(10)	ND(50)	200	1,000	3,700	--[f]
Methylene chloride	7.0BJ[e](8.0)	ND(5.0)	7.3BJ(8.0)	ND(5.0)	6.8BJ(8.0)	ND(5.0)	15	150	--	4.1
Toluene	3.4B(0.5)	2.5(1.0)	16(0.5)	ND(1.0)	1.2B(0.5)	ND(1.0)	68.6	343	750	--
METALS (ug/l)										
Aluminum	15,000(100)	40,200(100)	4,200(100)	3,000(100)	3,000(100)	800(100)	--	--	--	--
Arsenic	12(2.0)	20(10)	ND(2.0)	ND(10)	ND(2.0)	ND(10)	5	50	11	--
Barium	230	300(100)	110	ND(100)	47	ND(100)	400	2,000	2,600	--
Beryllium	ND(1.0)	4(4.0)	ND(1.0)	ND(4.0)	ND(1.0)	ND(4.0)	--	--	--	0.016
Cadmium	ND(2.0)	8(5)	ND(2.0)	ND(5)	ND(2.0)	ND(5)	0.5	5	18	--
Chromium	80B(5.0)	210(10)	24B(5.0)	30B(10)	20B(5.0)	30B(10)	10	100	180	--
Cobalt	100(3.0)	120(50)	12B(3.0)	ND(50)	13B(3.0)	ND(50)	--	--	2,200	--
Copper	100BJ(10)	250(20)	ND(10)	ND(20)	ND(10)	ND(20)	130	1,300	1,400	--
Lead	22(2.0)	37(3)	8.7(2.0)	ND(3)	6.1(2.0)	ND(3)	1.5	15	0.00037	--
Mercury	0.24J(0.2)	1.4BJ(0.2)	ND(0.2)	0.9BJ(0.2)	0.32J(0.2)	0.9BJ(0.2)	0.2	2	11	--
Nickel	93(7)	120(40)	25(7)	ND(40)	13(7)	ND(40)	--	--	730	--
Thallium	150(50)	ND(2)	ND(50)	ND(2)	ND(50)	ND(2)	--	--	--	--

TABLE 21-1 (Continued)

LANDFILL 8 GROUNDWATER
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

	OW147 (12-22 ft)[a]		OW149 (8-18 ft)		OW148 (Upgradient) (8-18 ft)		WAC NR 140 Public Health Standards		Risk-Based Concentration	
	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	PAL[b]	ES[b]	Non-C[c]	C[c]
Vanadium	46(3.0)	160(50)	12(3.0)	ND(50)	7.0(3.0)	ND(50)	--	--	260	--
WATER QUALITY PARAMETERS (mg/l)										
Nitrate/Nitrite	0.63(0.1)	1.1(0.1)	0.29(0.1)	0.7(0.1)	ND(0.1)	ND(0.1)	2	10	--	--
	OW147 (12-22 ft)[a]		OW149 (8-18 ft)		OW148 (Upgradient) (8-18 ft)		WAC NR 140 Public Welfare Standards		Risk-Based Concentration	
	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	PAL[b]	ES[b]	Non-C	C
METALS (ug/l)										
Iron	79,000(200)	208,000(100)	7,200(200)	5,500(100)	5,600(200)	1,600(100)	150	300	--	--
Manganese	4,500(3.0)	1,270(10)	610(3.0)	140(10)	490(3.0)	20(10)	25	50	180	--
Zinc	680 (50)	630B(20)	300(50)	420B(20)	460(50)	500B(20)	2,500	5,000	11,000	--
WATER QUALITY PARAMETERS (mg/l)										
Alkalinity	82(5.0)	88(2)	54(5.0)	69(2)	19(5.0)	5(2)	--	--	--	--
Chemical Oxygen Demand	24(8)	ND(10)	9.5(8)	ND(10)	9.5(8)	ND(10)	--	--	--	--
Chloride	32(1.0)	38(2)	20(1.0)	27(2)	1.5(1.0)	ND(2)	125	250	--	--
Phosphate, total	1.6(0.1)	1.4(0.1)	0.2(0.1)	0.3(0.1)	0.1(0.1)	ND(0.1)	--	--	--	--
Total Dissolved Solids	580(10)	1,160J(2)	230(10)	192J(2)	60(10)	58J(2)	--	--	--	--

TABLE 21-1 (Continued)

LANDFILL 8 GROUNDWATER
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

	OW147 (12-22 ft)[a]		OW149 (8-18 ft)		OW148 (Upgradient) (8-18 ft)		WAC NR 140 Public Welfare Standards		Risk-Based Concentration	
	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	PAL[b]	ES[b]	Non-C	C
Sulfate	9.9(1.0)	ND(10)	17(1.0)	ND(10)	11(1.0)	14(10)	125	250	--	--

NOTES:

[a] Depth interval of well screen.
[b] PAL = Preventive Action Limit; ES = Enforcement Standard (effective March 1994).
[c] Non-Carcinogenic Risk-Based Concentration; C = Carcinogenic Risk-Based Concentration (10^{-6} Risk).
[d] B indicates analyte detected in method or field blank; detection limit given in parentheses.
[e] ND indicates not detected; detection limit given in parentheses.
[f] -- indicates no standard available.
[g] J indicates estimated value, see discussion in Section 24.0.

presence in field samples during Round 1 sampling at concentrations up to 10 times that found in field and laboratory blanks is considered a false positive. This conclusion is supported by the fact that neither compound was detected during Round 2 sampling. Neither acetone nor methylene chloride will be considered further in the analysis of regulatory standards and human health assessment for this SWMU.

Sixteen metals were detected in downgradient wells OW-147 and OW-149. Six metals, arsenic, cadmium, chromium, copper, lead, and mercury, were present at concentrations that exceed the concentration in the upgradient well and exceed the WAC NR 140 Public Health PAL (arsenic, copper, and mercury) or ES (cadmium, chromium, and lead). Two metals, iron and manganese, were present at concentrations that exceed the concentration in the upgradient well and exceed the WAC NR 140 Public Welfare PAL and ES. Five metals, chromium, iron, lead, manganese, and mercury were also present in the upgradient well, OW-148, at concentrations that exceed the WAC NR 140 Public Health PAL (chromium, lead, and mercury) or Public Welfare PAL and ES (iron and manganese). Standards for iron and manganese are public welfare-based, that is, they are based on aesthetic characteristics of groundwater used for drinking and not on public health concerns. Mercury and zinc were detected in all samples during Round 2 sampling. Further investigation indicates that these two are contaminants introduced in Round 2 sampling (see Section 24 and Appendix T).

Water quality parameters alkalinity, chemical oxygen demand, nitrate/nitrite nitrogen, chloride, total phosphate, total dissolved solids, and sulfate were detected at higher concentrations in the downgradient wells than in the upgradient well. None of these analytes were present at concentrations which exceed the Public Health or Public Welfare PALs.

21.6 CONTAMINATION EVALUATION

21.6.1 Nature and Extent

Groundwater samples collected downgradient of Landfill 8 contained arsenic, beryllium, cadmium, copper, thallium, and nitrate/nitrite which were not detected upgradient of this SWMU. Except for aluminum, iron, manganese, chloride, nitrate/nitrite nitrogen, and phosphate, the detected downgradient inorganic constituents and water quality concentrations were within an order of magnitude of the upgradient concentration or the quantitation limit. Therefore, the majority of metals detected downgradient of this SWMU are not likely to be present in groundwater as a result of leaching through Landfill 8. Migration from Landfill 8, therefore, appears to be limited to iron, manganese, chloride, nitrate/nitrite nitrogen, and phosphate. Six metals, arsenic, cadmium, chromium, copper, lead, and mercury, were present at concentrations that exceed the concentration in the upgradient well and exceed the WAC NR 140 Public Health PAL (arsenic, copper, and mercury) or ES (cadmium, chromium, and lead). Two metals, iron and manganese, were present at concentrations that exceed the concentration in the upgradient well and exceed the WAC NR 140 Public Welfare PAL and ES. Five metals, chromium, iron, lead, manganese, and mercury were also present in the upgradient well, OW-148, at concentrations that exceed the WAC NR 140 Public Health PAL (chromium, lead, and mercury) or Public Welfare PAL and ES (iron and manganese).

21.6.2 Contaminant Fate and Transport

Transport of metals occurs primarily when metals are in solution. Metals can move as precipitated solids, but this migration is minimal under most environmental conditions. Once in solution, metals tend to migrate with groundwater flow or to migrate through groundwater in response to concentration gradients. Soil properties, such as clay content, organic matter, and cation exchange capacity may retard metal migration. The sandy aquifer at Fort McCoy, however, has reduced capacity to retard contaminant migration.

Precipitation and adsorption of metals also depends on the pH and redox potential of the groundwater. Reducing conditions (low oxygen transfer) are generally found in groundwater, and the pH at Landfill 8 recorded after well development is slightly acidic to neutral. Under reducing conditions, the more mobile and soluble form of iron, the divalent cation, dominates. Also, the more mobile and toxic form of arsenic (arsenite) may dominate under reducing and acidic conditions. Volatile arsenic compounds may also form under reducing conditions. Lead has a particularly strong affinity for cation exchange sites, and most lead precipitates at pH values greater than 6 (USEPA, 1990). The low cation exchange capacity and groundwater pH between 6 and 7 at Fort McCoy generally mobilize lead at the site. In water systems, the divalent cation form of barium will dominate (Dragun, 1988). Metals present near the top of the water table may precipitate and redissolve with the changing wetness/dryness and oxidation potential as the water table fluctuates.

Toluene in the subsurface will leach to groundwater. It may be slowly degraded in groundwater by natural microbial populations (Howard, 1991). Oxidizing conditions and sandy, permeable materials beneath the site favor microbial degradation of toluene at this site. Thus, toluene in groundwater is likely to slowly attenuate through biodegradation as it migrates with groundwater.

21.7 REGULATORY REQUIREMENTS

WAC NR 140 is the primary regulatory consideration for groundwater at Landfill 8. Table 21-1 lists the PALs and ESs for detected groundwater parameters. The parameters detected in groundwater at Landfill 8 at concentrations greater than the Public Health PAL or ES are shown on Table 21-2, and the parameters detected at concentrations greater than the Public Welfare PAL or ES are shown on Table 21-3. The standards for iron and manganese are not based on public health concerns.

21.8 HUMAN HEALTH ASSESSMENT

Table 21-1 lists the available RBCs for chemicals detected downgradient of Landfill 8. The concentration of manganese in all wells exceeds the noncarcinogenic RBC for this parameter. Arsenic detected in downgradient well OW-147 exceeds the noncarcinogenic RBC. Lead was detected at concentrations above the non-carcinogenic RBC at upgradient and downgradient wells during Round 1 sampling and at downgradient well OW-147 during the Round 2 sampling. Beryllium was detected at a concentration above the carcinogenic RBC in downgradient well OW-147 during Round 2 sampling.

RBCs reflect standard potential exposure scenarios to resident populations. Because this area is currently not residential, no current health risks exist.

TABLE 21-2

DETECTIONS IN GROUNDWATER EXCEEDING WAC NR 140
PUBLIC HEALTH STANDARDS
LANDFILL 8
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

Parameter	Public Health PAL Exceeded	Public Health ES Exceeded
Arsenic	Downgradient (OW-147 only)	
Cadmium	Downgradient (OW-147 Round 2 only)	Downgradient (OW-147 Round 2 only)
Chromium	Upgradient and downgradient (all wells)	Downgradient (OW-147 Round 2 only)
Copper	Downgradient (OW-147 Round 2 only)	
Lead	Upgradient (Round 1 only) and downgradient (OW-147 both rounds, OW-149 Round 1 only)	Downgradient (OW-147 only, both rounds)
Mercury	Upgradient (Round 1, qualified J) and downgradient (OW-147 Round 1, qualified J)	

TABLE 21-3

DETECTIONS IN GROUNDWATER EXCEEDING WAC NR 140 PUBLIC WELFARE STANDARDS LANDFILL 8 FORT MCCOY RFI ADDENDUM MONROE COUNTY, WISCONSIN

Parameter	Public Welfare PAL Exceeded	Public Welfare ES Exceeded
Iron	Upgradient and downgradient (all wells)	Upgradient and downgradient (all wells)
Manganese	Upgradient (Round 1 only) and downgradient	Upgradient (Round 1 only) and downgradient

21.9 CONCLUSIONS AND RECOMMENDATIONS

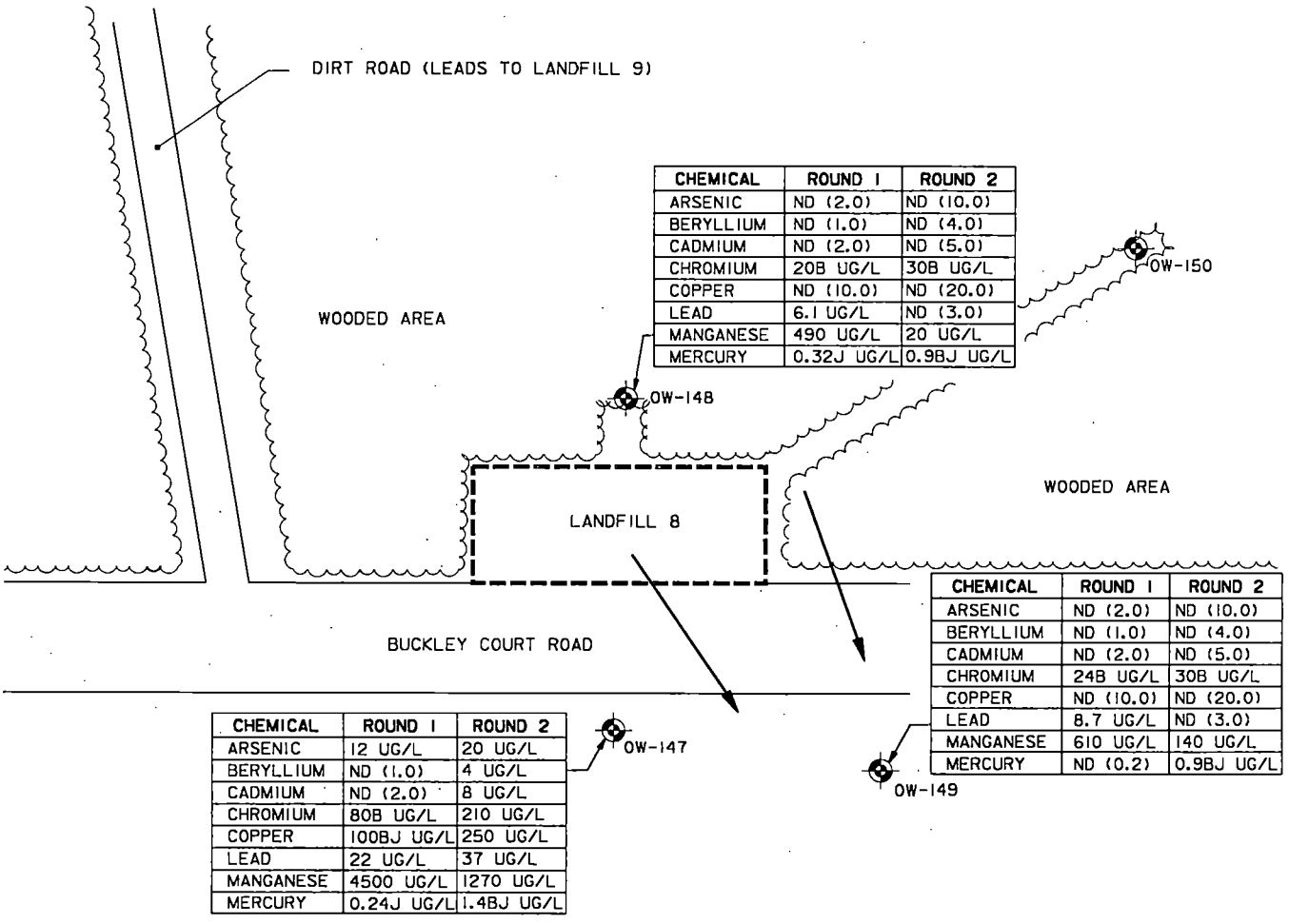
Table 21-4 lists the chemicals of concern for this SWMU. All the chemicals of concern are metals. It should be noted that the high metals concentrations detected in groundwater samples collected from this SWMU may be due in part to the turbidity of the groundwater samples. Metals arsenic, copper, and mercury were detected in groundwater downgradient of Landfill 8 above WAC NR 140 Public Health PAL, and cadmium, chromium, and lead were detected downgradient above the WAC NR 140 Public Health ES. Chromium, lead, and mercury were also detected above the WAC NR 140 Public Health PAL upgradient of the landfill. Iron is not considered a chemical of concern at this site because the standard exceeded is a Public Welfare standard, which is based on aesthic drinking water concerns rather than health concerns and because the standard was exceeded in both upgradient and downgradient wells. Manganese exceeds the noncarcinogenic RBC for that analyte in all wells and is also a chemical of concern, although its presence in both upgradient and downgradient wells suggests its source may not be Landfill 8, but may reflect natural conditions instead. Arsenic, in addition to exceeding the WAC NR 140 Public Health PAL in downgradient well OW-147, also exceeds RBCs. Lead, besides exceeding WAC NR 140 Public Health Standards, also exceeded the non-carcinogenic RBC at upgradient and downgradient wells during Round 1 sampling and at downgradient well OW-147 during Round 2 sampling. Beryllium was detected at a concentration exceeding the carcinogenic RBC in downgradient well OW-147 during Round 2 sampling. Figure 21-4 shows the areal distribution of Landfill 8 chemicals of concern.

Because of health risks and regulatory (WAC NR 140) exceedances of both the Public Health PAL and ES requirements, additional groundwater monitoring may be necessary to evaluate inconsistent contaminant trends observed in Round 1 and Round 2 groundwater sampling. Based on this information, Landfill 8 is not recommended to be included in the CMS until additional information (groundwater data) provides a clearer representation of groundwater conditions..

TABLE 21-4

CHEMICALS OF CONCERN
LANDFILL 8
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

Chemical	Reason for Concern
Arsenic	Exceeds WAC NR 140 Public Health PAL and RBCs (downgradient well OW-147 only)
Beryllium	Exceeds carcinogenic RBC (downgradient well OW-147 Round 2 only)
Cadmium	Exceeds WAC NR 140 Public Health Standards (downgradient well OW-147 Round 2 only)
Chromium	Exceeds WAC NR 140 Public Health PAL (all wells) and ES (downgradient well OW-147 only)
Copper	Exceeds WAC NR 140 Public Health PAL (downgradient well OW-147 only)
Lead	Exceeds WAC NR 140 Public Health PAL (upgradient well OW-148 Round 1 only; downgradient well OW-149 Round 1 only; downgradient well OW-147 both rounds) and ES (downgradient well OW-147 only, both rounds)
Manganese	Exceeds Noncarcinogenic RBC (upgradient well OW-148 Round 1 only; downgradient wells both rounds)
Mercury	Exceeds WAC NR 140 Public Health PAL (upgradient well OW-148 Round 1, but qualified J; downgradient well OW-147 Round 1, but qualified J)



CHEMICAL	ROUND 1	ROUND 2
ARSENIC	ND (2.0)	ND (10.0)
BERYLLIUM	ND (1.0)	ND (4.0)
CADMIUM	ND (2.0)	ND (5.0)
CHROMIUM	20B UG/L	30B UG/L
COPPER	ND (10.0)	ND (20.0)
LEAD	6.1 UG/L	ND (3.0)
MANGANESE	490 UG/L	20 UG/L
MERCURY	0.32J UG/L	0.9BJ UG/L

CHEMICAL	ROUND 1	ROUND 2
ARSENIC	ND (2.0)	ND (10.0)
BERYLLIUM	ND (1.0)	ND (4.0)
CADMIUM	ND (2.0)	ND (5.0)
CHROMIUM	24B UG/L	30B UG/L
COPPER	ND (10.0)	ND (20.0)
LEAD	8.7 UG/L	ND (3.0)
MANGANESE	610 UG/L	140 UG/L
MERCURY	ND (0.2)	0.9BJ UG/L

CHEMICAL	ROUND 1	ROUND 2
ARSENIC	12 UG/L	20 UG/L
BERYLLIUM	ND (1.0)	4 UG/L
CADMIUM	ND (2.0)	8 UG/L
CHROMIUM	80B UG/L	210 UG/L
COPPER	100BJ UG/L	250 UG/L
LEAD	22 UG/L	37 UG/L
MANGANESE	4500 UG/L	1270 UG/L
MERCURY	0.24J UG/L	1.4BJ UG/L

LEGEND

EDGE OF WOODED AREA

GROUNDWATER FLOW DIRECTION

ESTIMATED LIMITS OF WASTE

OW-149 GROUNDWATER MONITORING WELL AND CONCENTRATION OF CHEMICALS OF CONCERN

ND NOT DETECTED

(5.0) DETECTION LIMIT IN UG/L

J ESTIMATED

B DETECTED IN METHOD BLANK OR FIELD BLANK

N

0' 25' 50'

APPROXIMATE SCALE

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FIGURE 21-4
LANDFILL 8
DISTRIBUTION OF CHEMICALS OF CONCERN
FORT McCOY RFI
MONROE COUNTY, WISCONSIN

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22.0 LANDFILL 9

22.1 SITE BACKGROUND

Landfill 9 (Figure 22-1) is located in the NW 1/4 of the NW 1/4 of Section 27, T18N, R3W, Monroe County, Wisconsin. The site is located in a gully bordering the western boundary of Fort McCoy, approximately 1/4-mile north of Landfill 8 and Buckley Court Road, and approximately 4,400 feet west of the La Crosse River.

After reports of isolated dumping along the western facility boundary and a field inspection with private citizen Bob Smith on April 20, 1993, Fort McCoy initiated a preliminary investigation to determine the presence and nature of potential suspected SWMUs (USACE, 1993; Appendix R). Landfill 9 was verified as occupying a 10-foot by 30-foot area in and adjacent to the gully. To determine the limits of waste and investigate the site, two trenches were excavated by Fort McCoy on July 20, 1993 (Appendix R). Some of the waste identified during the trenching included: glass jars and bottles, metal cans, buckets, barbed wire, nails, stove pipe, a leather boot, and smaller pieces of metal and glass. The waste was determined to extend to a depth of approximately 3 feet. In interviews with present and past Fort McCoy employees (personal communication to Tim Kemmis and Connie Kelly, RUST E&I, October, 1993), one interviewee also indicated he had observed tin cans, wire, car bodies, batteries, and empty gas cans when he used a front-end loader to clean up part of the site about 5 years ago.

There are no records of when this landfill was operable. There is no indication of landfill activity on available aerial photographs, and there is no recollection of landfill activity at this site by present and past Fort McCoy employees interviewed by RUST E&I personnel (personal communication to Tim Kemmis and Connie Kelly, RUST E&I, October, 1993). In the field, the site appears to be trash thrown into an eroding gully, possibly for "erosion control."

22.2 PHYSICAL FEATURES

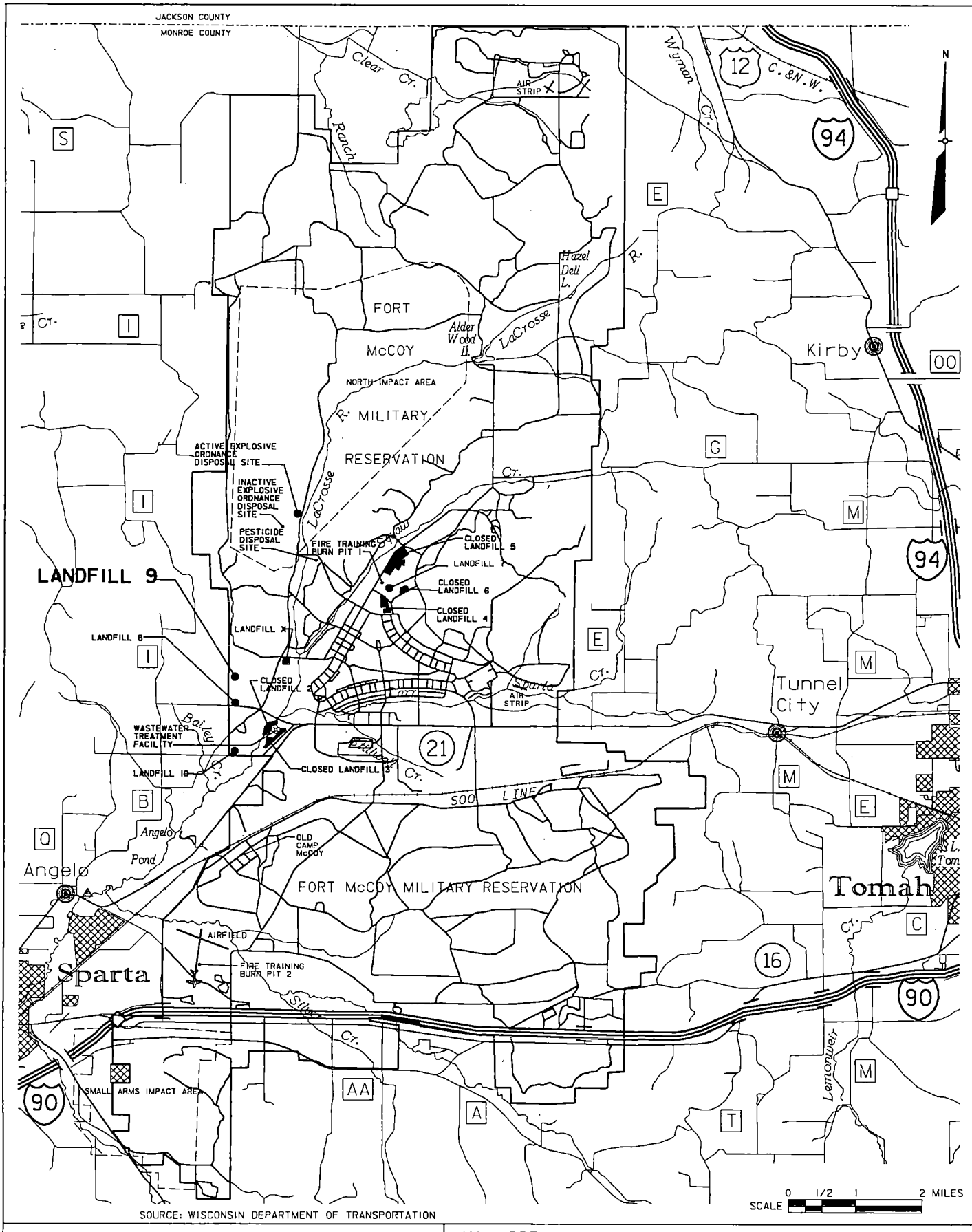
22.2.1 Site Setting

Landfill 9 is located at the western edge of Fort McCoy in a wooded gully approximately 1,500 feet north of Buckley Court Road. The gully extends south from bedrock uplands into the La Crosse River valley, and separates an overgrown field on Fort McCoy to the east from a cultivated field to the west of the fort.

Access to Landfill 9 is by a dirt road leading north to the cultivated field. The landfill cannot be seen from the dirt road, but occurs approximately 150 feet north of the road. Landfill 9 is located where refuse is present in and adjacent to the gully floor.

22.2.2 Topography and Drainage

The land surface at the site slopes gently to the south and southeast toward the La Crosse River, and the surficial materials are permeable sands. Infiltration of rainwater and overland flow occur.



SOURCE: WISCONSIN DEPARTMENT OF TRANSPORTATION

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FIGURE 22-1
LANDFILL 9
LOCATION MAP

FORT McCOY RFI
MONROE COUNTY, WISCONSIN

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22.2.3 Surficial Soils

The Landfill 9 area is mapped as the Council silt loam soil series (USDA, 1984). The Council silt loam is a deep, excessively drained soil that occurs on short toe slopes. The surface layer is typically a dark brown silt loam about 8 inches thick overlying brown to dark yellowish brown loam to a depth of about 60 inches. Clay content is less than 18 percent, and organic matter content is less than 2 percent. The soil is acidic, with a pH of 4.5 to 6.5 in the upper 52 inches, increasing to 7.3 at greater depth (USDA, 1984). At Landfill 9, the natural soils were likely excavated or disturbed where landfilling has occurred.

22.2.4 Geology

Only one stratigraphic unit, Quaternary alluvium, was encountered during installation of water table observation wells OW-151 and OW-152. The alluvium consisted primarily of fine-to-medium grained, poorly graded sand and poorly graded sand with silt, classifying as SP and as SP-SM, respectively, in the Unified Soil Classification. These sands were interbedded with lesser amounts of lean clay with sand that classifies as CL (see boring logs presented in Appendix E Addendum).

22.2.5 Hydrogeology

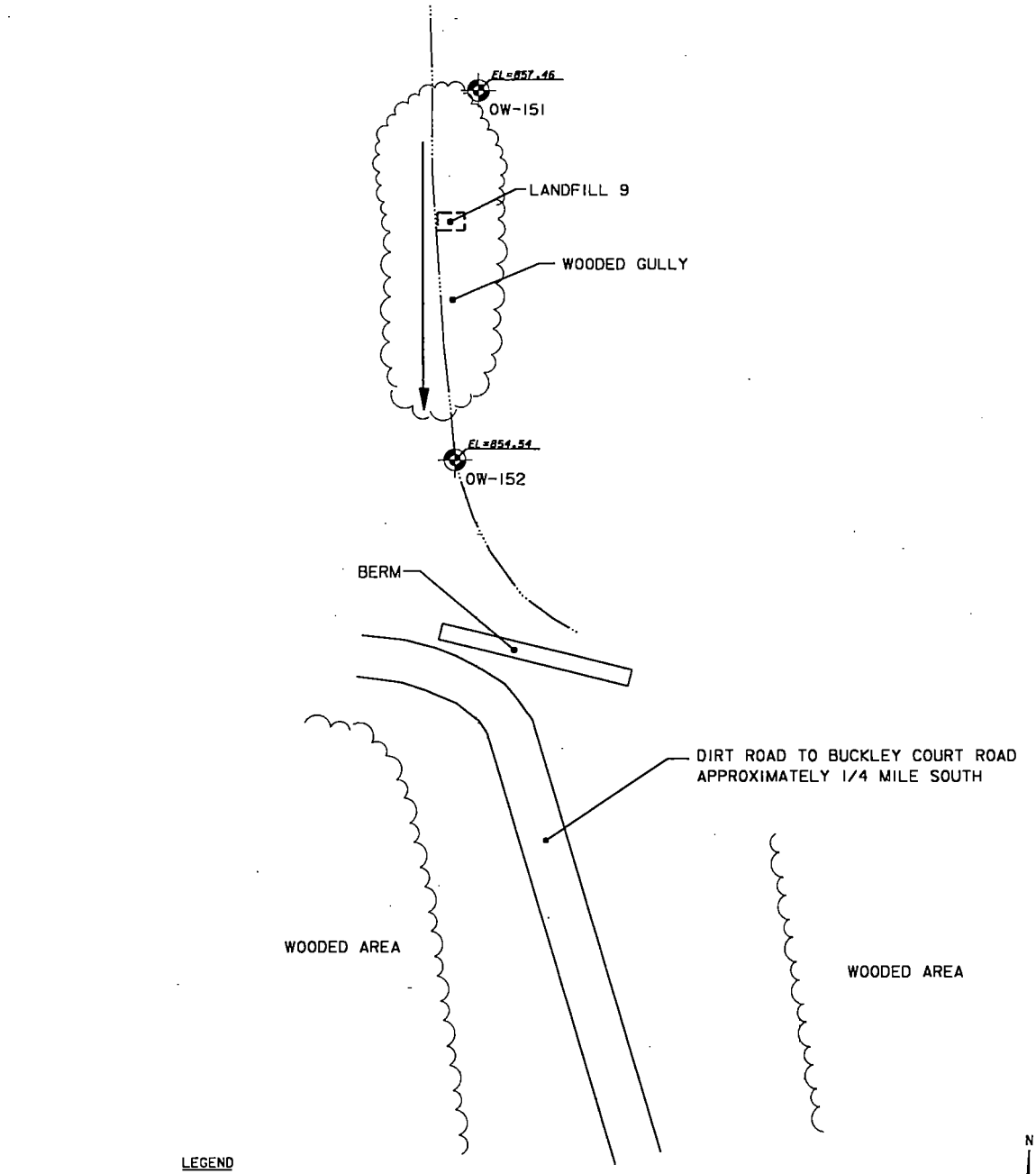
Two water table observation wells were installed at Landfill 9: OW-151 and OW-152 (Figure 22-2). These two wells were installed to detect possible groundwater contamination associated with the landfilling, to measure groundwater elevations that could be used to estimate the groundwater gradient and flow direction, and to determine the aquifer hydraulic conductivity for calculation of linear flow velocity.

Landfill 9 is located in a groundwater recharge area. The water table ranges from approximately 27 to 36 feet below the ground surface, and groundwater flow is south (Figure 22-2) toward an ephemeral drainageway that drains southeast to the La Crosse River.

The field hydraulic conductivity (K) for the alluvium ranges from 0.0036 to 0.0068 cm/sec with a geometric mean of 0.0049 cm/sec. The average linear flow velocity is 0.00033 cm/sec using a gradient of 0.014 ft/ft, an average K value of 0.0049 cm/sec, and a porosity of 0.2 cm^3/cm^3.

22.3 SITE CONCEPTUAL MODEL

The primary contaminant source at Landfill 9 is assumed to be the buried waste. The surface soil is sandy and permeable, and no landfill cap or liner appears to have been installed. The most likely release mechanism would, therefore, involve: 1) infiltration of precipitation through surface soils, 2) leaching through the waste from ephemeral stream flow in the gully and infiltration of this surface water where the gully opens downslope into an alluvial fan in the vicinity of water table observation well OW-152, and 3) mixing of the leachate with groundwater flowing beneath the site (Figure 22-3). The groundwater has a general flow direction south and southeast toward the La Crosse River where contaminants could be released to potential receptors. Because groundwater flow is the main transport mechanism, downgradient groundwater sampling provides contaminant characterization.



LEGEND

EDGE OF WOODED AREA

DRAINAGEWAY

APPROXIMATE GROUNDWATER FLOW DIRECTION

ESTIMATED LIMITS OF WASTE

EL=854.54
OW-152
GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL

NOTE

GROUNDWATER ELEVATIONS WERE MEASURED DECEMBER 15, 1993.

N

0' 50' 100'
APPROXIMATE SCALE

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FIGURE 22-2
LANDFILL 9
MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS
FORT McCOY RFI
MONROE COUNTY, WISCONSIN

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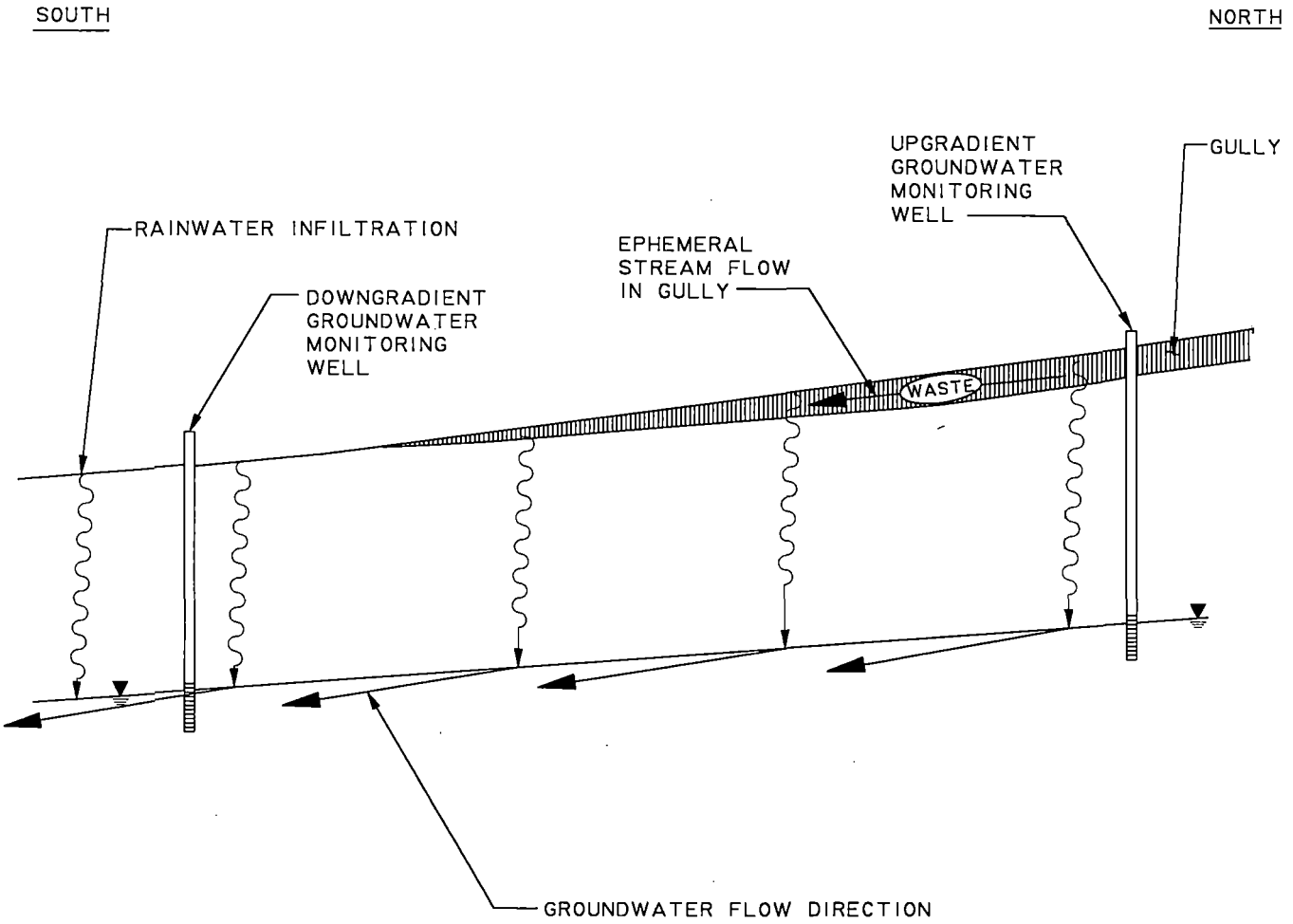

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FIGURE 22-3
LANDFILL 9
SITE CONCEPTUAL MODEL

FORT McCOY RFI
MONROE COUNTY, WISCONSIN

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22.4 SAMPLING ACTIVITIES

Sampling at Landfill 9 consisted of collecting groundwater samples to determine if a release of contamination from the waste had impacted groundwater. One upgradient and one downgradient water table observation well were installed at locations adjacent to and outside of the landfill area. The groundwater monitoring wells were installed, developed and sampled as described in Section 3 of the RFI report and Section 3 Addendum of this report. Groundwater samples were submitted for analyses of VOCs, SVOCs, TAL metals (total metals for Round 1 sampling, total and dissolved metals for Round 2 sampling), PCBs, pesticides, herbicides, organophosphorus pesticides, and water quality parameters. The analytical results from groundwater sampling are described in Section 22.5.

22.5 GROUNDWATER ANALYTICAL RESULTS

Groundwater data collected from Landfill 9 are summarized in this section. Complete analytical data are included in Appendix Q-13. Data quality for this SWMU is acceptable. However, some of the metals and water quality parameter data discussed in this section may be biased, either high or low, because the same parameter was detected in field blanks or method blanks associated with the samples. Section 24 discusses data quality for these samples in more detail.

Table 22-1 summarizes the data for the Landfill 9 groundwater monitoring wells. As shown on Figure 22-2, OW-152 is downgradient and OW-151 is upgradient of this SWMU. Table 22-1 includes only detected parameters and corresponding data qualified as usable.

Three VOCs, acetone, methylene chloride, and toluene, were detected in wells at the site. None of these analytes were present at concentrations above the WAC NR 140 Public Health Preventive Action Limit (PAL). Acetone was only detected in the upgradient well OW-151. All three of these analytes were detected in the field blank. Acetone and methylene chloride are common laboratory solvents; their presence in field samples at concentrations less than 10 times that found in field and laboratory blanks is considered a false positive. Neither acetone nor methylene chloride was detected during Round 2 sampling, and neither will be considered further in the analysis of regulatory standards and human health assessment for this SWMU.

One SVOC, bis(2-ethylhexyl)phthalate was present at both wells and the field blank during Round 1 sampling at concentrations which exceed the PAL. This analyte is also considered common in laboratory environments, and its presence in samples at concentrations less than 10 times that found in field and laboratory blanks is considered a false positive. Bis(2-ethylhexyl)phthalate was not detected in either well or in the field blank during Round 2 sampling, and will not be considered further in the analysis of regulatory standards and human health assessment for this SWMU.

Fifteen metals were detected in total metals analyses of groundwater from downgradient well OW-152. Only four of these metals, arsenic, chromium, lead, and mercury, were present at concentrations that exceed the concentration in upgradient well OW-151, and that exceed the Public Health PAL (arsenic, chromium, and mercury) or ES as well (lead). Two metals, iron and manganese, were present at concentrations that exceed the concentration in the upgradient well and exceed the Public Welfare PAL and ES. Cadmium, chromium, iron, lead, and silver were also present in the upgradient well OW-151 at concentrations that exceed the WAC NR 140 Public

TABLE 22-1

LANDFILL 9 GROUNDWATER
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

	OW152 (24.5-34.5 ft)[a]						OW151 (Upgradient) (30.5-40.5 ft)		WAC NR 140 Public Health Standards		Risk-Based Concentration (RBC)	
	Round 1	Round 2	Round 1 (Duplicate)	Round 2 (Duplicate)	Round 1 (Rinsate Blank)	Round 2 (Rinsate Blank)	Round 1	Round 2	PAL[b]	ES[b]	Non-C[c]	C[c]
VOLATILE ORGANIC COMPOUNDS (ug/l)												
Acetone	ND(10)[d]	ND(50)	ND(10)	ND(50)	4.1BJ[e](10)	ND(50)	4.7BJ(10)	ND(50)	200	1,000	3,700	–[f]
Methylene chloride	4.7BJ(8.0)	ND(5.0)	4.0BJ(8.0)	ND(5.0)	4.0BJ(8.0)	ND(5.0)	4.6BJ(8.0)	ND(5.0)	15	150	–	4.1
Toluene	4.2B(0.5)	ND(1.0)	4.2B(0.5)	ND(1.0)	1.7(0.5)	ND(1.0)	5.0B(0.5)	2.7(1.0)	68.6	343	750	–
SEMI-VOLATILE ORGANIC COMPOUNDS (ug/l)												
Bis(2-Ethylhexyl)phthalate	32B(10)	ND(5.0)	58B(10)	ND(5.0)	35(10)	ND(5.0)	17B(10)	ND(5.0)	0.3	3	–	4.8
METALS (ug/l)												
Aluminum	19,000(100)	2,400(100) [ND(100)][g]	5,600(100)	2,500(100) [ND(100)]	ND(100)	ND(100) [ND(100)]	4,200J(100)	10,400(100) [ND(100)]	–	–	–	–
Arsenic	18(2.0)	ND(10) [ND(10)]	4.2(2.0)	ND(10) [ND(10)]	ND(2.0)	ND(10) [ND(10)]	ND(2.0)	ND(10) [ND(10)]	5	50	11	–
Barium	200(4.0)	ND(100) [ND(100)]	79(4.0)	ND(100) [ND(100)]	ND(4.0)	ND(100) [ND(100)]	53(4.0)	ND(100) [ND(100)]	400	2,000	2,600	–
Beryllium	ND(1.0)	ND(4) [ND(4)]	ND(1.0)	ND(4) [ND(4)]	1.0(1.0)	ND(4) [ND(4)]	2(1.0)	ND(4) [ND(4)]	–	–	–	0.016
Cadmium	ND(2.0)	ND(5) [ND(5)]	ND(2.0)	ND(5) [ND(5)]	ND(2.0)	ND(5) [ND(5)]	6.0J(2.0)	ND(5) [ND(5)]	0.5	5	18	–
Chromium	42B(5.0)	50(10) [ND(10)]	18B(5.0)	40B(10) [ND(10)]	6.0B(5.0)	10(10) [ND(10)]	22B(5.0)	30B(10) [ND(10)]	10	100	180	–

TABLE 22-1 (Continued)

LANDFILL 9 GROUNDWATER
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

	OW152 (24.5-34.5 ft)[a]						OW151 (Upgradient) (30.5-40.5 ft)		WAC NR 140 Public Health Standards		Risk-Based Concentration (RBC)	
	Round 1	Round 2	Round 1 (Duplicate)	Round 2 (Duplicate)	Round 1 (Rinsate Blank)	Round 2 (Rinsate Blank)	Round 1	Round 2	PAL[b]	ES[b]	Non-C[c]	C[c]
Cobalt	19B(3.0)	ND(50) [ND(50)]	9.0B(3.0)	ND(50) [ND(50)]	4.0B(3.0)	ND(50) [ND(50)]	9.0B(3.0)	ND(50) [ND(50)]	–	–	2,200	–
Copper	100BJ(10)	ND(20) [ND(20)]	17J(10)	ND(20) [ND(20)]	12BJ(10)	ND(20) [ND(20)]	63BJ(10)	30(20) [ND(20)]	130	1,300	1,400	–
Lead	55(2.0)	5(3) [8(3)]	12(2.0)	4(3) [ND(3)]	ND(2.0)	ND(3) [ND(3)]	6.8(2.0)	24(3) [ND(3)]	1.5	15	0.00037	–
Mercury	0.31J(0.2)	1.1BJ(0.2) [1.4BJ(0.2)]	ND(0.2)	0.9BJ(0.2) [1.2BJ(0.2)]	ND(0.2)	0.8J(0.2) [1.0J(0.2)]	ND(0.2)	1.1BJ(0.2) [1.1BJ(0.2)]	0.2	2	11	–
Nickel	60B(7)	40 [ND(40)]	150(7)	ND(40) [ND(40)]	9(7)	ND(40) [ND(40)]	11J(7)	ND(40) [ND(40)]	–	–	730	–
Silver	ND(40)	ND(10) [ND(10)]	ND(40)	ND(10) [ND(10)]	ND(40)	ND(10) [ND(10)]	130BJ(40)	ND(10) [ND(10)]	10	50	180	–
Thallium	77(50)	ND(2) [ND(2)]	64(50)	ND(2) [ND(2)]	ND(50)	ND(2) [ND(2)]	ND(50)	ND(2) [ND(2)]	–	–	–	–
Vanadium	43(3.0)	ND(50) [ND(50)]	12B(3.0)	ND(50) [ND(50)]	3(3.0)	ND(50) [ND(50)]	18J(3.0)	ND(50) [ND(50)]	–	–	260	–

TABLE 22-1 (Continued)

LANDFILL 9 GROUNDWATER
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

	OW152 (24.5-34.5 ft)[a]						OW151 (Upgradient) (30.5-40.5 ft)		WAC NR 140 Public Welfare Standards		Risk-Based Concentration (RBC)	
	Round 1	Round 2	Round 1 (Duplicate)	Round 2 (Duplicate)	Round 1 (Rinsate Blank)	Round 2 (Rinsate Blank)	Round 1	Round 2	PAL[b]	ES[b]	Non-C[c]	C[c]
METALS (ug/l)												
Iron	48,000(200)	4,000(100) [ND(100)]	13,000(200)	4,500(100) [ND(100)]	ND(200)	ND(100) [ND(100)]	6,200(200)	13,600(100) [ND(100)]	150	300	–	–
Manganese	460(3.0)	50(10) [20(10)]	250(3.0)	60(10) [20(10)]	ND(3.0)	ND(10) [ND(10)]	83(3.0)	110(10) [ND(10)]	25	50	180	–
Zinc	560B(50)	400B(20) [400B(20)]	220B(50)	480B(20) [400B(20)]	220(50)	410(20) [420(20)]	590(50)	580B(20) [470B(20)]	2,500	5,000	11,000	–
WATER QUALITY PARAMETERS (mg/l)												
Alkalinity	26(5.0)	24(2)	26(5.0)	25(2)	ND(5.0)	ND(2)	60(5.0)	68(2)	–	–	–	–
Chemical Oxygen Demand	ND(8.0)	ND(10)	ND(8.0)	ND(10)	ND(8.0)	ND(10)	9.5(8.0)	ND(10)	–	–	–	–
Chloride	1.5(1.0)	2(2)	1(1.0)	ND(2)	ND(1.0)	ND(2)	1.5(1.0)	ND(2)	125	250	–	–
Phosphate, total	1.7(0.1)	0.2(0.1)	0.5(0.1)	0.2(0.1)	ND(0.1)	ND(0.1)	0.6(0.1)	0.4(0.1)	–	–	–	–
Total Dissolved Solids	540J(10)	98J(2)	190J(10)	102J(2)	ND(10)	4J(2)	170J(10)	248J(2)	–	–	–	–
Sulfate	5.8B(1.0)	ND(10)	6.3B(1.0)	ND(10)	2(1.0)	ND(10)	8(1.0)	ND(10)	125	250	–	–

NOTES:
[a] Depth interval of well screen.
[b] PAL = Preventive Action Limit; ES = Enforcement Standard (effective March 1994).
[c] Non-C = Non-Carcinogenic Risk-Based Concentration; C = Carcinogenic Risk-Based Concentration (10^{-6} Risk).
[d] ND indicates not detected; detection limit given in parentheses.
[e] B indicates analyte detected in method or field blank; J indicates estimated value, see discussion in Section 24.0.
[f] – indicates no standard available.
[g] Brackets [ ] indicate dissolved metals analytical data.

Health PAL (chromium) and ES as well (cadmium, lead, and silver) or the Public Welfare PAL and ES (iron). Standards for iron and manganese are public welfare-based, that is, they are based on aesthetic characteristics of groundwater used for drinking and not on public health concerns. Cadmium was qualified J (estimated), chromium as B because it was also detected in rinsate blanks, and silver was qualified BJ (see Sections 24.0, 25.0, and Appendix P Addendum). Mercury and zinc were detected in all samples during Round 2 sampling. Further investigation indicates that these are contaminants introduced in Round 2 sampling (see Section 24 and Appendix T).

During the Round 2 groundwater sampling, the samples were also analyzed for dissolved metals. The data indicate that except for lead and manganese, the presence of the metals is related to natural turbidity in the groundwater samples. Although dissolved lead concentrations in downgradient well OW-152 exceeded the Public Health PAL, dissolved lead was not detected in the OW-152 field duplicate or in the upgradient OW-151 sample. Dissolved manganese was detected in downgradient well OW-152 at concentrations below the Public Welfare PAL. Mercury and zinc detected in Round 2 samples analyzed for dissolved metals were qualified as B or BJ and are considered sampling related contaminants (see Section 24 and Appendix T).

The water quality parameters chloride, phosphate, and total dissolved solids were detected at higher concentrations in the downgradient wells than in the upgradient well. None of these concentrations exceed the Public Welfare PALs.

22.6 CONTAMINATION EVALUATION

22.6.1 Nature and Extent

The data from Landfill 9 do not indicate that Landfill 9 is a significant contaminant source to groundwater. Although VOCs and SVOCs were detected in both upgradient and downgradient samples during Round 1 sampling, the data are suspect since analytes were detected in the blank at nearly identical concentrations and none of the compounds were detected during Round 2 sampling. Most of the metals and water quality parameters were detected at similar concentrations at both the upgradient and downgradient monitoring wells. The downgradient and upgradient metals concentrations (or quantitation limits) are within an order of magnitude of one another. Most of these metals are naturally occurring, and concentrations may vary due to natural fluctuations or sampling and analytical procedures. The data from OW-152 and its field duplicate during Round 1 sampling, however, were dissimilar; the field duplicate concentrations were generally closer to those detected in sample OW-151 than to those in OW-152. As discussed in Section 24, the reason for this discrepancy may be the high and nonconstant turbidity observed during sampling. A second round of sampling was conducted to determine which of the Round 1 samples at OW-152 was representative of groundwater quality at this location. The Round 2 sampling results, in general, show chemical detections at low concentrations similar to those in the field duplicate of the Round 1 sampling. The lower concentrations of detected metals in the Round 1 and Round 2 samples at OW-152 are similar to concentrations in well OW-151. Only four of the metals (total metals analysis), arsenic, chromium, lead, and mercury, were present at concentrations that exceed the concentration in upgradient well OW-151, and that exceed the Public Health PAL (arsenic, chromium, and mercury) or ES as well (lead). Two metals (total metals analysis), iron and manganese, were present at concentrations that exceed the concentration in the upgradient well and

exceed the Public Welfare PAL and ES. Cadmium, chromium, iron, lead, and silver (total metals analysis) were also present in the upgradient well OW-151 at concentrations that exceed the WAC NR 140 Public Health PAL (chromium) and ES as well (cadmium, lead, and silver) or the Public Welfare PAL and ES (iron).

In order to evaluate the effects of turbidity on groundwater quality at Landfill 9, the Round 2 sampling included analysis of dissolved metals, as well as total metals. Only four dissolved metals, lead (downgradient well OW-152), manganese (downgradient well OW-152), mercury (both wells), and zinc (both wells), were detected. Of these, mercury and zinc were qualified B and BJ and are considered sampling contaminants as discussed in Section 24 and Appendix T. The Round 2 analyses indicate that except for lead and manganese, the metals detected at Landfill 9 are derived from particulates in the groundwater and are not dissolved constituents in the water.

22.6.2 Contaminant Fate and Transport

Transport of metals occurs primarily when metals are in solution. Metals can move as precipitated solids, but this migration is minimal under most environmental conditions. Once in solution, metals tend to migrate with groundwater flow or to migrate through groundwater in response to a concentration gradient. Soil properties, such as clay content, organic matter, and cation exchange capacity may retard metal migration. The sandy aquifer at Fort McCoy, however, has minimal capacity to impede or slow contaminant migration.

Precipitation and adsorption of metals also depends on the pH and redox potential of the groundwater. Reducing conditions are generally found in groundwater, and the pH at Landfill 9, recorded after well development, is very slightly acidic. Under reducing conditions, the more mobile and soluble divalent forms of iron and arsenic, and arsenite, may dominate. Volatile arsenic compounds may also form under reducing conditions. The more mobile and toxic forms of mercury, elemental and alkylated mercury, are more stable under reducing conditions. Lead has a particularly strong affinity for cation exchange sites and most lead precipitates at pH values greater than 6 (USEPA, 1990). The low cation exchange capacity and groundwater pH near 6 at Fort McCoy help mobilize lead at the site. Thallium can be removed by adsorption onto clay minerals or by precipitation as a metal sulfide in reducing environments. Except in very oxidating waters, thallium has a very high solubility compared to other heavy metals (USEPA, 1979). Metals present near the top of the water table may precipitate and redissolve with the changing wetness/dryness and oxidation potential as the water table elevation fluctuates.

22.7 REGULATORY REQUIREMENTS

The primary regulatory consideration for Landfill 9 groundwater is WAC NR 140. Table 22-1 lists the PALs and ESs for parameters detected in groundwater. The parameters detected in groundwater at Landfill 9 at concentrations greater than the Public Health PAL or ES are shown on Table 22-2, and the parameters detected at concentrations greater than the Public Welfare PAL or ES are shown on Table 22-3. The exceedances occur only for total metals analyses, except for lead, in which the dissolved metals analysis for Round 2 indicated a concentration above the WAC NR 140 Public Health PAL in the downgradient well OW-152.

TABLE 22-2

DETECTIONS IN GROUNDWATER EXCEEDING WAC NR 140
PUBLIC HEALTH STANDARDS
LANDFILL 9
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

Parameter	Public Health PAL Exceeded	Public Health ES Exceeded
Arsenic	Downgradient (OW-152 Round 1 total metals only)	
Cadmium	Upgradient (OW-151 Round 1 total metals only, but qualified J)	Upgradient (OW-151 Round 1 total metals only, but qualified J)
Chromium	Upgradient and downgradient (total metals only, but qualified B)	
Lead	Upgradient (OW-151 total metals only) and downgradient (OW-152 total metals both rounds and dissolved metals Round 2)	Upgradient (OW-151 Round 2 total metals only) and downgradient (OW-151 Round 1 total metals only)
Mercury	Downgradient (OW-152 Round 1 total metals, qualified J; not detected in field duplicate)	
Silver	Upgradient (OW-151, Round 1 total metals only, but qualified BJ)	Upgradient (OW-151 Round 1 total metals only, but qualified BJ)

TABLE 22-3

DETECTIONS IN GROUNDWATER EXCEEDING WAC NR 140
PUBLIC WELFARE STANDARDS
LANDFILL 9
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

Parameter	Public Welfare PAL Exceeded	Public Welfare ES Exceeded
Iron	Total metals only upgradient and downgradient (all wells, both rounds); not detected in dissolved metals.	Total metals only upgradient and downgradient (all wells, both rounds); not detected in dissolved metals.
Manganese	Total metals only downgradient (OW-152 Round 1 only)	Total metals only downgradient (OW-152 Round 1 only)

Iron and manganese standards are based on Public Welfare concerns (i.e., aesthetic drinking water characteristics) rather than health-based concerns.

22.8 HUMAN HEALTH ASSESSMENT

Table 22-1 lists the RBCs for detected downgradient groundwater parameters. Arsenic RBC (total metals analysis) was detected only in the Round 1 sampling in the samples from OW-152 above the non-carcinogenic RBC, but was not detected in either the total metals or dissolved metals samples during the Round 2 sampling event. Beryllium (total metals analysis) was detected above the carcinogenic RBC in upgradient well OW-151 during the Round 1 sampling, but was not detected during Round 2 sampling or in the dissolved metals analyses. Lead (total metals analysis) was detected above the non-carcinogenic RBC in both the upgradient and downgradient wells. Dissolved lead exceeded the non-carcinogenic RBC only in the downgradient well, and was not detected in the upgradient well. Manganese (total metals analysis) was detected above the non-carcinogenic RBC in the downgradient well during Round 1 sampling.

22.9 CONCLUSIONS AND RECOMMENDATIONS

Table 22-4 lists the chemicals of concern for Landfill 9. Chemicals of concern include chemicals exceeding WAC NR 140 Public Health standards and chemicals exceeding RBCs. Metals exceeding Public Welfare standards (iron) are not included because these standards are not health-based.

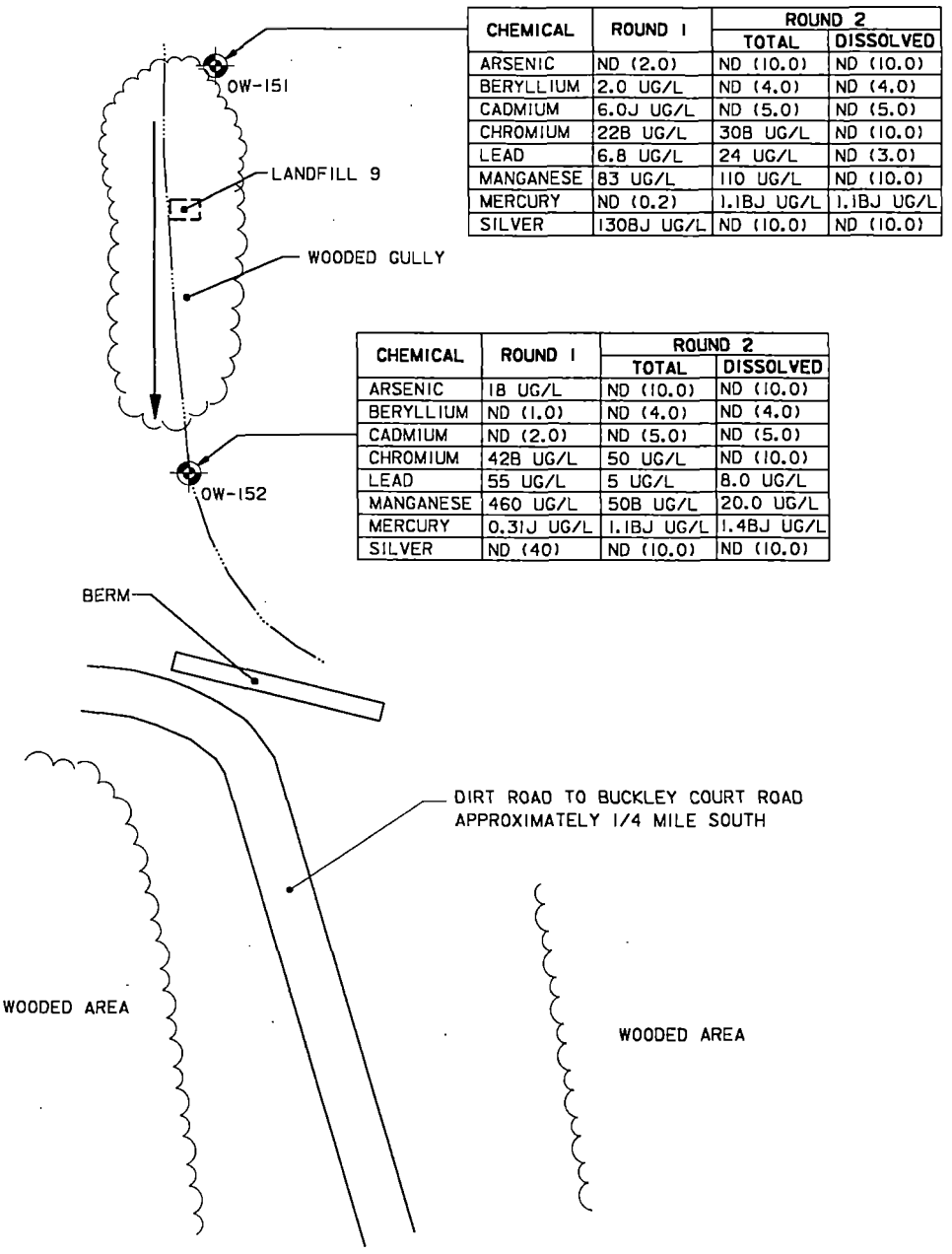
The chemicals of concern for this SWMU (total metals analysis) are arsenic, beryllium, cadmium, chromium, lead, manganese, mercury, and silver (Table 22-4). The distribution of chemicals of concern are shown on Figure 22-4.

Additional groundwater monitoring is recommended to evaluate inconsistent contaminant trends observed in Round 1 and Round 2 groundwater sampling for chemical constituents that exceeded regulatory standards (WAC NR 140 Public Health PAL and ES). Landfill 9 is not recommended to be included in the CMS at this time.

TABLE 22-4

CHEMICALS OF CONCERN
LANDFILL 9
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

Chemical	Reason for Concern
METALS	
Arsenic	Exceeds WAC NR 140 Public Health PAL (downgradient well OW-152 Round 1 total metals only; not detected in Round 2 total metals and dissolved metals sampling) and RBCs.
Beryllium	Exceeds carcinogenic RBC (upgradient well OW-151 Round 1 only; not detected in Round 2 total metals and dissolved metals samples).
Cadmium	Exceeds WAC NR 140 Public Health PAL and ES (upgradient well OW-151 Round 1 total metals only, but qualified J [estimated]; not detected in Round 2 total metals and dissolved metals sampling).
Chromium	Exceeds WAC NR 140 Public Health PAL (upgradient and downgradient wells both sampling rounds total metals only, but qualified B because detected in sample blank; not detected in Round 2 dissolved metals sampling).
Lead	Exceeds WAC NR 140 Public Health PAL(upgradient and downgradient wells both sampling rounds [total metals], downgradient well dissolved metals Round 2) and ES (upgradient well total metals Round 2; downgradient well total metals Round 1).
Manganese	Exceeds WAC NR 140 Public Health PAL and ES (downgradient well OW-152 Round 1 total metals only) and noncarcinogenic RBC (downgradient well OW-152 Round 1 total metals only).
Mercury	Exceeds WAC NR 140 Public Health PAL (downgradient well OW-152 Round 1 total metals only, but qualified J; not detected in associated field duplicate).
Silver	Exceeds WAC NR 140 Public Health PAL (upgradient well OW-151 Round 1 only, but qualified BJ; undetected in all other total metals and dissolved metals samples).



CHEMICAL	ROUND 1	ROUND 2	
		TOTAL	DISSOLVED
ARSENIC	ND (2.0)	ND (10.0)	ND (10.0)
BERYLLIUM	2.0 UG/L	ND (4.0)	ND (4.0)
CADMIUM	6.0J UG/L	ND (5.0)	ND (5.0)
CHROMIUM	22B UG/L	30B UG/L	ND (10.0)
LEAD	6.8 UG/L	24 UG/L	ND (3.0)
MANGANESE	83 UG/L	110 UG/L	ND (10.0)
MERCURY	ND (0.2)	1.1BJ UG/L	1.1BJ UG/L
SILVER	130BJ UG/L	ND (10.0)	ND (10.0)

CHEMICAL	ROUND 1	ROUND 2	
		TOTAL	DISSOLVED
ARSENIC	18 UG/L	ND (10.0)	ND (10.0)
BERYLLIUM	ND (1.0)	ND (4.0)	ND (4.0)
CADMIUM	ND (2.0)	ND (5.0)	ND (5.0)
CHROMIUM	42B UG/L	50 UG/L	ND (10.0)
LEAD	55 UG/L	5 UG/L	8.0 UG/L
MANGANESE	460 UG/L	50B UG/L	20.0 UG/L
MERCURY	0.31J UG/L	1.1BJ UG/L	1.4BJ UG/L
SILVER	ND (40)	ND (10.0)	ND (10.0)

CHEMICAL	ROUND 1	ROUND 2	
		TOTAL	DISSOLVED
ARSENIC	ND (2.0)	ND (10.0)	ND (10.0)
BERYLLIUM	2.0 UG/L	ND (4.0)	ND (4.0)
CADMIUM	6.0J UG/L	ND (5.0)	ND (5.0)
CHROMIUM	22B UG/L	30B UG/L	ND (10.0)
LEAD	6.8 UG/L	24 UG/L	ND (3.0)
MANGANESE	83 UG/L	110 UG/L	ND (10.0)
MERCURY	ND (0.2)	1.1BJ UG/L	1.1BJ UG/L
SILVER	130BJ UG/L	ND (10.0)	ND (10.0)

LEGEND

- EDGE OF WOODED AREA
- GROUNDWATER FLOW DIRECTION
- ESTIMATED LIMITS OF WASTE
- OW-151 — GROUNDWATER MONITORING WELL AND CONCENTRATION OF CHEMICALS OF CONCERN
- ND — NOT DETECTED
- (10.0) — DETECTION LIMIT IN UG/L
- J — ESTIMATED
- B — DETECTED IN METHOD BLANK OR FIELD BLANK

N

0' 50' 100'
APPROXIMATE SCALE

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FIGURE 22-4
LANDFILL 9
DISTRIBUTION OF CHEMICALS OF CONCERN
FORT McCOY RFI
MONROE COUNTY, WISCONSIN

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23.0 LANDFILL 10

23.1 SITE BACKGROUND

Landfill 10 is located in the SW 1/4 of the SW 1/4 of Section 27, T18N, R3W, Monroe County, Wisconsin. The site (Figure 23-1) is located on a nearly level stream terrace near the topographic divide between the La Crosse River, located approximately 1,700 feet to the east, and Bailey Creek, located approximately 1,900 feet to the west.

After reports of isolated dumping along the western facility boundary and a field inspection with private citizen Bob Smith on April 20, 1993, Fort McCoy initiated a preliminary investigation to determine the presence and nature of potential suspected SWMUs (USACE, 1993; Appendix R), and Landfill 10 was verified to exist in the fire break along the western boundary of the fort just north of County Highway BB. To determine the limits of waste and investigate the site, nine small trenches were excavated by Fort McCoy on July 20, 1993 (Appendix R). The width, length, and depth of these trenches, in feet, were:

Trench 1	2.5 x 16 x 2
Trench 2	1.5 x 18 x 2.5
Trench 3	3 x 12 x 2.7
Trench 4	3 x 9 x 2.7
Trench 5	3 x 10 x 4.3
Trench 6	3 x 6 x 2.5
Trench 7	3 x 12 x 5.2
Trench 8	3 x 6 x 3.5
Trench 9	4 x 12 x 3

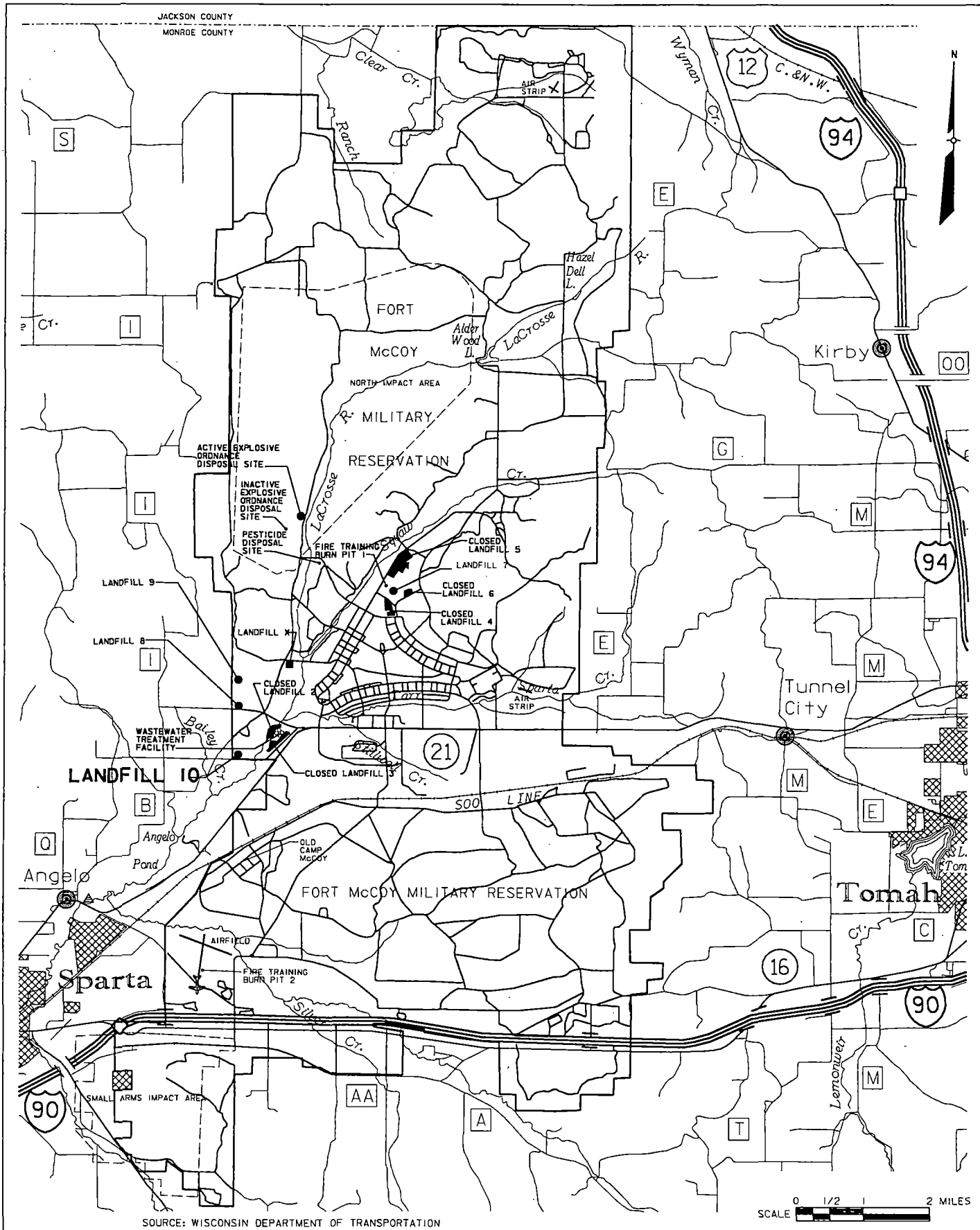
The waste was found to occupy a diagonal belt of greener, thicker vegetation trending SW-NE across the fire break that was approximately 30 feet wide and 140 feet long. Some of the waste identified during the trenching included: glass bottles, broken glass and dishes, barbed wire, cans, rusted metal debris and ash. The waste was determined to extend to a depth of approximately 3 feet.

There are no records of when this landfill was operable, and there is no indication of landfill activity on available aerial photographs taken in 1939, 1950, 1964, 1970, 1978, 1987, and 1992. Interviews with Fort McCoy personnel suggest the area was used by private citizens living off post to dispose of household waste during the 1950s.

23.2 PHYSICAL FEATURES

23.2.1 Site Setting, Topography, and Drainage

Landfill 10 is situated in the fire break at the western edge of Fort McCoy just north of County Highway BB. The site is located on the nearly level stream terrace that is the topographic divide between the La Crosse River valley on the east and Bailey Creek on the west. The surficial materials are permeable sands, and infiltration of rainwater predominates over overland flow.



SOURCE: WISCONSIN DEPARTMENT OF TRANSPORTATION

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FIGURE 23-1
LANDFILL 10
LOCATION MAP

FORT McCOY RFI
MONROE COUNTY, WISCONSIN

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23.2.2 Surficial Soils

The Landfill 10 area is mapped as the Impact sand series soil (USDA, 1984). The Impact sand series generally occurs on stream terraces, such as this site on a terrace between the La Crosse River and Bailey Creek, and on valley toe slopes. The natural soils were likely excavated or disturbed where landfilling has occurred. Impact series soils were described in Section 2.3 of the RFI report.

23.2.3 Geology

Only one stratigraphic unit, Quaternary alluvium, was encountered during installation of water table observation wells OW-154, OW-155, OW-156, OW-157, and OW-158. The alluvium consisted primarily of fine-to-medium grained, poorly graded sand classifying as SP in the Unified Soil Classification. Locally there were beds of slightly siltier sand that classified as poorly graded sand with silt (SP-SM) (see boring logs presented in Appendix E Addendum).

23.2.4 Hydrogeology

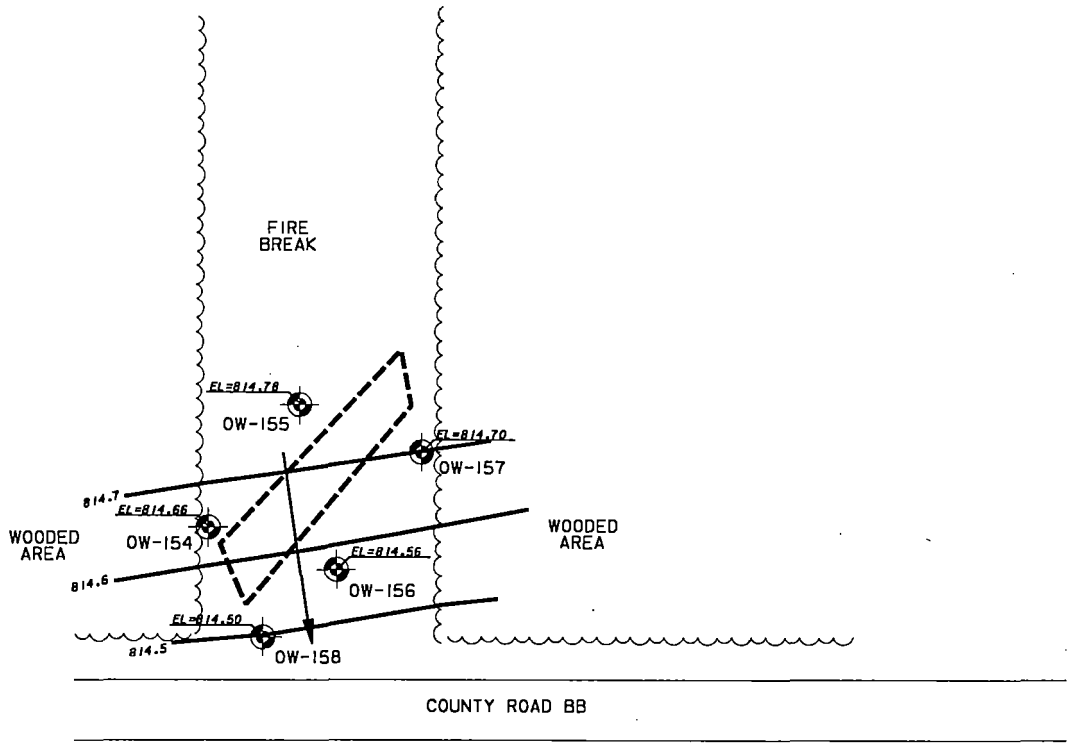
Five water table observation wells were installed at Landfill 10: well OW-155 was installed upgradient, well OW-154 sidegradient, and wells OW-156, OW-157, and OW-158 were downgradient wells (Figure 23-2). These wells were installed to detect possible groundwater contamination associated with the landfilling, to measure groundwater elevations to determine the groundwater gradient and flow direction, and to determine the aquifer hydraulic conductivity for a linear flow velocity calculation.

Landfill 10 is located in a groundwater recharge area. The water table is approximately 15 feet below the ground surface, and groundwater flow is southeast toward the La Crosse River (Figure 23-2).

The field hydraulic conductivity (K) for the alluvium ranges from 0.016 to 0.028 cm/sec with a geometric mean of 0.021 cm/sec. The average linear flow velocity is 0.00026 cm/sec using a gradient of 0.0025 ft/ft, an average K value of 0.021 cm/sec, and a porosity of 0.2 cm^3/cm^3.

23.3 SITE CONCEPTUAL MODEL

The conceptual model for this site is shown on Figure 23-3. The primary contaminant source is assumed to be the buried waste at Landfill 10. The ground surface is nearly level, the soil is sandy and permeable, and surface runoff is negligible. No landfill cap or liner appears to have been installed. The most likely release mechanism would, therefore, occur from vertical infiltration of precipitation through surface soils, leaching through the waste, and mixing of the leachate with groundwater flowing laterally beneath the site. The groundwater has a general flow southeast toward the La Crosse River approximately 1,900 feet to the east where contaminants could be released to potential receptors. Because groundwater flow is the main transport mechanism, downgradient groundwater sampling provides an indication of contaminant migration from the site.



LEGEND

- EDGE OF WOODED AREA
- 814.5 — GROUNDWATER CONTOUR (CONTOUR INTERVAL 0.1 FOOT)
- GROUNDWATER FLOW DIRECTION
- ESTIMATED LIMITS OF WASTE
- EL=814.78 / OW-155 — GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL

NOTE

GROUNDWATER ELEVATIONS WERE MEASURED DECEMBER 15, 1993.

N

0' 50' 100'
APPROXIMATE SCALE

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FIGURE 23-2
LANDFILL 10
WATER TABLE MAP AND GROUNDWATER MONITORING WELL LOCATIONS
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MONROE COUNTY, WISCONSIN

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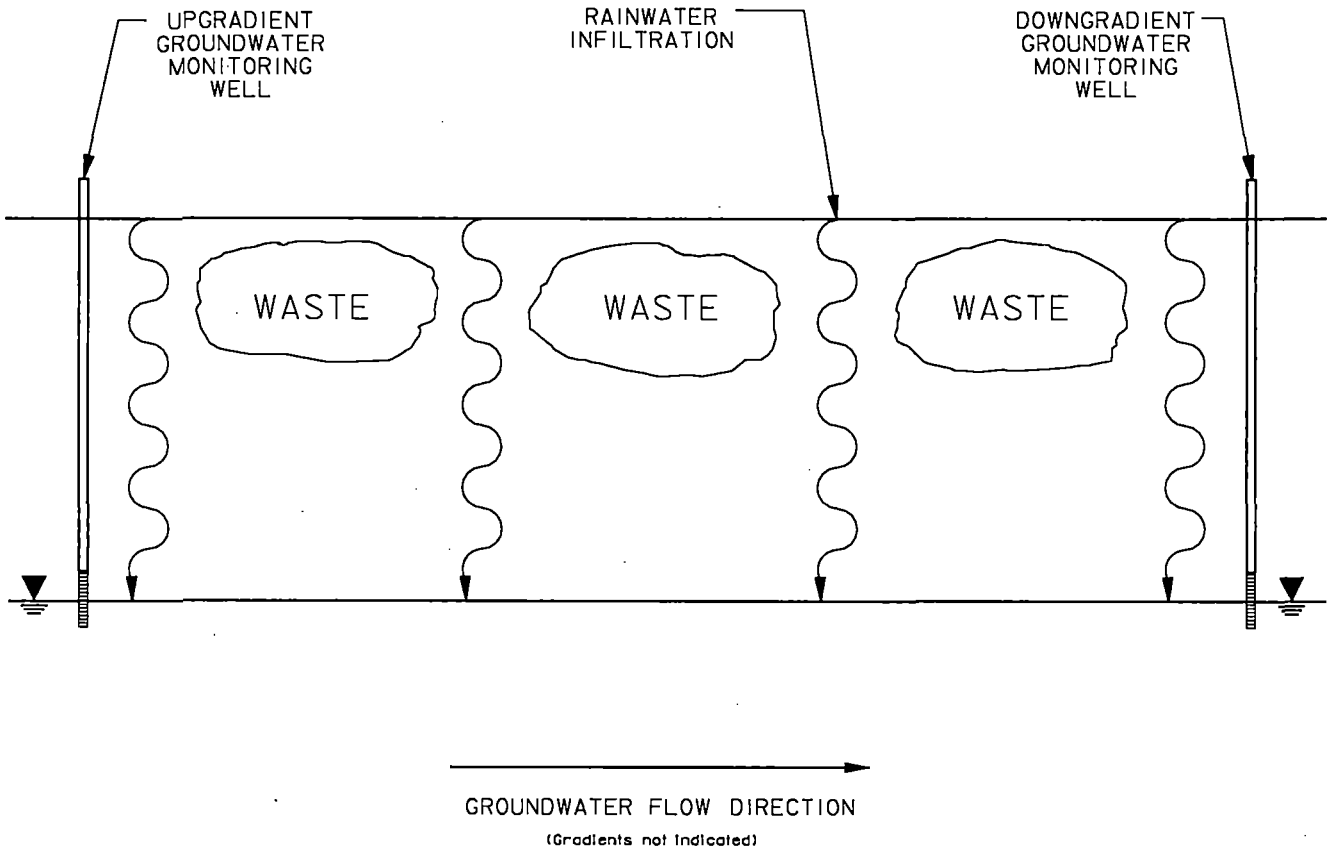

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FIGURE 23-3
LANDFILL 10
SITE CONCEPTUAL MODEL

FORT McCOY RFI
MONROE COUNTY, WISCONSIN

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23.4 SAMPLING ACTIVITIES

Sampling at Landfill 10 consisted of collecting groundwater samples to determine if a release of contamination from the waste had impacted groundwater. One upgradient and three downgradient water table observation wells were sampled at locations adjacent to and outside of the landfill area. The groundwater monitoring wells were installed, developed and sampled as described in Section 3 of the RFI report and Section 3 Addendum of this report. Groundwater samples were submitted for analyses of VOCs, SVOCs, TAL metals, PCBs, pesticides, herbicides, organosphorus pesticides, and water quality parameters. The analytical results from groundwater sampling are described in Section 23.5.

23.5 GROUNDWATER ANALYTICAL RESULTS

This section summarizes groundwater analytical results for Landfill 10. Appendix Q-14 includes the complete analytical data and Section 24 discusses the data quality. The data quality for this SWMU are acceptable, however, values for SVOCs and metals may be biased because the same compounds were detected in the method blanks and the field blanks.

Landfill 10 monitoring well locations are shown on Figure 23-2. OW-155 is upgradient, OW-154 is sidegradient, and monitoring wells OW-156, OW-157, and OW-158 are downgradient of this SWMU. Table 23-1 summarizes the analytical data for these wells. Only detected parameters and corresponding values qualified as usable are included.

Four VOCs, acetone, chloroform, methylene chloride, and toluene, were detected in wells at the site. Acetone, chloroform, and methylene chloride were detected only during Round 1 sampling and are common in laboratory environments; their presence in field samples at concentrations less than 10 times that found in field and laboratory blanks is considered a false positive. None of these three compounds was detected in the Round 2 sampling, and they will not be considered further in the analysis of regulatory standards and human health assessment for this SWMU. The toluene detections were at concentrations less than the WAC NR 140 Public Health PAL.

One SVOC, bis (2-ethylhexyl)phthalate was present in groundwater from OW-155, OW-156, OW-157, and OW-158 in the Round 1 sampling. This analyte is also considered common in laboratory environments, and its presence in samples at concentrations less than 10 times that found in field and laboratory blanks is considered a false positive. Bis(2-ethylhexyl)phthalate was not detected in any of the wells during Round 2 sampling, and this compound will not be considered further in the analysis of regulatory standards and human health assessment for this SWMU.

Eleven metals were detected in the downgradient wells. Only two of these metals, iron and lead, were present at concentrations that exceed the concentration in upgradient well OW-155 and that exceed the WAC NR 140 Public Health PAL (lead) or the Public Welfare PAL and ES (iron). Chromium, iron, lead, and manganese are also present in the upgradient well at concentrations that exceed the WAC NR 140 Public Health PAL (lead) or ES (chromium) or the Public Welfare PAL and ES (iron and manganese). Standards for iron and manganese are public welfare-based, that is, they are based on aesthetic characteristics of groundwater used for drinking and not on public health concerns.

TABLE 23-1

LANDFILL 10 GROUNDWATER
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

	OW154 (Sidegradient) (12-24 ft)[a]	OW156 (12-22 ft)		OW157 (14-24 ft)		OW158 (12-22 ft)		OW155 (Upgradient) (13-23 ft)		WAC NR 140 Public Health Standards		Risk-Based Concentration (RBC)	
	Round 2[b]	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	PAL[c]	ES[c]	Non-C[d]	C[d]
VOLATILE ORGANIC COMPOUNDS (ug/l)													
Acetone	ND(50)[e]	12B(10)[f]	ND(50)	14B(10)	ND(50)	2.9BJ(10)[g]	ND(50)	13B(10)	ND(50)	200	1,000	3,700	--[h]
Chloroform	ND(1.0)	ND(1.0)	ND(1.0)	1.7(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.6	6	--	0.15
Methylene chloride	ND(5.0)	26B(8.0)	ND(5.0)	24B(8.0)	ND(5.0)	9.6B(8.0)	ND(5.0)	25B(8,0)	ND(5.0)	15	150	--	4.1
Toluene	1.4(1.0)	ND(0.5)	ND(1.0)	ND(0.5)	ND(1.0)	5.7B(0.5)	ND(1.0)	ND(0.5)	1.6(1.0)	68.6	343	750	--
SEMI-VOLATILE ORGANIC COMPOUNDS (ug/l)													
Bis(2-Ethylhexyl)phthalate	ND(5.0)	4.5BJ(10)	ND(5.0)	79B(10)	ND(5.0)	19B(10)	ND(5.0)	260(10)	ND(5.0)	0.3	3	--	4.8
METALS (ug/l)													
Aluminum	200(100)	920J(100)	300(100)	540J(100)	200(100)	600J(100)	200(100)	330J(100)	ND(100)	--	--	--	--
Barium	ND(100)	29(4.0)	ND(100)	14(4.0)	ND(100)	17(4.0)	ND(100)	16(4.0)	ND(100)	400	2,000	2,600	--
Beryllium	ND(4)	ND(1.0)	ND(4)	ND(1.0)	ND(4)	ND(1.0)	ND(4)	1 (1.0)	ND(4)	--	--	--	0.016
Chromium	ND(10)	23B(5.0)	ND(10)	17B(5.0)	ND(10)	ND(5.0)	ND(10)	100(5.0)	ND(10)	10	100	180	--
Cobalt	ND(50)	4.0B(3.0)	ND(50)	ND(3.0)	ND(50)	3.0B(3.0)	ND(50)	6.0B(3.0)	ND(50)	--	--	2,200	--
Copper	ND(20)	13BJ(10)	ND(20)	19BJ(10)	ND(20)	ND(10)	ND(20)	29BJ(10)	ND(20)	130	1,300	1,400	--
Lead	ND(3)	3.2(2.0)	ND(3)	3(2.0)	ND(3)	4.4(2.0)	ND(3)	3.7(2.0)	ND(3)	1.5	15	0.00037	--
Mercury	0.9BJ(0.2)	ND(0.2)	1.0BJ(0.2)	ND(0.2)	1.0BJ(0.2)	ND(0.2)	1.0BJ(0.2)	ND(0.2)	0.9BJ(0.2)	0.2	2	11	--

TABLE 23-1 (Continued)

LANDFILL 10 GROUNDWATER
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

	OW154 (Sidegradient) (12-24 ft)[a]	OW156 (12-22 ft)		OW157 (14-24 ft)		OW158 (12-22 ft)		OW155 (Upgradient) (13-23 ft)		WAC NR 140 Public Health Standards		Risk-Based Concentration (RBC)	
	Round 2[b]	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	PAL[c]	ES[c]	Non-C[d]	C[d]
Nickel	ND(40)	10J(7)	ND(40)	ND(7)	ND(40)	ND(7)	ND(40)	ND(7)	ND(40)	--	--	730	--
WATER QUALITY PARAMETERS (mg/l)													
Nitrate/Nitrite	0.9(0.1)	0.58(0.1)	1.2(0.1)	0.49(0.1)	0.5(0.1)	0.6(0.1)	1.0(0.1)	0.63(0.1)	0.8(0.1)	2	10	--	--

	OW154 (Sidegradient) (12-24 ft)[a]	OW156 (12-22 ft)		OW157 (14-24 ft)		OW158 (12-22 ft)		OW155 (Upgradient) (13-23 ft)		WAC NR 140 Public Welfare Standards		Risk-Based Concentration (RBC)	
	Round 2[b]	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	PAL[c]	ES[c]	Non-C[d]	C[d]
METALS (ug/l)													
Iron	200(100)	1,500(200)	500(100)	560(200)	300(100)	620(200)	300(100)	930(200)	ND(100)	150	300	--	--
Manganese	20(10)	75(3.0)	20(10)	67(3.0)	20(10)	47(3.0)	10(10)	76(3.0)	20(10)	25	50	180	--
Zinc	420B(20)	440(50)	380B(20)	660(50)	470B(20)	530(50)	470B(20)	510(50)	360B(20)	2,500	5,000	11,000	--
WATER QUALITY PARAMETERS (mg/l)													
Alkalinity	ND(2)	31(5.0)	18(2)	12(5.0)	8(2)	280(5.0)	11(2)	5.8(5.0)	ND(2)	--	--	--	--
Chemical Oxygen Demand	ND(10)	12(8)	ND(10)	9.5(8)	ND(10)	12(8)	ND(10)	ND(8)	ND(10)	--	--	--	--
Phosphate, total	ND(0.1)	0.3(0.1)	0.2(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	--	--	--	--
Total Dissolved Solids	32J(2)	62J(10)	52J(2)	64J(10)	38J(2)	84J(10)	48J(2)	62J(10)	28J(2)	--	--	--	--

TABLE 23-1 (Continued)

LANDFILL 10 GROUNDWATER
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

	OW154 (Sidegradient) (12-24 ft)[a]	OW156 (12-22 ft)		OW157 (14-24 ft)		OW158 (12-22 ft)		OW155 (Upgradient) (13-23 ft)		WAC NR 140 Public Welfare Standards		Risk-Based Concentration (RBC)	
	Round 2[b]	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	PAL[c]	ES[c]	Non-C[d]	C[d]
Sulfate	ND(10)	3.8(1.0)	138(10)	2.8(1.0)	ND(10)	3.6(1.0)	ND(10)	3.8(1.0)	ND(10)	125	250	--	--

NOTES:

[a] Depth interval of well screen.
[b] No Round 1 samples collected for OW154.
[c] PAL = Preventive Action Limit; ES = Enforcement Standard (effective March, 1994).
[d] Non-C = Non-Carcinogenic Risk-Based Concentration; C = Carcinogentic Risk-Based Concentration (10^{-6} Risk).
[e] ND indicates not detected; detection limit given in parentheses.
[f] B indicates analyte detected in method or field blank.
[g] J indicates estimated value, see discussion in Section 24.0.
[h] indicates no standard available.

Water quality parameters alkalinity, chemical oxygen demand, nitrate/nitrite nitrogen, total phosphate, total dissolved solids, and sulfate were detected at higher concentrations in the downgradient wells than in the upgradient well.

23.6 CONTAMINATION EVALUATION

23.6.1 Nature and Extent

Groundwater samples collected downgradient of Landfill 10 during Round 1 sampling contained an elevated level of alkalinity which was not detected upgradient of this SWMU. Other detected downgradient metals and water quality parameter concentrations were below, or within an order of magnitude of, upgradient concentrations or quantitation limits for this SWMU. These slight variations in metals and water quality parameters are likely due to natural fluctuations or sampling and analytical procedures rather than to contamination from the SWMU. Potential chemical migration from Landfill 10, therefore, appears to be limited to alkalinity. Two metals, iron and lead, are present at concentrations that slightly exceed the concentration in upgradient well OW-155 and that exceed the WAC NR 140 Public Health PAL (lead) or Public Welfare PAL and ES (iron). Chromium, iron, lead, and manganese are also present in the upgradient well at concentrations that exceed the WAC NR 140 Public Health PAL (lead) and ES as well (chromium) and the Public Welfare PAL and ES (iron and manganese).

23.7 REGULATORY REQUIREMENTS

WAC NR 140 is the primary regulatory consideration for groundwater at Landfill 10. Table 23-1 lists the PALs and ESs for detected groundwater parameters. Parameters detected in groundwater at Landfill 10 at concentrations greater than the Public Health PAL or ES are shown on Table 23-2, and the parameters detected at concentrations greater than the Public Welfare PAL or ES are shown on Table 23-3. Iron and manganese are public welfare, not public health parameters.

23.8 HUMAN HEALTH ASSESSMENT

Table 23-1 lists the RBCs for parameters detected downgradient of Landfill 10. No RBCs were exceeded for compounds detected at this SWMU.

23.9 CONCLUSIONS AND RECOMMENDATIONS

Two metals detected at Landfill 10 exceed WAC NR 140 Public Health PAL or ES concentrations, and thus are chemicals of concern (Table 23-4): chromium and lead. Chromium and lead were only detected during Round 1 sampling, and chromium was qualified as B because of detection in a sample blank. The areal distribution of these chemicals of concern is shown on Figure 23-4. Iron and manganese were not considered chemicals of concern at this site because the standards that were exceeded are Public Welfare standards, which are based on aesthetic drinking water concerns rather than health concerns, and because the standards were exceeded in both upgradient and downgradient wells.

TABLE 23-2

DETECTIONS IN GROUNDWATER EXCEEDING WAC NR 140 PUBLIC HEALTH STANDARDS LANDFILL 10 FORT MCCOY RFI ADDENDUM MONROE COUNTY, WISCONSIN

Parameter	Public Health PAL Exceeded	Public Health ES Exceeded
Chromium	Upgradient (Round 1 only) and downgradient (OW-156 and OW-157 Round 1 only; qualified B)	Upgradient (Round 1 only)
Lead	Upgradient (Round 1 only) and downgradient (Round 1 only)	

TABLE 23-3

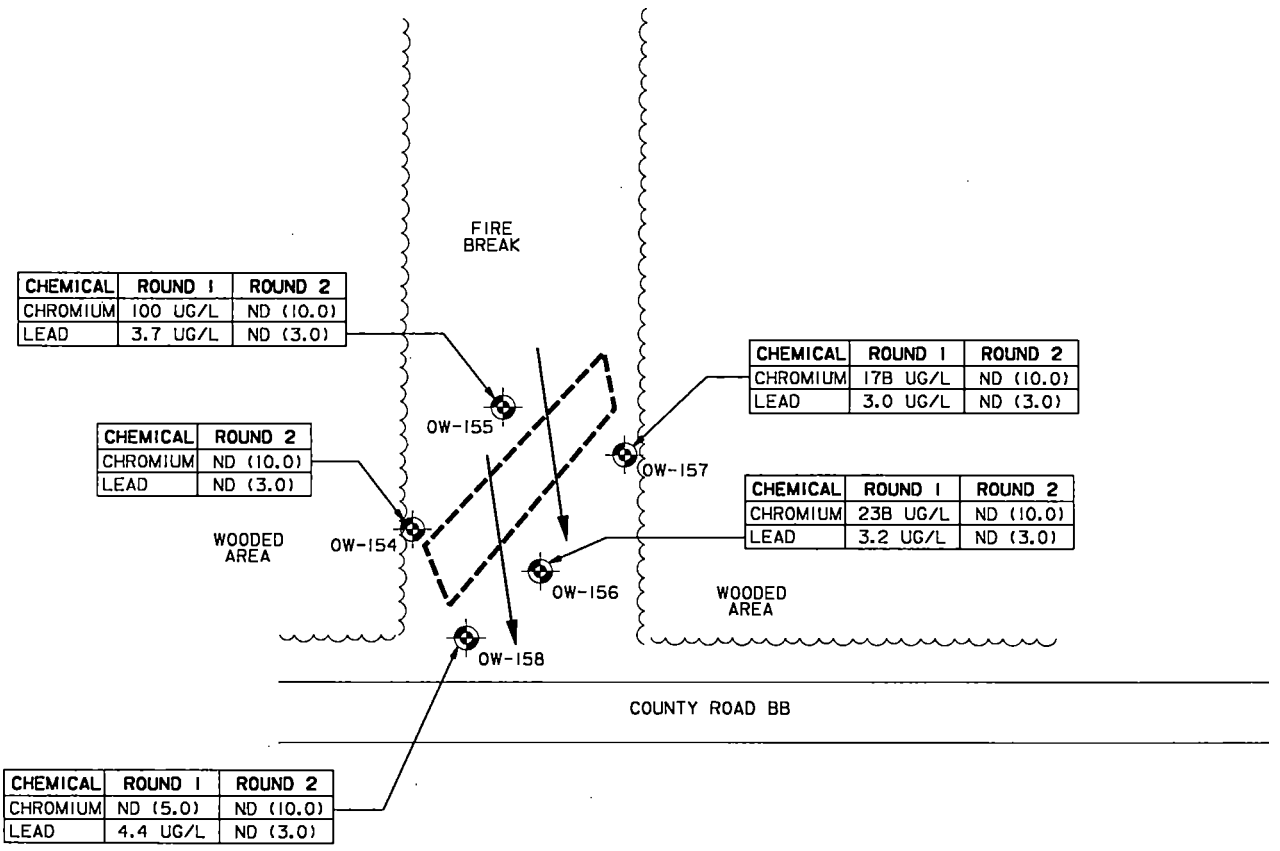
DETECTIONS IN GROUNDWATER EXCEEDING WAC NR 140
PUBLIC WELFARE STANDARDS
LANDFILL 10
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

Parameter	Public Welfare PAL Exceeded	Public Welfare ES Exceeded
Iron	Upgradient (Round 1 only) and downgradient	Upgradient (Round 1 only) and downgradient (OW-156, OW-157, and OW-158)
Manganese	Upgradient (Round 1 only) and downgradient (OW-156, OW-157, and OW-158 Round 1 only)	Upgradient (Round 1 only) and downgradient (OW-156 and OW-157 Round 1 only)

TABLE 23-4

CHEMICALS OF CONCERN
LANDFILL 10
FORT MCCOY RFI ADDENDUM
MONROE COUNTY, WISCONSIN

Chemical	Reason for Concern
Chromium	Exceeds WAC NR 140 Public Health PAL (upgradient well OW-155 Round 1 only; downgradient wells OW-156 and OW-157 Round 1 only) and ES (upgradient well OW-155 Round 1 only).
Lead	Exceeds WAC NR 140 Public Health PAL (all wells Round 1 only).



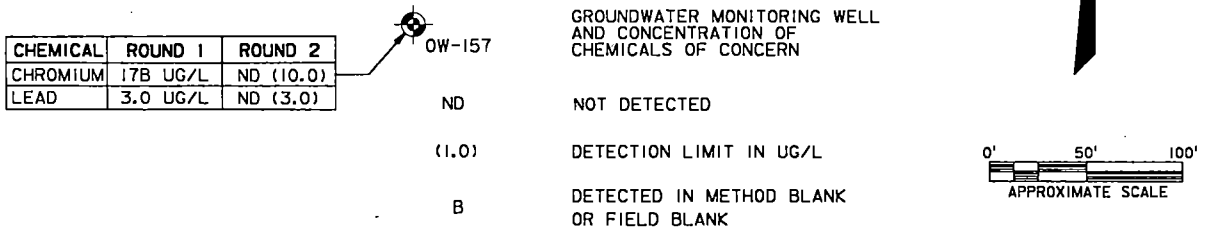


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FIGURE 23-4
LANDFILL 10
DISTRIBUTION OF CHEMICALS OF CONCERN

FORT McCOY RFI
MONROE COUNTY, WISCONSIN

71842

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Because of the inconsistent detection of compounds during the Round 1 and Round 2 sampling events, further groundwater sampling is recommended to evaluate contaminant trends. Based on information to date, Landfill 10 is recommended to not be included in the CMS.

24.0 ADDENDUM DATA QUALITY

24.1 INTRODUCTION

Two rounds of samples were collected for chemical analysis from Landfills 7, 8, 9, and 10 for the Fort McCoy RFI Addendum. Samples were submitted to laboratories validated by the USACE Missouri River Division. In addition to sample results, QC data were reported from the laboratories. The QC data included, when appropriate, the results of method blanks, laboratory duplicates, matrix spikes, matrix spike duplicates, surrogate spikes, internal standards, and laboratory control samples. Raw chromatograms and instrument readouts or calibration reports were not required to be reported.

The laboratory QC data were used to assess the quality of the analytical data. The assessment of data quality was performed using the procedures described in "Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses" (USEPA, 1988a) and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses" (USEPA, 1988b) as guidance. Suspect data were qualified using the codes found in these documents. However, it should be noted that the assessment of data quality that was performed is not equivalent to Contract Laboratory Program (CLP) Data Validation since the level of data reporting from the laboratories was not equivalent to CLP deliverables. Following the assessment of data quality, technical memoranda summarizing the data quality and describing qualifiers added to the data were written. These technical memoranda are provided in Appendix P Addendum. The following sections provide a discussion of the results of the field QC samples (field blanks, field duplicates, and trip blanks).

24.1.1 Round 1 Interim Monitoring

Samples FMM5-LF7-OW146-01, FMM5-LF7-OW146-02, and FMM5-LF7-OW146-04 were the field sample, field duplicate, and field blank, respectively, collected at well OW-146. Samples from FMM5-LF7-OW146-01 and FMM5-LF7-OW146-04 were used by the laboratory as a matrix spike and matrix spike duplicate for semi-volatile organic compound (SVOC) analysis and PCB/pesticide analysis without analyzing unspiked sample. Therefore, field duplicate and field blank information associated with well OW-146 cannot be evaluated for SVOC and PCB/pesticide spiking compounds. Sample FMM5-LF7-OW146-02 should be used to determine the concentrations of these compounds in an unspiked sample.

24.1.2 Round 2 Interim Monitoring

The frequency of laboratory QC was correct except for one batch of mercury analyses for which no MS/MSD RPD was reported. An estimated (J) qualifier was assigned to the four samples associated with this batch. See the inorganic data validation memorandum dated October 5, 1994, in Appendix P Addendum.

24.2 FIELD BLANKS

24.2.1 Round 1 Interim Monitoring

Two field blanks were collected in association with the samples collected from Landfills 7, 8, 9, and 10: samples FMM5-LF7-OW146-04 and FMM5-LF9-OW152-04.

Analytes detected in field blank FMM5-LF7-OW146-04 include alkalinity, beryllium, cadmium, calcium, chromium, cobalt, copper, lead, magnesium, silver, sodium, sulfate, thallium, toluene, total dissolved solids, vanadium, and zinc. Chromium, cobalt, copper, and silver were detected in the associated laboratory blank; their presence in the field blanks should be considered due to laboratory contamination. The concentrations of beryllium, cadmium, lead, thallium, toluene, total dissolved solids, vanadium, and zinc found in the field sample and field duplicate associated with FMM5-LF7-OW146-04 were approximately the same (within two times) or less than the concentrations detected in FMM5-LF7-OW146-04, therefore, it is unlikely the detections in the field blank were due to inadequate decontamination procedures. It is also unlikely that the analytes detected in the field blank were present in the source water used for decontamination since the analytes detected in both field blanks are not consistent. Zinc may be a contaminant introduced by the nitric acid preservative vials. A memorandum discussing contamination associated with the nitric acid preservatives is included as Appendix T of this report. Laboratory contamination or an unknown source of field contamination may be the most likely causes for the presence of the other analytes.

Analytes detected in field blank FMM5-LF9-OW152-04 include beryllium, calcium, cobalt, chromium, copper, magnesium, nickel, vanadium, and zinc. Chromium, cobalt, and copper were also detected in the associated laboratory blank; their presence in the field blanks should be considered due to laboratory contamination. Beryllium was not detected in the associated field sample or field duplicate. Zinc was detected in the field sample at a concentration 2-1/2 times greater than FMM5-LF9-OW152-04 and at the same concentration in the field duplicate, and may be a contaminant introduced by the nitric acid preservative vials (see Appendix T). At these levels, it is unlikely that the detections in the field blank were due to inadequate decontamination in the field. As previously discussed, it is also unlikely that the water used for decontamination is the cause and the detections in the field blank may be related to the laboratory or an unknown source of field contamination.

24.2.2 Round 2 Interim Monitoring

Two field blanks were collected in association with the samples collected from Landfills 7, 8, 9, and 10: samples FM94-LF7-OW146-04 and FM94-LF9-OW152-04.

Analytes detected in field blank FM94-LF7-OW146-04 include total dissolved solids, total mercury, and total zinc. Analytes detected in field blank FM94-LF9-OW152-04 include total dissolved solids, soluble mercury, soluble zinc, total mercury, total zinc, and total chromium.

Total dissolved solids, total mercury, and total zinc were also detected in a sample of the source water used for decontamination, therefore, the presence of these analytes in the field blanks should be considered false positives. The source of contamination for mercury and zinc has been determined to be the nitric acid preservative (see Appendix T).

Chromium detected in field blank FM94-LF9-OW152-04 was at a concentration equal to the detection limit of 10 ug/l. Since chromium was not detected in the laboratory blank or source water sample, but was detected in samples FM94-LF9-OW152-01 and FM94-LF9-OW152-02 at 50 ug/l and 40 ug/l, respectively, the presence of chromium in the field blank may be due to carryover during sampling. Field samples which may have been affected were qualified during the data quality assessment.

24.3 FIELD DUPLICATES

24.3.1 Round 1 Interim Monitoring

Two field duplicate pairs were collected in association with the samples from Landfills 7, 8, 9, and 10: samples FMM5-LF7-OW146-01 and FMM5-LF7-OW146-02, and samples FMM5-LF9-OW152-01 and FMM5-LF9-OW152-02.

For field duplicate pair FMM5-LF9-OW152-01 and FMM5-LF9-OW152-02, the RPD was outside of the limits specified for RPD in Table 10-1 of Quality Assurance Project Plan, Addendum No. 3, for RCRA Facility Investigation, November 1993 (QAPP Addendum No. 3) for 14 of the metals, chloride, total phosphate, and total dissolved solids. The Well Purging and Sample Collection form for well OW-152 was reviewed, and the sampler was asked if he could recall any circumstances that would account for the discrepancies in the field duplicate results. The Well Purging and Sample Collection form shows that during purging and sample collection, the water was characterized as having high turbidity and brown color. The sampler recalled that the turbidity of the sample from well OW-152 increased as the sample bottles were filled. If one of the field duplicate samples was more turbid and, therefore, contained a higher concentration of particulates, the concentrations of analytes in the sample might also differ.

For field duplicate pair FMM5-LF7-OW146-01 and FMM5-LF7-OW146-02, aluminum, cobalt, lead, and zinc failed to meet the $\leq$40 percent limit for RPD specified in Table 10-1 of the QAPP Addendum No. 3. The detections for aluminum were low level, ranging from 0.20 mg/l to 0.31 mg/l with a detection limit of 0.10 mg/l. The difference of approximately one detection limit between the field sample and field duplicate should not be considered significant. As discussed in Section 24.2.1, the results for cobalt, lead, and zinc may be due to laboratory or field contamination.

24.3.2 Round 2 Interim Monitoring

Two field duplicate pairs were collected in association with the samples from Landfills 7, 8, 9, and 10: samples FM94-LF7-OW146-01 and FM94-LF7-OW146-02 and samples FM94-LF9-OW152-01 and FM94-LF9-OW152-02.

Only one field duplicate analysis failed to meet the acceptance criteria. For field duplicate pair FM94-LF9-OW152-01 and FM94-LF9-OW152-02 the RPD for soluble lead was outside of the 40 percent limit specified in Table 10-1 of Quality Assurance Project Plan Addendum No. 4. The concentration in the sample was measured at 8 ug/l while the result reported for the field duplicate was a non-detect at a detection limit of 3 ug/l. This variability at concentrations near the detection limit should not be considered significant.

24.4 TRIP BLANKS

24.4.1 Round 1 Interim Monitoring

Two trip blanks were collected in association with the samples collected for VOC analysis from Landfills 7, 8, 9, and 10: samples FM5-TB05 and FMM5-TB07. Compounds detected in the trip blanks included 1,2-dichloropropane, 2-butanone, and chloroform. However, these compounds were not detected in associated samples, and therefore, are not affected.

24.4.2 Round 2 Interim Monitoring

One trip blank (FM94-TB03) was collected in association with the samples collected for VOC analysis from Landfills 7, 8, 9, and 10. No VOCs were detected.

25.0 ADDENDUM SUMMARY AND RECOMMENDATIONS

This RFI Addendum has been completed for four SWMUs discovered at Fort McCoy, Monroe County, Wisconsin during the period of the original RFI: Landfills 7, 8, 9, and 10. For this investigation, groundwater was sampled from the uppermost aquifer (the alluvial aquifer) to determine if the four newly identified SWMUs have had any impact on groundwater quality. A total of 14 new water table observation wells were installed. During Round 1 sampling, 12 groundwater samples were collected, and during Round 2 sampling, 13 groundwater samples were collected..

Two wells were not sampled during the Round 1 sampling, OW-150 at Landfill 8 and OW-154 at Landfill 10, and one well, was not sampled during the Round 2 sampling, OW-150 at Landfill 8. Evaluation of groundwater flow directions after well installation indicated these wells would not provide information on the landfills' potential impact on groundwater quality; OW-150 is located sidegradient of Landfill 8 and OW-154 is located sidegradient of Landfill 10.

25.1 DATA QUALITY SUMMARY

Data quality was evaluated during this RFI Addendum through the collection of field sample duplicates, field blanks, trip blanks, and laboratory quality control analyses. These measures of assessing data quality provide insight into data validity, weaknesses in sample quality and collection techniques, and where contamination may be introduced into samples.

25.1.1 Round 1 Data Quality

One of the field duplicate pairs showed a high degree of variability in the analytes that were detected. Field sampling documentation indicates that the well was properly purged prior to sample collection. However, the sampler recalled that a large volume of sample was removed from this well for collection of the field duplicate, quality assurance sample, and extra volume for laboratory quality control analyses, and the turbidity of the sample increased as the sample bottles were filled. The increased particulates in one sample of the duplicate pair may be the cause of this variability. It is not known if other samples which were characterized as having turbidity at the time of collection are affected.

Both laboratory blanks and field blanks had detections of analytes. Sample results within 10 times the concentration of the analytes detected in the laboratory blanks and within 5 times the concentration detected in the field blanks were qualified and are assumed to be false positives due to contamination. As discussed in Section 24.2, because of the levels of analytes found in both the samples and field blank were similar, it is unlikely that inadequate decontamination procedures are the cause. The presence of zinc may be due to contamination from the nitric acid preservative vials (see Section 24.2.1 and Appendix T).

Laboratory quality control information (matrix spikes, matrix spike duplicates, laboratory duplicates, surrogates, internal standards, laboratory control samples, and holding times) was also assessed. Sample results associated with quality control that did not meet the limits specified in the QAPP Addendum No. 3 were qualified. The technical memoranda discussing data validation, provided in

Appendix P Addendum, describes why results were qualified. Results qualified with a "J" are usable, however, sample bias may be associated with these analytical results. Results qualified with an "R" are considered unusable. PCB/pesticide results for two samples and the matrix spike compounds for semi-volatiles and PCB/pesticides for two other samples were coded "R". However, 3,052 out of 3,142 results are considered usable, and this corresponds to 97.1 percent data completeness.

25.1.2 Round 2 Data Quality

Both laboratory blanks and field blanks had detections of analytes. Sample results within 10 times the concentration of the analytes detected in the laboratory blanks and within 5 times the concentration detected in field blanks were qualified and are assumed to be false positives. As discussed in Sections 24.2 and 24.3, the levels of analytes found in both the samples and field blanks were similar. The source of the contamination for mercury and zinc has been determined to be the nitric acid preservatives (see Appendix T).

Laboratory quality control information (matrix spikes, matrix spike duplicates, laboratory duplicates, surrogates, internal standards, laboratory control samples, and holding times) was also assessed. Sample results associated with quality control that did not meet the limits specified in the QAPP Addendum No. 4 were qualified. The technical memoranda discussing data validation, provided in Appendix P Addendum, describes why results were qualified. Results qualified with a "J" are usable, however, sample bias may be associated with these analytical results. Results qualified with an "R" are considered unusable. Herbicide results for 2,4,5-T for four samples were coded "R". However, 3,422 out of 3,426 are considered usable , and this corresponds to 99.9 percent data completeness.

25.2 RFI RESULTS AND RECOMMENDATIONS

Results of the RFI for each SWMU are presented in Sections 20 through 23 of this report. These results are summarized below. Recommendations for each SWMU are also presented.

25.2.1 Landfill 7

25.2.1.1 Results

Six VOCs (acetone, benzene, ethyl benzene, methylene chloride, toluene, and xylenes) were detected in wells at the site. Acetone and methylene chloride are common laboratory contaminants, and their presence in field samples at concentrations less than 10 times that found in field and laboratory blanks is considered a false positive. This conclusion is supported by the fact that neither compound was detected during Round 2 sampling. Benzene, ethyl benzene and xylene were only detected at downgradient well OW-145. Benzene was the only analyte present at concentrations above the WAC NR 140 Public Health Preventive Action Limit (PAL) and Enforcement Standard (ES), and above the carcinogenic RBC. Toluene was detected at concentrations below the WAC NR 140 PAL.

Four SVOCs, 2-methylnaphthalene, acenaphthene, di-n-butylphthalate, and fluorene were also detected at downgradient well OW-145 during one of the sampling rounds at concentrations near the detection limit. None of these analytes have listed regulatory standards.

Thirteen metals were detected in downgradient wells OW-145 and OW-146. Only five of these metals, iron, lead, manganese, mercury, and silver were present at concentrations that exceed the concentration in upgradient well OW-144 and that exceed the WAC NR 140 Public Health PAL (mercury) or ES (lead and silver) or the Public Welfare PAL and ES (iron and manganese). The mercury and silver detections, however, were qualified J (estimated). Lead was detected above the non-carcinogenic RBC at upgradient and downgradient wells for both sampling rounds. Manganese was detected at concentrations above the non-carcinogenic RBC at upgradient well OW-144 during Round 1 and at downgradient wells OW-145 and OW-146 for both sampling rounds. Silver was detected only at downgradient well OW-146 during Round 1 sampling and qualified as J (estimated), but the concentration exceeded the non-carcinogenic RBC. Iron, lead, and manganese are also present in the upgradient well at concentrations that exceed the WAC NR 140 Public Health PAL (lead) and Public Welfare PAL and ES (iron and manganese) PAL. Standards for iron and manganese are public welfare-based, that is, they are based on aesthetic characteristics of groundwater used for drinking and not on public health concerns. Mercury and zinc were detected in all samples during Round 2 sampling. Further investigation indicates that these are contaminants introduced in Round 2 sampling (see Section 24 and Appendix T).

Water quality parameters alkalinity, chemical oxygen demand, nitrate/nitrite nitrogen, chloride, total dissolved solids, and sulfate were detected at higher concentrations in the downgradient wells than in the upgradient well. The concentration of nitrate/nitrite nitrogen in well OW-146 during the Round 2 sampling exceeded the WAC NR 140 Public Health PAL.

25.2.1.2 Recommendations

Landfill 7 is located adjacent to two parking lots and, due to construction of the Consolidated Maintenance Facility, presence of Closed Landfill 5, and operations at the Equipment Concentration Site, there will not likely be residents living on or near this SWMU. The monitoring wells installed are functional, and long-term groundwater monitoring is recommended.

Further corrective measures are not warranted because there will be no adults or children living on Landfill 7 and groundwater at Landfill 7 will not be used as a drinking water source. Evaluation of changing groundwater conditions may warrant future action or result in a reduction of monitoring requirements. Therefore, this unit is not recommended to be included in the CMS.

25.2.2 Landfill 8

25.2.2.1 Results

Three VOCs, acetone, methylene chloride, and toluene were detected in all three wells at this site during the Round 1 sampling; toluene was also detected at downgradient well OW-147 during Round 2 sampling. None of these analytes were present at concentrations above the WAC NR 140 Public Health Preventive Action Limit (PAL). Acetone and methylene chloride are common

laboratory solvents; their presence in field samples during Round 1 sampling at concentrations less than 10 times that found in field and laboratory blanks is considered a false positive. This conclusion is supported by the fact that neither compound was detected during Round 2 sampling.

Eight metals, arsenic, cadmium, chromium, copper, iron, lead, manganese, and mercury, were detected in downgradient wells OW-147 and/or OW-149 at concentrations that exceed the concentration in upgradient well OW-148 and that exceed the WAC NR 140 Public Health PAL (arsenic, copper, and mercury) or the ES as well (cadmium, chromium, and lead) or the Public Welfare PAL and ES (iron and manganese). Chromium, iron, lead, manganese, and mercury were also present in upgradient well OW-148 at concentrations that exceed the Public Health PAL (chromium, lead, and mercury) or the Public Welfare PAL and ES (iron and manganese). The mercury detections were qualified as J (estimated) and may be of contamination introduced during sampling (see Section 24 and Appendix T). The Public Welfare PAL and ES for iron and manganese are based on the aesthetic characteristics of groundwater used for drinking and not on public health concerns. Arsenic concentrations detected in downgradient well OW-147 also exceeded the non-carcinogenic RBC, and the manganese concentrations detected in all wells were above the non-carcinogenic RBC. Lead was detected at concentrations above the non-carcinogenic RBC at upgradient and downgradient wells during Round 1 sampling and at downgradient well, OW-147, during Round 2 sampling. Beryllium was detected at a concentration above the carcinogenic RBC in downgradient well OW-147 during Round 2 sampling.

Water quality parameters alkalinity, chemical oxygen demand, nitrate/nitrite nitrogen, chloride, total phosphate, total dissolved solids, and sulfate were detected at higher concentrations in the downgradient wells than in the upgradient well. None of these analytes were present at concentrations that exceed the WAC NR 140 Public Health or Public Welfare PALs.

25.2.2.2 Recommendations

Because of health risks and regulatory (WAC NR 140) exceedances of both the Public Health PAL or ES requirements, additional groundwater monitoring may be necessary to evaluate the inconsistent contaminant trends observed in Round 1 and Round 2 groundwater sampling. Based on information available to date, Landfill 8 is not recommended to be included in the CMS until additional information (groundwater data) provides a clearer representation of groundwater conditions.

25.2.3 Landfill 9

25.2.3.1 Results

One SVOC, bis (2-ethylhexyl) phthalate, was present in both wells and the field blank during Round 1 sampling at concentrations that exceed the WAC NR 140 Public Health PAL. This analyte is considered common in laboratory environments and its presence in samples at concentrations less than 10 times that found in field and laboratory blanks is considered a false positive. This conclusion is supported by the fact that this compound was not detected in either well or in the field blank during Round 2 sampling.

Six metals, arsenic, chromium, iron, lead, manganese, and mercury, were detected at concentrations (total metals analyses) that exceed those in the upgradient well and that exceed the WAC NR 140 Public Health PAL (arsenic, chromium, and mercury) and ES as well (lead) or the Public Welfare PAL and ES (iron and manganese). Cadmium, chromium, iron, lead, and silver were also present in total metals analyses of the upgradient well at concentrations that exceed the WAC NR 140 Public Health PAL (chromium) and ES as well (cadmium, lead, and silver) or the Public Welfare PAL and ES (iron). Cadmium, chromium, and silver detections in these wells were qualified as B or BJ because of detections in field or method blanks. The PAL and ES for iron and manganese are public-welfare based, that is, based on the aesthetic characteristics of groundwater used for drinking and not on public health concerns. Arsenic was also detected in the downgradient well (OW-152) during Round 1 sampling (total metals analysis) at concentrations that exceeded the non-carcinogenic RBC, although arsenic was not detected during Round 2 in either the total metals or dissolved metals analyses of either well. Manganese was detected above the non-carcinogenic RBC only during Round 1 sampling (total metals analysis) of the downgradient well in both OW-152 and the OW-152 field duplicate. Beryllium (total metals analysis) was detected above the carcinogenic RBC in upgradient well OW-151 during the Round 1 sampling, but was not detected during Round 2 sampling or in the dissolved metals analyses. Lead (total metals analysis) was detected above the non-carcinogenic RBC in both the upgradient and downgradient wells. Dissolved lead exceeded the non-carcinogenic RBC only in the downgradient well, and was not detected in the upgradient well.

During the Round 2 groundwater sampling, the samples were also analyzed for dissolved metals in order to evaluate the effect of turbidity on metal concentrations in the groundwater. In general, the metals detected at Landfill 9 are derived from particulates in the groundwater, and are not dissolved constituents in the water. Only four metals were detected in the dissolved metals analysis: lead, manganese, mercury, and zinc, and mercury and zinc were determined to be contaminants introduced during sampling (see Section 24 and Appendix T). Dissolved lead was detected only in the downgradient well OW-152 at a concentration above the PAL, but was undetected in the OW-152 field duplicate and in the upgradient well. Dissolved manganese concentrations were below the PAL and ES requirements as well as the non-carcinogenic RBC.

25.2.3.2 Recommendations

Additional groundwater monitoring may be necessary to evaluate the inconsistent contaminant trends observed in Round 1 and Round 2 groundwater sampling because of health risks and regulatory (WAC NR 140) exceedances of both the Public Health PAL or ES requirements in wells installed at Landfill 9. Based on information available to date, Landfill 9 is not recommended to be included in the CMS.

25.2.4 Landfill 10

25.2.4.1 Results

Four VOCs, acetone, chloroform, methylene chloride, and toluene, were detected in wells at this site. Acetone and methylene chloride are common laboratory solvents, however, and their presence in field samples only during Round 1 sampling and at concentrations less than 10 times that found in field and laboratory blanks is considered a false positive. Chloroform is also common in laboratory

environments, and its one time detection during Round 1 sampling also suggests it is a laboratory contaminant in this case. Neither acetone, chloroform, or methylene chloride were detected in Round 2 groundwater sampling. Toluene was detected at concentrations less than the WAC NR 140 Public Health PAL.

One SVOC, bis (2-ethylhexyl) phthalate, was present in upgradient well OW-155 and downgradient wells OW-156, OW-157, and OW-158 during Round 1 sampling at concentrations that exceed the WAC NR 140 Public Health PAL and ES. This analyte is considered common in laboratory environments and its presence in samples at concentrations less than 10 times that found in field and laboratory blanks is considered a false positive. This conclusion is supported by the fact that this compound was not detected in any of the wells during Round 2 sampling.

Only two metals, iron and lead, were present at concentrations that exceed the concentration in upgradient well OW-155 and that exceed the WAC NR 140 Public Health PAL (lead) or Public Welfare PAL and ES (iron). Chromium, iron, lead, and manganese were also present in the upgradient well at concentrations that exceed the WAC NR 140 Public Health PAL (lead) and ES as well (chromium) or Public Welfare PAL and ES (iron and manganese). Chromium and lead were only detected during Round 1 sampling, and the chromium detections were qualified as B because of detection in a sample blank. The standards for iron and manganese are public welfare based, that is, they are based on aesthetic characteristics of groundwater used for drinking, not on public health concerns. No RBCs were exceeded for compounds detected at this SWMU.

Water quality parameters alkalinity, chemical oxygen demand, nitrate/nitrite nitrogen, total phosphate, total dissolved solids, and sulfate were detected at higher concentrations in the downgradient wells than in the upgradient well.

25.2.4.2 Recommendations

Because of health risks and regulatory (WAC NR 140) exceedances of both the Public Health PAL or ES requirements in wells installed at Landfill 10, additional groundwater monitoring may be necessary to evaluate the inconsistent contaminant trends observed in Round 1 and Round 2 groundwater sampling. Based on information available to date, Landfill 10 is not recommended to be included in the CMS.

26.0 ADDENDUM REFERENCES

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APPENDIX E-1 ADDENDUM

DRILLING LOGS FOR MONITORING WELLS

(No boring logs exist for well points
OW-102, OW-103, OW-121, and OW-122)

HTW DRILLING LOG

HOLE NO. OW-144

1. COMPANY NAME: Rust E+I	2. DRILLING SUBCONTRACTOR: WTD	SHEET 1 OF 2 SHEETS
3. PROJECT: Fort McCoy Mod 5	4. LOCATION: Landfill 7 SE 1/4, NW 1/4, Sec 13, T18N, R3W	
5. NAME OF DRILLER: Brian Loveland	6. MANUFACTURER'S DESIGNATION OF DRILL: Truck Mounted Dietrick (D-50)	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6 1/4" ID Hollow Stem Augers; 2" standard split spoon 24" long stainless steel	8. HOLE LOCATION: N 743211.40 E 1819929.96	
	9. SURFACE ELEVATION: 898.8' MSL	
	10. DATE STARTED: 01-Dec-93	11. DATE COMPLETED: 01-Dec-93
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 10.5'	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 11.0' after 1.5 hours	
14. TOTAL DEPTH OF HOLE: 19'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
X	X		NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA						NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
OW-144		X		Timothy P. Giles 1-18-94 BJL

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
	0–1	F: 11 to 1'.	32.0 ppm	OW-144 01		5 7 n=12 5 6	Recovery 100%
	1–2	medium dense (10YR3/1) very dark grey SILTY SAND (SM) moist, non-plastic, non-cohesive; grains are well rounded; alluvium.	13:15	12:50			
	2–3	Loose, (10YR3/1 to 10YR4/4) very dark gray to dark brownish yellow ~~SILTY SAND (SM)~~, moist non-plastic, non-cohesive, alluvium. POORLY GRADED SAND WITH SILT (SP-SM) BJL	11.0 ppm	OW-144 02		4 3 n=7 4 7	Recovery 100%
	3–4		13:15	12:55			
	4–5	medium dense (10YR 8/2 to 10YR 6/6) very pale brown mottled to brownish yellow POORLY GRADED SAND (SP), non-plastic, non-cohesive, alluvium. moist,	2.0 ppm	ow-144 03		5 5 n=12 7 6	Recovery 75%
	5–6		13:25	13:00			
	6–7	medium dense (10YR8/2 and 10YR6/6 grading to 2.5YR7/2) white and brownish yellow, grading to pale red POORLY GRADED SAND (SP), moist, non-plastic, non-cohesive, alluvium.	2.0 ppm	OW-144 04		5 7 n=15 8 11	Recovery 60%
	7–8		13:25	13:04			
	8–9	as above	2.0 ppm	OW-145 05		4 5 n=12 7 9	Recovery 65%
	9–10	Wet at ±9'.	13:40	13:08			

HTW DRILLING LOG

HOLE NO. OW-144

PROJECT Fort McCoy Mod 5 | INSPECTOR Timothy P. Giles BJL | SHEET 2 OF 2 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
	10	medium dense (2.5YR 7/2 to 2.5YR 6/2) pale red, POORLY GRADED SAND, (SP) wet, non-plastic, non-cohesive, alluvium.	90.0ppm	OW-144		5	Recovery
	11		13:45	06		7 n=18 11	50%
				13:11		13	wet at 10.5.
	12	as above, but (5YR 7/2) pinkish gray.	1.5ppm	OW-144		4	Recovery
	13			07		5 5 n=10	40%
			13:45	13:17		7	
	14	as above.	0.0ppm	OW-144		7	Recovery
	15			08		8 n=16 8	30%
			13:50	13:23		9	
	16	as above, but loose.	0.0ppm	OW-144		3	Recovery
	17			09		4 n=7 3	30%
			13:55	13:30		5	
	18						
	19	EOB at 19' 01-Dec-93					
		OW-144 set in hole 01-Dec-93					

HTW DRILLING LOG

HOLE NO. OW-145

1. COMPANY NAME: Rust E&I	2. DRILLING SUBCONTRACTOR: WTD	SHEET 1 OF 2 SHEETS
3. PROJECT: Fort McCoy Mod.5 Landfill 17	4. LOCATION: Landfill 7 - SE¼, NW¼ sec 13, T18N R13W	
5. NAME OF DRILLER: Mike Mueller	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-57	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8¼" ID Hollow Stem Augers; 2" standard split spoon, 24" long stainless steel	8. HOLE LOCATION: N 743392.55 E 1819735.77	
	9. SURFACE ELEVATION: 896.5' MSL	
	10. DATE STARTED: 08-Dec-93	11. DATE COMPLETED: 08-Dec-93
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 11.5	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 13.0 ft - 10-Dec-93	
14. TOTAL DEPTH OF HOLE: 20.0	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	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 %
NA						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR	
OW-145		OW-145		[signature]	TJK 1-18-94

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
	0	dense medium (10YR2/2) very dark brown, POORLY GRADED SAND (SP), moist, non-plastic, non-cohesive, fill. BJK 1-18-94	3.2 ppm 10:29	OW-145 01 9:58		12 11 12 14 n=23	Recovery 70%
	2	dense medium (10YR6/6) brownish yellow POORLY GRADED SAND (SP), moist, non-plastic, non-cohesive, alluvium. BJK 1-18-94	8.4 ppm 10:35	OW-145 02 10:02		5 6 9 11 n=15	Recovery 60%
	4	BJK 1-18-94 as above.	0.0 ppm 10:40	OW-145 03 10:06		4 6 9 9 n=15	Recovery 70%
	6	BJK 1-18-94 (10YR 7/4) very pale brown as above. BJK 1-18-94	0.0 ppm 10:48	OW-145 04 10:10		4 10 10 12 n=20	Recovery 70%
	8	BJK 1-18-94 As above	6.0 ppm 10.48	OW-145 05 10:13		4 7 10 11 n=17	Recovery 80%
	10						

HTW DRILLING LOG

HOLE NO. OW-145

PROJECT: Fort McCoy Mod 5 Landfill 7

INSPECTOR: B.J. LeRoy

SHEET 2 OF 2 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
		dense light HSA BJL medium, (5Y 7/2) ~~yellowish~~ gray POORLY GRADED SAND, (SP), moist, non-plastic, non-cohesive, alluvium. Grains are fine, well rounded.	0.0ppm 10:52	OW-145 06 10:18		7 8 n=18 10 11	Recovery 80% wet at ± 11.5
	12	BJL 1-18-94 ~~medium~~, as above. Wet.	0.0ppm 10:52	OW-145 07 10:22		5 6 n=15 9 10	Recovery 80%
	14	BJL 1-18-94 ~~medium~~ as above.	0.0ppm 10:55	OW-145 08 10:27		4 4 6 n=10 10	Recovery 90%
	16	BJL 1-18-94 ~~medium~~, as above	0.0ppm 11:00	OW-145 09 10:30		3 6 n=14 8 13	Recovery 70%
	18	dense light HSA BJL medium, (5Y 7/2) ~~yellowish~~ gray, POORLY GRADED SAND, (SP), wet, non-plastic, non cohesive, alluvium. Grains are fine, well rounded.	0.0ppm 11:00	OW-145 10 10:33		7 8 n=17 9 12	Recovery 60%
	20	EOB 20.0 ft 10:35 08-Dec-93 OW 145 set in Hole 11:00 08-Dec-93					

HTW DRILLING LOG

HOLE NO. OW-146

1. COMPANY NAME: Rust E+I	2. DRILLING SUBCONTRACTOR: WTD	SHEET 1 OF 2 SHEETS
3. PROJECT: Fort McCoy Mod 5 Landfill 7	4. LOCATION: Landfill 7, SE 1/4, NW 1/4, sec 13, T18N R3W	
5. NAME OF DRILLER: Mike Mueller	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-57	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6 1/4" ID Hollow Stem Augers; 2" standard Split Spoon; 24" long Stainless steel	8. HOLE LOCATION: N 743228.69 E 1819653.60	
	9. SURFACE ELEVATION: 896.4' MSL	
	10. DATE STARTED: 08-Dec-93	11. DATE COMPLETED: 08-Dec-93
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 11.5	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 13.88 - 10-Dec-93	
14. TOTAL DEPTH OF HOLE: 20'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
BJK	✓		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
NA						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
OW-146		OW-146		BJK TJK 2-18-94

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
		dense, medium (10YR6/6) brownish yellow, POORLY GRADED SAND (SP), moist, non-plastic, non-cohesive, alluvium. Grains are fine, well rounded. BJK 1-18-94	0.0 ppm 8:33	OW-146 01 8:04		5 6 6 10 n=12	Recovery 70%
2		dense, medium (10YR7/4) very pale brown, as above. BJK 1-18-94	0.0 ppm 8:37	OW-146 02 8:07		9 12 17 18 n=29	Recovery 60%
4		as above. BJK 1-18-94	0.0 ppm 8:43	OW-146 03 8:11		8 9 12 12 n=21	Recovery 60%
6		dense, medium (10YR6/6) brownish yellow, POORLY GRADED SAND (SP) moist, non-plastic, non-cohesive, alluvium. Grains are fine, well rounded. BJK 1-18-94	0.0 ppm 8:48	OW-146 04 8:16		9 12 13 15 n=25	Recovery 70%
8		BJK 12-8-93 ~~10YR 5YR~~ (5Y7/2) light gray, as above. BJK 1-18-94	0.0 ppm 8:55	OW-146 05 8:22		5 6 10 20 n=16	Recovery 80%

HTW DRILLING LOG

HOLE NO. OW-146

PROJECT: Fort McCoy Mod 5 Landfill | INSPECTOR: B.J. LeRoy | SHEET 2 OF 2 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
		~~dense~~ medium, as above.	0.0ppm 8:55	OW-146 06 8:28		5 6 n=14 8 10	wet at = 11.5 Recovery 90%
	12	dense medium (5Y 7/2) light ~~yellowish~~ gray POORLY GRADED SAND, (SP), wet, non-plastic, non-cohesive, alluvium. Grains are ~~fine~~ medium, well rounded.	0.0ppm 9:00	OW-146 07 8:32		5 8 n=19 11 17	Recovery 70%
	14	as above.	0.0ppm 9:10	OW-146 08 8:35		6 8 n=17 9 17	Recovery 90%
	16	as above	0.0ppm 9:10	OW-146 09 8:40		5 12 n=34 22	Recovery 18"/18" = 100%
	18	dense medium (5Y 7/2) light ~~yellowish~~ gray, POORLY GRADED SAND (SP), wet, non-plastic, non-cohesive, alluvium. Grains are ~~fine~~ medium, well rounded.	0.0ppm 9:16	OW-146 10 8:45		3 7 n=15 8 10	Recovery 80%
	20	EOB 20.0ft 8:50 08-Dec-93 OW-146 set in hole 9:30 08-Dec-93					

HTW DRILLING LOG

HOLE NO. OW147

1. COMPANY NAME: Rust Environment & Infrastructure	2. DRILLING SUBCONTRACTOR: WTD
SHEET 1 OF 2 SHEETS	
3. PROJECT: FORT McCOY - MOD 5	4. LOCATION: Landfill 8 - NW¼, NW¼, sec. 27, T18N, R3W
5. NAME OF DRILLER: Bryan Loveland & Mike Mueller	6. MANUFACTURER'S DESIGNATION OF DRILL: Dietrick (D-50) & Mobil B-57
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Split Spoon * 24" x 2" Stainless; 6¼" ID Hollow Stem Augers	8. HOLE LOCATION: N 733339.03 E 1808437.87
	9. SURFACE ELEVATION: 854.2' MSL
	10. DATE STARTED: 12/1/93 — 11. DATE COMPLETED: 12/2/93
12. OVERBURDEN THICKNESS: 6.5'	15. DEPTH GROUNDWATER ENCOUNTERED: 15' TOG.
13. DEPTH DRILLED INTO ROCK: 17'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
14. TOTAL DEPTH OF HOLE: 23.5'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
X			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		Timothy P. Mills TK 2-18-94

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
	1	Loose (10YR 3/1 grading to 10YR 3/4) Very dark gray to dark yellowish brown, POORLY GRADED SAND with silt (SP-SM), non-plastic/cohesive, fine grained, moist, TNA Alluvium, moist, rounded grains, some roots to 1' depth.	0 ppm @ 0910	OW147 01 @ 0839		5 4 ∞ 4 = 8 3	90% REC. 12-1-93
	2						
	3	As Above, but Medium Dense (10YR 3/4 to 2.5' depth, mottled 10YR 8/4 and 10YR 7/3) Dark yellowish brown, mottled very pale brown to yellow, no roots.	0 ppm @ 0915	OW147 02 @ 0843		5 7 15 8 = 15 7	90% REC 12-1-93
	4						
	5	As Above, but Dense (Alternating bands 1-2" thick of 10YR 8/2 and 10YR 5/6) very pale brown and yellowish brown.	0 ppm @ 0915	OW147 03 @ 0847		10 17 46 29 = 75 44	50% REC 12-1-93
	6						
	7	As Above to 6.5' / SANDSTONE (10YR 8/3 to 10YR 7/6) very pale brown to yellow, moist, Fine to Medium grained, round grains, poorly cemented.	0 ppm @ 0930	OW147 04 @ 0856		48 100 for 12"	40% REC of 12" 12-1-93
	8						
	9	As Above.	0 ppm @ 0930	OW147 05 @ 0901		43 100 for 12"	85% REC of 12" 12-1-93

HTW DRILLING LOG

HOLE NO. OW147

PROJECT FORT McCOY - MOD 5

INSPECTOR Timothy P. Mc...

SHEET 2 OF 2 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. A e R	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	11	As Above.	0 ppm @ 1000	OW 147 -06 @ 0906		57 100 For 12"	70% REC of 12" 12-1-93
	12						
	13	As Above.	0 ppm @ 1015	OW 147 -07 @ 0913		100 for 6"	80% REC of 6" 12-1-93
	14	As Above, but wet.	0 ppm @ 1015	OW 147 -08 @ 0925		100 for 3"	100% REC for 3" 12-1-93
	15						
	16	As Above, but Saturated.	0 ppm @ 1200	OW 147 -09 @ 1125		100 for 4"	100% REC for 4" 12-2-93
	17						
	18	As Above, but (10YR6/6) Brownish Yellow.	0 ppm @ 1218	OW 147 -10 @ 1145		100 for 6"	100% REC for 6" 12-2-93
	19						
	20	As Above.	0 ppm @ ~~1435~~ TPG 1233	OW 147 -11 @ 1205		100 for 6"	100% REC of 6" 12-2-93
	21						
	22						
	23						
	24	BOREHOLE TERMINATED @ 23.5' Depth					
	25						
	26						
	27						

HTW DRILLING LOG

HOLE NO. OW-148

1. COMPANY NAME: Rust E+I	2. DRILLING SUBCONTRACTOR: WTD	SHEET 1 OF 2 SHEETS
3. PROJECT: Fort McCoy Mod 5	4. LOCATION: Landfill 8- NW¼, NW¼, Sec 27, T18N, R3W	
5. NAME OF DRILLER: Mike Mueller	6. MANUFACTURER'S DESIGNATION OF DRILL: B-57	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6¼" Hollow Stem Augers I.D.; 2" standard split spoon; 24" long stainless steel	8. HOLE LOCATION: N 733428.71 E 1808437.63	
	9. SURFACE ELEVATION: 849.6' MSL	
	10. DATE STARTED: 01-Dec-93	11. DATE COMPLETED: 01-Dec-93
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 8.5'	
13. DEPTH DRILLED INTO ROCK: 4'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 13.5'	
14. TOTAL DEPTH OF HOLE: 20'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 10.5' - utility installation 01-Dec-93	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	X		NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA						NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
OW-148		OW-148		B.J. TK 2-18-94

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
	1	BJH-18-SP dense c 3BJH-18-SP very dark medium (5YR 3/2) grayish brown POORLY GRADED SAND (SP) SP BJH-18-SP SILTY SAND (SM), moist, non plastic non cohesive, medium well rounded grains, ≈ 15 % silt and clay. Alluvium.	OW-148 0.0 ppm 9:19	OW-148 01 849		2 5 n=12 7 8	Recovery 90%
	2	dense BJH-18-SP very pale brown medium (10YR 7/4) POORLY GRADED SAND (SP), moist, non plastic, non cohesive; medium, well rounded grains. Alluvium.	0.0 ppm 9:27	OW-148 02 8:57		2 5 n=16 11 16	90%
	3.8'						
	4	very stiff (5YR 5/2) grayish BJH-18-SP brown SILT (SM), moist, BJH-18-SP Lean clay (CL), moist, medium plastic, cohesive, stained 10yr 6/6 dark yellowish orange along ped faces. ≈ 5 to 10% sand. Alluvium.	0.0 ppm 9:27	OW-148 03 9:01		4 6 n=16 10 12	90%
	6	as above	1.0 ppm 9:41	OW-148 04 9:10		1 3 n=9 6 6	90%
	8	as above 1" sand seams at 8.5 and 9.5	0.8 ppm 9:45	OW-148 05 9:15		1 3 n=9 6 8	90% wet at 8.5
	9.9'						
	10						

HTW DRILLING LOG

HOLE NO. OW-148

PROJECT Fort McCoy Mod 5 | INSPECTOR B.J. LeRoy | SHEET 2 OF 2 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
	10	Very dense, (10YR 7/4) ~~very pale~~ brown POORLY GRADED SAND (SP) with SILT (SP-SM), wet, non plastic, non cohesive; fine, well rounded grains. Alluvium.	0.6 ppm 9:51	OW-148 06 9:23		4 100 for 9"	Recovery 40%
	12	Very dense, (10YR 6/6) ~~dark~~ brownish yellow ~~orange~~, POORLY GRADED SAND (SP) with SILT (SP-SM), wet, non plastic, non cohesive, medium well rounded grains. Alluvium.	0.0 ppm 9:59	OW-148 07 9:29		100 for 7"	Recovery 30%
	14	as above	0.0 ppm 10:10	OW-148 08 9:39		100 for 8"	Recovery 30%
	16					50	Recovery 0% Rock - Refusal of split spoon
	18	Blind Drill to 20.0					
	20	EOB 20.0 feet 10:03 01-Dec-93 OW-148 Installed 01-Dec-93					

HTW DRILLING LOG

HOLE NO. OW149

1. COMPANY NAME: Rust Environment & Infrastructure	2. DRILLING SUBCONTRACTOR: WTD	SHEET 1 OF 2 SHEETS
3. PROJECT: FORT McCOY - MOD 5	4. LOCATION: Landfill 8 - NW1/4, NW1/4, Sec. 27 T18N, R3W	
5. NAME OF DRILLER: Bryan Loveland	6. MANUFACTURER'S DESIGNATION OF DRILL: Dietrick (D-50) Truck Mounted	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Split Spoon * 24" x 2" Stainless Steel; 6 1/4" ID Hollow Stem Auger	8. HOLE LOCATION: N 733330.2 E 1808506.9	
	9. SURFACE ELEVATION: 850.6' MSL	
	10. DATE STARTED: 12/8/93	11. DATE COMPLETED: 12/8/93
12. OVERBURDEN THICKNESS: 13.8'	15. DEPTH GROUNDWATER ENCOUNTERED: 10'	
13. DEPTH DRILLED INTO ROCK: 6.2'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 20'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
X			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
N/A						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		TJK 2-18-94

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
	1	Medium Dense (10YR 3/2) very dark grayish Brown, POORLY GRADED SAND (SP), non-plastic/cohesive, Fine grained Alluvium, moist rounded grains, roots to 1' depth.	0 ppm @ 0915	OW149 -01 @ 0840		7 7 9 11 n=16	100% REC
	2						
	3	As Above, but (10YR 3/2 to 3.5' depth 10YR 5/4) very dark grayish brown to light yellowish	0 ppm @ 0915	OW149 -02 @ 0845		4 6 5 6 n=11	95% REC
	4	brown, no roots.					
	5	As Above but (10YR 5/4 to 10YR 7/8) ~~Dark yellowish Brown~~ to very Pale Brown to yellow.	0 ppm @ 0915	OW149 -03 @ 0847		7 9 8 7 n=17	60% REC
	6						
	7	As Above.	0 ppm @ 0930	OW149 -04 @ 0851		4 7 11 14 n=18	50% REC
	8	As Above to 9' depth / ~~STIFF~~ Very Hard (7.5YR 5/3) Brown SILTY CLAY (CL) very plastic WET, numerous Sandy lamina and partings	0 ppm @ 0930	OW149 -05 @ 0856		6 18 23 20 n=41	65% REC
	9						

HTW DRILLING LOG

HOLE NO. OW149

PROJECT Fort McCoy

INSPECTOR Timothy P. Myhre

SHEET 2 OF 2 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. A e R	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	11	DAR HS-FH Very Stiff / As Above, but Saturated.	0 ppm @ 0930	OW 149 -06 @ 0904		10 11 14 17 N=25	100% REC
	12 13	As Above, but Hard, (10YR 5/6) reddish Yellow.	0 ppm @ 0945	OW 149 -07 @ 0915		17 22 28 44 N=50	90% REC Very Hard @ 13.3' probable SANDSTONE
	14 15	SANDSTONE (10 YR 8/3 TO 10YR 7/6) very pale Brown TO yellow, saturated, fine to medium grained, some coarse grains, round grains, poorly cemented.	0 ppm @ 1015	OW 149 -08 @ 0928		34 100 for 12"	75% REC of 12"
	16 17	As Above.	0 ppm @ 1015	OW 149 -09 @ 0935		100 for 9"	75% REC of 9"
	18 19	As Above.	0 ppm @ 1015	OW 149 -10 @ 0942		100 for 8"	100% REC for 8"
	20 21	BOREHOLE TERMINATED @ 20' Depth		OW 149			
	22 23 24 25 26 27						

HTW DRILLING LOG

HOLE NO. OW-150

1. COMPANY NAME: Rust E&I	2. DRILLING SUBCONTRACTOR: WTD	SHEET 1 OF 2 SHEETS
3. PROJECT: Fort McCoy Mod 5	4. LOCATION: Landfill 8 - NW¼, NW¼, Sec 27, T18N, R3W	
5. NAME OF DRILLER: Mike Mueller	6. MANUFACTURER'S DESIGNATION OF DRILL: B-57	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6¼" ID Hollow Stem Auger; 2" standard split spoon 24" long stainless steel	8. HOLE LOCATION: N 733474.91 E 1808574.65	
	9. SURFACE ELEVATION: 846.1' MSL	
	10. DATE STARTED: 01-Dec-93	11. DATE COMPLETED: 01-Dec-93
12. OVERBURDEN THICKNESS: NA.	15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 7.5'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 8' - 2 hours later	
14. TOTAL DEPTH OF HOLE: 17.5'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	X		NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA						NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
OW-150		X		B.A. EP TJK 2-18-94

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
	1	Very loose (10YR 4/2) dark brown, POORLY GRADED SAND WITH SILT, (SP-SM), moist, non plastic, non cohesive, medium, well rounded grains. Alluvium.	2.4 ppm 13:58	OW-150 BH4 01 13:24		1 2 n=4 2 3	Recovery 70%
	2 3	loose, as above 3" clay seam at 2.9'	0.0 13:58	OW-150 02 13:29		1 3 n=9 6 7	Recovery 100%
	4	loose, (10YR 6/2) POORLY GRADED SAND (SP), moist, non plastic non cohesive; medium well rounded grains, Alluvium					
	5	medium dense as above	0.0 ppm 14:07	OW-150 03 13:35		7 8 n=20 12 19	Recovery 80%
	6 7	medium dense as above wet	0.0 ppm 14:07	OW-150 04 13:38		5 12 n=25 13 13	Recovery 60% wet at 6'
	8 9	medium dense (10YR 8/2) white WITH SILT (SP-SM) POORLY GRADED SAND (SP), wet, non plastic, non cohesive; medium, well rounded grains. Alluvium	0.0 ppm BJE 14:15	OW-150 05 13:45		4 7 n=19 12 15	Recovery 60 %
	10						

HTW DRILLING LOG

HOLE NO. OW-150

PROJECT: Fort McCoy Mod 5 Landfill B

INSPECTOR: B.J. LeRoy

SHEET 2 OF 2 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. A e R	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	10	dense medium as above	0.0 ppm 14:20	OW-150 06 13:55		6 12 n=25 13 20	Recovery 100%
	12	dense medium as above	0.0 ppm BJL 14:29	OW-15 07 13:59		3 6 n=18 12 13	Recovery 100%
	13.3	very stiff, (10YR 4/2) dark gray brown lean CLAY (CL), wet, medium plasticity, cohesive, stained along broken peds, 10YR 6/6 dark yellowish orange. Alluvium.					
	14.4	loose medium (5Y 4/1) dark olive gray lean clay (CL) wet, medium plasticity, cohesive, unstained. Alluvium.	0.0 ppm 14:45	OW-15 08 14:10		1 2 n=7 5 5	Recovery 90%
	16	Blind drill to 17.5					
	17						
	17.5	EOB 17.5 14:30 01-Dec-93 set OW-150 at 16' 01-Dec-93					

HTW DRILLING LOG

HOLE NO. ow-151

1. COMPANY NAME: Rust E→I	2. DRILLING SUBCONTRACTOR: UTD
SHEET 1 OF 3 SHEETS	
3. PROJECT: Fort McCoy Mod 5 Landfill 9	4. LOCATION: Landfill 9 - NW¼, NW¼, sec 27, T18N, R3W
5. NAME OF DRILLER: Mike Mueller	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-57
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6¼" Hollow Stem Auger; 2" standard split spoon; 24" long stainless steel	8. HOLE LOCATION: N 734973.55 E 1807783.52
	9. SURFACE ELEVATION: 892.3' MSL
	10. DATE STARTED: 06-Dec-93 — 11. DATE COMPLETED: 06-Dec-93
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 34'
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 36.3 - after well construction
14. TOTAL DEPTH OF HOLE: 41'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	X		NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA						NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
OW-151		X		R.J. [illegible] TJK 2-18-94

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
	0–1.8	~~STIFF~~, (~~10YR 5YR~~ 3/2) ~~dark~~ reddish brown SILT (ML), low plasticity, cohesive, alluvium. moist	0.0 ppm 12:36	OW-151 01 12:07		2 5 n=11 6 8	Recovery 100%
	1.8–5.6	STIFF, (10YR 5/4) ~~moderate~~ yellowish brown, SANDY SILT (ML), moist, low plasticity, non-cohesive, alluvium.	0.0ppm 12:43	OW-151 02 12:15		5 6 n=14 8 8	Recovery 100%
		~~very~~ stiff, as above.	0.0ppm 12:48	OW-151 03 12:24		4 7 n=16 9 9	Recovery 100%
	5.6–7.0	STIFF (10YR 5/4) ~~moderate~~ yellowish brown LEAN CLAY WITH SAND (CL), moist, medium plasticity, cohesive, alluvium.	0.0ppm 12:53	OW-151 04 12:34		1 3 n=10 7 9	Recovery 80%
		STIFF, as above.	0.0 ppm 13:05	OW-151 05 12:40		1 3 n=10 7 8	Recovery 100%

HTW DRILLING LOG

HOLE NO. OW-151

PROJECT Fort McCoy Mod 5 | INSPECTOR R.J. LeRoy | SHEET 2 OF 3 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. A e R	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	10	medium dense, as above.	0.0 ppm 13.17	OW-151 06 12:45		1 2 n=6 4 5	Recovery 100%
	12	dense medium (10YR 5/4) ~~moderate~~ yellowish brown LEAN CLAY WITH SAND (CL), moist ~~high~~ plasticity, cohesive, alluvium.	0.0 ppm 13:22	OW-151 07 12:55		3 2 n=5 3 5	Recovery 80%
	14	~~dense~~ stiff, as above.	0.0 ppm 13:33	OW 151 08 13:03		2 3 n=10 7 8	Recovery 90%
	15	---15.6---					
	16	medium ~~dense~~ (10YR 6/6) ~~dark yellowish orange~~ brownish POORLY GRADED SAND (SP), moist non plastic, non-cohesive, alluvium.	0.0 ppm 13:40	OW-151 09 13:09		3 4 n=11 7 8	Recovery 100%
	17	stiff (10YR 5/4) moderate yellowish brown LEAN CLAY WITH SAND (CL) medium plasticity, cohesive, alluvium.					
	18						
	19	~~dense~~ ---18.8--- medium (10YR 6/6) ~~dark yellowish orange~~ brownish SILTY SAND (SM) ~~POORLY GRADED SAND (SP)~~ wet, non plastic, non-cohesive, alluvium. 4" CLAY seam at 19.4 to 19.8	0.0 ppm 13:45	OW-151 10 13:15		4 8 n=18 10 8	Recovery 60% wet at ≃
	20	very loose (10YR 6/2) ~~pale yellowish brown~~ light brownish gray, as above, with 1" clay seams at 20.4, 21.7 and 21.9.	0.0 ppm 13:50	OW-151 11 13:19		1 1 n=3 2 3	Recovery 80%
	22	dense medium, as above, dry.	0.0 ppm 13:55	OW-151 12 13:35		6 7 n=17 10 13	Recovery 60%
	24	very dense, as above, dry.	0.0 ppm 15:08	OW-151 13 14:40		10 20 n=52 32 40	Recovery 50%
	26	very dense, as above, dry.	0.0 ppm 15:20	OW-151 14 14:45		10 24 n=56 32 30	Recovery 50%
	28						

HTW DRILLING LOG

HOLE NO. OW-151

PROJECT Fort McCoy Mods

INSPECTOR B.J. LeRoy

SHEET 3 OF 3 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
	28	~~dense~~ medium, (10YR6/6) ~~dark~~ yellowish ~~orange~~ ~~POORLY GRADED SAND (SP)~~ moist, non plastic, non-cohesive, alluvium.	0.0ppm 15:32	OW 151 15 14:51		4 5 16 25 n = 21	Recovery 50%
	29	stained sand colors range from (10YR6/6 to 5YR5/6) ~~dark~~ brownish ~~yellowish~~ and ~~red~~ yellowish red.					
	30	very ~~Dense~~, (10YR8/2) ~~very pale orange~~ white POORLY GRADED SAND (SP) moist,	0.0ppm 15:55	OW-151 16 ~~17~~ 15:22		~~13~~ 4 ~~15~~ 16 n = ~~39~~ 56 ~~24~~ 40 ~~26~~ 49	Recovery 60%
	31	non plastic, non-cohesive, alluvium.					
	32	Dense, as above.	0.0ppm 16:03	OW-151 17 15:29		13 15 24 26 n = 39	Recovery 70%
	33						
	34	very dense, ~~as above, wet~~. (10YR 8/2) white POORLY GRADED SAND WITH SILT (SP-SM); wet,	0.0ppm 16:10	OW-151 18 15:40		13 26 30 30 n = 56	wet at 34 Recovery 60%
	35	non-plastic, non-cohesive. Alluvium, TJK 2-18-94					
	36	very dense, as above.	0.0ppm 16:25	OW-151 19 16:00		11 22 30 44 n = 52	Recovery 50%
	37						
	38	very dense (10YR7/4) ~~very pale brown~~ ~~grayish orange~~ POORLY GRADED SAND, (SP), wet,	0.0ppm 1639	OW-151 20 16:13		36 54 100	Recovery = 12" / 18" = 67%
	39	non plastic, non cohesive, alluvium.					
	40	Blind drill to 41'					
	41	EOB - 41 16:15 06-Dec-93 OW-151 set in borehole 06-Dec-93					

HTW DRILLING LOG

HOLE NO. OW-152

1. COMPANY NAME: Rust E+I	2. DRILLING SUBCONTRACTOR: WTD	SHEET 1 OF 3 SHEETS
3. PROJECT: Fort McCoy Mod 5 Landfill 9	4. LOCATION: Landfill 9 - NW 1/4 NW 1/4 Sec 27 T 18N R 3W	
5. NAME OF DRILLER: Mike Mueller	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-57	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6 1/4" ID Hollow stem Augers; 2" split spoon standard; 24" long stainless steel	8. HOLE LOCATION: N 734756.0 E 1807766.5	
	9. SURFACE ELEVATION: 880.7' MSL	
	10. DATE STARTED: 07-Dec-93	11. DATE COMPLETED: 07-Dec-93
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 27'	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 30.4 - after well construction	
14. TOTAL DEPTH OF HOLE: 35'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	X	~~X~~ Bxle	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA						NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
OW-152		OW-152		TJK 2-23-94

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
	0	~~dense~~ ~~medium~~ (10YR6/6) ~~dark~~ ~~yellowish~~ brownish POORLY GRADED SAND (SP) moist, non plastic, non-cohesive, alluvium.	0.0 ppm 11:15	OW-152 01 10:46		2 4 n=12 8 10	Recovery 70%
	1	Topsoil, (10YR4/2) Dark yellowish brown ~~from~~ SILT WITH SAND (ML) from 0.0 to 0.7.					
	2	0.7 - 2.0 Stiff (10YR 5/4) ~~moderate~~ yellowish brown SILT WITH SAND (~~to~~ ML), moist, ~~to~~ medium plasticity, cohesive, alluvium	0.0 ppm 11:23	OW-152 02 10:55		3 5 n=9 4 4	Recovery 90%
	3						
	4	very stiff, as above	0.0 ppm 11:30	OW-152 03 10:59		3 7 n=17 10 11	Recovery 80%
	5	1" sand seams at 4.6, 5.4 - - - 5.8					
	6	Dense, (10YR 6/6) ~~dark~~ ~~yellowish~~ brownish POORLY GRADED SAND (SP), moist, non plastic, non-cohesive, alluvium.	0.0 ppm 11:38	OW-152 11:10		4 16 n=39 23 24	Recovery 60%
	7						
	8	dense ~~medium~~, as above	0.0 ppm 11:50	OW-152 11:20		8 10 20 n=30 26	Recovery 60%
	9						
	10						

HTW DRILLING LOG

HOLE NO. OW-152

PROJECT: Fort McCoy Mod 5 LFG | INSPECTOR: B.S. LeRoy | SHEET 2 OF 3 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
	10	dense medium, (10YR 7/4) ~~very pale brown~~ ~~grayish orange~~ POORLY GRADED SAND (SP), moist, non-plastic, non-cohesive, alluvium. Grains are medium, well rounded.	0.0ppm 11:54	OW-152 06 11:25		6 9 n=24 15 24	Recovery 50%
	12	medium, dense as above	0.0ppm 12:00	OW-152 07 11:31		7 10 n=20 10 15	Recovery 70%
	14	medium, (10YR 8/2) white ~~very pale orange~~ POORLY GRADED SAND (SP), moist, non-plastic, non-cohesive, alluvium.	0.0ppm 12:10	OW-152 08 11:36		7 8 n=12 4 4	Recovery 60%
	15.7						
	16	soft, (10YR 6/2) light brownish gray ~~pale yellowish brown~~ LEAN CLAY (CL), wet, ~~highly~~ medium plastic, cohesive, alluvium. 4" sand seam at 16.4, 2" sand seam at 17.6.	0.0ppm 12:10	OW-152 09 11:42		1 1 n=3 2 3	Recovery 100%
	18	medium, as above.	0.0ppm 12:18	OW-152 ~~07~~ 10 11:48		1 1 n=8 7 8	Recovery 100%
	20	dense medium (10YR 8/2) white ~~very pale orange~~ POORLY GRADED SAND (SP), non-plastic, non-cohesive, alluvium, medium, well rounded grains. 1" clay interbeds at 20.4, 20.7, 21.0	0.0ppm 12:35	OW-152 ~~10~~ 11 11:52		4 7 n=17 10 18	Recovery 50%
	22	loose, as above. 1" clay seams at 22.2, 22.7	0.0ppm 12:35	OW-152 12 11:58		2 3 n=9 6 18	Recovery 50%
	24	medium, dense as above.	0.0ppm 12:41	OW-152 13 12:05		4 8 n=28 20 41	Recovery 60%
	26	medium, dense as above.	0.0ppm 12:45	OW-152 14 12:13		9 26 n=76 50 50	Recovery 60%
	28						

HTW DRILLING LOG

HOLE NO. OW-152

PROJECT Fort McCoy LF 9 | INSPECTOR B.J. LeRoy | SHEET 3 OF 3 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
	28	Dense (10YR6/6) ~~dark yellowish orange~~ brownish POORLY GRADED SAND (SP) wet, non-plastic, non-cohesive, alluvium. Few nodules of poorly cemented sandstone.	0.0ppm 12:45	OW-152 15 12:15		8 26 n=66 40 50	Recovery 60%
	30	~~med~~ Very dense, as above.	0.0ppm 12:50	OW-152 16 12:23		8 36 n=86 50	Recovery 12"/18" = 67%
	32	Very dense, (10YR8/2) white ~~very pale orange~~, as above.	0.0ppm 13:03	OW-152 17 12:30		23 36 n=86 50	Recovery 12"/18" = 67%
	34	Blind Drill to 35'					
	35	EOB 35' 07-Dec-93 OW-152 at 13:00 07-Dec-93					

NO BORING OR WELL WAS EVER

DESIGNATED OW-153

HTW DRILLING LOG

HOLE NO. OW-154

1. COMPANY NAME: Rust E & I	2. DRILLING SUBCONTRACTOR: WTD
3. PROJECT: Fort McCoy Mod 5	4. LOCATION: Landfill 10, SW1/4, SW1/4, Sec 27, T18N, R3W
5. NAME OF DRILLER: Brian Loveland	6. MANUFACTURER'S DESIGNATION OF DRILL: Truck Mounted Dietrick (D-50)
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6 1/4" ID Hollow Stem Augers; 2" Standard Split Spoon 24" long Stainless Steel	8. HOLE LOCATION: N 729500.47, E 1807791.27
	9. SURFACE ELEVATION: 830.50' MSL
	10. DATE STARTED: 30-Nov-93
	11. DATE COMPLETED: 30-Nov-93
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 15'
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 15.5 After 2 hours
14. TOTAL DEPTH OF HOLE: 23.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
X	X		NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA						NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
OW-154		X		Timothy P. Giles BJK 12-23-93

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	SLOW COUNTS g	REMARKS h
	1	Medium dense (7.5YR 3/2 grading to 7.5YR5/6) dark brown to strong brown POORLY GRADED SAND (SP), moist, non-plastic, non-cohesive, Alluvium. Grains are fine to medium, well rounded.	0.0 ppm 13:15	OW-154 01		7 9 8 7 n=17	Recovery 100%
	2						
	3	As above, but (7.5YR5/6 to 10YR8/4) strong brown to very pale brown.	0.0ppm 13:15	OW-154 02		12 10 17 23 n=27	Recovery 100%
	4	Dense (10YR8/4 to 10YR8/2) very pale brown to white, POORLY GRADED SAND (SP), moist, non-plastic, non-cohesive, alluvium Grains are medium, well rounded.	0.0ppm 13:15	OW-154 03		8 15 25 32 n=40	Recovery 75%
	5						
	6	As above, but (10YR8/2) white.	0.0ppm 13:30	OW-154 04		17 22 26 33 n=48	Recovery 60%
	7						
	8	as above, but very dense	0.0ppm 13:30	OW-154 05		19 24 28 43 n=52	Recovery 60%
	9						
	10						

HTW DRILLING LOG

HOLE NO.: OW-154

PROJECT: Fort McCoy Mod 5 | INSPECTOR: Timothy P. Giles BJL | SHEET 2 OF 2 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
	10	Dense, (10YR8/2) white, POORLY GRADED SAND, (SP), moist, non-plastic, non-cohesive, alluvium.	0.0 ppm 13:45	OW-154 06 13:10		12 24 n=49 25 40	Recovery 85%
	12	Very dense, as above.	0.0 ppm 13:45	OW-154 07		17 26 n=58 32 44	Recovery 75%
	14	medium dense, (10YR8/2 to 10YR7/2) white to light gray, POORLY GRADED SAND, (SP), wet, non-plastic, non-cohesive, alluvium.	0.0 ppm 13:50	OW-154 08		10 12 n=29 17 30	Recovery 60% wet at 15'
	16	as above.	0.0 ppm 13:50	OW-154 09		11 12 n=24 12 18	Recovery 70%
	18	medium dense, (10YR8/2) white, POORLY GRADED SAND, (SP), wet, non-plastic, non-cohesive, alluvium.	0.0 ppm 14:00	OW-154 10		9 11 n=22 11 10	Recovery 30%
	20	As above.	0.0 ppm 14:00	OW-154 11		4 5 n=12 7 11	Recovery 30%
	22	as above				—	—
	23	EOB at 23' 30-Nov-93 OW-154 set in hole 30-Nov-93					

HTW DRILLING LOG

HOLE NO. OW-155

1. COMPANY NAME: Rust E&I	2. DRILLING SUBCONTRACTOR: WTD
SHEET 1 OF 2 SHEETS	
3. PROJECT: Fort McCoy Mod 5	4. LOCATION: Landfill 10 - SW 1/4 SW 1/4 Sec 27 T18N R3W
5. NAME OF DRILLER: Mike Mueller	6. MANUFACTURER'S DESIGNATION OF DRILL: B-57
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6 1/4" ID Hollow Stem Auger; Standard 2" split spoon 24" long, stainless steel	8. HOLE LOCATION: N 729565.5' E 1807838.7'
	9. SURFACE ELEVATION: 829.5' MSL
	10. DATE STARTED: 30-Nov-93 / 11. DATE COMPLETED: 30-Nov-93
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 14.5'
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: TOC - 16.7
14. TOTAL DEPTH OF HOLE: 24.5'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	K		NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA						NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
OW-155		OW-155		BA. Lee TJK 2-23-94

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
	1	dense Medium (10 YR 8/6) ~~Pale~~ ~~yellowish~~ ~~orange~~ Poorly graded sand (SP), moist, non plastic, non cohesive, medium, well rounded grains. Alluvium.	0.0 ppm 9:22	OW-155 01 ~~8'-8.5' BGL~~ 5:55		3 4 n=12 8 9	recovery 75%
	2						
	3	medium dense (10YR 4/2) ~~with pebbles~~ ~~Orange~~ poorly graded sand, (SP) moist, non plastic, non cohesive; ~~Blue~~ medium, well rounded grains Alluvium.	0.2 ppm 9:28	OW-155 02 9:00		8 n=19 11 13	Recovery 75%
	4						
	5	medium dense as above, slightly stained from above.	0.2 ppm 9:43	OW-155 03 9:10		3 5 n=20 15 16	Recovery 60%
	6						
	7	dense, (10YR 5/2) ~~white~~ ~~orange~~ poorly graded sand (SP), moist, non plastic, non cohesive; medium, well rounded grains, Alluvium.	0.2 ppm 9:46	OW-155 04 9:16		5 14 n=34 20 21	Recovery 75%
	8						
		medium dense as above	0.0 ppm 9:53	OW-155 05 9:25		5 12 n=27 15 24	Recovery 60%

HTW DRILLING LOG

HOLE NO. OW-155

PROJECT Fort McCoy Mod. 5 Landfill 10

INSPECTOR B.J. LeRoy

SHEET 2 OF 2 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. A e R	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	11	~~dense~~ ~~white~~ medium^ (10 YR 8/2) ~~orange~~ poorly graded sand (SP), moist, non plastic, non cohesive, medium, well rounded grains Alluvium.	0.0 ppm 9:59	OW-155 06 9:33		4 8 n=23 15 21	Recovery 50%
	12 13	~~dense~~ medium^ (10 YR 8/2) as above	0.0 ppm 10:05	OW-155 07 9:38		5 10 n=27 17 21	Recovery 60% Bottom of spoon wet
	14 15	~~dense~~ medium^ (10 YR 8/2) as above, wet,	0.0 ppm 10:13	OW-155 08 9:46		5 12 n=26 14 7	Recovery 50% wet - water table at 14'
	16 17	~~dense~~ medium^ (10 YR 8/2) as above	0.0 ppm 10:21	OW-155 09 9:51		5 5 n=13 8 14	Recovery 50%
	18 19	~~dense~~ medium^ (10 YR 8/2) as above	0.0 ppm 10:34	OW-155 10 9:54		3 6 n=23 17 25	Recovery 50%
	20 22	Dense (10 YR 7/4) ~~very pale brown grayish orange~~, poorly graded sand (SP), ~~wet~~, nonplastic, non cohesive, medium, well rounded grains, alluvium.	0.0 ppm 10:40	OW-155 11 10:07		6 19 n=40 27 24	Recovery 50%
	22	Blind Drill to 24.5					
		EOB 24.5' 10:15 30-Nov-93					
		MONITORING WELL OW 155 set at 23'; 30-Nov-93	B.J.L				

HTW DRILLING LOG

HOLE NO. OW-156

1. COMPANY NAME: Rust E+I	2. DRILLING SUBCONTRACTOR: WTD
3. PROJECT: Fort McCoy Mod 5	4. LOCATION: Landfill 10, SW1/4, SW1/4, Sec 27, T18N, R3W
5. NAME OF DRILLER: Brian Loveland	6. MANUFACTURER'S DESIGNATION OF DRILL: Truck Mounted Dietrick (D-50)
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6 1/4" ID Hollow Stem Augers; 2" standard split spoon 24" long stainless steel	8. HOLE LOCATION: N 729482.04, E 1807859.18
	9. SURFACE ELEVATION: 829.97' MSL
	10. DATE STARTED: 30-Nov-93 / 11. DATE COMPLETED: 30-Nov-93
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 15'
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 15.3' after 1 hour
14. TOTAL DEPTH OF HOLE: 23'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
X	X		NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA						NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
OW-156		X		Timothy P. Giles BJK 12-2-93

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	SLOW COUNTS g	REMARKS h
	1	Dense, (7.5YR 3/2 to 7.5YR 5/6) dark brown to strong brown POORLY GRADED SAND, (SP) moist, non-plastic, non-cohesive, alluvium. Grains are fine to medium, well rounded.	0.0ppm 9:15	OW-156 01 8:55		9 14 n=31 17 19	Recovery 100%
	2						
	3	medium dense (7.5YR 5/6 to 7.5YR 4/4) strong brown to dark brown, POORLY GRADED SAND (SP), moist, non-plastic, non-cohesive, alluvium.	0.0ppm 9:15	OW-156 02 9:00		5 8 n=16 8 10	Recovery 80%
	4						
	5	medium dense (10YR 8/3) very pale brown POORLY GRADED SAND (SP), moist, non-plastic, non-cohesive, alluvium. Grains are medium, well rounded.	0.0ppm 9:30	OW-156 03 9:05		4 6 n=12 6 9	Recovery 70%
	6	as above.	0.0ppm 9:30	OW-156 04 9:12		5 8 n=28 20 40	Recovery 50%
	7						
	8	as above, but dense.	0.0ppm 9:40	OW-156 05 9:17		7 12 n=34 22 37	Recovery 75%
	9						
	10						

HTW DRILLING LOG

HOLE NO.: OW-156

PROJECT: Fort McCoy Mod 5 | INSPECTOR: Timothy P. Giles BJL | SHEET 2 OF 2 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
	10	Very Dense, (10YR 8/3) very pale brown POORLY GRADED SAND (SP), non-plastic, non-cohesive, alluvium. Grains are medium, well rounded.	0.0ppm 9:40	OW-156 06 9:24		18 27 n=59 32 40	Recovery 80%
	12	as above, but dense	0.0ppm 9:55	OW-156 07 9:37		10 17 n=44 27 43	Recovery 80% wet at 13.8
	14	Dense (10YR 8/2 to 10YR 7/2) white to light gray POORLY GRADED SAND, (SP), wet, non-plastic, non-cohesive, alluvium. Grains are medium, well rounded.	0.0ppm 10:10	OW-156 08 9:46		7 12 n=37 25 32	Recovery 65%
	16	As above, but (10YR 7/2) light gray.	0.0ppm 10:20	OW-156 09 9:52		10 9 n=30 21 29	Recovery 60%
	18	Dense (10YR 7/2) light gray POORLY GRADED SAND (SP), wet, non-plastic, non-cohesive, alluvium. Grains are medium, well rounded.	0.0ppm 10:30	OW-156 10 9:58		18 17 n=37 20 23	Recovery 30%
	20	as above, but medium dense.	0.0ppm 10:30	OW-156 11 10:04		8 12 n=27 15 17	Recovery 35%
	22						
	23	EOB at 23' 30-Nov-93 OW-156 set in hole 30-Nov-93					

HTW DRILLING LOG

HOLE NO. OW-157

1. COMPANY NAME: Rust E&I	2. DRILLING SUBCONTRACTOR: WTD	SHEET 1 OF 2 SHEETS
3. PROJECT: Fort McCoy Mod 5	4. LOCATION: Landfill 10 SW 1/4 SW 1/4 Sec 27 T18N R3W	
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: B-57	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6 1/4" ID Hollow Stem Auger; Standard 2" split spoon 24" long stainless steel	8. HOLE LOCATION: N 729542.7 E 1807900.5	
	9. SURFACE ELEVATION: 830.8' MSL	
	10. DATE STARTED: 30-Nov-93	11. DATE COMPLETED: 30-Nov-93
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 15.5'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 17.76' on 12/6/93	
14. TOTAL DEPTH OF HOLE: 25.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	⊗		NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA						NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
OW-157		OW-157		B.J. LeRoy TJK 2-23-94

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
	1	dense; medium (5YR 3/2) very dark grayish brown SP-SM POORLY Graded sand with silt (5%), B/G moist, non plastic, non cohesive, well rounded medium grains, ~15% silt and clay. Alluvium.	0.0 ppm 13:07	OW-157 01 12:35		5 7 n=11	Recovery 80%
	2	dense; medium (10YR 8/6) yellow POORLY GRADED SAND (SP)	0.0 ppm 13:12	OW-157 02 12:40		5 6 n=14 8 12	Recovery 70%
	4	dense; medium (10YR 8/2) white Poorly GRADED SAND (SP) moist, nonplastic, non cohesive, medium, well rounded grains Alluvium.	2.3 ppm 13:16	OW-157 03 12:43		4 5 n=12 7 10	Recovery 60%
	6	dense; medium, as above	8.6 ppm 13:18	OW-157 04 12:48		4 6 n=17 11 17	Recovery 60%
	8	dense; medium, as above.	0.6 ppm 13.23	OW-157 05 12:51		4 8 n=25 17 20	Recovery 50%
	10						

HTW DRILLING LOG

HOLE NO. OW-157

PROJECT Fort McCoy Mod 5 Landfill 10 | INSPECTOR B.J. LeRoy | SHEET 2 OF 2 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
	11	~~medium~~ Dense (10YR 8/2) ~~very pale orange~~ white poorly graded sand (SP) moist, non plastic, non cohesive; medium, well rounded grains. Alluvium.	~~X~~ 3.2 ppm 13:28	OW-157 06 12:59		6 12 n=32 20 22	Recovery 60%
	12						
	13	Dense, as above	3.4 ppm 13:33	OW-157 07 13:05		6 14 N=34 20 28	Recovery 60%
	14						
	15	Dense, as above	0.2 ppm 13:37	OW-157 08 13:10		5 14 n=31 17 19	Recovery 50% Wet at 15.5
	16						
	17	~~medium~~ dense (10YR 8/2) ~~very pale orange~~ white POORLY FRADED SAND (SP), ~~moist~~ wet, non plastic, non cohesive; medium, well rounded grains. Slight staining to 10YR6/6 dark yellowish orange. Alluvium.	0.4 ppm 13:37	OW-157 09 13:20		5 9 n=21 12 17	Recovery 50%
	18						
	19	~~medium~~ dense (10YR 8/2) ~~very pale orange~~ white POORLY FRADED SAND (SP), wet non plastic, non cohesive, medium, well rounded grains. Alluvium.	2.6 ppm 13:42	OW-157 10 13:26		5 6 n=16 10 ~~11~~	Recovery 90%
	20						
	21	~~medium~~ dense, as above	1.4 ppm 13:50	OW-157 11 13:34		5 7 n=19 12 15	Recovery 70%
	22						
	23	Dense, as above	—	OW-157 12 13:41		6 14 n=46 32 ~~30~~	Recovery 60%
	24	~~Brown~~ Bf6 ~~dense~~, as above					
	25	EOB 25' 13:50 - 30-Nov-93					
		OW-157 installed in borehole 30-Nov-93					

HTW DRILLING LOG

HOLE NO. OW158

1. COMPANY NAME: Rust Environment & Infrastructure	2. DRILLING SUBCONTRACTOR: WTD	SHEET 1 OF 2 SHEETS
3. PROJECT: FORT MCCOY - MODS	4. LOCATION: Landfill 10 SW1/4, SW1/4, Sec. 27, T18N, R3W	
5. NAME OF DRILLER: Bryan Loveland	6. MANUFACTURER'S DESIGNATION OF DRILL: Dietrick (D-50) Truck Mounted	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Split Spoon *24" x 2" Stainless Steel; 6¼" Hollow Stem Auger	8. HOLE LOCATION: N 729444.1 E 1807819.1	
	9. SURFACE ELEVATION: 829.8' MSL	
	10. DATE STARTED: 12/8/93	11. DATE COMPLETED: 12/8/93
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: 15'	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 16.5' after ½ Hrs T.O.G.	
14. TOTAL DEPTH OF HOLE: 23	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
X			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A						NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		TJC 2-23-94

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
	1	Loose (10YR 4/3 grading to 10YR 6/6) Weak Red to Brownish Yellow, POORLY GRADED SAND (SP) Moist, non-plastic/non-cohesive, fine grained Alluvium, rounded grains, some ~~grains~~ roots to 0.5' depth.	0 ppm @ 1340	OW158 -01 @ 1308		3 5 4 3 N=9	100% REC
	2						
	3	As Above, but medium dense (10YR 6/6 grading to 10YR 8/4) Brownish Yellow to very pale Brown, no roots.	0 ppm @ 1340	OW158 -02 @ 1314		3 7 11 10 N=18	75% REC
	4						
	5	As Above, but (10YR 8/4 grading to 10YR 8/2) very pale Brown, fine to medium grained.	0 ppm @ 1400	OW158 -03 @ 1317		7 13 15 11 N=28	60% REC
	6						
	7	As Above, but (10YR 8/2).	0 ppm @ 1400	OW158 -04 @ 1321		9 14 15 14 N=29	90% REC
	8						
	9	As Above	0 ppm @ 1400	OW158 -05 @ 1326		8 12 15 19 N=27	75% REC

HTW DRILLING LOG

HOLE NO. OW158

PROJECT FORT MCCOY - MODS | INSPECTOR [signature] | SHEET 2 OF 2 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. A e R	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	11	As Above, but Dense.	0 ppm @ 1400	OW158 -06 @ 1330		8 13 17 23 N=30	65% REC
	12 13	As Above, but very dense, wet @ 13.3' depth	0 ppm @ 1415	OW158 -07 @ 1336		15 24 26 37 N=50	65% REC
	14 15	As Above, but very Dense (10YR 7/2) light gray, wet, Saturated @ 15' depth	0 ppm @ 1415	OW158 -08 @ 1341		24 26 29 34 N=55	60% REC
	16 17	As Above, but Dense	~~0 ppm~~ TPH @ N/A	OW158 -09 @ 1346		22 24 24 28 N=48	0% REC
	18 19	As Above, but very Dense (10YR 6/2) light brownish gray.	0 ppm @ 1435	OW158 -10 @ 1350		11 24 26 30 N=50	15% REC
	20 21 22	As Above	0 ppm @ 1435	OW158 -11 @ 1357		28 25 27 38 N=52	50% REC
	23	BOREHOLE TERMINATED @ 22' DEPTH					
	24 25 26 27						

APPENDIX F ADDENDUM

GEOTECHNICAL DATA

F-1 Geotechnical Data - Phase 1
F-2 Geotechnical Data - Phase 2
F-3 Geotechnical Data - Phase 3
F-4 Geotechnical Data - Landfills 7, 8, 9, and 10

APPENDIX F-4

GEOTECHNICAL DATA - LANDFILLS 7, 8, 9, AND 10

RIVER VALLEY TESTING CORP.
1302 Cleveland Avenue
Wausau, WI 54401
715/848-1225

REPORT OF MECHANICAL ANALYSIS OF SOIL

Project: FORT MCCOY
SPARTA, WISCONSIN

Copies:

Client: WTD Environmental Drilling
Attn: Mr Ron Thalacker
PO Box 109
Schofield, WI 54476

Date: December 30, 1993

RVT File No: W93-258

GENERAL:

Scope of Work: For this report, only mechanical analysis including #200 sieve, moisture content and hydrometer tests were performed.

Date of Test: December 21, 1993

Lab Technician: B Jones

Sampled By: WTD Environmental Personnel

Date Submitted: December 14, 1993

RESULTS:

Test Method: ASTM C117-90, C136-84a, D422-92, D2487-92 & D2216-90

Boring Number:	OW144	OW144	OW144	0W145	0W145	OW145	0W146	OW146
Sample Number:	2	6	8	4	7	9	4	7
Sample Depth:	2-4'	10-12'	14-16'	6-8'	12-14'	16-18'	6-8'	12-14'
USCS Classification:	SP-SM	SP	SP	SP	SP	SP	SP	SP
In-Situ Moisture Content	9	16	18	4	19	18	4	17
Sieve Size	% Passing							
#10	100	100	100	100	100	100	100	100
#40	91	91	93	93	90	82	91	92
#100	16	16	21	20	15	6.9	21	19
#200	6.9	2.5	3.3	2.5	2.3	0.8	3.5	3.1
0.005 mm	3.5	1.0	2.5	2.0	2.0	0.8	2.0	2.0

REMARKS:

A portion of the sample will be held for 30 days after the date of this report and then will be discarded unless we are notified to do otherwise.

Respectfully Submitted,
River Valley Testing Corp.

RIVER VALLEY TESTING CORP.
1302 Cleveland Avenue
Wausau, WI 54401
715/848-1225

REPORT OF MECHANICAL ANALYSIS OF SOIL

Project: FORT MCCOY
SPARTA, WISCONSIN

Client: WTD Environmental Drilling
Attn: Mr Ron Thalacker
PO Box 109
Schofield, WI 54476

Copies:

Date: January 7, 1994

RVT File No: W93-258

GENERAL:

Scope of Work: For this report, only mechanical analysis including #200 sieve, moisture content and hydrometer tests were performed.

Date of Test: December 21, 1993
Lab Technician: B Jones
Sampled By: WTD Environmental Personnel
Date Submitted: December 14, 1993

RESULTS:

Test Method: ASTM C117-90, C136-84a, D422-92, D2487-92 & D2216-90

Boring Number:	OW146	OW147	OW147	OW147	OW148	OW148	OW148	OW149
Sample Number:	9	2	7	10	2	4	7	3
Sample Depth:	16-18'	2-4'	12-14'	17-19'	2-4'	6-8'	12-14'	4-6'
USCS Classification:	SP	SP-SM	SP-SM	SP-SM	SP	CL	SP-SM	SP
In-Situ Moisture Content	17	8	11	16	5	19	16	3
Sieve Size	% Passing							
3/4"	100	—	—	—	—	—	—	—
3/8"	99	—	—	—	—	—	—	100
#4	99	—	—	100	—	—	—	99
#10	99	100	100	99	100	100	100	99
#40	84	96	95	65	84	97	40	87
#100	7.3	50	56	22	16	64	15	11
#200	1.2	6.1	8.5	11	3.3	56	10	2.1
0.005 mm	0.0	2.9	3.3	3.4	1.0	1.5	4.0	1.0

REMARKS:

A portion of the sample will be held for 30 days after the date of this report and then will be discarded unless we are notified to do otherwise.

Respectfully Submitted,
River Valley Testing Corp.

Howard B. Barker

RIVER VALLEY TESTING CORP.
1302 Cleveland Avenue
Wausau, WI 54401
715/848-1225

REPORT OF MECHANICAL ANALYSIS OF SOIL

Project: FORT MCCOY
SPARTA, WISCONSIN

Copies:

Client: WTD Environmental Drilling
Attn: Mr Ron Thalacker
PO Box 109
Schofield, WI 54476

Date: January 7, 1993

RVT File No: W93-258

GENERAL:

Scope of Work: For this report, only mechanical analysis including #200 sieve, moisture content and hydrometer tests were performed.

Date of Test: December 21, 1993
Lab Technician: B Jones
Sampled By: WTD Environmental Personnel
Date Submitted: December 14, 1993

RESULTS:

Test Method: ASTM C117-90, C136-84a, D422-92, D2487-92 & D2216-90

Boring Number: Sample Number: Sample Depth:	OW149 6 10-12'	OW149 9 16-18'	OW150 3 4-6'	OW150 6 10-12'	OW150 8 14-16'	OW151 5 8-10'	OW151 11 20-22'	OW151 18 34-36'
USCS Classification:	CL-ML	SP-SM	SP	SP-SM	CL	CL	SM	SP-SM
In-Situ Moisture Content	20	23	14	19	33	25	17	16
Sieve Size	% Passing							
#10	100	100	100	100	100	---	100	100
#40	97	88	97	89	99	100	92	83
#100	79	25	12	20	95	84	50	21
#200	75	7.7	1.5	5.9	90	77	38	8.4
0.005 mm	18	2.7	1.0	3.5	17	21	9.0	2.5

REMARKS:

A portion of the sample will be held for 30 days after the date of this report and then will be discarded unless we are notified to do otherwise.

Respectfully Submitted,
River Valley Testing Corp.

Howard B. Barker

RIVER VALLEY TESTING CORP.
1302 Cleveland Avenue
Wausau, WI 54401
715/848-1225

REPORT OF MECHANICAL ANALYSIS OF SOIL

Project: FORT MCCOY
SPARTA, WISCONSIN

Copies:

Client: WTD Environmental Drilling
Attn: Mr Ron Thalacker
PO Box 109
Schofield, WI 54476

Date: January 11, 1994

RVT File No: W93-258

GENERAL:

Scope of Work: For this report, only mechanical analysis including #200 sieve, moisture content and hydrometer tests were performed.

Date of Test: December 21, 1993
Lab Technician: B Jones
Sampled By: WTD Environmental Personnel
Date Submitted: December 14, 1993

RESULTS:

Test Method: ASTM C117-90, C136-84a, D422-92, D2487-92 & D2216-90

Boring Number:	OW152	OW152	OW152	OW154	OW154	OW154	OW155	OW155
Sample Number:	7	9	15	5	7	9	3	8
Sample Depth:	12-14'	16-18'	28-30'	8-10'	12-14'	16-18'	4-6'	14-16'
USCS Classification:	SM	CL-ML	SP-SM	SP	SP	SP	SP	SP
In-Situ Moisture Content	16	26	16	5	3	17	2	15
Sieve Size	% Passing							
#10	100	100	100	100	100	100	100	100
#40	93	98	76	83	67	61	77	65
#100	41	92	17	4.1	0.7	3.3	1.7	3.6
#200	25	90	7.2	0.1	0.0	0.7	0.1	0.3
0.005 mm	4.2	25	2.3	0.0	0.0	0.0	0.0	0.0

REMARKS:

A portion of the sample will be held for 30 days after the date of this report and then will be discarded unless we are notified to do otherwise.

Respectfully Submitted,
River Valley Testing Corp.

Howard B. Barker

RIVER VALLEY TESTING CORP.
1302 Cleveland Avenue
Wausau, WI 54401
715/848-1225

REPORT OF MECHANICAL ANALYSIS OF SOIL

Project: FORT MCCOY
SPARTA, WISCONSIN

Copies:

Client: WTD Environmental Drilling
Attn: Mr Ron Thalacker
PO Box 109
Schofield, WI 54476

Date: January 11, 1994

RVT File No: W93-258

GENERAL:

Scope of Work: For this report, only mechanical analysis including #200 sieve, moisture content and hydrometer tests were performed.

Date of Test: December 21, 1993

Lab Technician: B Jones

Sampled By: WTD Environmental Personnel

Date Submitted: December 14, 1993

RESULTS:

Test Method: ASTM C117-90, C136-84a, D422-92, D2487-92 & D2216-90

Boring Number:	OW155	OW156	OW156	0W156	0W157	OW157	0W157	OW158
Sample Number:	10	3	7	9	4	9	10	4
Sample Depth:	18-20'	4-6'	12-14'	16-18'	6-8'	16-18'	18-20'	6-8'
USCS Classification:	SP	SP	SP	SP	SP	SP	SP	SP
In-Situ Moisture Content	17	3	3	15	2	17	18	3
Sieve Size	% Passing							
#10	100	100	100	100	100	100	100	100
#40	70	80	54	61	67	82	85	83
#100	3.1	2.4	1.4	5.0	1.5	4.8	7.0	3.1
#200	0.3	0.2	0.3	1.1	0.0	0.2	1.6	0.1
0.005 mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

REMARKS:

A portion of the sample will be held for 30 days after the date of this report and then will be discarded unless we are notified to do otherwise.

Respectfully Submitted,
River Valley Testing Corp.

RIVER VALLEY TESTING CORP.
1302 Cleveland Avenue
Wausau, WI 54401
715/848-1225

REPORT OF MECHANICAL ANALYSIS OF SOIL

Project: FORT MCCOY
SPARTA, WISCONSIN

Copies:

Client: WTD Environmental Drilling
Attn: Mr Ron Thalacker
PO Box 109
Schofield, WI 54476

Date: January 12, 1994

RVT File No: W93-258

GENERAL:

Scope of Work: For this report, only mechanical analysis including #200 sieve, moisture content and hydrometer tests were performed.

Date of Test: December 21, 1993
Lab Technician: B Jones
Sampled By: WTD Environmental Personnel
Date Submitted: December 14, 1993

RESULTS:

Test Method: ASTM C117-90, C136-84a, D422-92, D2487-92 & D2216-90

Boring Number:	OW158	OW158	OW159*	OW159*	OW159*	OW160*	OW160*	OW160*
Sample Number:	7	11	3	5	7	3	7	9
Sample Depth:	12-14'	20-22'	6-8'	10-12'	14-16'	6-8'	14-16'	18-20'
USCS Classification:	SP	SP	SP	SP	SP	SP	SP	SP
In-Situ Moisture Content	3	18	3	15	15	21	3	16
Sieve Size	% Passing							
3/8"	—	—	—	—	—	—	—	100
#4	—	—	—	—	—	—	—	99
#10	100	100	100	100	100	100	100	99
#40	64	66	81	38	85	96	93	88
#100	2.2	3.5	14	5.0	15	27	21	26
#200	0.0	0.4	0.8	3.5	2.3	1.8	1.2	1.9
0.005 mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

REMARKS:

A portion of the sample will be held for 30 days after the date of this report and then will be discarded unless we are notified to do otherwise.

* This boring not part of the RFI investigation.

Respectfully Submitted,
River Valley Testing Corp.

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

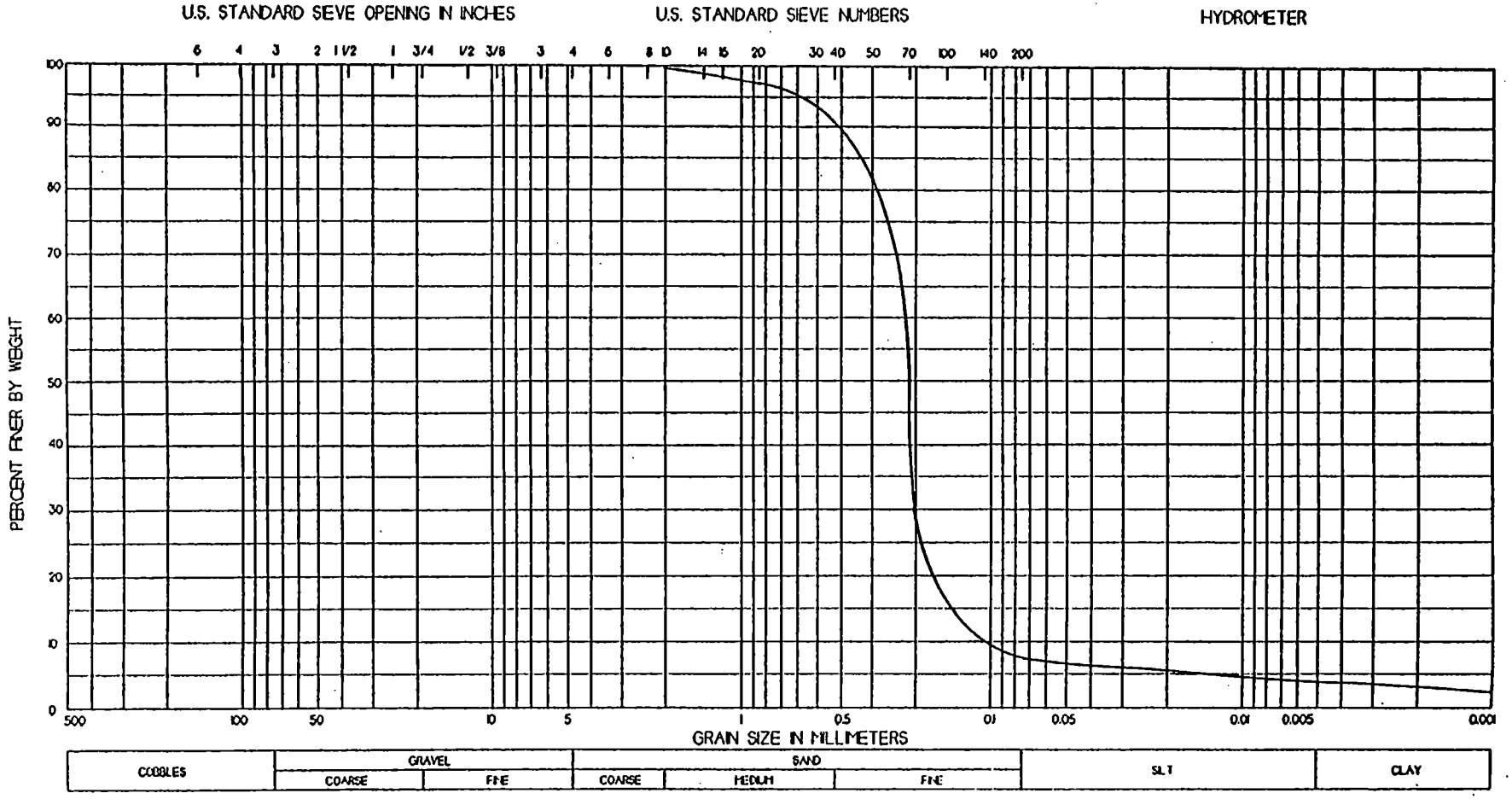
Date: **December 30, 1993**

GENERAL:

Sample Number: **2**
Sample Location: **2-4'**
Sample Source: **OW144**

USCS Classifications: **SAND, with organic silt, fine grained, brown and black (SP-SM)**

RESULTS:



RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

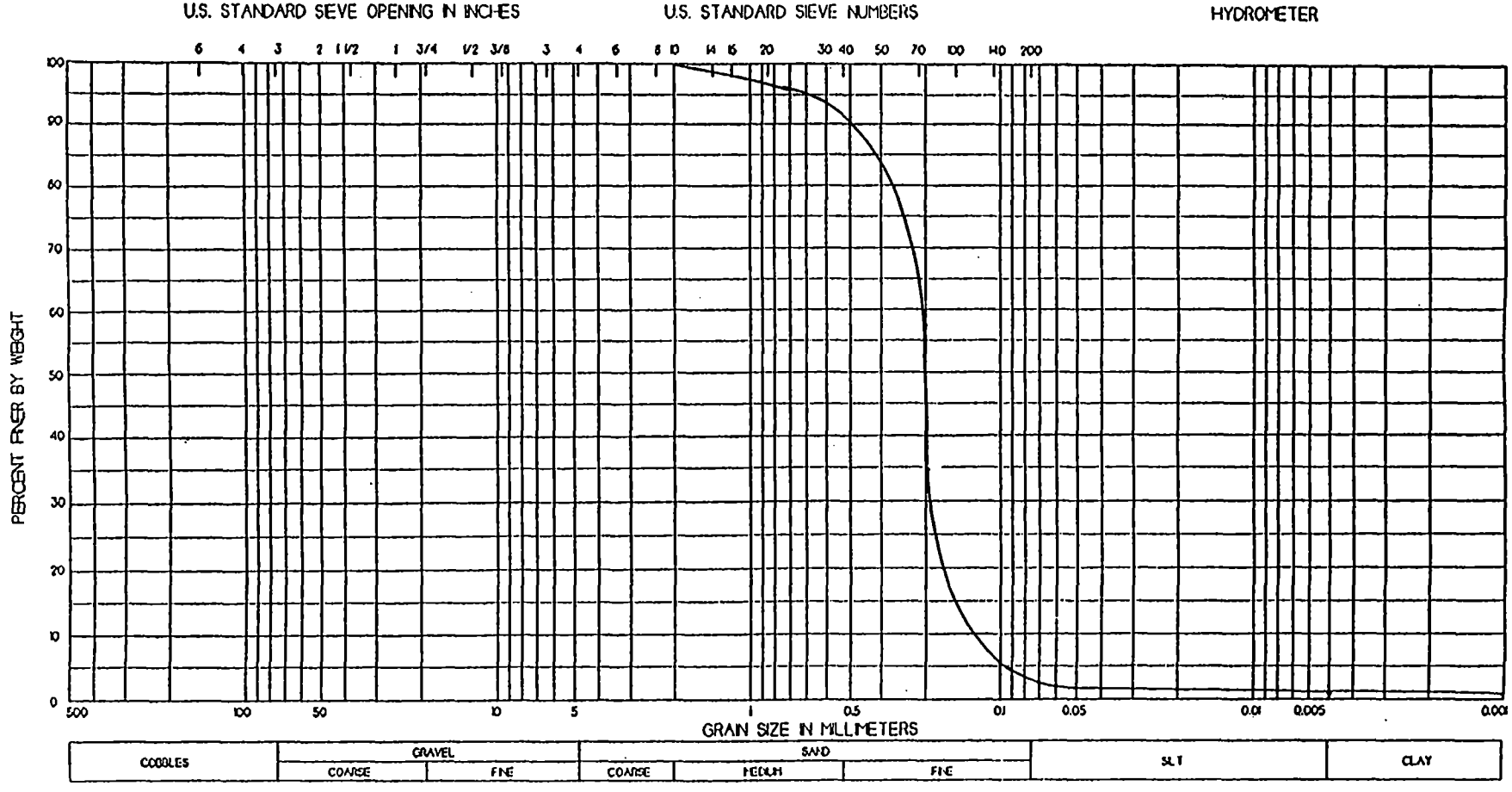
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **December 30, 1993**

GENERAL:

Sample Number: **6**
Sample Location: **10-12'**
Sample Source: **OW144**

USCS Classifications: **SAND, fine grained, gray (SP)**

RESULTS:



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RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

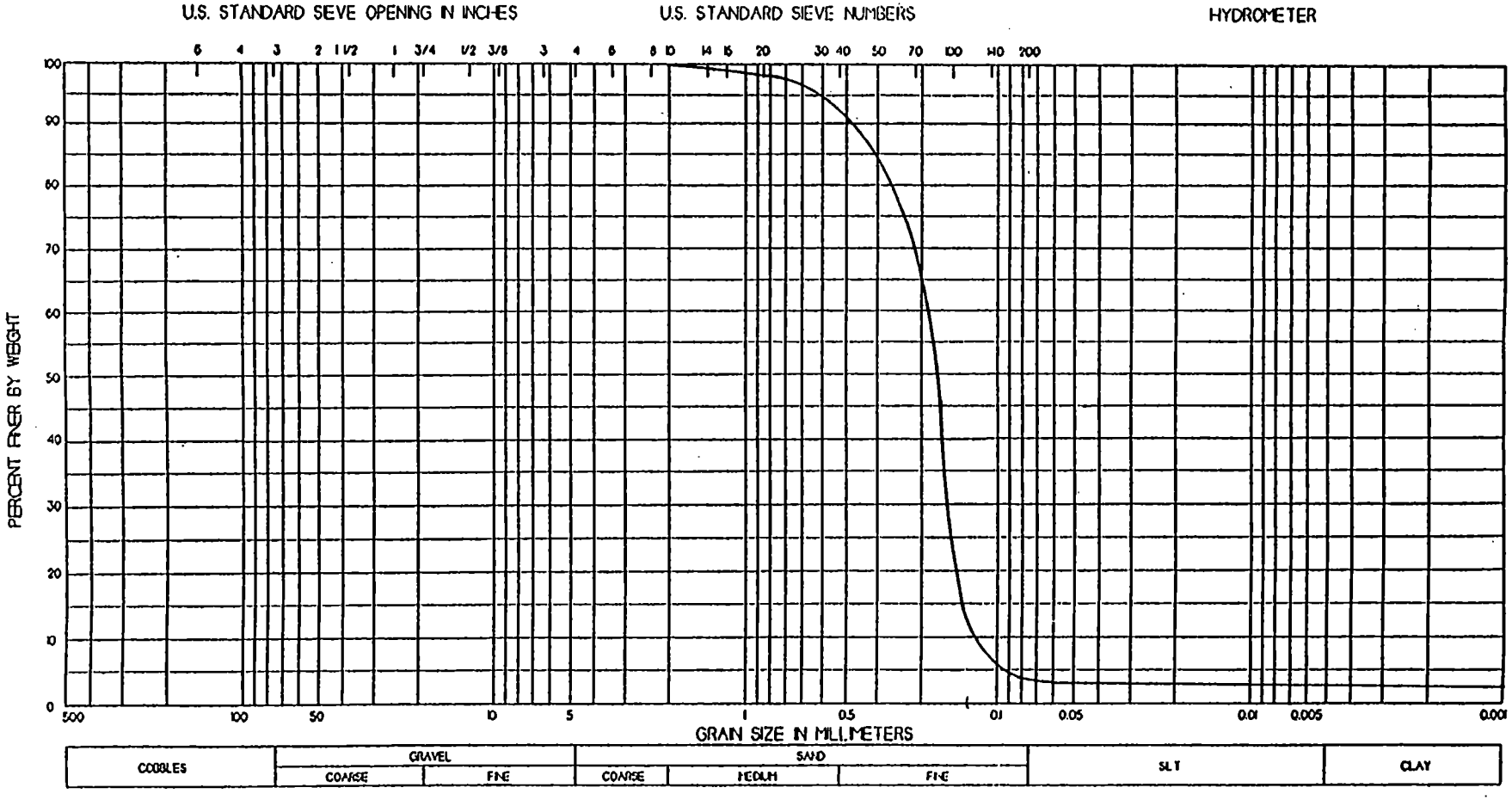
Date: **December 30, 1993**

GENERAL:

Sample Number: **8**
Sample Location: **14-16'**
Sample Source: **OW144**

USCS Classifications: **SAND, fine grained, gray (SP)**

RESULTS:



500 (4/83)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

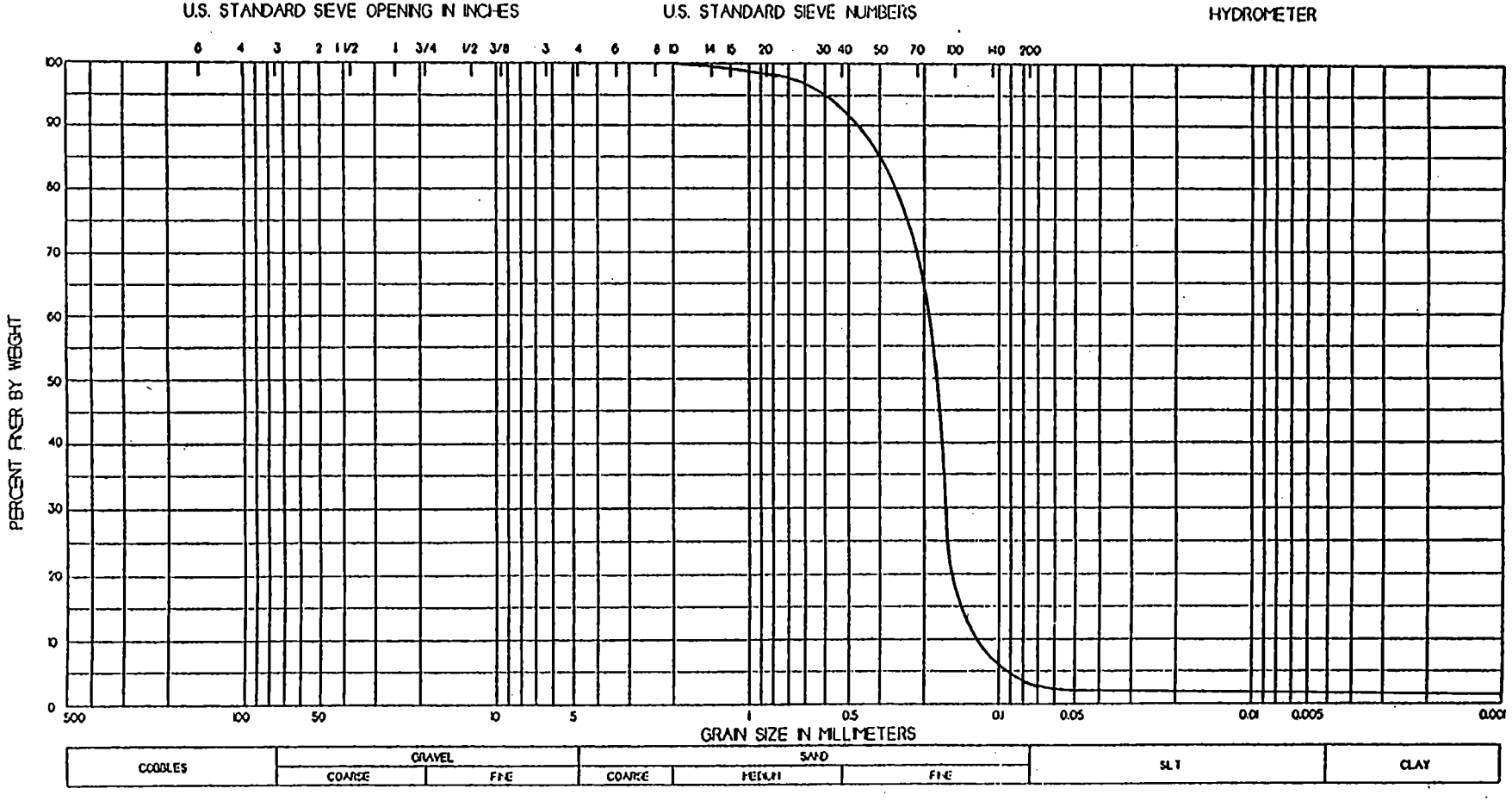
Date: **December 30, 1993**

GENERAL:

Sample Number: **4**
Sample Location: **6-8'**
Sample Source: **OW145**

USCS Classifications: **SAND, fine grained, light brown (SP)**

RESULTS:



RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

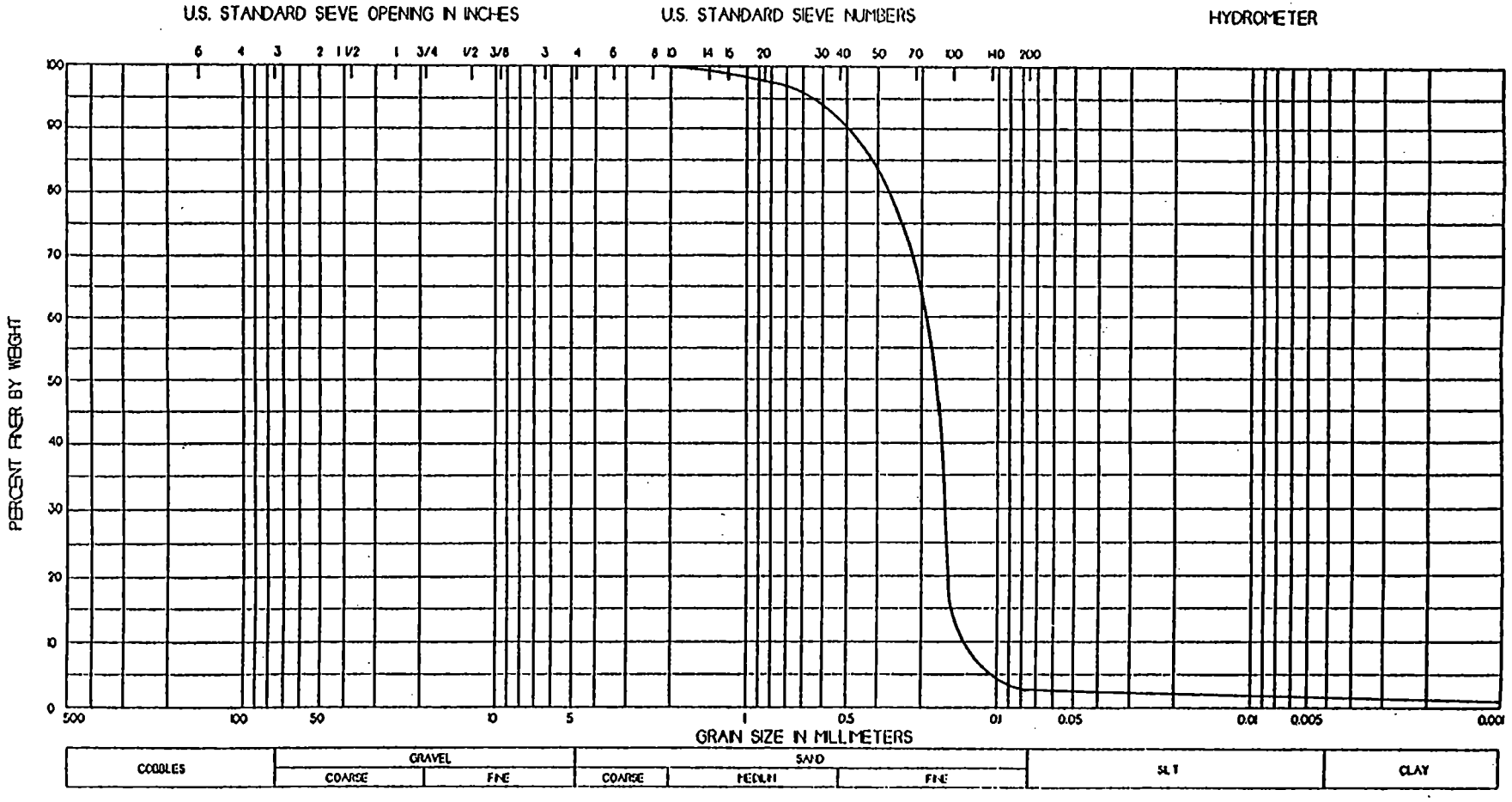
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **December 30, 1993**

GENERAL:

Sample Number: **7**
Sample Location: **12-14'**
Sample Source: **OW145**

USCS Classifications: **SAND, fine grained, gray (SP)**

RESULTS:



500 (4/93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

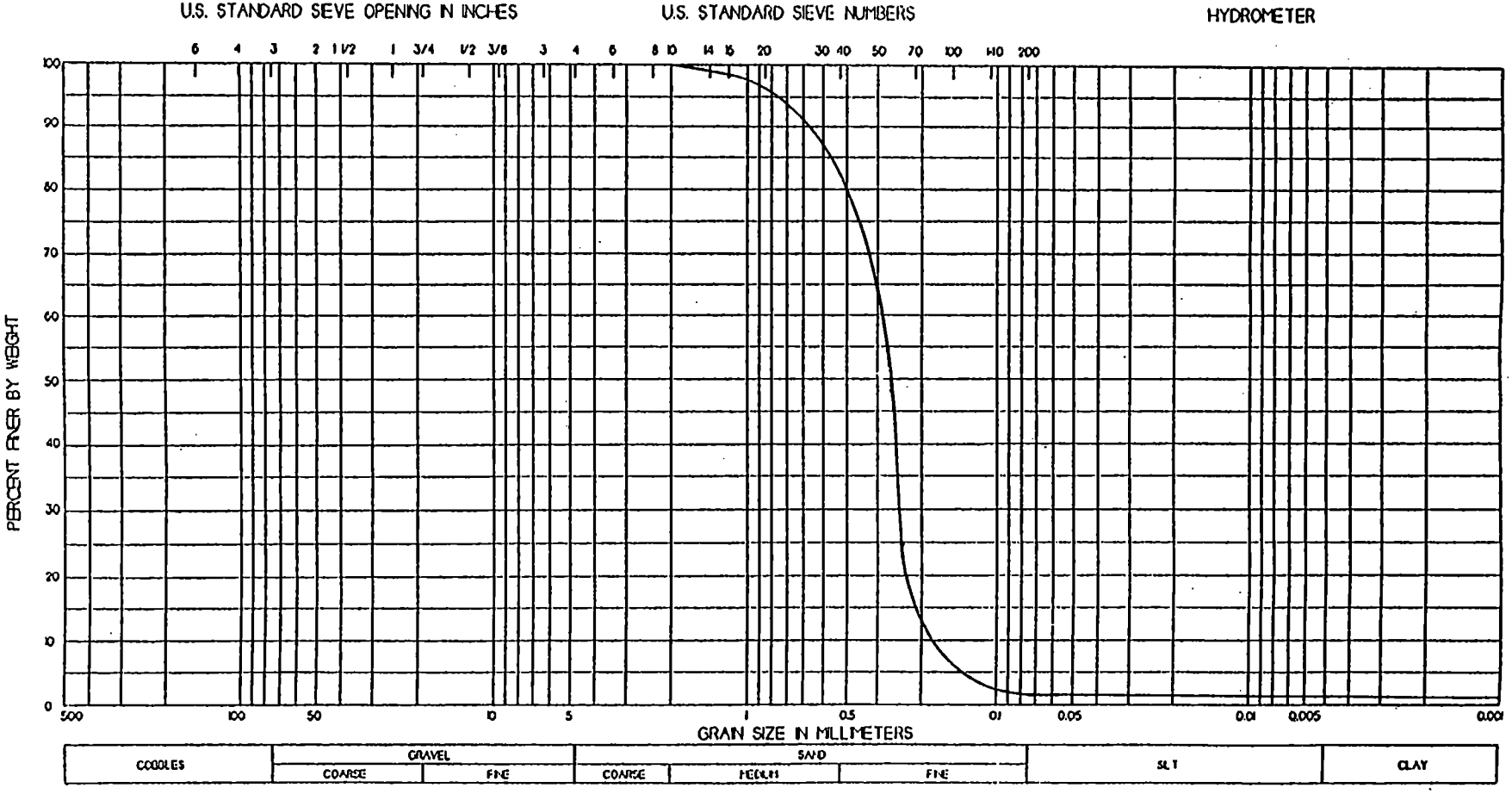
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **December 30, 1993**

GENERAL:

Sample Number: 9
Sample Location: 16-18'
Sample Source: OW145

USCS Classifications: **SAND, fine grained, gray (SP)**

RESULTS:



509 (4/9

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

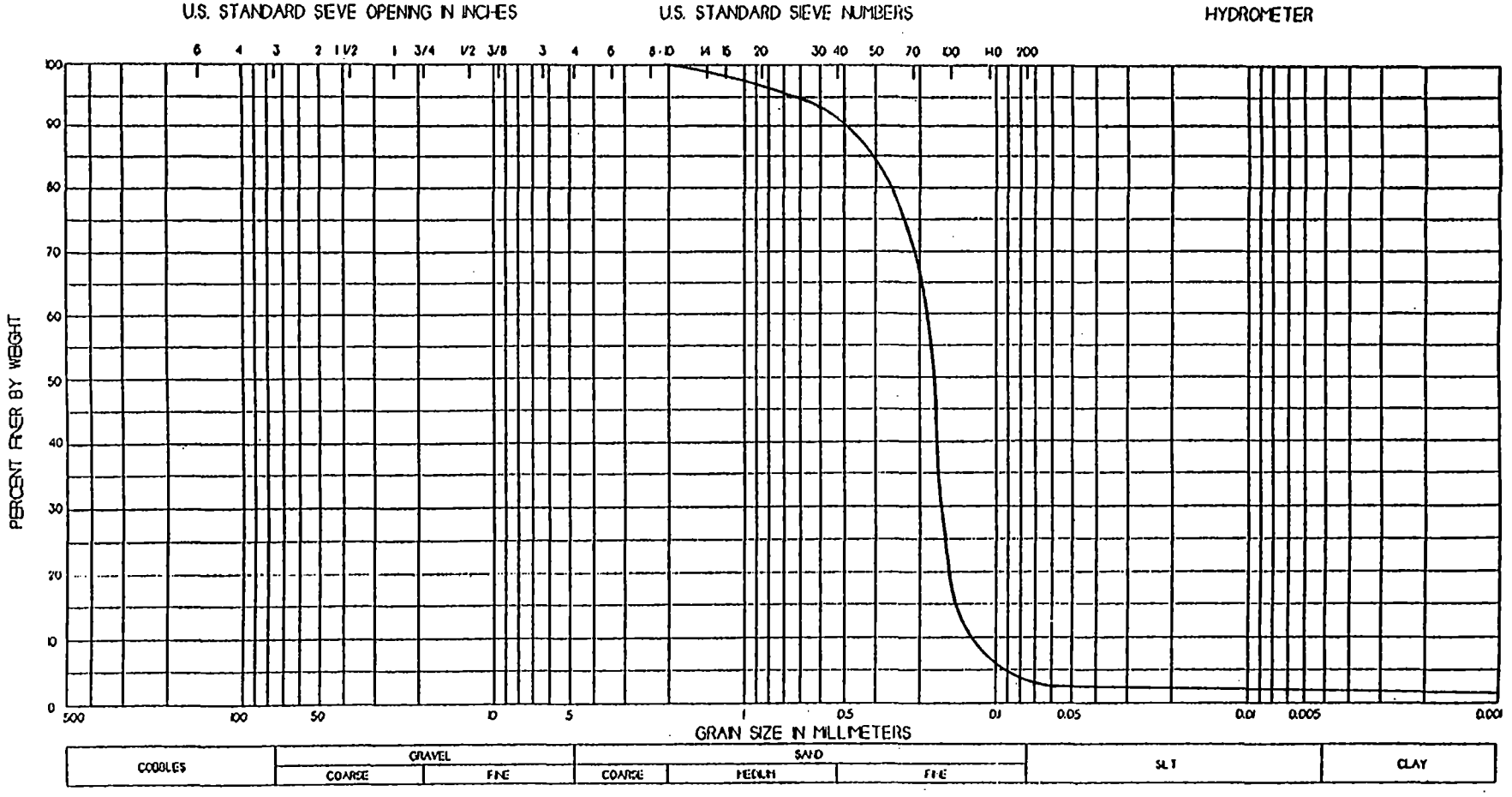
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **December 30, 1993**

GENERAL:

Sample Number: 4
Sample Location: 6-8'
Sample Source: OW146

USCS Classifications: **SAND, fine grained, light brown (SP)**

RESULTS:



RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

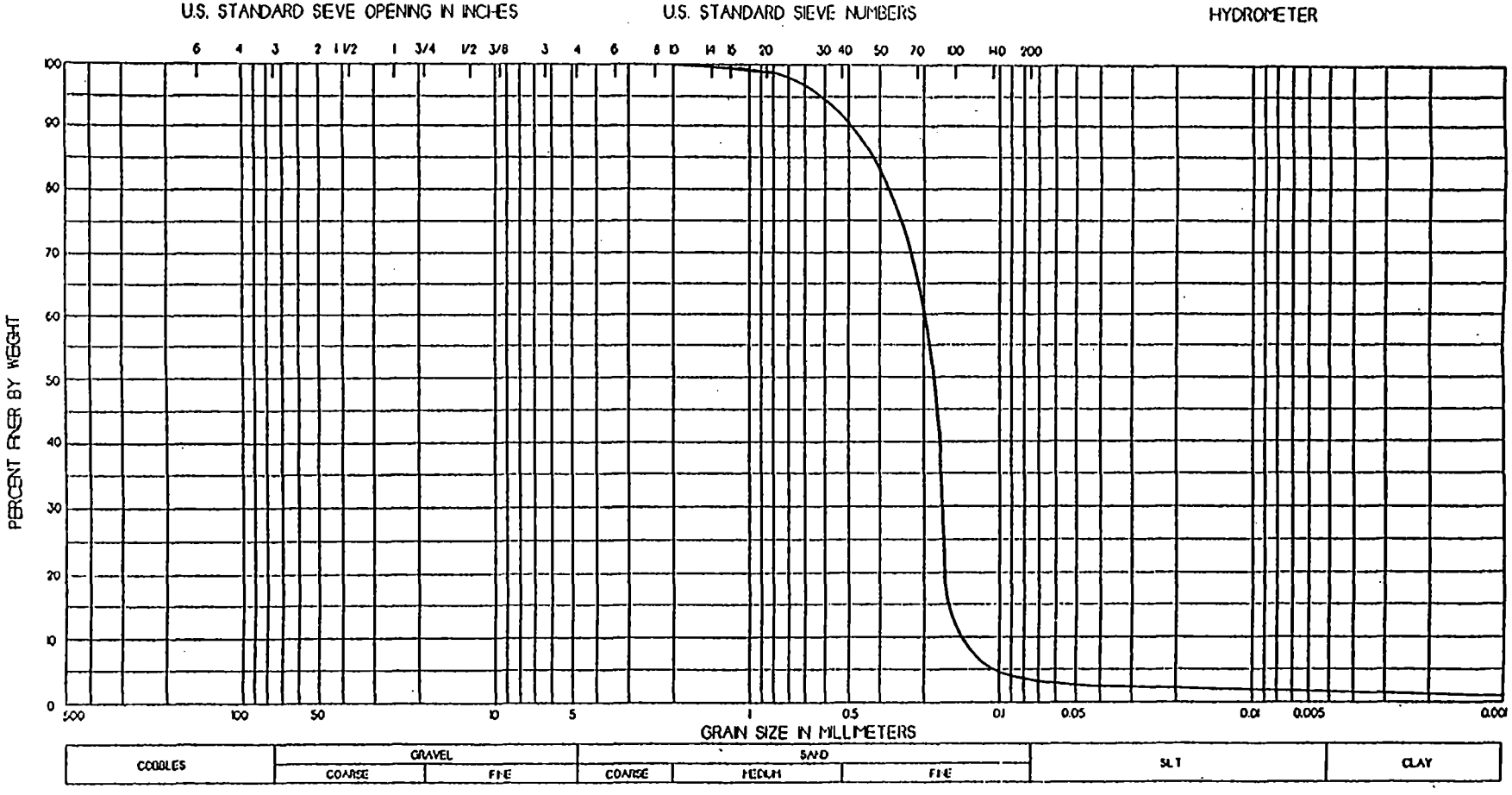
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **December 30, 1993**

GENERAL:

Sample Number: **7**
Sample Location: **12-14'**
Sample Source: **OW146**

USCS Classifications: **SAND, fine grained, gray (SP)**

RESULTS:



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RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

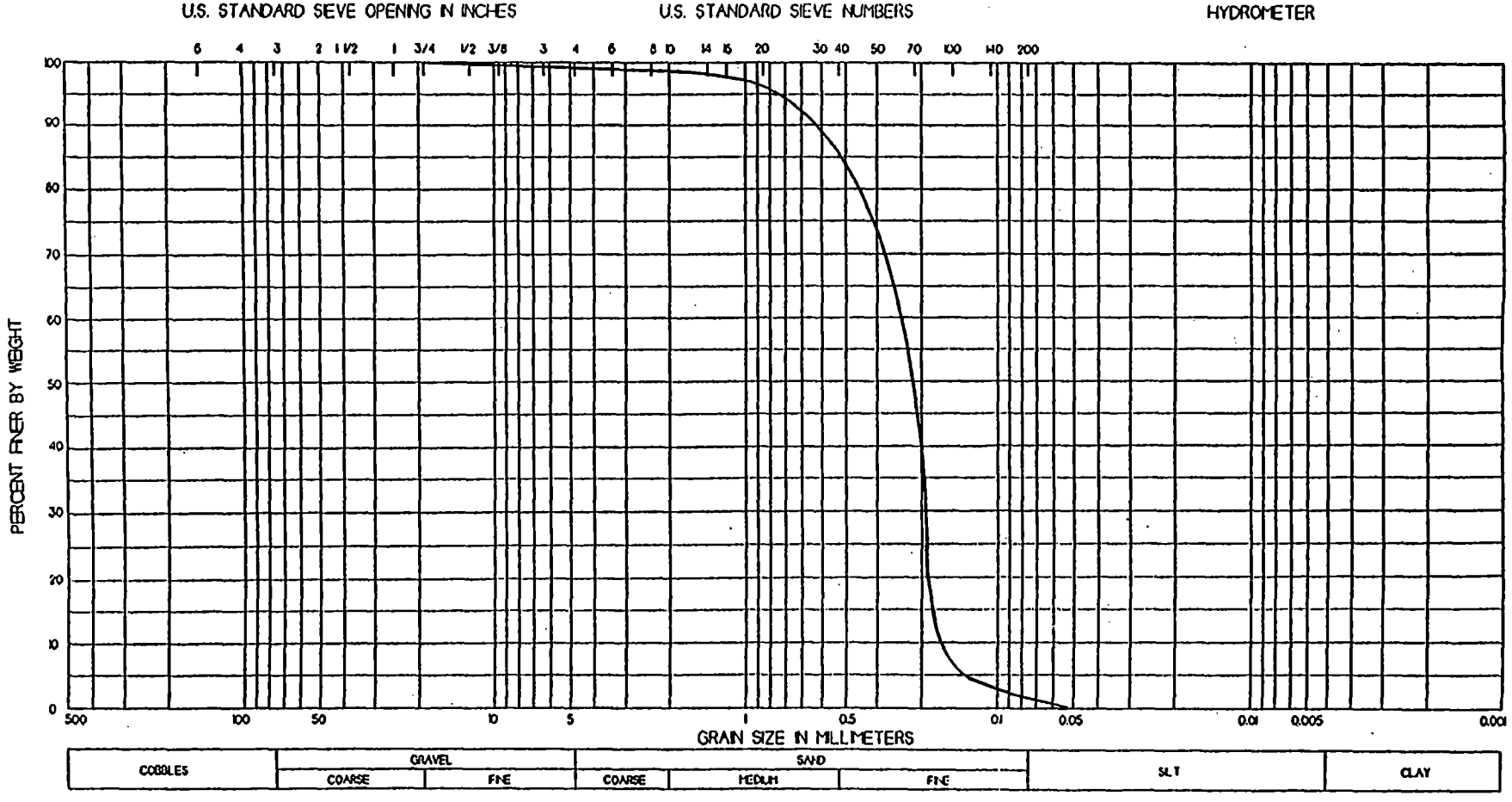
Date: **January 7, 1994**

GENERAL:

Sample Number: 9
Sample Location: 16-18'
Sample Source: OW146

USCS Classifications: **SAND, fine grained, gray (SP)**

RESULTS:



509 (4/93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

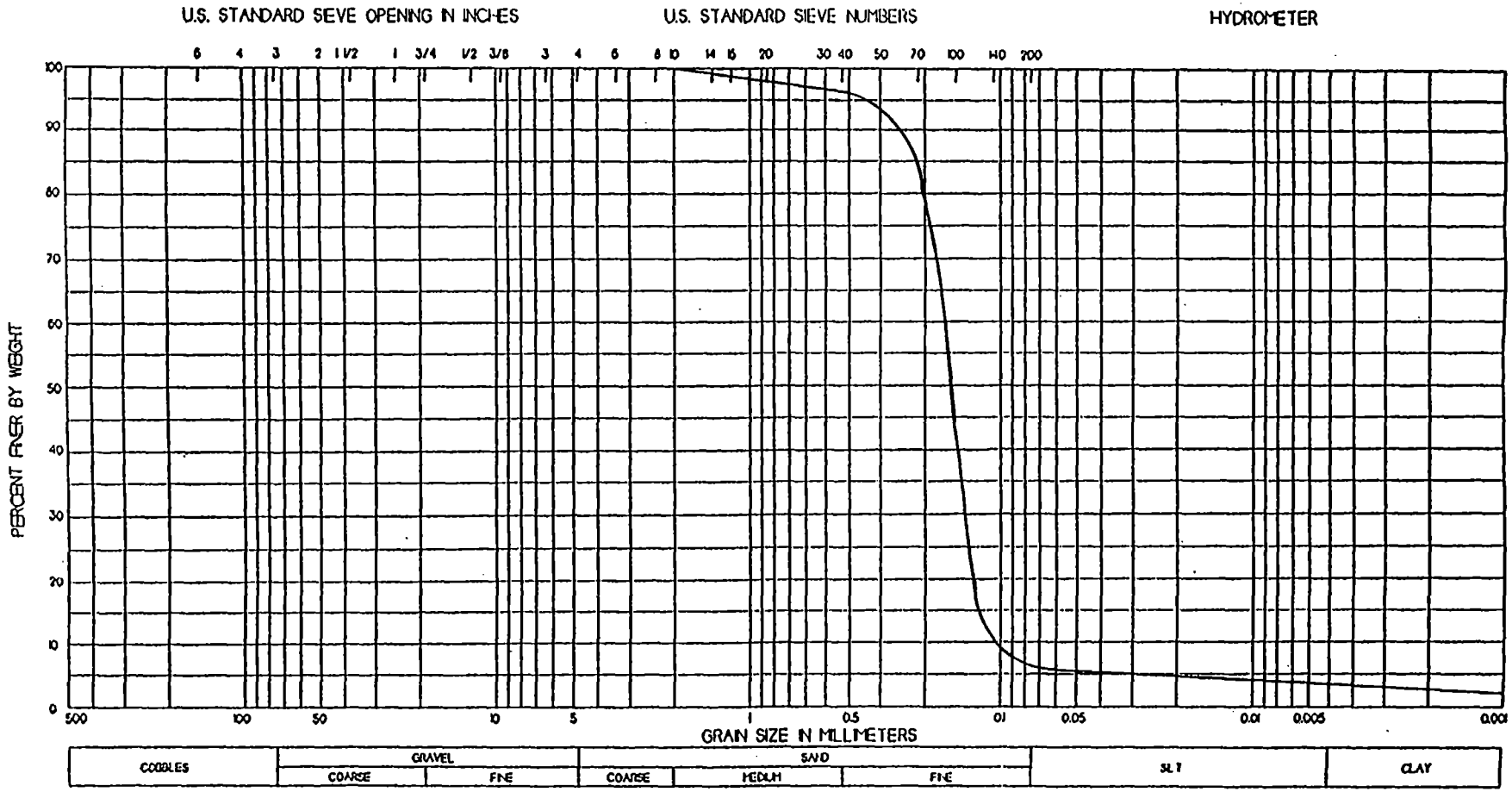
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **January 7, 1994**

GENERAL:

Sample Number: **2**
Sample Location: **2-4'**
Sample Source: **OW147**

USCS Classifications: **SAND, with organic silt, fine grained, light and dark brown (SP-SM)**

RESULTS:



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RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

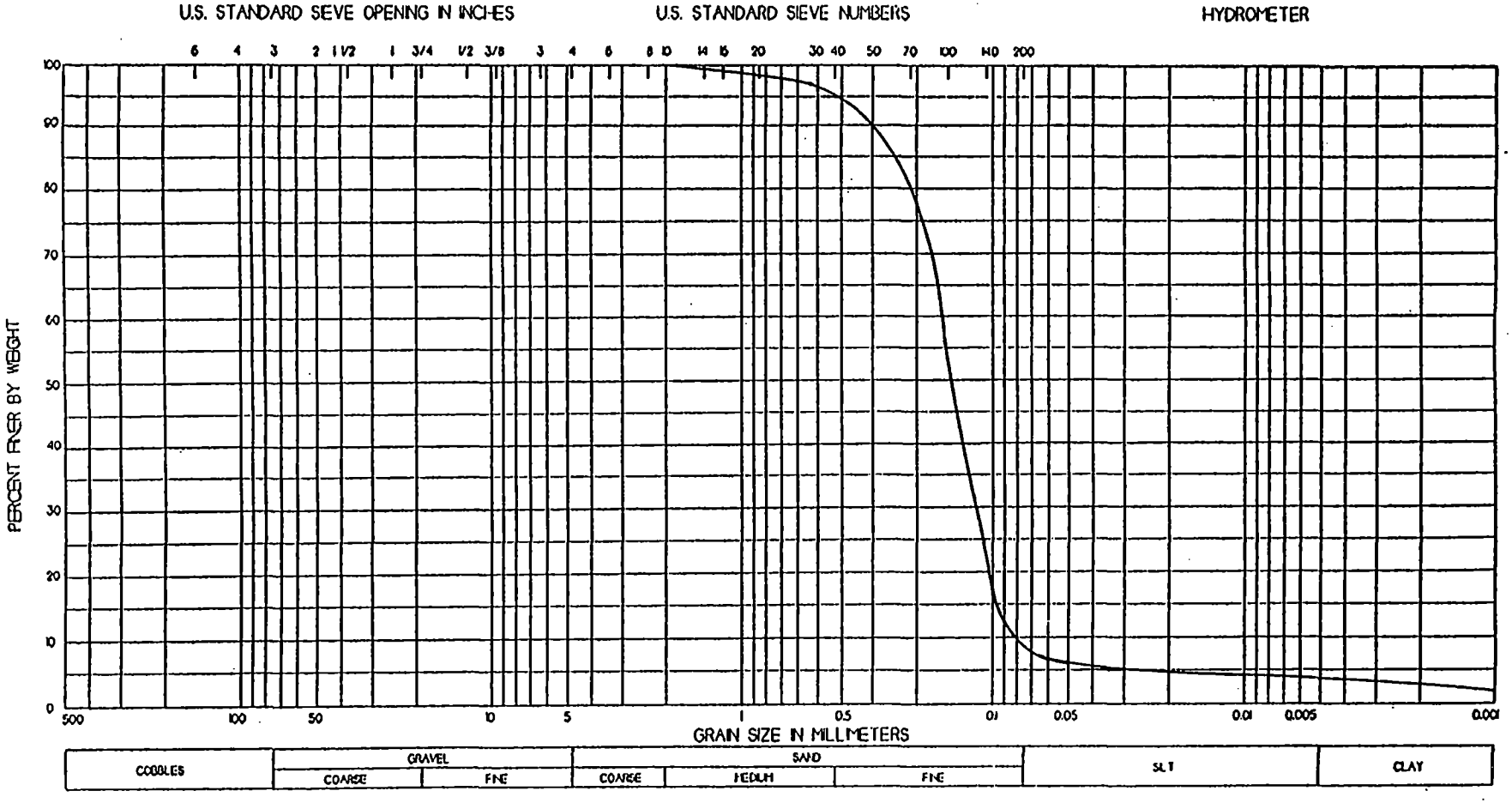
Date: **January 7, 1994**

GENERAL:

Sample Number: **7**
Sample Location: **12-14'**
Sample Source: **OW147**

USCS Classifications: **SAND, with silt, fine grained, light brown (SP-SM)**

RESULTS:



500 (4/93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

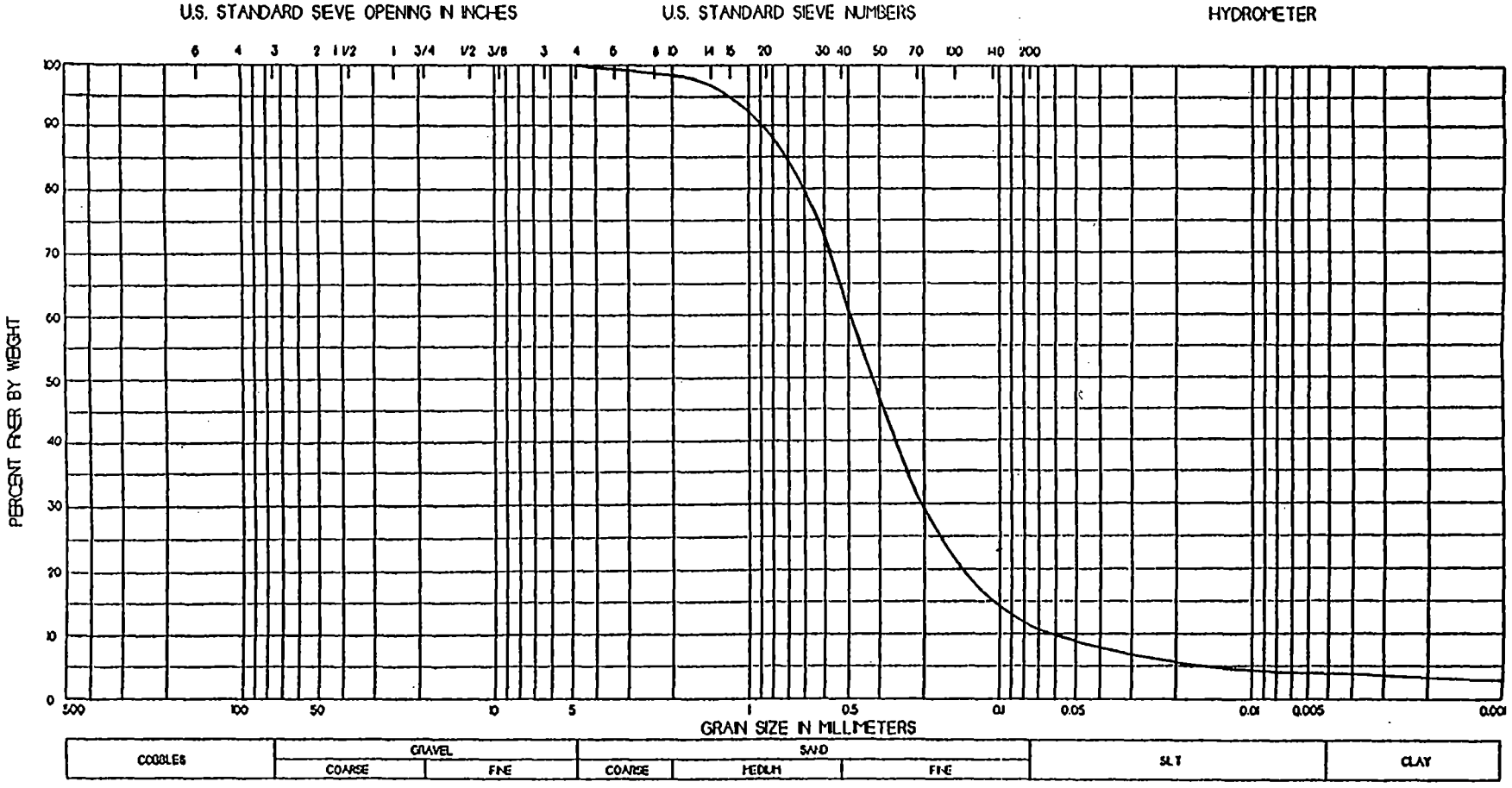
Date: **January 7, 1994**

GENERAL:

Sample Number: **10**
Sample Location: **17-19'**
Sample Source: **OW147**

USCS Classifications: **SAND, with silt, fine grained, brown (SP-SM)**

RESULTS:



500 (4)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

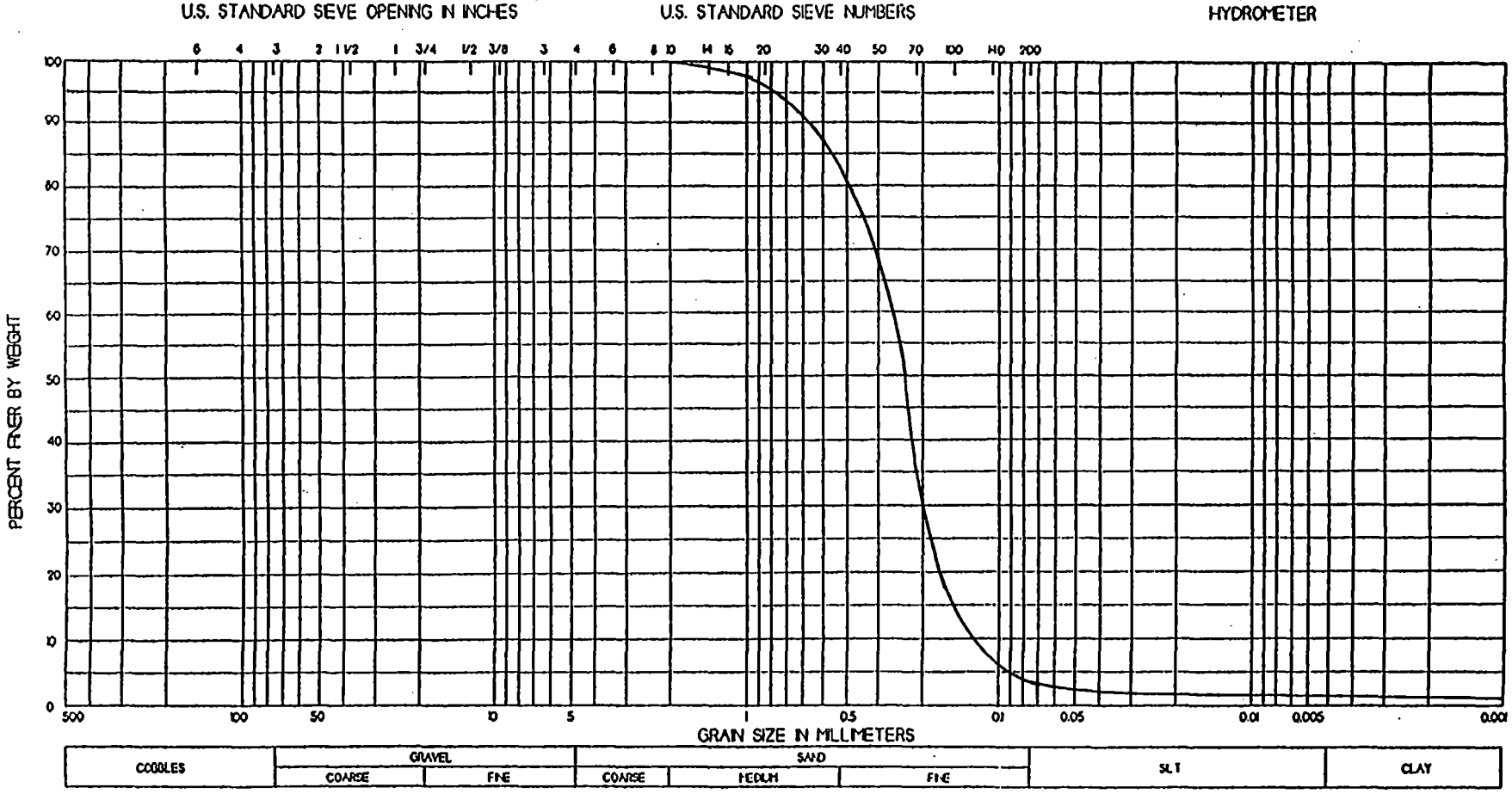
Date: **January 7, 1994**

GENERAL:

Sample Number: **2**
Sample Location: **2-4'**
Sample Source: **OW148**

USCS Classifications: **SAND, fine grained, brown (SP)**

RESULTS:



RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: FORT MCCOY
SPARTA, WISCONSIN

Copies:

Client: WTD Environmental Drilling

RVT File No: W93-258

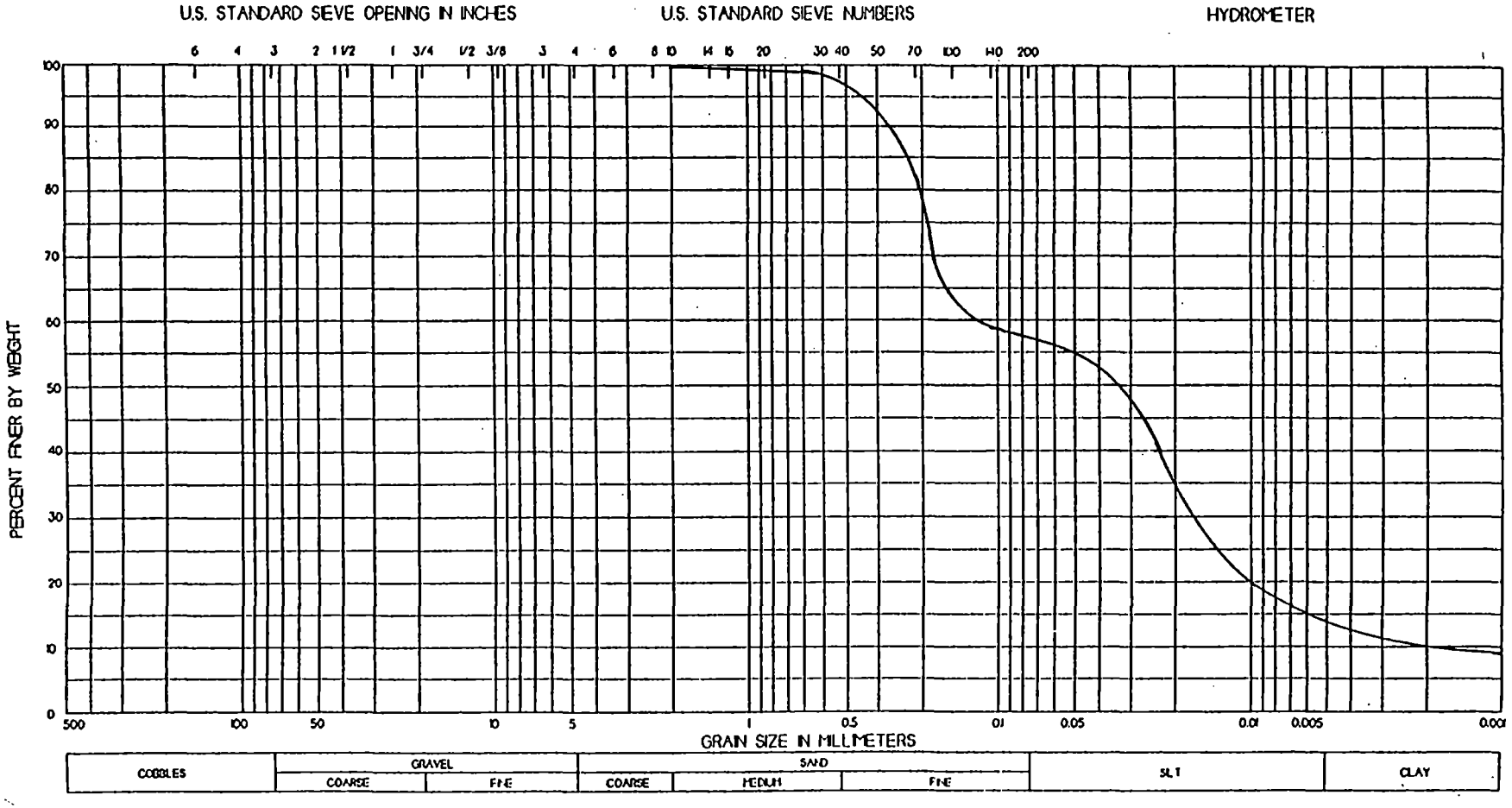
Date: January 7, 1994

GENERAL:

Sample Number: 4
Sample Location: 6-8'
Sample Source: OW148

USCS Classifications: SANDY LEAN CLAY, brown (CL)

RESULTS:



RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: WTD Environmental Drilling

RVT File No: W93-258

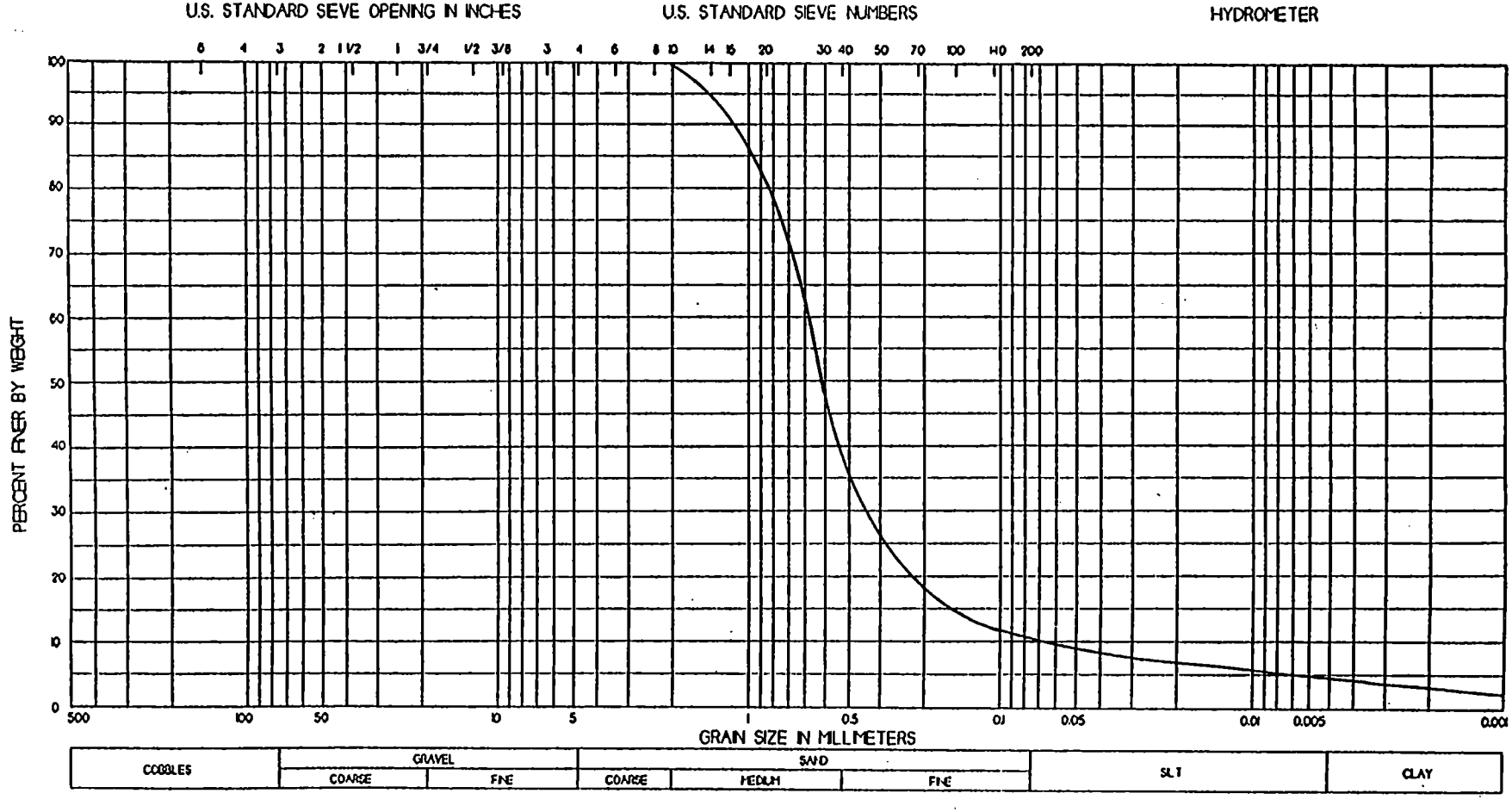
Date: January 7, 1994

GENERAL:

Sample Number: 7
Sample Location: 12-14'
Sample Source: OW148

USCS Classifications: SAND, with silt, medium to fine grained, light brown (SP-SM)

RESULTS:



500 (4/93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: WTD Environmental Drilling

RVT File No: W93-258

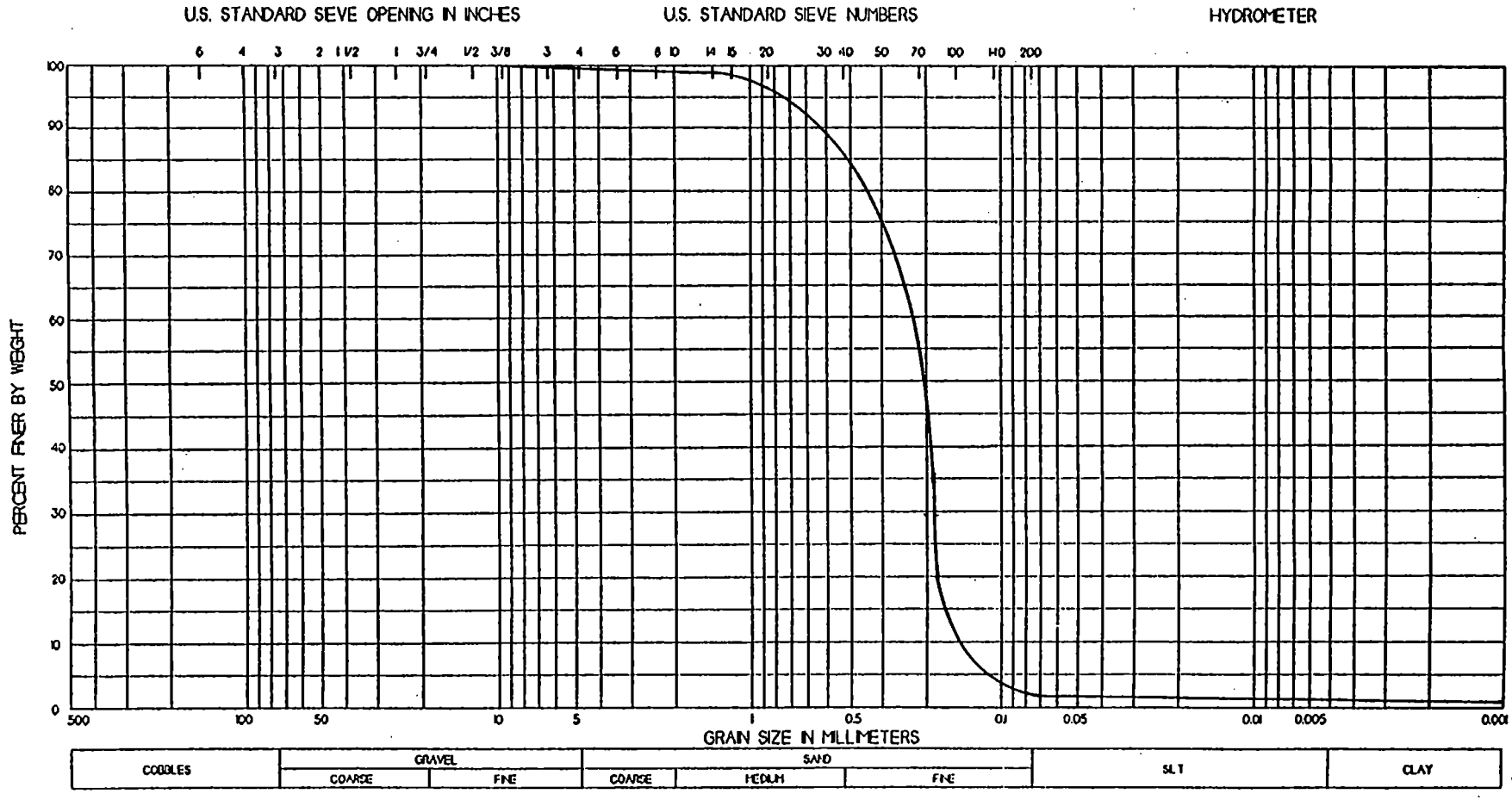
Date: January 7, 1994

GENERAL:

Sample Number: 3
Sample Location: 4-6'
Sample Source: OW149

USCS Classifications: SAND, fine grained, light brown (SP)

RESULTS:



500 (4)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

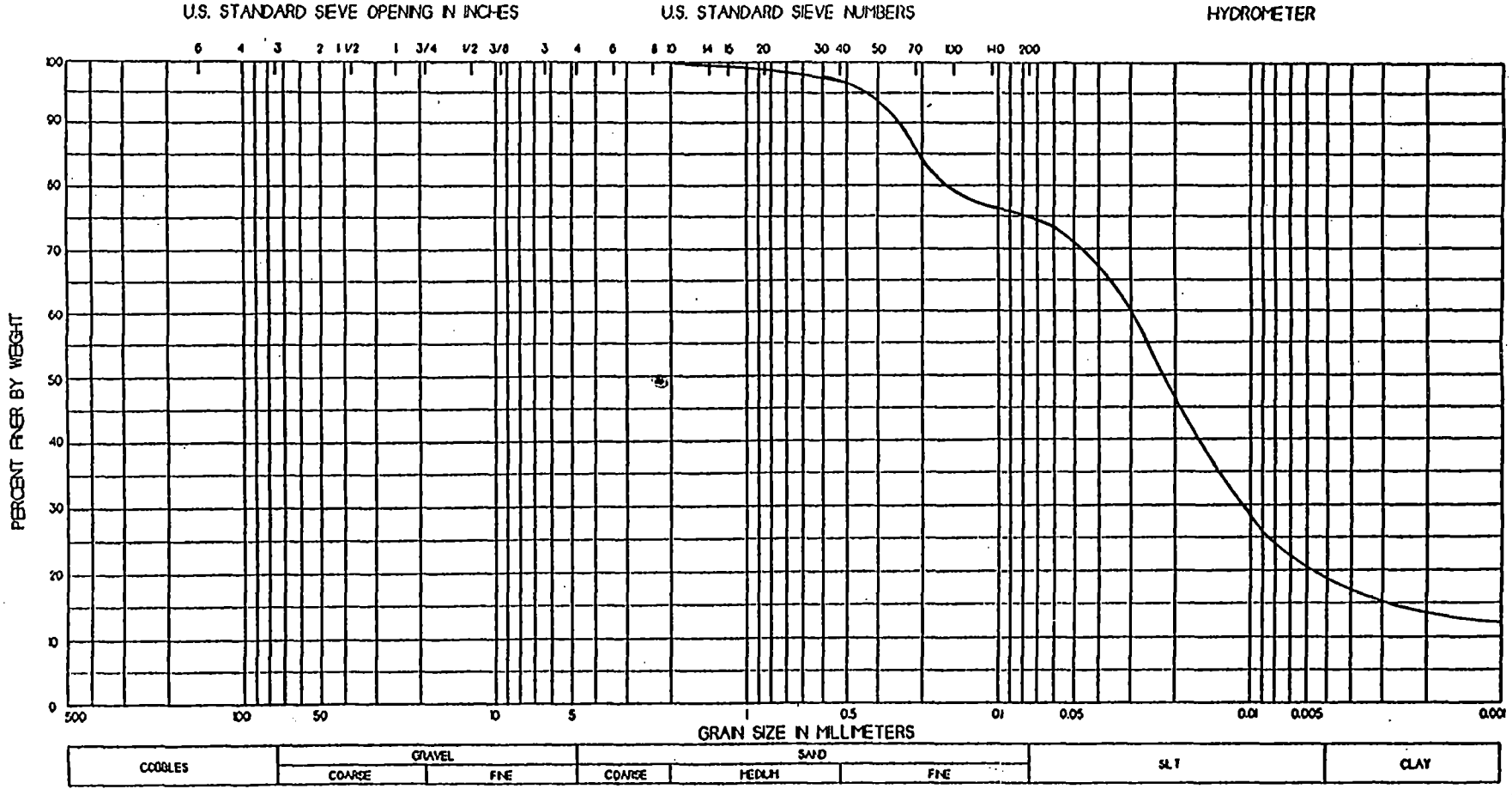
Date: **January 7, 1994**

GENERAL:

Sample Number: 6
Sample Location: 10-12'
Sample Source: OW149

USCS Classifications: **SILTY CLAY, with sand, brown (CL-ML)**

RESULTS:



500 (4/93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

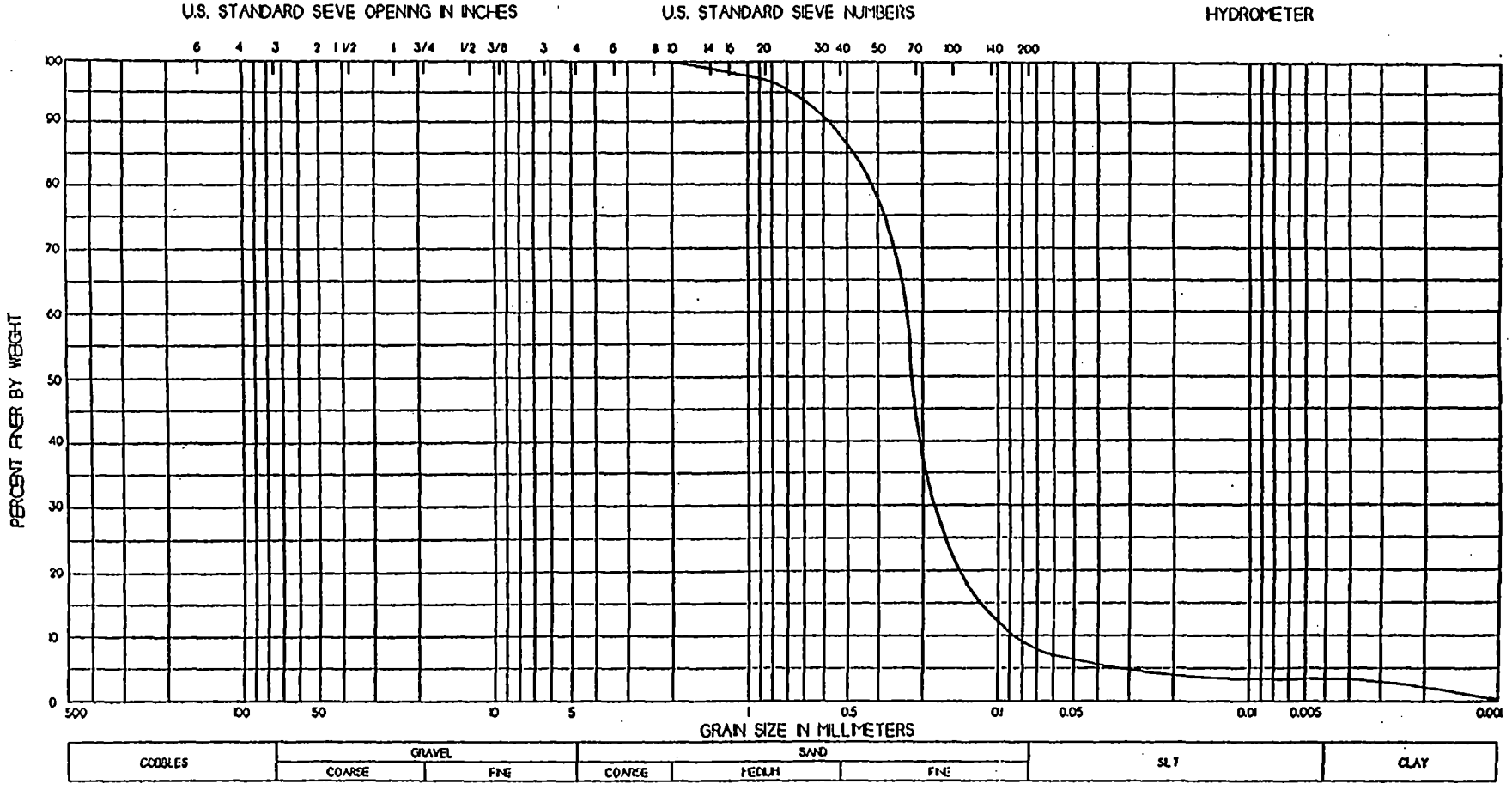
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **January 7, 1994**

GENERAL:

Sample Number: 9
Sample Location: 16-18'
Sample Source: OW149

USCS Classifications: **SAND, with silt, fine grained, light brown (SP-SM)**

RESULTS:



RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: WTD Environmental Drilling

RVT File No: W93-258

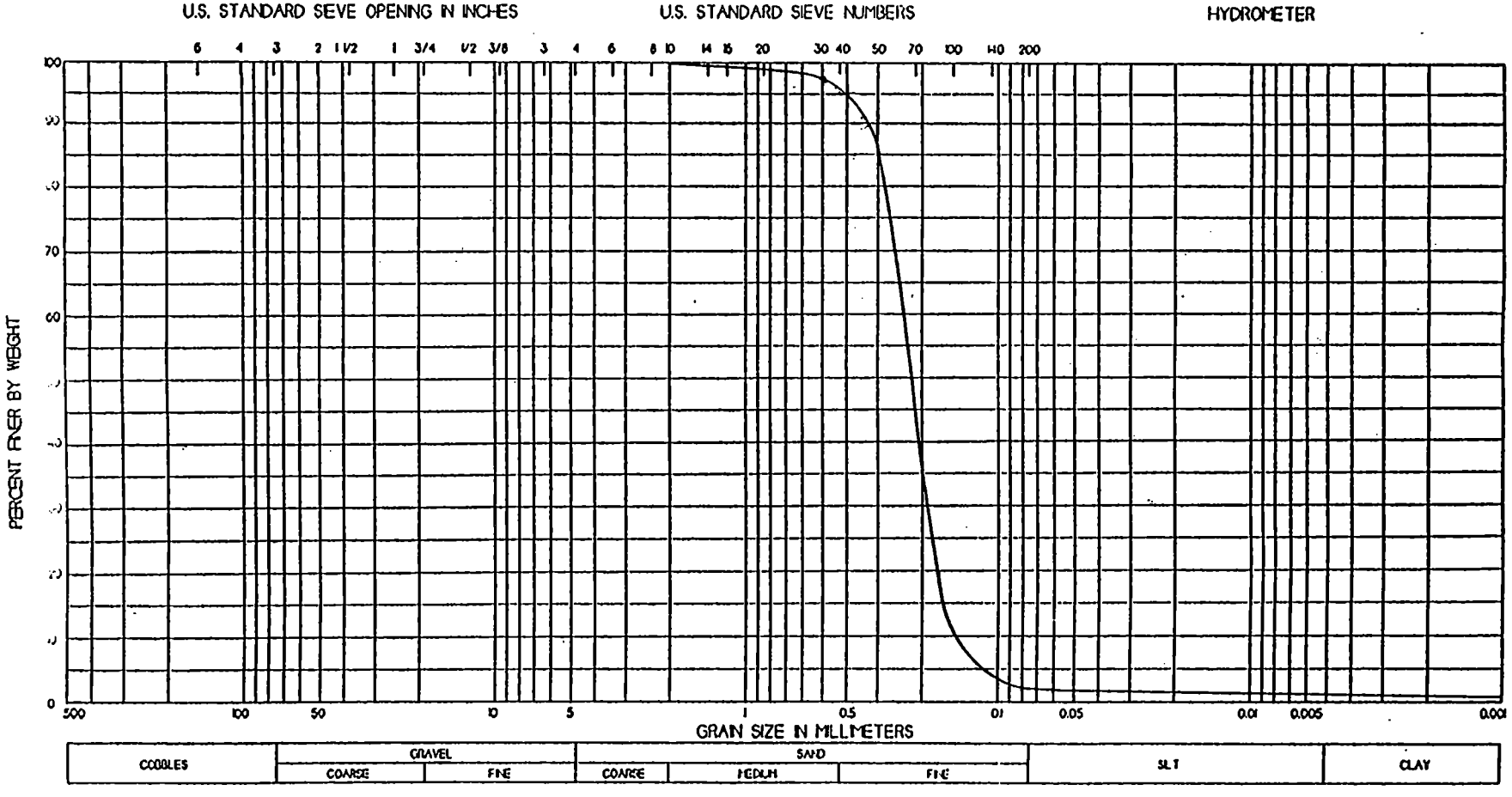
Date: January 7, 1994

GENERAL:

Sample Number: 3
Sample Location: 4-6'
Sample Source: OW150

USCS Classifications: SAND, fine grained, light brown (SP)

RESULTS:



500 (4/93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

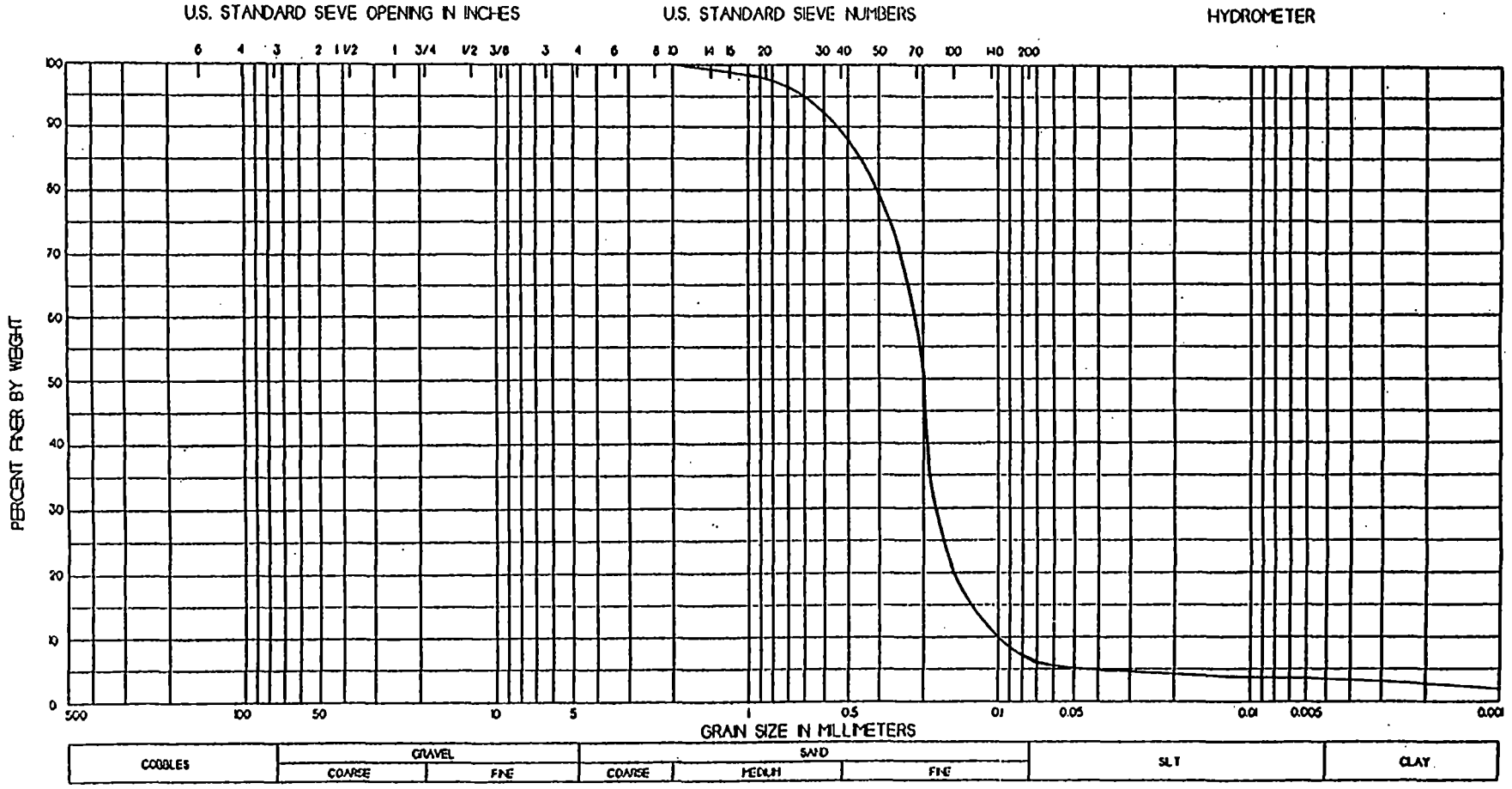
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **January 7, 1994**

GENERAL:

Sample Number: 6
Sample Location: 10-12'
Sample Source: OW150

USCS Classifications: **SAND, with silt, fine grained, brown (SP-SM)**

RESULTS:



500 (4

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: WTD Environmental Drilling

RVT File No: W93-258

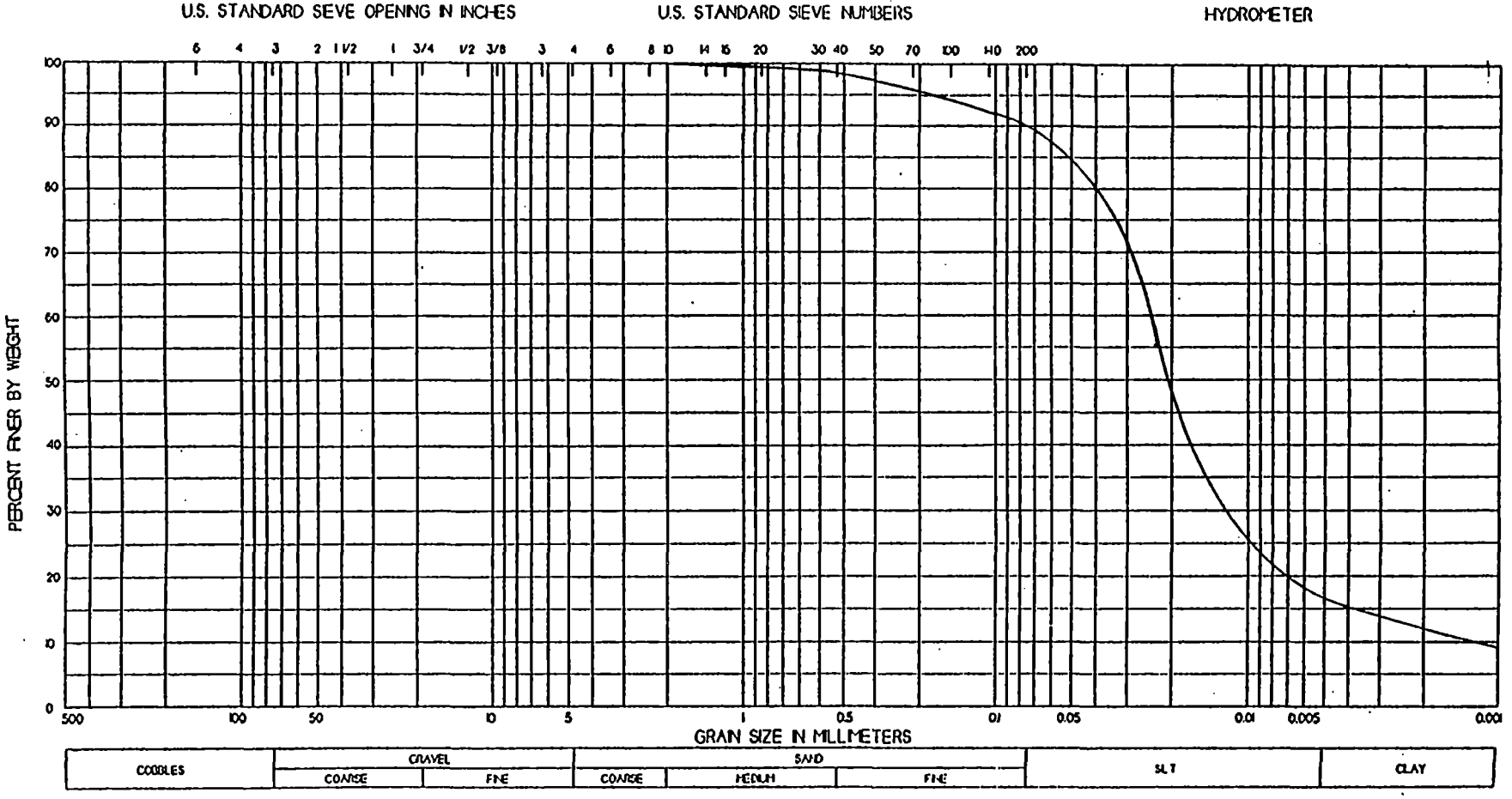
Date: January 7, 1994

GENERAL:

Sample Number: 8
Sample Location: 14-16'
Sample Source: OW150

USCS Classifications: **LEAN CLAY, dark gray (CL)**

RESULTS:



500 (4/93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: WTD Environmental Drilling

RVT File No: W93-258

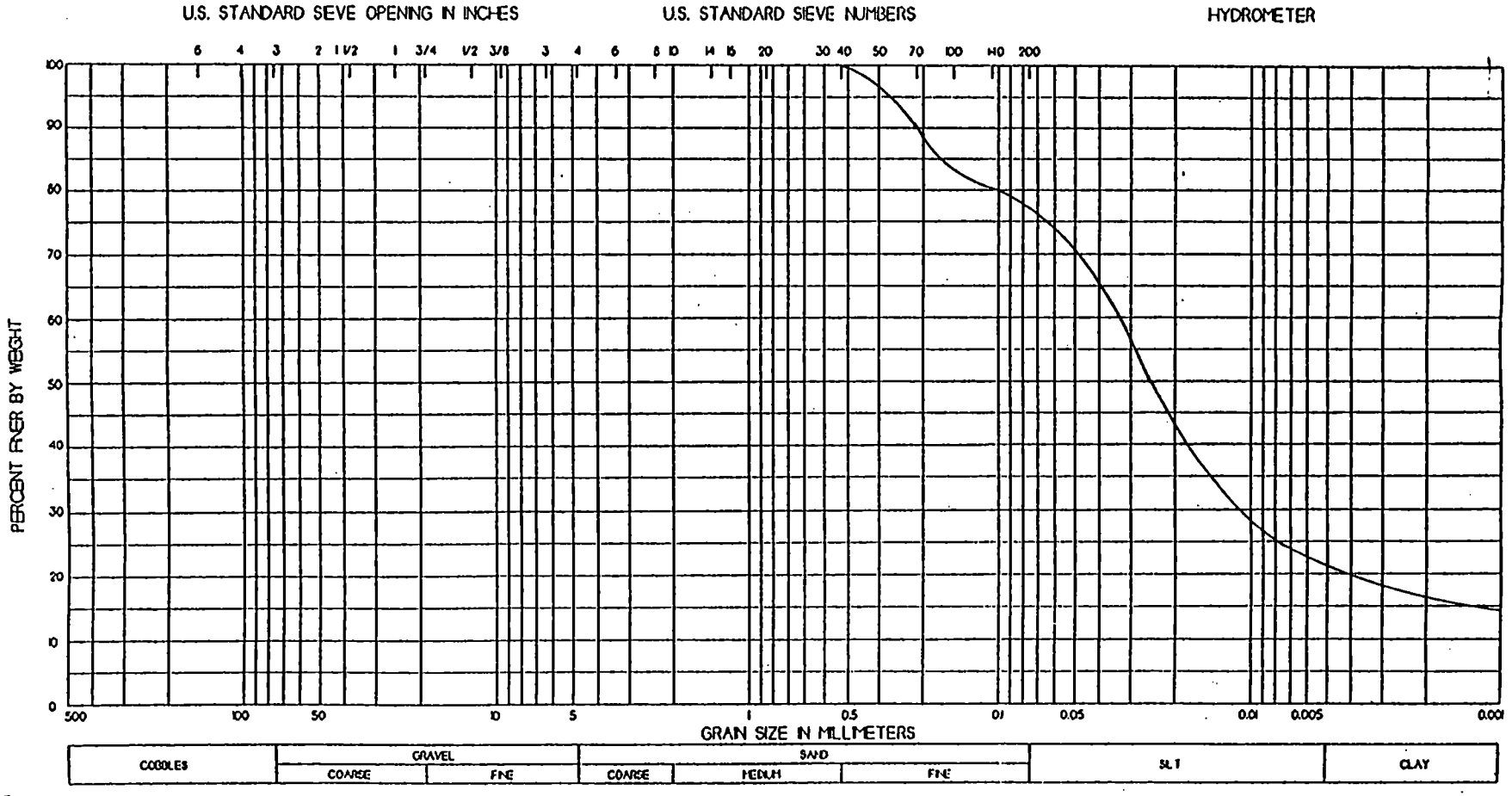
Date: January 7, 1994

GENERAL:

Sample Number: 5
Sample Location: 8-10'
Sample Source: OW151

USCS Classifications: LEAN CLAY, with sand, brown (CL)

RESULTS:



500 (1/93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

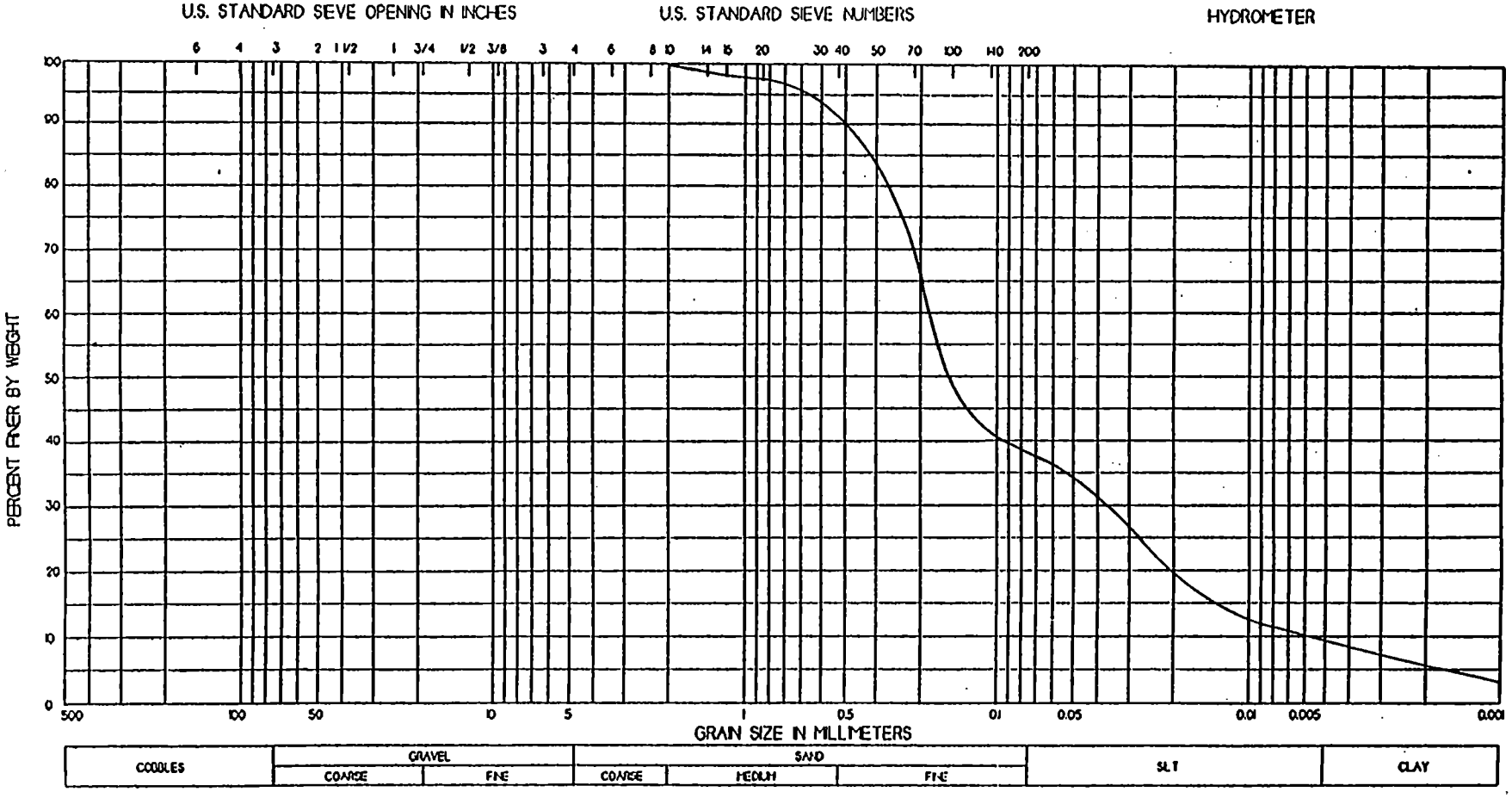
Date: **January 7, 1994**

GENERAL:

Sample Number: **11**
Sample Location: **20-22'**
Sample Source: **OW151**

USCS Classifications: **SILTY SAND, fine grained, with rust stains, brown (SM)**

RESULTS:



500 (4/93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: WTD Environmental Drilling

RVT File No: W93-258

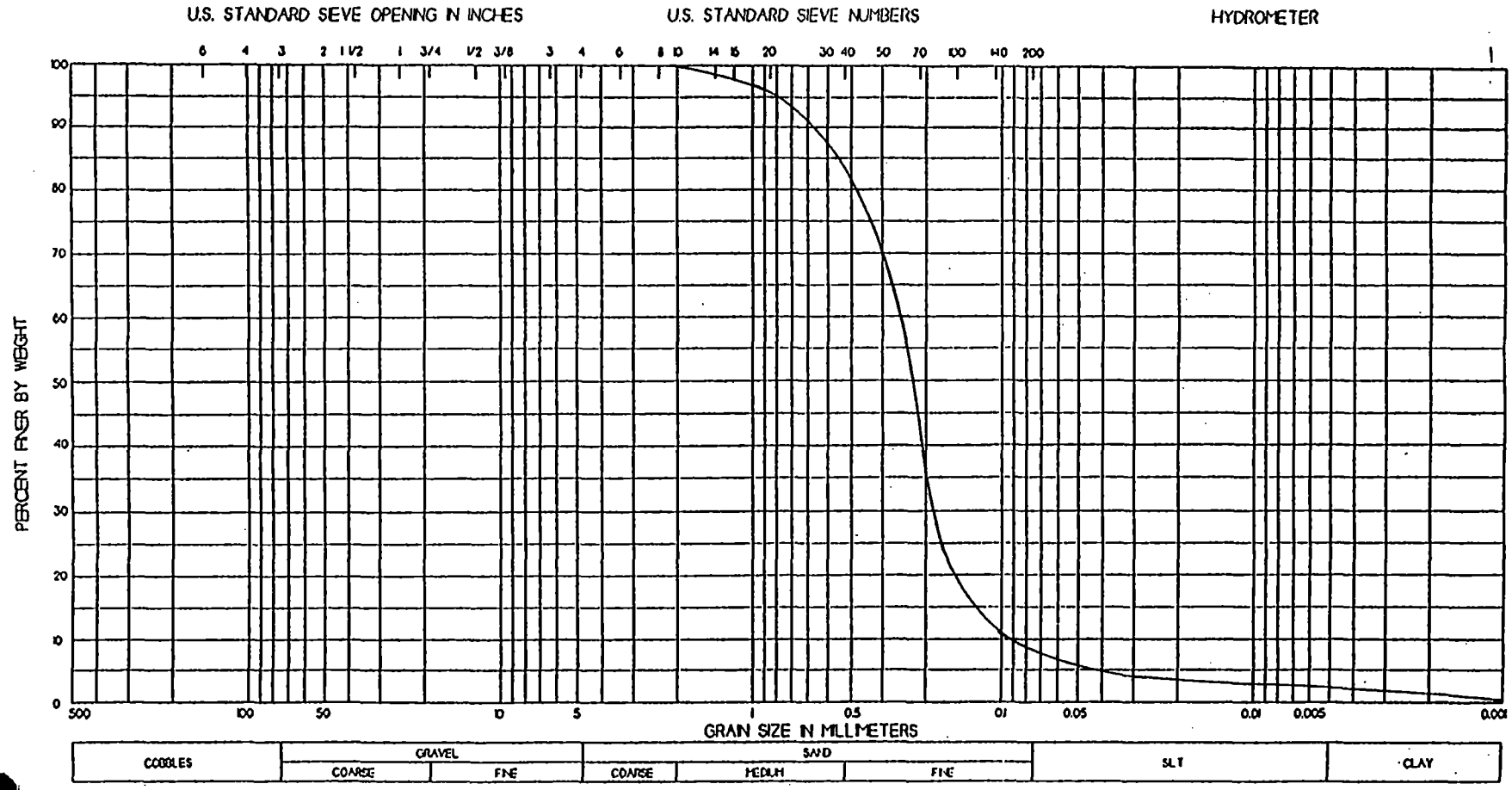
Date: January 7, 1994

GENERAL:

Sample Number: 18
Sample Location: 34-36'
Sample Source: OW151

USCS Classifications: SAND, with silt, fine grained, with rust stains, brown (SP-SM)

RESULTS:



(93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

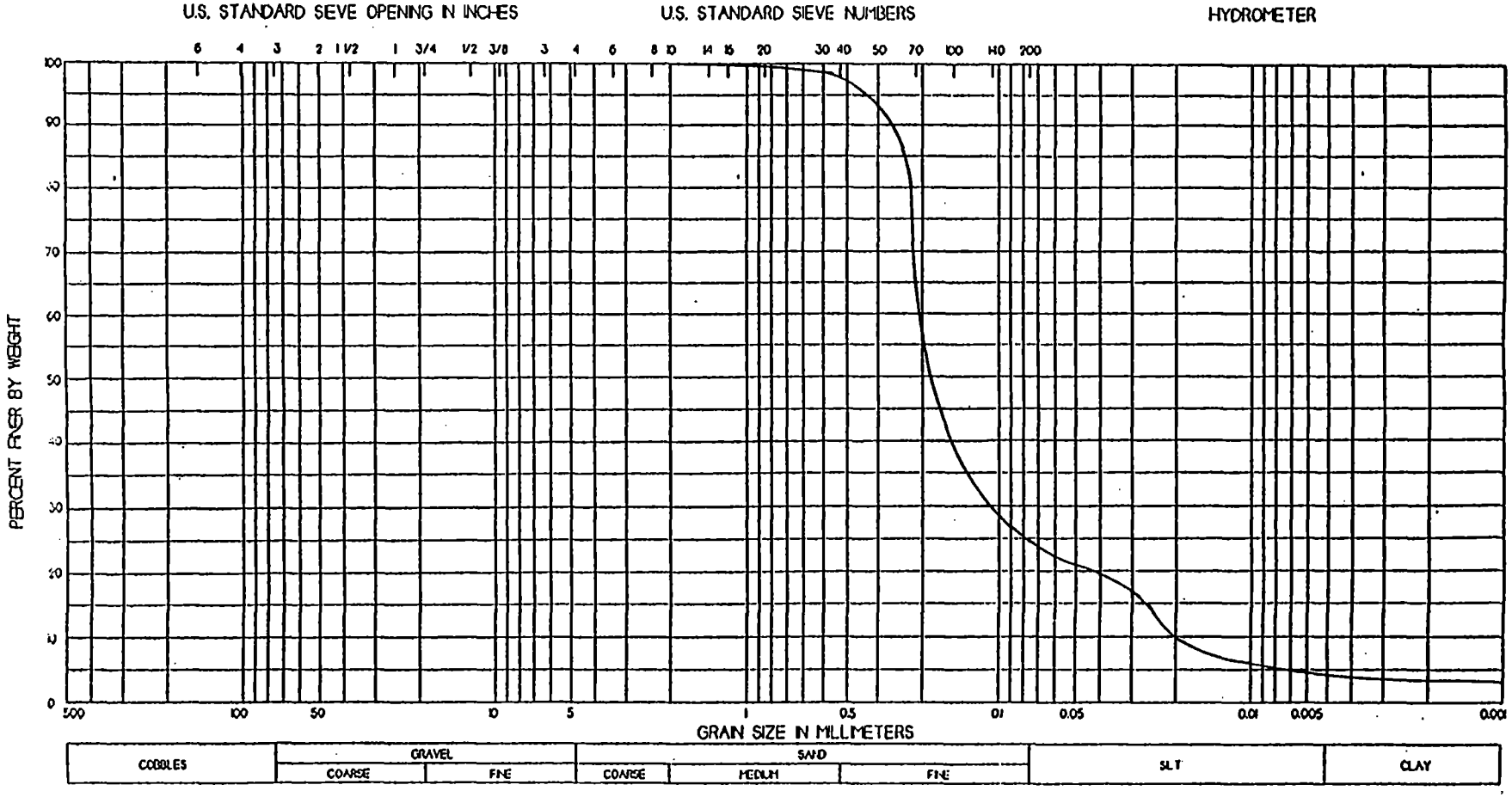
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **January 11, 1994**

GENERAL:

Sample Number: **7**
Sample Location: **12-14'**
Sample Source: **OW152**

USCS Classifications: **SILTY SAND, fine grained, yellowish brown and gray (SM)**

RESULTS:



500 (4/93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

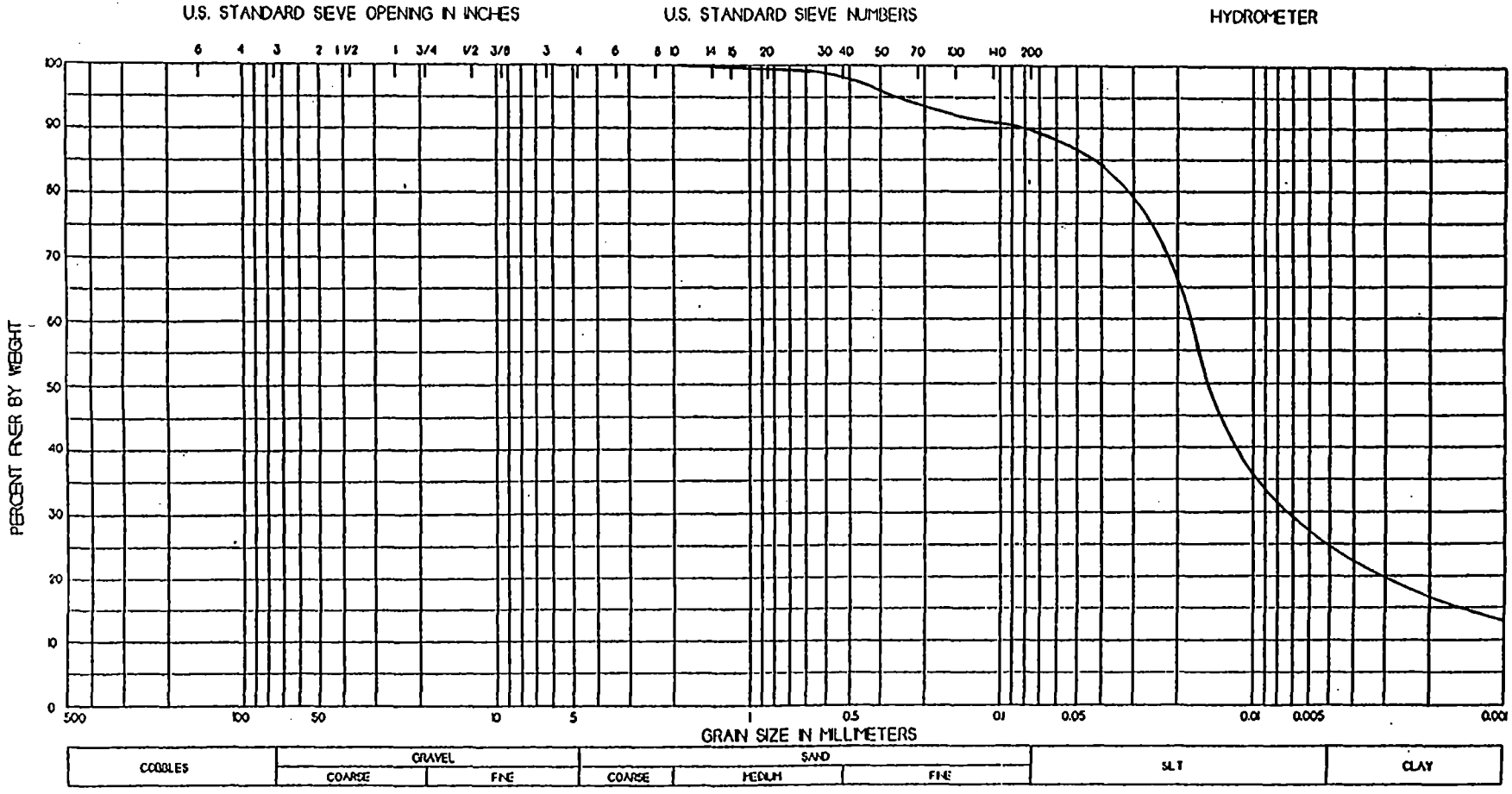
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **January 11, 1994**

GENERAL:

Sample Number: **9**
Sample Location: **16-18'**
Sample Source: **OW152**

USCS Classifications: **SILTY CLAY, with rust stains, gray and brown (CL-ML)**

RESULTS:



500 (4

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

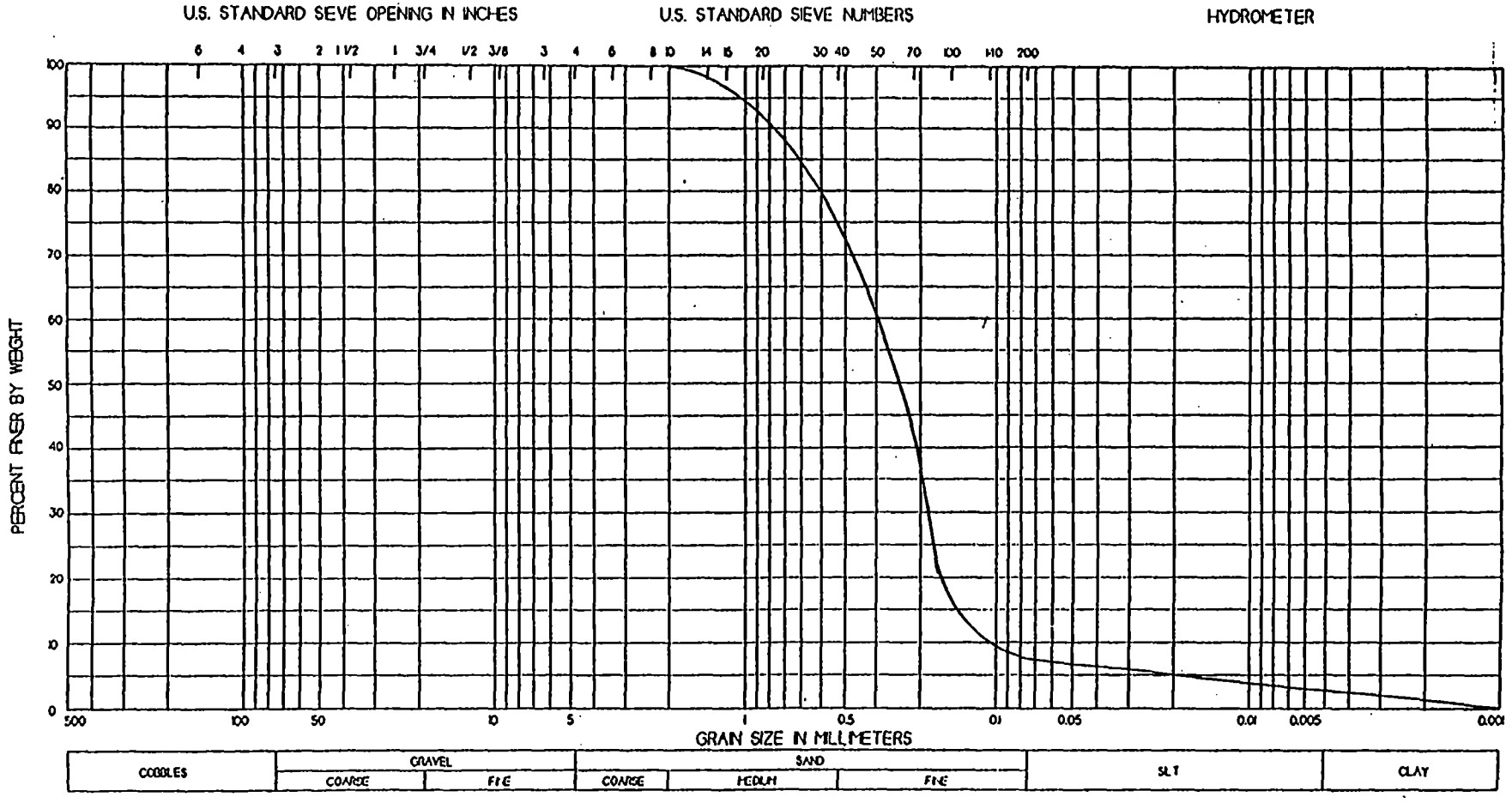
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **January 11, 1994**

GENERAL:

Sample Number: **15**
Sample Location: **28-30'**
Sample Source: **OW152**

USCS Classifications: **SAND, with silt, fine grained, brown (SP-SM)**

RESULTS:



RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

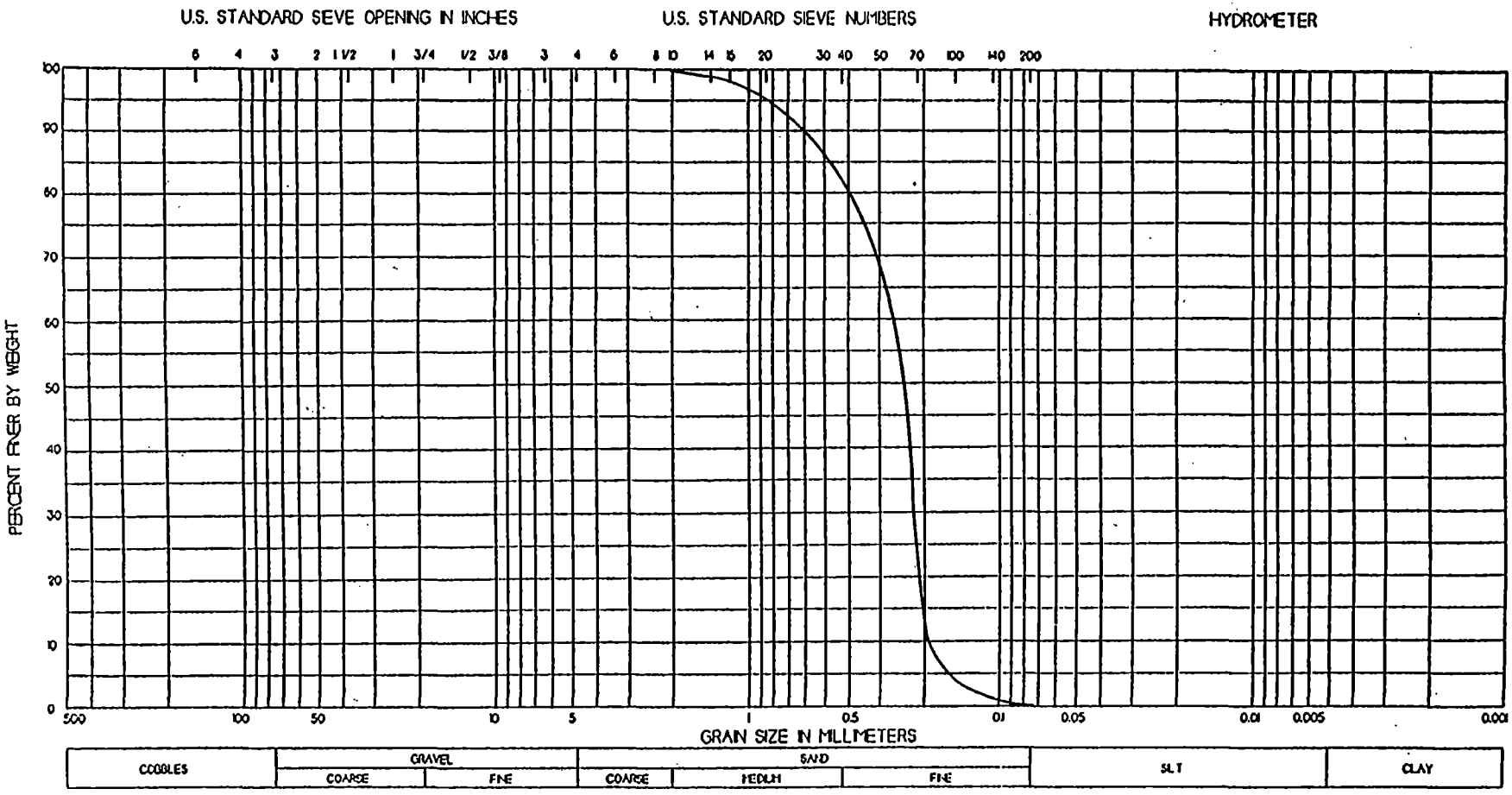
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **January 11, 1994**

GENERAL:

Sample Number: **5**
Sample Location: **8-10'**
Sample Source: **OW154**

USCS Classifications: **SAND, fine grained, brownish-white (SP)**

RESULTS:



500 (4/

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

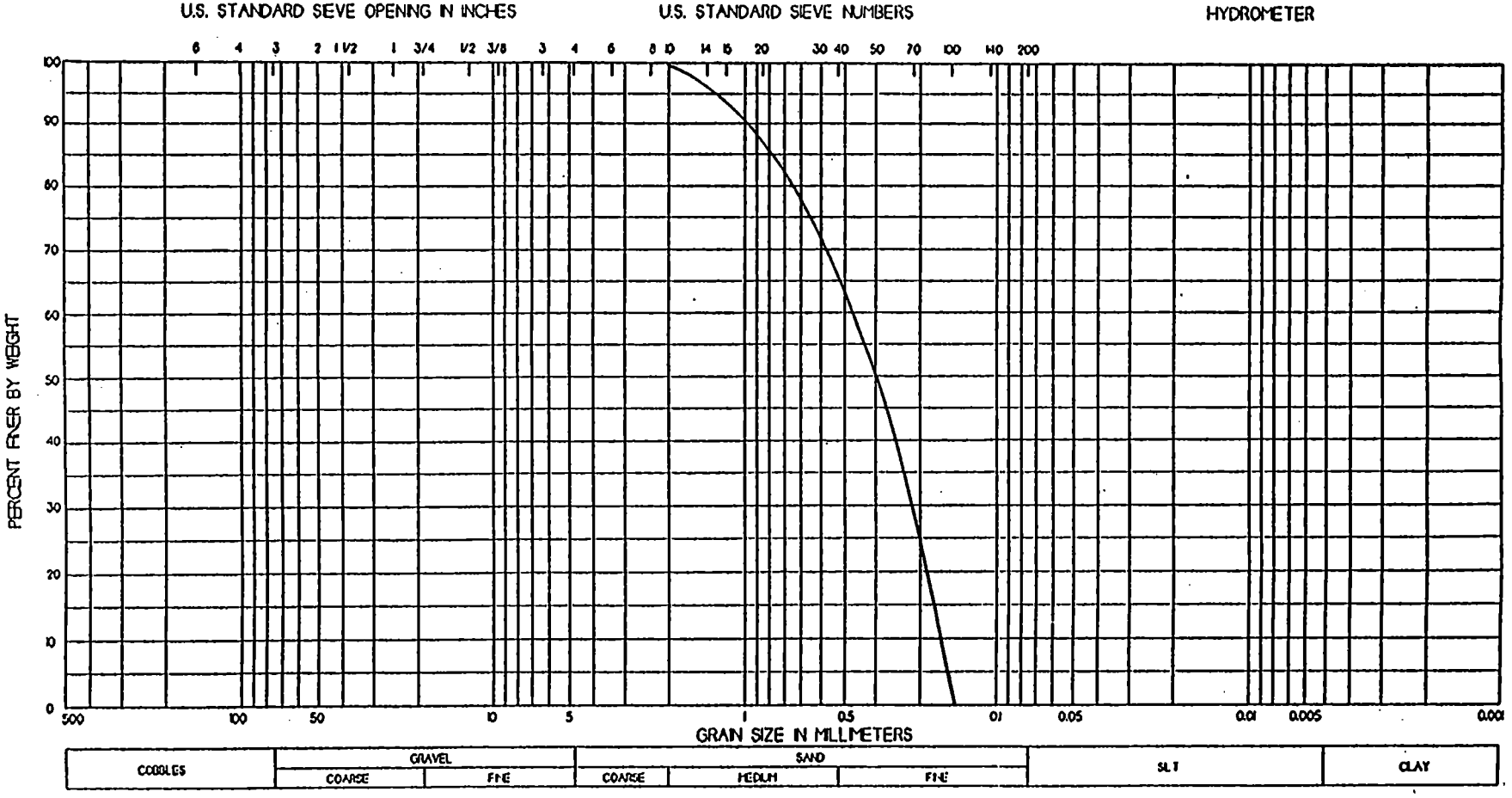
Date: **January 11, 1994**

GENERAL:

Sample Number: **7**
Sample Location: **12-14'**
Sample Source: **OW154**

USCS Classifications: **SAND, fine grained, brownish-white (SP)**

RESULTS:



RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

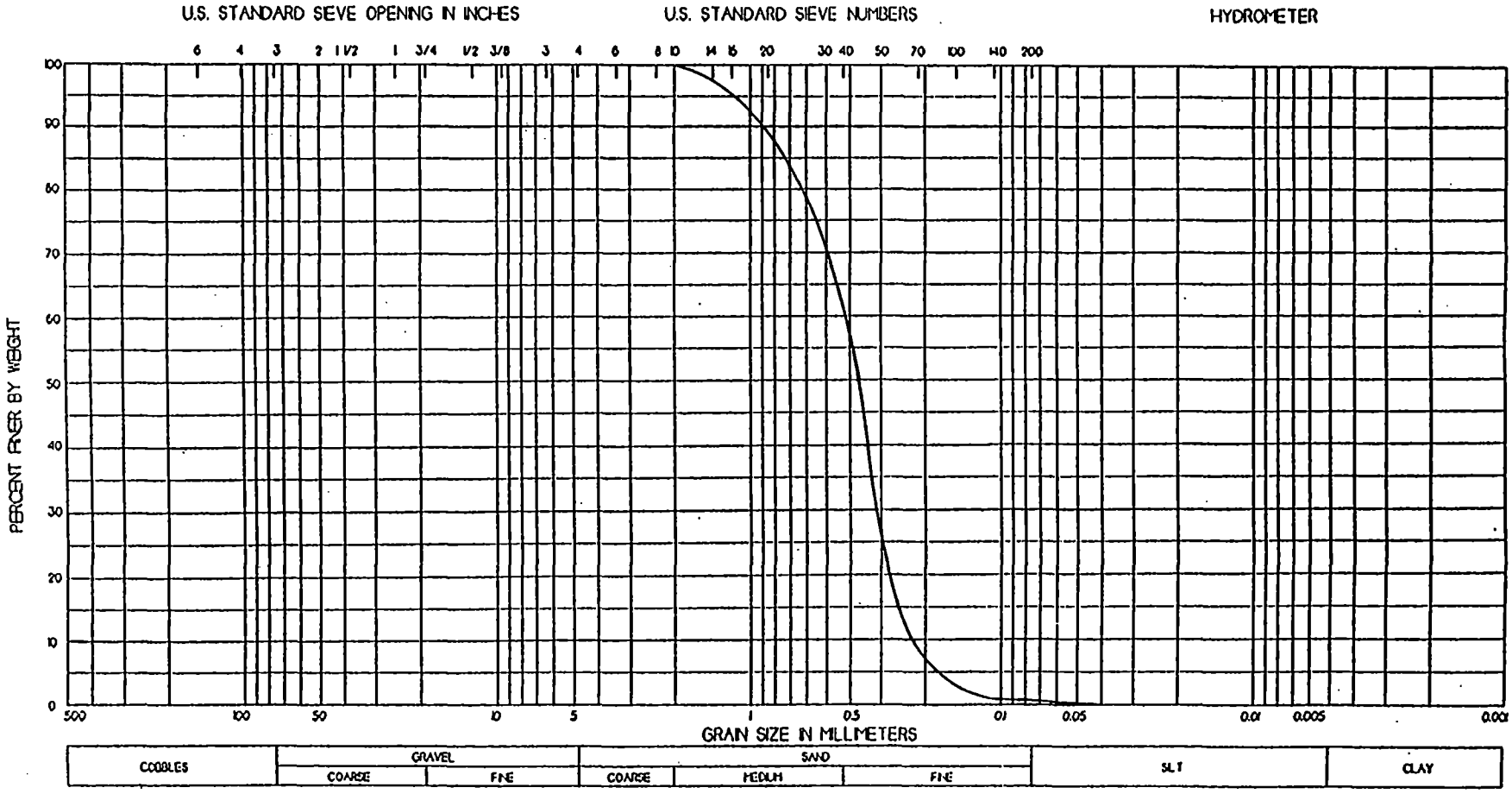
Date: **January 11, 1994**

GENERAL:

Sample Number: **9**
Sample Location: **16-18'**
Sample Source: **OW154**

USCS Classifications: **SAND, fine to medium grained, white (SP)**

RESULTS:



500 (4/

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

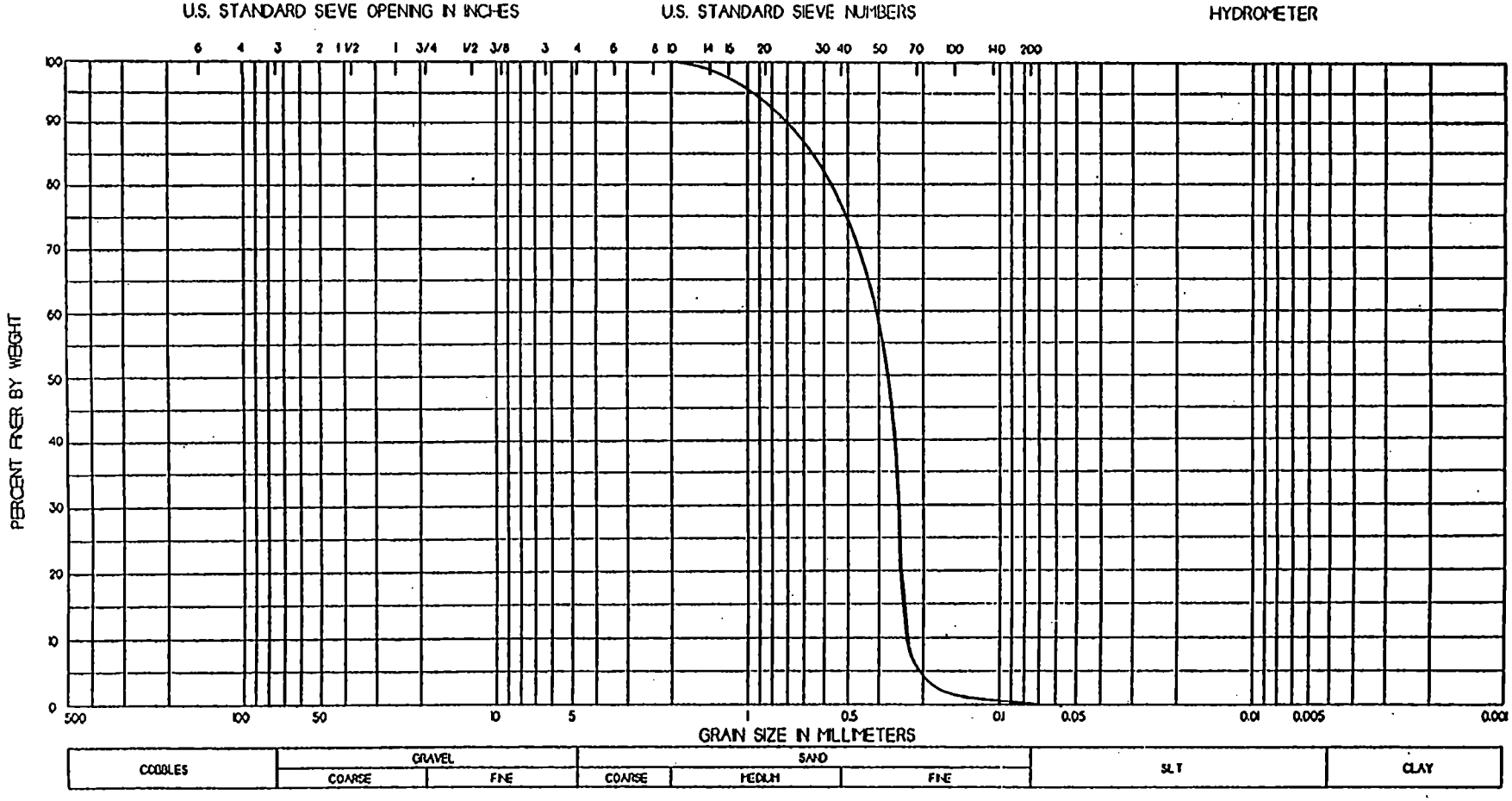
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **January 11, 1994**

GENERAL:

Sample Number: **3**
Sample Location: **4-6'**
Sample Source: **OW155**

USCS Classifications: **SAND, fine grained, white (SP)**

RESULTS:



509 (4/03)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

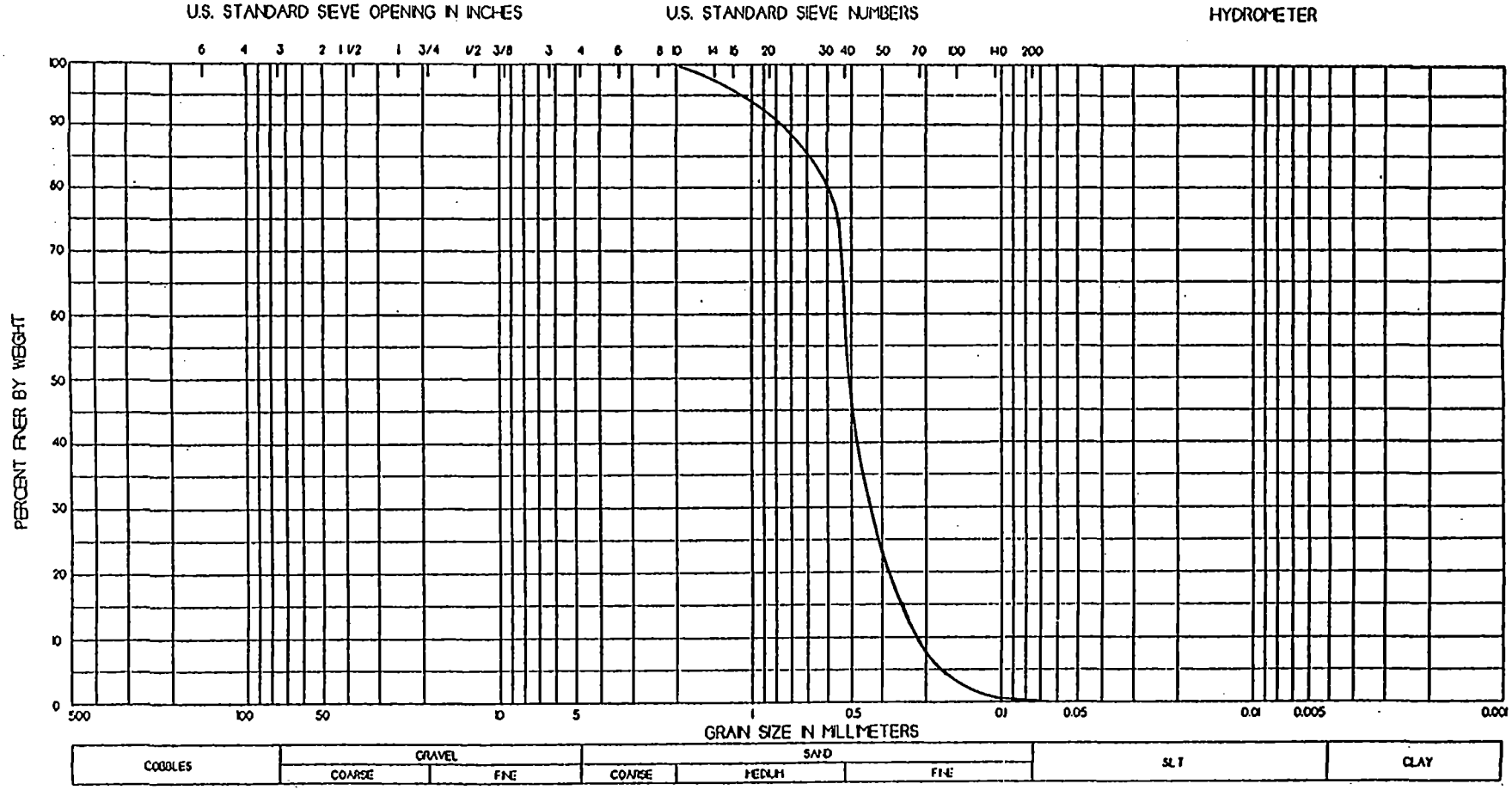
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **January 11, 1994**

GENERAL:

Sample Number: **8**
Sample Location: **14-16'**
Sample Source: **OW155**

USCS Classifications: **SAND, fine grained, white (SP)**

RESULTS:



500

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

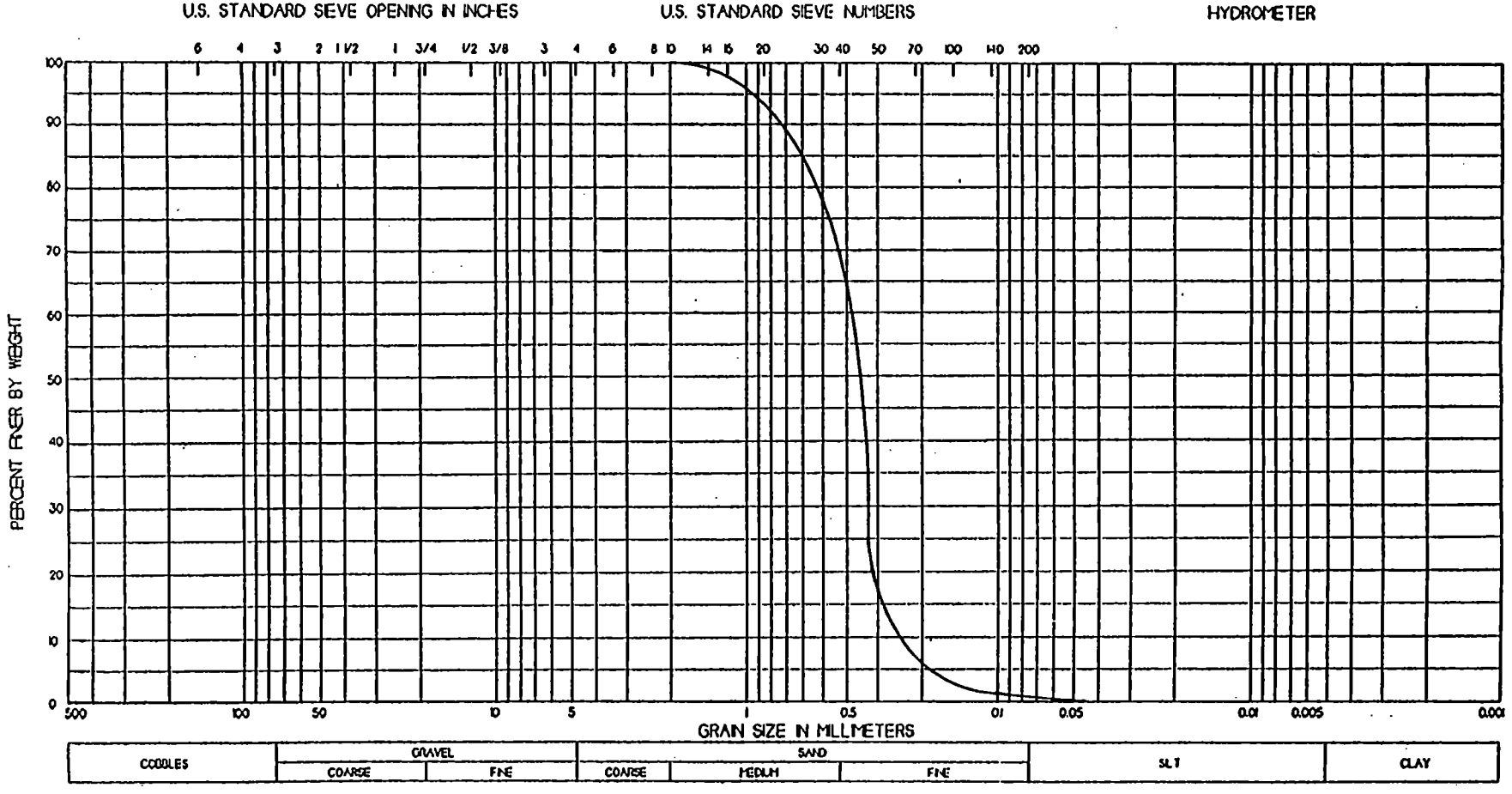
Date: **January 11, 1994**

GENERAL:

Sample Number: 10
Sample Location: 18-20'
Sample Source: OW155

USCS Classifications: **SAND, fine grained, white (SP)**

RESULTS:



RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

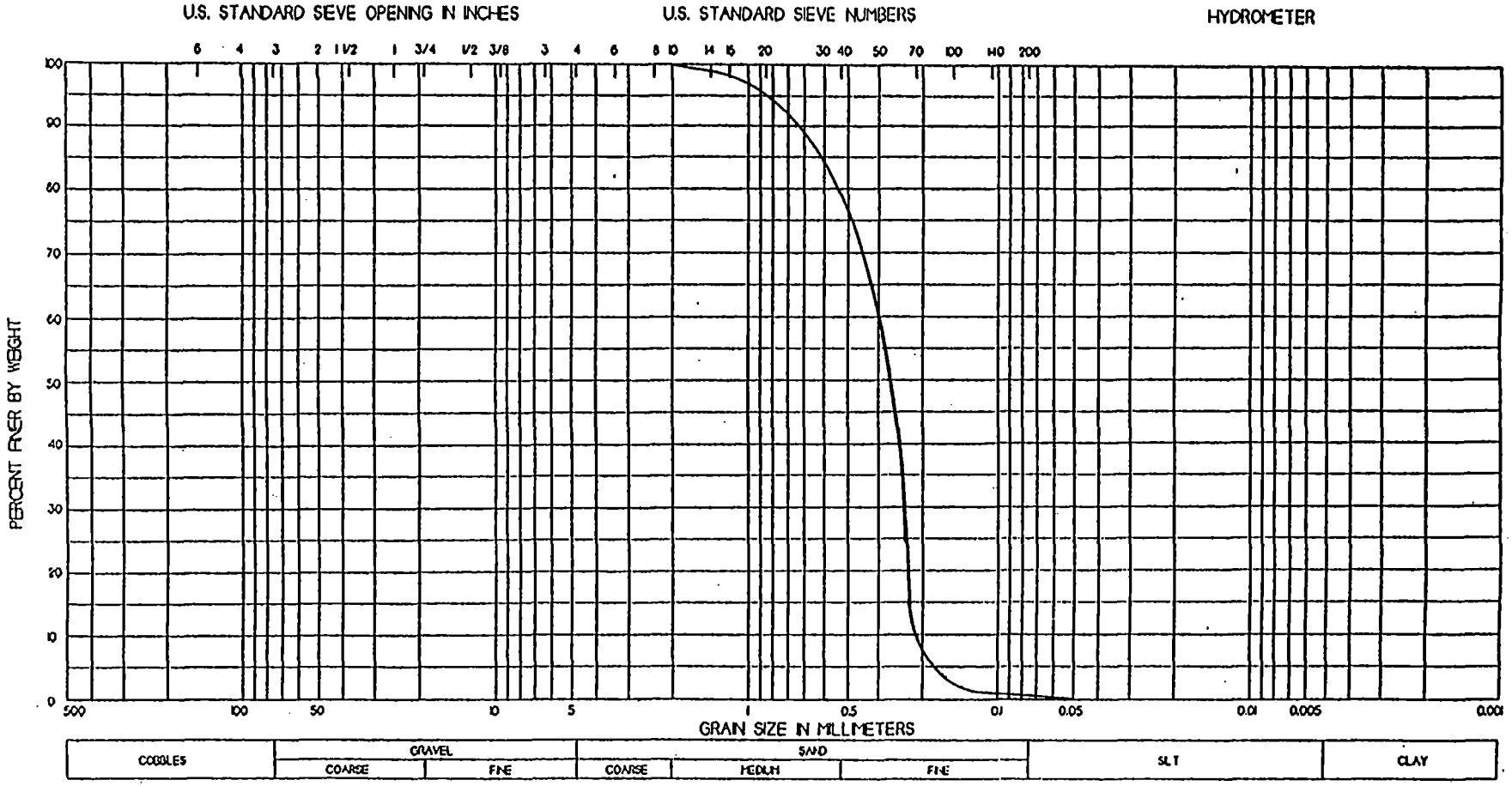
Date: **January 11, 1994**

GENERAL:

Sample Number: **3**
Sample Location: **4-6'**
Sample Source: **OW156**

USCS Classifications: **SAND, fine grained, brownish-white (SP)**

RESULTS:



RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

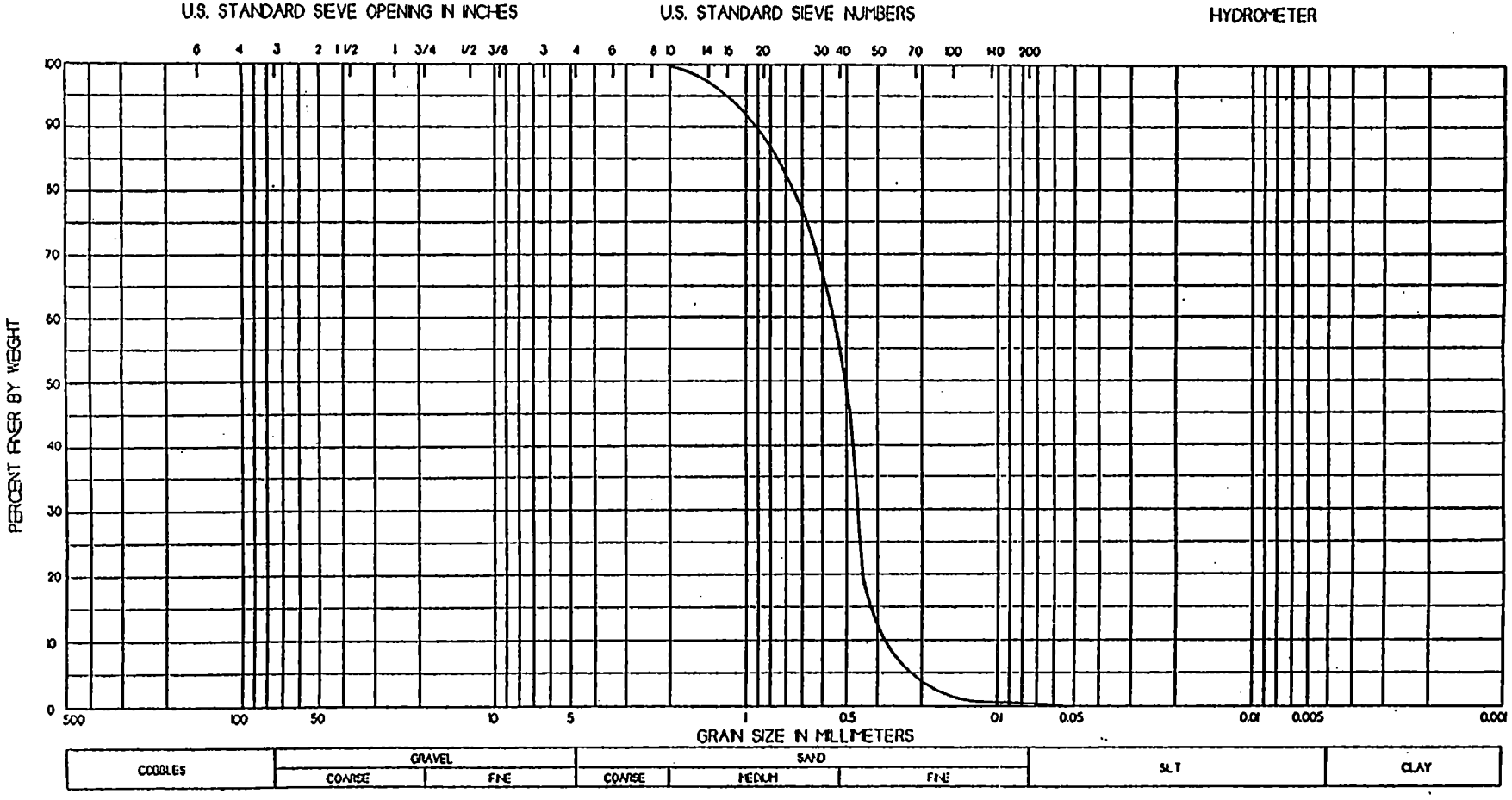
Date: **January 11, 1994**

GENERAL:

Sample Number: **7**
Sample Location: **12-14'**
Sample Source: **OW156**

USCS Classifications: **SAND, fine to medium grained, white (SP)**

RESULTS:



600 (4/03)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

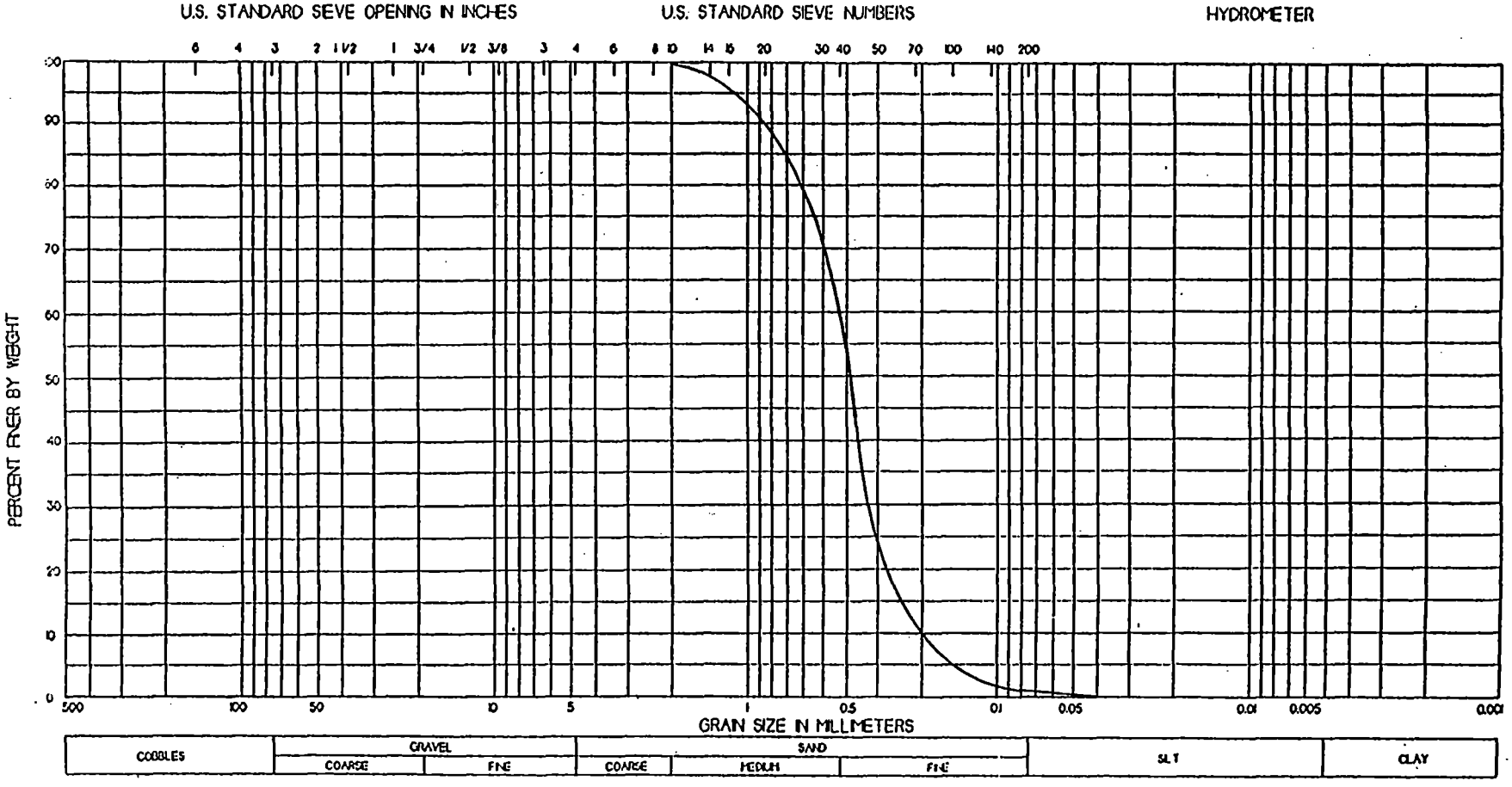
Date: **January 11, 1994**

GENERAL:

Sample Number: 9
Sample Location: 16-18'
Sample Source: OW156

USCS Classifications: **SAND, fine to medium grained, white (SP)**

RESULTS:



500 (4)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

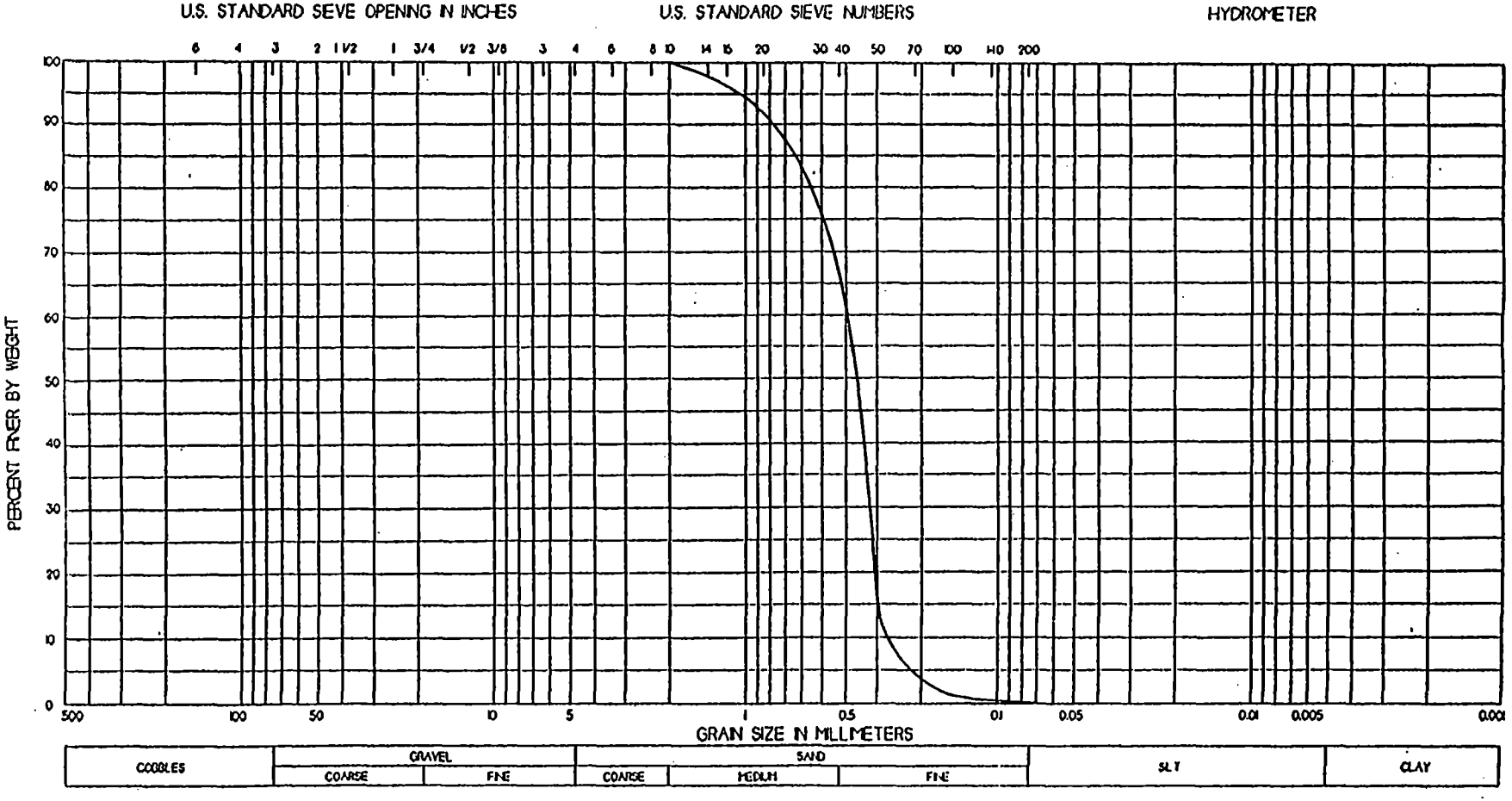
Date: **January 11, 1994**

GENERAL:

Sample Number: 4
Sample Location: 6-8'
Sample Source: OW157

USCS Classifications: **SAND, fine grained, gray (SP)**

RESULTS:



500 (4/93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

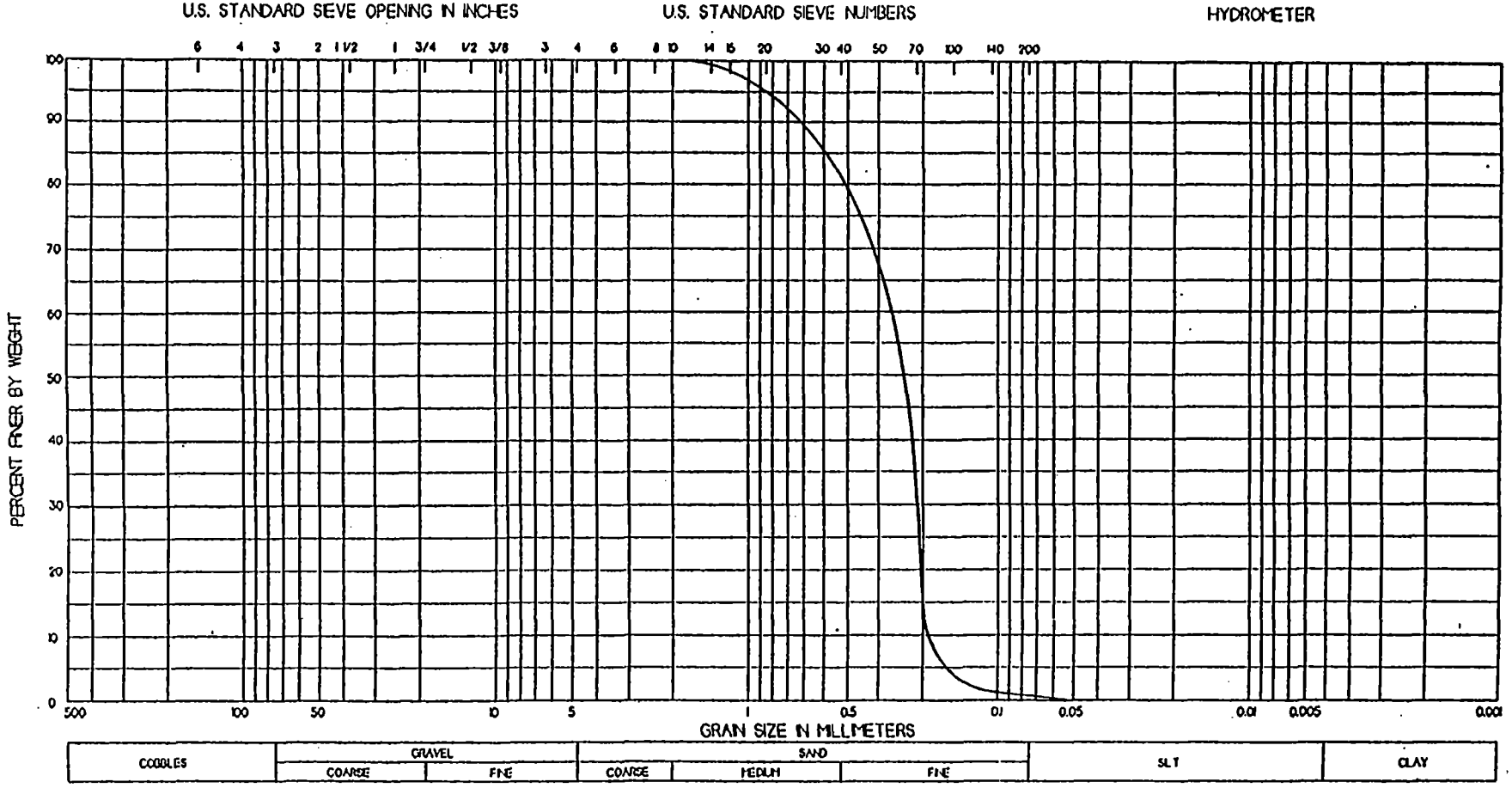
Date: **January 11, 1994**

GENERAL:

Sample Number: 9
Sample Location: 16-18'
Sample Source: OW157

USCS Classifications: **SAND, fine grained, gray (SP)**

RESULTS:



RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

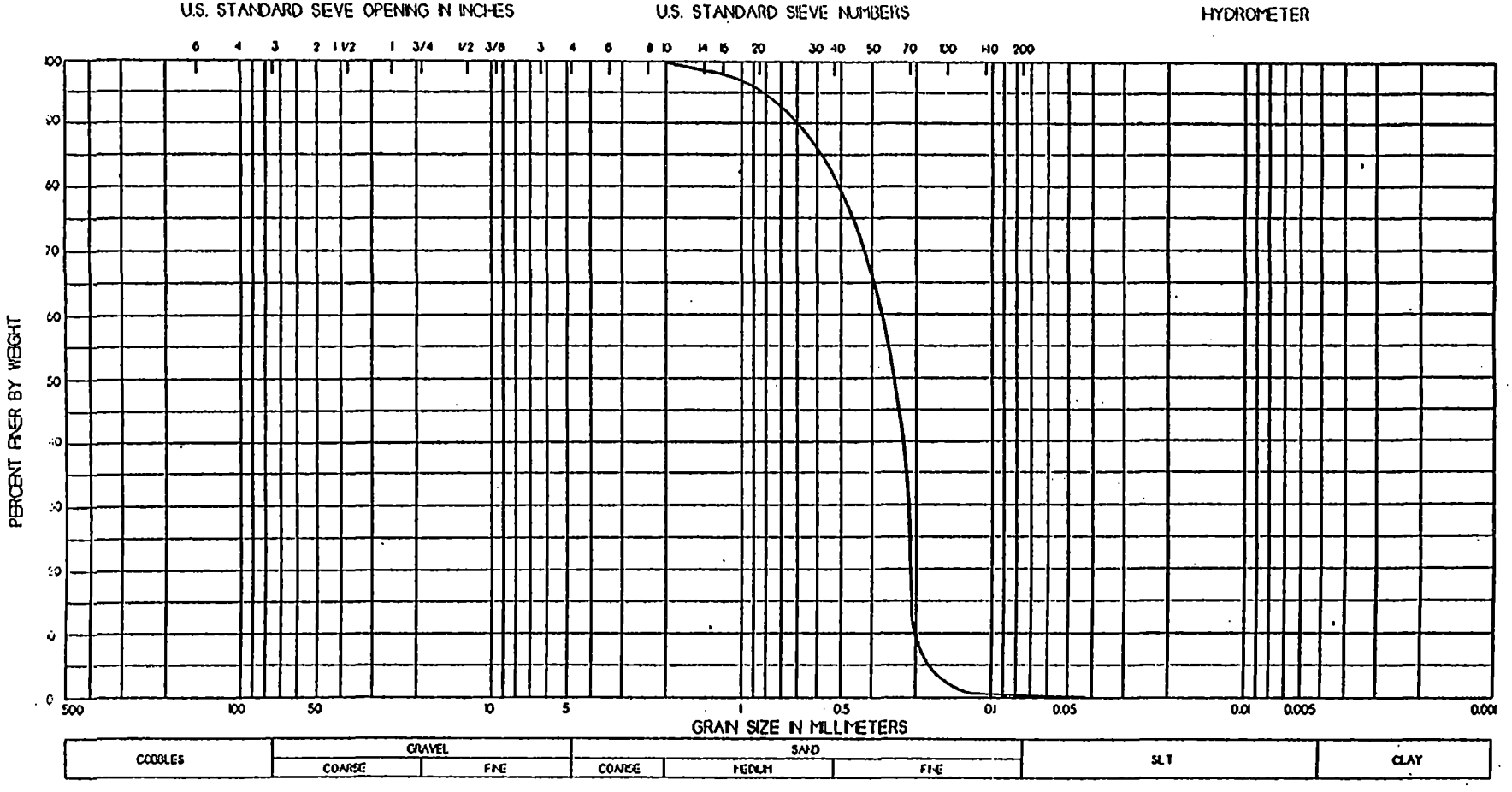
Date: **January 11, 1994**

GENERAL:

Sample Number: **4**
Sample Location: **6-8'**
Sample Source: **OW158**

USCS Classifications: **SAND, fine grained, gray (SP)**

RESULTS:



500 (4/93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

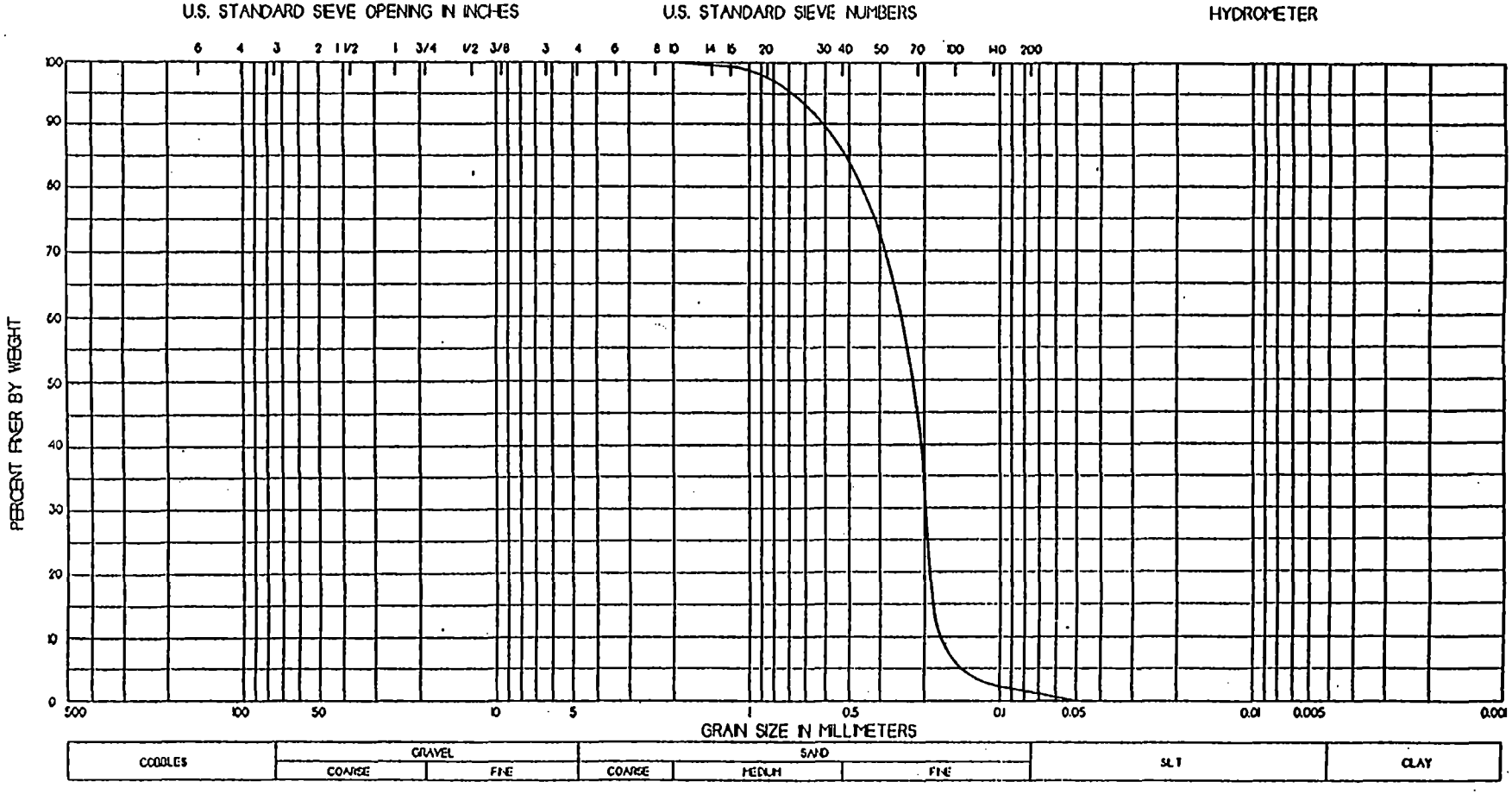
Date: **January 11, 1994**

GENERAL:

Sample Number: 10
Sample Location: 18-20'
Sample Source: OW157

USCS Classifications: **SAND, fine grained, white (SP)**

RESULTS:



500 (

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

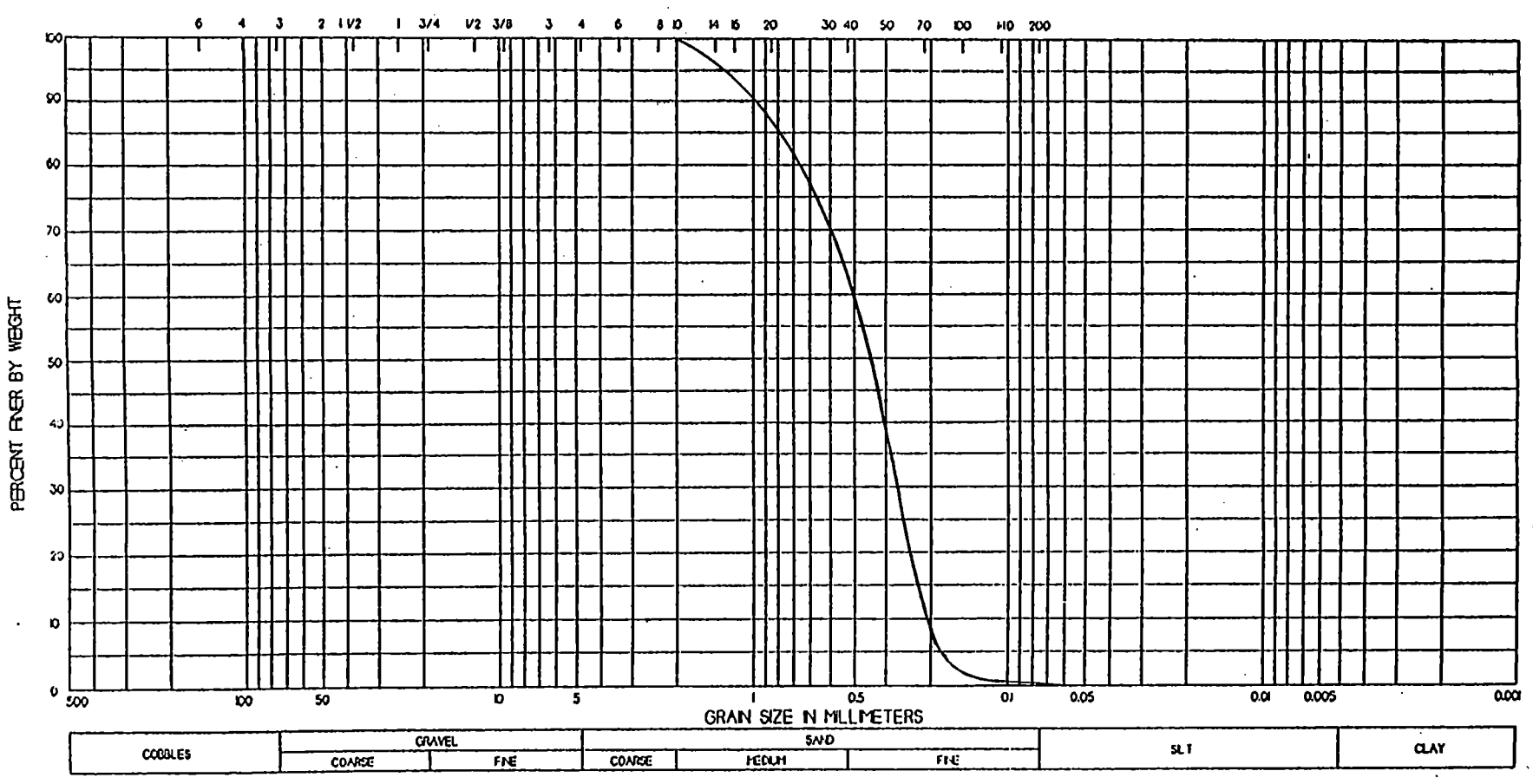
Client: **WTD Environmental Drilling** RVT File No: **W93-258** Date: **January 12, 1994**

GENERAL:

Sample Number: **7**
Sample Location: **12-14'**
Sample Source: **OW158**

USCS Classifications: **SAND, fine to medium grained, gray (SP)**

RESULTS:



600 (4/93)

RIVER VALLEY TESTING CORP.

GRAPH OF MECHANICAL ANALYSIS OF SOIL

Project: **FORT MCCOY**
SPARTA, WISCONSIN

Copies:

Client: **WTD Environmental Drilling**

RVT File No: **W93-258**

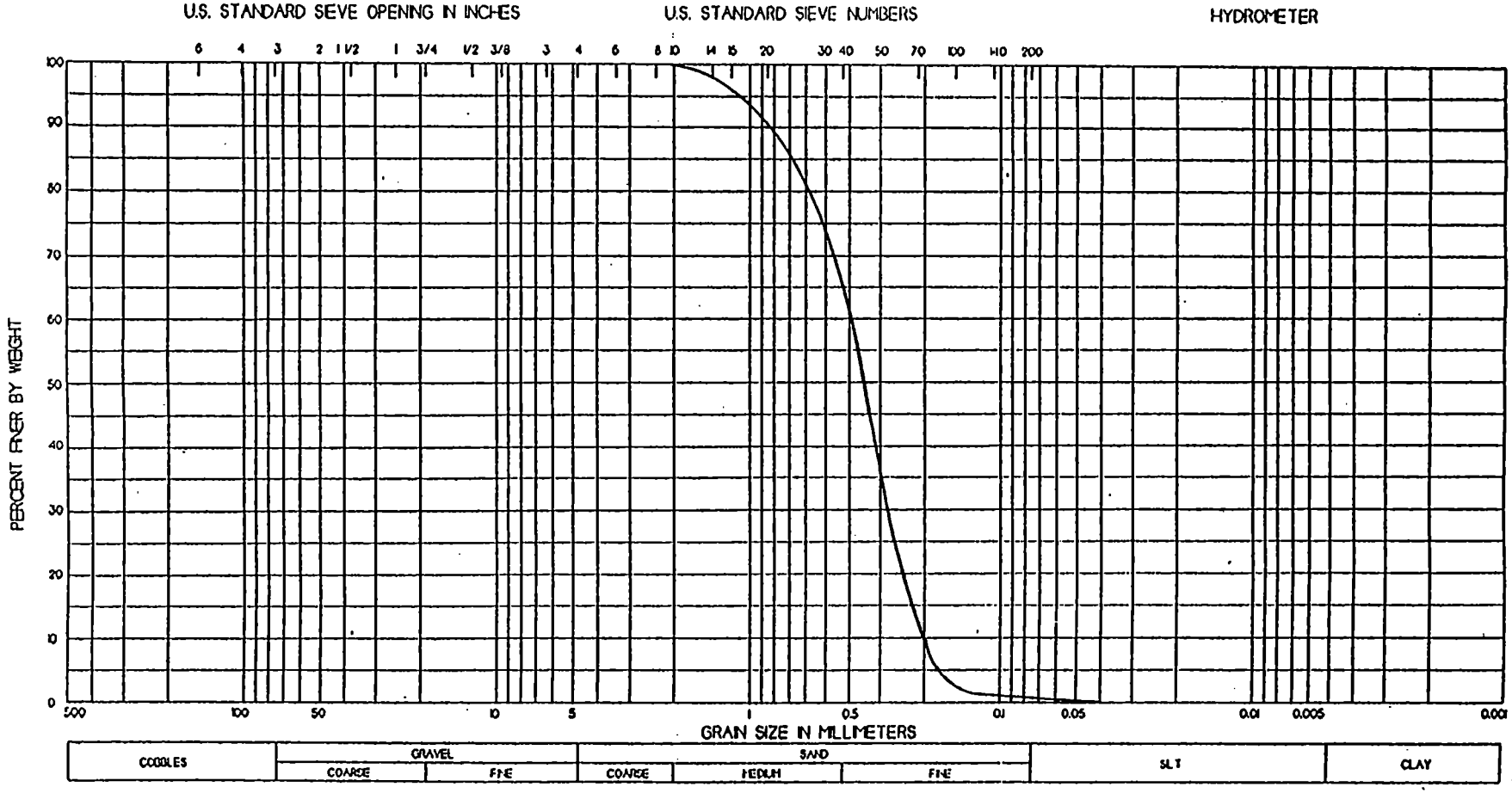
Date: **January 12, 1994**

GENERAL:

Sample Number: **11**
Sample Location: **20-22'**
Sample Source: **OW158**

USCS Classifications: **SAND, fine grained, gray (SP)**

RESULTS:



APPENDIX G ADDENDUM

MONITORING WELL CONSTRUCTION LOGS

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Form 4400-113A Rev. 4-96

Facility/Project Name: FORT McCOY - MOD 5-LF7	Local Grid Location of Well: _____ ft. ☐N ☐S _____ ft. ☐E ☐W	Well Name: OW144
Facility License, Permit or Monitoring Number: FJ0649 20502200	Grid Origin Location: Lat. _____ Long. _____ or	Wis. Unique Well Number / DNR Well Number: _____ / _____
Well Water Table Observation Well ■ 11 Piezometer ☐ 12	St. Plane 743211.90 ft. N. 181929.96 ft. E.	Date Well Installed: 12/01/93 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: Approx 20 ft.	Section Location of Waste/Source: SE 1/4 of NW 1/4 of Sec. 13 T. 18 N. R. 3 ☐E ■W	Well Installed By: (Person's Name and Firm): Bryan Loveland WTD
Is Well A Point of Enforcement Std. Application? ■ Yes ☐ No	Location of Well Relative to Waste/Source: u ■ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation 901.20 ft. MSL
B. Well casing, top elevation 901.12 ft. MSL
C. Land surface elevation 898.8 ft. MSL
D. Surface seal, bottom 896.8 ft. MSL or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ■ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ ___ _____

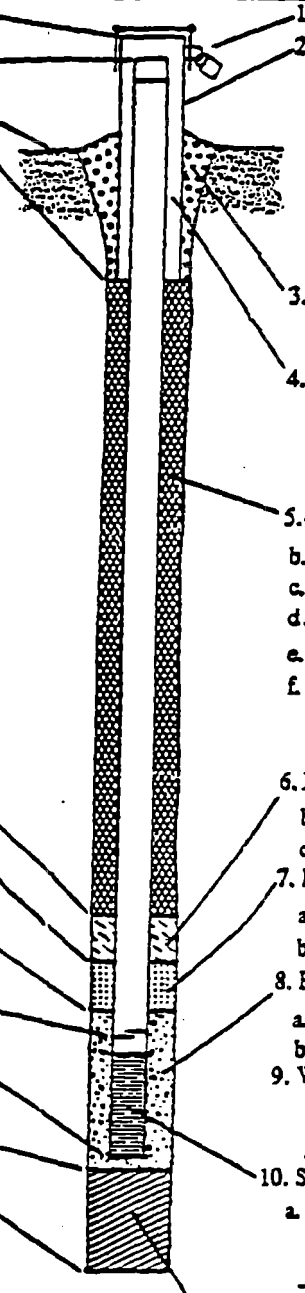
15. Drilling fluid used: Water ☐ 02 Air ☐ 01 Drilling Mud ☐ 03 None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe N/A

Source of water (attach analysis): ~~N/A~~ Fort McCoy Bldg #2860

E. Bentonite seal, top 896.8 ft. MSL or 2.0 ft.
F. Fine sand, top 894.8 ft. MSL or 4.0 ft.
G. Filter pack, top 892.8 ft. MSL or 6.0 ft.
H. Screen joint, top 890.8 ft. MSL or 8.0 ft.
I. Well bottom 888.8 ft. MSL or 18.0 ft.
J. Filter pack, bottom 879.8 ft. MSL or 19.0 ft.
K. Borehole, bottom 879.8 ft. MSL or 19.0 ft.
L. Borehole, diameter 10.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.02 in.



1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 4.5 ft.
c. Material: Steel ☐ 04 Other ☐ __ _____
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3 ea. 4" Dia. Steel Bumper Posts TP
3. Surface seal: Bentonite ☐ 30 Concrete ☐ 01 Other ☐ __ _____
4. Material between well casing and protective pipe: Bentonite ■ 30 Annular space seal ☐ __ Other ☐ __ _____
5. ~~Annular space seal~~ N/A a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ■3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. Baroid Bent. Chips Other __
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Silica Sand BB #7
b. Volume added 1.1 ft^3 ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint - American Materials 35/45
b. Volume added 7.1 ft^3
9. Well casing: Flush threaded PVC schedule 40 __ 23 Flush threaded PVC schedule 80 ☐ 24 Other ☐ __ _____
10. Screen material: Sch. 40 PVC
a. Screen type: Factory cut __ 11 Continuous slot ☐ 01 Other ☐ __ _____
b. Manufacturer Northern Air
c. Slot size: (2 ea. 5' sections) 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None 14 Other ☐ __ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Timothy P. Miller Firm: RUST Environment & Infrastructure

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Form 4400-113A Rev. 7-98

Facility/Project Name: Fort McCoy Mod 5 FMM5-LF7 LANDfill 7	Local Grid Location of Well: _____ ft. ☐N ☐S _____ ft. ☐E ☐W	Well Name: OW-145
Facility License, Permit or Monitoring Number: FD064 205 0200	Grid Origin Location: Lat. _____ Long. _____ or	Wis. Unique Well Number / DNR Well Number
Well Water Table Observation Well ■ 11 / Piezometer ☐ 12	St. Plane 743392.55 ft. N, 181935.77 ft. E	Date Well Installed: 12/08/93 (m m d d y y)
Distance Well Is From Waste/Source Boundary: ≈ 50 feet ft.	Section Location of Waste/Source: SE 1/4 of NW 1/4 of Sec. 13, T. 18 N, R. 3 ☐E ■W	Well Installed By: (Person's Name and Firm) B.J. Ke Mike Mu / Rust E&I WTD
Is Well A Point of Enforcement Std. Application? ■ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ■ Downgradient n ■ Not Known BJK	

A. Protective pipe, top elevation 898.25 ft. MSL
B. Well casing, top elevation 898.14 ft. MSL
C. Land surface elevation 896.4 ft. MSL
D. Surface seal, bottom 894.4 ft. MSL or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50 / Hollow Stem Auger ■ 41 / Other ☐ _____

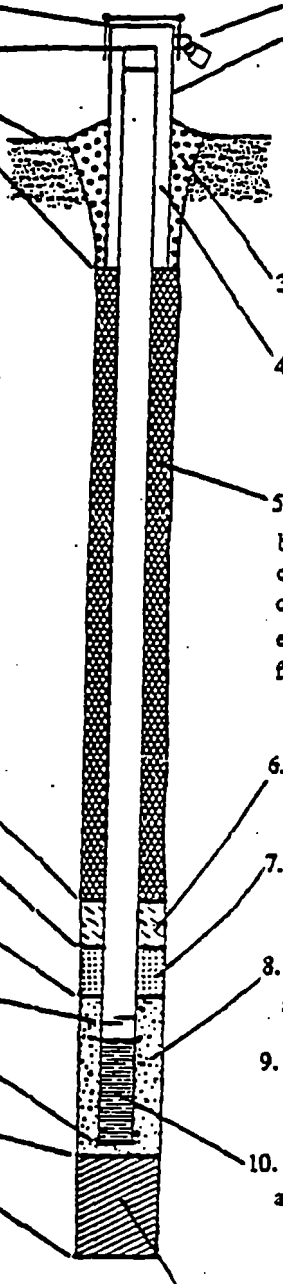
15. Drilling fluid used: Water ☐ 02 Air ☐ 01 / Drilling Mud ☐ 03 None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe _____

Source of water (attach analysis): Fort McCoy Water Supply Bldg #2860

E. Bentonite seal, top 891.4 ft. MSL or 5.0 ft.
F. Fine sand, top 885.4 ft. MSL or 11.0 ft.
G. Filter pack, top 883.4 ft. MSL or 13.0 ft.
H. Screen joint, top 882.4 ft. MSL or 14.0 ft.
I. Well bottom 877.4 ft. MSL or 19.0 ft.
J. Filter pack, bottom 876.4 ft. MSL or 20.0 ft.
K. Borehole, bottom 876.4 ft. MSL or 20.0 ft.
L. Borehole, diameter 10.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.02 in.



1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 04.0 in.
b. Length: 07.0 ft.
c. Material: Steel ■ 04 / Other ☐ _____
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3, 4" diameter steel protective pip
3. Surface seal: Bentonite ☐ 30 / Concrete ■ 01 / Other ☐ _____
4. Material between well casing and protective pipe: Bentonite ☐ 30 / Annular space seal ☐ _____ / Baroid 3/8" Bentonite chips Other ■ _____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01 / Tremie pumped ☐ _____ / Gravity ☐ 02
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ■3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. Bentonite chips Other ☐ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7
b. Volume added 1.0 ft^3
8. Filter pack material: Manufacturer, product name and mesh siz
a. Red Flint 35/45
b. Volume added 5.0 ft^3
9. Well casing: Flush threaded PVC schedule 40 ■ 23 / Flush threaded PVC schedule 80 ☐ 24 / Other ☐ _____
10. Screen material: Schedule 40 2" PVC
a. Screen type: Factory cut ■ 11 / Continuous slot ☐ 01 / Other ☐ _____
b. Manufacturer Northern Ai
c. Slot size: 0.01 in
d. Slotted length: 20.0 ft.
11. Backfill material (below filter pack): None ■ 14 / Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: B.J. Ke Firm: Rust E&I

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats. and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10. nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Fort McCoy Mod 5 FMMC-LF7 LANDFILL 7	Local Grid Location of Well: ____ ft. ☐N ☐S ____ ft. ☐E ☐W	Well Name: OW-146
Facility License, Permit or Monitoring Number: FID 64 205 0200	Grid Origin Location: Lat. ____ Long. ____ or	Wis. Unique Well Number: ____ DNR Well Number: ____
Well: Water Table Observation Well ■ 11; Piezometer ☐ 12	St. Plane 749228.69 ft. N. 1819653.60 ft. E.	Date Well Installed: 12/08/93 (m m d d y y)
Distance Well Is From Waste/Source Boundary: ≈ 50 feet	Section Location of Waste/Source: S 1/4 of NW 1/4 of Sec. 13, T. 18 N, R. 3 ☐E ■W.	Well Installed By: (Person's Name and Firm): B.J. LeRoy / Rust E&I; Mike Moell / WTD
Is Well A Point of Enforcement Std. Application? ■ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ■ Not Known	

A. Protective pipe, top elevation 898.30 ft. MSL
B. Well casing, top elevation 898.25 ft. MSL
C. Land surface elevation 896.4 ft. MSL
D. Surface seal, bottom 891.4 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe ____

Source of water (attach analysis):
Fort McCoy Water Supply Bldg #2860

E. Bentonite seal, top 891.4 ft. MSL or 5.0 ft.
F. Fine sand, top 889.4 ft. MSL or 7.0 ft.
G. Filter pack, top 888.4 ft. MSL or 8.0 ft.
H. Screen joint, top 887.4 ft. MSL or 9.0 ft.
I. Well bottom 877.4 ft. MSL or 19.0 ft.
J. Filter pack, bottom 876.4 ft. MSL or 20.0 ft.
K. Borehole, bottom 876.4 ft. MSL or 20.0 ft.
L. Borehole, diameter 10.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.02 in.

1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 27.2 ft.
c. Material: Steel ■ 04; Other ☐ ____
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3, 4" diameter steel protective pipes
3. Surface seal: Bentonite ☐ 30; Concrete ■ 01; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ ____; Baroid 3/8" Bentonite chips Other ■ ____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ■3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. Bentonite chips Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7
b. Volume added 1.0 ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint 35/45
b. Volume added 4.5 ft^3
9. Well casing: Flush threaded PVC schedule 40 ■ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ ____
10. Screen material: Schedule 40 2" PVC
a. Screen type: Factory cut ■ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Aire
c. Slot size: 0.01 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ■ 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Name: Bill Ec | Firm: Rust E&I

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis. Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Form 4400-113A Rev. 4-90

Facility/Project Name: 3 Fort McCoy - Mod 5-Landfill 8	Local Grid Location of Well: _____ ft. ☐N ☐S _____ ft. ☐E ☐W	Well Name: OW-147
Facility License, Permit or Monitoring Number: FT 064 205 0200	Grid Origin Location: Lat. _____ Long. _____ or	Wis. Unique Well Number / DNR Well Number
Well Water Table Observation Well ■ 11 / Piezometer ☐ 12	St. Plane 733339.03 ft. N, 1805437.87 ft. E.	Date Well Installed: 12/02/93 (m m d d y y)
Distance Well Is From Waste/Source Boundary: ≈50 feet ft.	Section Location of Waste/Source: NW 1/4 of NW 1/4 of Sec. 24, T. 18 N, R. 3 ☐E ■W	Well Installed By: (Person's Name and Firm) B.J. LeRoy / Mike Meeks; Rust E&I / WTD
Is Well A Point of Enforcement Std. Application? ■ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ■ Not Known	

A. Protective pipe, top elevation 855.85 ft. MSL
B. Well casing, top elevation 855.77 ft. MSL
C. Land surface elevation 854.7 ft. MSL
D. Surface seal, bottom 849.7 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ _____

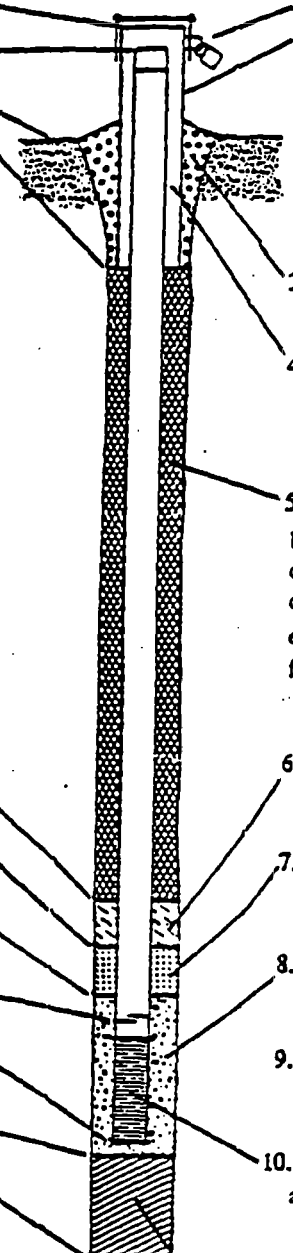
15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe _____

Source of water (attach analysis): Ft. McCoy Water Source Bldg #2860

E. Bentonite seal, top 849.7 ft. MSL or 5.0 ft.
F. Fine sand, top 846.7 ft. MSL or 8.0 ft.
G. Filter pack, top 844.7 ft. MSL or 10.0 ft.
H. Screen joint, top 842.7 ft. MSL or 12.0 ft.
I. Well bottom 832.7 ft. MSL or 22.0 ft.
J. Filter pack, bottom 831.7 ft. MSL or 23.0 ft.
K. Borehole, bottom 830.7 ft. MSL or 23.5 ft.
L. Borehole, diameter 10.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.02 in.



1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 3.0 ft.
c. Material: Steel ■ 04; Other ☐ _____
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3, 4" diameter steel bumper posts
3. Surface seal: Bentonite ☐ 30; Concrete 01; Other 3/8" Bent Blg
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐; Other 3/8" Bentonite Chips
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐; Gravity ☐ 03
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ■3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. Bentonite Chips Other
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7
b. Volume added 1 ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint 35/45
b. Volume added 5 ft^3
9. Well casing: Flush threaded PVC schedule 40 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ _____
10. Screen material: Schedule 40 PVC
a. Screen type: Factory cut 11; Continuous slot ☐ 01; Other ☐ _____
b. Manufacturer Northern Air
c. Slot size: 0.010 in
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Natural Formation; Other

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: B.J. LeRoy Firm: Rust E&I

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State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Form 4400-113A Rev. 4-90

Facility/Project Name: Fort McCoy - Mod 5 - Landfill 8	Local Grid Location of Well: _____ ft. ☐N ☐S _____ ft. ☐E ☐W	Well Name: OW-149
Facility License/Permit or Monitoring Number: FID 064 205 0200	Grid Origin Location: Lat. _____ Long. _____ or	Wis. Unique Well Number / DNR Well Number
Well Water Table Observation Well ■ 11 / Piezometer ☐ 12	St. Plane 733428.31 ft. N. 180843763 ft. E.	Date Well Installed: 12/01/93
Distance Well Is From Waste/Source Boundary: ≈25' ft.	Section Location of Waste/Source: NW 1/4 of NW 1/4 of Sec. 27, T. 18 N, R. 3 ☐E ■W	Well Installed By: (Person's Name and Firm) B.J. LeRoy / Mike Mueller; Rust E&I / WTO
Is Well A Point of Enforcement Std. Application? ■ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ■ Not Known	

A. Protective pipe, top elevation 851.09 ft. MSL
B. Well casing, top elevation 850.74 ft. MSL
C. Land surface elevation 849.6 ft. MSL
D. Surface seal, bottom 845.6 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ _____

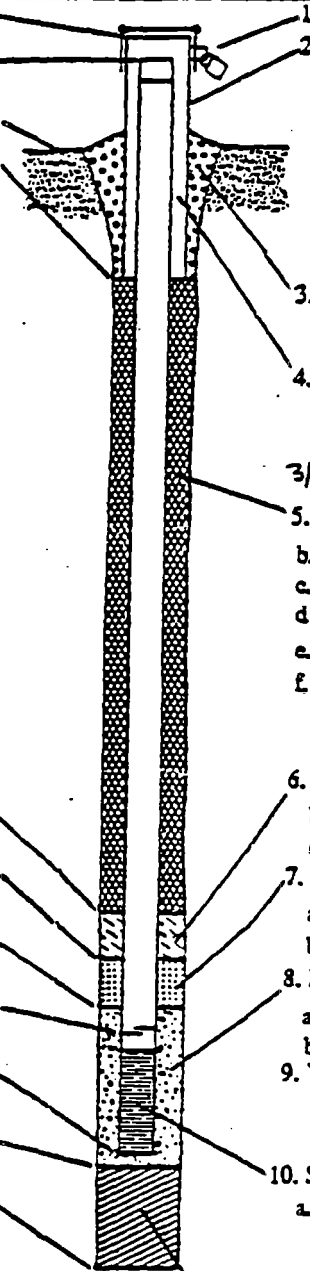
15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe _____

Source of water (attach analysis):
Ft McCoy Water Source Bldg #2860

E. Bentonite seal, top 841.6 ft. MSL or 5.0 ft.
F. Fine sand, top 842.6 ft. MSL or 7.0 ft.
G. Filter pack, top 841.6 ft. MSL or 8.0 ft.
H. Screen joint, top 841.6 ft. MSL or 8.0 ft.
I. Well bottom 831.6 ft. MSL or 18.0 ft.
J. Filter pack, bottom 830.6 ft. MSL or 19.0 ft.
K. Borehole, bottom 829.6 ft. MSL or 20.0 ft.
L. Borehole, diameter 10.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.02 in.



1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 3.0 ft.
c. Material: Steel ■ 04; Other ☐ _____
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3, 4" diameter steel bumper posts
3. Surface seal: Bentonite ☐ 30; Concrete ■ 01; Other ☐ _____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ _____; 3/8" Bentonite chips Other ■ _____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ■3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. Bentonite chips Other ☐ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB #7
b. Volume added 1 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint 35/45
b. Volume added 4.5 ft³
9. Well casing: Flush threaded PVC schedule 40 ■ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ _____
10. Screen material: Schedule 40 PVC
a. Screen type: Factory cut ■ 11; Continuous slot ☐ 01; Other ☐ _____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Natural Formation Other ■ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: B.J. LeRoy Firm: Rust E&I

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State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name	Local Grid Location of Well	Well Name
Fort McCoy - Mod 5-LF8	____ ft. ☐N ☐S ____ ft. ☐E ☐W	OW149
Facility License, Permit or Monitoring Number	**Grid Origin Location**	**Wis. Unique Well Number / DNR Well Number**
FID64 205020 00	Lat. ____ Long. ____ or	____ / ____
Well Water Table Observation Well ■ 11	St. Plane 733330.23 ft. N. 1803506.87 ft. E.	**Date Well Installed** 12/08/93 (m m d d y y)
Piezometer ☐ 12	**Section Location of Waste/Source**	
Distance Well Is From Waste/Source Boundary	NW 1/4 of NW 1/4 of Sec. 27 T. 19 N. R. 3 ☐E ■W	**Well Installed By: (Person's Name and Firm)**
50 ft.	**Location of Well Relative to Waste/Source**	Bryan Lovelend
Is Well A Point of Enforcement Std. Application?	u ☐ Upgradient s ☐ Sidegradient	WTD
■ Yes ☐ No	d ■ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation 852.27 ft. MSL
B. Well casing, top elevation 852.03 ft. MSL
C. Land surface elevation 850.6 ft. MSL
D. Surface seal, bottom 848.6 ft. MSL or 2.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50
Hollow Stem Auger ■ 41
Other ☐ ____

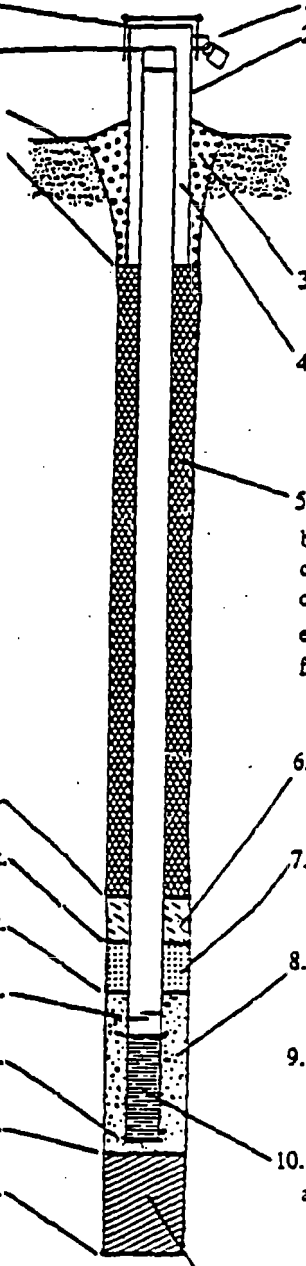
15. Drilling fluid used: Water ☐ 02 Air ☐ 01
Drilling Mud ☐ 03 None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe N/A

... Source of water (attach analysis):
~~N/A~~ Fort McCoy Bldg #2860

E. Bentonite seal, top 848.6 ft. MSL or 2.0 ft.
F. Fine sand, top 846.6 ft. MSL or 4.0 ft.
G. Filter pack, top 844.6 ft. MSL or 6.0 ft.
H. Screen joint, top 842.6 ft. MSL or 8.0 ft.
I. Well bottom 832.6 ft. MSL or 18.0 ft.
J. Filter pack, bottom 831.6 ft. MSL or 19.0 ft.
K. Borehole, bottom 831.6 ft. MSL or 19.0 ft.
L. Borehole, diameter 10.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.02 in.



1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel 04
Other ☐ ____
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3 ea. 4" Diam. Steel Bumper Posts
3. Surface seal: Bentonite ☐ 30
Concrete 01
Other ☐ ____
4. Material between well casing and protective pipe:
Bentonite ☐ 30
Annular space seal ☐ ____
Other ☐ ____
5. ~~Annular space seal~~ N/A a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 31
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 35
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. ____ Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01
Tremie pumped ■ 02
Gravity ☐ 01
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ■ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
c. Baroid → Bentonite Chips Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Silica Sand 1313 #7
b. Volume added 1.2 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Hint - American Materials 35/45
b. Volume added 7.3 ft³
9. Well casing: Flush threaded PVC schedule 40 2
Flush threaded PVC schedule 80 ☐ 2
Other ☐ ____
10. Screen material: Schedule 40 PVC
a. Screen type: Factory cut 1
Continuous slot ☐ 01
Other ☐ ____
b. Manufacturer Northern Dist
c. Slot size: (2 ea. 5' sections) 0.010
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None 1
Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Name Timothy P. Miles | Firm RUST Environment & Infrastructure

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis. Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL
Form 4400-113A Rev. 4-90

Facility/Project Name: Fort McCoy - Mad 5 - Landfill 8

Local Grid Location of Well: _____ ft. ☐N ☐S _____ ft. ☐E ☐W

Well Name: OW-150

Facility License, Permit or Monitoring Number: FID 64 205022 00

Grid Origin Location: Lat. _____ Long. _____ or

Wis. Unique Well Number: _____ DNR Well Number: _____

Well Water Table Observation Well ■ 11
Piezometer ☐ 12

St. Plane 733474.91 ft. N, 1808574.65 ft. E.

Date Well Installed: 12/01/93 (m m d d y y)

Distance Well Is From Waste/Source Boundary: ≈ 100 ft.

Section Location of Waste/Source: NW 1/4 of NW 1/4 of Sec. 27 T. 18 N, R. 3 ☐E ■W

Well Installed By: (Person's Name and Firm)
B.J. LeRoy — Mike Mueller
Rust E&I — WTD

Is Well A Point of Enforcement Std. Application? ■ Yes ☐ No

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ■ Not Known

A. Protective pipe, top elevation 848.16 ft. MSL
B. Well casing, top elevation 848.10 ft. MSL
C. Land surface elevation 846.1 ft. MSL
D. Surface seal, bottom 843.1 ft. MSL or 3.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ■ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ _____

15. Drilling fluid used: Water ☐ 02; ~~Air ■ 01~~ (TPCh); Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe _____

17. Source of water (attach analysis):
Ft McCoy Water Source Bldg #2860

E. Bentonite seal, top 843.1 ft. MSL or 3.0 ft.
F. Fine sand, top 841.1 ft. MSL or 5.0 ft.
G. Filter pack, top 840.1 ft. MSL or 6.0 ft.
H. Screen joint, top 840.1 ft. MSL or 6.0 ft.
I. Well bottom 830.1 ft. MSL or 16.0 ft.
J. Filter pack, bottom 829.1 ft. MSL or 17.0 ft.
K. Borehole, bottom 828.6 ft. MSL or 17.5 ft.
L. Borehole, diameter 10.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.02 in.

1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☐ 04; Other ☐ _____
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3, 4" diameter steel bumper posts
3. Surface seal: Bentonite ☐ 30; Concrete ☐ 01; Other ☐ _____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ _____; Other ☐ 3/8" Bentonite Chips
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ■3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. Bentonite Chips Other ☐ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7
b. Volume added 1 ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint 35-45
b. Volume added 4.5 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ _____
10. Screen material: Schedule 40 PVC
a. Screen type: Factory cut ☐ 11; Continuous slot ☐ 01; Other ☐ _____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Other ☐ Natural Formation

I, B.J. LeRoy certify that the information on this form is true and correct to the best of my knowledge.

Signature: B.J. LeRoy — Firm: Rust E&I

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10. nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☒ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Form 4400-113A Rev. 4-90

Facility/Project Name: Fort McCoy Mod 5 Landfill 9	Local Grid Location of Well: _____ ft. ☐N ☐S _____ ft. ☐E ☐W	Well Name: OW-151
Facility License, Permit or Monitoring Number: FID 64 205020 00	Grid Origin Location: Lat. _____ Long. _____ or	Wis. Unique Well Number / DNR Well Number: _____ / _____
Well: Water Table Observation Well ■ 11; Piezometer ☐ 12	St. Plane 734973.55 ft. N, 1807783.52 ft. E	Date Well Installed: 12/06/93
Distance Well Is From Waste/Source Boundary: ≃ 50' ft.	Section Location of Waste/Source: NW1/4 of NW 1/4 of Sec. 27, T. 18 N, R. 3 ☐E ■W	Well Installed By: (Person's Name and Firm) B.J. LeRoy / Rust E+I; Mike Mueller / WTD
Is Well A Point of Enforcement Std. Application? ■ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ■ Not Known	

A. Protective pipe, top elevation 894.05 ft. MSL
B. Well casing, top elevation 893.99 ft. MSL
C. Land surface elevation 892.3 ft. MSL
D. Surface seal, bottom 887.3 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ■ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ __

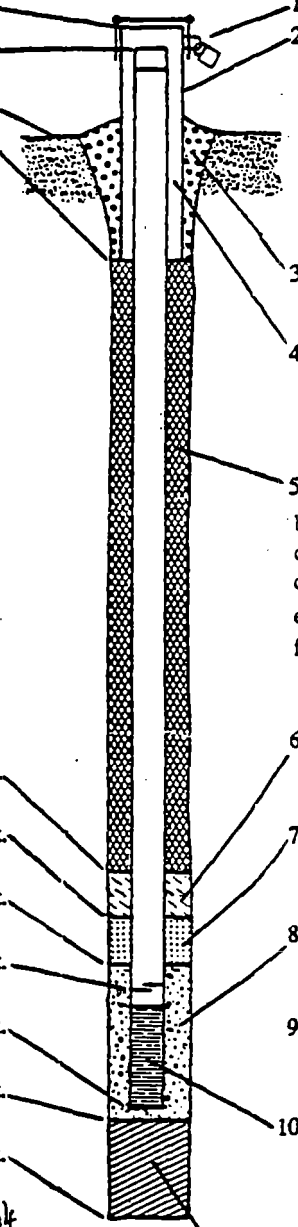
15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe _____

17. Source of water (attach analysis): Fort water Supply Bldg #2860

E. Bentonite seal, top 887.3 ft. MSL or 5.0 ft.
F. Fine sand, top 865.5 ft. MSL or 26.8 ft.
G. Filter pack, top 863.8 ft. MSL or 28.5 ft.
H. Screen joint, top 861.8 ft. MSL or 30.5 ft.
I. Well bottom 851.8 ft. MSL or 40.5 ft.
J. Filter pack, bottom 850.8 ft. MSL or 41.5 ft.
K. Borehole, bottom 850.8 ft. MSL or 41.5 ft.
L. Borehole, diameter 10.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.02 in.



1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ■ 04; Other ☐ __
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3, 4" diameter steel bumper posts
3. Surface seal: Bentonite ☐ 30; Concrete ■ 01; Other ☐ __
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ __; 3/8" Bentonite chips Other ■ __
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. _____ % Bentonite . . . . . Bentonite-cement grout ☐ 50
e. _____ Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ■3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. Bentonite Chips (Baroid) Other ☐ __
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB #7
b. Volume added 1 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint 35/45
b. Volume added 4.5 ft³
9. Well casing: Flush threaded PVC schedule 40 ■ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ __
10. Screen material: 2" diameter PVC
a. Screen type: Factory cut ■ 11; Continuous slot ☐ 01; Other ☐ __
b. Manufacturer Northern Air
c. Slot size: 0.010 in
d. Slotted length: 10.0 ft
11. Backfill material (below filter pack): None ■ 14; Other ☐ __

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: B.J. LeRoy Firm: Rust E+I

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ue of Wisconsin
partment of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Fort McCoy Mod 5 Landfill 9	Local Grid Location of Well: _____ ft. ☐N ☐S _____ ft. ☐E ☐W	Well Name: OW-157
cility License, Permit or Monitoring Number: FID64 205020200	Grid Origin Location: Lat. _____ Long. _____ or	Wis. Unique Well Number / DNR Well Number: _____ / _____
Well Water Table Observation Well ■ 11; Piezometer ☐ 12	St. Plane 734755.98 ft. N, 1800776.45 ft. E.	Date Well Installed: 12/07/93 (m m d d y y)
istance Well Is From Waste/Source Boundary: ≃50 feet ft.	Section Location of Waste/Source: NW 1/4 of NW 1/4 of Sec. 27, T. 18 N, R. 3 ■ W. ☐ E.	Well Installed By: (Person's Name and Firm) B.J. LeRoy / Rust E+I; Mike Mueller / WTD
Is Well A Point of Enforcement Std. Application? ■ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ■ Not Known	

A. Protective pipe, top elevation 882.47 ft. MSL
B. Well casing, top elevation 882.49 ft. MSL
C. Land surface elevation 880.7 ft. MSL
D. Surface seal, bottom 875.7 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ■ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ __
_____

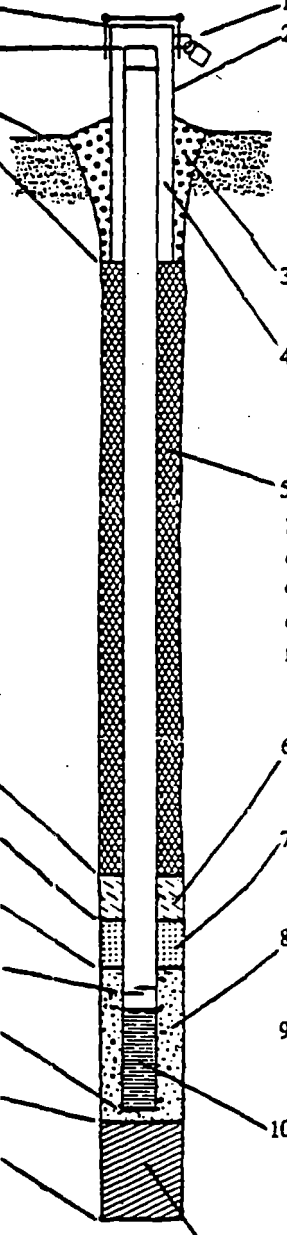
15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No

scribe _____

ource of water (attach analysis):
Ft. McCoy Water Source Bluff 2860

E. Bentonite seal, top 875.7 ft. MSL or 5.0 ft.
F. Fine sand, top 855.2 ft. MSL or 20.5 ft.
G. Filter pack, top 853.2 ft. MSL or 22.5 ft.
H. Screen joint, top 851.2 ft. MSL or 24.5 ft.
I. Well bottom 841.2 ft. MSL or 34.5 ft.
J. Filter pack, bottom 840.7 ft. MSL or 35.0 ft.
K. Borehole, bottom 840.7 ft. MSL or 35.0 ft.
L. Borehole, diameter 10.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.02 in.



1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ■ 04; Other ☐ __
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3,4" diameter steel bumper posts
3. Surface seal: Bentonite ☐ 30; Concrete ■ 01; Other ☐ __
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ __; Baroid 3/8" Bentonite Chips Other ■ __
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. _____ % Bentonite . . . . . Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ __; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ■3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. Baroid Bentonite Chips Other ■ __
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Silica BB#7
b. Volume added 1 ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint 35/45
b. Volume added 4.5 ft^3
9. Well casing: Flush threaded PVC schedule 40 ■ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ __
10. Screen material: 2" Schedule 40 PVC
a. Screen type: Factory cut ■ 11; Continuous slot ☐ 01; Other ☐ __
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ■ 14; Other ☐ __
_____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

ature B.J. LeRoy | Firm Rust E+I

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NO BORING OR WELL WAS EVER

DESIGNATED OW-153

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Form 4400-113A Rev. 4-90

Facility/Project Name: FORT MCCOY – MOD 5 LFH	Local Grid Location of Well: _____ ft. ☐N ☐S _____ ft. ☐E ☐W	Well Name: OW424 (TH1)
Facility License, Permit or Monitoring Number: FID64205020 0	Grid Origin Location: Lat. _____ Long. _____ or	Wis. Unique Well Number / DNR Well Number
Well Water Table Observation Well ■ 11 / Piezometer ☐ 12	St. Plane 729500.47 ft. N. 180279L.27 ft. E.	Date Well Installed: 11/30/93 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: APPROX 50 ft.	Section Location of Waste/Source: SW 1/4 of SW 1/4 of Sec. 21, T. 18 N. R. 3 ☐E ■W.	Well Installed By: (Person's Name and Firm): Bryan Loveland / WTD
Is Well A Point of Enforcement Std. Application? ■ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ■ Sidegradient d ☐ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation 832.29 ft. MSL
B. Well casing, top elevation 831.66 ft. MSL
C. Land surface elevation 830.5 ft. MSL
D. Surface seal, bottom 825.5 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ■ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ _____

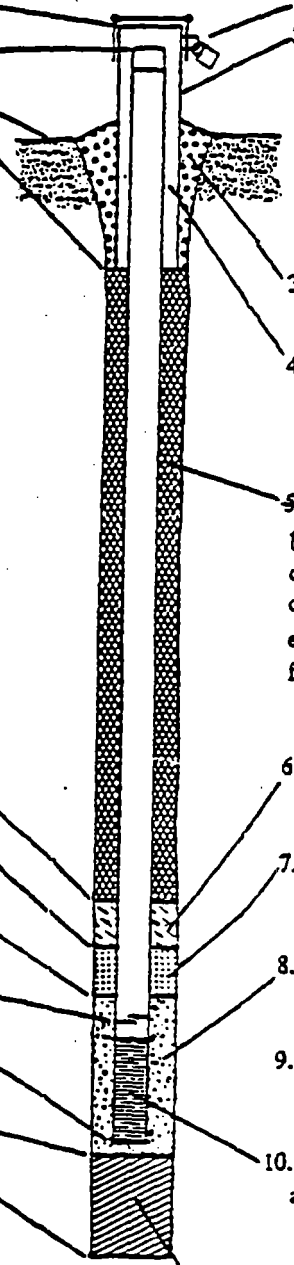
15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe N/A

Source of water (attach analysis): ~~N/A~~ Fort McCoy Bldg #2860

E. Bentonite seal, top 825.5 ft. MSL or 5.0 ft.
F. Fine sand, top 823.0 ft. MSL or 7.5 ft.
G. Filter pack, top 821.0 ft. MSL or 9.5 ft.
H. Screen joint, top 818.5 ft. MSL or 12.0 ft.
I. Well bottom 808.5 ft. MSL or 22.0 ft.
J. Filter pack, bottom 807.5 ft. MSL or 23.0 ft.
K. Borehole, bottom 807.5 ft. MSL or 23.0 ft.
L. Borehole, diameter 10.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.07 in.



1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel 04; Other ☐ _____
d. Additional protection? ■ Yes ~~No~~ (if)
If yes, describe: 3 ea. 4" Dia. Steel Bumper Posts
3. Surface seal: Bentonite 30; Concrete ☐ 01; Other ☐ _____
4. Material between well casing and protective pipe: Bentonite 30; Annular space seal ☐ _____; Other ☐ _____
5. ~~Annular space seal~~: N/A a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ■3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. Baroid → Bent. Chips Other ☐ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Silica Sand B13 #7
b. Volume added 1.7 ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint – American Materials 35/45
b. Volume added 7.4 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ _____
10. Screen material: Sch. 40 PVC
a. Screen type: Factory cut ☐ 11; Continuous slot ☐ 01; Other ☐ _____
b. Manufacturer Northern Air
c. Slot size: (2 ea. 5' sections) 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None 14; Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: RUST Environment & Infrastructure

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. [illegible] and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10. nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Fort McCoy-Mod 5-Landfill 10	Local Grid Location of Well: _____ ft. ☐N ☐S _____ ft. ☐E ☐W	Well Name: CW-155
Facility License, Permit or Monitoring Number: FID 64 205 0200	Grid Origin Location: Lat. _____ Long. _____ or St. Plane 729565.46 ft. N, 1807838.68 ft. E.	Wis. Unique Well Number / DNR Well Number
Well: Water Table Observation Well ■ 11; Piezometer ☐ 12	Section Location of Waste/Source: SW 1/4 of SW 1/4 of Sec. 27, T. 19 N. R. 3 ☐E ■W.	Date Well Installed: 1/13/93 (m m d d y y)
Distance Well Is From Waste/Source Boundary: ≈20 ft	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ■ Not Known	Well Installed By: (Person's Name and Firm): B.J. LeRoy / Rust E→I; Mike Mueller / WTD
Is Well A Point of Enforcement Std. Application? ■ Yes ☐ No		

A. Protective pipe, top elevation 831.51 ft. MSL
B. Well casing, top elevation 831.35 ft. MSL
C. Land surface elevation 829.5 ft. MSL
D. Surface seal, bottom 824.5 ft. MSL or 05.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ ___

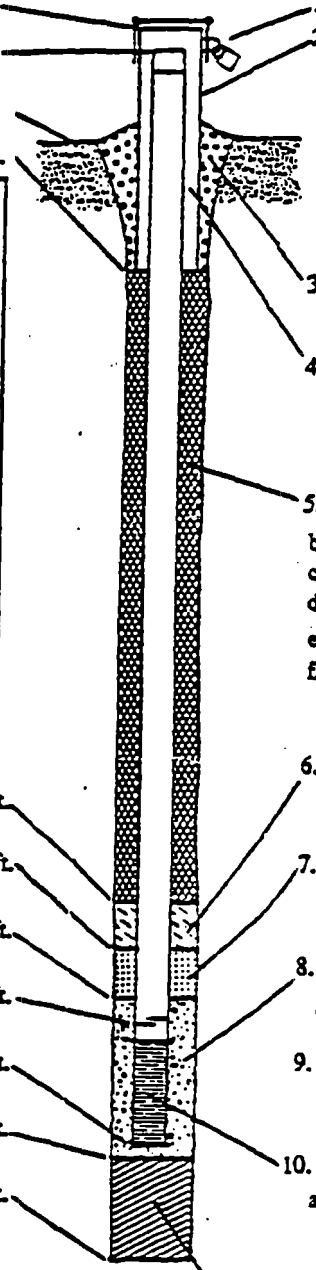
15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe _____

17. Source of water (attach analysis):
Ft Wtr Supply Bldg #2860

E. Bentonite seal, top 824.5 ft. MSL or 05.0 ft.
F. Fine sand, top 820.5 ft. MSL or 09.0 ft.
G. Filter pack, top 818.5 ft. MSL or 11.0 ft.
H. Screen joint, top 816.5 ft. MSL or 13.0 ft.
I. Well bottom 806.5 ft. MSL or 23.0 ft.
J. Filter pack, bottom 806.5 ft. MSL or 23.0 ft.
K. Borehole, bottom 805.5 ft. MSL or 24.5 ft.
L. Borehole, diameter 10.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.07 in.



1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 04.0 in.
b. Length: 27.0 ft.
c. Material: Steel ■ 04; Other ☐ ___
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3, 4" diameter bumper posts
3. Surface seal: Bentonite ☐ 30; Concrete ■ 01; Other ☐ ___
4. Material between well casing and protective pipe: Bentonite ■ 30; Annular space seal ☐ ___; Other ☐ ___
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft³ volume added for any of the above
f. How installed: Tremie ☐ 0; Tremie pumped ☐ ___; Gravity ☐ 09
6. Bentonite seal: a. Bentonite granules ☐ 3
b. ☐1/4 in. ■3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. BENTONITE CHIPS Other ☑ ___
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BR#7
b. Volume added 1 ft³
8. Filter pack material: Manufacturer, product name and mesh si
a. Red Flint No 35-45
b. Volume added 4.5 ft³
9. Well casing: Flush threaded PVC schedule 40 ■ 2
Flush threaded PVC schedule 80 ☐ 2
Other ☐ ___
10. Screen material: Sch. 40 PVC
a. Screen type: Factory cut ■ 1
Continuous slot ☐ 0
Other ☐ ___
b. Manufacturer Northern Wtr
c. Slot size: 0.010 in
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 1
Natural Formation Other ■ ___

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: B.J. LeRoy Firm: Rust E&I

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL
Form 4400-113A Rev. 4-90

Facility/Project Name: FORT MCCOY - MW05-LF10	Local Grid Location of Well: ____ ft. ☐N ☐S ____ ft. ☐E ☐W	Well Name: OW456
Facility License, Permit or Monitoring Number: FID 642050200	Grid Origin Location: Lat. ____ Long. ____ or	Wis. Unique Well Number / DNR Well Number: ____ / ____
Well: Water Table Observation Well ■ 11; Piezometer ☐ 12	St. Plane 720482.04 ft. N. 1807859.18 ft. E.	Date Well Installed: 11/30/93 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: Approx. 50 ft.	Section Location of Waste/Source: SW 1/4 of SW 1/4 of Sec. 27 T. 18 N. R. 3 ☐E ■W	Well Installed By: (Person's Name and Firm): Bryan Loveland / WTD
Is Well A Point of Enforcement Std. Application? ■ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ■ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation 832.06 ft. MSL
B. Well casing, top elevation 831.93 ft. MSL
C. Land surface elevation 830.0 ft. MSL
D. Surface seal, bottom 825.0 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ■ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ ____

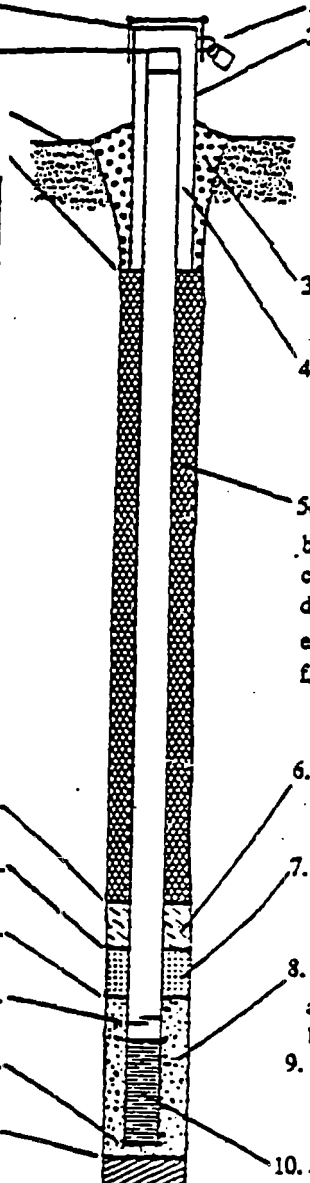
15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe N/A

Source of water (attach analysis): ~~N/A~~ Fort McCoy Bldg #2860

E. Bentonite seal, top 825.0 ft. MSL or 5.0 ft.
F. Fine sand, top 822.0 ft. MSL or 8.0 ft.
G. Filter pack, top 820.0 ft. MSL or 10.0 ft.
H. Screen joint, top 818.0 ft. MSL or 12.0 ft.
I. Well bottom 808.0 ft. MSL or 22.0 ft.
J. Filter pack, bottom 807.0 ft. MSL or 23.0 ft.
K. Borehole, bottom 807.0 ft. MSL or 23.0 ft.
L. Borehole, diameter 10.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.02 in.



1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel 04; Other ☐ ____
d. Additional protection? ■ Yes ~~■ No~~ (TPG)
If yes, describe: 3 ea. 4" Dia. Steel Bumper Posts
3. Surface seal: Bentonite ☐ 30; Concrete 01; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite 30; Annular space seal ☐ ____; (TPG) ~~Other~~ ____
5. ~~Annular space seal~~ N/A
a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ■3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. Baroid Bent. Chips Other ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Silica Sand BB#7
b. Volume added 1.1 ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint - American Materials 35/45
b. Volume added 7 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ ____
10. Screen material: Sch. 40 PVC
a. Screen type: Factory cut 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: (2 ea. 5' sections) 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Timothy P. Miller Firm: RUST Environment & Infrastructure

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10. nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Form 4400-113A Rev. 4-90

Facility/Project Name: Fort McCoy - Mod 5 - Landfill 10	Local Grid Location of Well: _____ ft. ☐N ☐S _____ ft. ☐E ☐W	Well Name: OW-157
Facility License, Permit or Monitoring Number: FID 64 205 02 00	Grid Origin Location: Lat. _____ Long. _____ or	Wis. Unique Well Number / DNR Well Number
Well: Water Table Observation Well ■ 11; Piezometer ☐ 12	St. Plane 729542.66 ft. N, 1807900.45 ft. E.	Date Well Installed: 11/30/93 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ≈20 ft	Section Location of Waste/Source: SW 1/4 of SW 1/4 of Sec. 27, T. 13 N, R. 3 ☐E ■W.	Well Installed By: (Person's Name and Firm) B.J. LeRoy / Mike Moeller; RUST E&I / WTM
Is Well A Point of Enforcement Std. Application? ■ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ■ Downgradient n ☐ Not Known (TPG)	

A. Protective pipe, top elevation 832.53 ft. MSL
B. Well casing, top elevation 832.50 ft. MSL
C. Land surface elevation 830.8 ft. MSL
D. Surface seal, bottom 825.8 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ ___

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe _____

Source of water (attach analysis): Ft. Water Supply Bldg #2860

E. Bentonite seal, top 825.8 ft. MSL or 5.0 ft.
F. Fine sand, top 820.8 ft. MSL or 10.0 ft.
G. Filter pack, top 818.8 ft. MSL or 12.0 ft.
H. Screen joint, top 816.8 ft. MSL or 14.0 ft.
I. Well bottom 806.8 ft. MSL or 24.0 ft.
J. Filter pack, bottom 806.8 ft. MSL or 24.0 ft.
K. Borehole, bottom 805.8 ft. MSL or 25.0 ft.
L. Borehole, diameter 12.0 in.
M. O.D. well casing 7.38 in.
N. I.D. well casing 2.07 in.

1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 3.0 ft.
c. Material: Steel ■ 04; Other ☐ ___
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3, 4" diameter bumper posts
3. Surface seal: Bentonite ☐ 30; Concrete ■ 01; Other ☐ ___
4. Material between well casing and protective pipe: Bentonite ■ 30; Annular space seal ☐ ___; Other ☐ ___
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ ___; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 32
b. ☐1/4 in. ■3/8 in. ☐1/2 in. Bentonite pellets ☐ 34
c. Bentonite chips Other ■ ___
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BR #4
b. Volume added 5 Yd 1 ft³
8. Filter pack material: Manufacturer, product name and mesh si
a. Red Flint No. 35-45
b. Volume added 5 ft³
9. Well casing: Flush threaded PVC schedule 40 ■ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ ___
10. Screen material: Schedule 40 PVC
a. Screen type: Factory cut ■ 11; Continuous slot ☐ 01; Other ☐ ___
b. Manufacturer Northern Nic
c. Slot size: 0.010 in
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 1; Natural Formation Other ■ ___

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: RUST E&I

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: FORT McCOY - MOD 5 - LF 10	Local Grid Location of Well: _____ ft. ☐N ☐S _____ ft. ☐E ☐W	Well Name: OW458
Facility License, Permit or Monitoring Number: FID 64205020 0	Grid Origin Location: Lat. _____ Long. _____ or St. Plane 729444.11 ft. N. 1807819.05 ft. E.	Wis. Unique Well Number / DNR Well Number: _____ / _____
Well Water Table Observation Well ■ 11 Piezometer ☐ 12	Section Location of Waste/Source: SW 1/4 of SW 1/4 of Sec. 21 T. 18 N. R. 3 ☐E ■W	Date Well Installed: 12/08/93 (m m d d y y)
Distance Well Is From Waste/Source Boundary: Approx 25 ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ■ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm) Bryan Loveland / WTI
Is Well A Point of Enforcement Std. Application? ■ Yes ☐ No		

A. Protective pipe, top elevation 831.67 ft. MSL
B. Well casing, top elevation 831.52 ft. MSL
C. Land surface elevation 829.8 ft. MSL
D. Surface seal, bottom 824.8 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ■ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ _____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe N/A

17. Source of water (attach analysis):
~~N/A~~ Fort McCoy Bldg #2860

E. Bentonite seal, top 824.8 ft. MSL or 5.0 ft.
F. Fine sand, top 821.8 ft. MSL or 8.0 ft.
G. Filter pack, top 819.8 ft. MSL or 10.0 ft.
H. Screen joint, top 817.8 ft. MSL or 12.0 ft.
I. Well bottom 807.8 ft. MSL or 22.0 ft.
J. Filter pack, bottom 806.8 ft. MSL or 23.0 ft.
K. Borehole, bottom 806.8 ft. MSL or 23.0 ft.
L. Borehole, diameter 10.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.02 in.

1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☐ 04; Other ☐ _____
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3 ea. 4" Dia. Steel Bumper Posts
3. Surface seal: Bentonite ☐ 30; Concrete ☐ 01; Other ☐ _____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ _____; Other ☐ _____
5. ~~Annular space seal~~: N/A a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ■3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. Baroid Bentonite Chips Other ☐ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Silica Sand BB #7
b. Volume added 1.1 ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint - American Materials 35/45
b. Volume added 7.2 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ _____
10. Screen material: Sch. 40 PVC
a. Screen type: Factory cut ☐ 11; Continuous slot ☐ 01; Other ☐ _____
b. Manufacturer Northern Air
c. Slot size: (2 ea 5' Sections) 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Timothy F. Miller Firm: RMT Environment & Infrastructure

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis. Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

APPENDIX H ADDENDUM

GROUNDWATER MONITORING WELL INFORMATION FORMS (WIFS)

Wisc
D ent c ral F ces

Chapter 14[illegible] Wis. Stats.
Form 4400-89

Rev. 1-90

Facility Name: Fort McCoy RFI

Facility ID Number: FID 642050200

Date: 18-JAN-94

Completed By (Name and Firm): B.J. LeRoy RUST E→I

Well Name	DNR Well ID Number	Well Location	N	S	E	W	Date Established	Well Casing Diam	Well Casing Type	Elevations Top of Well Casing	Elevations Ground Surface	Reference MSL (√)	Reference Site Datum (√)	Screen Length	Well Depth	Type of Well (√) PIEZ	OW	PW	EXT	Other	Aban-doned	Enf. Stds Apply	Gradient U, S, D or N
OW-144		743211.40	X				01-DEC-93	2.0"	PVC	901.12	898.8	X		10'	19.0'		X					Y	U
		1819929.96			X																		
OW-145		743392.55	X				08-DEC-93	2.0"	PVC	898.14	896.4	X		10'	20.0'		X					Y	D
		1819735.77			X																		
OW-146		743228.69	X				08-DEC-93	2.0"	PVC	898.25	896.4	X		10'	20.0'		X					Y	D
		1819653.60			X																		
OW-147		733539.03	X				02-DEC-93	2.0"	PVC	855.77	854.2	X		10'	23.0'		X					Y	D
		1808437.87			X																		
OW-148		733428.71	X				01-DEC-93	2.0"	PVC	850.74	849.6	X		10'	19.0'		X					Y	U
		1808437.63			X																		
OW-149		733330.23	X				08-DEC-93	2.0"	PVC	852.03	850.6	X		10'	19.0'		X					Y	D
		1808506.87			X																		
OW-150		733474.91	X				01-DEC-93	2.0"	PVC	848.10	846.1	X		10'	17.0'		X					Y	S
		1808574.65			X																		
OW-151		734973.55	X				06-DEC-93	2.0"	PVC	893.19	892.3	X		10'	41.5'		X					Y	N
		1807783.52			X																		
OW-152		734755.98	X				07-DEC-93	2.0"	PVC	882.44	880.7	X		10'	35.0'		X					Y	N
		1807766.95			X																		
OW-154		729500.47	X				30-Nov-93	2.0"	PVC	831.66	830.5	X		10'	23.0'		X					Y	U
		1807791.27			X																		
OW-155		729565.46	X				30-Nov-93	2.0"	PVC	831.35	829.5	X		10'	23.0'		X					Y	U
		1807838.68			X																		
OW-156		729482.04	X				30-Nov-93	2.0"	PVC	831.93	830.0'	X		10'	23.0'		X					Y	D
		1807859.18				X																	

Location Coordinates Are:

☐ Local Grid System (preferred) ■ State Plane Coordinate
☐ Northern
☐ Central

Remarks:

PSS Use:

Pile Maint. Completed: _____

Other: _____

State of Wisconsin
Department of Natural Resources

GROUNDWATER MONITORING WELL INFORMATION FORM
Chapter 144, Wis. Stats.
Form 4400-89

Rev. 1-90

Facility Name: Fort McCoy RFI
Facility ID Number: FID647050200
Date: 18-Jan-94
Completed By (Name and Firm): B.J. LeRoy Rust E&I

Well Name	DNR Well ID Number	Well Location	N	S	E	W	Date Established	Well Casing Diam	Well Casing Type	Elevations Top of Well Casing	Elevations Ground Surface	Reference MSL (√)	Reference Site Datum (√)	Screen Length	Well Depth	Type of Well (√) PIEZ	OW	PW	LYS	Other	Aban-doned	Enf. Stds Apply	Gradient U, S, D or N
OW-157		729542.66	X				30-NOV-93	20"	PVC	832.50	830.8	X		10'	29.0'		X					Y	D
		1807900.45			X																		
OW-158		729444.11	X				08-DEC-93	20"	PVC	831.52	829.8	X		10'	23.0'		X					Y	D
		1807879.05			X																		

Location Coordinates Are:

☐ Local Grid System (preferred) ☐ State Plane Coordinate ☐ Northern ☐ Central

Remarks:

PSS Use:

File Maint. Completed: _____

Other: _____

APPENDIX I ADDENDUM

MONITORING WELL DEVELOPMENT FORMS

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Fort McCoy - Mod 5 - Landfill #7	Monroe	OW - 144
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
FID64 205200	42	

1. Can this well be purged dry? ☐ Yes ■ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	■ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well 120 min.

4. Depth of well (from top of well casisng) 19.9 ft.

5. Inside diameter of well 2.02 in.

6. Volume of water in filter pack and well casing 8.8 gal.

7. Volume of water removed from well 90.0 gal.

8. Volume of water added (if any) ___.__ gal.

9. Source of water added N/A

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 13.19 ft.	13.21 ft.
Date	b. 12/08/93 (m m d d y y)	12/08/93 (m m d d y y)
Time	c. 11:05 ■ a.m. ☐ p.m.	1:25 ☐ a.m. ■ p.m.
12. Sediment in well bottom	___.__ inches	___.__ inches
13. Water clarity	Clear ☐ 10 Turbid ■ 15 (Describe) Muddy Brn	Clear ■ 20 Turbid ☐ 25 (Describe)
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Additional comments on development: Source NR 141

$V_1 + V_2$ = Well Volume

$V_1 = \pi \left(\frac{D_1}{2}\right)^2 H_1 = .147$ $\quad V_1 + V_2 = 1.19 \times 7.48 = 8.8$ gallons

$V_2 = N \pi H_2 \left[\left(\frac{D_1}{2}\right)^2 - \left(\frac{D_2}{2}\right)^2\right] = 1.037$

where $N = .3$

Well developed by: Person's Name and Firm

Name: Cortney Schmidt

Firm: RUST E:I

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Cortney Schmidt

Print Initials: CKS

Firm: RUST E:I

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Fort McCoy - Mod 5 - Landfill #7	Monroe	OW-145
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number**	**DNR Well Number**
FID 64 205020 00	42		

	Before Development	After Development
1. Can this well be purged dry?	☐ Yes ■ No	
2. Well development method		
surged with bailer and bailed	☐ 41	
surged with bailer and pumped	■ 61	
surged with block and bailed	☐ 42	
surged with block and pumped	☐ 62	
surged with block, bailed and pumped	☐ 70	
compressed air	☐ 20	
bailed only	☐ 10	
pumped only	☐ 51	
pumped slowly	☐ 50	
Other _____	☐ ▒	
3. Time spent developing well	70 min.	
4. Depth of well (from top of well casisng)	203 ft.	
5. Inside diameter of well	2.02 in.	
6. Volume of water in filter pack and well casing	9.6 gal.	
7. Volume of water removed from well	100.0 gal.	
8. Volume of water added (if any)	0.0 gal.	
9. Source of water added	N/A	
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No	
11. Depth to Water (from top of well casing)	a. 13.02 ft.	13.02 ft.
Date	b. 12/09/93 m m d d y y	12/09/93 m m d d y y
Time	c. 1:50 ☐ a.m. ■ p.m.	3:17 ☐ a.m. ■ p.m.
12. Sediment in well bottom	___. inches	___. inches
13. Water clarity	Clear ☐ 10 Turbid ■ 15	Clear ■ 20 Turbid ☐ 25
(Describe)	Muddy Dark Brown	Clear
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	___. mg/l	___. mg/l
15. COD	___. mg/l	___. mg/l

16. Additional comments on development: NR 141

$V_1 + V_2$ = well Volume

$V_1 = \pi \left(\frac{D_1}{2}\right)^2 H_1$

$V_2 = N\pi H_2 \left[\left(\frac{D_3}{2}\right)^2 - \left(\frac{D_2}{2}\right)^2\right]$

where $N = .3$

Well developed by: Person's Name and Firm

Name: Chris Itay

Firm: RUST E & I

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Chris Itay

Print Initials: C W H

Firm: RUST E & I

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Fort McCoy - Mod 5 - Landfill #7	Monroe	OW-146
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
FID 64 205 0200	42	

1. Can this well be purged dry? ☐ Yes ■ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☑ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well: 80 min.

4. Depth of well (from top of well casisng): 20.5 ft.

5. Inside diameter of well: 2.02 in.

6. Volume of water in filter pack and well casing: 7.5 gal.

7. Volume of water removed from well: 80.0 gal.

8. Volume of water added (if any): — gal.

9. Source of water added: N/A

10. Analysis performed on water added? ☐ Yes ☐ No (If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 14.83 ft.	14.84 ft.
Date	b. 12/09/93 (m m d d y y)	12/09/93 (m m d d y y)
Time	c. 2:30 ☐ a.m. ■ p.m.	3:55 ☐ a.m. ■ p.m.
12. Sediment in well bottom	— inches	— inches
13. Water clarity	Clear ☐ 10 Turbid ■ 15 (Describe) Muddy Brn	Clear ■ 20 Turbid ☐ 25 (Describe)
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Additional comments on development: Source NR 141

$V_1 + V_2$ = Well Volume × 7.48 gals/ft³ = Gallons

$V_1 = \pi \left(\frac{D_1}{2}\right)^2 H_1$

$V_2 = N\pi H_2 \left[\left(\frac{D_2}{2}\right)^2 - \left(\frac{D_2}{2}\right)^2\right]$

where N = .3

≈ 7.5 cubic

Well developed by: Person's Name and Firm

Name: Cortney Schindler

Firm: RUST E:I

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Cortney Schindler

Print Initials: CKS

Firm: RUST E:I

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Fort McCoy - Mod 5 - Landfill #8	Monroe	OW-147

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
FID 64 205020 00	42		

1. Can this well be purged dry? ■ Yes ☐ No

2. Well development method

surged with bailer and bailed	■ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well 90 min.

4. Depth of well (from top of well casing) 23.3 ft.

5. Inside diameter of well 2.02 in.

6. Volume of water in filter pack and well casing 9.3 gal.

7. Volume of water removed from well 45.0 gal.

8. Volume of water added (if any) ___ gal.

9. Source of water added N/A

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 16.23 ft.	18.82 ft.
Date	b. 12/08/93 (m m d d y y)	12/08/93 (m m d d y y)
Time	c. 8:15 ■ a.m. ☐ p.m.	2:00 ☐ a.m. ■ p.m.
12. Sediment in well bottom	___ inches	___ inches
13. Water clarity	Clear ☐ 10 Turbid ■ 15 (Describe) Muddy Brn	Clear ☐ 20 Turbid ■ 25 (Describe) Cloudy Brn

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	___ mg/l	___ mg/l
15. COD	___ mg/l	___ mg/l

16. Additional comments on development: Source NR141

$V_1 + V_2$ = Well Volume

$V_1 = \pi \left(\frac{D_1}{2}\right)^2 H_1 = .155$

$V_2 = N \pi H_2 \left[\left(\frac{D_2}{2}\right)^2 - \left(\frac{D_2}{2}\right)^2\right] = 1.088$

where N = .3

$V_1 + V_2 = 1.24 \times 7.48 = 9.3$ gallons

Well developed by: Person's Name and Firm

Name: Chris Hay

Firm: RUST E.I.

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Cathy Selch

Print Initials: CKS

Firm: RUST E.I.

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Fort McCoy - Mod 5 - Landfill #8	Monroe	OW-148
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
FID 64 205020 00	42	

1. Can this well be purged dry? ■ Yes ☐ No

2. Well development method

surged with bailer and bailed	■ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well 95 min.

4. Depth of well (from top of well casing) 20.16 ft.

5. Inside diameter of well 2.02 in.

6. Volume of water in filter pack and well casing 12.8 gal.

7. Volume of water removed from well 65.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added N/A

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results) —

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 10.87 ft.	11.02 ft.
Date	b. 12/08/93 (m m d d y y)	12/08/93 (m m d d y y)
Time	c. 9:00 ■ a.m. ☐ p.m.	1:40 ☐ a.m. ■ p.m.
12. Sediment in well bottom	— inches	— inches
13. Water clarity	Clear ☐ 10 Turbid ■ 15 (Describe) Muddy Brn	Clear ☐ 20 Turbid ■ 25 (Describe) Cloudy Brn
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Additional comments on development: Source NR141

$V_1 + V_2$ = Well Volume

$V_1 = \pi \left(\frac{D_1}{2}\right) H_1 = .214$

$V_2 = N \pi H_2 \left[\left(\frac{D_2}{2}\right)^2 - \left(\frac{D_2}{2}\right)^2\right] = 1.498$

Where $N = .3$

$V_1 + V_2 = 1.71 \times 7.48 = 12.8$ gals

Well developed by: Person's Name and Firm

Name: Chris Hey

Firm: RUST E:I

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Courtney S. Eich

Print Initials: CKS

Firm: RUST E:I

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Fort McCoy - Mods - Landfill #8	Monroe	OW-149

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
FID 64 205 0200	42		

1. Can this well be purged dry? ■ Yes ~~■ No~~ ~~0 45~~

2. Well development method

surged with bailer and bailed	■ 41
surged with bailer and pumped	~~■ 61~~ ~~cks~~
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well 70 min.

4. Depth of well (from top of well casisng) 19.4 ft.

5. Inside diameter of well 2.02 in.

6. Volume of water in filter pack and well casing 7.4 gal.

7. Volume of water removed from well 40.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added N/A

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 13.76 ft.	15.66 ft.
Date	b. 12/09/93 m m d d y y	12/09/93 m m d d y y
Time	c. 4:47 ☐ a.m. ■ p.m.	6:20 ☐ a.m. ■ p.m.
12. Sediment in well bottom	— inches	— inches
13. Water clarity	Clear ☐ 10 Turbid ■ 15 (Describe) Muddy Brn	Clear ☐ 20 Turbid ■ 25 (Describe) cloudy brn.

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/
15. COD	— mg/l	— mg/

16. Additional comments on development Source NR 141

$V_1 + V_2$ = Well Volume

$V_1 = \pi \left(\frac{D_1}{2}\right)^2 H_1$

$V_2 = N \pi H_2 \left[\left(\frac{D_2}{2}\right)^2 - \left(\frac{D_2}{2}\right)^2\right]$

where $N = .3$

Well developed by: Person's Name and Firm

Name: Chris Hay

Firm: RUST E&I

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Courtney Schultz

Print Initials: C KS

Firm: RUST E&I

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Fort McCoy - Mod 5 - Landfill #8	Monroe	OW-150
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
FID 64 205 0200	41	

	Before Development	After Development
1. Can this well be purged dry? ■ Yes ☐ No		
11. Depth to Water (from top of well casing)	a. 7.73 ft.	9.30 ft.
Date	b. 12/07/93 (m m d d y y)	12/07/93 (m m d d y y)
Time	c. 12:35 ☐ a.m. ■ p.m.	3:20 ☐ a.m. ■ p.m.
12. Sediment in well bottom	— inches	— inches
13. Water clarity	Clear ☐ 10 Turbid ■ 15 (Describe) Muddy Brn	Clear ☐ 20 Turbid ■ 25 (Describe) Cloudy Brn
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	■ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well: 150 min.

4. Depth of well (from top of well casisng): 17.8 ft.

5. Inside diameter of well: 2.02 in.

6. Volume of water in filter pack and well casing: 13.3 gal.

7. Volume of water removed from well: 130.0 gal.

8. Volume of water added (if any): — gal.

9. Source of water added: N/A

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

16. Additional comments on development: Source NR 141

$V_1 + V_2$ = well Volume

$V_1 = \pi \left(\frac{D_1}{2}\right)^2 H_1 = .222$

$V_2 = N\pi H_2 \left[\left(\frac{D_3}{2}\right)^2 - \left(\frac{D_2}{2}\right)^2\right] = 1.55$

where N: .3

$= 1.77 \times 7.48 =$ 13.3 gallons

Well developed by: Person's Name and Firm

Name: Courtney Schilt

Firm: Rust E&I

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Courtney Schilt

Print Initials: CKS

Firm: Rust E&I

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Fort McCoy - Mod 5 - Landfill #9	Monroe	OW-151
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
FID 64 205 0200	42	

1. Can this well be purged dry? ■ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	■ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well 90 min.

4. Depth of well (from top of well casing) 41.8 ft.

5. Inside diameter of well 2.02 in.

6. Volume of water in filter pack and well casing 7.0 gal.

7. Volume of water removed from well 35.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added N/A

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 36.43 ft.	36.42 ft.
Date	b. 12/08/93 (m m d d y y)	12/08/93 (m m d d y y)
Time	c. 10:10 ■ a.m. ☐ p.m.	1:00 ☐ a.m. ■ p.m.
12. Sediment in well bottom	___ inches	___ inches
13. Water clarity	Clear ☐ 10 Turbid ■ 15 (Describe) Muddy Brn	Clear ☐ 20 Turbid ■ 25 (Describe) Cloudy Brn
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	____ mg/l	____ mg/l
15. COD	____ mg/l	____ mg/l

16. Additional comments on development: Source: NR141

$V_1 + V_2$ = Well volume

$V_1 = \pi \left(\frac{D_1}{2}\right)^2 H_1 = .118$

$V_1 + V_2 = 9.45 \times 7.48 = 7.0$ gals

$V_2 = N\pi H_2 \left[\left(\frac{D_2}{2}\right)^2 - \left(\frac{D_1}{2}\right)^2\right] = .827$

where N = .3

Well developed by: Person's Name and Firm

Name: Chris Hay

Firm: RUST E&I

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Cathy S. Cik

Print Initials: CKS

Firm: RUST E,I

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Fort McCoy - Mod 5 - Landfill #9	Monroe	OW-152
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
FID64 205200	42	

		Before Development	After Development
1. Can this well be purged dry?	☐ Yes ■ No		
2. Well development method			
surged with bailer and bailed	☐ 41		
surged with bailer and pumped	■ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☐ 62		
surged with block, bailed and pumped	☐ 70		
compressed air	☐ 20		
bailed only	☐ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other _____	☐		
11. Depth to Water (from top of well casing)		a. 27.70 ft.	28.43 ft.
Date		b. 12/08/93 (m m d d y y)	12/08/93 (m m d d y y)
Time		c. 2:00 ☐ a.m. ■ p.m.	4:30 ☐ a.m. ■ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ■ 15	Clear ■ 20 Turbid ☐ 25
		(Describe) Muddy Brn	(Describe)
3. Time spent developing well	100 min.		
4. Depth of well (from top of well casisng)	35.9 ft.		
5. Inside diameter of well	2.02 in.		
6. Volume of water in filter pack and well casing	10.8 gal.		
7. Volume of water removed from well	110.0 gal.		
8. Volume of water added (if any)	0.0 gal.		
9. Source of water added	N/A		
Fill in if drilling fluids were used and well is at solid waste facility:			
14. Total suspended solids		mg/l	mg/l
15. COD		mg/l	mg/l

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

16. Additional comments on development: Source NR, HI

$V_1 + V_2$ = Well Volume

$V_1 = \pi \left(\frac{D_1}{2}\right)^2 H_1 = .18$

$V_2 = N \pi H_2 \left[\left(\frac{D_3}{2}\right)^2 - \left(\frac{D_2}{2}\right)^2\right] = 1.26$

where N = .3

$V_1 + V_2 = 1.44 \times 7.48 \frac{gal}{ft^3} = 10.8$ gallons

Well developed by: Person's Name and Firm

Name: Chris Hay

Firm: RUST E&I

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Courtney Schl

Print Initials: CKS

Firm: RUST E&I

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-9

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Fort McCoy - Mod 5 - Landfill #10	Monroe	OW - 154

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
FID 64 205 0200	42		

1. Can this well be purged dry? ☐ Yes ■ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	■ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well 80 min.

4. Depth of well (from top of well casing) 23.7 ft.

5. Inside diameter of well 2.02 in.

6. Volume of water in filter pack and well casing 8.4 gal.

7. Volume of water removed from well 90.0 gal.

8. Volume of water added (if any) ___.__ gal.

9. Source of water added N/A

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 17.36 ft.	16.92 ft.
Date	b. 12/06/93 m m d d y y	12/06/93 m m d d y y
Time	c. 12:30 ☐ a.m. ■ p.m.	1:58 ☐ a.m. ■ p.m.
12. Sediment in well bottom	___.__ inches	___.__ inches
13. Water clarity	Clear ☐ 10 Turbid ■ 15 (Describe) Muddy Brn	Clear ☐ 20 Turbid ■ 25 (Describe) Cloudy Brn

Fill in if drilling fluids were used and well is at solid waste facility.

14. Total suspended solids	___.__ mg/l	___.__ mg/l
15. COD	___.__ mg/l	___.__ mg/l

16. Additional comments on development: Source NR141

$V_1 + V_2$ = Well Volume

$V_1 = \pi \left(\frac{D_1}{2}\right)^2 H_1 = .141\ ft^3$

$V_2 = N \pi H_2 \left[\left(\frac{D_1}{2}\right)^2 - \left(\frac{D_2}{2}\right)^2\right] = .976\ ft^3$

where N = .3

$.141 + .976 = 1.12\ ft \times 7.48 \frac{gal}{ft^3}$

8.4 gallons

Well developed by: Person's Name and Firm

Name: Courtney Schlicht

Firm: RUST E;I

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Courtney Schlicht

Print Initials: CKS

Firm: RUST E:I

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Fort McCoy - Mod 5 - Landfill #10	Monroe	OW-155
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
FID 64 205020 00	42	

	Before Development	After Development
1. Can this well be purged dry? ☐ Yes ■ No		
11. Depth to Water (from top of well casing)	a. 16.58 ft.	16.48 ft.
Date	b. 12/07/93 (m m d d y y)	12/07/93 (m m d d y y)
Time	c. 9:10 ■ a.m. ☐ p.m.	10:45 ■ a.m. ☐ p.m.
12. Sediment in well bottom	___.__ inches	___.__ inches
13. Water clarity	Clear ☐ 10 Turbid ■ 15	Clear ☐ 20 Turbid ■ 25
(Describe)	Muddy Brn	Cloudy Brn

2. Well development method

surged with bailer and bailed	☐	41
surged with bailer and pumped	■	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☐	51
pumped slowly	☐	50
Other _____	☐	

3. Time spent developing well	85 min.
4. Depth of well (from top of well casing)	24.8 ft.
5. Inside diameter of well	2.02 in.
6. Volume of water in filter pack and well casing	10.8 gal.
7. Volume of water removed from well	110.0 gal.
8. Volume of water added (if any)	___.__ gal.
9. Source of water added	N/A
10. Analysis performed on water added? (If yes, attach results) ☐ Yes ☐ No	

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Additional comments on development: Source NR141

$V_1 + V_2$ = Well Volume

$V_1 = \pi \left(\frac{D_1}{2}\right)^2 H_1 = .182$ $\quad V_1+V_2 = 1.448 \times 7.48 = 10.8$ gals

$V_2 = N\pi H_2 \left[\left(\frac{D_3}{2}\right)^2 - \left(\frac{D_3}{2}\right)^2\right] = 1.266$

where N = .3

Well developed by: Person's Name and Firm

Name: Courtney S. Lisk

Firm: RUST E-I

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Courtney S. Lisk

Print Initials: CKS

Firm: RUST E-I

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-9

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Fort McCoy - Mod 5 - Landfill #10	Monroe	OW-156

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
FID64 205 0200	42		

1. Can this well be purged dry? ☐ Yes ■ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	■ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well 75 min.

4. Depth of well (from top of well casisng) 23.8 ft.

5. Inside diameter of well 2.02 in.

6. Volume of water in filter pack and well casing 8.6 gal.

7. Volume of water removed from well 90.0 gal.

8. Volume of water added (if any) ___ gal.

9. Source of water added N/A

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 17.23 ft.	17.26 ft.
Date	b. 12/06/93 (m m d d y y)	12/06/93 (m m d d y y)
Time	c. 2:25 ☐ a.m. ■ p.m.	3:35 ☐ a.m. ■ p.m.
12. Sediment in well bottom	___ inches	___ inches
13. Water clarity	Clear ☐ 10 Turbid ■ 15	Clear ☐ 20 Turbid ■ 25
(Describe)	Muddy Brn	Slightly Cloudy Brn.
14. Total suspended solids	____ mg/l	____ mg/l
15. COD	____ mg/l	____ mg/l

Fill in if drilling fluids were used and well is at solid waste facility

16. Additional comments on development: Source NR141

$V_1 + V_2$ = Well Volume

$V_1 = \pi \left(\frac{D_1}{2}\right)^2 H_1 = .144$ $V_1 + V_2 = 1.155 \times 7.48 = 8.64$

$V_2 = N\pi H_2 \left[\left(\frac{D_2}{2}\right)^2 - \left(\frac{D_2}{2}\right)^2\right] = 1.011$

where $N = .3$

Well developed by: Person's Name and Firm

Name: Courtney Schmidt

Firm: RUST E:I

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Courtney Schmidt

Print Initials: CKS

Firm: RUST E:I

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Ft. McCoy-Mod 5 - Landfill #10	Monroe	CLW-157
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
FID 64 205200	42	_____ / _____

	Before Development	After Development
1. Can this well be purged dry?	☐ Yes ■ No	
11. Depth to Water (from top of well casing)	a. 17.70 ft.	17.78 ft.
Date	b. 12/06/93 (m m d d y y)	12/06/93 (m m d d y y)
Time	c. 3:45 ☐ a.m. ■ p.m.	5:00 ☐ a.m. ■ p.m.
12. Sediment in well bottom	—.— inches	—.— inches
13. Water clarity	Clear ☐ 10 Turbid ■ 15 (Describe) Muddy Brn	Clear ☐ 20 Turbid ■ 25 (Describe) Cloudy Brn
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	—.— mg/l	—.— mg/l
15. COD	—.— mg/l	—.— mg/l

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	■ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well: 70 min.

4. Depth of well (from top of well casing): 25.5 ft.

5. Inside diameter of well: 2.03 in.

6. Volume of water in filter pack and well casing: 10.3 gal.

7. Volume of water removed from well: 100.0 gal.

8. Volume of water added (if any): —.— gal.

9. Source of water added: N/A

10. Analysis performed on water added? ☐ Yes ☐ No (If yes, attach results) —

16. Additional comments on development: Source NR 141

$V_1 + V_2$ = well volume

$V_1 = \pi \left(\frac{D_1}{2}\right)^2 H_1 = .172$

$V_2 = N\pi H_2 \left[\left(\frac{D_3}{2}\right)^2 - \left(\frac{D_2}{2}\right)^2\right] = 1.201$

where N# .3

$V_1 + V_2 = 1.373 \times 7.48 \frac{gal}{ft^3} = 10.3$ gallons

Well developed by: Person's Name and Firm

Name: Courtney Sleft

Firm: RUST E:I

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Courtney Sleft

Print Initials: CKS

Firm: RUST E:I

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ■ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name - Mod 5 Fort Mcloy, Landfill # 10	County Name Monroe	Well Name CW-158
Facility License, Permit or Monitoring Number FID 64 205 0200	County Code 42	Wis. Unique Well Number _____ / DNR Well Number _____

1. Can this well be purged dry? ☐ Yes ■ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	■ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well 75 min.

4. Depth of well (from top of well casing) 23.5 ft.

5. Inside diameter of well 2.02 in.

6. Volume of water in filter pack and well casing 8.2 gal.

7. Volume of water removed from well 80.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added N/A

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 16.96 ft.	16.94 ft.
Date	b. 12/09/93 (m m d d y y)	12/09/93 (m m d d y y)
Time	c. 3:30 ☐ a.m. ■ p.m.	4:45 ☐ a.m. ■ p.m.
12. Sediment in well bottom	___ inches	___ inches
13. Water clarity	Clear ☐ 10 Turbid ■ 15 (Describe) Muddy Brown	Clear ☐ 20 Turbid ■ 25 (Describe) Cloudy, light Brown
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	____ mg/l	____ mg/l
15. COD	____ mg/l	____ mg/l

16. Additional comments on development: NR. 141

$V_1 + V_2$ = well Volume (ft³)

$V_1 = \pi \left(\frac{D_1}{2}\right)^2 H_1$

$V_2 = N\pi H_2 \left[\left(\frac{D_2}{2}\right)^2 - \left(\frac{D_3}{2}\right)^2\right]$

where $N = .3$

$V_1 + V_2 = 8.2$ gal.

Well developed by: Person's Name and Firm

Name: Chris Hay

Firm: RUST E&I

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Chris Hay

Print Initials: C W H

Firm: RUST E&I

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.200 Well No. OW-144 Site: Fort McCoy - Mod 5 - Landfill # 7

Purging Method: Pumped ☒ Bailed ☒ Other: _____

Pump Type: Grundfos Bailer Type: 5' Teflon

Weather Conditions: Temp = 25° F, Winds ± 10 mph, overcast

Volume Calculation: ~~13.19 - 19.9 (.16) = 6.71 (.16) = 1.07 gal.~~ same see volume calculation on WDNR Form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 8.8 gal

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µS/cm Cond.	°C Temp.	Color	Odor Y/N	NTU Turbidity
11:05	13.19	19.9	0						
1210			9	6.2	170.9	6.6	Muddy Brown	N	>1000
1219			18	6.3	162	7.6	"	N	>1000
1227			27	6.2	144	7.9	"	N	>1000
1236			36	6.2	137	7.5	"	N	686
1245			45	6.2	131	7.5	Cloudy Brn	N	296
1:05			54	6.2	124	7.5	"	N	202
1:07			63	6.2	116	7.5	Slightly Cloudy Brn	N	125
1:10			72	6.1	111	7.6	"	N	89
1:12			81	6.1	107	7.6	"	N	63
1:15		Sample Readings 90		6.1	105	7.6	Almost clear	N	50.8

Comments: _____

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Courtney Schlicht

Date: 12/8/93

HNu/PPM	LEL/%	O2/%	H2S/PPM	CO/PPM	

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.200 Well No. (OW-145) Site: Ft. McCoy - Mod 5 - Landfill #7

Purging Method: Pumped ☒ Bailed ☒ Other: _____

Pump Type: Keck Bailer Type: 3" Stainless Steel

Weather Conditions: Overcast, Winds ± 15 mph Temp ≈ 32°F

Volume Calculation: See WDNR Form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 9.6 gal.

	Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µS/cm Cond.	C° Temp.	Color	Odor Y/N	Turbidity
	1350	13.02	20.3	0	7.3	414	7.5	muddy Brn	N	High >1000
1X	14:08			10	6.3	391	9.0	"	N	" >1000
2X	14:14			20	6.1	371	9.0	cloudy Brn	N	med 310
3X	14:20			30	6.1	385	9.0	Almost clear	N	low 117
4X	1451			40	6.1	370	9.0	clear	N	low 63
5X	1444			50	6.2	414	9.0	Clear	N	low 52
6X	1448			60	6.2	363	9.0	Muddy Brown	N	High 71,000
7X	1454			70	6.2	377	9.0	Cloudy	N	low 134
8X	1459			80	6.2	383	9.0	almost clear	N	low 72
9X	1504			90	6.2	381	9.0	clear	N	low 50
10X	1510		Sample Readings 100		6.2	380	9.0	clear	N	low 42

Comments: _____

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Chris Hay

Date: 12/9/93

HNu/PPM	LEL/%	O2/%	H2S/PPM	CO/PPM	

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.200 Well No. OW-14b Site: Fort McCoy - Mod 5 - Landfill #7

Purging Method: Pumped ☒ Bailed ☒ Other: _____

Pump Type: Grundfos Bailer Type: 5' Teflon

Weather Conditions: overcast windy Temp = 33°F

Volume Calculation: See WDNR Form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 7.5 gal.

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µS/cm Cond.	C° Temp.	Color	Odor Y/N	NTU Turbidity
2:30	1483	20.5	0	7.1	440	7.5°	muddy Brn	N	High >1000
2:52			8	6.4	404	7.0°	muddy Brn	N	High >1000
2:56			16	6.3	401	7.0	Very Cloudy Brn	N	High >1000
3:00			24	6.3	382	7.0	Cloudy Brn	N	med 478
3:05			32	6.2	347	7.0	Slightly Cloudy Brn	N	Low 180
3:09			40	6.3	339	7.0	Clear	N	V. Low 33.2
3:30			48	6.2	322	7.0	Very Cloudy Brn	N	High >1000
3:35			56	6.3	315	7.0	Slightly Cloudy Brn	N	Low 166
3:39			64	6.2	311	7.0	Almost clear	N	49
3:43			72	6.2	312	7.0	Clear	N	12
3:48		Sample Readings 80		6.1	317	7.0	Clear	N	10.7

Comments: _____

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Courtney Schultz

Date: 12 / 9 / 93

HNu/PPM	LEL/%	O2/%	H2S/PPM	CO/PPM	

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.200 Well No. (OW-147) Site: Ft McCoy - Mod S - Landfill #8

Purging Method: Pumped ☐ Bailed ☒ Other: _____

Pump Type: NA Bailer Type: 3' Stainless Steel

Weather Conditions: overcast, Temp = 20° F

Volume Calculation: see WDNR form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 9.3 gal.

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µS/cm Cond.	°C Temp.	Color	Odor Y/N	NTU Turbidity
0815	16.23	23.34	0	5.6	160.2	7	Drk Brn	N	>1000
1045			9	6.3	157.3	7	"	N	>1000
1147			18	6.8	154.0	7	"	N	>1000
1320			27	6.9	147.0	7	"	N	>1000
1345			36	6.8	138.5	7	"	N	>1000
1410			45	6.8	137.8	7	"	N	>1000
		Sample Readings							

Comments: _____

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Courtney Schlegel

Date: 12/8/93

HNu/PPM	LEL/%	O_2/%	H_2S/PPM	CO/PPM	

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.200 Well No. (OW-148) Site: Fort McCoy - Mod 5 - Landfill #8

Purging Method: Pumped ☐ Bailed ☒ Other: _____

Pump Type: _____ Bailer Type: 3' Stainless Steel

Weather Conditions: Overcast, Temp ≈ 20°F

Volume Calculation: see WDNR form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 12.8 gal.

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µS/cm Cond.	°C Temp.	Color	Odor Y/N	NTU Turbidity
9:00	10.87	20.6	0						
9:23			13	5.8	57.7	7°	Drk Brn	N	>1000
9:50			26	5.9	58.4	6°	"	N	>1000
10:30			39	6.1	52.7	6°	"	N	>1000
11:40			52	7.0	56.5	6°	"	N	>1000
1:37			63	7.0	53.8	6°	"	N	472
		Sample Readings							

Comments: _____

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Courtney Schaefer

Date: 12/8/93

HNu/PPM	LEL/%	O2/%	H2S/PPM	CO/PPM	

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.200 Well No. (OW-149) Site: Ft. McCoy-Mod 5- Landfill #8

Purging Method: Pumped ☐ Bailed ☒ Other: _____

Pump Type: _____ Bailer Type: 3' Stainless Steel

Weather Conditions: Overcast, Temp ≈ 35°F

Volume Calculation: see WDNR form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 7.4 gal

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µS/cm Cond.	C° Temp.	Color	Odor Y/N	NTU Turbidity
4:47	13.76	19.4	0	6.5	245	7.5°	muddy Brn	N	>1000
5:05			8	6.5	255	7.5°	"	N	>1000
5:14			16	6.3	251	7.5°	cloudy Brn	N	892
5:22			24	6.3	248	7.5	"	N	714
5:38			32	6.4	259	7.0	"	N	704
5:55			40	6.4	257	7.0	"	N	680
		Sample Readings							

Comments: Well bailed dry.

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Courtney S. Slift

Date: 10/9/93

HNu/PPM	LEL/%	O2/%	H2S/PPM	CO/PPM	

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.200 Well No. (OW-150) Site: Ft. McCoy - Mod 5 - Landfill #8

Purging Method: Pumped ☒ Bailed ☒ Other: _____

Pump Type: Keck Bailer Type: 3" Stainless Steel

Weather Conditions: Overcast, Lt Winds ± 5mph Temp = 20°F

Volume Calculation: see WDNR form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 13.3 gal.

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µS/cm Cond.	C° Temp.	Color	Odor Y/N	NTU Turbidity
1235	7.73	17.8	0						
1:05			13	6.5	69.4	6.5	Muddy Brn	N	High >1000
1:22			26	6.6	59.0	6.5	"	N	" >1000
1:29			39	6.7	41.5	6.0	"	N	" >1000
1:45			52 [illegible]	6.7	34.6	6.0	"	N	" 808 [illegible]
1:57			65	6.5	35.5	6.0	"	N	mod 432 [illegible]
2:34			78	6.5	36.4	6.0	"	N	" 716 [illegible]
2:40			91	6.5	34.2	7.0	"	N	" 550
2:51			104	6.5	32.0	7.0	"	N	" 510
2:59			117	6.5	31.6	7.0	Cloudy Brn	N	med-low 260
3:10		Sample Readings 130		6.4	31.8	7.0	"	N	" 192

Comments: Pump Slowly, well would pump dry.

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Courtney Schlaf

Date: 12/7/93

HNu/PPM	LEL/%	O_2/%	H_2S/PPM	CO/PPM	

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.200 Well No. (OW-151) Site: Fort McCoy-Mod 5-Landfill #9

Purging Method: Pumped ☐ Bailed ☒ Other: _____

Pump Type: _____ Bailer Type: 3' Stainless Steel

Weather Conditions: overcast, Temp ≈ 30° F

Volume Calculation: See WDNR form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 7.0 gal

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µS/cm Cond.	°C Temp.	Color	Odor Y/N	NTU Turbidity
1010	36.43	41.80	0.5	6.9	51.3	7°	Drk Brk	N	>1000
11:10			7	6.9	86.8	7°	"	N	>1000
12:10			14	6.9	84.0	7°	"	N	>1000
12:25			21	6.9	85.8	7°	"	N	>1000
12:40			28	6.9	84.9	7°	"	N	>1000
1300			35	6.9	86.0	7°	"	N	>1000
		Sample Readings							

Comments: _____

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Courtney S. Cobb

Date: 12/8/93

HNu/PPM	LEL/%	O2/%	H2S/PPM	CO/PPM	

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.200 Well No. OW-152 Site: Ft. McCoy - Mod 5 - Landfill #9

Purging Method: Pumped ☒ Bailed ☒ Other: _____

Pump Type: Keck Bailer Type: 3' Stainless Steel

Weather Conditions: Overcast Temp ≈ 35° F

Volume Calculation: See WONR form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 10.8 gal.

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µS/cm Cond.	°C Temp.	Color	Odor Y/N	NTU Turbidity
1412	27.70	35.9	0	6.5	82.6	7	Drk Brn	N	>1000
1433			11	6.8	71.6	7	"	N	>1000
1507			22	6.9	57.1	7	"	N	>1000
1512			33	6.9	50.8	7	"	N	722
1522			44	6.8	49.0	7	Cloudy Brn	N	312
1528			55	6.7	46.1	7	"	N	208
1554			66	6.4	38.4	7	Drk Brn	N	1000
1603			77	6.4	37.5	7	"	N	890
1608			88	6.4	39.0	7	Cloudy Brn	N	263
1613			99	6.7	37.2	7	Cloudy	N	128
1618		Sample Readings 110		6.5	37.2	7	"	N	113.6

Comments: _____

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Courtney Slick

Date: 12/8/93

HNu/PPM	LEL/%	O2/%	H2S/PPM	CO/PPM	

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.200 Well No. (OW-154) Site: Fort McCoy - Mod S - Landfill #10

Purging Method: Pumped ☒ Bailed ☒ Other: _____

Pump Type: Keck Bailer Type: 3' Stainless Steel

Weather Conditions: Partly Cloudy, windy ± 10 mph Temp ≈ 30°F

Volume Calculation: see WDNR form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 8.4 gal.

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µS/cm Cond.	C° Temp.	Color	Odor Y/N	NTu Turbidity
1230	17.36	23.70	0.5	8.2	381	6	muddy Brown	N	High >1000
1255			9.0	8.4	40.3	6	"	N	" >1000
1302			18.0	7.7	39.3	7	"	N	" >1000
1305			27.0	7.6	38.9	7	"	N	" 870
1310			36.0	7.4	39.4	7	"	N	" 744
1314			45.0	7.5	39.8	7	Cloudy Brown	N	med 576
1330			54.0	7.4	39.8	7	"	N	" 396
1334			63	7.3	37.0	7	"	N	" 378
1338			72	7.4	37.0	7	"	N	med-low 296
1342			81	7.4	37.1	7	"	N	" 290
1346			90 Sample Readings	7.3	36.2	7	"	N	" 286

Comments: _____

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Courtney Schiff

Date: 12/06/93

HNu/PPM	LEL/%	O2/%	H2S/PPM	CO/PPM	

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.200 Well No. (GW-155) Site: Ft. McCoy - Mod 5 - Landfill #10

Purging Method: Pumped ☒ Bailed ☒ Other: _____

Pump Type: Keck Bailer Type: 3' Stainless Steel

Weather Conditions: Sunny, Temp ≈ 15°F

Volume Calculation: see WDNR form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 10.8 gal.

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µS/cm Cond.	C° Temp.	Color	Odor Y/N	NTU Turbidity
0910	16.58	24.80	0						
0938			11	7.2	25	8	Drk Brn	N	>1000
0944			22	6.8	20.7	8	"	N	>1000
0949			33	6.8	20.2	8	"	N	>1000
0954			44	6.3	19.3	8	"	N	988
0959			55	6.2	18.0	7	"	N	532
1018			66	6.3	17.7	7	"	N	728
1025			77	6.3	17.4	7	Cloudy Brn	N	400
1031			88	6.3	16.8	7	"	N	388
1036			99	6.3	16.4	7	"	N	314
1042		Sample Readings 110		6.4	17.3	7	"	N	270

Comments: _____

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Corky Sale

Date: 12 7 93

HNu/PPM	LEL/%	O2/%	H2S/PPM	CO/PPM	

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.200 Well No. (OW-156) Site: Ft. McCoy-Mod 5-Landfill #10

Purging Method: Pumped ☒ Bailed ☒ Other: _____

Pump Type: Keck Bailer Type: 3' Stainless Steel

Weather Conditions: Sunny, Winds ± 10 mph Temp = 25° F

Volume Calculation: See WDNR form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 8.6 gal.

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µS/cm Cond.	C° Temp.	Color	Odor Y/N	NTU Turbidity
2:25	17.23	23.80	0						
2:45			9	8.6	25.4	6	Drk Brn	N	High >1000
2:49			18	7.5	29.3	7	"	N	" >1000
2:53			27	7.3	29.9	7	Brn	N	" >910
2:57			36	7.3	34.8	7	Lt Brn	N	Med 476
3:01			45	7.1	37.3	7	"	N	" 336
3:18			54	7.3	33.0	7	Brn	N	High >1000
3:22			63	7.3	37.3	7	"	N	med 774
3:25			72	7.3	37.1	7	Lt Brn	N	" 614
3:29			81	7.3	38.0	7	Lt Brn	N	" 318
3:33		Sample Readings 90		7.3	38.2	7	"	N	" 255

Comments: _____

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Courtney Schlit

Date: 12/6/93

HNu/PPM	LEL/%	O2/%	H2S/PPM	CO/PPM	

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.200 Well No. (GW-157) Site: Ft. McCoy - Mod 5 - Landfill #10

Purging Method: Pumped ☒ Bailed ☒ Other: _____

Pump Type: Keck Bailer Type: 3' Stainless Steel

Weather Conditions: Sunny, Windy ±10mph Temp ≈ 20°F

Volume Calculation: see WPNR Form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 10.3 gal.

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µS/cm Cond.	C° Temp.	Color	Odor Y/N	NTU Turbidity
13:45	17.70	25.5	0						
4:05			10	7.5	20.1	7	Drk Brn	N	High >1000
4:09			20	7.6	19.6	7	"	N	>1000
4:13			30	7.5	20.3	6.5	"	N	>1000
4:18			40	7.5	20.8	7	"	N	782
4:22			50	7.5	21.1	7	Brn	N	514
4:39			60	7.5	18.3	7	Lt Brn	N	664
4:43			70	7.5	19.9	7	"	N	512
4:47			80	7.5	19.9	7	"	N	448
4:52			90	7.5	19.0	7	"	N	380
4:58		Sample Readings 100		7.5	18.9	7	"	N	356

Comments: _____

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Courtney Schmidt

Date: 12/6/93

HNu/PPM	LEL/%	O2/%	H2S/PPM	CO/PPM	

RUST ENVIRONMENT & INFRASTRUCTURE

Well Purging and Sample Collection

Project No.: 71842.20c Well No. (OW-15S) Site: Fort McCoy - Landfill 10

Purging Method: Pumped ☒ Bailed ☒ Other: _____

Pump Type: Keck Bailer Type: 3' Stainless Steel

Weather Conditions: 35°, overcast

Volume Calculation: see WDNR form

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.)
(Gals./well vol. x 5 = Total Volume to be removed)

Gals./well vol.: 8.2 gal.

	Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	µs/cm Cond.	°C Temp.	Color	Odor Y/N	NTU Turbidity
	1531	16.96	23.48	0	6.2	62.0	6.8°C	Muddy Brown	N	High <1000
1X	1537			8	6.2	59.9	6.3°C	Muddy Brown	N	High <1000
2X	1546			16	6.2	50.6	6.7°C	Muddy Brown	N	High <1000
3X	1554			24	6.2	46.5	6.9°C	Muddy Brown	N	High <1000
4X	1600			32	6.2	44.2	6.9°C	Muddy Brown	N	High <1000
5X	1610			40	6.2	41.7	6.9°C	cloudy Brown	N	medium <1000
6X	1627			48	6.2	39.9	7.9°C	Muddy Brown	N	High <1000
7X	1633			56	6.2	37.4	8.4°C	cloudy Brown	N	medium <1000
8X	1642			64	6.3	34.0	9.0°C	cloudy Brown	N	medium 733
9X	1648			72	6.1	35.6	8.9°C	cloudy Brown	N	medium 525
10X	1659		Sample Readings 80		6.1	37.7	8.9°C	"	N	339

Comments: _____

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ Time: _____

Well Duplicate ☐ No.: _____

Signature: Chris Hay

Date: 12/9/93

HNu/PPM	LEL/%	O2/%	H2S/PPM	CO/PPM	

APPENDIX J ADDENDUM

AQTESOLV (HYDRAULIC CONDUCTIVITY) RESULTS AND PLOTS

J-1 Phase 1
J-2 Phase 2
J-3 Phase 3
J-4 Landfills 7, 8, 9, and 10

APPENDIX J-4

LANDFILLS 7, 8, 9, AND 10

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                         A Q T E S O L V   R E S U L T S
                                  Version  1.10

2/16/93                                                                         14:00:18

==========================================================================================
                                 TEST DESCRIPTION

ata set........... fm144r1.dat
ata set title..... Fort McCoy Mod 5
Company............ Rust E & I
roject............ 71842.200
lient............. USACE
Location........... Fort McCoy
est date.......... 09-Dec-93
bs. well.......... OW-144 R1

Knowns and Constants:
   No. of data points.................. 87
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 196
   Static height of water in well...... 196
   Log(Re/Rw).......................... 2.883
   A, B, C.............................  3.943,  0.630,  0.000

==========================================================================================
                                 ANALYTICAL METHOD

ouwer and Rice (unconfined aquifer slug test)

==========================================================================================
                      RESULTS FROM STATISTICAL CURVE MATCHING

TATISTICAL MATCH PARAMETER ESTIMATES

             Estimate          Std.  Error
   K  =   7.8637E-003 +/-   2.1268E-004
   y0 =   5.1955E+001 +/-   1.1768E+000

NALYSIS OF MODEL RESIDUALS

residual = calculated - observed
eighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals.............. 28
   Number of estimated parameters.... 2
   Degrees of freedom............... 26
   Residual mean.................... 0.1855
   Residual standard deviation...... 1.189
```

```
   Residual variance................ 1.413

 Model Residuals:

     Time         Observed      Calculated     Residual        Weight
 -------------  -------------  -------------  -------------  -------------
           1.5         43.861        39.672         4.1885              1
         1.998         35.905        36.274        -0.3685              1
         2.496         32.553        33.167       -0.61412              1
             3         29.383        30.293        -0.9103              1
         3.498         26.487        27.698         -1.211              1
         3.996         24.201        25.326        -1.1244              1
           4.5         22.159        23.131       -0.97222              1
         4.998         20.269         21.15       -0.88063              1
         5.496         18.623        19.338       -0.71486              1
             6         16.429        17.663        -1.2339              1
         6.498         15.545         16.15       -0.60485              1
         6.996         14.509        14.766       -0.25779              1
           7.5         12.771        13.487       -0.71577              1
         7.998         12.192        12.332        -0.1396              1
         8.496         11.339        11.275       0.063309              1
             9         10.455        10.298        0.15625              1
         9.498         9.8755        9.4162        0.45932              1
         9.996         9.0221        8.6096        0.41246              1
          10.5         8.3515        7.8636        0.48788              1
        10.998         7.8638        7.1901        0.67379              1
        11.496         7.2847        6.5742        0.71056              1
            12          6.919        6.0045        0.91442              1
        12.498         6.4313        5.4902        0.94108              1
        12.996          6.157        5.0199          1.137              1
          13.5         5.6693         4.585         1.0843              1
        13.998         5.3645        4.1922         1.1723              1
        14.496         5.0902        3.8331          1.257              1
            15         4.7854         3.501         1.2844              1


==============================================================================
                       RESULTS FROM VISUAL CURVE MATCHING


VISUAL MATCH PARAMETER ESTIMATES

          Estimate
   K  =   7.8637E-003
   y0 =   5.1955E+001


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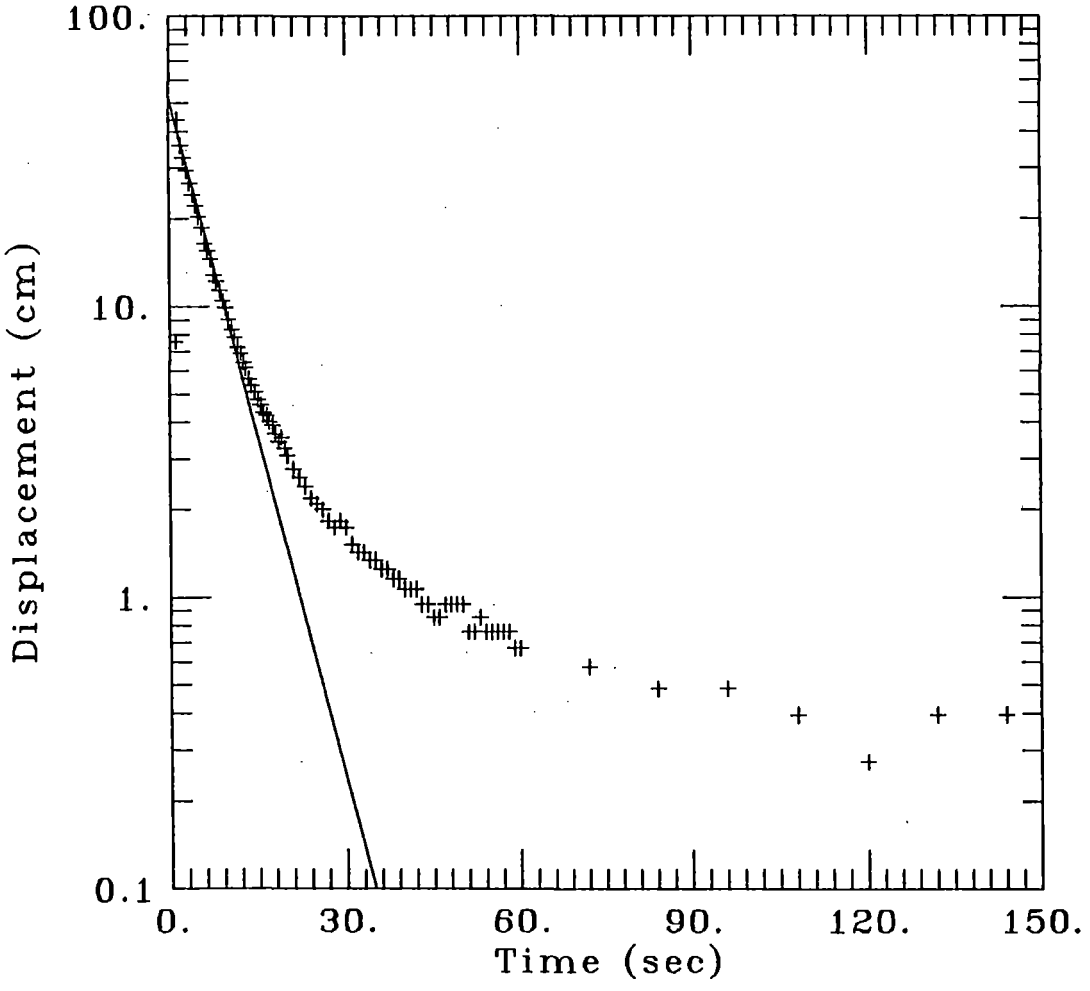
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm144r1.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
09-Dec-93
OBS. WELL:
OW-144 R1

ESTIMATED PARAMETERS:
K = 0.007864 cm/sec
y0 = 51.96 cm

TEST DATA:
H0 = 43.86 cm
rc = 2.438 cm
rw = 2.438 cm
L = 196. cm
b = 1.2192E+04 cm
H = 196. cm

```
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                         A Q T E S O L V   R E S U L T S
                                  Version 1.10

12/16/93                                                                14:00:3

===============================================================================
                                TEST DESCRIPTION

Data set........... fm144r2.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-144 R2

Knowns and Constants:
   No. of data points................... 88
   Radius of well casing................ 2.438
   Radius of well....................... 2.438
   Aquifer saturated thickness.......... 12190
   Well screen length................... 196
   Static height of water in well...... 196
   Log(Re/Rw)........................... 2.883
   A, B, C.............................. 3.943,  0.630,  0.000

===============================================================================
                                ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)


===============================================================================
                      RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate         Std. Error
   K  =   7.4731E-003 +/-   1.6682E-004
   y0 =   5.1338E+001 +/-   1.0565E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 37
   Number of estimated parameters.... 2
   Degrees of freedom................ 35
   Residual mean..................... 0.2591
   Residual standard deviation....... 0.9759
```

Residual variance..... 0.9523

del Residuals:

Time	Observed	Calculated	Residual	Weight
1.998	39.167	36.488	2.6784	1
2.496	34.381	33.512	0.86978	1
3	30.632	30.746	-0.11372	1
3.498	28.042	28.238	-0.19618	1
3.996	25.451	25.934	-0.48327	1
4.5	22.769	23.794	-1.0253	1
4.998	20.94	21.853	-0.91294	1
5.496	19.02	20.07	-1.0504	1
6	17.678	18.414	-0.73529	1
6.498	15.484	16.911	-1.4277	1
6.996	14.783	15.532	-0.74898	1
7.5	13.259	14.25	-0.99124	1
7.998	12.405	13.087	-0.68209	1
8.496	11.521	12.02	-0.49838	1
9	10.485	11.028	-0.54277	1
9.498	9.7231	10.128	-0.40507	1
9.996	9.144	9.3019	-0.15791	1
10.5	8.4734	8.5343	-0.060838	1
10.998	7.8943	7.838	0.056289	1
11.496	7.3152	7.1986	0.11661	1
12	6.919	6.6045	0.31443	1
12.498	6.4313	6.0657	0.36556	1
12.996	6.0655	5.5709	0.49466	1
13.5	5.6693	5.1111	0.55814	1
13.998	5.395	4.6942	0.7008	1
14.496	5.0902	4.3112	0.77896	1
15	4.8158	3.9554	0.86042	1
15.498	4.633	3.6327	1.0002	1
15.996	4.3282	3.3364	0.9918	1
16.5	4.1453	3.061	1.0842	1
16.998	3.9624	2.8113	1.1511	1
17.496	3.6576	2.582	1.0756	1
18	3.6576	2.3689	1.2887	1
18.498	3.4747	2.1756	1.2991	1
18.996	3.2918	1.9981	1.2937	1
19.5	3.0785	1.8332	1.2452	1
19.998	3.0785	1.6837	1.3948	1

==========

RESULTS FROM VISUAL CURVE MATCHING

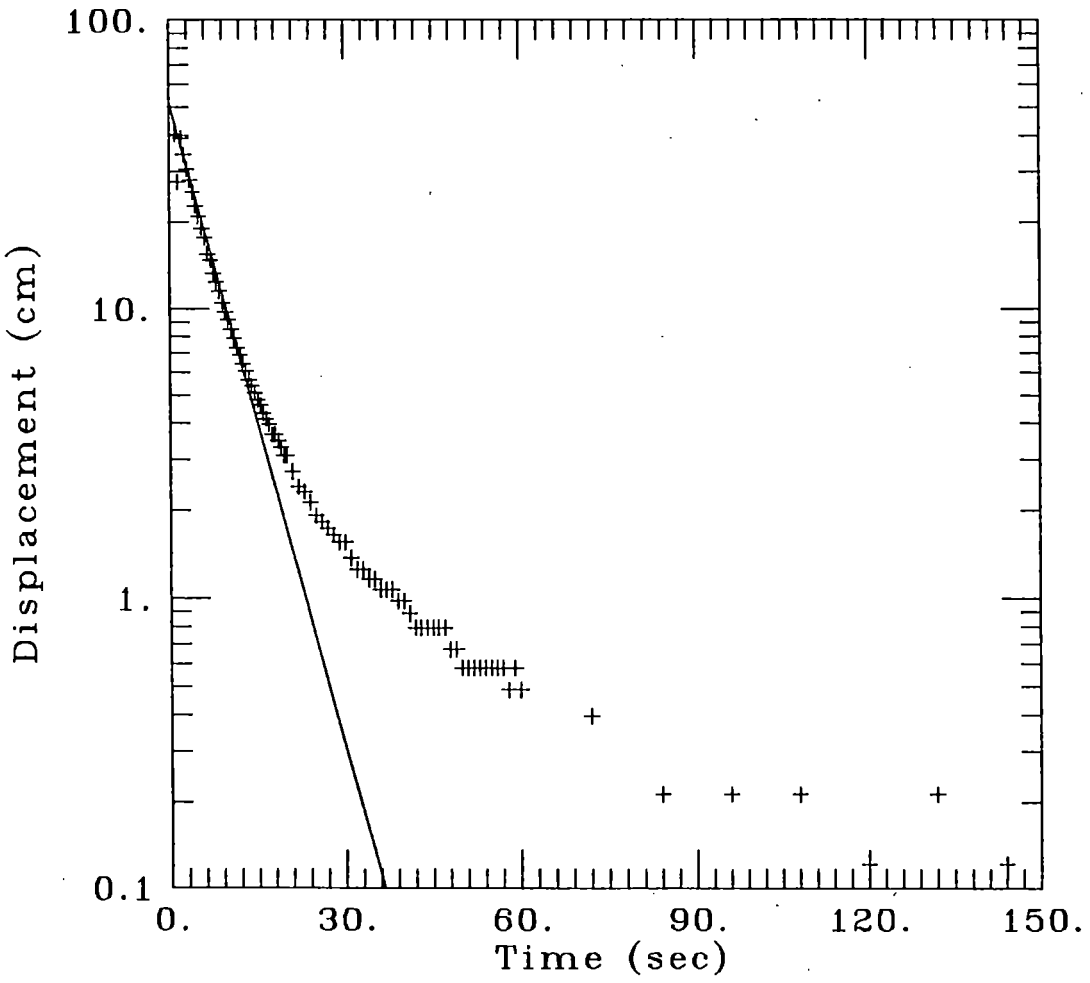
ISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	7.4731E-003
y0 =	5.1338E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm144r2.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
09-Dec-93
OBS. WELL:
OW-144 R2

ESTIMATED PARAMETERS:
K = 0.007473 cm/sec
y0 = 51.34 cm

TEST DATA:
H0 = 40.42 cm
rc = 2.438 cm
rw = 2.438 cm
L = 196. cm
b = 1.2192E+04 cm
H = 196. cm

```
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                      A Q T E S O L V   R E S U L T S
                              Version  1.10

2/16/93                                                                     14:00:58

=====================================================================================
                                TEST DESCRIPTION

ata set........... fm144r3.dat
ata set title..... Fort McCoy Mod 5
Company........... Rust E & I
roject............ 71842.200
lient............. USACE
ocation........... Fort McCoy
Test date......... 09-Dec-93
bs. well.......... OW-144 R3

Knowns and Constants:
   No. of data points.................... 90
   Radius of well casing................. 2.438
   Radius of well........................ 2.438
   Aquifer saturated thickness........... 12190
   Well screen length.................... 196
   Static height of water in well........ 196
   Log(Re/Rw)............................ 2.883
   A, B, C...............................  3.943,  0.630,  0.000

=====================================================================================
                                ANALYTICAL METHOD

ouwer and Rice (unconfined aquifer slug test)


=====================================================================================
                      RESULTS FROM STATISTICAL CURVE MATCHING


TATISTICAL MATCH PARAMETER ESTIMATES

          Estimate          Std.  Error
   K  =   7.5309E-003 +/-   1.8035E-004
   y0 =   4.7735E+001 +/-   9.6043E-001


NALYSIS OF MODEL RESIDUALS

residual = calculated - observed
eighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 32
   Number of estimated parameters.... 2
   Degrees of freedom................ 30
   Residual mean..................... 0.2157
   Residual standard deviation....... 1.025
```

```
   Residual variance................ 1.05

Model Residuals:

     Time          Observed        Calculated       Residual         Weight
 ------------  ------------  ------------  ------------  ------------
          1.5        39.472        36.868        2.6035             1
        1.998        34.961        33.838        1.1222             1
        2.496         31.12        31.057       0.06274             1
            3        28.042        28.475      -0.43383             1
        3.498        25.451        26.135      -0.68434             1
        3.996        23.134        23.987      -0.85289             1
          4.5        20.452        21.993       -1.5409             1
        4.998        18.623        20.186       -1.5622             1
        5.496        17.465        18.527       -1.0615             1
            6        15.941        16.986       -1.0454             1
        6.498        14.874         15.59      -0.71611             1
        6.996        13.655        14.309        -0.654             1
          7.5        12.588        13.119      -0.53123             1
        7.998        11.613        12.041       -0.4283             1
        8.496        10.759        11.052      -0.29217             1
            9        9.9974        10.133      -0.13537             1
        9.498        9.3269           9.3      0.026846             1
        9.996        8.6563        8.5357       0.12062             1
         10.5        8.0772        7.8261       0.25111             1
       10.998        7.5895        7.1829       0.40663             1
       11.496        7.2238        6.5926        0.6312             1
           12        6.6446        6.0445       0.60015             1
       12.498        6.2484        5.5477       0.70068             1
       12.996        5.9741        5.0918       0.88231             1
         13.5        5.6693        4.6685        1.0008             1
       13.998         5.395        4.2848        1.1102             1
       14.496        4.9987        3.9326        1.0661             1
           15        4.7244        3.6057        1.1187             1
       15.498         4.511        3.3094        1.2016             1
       15.996        4.2367        3.0374        1.1993             1
         16.5        4.1453        2.7849        1.3604             1
       16.998        3.9319         2.556        1.3759             1


========================================================================
                    RESULTS FROM VISUAL CURVE MATCHING

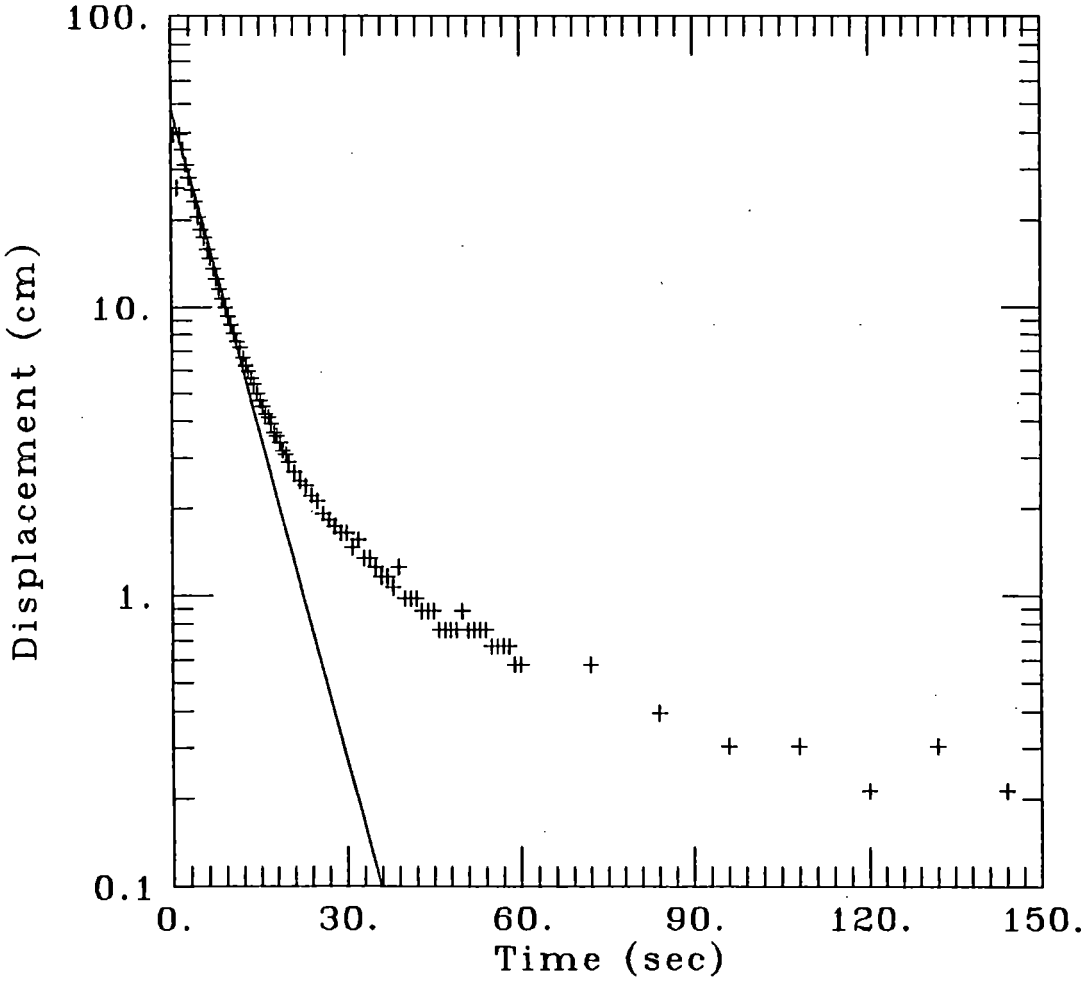
VISUAL MATCH PARAMETER ESTIMATES

          Estimate
  K  =   7.5309E-003
  y0 =   4.7735E+001


<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm144r3.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
OW-144 R3

ESTIMATED PARAMETERS:
K = 0.007531 cm/sec
y0 = 47.74 cm

TEST DATA:
H0 = 39.47 cm
rc = 2.438 cm
rw = 2.438 cm
L = 196. cm
b = 1.2192E+04 cm
H = 196. cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                       A Q T E S O L V   R E S U L T S
                               Version 1.10

12/16/93                                                                14:01:1

================================================================================
                              TEST DESCRIPTION

Data set........... fm145r1.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
Obs. well.......... OW-145 R1

Knowns and Constants:
   No. of data points.................. 84
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 234.7
   Static height of water in well...... 234.7
   Log(Re/Rw).......................... 3.034
   A, B, C.............................  4.336,  0.702,  0.000

================================================================================
                              ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)


================================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate         Std. Error
   K  =   9.7089E-003 +/-   3.7703E-004
   y0 =   7.3182E+001 +/-   3.0076E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals.............. 37
   Number of estimated parameters.... 2
   Degrees of freedom............... 35
   Residual mean.................... 0.6283
   Residual standard deviation...... 1.778
```

```
 Residual variance................. 3.161

[illegible]del Residuals:

    Time          Observed        Calculated       Residual         Weight
 ------------   ------------    ------------    ------------    ------------
       1.998          44.623          44.174         0.44883               1
       2.496          45.293          38.951          6.3421               1
           3          33.101          34.294         -1.1926               1
       3.498          28.042          30.239         -2.1977               1
       3.996          24.658          26.664         -2.0058               1
         4.5          21.488          23.476         -1.9876               1
       4.998          18.898            20.7         -1.8028               1
       5.496          16.612          18.253         -1.6414               1
           6            14.6          16.071         -1.4706               1
       6.498          13.167          14.171         -1.0031               1
       6.996          11.704          12.495        -0.79081               1
         7.5          10.546          11.001        -0.45502               1
       7.998          9.4183          9.7004        -0.28213               1
       8.496          8.6563          8.5536         0.10276               1
           9          7.7724          7.5308         0.24156               1
       9.498          7.1933          6.6405         0.55282               1
       9.996          6.5227          5.8554         0.66736               1
        10.5           6.035          5.1553         0.87979               1
      10.998          5.5778          4.5457          1.0321               1
      11.496          5.1816          4.0083          1.1733               1
          12          4.8158           3.529          1.2868               1
      12.498           4.511          3.1118          1.3992               1
      12.996          4.2367          2.7439          1.4928               1
        13.5          3.9319          2.4158          1.5161               1
      13.998          3.6576          2.1302          1.5274               1
      14.496          3.4442          1.8783          1.5659               1
          15          3.3528          1.6537          1.6991               1
      15.498          3.1699          1.4582          1.7117               1
      15.996          2.8956          1.2858          1.6098               1
        16.5          2.7737          1.1321          1.6416               1
      16.998          2.5908         0.99823          1.5926               1
      17.496          2.5908         0.88021          1.7106               1
          18          2.3165         0.77497          1.5415               1
      18.498          2.3165         0.68334          1.6331               1
      18.996          2.1946         0.60255           1.592               1
        19.5          2.1031         0.53051          1.5726               1
      19.998          2.0117         0.46778          1.5439               1


===============================================================================
                       RESULTS FROM VISUAL CURVE MATCHING

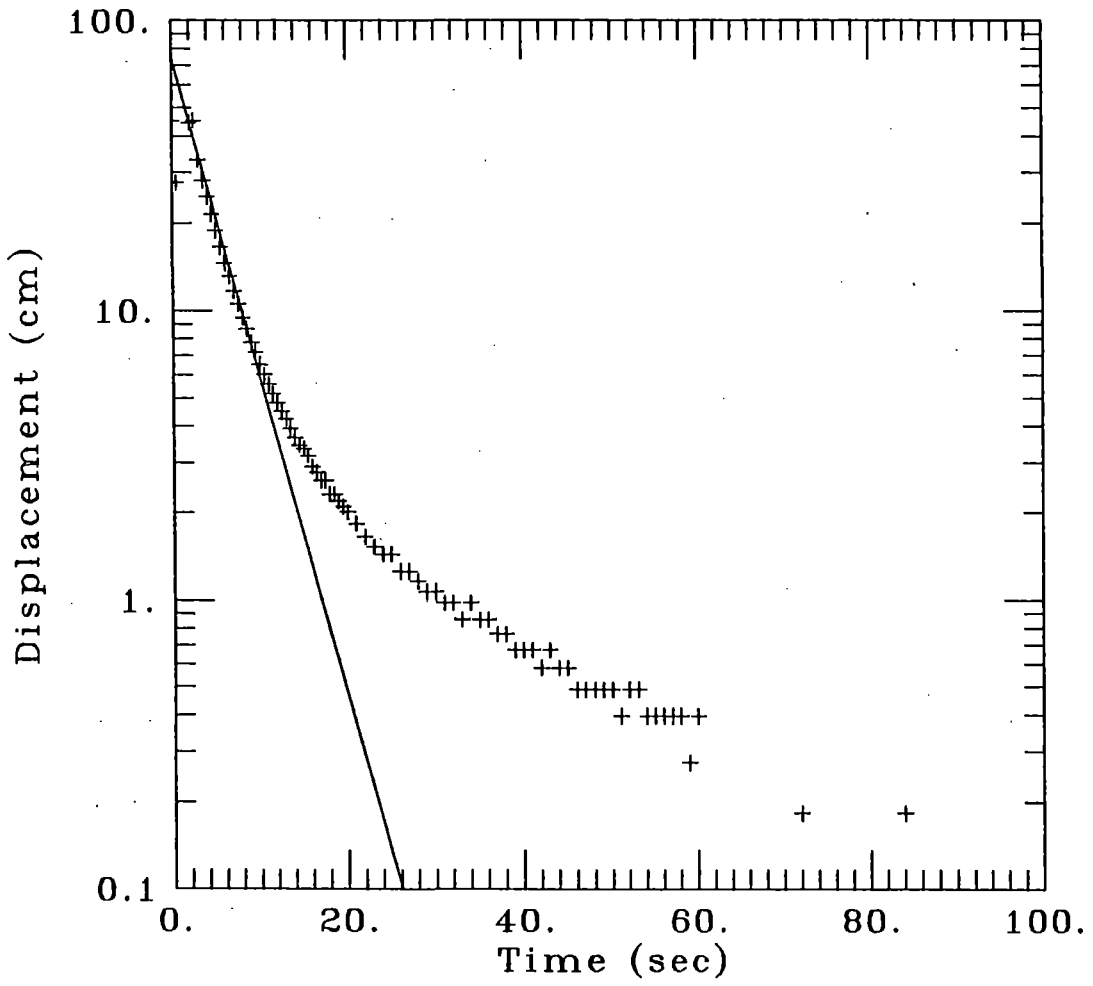
ISUAL MATCH PARAMETER ESTIMATES

           Estimate
  K   =   9.7089E-003
  y0  =   7.3182E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm145r1.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
10-Dec-93
OBS. WELL:
OW-145 R1

ESTIMATED PARAMETERS:
K = 0.009709 cm/sec
y0 = 73.18 cm

TEST DATA:
H0 = 45.29 cm
rc = 2.438 cm
rw = 2.438 cm
L = 234.7 cm
b = 1.2192E+04 cm
H = 234.7 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                    A Q T E S O L V   R E S U L T S
                             Version 1.10

 2/15/93                                                              08:10:06

 ===============================================================================
                              TEST DESCRIPTION

 ata set........... fm145r2.dat
 ata set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
 lient............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
 bs. well.......... OW-145 R2

Knowns and Constants:
   No. of data points................... 79
   Radius of well casing................ 2.438
   Radius of well....................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 234.7
   Static height of water in well...... 234.7
   Log(Re/Rw).......................... 3.034
   A, B, C.............................  4.336,  0.702,  0.000

 ===============================================================================
                              ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

 ===============================================================================
                  RESULTS FROM STATISTICAL CURVE MATCHING

 TATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std.  Error
   K  =   9.2054E-003 +/-   2.8273E-004
   y0 =   6.3530E+001 +/-   2.0245E+000

 NALYSIS OF MODEL RESIDUALS

residual = calculated - observed
 eighted residual = residual * weight

 eighted Residual Statistics:
    umber of residuals............... 37
    umber of estimated parameters.... 2
   Degrees of freedom................ 35
   Residual mean..................... 0.5057
   Residual standard deviation....... 1.281
```

```
   Residual variance................ 1.642

Model Residuals:

     Time          Observed      Calculated      Residual         Weight
 -------------  -------------  -------------  -------------  -------------
        1.998          40.63         39.365          1.265              1
        2.496         38.039         34.938         3.1009              1
            3         30.724         30.964       -0.24046              1
        3.498         26.426         27.482        -1.0563              1
        3.996         23.134         24.392        -1.2577              1
          4.5         20.178         21.618        -1.4395              1
        4.998          17.77         19.186        -1.4165              1
        5.496         15.667         17.029        -1.3618              1
            6         13.838         15.092        -1.2541              1
        6.498         12.192         13.395        -1.2028              1
        6.996         10.973         11.888       -0.91548              1
          7.5         9.8146         10.536       -0.72177              1
        7.998         8.9306         9.3515       -0.42087              1
        8.496         8.1686         8.2998       -0.13123              1
            9         7.4066         7.3559       0.050736              1
        9.498         6.8275         6.5286        0.29886              1
        9.996         6.2484         5.7944        0.45396              1
         10.5         5.6693         5.1354        0.53388              1
       10.998         5.2121         4.5579         0.6542              1
       11.496         4.9073         4.0453        0.86197              1
           12          4.633         3.5852         1.0478              1
       12.498         4.3282         3.1821         1.1461              1
       12.996         3.8405         2.8242         1.0163              1
         13.5          3.749          2.503          1.246              1
       13.998         3.5662         2.2215         1.3447              1
       14.496         3.2918         1.9717         1.3201              1
           15         3.1699         1.7474         1.4225              1
       15.498          2.987         1.5509         1.4361              1
       15.996         2.8042         1.3765         1.4277              1
         16.5         2.6213           1.22         1.4013              1
       16.998         2.4994         1.0828         1.4166              1
       17.496         2.4079          0.961         1.4469              1
           18          2.225         0.8517         1.3733              1
       18.498          2.225        0.75592         1.4691              1
       18.996         2.1336        0.67091         1.4627              1
         19.5         2.1336        0.59461          1.539              1
       19.998         1.9202        0.52774         1.3925              1


===========================================================================
                     RESULTS FROM VISUAL CURVE MATCHING

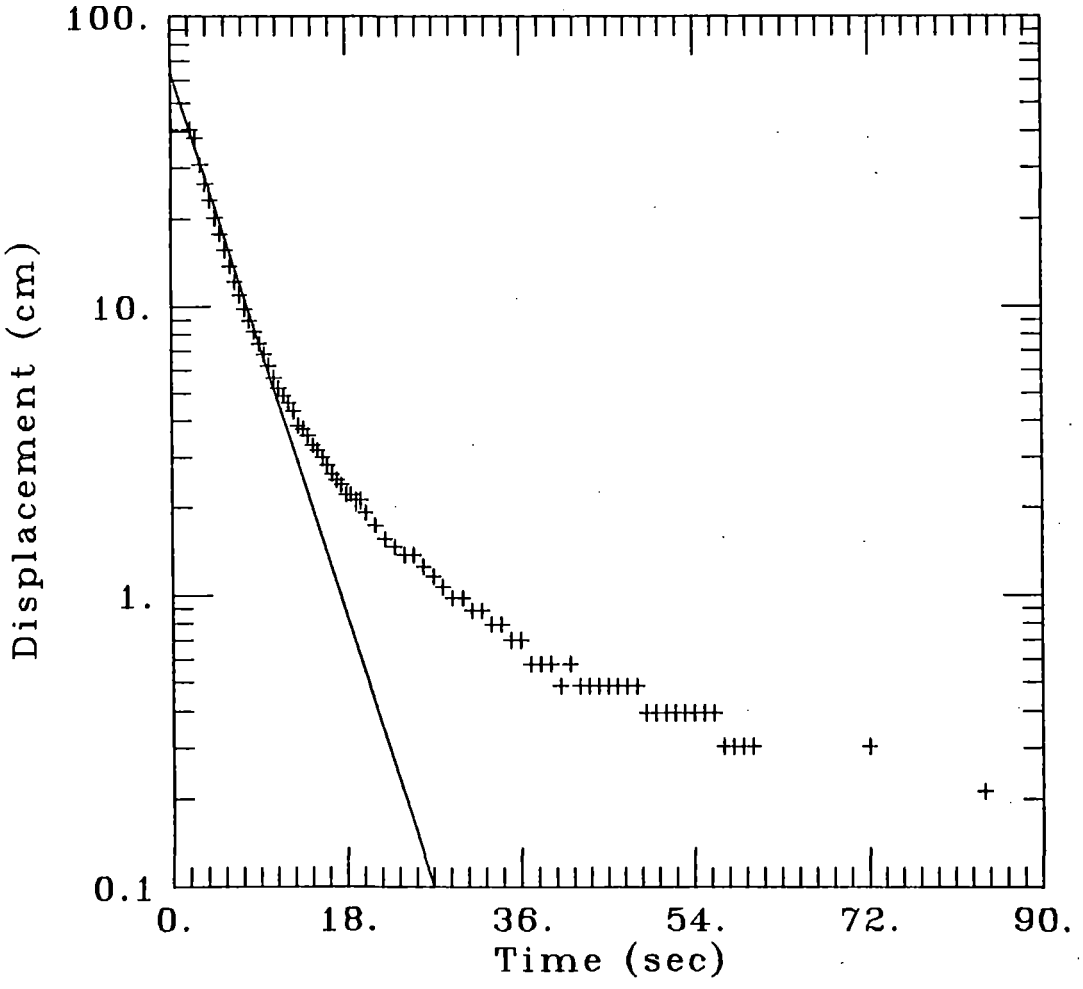

VISUAL MATCH PARAMETER ESTIMATES

          Estimate
  K  =   9.2054E-003
  y0 =   6.3530E+001


<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm145r2.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10-Dec-93

OBS. WELL:
OW-145 R2

ESTIMATED PARAMETERS:
K = 0.009205 cm/sec
y0 = 63.63 cm

TEST DATA:
H0 = 40.63 cm
rc = 2.438 cm
rw = 2.438 cm
L = 234.7 cm
b = 1.2192E+04 cm
H = 234.7 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                     A Q T E S O L V   R E S U L T S
                              Version 1.10

12/15/93                                                               08:13:2

================================================================================
                            TEST DESCRIPTION

Data set........... fm145r3.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
Obs. well.......... OW-145 R3

Knowns and Constants:
   No. of data points................... 84
   Radius of well casing................ 2.438
   Radius of well....................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length................... 234.7
   Static height of water in well...... 234.7
   Log(Re/Rw)........................... 3.034
   A, B, C.............................. 4.336,  0.702,  0.000

================================================================================
                            ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)


================================================================================
                  RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate           Std. Error
   K  =   7.9919E-003 +/-    2.0345E-004
   y0 =   5.1955E+001 +/-    1.3077E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 82
   Number of estimated parameters.... 2
   Degrees of freedom................ 80
   Residual mean..................... 0.5584
   Residual standard deviation....... 0.9847
```

Residual variance..... 0.9696

del Residuals:

Time	Observed	Calculated	Residual	Weight
1.998	37.247	34.289	2.9571	1
2.496	32.156	30.916	1.2407	1
3	28.346	27.839	0.50723	1
3.498	24.506	25.1	-0.59416	1
3.996	21.031	22.63	-1.5993	1
4.5	18.928	20.378	-1.4504	1
4.998	16.825	18.373	-1.5484	1
5.496	15.088	16.566	-1.478	1
6	13.564	14.917	-1.3535	1
6.498	12.405	13.449	-1.0441	1
6.996	11.156	12.126	-0.97047	1
7.5	10.089	10.919	-0.83054	1
7.998	9.0526	9.8451	-0.7925	1
8.496	8.3515	8.8764	-0.52489	1
9	7.8029	7.9931	-0.1902	1
9.498	7.2238	7.2066	0.017118	1
9.996	6.6446	6.4976	0.14706	1
10.5	6.157	5.851	0.30598	1
10.998	5.6693	5.2753	0.39398	1
11.496	5.3035	4.7563	0.54725	1
12	4.9987	4.283	0.71577	1
12.498	4.633	3.8616	0.77141	1
12.996	4.3282	3.4816	0.84655	1
13.5	4.1453	3.1351	1.0101	1
13.998	3.8405	2.8267	1.0138	1
14.496	3.5662	2.5486	1.0176	1
15	3.3833	2.2949	1.0883	1
15.498	3.1699	2.0691	1.1008	1
15.996	3.0785	1.8656	1.2129	1
16.5	2.8956	1.6799	1.2157	1
16.998	2.8042	1.5146	1.2895	1
17.496	2.5908	1.3656	1.2252	1
18	2.4994	1.2297	1.2697	1
18.498	2.4079	1.1087	1.2992	1
18.996	2.3165	0.99963	1.3169	1
19.5	2.225	0.90015	1.3249	1
19.998	2.1336	0.81159	1.322	1
21	2.0422	0.65892	1.3832	1
21.996	1.8288	0.53563	1.2932	1
22.998	1.7374	0.43487	1.3025	1
24	1.6459	0.35307	1.2929	1
24.996	1.5545	0.28701	1.2675	1
25.998	1.463	0.23302	1.23	1
27	1.3716	0.18919	1.1824	1
27.996	1.2497	0.15379	1.0959	1
28.998	1.2497	0.12486	1.1248	1
30	1.1582	0.10137	1.0569	1
30.996	1.1582	0.082405	1.0758	1
31.998	1.0668	0.066904	0.9999	1
33	0.97536	0.054318	0.92104	1
33.996	0.97536	0.044155	0.9312	1
34.998	0.97536	0.035849	0.93951	1
36	0.88392	0.029105	0.85481	1

```
      36.996        0.88392        0.02366        0.86026           1
      37.998        0.88392       0.019209        0.86471           1
          39        0.79248       0.015596        0.77688           1
      39.996        0.79248       0.012678         0.7798           1
      40.998        0.67056       0.010293        0.66027           1
          42        0.67056      0.0083567         0.6622           1
      42.996        0.67056      0.0067931        0.66377           1
      43.998        0.67056      0.0055153        0.66504           1
          45        0.67056      0.0044778        0.66608           1
      45.996        0.57912        0.00364        0.57548           1
      46.998        0.57912      0.0029553        0.57616           1
          48        0.57912      0.0023993        0.57672           1
      48.996        0.57912      0.0019504        0.57717           1
      49.998        0.57912      0.0015835        0.57754           1
          51        0.57912      0.0012856        0.57783           1
      51.996        0.48768      0.0010451        0.48663           1
      52.998        0.48768      0.0008485        0.48683           1
          54        0.48768     0.00068889        0.48699           1
      54.996        0.48768        0.00056        0.48712           1
      55.998        0.39624     0.00045465        0.39579           1
          57        0.39624     0.00036913        0.39587           1
      57.996        0.39624     0.00030006        0.39594           1
      58.998        0.39624     0.00024362          0.396           1
          60        0.39624     0.00019779        0.39604           1
          72         0.3048     1.6305E-005       0.30478           1
          84        0.21336     1.3441E-006       0.21336           1
          96        0.21336      1.108E-007       0.21336           1
         108        0.21336     9.1342E-009       0.21336           1
         120        0.12192     7.5298E-010       0.12192           1

============================================================================
                    RESULTS FROM VISUAL CURVE MATCHING

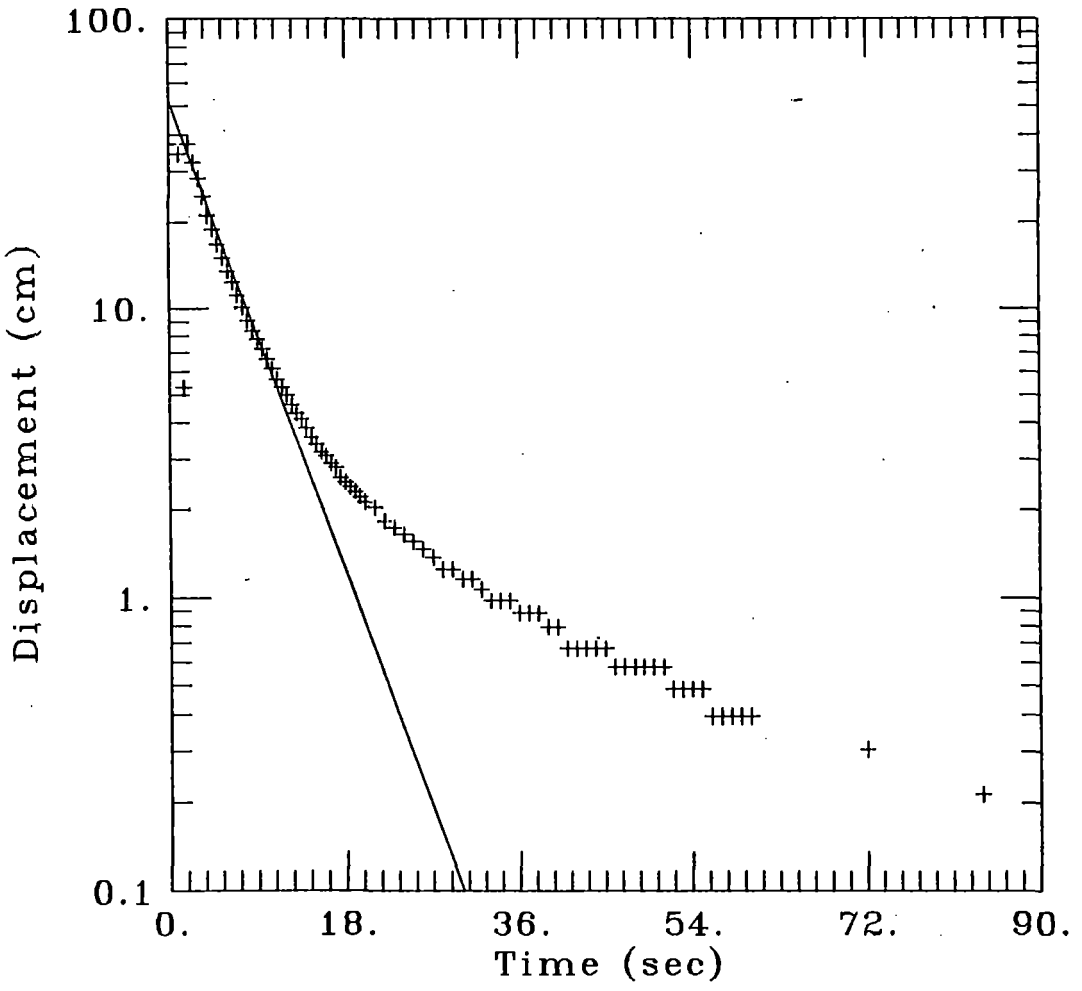
VISUAL MATCH PARAMETER ESTIMATES

          Estimate
   K  =   7.9919E-003
   y0 =   5.1955E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm145r3.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10-Dec-93

OBS. WELL:
OW-145 R3

ESTIMATED PARAMETERS:
K = 0.007992 cm/sec
y0 = 51.95 cm

TEST DATA:
H0 = 37.25 cm
rc = 2.438 cm
rw = 2.438 cm
L = 234.7 cm
b = 1.2192E+04 cm
H = 234.7 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                    A Q T E S O L V   R E S U L T S
                             Version 1.10

12/15/93                                                                08:30:2

===============================================================================
                            TEST DESCRIPTION

Data set........... fm146r1.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
Obs. well.......... OW-146 R1

Knowns and Constants:
   No. of data points.................. 84
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 207.9
   Static height of water in well...... 207.9
   Log(Re/Rw).......................... 2.932
   A, B, C.............................  4.068,  0.652,  0.000

===============================================================================
                            ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)


===============================================================================
                 RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate         Std.  Error
   K  =   8.7211E-003 +/-   2.2201E-004
   y0 =   5.1955E+001 +/-   1.3077E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 82
   Number of estimated parameters.... 2
   Degrees of freedom................ 80
   Residual mean..................... 0.5584
   Residual standard deviation....... 0.9847
```

Residual variance..... 0.9696

del Residuals:

Time	Observed	Calculated	Residual	Weight
1.998	37.247	34.289	2.9571	1
2.496	32.156	30.916	1.2407	1
3	28.346	27.839	0.50722	1
3.498	24.506	25.1	-0.59419	1
3.996	21.031	22.63	-1.5993	1
4.5	18.928	20.378	-1.4503	1
4.998	16.825	18.373	-1.5484	1
5.496	15.088	16.566	-1.4781	1
6	13.564	14.917	-1.3535	1
6.498	12.405	13.449	-1.044	1
6.996	11.156	12.126	-0.97045	1
7.5	10.089	10.919	-0.83053	1
7.998	9.0526	9.8451	-0.79251	1
8.496	8.3515	8.8764	-0.52489	1
9	7.8029	7.9931	-0.1902	1
9.498	7.2238	7.2066	0.017114	1
9.996	6.6446	6.4976	0.14705	1
10.5	6.157	5.851	0.30598	1
10.998	5.6693	5.2753	0.39397	1
11.496	5.3035	4.7563	0.54725	1
12	4.9987	4.283	0.71577	1
12.498	4.633	3.8616	0.77141	1
12.996	4.3282	3.4816	0.84654	1
13.5	4.1453	3.1351	1.0101	1
13.998	3.8405	2.8267	1.0138	1
14.496	3.5662	2.5486	1.0176	1
15	3.3833	2.2949	1.0883	1
15.498	3.1699	2.0691	1.1008	1
15.996	3.0785	1.8656	1.2129	1
16.5	2.8956	1.6799	1.2157	1
16.998	2.8042	1.5146	1.2895	1
17.496	2.5908	1.3656	1.2252	1
18	2.4994	1.2297	1.2697	1
18.498	2.4079	1.1087	1.2992	1
18.996	2.3165	0.99963	1.3169	1
19.5	2.225	0.90015	1.3249	1
19.998	2.1336	0.81159	1.322	1
21	2.0422	0.65892	1.3832	1
21.996	1.8288	0.53563	1.2932	1
22.998	1.7374	0.43487	1.3025	1
24	1.6459	0.35307	1.2929	1
24.996	1.5545	0.28701	1.2675	1
25.998	1.463	0.23302	1.23	1
27	1.3716	0.18919	1.1824	1
27.996	1.2497	0.15379	1.0959	1
28.998	1.2497	0.12486	1.1248	1
30	1.1582	0.10137	1.0569	1
30.996	1.1582	0.082405	1.0758	1
31.998	1.0668	0.066904	0.9999	1
33	0.97536	0.054318	0.92104	1
33.996	0.97536	0.044155	0.9312	1
34.998	0.97536	0.035849	0.93951	1
36	0.88392	0.029106	0.85481	1

```
     36.996          0.88392          0.02366          0.86026              1
     37.998          0.88392         0.019209          0.86471              1
         39          0.79248         0.015596          0.77688              1
     39.996          0.79248         0.012678           0.7798              1
     40.998          0.67056         0.010293          0.66027              1
         42          0.67056        0.0083567           0.6622              1
     42.996          0.67056        0.0067931          0.66377              1
     43.998          0.67056        0.0055153          0.66504              1
         45          0.67056        0.0044778          0.66608              1
     45.996          0.57912          0.00364          0.57548              1
     46.998          0.57912        0.0029553          0.57616              1
         48          0.57912        0.0023993          0.57672              1
     48.996          0.57912        0.0019504          0.57717              1
     49.998          0.57912        0.0015835          0.57754              1
         51          0.57912        0.0012856          0.57783              1
     51.996          0.48768        0.0010451          0.48663              1
     52.998          0.48768        0.0008485          0.48683              1
         54          0.48768       0.00068889          0.48699              1
     54.996          0.48768          0.00056          0.48712              1
     55.998          0.39624       0.00045466          0.39579              1
         57          0.39624       0.00036913          0.39587              1
     57.996          0.39624       0.00030007          0.39594              1
     58.998          0.39624       0.00024362            0.396              1
         60          0.39624       0.00019779          0.39604              1
         72           0.3048       1.6305E-005          0.30478              1
         84          0.21336       1.3441E-006          0.21336              1
         96          0.21336        1.108E-007          0.21336              1
        108          0.21336       9.1342E-009          0.21336              1
        120          0.12192       7.5298E-010          0.12192              1

=============================================================================
                    RESULTS FROM VISUAL CURVE MATCHING

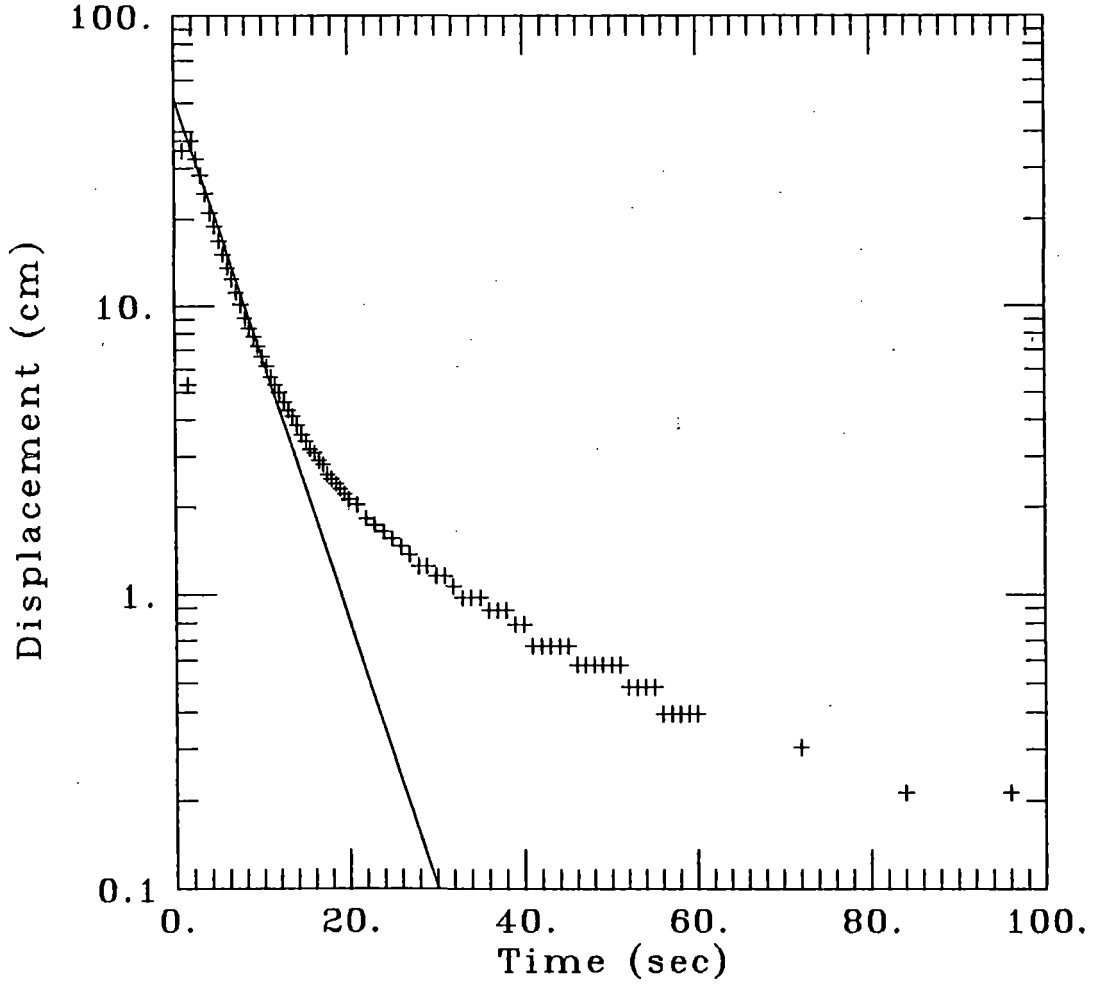
VISUAL MATCH PARAMETER ESTIMATES

          Estimate
  K  =   8.7211E-003
  y0 =   5.1955E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm146r1.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10-Dec-93

OBS. WELL:
OW-146 R1

ESTIMATED PARAMETERS:
K = 0.008721 cm/sec
y0 = 51.96 cm

TEST DATA:
H0 = 37.25 cm
rc = 2.438 cm
rw = 2.438 cm
L = 207.9 cm
b = 1.2192E+04 cm
H = 207.9 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                      A Q T E S O L V    R E S U L T S
                                 Version  1.10

12/15/93                                                                09:11:3

================================================================================
                               TEST DESCRIPTION

Data set........... fm146r2.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
Obs. well.......... OW-146 R2

Knowns and Constants:
   No. of data points.................... 83
   Radius of well casing................. 2.438
   Radius of well........................ 2.438
   Aquifer saturated thickness........... 12190
   Well screen length.................... 207.9
   Static height of water in well........ 207.9
   Log(Re/Rw)............................ 2.932
   A, B, C...............................  4.068,  0.652,  0.000

================================================================================
                               ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)


================================================================================
                    RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std.  Error
   K  =   8.6412E-003 +/-   2.2907E-004
   y0 =   5.0359E+001 +/-   1.3159E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 81
   Number of estimated parameters.... 2
   Degrees of freedom................ 79
   Residual mean..................... 0.6073
   Residual standard deviation....... 1.001
```

Residual variance..... 1.003

del Residuals:

Time	Observed	Calculated	Residual	Weight
1.998	36.363	33.363	2.9999	1
2.496	31.577	30.109	1.4685	1
3	26.975	27.139	-0.16375	1
3.498	23.805	24.492	-0.68674	1
3.996	20.909	22.103	-1.1936	1
4.5	18.532	19.922	-1.3906	1
4.998	16.612	17.979	-1.3677	1
5.496	14.783	16.226	-1.4429	1
6	13.35	14.625	-1.2748	1
6.498	12.009	13.199	-1.1895	1
6.996	10.942	11.911	-0.96899	1
7.5	9.967	10.736	-0.7693	1
7.998	9.1135	9.6891	-0.57559	1
8.496	8.3515	8.7441	-0.39258	1
9	7.5895	7.8815	-0.29198	1
9.498	7.1018	7.1128	-0.010944	1
9.996	6.5227	6.419	0.10367	1
10.5	5.9436	5.7858	0.15779	1
10.998	5.5778	5.2215	0.35634	1
11.496	5.1816	4.7122	0.46938	1
12	4.7854	4.2474	0.53799	1
12.498	4.511	3.8331	0.67794	1
12.996	4.2062	3.4592	0.74699	1
13.5	4.0234	3.118	0.90537	1
13.998	3.749	2.8139	0.93516	1
14.496	3.5357	2.5394	0.99625	1
15	3.3528	2.2889	1.0639	1
15.498	3.1699	2.0657	1.1042	1
15.996	3.0785	1.8642	1.2143	1
16.5	2.8651	1.6803	1.1848	1
16.998	2.7737	1.5164	1.2573	1
17.496	2.6822	1.3685	1.3137	1
18	2.4994	1.2335	1.2659	1
18.498	2.4079	1.1132	1.2947	1
18.996	2.286	1.0046	1.2814	1
19.5	2.1946	0.90552	1.289	1
19.998	2.1031	0.8172	1.2859	1
21	1.9202	0.66474	1.2555	1
21.996	1.8288	0.5414	1.2874	1
22.998	1.7374	0.44039	1.297	1
24	1.6154	0.35823	1.2572	1
24.996	1.524	0.29176	1.2322	1
25.998	1.4326	0.23733	1.1952	1
27	1.3411	0.19305	1.1481	1
27.996	1.3411	0.15723	1.1839	1
28.998	1.2497	0.1279	1.1218	1
30	1.2497	0.10404	1.1456	1
30.996	1.1582	0.084732	1.0735	1
31.998	1.1582	0.068924	1.0893	1
33	1.0363	0.056066	0.98025	1
33.996	1.0363	0.045662	0.99066	1
34.998	0.94488	0.037144	0.90774	1
36	0.94488	0.030214	0.91467	1

```
     36.996         0.94488       0.024608         0.92027              1
     37.998         0.85344       0.020017         0.83342              1
         39         0.85344       0.016282         0.83716              1
     39.996           0.762       0.013261         0.74874              1
     40.998           0.762       0.010787         0.75121              1
         42           0.762      0.0087747         0.75323              1
     42.996           0.762      0.0071465         0.75485              1
     43.998         0.67056      0.0058132         0.66475              1
         45           0.762      0.0047287         0.75727              1
     45.996           0.762      0.0038513         0.75815              1
     46.998           0.762      0.0031328         0.75887              1
         48           0.762      0.0025483         0.75945              1
     48.996           0.762      0.0020755         0.75992              1
     49.998           0.762      0.0016883         0.76031              1
         51         0.67056      0.0013733         0.66919              1
     51.996         0.67056      0.0011185         0.66944              1
     52.998         0.67056     0.00090981         0.66965              1
         54         0.67056     0.00074007         0.66982              1
     54.996         0.67056     0.00060275         0.66996              1
     55.998         0.67056      0.0004903         0.67007              1
         57         0.57912     0.00039883         0.57872              1
     57.996         0.67056     0.00032482         0.67024              1
     58.998         0.67056     0.00026422          0.6703              1
         60         0.57912     0.00021493         0.57891              1
         72         0.48768    1.8128E-005         0.48766              1
         84         0.36576    1.5289E-006         0.36576              1
         96         0.36576    1.2895E-007         0.36576              1
        108         0.36576    1.0876E-008         0.36576              1

==========================================================================
                      RESULTS FROM VISUAL CURVE MATCHING

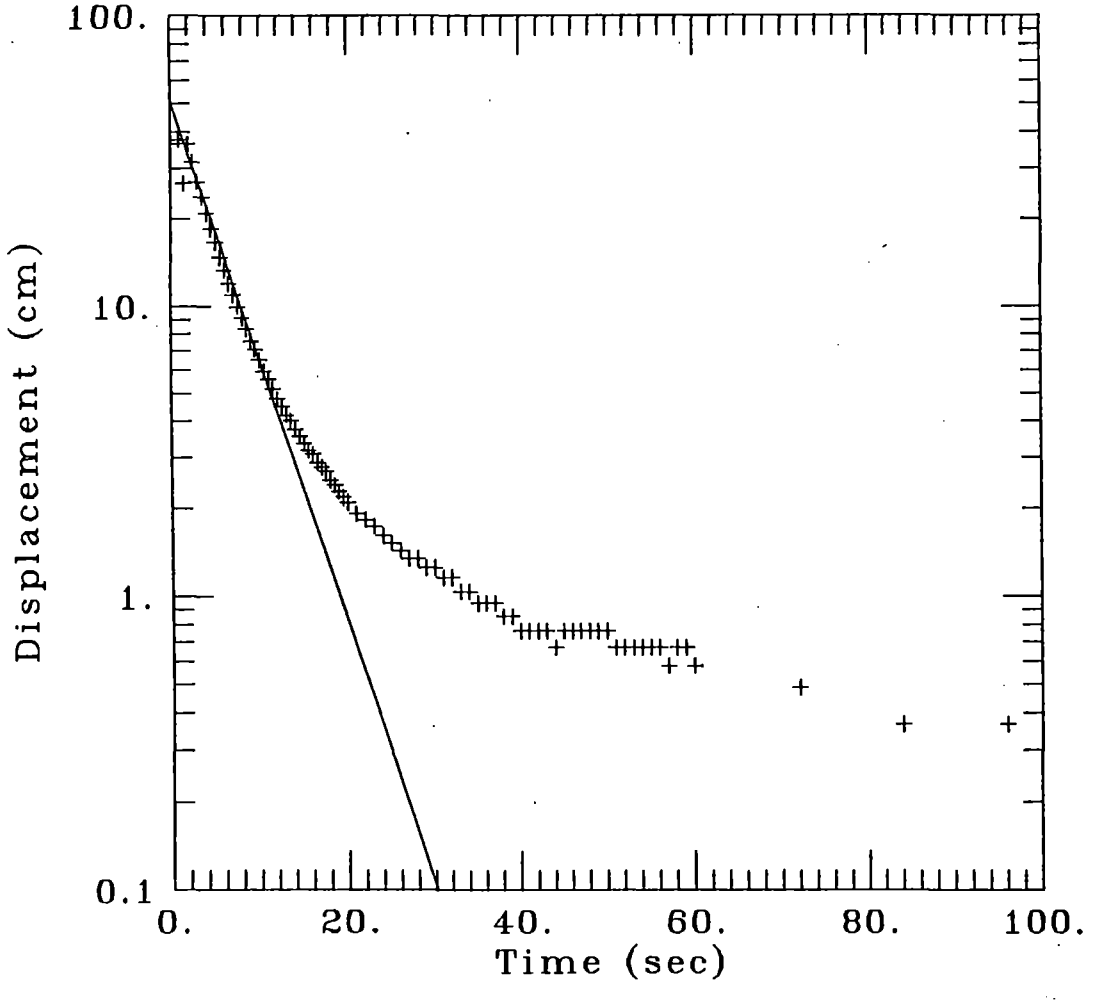
VISUAL MATCH PARAMETER ESTIMATES

          Estimate
  K  =    8.6412E-003
  y0 =    5.0359E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm146r2.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10-Dec-93

OBS. WELL:
OW-146 R2

ESTIMATED PARAMETERS:
K = 0.008641 cm/sec
y0 = 50.36 cm

TEST DATA:
H0 = 36.36 cm
rc = 2.438 cm
rw = 2.438 cm
L = 207.9 cm
b = 1.2192E+04 cm
H = 207.9 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                        A Q T E S O L V   R E S U L T S
                                Version  1.10

12/15/93                                                                  09:18:3

================================================================================
                                TEST DESCRIPTION

Data set........... fm146r3.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
Obs. well.......... OW-146 R3

Knowns and Constants:
   No. of data points................... 80
   Radius of well casing................ 2.438
   Radius of well....................... 2.438
   Aquifer saturated thickness.......... 12190
   Well screen length................... 207.9
   Static height of water in well....... 207.9
   Log(Re/Rw)........................... 2.932
   A, B, C..............................  4.068,  0.652,  0.000

================================================================================
                                ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)


================================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate         Std. Error
   K  =   8.6438E-003 +/-   2.0191E-004
   y0 =   5.3690E+001 +/-   1.2100E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 27
   Number of estimated parameters.... 2
   Degrees of freedom................ 25
   Residual mean..................... 0.1517
   Residual standard deviation....... 0.8887
```

```
  Residual variance................. 0.7897

del Residuals:

     Time         Observed      Calculated      Residual         Weight
 ------------  ------------  ------------  ------------  ------------
        1.998        34.839        35.565      -0.72647              1
        2.496        34.747        32.095        2.6519              1
            3        28.986        28.928      0.058239              1
        3.498         26.67        26.106       0.56405              1
        3.996        23.012        23.559      -0.54661              1
          4.5        20.422        21.234      -0.81268              1
        4.998        18.136        19.163        -1.027              1
        5.496        16.581        17.293      -0.71197              1
            6        14.661        15.587      -0.92577              1
        6.498        13.807        14.066      -0.25855              1
        6.996        11.979        12.694      -0.71505              1
          7.5         10.82        11.441      -0.62071              1
        7.998        9.8755        10.325      -0.44938              1
        8.496        9.0221        9.3176      -0.29551              1
            9        8.2296        8.3982      -0.16855              1
        9.498         7.559        7.5788     -0.019775              1
        9.996        6.9799        6.8394       0.14051              1
         10.5        6.4313        6.1645       0.26676              1
       10.998         6.035        5.5631       0.47194              1
       11.496        5.5474        5.0204       0.52701              1
           12        5.1816         4.525       0.65664              1
       12.498        4.8768        4.0835        0.7933              1
       12.996        4.6025        3.6851       0.91738              1
         13.5        4.2977        3.3215       0.97621              1
       13.998        4.0234        2.9974        1.0259              1
       14.496        3.8405         2.705        1.1355              1
           15        3.6271        2.4381        1.1891              1

================================================================================
                    RESULTS FROM VISUAL CURVE MATCHING

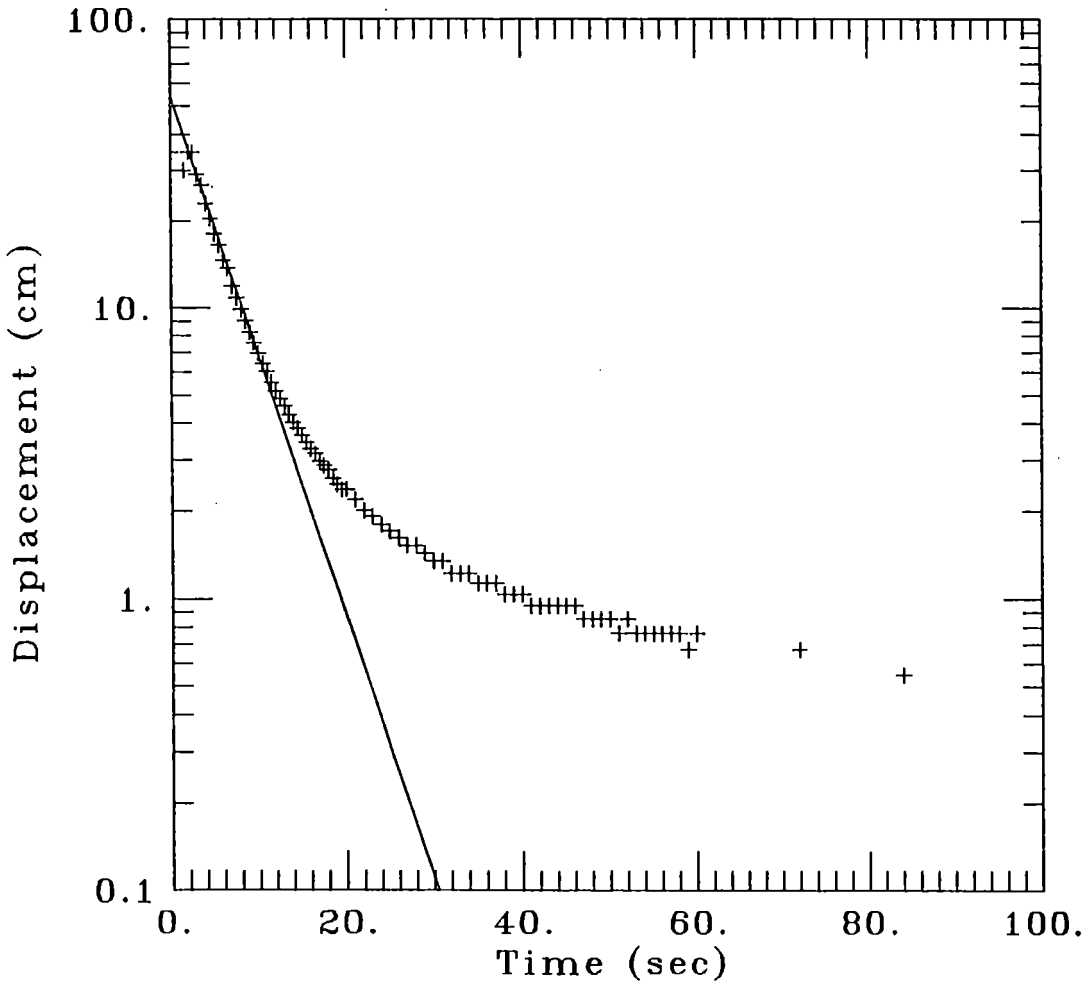
VISUAL MATCH PARAMETER ESTIMATES

           Estimate
  K  =   8.6438E-003
  y0 =   5.3690E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm146r3.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10-Dec-93

OBS. WELL:
OW-146 R3

ESTIMATED PARAMETERS:
K = 0.008644 cm/sec
y0 = 53.69 cm

TEST DATA:
H0 = 34.84 cm
rc = 2.438 cm
rw = 2.438 cm
L = 207.9 cm
b = 1.2192E+04 cm
H = 207.9 cm

```
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                        AQTESOLV   RESULTS
                          Version  1.10

l2/15/93                                                              09:24:51

================================================================================
                              TEST DESCRIPTION

ata set........... fm147r1.dat
ata set title..... Fort McCoy Mod 5
Company........... Rust E & I
Project........... 71842.200
lient............. USACE
ocation........... Fort McCoy
Test date......... 09-Dec-93
bs. well.......... OW-147 R1

Knowns and Constants:
   No. of data points.................. 106
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 232.6
   Static height of water in well...... 232.6
   Log(Re/Rw).......................... 3.026
   A, B, C.............................  4.315,  0.698,  0.000

================================================================================
                              ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

================================================================================
                   RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std.  Error
   K  =   1.0935E-003 +/-    3.5731E-005
   y0 =   4.0772E+001 +/-    5.0100E-001

NALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 55
   Number of estimated parameters.... 2
   Degrees of freedom................ 53
   Residual mean..................... -0.00906
   Residual standard deviation....... 1.573
```

Residual variance..... 2.475

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.498	30.328	40.202	-9.8742	1
0.996	36.667	39.64	-2.9728	1
1.5	42.123	39.079	3.0439	1
1.998	40.599	38.533	2.0662	1
2.496	39.533	37.994	1.5381	1
3	38.862	37.457	1.405	1
3.498	38.191	36.933	1.2581	1
3.996	37.429	36.417	1.0124	1
4.5	36.759	35.902	0.85698	1
4.998	36.271	35.4	0.87119	1
5.496	35.692	34.905	0.78686	1
6	35.022	34.411	0.61017	1
6.498	34.442	33.93	0.51209	1
6.996	33.863	33.456	0.4073	1
7.5	33.406	32.983	0.42339	1
7.998	32.918	32.522	0.39678	1
8.496	32.339	32.067	0.27229	1
9	31.852	31.613	0.23825	1
9.498	31.364	31.171	0.19251	1
9.996	30.907	30.736	0.17106	1
10.5	30.419	30.301	0.11815	1
10.998	30.023	29.877	0.14553	1
11.496	29.566	29.46	0.106	1
12	29.078	29.043	0.035072	1
12.498	28.682	28.637	0.044832	1
12.996	28.194	28.237	-0.042523	1
13.5	27.828	27.837	-0.0088327	1
13.998	27.432	27.448	-0.015928	1
14.496	27.066	27.064	0.002016	1
15	26.67	26.681	-0.011358	1
15.498	26.274	26.308	-0.034369	1
15.996	25.908	25.941	-0.032595	1
16.5	25.512	25.574	-0.061864	1
16.998	25.146	25.216	-0.070122	1
17.496	24.75	24.864	-0.11386	1
18	24.354	24.512	-0.15836	1
18.498	23.988	24.169	-0.18146	1
18.996	23.683	23.831	-0.14839	1
19.5	23.317	23.494	-0.17702	1
19.998	23.012	23.166	-0.15338	1
21	22.25	22.519	-0.26881	1
21.996	21.671	21.894	-0.22233	1
22.998	21.001	21.282	-0.28144	1
24	20.422	20.688	-0.26619	1
24.996	19.842	20.113	-0.27095	1
25.998	19.263	19.552	-0.28834	1
27	18.806	19.006	-0.19949	1
27.996	18.227	18.478	-0.25095	1
28.998	17.739	17.962	-0.22258	1
30	17.252	17.46	-0.20861	1
30.996	16.794	16.976	-0.18154	1
31.998	16.398	16.501	-0.10344	1
33	15.911	16.041	-0.12959	1

```
      33.996          15.545          15.595      -0.050247              1
      34.998          15.149           15.16        -0.0107              1

=================================================================================
                         RESULTS FROM VISUAL CURVE MATCHING

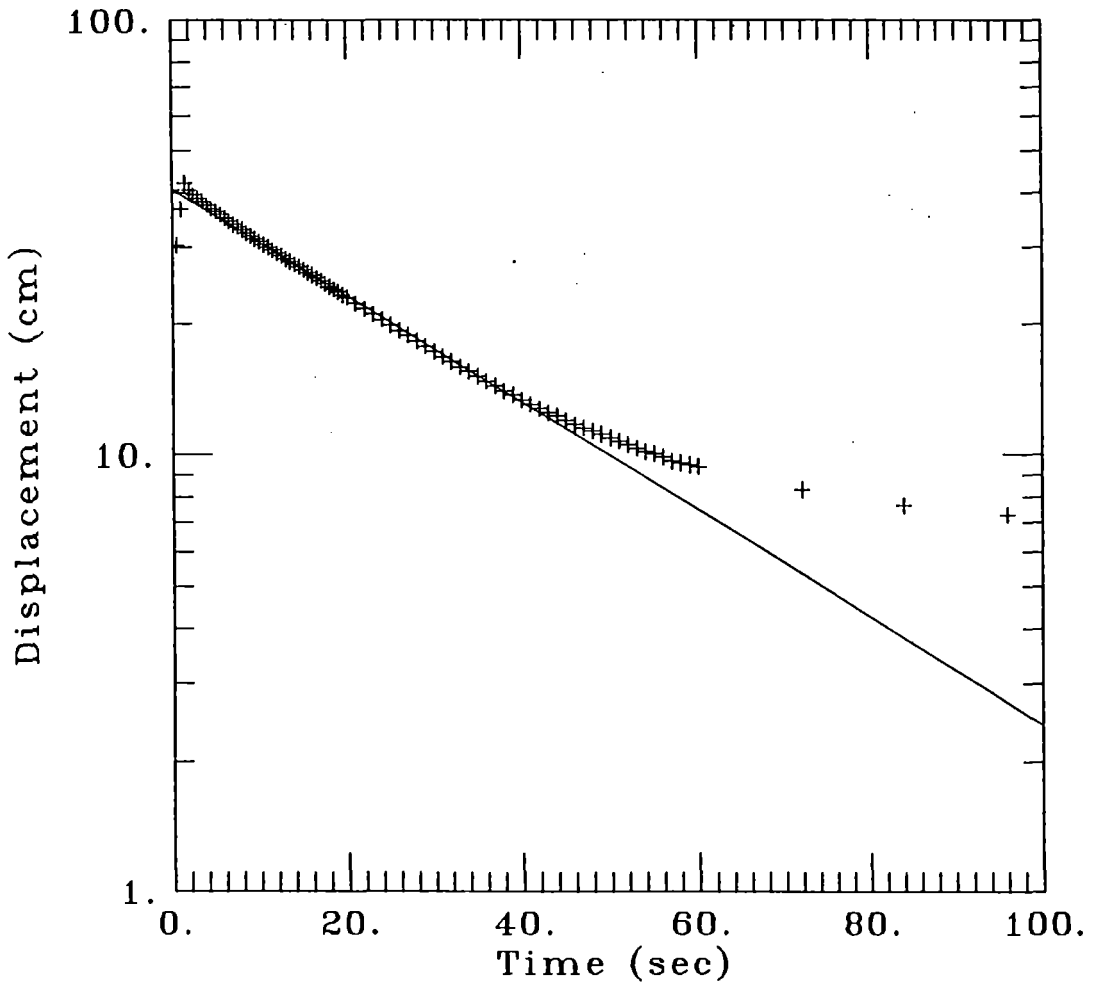
VISUAL MATCH PARAMETER ESTIMATES

              Estimate
   K  =    1.0935E-003
   y0 =    4.0772E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm147r1.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
09-Dec-93
OBS. WELL:
OW-147 R1

ESTIMATED PARAMETERS:
K = 0.001093 cm/sec
y0 = 40.77 cm

TEST DATA:
H0 = 40.6 cm
rc = 2.438 cm
rw = 2.438 cm
L = 232.6 cm
b = 1.2192E+04 cm
H = 232.6 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                         A Q T E S O L V   R E S U L T S
                                  Version  1.10

12/15/93                                                                       09:35:47

==============================================================================
                                TEST DESCRIPTION

Data set........... fm147r2.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-147 R2

Knowns and Constants:
   No. of data points.................. 104
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 232.6
   Static height of water in well...... 232.6
   Log(Re/Rw).......................... 3.026
   A, B, C.............................  4.315,  0.698,  0.000

==============================================================================
                                ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)


==============================================================================
                      RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std.  Error
   K  =   1.1467E-003 +/-   9.6095E-006
   y0 =   4.2852E+001 +/-   1.6086E-001


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals.............. 56
   Number of estimated parameters.... 2
   Degrees of freedom............... 54
   Residual mean.................... 0.01576
   Residual standard deviation...... 0.4306
```

Residual variance..... 0.1854

Model Residuals:

Time	Observed	Calculated	Residual	Weight
2.496	42.032	39.795	2.2367	1
3	39.807	39.205	0.60181	1
3.498	39.045	38.631	0.41437	1
3.996	38.283	38.064	0.2185	1
4.5	37.612	37.5	0.11244	1
4.998	37.125	36.95	0.17433	1
5.496	36.363	36.409	-0.045806	1
6	35.875	35.869	0.0061077	1
6.498	35.204	35.343	-0.13879	1
6.996	34.625	34.825	-0.19996	1
7.5	34.138	34.309	-0.17117	1
7.998	33.558	33.806	-0.24749	1
8.496	33.101	33.311	-0.20926	1
9	32.614	32.817	-0.20294	1
9.498	32.034	32.336	-0.30113	1
9.996	31.547	31.862	-0.31493	1
10.5	31.181	31.389	-0.20821	1
10.998	30.693	30.929	-0.23584	1
11.496	30.206	30.476	-0.27025	1
12	29.718	30.024	-0.30597	1
12.498	29.261	29.584	-0.32316	1
12.996	28.865	29.15	-0.28585	1
13.5	28.468	28.718	-0.24978	1
13.998	28.011	28.297	-0.28612	1
14.496	27.615	27.883	-0.26766	1
15	27.249	27.469	-0.21991	1
15.498	26.761	27.066	-0.30547	1
15.996	26.365	26.67	-0.30461	1
16.5	25.999	26.274	-0.27485	1
16.998	25.603	25.889	-0.28604	1
17.496	25.207	25.51	-0.30287	1
18	24.933	25.132	-0.19887	1
18.498	24.536	24.763	-0.22681	1
18.996	24.171	24.4	-0.22967	1
19.5	23.866	24.038	-0.1726	1
19.998	23.5	23.686	-0.18608	1
21	22.83	22.993	-0.16291	1
21.996	22.159	22.324	-0.16497	1
22.998	21.58	21.671	-0.090709	1
24	20.909	21.036	-0.12702	1
24.996	20.33	20.424	-0.094078	1
25.998	19.751	19.826	-0.075421	1
27	19.263	19.246	0.01718	1
27.996	18.684	18.686	-0.0019667	1
28.998	18.197	18.139	0.057261	1
30	17.739	17.608	0.13096	1
30.996	17.252	17.096	0.15592	1
31.998	16.855	16.596	0.25929	1
33	16.398	16.11	0.28825	1
33.996	16.002	15.641	0.36074	1
34.998	15.606	15.183	0.42229	1
36	15.24	14.739	0.50092	1
36.996	14.844	14.31	0.53352	1

```
      37.998          14.478          13.891          0.58659            1
          39          14.173          13.485          0.68836            1
      39.996          13.899          13.092          0.80639            1

================================================================================
                      RESULTS FROM VISUAL CURVE MATCHING

ISUAL MATCH PARAMETER ESTIMATES

           Estimate
  K  =   1.1467E-003
  y0 =   4.2852E+001

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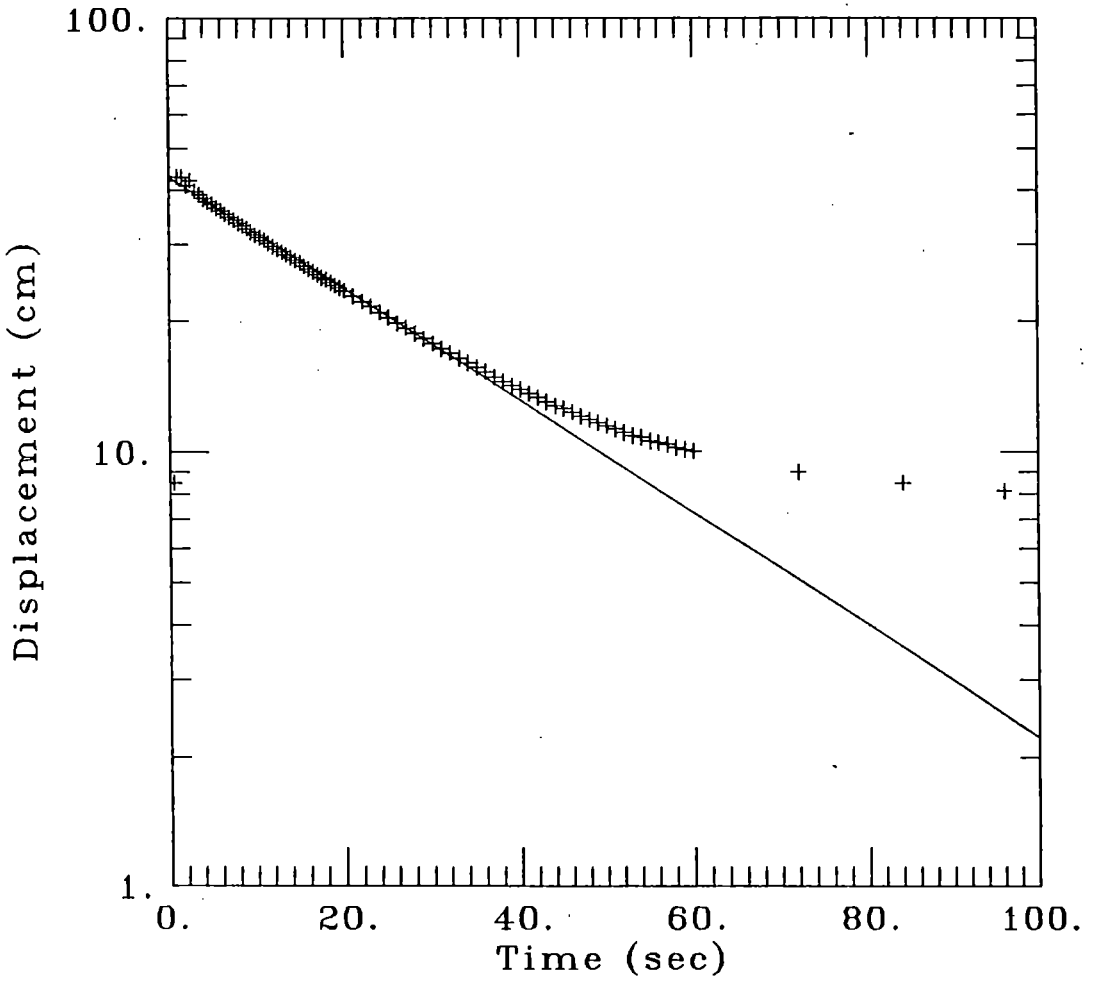
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm147r2.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
OW-147 R2

ESTIMATED PARAMETERS:
K = 0.001147 cm/sec
y0 = 42.85 cm

TEST DATA:
H0 = 42.03 cm
rc = 2.438 cm
rw = 2.438 cm
L = 232.6 cm
b = 1.2192E+04 cm
H = 232.6 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                          A Q T E S O L V   R E S U L T S
                                  Version  1.10

12/15/93                                                                09:37:54

================================================================================
                                TEST DESCRIPTION

Data set........... fm147r3.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-147 R3

Knowns and Constants:
   No. of data points.................. 98
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 232.6
   Static height of water in well...... 232.6
   Log(Re/Rw).......................... 3.026
   A, B, C.............................  4.315,  0.698,  0.000

================================================================================
                                ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)


================================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std. Error
   K  =   1.2316E-003 +/-   7.5398E-006
   y0 =   4.1279E+001 +/-   1.1907E-001


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 62
   Number of estimated parameters.... 2
   Degrees of freedom................ 60
   Residual mean..................... 0.01859
   Residual standard deviation....... 0.3522
```

Residual variance..... 0.124

Model Residuals:

Time	Observed	Calculated	Residual	Weight
1.5	40.965	39.353	1.6116	1
1.998	39.533	38.734	0.79817	1
2.496	38.862	38.125	0.73696	1
3	37.795	37.518	0.27709	1
3.498	36.942	36.928	0.013871	1
3.996	36.454	36.347	0.10712	1
4.5	35.784	35.768	0.015188	1
4.998	35.204	35.206	-0.0012425	1
5.496	34.442	34.652	-0.2094	1
6	33.863	34.1	-0.23688	1
6.498	33.406	33.564	-0.15764	1
6.996	32.522	33.036	-0.51355	1
7.5	32.339	32.51	-0.17052	1
7.998	31.669	31.998	-0.32965	1
8.496	31.272	31.495	-0.22251	1
9	30.693	30.994	-0.30024	1
9.498	30.328	30.506	-0.17843	1
9.996	29.84	30.026	-0.1862	1
10.5	29.352	29.548	-0.19588	1
10.998	28.865	29.083	-0.21872	1
11.496	28.407	28.626	-0.2184	1
12	27.92	28.17	-0.25037	1
12.498	27.523	27.727	-0.20345	1
12.996	27.066	27.291	-0.22447	1
13.5	26.67	26.856	-0.18625	1
13.998	26.274	26.434	-0.16	1
14.496	25.817	26.018	-0.20136	1
15	25.42	25.604	-0.18341	1
15.498	25.024	25.201	-0.17686	1
15.996	24.658	24.804	-0.14617	1
16.5	24.262	24.41	-0.14754	1
16.998	23.896	24.026	-0.1293	1
17.496	23.5	23.648	-0.14758	1
18	23.104	23.271	-0.16736	1
18.498	22.738	22.905	-0.16703	1
18.996	22.342	22.545	-0.20294	1
19.5	22.068	22.186	-0.11836	1
19.998	21.671	21.837	-0.16558	1
21	21.001	21.151	-0.15045	1
21.996	20.33	20.491	-0.16076	1
22.998	19.751	19.847	-0.096456	1
24	19.08	19.224	-0.14379	1
24.996	18.501	18.624	-0.12282	1
25.998	17.922	18.039	-0.11713	1
27	17.465	17.473	-0.0078808	1
27.996	16.886	16.927	-0.041574	1
28.998	16.398	16.396	0.0022788	1
30	15.911	15.881	0.029442	1
30.996	15.423	15.385	0.037499	1
31.998	14.966	14.902	0.063409	1
33	14.569	14.434	0.13511	1
33.996	14.082	13.984	0.098004	1
34.998	13.716	13.545	0.17134	1

```
           36          13.32         13.119        0.20041              1
       36.996         12.954          12.71        0.24418              1
       37.998         12.649         12.311        0.33848              1
           39         12.375         11.924        0.45072              1
       39.996         11.979         11.552         0.4267              1
       40.998         11.704         11.189        0.51512              1
           42           11.4         10.838        0.56166              1
       42.996         11.125           10.5        0.62565              1
       43.998          10.82          10.17        0.65054              1

================================================================================
                       RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

           Estimate
   K  =   1.2316E-003
   y0 =   4.1279E+001

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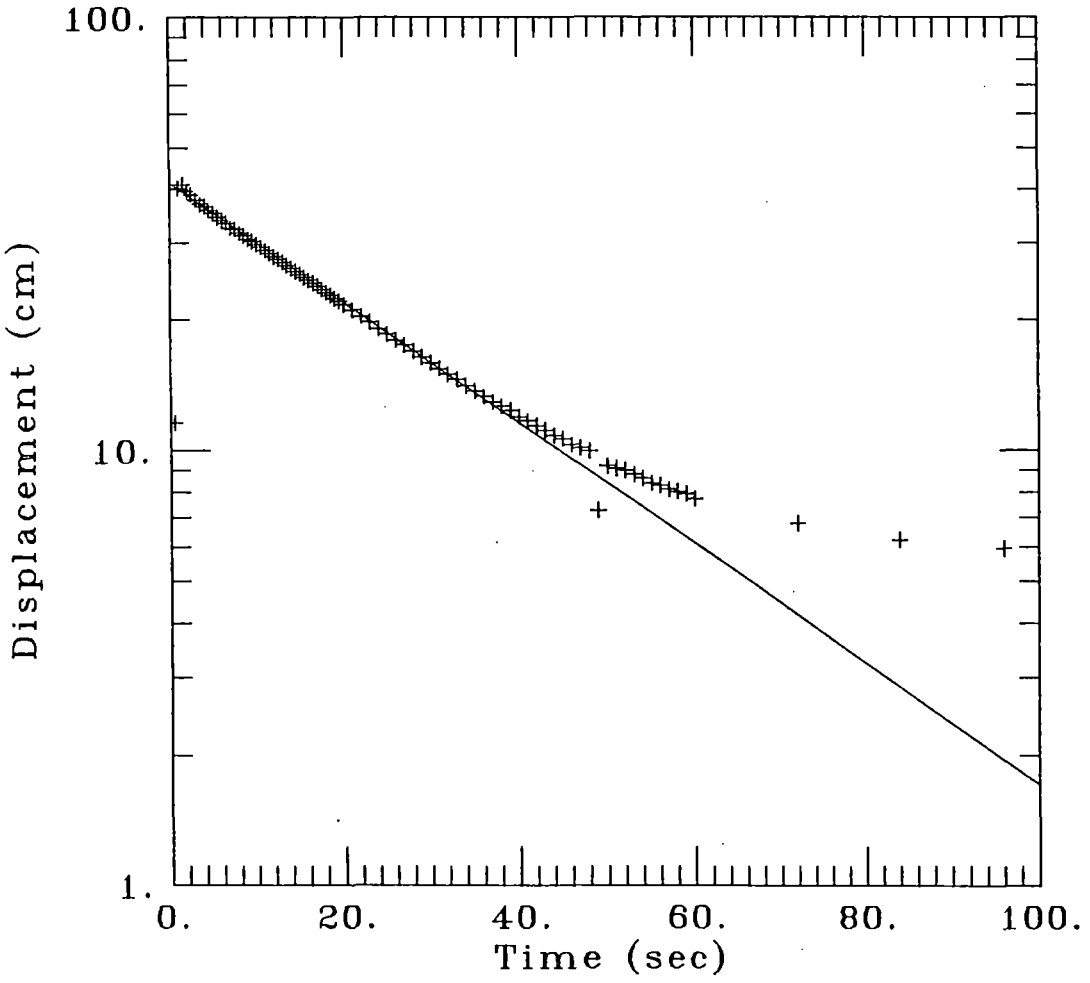
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm147r3.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
09-Dec-93
OBS. WELL:
OW-147 R3

ESTIMATED PARAMETERS:
K = 0.001232 cm/sec
y0 = 41.28 cm

TEST DATA:
H0 = 40.97 cm
rc = 2.438 cm
rw = 2.438 cm
L = 232.6 cm
b = 1.2192E+04 cm
H = 232.6 cm

```
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                        A Q T E S O L V   R E S U L T S
                                 Version  1.10

12/15/93                                                                      09:44:33

=======================================================================================
                                 TEST DESCRIPTION

ata set........... fm148r1.dat
ata set title..... Fort McCoy Mod 5
Company............ Rust E & I
roject............ 71842.200
lient............. USACE
ocation........... Fort McCoy
Test date.......... 09-Dec-93
bs. well.......... OW-148 R1

Knowns and Constants:
   No. of data points.................... 105
   Radius of well casing................. 2.438
   Radius of well........................ 2.438
   Aquifer saturated thickness........... 12190
   Well screen length.................... 294.4
   Static height of water in well........ 294.4
   Log(Re/Rw)............................ 3.225
   A, B, C...............................  4.864,   0.812,   0.000

=======================================================================================
                                  ANALYTICAL METHOD

ouwer and Rice (unconfined aquifer slug test)

=======================================================================================
                      RESULTS FROM STATISTICAL CURVE MATCHING

TATISTICAL MATCH PARAMETER ESTIMATES

           Estimate           Std. Error
   K  =   2.7661E-003 +/-   3.4075E-005
   y0 =   4.4380E+001 +/-   3.7117E-001

NALYSIS OF MODEL RESIDUALS

residual = calculated - observed
eighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 43
   Number of estimated parameters.... 2
   Degrees of freedom................ 41
   Residual mean..................... 0.07867
   Residual standard deviation....... 0.655
```

Residual variance..... 0.429

Model Residuals:

Time	Observed	Calculated	Residual	Weight
1.5	40.477	39.07	1.407	1
1.998	38.862	37.452	1.41	1
2.496	36.18	35.901	0.27911	1
3	34.625	34.396	0.22928	1
3.498	33.376	32.971	0.40439	1
3.996	31.272	31.605	-0.33297	1
4.5	30.206	30.281	-0.075138	1
4.998	28.59	29.026	-0.43626	1
5.496	27.341	27.824	-0.48357	1
6	26.091	26.658	-0.5671	1
6.498	24.933	25.554	-0.62109	1
6.996	23.866	24.495	-0.62938	1
7.5	22.921	23.469	-0.54762	1
7.998	21.854	22.496	-0.64229	1
8.496	20.909	21.565	-0.6553	1
9	20.117	20.661	-0.54397	1
9.498	19.263	19.805	-0.54158	1
9.996	18.41	18.985	-0.57464	1
10.5	17.739	18.189	-0.44953	1
10.998	16.947	17.435	-0.48857	1
11.496	16.276	16.713	-0.4369	1
12	15.606	16.013	-0.40699	1
12.498	15.027	15.349	-0.32281	1
12.996	14.356	14.714	-0.35755	1
13.5	13.99	14.097	-0.10664	1
13.998	13.228	13.513	-0.2847	1
14.496	12.832	12.953	-0.12119	1
15	12.344	12.41	-0.065983	1
15.498	11.979	11.896	0.082333	1
15.996	11.674	11.404	0.27031	1
16.5	10.912	10.926	-0.013748	1
16.998	10.607	10.473	0.13402	1
17.496	10.333	10.039	0.29353	1
18	10.15	9.6184	0.5314	1
18.498	9.6622	9.22	0.44215	1
18.996	9.3878	8.8381	0.54975	1
19.5	9.1745	8.4677	0.70681	1
19.998	8.9916	8.1169	0.87468	1
21	8.2296	7.4546	0.77501	1
21.996	7.8334	6.8498	0.98356	1
22.998	7.3457	6.2909	1.0548	1
24	6.9799	5.7775	1.2024	1
24.996	6.7666	5.3088	1.4578	1

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	2.7661E-003

```
 y0 =    4.4380E+001

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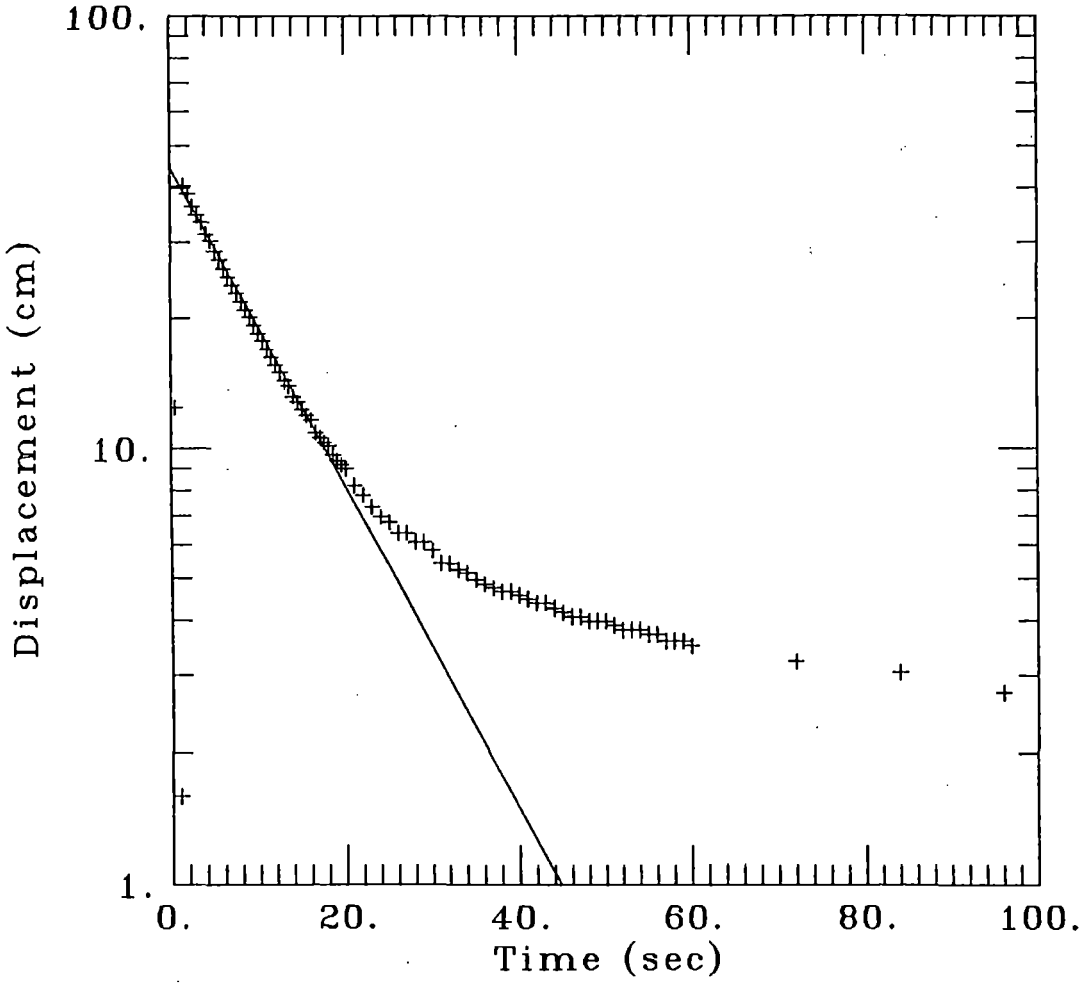
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm148r1.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
OW-148 R1

ESTIMATED PARAMETERS:
K = 0.002766 cm/sec
y0 = 44.38 cm

TEST DATA:
H0 = 40.48 cm
rc = 2.438 cm
rw = 2.438 cm
L = 294.4 cm
b = 1.2192E+04 cm
H = 294.4 cm

```
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                         A Q T E S O L V   R E S U L T S
                                  Version  1.10

12/15/93                                                                   09:46:4

==================================================================================
                                TEST DESCRIPTION

Data set........... fm148r2.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-148 R2

Knowns and Constants:
   No. of data points................... 97
   Radius of well casing................ 2.438
   Radius of well....................... 2.438
   Aquifer saturated thickness.......... 12190
   Well screen length................... 294.4
   Static height of water in well....... 294.4
   Log(Re/Rw)........................... 3.225
   A, B, C..............................  4.864,  0.812,  0.000

==================================================================================
                                ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)


==================================================================================
                      RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std. Error
   K  =   4.5638E-003 +/-   1.1732E-004
   y0 =   4.1819E+001 +/-   7.1493E-001


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 55
   Number of estimated parameters.... 2
   Degrees of freedom................ 53
   Residual mean..................... 0.2698
   Residual standard deviation....... 1.447
```

Residual variance..... 2.094

del Residuals:

Time	Observed	Calculated	Residual	Weight
0.762	41.392	37.583	3.8092	1
1.015	38.313	36.273	2.0396	1
1.268	36.576	35.01	1.5662	1
1.524	34.381	33.776	0.60566	1
1.777	33.04	32.599	0.44118	1
2.03	31.486	31.463	0.022353	1
2.286	30.145	30.354	-0.20971	1
2.539	29.108	29.297	-0.18858	1
2.792	27.737	28.276	-0.53956	1
3.048	26.792	27.28	-0.48773	1
3.301	25.634	26.329	-0.69563	1
3.554	24.689	25.412	-0.72328	1
3.81	23.713	24.516	-0.80289	1
4.063	22.769	23.662	-0.8937	1
4.316	21.885	22.838	-0.9533	1
4.572	21.031	22.033	-1.0017	1
4.825	20.178	21.265	-1.0876	1
5.078	19.385	20.525	-1.1393	1
5.334	18.623	19.801	-1.1778	1
5.587	17.953	19.111	-1.1586	1
5.84	17.282	18.445	-1.1633	1
6.096	16.703	17.795	-1.0923	1
6.349	16.032	17.175	-1.1429	1
6.602	15.453	16.577	-1.1237	1
6.858	14.966	15.993	-1.027	1
7.111	14.387	15.436	-1.049	1
7.364	13.929	14.898	-0.9685	1
7.62	13.442	14.373	-0.93104	1
7.873	13.045	13.872	-0.82658	1
8.126	12.68	13.389	-0.70908	1
8.382	12.192	12.917	-0.72482	1
8.635	11.796	12.467	-0.67108	1
8.888	11.521	12.033	-0.5111	1
9.144	11.217	11.608	-0.39176	1
9.397	10.942	11.204	-0.26168	1
9.65	10.546	10.814	-0.26761	1
9.906	10.272	10.433	-0.16076	1
10.159	10.089	10.069	0.019798	1
10.668	9.6012	9.3757	0.22545	1
11.174	9.205	8.7339	0.47108	1
11.683	8.8392	8.1325	0.70672	1
12.192	8.443	7.5725	0.87046	1
12.698	8.1686	7.0541	1.1146	1
13.207	7.8638	6.5684	1.2955	1
13.716	7.5895	6.1161	1.4734	1
14.222	7.3762	5.6974	1.6788	1
14.731	7.1933	5.3051	1.8882	1
15.24	7.0104	4.9398	2.0706	1
15.746	6.8275	4.6016	2.2259	1
16.255	6.7056	4.2847	2.4209	1
16.764	6.5227	3.9897	2.533	1
17.27	6.4313	3.7166	2.7147	1
17.779	6.2484	3.4606	2.7878	1

```
        18.288          6.1265          3.2224          2.9041                  1
        18.794           6.035          3.0017          3.0333                  1

====================================================================================
                          RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

              Estimate
   K  =    4.5638E-003
   y0 =    4.1819E+001

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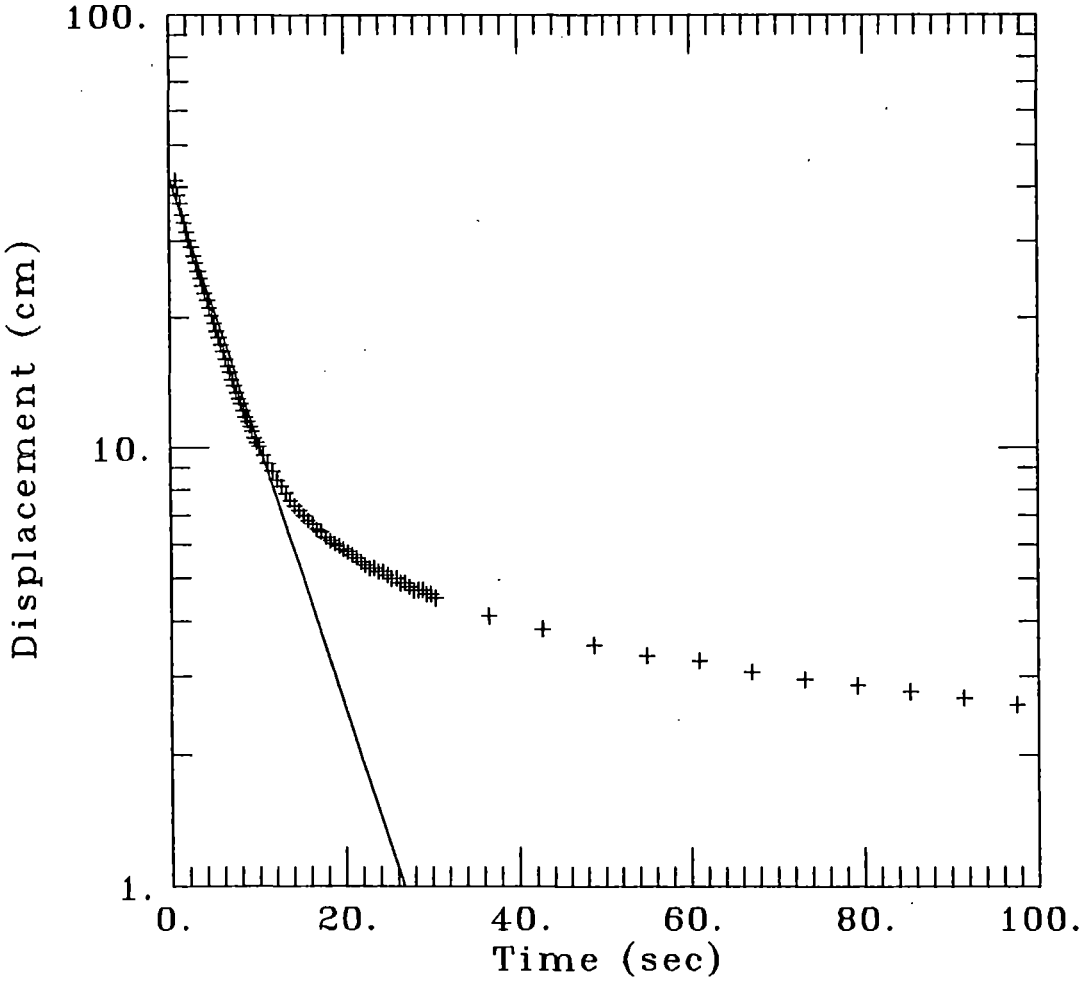
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm148r2.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
09-Dec-93
OBS. WELL:
OW-148 R2

ESTIMATED PARAMETERS:
K = 0.004564 cm/sec
y0 = 41.82 cm

TEST DATA:
H0 = 40.48 cm
rc = 2.438 cm
rw = 2.438 cm
L = 294.4 cm
b = 1.2192E+04 cm
H = 294.4 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                         A Q T E S O L V   R E S U L T S
                                 Version  1.10

12/15/93                                                                09:57:

================================================================================
                              TEST DESCRIPTION

Data set........... fm148r3.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-148 R3

Knowns and Constants:
   No. of data points.................. 98
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 294.4
   Static height of water in well...... 294.4
   Log(Re/Rw).......................... 3.225
   A, B, C.............................  4.864,  0.812,  0.000

================================================================================
                              ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

================================================================================
                    RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std. Error
   K  =   2.5932E-003 +/-   3.3841E-005
   y0 =   4.4385E+001 +/-   3.6470E-001

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 38
   Number of estimated parameters.... 2
   Degrees of freedom................ 36
   Residual mean..................... 0.04213
   Residual standard deviation....... 0.6419
```

```
   Residual variance................ 0.4121

[illegible]del Residuals:

     Time         Observed      Calculated      Residual        Weight
 ------------  ------------  ------------  ------------  ------------
          1.5          41.3        39.387        1.9135             1
        1.998        39.472        37.855        1.6163             1
        2.496        36.789        36.383       0.40601             1
            3        33.711        34.952        -1.241             1
        3.498        33.528        33.593     -0.064829             1
        3.996        31.882        32.287      -0.40452             1
          4.5        30.754        31.016      -0.26201             1
        4.998        29.505         29.81      -0.30565             1
        5.496        28.042        28.651      -0.60913             1
            6        27.097        27.524      -0.42718             1
        6.498        25.938        26.454      -0.51517             1
        6.996        24.872        25.425      -0.55334             1
          7.5        23.927        24.425      -0.49792             1
        7.998        23.073        23.475      -0.40162             1
        8.496        22.098        22.562      -0.46417             1
            9        21.245        21.675      -0.42994             1
        9.498        20.483        20.832      -0.34914             1
        9.996         19.69        20.022       -0.3316             1
         10.5        18.928        19.234      -0.30596             1
       10.998        18.166        18.486      -0.31998             1
       11.496        17.496        17.767      -0.27172             1
           12        16.916        17.068      -0.15182             1
       12.498        16.246        16.405      -0.15869             1
       12.996        15.667        15.767     -0.099936             1
         13.5        15.088        15.146     -0.058742             1
       13.998        14.508        14.557     -0.048908             1
       14.496        14.021        13.991      0.029466             1
           15        13.564        13.441       0.12273             1
       15.498        13.076        12.918       0.15777             1
       15.996         12.68        12.416       0.26409             1
         16.5        12.314        11.927       0.38657             1
       16.998        11.918        11.464       0.45436             1
       17.496        11.521        11.018       0.50311             1
           18        11.247        10.584        0.6626             1
       18.498        10.851        10.173       0.67816             1
       18.996        10.577        9.7773       0.79973             1
         19.5        10.302        9.3926        0.9094             1
       19.998        9.9974        9.0274       0.97002             1

==============================================================================
                     RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

          Estimate
   K  =   2.5932E-003
   y0 =   4.4385E+001

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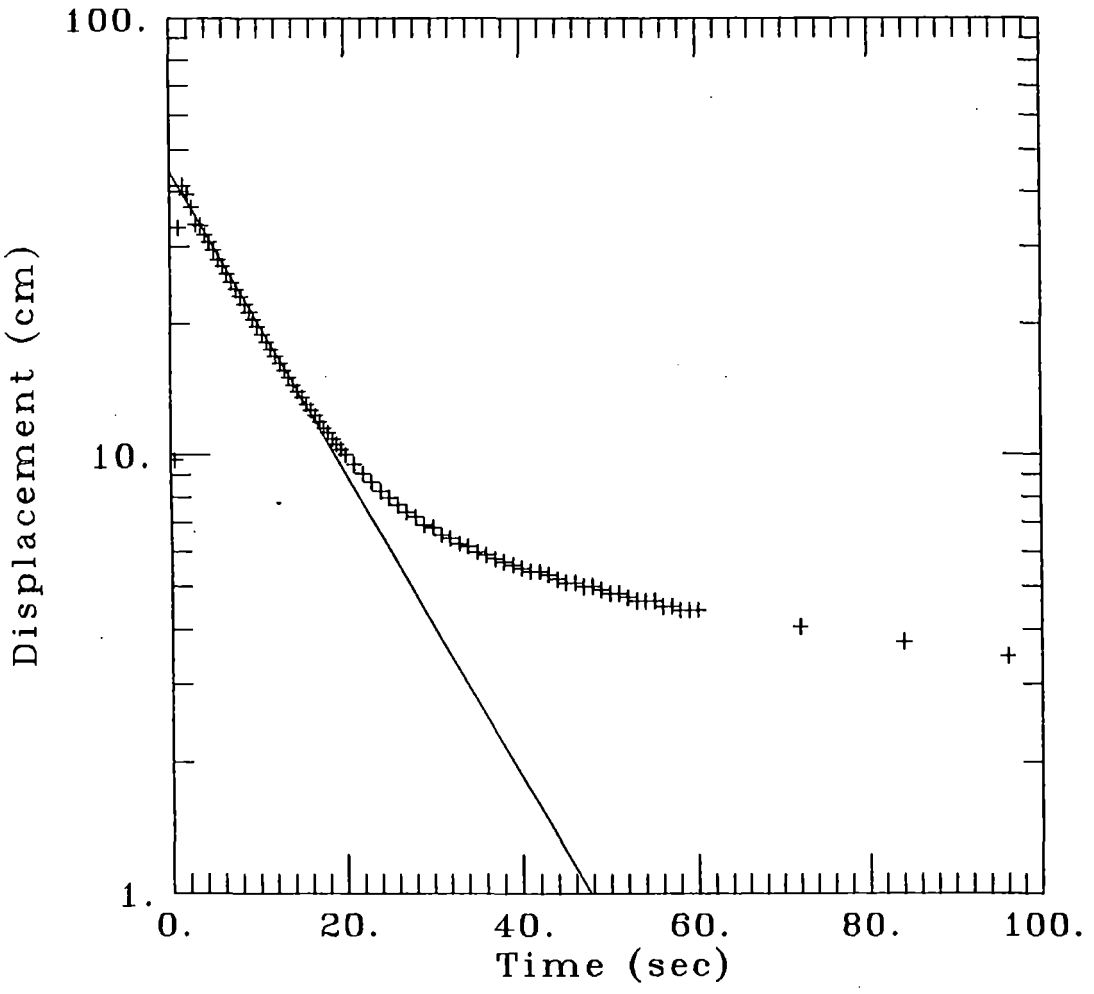
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm148r3.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
09-Dec-93
OBS. WELL:
OW-148 R3

ESTIMATED PARAMETERS:
K = 0.002593 cm/sec
y0 = 44.38 cm

TEST DATA:
H0 = 41.3 cm
rc = 2.438 cm
rw = 2.438 cm
L = 294.4 cm
b = 1.2192E+04 cm
H = 294.4 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                         A Q T E S O L V    R E S U L T S
                                 Version  1.10

12/15/93                                                                 10:06:08

==================================================================================
                                TEST DESCRIPTION

Data set........... fm149r2.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-149 R2

Knowns and Constants:
   No. of data points.................. 103
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 177.4
   Static height of water in well...... 177.4
   Log(Re/Rw).......................... 2.8
   A, B, C.............................  3.740,  0.596,  0.000

==================================================================================
                                ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)


==================================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

            Estimate        Std.  Error
   K  =   3.3593E-003 +/-   4.5077E-005
   y0 =   4.3995E+001 +/-   3.5388E-001


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 39
   Number of estimated parameters.... 2
   Degrees of freedom................ 37
   Residual mean..................... 0.04221
   Residual standard deviation....... 0.6566
```

```
   Residual variance................ 0.4311

Model Residuals:

      Time          Observed       Calculated      Residual        Weight
  ------------   ------------   ------------   ------------   ------------
           1.5         39.746         39.515        0.23097              1
         1.998         39.289         38.131         1.1578              1
         2.496         37.826         36.795         1.0303              1
             3         36.606         35.491         1.1151              1
         3.498         34.381         34.248        0.13319              1
         3.996         33.223         33.049        0.17451              1
           4.5         32.095         31.877        0.21799              1
         4.998         30.358         30.761       -0.40284              1
         5.496           29.2         29.684       -0.48367              1
             6         28.164         28.632       -0.46801              1
         6.498         27.005         27.629       -0.62342              1
         6.996         25.938         26.661       -0.72251              1
           7.5         24.994         25.716       -0.72253              1
         7.998         24.018         24.815       -0.79717              1
         8.496         23.165         23.946       -0.78144              1
             9         22.403         23.098       -0.69479              1
         9.498         21.519         22.289        -0.7697              1
         9.996         20.848         21.508        -0.6596              1
          10.5         20.086         20.746       -0.65936              1
        10.998         19.507         20.019       -0.51185              1
        11.496         18.837         19.318       -0.48124              1
            12         18.258         18.633       -0.37573              1
        12.498         17.678         17.981       -0.30221              1
        12.996         17.099         17.351       -0.25156              1
          13.5         16.551         16.736       -0.18528              1
        13.998         16.063          16.15      -0.086781              1
        14.496         15.575         15.584     -0.0088088              1
            15         15.088         15.032       0.055809              1
        15.498         14.722         14.505        0.21654              1
        15.996         14.326         13.997        0.32836              1
          16.5          13.96         13.501        0.45866              1
        16.998         13.472         13.028        0.44386              1
        17.496         13.167         12.572        0.59539              1
            18         12.802         12.126        0.67518              1
        18.498         12.497         11.702        0.79511              1
        18.996         12.131         11.292        0.83921              1
          19.5         11.826         10.892        0.93459              1
        19.998         11.552          10.51         1.0418              1
            21         10.973         9.7826         1.1902              1


=========================================================================
                      RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

          Estimate
   K  =   3.3593E-003
   y0 =   4.3995E+001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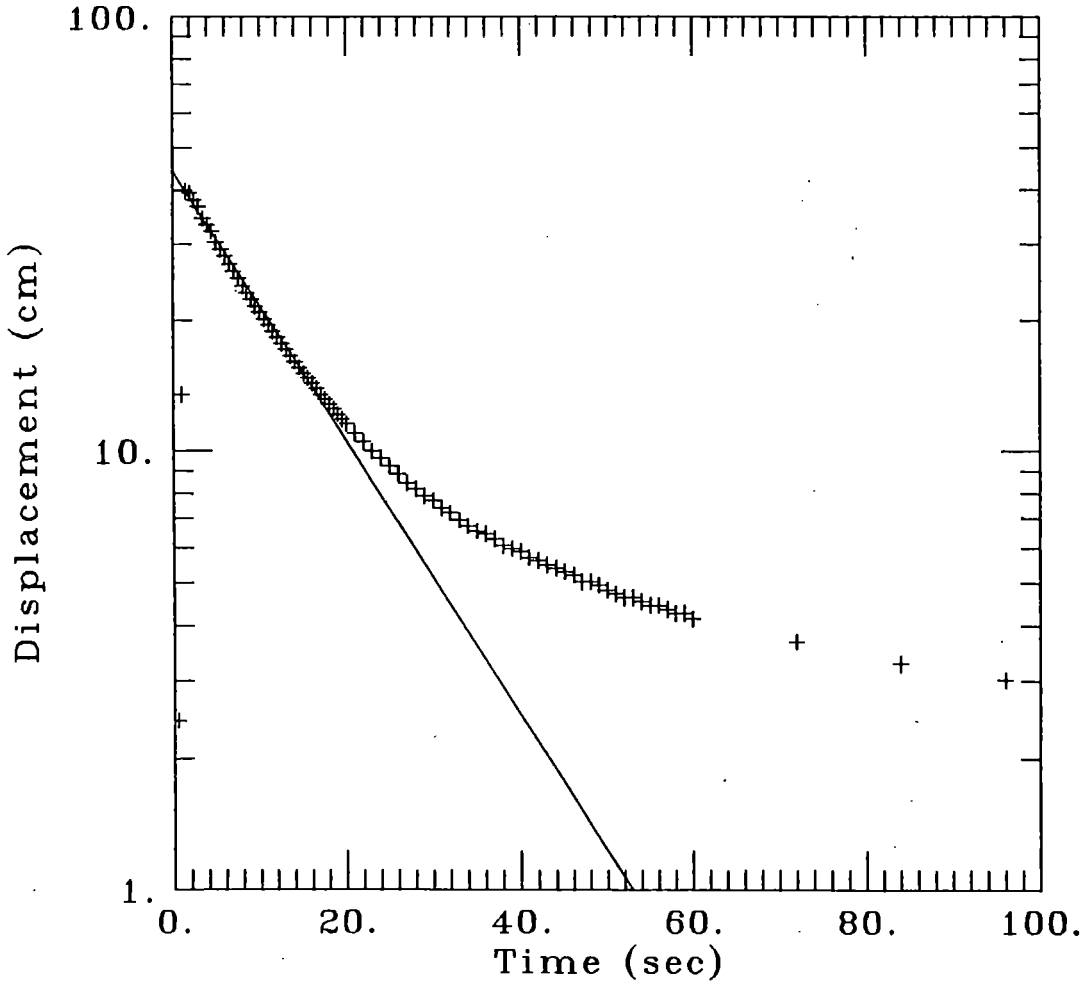
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm149r2.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
09-Dec-93
OBS. WELL:
OW-149 R2

ESTIMATED PARAMETERS:
K = 0.003359 cm/sec
y0 = 43.99 cm

TEST DATA:
H0 = 39.75 cm
rc = 2.438 cm
rw = 2.438 cm
L = 177.4 cm
b = 1.2192E+04 cm
H = 177.4 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                         A Q T E S O L V   R E S U L T S
                                   Version  1.10

12/15/93                                                                 10:15:5

================================================================================
                                TEST DESCRIPTION

Data set........... fm149r3.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-149 R3

Knowns and Constants:
   No. of data points.................. 105
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 177.4
   Static height of water in well...... 177.4
   Log(Re/Rw).......................... 2.8
   A, B, C.............................  3.740,  0.596,  0.000

================================================================================
                                ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)


================================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

            Estimate          Std. Error
   K  =   3.3539E-003 +/-   4.9437E-005
   y0 =   4.3013E+001 +/-   3.8398E-001


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 40
   Number of estimated parameters.... 2
   Degrees of freedom................ 38
   Residual mean..................... 0.05178
   Residual standard deviation....... 0.7187
```

Residual variance..... 0.5165

del Residuals:

Time	Observed	Calculated	Residual	Weight
1.5	40.356	38.639	1.716	1
1.998	38.344	37.288	1.0556	1
2.496	36.515	35.984	0.5308	1
3	35.265	34.711	0.55441	1
3.498	33.65	33.497	0.15284	1
3.996	32.095	32.326	-0.23023	1
4.5	31.242	31.182	0.060163	1
4.998	29.809	30.091	-0.28195	1
5.496	28.743	29.039	-0.29607	1
6	27.676	28.012	-0.33569	1
6.498	26.335	27.032	-0.69723	1
6.996	25.298	26.087	-0.78822	1
7.5	24.323	25.164	-0.84052	1
7.998	23.47	24.284	-0.81397	1
8.496	22.586	23.434	-0.84868	1
9	21.824	22.605	-0.78146	1
9.498	21.062	21.815	-0.75294	1
9.996	20.3	21.052	-0.75207	1
10.5	19.629	20.307	-0.67784	1
10.998	18.959	19.597	-0.63814	1
11.496	18.379	18.911	-0.53195	1
12	17.8	18.242	-0.4419	1
12.498	17.221	17.604	-0.38307	1
12.996	16.642	16.989	-0.34656	1
13.5	16.185	16.388	-0.20262	1
13.998	15.697	15.814	-0.11722	1
14.496	15.21	15.261	-0.051859	1
15	14.813	14.721	0.091917	1
15.498	14.356	14.207	0.14945	1
15.996	13.96	13.71	0.25011	1
16.5	13.594	13.225	0.36946	1
16.998	13.198	12.762	0.43569	1
17.496	12.893	12.316	0.5772	1
18	12.527	11.88	0.64723	1
18.498	12.222	11.465	0.75788	1
18.996	11.948	11.064	0.88449	1
19.5	11.674	10.672	1.0016	1
19.998	11.369	10.299	1.0701	1
21	10.79	9.5871	1.2029	1
21.996	10.302	8.9283	1.3737	1

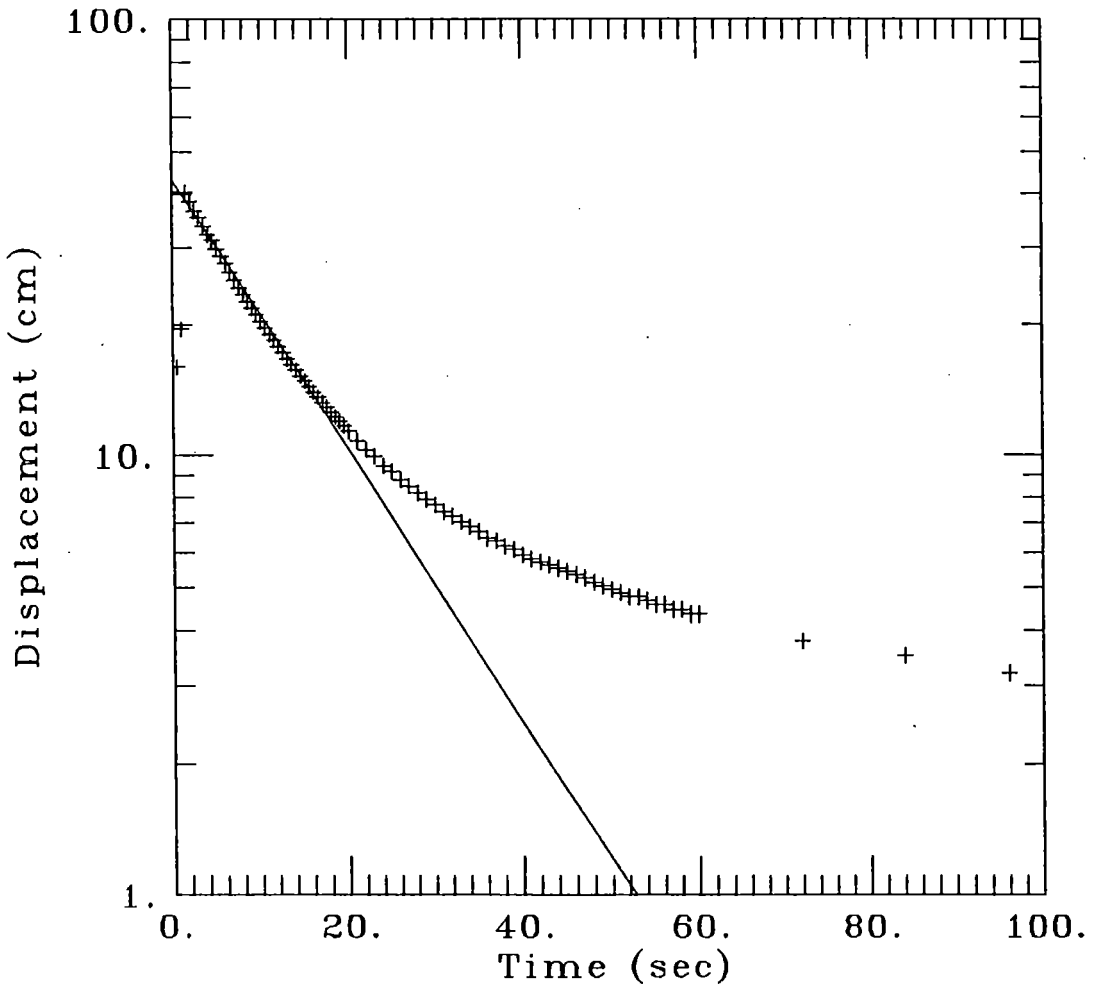
RESULTS FROM VISUAL CURVE MATCHING

ISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	3.3539E-003
y0 =	4.3013E+001

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm149r3.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
OW-149 R3

ESTIMATED PARAMETERS:
K = 0.003354 cm/sec
y0 = 43.01 cm

TEST DATA:
H0 = 40.36 cm
rc = 2.438 cm
rw = 2.438 cm
L = 177.4 cm
b = 1.2192E+04 cm
H = 177.4 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                       A Q T E S O L V   R E S U L T S
                               Version  1.10

12/15/93                                                                10:23:50

================================================================================
                               TEST DESCRIPTION

ata set........... fm150r1.dat
ata set title..... Fort McCoy Mod 5
Company........... Rust E & I
roject............ 71842.200
lient............. USACE
Location.......... Fort McCoy
Test date......... 09-Dec-93
bs. well.......... OW-150 R1

Knowns and Constants:
   No. of data points.................... 91
   Radius of well casing................. 2.438
   Radius of well........................ 2.438
   Aquifer saturated thickness........... 12190
   Well screen length.................... 304.8
   Static height of water in well........ 309.1
   Log(Re/Rw)............................ 3.261
   A, B, C...............................  4.948,  0.831,  0.000

================================================================================
                               ANALYTICAL METHOD

ouwer and Rice (unconfined aquifer slug test)


================================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING


TATISTICAL MATCH PARAMETER ESTIMATES

            Estimate          Std.  Error
   K  =   1.3190E-003 +/-   4.5372E-005
   y0 =   4.0826E+001 +/-   7.2271E-001


NALYSIS OF MODEL RESIDUALS

residual = calculated - observed
eighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals.............. 59
   Number of estimated parameters.... 2
   Degrees of freedom............... 57
   Residual mean.................... 0.04782
   Residual standard deviation...... 2.006
```

Residual variance..... 4.022

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.996	52.395	39.175	13.22	1
1.5	32.431	38.364	-5.9337	1
1.998	39.441	37.58	1.8608	1
2.496	35.601	36.812	-1.2117	1
3	35.326	36.051	-0.72463	1
3.498	34.747	35.314	-0.56694	1
3.996	33.68	34.592	-0.91198	1
4.5	33.101	33.877	-0.77567	1
4.998	32.248	33.185	-0.93672	1
5.496	31.669	32.506	-0.83761	1
6	30.998	31.834	-0.83588	1
6.498	30.328	31.183	-0.85581	1
6.996	29.84	30.546	-0.70616	1
7.5	29.261	29.914	-0.65353	1
7.998	28.682	29.303	-0.62126	1
8.496	28.103	28.704	-0.60148	1
9	27.615	28.11	-0.49551	1
9.498	27.036	27.536	-0.50011	1
9.996	26.579	26.973	-0.39453	1
10.5	26.091	26.415	-0.32435	1
10.998	25.512	25.875	-0.36359	1
11.496	25.024	25.347	-0.32243	1
12	24.567	24.822	-0.25542	1
12.498	24.171	24.315	-0.14434	1
12.996	23.683	23.818	-0.13506	1
13.5	23.195	23.325	-0.13014	1
13.998	22.738	22.849	-0.11061	1
14.496	22.25	22.382	-0.13131	1
15	21.854	21.919	-0.064655	1
15.498	21.397	21.471	-0.073875	1
15.996	21.001	21.032	-0.031291	1
16.5	20.604	20.597	0.0074489	1
16.998	20.147	20.176	-0.028786	1
17.496	19.751	19.764	-0.012665	1
18	19.355	19.355	-0.00015517	1
18.498	18.989	18.959	0.029664	1
18.996	18.593	18.572	0.020919	1
19.5	18.197	18.188	0.008779	1
19.998	17.831	17.816	0.014744	1
21	17.069	17.091	-0.022192	1
21.996	16.398	16.4	-0.0012745	1
22.998	15.728	15.732	-0.0044191	1
24	15.027	15.092	-0.065206	1
24.996	14.478	14.481	-0.0032511	1
25.998	13.777	13.892	-0.11494	1
27	13.32	13.327	-0.0067812	1
27.996	12.832	12.787	0.044712	1
28.998	12.344	12.267	0.077443	1
30	11.979	11.768	0.21091	1
30.996	11.582	11.292	0.29078	1
31.998	11.186	10.832	0.35408	1
33	10.82	10.391	0.42915	1
33.996	10.516	9.9708	0.54477	1

```
     34.998          10.241           9.565         0.67623              1
         36          9.9365          9.1758         0.76071              1
     36.996          9.6622          8.8045         0.85762              1
     37.998          9.4793          8.4462          1.0331              1
         39          9.1745          8.1025           1.072              1
     39.996          8.9916          7.7747          1.2169              1

==================================================================================
                        RESULTS FROM VISUAL CURVE MATCHING

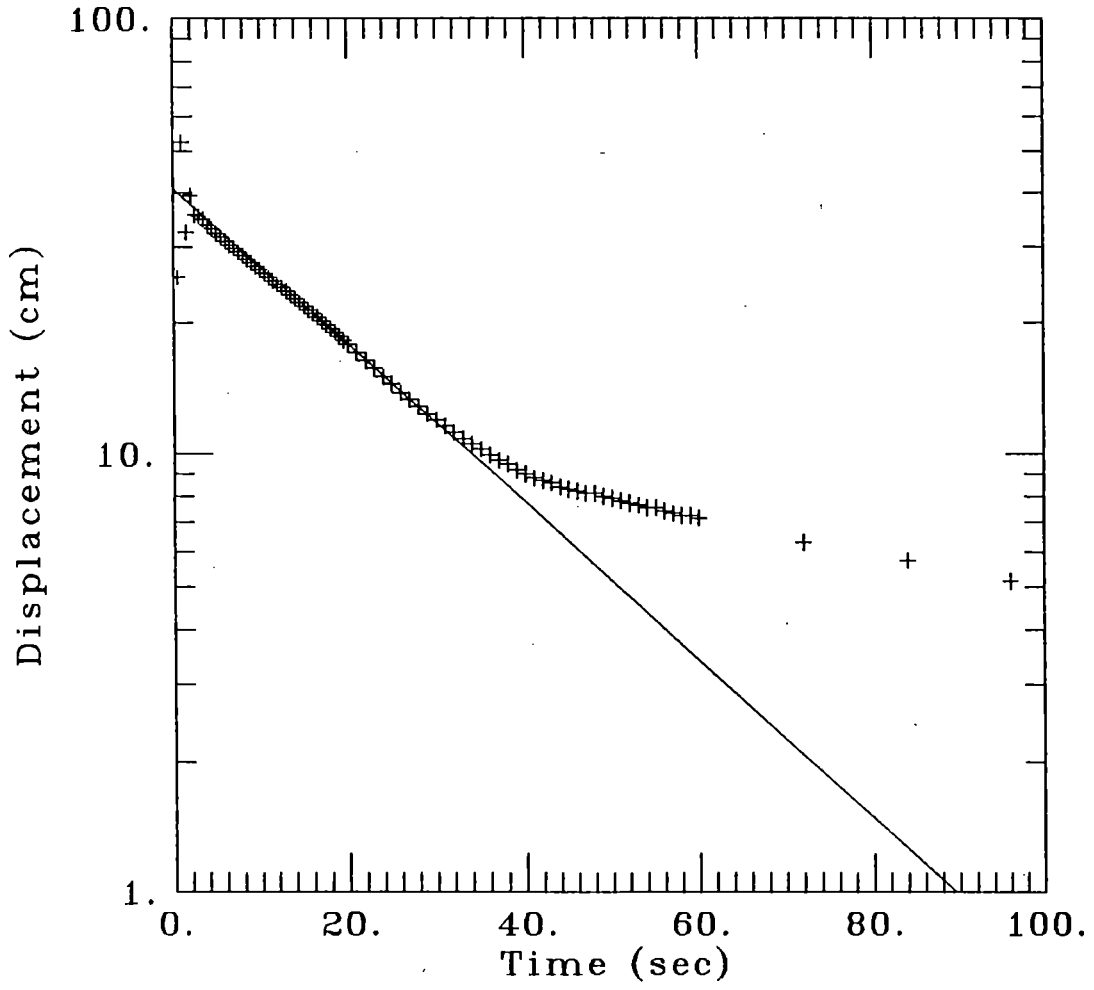
ISUAL MATCH PARAMETER ESTIMATES

          Estimate
  K  =    1.3190E-003
  y0 =    4.0826E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm150r1.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
OW-150 R1

ESTIMATED PARAMETERS:
K = 0.001319 cm/sec
y0 = 40.83 cm

TEST DATA:
H0 = 52.4 cm
rc = 2.438 cm
rw = 2.438 cm
L = 304.8 cm
b = 1.2192E+04 cm
H = 309.1 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                        A Q T E S O L V   R E S U L T S
                                 Version  1.10

2/15/93                                                               10:33:47

==============================================================================
                                TEST DESCRIPTION

ata set........... fm150r2.dat
ata set title..... Fort McCoy Mod 5
Company........... Rust E & I
roject............ 71842.200
lient............. USACE
Location.......... Fort McCoy
Test date......... 09-Dec-93
bs. well.......... OW-150 R2

Knowns and Constants:
   No. of data points.................. 93
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 304.8
   Static height of water in well...... 309.1
   Log(Re/Rw).......................... 3.261
   A, B, C.............................  4.948,  0.831,  0.000

==============================================================================
                               ANALYTICAL METHOD

ouwer and Rice (unconfined aquifer slug test)

==============================================================================
                      RESULTS FROM STATISTICAL CURVE MATCHING


TATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std.  Error
  K  =   1.4331E-003 +/-   1.2597E-005
  y0 =   4.1564E+001 +/-   2.2465E-001


NALYSIS OF MODEL RESIDUALS

residual = calculated - observed
eighted residual = residual * weight

Weighted Residual Statistics:
   umber of residuals.............. 77
   Number of estimated parameters.... 2
   Degrees of freedom................ 75
   Residual mean..................... -0.0561
   Residual standard deviation....... 0.5776
```

Residual variance..... 0.3336

Model Residuals:

Time	Observed	Calculated	Residual	Weight
1.998	39.959	37.986	1.9736	1
2.496	34.778	37.143	-2.3652	1
3	36.119	36.309	-0.19017	1
3.498	35.753	35.503	0.24964	1
3.996	34.016	34.716	-0.69993	1
4.5	33.254	33.936	-0.6825	1
4.998	32.492	33.183	-0.69155	1
5.496	31.913	32.447	-0.53399	1
6	31.242	31.719	-0.4765	1
6.498	30.571	31.015	-0.44335	1
6.996	29.992	30.327	-0.33431	1
7.5	29.413	29.646	-0.23252	1
7.998	28.834	28.988	-0.15386	1
8.496	28.255	28.345	-0.089789	1
9	27.676	27.708	-0.032598	1
9.498	27.097	27.094	0.0030813	1
9.996	26.518	26.492	0.02512	1
10.5	26.03	25.898	0.13232	1
10.998	25.481	25.323	0.15823	1
11.496	24.994	24.761	0.23238	1
12	24.506	24.205	0.30062	1
12.498	24.018	23.668	0.34997	1
12.996	23.531	23.143	0.38751	1
13.5	23.073	22.623	0.44991	1
13.998	22.586	22.122	0.46417	1
14.496	22.098	21.631	0.46729	1
15	21.61	21.145	0.46524	1
15.498	21.245	20.676	0.56909	1
15.996	20.757	20.217	0.53974	1
16.5	20.269	19.763	0.50595	1
16.998	19.903	19.325	0.57865	1
17.496	19.507	18.896	0.61121	1
18	19.02	18.472	0.54776	1
18.498	18.654	18.062	0.5919	1
18.996	18.258	17.661	0.59635	1
19.5	17.892	17.265	0.62718	1
19.998	17.496	16.882	0.61393	1
21	16.734	16.136	0.59761	1
21.996	15.941	15.428	0.51271	1
22.998	15.179	14.747	0.43174	1
24	14.509	14.096	0.4122	1
24.996	13.838	13.478	0.36018	1
25.998	13.167	12.883	0.2846	1
27	12.497	12.314	0.18266	1
27.996	11.918	11.774	0.14394	1
28.998	11.247	11.254	-0.0069548	1
30	10.668	10.757	-0.089288	1
30.996	10.089	10.285	-0.19623	1
31.998	9.6012	9.8312	-0.23003	1
33	9.144	9.3973	-0.25327	1
33.996	8.5649	8.9849	-0.42001	1
34.998	8.1686	8.5883	-0.41965	1
36	7.681	8.2092	-0.52823	1

```
      36.996           7.3152           7.8489           -0.53375            1
      37.998           6.8275           7.5025           -0.67497            1
          39           6.5532           7.1713           -0.61812            1
      39.996            6.157           6.8566           -0.69966            1
      40.998           5.8522            6.554           -0.70176            1
          42           5.5778           6.2647           -0.68683            1
      42.996           5.1816           5.9898           -0.80816            1
      43.998           4.9987           5.7254           -0.72664            1
          45           4.8158           5.4726            -0.6568            1
      45.996            4.511           5.2325           -0.72144            1
      46.998           4.3282           5.0015           -0.67336            1
          48           4.2367           4.7807           -0.54402            1
      48.996           4.0538            4.571           -0.51711            1
      49.998           3.9319           4.3692           -0.43726            1
          51           3.8405           4.1763           -0.33582            1
      51.996           3.6576           3.9931           -0.33546            1
      52.998           3.5662           3.8168           -0.25064            1
          54           3.4747           3.6483            -0.1736            1
      54.996           3.3833           3.4882           -0.10494            1
      55.998           3.2614           3.3342          -0.072888            1
          57           3.2614           3.1871           0.074289            1
      57.996           3.1699           3.0472            0.12269            1
      58.998           3.0785           2.9127            0.16579            1
          60           3.0785           2.7841            0.29436            1

===============================================================================
                         RESULTS FROM VISUAL CURVE MATCHING

ISUAL MATCH PARAMETER ESTIMATES

          Estimate
 K  =    1.4331E-003
 y0 =    4.1564E+001

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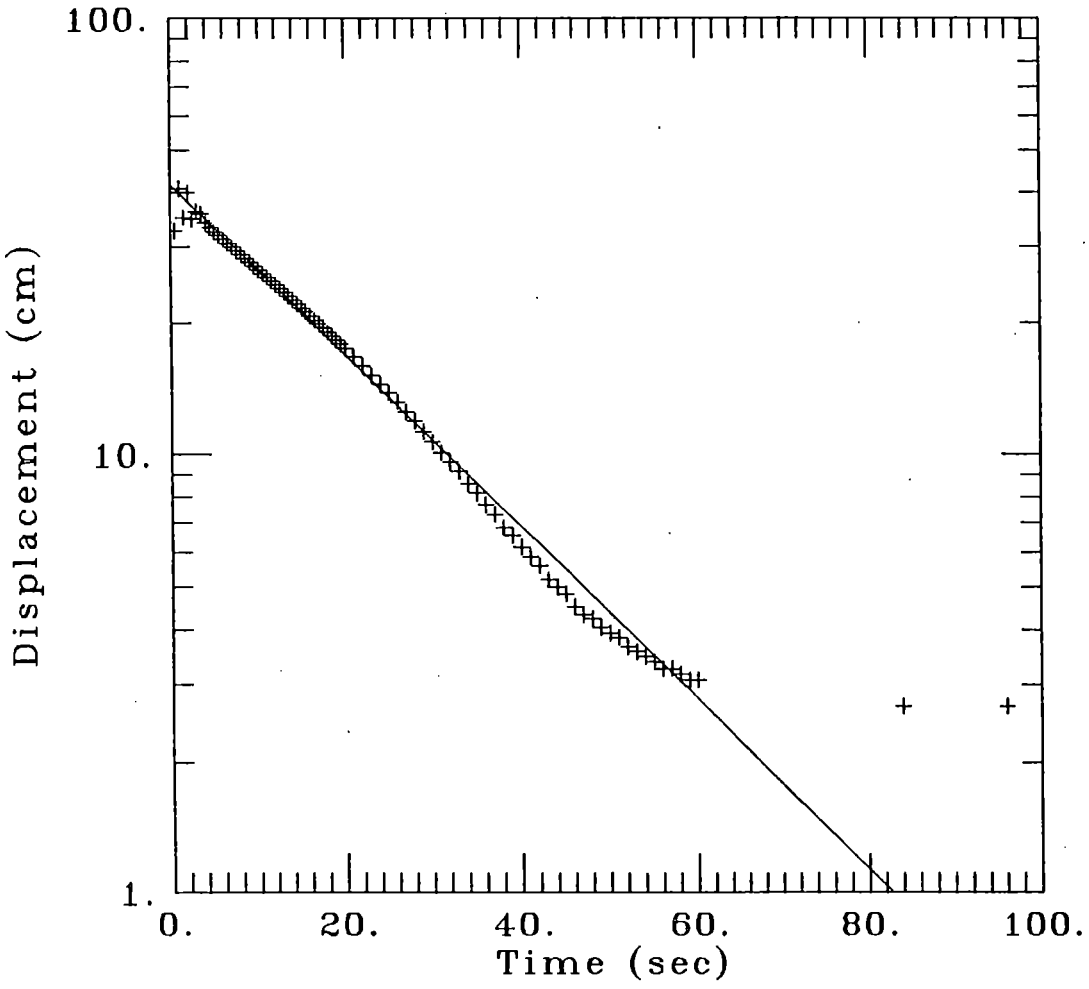
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm150r2.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
09-Dec-93
OBS. WELL:
OW-150 R2

ESTIMATED PARAMETERS:
K = 0.001433 cm/sec
y0 = 41.56 cm

TEST DATA:
H0 = 39.96 cm
rc = 2.438 cm
rw = 2.438 cm
L = 304.8 cm
b = 1.2192E+04 cm
H = 309.1 cm

```
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                    A Q T E S O L V   R E S U L T S
                             Version  1.10

12/15/93                                                               13:16:54

================================================================================
                                TEST DESCRIPTION

Data set........... fm150r3.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-150 R3

Knowns and Constants:
   No. of data points.................... 95
   Radius of well casing................. 2.438
   Radius of well........................ 2.438
   Aquifer saturated thickness........... 12190
   Well screen length.................... 304.8
   Static height of water in well........ 309.1
   Log(Re/Rw)............................ 3.261
   A, B, C...............................  4.948,  0.831,  0.000

================================================================================
                                ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)


================================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

             Estimate          Std.  Error
   K  =   1.3967E-003 +/-    1.0823E-005
   y0 =   4.1682E+001 +/-    1.7223E-001


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals.............. 52
   Number of estimated parameters.... 2
   Degrees of freedom............... 50
   Residual mean.................... -0.008621
   Residual standard deviation...... 0.4033
```

Residual variance..... 0.1627

Model Residuals:

Time	Observed	Calculated	Residual	Weight
1.998	40.173	38.181	1.9914	1
2.496	36.606	37.355	-0.7489	1
3	36.606	36.538	0.068731	1
3.498	35.265	35.747	-0.48207	1
3.996	34.29	34.974	-0.68421	1
4.5	33.741	34.209	-0.46733	1
4.998	33.071	33.469	-0.39795	1
5.496	32.278	32.745	-0.46682	1
6	31.608	32.028	-0.42034	1
6.498	31.12	31.335	-0.21525	1
6.996	30.663	30.658	0.0053409	1
7.5	30.754	29.987	0.76781	1
7.998	29.505	29.338	0.16674	1
8.496	28.529	28.703	-0.17403	1
9	27.95	28.075	-0.1249	1
9.498	27.402	27.468	-0.066266	1
9.996	26.822	26.874	-0.051253	1
10.5	26.243	26.285	-0.042444	1
10.998	25.847	25.717	0.13015	1
11.496	25.085	25.161	-0.075584	1
12	24.597	24.61	-0.01255	1
12.498	24.11	24.078	0.032087	1
12.996	23.652	23.557	0.09569	1
13.5	23.165	23.041	0.12362	1
13.998	22.677	22.543	0.13432	1
14.496	22.311	22.055	0.25617	1
15	21.732	21.572	0.15979	1
15.498	21.336	21.106	0.23017	1
15.996	20.848	20.649	0.19901	1
16.5	20.361	20.197	0.1633	1
16.998	19.995	19.76	0.23441	1
17.496	19.507	19.333	0.17416	1
18	19.111	18.91	0.20108	1
18.498	18.745	18.501	0.24434	1
18.996	18.258	18.101	0.15684	1
19.5	17.892	17.704	0.18726	1
19.998	17.496	17.322	0.17398	1
21	16.734	16.576	0.15806	1
21.996	16.063	15.867	0.19634	1
22.998	15.27	15.184	0.086836	1
24	14.6	14.53	0.069851	1
24.996	13.929	13.908	0.021069	1
25.998	13.259	13.31	-0.050813	1
27	12.68	12.737	-0.057025	1
27.996	12.101	12.192	-0.09111	1
28.998	11.43	11.667	-0.23688	1
30	10.973	11.165	-0.19189	1
30.996	10.394	10.687	-0.29292	1
31.998	9.906	10.227	-0.32091	1
33	9.4183	9.7867	-0.36837	1
33.996	8.9306	9.3679	-0.43725	1
34.998	8.5649	8.9647	-0.39978	1

```
==============================================================================================
                              RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

             Estimate
   K  =    1.3967E-003
   y0 =    4.1682E+001

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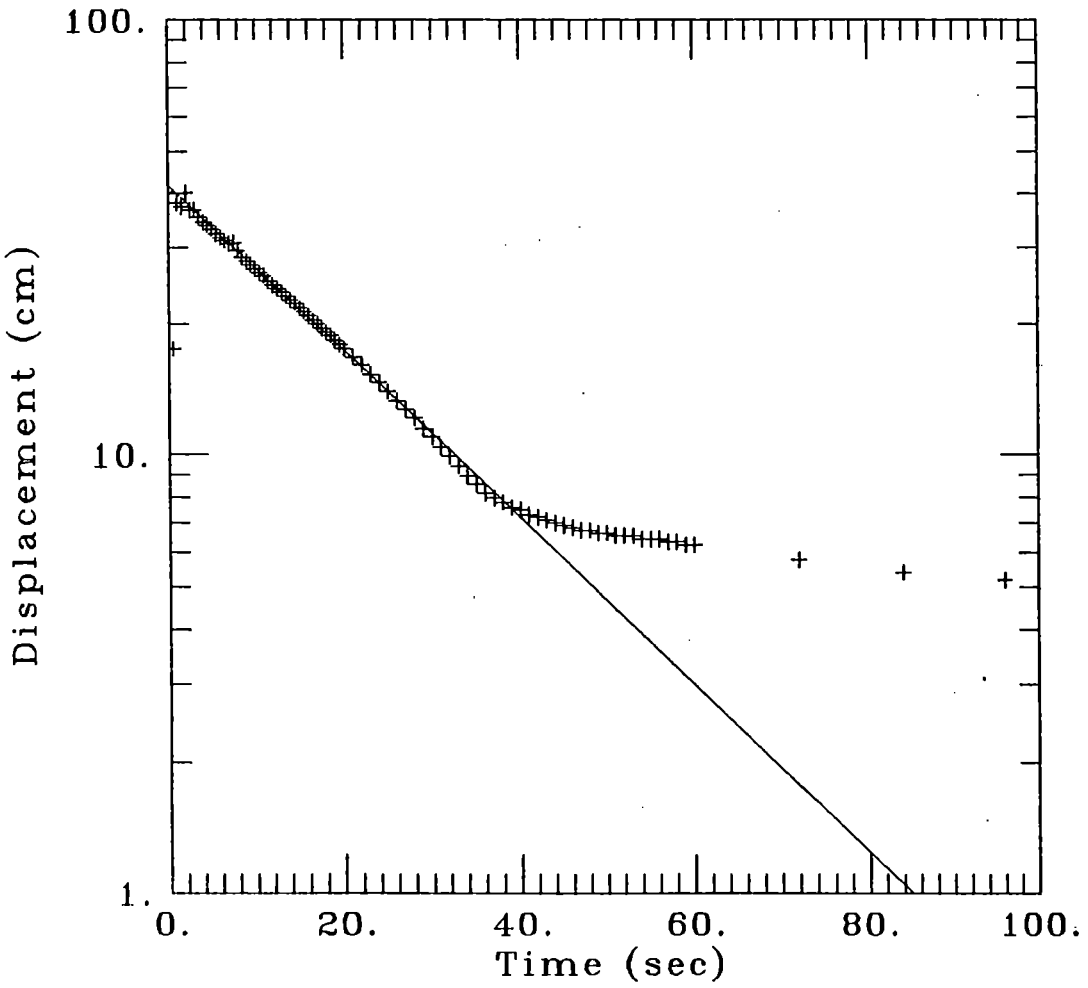
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm150r3.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
09-Dec-93
OBS. WELL:
OW-150 R3

ESTIMATED PARAMETERS:
K = 0.001397 cm/sec
y0 = 41.68 cm

TEST DATA:
H0 = 40.17 cm
rc = 2.438 cm
rw = 2.438 cm
L = 304.8 cm
b = 1.2192E+04 cm
H = 309.1 cm

```
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                       A Q T E S O L V   R E S U L T S
                                 Version 1.10

12/15/93                                                                13:41:40

 ===============================================================================
                                TEST DESCRIPTION

Data set........... fm151r1.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
Obs. well.......... OW-151 R1

Knowns and Constants:
   No. of data points.................. 93
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 168.9
   Static height of water in well...... 168.9
   Log(Re/Rw).......................... 2.759
   A, B, C.............................  3.643,  0.581,  0.000

================================================================================
                               ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

================================================================================
                      RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

          Estimate          Std. Error
   K  =   3.9365E-003 +/-   4.1227E-005
   y0 =   4.7635E+001 +/-   3.4551E-001

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals.............. 52
   Number of estimated parameters.... 2
   Degrees of freedom............... 50
   Residual mean.................... 0.1171
   Residual standard deviation....... 0.6466
```

Residual variance..... 0.418

Model Residuals:

Time	Observed	Calculated	Residual	Weight
1.5	44.531	42.182	2.3486	1
1.998	41.239	40.514	0.72575	1
2.496	39.228	38.911	0.31671	1
3	37.308	37.354	-0.046116	1
3.498	36.058	35.876	0.18184	1
3.996	33.955	34.457	-0.5021	1
4.5	32.918	33.078	-0.15929	1
4.998	31.577	31.769	-0.19192	1
5.496	30.206	30.512	-0.30648	1
6	28.986	29.291	-0.30474	1
6.498	27.92	28.133	-0.21284	1
6.996	26.579	27.02	-0.44109	1
7.5	25.512	25.938	-0.42643	1
7.998	24.354	24.912	-0.55861	1
8.496	23.409	23.927	-0.51802	1
9	22.342	22.969	-0.62716	1
9.498	21.885	22.06	-0.17575	1
9.996	21.092	21.188	-0.095566	1
10.5	19.842	20.34	-0.49769	1
10.998	18.989	19.535	-0.54605	1
11.496	18.136	18.762	-0.62672	1
12	17.465	18.011	-0.54632	1
12.498	16.794	17.299	-0.50439	1
12.996	16.124	16.615	-0.49064	1
13.5	15.545	15.95	-0.40477	1
13.998	14.966	15.319	-0.35295	1
14.496	14.387	14.713	-0.3261	1
15	14.112	14.124	-0.011548	1
15.498	13.32	13.565	-0.24508	1
15.996	13.045	13.028	0.016968	1
16.5	12.375	12.507	-0.13213	1
16.998	11.887	12.012	-0.12506	1
17.496	11.521	11.537	-0.015637	1
18	11.034	11.075	-0.041547	1
18.498	10.638	10.637	0.00033008	1
18.996	10.272	10.216	0.055356	1
19.5	9.967	9.8075	0.15947	1
19.998	9.6012	9.4195	0.18167	1
21	9.0221	8.6848	0.33729	1
21.996	8.443	8.0113	0.43167	1
22.998	7.8638	7.3864	0.47742	1
24	7.3762	6.8103	0.56588	1
24.996	7.3762	6.2821	1.094	1
25.998	6.5227	5.7921	0.73059	1
27	6.1265	5.3403	0.78613	1
27.996	5.7607	4.9262	0.83452	1
28.998	5.4559	4.542	0.91396	1
30	5.1816	4.1877	0.99391	1
30.996	4.8768	3.8629	1.0139	1
31.998	4.6025	3.5616	1.0409	1
33	4.4196	3.2838	1.1358	1
33.996	4.2062	3.0292	1.177	1

```
================================================================================
                       RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

           Estimate
   K  =   3.9365E-003
   y0 =   4.7635E+001

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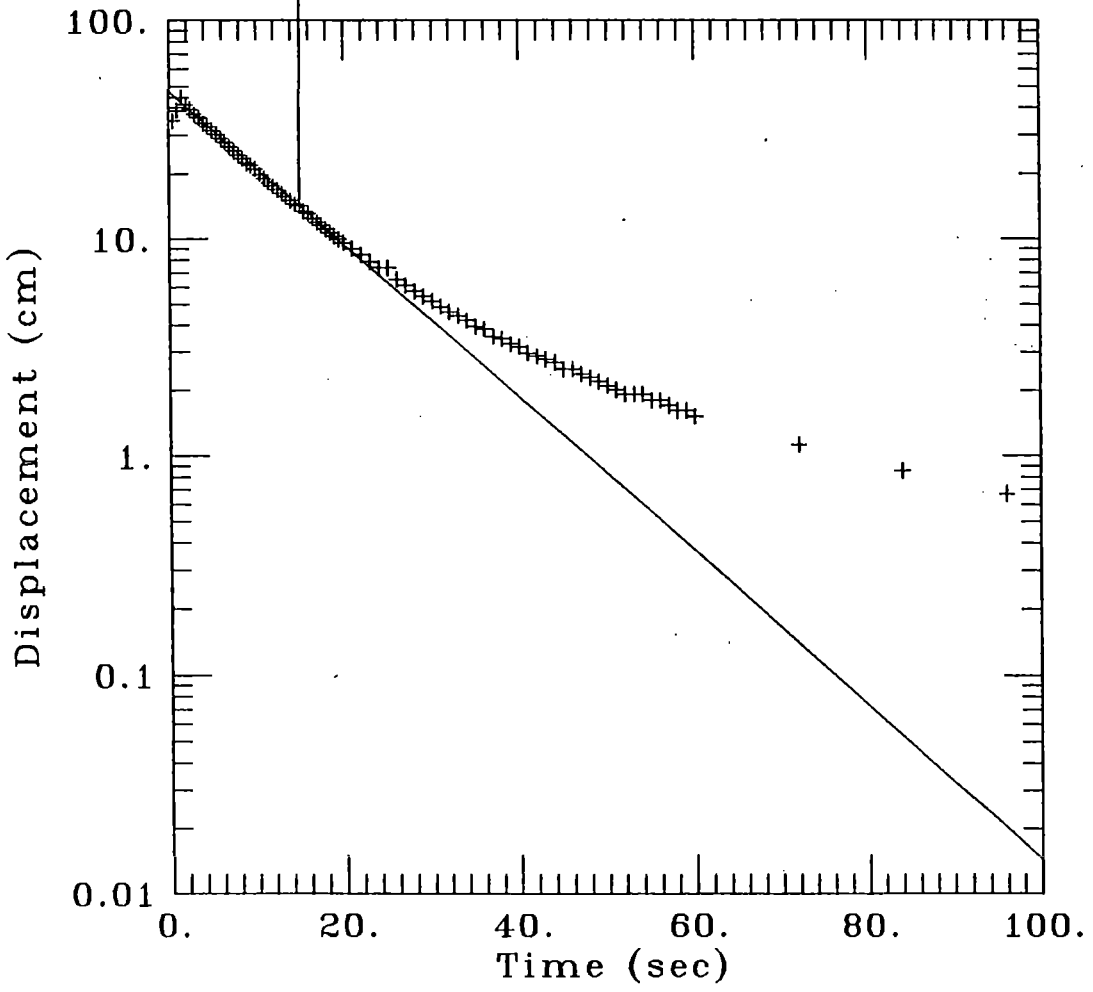
```

Rust E & I		Client: USACE
Project No.: 71842.200		Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm151r1.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
10-Dec-93
OBS. WELL:
OW-151 R1

ESTIMATED PARAMETERS:
K = 0.003936 cm/sec
y0 = 47.64 cm

TEST DATA:
H0 = 44.53 cm
rc = 2.438 cm
rw = 2.438 cm
L = 168.9 cm
b = 1.2192E+04 cm
H = 168.9 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                       A Q T E S O L V   R E S U L T S
                                 Version  1.10

12/15/93                                                                13:45:56

=================================================================================
                               TEST DESCRIPTION

Data set........... fm151r2.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
 lient............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
Obs. well.......... Ow-151 R2

Knowns and Constants:
   No. of data points.................. 99
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 168.9
   Static height of water in well...... 168.9
   Log(Re/Rw).......................... 2.759
   A, B, C.............................  3.643,  0.581,  0.000

=================================================================================
                               ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)


=================================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std.  Error
   K  =   3.7712E-003 +/-   6.3224E-005
   y0 =   4.9602E+001 +/-   5.6829E-001


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 53
   Number of estimated parameters.... 2
   Degrees of freedom................ 51
   Residual mean..................... 0.1721
   Residual standard deviation....... 1.092
```

Residual variance..... 1.192

Model Residuals:

Time	Observed	Calculated	Residual	Weight
1.5	48.158	44.149	4.0099	1
1.998	43.464	42.474	0.99046	1
2.496	41.057	40.863	0.19354	1
3	39.715	39.295	0.42062	1
3.498	37.49	37.804	-0.31401	1
3.996	35.966	36.371	-0.40412	1
4.5	34.32	34.975	-0.65425	1
4.998	33.101	33.648	-0.54689	1
5.496	32.217	32.372	-0.15457	1
6	30.51	31.13	-0.61911	1
6.498	29.352	29.949	-0.59663	1
6.996	28.103	28.813	-0.71038	1
7.5	27.249	27.707	-0.45806	1
7.998	26.182	26.656	-0.47396	1
8.496	25.024	25.645	-0.62115	1
9	24.079	24.661	-0.58184	1
9.498	23.287	23.726	-0.43895	1
9.996	22.068	22.826	-0.75826	1
10.5	21.275	21.95	-0.67475	1
10.998	20.422	21.117	-0.69566	1
11.496	19.66	20.316	-0.6567	1
12	18.898	19.537	-0.63902	1
12.498	18.227	18.796	-0.56858	1
12.996	17.556	18.083	-0.52624	1
13.5	16.977	17.389	-0.41139	1
13.998	16.49	16.729	-0.23954	1
14.496	15.819	16.095	-0.27557	1
15	15.331	15.477	-0.14559	1
15.498	14.661	14.89	-0.22912	1
15.996	14.173	14.325	-0.15203	1
16.5	13.716	13.775	-0.059473	1
16.998	13.045	13.253	-0.20754	1
17.496	12.832	12.75	0.08177	1
18	12.375	12.261	0.11389	1
18.498	11.979	11.796	0.1827	1
18.996	10.058	11.349	-1.2901	1
19.5	8.1382	10.913	-2.7749	1
19.998	11.674	10.499	1.1747	1
21	10.546	9.7132	0.83285	1
21.996	9.5707	8.9904	0.58034	1
22.998	9.205	8.3174	0.88752	1
24	8.5344	7.6949	0.83952	1
24.996	8.0467	7.1222	0.92449	1
25.998	7.559	6.5891	0.96991	1
27	7.3762	6.0959	1.2802	1
27.996	6.9799	5.6423	1.3376	1
28.998	6.6142	5.2199	1.3942	1
30	6.3094	4.8292	1.4801	1
30.996	6.035	4.4698	1.5652	1
31.998	5.7302	4.1353	1.595	1
33	5.4559	3.8257	1.6302	1
33.996	5.273	3.541	1.732	1
34.998	5.0597	3.276	1.7837	1

```
===============================================================================
                      RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

            Estimate
  K  =    3.7712E-003
  y0 =    4.9602E+001

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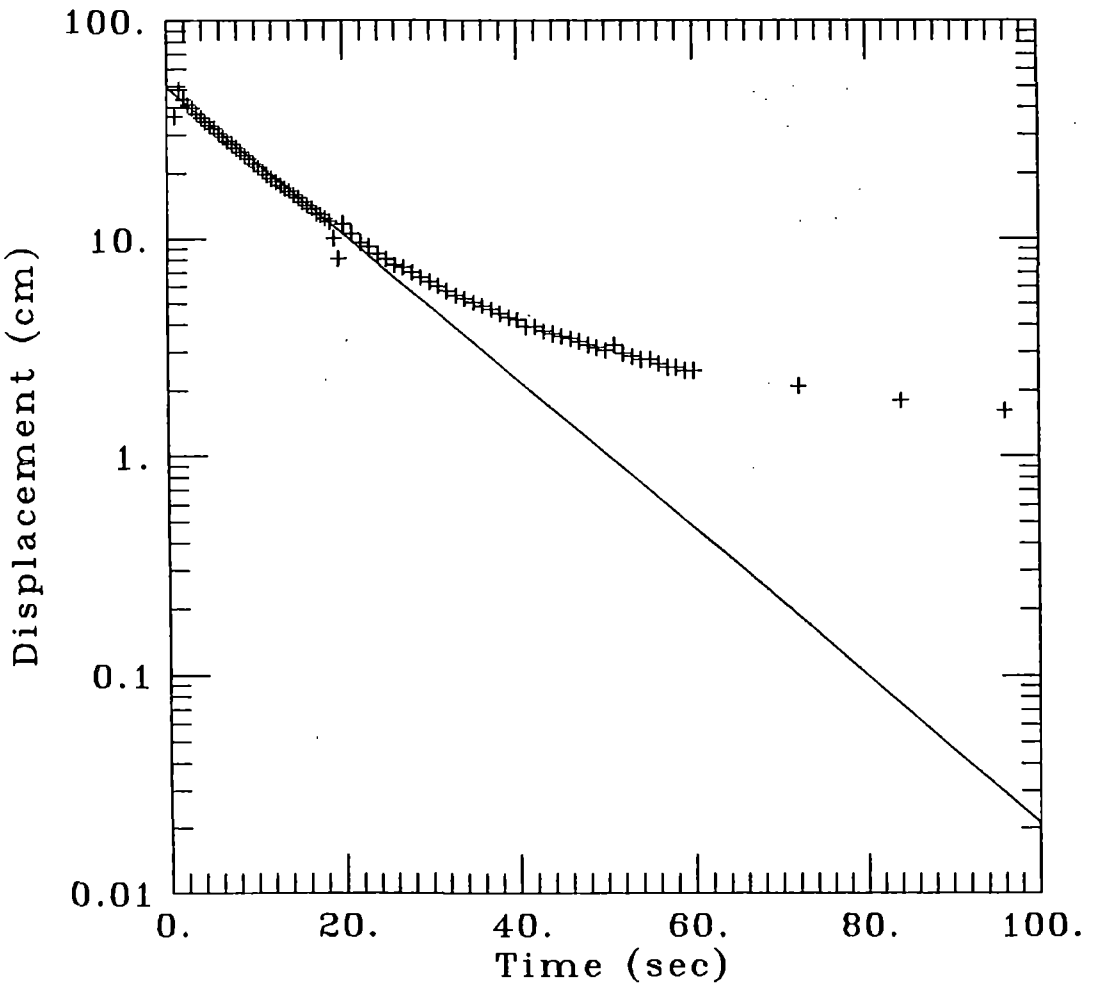
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm151r2.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
10-Dec-93
OBS. WELL:
Ow-151 R2

ESTIMATED PARAMETERS:
K = 0.003771 cm/sec
y0 = 49.6 cm

TEST DATA:
H0 = 48.16 cm
rc = 2.438 cm
rw = 2.438 cm
L = 168.9 cm
b = 1.2192E+04 cm
H = 168.9 cm

```
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                        A Q T E S O L V   R E S U L T S
                                  Version 1.10

12/15/93                                                                13:48:10

 ===============================================================================
                                TEST DESCRIPTION

 ata set........... fm151r3.dat
 ata set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
)bs. well.......... OW-151 R3

Knowns and Constants:
   No. of data points................... 88
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 168.9
   Static height of water in well...... 168.9
   Log(Re/Rw).......................... 2.759
   A, B, C.............................  3.643,  0.581,  0.000

 ===============================================================================
                                ANALYTICAL METHOD

3ouwer-Rice (Unconfined Aquifer Slug Test)

 ===============================================================================
                       RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

              Estimate           Std.  Error
   K  =    3.9339E-003 +/-    4.4753E-005
   y0 =    4.8386E+001 +/-    3.8215E-001


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 53
   Number of estimated parameters.... 2
   Degrees of freedom................ 51
   Residual mean..................... 0.1401
   Residual standard deviation....... 0.7171
```

Residual variance..... 0.5143

Model Residuals:

Time	Observed	Calculated	Residual	Weight
1.5	44.287	42.851	1.4366	1
1.998	42.459	41.157	1.3018	1
2.496	40.63	39.53	1.1001	1
3	38.527	37.949	0.5781	1
3.498	36.789	36.448	0.34094	1
3.996	34.869	35.008	-0.1384	1
4.5	33.437	33.607	-0.17069	1
4.998	32.004	32.279	-0.27467	1
5.496	30.45	31.003	-0.5531	1
6	29.322	29.763	-0.44078	1
6.498	27.981	28.586	-0.60531	1
6.996	26.822	27.456	-0.63348	1
7.5	25.756	26.358	-0.60207	1
7.998	24.597	25.316	-0.71832	1
8.496	23.744	24.315	-0.57097	1
9	22.677	23.342	-0.6652	1
9.498	21.732	22.42	-0.6873	1
9.996	20.879	21.533	-0.65444	1
10.5	20.086	20.672	-0.58561	1
10.998	19.324	19.855	-0.53039	1
11.496	18.379	19.07	-0.69037	1
12	17.8	18.307	-0.50671	1
12.498	16.368	17.583	-1.2155	1
12.996	16.368	16.888	-0.52044	1
13.5	15.88	16.213	-0.3326	1
13.998	15.21	15.572	-0.36224	1
14.496	14.63	14.956	-0.32577	1
15	14.143	14.358	-0.21521	1
15.498	13.655	13.79	-0.13529	1
15.996	13.198	13.245	-0.047322	1
16.5	13.198	12.715	0.48247	1
16.998	12.436	12.213	0.22314	1
17.496	11.948	11.73	0.21826	1
18	11.369	11.261	0.10833	1
18.498	10.973	10.816	0.15725	1
18.996	10.394	10.388	0.0056968	1
19.5	10.211	9.9725	0.23833	1
19.998	10.028	9.5782	0.44968	1
21	8.9611	8.8316	0.12951	1
21.996	8.6868	8.1471	0.53966	1
22.998	8.0162	7.5121	0.50417	1
24	7.4371	6.9265	0.51062	1
24.996	7.1323	6.3897	0.74264	1
25.998	6.6751	5.8916	0.78352	1
27	6.2789	5.4324	0.84653	1
27.996	6.096	5.0113	1.0847	1
28.998	5.5169	4.6207	0.89618	1
30	5.334	4.2605	1.0735	1
30.996	5.0292	3.9303	1.0989	1
31.998	4.7549	3.6239	1.1309	1
33	4.4501	3.3415	1.1086	1
33.996	4.3586	3.0825	1.2762	1
34.998	4.0843	2.8422	1.2421	1

```
==============================================================================
                      RESULTS FROM VISUAL CURVE MATCHING

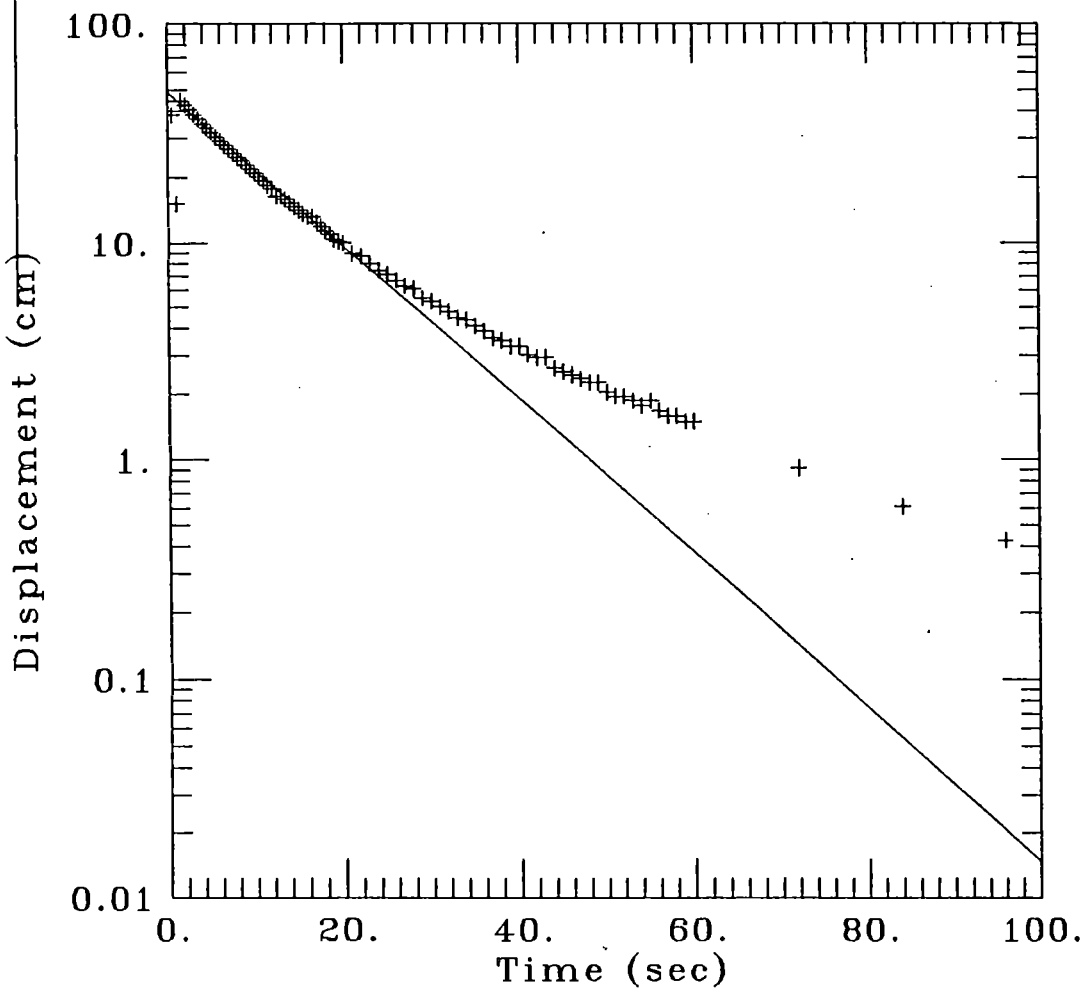
VISUAL MATCH PARAMETER ESTIMATES

          Estimate
  K  =   3.9339E-003
  y0 =   4.8386E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm151r3.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
10-Dec-93
OBS. WELL:
OW-151 R3

ESTIMATED PARAMETERS:
K = 0.003934 cm/sec
y0 = 48.39 cm

TEST DATA:
H0 = 44.29 cm
rc = 2.438 cm
rw = 2.438 cm
L = 168.9 cm
b = 1.2192E+04 cm
H = 168.9 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
                         A Q T E S O L V   R E S U L T S
                                   Version 1.10

12/15/93                                                                   13:57:55

   ==============================================================================
                                 TEST DESCRIPTION

 ata set........... fm152r1.dat
 ata set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
Obs. well.......... OW-152 R1

Knowns and Constants:
   No. of data points.................. 87
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 253.9
   Static height of water in well...... 253.9
   Log(Re/Rw).......................... 3.1
   A, B, C.............................  4.515,  0.737,  0.000

  ===============================================================================
                                 ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)


  ===============================================================================
                       RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

          Estimate          Std.  Error
   K  =   6.8233E-003 +/-   1.7801E-004
   y0 =   4.8488E+001 +/-   1.1069E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals.............. 38
   Number of estimated parameters.... 2
   Degrees of freedom............... 36
   Residual mean.................... 0.3257
   Residual standard deviation....... 1.114
```

```
    Residual variance................. 1.24

 Model Residuals:

      Time          Observed      Calculated      Residual         Weight
  ------------  ------------  ------------  ------------  ------------
             1.5         40.264         36.573         3.6911              1
           1.998         34.016         33.304        0.71144              1
           2.496         30.084         30.328       -0.24389              1
               3           26.7         27.586       -0.88548              1
           3.498         23.927          25.12        -1.1936              1
           3.996          21.61         22.875         -1.265              1
             4.5         19.599         20.807        -1.2087              1
           4.998         17.678         18.948        -1.2692              1
           5.496         16.063         17.254        -1.1912              1
               6         14.813         15.694       -0.88137              1
           6.498         13.472         14.292       -0.81952              1
           6.996         12.222         13.014       -0.79187              1
             7.5         11.339         11.838       -0.49926              1
           7.998         10.394          10.78       -0.38613              1
           8.496         9.6317         9.8164       -0.18468              1
               9         8.8392         8.9289      -0.089738              1
           9.498         7.9858         8.1309       -0.14515              1
           9.996         7.5895         7.4042        0.18532              1
            10.5         7.0409         6.7348        0.30603              1
          10.998         6.5532         6.1329        0.42028              1
          11.496         6.0655         5.5848        0.48074              1
              12         5.6693         5.0799        0.58937              1
          12.498          5.395         4.6259        0.76907              1
          12.996         4.8158         4.2124         0.6034              1
            13.5         4.8158         3.8316        0.98421              1
          13.998         4.4196         3.4892        0.93042              1
          14.496         4.2367         3.1773         1.0594              1
              15         3.9624         2.8901         1.0723              1
          15.498         3.6576         2.6318         1.0258              1
          15.996         3.4747         2.3966         1.0781              1
            16.5         3.0785         2.1799        0.89859              1
          16.998         3.1699         1.9851         1.1848              1
          17.496          2.987         1.8077         1.1793              1
              18          2.987         1.6442         1.3428              1
          18.498         2.6213         1.4973          1.124              1
          18.996         2.6213         1.3635         1.2578              1
            19.5         2.4994         1.2402         1.2592              1
          19.998         2.4079         1.1294         1.2785              1


================================================================================
                        RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

          Estimate
   K  =   6.8233E-003
   y0 =   4.8488E+001

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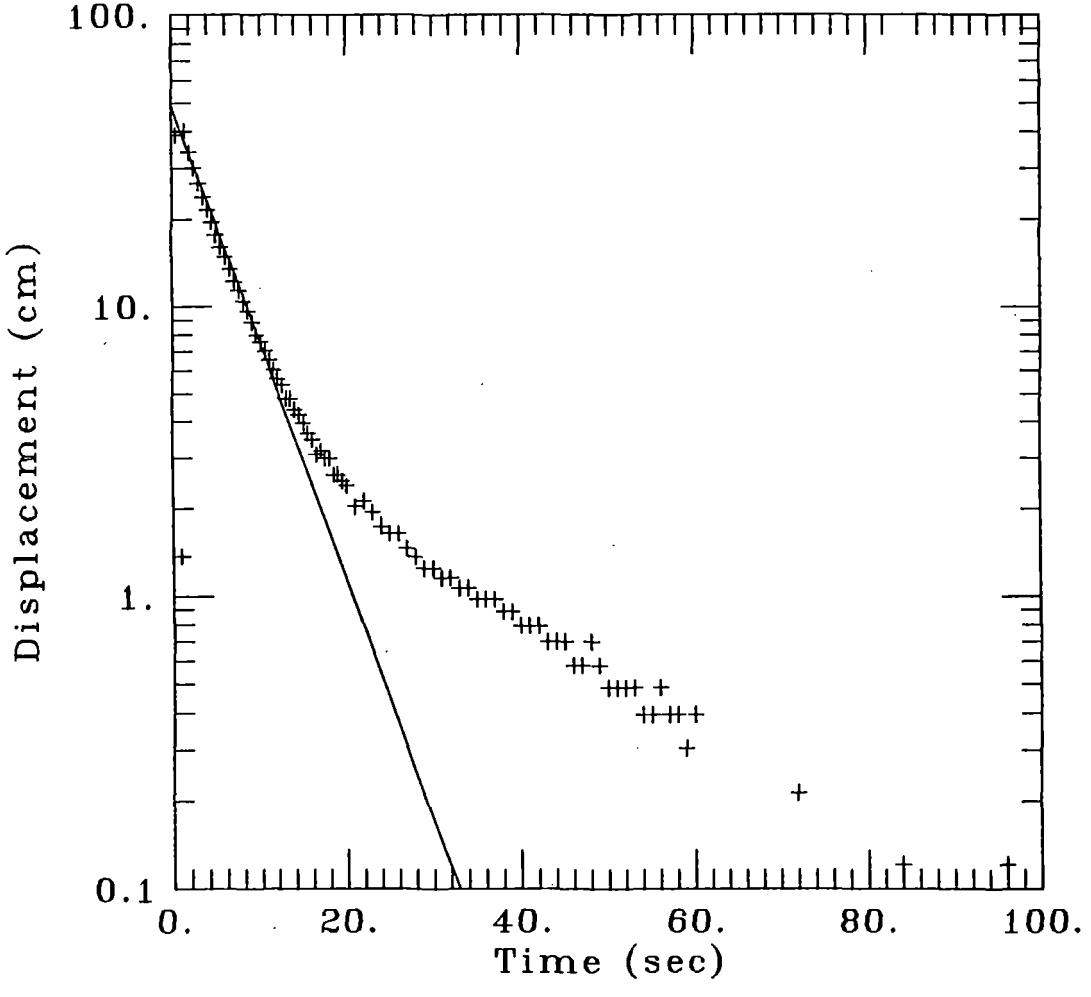
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm152r1.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10-Dec-93

OBS. WELL:
OW-152 R1

ESTIMATED PARAMETERS:
K = 0.006823 cm/sec
y0 = 48.49 cm

TEST DATA:
H0 = 40.26 cm
rc = 2.438 cm
rw = 2.438 cm
L = 253.9 cm
b = 1.2192E+04 cm
H = 253.9 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                     A Q T E S O L V   R E S U L T S
                              Version  1.10

12/15/93                                                                14:02:5

================================================================================
                              TEST DESCRIPTION

Data set........... fm152r2.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
Obs. well.......... Ow-152 R2

Knowns and Constants:
   No. of data points.................. 93
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 253.9
   Static height of water in well...... 253.9
   Log(Re/Rw).......................... 3.1
   A, B, C.............................  4.515,  0.737,  0.000

================================================================================
                              ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

================================================================================
                   RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std.  Error
   K  =   6.4210E-003 +/-   1.5552E-004
   y0 =   4.6623E+001 +/-   1.0562E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 39
   Number of estimated parameters.... 2
   Degrees of freedom................ 37
   Residual mean..................... 0.2869
   Residual standard deviation....... 0.946
```

```
   Residual variance................ 0.8949

   del Residuals:

      Time          Observed        Calculated       Residual          Weight
  ------------   ------------   ------------   ------------   ------------
         1.998         35.235          32.74         2.4944              1
         2.496         30.998         29.979         1.0189              1
             3         27.554         27.422        0.13205              1
         3.498          24.78         25.109       -0.32901              1
         3.996         22.281         22.992       -0.71079              1
           4.5         20.147          21.03       -0.88306              1
         4.998         18.227         19.257        -1.0297              1
         5.496          16.52         17.633        -1.1127              1
             6         15.057         16.129        -1.0714              1
         6.498         13.807         14.768       -0.96092              1
         6.996         12.558         13.523       -0.96512              1
           7.5         11.521         12.369       -0.84785              1
         7.998         10.638         11.326       -0.68861              1
         8.496         9.8755         10.371       -0.49543              1
             9         9.1135         9.4862       -0.37272              1
         9.498          8.443         8.6862       -0.24326              1
         9.996         7.8638         7.9537      -0.089833              1
          10.5         7.0104         7.2752       -0.26478              1
        10.998         6.7056         6.6616       0.043973              1
        11.496         6.3398         6.0998        0.24002              1
            12         5.8522         5.5795        0.27269              1
        12.498         5.5474         5.1089        0.43843              1
        12.996         5.1816         4.6781        0.50353              1
          13.5         4.8768          4.279         0.5978              1
        13.998         4.6025         3.9181        0.68435              1
        14.496         4.4196         3.5877         0.8319              1
            15         4.1148         3.2816        0.83316              1
        15.498         3.8405         3.0049        0.83561              1
        15.996         3.6271         2.7515        0.87565              1
          16.5         3.5357         2.5168         1.0189              1
        16.998         3.3528         2.3045         1.0483              1
        17.496         3.1699         2.1102         1.0598              1
            18         3.0785         1.9301         1.1483              1
        18.498         2.9566         1.7674         1.1892              1
        18.996         2.7737         1.6183         1.1554              1
          19.5         2.6822         1.4803          1.202              1
        19.998         2.5908         1.3554         1.2354              1
            21          2.286         1.1352         1.1508              1
        21.996         2.1946        0.95184         1.2427              1

 ================================================================================
                       RESULTS FROM VISUAL CURVE MATCHING

 ISUAL MATCH PARAMETER ESTIMATES

            Estimate
       =    6.4210E-003
    y0 =    4.6623E+001

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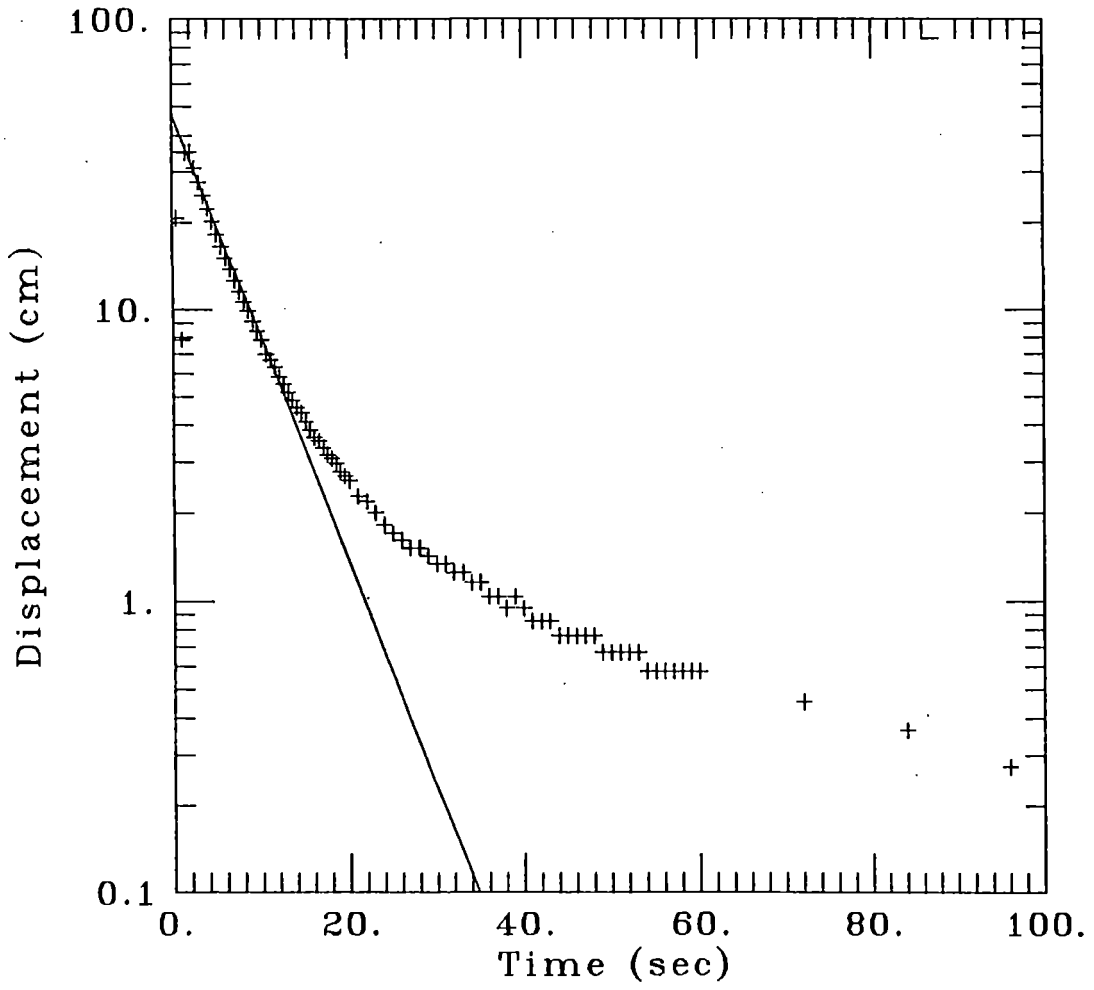
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm152r2.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
10-Dec-93
OBS. WELL:
Ow-152 R2

ESTIMATED PARAMETERS:
K = 0.006421 cm/sec
y0 = 46.62 cm

TEST DATA:
H0 = 35.23 cm
rc = 2.438 cm
rw = 2.438 cm
L = 253.9 cm
b = 1.2192E+04 cm
H = 253.9 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                      A Q T E S O L V   R E S U L T S
                               Version 1.10

12/15/93                                                                14:06:43

 ===============================================================================
                                TEST DESCRIPTION

 ata set........... fm152r3.dat
 ata set title..... Fort McCoy Mod 5
Company............ Rust E & I
roject............ 71842.200
lient............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
bs. well.......... Ow-152 R3

Knowns and Constants:
   No. of data points.................. 85
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 253.9
   Static height of water in well...... 253.9
   Log(Re/Rw).......................... 3.1
   A, B, C.............................  4.515,  0.737,  0.000

================================================================================
                               ANALYTICAL METHOD

ouwer-Rice (Unconfined Aquifer Slug Test)


================================================================================
                   RESULTS FROM STATISTICAL CURVE MATCHING


TATISTICAL MATCH PARAMETER ESTIMATES

             Estimate          Std. Error
   K  =   6.1111E-003 +/-   1.6331E-004
   y0 =   4.0999E+001 +/-   7.8931E-001


NALYSIS OF MODEL RESIDUALS

residual = calculated - observed
eighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals.............. 40
   Number of estimated parameters.... 2
   Degrees of freedom............... 38
   Residual mean.................... 0.1429
   Residual standard deviation....... 1.23
```

Residual variance..... 1.514

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.498	33.619	37.702	-4.0826	1
0.996	35.052	34.669	0.38286	1
1.5	36.119	31.848	4.2704	1
1.998	31.608	29.287	2.321	1
2.496	28.133	26.931	1.2019	1
3	25.177	24.74	0.43651	1
3.498	22.586	22.75	-0.16439	1
3.996	20.361	20.92	-0.55964	1
4.5	18.623	19.218	-0.59484	1
4.998	16.703	17.672	-0.96938	1
5.496	15.271	16.251	-0.98044	1
6	13.929	14.929	-0.99934	1
6.498	12.68	13.728	-1.0483	1
6.996	11.826	12.624	-0.7976	1
7.5	10.759	11.597	-0.83732	1
7.998	9.9974	10.664	-0.66652	1
8.496	9.144	9.8062	-0.66223	1
9	8.3515	9.0084	-0.65686	1
9.498	7.9858	8.2838	-0.29805	1
9.996	7.4066	7.6175	-0.21088	1
10.5	6.919	6.9978	-0.078793	1
10.998	6.5227	6.4349	0.087815	1
11.496	5.8522	5.9173	-0.065168	1
12	5.5778	5.4359	0.14195	1
12.498	5.1816	4.9987	0.18294	1
12.996	4.9073	4.5966	0.31067	1
13.5	4.511	4.2226	0.28842	1
13.998	4.3282	3.883	0.44517	1
14.496	4.0538	3.5707	0.48317	1
15	3.8405	3.2802	0.56033	1
15.498	3.6576	3.0163	0.64128	1
15.996	3.4747	2.7737	0.70101	1
16.5	3.2614	2.548	0.71332	1
16.998	3.0785	2.3431	0.73539	1
17.496	2.987	2.1546	0.83241	1
18	2.8956	1.9793	0.91627	1
18.498	2.6822	1.8201	0.86212	1
18.996	2.5908	1.6737	0.91707	1
19.5	2.4994	1.5376	0.96181	1
19.998	2.4079	1.4139	0.99404	1

==========

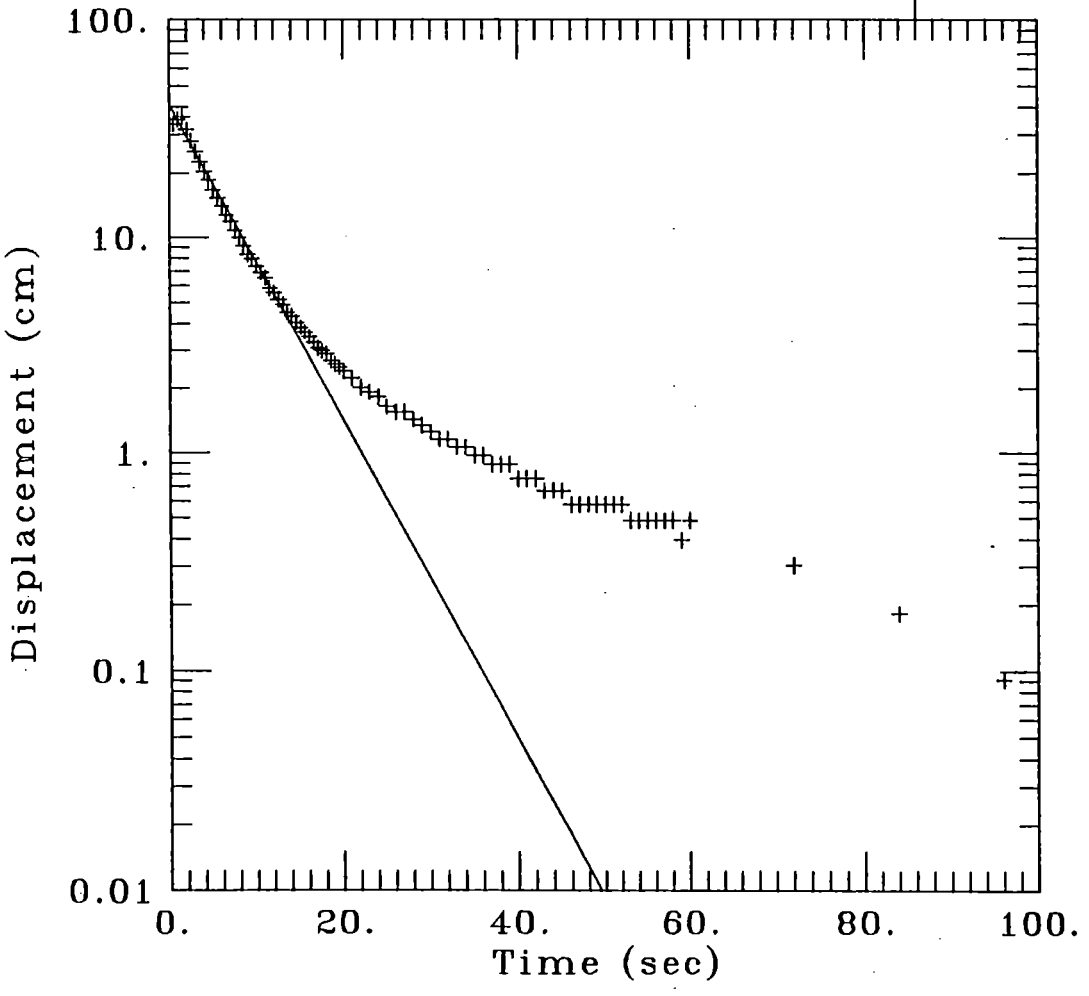
RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	6.1111E-003
y0 =	4.0999E+001

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm152r3.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10-Dec-93

OBS. WELL:
Ow-152 R3

ESTIMATED PARAMETERS:
K = 0.006111 cm/sec
y0 = 41. cm

TEST DATA:
H0 = 35.23 cm
rc = 2.438 cm
rw = 2.438 cm
L = 253.9 cm
b = 1.2192E+04 cm
H = 253.9 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                          A Q T E S O L V   R E S U L T S
                                    Version  1.10

12/16/93                                                                        14:09:0

=========================================================================================
                                  TEST DESCRIPTION

Data set........... fm154r1.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
Obs. well.......... Ow-154 R1

Knowns and Constants:
   No. of data points.................. 81
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 207.6
   Static height of water in well...... 207.6
   Log(Re/Rw).......................... 2.931
   A, B, C.............................  4.065,  0.652,  0.000

=========================================================================================
                                  ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

=========================================================================================
                        RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std. Error
   K  =   2.8122E-002 +/-   4.6442E-004
   y0 =   5.6165E+001 +/-   1.0390E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 13
   Number of estimated parameters.... 2
   Degrees of freedom................ 11
   Residual mean..................... 0.1283
   Residual standard deviation....... 0.327
```

```
  Residual variance................ 0.107

 del Residuals:

      Time          Observed       Calculated       Residual          Weight
  -------------  -------------  -------------  -------------  -------------
          0.996         29.169         28.819        0.35031              1
            1.5          20.33         20.561       -0.23061              1
          1.998         14.387         14.728       -0.34147              1
          2.496         10.333          10.55       -0.21727              1
              3         7.3762         7.5268       -0.15065              1
          3.498         5.3645         5.3916      -0.027108              1
          3.996         4.0234         3.8621        0.16127              1
            4.5         2.9566         2.7554        0.20118              1
          4.998          2.286         1.9737        0.31227              1
          5.496         1.7983         1.4138         0.3845              1
              6         1.4021         1.0087         0.3934              1
          6.498         1.1278        0.72253        0.40523              1
          6.996        0.94488        0.51756        0.42732              1

===============================================================================
                    RESULTS FROM VISUAL CURVE MATCHING

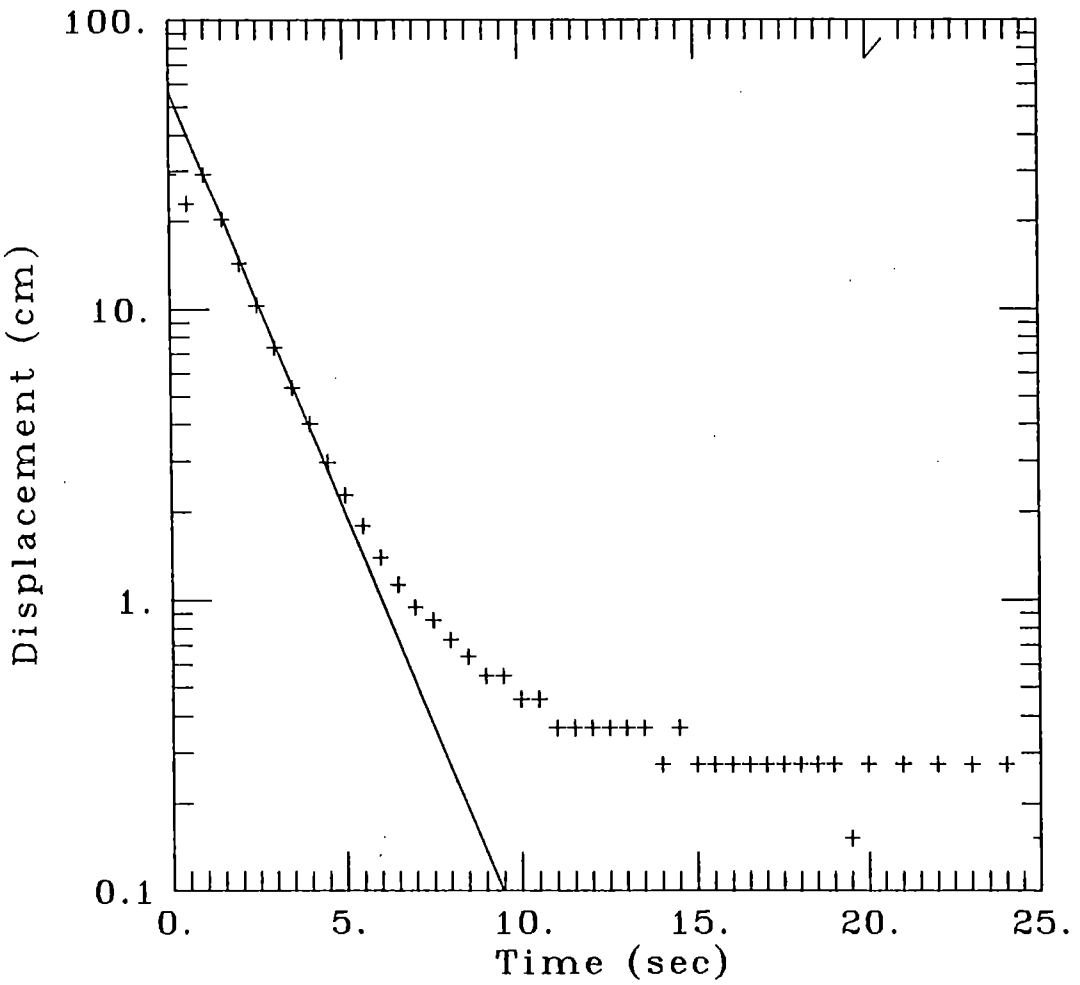
ISUAL MATCH PARAMETER ESTIMATES

          Estimate
  K  =   2.8122E-002
  y0 =   5.6165E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm154r1.dat
12/16/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
10-Dec-93
OBS. WELL:
Ow-154 R1

ESTIMATED PARAMETERS:
K = 0.02812 cm/sec
y0 = 56.17 cm

TEST DATA:
H0 = 29.17 cm
rc = 2.438 cm
rw = 2.438 cm
L = 207.6 cm
b = 1.2192E+04 cm
H = 207.6 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                      A Q T E S O L V   R E S U L T S
                               Version 1.10

12/15/93                                                                  14:25:59

==============================================================================
                             TEST DESCRIPTION

Data set........... fm154r2.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 10-Dec-93
 bs. well.......... OW-154 R2

Knowns and Constants:
   No. of data points.................. 81
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 207.6
   Static height of water in well...... 207.6
   Log(Re/Rw).......................... 2.931
   A, B, C.............................  4.065,  0.652,  0.000

==============================================================================
                            ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)


==============================================================================
                  RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

            Estimate          Std.  Error
   K  =    2.8122E-002 +/-   4.6436E-004
   y0 =    5.6164E+001 +/-   1.0389E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
 eighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 13
   Number of estimated parameters.... 2
   Degrees of freedom................ 11
   Residual mean..................... 0.1283
   Residual standard deviation....... 0.327
```

```
   Residual variance................ 0.1069

Model Residuals:

     Time         Observed      Calculated       Residual         Weight
 -------------  -------------  -------------  -------------  -------------
        0.996         29.169         28.819        0.35021              1
          1.5          20.33         20.561       -0.23046              1
        1.998         14.387         14.728       -0.34142              1
        2.496         10.333          10.55       -0.21727              1
            3         7.3762         7.5268       -0.15068              1
        3.498         5.3645         5.3916      -0.027147              1
        3.996         4.0234         3.8621        0.16123              1
          4.5         2.9566         2.7554        0.20114              1
        4.998          2.286         1.9738        0.31224              1
        5.496         1.7983         1.4138        0.38447              1
            6         1.4021         1.0087        0.39338              1
        6.498         1.1278        0.72256         0.4052              1
        6.996        0.94488        0.51758         0.4273              1


===============================================================================
                       RESULTS FROM VISUAL CURVE MATCHING

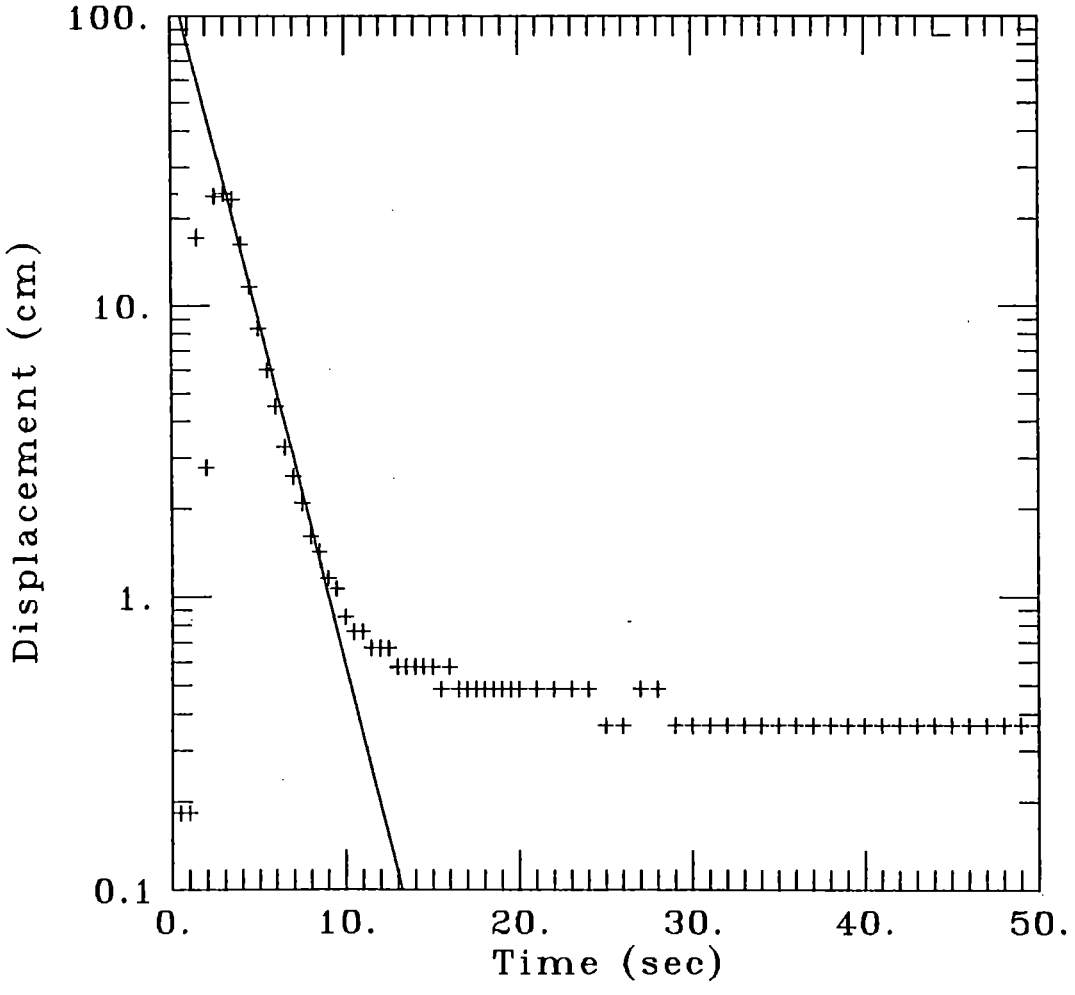

VISUAL MATCH PARAMETER ESTIMATES

           Estimate
   K  =   2.8122E-002
   y0 =   5.6164E+001


<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm154r3.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10-Dec-93

OBS. WELL:
Ow-154 R3

ESTIMATED PARAMETERS:
K = 0.02293 cm/sec
y0 = 136.4 cm

TEST DATA:
H0 = 24.29 cm
rc = 2.438 cm
rw = 2.438 cm
L = 207.6 cm
b = 1.2192E+04 cm
H = 207.6 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                        A Q T E S O L V   R E S U L T S
                                 Version  1.10

12/15/93                                                                 14:36:5

================================================================================
                                TEST DESCRIPTION

Data set........... fm155r1.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-155 R1

Knowns and Constants:
   No. of data points.................. 13
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 253.9
   Static height of water in well...... 253.9
   Log(Re/Rw).......................... 3.1
   A, B, C.............................  4.515,  0.737,  0.000

================================================================================
                               ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)


================================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std. Error
   K  =   2.7276E-002 +/-   1.2722E-003
   y0 =   3.6689E+001 +/-   1.9220E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 6
   Number of estimated parameters.... 2
   Degrees of freedom................ 4
   Residual mean..................... 0.06095
   Residual standard deviation....... 0.4543
```

```
  Residual variance................. 0.2064

del Residuals:

    Time          Observed        Calculated       Residual         Weight
 -------------  -------------  -------------  -------------  -------------
         0.996         17.709         17.357        0.35247              1
           1.5         11.369         11.884       -0.51513              1
         1.998         7.8029         8.1739       -0.37102              1
         2.496         5.8826          5.622        0.26057              1
             3         4.0538         3.8494        0.20436              1
         3.996         2.2555         1.8211        0.43445              1

================================================================================
                        RESULTS FROM VISUAL CURVE MATCHING

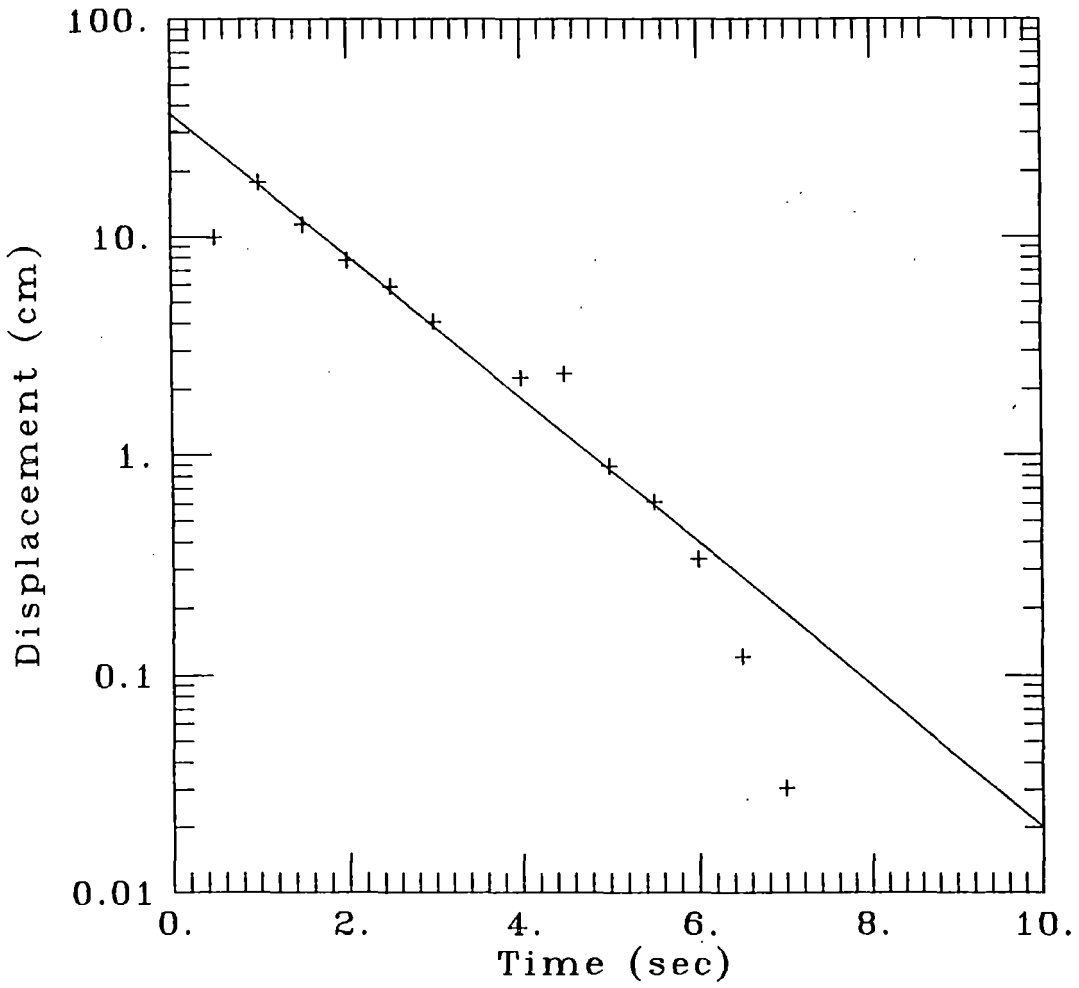
ISUAL MATCH PARAMETER ESTIMATES

           Estimate
  K  =   2.7276E-002
  y0 =   3.6689E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm155r1.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
OW-155 R1

ESTIMATED PARAMETERS:
K = 0.02728 cm/sec
y0 = 36.69 cm

TEST DATA:
H0 = 30.48 cm
rc = 2.438 cm
rw = 2.438 cm
L = 253.9 cm
b = 1.2192E+04 cm
H = 253.9 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                        A Q T E S O L V   R E S U L T S
                                 Version 1.10

12/15/93                                                              14:41:36

================================================================================
                               TEST DESCRIPTION

ata set........... fm155r2.dat
ata set title..... Fort McCoy Mod 5
Company........... Rust E & I
roject........... 71842.200
lient............ USACE
Location.......... Fort McCoy
Test date......... 09-Dec-93
bs. well......... OW-155 R2

Knowns and Constants:
   No. of data points.................. 79
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 253.9
   Static height of water in well...... 253.9
   Log(Re/Rw).......................... 3.1
   A, B, C.............................  4.515,  0.737,  0.000

================================================================================
                               ANALYTICAL METHOD

ouwer-Rice (Unconfined Aquifer Slug Test)

================================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING

TATISTICAL MATCH PARAMETER ESTIMATES

          Estimate          Std. Error
  K  =   1.9831E-002 +/-   8.0481E-004
  y0 =   2.0024E+002 +/-   1.8748E+001

NALYSIS OF MODEL RESIDUALS

residual = calculated - observed
eighted residual = residual * weight

Weighted Residual Statistics:
  Number of residuals.............. 14
  Number of estimated parameters.... 2
  Degrees of freedom............... 12
  Residual mean.................... 0.2112
  Residual standard deviation...... 0.8771
```

```
   Residual variance................ 0.7693

Model Residuals:

     Time          Observed       Calculated       Residual          Weight
 ------------  -------------  -------------  -------------  -------------
        3.498         30.175         29.614          0.561              1
        3.996         22.891         22.559        0.33107              1
          4.5         16.063         17.129         -1.066              1
        4.998         12.588         13.048        -0.4603              1
        5.496         8.8697         9.9401        -1.0704              1
            6         8.1991         7.5473         0.6518              1
        6.498         5.5778         5.7494       -0.17154              1
        6.996         4.4501         4.3797        0.07033              1
          7.5         3.2918         3.3255      -0.033635              1
        7.998         2.6213         2.5333       0.088008              1
        8.496         3.9624         1.9298         2.0326              1
            9         2.6213         1.4653          1.156              1
        9.498         1.5545         1.1162        0.43828              1
        9.996         1.2802         0.8503        0.42986              1

================================================================================
                         RESULTS FROM VISUAL CURVE MATCHING

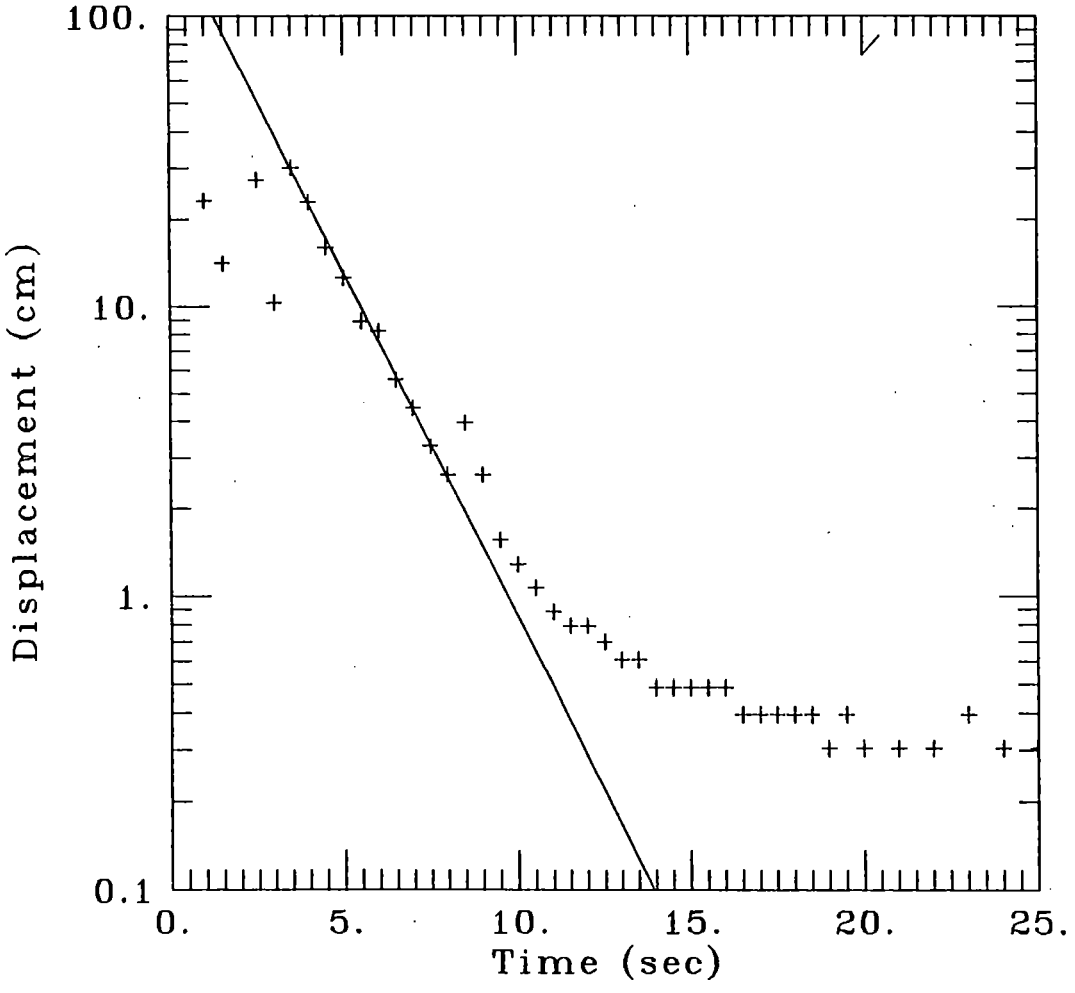
VISUAL MATCH PARAMETER ESTIMATES

           Estimate
   K  =   1.9831E-002
   y0 =   2.0024E+002

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm155r2.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
OW-155 R2

ESTIMATED PARAMETERS:
K = 0.01983 cm/sec
y0 = 200.2 cm

TEST DATA:
H0 = 30.18 cm
rc = 2.438 cm
rw = 2.438 cm
L = 253.9 cm
b = 1.2192E+04 cm
H = 253.9 cm

```
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                    A Q T E S O L V   R E S U L T S
                             Version  1.10

12/15/93                                                              14:47:2

===============================================================================
                            TEST DESCRIPTION

Data set........... fm155r3.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-155 R3

Knowns and Constants:
   No. of data points................... 19
   Radius of well casing................ 2.475
   Radius of well....................... 2.475
   Aquifer saturated thickness.......... 12370
   Well screen length................... 257.7
   Static height of water in well....... 257.7
   Log(Re/Rw)........................... 3.1
   A, B, C..............................  4.515,  0.737,  0.000

===============================================================================
                            ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)


===============================================================================
                  RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std.  Error
   K  =   2.3363E-002 +/-   5.0905E-004
   y0 =   1.5635E+002 +/-   6.7473E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 17
   Number of estimated parameters.... 2
   Degrees of freedom................ 15
   Residual mean..................... 0.09075
   Residual standard deviation....... 0.4891
```

```
Residual variance................ 0.2392

del Residuals:

     Time          Observed       Calculated       Residual        Weight
------------    ------------    ------------    ------------    ------------
       2.496          32.827          32.108         0.71932               1
           3          22.738          23.323        -0.58506               1
       3.498          16.307          17.007        -0.69982               1
       3.996          11.887          12.401        -0.51359               1
         4.5           9.205           9.008         0.19697               1
       4.998          6.8885          6.5684         0.32009               1
       5.496          5.0902          4.7895         0.30066               1
           6          3.7186          3.4791         0.23944               1
       6.498          2.7737          2.5369          0.2368               1
       6.996          2.0117          1.8498         0.16185               1
         7.5          2.5908          1.3437          1.2471               1
       7.998          1.1278         0.97981         0.14795               1
       8.496           0.762         0.71445         0.04755               1
           9          0.4572         0.51898        -0.06178               1
       9.498         0.36576         0.37843       -0.012667               1
       9.996         0.18288         0.27594       -0.093059               1
        10.5         0.09144         0.20044          -0.109               1

================================================================================
                       RESULTS FROM VISUAL CURVE MATCHING

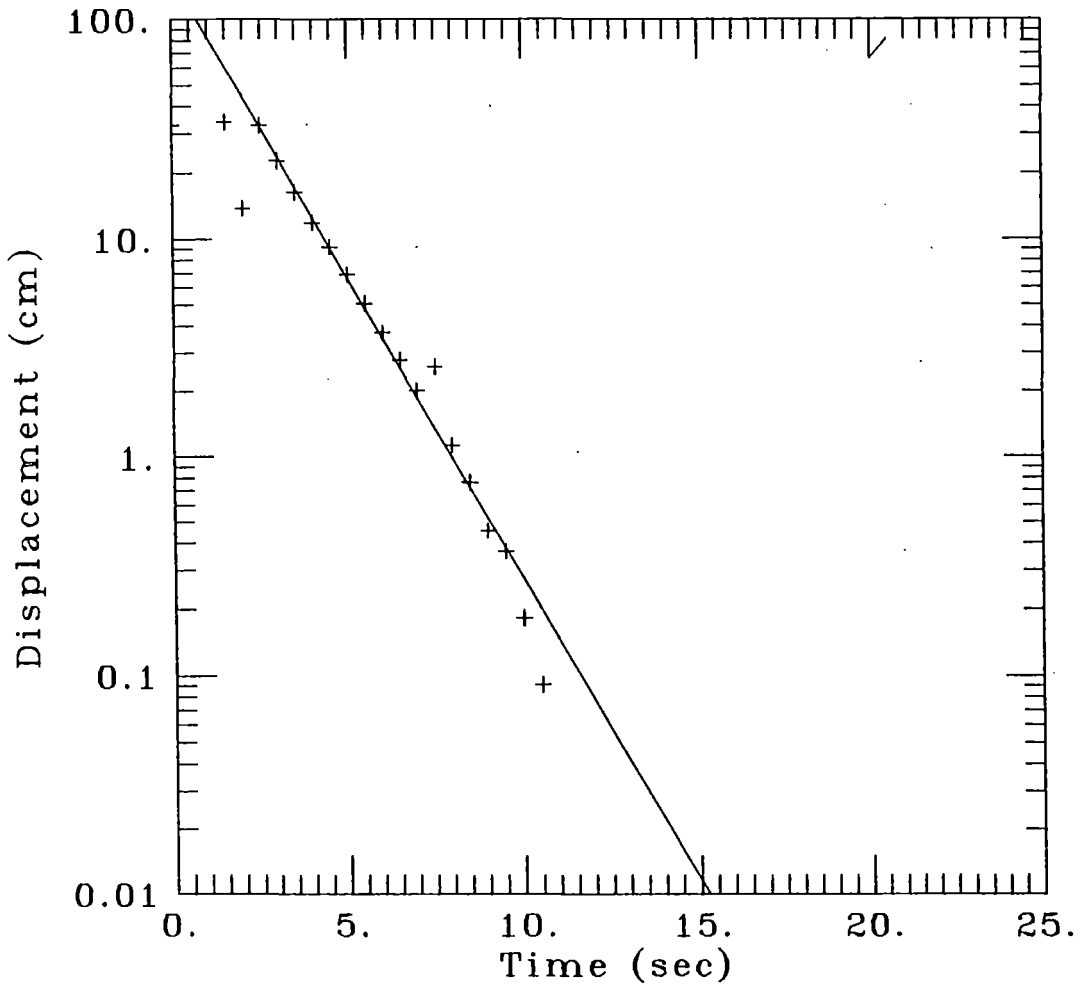
VISUAL MATCH PARAMETER ESTIMATES

          Estimate
 K  =    2.3363E-002
 y0 =    1.5635E+002

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm155r3.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
09-Dec-93
OBS. WELL:
OW-155 R3

ESTIMATED PARAMETERS:
K = 0.02336 cm/sec
y0 = 156.4 cm

TEST DATA:
H0 = 32.83 cm
rc = 2.475 cm
rw = 2.475 cm
L = 257.7 cm
b = 1.2375E+04 cm
H = 257.7 cm

```
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                         A Q T E S O L V   R E S U L T S
                                 Version  1.10

2/15/93                                                                14:54:59

===============================================================================
                                TEST DESCRIPTION

 ata set........... fm156r1.dat
 ata set title..... Fort McCoy Mod 5
Company............ Rust E & I
 roject............ 71842.200
 lient............. USACE
Location........... Fort McCoy
 est date.......... 09-Dec-93
 bs. well.......... Ow-156 R1

Knowns and Constants:
   No. of data points.................. 51
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 191.1
   Static height of water in well...... 191.1
   Log(Re/Rw).......................... 2.862
   A, B, C.............................  3.891,  0.621,  0.000

===============================================================================
                                ANALYTICAL METHOD

ouwer-Rice (Unconfined Aquifer Slug Test)


===============================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING


 TATISTICAL MATCH PARAMETER ESTIMATES

           Estimate         Std.  Error
   K  =   2.3496E-002 +/-   6.2306E-004
   y0 =   1.0649E+002 +/-   4.2401E+000


 NALYSIS OF MODEL RESIDUALS

residual = calculated - observed
 eighted residual = residual * weight

Weighted Residual Statistics:
   umber of residuals............... 17
   umber of estimated parameters.... 2
   Degrees of freedom............... 15
   Residual mean.................... 0.1322
   Residual standard deviation...... 0.741
```

```
   Residual variance................ 0.5491

Model Residuals:

     Time          Observed       Calculated       Residual         Weight
 ------------   ------------   ------------   ------------   ------------
        1.998         38.588         37.099         1.4882              1
        2.496         26.761         28.525        -1.7635              1
            3         20.818         21.863         -1.045              1
        3.498         17.465          16.81        0.65517              1
        3.996         12.863         12.925       -0.06217              1
          4.5         10.272         9.9061        0.36564              1
        4.998         7.3762         7.6166       -0.24043              1
        5.496         6.1265         5.8562        0.27025              1
            6         4.6025         4.4885        0.11399              1
        6.498         3.6271         3.4511        0.17602              1
        6.996         2.6822         2.6535        0.02877              1
          7.5         2.7737         2.0337        0.73994              1
        7.998         2.0117         1.5637        0.44798              1
        8.496         1.6154         1.2023        0.41315              1
            9         1.1278        0.92149        0.20627              1
        9.498        0.85344        0.70852        0.14492              1
        9.996        0.85344        0.54476        0.30868              1

================================================================================
                      RESULTS FROM VISUAL CURVE MATCHING

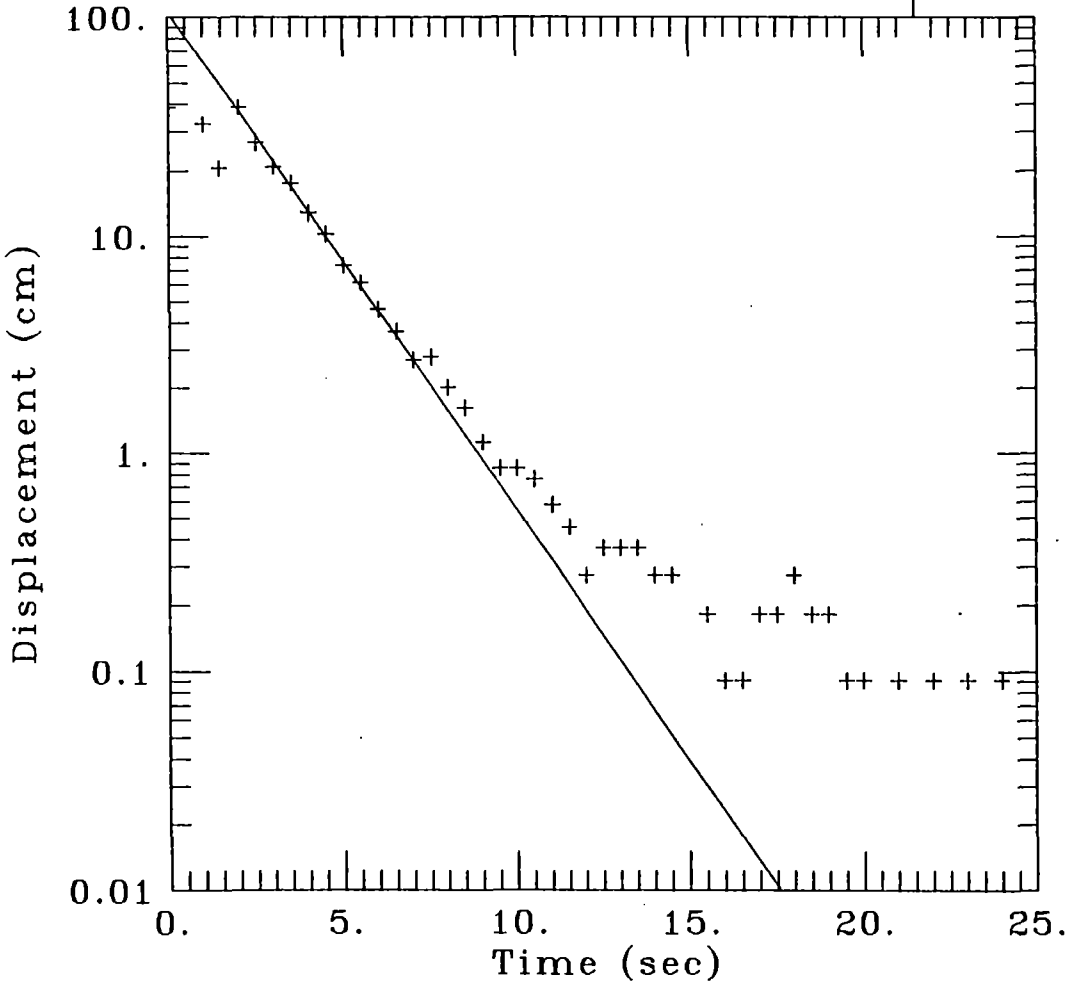
VISUAL MATCH PARAMETER ESTIMATES

          Estimate
  K  =   2.3496E-002
  y0 =   1.0649E+002

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm156r1.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
Ow-156 R1

ESTIMATED PARAMETERS:
K = 0.0235 cm/sec
y0 = 106.5 cm

TEST DATA:
H0 = 38.59 cm
rc = 2.438 cm
rw = 2.438 cm
L = 191.1 cm
b = 1.2192E+04 cm
H = 191.1 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                        A Q T E S O L V   R E S U L T S
                                 Version 1.10

12/15/93                                                                  15:04:3

================================================================================
                                TEST DESCRIPTION

Data set........... fm156r2.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-156 R2

Knowns and Constants:
   No. of data points................... 76
   Radius of well casing................ 2.438
   Radius of well....................... 2.438
   Aquifer saturated thickness.......... 12190
   Well screen length................... 191.1
   Static height of water in well....... 191.1
   Log(Re/Rw)........................... 2.862
   A, B, C..............................  3.891,  0.621,  0.000

================================================================================
                               ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)


================================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

            Estimate          Std. Error
   K  =   2.0176E-002 +/-   5.5053E-004
   y0 =   1.6771E+002 +/-   8.2488E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 19
   Number of estimated parameters.... 2
   Degrees of freedom................ 17
   Residual mean..................... -0.04451
   Residual standard deviation....... 0.9371
```

```
Residual variance................. 0.8782

del Residuals:
    Time          Observed      Calculated      Residual          Weight
 ------------  ------------  ------------  ------------  ------------
           3        40.904         43.06       -2.1563              1
       3.498        36.393        34.361        2.0325              1
       3.996        28.895        27.418        1.4766              1
         4.5        22.372        21.819       0.55295              1
       4.998         17.77        17.411       0.35883              1
       5.496        12.283        13.893       -1.6099              1
           6        10.759        11.056      -0.29677              1
       6.498        8.3515        8.8224      -0.47086              1
       6.996        6.8275        7.0399      -0.21239              1
         7.5        5.0902        5.6023      -0.51215              1
       7.998        4.1453        4.4704      -0.32514              1
       8.496        3.5662        3.5672    -0.0010593              1
           9        2.6822        2.8388      -0.15653              1
       9.498         2.225        2.2652     -0.040185              1
       9.996        1.8288        1.8076      0.021241              1
        10.5        1.2497        1.4384      -0.18876              1
      10.998        1.3411        1.1478        0.1933              1
      11.496        1.1582       0.91592       0.24232              1
          12       0.97536       0.72888       0.24648              1

================================================================================
                         RESULTS FROM VISUAL CURVE MATCHING

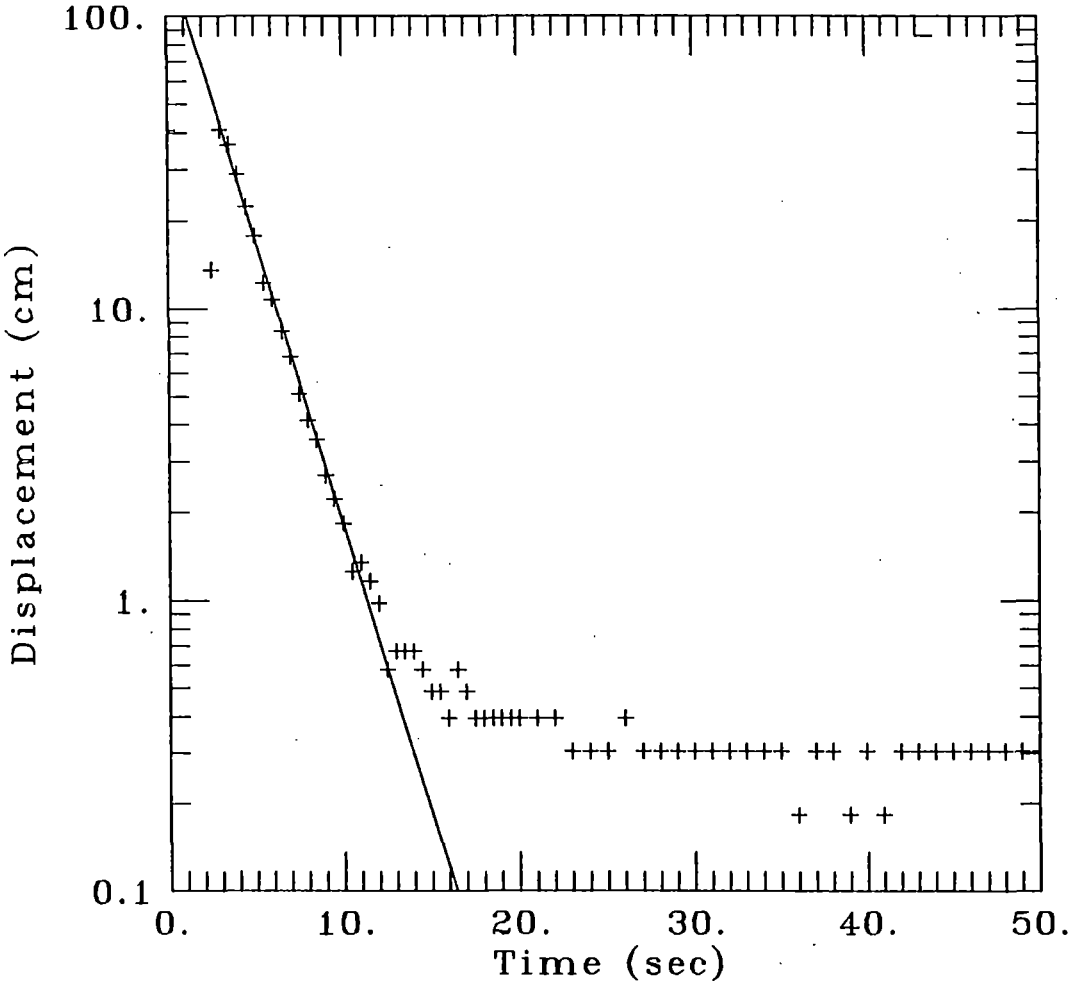
VISUAL MATCH PARAMETER ESTIMATES

          Estimate
 K  =   2.0176E-002
 y0 =   1.6771E+002

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm156r2.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
09-Dec-93
OBS. WELL:
OW-156 R2

ESTIMATED PARAMETERS:
K = 0.02018 cm/sec
y0 = 167.7 cm

TEST DATA:
H0 = 40.9 cm
rc = 2.438 cm
rw = 2.438 cm
L = 191.1 cm
b = 1.2192E+04 cm
H = 191.1 cm

```
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                        A Q T E S O L V   R E S U L T S
                                  Version  1.10

2/15/93                                                                    15:08:59

 ================================================================================
                               TEST DESCRIPTION

ata set........... fm156r3.dat
ata set title..... Fort McCoy Mod 5
Company............ Rust E & I
roject............ 71842.200
lient............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
bs. well.......... Ow-156 R3

Knowns and Constants:
   No. of data points................... 80
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 191.1
   Static height of water in well...... 191.1
   Log(Re/Rw).......................... 2.862
   A, B, C.............................  3.891,  0.621,  0.000

 ================================================================================
                               ANALYTICAL METHOD

ouwer-Rice (Unconfined Aquifer Slug Test)


================================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING


TATISTICAL MATCH PARAMETER ESTIMATES

            Estimate        Std.  Error
   K  =   1.9465E-002 +/-   5.0075E-004
   y0 =   2.4440E+002 +/-   1.4910E+001


NALYSIS OF MODEL RESIDUALS

residual = calculated - observed
eighted residual = residual * weight

Weighted Residual Statistics:
   umber of residuals.............. 13
   umber of estimated parameters.... 2
   Degrees of freedom............... 11
   Residual mean.................... 0.06229
   Residual standard deviation....... 0.6705
```

```
   Residual variance................ 0.4495

Model Residuals:

     Time          Observed       Calculated       Residual          Weight
 ------------   ------------   ------------   ------------   ------------
          4.5          34.29         34.166        0.12359              1
        4.998          27.95         27.481        0.46902              1
        5.496         20.848         22.104        -1.2557              1
            6         18.837         17.732         1.1043              1
        6.498         13.929         14.263       -0.33334              1
        6.996         11.064         11.472       -0.40771              1
          7.5         8.7478         9.2031       -0.45533              1
        7.998         7.3152         7.4023      -0.087138              1
        8.496         6.3703         5.9539        0.41638              1
            9         4.3282         4.7764       -0.44824              1
        9.498         4.1453         3.8418        0.30347              1
        9.996          3.749         3.0901        0.65895              1
         10.5         3.2004         2.4789        0.72145              1

================================================================================
                        RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

          Estimate
   K  =   1.9465E-002
   y0 =   2.4440E+002

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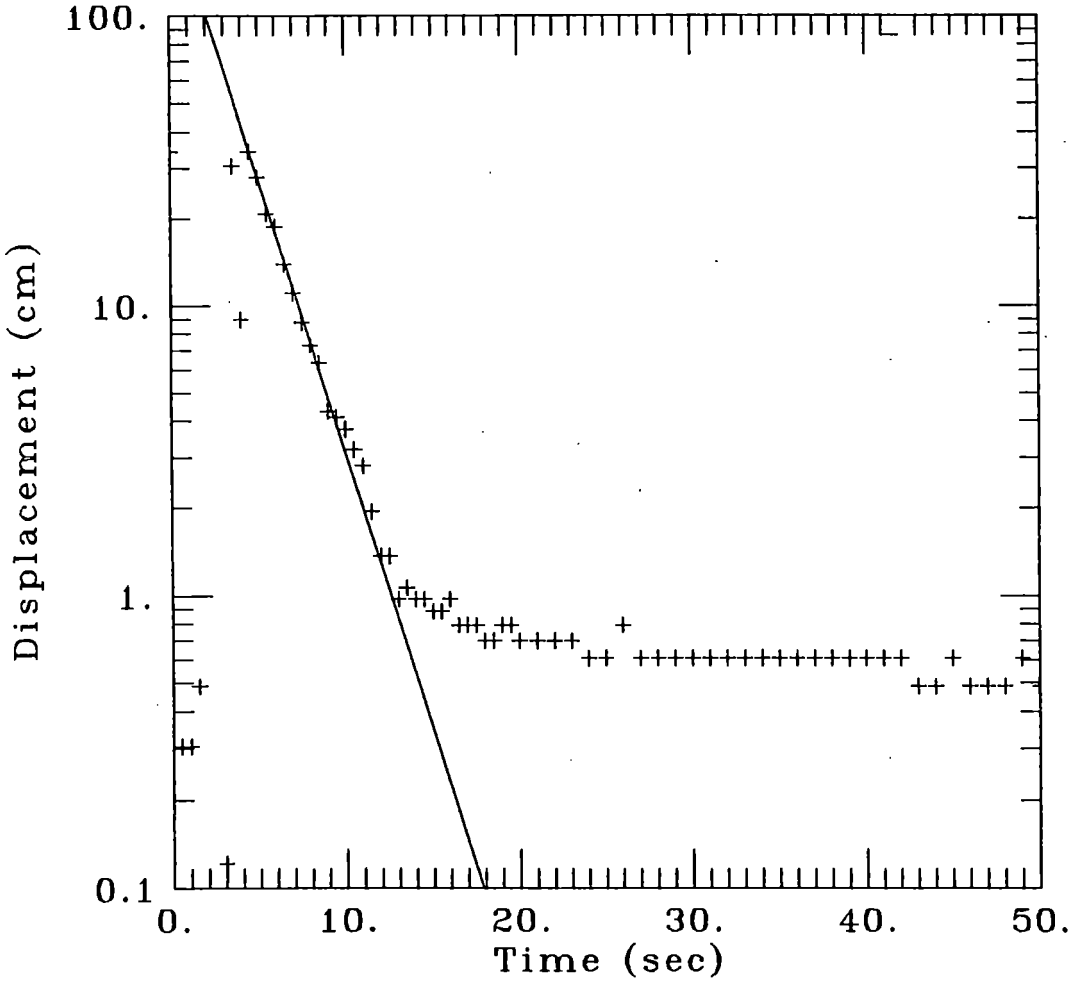
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm156r3.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
Ow-156 R3

ESTIMATED PARAMETERS:
K = 0.01947 cm/sec
y0 = 244.4 cm

TEST DATA:
H0 = 34.29 cm
rc = 2.438 cm
rw = 2.438 cm
L = 191.1 cm
b = 1.2192E+04 cm
H = 191.1 cm

```
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                         A Q T E S O L V   R E S U L T S
                                   Version 1.10

12/15/93                                                                      15:18:3

==================================================================================
                                 TEST DESCRIPTION

Data set........... fm157r1.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-157 R1

Knowns and Constants:
   No. of data points.................. 83
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 241.1
   Static height of water in well...... 241.1
   Log(Re/Rw).......................... 3.056
   A, B, C.............................  4.396,  0.713,  0.000

==================================================================================
                                 ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)


==================================================================================
                       RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std.  Error
   K  =   1.5519E-002 +/-   4.7303E-004
   y0 =   6.3229E+001 +/-   2.1607E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals.............. 18
   Number of estimated parameters.... 2
   Degrees of freedom............... 16
   Residual mean.................... 0.04709
   Residual standard deviation...... 0.8601
```

```
 Residual variance................ 0.7397

del Residuals:
    Time          Observed       Calculated       Residual         Weight
 ------------   ------------   ------------   ------------   ------------
          1.5         32.278         34.092        -1.8137               1
        1.998         29.901         27.771           2.13               1
        2.496         23.835         22.622         1.2136               1
            3         18.379         18.382     -0.0024083               1
        3.498         14.722         14.974       -0.25174               1
        3.996         11.369         12.197       -0.82821               1
          4.5         9.2354         9.9112       -0.67574               1
        4.998           7.62         8.0735        -0.4535               1
        5.496         6.1874         6.5766       -0.38911               1
            6         5.1206         5.3439        -0.2233               1
        6.498         4.2367         4.3531       -0.11637               1
        6.996         3.5662          3.546       0.020194               1
          7.5          3.109         2.8814         0.2276               1
        7.998         2.6213         2.3471        0.27416               1
        8.496          2.225         1.9119        0.31312               1
            9         1.9507         1.5536        0.39714               1
        9.498         1.7678         1.2655        0.50232               1
        9.996         1.5545         1.0309         0.5236               1

===============================================================================
                         RESULTS FROM VISUAL CURVE MATCHING

SUAL MATCH PARAMETER ESTIMATES

           Estimate
 K  =    1.5519E-002
 y0 =    6.3229E+001

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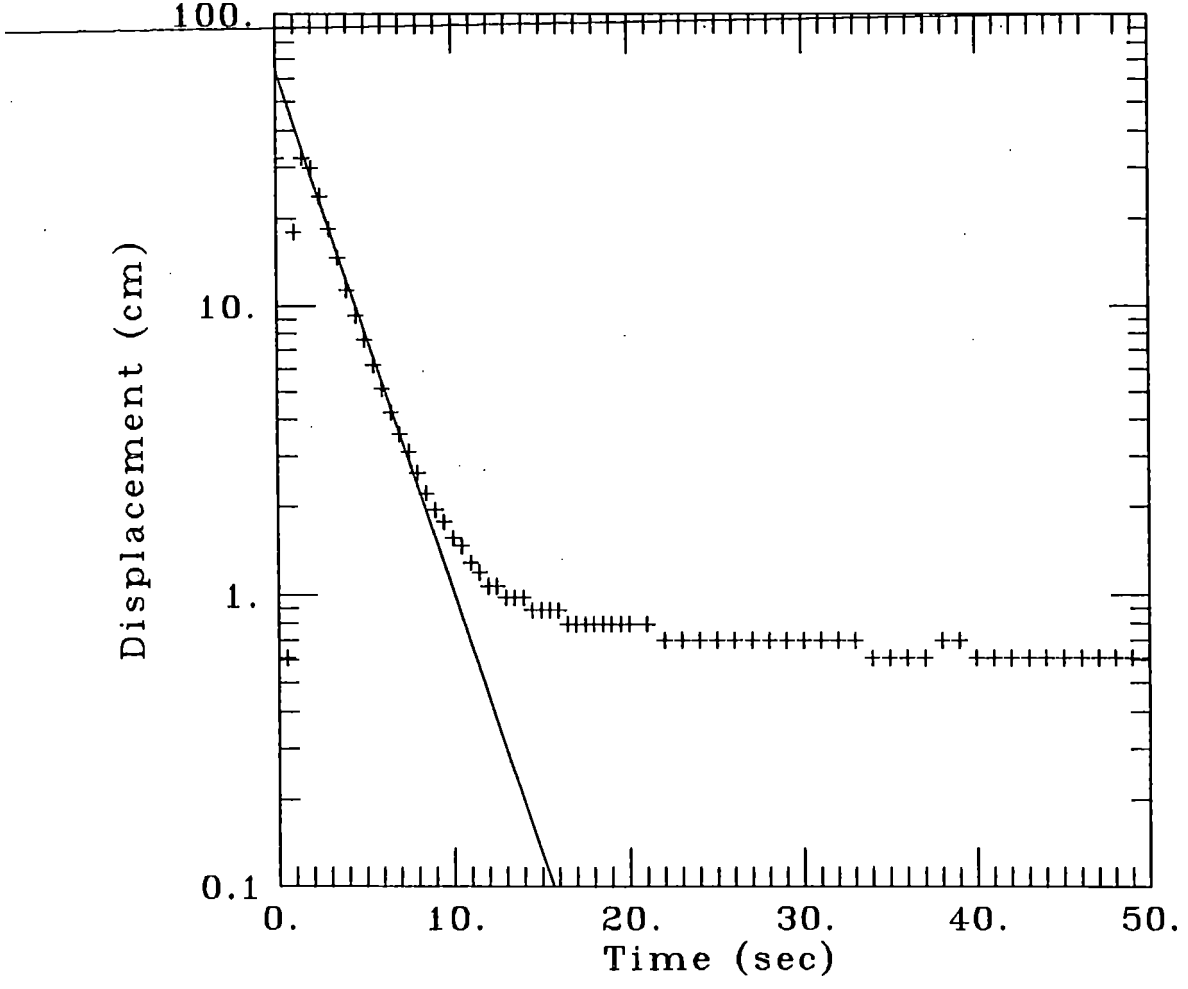
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm157r1.dat
12/15/93

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
09-Dec-93
OBS. WELL:
OW-157 R1

ESTIMATED PARAMETERS:
K = 0.01552 cm/sec
y0 = 63.23 cm

TEST DATA:
H0 = 32.28 cm
rc = 2.438 cm
rw = 2.438 cm
L = 241.1 cm
b = 1.2192E+04 cm
H = 241.1 cm

```
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                         A Q T E S O L V    R E S U L T S
                                   Version 1.10

12/15/93                                                                15:22:14

   ============================================================================
                                 TEST DESCRIPTION

Data set........... fm157r2.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
 bs. well.......... Ow-157 R2

Knowns and Constants:
   No. of data points.................. 81
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 241.1
   Static height of water in well...... 241.1
   Log(Re/Rw).......................... 3.056
   A, B, C.............................  4.396,  0.713,  0.000

===============================================================================
                                ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)


===============================================================================
                      RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std.  Error
   K  =   1.7735E-002 +/-   2.3643E-004
   y0 =   2.3213E+002 +/-   7.0928E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 15
   Number of estimated parameters.... 2
   Degrees of freedom................ 13
   Residual mean..................... 0.1028
   Residual standard deviation....... 0.3629
```

```
   Residual variance................ 0.1317

Model Residuals:

     Time            Observed      Calculated     Residual        Weight
 -------------  -------------  -------------  -------------  -------------
        3.996         35.936         35.401        0.53485              1
          4.5         27.493         27.926       -0.43297              1
        4.998         22.007         22.091      -0.084932              1
        5.496         17.313         17.476       -0.16338              1
            6         13.472         13.786       -0.31369              1
        6.498          10.79         10.906       -0.11572              1
        6.996         8.5649         8.6272      -0.062295              1
          7.5         6.5532         6.8055        -0.2523              1
        7.998          5.395         5.3837       0.011304              1
        8.496         4.5415         4.2589        0.28265              1
            9         3.6881         3.3596        0.32849              1
        9.498         3.0175         2.6577        0.35984              1
        9.996         2.5298         2.1024        0.42741              1
         10.5         2.1336         1.6585        0.47511              1
       10.998         1.8593          1.312        0.54729              1

===============================================================================
                       RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

           Estimate
   K  =   1.7735E-002
   y0 =   2.3213E+002

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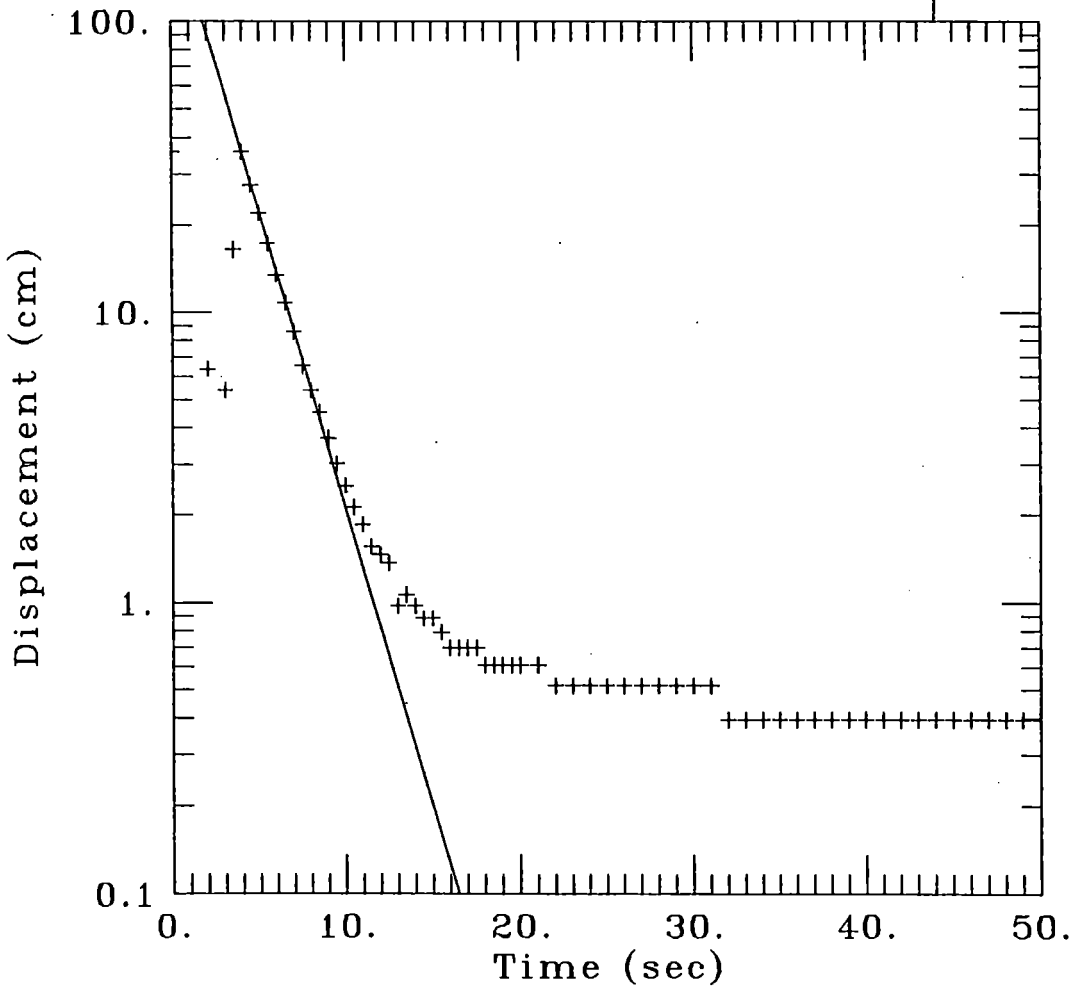
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm157r2.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
Ow-157 R2

ESTIMATED PARAMETERS:
K = 0.01773 cm/sec
y0 = 232.1 cm

TEST DATA:
H0 = 35.94 cm
rc = 2.438 cm
rw = 2.438 cm
L = 241.1 cm
b = 1.2192E+04 cm
H = 241.1 cm

```
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                          A Q T E S O L V   R E S U L T S
                                    Version  1.10

12/15/93                                                                15:35:4

================================================================================
                                TEST DESCRIPTION

Data set........... fm157r3.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-157 R3

Knowns and Constants:
   No. of data points.................. 98
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 241.1
   Static height of water in well...... 241.1
   Log(Re/Rw).......................... 3.056
   A, B, C.............................  4.396,  0.713,  0.000

================================================================================
                                ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)


================================================================================
                     RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate         Std.  Error
   K  =   1.8170E-002 +/-   8.0707E-004
   y0 =   1.7120E+002 +/-   1.4264E+001


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 15
   Number of estimated parameters.... 2
   Degrees of freedom................ 13
   Residual mean..................... 0.2595
   Residual standard deviation....... 1.373
```

```
  Residual variance................. 1.886

 del Residuals:

       Time          Observed       Calculated       Residual         Weight
  -------------   -------------   -------------   -------------   -------------
              3          42.977          40.302          2.6753               1
          3.498          29.901          31.699         -1.7979               1
          3.996          21.854          24.932         -3.0782               1
            4.5          19.812          19.554         0.25832               1
          4.998           15.21           15.38        -0.17026               1
          5.496          12.344          12.097          0.2472               1
              6          9.5402          9.4871          0.0531               1
          6.498          8.1991           7.462          0.7371               1
          6.996          6.6751          5.8692         0.80594               1
            7.5          4.7549           4.603         0.15187               1
          7.998          4.2672          3.6205         0.64674               1
          8.496          3.5966          2.8476           0.749               1
              9          3.0175          2.2333         0.78421               1
          9.498          2.6213          1.7566         0.86469               1
          9.996           2.347          1.3816         0.96533               1

================================================================================
                        RESULTS FROM VISUAL CURVE MATCHING

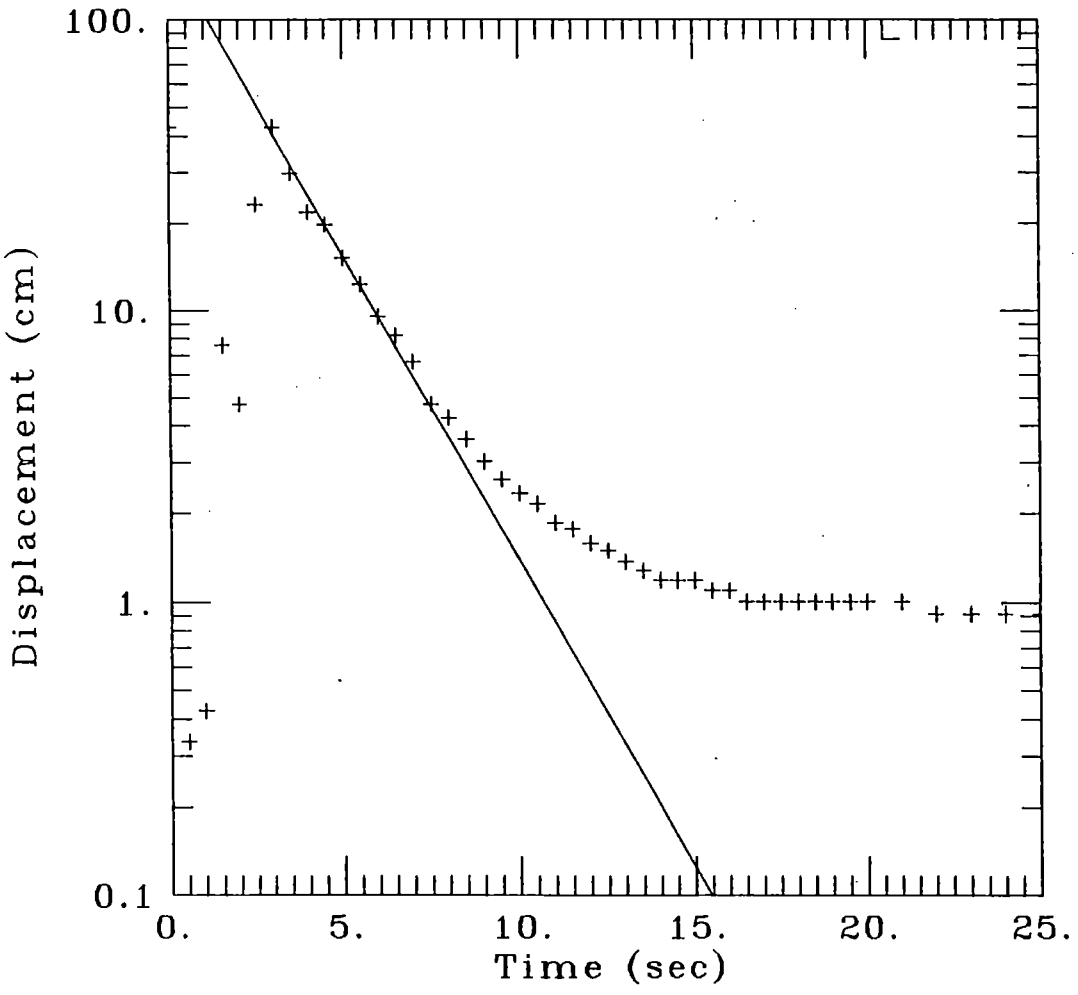
VISUAL MATCH PARAMETER ESTIMATES

           Estimate
   K  =   1.8170E-002
  y0  =   1.7120E+002

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm157r3.dat
12/15/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
OW-157 R3

ESTIMATED PARAMETERS:
K = 0.01817 cm/sec
y0 = 171.2 cm

TEST DATA:
H0 = 42.98 cm
rc = 2.438 cm
rw = 2.438 cm
L = 241.1 cm
b = 1.2192E+04 cm
H = 241.1 cm

```
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                        A Q T E S O L V   R E S U L T S
                                Version  1.10

.2/16/93                                                                09:09:29

 ================================================================================
                              TEST DESCRIPTION

ata set........... fm158r1.dat
ata set title..... Fort McCoy Mod 5
Company........... Rust E & I
roject............ 71842.200
lient............. USACE
Location.......... Fort McCoy
Test date......... 09-Dec-93
bs. well.......... Ow-158 R1

Knowns and Constants:
   No. of data points................... 52
   Radius of well casing................ 2.438
   Radius of well....................... 2.438
   Aquifer saturated thickness.......... 12190
   Well screen length................... 210.9
   Static height of water in well...... 210.9
   Log(Re/Rw)........................... 2.944
   A, B, C.............................. 4.100,  0.658,  0.000

 ================================================================================
                              ANALYTICAL METHOD

ouwer-Rice (Unconfined Aquifer Slug Test)


================================================================================
                    RESULTS FROM STATISTICAL CURVE MATCHING


TATISTICAL MATCH PARAMETER ESTIMATES

          Estimate          Std. Error
 K  =   1.8326E-002 +/-   1.4054E-004
 y0 =   8.6226E+001 +/-   1.0346E+000


NALYSIS OF MODEL RESIDUALS

residual = calculated - observed
eighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals.............. 21
   Number of estimated parameters.... 2
   Degrees of freedom............... 19
   Residual mean.................... 0.04727
   Residual standard deviation....... 0.1779
```

```
   Residual variance................ 0.03165

Model Residuals:

     Time          Observed       Calculated       Residual          Weight
 ------------   ------------   ------------   ------------   ------------
        2.496         28.407         28.638       -0.23014              1
            3         23.409         22.923        0.48545              1
        3.498          18.41         18.398        0.01219              1
        3.996         14.661         14.766       -0.10477              1
          4.5         11.704         11.819         -0.115              1
        4.998         9.3878          9.486      -0.098117              1
        5.496         7.4676         7.6133       -0.14566              1
            6          6.035         6.0941      -0.059054              1
        6.498         4.7854          4.891       -0.10565              1
        6.996         3.9319         3.9254      0.0064837              1
          7.5         3.1394         3.1421     -0.0027076              1
        7.998         2.5603         2.5218       0.038489              1
        8.496         2.0117          2.024      -0.012296              1
            9         1.7069         1.6201       0.086772              1
        9.498         1.4326         1.3003        0.13229              1
        9.996         1.1278         1.0436       0.084187              1
         10.5         1.0363        0.83534        0.20098              1
       10.998        0.85344        0.67043        0.18301              1
       11.496          0.762        0.53807        0.22393              1
           12        0.64008         0.4307        0.20938              1
       12.498        0.54864        0.34568        0.20296              1

================================================================================
                         RESULTS FROM VISUAL CURVE MATCHING

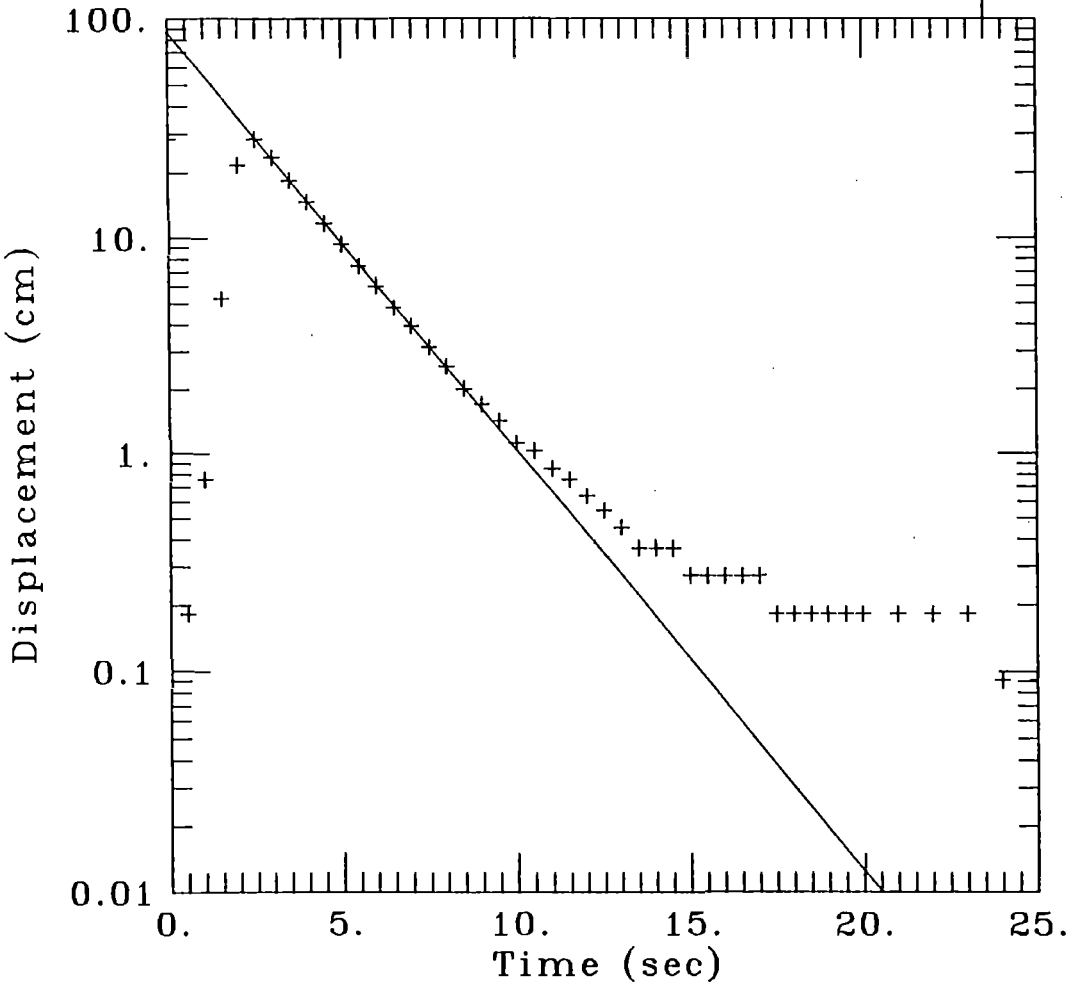
VISUAL MATCH PARAMETER ESTIMATES

             Estimate
   K  =    1.8326E-002
   y0 =    8.6226E+001

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm158r1.dat
12/16/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
Ow-158 R1

ESTIMATED PARAMETERS:
K = 0.01833 cm/sec
y0 = 86.23 cm

TEST DATA:
H0 = 28.41 cm
rc = 2.438 cm
rw = 2.438 cm
L = 210.9 cm
b = 1.2192E+04 cm
H = 210.9 cm

```
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                      A Q T E S O L V   R E S U L T S
                               Version  1.10

12/16/93                                                                09:16:4

===============================================================================
                              TEST DESCRIPTION

Data set........... fm158r2.dat
Data set title..... Fort McCoy Mod 5
Company............ Rust E & I
Project............ 71842.200
Client............. USACE
Location........... Fort McCoy
Test date.......... 09-Dec-93
Obs. well.......... OW-158 R2

Knowns and Constants:
   No. of data points.................. 80
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 210.9
   Static height of water in well...... 210.9
   Log(Re/Rw).......................... 2.944
   A, B, C.............................  4.100,  0.658,  0.000

===============================================================================
                              ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)


===============================================================================
                    RESULTS FROM STATISTICAL CURVE MATCHING


STATISTICAL MATCH PARAMETER ESTIMATES

           Estimate          Std.  Error
   K  =   1.9364E-002 +/-   3.9497E-004
   y0 =   1.0838E+002 +/-   3.5694E+000


ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 16
   Number of estimated parameters.... 2
   Degrees of freedom................ 14
   Residual mean..................... 0.142
   Residual standard deviation....... 0.5392
```

```
   Residual variance................ 0.2907

 del Residuals:

     Time           Observed        Calculated       Residual          Weight
 ------------    ------------    ------------    ------------    ------------
        2.496          34.961          33.816          1.1446               1
            3          25.938          26.729        -0.79051               1
        3.498          20.452          21.187        -0.73445               1
        3.996          16.337          16.793        -0.45606               1
          4.5          13.076          13.274        -0.19798               1
        4.998          10.485          10.521       -0.036334               1
        5.496           8.382          8.3398        0.042249               1
            6          6.7361           6.592         0.14412               1
        6.498          5.4864          5.2251         0.26133               1
        6.996          4.4196          4.1416         0.27799               1
          7.5          3.5662          3.2736         0.29252               1
        7.998           2.987          2.5948         0.39222               1
        8.496          2.4994          2.0568         0.44259               1
            9          2.1336          1.6257         0.50788               1
        9.498          1.7374          1.2886         0.44874               1
        9.996          1.5545          1.0214         0.53307               1


================================================================================
                       RESULTS FROM VISUAL CURVE MATCHING

ISUAL MATCH PARAMETER ESTIMATES

             Estimate
  K  =    1.9364E-002
  y0 =    1.0838E+002

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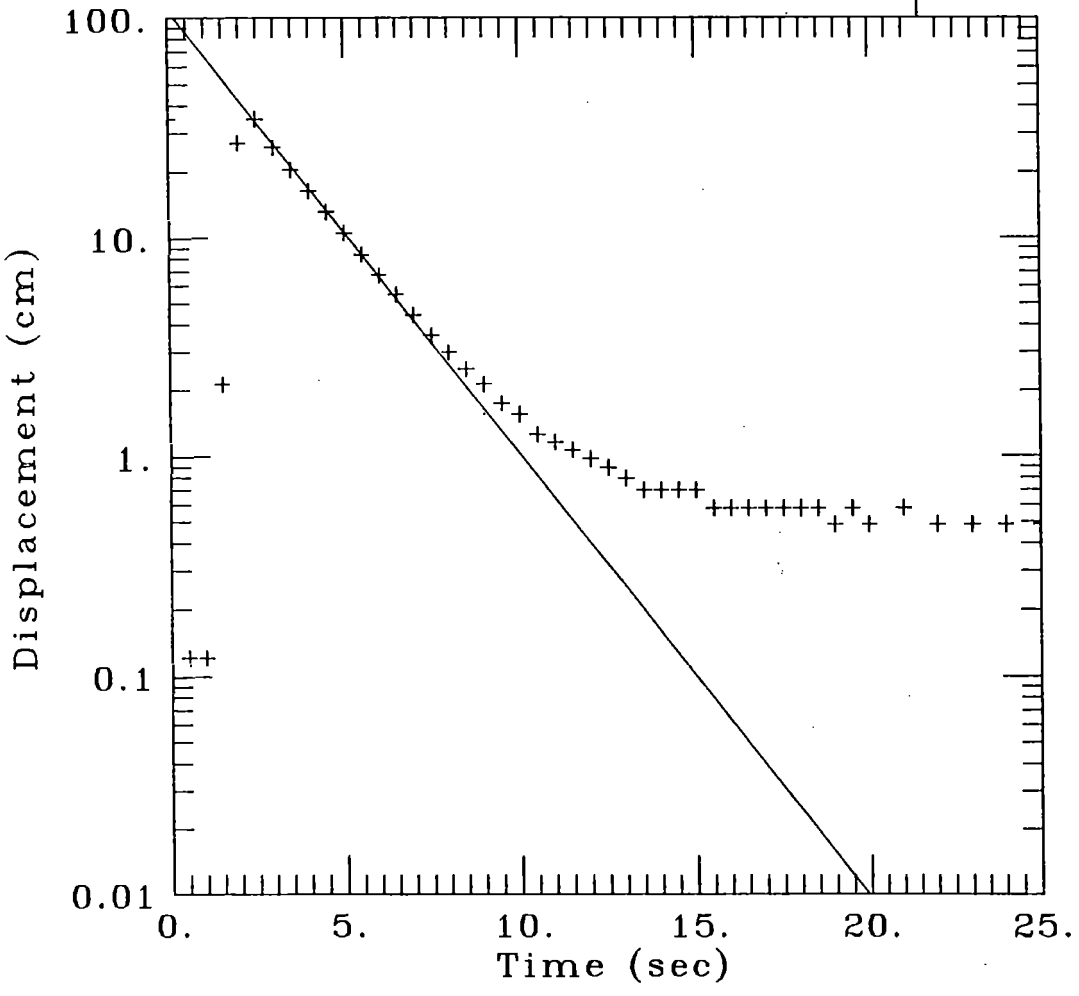
```

Rust E & I	Client:	USACE
Project No.: 71842.200	Location:	Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm158r2.dat
12/16/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
OW-158 R2

ESTIMATED PARAMETERS:
K = 0.01936 cm/sec
y0 = 108.4 cm

TEST DATA:
H0 = 34.96 cm
rc = 2.438 cm
rw = 2.438 cm
L = 210.9 cm
b = 1.2192E+04 cm
H = 210.9 cm

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                        A Q T E S O L V   R E S U L T S
                                 Version 1.10

12/16/93                                                               09:20:23

 ==============================================================================
                               TEST DESCRIPTION

)ata set........... fm158r3.dat
)ata set title..... Fort McCoy Mod 5
Company............ Rust E & I
roject............ 71842.200
 lient............. USACE
ocation........... Fort McCoy
Test date.......... 09-Dec-93
)bs. well.......... OW-158 R3

Knowns and Constants:
   No. of data points.................. 78
   Radius of well casing............... 2.438
   Radius of well...................... 2.438
   Aquifer saturated thickness......... 12190
   Well screen length.................. 210.9
   Static height of water in well...... 210.9
   Log(Re/Rw).......................... 2.944
   A, B, C.............................  4.100,  0.658,  0.000

===============================================================================
                               ANALYTICAL METHOD

ouwer-Rice (Unconfined Aquifer Slug Test)


===============================================================================
                      RESULTS FROM STATISTICAL CURVE MATCHING


TATISTICAL MATCH PARAMETER ESTIMATES

            Estimate          Std.  Error
  K  =   1.7980E-002 +/-    2.9908E-004
  y0 =   2.3278E+002 +/-    9.1547E+000


NALYSIS OF MODEL RESIDUALS

residual = calculated - observed
eighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals.............. 16
   umber of estimated parameters.... 2
   Degrees of freedom............... 14
   Residual mean.................... 0.07664
   Residual standard deviation...... 0.4374
```

```
   Residual variance................ 0.1913

Model Residuals:

     Time          Observed      Calculated      Residual        Weight
  -------------  -------------  -------------  -------------  -------------
            4.5        32.766         33.128       -0.36163              1
          4.998        27.798         26.698         1.0995              1
          5.496        21.367         21.517       -0.15026              1
              6        16.855         17.296       -0.44042              1
          6.498        13.594         13.939       -0.34509              1
          6.996        10.912         11.234       -0.32202              1
            7.5        8.8697         9.0301       -0.16041              1
          7.998        7.1628         7.2775       -0.11475              1
          8.496        5.8217         5.8651       -0.04346              1
              9        4.9378         4.7146        0.22318              1
          9.498        3.6881         3.7996        -0.1115              1
          9.996        3.3223         3.0622        0.26015              1
           10.5        2.8346         2.4615        0.37318              1
         10.998         2.347         1.9837        0.36321              1
         11.496        2.0726         1.5987        0.47385              1
             12        1.7678         1.2851        0.48268              1

===============================================================================
                        RESULTS FROM VISUAL CURVE MATCHING

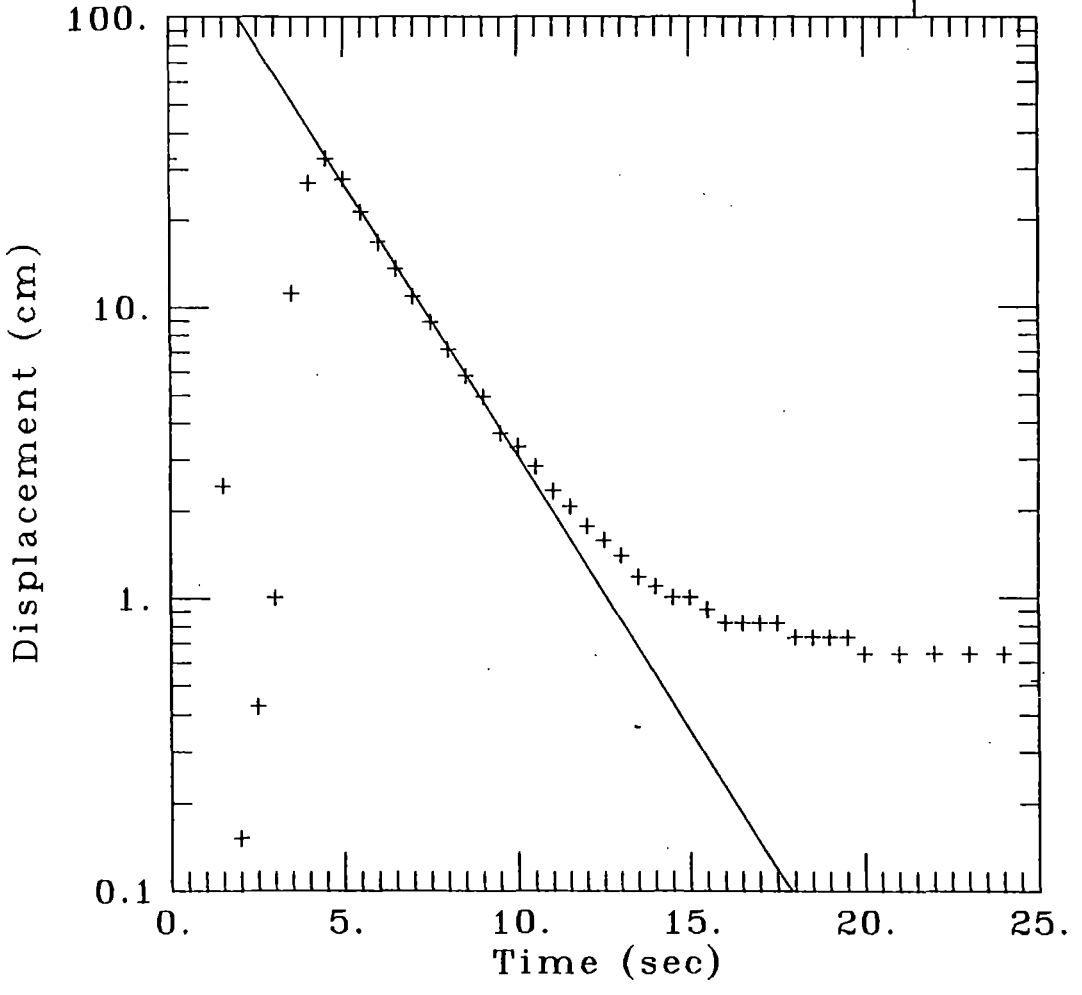
VISUAL MATCH PARAMETER ESTIMATES

          Estimate
   K  =   1.7980E-002
   y0 =   2.3278E+002

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

Rust E & I	Client: USACE
Project No.: 71842.200	Location: Fort McCoy

Fort McCoy Mod 5



DATA SET:
fm158r3.dat
12/16/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
09-Dec-93

OBS. WELL:
OW-158 R3

ESTIMATED PARAMETERS:
K = 0.01798 cm/sec
y0 = 232.8 cm

TEST DATA:
H0 = 32.77 cm
rc = 2.438 cm
rw = 2.438 cm
L = 210.9 cm
b = 1.2192E+04 cm
H = 210.9 cm

APPENDIX K ADDENDUM

WATER ELEVATION FORMS

RUST ENVIRONMENT & INFRASTRUCTURE

Water Elevation

PROJECT NO. 71842.200 SITE Fort McCoy - Mod 5

Time	Well Number	Elevation Of Top Of Pipe	Depth To Water	Water Elevation	Depth To Bottom	Well Integrity: Locked	Capped	Cracked	Obstruct	Comments	
1:15	OW-158	831.522	17.02	814.50	23.76	✓	✓			Photo 1 L.F # 10	# 6 overview
1:17	OW-154	831.655	17.00	814.66	23.68	✓	✓			" 2	
1:18	OW-155	831.348	16.57	814.78	24.76	✓	✓			" 3	
1:20	OW-157	832.503	17.80	814.70	25.57	✓	✓			" 4	
1:22	OW-156	831.932	17.37	814.56	23.77	✓	✓			" 5	
1:35	OW-152	882.438	27.90	854.54	36.02	✓	✓			# 7 L.F # 9	# 9 overview
1:39	OW-151	893.989	36.53	857.46	41.92	✓	✓			# 8	
1:45	OW-147	855.774	16.46	839.31	23.69	✓	✓			# 11 L.F. # 8	# 10 overview
1:47	OW-148	850.743	10.86	839.88	20.14	✓	✓			# 12	
1:49	OW-150	848.097	7.84	840.26	17.80	✓	✓			# 13	
1:51	OW-149	852.033	13.87	838.16	19.57	✓	✓			# 14	
2:08	OW-145	898.138	13.21	884.93	20.63	✓	✓			# 15 L.F # 7	# 18 overview
2:16	OW-146	898.254	14.06	884.19	20.65	✓	✓			# 16	
2:56	OW-144	901.120	13.50	887.62	19.77	✓	✓			# 17	
3:08	OW-160	873.788	15.40	858.39	22.16	✓	✓			# 19 B.R.A.C	# 23 overview
3:11	OW-163	873.870	17.00	856.87	22.10	✓	✓			# 20	
3:14	OW-162	871.553	15.06	856.49	21.03	✓	✓			# 21	
3:17	OW-161	872.453	16.12	856.33	22.40	✓	✓			# 22	

Description Of Site Landfills & Parking Lot

Soil Conditions No Snow on Ground

Weather 40° F Sunny Temperature

Entered On Computer _____ Signature Cathy S. Cheatham Date 12/15/93

APPENDIX P ADDENDUM

TECHNICAL MEMORANDA: DATA QUALITY FOR LANDFILLS 7, 8, 9, AND 10

1. ROUND 1 GROUNDWATER SAMPLING
2. ROUND 2 GROUNDWATER SAMPLING

1. ROUND 1 GROUNDWATER SAMPLING

TECHNICAL MEMORANDUM

DATE: January 27, 1994

TO: Tim Kemmis
Greg Ruechel

FROM: Lisa Smith

RE: Organic Data Validation
RCRA Facility Investigation
Fort McCoy Military Reservation

I have assessed the data packages submitted to RUST E&I from Precision Analytical Lab, Inc. (PAL) and Enesco-Rocky Mountain Analytical Laboratory using procedures contained in the USEPA "National Functional Guidelines for Organic Data Review," December 1990, and revised June 1991, and control limits as listed in Table 10-1 of the Quality Assurance Project Plan (QAPP), Addendum No. 3, for the RCRA Facility Investigation, November 1993. Level III quality data was accomplished for organic analyses through following EPA methodology for volatiles, semi-volatiles, PCB/pesticides, organophosphorus pesticides, and herbicides. Raw data was not submitted by the laboratories; case narratives and quality control summary reports were evaluated. Results for the following QC parameters were evaluated during organic data review:

Holding time
Laboratory blanks
Surrogate spike recoveries
Matrix spike/matrix spike duplicate results
Internal standards
Field duplicates
Field blanks/trip blanks

The following sections discuss only noncompliances to QAPP/method criteria. If a QC parameter listed above is not discussed, QAPP/method criteria has been met.

1.0 Volatile Organics

Eighteen aqueous volatile samples were analyzed by SW-846 method 8240. Two of the samples were field duplicates (FMM5-LF7-OW146-02 and FMM5-LF9-OW152-02) , two of the samples were field blanks (FMM5-LF7-OW146-04 and FMM5-LF9-OW152-04), and two of the samples were trip blanks (FMM5-TB05 and FMM5-TB07).

1.1 Laboratory Blanks

Acetone and methylene chloride were consistently detected in laboratory blanks. Concentrations of these compounds ranged from 5 ug/L to 12 ug/L for acetone and 4 ug/L

to 8 ug/L for methylene chloride. Sample results within 10 times the concentrations of the laboratory blank are assumed to be false positives and were qualified B.

1.2 Field Duplicates

Two field duplicates (FMM5-LF7-OW146-02 and FMM5-LF9-OW152-02) were collected and analyzed for volatile organics. Volatile organic compounds were either not detected in the field duplicates or qualified due to blank contamination.

1.3 Field Blanks

Two field blanks (FMM5-LF7-OW146-04 and FMM5-LF9-OW152-04) were collected and analyzed for volatile organics. Toluene was detected in both field blanks at 3.0 ug/L and 1.7 ug/L, respectively. Toluene detects within five times the concentration of the field blank concentration were qualified B and include:

FMM5-LF7-OW145-01	FMM5-LF7-OW146-01	FMM5-LF7-OW146-02
FMM5-LF8-OW147-01	FMM5-LF8-OW148-01	FMM5-LF9-OW151-01
FMM5-LF9-OW152-01	FMM5-LF9-OW152-02	FMM5-LF10-OW158-01

1.4 Trip Blanks

Two trip blanks (FMM5-TB05 and FMM5-TB07) were associated with samples collected for volatile organic compounds. 1,2-Dichloropropane, 2-butanone, and chloroform were detected in trip blanks. 1,2-Dichloropropane and 2-butanone were not detected in the environmental samples. Chloroform was detected in only one of the trip blanks and samples associated with this trip blank did not detect chloroform. Volatile organic compound results were not qualified due to trip blank contamination.

2.0 Semi-Volatile Organics

Sixteen aqueous samples were collected and analyzed for semi-volatile organic compounds by SW-846 method 8270. Two of the samples (FMM5-LF7-OW146-01 and FMM5-LF7-OW146-04) were mistakenly used for matrix spikes and the actual samples were not analyzed without the addition of the spiking compounds. The positive results reported for the spiked compound were qualified as rejected (R) since it is assumed these results are due to the addition of matrix spike compounds rather than being site derived.

2.1 Surrogates

Acid extractable surrogate recoveries were low for samples FMM5-LF8-OW147-01 and FMM5-LF8-OW148-01. The samples were re-extracted and reanalyzed with surrogate recoveries in control and results were not qualified.

Sample FMM5-LF8-OW149-01 also had low surrogate recoveries:

Surrogate	Percent Recovery
2-Fluorobiphenyl	36
2-Fluorophenol	18
2-Chlorophenol-d_4	27

Base neutral compounds were not qualified since only one surrogate (2-Fluorobiphenyl) was outside of the required limits; however, acid extractable compounds were qualified as estimated (J) and are considered to have a potential for low bias.

2.2 Matrix Spike/Matrix Spike Duplicates

Samples FMM5-LF7-OW146-01 and FMM5-LF7-OW146-02 were spiked for semi-volatile compounds. Acenaphthene exhibited a low matrix spike duplicate recovery (44 percent) for the spiked sample FMM5-LF7-OW146-02. Acenaphthene was qualified as estimated in the unspiked sample (FMM5-LF7-OW146-02) and is considered to have a potential for low bias.

2.3 Field Duplicates

Bis(2-ethylhexyl)phthalate was detected in field duplicate FMM5-LF9-OW152-02, however, results were qualified B due to the detection of this compound in the field blank, therefore, field duplicate precision was not evaluated.

2.4 Field Blanks

The field blank FMM5-LF9-OW152-04 was used to evaluate for possible field contamination since field blank FMM5-LF7-OW146-04 was analyzed as a matrix spike and results are unreliable. The field blank FMM5-LF9-OW152-04 had 35 ug/L of bis(2-ethylhexyl)phthalate. Sample results within five times the field blank concentration were qualified B. This indicates a possible problem with field contamination or equipment decontamination, however, bis(2-ethylhexyl)phthalate is also a common laboratory contaminant. Samples qualified include:

FMM5-LF9-OW151-01	FMM5-LF9-OW152-01	FMM5-LF9-OW152-02
FMM5-LF10-OW156-01	FMM5-LF10-OW157-01	FMM5-LF10-OW158-01

3.0 PCB/Pesticides

Sixteen aqueous samples were collected and analyzed for PCB/pesticides by SW-846 method 8080. Two of the samples (FMM5-LF7-OW146-01 and FMM5-LF7-OW146-04) were mistakenly used for matrix spikes and the actual samples were not analyzed without the addition of the spiking compounds. PCB/pesticide spiking compounds were qualified

as rejected (R) since the nondetect results reported for these compounds are unreliable and cannot be verified since a non-spiked sample was not analyzed.

3.1 Surrogates

Ten samples had low surrogate recoveries and were qualified as estimated (J) and are considered to have a potential for low bias.

FMM5-LF7-OW144-01	FMM5-LF7-OW145-01	FMM5-LF8-OW147-01
FMM5-LF8-OW148-01	FMM5-LF9-OW151-01	FMM5-LF9-OW152-01
FMM5-LF9-OW152-04	FMM5-LF10-OW155-01	FMM5-LF10-OW156-01
FMM5-LF10-OW157-01		

Two samples (FMM5-LF8-OW149-01 and FMM5-LF9-OW152-02) exhibited very low surrogate recoveries (<10 percent) and the reported nondetects were rejected (R).

3.2 Matrix Spike/Matrix Spike Duplicates

Samples FMM5-LF7-OW146-01 and FMM5-LF7-OW146-04 were spiked and analyzed as an MS/MSD pair without analyzing the unspiked samples for PCB/pesticides. Since the MS and MSD are from different samples, the RPD cannot be evaluated, and since the unspiked samples were not analyzed, matrix spike results for these samples cannot be analyzed. Results for PCB/pesticide spiking compounds (gamma-BHC, heptachlor, aldrin, dieldrin, endrin, and 4,4'-DDT) were previously qualified as rejected (R) in samples FMM5-LF7-OW146-01 and FMM5-LF7-OW146-04, and further qualifications were not made.

4.0 Organophosphorus Pesticides and Herbicides

Sixteen aqueous samples were collected and analyzed by Enesco-Rocky Mountain Analytical Laboratory for organophosphorus pesticides and herbicides by SW-846 methods 8140 and 8150, respectively. Two of the samples collected were field duplicates (FMM5-LF7-OW146-02 and FMM5-LF9-OW152-02) and two of the samples were field blanks (FMM5-LF7-OW146-04 and FMM5-LF9-OW152-04).

4.1 Surrogates

The surrogates listed in the QAPP for organophosphorus pesticide and herbicide analysis were not used. The surrogate compounds, chlormefos and ethyl pirimifos were used during organophosphorus pesticide analysis while the surrogate compound DCAA was used during herbicide analysis. Surrogate recoveries were within the 60 percent to 150 percent recovery limits.

4.2 Matrix Spikes/Matrix Spike Duplicates

Compounds used for spiking organophosphorus pesticide samples were different than those listed in the QAPP. Compounds used for organophosphorus pesticide spiking include diazinon, malathion, ethyl parathion, and methyl parathion; recoveries were within the laboratory required limits.

5.0 Overall Assessment

Samples were successfully analyzed with the exception of two PCB/pesticide samples, and matrix spiking compounds for two semi-volatile and PCB/pesticide samples. Two PCB/pesticide samples (FMM5-LF8-OW149-01 and FMM5-LF9-OW152-02) had very low surrogate recoveries (<10 percent) and were qualified as rejected. Samples FMM5-LF7-OW146-01 and FMM5-LF7-OW146-04 were analyzed as matrix spikes during semi-volatile and PCB/pesticide analysis. Matrix spiking compounds for these two samples were qualified as rejected since the presence or absence of these compounds cannot be verified. In addition, some results were qualified as estimated (J) due to QC results which were outside the required limits.

MEMORANDUM

DATE: February 1, 1994

TO: Tim Kemmis, Project Manager
Greg Ruechel, Project Chemist

FROM: Roxann Ruechel, Environmental Chemist

RE: Inorganic Data Validation for RCRA Facility Investigation
Fort McCoy Military Reservation
RUST E&I Project No. 71842.402

1.0 INTRODUCTION

Analytical results for samples collected in accordance with the approved Fort McCoy RCRA Facility Investigation (RFI) have been reviewed and deviations from the Final Quality Assurance Project Plan (QAPP), Addendum No. 3, dated November 1993, are presented in this memorandum. The data package submitted to RUST E&I from Precision Analytical Laboratories (PAL) has been evaluated according to validation procedures outlined in the EPA guidance document "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analysis," revised October 1989, using quality control limits referenced in Table 10-1 of the QAPP. CLP Level III quality data was performed following EPA methodologies for the Target Analyte List (TAL) metals, listed in Table 5-2 of the QAPjP, alkalinity, chloride, chemical oxygen demand (COD), fluoride, nitrate/nitrite, phosphate, sulfate, and total dissolved solids (TDS). Results for the following QC parameters were validated during the review process, as applicable:

- Holding Time
- Laboratory Blanks
- Laboratory Control Samples (LCS)
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Duplicates
- Field Blanks (Table 1)
- Field Duplicates (Table 2)

A total of seventeen samples were collected and analyzed for metals and water quality parameters for Landfill Nos. 7, 8, 9, and 10. Two samples, FMM5-LF9-OW152-04 and FMM5-LF7-OW146-04, were Field Blanks and two samples, FMM5-LF9-0W152-02 and FMM5-LF7-OW146-02, were Field Duplicates of FMM5-LF9-OW152-01 and FMM5-LF7-OW146-01, respectively.

The following sections discuss only noncompliances to the QAPP/method standards. If a QC parameter is not discussed, the QAPP/method criteria has been met.

2.0 WATER QUALITY PARAMETERS

2.1 Holding Time

Required holding times are presented in Table 6-1 of the QAPjP.

The following samples, for Total Dissolved Solids (TDS), were analyzed 1-day over holding time (requirement: 7 days) and qualified estimated (J).

FMM5-LF10-OW155-01
FMM5-LF10-OW157-01
FMM5-LF10-OW156-01
FMM5-LF10-OW158-01
FMM5-LF9-OW151-01
FMM5-LF9-OW152-01
FMM5-LF9-OW152-02

Sample FMM5-LF9-OW152-04 was qualified estimated and not detected (UJ). It also was analyzed 1-day over holding time for TDS.

2.2 Laboratory Control Samples (LCS)

LCS requirements for water quality parameters were not listed in Table 10-1 of the QAPP. The laboratory, PAL, provided the necessary quality control information to validate the data. All LCS' were within the laboratories required ranges.

2.3 Matrix Spikes

PAL does not analyze for alkalinity matrix spikes, therefore, no validation codes could be applied to the data.

All other water quality matrix spikes, according to Table 10-1 of the QAPP, were within the required range of 80-120 percent recovery.

3.0 METALS ANALYSIS

3.1 Holding Time

Required holding times are presented in Table 6-1 of the QAPjP.

The following samples, for total mercury, were analyzed 3 days over holding time (requirement: 28 days) and qualified estimated and not detected (UJ).

FMM5-LF10-OW155-01
FMM5-LF10-OW157-01
FMM5-LF10-OW156-01
FMM5-LF10-OW158-01
FMM5-LF9-OW151-01
FMM5-LF9-OW152-02
FMM5-LF9-OW152-04

Sample FMM5-LF9-0W152-01 was also analyzed 3 days over holding time for total mercury and was qualified estimated (J).

The following samples, for total mercury, were analyzed 2 days over holding time and qualified estimated and not detected (UJ).

FMM5-LF8-OW149-01	FMM5-LF7-OW146-04
FMM5-LF7-OW144-01	FMM5-LF7-OW146-01

The following samples, for total mercury, were analyzed 2 days over holding time and qualified estimated (J).

FMM5-LF8-OW148-01	FMM5-LF7-OW145-01
FMM5-LF8-OW147-01	FMM5-LF7-OW146-02

3.2 Laboratory Blanks

The reporting limits PAL listed on the final reports, met the method detection limits provided in the QAPjP except for the following analytes:

Analyte	QAPjP Limit	PAL Limit
Iron	0.100 mg/l	0.200 mg/l
Silver	0.025 mg/l	0.040 mg/l
Thallium	0.010 mg/l	0.050 mg/l
Zinc	0.020 mg/l	0.050 mg/l

Chromium, cobalt, copper, and silver were detected in the laboratory method blank at concentrations of 0.009 mg/l, 0.005 mg/l, 0.058 mg/l, and 0.066 mg/l respectively. Sample results within ten times the concentrations of the laboratory blank are assumed false positives and were qualified B.

3.3 Laboratory Control Samples (LCS)

The LCS' reported in the quality summary from PAL reported limit ranges of 90-110 percent. This was found to be a reporting error, the actual LCS limits used for the project were 80-120 percent recovery, except for silver and antimony which have no control limits. The only analyte out of this range was potassium, at 79 percent recovery.

Three samples, FMM5-LF10-OW155-01, FMM5-LF9-OW152-04, and FMM5-LF7-OW146-04 were qualified estimated and not detected (UJ) for the slightly low potassium recovery.

The following samples, for potassium, were qualified estimated (J) for the low recovery.

FMM5-LF10-OW157-01	FMM5-LF8-OW147-01
FMM5-LF10-OW156-01	FMM5-LF8-OW149-01
FMM5-LF10-OW158-01	FMM5-LF7-OW144-01

FMM5-LF9-OW151-01
FMM5-LF9-OW152-01
FMM5-LF9-OW152-02
FMM5-LF8-OW148-01
FMM5-LF7-OW145-01
FMM5-LF7-OW146-02
FMM5-LF7-OW146-01

3.4 Matrix Spikes/Matrix Spike Duplicates

The following samples had high matrix spike duplicate recoveries of 194/196 percent, for aluminum and were qualified estimated (J). These samples may have a potential for a high bias.

FMM5-LF10-OW155-01
FMM5-LF10-OW157-01
FMM5-LF10-OW156-01
FMM5-LF10-OW158-01
FMM5-LF9-OW151-01

The following samples had low matrix spike recoveries of 41.2/41.6 percent and 46.2/45.4 percent, for silver and were qualified estimated and not detected (UJ). These samples have a potential for a low bias.

FMM5-LF10-OW155-01
FMM5-LF10-OW157-01
FMM5-LF10-OW156-01
FMM5-LF10-OW158-01
FMM5-LF9-OW152-01
FMM5-LF9-OW152-02
FMM5-LF9-OW152-04
FMM5-LF8-OW148-01
FMM5-LF8-OW147-01
FMM5-LF8-OW149-01
FMM5-LF7-OW144-01
FMM5-LF7-OW145-01
FMM5-LF7-OW146-02

The following samples had low matrix spike/matrix spike recoveries of 41.2/41.6 percent and 46.2/45.4 percent, for silver and were qualified estimated (J). These samples have a potential for a low bias.

FMM5-LF9-OW151-01
FMM5-LF7-OW146-04
FMM5-LF7-OW146-01

3.5 Laboratory Duplicates

A high Relative Percent Difference (RPD) was reported for silver and copper, and the validation criteria of ± MDL was used for sample values <5X MDL. All samples were qualified estimated (J) for both silver and copper due to this high RPD.

The following samples were qualified estimated (J) for cadmium, nickel, and vanadium, due to the RPD being out of the ±20 percent range.

FMM5-LF10-OW155-01
FMM5-LF10-OW157-01
FMM5-LF10-OW156-01
FMM5-LF10-OW158-01
FMM5-LF9-OW151-01

4.0 FIELD BLANKS

Field Blank data is reported in Table 1.

Field Blank, FMM5-LF9-OW152-04, had positive results for the following parameters: sulfate, beryllium, calcium, cobalt, chromium, copper, magnesium, nickel, vanadium, and zinc. Associated samples, FMM5-LF9-OW152-01 and FMM5-LF9-OW152-02, having detections within ten times the concentration of the field blank concentrations, are assumed false positives and were qualified B.

Field Blank, FMM5-LF7-OW146-04, had positive results for the following parameters: alkalinity, sulfate, TDS, silver, beryllium, calcium, cadmium, cobalt, chromium, copper, magnesium, sodium, lead, thallium, vanadium, and zinc. Associated samples, FMM5-LF7-OW146-01 and FMM5-LF7-OW146-02, having detections within ten times the concentration of the field blank concentrations, are assumed false positives and were qualified B.

5.0 FIELD DUPLICATES

Field duplicate data is reported in Table 2.

Field duplicate RPD limits, supplied in Table 10-1 of the QAPjP, are listed as $\leq$40 percent for the TAL metals and $\leq$30 percent for the water quality parameters.

Field duplicate pair FMM5-LF9-OW152-01/02, have many analytes out of this range. The RPDs range from 0 to 142 percent. There is no clear indication of a reason for this discrepancy in duplicates.

RPDs for field duplicate pair FMM5-LF7-OW146-01/02, ranged from 0 to 67 percent. The only analytes out of the required limits were: aluminum, cobalt, lead, and zinc.

6.0 OVERALL ASSESSMENT

Samples were qualified as estimated (J) or estimated and no detection (UJ) due to noncompliant quality control/quality assurance results. Several samples were qualified B due to either the method blank or field blank contamination. Results qualified as estimated are usable, however, there is a potential for sample bias, either low or high, associated with the sample results.

Sixteen analytes were detected in Field Blank FMM5-LF7-OW146-04. A good number of these positive results could be due to the fact the laboratory reported lower detection limits than the ones listed in Table 5-2 of the QAPjP. However, it also should be noted that several of these analytes reported results significantly higher than the detection limit.

TABLE 1

FIELD QUALITY CONTROL BLANKS - INORGANICS
RCRA FACILITY INVESTIGATION
FORT MCCOY

Field Quality Control Sample	Analyte Detected	Concentration	Results Qualified
FMM5-LF9-OW152-04	Sulfate	2.0 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Beryllium	0.001 mg/L	Associated samples did not detect Beryllium.
	Calcium	2.0 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Cobalt	0.004 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Chromium	0.006 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Copper	0.012 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Magnesium	0.080 mg/L	Not qualified - associated samples >10x blank concentration
	Nickel	0.009 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Vanadium	0.003 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Zinc	0.22 mg/L	Associated sample concentration within 10x field blank concentration - qualified B

TABLE 1 (Continued)

FIELD QUALITY CONTROL BLANKS - INORGANICS
RCRA FACILITY INVESTIGATION
FORT MCCOY

Field Quality Control Sample	Analyte Detected	Concentration	Results Qualified
FMM5-LF7-OW146-04	Alkalinity	5.0 mg/L	Not qualified - associated samples >10x blank concentration
	Sulfate	2.0 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Total Dissolved Solids	160 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Beryllium	0.001 mg/L	Associated samples did not detect Beryllium
	Cadmium	0.008 mg/L	Associated samples did not detect Cadmium
	Calcium	2.5 mg/L	Not qualified - associated samples >10x blank concentration
	Chromium	0.012 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Cobalt	0.005 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Copper	0.044 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Lead	0.0033 mg/L	Associated sample concentration within 10x field blank concentration - qualified B

TABLE 1 (Continued)

FIELD QUALITY CONTROL BLANKS - INORGANICS
RCRA FACILITY INVESTIGATION
FORT MCCOY

Field Quality Control Sample	Analyte Detected	Concentration	Results Qualified
FMM5-LF7-OW146-04	Magnesium	0.096 mg/L	Not qualified - associated samples >10x blank concentration
	Silver	0.37 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Sodium	0.24 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Thallium	0.058 mg/L	Associated samples did not detect Thallium
	Vanadium	0.005 mg/L	Associated sample concentration within 10x field blank concentration - qualified B
	Zinc	0.31 mg/L	Associated sample concentration within 10x field blank concentration - qualified B

TABLE 2

FIELD DUPLICATE PRECISION - INORGANICS
RCRA FACILITY INVESTIGATION
FORT MCCOY

Sample	Sample Duplicate	Analyte Detected	Sample Result	Field Duplicate Result	RPD
FMM5-LF9-OW152-01	FMM5-LF9-OW152-02	Alkalinity	26 mg/L	26 mg/L	0
		Chloride	1.5 mg/L	1.0 mg/L	40*
		Phosphate, Total	1.7 mg/L	0.5 mg/L	109*
		Sulfate	5.8 mg/L	6.3 mg/L	8
		Total Dissolved solids	540 mg/L	190 mg/L	96*
		Aluminum	19 mg/L	5.6 mg/L	109**
		Arsenic	0.018 mg/L	0.0042 mg/L	124**
		Barium	0.20 mg/L	0.079 mg/L	87**
		Calcium	14 mg/L	9.9 mg/L	34
		Chromium	0.042 mg/L	0.018 mg/L	80**
		Cobalt	0.019 mg/L	0.009 mg/L	71**
		Copper	0.10 mg/L	0.017 mg/L	142**
		Iron	48 mg/L	13 mg/L	115**
		Lead	0.055 mg/L	0.012 mg/L	128**
		Magnesium	5.4 mg/L	3.5 mg/L	43**
		Manganese	0.46 mg/L	0.25 mg/L	59**
		Mercury (D.L. = 0.0002 mg/L)	0.00031 mg/L	ND	--

TABLE 2 (Continued)

FIELD DUPLICATE PRECISION - INORGANICS
RCRA FACILITY INVESTIGATION
FORT MCCOY

Sample	Sample Duplicate	Analyte Detected	Sample Result	Field Duplicate Result	RPD
FMM5-LF9-OW152-01	FMM5-LF9-OW152-02	Nickel	0.060 mg/L	0.15 mg/L	86**
		Potassium	5.2 mg/L	1.9 mg/L	93**
		Sodium	3.5 mg/L	3.5 mg/L	0
		Thallium	0.077 mg/L	0.064 mg/L	18
		Vanadium	0.043 mg/L	0.012 mg/L	113**
		Zinc	0.56 mg/L	0.22 mg/L	87**
FMM5-LF7-OW146-01	FMM5-LF7-OW146-02	Alkalinity	150 mg/L	150 mg/L	0
		Chloride	2.5 mg/L	3.0 mg/L	18
		Chemical Oxygen Demand	16 mg/L	12 mg/L	29
		Nitrate/Nitrite	0.60 mg/L	0.59 mg/L	2
		Sulfate	9.4 mg/L	9.1 mg/L	3
		Total Dissolved Solids	180 mg/L	230 mg/L	24
		Aluminum	0.31 mg/L	0.20 mg/L	43**
		Barium	0.20 mg/L	0.20 mg/L	0
		Calcium	29 mg/L	26 mg/L	11
		Chromium	0.005 mg/L	0.007 mg/L	33
		Cobalt	0.005 mg/L	0.003 mg/L	50**

TABLE 2 (Continued)

FIELD DUPLICATE PRECISION - INORGANICS
RCRA FACILITY INVESTIGATION
FORT MCCOY

Sample	Sample Duplicate	Analyte Detected	Sample Result	Field Duplicate Result	RPD
FMM5-LF7-OW146-01	FMM5-LF7-OW146-02	Copper (D.L. = 0.010 mg/L)	0.023 mg/L	ND	--
		Iron	0.44 mg/L	0.32 mg/L	32
		Lead	0.0046 mg/L	0.0023 mg/L	67**
		Magnesium	16 mg/L	16 mg/L	0
		Manganese	0.21 mg/L	0.22 mg/L	5
		Mercury (D.L. = 0.0002 mg/L)	ND	0.00036 mg/L	--
		Potassium	20 mg/L	19 mg/L	5
		Silver (D.L. = 0.040 mg/L)	0.19 mg/L	ND	--
		Sodium	1.5 mg/L	1.5 mg/L	0
		Vanadium (D.L. = 0.003 mg/L)	0.0030 mg/L	ND	--
		Zinc	0.59 mg/L	0.30 mg/L	65**

Notes: ND - Not Detected
* - Exceeds Water Quality field duplicate RPD Limit (≤30%)
** - Exceeds TAL Metals field duplicate RPD Limit (≤40%)

2. ROUND 2 GROUNDWATER SAMPLING

TECHNICAL MEMORANDUM

DATE: September 14, 1994

TO: Tim Kemmis, Project Manager
Greg Ruechel, Project Chemist

FROM: Lisa Smith, Environmental Chemist

RE: Organic Data Validation
Fort McCoy MOD5 Interim Monitoring
Fort McCoy Military Reservation

I have assessed the data packages submitted to RUST E&I from Continental Analytical Services (CAS) using procedures contained in the USEPA "National Functional Guidelines for Organic Data Review," December 1990 and revised June 1991; and control limits as listed in the Final Quality Assurance Project Plan (QAPP) Addendum No. 4 for the Fort McCoy RFI, July 1994. Level III quality data was accomplished for analyses through following EPA methodology for volatiles, semivolatiles, organochlorine PCB/pesticides, organophosphorus pesticides, and herbicides. Results for the following QC parameters were evaluated during data review:

Holding Time
Laboratory Blanks
Surrogate Spike Recoveries
Matrix Spike/Matrix Spike Duplicate Results
Laboratory Control Samples/Laboratory Control Sample Duplicates
Field Duplicates
Field Blanks/Trip Blanks

The following sections discuss only noncompliances to QAPP/method criteria. If a QC parameter listed above is not discussed, QAPP/method criteria has been met.

1.0 VOLATILE ORGANICS

Nineteen aqueous samples were analyzed for volatile organics by SW-846 Method 8240 (CDAP listed SW-846 Method 8260). Two of the samples were field duplicates (FM94-LF7-OW146-02 and FM94-LF9-OW152-02), two of the samples were field blanks (FM94-LF7-OW146-04 and FM94-LF9-OW152-02), and two of the samples were trip blanks (FM94-TB03 and FM94-TB05). QAPP/method non-compliances were not found during volatile organics data review.

2.0 SEMIVOLATILE ORGANICS

Seventeen aqueous samples were analyzed for semivolatile organics by SW-846 Method 8270. Two of the samples were field duplicates (FM94-LF7-OW146-02 and FM94-LF9-OW152-02), and two of the samples were field blanks (FM94-LF7-OW146-04 and FM94-LF9-OW152-04).

2.1 LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATES (LCS/LCSD)

Two laboratory control samples (940729LCS2 and 940803LCS1) had low 1,2,4-trichlorobenzene recoveries and high RPDs. The associated sample results were qualified as estimated (UJ) and are considered to have a potential for low bias. They include:

FM94-LF7-OW144-01	FM94-LF8-OW148-01	FM94-LF10-OW151-01
FM94-LF7-OW145-01	FM94-LF8-OW149-01	FM94-LF10-OW155-01
FM94-LF7-OW146-01	FM94-LF9-OW151-01	FM94-LF10-OW156-01
FM94-LF7-OW146-02	FM94-LF9-OW152-01	FM94-LF10-OW157-01
FM94-LF7-OW146-04	FM94-LF9-OW152-02	FM94-LF10-OW158-01
FM94-LF8-OW147-01	FM94-LF9-OW152-04	

3.0 ORGANOCHLORINE PCB/PESTICIDES

Seventeen aqueous samples were analyzed for organochlorine PCB/pesticides by SW-846 Method 8080. Two of the samples were field duplicates (FM94-LF7-OW146-02 and FM94-LF9-OW152-02), and two of the samples were field blanks (FM94-LF7-OW146-04 and FM94-LF9-OW152-04). QAPP/method noncompliances were not found during organochlorine PCB/pesticide data review.

4.0 ORGANOPHOSPHOROUS PESTICIDES

Seventeen aqueous samples were analyzed for organophosphorous pesticides by SW-846 Method 8141. Two of the samples were field duplicates (FM94-LF7-OW146-02 and FM94-LF9-OW152-02), and two of the samples were field blanks (FM94-LF7-OW146-04 and FM94-LF9-OW152-04).

4.1 SURROGATES

The surrogate recovery for sample FM94-LF10-OW157-01 was below the QAPP limits of 41 to 112 percent recovery (30 percent recovery was reported). Organophosphorus pesticide results for sample FM94-LF10-OW157-01 were qualified as estimated (UJ) due to the low surrogate recovery and are considered to have a potential for low bias.

5.0 HERBICIDES

Seventeen samples were analyzed for herbicides by SW-846 Method 8150. Two of the samples were field duplicates (FM94-LF7-OW146-02 and FM94-LF9-OW152-02), and two of the samples were field blanks (FM94-LF7-OW146-04 and FM94-LF9-OW152-04).

5.1 HOLDING TIMES

Seven samples were re-extracted/reanalyzed due to low surrogate recoveries. These seven samples were re-extracted 2 to 3 days over holding. Herbicide results for these seven samples were qualified as estimated (UJ) and are considered to have a potential for low bias due to losses which may have occurred due to constituent degradation during the prolonged holding time. Results qualified as discussed above include the following re-extracted samples:

FM94-LF7-OW146-01
FM94-LF8-OW147-01
FM94-LF8-OW148-01
FM94-LF9-OW151-01
FM94-LF9-OW152-04
FM94-LF10-OW155-01
FM94-LF10-OW157-01

5.2 SURROGATES

Seven herbicide samples had low surrogate recoveries. These seven samples were re-extracted/reanalyzed with surrogate recoveries in control. The results reported for the original analyses were qualified as estimated (UJ) and are considered to have a potential for low bias. These seven samples are listed under Section 5.1.

5.3 MATRIX SPIKES/MATRIX SPIKE DUPLICATES

The matrix spike duplicate (MSD) had low recoveries for 2,4-D and 2,4,5-TP and the MSD recovery for 2,4,5-T was very low (4 percent) for the extraction group dated August 1, 1994. Sample results associated with this extraction group were qualified as estimated (UJ) for 2,4-D and 2,4,5-TP and rejected (R) for 2,4,5-T results. The RPDs for these three herbicides were also elevated for the MS/MSD associated with the extraction group dated August 1, 1994. The samples qualified as discussed above include:

FM94-LF8-OW149-01
FM94-LF9-OW152-01
FM94-LF9-OW152-02
FM94-LF10-OW156-01

In addition, the analyst failed to add the matrix spike solution for the MS sample extracted August 2, 1994. The MSD analyzed with this extraction group was in control. Associated samples should be considered as estimated due to the lack of matrix spike recovery data. Seven of the associated samples were previously qualified; therefore, only the two remaining samples (FM94-LF10-OW154-01 and FM94-LF10-OW158-01) were qualified.

6.0 OVERALL ASSESSMENT

Samples collected in association with the Fort McCoy MOD5 interim monitoring were successfully analyzed and are acceptable for project use with the exception of four 2,4-D results. The 2,4-D matrix spike duplicate recovery was very low (4 percent) for samples extracted August 1, 1994; therefore, associated results were rejected. In addition, results were qualified as estimated (UJ) due to noncompliant QC results. Results qualified as estimated are usable, however, sample bias may be associated with these analytical results.

TECHNICAL MEMORANDUM

DATE: October 5, 1994

TO: Tim Kemmis, Project Manager
Greg Ruechel, Project Chemist

FROM: Roxann Ruechel, Environmental Chemist

RE: Inorganic Data Validation Memorandum for
RCRA Facility Investigation
Fort McCoy Military Reservation
Mod 5, Round 2 Sampling Event

1.0 INTRODUCTION

Analytical results submitted to RUST E&I from Continental Analytical Services, Inc. (CAS), collected during the Round 2 sampling event conducted in July 1994, have been assessed using procedures contained in the USEPA "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analysis," October 1989, and control limits as listed in Table 10-1 of the Final Quality Assurance Project Plan (QAPjP), Addendum No. 4, for the RCRA Facility Investigation (RFI). Level III quality data was accomplished following USEPA methodologies for analyses of Target Analyte List (TAL) metals, dissolved metals, alkalinity, chemical oxygen demand (COD), chloride, fluoride, phosphate, nitrate+nitrite, sulfate, and total dissolved solids (TDS). Results for the following quality control (QC) parameters were evaluated during the data review:

- Holding Time
- Laboratory Blanks
- Laboratory Control Samples/Laboratory Control Sample Duplicates (LCS/LCSD)
- Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
- Laboratory Duplicates/Relative Percent Difference (RPD)
- Field Blanks (Table 1)
- Field Duplicates (Table 2)

A total of 17 samples were collected and analyzed for metals and water quality parameters for Landfill Nos. 7, 8, 9, and 10. Two samples, FM94-LF7-OW146-04 and FM94-LF9-OW152-04, were Field Blanks, and two samples, FM94-LF7-OW146-02 and FM94-LF9-OW152-02, were Field Duplicates of FM94-LF7-OW146-01 and FM94-LF9-OW152-01, respectively.

The following sections discuss only noncompliances to the QAPjP/method SOP criteria. If a QC parameter listed above is not discussed, QAPjP/method criteria has been met.

2.0 WATER QUALITY PARAMETERS

Two analytes were reported using different methods than those listed in the QAPjP. They are:

Analyte	Required Method	Method Reported
Chloride	SW846 9252	Std. Methods 4500-Cl-B
Orthophosphate	EPA 365.4	EPA 365.1

2.1 HOLDING TIMES

Several samples exceeded the 7-day holding time for total dissolved solids (TDS) by one day, and one sample exceeded the 48-hour holding time for orthophosphate by 24 hours. Samples were qualified as estimated (J) due to the holding time exceedances and are listed below:

TDS:

FM94-LF8-OW149-01	FM94-LF8-OW147-01	FM94-LF10-OW155-01
FM94-LF9-OW152-01	FM94-LF10-OW158-01	FM94-LF8-OW148-01
FM94-LF10-OW156-01	FM94-LF9-OW151-01	FM94-LF7-OW146-02
FM94-LF9-OW152-02	FM94-LF10-OW154-01	FM94-LF7-OW146-04
FM94-LF10-OW157-01	FM94-LF9-OW152-04	

Orthophosphate:

FM94-LF9-OW152-04

Results qualified as estimated due to holding time exceedances are considered to have a potential for low bias.

2.2 LABORATORY CONTROL SAMPLES/LABORATORY CONTROL SAMPLE DUPLICATES (LCS/LCSD)

LCS/LCSD requirements for water quality parameters were not listed in the Internal QC Checks and Acceptance Criteria, Table 10-1, of the QAPjP. The laboratory, CAS, provided the necessary quality control information to validate the data. All LCS/LCSDs were within the laboratory's required ranges.

2.3 MATRIX SPIKES/MATRIX SPIKE DUPLICATES (MS/MSD)

One chemical oxygen demand (COD) MSD had a high RPD recovery of 31 percent (QC limit = $\leq$20 percent). Sample FM94-LF7-OW145-01 had a positive result and was qualified estimated (J).

3.0 TAL METALS

3.1 MATRIX SPIKES/MATRIX SPIKE DUPLICATES (MS/MSD)

A high MSD RPD was reported for Mercury, Total, 22 percent (QC limit = ≤20 percent). The following samples were qualified estimated (J):

FM94-LF7-OW146-01	FM94-LF10-OW157-01	FM94-LF9-OW152-04
FM94-LF8-OW149-01	FM94-LF8-OW147-01	FM94-LF10-OW155-01
FM94-LF9-OW152-01	FM94-LF10-OW158-01	FM94-LF8-OW148-01
FM94-LF10-OW156-01	FM94-LF9-OW151-01	
FM94-LF9-OW152-02	FM94-LF10-OW154-01	

QC Batch No. 2 for mercury, soluble, reported no Percent Recoveries or RPDs. The reason given by the laboratory was "matrix interference". An estimated (J) qualifier code was assigned to the following samples:

FM94-LF9-OW151-01
FM94-LF9-OW152-01
FM94-LF9-OW152-02
FM94-LF9-OW152-04

3.2 QUANTITATION

One sample, FM94-LF8-OW147-01, reported a higher reporting limit for thallium (ND (0.010 mg/l)), than the limit listed in the QAPjP (0.002 mg/l). The laboratory reported matrix interferences.

4.0 FIELD BLANKS

Field Blank data is reported in Table 1.

Field Blank, FM94-LF7-OW146-04, had positive results for the following parameters: TDS (8 mg/l), mercury, total (0.0009 mg/l), and zinc, total (0.46 mg/l). All samples having detections within five times the concentration of the Field Blank concentrations were assumed to be false positives and were qualified B.

Field Blank, FM94-LF9-OW152-04, had positive results for the following parameters:

Parameter	Concentration
TDS	4 mg/l
Mercury, Soluble	0.0010 mg/l
Zinc, Soluble	0.42 mg/l
Chromium, Total	0.01 mg/l
Mercury, Total	0.0008 mg/l
Zinc, Total	0.41 mg/l

Associated samples having detections within five times the concentration of the Field Blank concentrations were assumed to be false positives and were qualified B.

5.0 FIELD DUPLICATES

Field duplicate data is reported in Table 2.

Field duplicate RPD limits, supplied in Table 10-1 of the QAPjP, are listed as ≤40 percent for the TAL metals and ≤30 percent for the water quality parameters.

RPDs for field duplicates, FM94-LF7-OW146-01/02, ranged from 0 to 29 percent. There were no analytes out of the required ranges.

Field duplicates, FM94-LF9-OW152-01/02, had only one analyte, lead, soluble, out of the required range (91 percent). The RPDs range from 0 to 91 percent.

6.0 OVERALL ASSESSMENT

Several samples were qualified as estimated (J) due to holding time exceedances and noncompliant quality control/quality assurance results. Many samples were qualified B due to the Field Blank contamination. Results qualified as estimated are usable, however, there is a potential for sample bias, either high or low, associated with the sample results.

Attachments: As Noted

TABLE 1

FIELD QUALITY CONTROL BLANKS - INORGANICS
RCRA FACILITY INVESTIGATION
FORT MCCOY MOD 5, ROUND 2

Field Quality Control Sample	Analyte Detected	Concentration	Samples Qualified B[(1)]
FM94-LF7-OW146-04	TDS	8 mg/l	Not qualified - associated samples >5 times field blank concentration
	Mercury, Total	0.0009 mg/l	FM94-LF7-OW146-01 FM94-LF7-OW145-01 FM94-LF7-OW144-01 FM94-LF7-OW146-02
	Zinc, Total	0.46 mg/l	
FM94-LF9-OW152-04	TDS	4 mg/l	Not qualified - associated sample >5 times field blank concentration
	Mercury, Soluble	0.0010 mg/l(J)	FM94-LF9-OW152-01 FM94-LF9-OW152-02 FM94-LF9-OW151-01
	Zinc, Soluble	0.42 mg/l	
	Chromium, Total	0.01 mg/l	FM94-LF8-OW149-01 FM94-LF9-OW152-02 FM94-LF9-OW151-01 FM94-LF8-OW148-01
	Mercury, Total	0.0008 mg/l(J)	FM94-LF8-OW149-01 FM94-LF9-OW152-01 FM94-LF10-OW156-01 FM94-LF9-OW152-02 FM94-LF10-OW157-01 FM94-LF8-OW147-01 FM94-LF10-OW158-01 FM94-LF9-OW151-01 FM94-LF9-OW154-01 FM94-LF10-OW155-01 FM94-LF8-OW148-01
	Zinc, Total	0.41 mg/l	

Notes:

(1) Associated sample concentration within 5 times field blank concentration - sample qualified B.

TABLE 2

FIELD DUPLICATE PRECISION - INORGANICS
RCRA FACILITY INVESTIGATION
FORT MCCOY MOD 5, ROUND 2

Sample	Sample Duplicate	Analyte Detected	Sample Result	Field Duplicate Result	% RPD
FM94-LF9-OW152-01	FM94-LF9-OW152-02	Alkalinity	24 mg/l	25 mg/l	4
		Chloride	2 mg/l	ND (2) mg/l	0
		Orthophosphate	0.2 mg/l	0.2 mg/l	0
		TDS	98 mg/l (J)	102 mg/l (J)	4
		Calcium, Soluble	10 mg/l	9 mg/l	10
		Lead, Soluble	0.008 mg/l	ND (0.003) mg/l	91*
		Manganese, Soluble	0.02 mg/l	0.02 mg/l	0
		Mercury, Soluble	0.0014 mg/l (BJ)	0.0012 mg/l (BJ)	15
		Zinc, Soluble	0.40 mg/l (B)	0.40 mg/l (B)	0
		Aluminum, Total	2.4 mg/l	2.5 mg/l	4
		Calcium, Total	11 mg/l	12 mg/l	9
		Chromium, Total	0.05 mg/l	0.04 mg/l (B)	22
		Iron, Total	4.0 mg/l	4.5 mg/l	12
		Lead, Total	0.005 mg/l	0.004 mg/l	22
		Manganese, Total	0.05 mg/l	0.06 mg/l	18
		Mercury, Total	0.0011 mg/l (BJ)	0.0009 mg/l (BJ)	20
		Nickel, Total	0.04 mg/l	ND (0.04) mg/l	0
		Zinc, Total	0.40 mg/l (B)	0.48 mg/l (B)	18
FM94-LF7-OW146-01	FM94-LF7-OW146-02	Alkalinity	98 mg/l	93 mg/l	5
		Nitrate/Nitrite	15.2 mg/l	15.0 mg/l	1
		Orthophosphate	ND (0.1) mg/l	0.1 mg/l	0
		TDS	180 mg/l	204 mg/l (J)	12
		Aluminum, Total	ND (0.1) mg/l	0.1 mg/l	0
		Calcium, Total	30 mg/l	30 mg/l	0
		Iron, Total	3.2 mg/l	3.3 mg/l	3
		Lead, Total	0.004 mg/l	ND (0.003) mg/l	29
		Magnesium, Total	12 mg/l	12 mg/l	0
		Manganese, Total	1.43 mg/l	1.41 mg/l	1
		Mercury, Total	0.0013 mg/l (BJ)	0.0013 mg/l (B)	0
		Zinc, Total	0.56 mg/l (B)	0.49 mg/l (B)	13

Notes:

ND - Not Detected.
J - Estimated qualifier code.
B - Blank contamination qualifier code.
* - Exceeds TAL Metals field duplicate RPD limit (≤40 percent).

APPENDIX Q ADDENDUM

FORT MCCOY RFI ANALYTICAL DATA FOR PHASES 1, 2, AND 3

APPENDIX Q-11

LANDFILL 7 ANALYTICAL DATA

1. ROUND 1 GROUNDWATER SAMPLING
2. ROUND 2 GROUNDWATER SAMPLING

1. ROUND 1 GROUNDWATER SAMPLING

FORT MCCOY
November-December 1993
Landfill 7
Water

SAMPLE ID:		OW144	OW145	OW146	OW146	OW146	OW146
DEPTH:		-	-	-	-	-	-
AGENCY SAMPLE ID:		LF7-OW144-01	LF7-OW145-01	LF7-OW146-01	LF7-OW146-02	LF7-OW146-04	TB07
DATE SAMPLED:		14-DEC-93	14-DEC-93	14-DEC-93	14-DEC-93	14-DEC-93	15-DEC-93
COMPOUND							
Volatile Compounds							
1,1,1-Trichloroethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,2-Dichloroethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.6
trans-1,2-Dichloroethene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	ug/l	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	ug/l	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	ug/l	37 B	32 B	10 B	42 B	12 B	14 B
Benzene	ug/l	1.0 U	6.4	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane	ug/l	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
Carbon Tetrachloride	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Carbon disulfide	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	ug/l	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chloroform	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0
Chloromethane	ug/l	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dibromochloromethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethyl Benzene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Methyl Ethyl Ketone	ug/l	10 U	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	ug/l	11 B	7.9 BJ	7.4 BJ	9.7 B	8.2 B	8.6 B
Styrene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Tetrachloroethene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	ug/l	0.50 U	3.8 B	3.2 B	2.8 B	3.0	0.50 U
Trichloroethene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl Acetate	ug/l	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	ug/l	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Xylenes (Total)	ug/l	0.50 U	2.4	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Semi-Volatile Compounds							
1,4-Dichlorobenzene	ug/l	10 U	10 U	22 R	10 U	23 R	
1,2,4-Trichlorobenzene	ug/l	10 U	10 U	22 R	10 U	23 R	
1,2-Dichlorobenzene	ug/l	10 U	10 U	10 U	10 U	10 U	
1,3-Dichlorobenzene	ug/l	10 U	10 U	10 U	10 U	10 U	

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Water

SAMPLE ID:		OW144	OW145	OW146	OW146	OW146	OW146
DEPTH:		-	-	-	-	-	-
AGENCY SAMPLE ID:		LF7-OW144-01	LF7-OW145-01	LF7-OW146-01	LF7-OW146-02	LF7-OW146-04	TB07
DATE SAMPLED:		14-DEC-93	14-DEC-93	14-DEC-93	14-DEC-93	14-DEC-93	15-DEC-93
COMPOUND							
Semi-Volatile Compounds							
Hexachlorobutadiene	ug/l	10 U	10 U	10 U	10 U	10 U	
2,4,5-Trichlorophenol	ug/l	10 U	10 U	10 U	10 U	10 U	
2,4,6-Trichlorophenol	ug/l	10 U	10 U	10 U	10 U	10 U	
2,4-Dichlorophenol	ug/l	10 U	10 U	10 U	10 U	10 U	
2,4-Dimethylphenol	ug/l	10 U	10 U	10 U	10 U	10 U	
2,4-Dinitrophenol	ug/l	25 U	25 U	25 U	25 U	25 U	
Naphthalene	ug/l	10 U	10 U	10 U	10 U	10 U	
2,4-Dinitrotoluene	ug/l	10 U	10 U	30 R	10 U	25 R	
Benzyl Alcohol	ug/l	10 U	10 U	10 U	10 U	10 U	
Benzoic Acid	ug/l	25 U	25 U	25 U	25 U	25 U	
2-Chloronaphthalene	ug/l	10 U	10 U	10 U	10 U	10 U	
2-Chlorophenol	ug/l	10 U	10 U	32 R	10 U	34 R	
Nitrobenzene	ug/l	10 U	10 U	10 U	10 U	10 U	
2-Methylnaphthalene	ug/l	10 U	10 U	10 U	10 U	10 U	
2-Methylphenol	ug/l	10 U	10 U	10 U	10 U	10 U	
2-Nitroaniline	ug/l	25 U	25 U	25 U	25 U	25 U	
2-Nitrophenol	ug/l	10 U	10 U	10 U	10 U	10 U	
3,3-Dichlorobenzidine	ug/l	10 U	10 U	10 U	10 U	10 U	
2,6-Dinitrotoluene	ug/l	10 U	10 U	10 U	10 U	10 U	
3-Nitroaniline	ug/l	25 U	25 U	25 U	25 U	25 U	
4,6-Dinitro-2-methylphenol	ug/l	25 U	25 U	25 U	25 U	25 U	
4-Bromophenyl-phenylether	ug/l	10 U	10 U	10 U	10 U	10 U	
4-Chloro-3-methylphenol	ug/l	10 U	10 U	35 R	10 U	34 R	
4-Chloroaniline	ug/l	10 U	10 U	10 U	10 U	10 U	
4-Chlorophenyl-phenyl ether	ug/l	10 U	10 U	10 U	10 U	10 U	
4-Methylphenol	ug/l	10 U	10 U	10 U	10 U	10 U	
4-Nitroaniline	ug/l	25 U	25 U	25 U	25 U	25 U	
4-Nitrophenol	ug/l	25 U	25 U	27 R	25 U	23 R	
Acenaphthene	ug/l	10 U	1.3 J	22 R	10 UJ	23 R	
Acenaphthylene	ug/l	10 U	10 U	10 U	10 U	10 U	
Anthracene	ug/l	10 U	10 U	10 U	10 U	10 U	
Benzo(a)anthracene	ug/l	10 U	10 U	10 U	10 U	10 U	
Benzo(a)pyrene	ug/l	10 U	10 U	10 U	10 U	10 U	
Benzo(b)fluoranthene	ug/l	10 U	10 U	10 U	10 U	10 U	
Benzo(g,h,i)perylene	ug/l	10 U	10 U	10 U	10 U	10 U	
Benzo(k)fluoranthene	ug/l	10 U	10 U	10 U	10 U	10 U	
Butylbenzylphthalate	ug/l	10 U	10 U	10 U	10 U	10 U	
Chrysene	ug/l	10 U	10 U	10 U	10 U	10 U	
Di-n-butylphthalate	ug/l	10 U	1.6 J	10 U	10 U	10 U	
Di-n-octylphthalate	ug/l	10 U	10 U	10 U	10 U	10 U	
Dibenzo(a,h)anthracene	ug/l	10 U	10 U	10 U	10 U	10 U	
Dibenzofuran	ug/l	10 U	10 U	10 U	10 U	10 U	

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Water

SAMPLE ID:		OW144	OW145	OW146	OW146	OW146	OW146
DEPTH:		-	-	-	-	-	-
AGENCY SAMPLE ID:		LF7-OW144-01	LF7-OW145-01	LF7-OW146-01	LF7-OW146-02	LF7-OW146-04	TB07
DATE SAMPLED:		14-DEC-93	14-DEC-93	14-DEC-93	14-DEC-93	14-DEC-93	15-DEC-93
COMPOUND							
Semi-Volatile Compounds							
Diethylphthalate	ug/l	10 U	10 U	10 U	10 U	10 U	
Dimethylphthalate	ug/l	10 U	10 U	10 U	10 U	10 U	
Fluoranthene	ug/l	10 U	10 U	10 U	10 U	10 U	
Fluorene	ug/l	10 U	1.9 J	10 U	10 U	10 U	
Hexachlorobenzene	ug/l	10 U	10 U	10 U	10 U	10 U	
Hexachlorocyclopentadiene	ug/l	10 U	10 U	10 U	10 U	10 U	
Hexachloroethane	ug/l	10 U	10 U	10 U	10 U	10 U	
Indeno(1,2,3-cd)pyrene	ug/l	10 U	10 U	10 U	10 U	10 U	
Isophorone	ug/l	10 U	10 U	10 U	10 U	10 U	
N-Nitrosodi-N-Propylamine	ug/l	10 U	10 U	23 R	10 U	23 R	
N-nitrosodiphenylamine	ug/l	10 U	10 U	10 U	10 U	10 U	
Pentachlorophenol	ug/l	25 U	25 U	57 R	25 U	52 R	
Phenanthrene	ug/l	10 U	10 U	10 U	10 U	10 U	
Phenol	ug/l	10 U	10 U	18 R	10 U	18 R	
Pyrene	ug/l	10 U	10 U	33 R	10 U	37 R	
Bis(2-chloroethoxy)methane	ug/l	10 U	10 U	10 U	10 U	10 U	
bis(2-Chloroethyl) ether	ug/l	10 U	10 U	10 U	10 U	10 U	
bis(2-Ethylhexyl)phthalate	ug/l	10 U	10 U	10 U	10 U	10 U	
Herbicide							
2,4,5-T	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	
2,4,5-TP (Silvex)	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	
2,4-D	ug/l	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	
2,4-DB	ug/l	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	
Dalapon	ug/l	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	
Dicamba	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	
Dichloroprop	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	
Dinoseb	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	
MCPA	ug/l	250. U	250. U	250. U	250. U	250. U	
MCPP	ug/l	250. U	250. U	250. U	250. U	250. U	
Pesticide							
4,4-DDD	ug/l	0.096 UJ	0.097 UJ	0.097 U	0.097 U	0.096 U	
4,4-DDE	ug/l	0.096 UJ	0.097 UJ	0.097 U	0.097 U	0.096 U	
4,4-DDT	ug/l	0.096 UJ	0.097 UJ	0.097 UR	0.097 U	0.096 UR	
Aldrin	ug/l	0.048 UJ	0.049 UJ	0.049 UR	0.049 U	0.048 UR	
Dieldrin	ug/l	0.096 UJ	0.097 UJ	0.097 UR	0.097 U	0.096 UR	
Endosulfan I	ug/l	0.048 UJ	0.049 UJ	0.049 U	0.049 U	0.048 U	
Endosulfan II	ug/l	0.096 UJ	0.097 UJ	0.097 U	0.097 U	0.096 U	
Endosulfan sulfate	ug/l	0.048 UJ	0.049 UJ	0.049 U	0.049 U	0.048 U	

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SAMPLE ID:		OW144	OW145	OW146	OW146	OW146	OW146
DEPTH:		-	-	-	-	-	-
AGENCY SAMPLE ID:		LF7-OW144-01	LF7-OW145-01	LF7-OW146-01	LF7-OW146-02	LF7-OW146-04	TB07
DATE SAMPLED:		14-DEC-93	14-DEC-93	14-DEC-93	14-DEC-93	14-DEC-93	15-DEC-93
COMPOUND							
Pesticide							
Endrin	ug/l	0.096 UJ	0.097 UJ	0.097 UR	0.097 U	0.096 UR	
Endrin aldehyde	ug/l	0.096 UJ	0.097 UJ	0.097 U	0.097 U	0.096 U	
Heptachlor	ug/l	0.048 UJ	0.049 UJ	0.049 UR	0.049 U	0.048 UR	
Heptachlor epoxide	ug/l	0.048 UJ	0.049 UJ	0.049 U	0.049 U	0.048 U	
Methoxychlor	ug/l	0.48 UJ	0.49 UJ	0.49 U	0.49 U	0.48 U	
a-Chlordane	ug/l	0.048 UJ	0.049 UJ	0.049 U	0.049 U	0.048 U	
Toxaphene	ug/l	4.8 UJ	4.9 UJ	4.9 U	4.9 U	4.8 U	
alpha-BHC	ug/l	0.048 UJ	0.049 UJ	0.049 U	0.049 U	0.048 U	
beta-BHC	ug/l	0.048 UJ	0.049 UJ	0.049 U	0.049 U	0.048 U	
delta-BHC	ug/l	0.048 UJ	0.049 UJ	0.049 U	0.049 U	0.048 U	
gamma-BHC (lindane)	ug/l	0.048 UJ	0.049 UJ	0.049 UR	0.049 U	0.048 UR	
Endrin ketone	ug/l	0.096 UJ	0.097 UJ	0.097 U	0.097 U	0.096 U	
g-Chlordane	ug/l	0.048 UJ	0.049 UJ	0.049 U	0.049 U	0.048 U	
Ortho-Phosphorus Pesticides							
Naled	ug/l	10. U	10. U	10. U	10. U	10. U	
Ethyl Parathion	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Methyl Parathion	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Azinphos Methyl	ug/l	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	
Bolstar(Suprophos)	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	
Chlorpyrifos	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Coumaphos	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	
Demeton O,S	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Diazinon	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Dimethoate	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	
Disulfoton	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Ethoprop	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Fensulfothion	ug/l	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	
Fenthion	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Malathion	ug/l	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	
Merphos	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Mevinphos	ug/l	6.2 U	6.2 U	6.2 U	6.2 U	6.2 U	
Phorate	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Ronnel	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Stirophos (Tetrachlorovinphos	ug/l	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	
Sulfotep	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Tokuthion	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Trichloronate	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	
Dichlorvos (Vapona)	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	

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SAMPLE ID:		OW144	OW145	OW146	OW146	OW146	OW146
DEPTH:		-	-	-	-	-	-
AGENCY SAMPLE ID:		LF7-OW144-01	LF7-OW145-01	LF7-OW146-01	LF7-OW146-02	LF7-OW146-04	TB07
DATE SAMPLED:		14-DEC-93	14-DEC-93	14-DEC-93	14-DEC-93	14-DEC-93	15-DEC-93
COMPOUND							
Polychlorinated Biphenyls							
Aroclor-1016	ug/l	0.96 UJ	0.97 UJ	0.97 U	0.97 U	0.96 U	
Aroclor-1221	ug/l	1.9 UJ	1.9 UJ	1.9 U	1.9 U	1.9 U	
Aroclor-1232	ug/l	0.96 UJ	0.97 UJ	0.97 U	0.97 U	0.96 U	
Aroclor-1242	ug/l	0.96 UJ	0.97 UJ	0.97 U	0.97 U	0.96 U	
Aroclor-1248	ug/l	0.96 UJ	0.97 UJ	0.97 U	0.97 U	0.96 U	
Aroclor-1254	ug/l	0.96 UJ	0.97 UJ	0.97 U	0.97 U	0.96 U	
Aroclor-1260	ug/l	0.96 UJ	0.97 UJ	0.97 U	0.97 U	0.96 U	
Metals							
Aluminum	ug/l	620	1000	310	200	100 U	
Antimony	ug/l	30 U	30 U	30 U	30 U	30 U	
Arsenic	ug/l	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	
Barium	ug/l	45	190	200	200	4.0 U	
Beryllium	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0	
Cadmium	ug/l	2.0 U	2.0 U	2.0 U	2.0 U	8.0	
Calcium	ug/l	16000	33000	29000	26000	2500	
Chromium	ug/l	5.0 U	5.0 B	5.0 B	7.0 B	12 B	
Cobalt	ug/l	7.0 B	7.0 B	5.0 B	3.0 B	5.0 B	
Copper	ug/l	10 UJ	10 UJ	23 B J	10 UJ	44 B J	
Iron	ug/l	850	15000	440	320	200 U	
Lead	ug/l	3.3	12	4.6 B	2.3 B	3.3	
Magnesium	ug/l	5300	16000	16000	16000	96	
Manganese	ug/l	340	1400	210	220	3.0 U	
Mercury	ug/l	.20 UJ	.23 J	.20 UJ	.36 J	.20 UJ	
Nickel	ug/l	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U	
Potassium	ug/l	910 J	21000 J	20000 J	19000 J	500 UJ	
Selenium	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	
Silver	ug/l	40 UJ	40 UJ	190 BJ	40 UJ	370 BJ	
Sodium	ug/l	540	2100	1500 B	1500 B	240	
Thallium	ug/l	50 U	50 U	50 U	50 U	58	
Vanadium	ug/l	3.0 U	3.0 U	3.0 B	3.0 U	5.0	
Zinc	ug/l	550	560	590 B	300 B	310	
Miscellaneous Parameters							
Alkalinity	mg/l	46	190	150	150	5.0	
Chemical Oxygen Demand	mg/l	9.5	36	16	12	8.0 U	
Nitrate/Nitrite	ug/l	100 U	560	600	590	100 U	
Chloride	mg/l	1.0	5.1	2.5	3.0	1.0 U	
Fluoride, Total	mg/l	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	
Phosphate, Total	mg/l	0.2	0.1	0.1 U	0.1 U	0.1 U	

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Water

SAMPLE ID:		OW144	OW145	OW146	OW146	OW146	OW146
DEPTH:		-	-	-	-	-	-
AGENCY SAMPLE ID:		LF7-OW144-01	LF7-OW145-01	LF7-OW146-01	LF7-OW146-02	LF7-OW146-04	TB07
DATE SAMPLED:		14-DEC-93	14-DEC-93	14-DEC-93	14-DEC-93	14-DEC-93	15-DEC-93
COMPOUND							
Miscellaneous Parameters							
Total Dissolved Solids	mg/l	62	320	180 B	230 B	160	
Sulfate	mg/l	4.1	1.0 U	9.4 B	9.1 B	2.0	

2. ROUND 2 GROUNDWATER SAMPLING

SAMPLE ID:		OW144	OW145	OW146	OW146	OW146	OW146
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF7-OW144-01	FM94-LF7-OW145-01	FM94-LF7-OW146-01	FM94-LF7-OW146-01RE	FM94-LF7-OW146-02	FM94-LF7-OW146-04
DATE SAMPLED:		27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94
COMPOUND							
Volatile Compounds							
1,1,1-Trichloroethane	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
1,1,2-Trichloroethane	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
1,1-Dichloroethane	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
1,1-Dichloroethene	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
1,2-Dichloroethane	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
1,2-Dichloroethene(total)	ug/l	2.0 U	2.0 U	2.0 U		2.0 U	2.0 U
1,2-Dichloropropane	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
2-Hexanone	ug/l	10 U	10 U	10. U		10 U	10. U
4-Methyl-2-pentanone	ug/l	10 U	10 U	10. U		10 U	10. U
Acetone	ug/l	50 U	50 U	50 U		50 U	50 U
Benzene	ug/l	1.0 U	3.8	1.0 U		1.0 U	1.0 U
Bromodichloromethane	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
Bromoform	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
Bromomethane	ug/l	2.0 U	2.0 U	2.0 U		2.0 U	2.0 U
Carbon Tetrachloride	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
Carbon disulfide	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
Chlorobenzene	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
Chloroethane	ug/l	2.0 U	2.0 U	2.0 U		2.0 U	2.0 U
Chloroform	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
Chloromethane	ug/l	2.0 U	2.0 U	2.0 U		2.0 U	2.0 U
Dibromochloromethane	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
Ethyl Benzene	ug/l	1.0 U	7.6	1.0 U		1.0 U	1.0 U
Methyl Ethyl Ketone	ug/l	10 U	10 U	10 U		10 U	10 U
Methylene Chloride	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Styrene	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
Tetrachloroethene	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
Toluene	ug/l	1.9	1.0 U	1.0 U		1.0 U	1.0 U
Trichloroethene	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
Vinyl Acetate	ug/l	25 U	25 U	25. U		25 U	25. U
Vinyl Chloride	ug/l	2.0 U	2.0 U	2.0 U		2.0 U	2.0 U
Xylenes (Total)	ug/l	2.0 U	14.	2.0 U		2.0 U	2.0 U
cis-1,3-Dichloropropene	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
trans-1,3-Dichloropropene	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
Semi-Volatile Compounds							
1,4-Dichlorobenzene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
1,2,4-Trichlorobenzene	ug/l	5.0 UJ	5.0 UJ	5.0 UJ		5.0 UJ	5.0 UJ
1,2-Dichlorobenzene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
1,3-Dichlorobenzene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Hexachlorobutadiene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:		OW144	OW145	OW146	OW146	OW146	OW146
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF7-OW144-01	FM94-LF7-OW145-01	FM94-LF7-OW146-01	FM94-LF7-OW146-01RE	FM94-LF7-OW146-02	FM94-LF7-OW146-04
DATE SAMPLED:		27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94
COMPOUND							
Semi-Volatile Compounds							
2,4,5-Trichlorophenol	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
2,4,6-Trichlorophenol	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
2,4-Dichlorophenol	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
2,4-Dimethylphenol	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Methylphenol (2,3)	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
2,4-Dinitrophenol	ug/l	50 U	50 U	50 U		50 U	50 U
Naphthalene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
2,4-Dinitrotoluene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Benzyl Alcohol	ug/l	20 U	20 U	20 U		20 U	20 U
Benzoic Acid	ug/l	50 U	50 U	50 U		50 U	50 U
2-Chloronaphthalene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
2-Chlorophenol	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Nitrobenzene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
2-Methylnaphthalene	ug/l	5.0 U	18.	5.0 U		5.0 U	5.0 U
2-Nitroaniline	ug/l	50 U	50 U	50 U		50 U	50 U
2-Nitrophenol	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
3,3-Dichlorobenzidine	ug/l	50 U	50 U	50 U		50 U	50 U
2,6-Dinitrotoluene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
3-Nitroaniline	ug/l	50 U	50 U	50 U		50 U	50 U
4,6-Dinitro-2-methylphenol	ug/l	50 U	50 U	50 U		50 U	50 U
4-Bromophenyl phenyl ether	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
4-Chloro-3-methylphenol	ug/l	20 U	20 U	20 U		20 U	20 U
4-Chloroaniline	ug/l	20 U	20 U	20 U		20 U	20 U
4-Chlorophenyl phenyl ether	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
4-Methylphenol	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
4-Nitroaniline	ug/l	50 U	50 U	50 U		50 U	50 U
4-Nitrophenol	ug/l	50 U	50 U	50 U		50 U	50 U
Acenaphthene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Acenaphthylene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Anthracene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Benzo(a)anthracene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Benzo(a)pyrene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Benzo(b)fluoranthene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Benzo(g,h,i)perylene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Benzo(k)fluoranthene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Butylbenzylphthalate	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Chrysene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Di-n-butylphthalate	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Di-n-octylphthalate	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Dibenzo(a,h)anthracene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Dibenzofuran	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Diethylphthalate	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U

SAMPLE ID:		OW144	OW145	OW146	OW146	OW146	OW146
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF7-OW144-01	FM94-LF7-OW145-01	FM94-LF7-OW146-01	FM94-LF7-OW146-01RE	FM94-LF7-OW146-02	FM94-LF7-OW146-04
DATE SAMPLED:		27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94
COMPOUND							
Semi-Volatile Compounds							
Dimethylphthalate	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Fluoranthene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Fluorene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Hexachlorobenzene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Hexachlorocyclopentadiene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Hexachloroethane	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Indeno(1,2,3-cd)pyrene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Isophorone	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
N-Nitrosodi-N-Propylamine	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
N-nitrosodiphenylamine	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Pentachlorophenol	ug/l	20 U	20 U	20 U		20 U	20 U
Phenanthrene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Phenol	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Pyrene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
bis(2-Chloroethoxy) methane	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
bis(2-Chloroethyl) ether	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
bis(2-Chloroisopropyl) ether	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
bis(2-Ethylhexyl)phthalate	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
Herbicide							
2,4,5-T	ug/l	2.0 U	2.0 U	2.0 UJ	2.0 UJ	2.0 U	2.0 U
2,4,5-TP (Silvex)	ug/l	2.0 U	2.0 U	2.0 UJ	2.0 UJ	2.0 U	2.0 U
2,4-D	ug/l	10 U	10 U	10 UJ	10 UJ	10 U	10 U
2,4-DB	ug/l	5.0 U	5.0 U	5.0 UJ	5.0 UJ	5.0 U	5.0 U
Dalapon	ug/l	50 U	50 U	50 UJ	50 UJ	50 U	50 U
Dicamba	ug/l	2.0 U	2.0 U	2.0 UJ	2.0 UJ	2.0 U	2.0 U
Dichloroprop	ug/l	5.0 U	5.0 U	5.0 UJ	5.0 UJ	5.0 U	5.0 U
Dinoseb	ug/l	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 U	1.0 U
MCPP	ug/l	200 U	200 U	200 UJ	200 UJ	200 U	200 U
MCPA	ug/l	200 U	200 U	200 UJ	200 UJ	200 U	200 U
Pesticide							
4,4'-DDD	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
4,4'-DDE	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
4,4-DDT	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
Aldrin	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
Chlordane	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
Dieldrin	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
Endosulfan I	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
Endosulfan II	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:		OW144	OW145	OW146	OW146	OW146	OW146
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF7-OW144-01	FM94-LF7-OW145-01	FM94-LF7-OW146-01	FM94-LF7-OW146-01RE	FM94-LF7-OW146-02	FM94-LF7-OW146-04
DATE SAMPLED:		27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94
COMPOUND							
Pesticide							
Endosulfan sulfate	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
Endrin	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
Endrin aldehyde	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
Heptachlor	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
Heptachlor epoxide	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
Methoxychlor	ug/l	1.0 U	1.0 U	1.0 U		1.0 U	1.0 U
Toxaphene	ug/l	5.0 U	5.0 U	5.0 U		5.0 U	5.0 U
alpha-BHC	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
beta-BHC	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
delta-BHC	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
gamma-BHC (lindane)	ug/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
Organo-Phosphorus Pesticides							
Naled	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Azinphos Methyl	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Bolstar(Suprophos)	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Chlorpyrifos	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Coumaphos	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Demeton O,S	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Diazinon	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Dimethoate	ug/l	2.0 U	2.0 U	2.0 U		2.0 U	2.0 U
Disulfoton	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
EPN	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Ethoprop	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Fensulfothion	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Fenthion	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Malathion	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Merphos	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Mevinphos	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Ethyl Paration	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Parathion-methyl	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Phorate	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Ronnel	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Stirophos (Tetrachlorovinphos	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Sulfotep	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
TEPP	ug/l	2.0 U	2.0 U	2.0 U		2.0 U	2.0 U
Tokuthion	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Trichloronate	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U
Dichlorvos (Vapona)	ug/l	0.50 U	0.50 U	0.50 U		0.50 U	0.50 U

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:		OW144	OW145	OW146	OW146	OW146	OW146
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF7-OW144-01	FM94-LF7-OW145-01	FM94-LF7-OW146-01	FM94-LF7-OW146-01RE	FM94-LF7-OW146-02	FM94-LF7-OW146-04
DATE SAMPLED:		27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94
COMPOUND							
Polychlorinated Biphenyls							
Aroclor-1016	ug/l	0.5 U	0.5 U	0.5 U		0.5 U	0.5 U
Aroclor-1221	ug/l	0.5 U	0.5 U	0.5 U		0.5 U	0.5 U
Aroclor-1232	ug/l	0.5 U	0.5 U	0.5 U		0.5 U	0.5 U
Aroclor-1242	ug/l	0.5 U	0.5 U	0.5 U		0.5 U	0.5 U
Aroclor-1248	ug/l	0.5 U	0.5 U	0.5 U		0.5 U	0.5 U
Aroclor-1254	ug/l	0.5 U	0.5 U	0.5 U		0.5 U	0.5 U
Aroclor-1260	ug/l	0.5 U	0.5 U	0.5 U		0.5 U	0.5 U
Metals							
Aluminum	ug/l	100 U	100	100 U		100	100 U
Antimony	ug/l	6 U	6 U	6 U		6 U	6 U
Arsenic	ug/l	10 U	10 U	10 U		10 U	10 U
Barium	ug/l	100 U	100 U	100 U		100 U	100 U
Beryllium	ug/l	4 U	4 U	4 U		4 U	4 U
Cadmium	ug/l	5 U	5 U	5 U		5 U	5 U
Calcium	ug/l	11000	31000	30000		30000	5000 U
Chromium	ug/l	10 U	10 U	10 U		10 U	10 U
Cobalt	ug/l	50 U	50 U	50 U		50 U	50 U
Copper	ug/l	20 U	20 U	20 U		20 U	20 U
Iron	ug/l	300	32500	3200		3300	100 U
Lead	ug/l	3 U	20	4		3 U	3 U
Magnesium	ug/l	5000 U	11000	12000		12000	5000 U
Manganese	ug/l	30	3620	1430		1410	10 U
Mercury	ug/l	.9 B	1.1 B	1.3 BJ		1.3 B	.9
Nickel	ug/l	40 U	40 U	40 U		40 U	40 U
Potassium	ug/l	5000 U	5000 U	5000 U		5000 U	5000 U
Selenium	ug/l	5 U	7	5 U		5 U	5 U
Silver	ug/l	10 U	10 U	10 U		10 U	10 U
Sodium	ug/l	5000 U	5000 U	5000 U		5000 U	5000 U
Thallium	ug/l	2 U	2 U	2 U		2 U	2 U
Vanadium	ug/l	50 U	50 U	50 U		50 U	50 U
Zinc	ug/l	500 B	490 B	560 B		490 B	460
Miscellaneous Parameters							
Alkalinity	mg/l	18.	146.	98.		93.	2 U
Chemical Oxygen Demand	mg/l	10 U	38. J	10 U		10 U	10 U
Nitrate/Nitrite	ug/l	300	1400	15200		15000	100 U
Chloride	mg/l	2 U	2 U	2 U		2 U	2 U
Fluoride, Total	mg/l	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U
Total Dissolved Solids	mg/l	60.	232.	180.		204. J	8. J

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:		OW144	OW145	OW146	OW146	OW146	OW146
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF7-OW144-01	FM94-LF7-OW145-01	FM94-LF7-OW146-01	FM94-LF7-OW146-01RE	FM94-LF7-OW146-02	FM94-LF7-OW146-04
DATE SAMPLED:		27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94	27-JUL-94
COMPOUND							
Miscellaneous Parameters							
Sulfate	mg/l	10 U	10 U	10 U		10 U	10 U
Orthophosphate	mg/l	0.1 U	0.1 U	0.1 U		0.1	0.1 U

APPENDIX Q-12

LANDFILL 8 ANALYTICAL DATA

1. ROUND 1 GROUNDWATER SAMPLING
2. ROUND 2 GROUNDWATER SAMPLING

1. ROUND 1 GROUNDWATER SAMPLING

FORT MCCOY
November-December 1993
Landfill 8
Water

SAMPLE ID:	OW147	OW148	OW149
DEPTH:	-	-	-
AGENCY SAMPLE ID:	LF8-OW147-01	LF8-OW148-01	LF8-OW149-01
DATE SAMPLED:	14-DEC-93	14-DEC-93	14-DEC-93

COMPOUND				
Volatile Compounds				
1,1,1-Trichloroethane	ug/l	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	ug/l	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	ug/l	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	ug/l	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	ug/l	1.1 U	1.1 U	1.1 U
1,2-Dichloroethane	ug/l	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	ug/l	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	ug/l	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/l	1.0 U	1.0 U	1.0 U
2-Hexanone	ug/l	10 U	10 U	10 U
4-Methyl-2-pentanone	ug/l	10 U	10 U	10 U
Acetone	ug/l	33 B	17 B	15 B
Benzene	ug/l	1.0 U	1.0 U	1.0 U
Bromodichloromethane	ug/l	1.0 U	1.0 U	1.0 U
Bromoform	ug/l	0.50 U	0.50 U	0.50 U
Bromomethane	ug/l	2.3 U	2.3 U	2.3 U
Carbon Tetrachloride	ug/l	1.1 U	1.1 U	1.1 U
Carbon disulfide	ug/l	1.0 U	1.0 U	1.0 U
Chlorobenzene	ug/l	0.50 U	0.50 U	0.50 U
Chloroethane	ug/l	2.0 U	2.0 U	2.0 U
Chloroform	ug/l	1.0 U	1.0 U	1.0 U
Chloromethane	ug/l	2.0 U	2.0 U	2.0 U
Dibromochloromethane	ug/l	1.0 U	1.0 U	1.0 U
Ethyl Benzene	ug/l	0.50 U	0.50 U	0.50 U
Methyl Ethyl Ketone	ug/l	10 U	10 U	10 U
Methylene Chloride	ug/l	7.0 BJ	6.8 BJ	7.3 BJ
Styrene	ug/l	0.50 U	0.50 U	0.50 U
Tetrachloroethene	ug/l	0.50 U	0.50 U	0.50 U
Toluene	ug/l	3.4 B	1.2 B	16
Trichloroethene	ug/l	1.0 U	1.0 U	1.0 U
Vinyl Acetate	ug/l	2.0 U	2.0 U	2.0 U
Vinyl Chloride	ug/l	2.0 U	2.0 U	2.0 U
Xylenes (Total)	ug/l	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/l	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	ug/l	0.50 U	0.50 U	0.50 U
Semi-Volatile Compounds				
1,4-Dichlorobenzene	ug/l	10 U	10 U	10 U
1,2,4-Trichlorobenzene	ug/l	10 U	10 U	10 U
1,2-Dichlorobenzene	ug/l	10 U	10 U	10 U
1,3-Dichlorobenzene	ug/l	10 U	10 U	10 U

FORT MCCOY
November-December 1993
Landfill 8
Water

SAMPLE ID:	OW147	OW148	OW149
DEPTH:	-	-	-
AGENCY SAMPLE ID:	LF8-OW147-01	LF8-OW148-01	LF8-OW149-01
DATE SAMPLED:	14-DEC-93	14-DEC-93	14-DEC-93

COMPOUND				
Semi-Volatile Compounds				
Hexachlorobutadiene	ug/l	10 U	10 U	10 U
2,4,5-Trichlorophenol	ug/l	10 U	10 U	10 UJ
2,4,6-Trichlorophenol	ug/l	10 U	10 U	10 UJ
2,4-Dichlorophenol	ug/l	10 U	10 U	10 UJ
2,4-Dimethylphenol	ug/l	10 U	10 U	10 UJ
2,4-Dinitrophenol	ug/l	25 U	25 U	25 UJ
Naphthalene	ug/l	10 U	10 U	10 U
2,4-Dinitrotoluene	ug/l	10 U	10 U	10 U
Benzyl Alcohol	ug/l	10 U	10 U	10 UJ
Benzoic Acid	ug/l	25 U	25 U	25 UJ
2-Chloronaphthalene	ug/l	10 U	10 U	10 U
2-Chlorophenol	ug/l	10 U	10 U	10 UJ
Nitrobenzene	ug/l	10 U	10 U	10 U
2-Methylnaphthalene	ug/l	10 U	10 U	10 U
2-Methylphenol	ug/l	10 U	10 U	10 UJ
2-Nitroaniline	ug/l	25 U	25 U	25 U
2-Nitrophenol	ug/l	10 U	10 U	10 UJ
3,3-Dichlorobenzidine	ug/l	10 U	10 U	10 U
2,6-Dinitrotoluene	ug/l	10 U	10 U	10 U
3-Nitroaniline	ug/l	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	ug/l	25 U	25 U	25 UJ
4-Bromophenyl-phenylether	ug/l	10 U	10 U	10 U
4-Chloro-3-methylphenol	ug/l	10 U	10 U	10 UJ
4-Chloroaniline	ug/l	10 U	10 U	10 U
4-Chlorophenyl-phenyl ether	ug/l	10 U	10 U	10 U
4-Methylphenol	ug/l	10 U	10 U	10 UJ
4-Nitroaniline	ug/l	25 U	25 U	25 U
4-Nitrophenol	ug/l	25 U	25 U	25 UJ
Acenaphthene	ug/l	10 U	10 U	10 U
Acenaphthylene	ug/l	10 U	10 U	10 U
Anthracene	ug/l	10 U	10 U	10 U
Benzo(a)anthracene	ug/l	10 U	10 U	10 U
Benzo(a)pyrene	ug/l	10 U	10 U	10 U
Benzo(b)fluoranthene	ug/l	10 U	10 U	10 U
Benzo(g,h,i)perylene	ug/l	10 U	10 U	10 U
Benzo(k)fluoranthene	ug/l	10 U	10 U	10 U
Butylbenzylphthalate	ug/l	10 U	10 U	10 U
Chrysene	ug/l	10 U	10 U	10 U
Di-n-butylphthalate	ug/l	10 U	10 U	10 U
Di-n-octylphthalate	ug/l	10 U	10 U	10 U
Dibenzo(a,h)anthracene	ug/l	10 U	10 U	10 U
Dibenzofuran	ug/l	10 U	10 U	10 U

FORT MCCOY
November-December 1993
Landfill 8
Water

SAMPLE ID:	OW147	OW148	OW149
DEPTH:	-	-	-
AGENCY SAMPLE ID:	LF8-OW147-01	LF8-OW148-01	LF8-OW149-01
DATE SAMPLED:	14-DEC-93	14-DEC-93	14-DEC-93

COMPOUND				
Semi-Volatile Compounds				
Diethylphthalate	ug/l	10 U	10 U	10 U
Dimethylphthalate	ug/l	10 U	10 U	10 U
Fluoranthene	ug/l	10 U	10 U	10 U
Fluorene	ug/l	10 U	10 U	10 U
Hexachlorobenzene	ug/l	10 U	10 U	10 U
Hexachlorocyclopentadiene	ug/l	10 U	10 U	10 U
Hexachloroethane	ug/l	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	ug/l	10 U	10 U	10 U
Isophorone	ug/l	10 U	10 U	10 U
N-Nitrosodi-N-Propylamine	ug/l	10 U	10 U	10 U
N-nitrosodiphenylamine	ug/l	10 U	10 U	10 U
Pentachlorophenol	ug/l	25 U	25 U	25 UJ
Phenanthrene	ug/l	10 U	10 U	10 U
Phenol	ug/l	10 U	10 U	10 UJ
Pyrene	ug/l	10 U	10 U	10 U
Bis(2-chloroethoxy)methane	ug/l	10 U	10 U	10 U
bis(2-Chloroethyl) ether	ug/l	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	ug/l	10 U	10 U	10 U
Herbicide				
2,4,5-T	ug/l	0.50 U	0.50 U	0.50 U
2,4,5-TP (Silvex)	ug/l	0.50 U	0.50 U	0.50 U
2,4-D	ug/l	2.0 U	2.0 U	2.0 U
2,4-DB	ug/l	5.0 U	5.0 U	5.0 U
Dalapon	ug/l	5.0 U	5.0 U	5.0 U
Dicamba	ug/l	0.50 U	0.50 U	0.50 U
Dichloroprop	ug/l	1.0 U	1.0 U	1.0 U
Dinoseb	ug/l	1.0 U	1.0 U	1.0 U
MCPA	ug/l	250. U	250. U	250. U
MCPP	ug/l	250. U	250. U	250. U
Pesticide				
4,4-DDD	ug/l	0.094 UJ	0.095 UJ	0.095 UR
4,4-DDE	ug/l	0.094 UJ	0.095 UJ	0.095 UR
4,4-DDT	ug/l	0.094 UJ	0.095 UJ	0.095 UR
Aldrin	ug/l	0.047 UJ	0.048 UJ	0.048 UR
Dieldrin	ug/l	0.094 UJ	0.095 UJ	0.095 UR
Endosulfan I	ug/l	0.047 UJ	0.048 UJ	0.048 UR
Endosulfan II	ug/l	0.094 UJ	0.095 UJ	0.095 UR
Endosulfan sulfate	ug/l	0.047 UJ	0.048 UJ	0.048 UR

FORT MCCOY
November-December 1993
Landfill 8
Water

SAMPLE ID:	OW147	OW148	OW149
DEPTH:	-	-	-
AGENCY SAMPLE ID:	LF8-OW147-01	LF8-OW148-01	LF8-OW149-01
DATE SAMPLED:	14-DEC-93	14-DEC-93	14-DEC-93

COMPOUND				
Pesticide				
Endrin	ug/l	0.094 UJ	0.095 UJ	0.095 UR
Endrin aldehyde	ug/l	0.094 UJ	0.095 UJ	0.095 UR
Heptachlor	ug/l	0.047 UJ	0.048 UJ	0.048 UR
Heptachlor epoxide	ug/l	0.047 UJ	0.048 UJ	0.048 UR
Methoxychlor	ug/l	0.47 UJ	0.48 UJ	0.48 UR
a-Chlordane	ug/l	0.047 UJ	0.048 UJ	0.048 UR
Toxaphene	ug/l	4.7 UJ	4.8 UJ	4.8 UR
alpha-BHC	ug/l	0.047 UJ	0.048 UJ	0.048 UR
beta-BHC	ug/l	0.047 UJ	0.048 UJ	0.048 UR
delta-BHC	ug/l	0.047 UJ	0.048 UJ	0.048 UR
gamma-BHC (lindane)	ug/l	0.047 UJ	0.048 UJ	0.048 UR
Endrin ketone	ug/l	0.094 UJ	0.095 UJ	0.095 UR
g-Chlordane	ug/l	0.047 UJ	0.048 UJ	0.048 UR
Ortho-Phosphorus Pesticides				
Naled	ug/l	10. U	10. U	10. U
Ethyl Parathion	ug/l	0.25 U	0.25 U	0.25 U
Methyl Parathion	ug/l	0.25 U	0.25 U	0.25 U
Azinphos Methyl	ug/l	2.5 U	2.5 U	2.5 U
Bolstar(Suprophos)	ug/l	0.50 U	0.50 U	0.50 U
Chlorpyrifos	ug/l	0.25 U	0.25 U	0.25 U
Coumaphos	ug/l	0.50 U	0.50 U	0.50 U
Demeton O,S	ug/l	0.25 U	0.25 U	0.25 U
Diazinon	ug/l	0.25 U	0.25 U	0.25 U
Dimethoate	ug/l	0.50 U	0.50 U	0.50 U
Disulfoton	ug/l	0.25 U	0.25 U	0.25 U
Ethoprop	ug/l	0.25 U	0.25 U	0.25 U
Fensulfothion	ug/l	2.5 U	2.5 U	2.5 U
Fenthion	ug/l	0.25 U	0.25 U	0.25 U
Malathion	ug/l	1.2 U	1.2 U	1.2 U
Merphos	ug/l	0.25 U	0.25 U	0.25 U
Mevinphos	ug/l	6.2 U	6.2 U	6.2 U
Phorate	ug/l	0.25 U	0.25 U	0.25 U
Ronnel	ug/l	0.25 U	0.25 U	0.25 U
Stirophos (Tetrachlorovinphos	ug/l	2.5 U	2.5 U	2.5 U
Sulfotep	ug/l	0.25 U	0.25 U	0.25 U
Tokuthion	ug/l	0.25 U	0.25 U	0.25 U
Trichloronate	ug/l	0.25 U	0.25 U	0.25 U
Dichlorvos (Vapona)	ug/l	0.50 U	0.50 U	0.50 U

FORT MCCOY
November-December 1993
Landfill 8
Water

SAMPLE ID:	OW147	OW148	OW149
DEPTH:	-	-	-
AGENCY SAMPLE ID:	LF8-OW147-01	LF8-OW148-01	LF8-OW149-01
DATE SAMPLED:	14-DEC-93	14-DEC-93	14-DEC-93

COMPOUND				
Polychlorinated Biphenyls				
Aroclor-1016	ug/l	0.94 UJ	0.95 UJ	0.95 UR
Aroclor-1221	ug/l	1.9 UJ	1.9 UJ	1.9 UR
Aroclor-1232	ug/l	0.94 UJ	0.95 UJ	0.95 UR
Aroclor-1242	ug/l	0.94 UJ	0.95 UJ	0.95 UR
Aroclor-1248	ug/l	0.94 UJ	0.95 UJ	0.95 UR
Aroclor-1254	ug/l	0.94 UJ	0.95 UJ	0.95 UR
Aroclor-1260	ug/l	0.94 UJ	0.95 UJ	0.95 UR
Metals				
Aluminum	ug/l	15000	3000	4200
Antimony	ug/l	30 U	30 U	30 U
Arsenic	ug/l	12	2.0 U	2.0 U
Barium	ug/l	230	47	110
Beryllium	ug/l	1.0 U	1.0 U	1.0 U
Cadmium	ug/l	2.0 U	2.0 U	2.0 U
Calcium	ug/l	31000	9500	24000
Chromium	ug/l	80 B	20 B	24 B
Cobalt	ug/l	100	13 B	12 B
Copper	ug/l	100 B J	10 UJ	10 UJ
Iron	ug/l	79000	5600	7200
Lead	ug/l	22	6.1	8.7
Magnesium	ug/l	14000	2400	8600
Manganese	ug/l	4500	490	610
Mercury	ug/l	.24 J	.32 J	.20 UJ
Nickel	ug/l	93	13	25
Potassium	ug/l	5200 J	1200 J	2200 J
Selenium	ug/l	1.0 U	1.0 U	1.0 U
Silver	ug/l	40 UJ	40 UJ	40 UJ
Sodium	ug/l	7100	4100	10000
Thallium	ug/l	150	50 U	50 U
Vanadium	ug/l	46	7.0	12
Zinc	ug/l	680	460	300
Miscellaneous Parameters				
Alkalinity	mg/l	82	19	54
Chemical Oxygen Demand	mg/l	24	9.5	9.5
Nitrate/Nitrite	ug/l	630	100 U	290
Chloride	mg/l	32	1.5	20
Fluoride, Total	mg/l	0.1 U	0.1 U	0.1 U
Phosphate, Total	mg/l	1.6	0.1	0.2

FORT MCCOY
November-December 1993
Landfill 8
Water

SAMPLE ID:	OW147	OW148	OW149
DEPTH:	-	-	-
AGENCY SAMPLE ID:	LF8-OW147-01	LF8-OW148-01	LF8-OW149-01
DATE SAMPLED:	14-DEC-93	14-DEC-93	14-DEC-93

COMPOUND				
Miscellaneous Parameters				
Total Dissolved Solids	mg/l	580	60	230
Sulfate	mg/l	9.9	11	17

2. ROUND 2 GROUNDWATER SAMPLING

SAMPLE ID:		OW147	OW147	OW148	OW148	OW149
DEPTH:		-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF8-OW147-01	FM94-LF8-OW147-01RE	FM94-LF8-OW148-01	FM94-LF8-OW148-01RE	FM94-LF8-OW149-01
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND						
Volatile Compounds						
1,1,1-Trichloroethane	ug/l	1.0 U		1.0 U		1.0 U
1,1,2,2-Tetrachloroethane	ug/l	1.0 U		1.0 U		1.0 U
1,1,2-Trichloroethane	ug/l	1.0 U		1.0 U		1.0 U
1,1-Dichloroethane	ug/l	1.0 U		1.0 U		1.0 U
1,1-Dichloroethene	ug/l	1.0 U		1.0 U		1.0 U
1,2-Dichloroethane	ug/l	1.0 U		1.0 U		1.0 U
1,2-Dichloroethene(total)	ug/l	2.0 U		2.0 U		2.0 U
1,2-Dichloropropane	ug/l	1.0 U		1.0 U		1.0 U
2-Hexanone	ug/l	10 U		10 U		10 U
4-Methyl-2-pentanone	ug/l	10 U		10 U		10 U
Acetone	ug/l	50 U		50 U		50 U
Benzene	ug/l	1.0 U		1.0 U		1.0 U
Bromodichloromethane	ug/l	1.0 U		1.0 U		1.0 U
Bromoform	ug/l	1.0 U		1.0 U		1.0 U
Bromomethane	ug/l	2.0 U		2.0 U		2.0 U
Carbon Tetrachloride	ug/l	1.0 U		1.0 U		1.0 U
Carbon disulfide	ug/l	1.0 U		1.0 U		1.0 U
Chlorobenzene	ug/l	1.0 U		1.0 U		1.0 U
Chloroethane	ug/l	2.0 U		2.0 U		2.0 U
Chloroform	ug/l	1.0 U		1.0 U		1.0 U
Chloromethane	ug/l	2.0 U		2.0 U		2.0 U
Dibromochloromethane	ug/l	1.0 U		1.0 U		1.0 U
Ethyl Benzene	ug/l	1.0 U		1.0 U		1.0 U
Methyl Ethyl Ketone	ug/l	10 U		10 U		10 U
Methylene Chloride	ug/l	5.0 U		5.0 U		5.0 U
Styrene	ug/l	1.0 U		1.0 U		1.0 U
Tetrachloroethene	ug/l	1.0 U		1.0 U		1.0 U
Toluene	ug/l	2.5		1.0 U		1.0 U
Trichloroethene	ug/l	1.0 U		1.0 U		1.0 U
Vinyl Acetate	ug/l	25 U		25 U		25 U
Vinyl Chloride	ug/l	2.0 U		2.0 U		2.0 U
Xylenes (Total)	ug/l	2.0 U		2.0 U		2.0 U
cis-1,3-Dichloropropene	ug/l	1.0 U		1.0 U		1.0 U
trans-1,3-Dichloropropene	ug/l	1.0 U		1.0 U		1.0 U
Semi-Volatile Compounds						
1,4-Dichlorobenzene	ug/l	5.0 U		5.0 U		5.0 U
1,2,4-Trichlorobenzene	ug/l	5.0 UJ		5.0 UJ		5.0 UJ
1,2-Dichlorobenzene	ug/l	5.0 U		5.0 U		5.0 U
1,3-Dichlorobenzene	ug/l	5.0 U		5.0 U		5.0 U
Hexachlorobutadiene	ug/l	5.0 U		5.0 U		5.0 U

Groundwater Monitoring Results
Fort McCoy

	SAMPLE ID:	OW147	OW147	OW148	OW148	OW149
	DEPTH:	-	-	-	-	-
	FIELD SAMPLE ID:	FM94-LF8-OW147-01	FM94-LF8-OW147-01RE	FM94-LF8-OW148-01	FM94-LF8-OW148-01RE	FM94-LF8-OW149-01
	DATE SAMPLED:	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND						
Semi-Volatile Compounds						
2,4,5-Trichlorophenol	ug/l	5.0 U		5.0 U		5.0 U
2,4,6-Trichlorophenol	ug/l	5.0 U		5.0 U		5.0 U
2,4-Dichlorophenol	ug/l	5.0 U		5.0 U		5.0 U
2,4-Dimethylphenol	ug/l	5.0 U		5.0 U		5.0 U
Methylphenol (2,3)	ug/l	5.0 U		5.0 U		5.0 U
2,4-Dinitrophenol	ug/l	50 U		50 U		50 U
Naphthalene	ug/l	5.0 U		5.0 U		5.0 U
2,4-Dinitrotoluene	ug/l	5.0 U		5.0 U		5.0 U
Benzyl Alcohol	ug/l	20 U		20 U		20 U
Benzoic Acid	ug/l	50 U		50 U		50 U
2-Chloronaphthalene	ug/l	5.0 U		5.0 U		5.0 U
2-Chlorophenol	ug/l	5.0 U		5.0 U		5.0 U
Nitrobenzene	ug/l	5.0 U		5.0 U		5.0 U
2-Methylnaphthalene	ug/l	5.0 U		5.0 U		5.0 U
2-Nitroaniline	ug/l	50 U		50 U		50 U
2-Nitrophenol	ug/l	5.0 U		5.0 U		5.0 U
3,3-Dichlorobenzidine	ug/l	50 U		50 U		50 U
2,6-Dinitrotoluene	ug/l	5.0 U		5.0 U		5.0 U
3-Nitroaniline	ug/l	50 U		50 U		50 U
4,6-Dinitro-2-methylphenol	ug/l	50 U		50 U		50 U
4-Bromophenyl phenyl ether	ug/l	5.0 U		5.0 U		5.0 U
4-Chloro-3-methylphenol	ug/l	20 U		20 U		20 U
4-Chloroaniline	ug/l	20 U		20 U		20 U
4-Chlorophenyl phenyl ether	ug/l	5.0 U		5.0 U		5.0 U
4-Methylphenol	ug/l	5.0 U		5.0 U		5.0 U
4-Nitroaniline	ug/l	50 U		50 U		50 U
4-Nitrophenol	ug/l	50 U		50 U		50 U
Acenaphthene	ug/l	5.0 U		5.0 U		5.0 U
Acenaphthylene	ug/l	5.0 U		5.0 U		5.0 U
Anthracene	ug/l	5.0 U		5.0 U		5.0 U
Benzo(a)anthracene	ug/l	5.0 U		5.0 U		5.0 U
Benzo(a)pyrene	ug/l	5.0 U		5.0 U		5.0 U
Benzo(b)fluoranthene	ug/l	5.0 U		5.0 U		5.0 U
Benzo(g,h,i)perylene	ug/l	5.0 U		5.0 U		5.0 U
Benzo(k)fluoranthene	ug/l	5.0 U		5.0 U		5.0 U
Butylbenzylphthalate	ug/l	5.0 U		5.0 U		5.0 U
Chrysene	ug/l	5.0 U		5.0 U		5.0 U
Di-n-butylphthalate	ug/l	5.0 U		5.0 U		5.0 U
Di-n-octylphthalate	ug/l	5.0 U		5.0 U		5.0 U
Dibenzo(a,h)anthracene	ug/l	5.0 U		5.0 U		5.0 U
Dibenzofuran	ug/l	5.0 U		5.0 U		5.0 U
Diethylphthalate	ug/l	5.0 U		5.0 U		5.0 U

	SAMPLE ID:	OW147	OW147	OW148	OW148	OW149
	DEPTH:	-	-	-	-	-
	FIELD SAMPLE ID:	FM94-LF8-OW147-01	FM94-LF8-OW147-01RE	FM94-LF8-OW148-01	FM94-LF8-OW148-01RE	FM94-LF8-OW149-01
	DATE SAMPLED:	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND						
Semi-Volatile Compounds						
Dimethylphthalate	ug/l	5.0 U		5.0 U		5.0 U
Fluoranthene	ug/l	5.0 U		5.0 U		5.0 U
Fluorene	ug/l	5.0 U		5.0 U		5.0 U
Hexachlorobenzene	ug/l	5.0 U		5.0 U		5.0 U
Hexachlorocyclopentadiene	ug/l	5.0 U		5.0 U		5.0 U
Hexachloroethane	ug/l	5.0 U		5.0 U		5.0 U
Indeno(1,2,3-cd)pyrene	ug/l	5.0 U		5.0 U		5.0 U
Isophorone	ug/l	5.0 U		5.0 U		5.0 U
N-Nitrosodi-N-Propylamine	ug/l	5.0 U		5.0 U		5.0 U
N-nitrosodiphenylamine	ug/l	5.0 U		5.0 U		5.0 U
Pentachlorophenol	ug/l	20 U		20 U		20 U
Phenanthrene	ug/l	5.0 U		5.0 U		5.0 U
Phenol	ug/l	5.0 U		5.0 U		5.0 U
Pyrene	ug/l	5.0 U		5.0 U		5.0 U
bis(2-Chloroethoxy) methane	ug/l	5.0 U		5.0 U		5.0 U
bis(2-Chloroethyl) ether	ug/l	5.0 U		5.0 U		5.0 U
bis(2-Chloroisopropyl) ether	ug/l	5.0 U		5.0 U		5.0 U
bis(2-Ethylhexyl)phthalate	ug/l	5.0 U		5.0 U		5.0 U
Herbicide						
2,4,5-T	ug/l	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UR
2,4,5-TP (Silvex)	ug/l	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ
2,4-D	ug/l	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
2,4-DB	ug/l	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 U
Dalapon	ug/l	50 UJ	50 UJ	50 UJ	50 UJ	50 U
Dicamba	ug/l	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 U
Dichloroprop	ug/l	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 U
Dinoseb	ug/l	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 U
MCPP	ug/l	200 UJ	200 UJ	200 UJ	200 UJ	200 U
MCPA	ug/l	200 UJ	200 UJ	200 UJ	200 UJ	200 U
Pesticide						
4,4'-DDD	ug/l	0.1 U		0.1 U		0.1 U
4,4'-DDE	ug/l	0.1 U		0.1 U		0.1 U
4,4-DDT	ug/l	0.1 U		0.1 U		0.1 U
Aldrin	ug/l	0.1 U		0.1 U		0.1 U
Chlordane	ug/l	0.1 U		0.1 U		0.1 U
Dieldrin	ug/l	0.1 U		0.1 U		0.1 U
Endosulfan I	ug/l	0.1 U		0.1 U		0.1 U
Endosulfan II	ug/l	0.1 U		0.1 U		0.1 U

Groundwater Monitoring Results
Fort McCoy

	SAMPLE ID:	OW147	OW147	OW148	OW148	OW149
	DEPTH:	-	-	-	-	-
	FIELD SAMPLE ID:	FM94-LF8-OW147-01	FM94-LF8-OW147-01RE	FM94-LF8-OW148-01	FM94-LF8-OW148-01RE	FM94-LF8-OW149-01
	DATE SAMPLED:	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND						
Pesticide						
Endosulfan sulfate	ug/l	0.1 U		0.1 U		0.1 U
Endrin	ug/l	0.1 U		0.1 U		0.1 U
Endrin aldehyde	ug/l	0.1 U		0.1 U		0.1 U
Heptachlor	ug/l	0.1 U		0.1 U		0.1 U
Heptachlor epoxide	ug/l	0.1 U		0.1 U		0.1 U
Methoxychlor	ug/l	1.0 U		1.0 U		1.0 U
Toxaphene	ug/l	5.0 U		5.0 U		5.0 U
alpha-BHC	ug/l	0.1 U		0.1 U		0.1 U
beta-BHC	ug/l	0.1 U		0.1 U		0.1 U
delta-BHC	ug/l	0.1 U		0.1 U		0.1 U
gamma-BHC (lindane)	ug/l	0.1 U		0.1 U		0.1 U
Organo-Phosphorus Pesticides						
Naled	ug/l	0.50 U		0.50 U		0.50 U
Azinphos Methyl	ug/l	0.50 U		0.50 U		0.50 U
Bolstar(Suprophos)	ug/l	0.50 U		0.50 U		0.50 U
Chlorpyrifos	ug/l	0.50 U		0.50 U		0.50 U
Coumaphos	ug/l	0.50 U		0.50 U		0.50 U
Demeton O,S	ug/l	0.50 U		0.50 U		0.50 U
Diazinon	ug/l	0.50 U		0.50 U		0.50 U
Dimethoate	ug/l	2.0 U		2.0 U		2.0 U
Disulfoton	ug/l	0.50 U		0.50 U		0.50 U
EPN	ug/l	0.50 U		0.50 U		0.50 U
Ethoprop	ug/l	0.50 U		0.50 U		0.50 U
Fensulfothion	ug/l	0.50 U		0.50 U		0.50 U
Fenthion	ug/l	0.50 U		0.50 U		0.50 U
Malathion	ug/l	0.50 U		0.50 U		0.50 U
Merphos	ug/l	0.50 U		0.50 U		0.50 U
Mevinphos	ug/l	0.50 U		0.50 U		0.50 U
Ethyl Paration	ug/l	0.50 U		0.50 U		0.50 U
Parathion-methyl	ug/l	0.50 U		0.50 U		0.50 U
Phorate	ug/l	0.50 U		0.50 U		0.50 U
Ronnel	ug/l	0.50 U		0.50 U		0.50 U
Stirophos (Tetrachlorovinphos	ug/l	0.50 U		0.50 U		0.50 U
Sulfotep	ug/l	0.50 U		0.50 U		0.50 U
TEPP	ug/l	2.0 U		2.0 U		2.0 U
Tokuthion	ug/l	0.50 U		0.50 U		0.50 U
Trichloronate	ug/l	0.50 U		0.50 U		0.50 U
Dichlorvos (Vapona)	ug/l	0.50 U		0.50 U		0.50 U

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:		OW147	OW147	OW148	OW148	OW149
DEPTH:		-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF8-OW147-01	FM94-LF8-OW147-01RE	FM94-LF8-OW148-01	FM94-LF8-OW148-01RE	FM94-LF8-OW149-01
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND						
Polychlorinated Biphenyls						
Aroclor-1016	ug/l	0.5 U		0.5 U		0.5 U
Aroclor-1221	ug/l	0.5 U		0.5 U		0.5 U
Aroclor-1232	ug/l	0.5 U		0.5 U		0.5 U
Aroclor-1242	ug/l	0.5 U		0.5 U		0.5 U
Aroclor-1248	ug/l	0.5 U		0.5 U		0.5 U
Aroclor-1254	ug/l	0.5 U		0.5 U		0.5 U
Aroclor-1260	ug/l	0.5 U		0.5 U		0.5 U
Metals						
Aluminum	ug/l	40200		800		3000
Antimony	ug/l	6 U		6 U		6 U
Arsenic	ug/l	20		10 U		10 U
Barium	ug/l	300		100 U		100 U
Beryllium	ug/l	4		4 U		4 U
Cadmium	ug/l	8		5 U		5 U
Calcium	ug/l	33000		9000		26000
Chromium	ug/l	210		30 B		30 B
Cobalt	ug/l	120		50 U		50 U
Copper	ug/l	250		20 U		20 U
Iron	ug/l	208000		1600		5500
Lead	ug/l	37		3 U		3 U
Magnesium	ug/l	19000		5000 U		10000
Manganese	ug/l	1270		20		140
Mercury	ug/l	1.4 BJ		.9 BJ		.9 BJ
Nickel	ug/l	120		40 U		40 U
Potassium	ug/l	10000		5000 U		5000 U
Selenium	ug/l	5 U		5 U		5 U
Silver	ug/l	10 U		10 U		10 U
Sodium	ug/l	11000		5000 U		9000
Thallium	ug/l	10 U		2 U		2 U
Vanadium	ug/l	160		50 U		50 U
Zinc	ug/l	630 B		500 B		420 B
Miscellaneous Parameters						
Alkalinity	mg/l	88.		5.		69.
Chemical Oxygen Demand	mg/l	10 U		10 U		10 U
Nitrate/Nitrite	ug/l	1100		100 U		700
Chloride	mg/l	38.		2 U		27.
Fluoride, Total	mg/l	0.1 U		0.1 U		0.1 U
Total Dissolved Solids	mg/l	1160. J		58. J		192. J

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:		OW147	OW147	OW148	OW148	OW149
DEPTH:		-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF8-OW147-01	FM94-LF8-OW147-01RE	FM94-LF8-OW148-01	FM94-LF8-OW148-01RE	FM94-LF8-OW149-01
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND						
Miscellaneous Parameters						
Sulfate	mg/l	10 U		14.		10 U
Orthophosphate	mg/l	1.4		0.1 U		0.3

APPENDIX Q-13

LANDFILL 9 ANALYTICAL DATA

1. ROUND 1 GROUNDWATER SAMPLING
2. ROUND 2 GROUNDWATER SAMPLING

1. ROUND 1 GROUNDWATER SAMPLING

FORT MCCOY
November-December 1993
Landfill 9
Water

SAMPLE ID:		OW151	OW152	OW152	OW152	OW152
DEPTH:		-	-	-	-	-
AGENCY SAMPLE ID:		LF9-OW151-01	LF9-OW152-01	LF9-OW152-02	LF9-OW152-04	TB05
DATE SAMPLED:		13-DEC-93	13-DEC-93	13-DEC-93	13-DEC-93	14-DEC-93
COMPOUND						
Volatile Compounds						
1,1,1-Trichloroethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
1,2-Dichloroethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	2.8
trans-1,2-Dichloroethene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	ug/l	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	ug/l	10 U	10 U	10 U	10 U	10 U
Acetone	ug/l	4.7 BJ	10 U	10 U	4.1 BJ	9.0 BJ
Benzene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane	ug/l	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
Carbon Tetrachloride	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Carbon disulfide	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	ug/l	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chloroform	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	ug/l	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dibromochloromethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethyl Benzene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Methyl Ethyl Ketone	ug/l	10 U	10 U	10 U	10 U	8.0
Methylene Chloride	ug/l	4.6 BJ	4.7 BJ	4.0 BJ	4.0 BJ	4.6 BJ
Styrene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Tetrachloroethene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	ug/l	5.0 B	4.2 B	4.2 B	1.7	0.50 U
Trichloroethene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl Acetate	ug/l	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	ug/l	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Xylenes (Total)	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Semi-Volatile Compounds						
1,4-Dichlorobenzene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
1,2,4-Trichlorobenzene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
1,2-Dichlorobenzene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
1,3-Dichlorobenzene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	

FORT MCCOY
November-December 1993
Landfill 9
Water

SAMPLE ID:		OW151	OW152	OW152	OW152	OW152
DEPTH:		-	-	-	-	-
AGENCY SAMPLE ID:		LF9-OW151-01	LF9-OW152-01	LF9-OW152-02	LF9-OW152-04	TB05
DATE SAMPLED:		13-DEC-93	13-DEC-93	13-DEC-93	13-DEC-93	14-DEC-93
COMPOUND						
Semi-Volatile Compounds						
Hexachlorobutadiene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
2,4,5-Trichlorophenol	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
2,4,6-Trichlorophenol	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
2,4-Dichlorophenol	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
2,4-Dimethylphenol	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
2,4-Dinitrophenol	ug/l	24 U	24 U	24 U	24 U	
Naphthalene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
2,4-Dinitrotoluene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Benzyl Alcohol	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Benzoic Acid	ug/l	24 U	24 U	24 U	24 U	
2-Chloronaphthalene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
2-Chlorophenol	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Nitrobenzene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
2-Methylnaphthalene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
2-Methylphenol	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
2-Nitroaniline	ug/l	24 U	24 U	24 U	24 U	
2-Nitrophenol	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
3,3-Dichlorobenzidine	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
2,6-Dinitrotoluene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
3-Nitroaniline	ug/l	24 U	24 U	24 U	24 U	
4,6-Dinitro-2-methylphenol	ug/l	24 U	24 U	24 U	24 U	
4-Bromophenyl-phenylether	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
4-Chloro-3-methylphenol	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
4-Chloroaniline	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
4-Chlorophenyl-phenyl ether	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
4-Methylphenol	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
4-Nitroaniline	ug/l	24 U	24 U	24 U	24 U	
4-Nitrophenol	ug/l	24 U	24 U	24 U	24 U	
Acenaphthene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Acenaphthylene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Anthracene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Benzo(a)anthracene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Benzo(a)pyrene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Benzo(b)fluoranthene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Benzo(g,h,i)perylene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Benzo(k)fluoranthene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Butylbenzylphthalate	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Chrysene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Di-n-butylphthalate	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Di-n-octylphthalate	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Dibenzo(a,h)anthracene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Dibenzofuran	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	

FORT MCCOY
November-December 1993
Landfill 9
Water

SAMPLE ID:		OW151	OW152	OW152	OW152	OW152
DEPTH:		-	-	-	-	-
AGENCY SAMPLE ID:		LF9-OW151-01	LF9-OW152-01	LF9-OW152-02	LF9-OW152-04	TB05
DATE SAMPLED:		13-DEC-93	13-DEC-93	13-DEC-93	13-DEC-93	14-DEC-93
COMPOUND						
Semi-Volatile Compounds						
Diethylphthalate	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Dimethylphthalate	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Fluoranthene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Fluorene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Hexachlorobenzene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Hexachlorocyclopentadiene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Hexachloroethane	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Indeno(1,2,3-cd)pyrene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Isophorone	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
N-Nitrosodi-N-Propylamine	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
N-nitrosodiphenylamine	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Pentachlorophenol	ug/l	24 U	24 U	24 U	24 U	
Phenanthrene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Phenol	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Pyrene	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
Bis(2-chloroethoxy)methane	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
bis(2-Chloroethyl) ether	ug/l	9.6 U	9.6 U	9.6 U	9.6 U	
bis(2-Ethylhexyl)phthalate	ug/l	17 B	32 B	58 B	35	
Herbicide						
2,4,5-T	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	
2,4,5-TP (Silvex)	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	
2,4-D	ug/l	2.0 U	2.0 U	2.0 U	2.0 U	
2,4-DB	ug/l	5.0 U	5.0 U	5.0 U	5.0 U	
Dalapon	ug/l	5.0 U	5.0 U	5.0 U	5.0 U	
Dicamba	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	
Dichloroprop	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	
Dinoseb	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	
MCPA	ug/l	250. U	250. U	250. U	250. U	
MCPP	ug/l	250. U	250. U	250. U	250. U	
Pesticide						
4,4-DDD	ug/l	0.095 UJ	0.095 UJ	0.095 UR	0.095 UJ	
4,4-DDE	ug/l	0.095 UJ	0.095 UJ	0.095 UR	0.095 UJ	
4,4-DDT	ug/l	0.095 UJ	0.095 UJ	0.095 UR	0.095 UJ	
Aldrin	ug/l	0.048 UJ	0.048 UJ	0.048 UR	0.048 UJ	
Dieldrin	ug/l	0.095 UJ	0.095 UJ	0.095 UR	0.095 UJ	
Endosulfan I	ug/l	0.048 UJ	0.048 UJ	0.048 UR	0.048 UJ	
Endosulfan II	ug/l	0.095 UJ	0.095 UJ	0.095 UR	0.095 UJ	
Endosulfan sulfate	ug/l	0.048 UJ	0.048 UJ	0.048 UR	0.048 UJ	

FORT MCCOY
November-December 1993
Landfill 9
Water

	SAMPLE ID:	OW151	OW152	OW152	OW152	OW152
	DEPTH:	-	-	-	-	-
	AGENCY SAMPLE ID:	LF9-OW151-01	LF9-OW152-01	LF9-OW152-02	LF9-OW152-04	TB05
	DATE SAMPLED:	13-DEC-93	13-DEC-93	13-DEC-93	13-DEC-93	14-DEC-93
COMPOUND						
Pesticide						
Endrin	ug/l	0.095 UJ	0.095 UJ	0.095 UR	0.095 UJ	
Endrin aldehyde	ug/l	0.095 UJ	0.095 UJ	0.095 UR	0.095 UJ	
Heptachlor	ug/l	0.048 UJ	0.048 UJ	0.048 UR	0.048 UJ	
Heptachlor epoxide	ug/l	0.048 UJ	0.048 UJ	0.048 UR	0.048 UJ	
Methoxychlor	ug/l	0.48 UJ	0.48 UJ	0.48 UR	0.48 UJ	
a-Chlordane	ug/l	0.048 UJ	0.048 UJ	0.048 UR	0.048 UJ	
Toxaphene	ug/l	4.8 UJ	4.8 UJ	4.8 UR	4.8 UJ	
alpha-BHC	ug/l	0.048 UJ	0.048 UJ	0.048 UR	0.048 UJ	
beta-BHC	ug/l	0.048 UJ	0.048 UJ	0.048 UR	0.048 UJ	
delta-BHC	ug/l	0.048 UJ	0.048 UJ	0.048 UR	0.048 UJ	
gamma-BHC (lindane)	ug/l	0.048 UJ	0.048 UJ	0.048 UR	0.048 UJ	
Endrin ketone	ug/l	0.095 UJ	0.095 UJ	0.095 UR	0.095 UJ	
g-Chlordane	ug/l	0.048 UJ	0.048 UJ	0.048 UR	0.048 UJ	
Ortho-Phosphorus Pesticides						
Naled	ug/l	10. U	10. U	10. U	10. U	
Ethyl Parathion	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Methyl Parathion	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Azinphos Methyl	ug/l	2.5 U	2.5 U	2.5 U	2.5 U	
Bolstar(Suprophos)	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	
Chlorpyrifos	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Coumaphos	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	
Demeton O,S	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Diazinon	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Dimethoate	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	
Disulfoton	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Ethoprop	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Fensulfothion	ug/l	2.5 U	2.5 U	2.5 U	2.5 U	
Fenthion	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Malathion	ug/l	1.2 U	1.2 U	1.2 U	1.2 U	
Merphos	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Mevinphos	ug/l	6.2 U	6.2 U	6.2 U	6.2 U	
Phorate	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Ronnel	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Stirophos (Tetrachlorovinphos	ug/l	2.5 U	2.5 U	2.5 U	2.5 U	
Sulfotep	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Tokuthion	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Trichloronate	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	
Dichlorvos (Vapona)	ug/l	0.50 U	0.50 U	0.50 U	0.50 U	

FORT MCCOY
November-December 1993
Landfill 9
Water

SAMPLE ID:		OW151	OW152	OW152	OW152	OW152
DEPTH:		-	-	-	-	-
AGENCY SAMPLE ID:		LF9-OW151-01	LF9-OW152-01	LF9-OW152-02	LF9-OW152-04	TB05
DATE SAMPLED:		13-DEC-93	13-DEC-93	13-DEC-93	13-DEC-93	14-DEC-93
COMPOUND						
Polychlorinated Biphenyls						
Aroclor-1016	ug/l	0.95 UJ	0.95 UJ	0.95 UR	0.95 UJ	
Aroclor-1221	ug/l	1.9 UJ	1.9 UJ	1.9 UR	1.9 UJ	
Aroclor-1232	ug/l	0.95 UJ	0.95 UJ	0.95 UR	0.95 UJ	
Aroclor-1242	ug/l	0.95 UJ	0.95 UJ	0.95 UR	0.95 UJ	
Aroclor-1248	ug/l	0.95 UJ	0.95 UJ	0.95 UR	0.95 UJ	
Aroclor-1254	ug/l	0.95 UJ	0.95 UJ	0.95 UR	0.95 UJ	
Aroclor-1260	ug/l	0.95 UJ	0.95 UJ	0.95 UR	0.95 UJ	
Metals						
Aluminum	ug/l	4200 J	19000	5600	100 U	
Antimony	ug/l	30 U	30 U	30 U	30 U	
Arsenic	ug/l	2.0 U	18	4.2	2.0 U	
Barium	ug/l	53	200	79	4.0 U	
Beryllium	ug/l	2.0	1.0 U	1.0 U	1.0	
Cadmium	ug/l	6.0 J	2.0 U	2.0 U	2.0 U	
Calcium	ug/l	19000	14000 B	9900 B	2000	
Chromium	ug/l	22 B	42 B	18 B	6.0 B	
Cobalt	ug/l	9.0 B	19 B	9.0 B	4.0 B	
Copper	ug/l	63 B J	100 B J	17 J	12 B J	
Iron	ug/l	6200	48000	13000	200 U	
Lead	ug/l	6.8	55	12	2.0 U	
Magnesium	ug/l	6700	5400	3500	80	
Manganese	ug/l	83	460	250	3.0 U	
Mercury	ug/l	.20 UJ	.31 J	.20 UJ	.20 UJ	
Nickel	ug/l	11 J	60 B	150	9.0	
Potassium	ug/l	1400 J	5200 J	1900 J	500 UJ	
Selenium	ug/l	1.0 U	1.0 U	1.0 U	1.0 U	
Silver	ug/l	130 BJ	40 UJ	40 UJ	40 UJ	
Sodium	ug/l	3800	3500	3500	200 U	
Thallium	ug/l	50 U	77	64	50 U	
Vanadium	ug/l	18 J	43	12 B	3.0	
Zinc	ug/l	590	560 B	220 B	220	
Miscellaneous Parameters						
Alkalinity	mg/l	60	26	26	5.0 U	
Chemical Oxygen Demand	mg/l	9.5	8.0 U	8.0 U	8.0 U	
Nitrate/Nitrite	ug/l	100 U	100 U	100 U	100 U	
Chloride	mg/l	1.5	1.5	1.0	1.0 U	
Fluoride, Total	mg/l	0.1 U	0.1 U	0.1 U	0.1 U	
Phosphate, Total	mg/l	0.6	1.7	0.5	0.1 U	

FORT MCCOY
November-December 1993
Landfill 9
Water

	SAMPLE ID:	OW151	OW152	OW152	OW152	OW152
	DEPTH:	-	-	-	-	-
	AGENCY SAMPLE ID:	LF9-OW151-01	LF9-OW152-01	LF9-OW152-02	LF9-OW152-04	TB05
	DATE SAMPLED:	13-DEC-93	13-DEC-93	13-DEC-93	13-DEC-93	14-DEC-93
COMPOUND						
Miscellaneous Parameters						
Total Dissolved Solids	mg/l	170 J	540 J	190 J	10 UJ	
Sulfate	mg/l	8.0	5.8 B	6.3 B	2.0	

2. ROUND 2 GROUNDWATER SAMPLING

SAMPLE ID:		OW151	OW151	OW152	OW152	OW152	OW152
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF9-OW151-01	FM94-LF9-OW151-01RE	FM94-LF9-OW152-01	FM94-LF9-OW152-02	FM94-LF9-OW152-04	FM94-LF9-OW152-04RE
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND							
Volatile Compounds							
1,1,1-Trichloroethane	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
1,1,2,2-Tetrachloroethane	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
1,1,2-Trichloroethane	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
1,1-Dichloroethane	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
1,1-Dichloroethene	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
1,2-Dichloroethane	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
1,2-Dichloroethene(total)	ug/l	2.0 U		2.0 U	2.0 U	2.0 U	
1,2-Dichloropropane	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
2-Hexanone	ug/l	10 U		10 U	10 U	10 U	
4-Methyl-2-pentanone	ug/l	10 U		10 U	10 U	10 U	
Acetone	ug/l	50 U		50 U	50 U	50 U	
Benzene	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Bromodichloromethane	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Bromoform	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Bromomethane	ug/l	2.0 U		2.0 U	2.0 U	2.0 U	
Carbon Tetrachloride	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Carbon disulfide	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Chlorobenzene	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Chloroethane	ug/l	2.0 U		2.0 U	2.0 U	2.0 U	
Chloroform	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Chloromethane	ug/l	2.0 U		2.0 U	2.0 U	2.0 U	
Dibromochloromethane	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Ethyl Benzene	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Methyl Ethyl Ketone	ug/l	10 U		10 U	10 U	10 U	
Methylene Chloride	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Styrene	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Tetrachloroethene	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Toluene	ug/l	2.7		1.0 U	1.0 U	1.0 U	
Trichloroethene	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Vinyl Acetate	ug/l	25 U		25 U	25 U	25 U	
Vinyl Chloride	ug/l	2.0 U		2.0 U	2.0 U	2.0 U	
Xylenes (Total)	ug/l	2.0 U		2.0 U	2.0 U	2.0 U	
cis-1,3-Dichloropropene	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
trans-1,3-Dichloropropene	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Semi-Volatile Compounds							
1,4-Dichlorobenzene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
1,2,4-Trichlorobenzene	ug/l	5.0 UJ		5.0 UJ	5.0 UJ	5.0 UJ	
1,2-Dichlorobenzene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
1,3-Dichlorobenzene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Hexachlorobutadiene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:		OW151	OW151	OW152	OW152	OW152	OW152
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF9-OW151-01	FM94-LF9-OW151-01RE	FM94-LF9-OW152-01	FM94-LF9-OW152-02	FM94-LF9-OW152-04	FM94-LF9-OW152-04RE
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND							
Semi-Volatile Compounds							
2,4,5-Trichlorophenol	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
2,4,6-Trichlorophenol	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
2,4-Dichlorophenol	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
2,4-Dimethylphenol	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Methylphenol (2,3)	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
2,4-Dinitrophenol	ug/l	50 U		50 U	50 U	50 U	
Naphthalene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
2,4-Dinitrotoluene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Benzyl Alcohol	ug/l	20 U		20 U	20 U	20 U	
Benzoic Acid	ug/l	50 U		50 U	50 U	50 U	
2-Chloronaphthalene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
2-Chlorophenol	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Nitrobenzene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
2-Methylnaphthalene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
2-Nitroaniline	ug/l	50 U		50 U	50 U	50 U	
2-Nitrophenol	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
3,3-Dichlorobenzidine	ug/l	50 U		50 U	50 U	50 U	
2,6-Dinitrotoluene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
3-Nitroaniline	ug/l	50 U		50 U	50 U	50 U	
4,6-Dinitro-2-methylphenol	ug/l	50 U		50 U	50 U	50 U	
4-Bromophenyl phenyl ether	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
4-Chloro-3-methylphenol	ug/l	20 U		20 U	20 U	20 U	
4-Chloroaniline	ug/l	20 U		20 U	20 U	20 U	
4-Chlorophenyl phenyl ether	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
4-Methylphenol	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
4-Nitroaniline	ug/l	50 U		50 U	50 U	50 U	
4-Nitrophenol	ug/l	50 U		50 U	50 U	50 U	
Acenaphthene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Acenaphthylene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Anthracene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Benzo(a)anthracene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Benzo(a)pyrene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Benzo(b)fluoranthene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Benzo(g,h,i)perylene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Benzo(k)fluoranthene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Butylbenzylphthalate	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Chrysene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Di-n-butylphthalate	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Di-n-octylphthalate	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Dibenzo(a,h)anthracene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Dibenzofuran	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Diethylphthalate	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	

SAMPLE ID:		OW151	OW151	OW152	OW152	OW152	OW152
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF9-OW151-01	FM94-LF9-OW151-01RE	FM94-LF9-OW152-01	FM94-LF9-OW152-02	FM94-LF9-OW152-04	FM94-LF9-OW152-04RE
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND							
Semi-Volatile Compounds							
Dimethylphthalate	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Fluoranthene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Fluorene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Hexachlorobenzene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Hexachlorocyclopentadiene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Hexachloroethane	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Indeno(1,2,3-cd)pyrene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Isophorone	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
N-Nitrosodi-N-Propylamine	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
N-nitrosodiphenylamine	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Pentachlorophenol	ug/l	20 U		20 U	20 U	20 U	
Phenanthrene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Phenol	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Pyrene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
bis(2-Chloroethoxy) methane	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
bis(2-Chloroethyl) ether	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
bis(2-Chloroisopropyl) ether	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
bis(2-Ethylhexyl)phthalate	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
Herbicide							
2,4,5-T	ug/l	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ
2,4,5-TP (Silvex)	ug/l	2.0 UJ	2.0 UJ	2.0 UR	2.0 UR	2.0 UJ	2.0 UJ
2,4-D	ug/l	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
2,4-DB	ug/l	5.0 UJ	5.0 UJ	5.0 U	5.0 U	5.0 UJ	5.0 UJ
Dalapon	ug/l	50 UJ	50 UJ	50 U	50 U	50 UJ	50 UJ
Dicamba	ug/l	2.0 UJ	2.0 UJ	2.0 U	2.0 U	2.0 UJ	2.0 UJ
Dichloroprop	ug/l	5.0 UJ	5.0 UJ	5.0 U	5.0 U	5.0 UJ	5.0 UJ
Dinoseb	ug/l	1.0 UJ	1.0 UJ	1.0 U	1.0 U	1.0 UJ	1.0 UJ
MCPP	ug/l	200 UJ	200 UJ	200 U	200 U	200 UJ	200 UJ
MCPA	ug/l	200 UJ	200 UJ	200 U	200 U	200 UJ	200 UJ
Pesticide							
4,4'-DDD	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
4,4'-DDE	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
4,4-DDT	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
Aldrin	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
Chlordane	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
Dieldrin	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
Endosulfan I	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
Endosulfan II	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:		OW151	OW151	OW152	OW152	OW152	OW152
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF9-OW151-01	FM94-LF9-OW151-01RE	FM94-LF9-OW152-01	FM94-LF9-OW152-02	FM94-LF9-OW152-04	FM94-LF9-OW152-04RE
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND							
Pesticide							
Endosulfan sulfate	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
Endrin	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
Endrin aldehyde	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
Heptachlor	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
Heptachlor epoxide	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
Methoxychlor	ug/l	1.0 U		1.0 U	1.0 U	1.0 U	
Toxaphene	ug/l	5.0 U		5.0 U	5.0 U	5.0 U	
alpha-BHC	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
beta-BHC	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
delta-BHC	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
gamma-BHC (lindane)	ug/l	0.1 U		0.1 U	0.1 U	0.1 U	
Organo-Phosphorus Pesticides							
Naled	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Azinphos Methyl	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Bolstar(Suprophos)	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Chlorpyrifos	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Coumaphos	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Demeton O,S	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Diazinon	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Dimethoate	ug/l	2.0 U		2.0 U	2.0 U	2.0 U	
Disulfoton	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
EPN	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Ethoprop	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Fensulfothion	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Fenthion	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Malathion	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Merphos	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Mevinphos	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Ethyl Paration	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Parathion-methyl	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Phorate	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Ronnel	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Stirophos (Tetrachlorovinphos	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Sulfotep	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
TEPP	ug/l	2.0 U		2.0 U	2.0 U	2.0 U	
Tokuthion	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Trichloronate	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	
Dichlorvos (Vapona)	ug/l	0.50 U		0.50 U	0.50 U	0.50 U	

SAMPLE ID:		OW151	OW151	OW152	OW152	OW152	OW152
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF9-OW151-01	FM94-LF9-OW151-01RE	FM94-LF9-OW152-01	FM94-LF9-OW152-02	FM94-LF9-OW152-04	FM94-LF9-OW152-04RE
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND							
Polychlorinated Biphenyls							
Aroclor-1016	ug/l	0.5 U		0.5 U	0.5 U	0.5 U	
Aroclor-1221	ug/l	0.5 U		0.5 U	0.5 U	0.5 U	
Aroclor-1232	ug/l	0.5 U		0.5 U	0.5 U	0.5 U	
Aroclor-1242	ug/l	0.5 U		0.5 U	0.5 U	0.5 U	
Aroclor-1248	ug/l	0.5 U		0.5 U	0.5 U	0.5 U	
Aroclor-1254	ug/l	0.5 U		0.5 U	0.5 U	0.5 U	
Aroclor-1260	ug/l	0.5 U		0.5 U	0.5 U	0.5 U	
Metals							
Aluminum	ug/l	10400		2400	2500	100 U	
Antimony	ug/l	6 U		6 U	6 U	6 U	
Arsenic	ug/l	10 U		10 U	10 U	10 U	
Barium	ug/l	100 U		100 U	100 U	100 U	
Beryllium	ug/l	4 U		4 U	4 U	4 U	
Cadmium	ug/l	5 U		5 U	5 U	5 U	
Calcium	ug/l	24000		11000	12000	5000 U	
Chromium	ug/l	30 B		50	40 B	10	
Cobalt	ug/l	50 U		50 U	50 U	50 U	
Copper	ug/l	30		20 U	20 U	20 U	
Iron	ug/l	13600		4000	4500	100 U	
Lead	ug/l	24		5	4	3 U	
Magnesium	ug/l	9000		5000 U	5000 U	5000 U	
Manganese	ug/l	110		50	60	10 U	
Mercury	ug/l	1.1 BJ		1.1 BJ	.9 BJ	.8 J	
Nickel	ug/l	40 U		40	40 U	40 U	
Potassium	ug/l	5000 U		5000 U	5000 U	5000 U	
Selenium	ug/l	5 U		5 U	5 U	5 U	
Silver	ug/l	10 U		10 U	10 U	10 U	
Sodium	ug/l	5000 U		5000 U	5000 U	5000 U	
Thallium	ug/l	2 U		2 U	2 U	2 U	
Vanadium	ug/l	50 U		50 U	50 U	50 U	
Zinc	ug/l	580 B		400 B	480 B	410	
Miscellaneous Parameters							
Alkalinity	mg/l	68.		24.	25.	2 U	
Chemical Oxygen Demand	mg/l	10 U		10 U	10 U	10 U	
Nitrate/Nitrite	ug/l	100 U		100 U	100 U	100 U	
Chloride	mg/l	2 U		2.	2 U	2 U	
Fluoride, Total	mg/l	0.1 U		0.1 U	0.1 U	0.1 U	
Total Dissolved Solids	mg/l	248. J		98. J	102. J	4. J	

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:		OW151	OW151	OW152	OW152	OW152	OW152
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF9-OW151-01	FM94-LF9-OW151-01RE	FM94-LF9-OW152-01	FM94-LF9-OW152-02	FM94-LF9-OW152-04	FM94-LF9-OW152-04RE
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND							
Miscellaneous Parameters							
Sulfate	mg/l	10 U		10 U	10 U	10 U	
Orthophosphate	mg/l	0.4		0.2	0.2	0.1 UJ	
Metals, Dissolved							
Aluminum Dissolved	ug/l	100 U		100 U	100 U	100 U	
Antimony Dissolved	ug/l	6 U		6 U	6 U	6 U	
Arsenic Dissolved	ug/l	10 U		10 U	10 U	10 U	
Barium Dissolved	ug/l	100 U		100 U	100 U	100 U	
Beryllium Dissolved	ug/l	4 U		4 U	4 U	4 U	
Cadmium Dissolved	ug/l	5 U		5 U	5 U	5 U	
Calcium Dissolved	ug/l	18000		10000	9000	5000 U	
Chromium Dissolved	ug/l	10 U		10 U	10 U	10 U	
Cobalt Dissolved	ug/l	50 U		50 U	50 U	50 U	
Copper Dissolved	ug/l	20 U		20 U	20 U	20 U	
Iron Dissolved	ug/l	100 U		100 U	100 U	100 U	
Lead Dissolved	ug/l	3 U		8	3 U	3 U	
Magnesium Dissolved	ug/l	7000		5000 U	5000 U	5000 U	
Manganese Dissolved	ug/l	10 U		20	20	10 U	
Mercury Dissolved	ug/l	1.1 BJ		1.4 BJ	1.2 BJ	1.0 J	
Nickel Dissolved	ug/l	40 U		40 U	40 U	40 U	
Potassium Dissolved	ug/l	5000 U		5000 U	5000 U	5000 U	
Selenium Dissolved	ug/l	5 U		5 U	5 U	5 U	
Silver Dissolved	ug/l	10 U		10 U	10 U	10 U	
Sodium Dissolved	ug/l	5000 U		5000 U	5000 U	5000 U	
Thallium Dissolved	ug/l	2 U		2 U	2 U	2 U	
Vanadium Dissolved	ug/l	50 U		50 U	50 U	50 U	
Zinc Dissolved	ug/l	470 B		400 B	400 B	420	

APPENDIX Q-14

LANDFILL 10 ANALYTICAL DATA

1. ROUND 1 GROUNDWATER SAMPLING
2. ROUND 2 GROUNDWATER SAMPLING

1. ROUND 1 GROUNDWATER SAMPLING

FORT MCCOY
November-December 1993
Landfill 10
Water

SAMPLE ID:		OW155	OW156	OW157	OW158
DEPTH:		-	-	-	-
AGENCY SAMPLE ID:		LF10-OW155-01	LF10-OW156-01	LF10-OW157-01	LF10-OW158-01
DATE SAMPLED:		13-DEC-93	13-DEC-93	13-DEC-93	13-DEC-93
COMPOUND					
Volatile Compounds					
1,1,1-Trichloroethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	ug/l	1.1 U	1.1 U	1.1 U	1.1 U
1,2-Dichloroethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	ug/l	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	ug/l	10 U	10 U	10 U	10 U
Acetone	ug/l	13 B	12 B	14 B	2.9 BJ
Benzene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
Bromomethane	ug/l	2.3 U	2.3 U	2.3 U	2.3 U
Carbon Tetrachloride	ug/l	1.1 U	1.1 U	1.1 U	1.1 U
Carbon disulfide	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	ug/l	2.0 U	2.0 U	2.0 U	2.0 U
Chloroform	ug/l	1.0 U	1.0 U	1.7	1.0 U
Chloromethane	ug/l	2.0 U	2.0 U	2.0 U	2.0 U
Dibromochloromethane	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
Ethyl Benzene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
Methyl Ethyl Ketone	ug/l	10 U	10 U	10 U	10 U
Methylene Chloride	ug/l	25 B	26 B	24 B	9.6 B
Styrene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
Tetrachloroethene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	ug/l	0.50 U	0.50 U	0.50 U	5.7 B
Trichloroethene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl Acetate	ug/l	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	ug/l	2.0 U	2.0 U	2.0 U	2.0 U
Xylenes (Total)	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
cis-1,3-Dichloropropene	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
Semi-Volatile Compounds					
1,4-Dichlorobenzene	ug/l	49 U	10 U	9.7 U	9.7 U
1,2,4-Trichlorobenzene	ug/l	49 U	10 U	9.7 U	9.7 U
1,2-Dichlorobenzene	ug/l	49 U	10 U	9.7 U	9.7 U
1,3-Dichlorobenzene	ug/l	49 U	10 U	9.7 U	9.7 U

FORT MCCOY
November-December 1993
Landfill 10
Water

	SAMPLE ID:	OW155	OW156	OW157	OW158
	DEPTH:	-	-	-	-
	AGENCY SAMPLE ID:	LF10-OW155-01	LF10-OW156-01	LF10-OW157-01	LF10-OW158-01
	DATE SAMPLED:	13-DEC-93	13-DEC-93	13-DEC-93	13-DEC-93
COMPOUND					
Semi-Volatile Compounds					
Hexachlorobutadiene	ug/l	49 U	10 U	9.7 U	9.7 U
2,4,5-Trichlorophenol	ug/l	49 U	10 U	9.7 U	9.7 U
2,4,6-Trichlorophenol	ug/l	49 U	10 U	9.7 U	9.7 U
2,4-Dichlorophenol	ug/l	49 U	10 U	9.7 U	9.7 U
2,4-Dimethylphenol	ug/l	49 U	10 U	9.7 U	9.7 U
2,4-Dinitrophenol	ug/l	120 U	25 U	24 U	24 U
Naphthalene	ug/l	49 U	10 U	9.7 U	9.7 U
2,4-Dinitrotoluene	ug/l	49 U	10 U	9.7 U	9.7 U
Benzyl Alcohol	ug/l	49 U	10 U	9.7 U	9.7 U
Benzoic Acid	ug/l	120 U	25 U	24 U	24 U
2-Chloronaphthalene	ug/l	49 U	10 U	9.7 U	9.7 U
2-Chlorophenol	ug/l	49 U	10 U	9.7 U	9.7 U
Nitrobenzene	ug/l	49 U	10 U	9.7 U	9.7 U
2-Methylnaphthalene	ug/l	49 U	10 U	9.7 U	9.7 U
2-Methylphenol	ug/l	49 U	10 U	9.7 U	9.7 U
2-Nitroaniline	ug/l	120 U	25 U	24 U	24 U
2-Nitrophenol	ug/l	49 U	10 U	9.7 U	9.7 U
3,3-Dichlorobenzidine	ug/l	49 U	10 U	9.7 U	9.7 U
2,6-Dinitrotoluene	ug/l	49 U	10 U	9.7 U	9.7 U
3-Nitroaniline	ug/l	120 U	25 U	24 U	24 U
4,6-Dinitro-2-methylphenol	ug/l	120 U	25 U	24 U	24 U
4-Bromophenyl-phenylether	ug/l	49 U	10 U	9.7 U	9.7 U
4-Chloro-3-methylphenol	ug/l	49 U	10 U	9.7 U	9.7 U
4-Chloroaniline	ug/l	49 U	10 U	9.7 U	9.7 U
4-Chlorophenyl-phenyl ether	ug/l	49 U	10 U	9.7 U	9.7 U
4-Methylphenol	ug/l	49 U	10 U	9.7 U	9.7 U
4-Nitroaniline	ug/l	120 U	25 U	24 U	24 U
4-Nitrophenol	ug/l	120 U	25 U	24 U	24 U
Acenaphthene	ug/l	49 U	10 U	9.7 U	9.7 U
Acenaphthylene	ug/l	49 U	10 U	9.7 U	9.7 U
Anthracene	ug/l	49 U	10 U	9.7 U	9.7 U
Benzo(a)anthracene	ug/l	49 U	10 U	9.7 U	9.7 U
Benzo(a)pyrene	ug/l	49 U	10 U	9.7 U	9.7 U
Benzo(b)fluoranthene	ug/l	49 U	10 U	9.7 U	9.7 U
Benzo(g,h,i)perylene	ug/l	49 U	10 U	9.7 U	9.7 U
Benzo(k)fluoranthene	ug/l	49 U	10 U	9.7 U	9.7 U
Butylbenzylphthalate	ug/l	49 U	10 U	9.7 U	9.7 U
Chrysene	ug/l	49 U	10 U	9.7 U	9.7 U
Di-n-butylphthalate	ug/l	49 U	10 U	9.7 U	9.7 U
Di-n-octylphthalate	ug/l	49 U	10 U	9.7 U	9.7 U
Dibenzo(a,h)anthracene	ug/l	49 U	10 U	9.7 U	9.7 U
Dibenzofuran	ug/l	49 U	10 U	9.7 U	9.7 U

FORT MCCOY
November-December 1993
Landfill 10
Water

SAMPLE ID:		OW155	OW156	OW157	OW158
DEPTH:		-	-	-	-
AGENCY SAMPLE ID:		LF10-OW155-01	LF10-OW156-01	LF10-OW157-01	LF10-OW158-01
DATE SAMPLED:		13-DEC-93	13-DEC-93	13-DEC-93	13-DEC-93
COMPOUND					
Semi-Volatile Compounds					
Diethylphthalate	ug/l	49 U	10 U	9.7 U	9.7 U
Dimethylphthalate	ug/l	49 U	10 U	9.7 U	9.7 U
Fluoranthene	ug/l	49 U	10 U	9.7 U	9.7 U
Fluorene	ug/l	49 U	10 U	9.7 U	9.7 U
Hexachlorobenzene	ug/l	49 U	10 U	9.7 U	9.7 U
Hexachlorocyclopentadiene	ug/l	49 U	10 U	9.7 U	9.7 U
Hexachloroethane	ug/l	49 U	10 U	9.7 U	9.7 U
Indeno(1,2,3-cd)pyrene	ug/l	49 U	10 U	9.7 U	9.7 U
Isophorone	ug/l	49 U	10 U	9.7 U	9.7 U
N-Nitrosodi-N-Propylamine	ug/l	49 U	10 U	9.7 U	9.7 U
N-nitrosodiphenylamine	ug/l	49 U	10 U	9.7 U	9.7 U
Pentachlorophenol	ug/l	120 U	25 U	24 U	24 U
Phenanthrene	ug/l	49 U	10 U	9.7 U	9.7 U
Phenol	ug/l	49 U	10 U	9.7 U	9.7 U
Pyrene	ug/l	49 U	10 U	9.7 U	9.7 U
Bis(2-chloroethoxy)methane	ug/l	49 U	10 U	9.7 U	9.7 U
bis(2-Chloroethyl) ether	ug/l	49 U	10 U	9.7 U	9.7 U
bis(2-Ethylhexyl)phthalate	ug/l	260	4.5 BJ	79 B	19 B
Herbicide					
2,4,5-T	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
2,4,5-TP (Silvex)	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
2,4-D	ug/l	2.0 U	2.0 U	2.0 U	2.0 U
2,4-DB	ug/l	5.0 U	5.0 U	5.0 U	5.0 U
Dalapon	ug/l	5.0 U	5.0 U	5.0 U	5.0 U
Dicamba	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
Dichloroprop	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
Dinoseb	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
MCPA	ug/l	250. U	250. U	250. U	250. U
MCPP	ug/l	250. U	250. U	250. U	250. U
Pesticide					
4,4-DDD	ug/l	0.097 UJ	0.098 UJ	0.096 UJ	0.097 U
4,4-DDE	ug/l	0.097 UJ	0.098 UJ	0.096 UJ	0.097 U
4,4-DDT	ug/l	0.097 UJ	0.098 UJ	0.096 UJ	0.097 U
Aldrin	ug/l	0.048 UJ	0.049 UJ	0.048 UJ	0.049 U
Dieldrin	ug/l	0.097 UJ	0.098 UJ	0.096 UJ	0.097 U
Endosulfan I	ug/l	0.048 UJ	0.049 UJ	0.048 UJ	0.049 U
Endosulfan II	ug/l	0.097 UJ	0.098 UJ	0.096 UJ	0.097 U
Endosulfan sulfate	ug/l	0.048 UJ	0.049 UJ	0.048 UJ	0.049 U

FORT MCCOY
November-December 1993
Landfill 10
Water

	SAMPLE ID:	OW155	OW156	OW157	OW158
	DEPTH:	-	-	-	-
	AGENCY SAMPLE ID:	LF10-OW155-01	LF10-OW156-01	LF10-OW157-01	LF10-OW158-01
	DATE SAMPLED:	13-DEC-93	13-DEC-93	13-DEC-93	13-DEC-93
COMPOUND					
Pesticide					
Endrin	ug/l	0.097 UJ	0.098 UJ	0.096 UJ	0.097 U
Endrin aldehyde	ug/l	0.097 UJ	0.098 UJ	0.096 UJ	0.097 U
Heptachlor	ug/l	0.048 UJ	0.049 UJ	0.048 UJ	0.049 U
Heptachlor epoxide	ug/l	0.048 UJ	0.049 UJ	0.048 UJ	0.049 U
Methoxychlor	ug/l	0.48 UJ	0.49 UJ	0.48 UJ	0.49 U
a-Chlordane	ug/l	0.048 UJ	0.049 UJ	0.048 UJ	0.049 U
Toxaphene	ug/l	4.8 UJ	4.9 UJ	4.8 UJ	4.9 U
alpha-BHC	ug/l	0.048 UJ	0.049 UJ	0.048 UJ	0.049 U
beta-BHC	ug/l	0.048 UJ	0.049 UJ	0.048 UJ	0.049 U
delta-BHC	ug/l	0.048 UJ	0.049 UJ	0.048 UJ	0.049 U
gamma-BHC (lindane)	ug/l	0.048 UJ	0.049 UJ	0.048 UJ	0.049 U
Endrin ketone	ug/l	0.097 UJ	0.098 UJ	0.096 UJ	0.097 U
g-Chlordane	ug/l	0.048 UJ	0.049 UJ	0.048 UJ	0.049 U
Ortho-Phosphorus Pesticides					
Naled	ug/l	10. U	10. U	10. U	10. U
Ethyl Parathion	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Methyl Parathion	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Azinphos Methyl	ug/l	2.5 U	2.5 U	2.5 U	2.5 U
Bolstar(Suprophos)	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
Chlorpyrifos	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Coumaphos	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
Demeton O,S	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Diazinon	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Dimethoate	ug/l	0.50 U	0.50 U	0.50 U	0.50 U
Disulfoton	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Ethoprop	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Fensulfothion	ug/l	2.5 U	2.5 U	2.5 U	2.5 U
Fenthion	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Malathion	ug/l	1.2 U	1.2 U	1.2 U	1.2 U
Merphos	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Mevinphos	ug/l	6.2 U	6.2 U	6.2 U	6.2 U
Phorate	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Ronnel	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Stirophos (Tetrachlorovinphos	ug/l	2.5 U	2.5 U	2.5 U	2.5 U
Sulfotep	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Tokuthion	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Trichloronate	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
Dichlorvos (Vapona)	ug/l	0.50 U	0.50 U	0.50 U	0.50 U

FORT MCCOY
November-Decembe[illegible]993
Landfill 10
Water

SAMPLE ID:		OW155	OW156	OW157	OW158
DEPTH:		-	-	-	-
AGENCY SAMPLE ID:		LF10-OW155-01	LF10-OW156-01	LF10-OW157-01	LF10-OW158-01
DATE SAMPLED:		13-DEC-93	13-DEC-93	13-DEC-93	13-DEC-93
COMPOUND					
Polychlorinated Biphenyls					
Aroclor-1016	ug/l	0.97 UJ	0.98 UJ	0.96 UJ	0.97 U
Aroclor-1221	ug/l	1.9 UJ	2.0 UJ	1.9 UJ	1.9 U
Aroclor-1232	ug/l	0.97 UJ	0.98 UJ	0.96 UJ	0.97 U
Aroclor-1242	ug/l	0.97 UJ	0.98 UJ	0.96 UJ	0.97 U
Aroclor-1248	ug/l	0.97 UJ	0.98 UJ	0.96 UJ	0.97 U
Aroclor-1254	ug/l	0.97 UJ	0.98 UJ	0.96 UJ	0.97 U
Aroclor-1260	ug/l	0.97 UJ	0.98 UJ	0.96 UJ	0.97 U
Metals					
Aluminum	ug/l	330 J	920 J	540 J	600 J
Antimony	ug/l	30 U	30 U	30 U	30 U
Arsenic	ug/l	2.0 U	2.0 U	2.0 U	2.0 U
Barium	ug/l	16	29	14	17
Beryllium	ug/l	1.0	1.0 U	1.0 U	1.0 U
Cadmium	ug/l	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ
Calcium	ug/l	7100	15000	9400	9400
Chromium	ug/l	100	23 B	17 B	5.0 U
Cobalt	ug/l	6.0 B	4.0 B	3.0 U	3.0 B
Copper	ug/l	29 B J	13 B J	19 B J	10 UJ
Iron	ug/l	930	1500	560	620
Lead	ug/l	3.7	3.2	3.0	4.4
Magnesium	ug/l	950	2000	1100	1600
Manganese	ug/l	76	75	67	47
Mercury	ug/l	.20 UJ	.20 UJ	.20 UJ	.20 UJ
Nickel	ug/l	7.0 UJ	10 J	7.0 UJ	7.0 UJ
Potassium	ug/l	500 UJ	1100 J	1200 J	950 J
Selenium	ug/l	1.0 U	1.0 U	1.0 U	1.0 U
Silver	ug/l	40 UJ	40 UJ	40 UJ	40 UJ
Sodium	ug/l	730	3400	1200	630
Thallium	ug/l	50 U	50 U	50 U	50 U
Vanadium	ug/l	3.0 UJ	3.0 UJ	3.0 UJ	3.0 UJ
Zinc	ug/l	510	440	660	530
Miscellaneous Parameters					
Alkalinity	mg/l	5.8	31	12	280
Chemical Oxygen Demand	mg/l	8.0 U	12	9.5	12
Nitrate/Nitrite	ug/l	630	580	490	600
Chloride	mg/l	1.0 U	1.0 U	1.0 U	1.0 U
Fluoride, Total	mg/l	0.1 U	0.1 U	0.1 U	0.1 U
Phosphate, Total	mg/l	0.1 U	0.3	0.1 U	0.1 U

FORT MCCOY
November-December 1993
Landfill 10
Water

SAMPLE ID:		OW155	OW156	OW157	OW158
DEPTH:		-	-	-	-
AGENCY SAMPLE ID:		LF10-OW155-01	LF10-OW156-01	LF10-OW157-01	LF10-OW158-01
DATE SAMPLED:		13-DEC-93	13-DEC-93	13-DEC-93	13-DEC-93
COMPOUND					
Miscellaneous Parameters					
Total Dissolved Solids	mg/l	62 J	62 J	64 J	84 J
Sulfate	mg/l	3.8	3.8	2.8	3.6

2. ROUND 2 GROUNDWATER SAMPLING

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:		OW154	OW155	OW155	OW156	OW157	OW158
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF10-OW154-01	FM94-LF10-OW155-01	FM94-LF10-OW155-01RE	FM94-LF10-OW156-01	FM94-LF10-OW157-01	FM94-LF10-OW157-01R
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND							
Volatile Compounds							
1,1,1-Trichloroethane	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
1,1,2,2-Tetrachloroethane	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
1,1,2-Trichloroethane	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
1,1-Dichloroethane	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
1,1-Dichloroethene	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
1,2-Dichloroethane	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
1,2-Dichloroethene(total)	ug/l	2.0 U	2.0 U		2.0 U	2.0 U	
1,2-Dichloropropane	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
2-Hexanone	ug/l	10 U	10 U		10 U	10 U	
4-Methyl-2-pentanone	ug/l	10 U	10 U		10 U	10 U	
Acetone	ug/l	50 U	50 U		50 U	50 U	
Benzene	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Bromodichloromethane	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Bromoform	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Bromomethane	ug/l	2.0 U	2.0 U		2.0 U	2.0 U	
Carbon Tetrachloride	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Carbon disulfide	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Chlorobenzene	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Chloroethane	ug/l	2.0 U	2.0 U		2.0 U	2.0 U	
Chloroform	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Chloromethane	ug/l	2.0 U	2.0 U		2.0 U	2.0 U	
Dibromochloromethane	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Ethyl Benzene	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Methyl Ethyl Ketone	ug/l	10 U	10 U		10 U	10 U	
Methylene Chloride	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Styrene	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Tetrachloroethene	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Toluene	ug/l	1.4	1.6		1.0 U	1.0 U	
Trichloroethene	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Vinyl Acetate	ug/l	25 U	25 U		25 U	25 U	
Vinyl Chloride	ug/l	2.0 U	2.0 U		2.0 U	2.0 U	
Xylenes (Total)	ug/l	2.0 U	2.0 U		2.0 U	2.0 U	
cis-1,3-Dichloropropene	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
trans-1,3-Dichloropropene	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Semi-Volatile Compounds							
1,4-Dichlorobenzene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
1,2,4-Trichlorobenzene	ug/l	5.0 UJ	5.0 UJ		5.0 UJ	5.0 UJ	
1,2-Dichlorobenzene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
1,3-Dichlorobenzene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Hexachlorobutadiene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:		OW154	OW155	OW155	OW156	OW157	OW158
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF10-OW154-01	FM94-LF10-OW155-01	FM94-LF10-OW155-01RE	FM94-LF10-OW156-01	FM94-LF10-OW157-01	FM94-LF10-OW157-01R
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND							
Semi-Volatile Compounds							
2,4,5-Trichlorophenol	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
2,4,6-Trichlorophenol	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
2,4-Dichlorophenol	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
2,4-Dimethylphenol	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Methylphenol (2,3)	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
2,4-Dinitrophenol	ug/l	50 U	50 U		50 U	50 U	
Naphthalene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
2,4-Dinitrotoluene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Benzyl Alcohol	ug/l	20 U	20 U		20 U	20 U	
Benzoic Acid	ug/l	50 U	50 U		50 U	50 U	
2-Chloronaphthalene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
2-Chlorophenol	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Nitrobenzene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
2-Methylnaphthalene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
2-Nitroaniline	ug/l	50 U	50 U		50 U	50 U	
2-Nitrophenol	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
3,3-Dichlorobenzidine	ug/l	50 U	50 U		50 U	50 U	
2,6-Dinitrotoluene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
3-Nitroaniline	ug/l	50 U	50 U		50 U	50 U	
4,6-Dinitro-2-methylphenol	ug/l	50 U	50 U		50 U	50 U	
4-Bromophenyl phenyl ether	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
4-Chloro-3-methylphenol	ug/l	20 U	20 U		20 U	20 U	
4-Chloroaniline	ug/l	20 U	20 U		20 U	20 U	
4-Chlorophenyl phenyl ether	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
4-Methylphenol	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
4-Nitroaniline	ug/l	50 U	50 U		50 U	50 U	
4-Nitrophenol	ug/l	50 U	50 U		50 U	50 U	
Acenaphthene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Acenaphthylene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Anthracene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Benzo(a)anthracene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Benzo(a)pyrene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Benzo(b)fluoranthene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Benzo(g,h,i)perylene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Benzo(k)fluoranthene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Butylbenzylphthalate	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Chrysene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Di-n-butylphthalate	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Di-n-octylphthalate	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Dibenzo(a,h)anthracene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Dibenzofuran	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Diethylphthalate	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	

SAMPLE ID:		OW154	OW155	OW155	OW156	OW157	OW158
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF10-OW154-01	FM94-LF10-OW155-01	FM94-LF10-OW155-01RE	FM94-LF10-OW156-01	FM94-LF10-OW157-01	FM94-LF10-OW157-01R
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND							
Semi-Volatile Compounds							
Dimethylphthalate	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Fluoranthene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Fluorene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Hexachlorobenzene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Hexachlorocyclopentadiene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Hexachloroethane	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Indeno(1,2,3-cd)pyrene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Isophorone	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
N-Nitrosodi-N-Propylamine	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
N-nitrosodiphenylamine	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Pentachlorophenol	ug/l	20 U	20 U		20 U	20 U	
Phenanthrene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Phenol	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Pyrene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
bis(2-Chloroethoxy) methane	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
bis(2-Chloroethyl) ether	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
bis(2-Chloroisopropyl) ether	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
bis(2-Ethylhexyl)phthalate	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
Herbicide							
2,4,5-T	ug/l	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ
2,4,5-TP (Silvex)	ug/l	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UR	2.0 UJ	2.0 UJ
2,4-D	ug/l	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
2,4-DB	ug/l	5.0 UJ	5.0 UJ	5.0 UJ	5.0 U	5.0 UJ	5.0 UJ
Dalapon	ug/l	50 UJ	50 UJ	50 UJ	50 U	50 UJ	50 UJ
Dicamba	ug/l	2.0 UJ	2.0 UJ	2.0 UJ	2.0 U	2.0 UJ	2.0 UJ
Dichloroprop	ug/l	5.0 UJ	5.0 UJ	5.0 UJ	5.0 U	5.0 UJ	5.0 UJ
Dinoseb	ug/l	1.0 UJ	1.0 UJ	1.0 UJ	1.0 U	1.0 UJ	1.0 UJ
MCPP	ug/l	200 UJ	200 UJ	200 UJ	200 U	200 UJ	200 UJ
MCPA	ug/l	200 UJ	200 UJ	200 UJ	200 U	200 UJ	200 UJ
Pesticide							
4,4'-DDD	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
4,4'-DDE	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
4,4-DDT	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
Aldrin	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
Chlordane	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
Dieldrin	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
Endosulfan I	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
Endosulfan II	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:		OW154	OW155	OW155	OW156	OW157	OW158
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF10-OW154-01	FM94-LF10-OW155-01	FM94-LF10-OW155-01RE	FM94-LF10-OW156-01	FM94-LF10-OW157-01	FM94-LF10-OW157-01R
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND							
Pesticide							
Endosulfan sulfate	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
Endrin	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
Endrin aldehyde	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
Heptachlor	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
Heptachlor epoxide	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
Methoxychlor	ug/l	1.0 U	1.0 U		1.0 U	1.0 U	
Toxaphene	ug/l	5.0 U	5.0 U		5.0 U	5.0 U	
alpha-BHC	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
beta-BHC	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
delta-BHC	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
gamma-BHC (lindane)	ug/l	0.1 U	0.1 U		0.1 U	0.1 U	
Organo-Phosphorus Pesticides							
Naled	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Azinphos Methyl	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Bolstar(Suprophos)	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Chlorpyrifos	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Coumaphos	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Demeton O,S	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Diazinon	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Dimethoate	ug/l	2.0 U	2.0 U		2.0 U	2.0 UJ	
Disulfoton	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
EPN	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Ethoprop	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Fensulfothion	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Fenthion	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Malathion	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Merphos	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Mevinphos	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Ethyl Paration	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Parathion-methyl	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Phorate	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Ronnel	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Stirophos (Tetrachlorovinphos	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Sulfotep	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
TEPP	ug/l	2.0 U	2.0 U		2.0 U	2.0 UJ	
Tokuthion	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Trichloronate	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	
Dichlorvos (Vapona)	ug/l	0.50 U	0.50 U		0.50 U	0.50 UJ	

SAMPLE ID:		OW154	OW155	OW155	OW156	OW157	OW158
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF10-OW154-01	FM94-LF10-OW155-01	FM94-LF10-OW155-01RE	FM94-LF10-OW156-01	FM94-LF10-OW157-01	FM94-LF10-OW157-01R
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND							
Polychlorinated Biphenyls							
Aroclor-1016	ug/l	0.5 U	0.5 U		0.5 U	0.5 U	
Aroclor-1221	ug/l	0.5 U	0.5 U		0.5 U	0.5 U	
Aroclor-1232	ug/l	0.5 U	0.5 U		0.5 U	0.5 U	
Aroclor-1242	ug/l	0.5 U	0.5 U		0.5 U	0.5 U	
Aroclor-1248	ug/l	0.5 U	0.5 U		0.5 U	0.5 U	
Aroclor-1254	ug/l	0.5 U	0.5 U		0.5 U	0.5 U	
Aroclor-1260	ug/l	0.5 U	0.5 U		0.5 U	0.5 U	
Metals							
Aluminum	ug/l	200	100 U		300	200	
Antimony	ug/l	6 U	6 U		6 U	6 U	
Arsenic	ug/l	10 U	10 U		10 U	10 U	
Barium	ug/l	100 U	100 U		100 U	100 U	
Beryllium	ug/l	4 U	4 U		4 U	4 U	
Cadmium	ug/l	5 U	5 U		5 U	5 U	
Calcium	ug/l	7000	6000		12000	8000	
Chromium	ug/l	10 U	10 U		10 U	10 U	
Cobalt	ug/l	50 U	50 U		50 U	50 U	
Copper	ug/l	20 U	20 U		20 U	20 U	
Iron	ug/l	200	100 U		500	300	
Lead	ug/l	3 U	3 U		3 U	3 U	
Magnesium	ug/l	5000 U	5000 U		5000 U	5000 U	
Manganese	ug/l	20	20		20	20	
Mercury	ug/l	.9 BJ	.9 BJ		1.0 BJ	1.0 BJ	
Nickel	ug/l	40 U	40 U		40 U	40 U	
Potassium	ug/l	5000 U	5000 U		5000 U	5000 U	
Selenium	ug/l	5 U	5 U		5 U	5 U	
Silver	ug/l	10 U	10 U		10 U	10 U	
Sodium	ug/l	5000 U	5000 U		5000 U	5000 U	
Thallium	ug/l	2 U	2 U		2 U	2 U	
Vanadium	ug/l	50 U	50 U		50 U	50 U	
Zinc	ug/l	420 B	360 B		380 B	470 B	
Miscellaneous Parameters							
Alkalinity	mg/l	2 U	2 U		18.	8.	
Chemical Oxygen Demand	mg/l	10 U	10 U		10 U	10 U	
Nitrate/Nitrite	ug/l	900	800		1200	500	
Chloride	mg/l	2 U	2 U		2 U	2 U	
Fluoride, Total	mg/l	0.1 U	0.1 U		0.1 U	0.1 U	
Total Dissolved Solids	mg/l	32. J	28. J		52. J	38. J	

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:		OW154	OW155	OW155	OW156	OW157	OW158
DEPTH:		-	-	-	-	-	-
FIELD SAMPLE ID:		FM94-LF10-OW154-01	FM94-LF10-OW155-01	FM94-LF10-OW155-01RE	FM94-LF10-OW156-01	FM94-LF10-OW157-01	FM94-LF10-OW157-01R
DATE SAMPLED:		26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94	26-JUL-94
COMPOUND							
Miscellaneous Parameters							
Sulfate	mg/l	10 U	10 U		138.	10 U	
Orthophosphate	mg/l	0.1 U	0.1 U		0.2	0.1 U	

SAMPLE ID:	OW158
DEPTH:	-
FIELD SAMPLE ID:	FM94-LF10-OW158-01
DATE SAMPLED:	26-JUL-94

COMPOUND		
Volatile Compounds		
1,1,1-Trichloroethane	ug/l	1.0 U
1,1,2,2-Tetrachloroethane	ug/l	1.0 U
1,1,2-Trichloroethane	ug/l	1.0 U
1,1-Dichloroethane	ug/l	1.0 U
1,1-Dichloroethene	ug/l	1.0 U
1,2-Dichloroethane	ug/l	1.0 U
1,2-Dichloroethene(total)	ug/l	2.0 U
1,2-Dichloropropane	ug/l	1.0 U
2-Hexanone	ug/l	10 U
4-Methyl-2-pentanone	ug/l	10 U
Acetone	ug/l	50 U
Benzene	ug/l	1.0 U
Bromodichloromethane	ug/l	1.0 U
Bromoform	ug/l	1.0 U
Bromomethane	ug/l	2.0 U
Carbon Tetrachloride	ug/l	1.0 U
Carbon disulfide	ug/l	1.0 U
Chlorobenzene	ug/l	1.0 U
Chloroethane	ug/l	2.0 U
Chloroform	ug/l	1.0 U
Chloromethane	ug/l	2.0 U
Dibromochloromethane	ug/l	1.0 U
Ethyl Benzene	ug/l	1.0 U
Methyl Ethyl Ketone	ug/l	10 U
Methylene Chloride	ug/l	5.0 U
Styrene	ug/l	1.0 U
Tetrachloroethene	ug/l	1.0 U
Toluene	ug/l	1.0 U
Trichloroethene	ug/l	1.0 U
Vinyl Acetate	ug/l	25 U
Vinyl Chloride	ug/l	2.0 U
Xylenes (Total)	ug/l	2.0 U
cis-1,3-Dichloropropene	ug/l	1.0 U
trans-1,3-Dichloropropene	ug/l	1.0 U
Semi-Volatile Compounds		
1,4-Dichlorobenzene	ug/l	5.0 U
1,2,4-Trichlorobenzene	ug/l	5.0 UJ
1,2-Dichlorobenzene	ug/l	5.0 U
1,3-Dichlorobenzene	ug/l	5.0 U
Hexachlorobutadiene	ug/l	5.0 U

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID: OW158
DEPTH: -
FIELD SAMPLE ID: FM94-LF10-OW158-01
DATE SAMPLED: 26-JUL-94

COMPOUND		
Semi-Volatile Compounds		
2,4,5-Trichlorophenol	ug/l	5.0 U
2,4,6-Trichlorophenol	ug/l	5.0 U
2,4-Dichlorophenol	ug/l	5.0 U
2,4-Dimethylphenol	ug/l	5.0 U
Methylphenol (2,3)	ug/l	5.0 U
2,4-Dinitrophenol	ug/l	50 U
Naphthalene	ug/l	5.0 U
2,4-Dinitrotoluene	ug/l	5.0 U
Benzyl Alcohol	ug/l	20 U
Benzoic Acid	ug/l	50 U
2-Chloronaphthalene	ug/l	5.0 U
2-Chlorophenol	ug/l	5.0 U
Nitrobenzene	ug/l	5.0 U
2-Methylnaphthalene	ug/l	5.0 U
2-Nitroaniline	ug/l	50 U
2-Nitrophenol	ug/l	5.0 U
3,3-Dichlorobenzidine	ug/l	50 U
2,6-Dinitrotoluene	ug/l	5.0 U
3-Nitroaniline	ug/l	50 U
4,6-Dinitro-2-methylphenol	ug/l	50 U
4-Bromophenyl phenyl ether	ug/l	5.0 U
4-Chloro-3-methylphenol	ug/l	20 U
4-Chloroaniline	ug/l	20 U
4-Chlorophenyl phenyl ether	ug/l	5.0 U
4-Methylphenol	ug/l	5.0 U
4-Nitroaniline	ug/l	50 U
4-Nitrophenol	ug/l	50 U
Acenaphthene	ug/l	5.0 U
Acenaphthylene	ug/l	5.0 U
Anthracene	ug/l	5.0 U
Benzo(a)anthracene	ug/l	5.0 U
Benzo(a)pyrene	ug/l	5.0 U
Benzo(b)fluoranthene	ug/l	5.0 U
Benzo(g,h,i)perylene	ug/l	5.0 U
Benzo(k)fluoranthene	ug/l	5.0 U
Butylbenzylphthalate	ug/l	5.0 U
Chrysene	ug/l	5.0 U
Di-n-butylphthalate	ug/l	5.0 U
Di-n-octylphthalate	ug/l	5.0 U
Dibenzo(a,h)anthracene	ug/l	5.0 U
Dibenzofuran	ug/l	5.0 U
Diethylphthalate	ug/l	5.0 U

SAMPLE ID:	OW158
DEPTH:	-
FIELD SAMPLE ID:	FM94-LF10-OW158-01
DATE SAMPLED:	26-JUL-94

COMPOUND		
Semi-Volatile Compounds		
Dimethylphthalate	ug/l	5.0 U
Fluoranthene	ug/l	5.0 U
Fluorene	ug/l	5.0 U
Hexachlorobenzene	ug/l	5.0 U
Hexachlorocyclopentadiene	ug/l	5.0 U
Hexachloroethane	ug/l	5.0 U
Indeno(1,2,3-cd)pyrene	ug/l	5.0 U
Isophorone	ug/l	5.0 U
N-Nitrosodi-N-Propylamine	ug/l	5.0 U
N-nitrosodiphenylamine	ug/l	5.0 U
Pentachlorophenol	ug/l	20 U
Phenanthrene	ug/l	5.0 U
Phenol	ug/l	5.0 U
Pyrene	ug/l	5.0 U
bis(2-Chloroethoxy) methane	ug/l	5.0 U
bis(2-Chloroethyl) ether	ug/l	5.0 U
bis(2-Chloroisopropyl) ether	ug/l	5.0 U
bis(2-Ethylhexyl)phthalate	ug/l	5.0 U
Herbicide		
2,4,5-T	ug/l	2.0 UJ
2,4,5-TP (Silvex)	ug/l	2.0 UJ
2,4-D	ug/l	10 UJ
2,4-DB	ug/l	5.0 UJ
Dalapon	ug/l	50 UJ
Dicamba	ug/l	2.0 UJ
Dichloroprop	ug/l	5.0 UJ
Dinoseb	ug/l	1.0 UJ
MCPP	ug/l	200 UJ
MCPA	ug/l	200 UJ
Pesticide		
4,4'-DDD	ug/l	0.1 U
4,4'-DDE	ug/l	0.1 U
4,4-DDT	ug/l	0.1 U
Aldrin	ug/l	0.1 U
Chlordane	ug/l	0.1 U
Dieldrin	ug/l	0.1 U
Endosulfan I	ug/l	0.1 U
Endosulfan II	ug/l	0.1 U

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:	OW158
DEPTH:	-
FIELD SAMPLE ID:	FM94-LF10-OW158-01
DATE SAMPLED:	26-JUL-94

COMPOUND		
Pesticide		
Endosulfan sulfate	ug/l	0.1 U
Endrin	ug/l	0.1 U
Endrin aldehyde	ug/l	0.1 U
Heptachlor	ug/l	0.1 U
Heptachlor epoxide	ug/l	0.1 U
Methoxychlor	ug/l	1.0 U
Toxaphene	ug/l	5.0 U
alpha-BHC	ug/l	0.1 U
beta-BHC	ug/l	0.1 U
delta-BHC	ug/l	0.1 U
gamma-BHC (lindane)	ug/l	0.1 U
Organo-Phosphorus Pesticides		
Naled	ug/l	0.50 U
Azinphos Methyl	ug/l	0.50 U
Bolstar(Suprophos)	ug/l	0.50 U
Chlorpyrifos	ug/l	0.50 U
Coumaphos	ug/l	0.50 U
Demeton O,S	ug/l	0.50 U
Diazinon	ug/l	0.50 U
Dimethoate	ug/l	2.0 U
Disulfoton	ug/l	0.50 U
EPN	ug/l	0.50 U
Ethoprop	ug/l	0.50 U
Fensulfothion	ug/l	0.50 U
Fenthion	ug/l	0.50 U
Malathion	ug/l	0.50 U
Merphos	ug/l	0.50 U
Mevinphos	ug/l	0.50 U
Ethyl Paration	ug/l	0.50 U
Parathion-methyl	ug/l	0.50 U
Phorate	ug/l	0.50 U
Ronnel	ug/l	0.50 U
Stirophos (Tetrachlorovinphos	ug/l	0.50 U
Sulfotep	ug/l	0.50 U
TEPP	ug/l	2.0 U
Tokuthion	ug/l	0.50 U
Trichloronate	ug/l	0.50 U
Dichlorvos (Vapona)	ug/l	0.50 U

SAMPLE ID:	OW158
DEPTH:	-
FIELD SAMPLE ID:	FM94-LF10-OW158-01
DATE SAMPLED:	26-JUL-94

COMPOUND			
Polychlorinated Biphenyls			
Aroclor-1016	ug/l	0.5	U
Aroclor-1221	ug/l	0.5	U
Aroclor-1232	ug/l	0.5	U
Aroclor-1242	ug/l	0.5	U
Aroclor-1248	ug/l	0.5	U
Aroclor-1254	ug/l	0.5	U
Aroclor-1260	ug/l	0.5	U
Metals			
Aluminum	ug/l	200	
Antimony	ug/l	6	U
Arsenic	ug/l	10	U
Barium	ug/l	100	U
Beryllium	ug/l	4	U
Cadmium	ug/l	5	U
Calcium	ug/l	10000	
Chromium	ug/l	10	U
Cobalt	ug/l	50	U
Copper	ug/l	20	U
Iron	ug/l	300	
Lead	ug/l	3	U
Magnesium	ug/l	5000	U
Manganese	ug/l	10	
Mercury	ug/l	1.0	BJ
Nickel	ug/l	40	U
Potassium	ug/l	5000	U
Selenium	ug/l	5	U
Silver	ug/l	10	U
Sodium	ug/l	5000	U
Thallium	ug/l	2	U
Vanadium	ug/l	50	U
Zinc	ug/l	470	B
Miscellaneous Parameters			
Alkalinity	mg/l	11.	
Chemical Oxygen Demand	mg/l	10	U
Nitrate/Nitrite	ug/l	1000	
Chloride	mg/l	2	U
Fluoride, Total	mg/l	0.1	U
Total Dissolved Solids	mg/l	48.	J

Groundwater Monitoring Results
Fort McCoy

SAMPLE ID:	OW158
DEPTH:	-
FIELD SAMPLE ID:	FM94-LF10-OW158-01
DATE SAMPLED:	26-JUL-94

COMPOUND		
Miscellaneous Parameters		
Sulfate	mg/l	10 U
Orthophosphate	mg/l	0.1 U

APPENDIX R

MEMORANDUM: PRELIMINARY INVESTIGATION FOR SUSPECTED SWMUs AT THE FORT MCCOY ARMY INSTALLATION

CEMRO-ED-GH 26 JULY 1993

MEMORANDUM

FOR Files (CEMRO-ED-GH)

SUBJECT: Preliminary Investigation for Suspected SWMUs at the Fort McCoy Army Installation.

1. **INTRODUCTION.**

a. Date: 20 July 1993.
b. Location: Fort McCoy Army Installation, Wisconsin.
c. Purpose: Assist and oversee preliminary investigation for suspected SWMUs on Fort McCoy Army Installation property; photodocument all findings from the investigation.
d. Traveller: Steve Pearson, Geologist, CEMRO-ED-GH.
e. Ft. McCoy Employees:
Lynn McIntosh, Chief, Environmental Management Division
Jeff Bullen, Environmental Management Division
Larry Moe, Backhoe Operator

2. **SUMMARY.**

Background. In response to reported historic dumping on installation property the base Environmental Management Division initiated a preliminary investigation of three suspected SWMU sites. At Ft. McCoy's request, Omaha District supplied a geologist to help oversee and document findings from the investigation.

Investigation. A total of 14 test pits were excavated at three suspected burial/landfill sites (see attached location plan). Test pits were excavated with a John Deere 410C Backhoe. Ft. McCoy personnel directly involved with the investigation were Lynn McIntosh, Jeff Bullen and Larry Moe.

SITE 1 (Landfill 9) . The site is located along the installations western boundary, north of Buckley Court road (see Attachment A and B). The suspected dump site occuppied a drainage ditch that was overgrown with trees and heavy underbrush. A trench (TP-1) was excavated in an area previously identified and flagged. No waste was encountered at this location. Upon further investigation along the same drainage, some rusted metal cans were observed partially buried. The next test pit (TP-2) was excavated next to a tree where the surface material was observed. The pit was excavated to a depth of approximately three feet to the bottom of the waste. The waste material consisted of glass jars and bottles, metal cans, buckets, barbed wire, nails, stove pipe, a leather boot

and smaller pieces of rusted metal and glass. Near surface waste also appeared on the other side of the tree in the ditch, but a trench was not excavated here. The actual burial site appears to occupy approximately 20 to 30 feet of the drainage ditch.

SITE 2 (Landfill 8) . This site is located just east of the western installation boundary and adjacent to (north side) of Buckley Court road. There was no surface evidence of material buried here. The site was grass covered; the area had been cleared of trees in the past, which presently distinguishes it from the surrounding area. A total of three test pits were excavated at this site and waste was encountered in all three (see Attachments A and B). Trench depth varied from 42 inches to 58 inches; waste thickness varied from 18 to 26 inches, and the waste was covered with about 12 inches of topsoil. The waste identified consisted of glass (intact and broken) bottles and jars, wire, metal cans, a rubber overshoe, concrete block, bones, wood fragments, porcelain fragments and ash. Intact bottles were identified as milk bottles, soda bottles, beer, baby food, ketchup; metal cans that could be identified included coffee, floor wax and liquid detergent. The waste appeared similar in composition to that found at Site 1. The amount of waste contained at this site represents a more significant volume than that found at Site 1.

SITE 3 (Landfill 10) . This site is located on the north side of county road BB, adjacent to the west installation boundary. The site is maintained as a fire break; activities to maintain it as a fire break has resulted in spreading small pieces of metal and glass over a very large surface area. The area is relatively flat and grass covered. A total of nine test pits were excavated over the area (see Attachments A and B). Five of the pits did not encounter buried waste; the other four encountered waste at various depths. Trench depths ranged from 24 to 63 inches; waste thickness varied from 6 to 37 inches. Waste type consisted of minor unbroken bottles, broken glass and dishes, rusted metal debris, barbed wire, cans and a 10-foot length of corregated metal culvert pipe, ash and burnt material. The distribution of waste appeared to run diagonally across the site, corresponding to areas of thicker, greener vegetation. Trenching indicated a different topsoil may have been brought into the site for waste cover, and this may be supporting the thicker vegetation. In trench TP-5 two waste layers were found, with a layer of sandy fill separating them. Waste at this site appeared to be more throughly burned than at the previous locations.

Conclusion. Buried waste was confirmed at all three suspected sites. The waste type, depth and thickness have been documented in this report and the accompanying attachments.

Encls

Steven G. Pearson
Geologist, CEMRO-ED-GH

ATTACHMENT A

TEST PIT LOGS

Hole No. TP-1

DRILLING LOG	DIVISION: MISSOURI RIVER	INSTALLATION: OMAHA DISTRICT	SHEET 1 OF 1 SHEETS

1. PROJECT: Ft. McCoy RCRA Corrective Action Program
2. LOCATION (Coordinates or Station): SITE 1 (see location plan)
3. DRILLING AGENCY: Ft. McCoy
4. HOLE NO. (As shown on drawing title and file number): TP-1
5. NAME OF DRILLER: Larry Moe
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: —
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: —
10. SIZE AND TYPE OF BIT: TOOTH BUCKET
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NA
12. MANUFACTURER'S DESIGNATION OF DRILL: John Deere 410C Backhoe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: — UNDISTURBED: —
14. TOTAL NUMBER CORE BOXES: NA
15. ELEVATION GROUND WATER: NE
16. DATE HOLE: STARTED 7-20-93 COMPLETED 7-20-93
17. ELEVATION TOP OF HOLE: NOT SURVEYED
18. TOTAL CORE RECOVERY FOR BORING: NA %
19. SIGNATURE OF INSPECTOR: M. Pearson

ELEVATION a	FEET DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	1		Sandy Clay (SC) low plasticity, moist, dark brown; vf-f sand.			Trench excavated in low part of drainage course.
	2		Poorly-graded Sand (SP) moist, rust brown, fine grained, tr. silt.			Dimensions 3' x 20' parallel to axis of drainage.
			BOTTOM OF TRENCH			NO waste encountered.
	3					Trench was immediately backfilled w/ excavated material.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT: Ft. McCoy RCRA | HOLE NO. TP-1.

Hole No. TP-1

DRILLING LOG	DIVISION: MISSOURI RIVER	INSTALLATION: OMAHA DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT: Ft. McCoy RCRA Corrective Action Program		10. SIZE AND TYPE OF BIT: Tooth Bucket	
2. LOCATION (Coordinates or Station): Site 1 (see location plan)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NA	
3. DRILLING AGENCY: Ft. McCoy		12. MANUFACTURER'S DESIGNATION OF DRILL: John Deere 410C Backhoe	
4. HOLE NO. (As shown on drawing title and file number): TP-1		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER: Larry Moe		14. TOTAL NUMBER CORE BOXES: NA	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: NE	
		16. DATE HOLE: STARTED 7-20-93 / COMPLETED 7-20-93	
7. THICKNESS OF OVERBURDEN: —		17. ELEVATION TOP OF HOLE: NOT SURVEYED	
8. DEPTH DRILLED INTO ROCK: —		18. TOTAL CORE RECOVERY FOR BORING: NA %	
9. TOTAL DEPTH OF HOLE: —		19. SIGNATURE OF INSPECTOR: A. Graham	

ELEVATION (a)	FEET DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	1		Sandy Clay (SC) low plasticity, moist, dark brown; vf-f sand.			Trench excavated in low part of drainage course.
			Poorly-graded Sand (SP) moist, rust brown, fine grained; tr. silt.			Dimensions 3' x 20' parallel to axis of drainage.
	2		Bottom of TRENCH			NO waste encountered.
	3					Trench was immediately backfilled w/ excavated material.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO.

Hole No. TP-2

DRILLING LOG	DIVISION: MISSOURI RIVER	INSTALLATION: OMAHA DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT: Ft. McCoy RCRA Corrective Action Program		10. SIZE AND TYPE OF BIT: TEETH BUCKET	
2. LOCATION (Coordinates or Station): SITE 1 (see location plan)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NA	
3. DRILLING AGENCY: Ft. McCoy		12. MANUFACTURER'S DESIGNATION OF DRILL: J. Deere 410C Backhoe	
4. HOLE NO. (As shown on drawing title and file number): TP-1		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER: Larry Mee		14. TOTAL NUMBER CORE BOXES: NA	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: NE	
7. THICKNESS OF OVERBURDEN: —		16. DATE HOLE: STARTED 7-20-93 / COMPLETED 7-20-93	
8. DEPTH DRILLED INTO ROCK: —		17. ELEVATION TOP OF HOLE: NOT SURVEYED	
9. TOTAL DEPTH OF HOLE: —		18. TOTAL CORE RECOVERY FOR BORING: NA %	
		19. SIGNATURE OF INSPECTOR: [signature]	

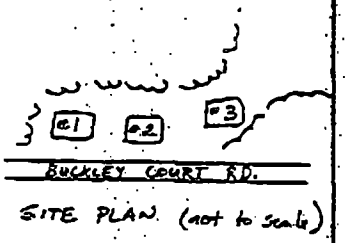
ELEVATION (a)	FEET DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	1		Topsoil Sandy Clay (SC) moist, dk. brown			Trench excavated in drainage course next to tree; heavy underbrush.
			Sandy Fill and Waste Material - glass bottles (i.e. beer, salad dressings) & jars - metal cans (beer, coffee, sardine). - metal buckets, barbed wire, nails, piece of stove pipe - leather boot.			Dimensions 3' x 8' perpendicular to axis of drainage. Scattered surface debris indicated this could be a dump site.
	2					
	3		Poorly Graded Sand (SP) sl. moist, rust brn. to tan, fine grained.			
			Bottom of TRENCH 3.3'			Trench was immediately backfilled w/ excavated material. Waste did not appear crushed or compacted; probably dumped or piled & covered w/ a thin layer of soil. Appears to be mostly common farm household waste. (one bucket had a feeding nipple attached. one bottle was the variety antibiotics would be in (needle to be inserted thru lid.).

ENG FORM 1836

Hole No. TP-1

DRILLING LOG	DIVISION: MISSOURI RIVER	INSTALLATION: OMAHA DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT: Ft. McCoy RCRA Corrective Action Program		10. SIZE AND TYPE OF BIT: TOOTH BUCKET	
2. LOCATION (Coordinates or Station): SITE 2 (see location plan)		11. DATUM FOR ELEVATION SHOWN (MSL or USC): NA	
3. DRILLING AGENCY: Ft. McCoy		12. MANUFACTURER'S DESIGNATION OF DRILL: J. DEERE 410C BACKHOE	
4. HOLE NO. (As shown on drawing title and file number): TP-1		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED	UNDISTURBED
5. NAME OF DRILLER: Larry Moe		14. TOTAL NUMBER CORE BOXES: NA	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: NE	
		16. DATE HOLE: STARTED 7-20-93	COMPLETED 7-20-93
7. THICKNESS OF OVERBURDEN: —		17. ELEVATION TOP OF HOLE: NA	
8. DEPTH DRILLED INTO ROCK: —		18. TOTAL CORE RECOVERY FOR BORING: NA %	
9. TOTAL DEPTH OF HOLE: —		19. SIGNATURE OF INSPECTOR: L Pearson	

ELEVATION (a)	FEET DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
			Topsoil and 'clean' fill Dk. brown clayey sand (SC)			Trench located 25' N of Buckley Ct. road in clearing.
	1		Fill - Waste Layer. Clayey Sand w/ pockets of lt. tan ash. See Notes below on WASTE. @ 2.5' black burnt layer ~ 1"			Approx. dimensions of excavation 8'x8'
	2.5		Poorly Graded Sand (SP) sl. moist to moist, rust to tan, fine grained.			WASTE: Glass bottles (milk, soda, beer, baby food, ketchup), 1 gallon clear & amber glass jugs, wire, metal cans (coffee, floor wax, liquid detergent), rubber overshoe, bones, concrete block pc., porcelain fragments.
	3.5		BOTTOM of TRENCH @ 3.5'. Trench was immediately backfilled w/ excavated material.			



SITE PLAN (not to scale)

Hole No. TP-2

DRILLING LOG	DIVISION: MISSOURI RIVER	INSTALLATION: OMAHA DISTRICT	SHEET 1 OF 1 SHEETS

1. PROJECT: Ft. McCoy RCRA Corrective Action Program
2. LOCATION (Coordinates or Station): SITE 2 (see location plan)
3. DRILLING AGENCY: Ft. McCoy
4. HOLE NO. (As shown on drawing title and file number): TP-2
5. NAME OF DRILLER: Larry Moe
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: —
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: —
10. SIZE AND TYPE OF BIT: Tooth Bucket
11. DATUM FOR ELEVATION SHOWN (USGS or NGS): NA
12. MANUFACTURER'S DESIGNATION OF DRILL: J. Deere 410C Backhoe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: UNDISTURBED:
14. TOTAL NUMBER CORE BOXES: NA
15. ELEVATION GROUND WATER: NE
16. DATE HOLE: STARTED 7-20-93 COMPLETED 7-20-93
17. ELEVATION TOP OF HOLE: NA
18. TOTAL CORE RECOVERY FOR BORING: NA %
19. SIGNATURE OF INSPECTOR: L. Wisdom

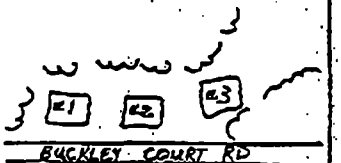
ELEVATION a	FEET DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Topsoil and 'clean' Fill			Trench located 15' east of TP-1.
	1		Dk. brown Clayey Sand			Approx. trench dimensions 8'x8'.
	1		FILL & WASTE LAYER			
	2		Similar to waste found in TP-1			
	3					Waste appears continuous with material in TP-1 and is composed of the same type of waste.
	3.2		Poorly Graded Sand (SP)			Also found used 1 gallon paint can, metal coil spring.
	4		sl. moist, rust to tan, fine grained.			
	4		undisturbed			
	4.8		BOTTOM OF TRENCH @ 4.8'			
			Trench was immediately backfilled w/ excavated material.			

SITE PLAN
(not to scale)

Hole No. TP-3

DRILLING LOG	DIVISION: MISSOURI RIVER	INSTALLATION: OMAHA DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT: Ft. McCoy RCRA Corrective Action Program		10. SIZE AND TYPE OF BIT: TOOTH BUCKET	
2. LOCATION (Coordinates or Station): Site 2 (see location plan)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NA	
3. DRILLING AGENCY: Ft. McCoy		12. MANUFACTURER'S DESIGNATION OF DRILL: J. DEERE 410C Backhoe	
4. HOLE NO. (As shown on drawing title and file number): TP-3		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER: Larry Moe		14. TOTAL NUMBER CORE BOXES: NA	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: NE	
		16. DATE HOLE: STARTED 7-20-93 / COMPLETED 7-20-93	
7. THICKNESS OF OVERBURDEN: —		17. ELEVATION TOP OF HOLE: NA	
8. DEPTH DRILLED INTO ROCK: —		18. TOTAL CORE RECOVERY FOR BORING: NA %	
9. TOTAL DEPTH OF HOLE: —		19. SIGNATURE OF INSPECTOR: S. Sandon	

ELEVATION (a)	FEET DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	0		Topsoil & 'Clean' Fill. Dk. brown clayey sand.			Trench is located approx. 25' east of TP-2.
	1		Fill & Waste Layer Similar to waste found in TP-1 & 2.			Approx. trench dimensions 5' x 8'.
	2					Waste appears continuous with material in TP-1 & 2, and is composed of the same type of waste.
	2.5		Poorly Graded Sand (SP) sl. moist, light rust to tan, fine grained. Undisturbed.			Noted solvent smell (i.e. paint thinner) from glass jar, in trench.
	3					
	4					
	4.6		BOTTOM OF TRENCH @ 4.6'			
	5		Trench was immediately backfilled w/ excavated material.			

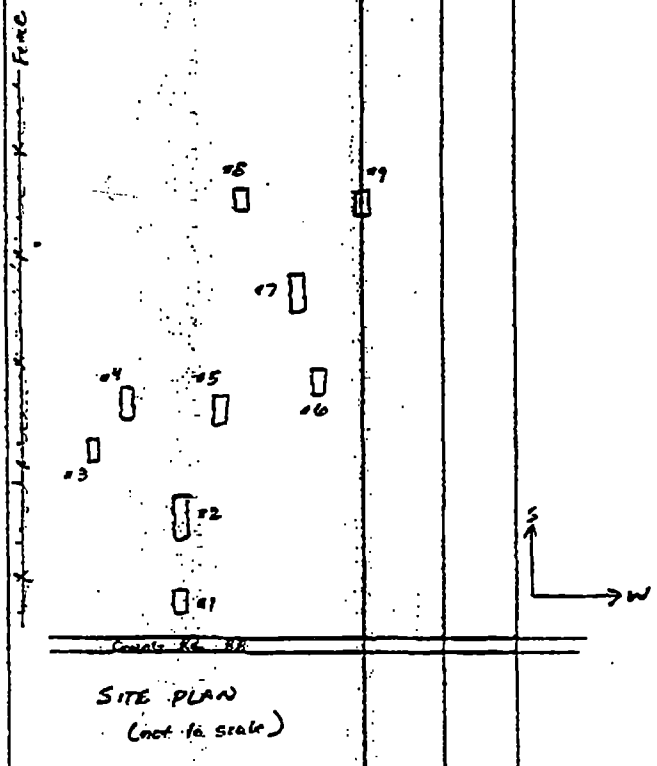


SITE PLAN (not to scale)

Hole No. TP-1

DRILLING LOG	DIVISION MISSOURI RIVER	INSTALLATION OMAHA DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT Ft. McCoy RCRA Corrective Action Program		10. SIZE AND TYPE OF BIT TOOTH BUCKET	
2. LOCATION (Coordinates or Station) SITE 3 (see location plan)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NA	
3. DRILLING AGENCY Ft. McCoy		12. MANUFACTURER'S DESIGNATION OF DRILL J. DEERE 410C Backhoe	
4. HOLE NO. (As shown on drawing title and file number) TP-1		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED	UNDISTURBED
5. NAME OF DRILLER Larry Moe		14. TOTAL NUMBER CORE BOXES NA	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NE	
7. THICKNESS OF OVERBURDEN —		16. DATE HOLE STARTED 7-20-93	COMPLETED 7-20-93
8. DEPTH DRILLED INTO ROCK —		17. ELEVATION TOP OF HOLE NA	
9. TOTAL DEPTH OF HOLE —		18. TOTAL CORE RECOVERY FOR BORING NA %	
		19. SIGNATURE OF INSPECTOR A. Branson	

ELEVATION a	DEPTH (FEET) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	.6		Topsoil + dk. clayey sand scattered debris on surface (pcs. metal + broken plastic)			Approximate trench dimensions 2½' x 16'
	1		Poorly Graded Sand (SP) sl. moist, rust to tan, fine grained.			Crushed, rusted can found; not sure at what depth it is from.
	2		BOTTOM OF TRENCH			No identifiable waste layer found.
			Trench backfilled with excavated material.			

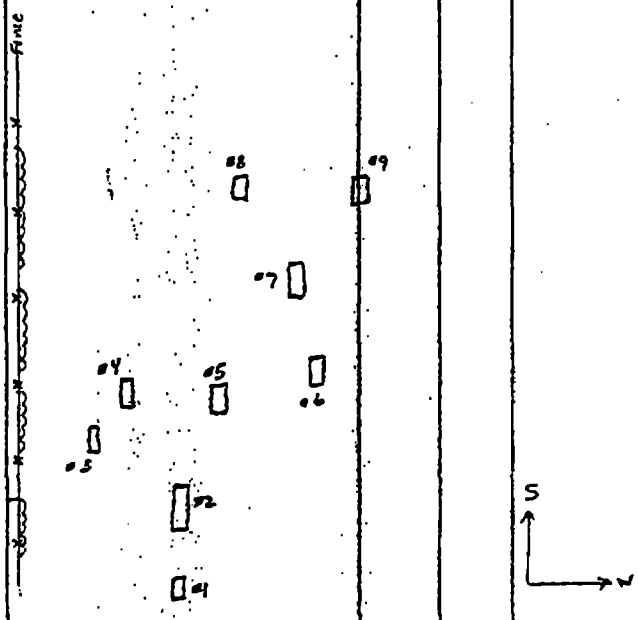


SITE PLAN
(not to scale)

Hole No. TP-2

DRILLING LOG	DIVISION: MISSOURI RIVER	INSTALLATION: OMAHA DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT: Ft. McCoy RCRA Corrective Action Program		10. SIZE AND TYPE OF BIT: TOOTH BUCKET	
2. LOCATION (Coordinates or Station): SITE 3 (see location plan)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NA	
3. DRILLING AGENCY: Ft. McCoy		12. MANUFACTURER'S DESIGNATION OF DRILL: J. DEERE 410C Backhoe	
4. HOLE NO. (As shown on drawing title and file number): TP-2		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER: Larry Moe		14. TOTAL NUMBER CORE BOXES: NA	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: NE	
		16. DATE HOLE: STARTED 7-20-93 / COMPLETED 7-20-93	
7. THICKNESS OF OVERBURDEN: —		17. ELEVATION TOP OF HOLE: NA	
8. DEPTH DRILLED INTO ROCK: —		18. TOTAL CORE RECOVERY FOR BORING: NA %	
9. TOTAL DEPTH OF HOLE: —		19. SIGNATURE OF INSPECTOR: A. Haroum	

ELEVATION (a)	FEET DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	.8		Topsoil = Fill - Clayey Sand sl. moist, dk. brown			Approx. trench dimensions 2½' x 18'
	1		Waste Layer see note below			
	2		Poorly Graded Sand (SP) sl. moist, lt. brown, fine grained.			NOTE: Waste layer includes various rusted metal debris, broken plates, bottles.
	2.5		Bottom of TRENCH @ 2.5'			
	3		Trench was backfilled w/ excavated material.			



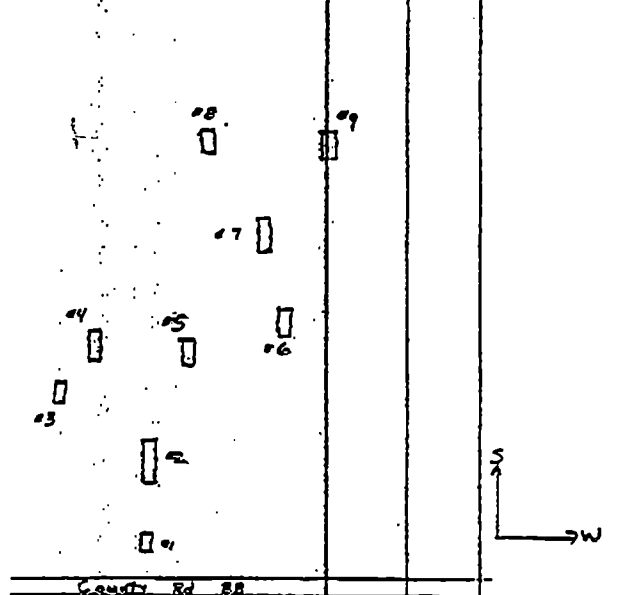
SITE PLAN (not to scale)

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT: Ft. McCoy RCRA HOLE NO. TP-2

Hole No. TP-3

DRILLING LOG	DIVISION: MISSOURI RIVER	INSTALLATION: OMAHA DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT: Ft. McCoy RCRA Corrective Action Program		10. SIZE AND TYPE OF BIT: TOOTH BUCKET	
2. LOCATION (Coordinates or Station): SITE 3 (see location plan)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NA	
3. DRILLING AGENCY: Ft. McCoy		12. MANUFACTURER'S DESIGNATION OF DRILL: J. DEERE 410C Backhoe	
4. HOLE NO. (As shown on drawing title and file number): TP-3		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER: Larry Mee		14. TOTAL NUMBER CORE BOXES: NA	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: NE	
		16. DATE HOLE: STARTED 7-20-93 / COMPLETED 7-20-93	
7. THICKNESS OF OVERBURDEN: —		17. ELEVATION TOP OF HOLE: NA	
8. DEPTH DRILLED INTO ROCK: —		18. TOTAL CORE RECOVERY FOR BORING: NA %	
9. TOTAL DEPTH OF HOLE: —		19. SIGNATURE OF INSPECTOR: J. Haran	

ELEVATION a	FEET DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Topsoil Clayey Sand, sl. moist, dk brn.			Approx. trench dimension 3' x 12'.
	.5					
	1		Poorly Graded Sand (SP) sl. moist to dry, tan to rust brown, fine grained.			Scattered debris found on ground surface but none in trench.
	2					
	2.7					
	3		BOTTOM OF TRENCH @ 2.7'			
			Trench was backfilled w/ excavated material.			



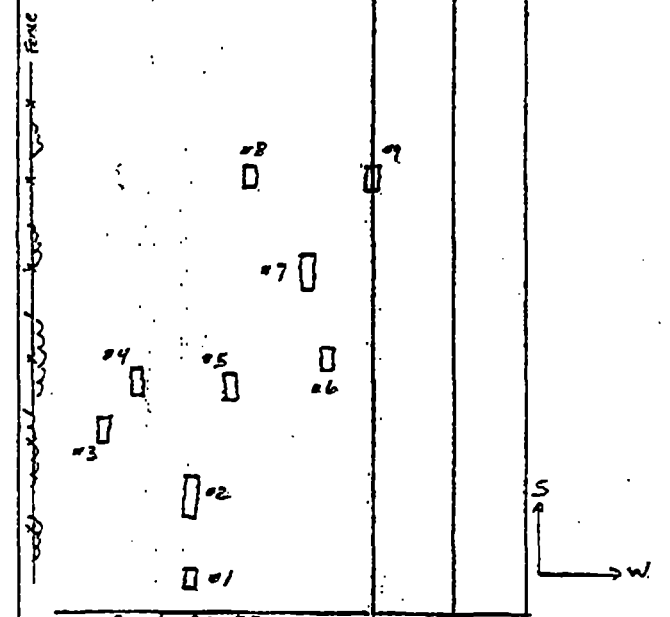
ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO.

Hole No. TP-4

DRILLING LOG

DIVISION: MISSOURI RIVER	INSTALLATION: OMAHA DISTRICT
	SHEET 1 OF 1 SHEETS
1. PROJECT: Ft. McCoy RCRA Corrective Action Program	10. SIZE AND TYPE OF BIT: TOOTH BUCKET
2. LOCATION (Coordinates or Station): SITE 3 (see location plan)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NA
3. DRILLING AGENCY: Ft. McCoy	12. MANUFACTURER'S DESIGNATION OF DRILL: J. DEERE 410C Backhoe
4. HOLE NO. (As shown on drawing title and file number): TP-4	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
5. NAME OF DRILLER: Larry Moe	14. TOTAL NUMBER CORE BOXES: NA
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER: NE
	16. DATE HOLE: STARTED 7-20-93 / COMPLETED 7-20-93
7. THICKNESS OF OVERBURDEN: —	17. ELEVATION TOP OF HOLE: NA
8. DEPTH DRILLED INTO ROCK: —	18. TOTAL CORE RECOVERY FOR BORING: NA %
9. TOTAL DEPTH OF HOLE: —	19. SIGNATURE OF INSPECTOR: L. Johansen

ELEVATION a	FEET DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0.7		Topsoil; Clayey Sand, sl. moist; dk. brown-brown.			Approx. trench dimensions 3' x 9'
	1		Poorly Graded Sand (SP) sl. moist - dry, tan - lt. brown; fine grained.			Scattered debris on surface but none in trench.
	2					
	3		BOTTOM OF TRENCH @ 2.7'			
			Trench was backfilled w/ excavated material.			



SITE PLAN (not to scale)

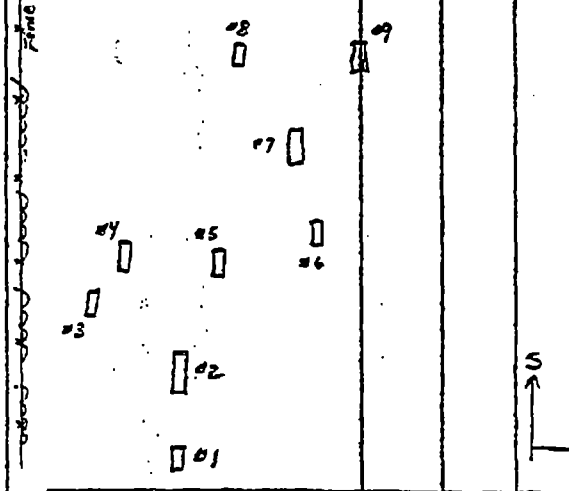
ENVIR NO. 17-5

DRILLING LOG

DIVISION: MISSOURI RIVER
INSTALLATION: OMAHA DISTRICT
SHEET 1 OF 1 SHEETS

1. PROJECT: Ft. McCoy RCRA Corrective Action Program
2. LOCATION (Coordinates or Station): SITE 3 (see location plan)
3. DRILLING AGENCY: Ft. McCoy
4. HOLE NO. (As shown on drawing title and file number): TP-5
5. NAME OF DRILLER: Larry Moe
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: —
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: —
10. SIZE AND TYPE OF BIT: TOOTH BUCKET
11. DATUM FOR ELEVATION SHOWN (MSL or ASL): NA
12. MANUFACTURER'S DESIGNATION OF DRILL: J. DEERE 410C Backhoe
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: UNDISTURBED:
14. TOTAL NUMBER CORE BOXES: NA
15. ELEVATION GROUND WATER: NE
16. DATE HOLE: STARTED 7-20-93 COMPLETED 7-20-93
17. ELEVATION TOP OF HOLE: NA
18. TOTAL CORE RECOVERY FOR BORING: NA %
19. SIGNATURE OF INSPECTOR: L. Hansen

ELEVATION a	FEET DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	.3		Topsoil Clayey Sand, sl. moist, dk brn - brn.			Approx. trench dimensions 3' x 10'.
			Waste + fill; wire, glass, cans, broken plates, burnt material.			
	1					
	1.1		FILL - Poorly Graded Sand (SP) moist, rust brown,			
	1.9					
	2		Waste (as above) mixed w/ sand.			
	3					
	3.3		Poorly Graded Sand (SP), dry, tan to lt. brown, fine grained.			
	4					
	4.3		BOTTOM OF TRENCH @ 4.3'			
	5		Trench was backfilled w/ excavated material.			



SITE PLAN (not to scale)

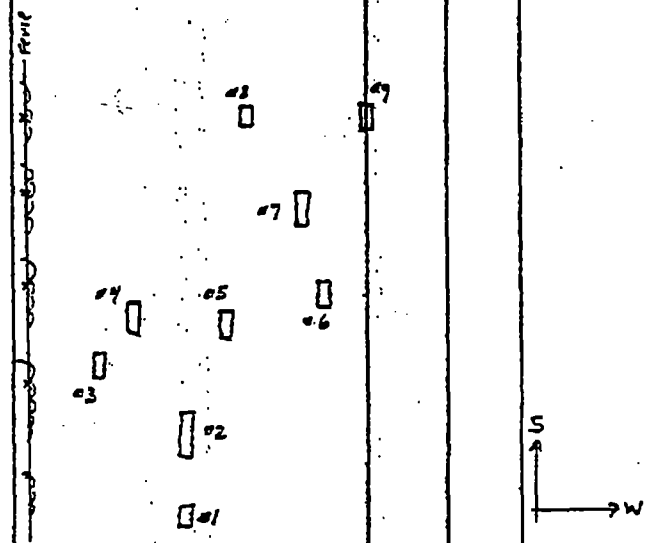
ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT: Ft. McCoy RCRA
HOLE NO.: TP-5

Hole No. TP-6

DRILLING LOG	DIVISION: MISSOURI RIVER	INSTALLATION: OMAHA DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT: Ft. McCoy RCRA Corrective Action Program		10. SIZE AND TYPE OF BIT: TOOTH BUCKET	
2. LOCATION (Coordinates or Station): SITE 3 (see location plan)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NA	
3. DRILLING AGENCY: Ft. McCoy		12. MANUFACTURER'S DESIGNATION OF DRILL: J. DEERE 410C Backhoe	
4. HOLE NO. (As shown on drawing title and file number): TP-6		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED	UNDISTURBED
5. NAME OF DRILLER: Larry Moe		14. TOTAL NUMBER CORE BOXES: NA	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: NE	
7. THICKNESS OF OVERBURDEN: —		16. DATE HOLE: STARTED 7-20-93	COMPLETED 7-20-93
8. DEPTH DRILLED INTO ROCK: —		17. ELEVATION TOP OF HOLE: NA	
9. TOTAL DEPTH OF HOLE: —		18. TOTAL CORE RECOVERY FOR BORING: NA %	
		19. SIGNATURE OF INSPECTOR: L. Pearson	

ELEVATION a	FEET DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Topsoil - Clayey Sand (SC) sl. moist, dk brn - brn.			Approx. Trench dimensions 3' x 6'.
	1		Poorly Graded Sand (SP) sl. moist - dry, tan to white; fine grained.			Scattered debris on surface but none in trench.
	2					
	2.5		BOTTOM OF TRENCH @ 2.5'			
	3		Trench was backfilled w/ excavated material.			



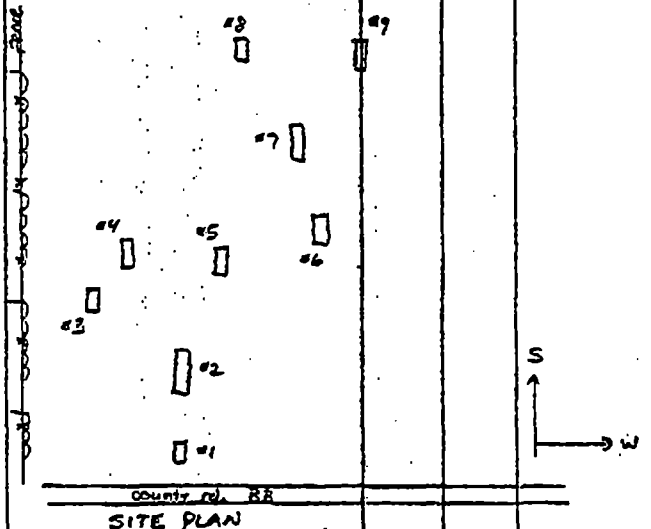
SITE PLAN (not to scale)

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT Ft. McCoy RCRA HOLE NO. —

Hole No. TP-7

DRILLING LOG	DIVISION: MISSOURI RIVER	INSTALLATION: OMAHA DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT: Ft. McCoy RCRA Corrective Action Program		10. SIZE AND TYPE OF BIT: TOOTH BUCKET	
2. LOCATION (Coordinates or Station): SITE 3 (see location plan)		11. DATUM FOR ELEVATION SHOWN (MSL or MSL): NA	
3. DRILLING AGENCY: Ft. McCoy		12. MANUFACTURER'S DESIGNATION OF DRILL: J. DEERE 410C BACKHOE	
4. HOLE NO. (As shown on drawing title and title number): TP-7		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER: Larry Moc		14. TOTAL NUMBER CORE BOXES: NA	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: NE	
		16. DATE HOLE: STARTED 7-20-93 / COMPLETED 7-20-93	
7. THICKNESS OF OVERBURDEN: —		17. ELEVATION TOP OF HOLE: NA	
8. DEPTH DRILLED INTO ROCK: —		18. TOTAL CORE RECOVERY FOR BORING: NA %	
9. TOTAL DEPTH OF HOLE: —		19. SIGNATURE OF INSPECTOR: J. Gladem.	

ELEVATION (a)	FEET DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	1		Topsoil & Fill, Sand (SP) moist, dark brown, tr. clay.			Approx. Trench dimensions 3' x 12'.
	2		Waste & Sandy Fill; Waste similar to test pits 2 & 5; includes barb wire, rusted bucket.			
	3					
	3.3		Poorly Graded Sand (SP) dry, tan to white, fine grained.			
	4					
	5					
	5.2		BOTTOM OF TRENCH @ 5.2' Trench was backfilled w/ excavated material.			
	6					



SITE PLAN (not to scale)

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

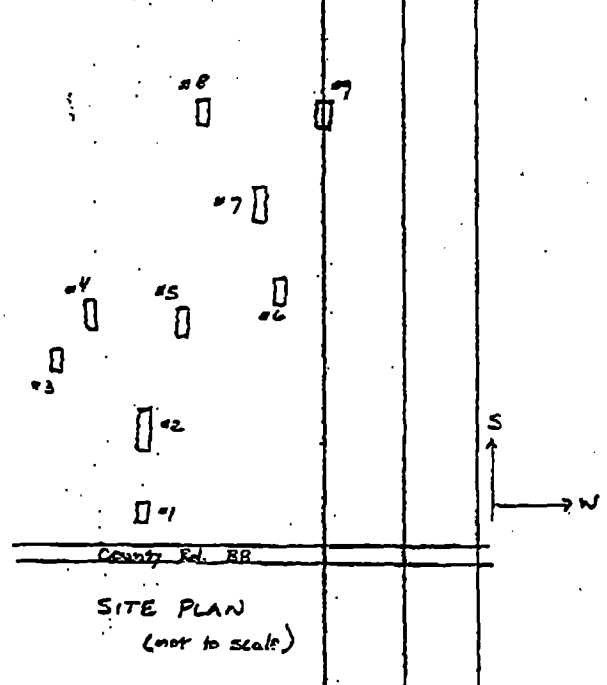
PROJECT: Ft. McCoy RCRA | HOLE NO. TP-7

Hole No. TP-8

DRILLING LOG

DIVISION: MISSOURI RIVER	INSTALLATION: OMAHA DISTRICT
SHEET 1 OF 1 SHEETS	
1. PROJECT: Ft. McCoy RCRA Corrective Action Program	10. SIZE AND TYPE OF BIT: TOOTH BUCKET
2. LOCATION (Coordinates or Station): S.TE 3 (see location plan)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NA
3. DRILLING AGENCY: Ft. McCoy	12. MANUFACTURER'S DESIGNATION OF DRILL: J. DEERE 410C Backhoe
4. HOLE NO. (As shown on drawing title and file number): TP-8	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
5. NAME OF DRILLER: Larry Moe	14. TOTAL NUMBER CORE BOXES: NA
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER: NE
	16. DATE HOLE: STARTED 7-20-93 / COMPLETED 7-20-93
7. THICKNESS OF OVERBURDEN: —	17. ELEVATION TOP OF HOLE: NA
8. DEPTH DRILLED INTO ROCK: —	18. TOTAL CORE RECOVERY FOR BORING: NA %
9. TOTAL DEPTH OF HOLE: —	19. SIGNATURE OF INSPECTOR: L. Reardon

ELEVATION a	FEET DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Topsoil, Clayey Sand sl. moist, dk. brown.			Approx. Trench dimensions 3'x 6'.
	.8					
	1		Poorly Graded Sand (SP) sl. moist, rust brown, fr. silt.; fine grained.			
	1.9					
	2		Poorly Graded Sand (SP) sl. moist-dry, tan. fine grained.			
	3					Scattered debris on surface but none in trench.
	3.5		BOTTOM OF TRENCH 3.5'			
	4		Trench was backfilled w/ excavated material.			

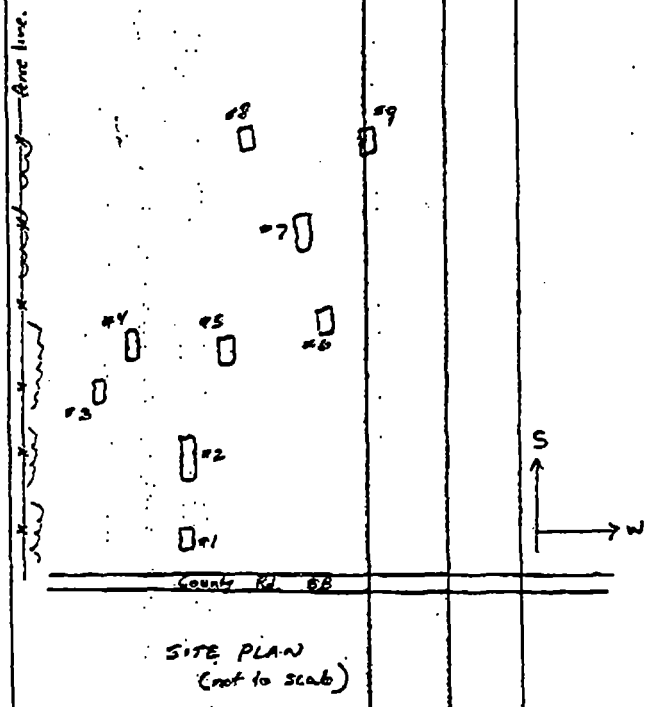


SITE PLAN (not to scale)

Hole No. TP-9

DRILLING LOG	DIVISION: MISSOURI RIVER	INSTALLATION: OMAHA DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT: Ft. McCoy RCRA Corrective Action Program		10. SIZE AND TYPE OF BIT: TOOTH BUCKET	
2. LOCATION (Coordinates or Station): SITE 3 (see location plan)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NA	
3. DRILLING AGENCY: Ft. McCoy		12. MANUFACTURER'S DESIGNATION OF DRILL: J. DEERE 410C Backhoe	
4. HOLE NO. (As shown on drawing title and file number): TP-9		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED	
5. NAME OF DRILLER: Larry Moc		14. TOTAL NUMBER CORE BOXES: NA	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: NE	
7. THICKNESS OF OVERBURDEN: —		16. DATE HOLE: STARTED 7-20-93 / COMPLETED 7-20-93	
8. DEPTH DRILLED INTO ROCK: —		17. ELEVATION TOP OF HOLE: NA	
9. TOTAL DEPTH OF HOLE: —		18. TOTAL CORE RECOVERY FOR BORING: NA %	
		19. SIGNATURE OF INSPECTOR: A. Hanson	

ELEVATION a	FEET DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	1		Topsoil Clayey Sand sl. moist, dk. brown.			Approx. Trench dimensions 4' x 12'.
	2		Waste - Fill; glass, barbed wire, 10' long pc. of 12" culvert pipe.			Hole collapsed at 3' after removal of culvert pipe. Trench was abandoned.
	3		BOTTOM OF TRENCH @ approx. 3'. Trench backfilled w/ excavated material.			



SITE PLAN (not to scale)

ATTACHMENT B

PHOTOGRAPHIC DOCUMENTATION

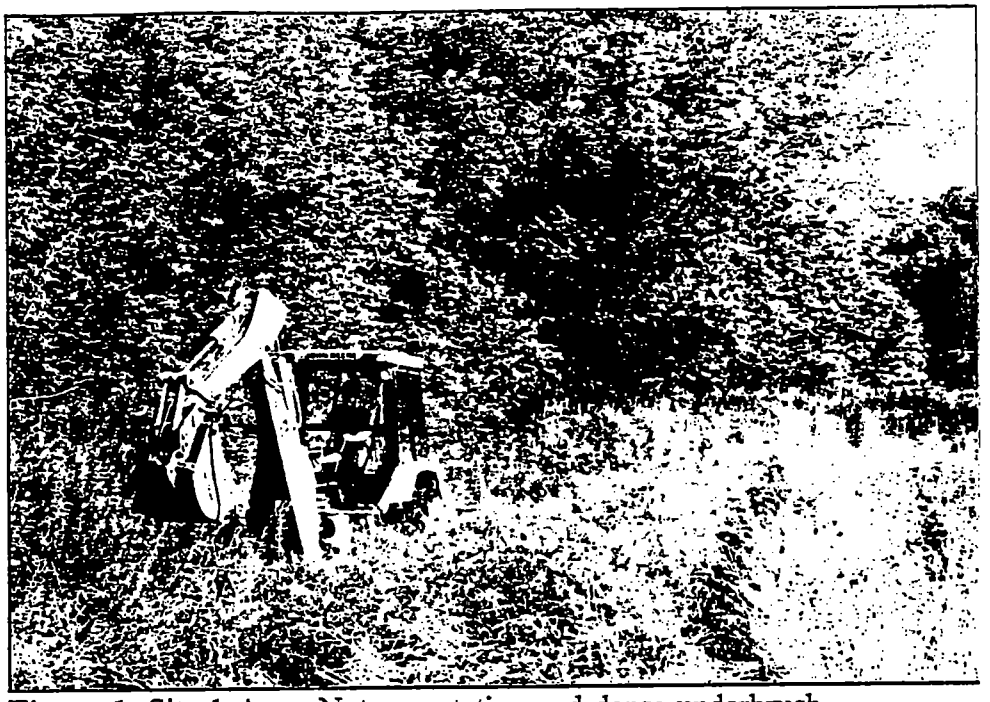


Figure 1. Site 1 Area; Note vegetation and dense underbrush.

Figure 2. Site 1 - TP-1; no waste encountered.

Figure 3. Site 1 - Near surface evidence of dump site; location of TP-2.

Figure 4. Site 1 - Barbed wire from TP-2.

Figure 5. Site 1 - Rusted can and bucket from TP-2.

Figure 6. Site 1 - Glass bottles, rusted cans and buckets from TP-2.

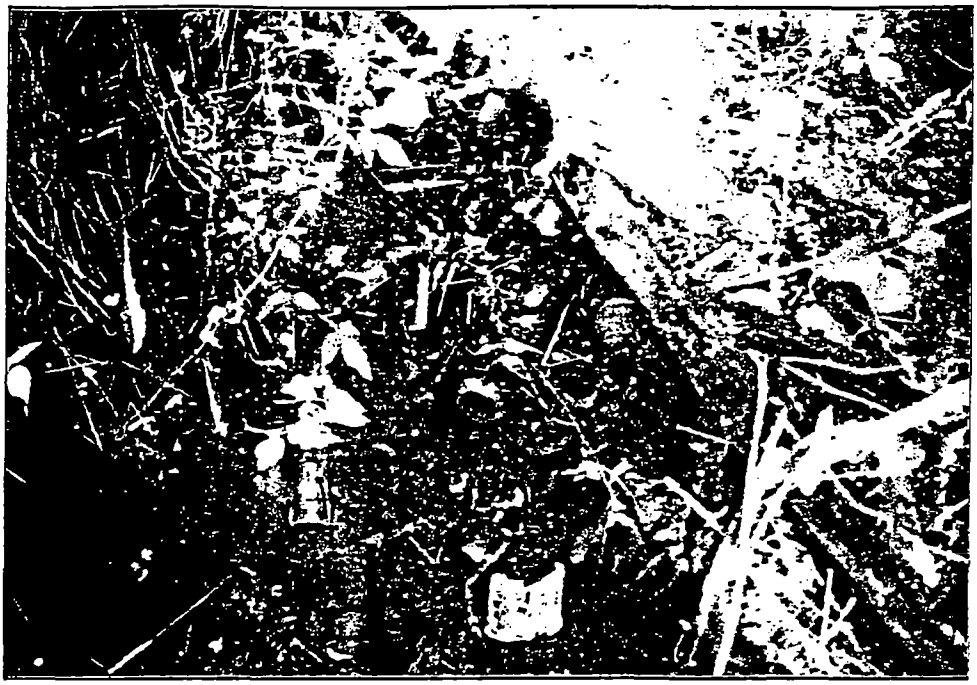


Figure 7. Site 1 - Unearthed glass bottles from TP-2.

Figure 8. Site 1 - Discarded stovepipe, leather boot and glass bottles from TP-2.

Figure 9. Site 1 - Various glass bottles unearthed from TP-2.

Figure 10. Site 2 Area, west portion.

Figure 11. Site 2 - Rusted metal, glass and concrete block piece from TP-1.

Figure 12. Site 2 - Wire, glass and rusted cans in TP-1.

Figure 13. Site 2 - same as Figure 12.

Figure 14. Site 2 - One-gallon clear and amber glass containers, metal cans (liquid detergent products) from TP-1.

Figure 15. Site 2 - Glass and rusted metal from TP-1.

Figure 16. Site 2 - Glass, metal and ash from TP-1.

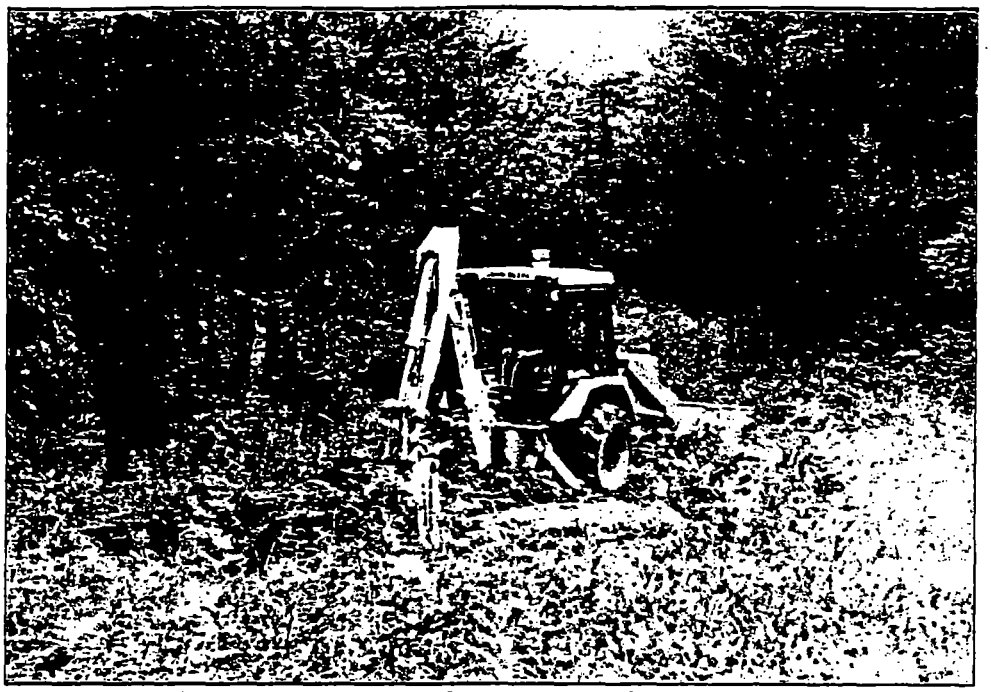


Figure 17. Site 2 - Excavation of TP-2, east of TP-1.

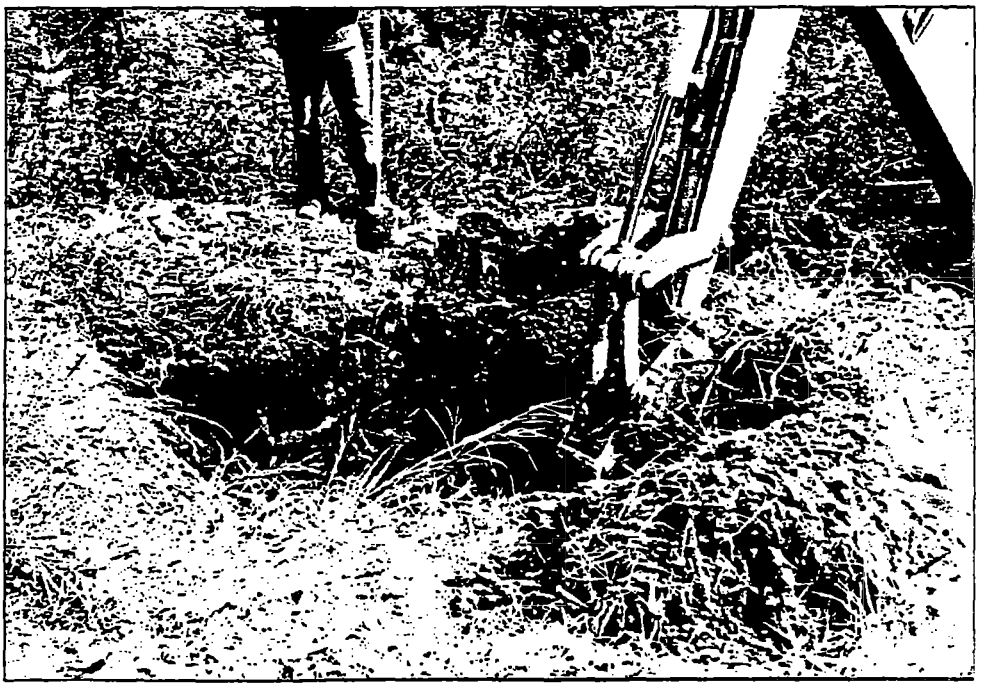


Figure 18. Site 2 - Excavation of TP-2.

Figure 19. Site 2 - Coil of barbed wire from TP-2.

Figure 20. Site 2 - Glass bottle and jar from TP-2.

Figure 21. Site 2 - Tire from TP-2.

Figure 22. Site 2 - Glass and metal debris in TP-2.

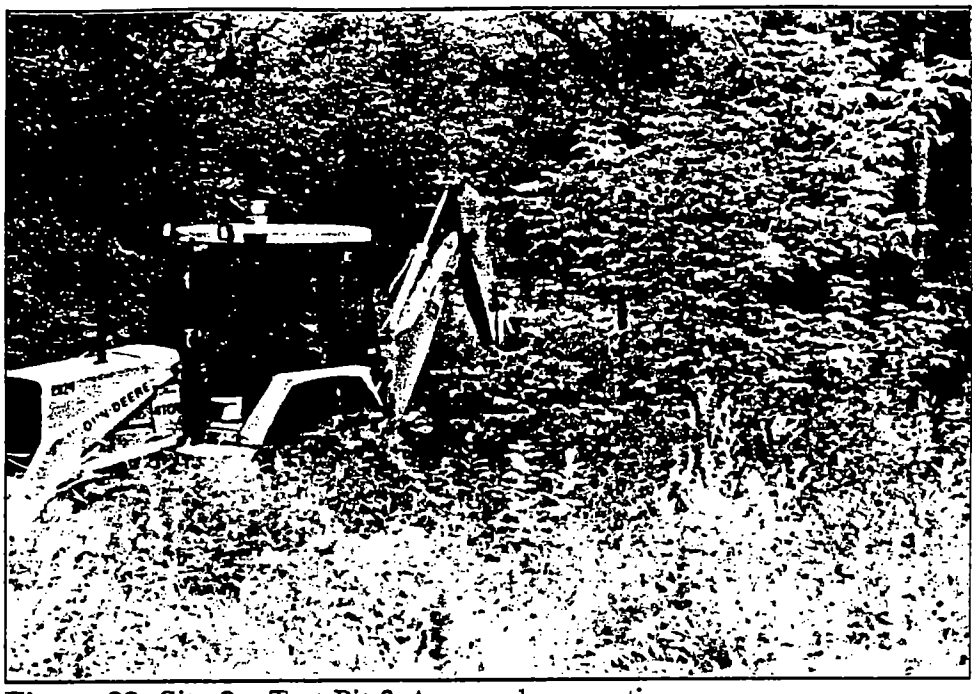


Figure 23. Site 2 - Test Pit 3 Area and excavation.

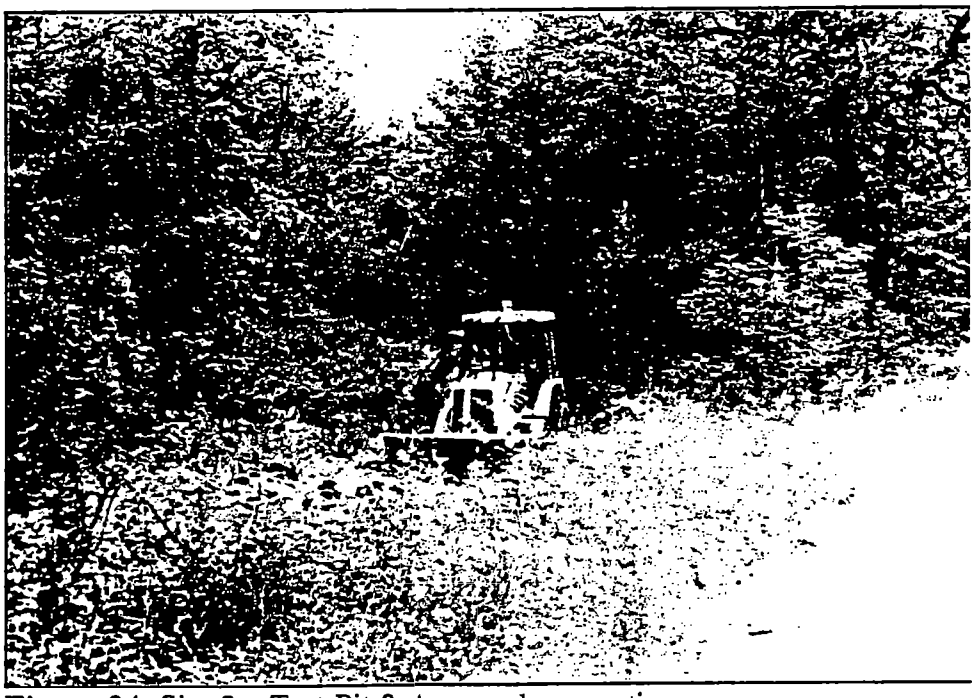


Figure 24. Site 2 - Test Pit 3 Area and excavation.

Figure 25. Site 2 - Metal and glass debris in TP-3.

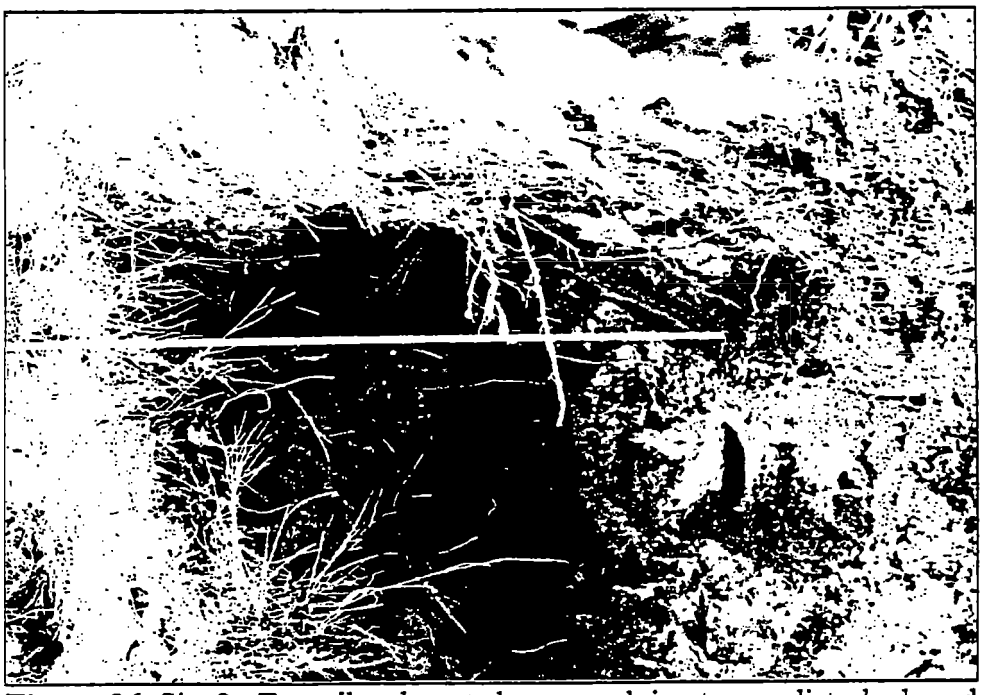


Figure 26. Site 2 - Topsoil and waste layer overlying tan, undisturbed sand in TP-3.

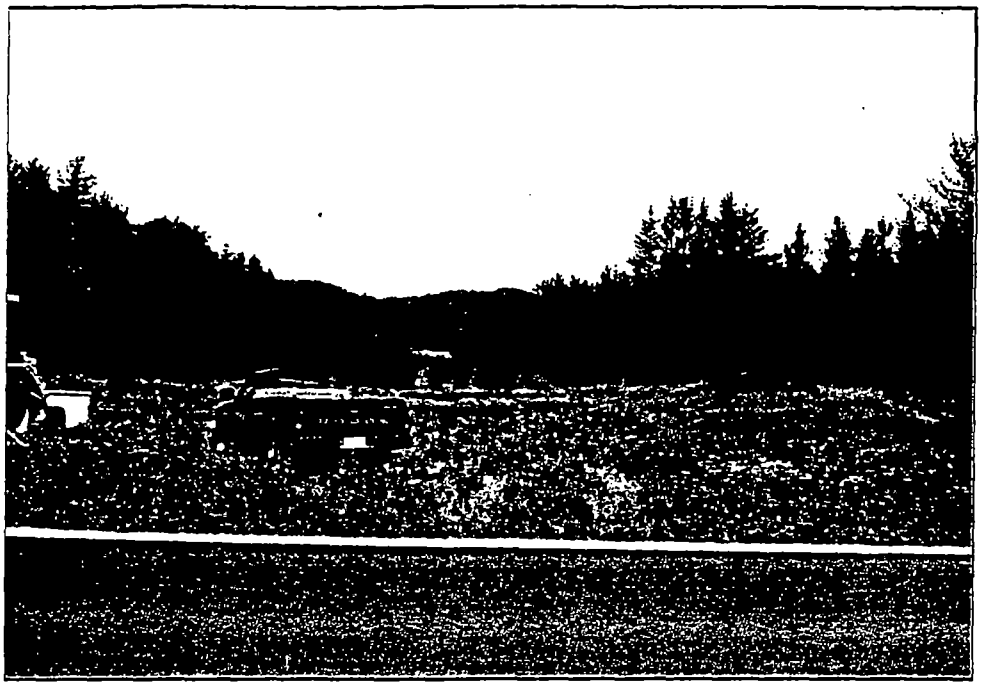


Figure 27. Site 3 Area.

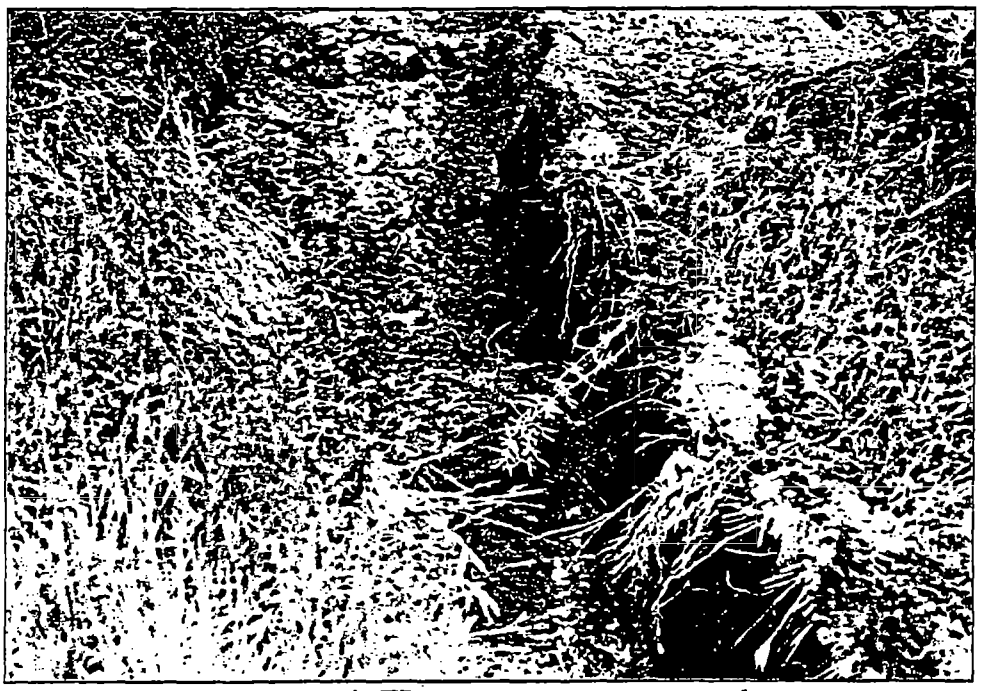


Figure 28. Site 3 - Test pit TP-1; no waste encountered.

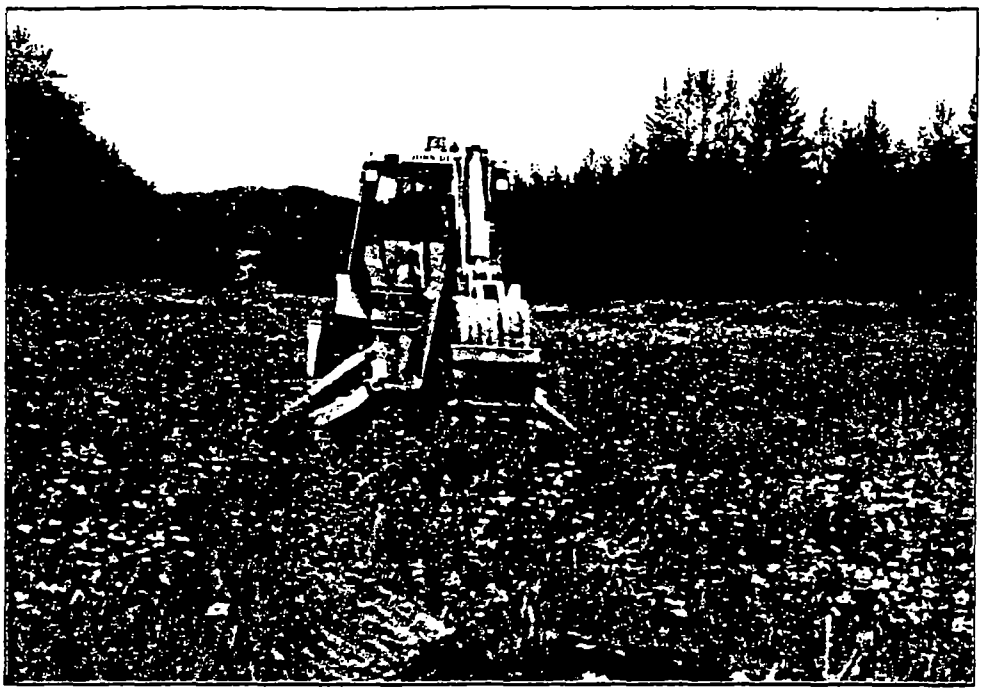


Figure 29. Site 3 - Excavation of TP-2.

Figure 30. Site 3 - Glass bottle and misc. rusted metal debris in TP-2.

Figure 31. Site 3 - Cross section of trench side showing waste layer above natural sand in TP-2.

Figure 32. Site 3 - Same as Figure 31.

Figure 33. Site 3 - TP-2 excavation.

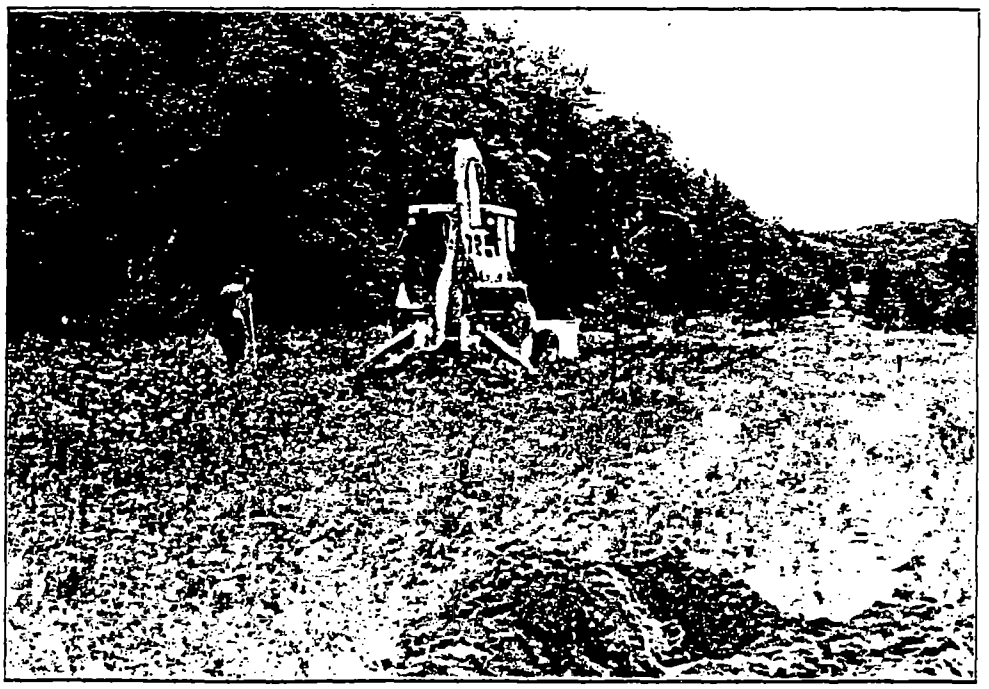


Figure 34. Site 3 - Excavation of TP-3.

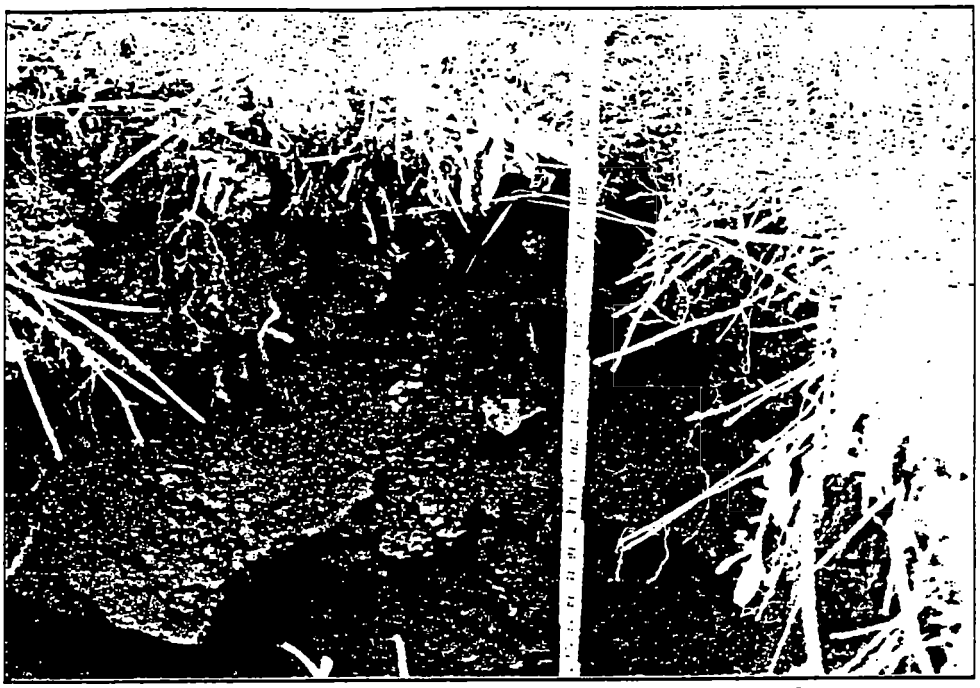


Figure 37. Site 3 - Sidewall of TP-5 showing upper waste layer.

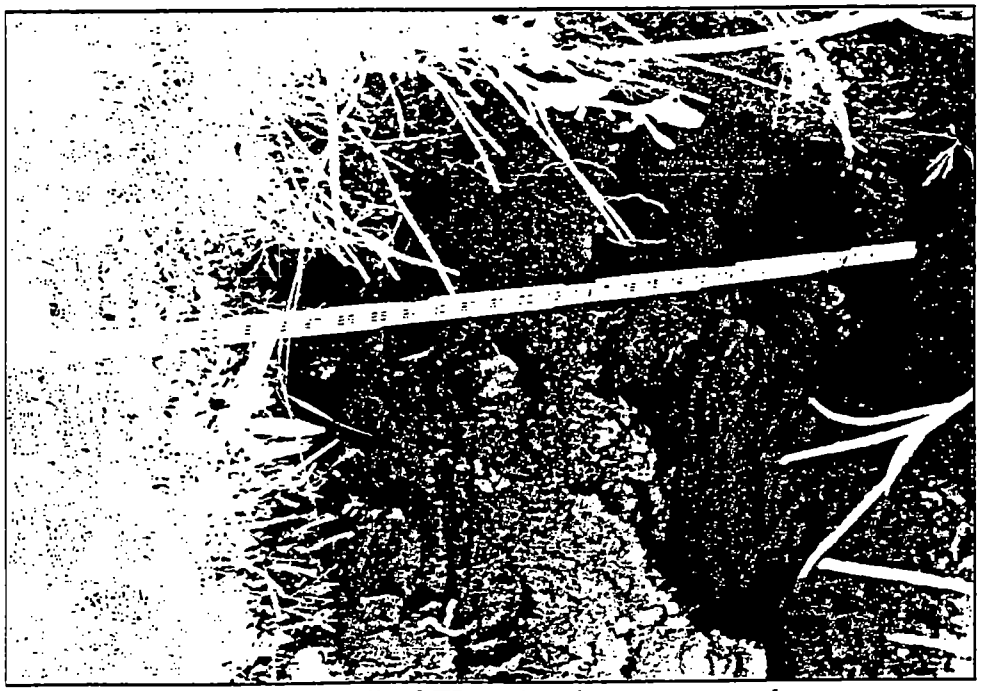


Figure 38. Site 3 - Sidewall of TP-5 showing two waste layers.

Figure 39. Site 3 - Wire and rusted metal debris from TP-5.

Figure 40. Site 3 - Wire, rusted cans and glass bottles from TP-5.

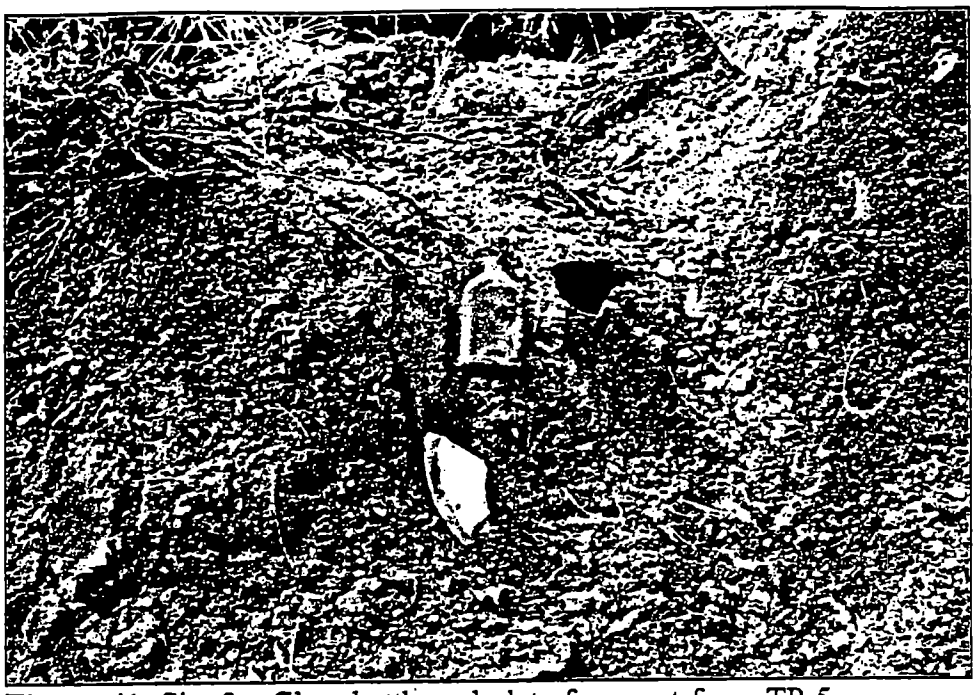


Figure 41. Site 3 - Glass bottle and plate fragment from TP-5.

Figure 42. Site 3 - Excavation of TP-6.

Figure 43. Site 3 - Excavated TP-6.

Figure 44. Site 3 - Rusted metal bowl, can and glass jar from TP-7.

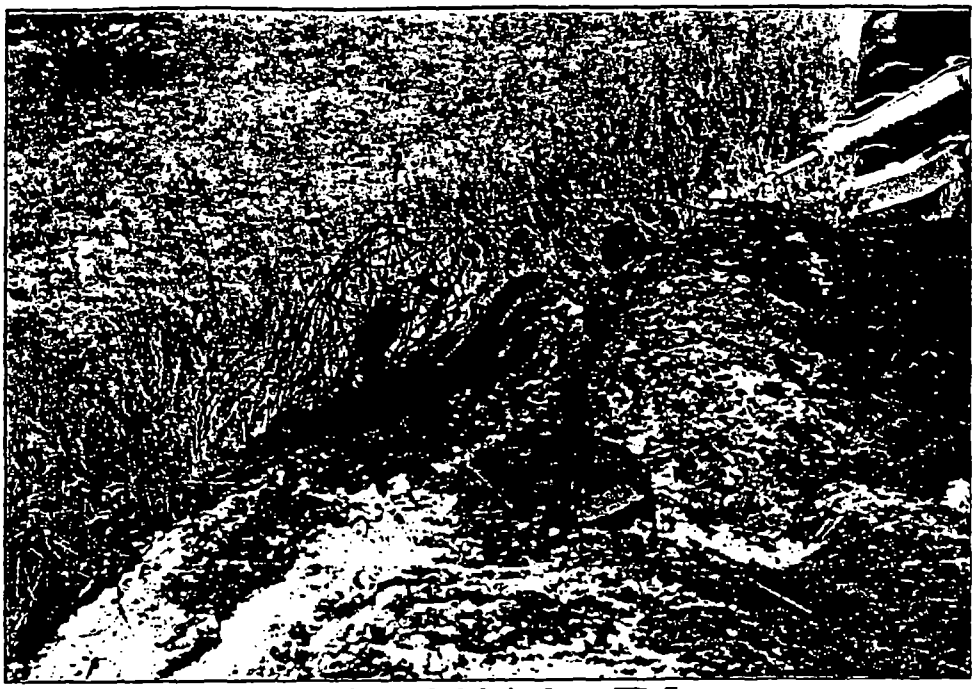


Figure 45. Site 3 - Rusted metal debris from TP-7.

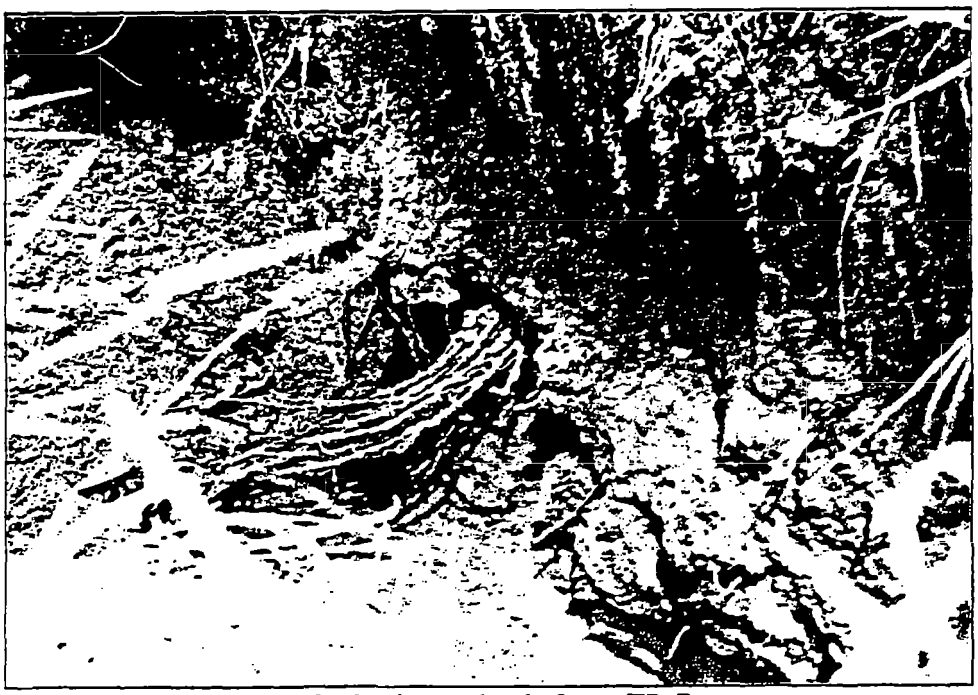


Figure 46. Site 3 - Barbed wire and ash from TP-7.

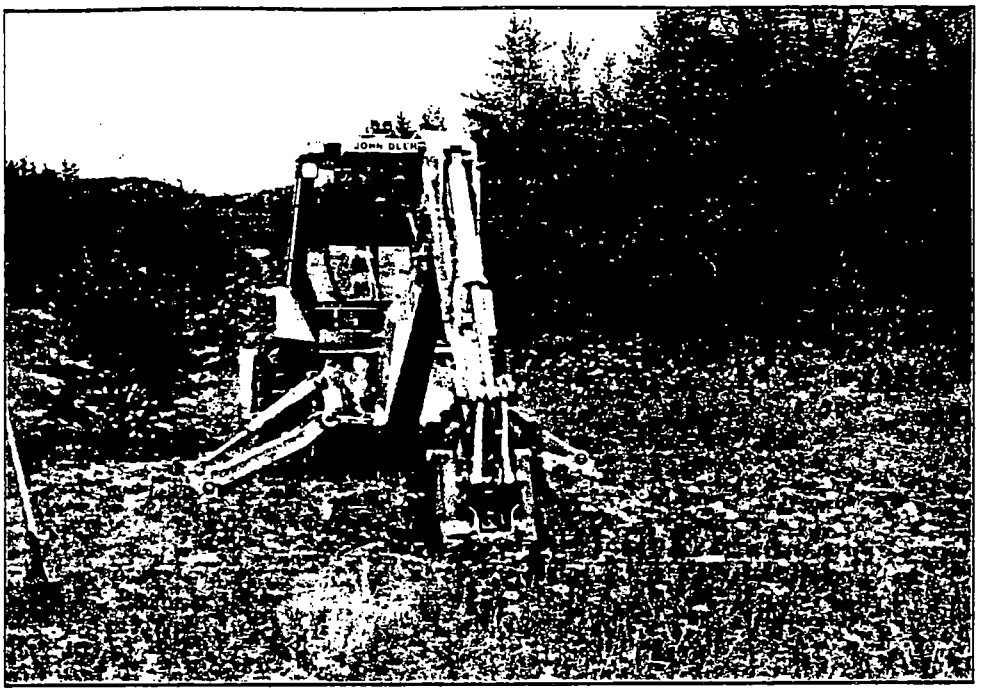


Figure 47. Site 3 - Excavation of TP-8.

Figure 48. Site 3 - Clean sidewall from TP-8.

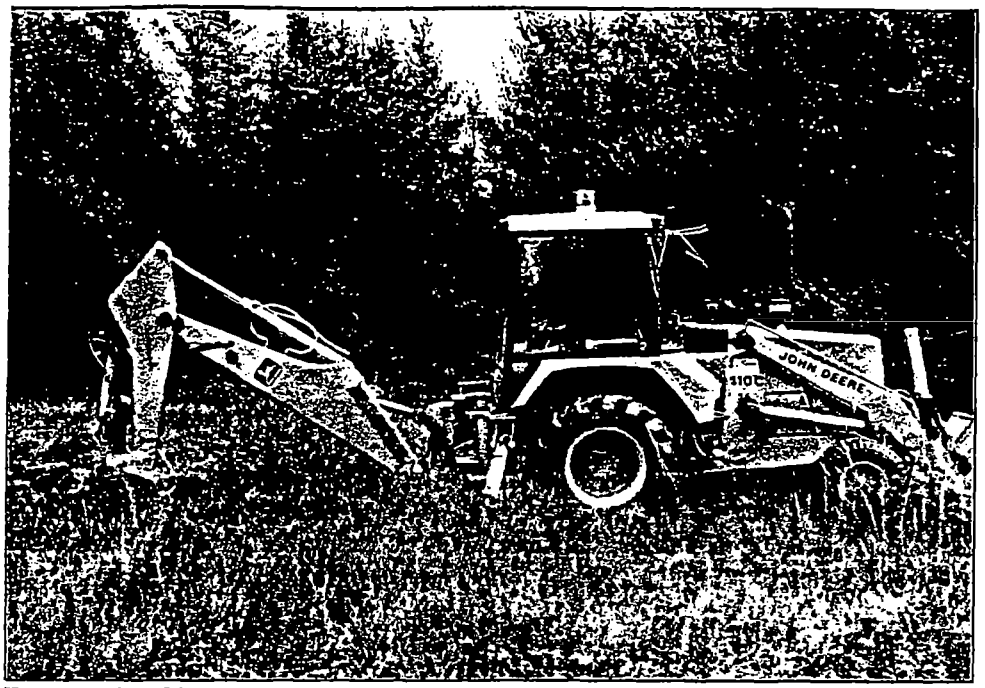


Figure 49. Site 3 - Excavation of TP-9.

Figure 50. Site 3 - Metal culvert pipe unearthed from TP-9.

APPENDIX S

USEPA REGION III RISK-BASED CONCENTRATION (RBC) TABLE (THIRD QUARTER 1994)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region III
841 Chestnut Street
Philadelphia, Pennsylvania 19107

July 11, 1994

SUBJECT: Risk-Based Concentration Table, Third Quarter 1994

FROM: Roy L. Smith, Ph.D., Senior Toxicologist
Technical Support Section (3HW13)

TO: RBC Table mailing list

Attached is the EPA Region III risk-based concentration (RBC) table, which we have distributed quarterly to all interested parties since 1991. If you are not currently on the mailing list, but would like to be, please contact Anna Poulton (phone: 215-597-3179, fax: 215-597-9890) and give her your name, address, and phone and fax numbers.

The table contains reference doses and carcinogenic potency slopes (obtained from IRIS through July 1, 1994, HEAST through November March 1994, the Superfund Health Risk Technical Support Center, and other EPA sources) for nearly 600 chemicals. These toxicity constants have been combined with "standard" exposure scenarios to calculate RBCs - chemical concentrations corresponding to fixed levels of risk (*i.e.*, a hazard quotient of 1, or lifetime cancer risk of 10^{-6}, whichever occurs at a lower concentration) in water, air, fish tissue, and soil.

The Region III toxicologists use the table to screen sites not yet on the NPL, respond rapidly to citizen inquiries, and spot-check formal baseline risk assessments. The background materials provide the complete basis for all the calculations, with the intent of showing users exactly how the RBCs were developed. Simply put, RBCs are risk assessments run in reverse. For a single contaminant in a single medium, under standard default exposure assumptions, the RBC corresponds to the target risk or hazard quotient.

The calculations also have several important limitations. Specifically excluded from consideration are (1) transfers from soil to air and groundwater, and (2) cumulative risk from multiple contaminants or media. Also, the toxicity information in the table has been assembled by hand, and (despite extensive checking and years of use) may contain errors. It's advisable to cross-check before relying on any RfDs or CPSs in the table. If you find any errors, please send me a note.

Lately, many callers have asked whether the risk-based concentrations can be used as valid no-action levels or cleanup levels, especially for soils.. The answer is a bit complex. First, it is important to realize that the RBC table does not constitute regulation or guidance, and should not be viewed as a substitute for a site-specific risk assessment. For sites where:

1. A single medium is contaminated;

2. A single contaminant contributes nearly all of the health risk;

3. Volatilization or leaching of that contaminant from soil is expected not to be significant;

4. The exposure scenarios used in the RBC table are appropriate for the site;

5. The fixed risk levels used in the RBC table are appropriate for the site; and

6. Risk to ecological receptors is expected not to be significant;

the risk-based concentrations would probably be protective as no-action levels or cleanup goals. However, to the extent that a site deviates from this description, as most do, the RBCs would not necessarily be appropriate.

To summarize, the table should generally not be used to (1) set cleanup or no-action levels at CERCLA or RCRA Corrective Action sites, (2) substitute for EPA guidance for preparing baseline risk assessments, or (3) determine if a waste is hazardous under RCRA.

This issue of the RBC table includes new toxicity constants and media concentrations, which are marked on the table in underlined boldface print. On pg. 4, the source of the toxicological constants labeled "ECAO-Cincinnati" has been clarified.

I get many telephone calls about the RBC table, but am often unable to answer the phone. Many of you have the same problem, so we play a lot of "phone tag". Last quarter, I suggested that you fax me (at 215-597-9890) your technical questions and concerns, so I could respond by return fax. This has worked very well for me, and I hope you have been satisfied with my responses. I would like to continue this method. Of course, if you don't have access to a fax machine, I will also continue to respond to voice mail messages.

Attachment

Risk-Based Concentration Table
Background Information

General: Separate carcinogenic and non-carcinogenic risk-based concentrations were calculated for each compound for each pathway. The concentration in the table is the lower of the two, rounded to two significant figures. The following terms and values were used in the calculations:

Exposure variables	Value	Name
1-General:		
Carcinogenic potency slope oral (risk per mg/kg/d):	*	CPSo
Carcinogenic potency slope inhaled (risk per mg/kg/d):	*	CPSi
Reference dose oral (mg/kg/d):	*	RfDo
Reference dose inhaled (mg/kg/d):	*	RfDi
Target cancer risk:	1e-06	TR
Target hazard quotient:	1	THQ
Body weight, adult (kg):	70	BWa
Body weight, age 1-6 (kg):	15	BWc
Averaging time carcinogens (d):	25550	ATc
Averaging time non-carcinogens (d):	ED*365	ATn
Inhalation, adult (m3/d):	20	IRAa
Inhalation, child (m3/d):	12	IRAc
Inhalation factor, age-adjusted (m3-y/kg-d):	11.66	IFAadj
Tap water ingestion, adult (L/d):	2	IRWa
Tap water ingestion, age 1-6 (L/d):	1	IRWc
Tap water ingestion factor, age-adjusted (L-y/kg-d):	1.09	IFWadj
Fish ingestion (g/d):	54	IRF
Soil ingestion, adult (mg/d):	100	IRSa
Soil ingestion, age 1-6 (mg/d):	200	IRSc
Soil ingestion factor, age adjusted (mg-y/kg-d):	114.29	IFSadj
2-Residential:		
Exposure frequency (d/y):	350	EFr
Exposure duration, total (y):	30	EDtot

Exposure variables	Value	Name
Exposure duration, age 1-6 (y):	6	EDc
Volatilization factor (L/m3):	0.5	VF
3-Occupational:		
Exposure frequency (d/y):	250	EFo
Exposure duration (y):	25	EDo
* = Contaminant-specific toxicity parameters		

The priority among sources of toxicological constants was as follows: (1) IRIS, (2) HEAST, (3) HEAST alternative method, (4) EPA Superfund Health Risk Technical Support Center, (5) withdrawn from IRIS or HEAST, and (6) other EPA documents. Each source was used only if numbers from higher-priority sources were unavailable. The EPA Superfund Health Risk Technical Support Center, part of the Chemical Mixtures Branch of ECAO-Cincinnati, develops provisional RfDs and CPSs on request for contaminants not in IRIS or HEAST. These provisional values are labeled "e = EPA-ECAO provisional" in the table. It is possible they may be obsolete. If one of the "e" constants is important to a Superfund risk assessment, consider requesting, through a Regional risk assessor, a new provisional value.

Algorithms:

1. Age-adjusted factors: Because contact rates with tap water, ambient air, and residential soil are different for children and adults, carcinogenic risks during the first 30 years of life were calculated using age-adjusted factors. These factors approximated the integrated exposure from birth until age 30 by combining contact rates, body weights, and exposure durations for two age groups - small children and adults. The age-adjusted factor for soil was obtained from RAGS IB; the others were developed by analogy.

a. Air inhalation ($[m^3 \cdot y]/[kg \cdot d]$):

$$IFAadj = \frac{EDc \cdot IRAc}{BWc} + \frac{(EDtot - EDc) \cdot IRAa}{BWa}$$

b. Tap water ingestion ($[L \cdot y]/[kg \cdot d]$):

$$IFWadj = \frac{EDc \cdot IRWc}{BWc} + \frac{(EDtot - EDc) \cdot IRWa}{BWa}$$

c. Soil ingestion ([mg · y]/[kg · d]):

$$IFSadj = \frac{EDc \cdot IRSc}{BWc} + \frac{(EDtot - EDc) \cdot IRSa}{BWa}$$

2. Residential water use (µg/L). Volatilization terms were calculated only for compounds with "***" in the "VOC" column. Compounds having a Henry's Law constant greater than 10^{-5} were considered volatile. The list may be incomplete, but is unlikely to include false positives. The equations and the volatilization factor (VF, above) were obtained from RAGS IB. Oral potency slopes and reference doses were used for both oral and inhaled exposures for volatile compounds lacking inhalation values. Inhaled potency slopes were substituted for unavailable oral potency slopes only for volatile compounds; inhaled RfDs were substituted for unavailable oral RfDs for both volatile and non-volatile compounds.

a. Carcinogens: Calculations were based on combined childhood and adult exposure.

$$\frac{TR \cdot ATc \cdot 1000 \frac{ug}{mg}}{EFr \cdot ([VF \cdot IFAadj \cdot CPSi] + [IFWadj \cdot CPSo])}$$

b. Non-carcinogens: Calculations were based on adult exposure.

$$\frac{THQ \cdot BWa \cdot ATn \cdot 1000 \frac{ug}{mg}}{EFr \cdot EDtot \cdot \left(\frac{VF \cdot IRAa}{RfDi} + \frac{IRWa}{RfDo}\right)}$$

3. Air (µg/m^3). Oral potency slopes and references were used where inhalation values were not available.

a. Carcinogens: Calculations were based on combined childhood and adult exposure.

$$\frac{TR \cdot ATc \cdot 1000 \frac{ug}{mg}}{EFr \cdot IFAadj \cdot CPSi}$$

b. Non-carcinogens: Calculations were based on adult exposure.

$$\frac{THQ \cdot RfDi \cdot BWa \cdot ATn \cdot 1000 \frac{ug}{mg}}{EFr \cdot EDtot \cdot IRAa}$$

4. Fish (mg/kg):

a. Carcinogens: Calculations were based on adult exposure.

$$\frac{TR \cdot BWa \cdot ATc}{EFr \cdot EDtot \cdot \frac{IRF}{1000\ \frac{g}{kg}} \cdot CPSo}$$

b. Non-carcinogens: Calculations were based on adult exposure.

$$\frac{THQ \cdot RfDo \cdot BWa \cdot ATn}{EFr \cdot EDtot \cdot \frac{IRF}{1000\ \frac{g}{kg}}}$$

5. Soil commercial/industrial (mg/kg): The default exposure assumption that only 50% of incidental soil ingestion occurs at work has been omitted. Calculations were based on adult occupational exposure.

a. Carcinogens:

$$\frac{TR \cdot BWa \cdot ATc}{EFo \cdot EDo \cdot \frac{IRSa}{10^6\ \frac{mg}{kg}} \cdot CPSo}$$

b. Non-carcinogens:

$$\frac{THQ \cdot RfDo \cdot BWa \cdot ATn}{EFo \cdot EDo \cdot \frac{IRSa}{10^6\ \frac{mg}{kg}}}$$

6. Soil residential (mg/kg):

a. Carcinogens: Calculations were based on combined childhood and adult exposure.

$$\frac{TR \cdot ATc}{EFr \cdot \frac{IFSadj}{10^6\ \frac{mg}{kg}} \cdot CPSo}$$

b. Non-carcinogens: Calculations were based on childhood exposure only.

$$\frac{THQ \cdot RfDo \cdot BWc \cdot ATn}{EFr \cdot EDc \cdot \frac{IRSc}{10^6\ \frac{mg}{kg}}}$$

Sources: i=IRIS h=HEAST a=HEAST alt. w=Withdrawn from IRIS or HEAST e=EPA-ECAO provisional o=Other EPA documents *Basis of RBC: c=carcinogenic effects n=noncarcinogenic effects.*

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg·d/mg	CPSi kg·d/mg	V o c	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Acephate	30560191	4.00E-03 i		8.70E-03 i			7.7 c	0.72 c	0.36 c	330 c	73 c
Acetaldehyde	75070		2.57E-03 i		7.70E-03 i		94 n	0.81 c			
Acetochlor	34256821	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Acetone	67641	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Acetone cyanohydrin	75865	7.00E-02 h	2.86E-03 a				2600 n	10 n	95 n	72000 n	5500 n
Acetonitrile	75078	6.00E-03 i	1.43E-02 a				220 n	52 n	8.1 n	6100 n	470 n
Acetophenone	98862	1.00E-01 i	5.71E-06 w			***	0.042 n	0.021 n	140 n	100000 n	7800 n
Acifluorfen	62476599	1.30E-02 i					470 n	47 n	18 n	13000 n	1000 n
Acrolein	107028	2.00E-02 h	5.71E-06 i				730 n	0.021 n	27 n	20000 n	1600 n
Acrylamide	79061	2.00E-04 i		4.50E+00 i	4.55E+00 i		0.015 c	0.0014 c	0.0007 c	0.64 c	0.14 c
Acrylic acid	79107	5.00E-01 i	1.00E-03 i				18000 n	3.7 n	680 n	510000 n	39000 n
Acrylonitrile	107131	1.00E-03 h	5.71E-04 i	5.40E-01 i	2.38E-01 i		0.12 c	0.026 c	0.0058 c	5.3 c	1.2 c
Alachlor	15972608	1.00E-02 i		8.00E-02 h			0.84 c	0.078 c	0.039 c	36 c	8 c
Alar	1596845	1.50E-01 i					5500 n	550 n	200 n	150000 n	12000 n
Aldicarb	116063	1.00E-03 i					37 n	3.7 n	1.4 n	1000 n	78 n
Aldicarb sulfone	1646884	1.00E-03 i					37 n	3.7 n	1.4 n	1000 n	78 n
Aldrin	309002	3.00E-05 i		1.70E+01 i	1.71E+01 i		0.004 c	0.00037 c	0.00019 c	0.17 c	0.038 c
Ally	74223646	2.50E-01 i					9100 n	910 n	340 n	260000 n	20000 n
Allyl alcohol	107186	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Allyl chloride	107051	5.00E-02 w	2.86E-04 i				1800 n	1 n	68 n	51000 n	3900 n
Aluminum phosphide	20859738	4.00E-04 i					15 n	1.5 n	0.54 n	410 n	31 n
Amdro	67485294	3.00E-04 i					11 n	1.1 n	0.41 n	310 n	23 n
Ametryn	834128	9.00E-03 i					330 n	33 n	12 n	9200 n	700 n
m-Aminophenol	591275	7.00E-02 h					2600 n	260 n	95 n	72000 n	5500 n
4-Aminopyridine	504245	2.00E-05 h					0.73 n	0.073 n	0.027 n	20 n	1.6 n
Amitraz	33089611	2.50E-03 i					91 n	9.1 n	3.4 n	2600 n	200 n
Ammonia	7664417		2.86E-02 i				1000 n	100 n			
Ammonium sulfamate	7773060	2.00E-01 i					7300 n	730 n	270 n	200000 n	16000 n
Aniline	62533		2.86E-04 i	5.70E-03 i			10 n	1 n	0.55 c	500 c	110 c
Antimony and compounds	7440360	4.00E-04 i					15 n	1.5 n	0.54 n	410 n	31 n
Antimony pentoxide	1314609	5.00E-04 h					18 n	1.8 n	0.68 n	510 n	39 n
Antimony potassium tartrate	304610	9.00E-04 h					33 n	3.3 n	1.2 n	920 n	70 n
Antimony tetroxide	1332316	4.00E-04 h					15 n	1.5 n	0.54 n	410 n	31 n
Antimony trioxide	1309644	4.00E-04 h					15 n	1.5 n	0.54 n	410 n	31 n
Apollo	74115245	1.30E-02 i					470 n	47 n	18 n	13000 n	1000 n
Aramite	140578	5.00E-02 h		2.50E-02 i	2.49E-02 i		2.7 c	0.25 c	0.13 c	110 c	26 c
Arsenic	7440382	3.00E-04 i					11 n	1.1 n	0.41 n	310 n	23 n
Arsenic (as carcinogen)	7440382			1.75E+00 i	1.51E+01 i		0.038 c	0.00041 c	0.0018 c	1.6 c	0.37 c
Arsine	7784421		1.43E-05 i				0.52 n	0.052 n			
Assure	76578148	9.00E-03 i					330 n	33 n	12 n	9200 n	700 n
Asulam	3337711	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Atrazine	1912249	3.50E-02 i		2.22E-01 h			0.3 c	0.028 c	0.014 c	13 c	2.9 c

Sources: i=IRIS h=HEAST a=HEAST alt. w=Withdrawn from IRIS or HEAST e=EPA-ECAO provisional o=Other EPA documents *Basis of RBC: c=carcinogenic effects n=noncarcinogenic effects.*

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg d/mg	CPSi kg d/mg	V o c	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Avermectin B1	65195553	4.00E-04 i					15 n	1.5 n	0.54 n	410 n	31 n
Azobenzene	103333			1.10E-01 i	1.08E-01 i		0.61 c	0.058 c	0.029 c	26 c	5.8 c
Barium and compounds	7440393	7.00E-02 i	1.43E-04 a				2600 n	0.52 n	95 n	72000 n	5500 n
Baygon	114261	4.00E-03 i					150 n	15 n	5.4 n	4100 n	310 n
Bayleton	43121433	3.00E-02 i					1100 n	110 n	41 n	31000 n	2300 n
Baythroid	68359375	2.50E-02 i					910 n	91 n	34 n	26000 n	2000 n
Benefin	1861401	3.00E-01 i					11000 n	1100 n	410 n	310000 n	23000 n
Benomyl	17804352	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Bentazon	25057890	2.50E-03 i					91 n	9.1 n	3.4 n	2600 n	200 n
Benzaldehyde	100527	1.00E-01 i				•••	610 n	370 n	140 n	100000 n	7800 n
Benzene	71432		1.71E-03 a	2.90E-02 i	2.90E-02 i	•••	0.36 c	0.22 c	0.11 c	99 c	22 c
Benzenethiol	108985	1.00E-05 h					0.37 n	0.037 n	0.014 n	10 n	0.78 n
Benzidine	92875	3.00E-03 i		2.30E+02 i	2.35E+02 i		0.00029 c	0.000027 c	0.000014 c	0.012 c	0.0028 c
Benzoic acid	65850	4.00E+00 i					150000 n	15000 n	5400 n	1000000 n	310000 n
Benzotrichloride	98077			1.30E+01 i			0.0052 c	0.00048 c	0.00024 c	0.22 c	0.049 c
Benzyl alcohol	100516	3.00E-01 h					11000 n	1100 n	410 n	310000 n	23000 n
Benzyl chloride	100447			1.70E-01 i		•••	0.062 c	0.037 c	0.019 c	17 c	3.8 c
Beryllium and compounds	7440417	5.00E-03 i		4.30E+00 i	8.40E+00 i		0.016 c	0.00075 c	0.00073 c	0.67 c	0.15 c
Bidrin	141662	1.00E-04 i					3.7 n	0.37 n	0.14 n	100 n	7.8 n
Biphenthrin (Talstar)	82657043	1.50E-02 i					550 n	55 n	20 n	15000 n	1200 n
1,1-Biphenyl	92524	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Bis(2-chloroisopropyl)ether	39638329	4.00E-02 i		7.00E-02 h	3.50E-02 h	•••	0.26 c	0.18 c	0.045 c	41 c	9.1 c
Bis(chloromethyl)ether	542881			2.20E+02 i	2.17E+02 i	•••	0.000049 c	0.000029 c	0.000014 c	0.013 c	0.0029 c
Bis(2-chloro-1-methylethyl)ether				7.00E-02 w	7.00E-02 w		0.96 c	0.089 c	0.045 c	41 c	9.1 c
Bis(2-ethylhexyl)phthalate (DEHP)	117817	2.00E-02 i		1.40E-02 i			4.8 c	0.45 c	0.23 c	200 c	46 c
Bis(chloroethyl)ether	111444			1.10E+00 i	1.16E+00 i	•••	0.0092 c	0.0054 c	0.0029 c	2.6 c	0.58 c
Bisphenol A	80057	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Boron (and borates)	7440428	9.00E-02 i	5.71E-03 h				3300 n	21 n	120 n	92000 n	7000 n
Boron trifluoride	7637072		2.00E-04 h				7.3 n	0.73 n			
Bromodichloromethane	75274	2.00E-02 i		6.20E-02 i		•••	0.17 c	0.1 c	0.051 c	46 c	10 c
Bromoethene	593602				1.10E-01 h	•••	0.096 c	0.057 c			
Bromoform (tribromomethane)	75252	2.00E-02 i		7.90E-03 i	3.85E-03 i	•••	2.4 c	1.6 c	0.4 c	360 c	81 c
Bromomethane	74839	1.40E-03 i	1.43E-03 i			•••	8.7 n	5.2 n	1.9 n	1400 n	110 n
4-Bromophenyl phenyl ether	101553	5.80E-02 o					2100 n	210 n	78 n	59000 n	4500 n
Bromophos	2104963	5.00E-03 h					180 n	18 n	6.8 n	5100 n	390 n
Bromoxynil	1689845	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Bromoxynil octanoate	1689992	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
1,3-Butadiene	106990				9.80E-01 i	•••	0.011 c	0.0064 c			
1-Butanol	71363	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Butyl benzyl phthalate	85687	2.00E-01 i					7300 n	730 n	270 n	200000 n	16000 n
Butylat[redacted]	2008415	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
sec-Bu[redacted]nzene	135988	1.00E-02 e				•••	61 n	37 n	14 n	10000 n	780 n

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tert-Butylbenzene	104518	1.00E-02 e				***	61 n	37 n	14 n	10000 n	780 n
Butylphthalyl butylglycolate	85701	1.00E+00 i					37000 n	3700 n	1400 n	1000000 n	78000 n
Cacodylic acid	75605	3.00E-03 h					110 n	11 n	4.1 n	3100 n	230 n
Cadmium and compounds	7440439	5.00E-04 i			6.30E+00 i		18 n	0.00099 c	0.68 n	510 n	39 n
Caprolactam	105602	5.00E-01 i					18000 n	1800 n	680 n	510000 n	39000 n
Captafol	2425061	2.00E-03 i		8.60E-03 h			7.8 c	0.73 c	0.37 c	330 c	74 c
Captan	133062	1.30E-01 i		3.50E-03 h			19 c	1.8 c	0.9 c	820 c	180 c
Carbaryl	63252	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Carbazole	86748			2.00E-02 h			3.4 c	0.31 c	0.16 c	140 c	32 c
Carbofuran	1563662	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Carbon disulfide	75150	1.00E-01 i	2.86E-03 h			***	21 n	10 n	140 n	100000 n	7800 n
Carbon tetrachloride	56235	7.00E-04 i	5.71E-04 e	1.30E-01 i	5.25E-02 i	***	0.16 c	0.12 c	0.024 c	22 c	4.9 c
Carbosulfan	55285148	1.00E-02 i					370 n	37 n	14 n	10000 n	780 n
Carboxin	5234684	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Chloral	75876	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
Chloramben	133904	1.50E-02 i					550 n	55 n	20 n	15000 n	1200 n
Chloranil	118752			4.03E-01 h			0.17 c	0.016 c	0.0078 c	7.1 c	1.6 c
Chlordane	57749	6.00E-05 i		1.30E+00 i	1.29E+00 i		0.052 c	0.0049 c	0.0024 c	2.2 c	0.49 c
Chlorimuron-ethyl	90982324	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Chlorine	7782505	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Chlorine dioxide	10049044		5.71E-05 i				2.1 n	0.21 n			
Chloroacetaldehyde	107200	6.90E-03 o					250 n	25 n	9.3 n	7100 n	540 n
Chloroacetic acid	79118	2.00E-03 h					73 n	7.3 n	2.7 n	2000 n	160 n
2-Chloroacetophenone	532274		8.57E-06 i				0.31 n	0.031 n			
4-Chloroaniline	106478	4.00E-03 i					150 n	15 n	5.4 n	4100 n	310 n
Chlorobenzene	108907	2.00E-02 i	5.71E-03 e			***	39 n	21 n	27 n	20000 n	1600 n
Chlorobenzilate	510156	2.00E-02 i		2.70E-01 h	2.70E-01 h		0.25 c	0.023 c	0.012 c	11 c	2.4 c
p-Chlorobenzoic acid	74113	2.00E-01 h					7300 n	730 n	270 n	200000 n	16000 n
4-Chlorobenzotrifluoride	98566	2.00E-02 h					730 n	73 n	27 n	20000 n	1600 n
2-Chloro-1,3-butadiene	126998	2.00E-02 e	2.00E-03 h			***	14 n	7.3 n	27 n	20000 n	1600 n
1-Chlorobutane	109693	4.00E-01 h				***	2400 n	1500 n	540 n	410000 n	31000 n
Chlorodifluoromethane	75456		1.43e+01 i			***	87000 n	52000 n			
Chloroethane	75003	4.00E-01 e	2.86E+00 i			***	8600 n	10000 n	540 n	410000 n	31000 n
2-Chloroethyl vinyl ether	110758	2.50E-02 o				***	150 n	91 n	34 n	26000 n	2000 n
Chloroform	67663	1.00E-02 i		6.10E-03 i	8.05E-02 i	***	0.15 c	0.078 c	0.52 c	470 c	100 c
Chloromethane	74873			1.30E-02 h	6.30E-03 h	***	1.4 c	0.99 c	0.24 c	220 c	49 c
4-Chloro-2,2-methylaniline hydrochloride	3165933			4.60E-01 h			0.15 c	0.014 c	0.0069 c	6.2 c	1.4 c
4-Chloro-2-methylaniline	95692			5.80E-01 h			0.12 c	0.011 c	0.0054 c	4.9 c	1.1 c
beta-Chloronaphthalene	91587	8.00E-02 i					2900 n	290 n	110 n	82000 n	6300 n
o-Chloronitrobenzene	88733			2.50E-02 h		***	0.42 c	0.25 c	0.13 c	110 c	26 c
p-Chloronitrobenzene	100005			1.80E-02 h		***	0.59 c	0.35 c	0.18 c	160 c	35 c
2-Chlorophenol	95578	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n

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2-Chloropropane	75296		2.86E-02 h			•••	170 n	100 n			
Chlorothalonil	1897456	1.50E-02 i		1.10E-02 h			6.1 c	0.57 c	0.29 c	260 c	58 c
o-Chlorotoluene	95498	2.00E-02 i				•••	120 n	73 n	27 n	20000 n	1600 n
Chlorpropham	101213	2.00E-01 i					7300 n	730 n	270 n	200000 n	16000 n
Chlorpyrifos	2921882	3.00E-03 i					110 n	11 n	4.1 n	3100 n	230 n
Chlorpyrifos-methyl	5598130	1.00E-02 h					370 n	37 n	14 n	10000 n	780 n
Chlorsulfuron	64902723	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Chlorthiophos	60238564	8.00E-04 h					29 n	2.9 n	1.1 n	820 n	63 n
Chromium III and compounds	16065831	1.00E+00 i	5.71E-07 w				37000 n	0.0021 n	1400 n	1000000 n	78000 n
Chromium VI and compounds	7440473	5.00E-03 i			4.20E+01 i		180 n	0.00015 c	6.8 n	5100 n	390 n
Coal tar	8001589				2.20E+00 w			0.0028 c			
Cobalt	7440484	6.00E-02 a					2200 n	220 n	81 n	61000 n	4700 n
Coke Oven Emissions	8007452				2.17E+00 i			0.0029 c			
Copper and compounds	7440508	3.71E-02 h					1400 n	140 n	50 n	38000 n	2900 n
Crotonaldehyde	123739	1.00E-02 w		1.90E+00 h	1.90E+00 w		0.035 c	0.0033 c	0.0017 c	1.5 c	0.34 c
Cumene	98828	4.00E-02 i	2.57E-03 h				1500 n	9.4 n	54 n	41000 n	3100 n
Cyanides:											
Barium cyanide	542621	1.00E-01 w					3700 n	370 n	140 n	100000 n	7800 n
Calcium cyanide	592018	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
Copper cyanide	544923	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Cyanazine	21725462	2.00E-03 h		8.40E-01 h			0.08 c	0.0075 c	0.0038 c	3.4 c	0.76 c
Cyanogen	460195	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
Cyanogen bromide	506683	9.00E-02 i					3300 n	330 n	120 n	92000 n	7000 n
Cyanogen chloride	506774	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Free cyanide	57125	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Hydrogen cyanide	74908	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Potassium cyanide	151508	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Potassium silver cyanide	506616	2.00E-01 i					7300 n	730 n	270 n	200000 n	16000 n
Silver cyanide	506649	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Sodium cyanide	143339	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
Zinc cyanide	557211	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Cyclohexanone	108941	5.00E+00 i				•••	30000 n	18000 n	6800 n	1000000 n	390000 n
Cyclohexlamine	108918	2.00E-01 i					7300 n	730 n	270 n	200000 n	16000 n
Cyhalothrin/Karate	68085858	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Cypermethrin	52315078	1.00E-02 i					370 n	37 n	14 n	10000 n	780 n
Cyromazine	66215278	7.50E-03 i					270 n	27 n	10 n	7700 n	590 n
Dacthal	1861321	5.00E-01 i					18000 n	1800 n	680 n	510000 n	39000 n
Dalapon	75990	3.00E-02 i					1100 n	110 n	41 n	31000 n	2300 n
Danitol	39515418	5.00E-04 w					18 n	1.8 n	0.68 n	510 n	39 n
DDD	72548			2.40E-01 i			0.28 c	0.026 c	0.013 c	12 c	2.7 c
DDE	72559			3.40E-01 i			0.2 c	0.018 c	0.0093 c	8.4 c	1.9 c
DDT	50293	5.00E-04 i		3.40E-01 i	3.40E-01 i		0.2 c	0.018 c	0.0093 c	8.4 c	1.9 c

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Decabromodiphenyl ether	1163195	1.00E-02 i				***	61 n	37 n	14 n	10000 n	780 n
Demeton	8065483	4.00E-05 i					1.5 n	0.15 n	0.054 n	41 n	3.1 n
Diallate	2303164			6.10E-02 h		***	0.17 c	0.1 c	0.052 c	47 c	10 c
Diazinon	333415	9.00E-04 h					33 n	3.3 n	1.2 n	920 n	70 n
1,4-Dibromobenzene	106376	1.00E-02 i				***	61 n	37 n	14 n	10000 n	780 n
Dibromochloromethane	124481	2.00E-02 i		8.40E-02 i		***	0.13 c	0.075 c	0.038 c	34 c	7.6 c
1,2-Dibromo-3-chloropropane	96128		5.71E-05 i	1.40E+00 h	2.42E-03 h	***	0.048 c	0.21 n	0.0023 c	2 c	0.46 c
1,2-Dibromoethane	106934		5.71E-05 h	8.50E+01 i	7.70E-01 i	***	0.00075 c	0.0081 c	0.000037 c	0.034 c	0.0075 c
Dibutyl phthalate	84742	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Dicamba	1918009	3.00E-02 i					1100 n	110 n	41 n	31000 n	2300 n
1,2-Dichlorobenzene	95501	9.00E-02 i	5.71E-02 a			***	370 n	210 n	120 n	92000 n	7000 n
1,3-Dichlorobenzene	541731	8.90E-02 o				***	540 n	320 n	120 n	91000 n	7000 n
1,4-Dichlorobenzene	106467		2.29E-01 i	2.40E-02 h		***	0.44 c	0.26 c	0.13 c	120 c	27 c
3,3'-Dichlorobenzidine	91941			4.50E-01 i			0.15 c	0.014 c	0.007 c	6.4 c	1.4 c
1,4-Dichloro-2-butene	764410				9.30E+00 h	***	0.0011 c	0.00067 c			
Dichlorodifluoromethane	75718	2.00E-01 i	5.71E-02 a			***	390 n	210 n	270 n	200000 n	16000 n
1,1-Dichloroethane	75343	1.00E-01 h	1.43E-01 a			***	810 n	520 n	140 n	100000 n	7800 n
1,2-Dichloroethane (EDC)	107062		2.86E-03 a	9.10E-02 i	9.10E-02 i	***	0.12 c	0.069 c	0.035 c	31 c	7 c
1,1-Dichloroethylene	75354	9.00E-03 i		6.00E-01 i	1.75E-01 i	***	0.044 c	0.036 c	0.0053 c	4.8 c	1.1 c
1,2-Dichloroethylene (cis)	156592	1.00E-02 h				***	61 n	37 n	14 n	10000 n	780 n
1,2-Dichloroethylene (trans)	156605	2.00E-02 i				***	120 n	73 n	27 n	20000 n	1600 n
1,2-Dichloroethylene (mixture)	540590	9.00E-03 h				***	55 n	33 n	12 n	9200 n	700 n
2,4-Dichlorophenol	120832	3.00E-03 i					110 n	11 n	4.1 n	3100 n	230 n
2,4-Dichlorophenoxyacetic Acid (2,4-D)	94757	1.00E-02 i				***	61 n	37 n	14 n	10000 n	780 n
4-(2,4-Dichlorophenoxy)butyric Acid	94826	8.00E-03 i					290 n	29 n	11 n	8200 n	630 n
1,2-Dichloropropane	78875		1.14E-03 i	6.80E-02 h		***	0.16 c	0.092 c	0.046 c	42 c	9.4 c
2,3-Dichloropropanol	616239	3.00E-03 i					110 n	11 n	4.1 n	3100 n	230 n
1,3-Dichloropropene	542756	3.00E-04 i	5.71E-03 i	1.75E-01 h	1.30E-01 h	***	0.077 c	0.048 c	0.018 c	16 c	3.7 c
Dichlorvos	62737	5.00e-04 i	1.43E-04 i	2.90E-01 i			0.23 c	0.022 c	0.011 c	9.9 c	2.2 c
Dicofol	115322			4.40E-01 w			0.15 c	0.014 c	0.0072 c	6.5 c	1.5 c
Dicyclopentadiene	77736	3.00E-02 h	5.71E-05 a			***	0.42 n	0.21 n	41 n	31000 n	2300 n
Dieldrin	60571	5.00E-05 i		1.60E+01 i	1.61E+01 i		0.0042 c	0.00039 c	0.0002 c	0.18 c	0.04 c
Diesel emissions			1.43E-03 i				52 n	5.2 n			
Diethyl phthalate	84662	8.00E-01 i					29000 n	2900 n	1100 n	820000 n	63000 n
Diethylene glycol, monobutyl ether	112345		5.71E-03 h				210 n	21 n			
Diethylene glycol, monoethyl ether	111900	2.00E+00 h					73000 n	7300 n	2700 n	1000000 n	160000 n
Diethylforamide	617845	1.10E-02 h					400 n	40 n	15 n	11000 n	850 n
Di(2-ethylhexyl)adipate	103231	6.00E-01 i		1.20E-03 i			56 c	5.2 c	2.6 c	2400 c	530 c
Diethylstilbestrol	56531			4.70E+03 h			0.000014 c	1.30E-06 c	6.70E-07 c	0.00061 c	0.00014 c
Difenzoquat (Avenge)	43222486	8.00E-02 i					2900 n	290 n	110 n	82000 n	6300 n
Diflubenzuron	35367385	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Diisopropyl methylphosphonate (DIMP)	1445756	8.00E-02 i					2900 n	290 n	110 n	82000 n	6300 n

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Dimethipin	55290647	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Dimethoate	60515	2.00E-04 i					7.3 n	0.73 n	0.27 n	200 n	16 n
3,3'-Dimethoxybenzidine	119904			1.40E-02 h			4.8 c	0.45 c	0.23 c	200 c	46 c
Dimethyl phthalate	131113	1.00E+01 h					370000 n	37000 n	14000 n	1000000 h	780000 n
Dimethyl terephthalate	120616	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Dimethylamine	124403		5.71E-06 w				0.21 n	0.021 n			
2,4-Dimethylaniline hydrochloride	21436964			5.80E-01 h			0.12 c	0.011 c	0.0054 c	4.9 c	1.1 c
2,4-Dimethylaniline	95681			7.50E-01 h			0.09 c	0.0083 c	0.0042 c	3.8 c	0.85 c
N-N-Dimethylaniline	121697	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
3,3'-Dimethylbenzidine	119937			9.20E+00 h			0.0073 c	0.00068 c	0.00034 c	0.31 c	0.069 c
N,N-Dimethylformamide	68122	1.00E-01 h	8.57E-03 i				3700 n	31 n	140 n	100000 n	7800 n
1,1-Dimethylhydrazine	57147			2.60E+00_	3.50E+00_		0.026 c	0.0018 c	0.0012 c	1.1 c	0.25 c
1,2-Dimethylhydrazine	540738			3.70E+01 w	3.70E+01 w		0.0018 c	0.00017 c	0.000085 c	0.077 c	0.017 c
2,4-Dimethylphenol	105679	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
2,6-Dimethylphenol	576261	6.00E-04 i					22 n	2.2 n	0.81 n	610 n	47 n
3,4-Dimethylphenol	95658	1.00E-03 i					37 n	3.7 n	1.4 n	1000 n	78 n
1,2-Dinitrobenzene	528290	4.00E-04 h					15 n	1.5 n	0.54 n	410 n	31 n
1,3-Dinitrobenzene	99650	1.00E-04 i					3.7 n	0.37 n	0.14 n	100 n	7.8 n
1,4-Dinitrobenzene	100254	4.00E-04 h					15 n	1.5 n	0.54 n	410 n	31 n
4,6-Dinitro-o-cyclohexyl phenol	131895	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
2,4-Dinitrophenol	51285	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
Dinitrotoluene mixture				6.80E-01 i			0.099 c	0.0092 c	0.0046 c	4.2 c	0.94 c
2,4-Dinitrotoluene	121142	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
2,6-Dinitrotoluene	606202	1.00E-03 h					37 n	3.7 n	1.4 n	1000 n	78 n
Dinoseb	88857	1.00E-03 i					37 n	3.7 n	1.4 n	1000 n	78 n
di-n-Octyl phthalate	117840	2.00E-02 h					730 n	73 n	27 n	20000 n	1600 n
1,4-Dioxane	123911			1.10E-02 i			6.1 c	0.57 c	0.29 c	260 c	58 c
Diphenamid	957517	3.00E-02 i					1100 n	110 n	41 n	31000 n	2300 n
Diphenylamine	122394	2.50E-02 i					910 n	91 n	34 n	26000 n	2000 n
1,2-Diphenylhydrazine	122667			8.00E-01 i	7.70E-01 i		0.084 c	0.0081 c	0.0039 c	3.6 c	0.8 c
Diquat	85007	2.20E-03 i					80 n	8 n	3 n	2200 n	170 n
Direct black 38	1937377			8.60E+00 h			0.0078 c	0.00073 c	0.00037 c	0.33 c	0.074 c
Direct blue 6	2602462			8.10E+00 h			0.0083 c	0.00077 c	0.00039 c	0.35 c	0.079 c
Direct brown 95	16071866			9.30E+00 h			0.0072 c	0.00067 c	0.00034 c	0.31 c	0.069 c
Disulfoton	298044	4.00E-05 i					1.5 n	0.15 n	0.054 n	41 n	3.1 n
1,4-Dithiane	505293	1.00E-02 i					370 n	37 n	14 n	10000 n	780 n
Diuron	330541	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
Dodine	2439103	4.00E-03 i					150 n	15 n	5.4 n	4100 n	310 n
Endosulfan	115297	6.00E-03 h					220 n	22 n	8.1 n	6100 n	470 n
Endothall	145733	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Endrin	72208	3.00E-04 i					11 n	1.1 n	0.41 n	310 n	23 n
Epichlo[illegible]drin	106898	2.00E-03 h	2.86E-0[illegible]	9.90E-03 i	4.20E-03 i		6.8 c	1 n	0.32 c	290	65 c

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1,2-Epoxybutane	106887		5.71E-03 i				210 n	21 n			
Ethephon (2-chloroethyl phosphonic acid)	16672870	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Ethion	563122	5.00E-04 i					18 n	1.8 n	0.68 n	510 n	39 n
2-Ethoxyethanol acetate	111159	3.00E-01 e					11000 n	1100 n	410 n	310000 n	23000 n
2-Ethoxyethanol	110805	4.00E-01 h	5.71E-02 i				15000 n	210 n	540 n	410000 n	31000 n
Ethyl acrylate	140885			4.80E-02 h			1.4 c	0.13 c	0.066 c	60 c	15 c
EPTC (S-Ethyl dipropylthiocarbamate)	759944	2.50E-02 i					910 n	91 n	34 n	26000 n	2000 n
Ethyl ether	60297	2.00E-01 i				***	1200 n	730 n	270 n	200000 n	16000 n
Ethyl methacrylate	97632	9.00E-02 h					3300 n	330 n	120 n	92000 n	7000 n
Ethyl acetate	141786	9.00E-01 i					33000 n	3300 n	1200 n	920000 n	70000 n
Ethylbenzene	100414	1.00E-01 i	2.86E-01 i			***	1300 n	1000 n	140 n	100000 n	7800 n
Ethylene cyanohydrin	109784	3.00E-01 h					11000 n	1100 n	410 n	310000 n	23000 n
Ethylene diamine	107153	2.00E-02 h					730 n	73 n	27 n	20000 n	1600 n
Ethylene glycol	107211	2.00E+00 i					73000 n	7300 n	2700 n	1000000 n	160000 n
Ethylene glycol, monobutyl ether	111762		5.71E-03 h				210 n	21 n			
Ethylene oxide	75218			1.02E+00 h	3.50E-01 h		0.066 c	0.018 c	0.0031 c	2.8 c	0.63 c
Ethylene thiourea (ETU)	96457	8.00E-05 i		1.19E-01 h			0.57 c	0.053 c	0.027 c	24 c	5.4 c
Ethyl p-nitrophenyl phenylphosphorothioate	2104645	1.00E-05 i					0.37 n	0.037 n	0.014 n	10 n	0.78 n
Ethylnitrosourea	759739			1.40E+02 w			0.00048 c	0.000045 c	0.000023 c	0.02 c	0.0046 c
Ethylphthalyl ethyl glycolate	84720	3.00E+00 i					110000 n	11000 n	4100 n	1000000 n	230000 n
Express	10120	8.00E-03 i					290 n	29 n	11 n	8200 n	630 n
Fenamiphos	22224926	2.50E-04 i					9.1 n	0.91 n	0.34 n	260 n	20 n
Fluometuron	2164172	1.30E-02 i					470 n	47 n	18 n	13000 n	1000 n
Fluoride	7782414	6.00E-02 i					2200 n	220 n	81 n	61000 n	4700 n
Fluoridone	59756604	8.00E-02 i					2900 n	290 n	110 n	82000 n	6300 n
Flurprimidol	56425913	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Flutolanil	66332965	6.00E-02 i					2200 n	220 n	81 n	61000 n	4700 n
Fluvalinate	69409945	1.00E-02 i					370 n	37 n	14 n	10000 n	780 n
Folpet	133073	1.00E-01 i		3.50E-03 i			19 c	1.8 c	0.9 c	820 c	180 c
Fomesafen	72178020			1.90E-01 i			0.35 c	0.033 c	0.017 c	15 c	3.4 c
Fonofos	944229	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
Formaldehyde	50000	2.00E-01 i			4.55E-02 i		7300 n	0.14 c	270 n	200000 n	16000 n
Formic Acid	64186	2.00E+00 h					73000 n	7300 n	2700 n	1000000 n	160000 n
Fosetyl-al	39148248	3.00E+00 i					110000 n	11000 n	4100 n	1000000 n	230000 n
Furan	110009	1.00E-03 i					37 n	3.7 n	1.4 n	1000 n	78 n
Furazolidone	67458			3.80E+00 h			0.018 c	0.0016 c	0.00083 c	0.75 c	0.17 c
Furfural	98011	3.00E-03 i	1.43E-02 a				110 n	52 n	4.1 n	3100 n	230 n
Furium	531828			5.00E+01 h			0.0013 c	0.00013 c	0.000063 c	0.057 c	0.013 c
Furmecyclox	60568050			3.00E-02 i			2.2 c	0.21 c	0.11 c	95 c	21 c
Glufosinate-ammonium	77182822	4.00E-04 i					15 n	1.5 n	0.54 n	410 n	31 n
Glycidaldehyde	765344	4.00E-04 i	2.86E-04 h				15 n	1.1 n	0.54 n	410 n	31 n
Glyphosate	1071836	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n

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Haloxyfop-methyl	69806402	5.00E-05 i					1.8 n	0.18 n	0.068 n	51 n	3.9 n
Harmony	79277273	1.30E-02 i					470 n	47 n	18 n	13000 n	1000 n
HCH (alpha)	319846			6.30E+00 i	6.30E+00 i		0.011 c	0.00099 c	0.0005 c	0.45 c	0.1 c
HCH (beta)	319857			1.80E+00 i	1.80E+00 i		0.037 c	0.0035 c	0.0018 c	1.6 c	0.35 c
HCH (gamma) Lindane	58899	3.00E-04 i		1.30E+00 h			0.052 c	0.0048 c	0.0024 c	2.2 c	0.49 c
HCH-technical	608731			1.80E+00 i	1.79E+00 i		0.037 c	0.0035 c	0.0018 c	1.6 c	0.35 c
Heptachlor	76448	5.00E-04 i		4.50E+00 i	4.55E+00 i	•••	0.0023 c	0.0014 c	0.0007 c	0.64 c	0.14 c
Heptachlor epoxide	1024573	1.30E-05 i		9.10E+00 i	9.10E+00 i	•••	0.0012 c	0.00069 c	0.00035 c	0.31 c	0.07 c
Hexabromobenzene	87821	2.00E-03 i				•••	12 n	7.3 n	2.7 n	2000 n	160 n
Hexachlorobenzene	118741	8.00E-04 i		1.60E+00 i	1.61E+00 i	•••	0.0066 c	0.0039 c	0.002 c	1.8 c	0.4 c
Hexachlorobutadiene	87683	2.00E-04 h		7.80E-02 i	7.70E-02 i	•••	0.14 c	0.081 c	0.04 c	37 c	8.2 c
Hexachlorocyclopentadiene	77474	7.00E-03 i	2.00E-05 h			•••	0.15 n	0.073 n	9.5 n	7200 n	550 n
Hexachlorodibenzo-p-dioxin mixture	19408743			6.20E+03 i	4.55E+03 i		0.000011 c	1.40E-06 c	5.10E-07 c	0.00046 c	0.0001 c
Hexachloroethane	67721	1.00E-03 i		1.40E-02 i	1.40E-02 i	•••	0.75 c	0.45 c	0.23 c	200 c	46 c
Hexachlorophene	70304	3.00E-04 i					11 n	1.1 n	0.41 n	310 n	23 n
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121824	3.00E-03 i		1.10E-01 i			0.61 c	0.057 c	0.029 c	26 c	5.8 c
n-Hexane	110543	6.00E-02 h	5.71E-02 i			•••	350 n	210 n	81 n	61000 n	4700 n
Hexazinone	51235042	3.30E-02 i					1200 n	120 n	45 n	34000 n	2600 n
Hydrazine, hydrazine sulfate	302012			3.00E+00 i	1.71E+01 i		0.022 c	0.00037 c	0.0011 c	0.95 c	0.21 c
Hydrogen chloride	7647010		2.00E-03 i				73 n	7.3 n			
Hydrogen sulfide	7783064	3.00E-03 i	2.57E-04 i				110 n	0.94 n	4.1 n	3100 n	230 n
Hydroquinone	123319	4.00E-02 h					1500 n	150 n	54 n	41000 n	3100 n
Imazalil	35554440	1.30E-02 i					470 n	47 n	18 n	13000 n	1000 n
Imazaquin	81335377	2.50E-01 i					9100 n	910 n	340 n	260000 n	20000 n
Iprodione	36734197	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
Isobutanol	78831	3.00E-01 i				•••	1800 n	1100 n	410 n	310000 n	23000 n
Isophorone	78591	2.00E-01 i		9.50E-04 i			71 c	6.6 c	3.3 c	3000 c	670 c
Isopropalin	33820530	1.50E-02 i					550 n	55 n	20 n	15000 n	1200 n
Isopropyl methyl phosphonic acid	1832548	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Isoxaben	82558507	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Kepone	143500			1.80E+01 e			0.0037 c	0.00035 c	0.00018 c	0.16 c	0.035 c
Lactofen	77501634	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
Lead (tetraethyl)	78002	1.00E-07 i					0.0037 n	0.00037 n	0.00014 n	0.1 n	0.0078 n
Linuron	330552	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
Lithium	7439932	2.00E-02 e					730 n	73 n	27 n	20000 n	1600 n
Londax	83056996	2.00E-01 i					7300 n	730 n	270 n	200000 n	16000 n
Malathion	121755	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Maleic anhydride	108316	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Maleic hydrazide	123331	5.00E-01 i					18000 n	1800 n	680 n	510000 n	39000 n
Malononitrile	109773	2.00E-05 h					0.73 n	0.073 n	0.027 n	20 n	1.6 n
Mancozeb	8018017	3.00E-02 h					1100 n	110 n	41 n	31000 n	2300 n
Maneb	12427382	5.00E-03 i					180 n	18 n	6.8 n	5100	390 n

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Manganese and compounds	7439965	5.00E-03 i	1.43e-05 i				180 n	0.052 n	6.8 n	5100 n	390 n
Mephosfolan	950107	9.00E-05 h					3.3 n	0.33 n	0.12 n	92 n	7 n
Mepiquat chloride	24307264	3.00E-02 i					1100 n	110 n	41 n	31000 n	2300 n
Mercury (inorganic)	7439976	3.00E-04 h	8.57E-05 h				11 n	0.31 n	0.41 n	2310 n	23 n
Mercury (methyl)	22967926	3.00E-04 i					11 n	1.1 n	0.41 n	310 n	23 n
Merphos	150505	3.00E-05 i					1.1 n	0.11 n	0.041 n	31 n	2.3 n
Merphos oxide	78488	3.00E-05 i					1.1 n	0.11 n	0.041 n	31 n	2.3 n
Metalaxyl	57837191	6.00E-02 i					2200 n	220 n	81 n	61000 n	4700 n
Methacrylonitrile	126987	1.00E-04 i	2.00E-04 e				3.7 n	0.73 n	0.14 n	100 n	7.8 n
Methamidophos	10265926	5.00E-05 i					1.8 n	0.18 n	0.068 n	51 n	3.9 n
Methanol	67561	5.00E-01 i					18000 n	1800 n	680 n	510000 n	39000 n
Methidathion	950378	1.00E-03 i					37 n	3.7 n	1.4 n	1000 n	78 n
Methomyl	16752775	2.50E-02 i					910 n	91 n	34 n	26000 n	2000 n
Methoxychlor	72435	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
2-Methoxyethanol acetate	110496	2.00E-03 e					73 n	7.3 n	2.7 n	2000 n	160 n
2-Methoxyethanol	109864	1.00E-03 h	5.71E-03 i				37 n	21 n	1.4 n	1000 n	178 n
2-Methoxy-5-nitroaniline	99592			4.60E-02 h			1.5 c	0.14 c	0.069 c	62 c	14 c
Methyl acetate	79209	1.00E+00 h					37000 n	3700 n	1400 n	1000000 n	78000 n
Methyl acrylate	96333	3.00E-02 e					1100 n	110 n	41 n	31000 n	2300 n
2-Methylaniline hydrochloride	636215			1.80E-01 h			0.37 c	0.035 c	0.018 c	16 c	3.5 c
2-Methylaniline	95534			2.40E-01 h			0.28 c	0.026 c	0.013 c	12 c	2.7 c
Methyl chlorocarbonate	79221	1.00E+00 w					37000 n	3700 n	1400 n	1000000 n	78000 n
4-(2-Methyl-4-chlorophenoxy) butyric acid	94815	1.00E-02 i					370 n	37 n	14 n	10000 n	780 n
2-Methyl-4-chlorophenoxyacetic acid	94746	5.00E-04 i					18 n	1.8 n	0.68 n	510 n	39 n
2-(2-Methyl-14-chlorophenoxy)propionic acid	93652	1.00E-03 i					37 n	3.7 n	1.4 n	1000 n	78 n
Methylcyclohexane	108872		8.57E-01 h				31000 n	3100 n			
Methylene bromide	74953	1.00E-02 e				•••	61 n	37 n	14 n	10000 n	780 n
Methylene chloride	75092	6.00E-02 i	8.57E-01 h	7.50E-03 i	1.64E-03 i	•••	4.1 c	3.8 c	0.42 c	380 c	85 c
4,4'-Methylene bis(2-chloroaniline)	101144	7.00E-04 h		1.30E-01 h	1.30E-01 h		0.52 c	0.048 c	0.024 c	22 c	4.9 c
4,4'-Methylenebisbenzeneamine	101779			2.50E-01 w			0.27 c	0.025 c	0.013 c	11 c	2.6 c
4,4'-Methylene bis(N,N'-dimethyl)aniline	101611			4.60E-02 i			1.5 c	0.14 c	0.069 c	62 c	14 c
4,4'-Methylenediphenyl isocyanate	101688		5.71E-06 i			•••	0.035 n	0.021 n			
Methyl ethyl ketone	78933	6.00E-01 i	2.86E-01 i				22000 n	1000 n	810 n	610000 n	47000 n
Methyl hydrazine	60344			1.10E+00			0.061 c	0.0057 c	0.0029 c	2.6 c	0.58 c
Methyl isobutyl ketone	108101	8.00E-02 h	2.29E-02 a				2900 n	84 n	110 n	82000 n	6300 n
Methyl methacrylate	80626	8.00E-02 h					2900 n	290 n	110 n	82000 n	6300 n
2-Methyl-5-nitroaniline	99558			3.30E-02 h			2 c	0.19 c	0.096 c	87 c	19 c
Methyl parathion	298000	2.50E-04 i					9.1 n	0.91 n	0.34 n	260 n	20 n
2-Methylphenol (o-cresol)	95487	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
3-Methylphenol (m-cresol)	103394	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
4-Methylphenol (p-cresol)	106445	5.00E-03 h					180 n	18 n	6.8 n	5100 n	390 n
Methyl styrene (mixture)	25013154	6.00E-03 e	1.14E-02 e			•••	60 n	42 n	8.1 n	6100 n	470 n

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Methyl styrene (alpha)	98839	7.00E-02 a				•••	430 n	260 n	95 n	72000 n	5500 n
Methyl tertbutyl ether (MTBE)	1634044	5.00E-03 e	8.57E-01 i			•••	180 n	3100 n	6.8 n	5100 n	390 n
Metolaclor (Dual)	51218452	1.50E-01 h					5500 n	550 n	200 n	150000 n	12000 n
Metribuzin	21807649	2.50E-02 i					910 n	91 n	34 n	26000 n	2000 n
Mirex	2385855	2.00E-04 i		1.80E+00 w			0.037 c	0.0035 c	0.0018 c	1.6 c	0.35 c
Molinate	2212671	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
Molybdenum	7439987	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Monochloramine	10599903	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Naled	300765	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
2-Naphthylamine	91598			1.39e+02 a			0.00052 c	0.000048 c	0.000024 c	0.022 c	0.0042 c
Napropamide	15299997	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Nickel refinery dust					8.40E-01 i			0.0075 c			
Nickel (soluble salts)	7440020	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Nickel subsulfide	12035722				1.70E+00 i			0.0037 c			
Nitrapyrin	1929824	1.50E-03 w					55 n	5.5 n	2 n	1500 n	120 n
Nitrate	14797558	1.60E+00 i					58000 n	5800 n	2200 n	1000000 n	130000 n
Nitric Oxide	10102439	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
Nitrite	14797650	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
2-Nitroaniline	88744	6.00E-05 w	5.71E-05 h				2.2 n	0.21 n	0.081 n	61 n	4.7 n
3-Nitroaniline	99092	3.00E-03 o					110 n	11 n	4.1 n	3100 n	230 n
4-Nitroaniline	100016	3.00E-03 o					110 n	11 n	4.1 n	3100 n	230 n
Nitrobenzene	98953	5.00E-04 i	5.71E-04 a			•••	3.4 n	2.1 n	0.68 n	510 n	39 n
Nitrofurantoin	67209	7.00E-02 h					2600 n	260 n	95 n	72000 n	5500 n
Nitrofurazone	59870			1.50E+00 h	9.40E+00 h		0.045 c	0.00067 c	0.0021 c	1.9 c	0.43 c
Nitrogen dioxide	10102440	1.00E+00 i					37000 n	3700 n	1400 n	1000000 n	78000 n
Nitroguanidine	556887	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
4-Nitrophenol	100027	6.20E-02 o					2300 n	230 n	84 n	63000 n	4800 n
2-Nitropropane	79469		5.71E-03 i		9.40E+00 h		210 n	0.00067 c			
N-Nitrosodi-n-butylamine	924163			5.40E+00 i	5.60E+00 i		0.012 c	0.0011 c	0.00058 c	0.53 c	0.12 c
N-Nitrosodiethanolamine	1116547			2.80E+00 i			0.024 c	0.0022 c	0.0011 c	1 c	0.23 c
N-Nitrosodiethylamine	55185			1.50E+02 i	1.51E+02 i		0.00045 c	0.000041 c	0.000021 c	0.019 c	0.0043 c
N-Nitrosodimethylamine	62759			5.10E+01 i	4.90E+01 i		0.0013 c	0.00013 c	0.000062 c	0.056 c	0.013 c
N-Nitrosodiphenylamine	86306			4.90E-03 i			14 c	1.3 c	0.64 c	580 c	130 c
N-Nitroso di-n-propylamine	621647			7.00E+00 i			0.0096 c	0.00089 c	0.00045 c	0.41 c	0.091 c
N-Nitroso-N-methylethylamine	10595956			2.20E+01 i			0.0031 c	0.00028 c	0.00014 c	0.13 c	0.029 c
N-Nitrosopyrrolidine	930552			2.10E+00 i	2.13E+00 i		0.032 c	0.0029 c	0.0015 c	1.4 c	0.3 c
m-Nitrotoluene	99081	1.00E-02 h				•••	61 n	37 n	14 n	10000 n	780 n
o-Nitrotoluene	88722	1.00E-02 h				•••	61 n	37 n	14 n	10000 n	780 n
p-Nitrotoluene	99990	1.00E-02 h				•••	61 n	37 n	14 n	10000 n	780 n
Norflurazon	27314132	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
NuStar	85509199	7.00E-04 i					26 n	2.6 n	0.95 n	720 n	55 n
Octabro[redacted]iphenyl ether	32536520	3.00E-03 i					110 n	11 n	4.1 n	3100 n	230 n

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg d/mg	CPSi kg d/mg	V O C	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Octahydro-1357-tetranitro-1357-tetrazocine	2691410	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Octamethylpyrophosphoramide	152169	2.00E-03 h					73 n	7.3 n	2.7 n	2000 n	160 n
Oryzalin	19044883	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Oxadiazon	19666309	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Oxamyl	23135220	2.50E-02 i					910 n	91 n	34 n	26000 n	2000 n
Oxyfluorfen	42874033	3.00E-03 i					110 n	11 n	4.1 n	3100 n	230 n
Paclobutrazol	76738620	1.30E-02 i					470 n	47 n	18 n	13000 n	1000 n
Paraquat	1910425	4.50E-03 i					160 n	16 n	6.1 n	4600 n	350 n
Parathion	56382	6.00E-03 h					220 n	22 n	8.1 n	6100 n	470 n
Pebulate	1114712	5.00E-02 h					1800 n	180 n	68 n	51000 n	3900 n
Pendimethalin	40487421	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
Pentabromo-6-chloro cyclohexane	87843			2.30E-02 h			2.9 o	0.27 o	0.14 o	120 o	28 o
Pentabromodiphenyl ether	32534819	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
Pentachlorobenzene	608935	8.00E-04 i				•••	4.9 n	2.9 n	1.1 n	820 n	63 n
Pentachloronitrobenzene	82688	3.00E-03 i		2.60E-01 h		•••	0.041 o	0.024 o	0.012 o	11 o	2.5 o
Pentachlorophenol	87865	3.00E-02 i		1.20E-01 i			0.56 o	0.052 o	0.026 o	24 o	5.3 o
Permethrin	52645531	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Phenmedipham	13684634	2.50E-01 i					9100 n	910 n	340 n	260000 n	20000 n
Phenol	108952	6.00E-01 i					22000 n	2200 n	810 n	610000 n	47000 n
m-Phenylenediamine	108452	6.00E-03 i					220 n	22 n	8.1 n	6100 n	470 n
p-Phenylenediamine	106503	1.90E-01 h					6900 n	690 n	260 n	190000 n	15000 n
Phenylmercuric acetate	62384	8.00E-05 i					2.9 n	0.29 n	0.11 n	82 n	6.3 n
2-Phenylphenol	90437			1.94E-03 h			35 o	3.2 o	1.6 o	1500 o	330 o
Phorate	298022	2.00E-04 h					7.3 n	0.73 n	0.27 n	200 n	16 n
Phosmet	732116	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Phosphine	7803512	3.00E-04 i	8.57E-06 h				11 n	0.031 n	0.41 n	310 n	23 n
Phosphorus (white)	7723140	2.00E-05 i					0.73 n	0.073 n	0.027 n	20 n	1.6 n
p-Phthalic acid	100210	1.00E+00 h					37000 n	3700 n	1400 n	1000000 n	78000 n
Phthalic anhydride	85449	2.00E+00 i	3.43E-01 h				73000 n	1300 n	2700 n	1000000 n	160000 n
Picloram	1918021	7.00E-02 i					2600 n	260 n	95 n	72000 n	5500 n
Pirimiphos-methyl	29232937	1.00E-02 i					370 n	37 n	14 n	10000 n	780 n
Polybrominated biphenyls		7.00E-06 h		8.90E+00 h			0.0076 o	0.0007 o	0.00035 o	0.32 o	0.072 o
Polychlorinated biphenyls (PCBs)	1336363			7.70E+00 i			0.0087 o	0.00081 o	0.00041 o	0.37 o	0.083 o
Aroclor 1016	12674112	7.00E-05 i					2.6 n	0.26 n	0.095 n	72 h	5.5 n
Polychlorinated terphenyls (PCTs)				4.50E+00 e			0.015 o	0.0014 o	0.0007 o	0.64 o	0.14 o
Polynuclear aromatic hydrocarbons											
Acenaphthene	83329	6.00E-02 i					2200 n	220 n	81 n	61000 n	4700 n
Anthracene	120127	3.00E-01 i					11000 n	1100 n	410 n	310000 n	23000 n
Benzo[a]pyrene	50328			7.30E+00 i	6.10E+00 h		0.0092 o	0.001 o	0.00043 o	0.39 o	0.088 o
Benzo[b]fluoranthene	205992			7.30E-01 e	6.10E-01 e		0.092 o	0.01 o	0.0043 o	3.9 o	0.88 o
Benzo[k]fluoranthene	207089			7.30E-02 e	6.10E-02 e		0.92 o	0.1 o	0.043 o	39 o	8.8 o
Benz[a]anthracene	56553			7.30E-01 e	6.10E-01 e		0.092 o	0.01 o	0.0043 o	3.9 o	0.88 o

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg d/mg	CPSi kg d/mg	VOC	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Chrysene	218019			7.30E-03 e	6.10E-03 e		9.2 c	1 c	0.43 c	390 c	88 c
Dibenz[ah]anthracene	53703			7.30E+00 e	6.10E+00 e		0.0092 c	0.001 c	0.00043 c	0.39 c	0.088 c
Fluoranthene	206440	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
Fluorene	86737	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
Indeno[1,2,3-cd]pyrene	193395			7.30E-01 e	6.10E-01 e		0.092 c	0.01 c	0.0043 c	3.9 c	0.88 c
Naphthalene	91203	4.00E-02 w					1500 n	150 n	54 n	41000 n	3100 n
Pyrene	129000	3.00E-02 i					1100 n	110 n	41 n	31000 n	2300 n
Prochloraz	67747095	9.00E-03 i		1.50E-01 i			0.45 c	0.042 c	0.021 c	19 c	4.3 c
Profluralin	26399360	6.00E-03 h					220 n	22 n	8.1 n	6100 n	470 n
Prometon	1610180	1.50E-02 i					550 n	55 n	20 n	15000 n	1200 n
Prometryn	7287196	4.00E-03 i					150 n	15 n	5.4 n	4100 n	310 n
Pronamide	23950585	7.50E-02 i					2700 n	270 n	100 n	77000 n	5900 n
Propachlor	1918167	1.30E-02 i					470 n	47 n	18 n	13000 n	1000 n
Propanil	709988	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Propargite	2312358	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Propargyl alcohol	107197	2.00E-03 i					73 n	7.3 n	2.7 n	2000 n	160 n
Propazine	139402	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Propham	122429	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Propiconazole	60207901	1.30E-02 i					470 n	47 n	18 n	13000 n	1000 n
Propylene glycol	57556	2.00E+01 h					730000 n	73000 n	27000 n	1000000 n	1000000 n
Propylene glycol, monoethyl ether	52125538	7.00E-01 h					26000 n	2600 n	950 n	720000 n	55000 n
Propylene glycol, monomethyl ether	107982	7.00E-01 h	5.71E-01 i				26000 n	2100 n	950 n	720000 n	55000 n
Propylene oxide	75569		8.57E-03 i	2.40E-01 i	1.29E-02 i		0.28 c	0.49 c	0.013 c	12 c	2.7 c
Pursuit	81335775	2.50E-01 i					9100 n	910 n	340 n	260000 n	20000 n
Pydrin	51630581	2.50E-02 i					910 n	91 n	34 n	26000 n	2000 n
Pyridine	110861	1.00E-03 i					37 n	3.7 n	1.4 n	1000 n	78 n
Quinalphos	13593038	5.00E-04 i					18 n	1.8 n	0.68 n	510 n	39 n
Quinoline	91225			1.20E+01 h			0.0056 c	0.00052 c	0.00026 c	0.24 c	0.053 c
Resmethrin	10463868	3.00E-02 i					1100 n	110 n	41 n	31000 n	2300 n
Ronnel	299843	5.00E-02 h					1800 n	180 n	68 n	51000 n	3900 n
Rotenone	83794	4.00E-03 i					150 n	15 n	5.4 n	4100 n	310 n
Savey	78587050	2.50E-02 i					910 n	91 n	34 n	26000 n	2000 n
Selenious Acid	7783008	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Selenium	7782492	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Selenourea	630104	5.00E-03 h					180 n	18 n	6.8 n	5100 n	390 n
Sethoxydim	74051802	9.00E-02 i					3300 n	330 n	120 n	92000 n	7000 n
Silver and compounds	7440224	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Simazine	122349	5.00E-03 i		1.20E-01 h			0.56 c	0.052 c	0.026 c	24 c	5.3 c
Sodium azide	26628228	4.00E-03 i					150 n	15 n	5.4 n	4100 n	310 n
Sodium diethyldithiocarbamate	148185	3.00E-02 i		2.70E-01 h			0.25 c	0.023 c	0.012 c	11 c	2.4 c
Sodium [illegible]roacetate	62748	2.00E-05 i					0.73 n	0.073 n	0.027 n	20 n	1.6 n
Sodium [illegible]avanadate	13718268	1.00E-03 h					37 n	3.7 n	1.4 n	1000	78 n

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Strontium, stable	7440246	6.00E-01 i					22000 n	2200 n	810 n	610000 n	47000 n
Strychnine	57249	3.00E-04 i					11 n	1.1 n	0.41 n	310 n	23 n
Styrene	100425	2.00E-01 i	2.86E-01 i			***	1600 n	1000 n	270 n	200000 n	16000 n
Systhane	88671890	2.50E-02 i					910 n	91 n	34 n	26000 n	2000 n
2,3,7,8-TCDD (dioxin)	1746016			1.56E+05 h	1.16E+05 h		4.30E-07 c	5.40E-08 c	2.00E-08 c	0.000018 c	4.10E-06 c
Tebuthiuron	34014181	7.00E-02 i					2600 n	260 n	95 n	72000 n	5500 n
Temephos	3383968	2.00E-02 h					730 n	73 n	27 n	20000 n	1600 n
Terbacil	5902512	1.30E-02 i					470 n	47 n	18 n	13000 n	1000 n
Terbufos	13071799	2.50E-05 h					0.91 n	0.091 n	0.034 n	26 n	2 n
Terbutryn	886500	1.00E-03 i					37 n	3.7 n	1.4 n	1000 n	78 n
1,2,4,5-Tetrachlorobenzene	95943	3.00E-04 i				***	1.8 n	1.1 n	0.41 n	310 n	23 n
1,1,1,2-Tetrachloroethane	630206	3.00E-02 i		2.60E-02 i	2.59E-02 i	***	0.41 c	0.24 c	0.12 c	110 c	25 c
1,1,2,2-Tetrachloroethane	79345			2.00E-01 i	2.03E-01 i	***	0.052 c	0.031 c	0.016 c	14 c	3.2 c
Tetrachloroethylene (PCE)	127184	1.00E-02 i		5.20E-02 e	2.03E-03 e	***	1.1 c	3.1 c	0.061 c	55 c	12 c
2,3,4,6-Tetrachlorophenol	58902	3.00E-02 i					1100 n	110 n	41 n	31000 n	2300 n
p,a,a,a-Tetrachlorotoluene	5216251			2.00E+01 h		***	0.00053 c	0.00031 c	0.00016 c	0.14 c	0.032 c
Tetrachlorovinphos	961115	3.00E-02 i		2.40E-02 h			2.8 c	0.26 c	0.13 c	120 c	27 c
Tetraethyldithiopyrophosphate	3689245	5.00E-04 i					18 n	1.8 n	0.68 n	510 n	39 n
Thallic oxide	1314325	7.00E-05 w					2.6 n	0.26 n	0.095 n	72 n	5.5 n
Thallium											
Thallium acetate	563688	9.00E-05 i					3.3 n	0.33 n	0.12 n	92 n	7 n
Thallium carbonate	6533739	8.00E-05 i					2.9 n	0.29 n	0.11 n	82 n	6.3 n
Thallium chloride	7791120	8.00E-05 i					2.9 n	0.29 n	0.11 n	82 n	6.3 n
Thallium nitrate	10102451	9.00E-05 i					3.3 n	0.33 n	0.12 n	92 n	7 n
Thallium selenite	12039520	9.00E-05 w					3.3 n	0.33 n	0.12 n	92 n	7 n
Thallium sulfate	7446186	8.00E-05 i					2.9 n	0.29 n	0.11 n	82 n	6.3 n
Thiobencarb	28249776	1.00E-02 i					370 n	37 n	14 n	10000 n	780 n
2-(Thiocyanomethylthio)-benzothiazole	21564170	3.00E-02 h					1100 n	110 n	41 n	31000 n	2300 n
Thiofanox	39196184	3.00E-04 h					11 n	1.1 n	0.41 n	310 n	23 n
Thiophanate-methyl	23564058	8.00E-02 i					2900 n	290 n	110 n	82000 n	6300 n
Thiram	137268	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Tin and compounds		6.00E-01 h					22000 n	2200 n	810 n	610000 n	47000 n
Toluene	108883	2.00E-01 i	1.14E-01 w			***	750 n	420 n	270 n	200000 n	16000 n
Toluene-2,4-diamine	95807			3.20E+00 h			0.021 c	0.002 c	0.00099 c	0.89 c	0.2 c
Toluene-2,5-diamine	95705	6.00E-01 h					22000 n	2200 n	810 n	610000 n	47000 n
Toluene-2,6-diamine	823405	2.00E-01 h					7300 n	730 n	270 n	200000 n	16000 n
p-Toluidine	106490			1.90E-01 h			0.35 c	0.033 c	0.017 c	15 c	3.4 c
Toxaphene	8001352			1.10E+00 i	1.12E+00 i		0.061 c	0.0056 c	0.0029 c	2.6 c	0.58 c
Tralomethrin	66841256	7.50E-03 i					270 n	27 n	10 n	7700 n	590 n
Triallate	2303175	1.30E-02 i					470 n	47 n	18 n	13000 n	1000 n
Triasulfuron	82097505	1.00E-02 i					370 n	37 n	14 n	10000 n	780 n
1,2,4-Tribromobenzene	615543	5.00E-03 i				***	30 n	18 n	6.8 n	5100 n	390 n

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg-d/mg	CPSi kg-d/mg	VOC	Tap water µg/L	Ambient air µg/m3	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Tributyltin oxide (TBTO)	56359	3.00E-05 i					1.1 n	0.11 n	0.041 n	31 n	2.3 n
2,4,6-Trichloroaniline hydrochloride	33663502			2.90E-02 h			2.3 c	0.22 c	0.11 c	99 c	22 c
2,4,6-Trichloroaniline	634935			3.40E-02 h			2 c	0.18 c	0.093 c	84 c	19 c
1,2,4-Trichlorobenzene	120821	1.00E-02 i	5.71e-02 h			•••	190 n	210 n	14 n	10000 n	780 n
1,1,1-Trichloroethane	71556	9.00E-02 w	2.86E-01 w			•••	1300 n	1000 n	120 n	92000 n	7000 n
1,1,2-Trichloroethane	79005	4.00E-03 i		5.70E-02 i	5.60E-02 i	•••	0.19 c	0.11 c	0.055 c	50 c	11 c
Trichloroethylene (TCE)	79016	6.00E-03 e		1.10E-02 w	6.00E-03 e	•••	1.6 c	1 c	0.29 c	260 c	58 c
Trichlorofluoromethane	75694	3.00E-01 i	2.00E-01 e			•••	1300 n	730 n	410 n	310000 n	23000 n
2,4,5-Trichlorophenol	95954	1.00E-01 i					3700 n	370 n	140 n	100000 n	7800 n
2,4,6-Trichlorophenol	88062			1.10E-02 i	1.09E-02 i		6.1 c	0.57 c	0.29 c	260 c	58 c
2,4,5-Trichlorophenoxyacetic acid	93765	1.00E-02 i					370 n	37 n	14 n	10000 n	780 n
2-(2,4,5-Trichlorophenoxy)propionic acid	93721	8.00E-03 i					290 n	29 n	11 n	8200 n	630 n
1,1,2-Trichloropropane	598776	5.00E-03 i				•••	30 n	18 n	6.8 n	5100 n	390 n
1,2,3-Trichloropropane	96184	6.00E-03 i		7.00e+00 i		•••	0.0015 c	0.00089 c	0.00045 c	0.41 c	0.091 c
1,2,3-Trichloropropene	96195	5.00E-03 h				•••	30 n	18 n	6.8 n	5100 n	390 n
1,1,2-Trichloro-1,2,2- trifluoroethane	76131	3.00E+01 i	8.57E+00 h			•••	59000 n	31000 n	41000 n	1000000 n	1000000 n
Tridiphane	58138082	3.00E-03 i					110 n	11 n	4.1 n	3100 n	230 n
Triethylamine	121448		2.00E-03 i				73 n	7.3 n			
Trifluralin	1582098	7.50E-03 i		7.70E-03 i			8.7 c	0.81 c	0.41 c	370 c	83 c
1,2,4-Trimethylbenzene	95636	5.00e-04 e				•••	3 n	1.8 n	0.68 n	510 n	39 n
1,3,5-Trimethylbenzene	108678	4.00e-04 e				•••	2.4 n	1.5 n	0.54 n	410 n	31 n
Trimethyl phosphate	512561			3.70E-02 h			1.8 c	0.17 c	0.085 c	77 c	17 c
1,3,5-Trinitrobenzene	99354	5.00E-05 i					1.8 n	0.18 n	0.068 n	51 n	3.9 n
Trinitrophenylmethylnitramine	479458	1.00E-02 h					370 n	37 n	14 n	10000 n	780 n
2,4,6-Trinitrotoluene	118967	5.00E-04 i		3.00E-02 i			2.2 c	0.21 c	0.11 c	95 c	21 c
Uranium (soluble salts)	7440611	3.00E-03 i					110 n	11 n	4.1 n	3100 n	230 n
Vanadium	7440622	7.00E-03 h					260 n	26 n	9.5 n	7200 n	550 n
Vanadium pentoxide	1314621	9.00E-03 i					330 n	33 n	12 n	9200 n	700 n
Vanadium sulfate	36907423	2.00E-02 h					730 n	73 n	27 n	20000 n	1600 n
Vernam	1929777	1.00E-03 i					37 n	3.7 n	1.4 n	1000 n	78 n
Vinclozolin	50471448	2.50E-02 i					910 n	91 n	34 n	26000 n	2000 n
Vinyl acetate	108054	1.00E+00 h	5.71E-02 i				37000 n	210 n	1400 n	1000000 n	78000 n
Vinyl bromide	593602		8.57E-04 i			•••	5.2 n	3.1 n			
Vinyl chloride	75014			1.90E+00 h	3.00E-01 h	•••	0.019 c	0.021 c	0.0017 c	1.5 c	0.34 c
Warfarin	81812	3.00E-04 i					11 n	1.1 n	0.41 n	310 n	23 n
m-Xylene	108323	2.00E+00 h	2.00E-01 w			•••	1400 n	730 n	2700 n	1000000 n	160000 n
o-Xylene	95476	2.00E+00 h	2.00E-01 w			•••	1400 n	730 n	2700 n	1000000 n	160000 n
p-Xylene	106423		8.57E-02 w			•••	520 n	310 n			
Xylene (mixed)	1330207	2.00E+00 i				•••	12000 n	7300 n	2700 n	1000000 n	160000 n
Zinc	7440666	3.00E-01 i					11000 n	1100 n	410 n	310000 n	23000 n
Zinc phosphide	1314847	3.00E-04 i					11 n	1.1 n	0.41 n	310 n	23 n
Zineb	12122677	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n

APPENDIX T

MEMORANDUM: MERCURY AND ZINC CONTAMINATION IN AQUEOUS SAMPLES

MEMORANDUM

Date: December 7, 1994

To: Tim Kemmis

From: Greg Ruechel

CC: Ted Hartsig
Lisa Smith
Roxann Ruechel

Subject: Mercury and zinc contamination in aqueous samples.

The data quality assessment of the samples collected during the interim monitoring noted that mercury and zinc were present in the field blank samples and the samples of the water used for decontamination (water source samples). Since the presence of these constituents in the field blank and water source samples indicates contamination of the field samples may have occurred, an attempt was made to identify the source of the contamination. Three possible sources of contamination were considered: laboratory, carryover during sampling, and the nitric acid preservative.

Carryover from inadequate decontamination of the sampling equipment was eliminated as a possible source of contamination since the water source samples were collected by pouring the water from the five gallon containers directly into the sample containers. Thus, the water source samples did not come in contact with the field sampling equipment but still contained mercury and zinc.

Laboratory contamination was also eliminated as a possible source of contamination due to the absence of mercury and zinc in the laboratory method blanks. In addition, in a personal conversation between Tim Kemmis and C. Michael Pfeiffer, USACE Omaha District Technical Manager, it was reported by Mr. Pfeiffer that the Quality Assurance samples sent to the Missouri River Division laboratory also contained mercury and zinc. It is extremely unlikely that similar contamination of mercury and zinc would occur in two separate laboratories.

Two samples of the stock nitric acid used as preservative and two samples of nitric acid from the preservative vials were sent to Precision Analytical Laboratory, Inc. for mercury and zinc analysis on October 21, 1994. Mercury was detected in both of the stock nitric acid samples at 3.02 mg/l and 2.93 mg/l, and in both of the nitric acid samples from the preservative vials at 0.74 mg/l and 2.90 mg/l. Zinc was not detected in the stock nitric acid, but was detected in both of the nitric

acid samples from the preservative vials, each at 120 mg/l. Therefore, we believe that the stock nitric acid used as preservative for the samples collected for metals analysis to be the source of contamination for mercury, and the vials used to contain the 5 ml aliquots of preservative to be the source of contamination for zinc.

Subsequently, new high purity nitric acid and new vials with Teflon lined closures have been ordered to replace the contaminated supplies.