LANL Reports

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Los Alamos Site Operations, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
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Date: May 12, 2004
Refer to: ER2004-0261

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MAY 2004
NMED Hazardous Waste Bureau

Mr. John Young, Corrective Action Project Leader
Permits Management Program
NMED – Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building 1
Santa Fe, NM 87505-6303

SUBJECT: QUARTERLY TECHNICAL REPORT FOR JANUARY THROUGH MARCH 2004

Dear Mr. Young:

Enclosed are two copies of the Remediation Services Quarterly Technical Report, January through March 2004. The Quarterly Technical Report presents information on the quarter's activities, including regulatory meetings, sampling, cleanups, and report writing. Also enclosed is a certification statement signed by the designee owner and operator for the Los Alamos National Laboratory. In accordance with Laboratory security requirements, copies of this report are available upon request through the external Remediation Services Web site at: http://erproject.lanl.gov/documents/virtualhome.html. The report is also available on the internal Web site at http://erproject.lanl.gov/documents/VL/status.html.

If you have questions regarding this report, please contact Dave McInroy at (505) 667-0819 or David Gregory at (505) 667-5808.

Sincerely,

David McInroy, Deputy Project Director
Remediation Services
Los Alamos National Laboratory

Sincerely,

David Gregory, Federal Project Director
Department of Energy
Los Alamos Site Operations

DM/DG/MB/jr

8224

Enclosure: 1) Quarterly Technical Report for January through March 2004 (ER2004-0162)
2) Certification

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S. Martin, NMED-HWB
C. Voorhees, NMED-OB

CERTIFICATION

CERTIFICATION BY THE RISK REDUCTION AND ENVIRONMENTAL STEWARDSHIP–REMEDIATION SERVICES (RRES–RS) PROJECT TECHNICAL REPRESENTATIVES

Document Title: **QUARTERLY TECHNICAL REPORT FOR JANUARY THROUGH MARCH 2004**

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Name: _____ Date: 5/13/04

David McInroy, Deputy Project Director
Remediation Services
Los Alamos National Laboratory

or

_____ Date: _____

Beverly A. Ramsey, Division Leader
Risk Reduction and Environmental Stewardship Division
Los Alamos National Laboratory

_____ Date: 5/13/04

David Gregory, Federal Project Director
Environmental Restoration Program
Department Of Energy/Los Alamos Site Office

or

_____ Date: _____

Herman LeDoux,
Assistant Area Manager of
Environmental Projects
Department Of Energy/Los Alamos Site Office

LA-UR-04-3132
May 13, 2004
ER2004-0162

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Quarterly Technical Report January–March 2004

Los Alamos
NATIONAL LABORATORY
Los Alamos NM 87545

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CONTENTS

1.0 INTRODUCTION 1

2.0 WORK PACKAGES 1

2.1 Townsites — Project Team Leader: Terry Rust 1
2.2 Industrial Sites — Project Team Leader: Gabriela Lopez Escobedo 2
2.3 High Explosives Production Sites and MDA P Closure — Project Team Leaders: Don Hickmott and Bill Criswell 6
2.4 Canyon Investigations — Project Team Leader: Kent Rich 8
2.5 Deep Groundwater Wells — Project Team Leader: John McCann 9
2.6 TA-21 Material Disposal Areas — Project Team Leader: Ron Rager 10
2.7 TA-21 Non-Material Disposal Areas — Project Team Leaders: Mark Thacker and Becky Coel-Roback 10
2.8 TA-49, TA-50, and TA-54 — Project Team Leaders: John Hopkins and Dwain Farley 11
2.9 Corrective Action Strategy — Project Team Leader: Richard Mirenda 12
2.10 Regulatory Compliance — Project Team Leader: Phillip Noll 16
2.11 Land Transfer — Project Team Leader (Acting): Terry Rust 18
2.12 Documentation and Tracking — Project Team Leader: Stephen Bolivar 18
2.13 Facility Integration and Site Identification — Project Team Leader: Roy Bohn 20
2.14 Surface Water Programs and BMPs — Project Team Leader: Steve Veenis 21

3.0 REFERENCES 22

APPENDIX A TRANSDUCER DATA FROM MW-1 AT SWMU 03-010(a), SECOND QUARTER, FISCAL YEAR 2004

APPENDIX B DP CANYON QUARTERLY INSPECTION REPORT SECOND QUARTER, FISCAL YEAR 2004

APPENDIX C QUARTERLY MOISTURE-MONITORING REPORT, SECOND QUARTER, FISCAL YEAR 2004, TECHNICAL AREA 49, MATERIAL DISPOSAL AREA AB

APPENDIX D QUARTERLY PORE-GAS SAMPLING AT TECHNICAL AREA 54 MATERIAL DISPOSAL AREAS L AND G, SECOND QUARTER, FISCAL YEAR 2004

LIST OF ACRONYMS AND ABBREVIATIONS

AOC	area of concern
BMP	best management practice
CFR	Code of Federal Regulations
CMS	corrective measures study
D&D	decontamination and decommissioning
DI	desk instruction
DOE	US Department of Energy
DSA	documented safety analysis
DX	Dynamic Experimentation (Laboratory Division)
Eco-SSL	ecological soil screening level
EMS	Emergency Management System
EPA	US Environmental Protection Agency
ER	environmental restoration
ERDB	Environmental Restoration database
ESH ID	environment, safety, and health identification number
ESL	ecological screening level
FWO	Facility and Waste Operations (Laboratory Division)
FWO-IP	Facility and Waste Operations Division–Infrastructure Projects
FY	fiscal year
GIS	Geographic Information System
HSWA	Hazardous and Solid Waste Amendments
Laboratory	Los Alamos National Laboratory
MDA	material disposal area
NMED	New Mexico Environment Department
NMT	Nuclear Materials Technology (Laboratory Division)
NNSA	National Nuclear Security Administration
NOD	notice of deficiency
NTISV	nontraditional in situ vitrification
PM	Program Management (Laboratory Division)
PR-ID	permit and requirement identification
PRS	potential release site
QP	quality procedure

RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RPF	Records Processing Facility
RRES	Risk Reduction and Environmental Stewardship (Laboratory Division)
RRES-ECO	Risk Reduction and Environmental Stewardship Division–Ecology Group
RRES-ECR	Risk Reduction and Environmental Stewardship Division–Environmental Characterization and Remediation Group
RRES-OEIM	Risk Reduction and Environmental Stewardship Division–Office of Information Management
RRES-RS	Risk Reduction and Environmental Stewardship Division–Remediation Services
RRES-WQH	Risk Reduction and Environmental Stewardship Division–Water Quality and Hydrology Group
SAP	sampling and analysis plan
SMART	Spatial Mapping and Reporting Tool
SMO	Sample Management Office
SOP	standard operating procedure
SWMU	solid waste management unit
TA	technical area
TDR	time domain reflectometry
TRV	toxicity reference value
VCA	voluntary corrective action
VCM	voluntary corrective measure

QUARTERLY TECHNICAL REPORT

JANUARY–MARCH 2004

LOS ALAMOS NATIONAL LABORATORY

RISK REDUCTION AND ENVIRONMENTAL STEWARDSHIP

REMEDIATION SERVICES

LOS ALAMOS SITE OFFICE

CONTRACTOR: University of California

DEPUTY PROJECT DIRECTOR: David McInroy

NUMBER OF POTENTIAL RELEASE SITES: Approximately 830

POTENTIAL WASTE: Radionuclides, High Explosives, Inorganic Chemicals, Organic Chemicals

1.0 INTRODUCTION

This quarterly report describes the technical status of activities in the Los Alamos National Laboratory (the Laboratory) Risk Reduction and Environmental Stewardship--Remediation Services (RRES-RS), formerly the Environmental Restoration (ER) Project. The activities are reported according to the current program structure and then, when applicable, by the technical area (TA) where the specific activity is located. The Hazardous and Solid Waste Amendments (HSWA) portion of the Laboratory's Hazardous Waste Facility Permit (Module VIII, Section P, Task V, C) requires the submission of a technical progress report on a quarterly basis. This report, submitted to fulfill the permit's requirement, summarizes much of the fieldwork and report-writing performed this quarter in RRES-RS.

2.0 WORK PACKAGES

2.1 Townsites — Project Team Leader: Terry Rust

2.1.1 TA-00

DP Road Land Transfer Tract [SWMUs 00-030(a), 00-030(b)-00, and 00-033(a) and part of SWMU 21-021-99] and AOCs 00-010(a,b), 00-027, and 00-029(a,b,c). The soil vapor extraction system continues to operate at Area of Concern (AOC) 00-027. A pulsed mode operation test will be initiated soon to re-evaluate removal rates and to complete the extraction phase of the remediation activities.

Staff provided input to the US Department of Energy (DOE) responses to two sets of comments from the New Mexico Environment Department (NMED) regarding the adequacy of the remediation work on the land transfer tract represented in the voluntary corrective action (VCA) report for Solid Waste Management Units (SWMUs) 00-030(a), 00-030(b)-00, and 00-033(a) and AOCs 00-010(a,b) and 00-029(a,b,c) submitted late in fiscal year (FY) 2003.

NMED responded to DOE's letter on February 20, 2004, regarding the VCA conducted at Subparcel A-8, DP Road South. Staff prepared and transmitted further input on March 17, 2004.

Rendija Canyon Land Transfer Tract. Staff continued to provide detail to DOE regarding the RRES-RS cost and schedule estimates and assumptions for the corrective action at AOC 00-015, the Sportsmen's Club firing range.

2.1.2 TA-19

In support of TA-74 land transfer activities, an accelerated corrective action work plan for former TA-19 was completed and submitted to the NMED this quarter for review and approval. Mobilization and fieldwork are pending work plan approval. The review fee has been paid.

2.1.3 TA-73

SWMU 73-001(a)-99 and SWMU 73-001(b)-99. The interim measures report for the drainage debris removal was completed and submitted to NMED March 1, 2004.

Staff worked on the development of the plan for constructing an appropriate airport landfill cover. The 60% and 90% design reviews were completed.

SWMU 73-002-99. Preparations are under way to resume the remedial action at SWMU 73-002-99, miscellaneous structures at the airport.

2.1.4 Facility Integration Activities

Land transfer, private property, Los Alamos community development, and other non-DOE property-related issues were addressed this quarter.

2.2 Industrial Sites — Project Team Leader: Gabriela Lopez Escobedo

2.2.1 TA-03

SWMU 03-010(a). The second quarter of ongoing water-level monitoring within MW-1 at SWMU 03-010(a) was conducted according to a response to a request for supplemental information for the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) report addendum for SWMU 03-010(a). This work is being conducted to determine the relationship between precipitation and the water level in the monitoring well.

Background Pressure Transducer and Datalogger Information. The depth to water from the top of the casing in MW-1 at SWMU 03-010(a) has ranged from 20 to 26 ft since completion in 1994. In an effort to better understand the shallow groundwater, the groundwater investigation work plan for SWMU 03-010(a) (LANL 2003, 81599) specified in Section 6.0 that the depth of water in MW-1 would be monitored by a pressure transducer for the duration of investigation activities. The data collected from this instrument will be used to correlate groundwater levels with precipitation events, melt events, improved stormwater drainage from the surface of the site, or any other contributing sources of water input into the system.

The pressure transducer chosen for this application was an In-Situ miniTroll Professional with an internal datalogger. The pressure transducer measures temperature to an accuracy of $\pm$ 0.25 °C and pressure to an accuracy of $\pm$ 0.1%. The transducer compensates for atmospheric pressure variability related to

altitude, latitude, and weather. The probe is connected to the surface by a cable, which along with the communications cable and atmospheric pressure vent, is coated with Teflon. A preliminary test of the pressure transducer in MW-1 was conducted from December 18–30, 2003, and reported last quarter. Only 0.03 in. precipitation fell during the December test period. The precipitation had no effect (as measured on a 12-hr interval) on the water level in MW-1.

2004 Installation for Investigation. The pressure transducer was programmed and installed on December 31, 2003, for long-term data collection. The transducer was programmed to record temperature and pressure at 6-hr intervals beginning at 6:00 a.m. on January 1, 2004. After the transducer was set at a depth of 26.67 ft, the vault was sealed. The worn rubber gasket on the vault was replaced with a bead of silicon rubber sealant to help prevent stormwater from infiltrating directly from the surface into the well casing.

Data Download, February 2004. Data were downloaded from the pressure transducer on February 19, 2004, at which time the transducer was removed from the well and inspected for damage and corrosion. The data retrieved from the pressure transducer from December 31, 2003, to February 19, 2004, are presented in Table A-1 of Appendix A. After the data download, the transducer was reprogrammed to collect data on 1-hr intervals to further investigate the water-level response in MW-1 to precipitation events.

Data Download, March 2004. The pressure transducer data were downloaded again on March 25, 2004, so that 1-hr interval data could be presented in the monitoring report for this quarter. The data retrieved from the pressure transducer from February 20, 2004, to March 25, 2004, are presented in Table A-2 of Appendix A. The transducer is currently programmed to collect data on 1-hr intervals.

Data Summary and Interpretation. The pressure transducer collected temperature and pressure data at 6-hr and 1-hr intervals during this quarter. These data are useful in determining the relationship between precipitation and the water level in MW-1. Over the time period that the data were collected, several significant snow events occurred, and these events correlate with an increase of water level in MW-1. Figure 1 provides a comparison of the water level in MW-1 and precipitation from December 18, 2003, to February 4, 2004. Figure 2 shows data from February 20, 2004, to March 25, 2004.

Transducer data indicate that, following precipitation events, the water level in MW-1 increases significantly and rapidly. The water level increased as much as 2 ft in a 6-hr period after a precipitation event totaling 0.05 in. The data show significant water level responses in MW-1 to precipitation events as small as 0.01 in. In addition, the 1-hr-interval data collected in late February and March indicate the water level in MW-1 will increase within an hour from the onset of precipitation.

Following the rapid spikes of water entering MW-1 are periods of slow decline, and during periods of snow-pack freeze and thaw, diurnal fluctuations in the water level show a response to snowmelt. Figure 3 shows maximum and minimum temperature compared with the water-column height in MW-1.

Figure 4 provides a closer examination of water-level responses during two major snowfalls in early February and the following periods of snow-pack freeze and thaw cycles. The data from both storm events indicate that the peak water level in MW-1 occurred 30 hr after the onset of snowfall. Following the peak, the water-level data show a prolonged period of fluctuation that can be attributed to the freeze and thaw of the snow pack, and associated influx of snowmelt into the shallow groundwater system.

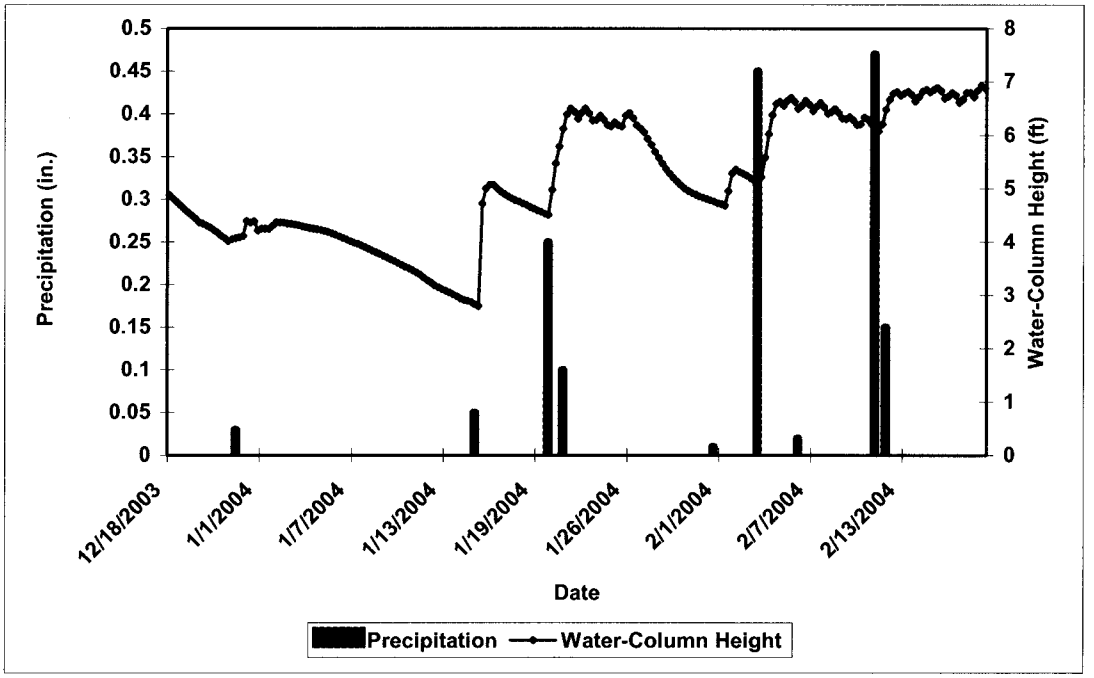

Figure 1. **MW-1 water-column height versus precipitation, December 18, 2004, to February 18, 2004**

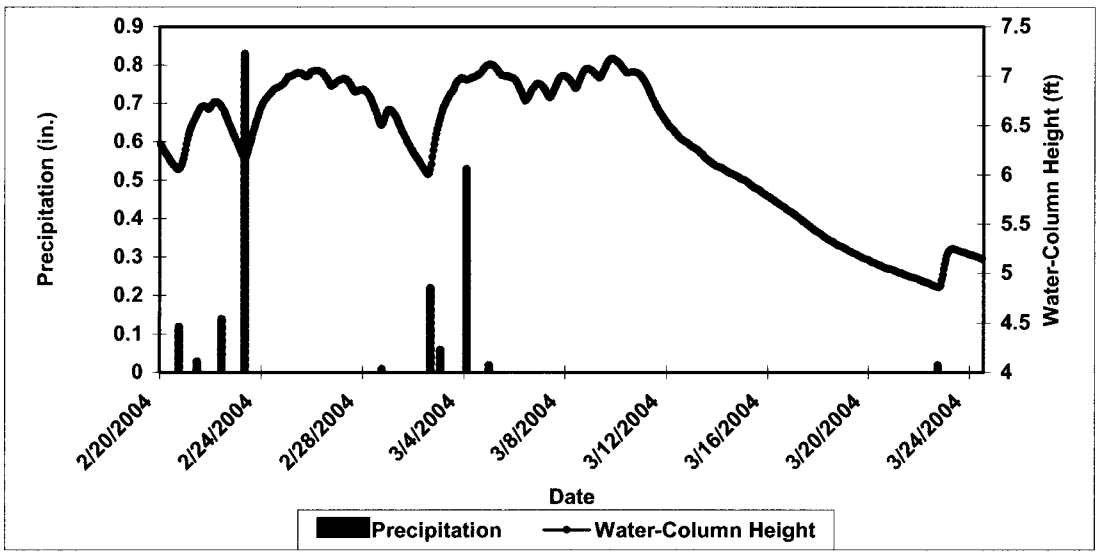

Figure 2. **MW-1 water-column height versus precipitation, February 20, 2004, to March 25, 2004**

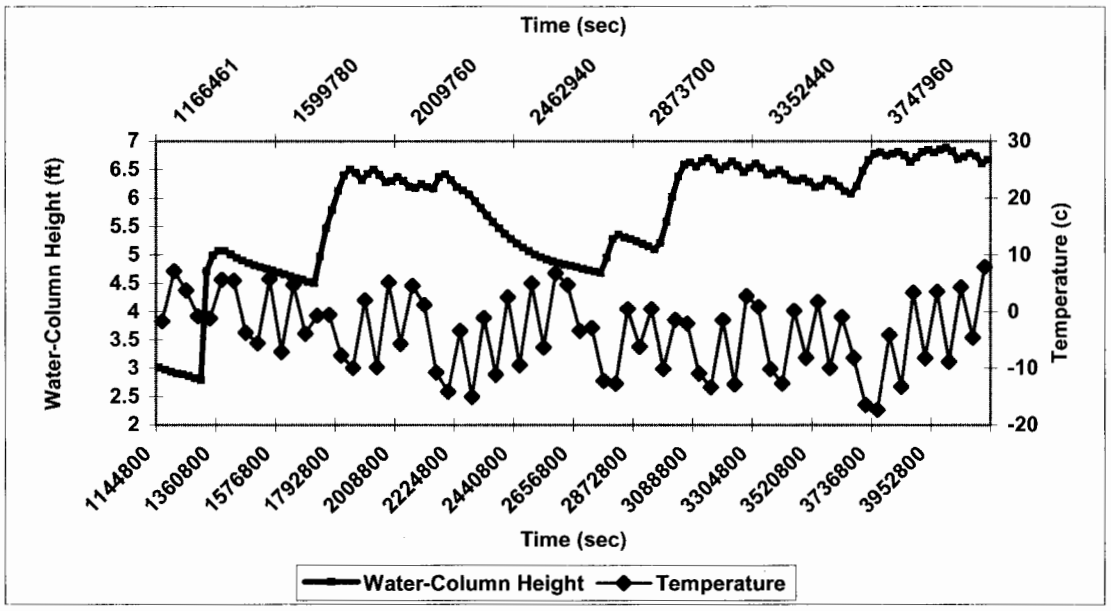

Figure 3. MW-1 water-column height versus temperature

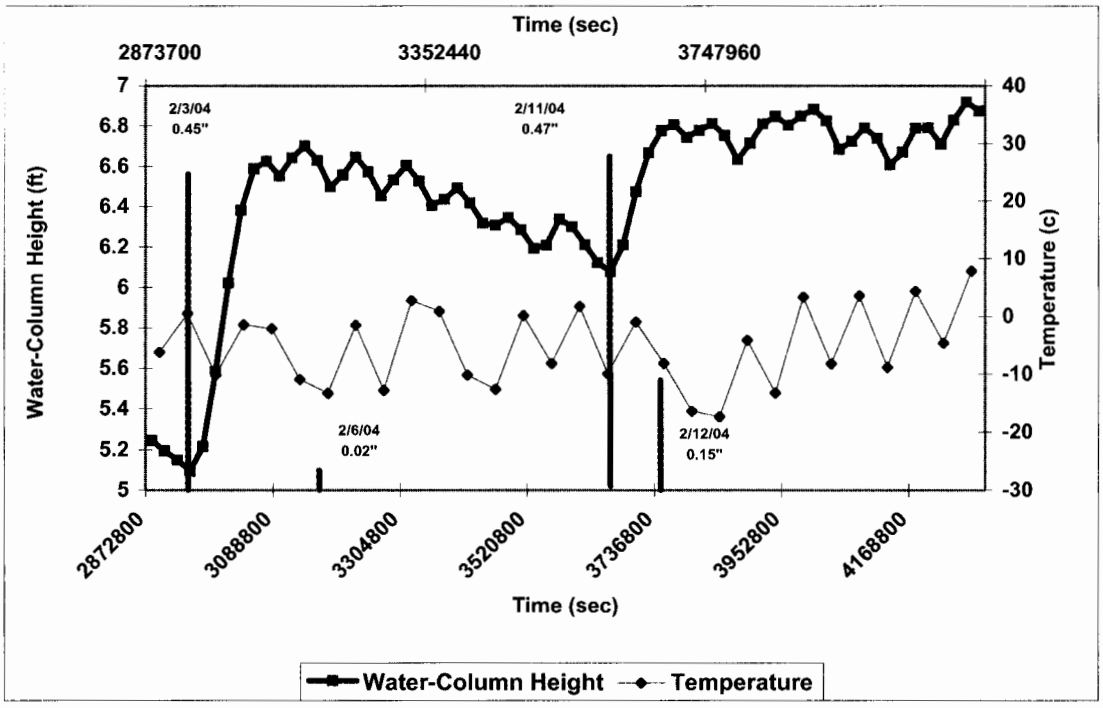

Figure 4. Water-level response to snowfall events

Once the snow has melted and diurnal infiltration does not occur, the water level in MW-1 begins to decline (Figure 2). However, during this quarter, a dry period of sufficient length did not occur for MW-1 to reach equilibrium.

The current information collected from the transducer cannot be used to determine the source of the water entering the well, except to show its relation with precipitation events. The fast response to precipitation, seen in the MW-1 water-level data, indicates that it enters into the shallow groundwater system through a rapid conduit such as stormwater drainlines or infiltration through fractures in tuff. A systematic removal of these conduits through best management practice (BMP) installations, coupled with further monitoring of MW-1, may lead to a better understanding of transport mechanisms producing shallow groundwater beneath Building SM-30.

Next quarter's work, as proposed in the investigation work plan for this site, will entail replacing the MW-1 well head, cleaning out the north drainage ditch area, and video-logging the south culvert and roof drains.

2.2.2 TA-35

Supplement to the Sampling and Analysis Plan for Middle Mortandad and Ten Site Aggregate. The addendum to the Middle Mortandad/Ten Site Aggregate sampling and analysis plan (SAP) was completed this quarter and delivered to NMED on March 31, 2004. This document describes the sampling and analysis work proposed for the remainder of the SWMUs and AOCs from TAs-04, -05, -52, -60, and -63 in the Middle Mortandad/Ten Site Aggregate of the Mortandad Watershed.

2.2.3 TA-53

SWMU 53-002(a)-99, Northern and Southern Surface Impoundments. The investigation and remediation report for SWMU 53-002(a)-99 and AOC 53-008 (LANL 2004, 85221) was delivered to NMED on January 30, 2004.

2.2.4 Facility Integration Activities

During the second quarter of FY2004, Industrial Sites Team members responded to approximately 139 requests for excavation permits, permit and requirement identification (PR-ID) questionnaires, and facility inquiries about new construction projects. In addition, the team worked with facility managers (by attending meetings, conducting field visits, and providing information) on ongoing projects and planned construction projects collocated with SWMUs and AOCs. See Section 2.13 for more details.

2.3 High Explosives Production Sites and MDA P Closure — Project Team Leaders: Don Hickmott and Bill Criswell

2.3.1 TA-16-260 Outfall Corrective Action

The TA-16-260 Outfall Corrective Action Team continued fieldwork, data analysis, and notice of deficiency (NOD) response activities in support of the corrective measures study (CMS) at SWMU 16-021(c)-99 (the 260 outfall). Hydrogeology studies and high-performance team activities continued.

2.3.1.1 TA-16 CMS Hydrogeology and Monitoring

The field team continued to monitor water levels in the Cañon de Valle alluvial wells and in the intermediate-depth wells. The hydrologic system in that canyon remained dry through much of the reporting period, although the system became wet in March because of spring snowmelt. Cañon de Valle surface water was present between Burning Ground Spring and Material Disposal Area (MDA) P during most of the reporting period; however, flow extended downstream in late March. Four of the five alluvial wells in Cañon de Valle contained water during most of this quarter; the uppermost well was dry until March, when it also became wet. The farthest downgradient of the three alluvial wells in Martin Spring Canyon also contained water during the reporting period. The second alluvial well in Martin Spring Canyon became wet in March; however, none of the intermediate-depth boreholes contained water throughout the quarter. Martin Spring and SWSC Spring remained dry until March, when Martin Spring began flowing again. The Cañon de Valle headwaters were saturated, and a small, new spring continued to flow in the headwaters region.

Deep well CdV-R-15-3 was sampled during January. Quarterly sampling in the Cañon de Valle alluvial system was begun in late March.

Drilling and evaluation of three intermediate-depth boreholes were continued. The first well, CdV-16-1(i), was drilled in Cañon de Valle west of the TA-16 Burning Ground. It was drilled to a total depth of approximately 683 ft and was completed as a single-screen well, with the screen located at a depth of approximately 630 ft. Hydrologic tests were performed at this well in March. The second well, CdV-16-2(i), was drilled east of the TA-16 Burning Ground to a total depth of 1063 ft. It was completed as a two-screen well, with the screens located at approximately 860 and 1000 ft. This well became dry in January 2004. The third well, CdV-16-3(i), was drilled southeast of TA-16-340 to a depth of approximately 1400 ft. No water was observed in this well during drilling; therefore, it has not been completed as a well. Water-level measurements in CdV-16-2(i) suggest that little water is being produced in the borehole, whereas similar measurements in CdV-16-3(i) suggest that water is present, but that infiltration is extremely slow. Low levels of high explosives were detected in the initial laboratory samples from the first two of these boreholes.

Stable isotope samples were collected during precipitation events.

An NOD for the Phase III RFI report for SWMU 16-021(c)-99 was received in late December 2003. A response to this NOD was submitted to NMED in late January 2004.

2.3.1.2 SWMU 16-021(c)-99 CMS

The CMS report for SWMU 16-021(c)-99 was submitted to NMED on November 26, 2003. There was no new activity related to this report during this quarter.

2.3.1.3 Surface Water

BMPs at TA-16 were inspected and maintained.

2.3.2 TA-16-340 Complex

The investigation work plan for the TA-16-340 Complex was submitted to NMED on March 31, 2004. This work plan describes cleanup activities, which will be coordinated with decontamination and

decommissioning (D&D) activities at the TA-16-340 Complex, and Phase II characterization activities for soils, tuff, and alluvial groundwater associated with SWMUs at the TA-16-340 Complex.

2.3.3 MDA P Closure

The MDA P and Flash Pad 387 closure certification report was submitted to NMED October 31, 2003. The VCA report for SWMU 16-016(c)-99 (Flash Pad 386, a barium nitrate pile, and a septic system) was submitted to NMED November 26, 2003. There was no new activity related to this report during this quarter.

2.4 Canyon Investigations — Project Team Leader: Kent Rich

2.4.1 Los Alamos and Pueblo Canyons

Work continues on the Los Alamos and Pueblo Canyons investigation report, which will present the assessment and evaluation of all Canyons Team investigations conducted to date in the Los Alamos Canyon and Pueblo Canyon watersheds. Other data relevant to a watershed-scale assessment of contamination will also be evaluated. The primary objective of the report, currently planned for submittal to the NMED in April 2004, will be to assess potential human health and ecological risk associated with current and estimated future contamination in sediment, surface water, and alluvial groundwater in the watershed.

2.4.2 Mortandad Canyon

Following the Laboratory's response to the NOD for the groundwater work plan for Mortandad Canyon (LANL 2003, 79557), a revised groundwater work plan was prepared and submitted to NMED on January 16, 2004 (LANL 2004, 82613). The NMED approved the work plan on February 11, 2004.

2.4.2.1 Sediment Investigation

No fieldwork occurred in the Mortandad Canyon sediment investigation in the second quarter; however, safety plans and waste management plans were finalized in preparation for fieldwork and sediment sampling in the third quarter. Fieldwork is currently planned to be resumed in April 2004, with sample collection in May 2004.

2.4.2.2 Surface & Alluvial Groundwater Investigation

In accordance with the approved Mortandad Canyon groundwater work plan (LANL 2004, 82613), planning for installation of alluvial groundwater monitoring wells has begun. Planning activities include procurement of drilling contractors, staking well and borehole locations, obtaining permits, and completing safety and waste management plans. Drilling is planned to begin in early June. Surface water sampling sites have been selected and are discussed in the approved groundwater work plan.

2.4.2.3 Regional Groundwater Investigation

A constant-rate pumping test in the regional aquifer was performed in the deep borehole at R-1, in Mortandad Canyon west of TW-8, from January 15–19, 2004. Farther down-canyon, at R-28, well development of the single screen in the regional aquifer was completed on January 13, and a water sample was collected from the completed well. Hydrologic testing was completed at R-28 from January 23 to February 4, 2004, using constant-rate pumping as at R-1. The screen in R-1 is located in pumiceous

sediments below Puye fanglomerates; the screen in R-28 spans the contact between these two units. Hydrologic testing within these strata will supplement the information obtained from similar tests at R-15 and R-13 to improve flow and transport models in these widespread hydrogeologic units.

The groundwater sample collected at R-28 during well development contained tritium at 114.3 pCi/L, nitrate (as nitrogen) at 7.2 ppm, and chromium at 0.27 ppm; results for low-level perchlorate are pending. For R-1, all analyses showed contaminants below detection limits, including tritium.

The locations for drill holes planned as part of the Mortandad Canyon groundwater work plan (LANL 2004, 82613) were flagged and located by a global positioning system survey. Environmental and archaeological concerns for the drill sites will be addressed based on these locations.

2.4.2.4 Direct Current Resistivity Investigation

A report describing the direct current resistivity survey results in upper Mortandad Canyon was completed by Geophex Ltd. and finalized in March 2004. The longitudinal profile along the canyon, from the junction with Effluent Canyon east to drill hole MCWB-4, indicates a transition from lower-conductivity to higher-conductivity bedrock beginning at approximately 1629640 easting (North American Datum 1983 coordinates). This transition occurs at a location along Mortandad Canyon north of drill hole R-14 in Ten Site Canyon. The effective depth of the survey is approximately 150 ft; the affected geologic units include alluvium, subunits of the lower Tshirege Member of the Bandelier Tuff, the Cerro Toledo interval, and the upper Otowi Member of the Bandelier Tuff. Farther to the west, from approximately 1628000 to 1628400 easting, vertical conductivity structures extend through the deepest extent of the profile. Similar vertical conductivity features are indicated even farther to the west at the confluence of Effluent and Mortandad Canyons. Drilling planned for the Mortandad Canyon groundwater work plan may address the conductivity feature near Effluent Canyon, but the other conductivity features along this profile occur in canyon segments too narrow for drilling. Analysis of data to be obtained elsewhere in Mortandad Canyon from resistivity (RES-series), alluvial and characterization boreholes, and 3D stratigraphic modeling will be available to aid in evaluating the direct current resistivity results.

2.5 Deep Groundwater Wells — Project Team Leader: John McCann

The boring for intermediate monitoring well CdV-16-3(i) was drilled at TA-16 to a depth of 1405 ft. It penetrated the Tshirege Member of the Bandelier Tuff, the Cerro Toledo interval, the Otowi Member of the Bandelier Tuff, the Guaje Pumice Bed, the Puye Formation, and the Tschicoma Lavas. Groundwater was not encountered during drilling. As a result, no monitoring well was installed; however, a temporary protective surface cap was installed for security purposes. The Laboratory's Water Quality and Hydrology Group (RRES-WQH) implemented a bimonthly water-level measurement schedule to determine if groundwater may be present. Measurements will also be collected at CdV-16-2(i), where a well was installed during the last quarter of 2003, but the well was bailed dry during development.

Rehabilitation efforts at well R-11 continued during late January and early February and again during late February and early March. Attempts to retrieve the submersible pump lost at the conclusion of hydro-testing failed in late January and resulted in separating the well casing at a depth of 755 ft to 765 ft. The goal of the second attempt in late February was to remove the stainless steel well casing, ream the borehole to the original hole diameter, and reinstall new well materials. The second effort resulted in removing the upper 150 ft of well casing. Drilling and technical problems prevented further progress in rehabilitation of the well. A temporary plate has been welded to the top of the conductor casing. It is anticipated that additional rehabilitation efforts will commence in late spring or early summer to reinstall a fully functioning monitoring well.

Constant-rate pumping tests were conducted at wells R-1, R-2, R-4, R-26, R-28, and CdV-16-1(i) as part of the hydro-testing task. In addition, the subcontractor submitted well completion reports for wells R-2, R-4, and R-11 to the DOE.

Regional observational wells R-5, R-8, R-14, R-16, R-20, R-21, R-23, R-31, and R-32 were sampled in February and March by RRES-WQH field teams. Sampling from the perched groundwater zones was attempted at R-5. Data from these wells are not yet complete and will be available in the next quarter.

2.6 TA-21 Material Disposal Areas — Project Team Leader: Ron Rager

SWMU 21-014 (MDA A) General's Tanks. Because the General's Tanks contain radionuclide inventories that exceed the thresholds in DOE STD 1027, "Hazards Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports," safety-basis documentation is being prepared in compliance with 10 CFR 830 Subpart B, "Nuclear Safety Management—Safety Basis Requirements." The tanks have been categorized as containing Hazard Category 2 nuclear facility inventories; hence, a documented safety analysis (DSA) must be prepared and approved by DOE/National Nuclear Security Administration (NNSA). The compilation and review of the safety analysis are being coordinated with the Laboratory's Safety Basis Office. The schedule for the plan is delayed.

SWMU 21-014 (MDA A), SWMU 21-015 (MDA B), SWMU 21-016(a)-99 (MDA T), and SWMU 21-018(a)-99 (MDA V). Development of an investigation work plan has begun for MDA A and MDA U. An investigation work plan is being developed for MDA B that proposes to characterize the waste within the MDA and sample bedrock immediately below the trenches. The investigation gathers needed information for decision making regarding the future disposition of the MDA. An investigation work plan for MDA T was submitted to NMED on February 29, 2004. An investigation work plan for MDA V is being developed incorporating a removal action for the existing facility along with the investigation of nature and extent of subsurface contamination.

All of these MDAs have undergone categorization in accordance with 10 CFR 830. Based on the categorization, MDAs A and T are Hazard Category 2 nuclear facilities, MDA B is a Hazard Category 3 nuclear facility, MDA V is below Hazard Category 3 and is considered a radiological site, and MDA U is categorized as not a radiological site. At the Hazard Category 2 and 3 MDAs, all field activities will require a DSA if the operations will intrude on the facility boundary. Compilation of DSAs for the work activities at MDA B and General's Tanks at MDA A has begun. The investigation for MDA T, currently planned to begin in the third quarter of FY2004, will not penetrate the area designated as a Hazard Category 2 nuclear facility and therefore will be included in the general environmental investigation DSA currently being developed. The ongoing parallel effort to complete the investigation work plans for the MDAs with the safety basis analyses will ensure that safety requirements are incorporated into the plans.

2.7 TA-21 Non-Material Disposal Areas — Project Team Leaders: Mark Thacker and Becky Coel-Roback

SWMU 21-011(k), VCM Activities. The voluntary corrective measure (VCM) report documenting field activities at the SWMU 21-011(k) outfall was submitted to NMED at the end of October. The VCM was successful in removing low-level radioactively contaminated soil, sediment, and tuff, and confirmation samples show the site meets the trail-user risk-based scenario.

SWMU 21-013(d)-99, VCA Activities. An NOD was received on the VCA completion report for the SWMU 21-013(d)-99 surface disposal areas. A response to the NOD is being drafted and will be submitted to NMED on April 8, 2004.

SWMU 21-018(a)-99, NTISV Hot Demonstration at MDA V. To date, no comments have been received on the interim measure completion report for the nontraditional in situ vitrification (NTISV) hot demonstration project at MDA V. The report was submitted to NMED on September 30, 2003.

SWMU 21-024(f) and AOCs 21-030 and C-21-015 VCA Activities. To date, no comments have been received on the VCA completion report for SWMU 21-024(f) (a septic system) and AOCs 21-030 and C-21-015 (a sump and footprint of former Building 21-45, respectively). The report was submitted to NMED on September 30, 2003.

SWMU 21-029, DP Tank Farm. The quarterly site inspection at the two hydrocarbon seep areas in DP Canyon was conducted at the end of March. The inspection report for the second quarter of FY2004 is included as Appendix B of this document. A letter requesting that DP Canyon quarterly inspections cease was submitted to NMED in May 2003. Quarterly inspections will continue until RRES-RS receives concurrence from NMED.

TA-21 Combined Plans. An accelerated corrective action work plan is being developed for numerous outfalls and associated seepage pits, septic systems, and drainage systems that will be removed at TA-21. Work is continuing on the DP Site Area Aggregate investigation work plan for multiple SWMUs and AOCs that require additional investigation of the nature and extent of contamination. The plan will be delivered to NMED on or before August 30, 2004.

2.8 TA-49, TA-50, and TA-54 — Project Team Leaders: John Hopkins and Dwain Farley

2.8.1 TA-49

SWMU 49-001(a)-00, MDA AB, Areas 2, 2A, and 2B. Moisture monitoring continued at this site during the second quarter of FY2004. In accordance with the NMED letter of April 4, 2003 (NMED 2003, 76023), the moisture-monitoring frequency was reduced to bi-monthly for the neutron-based measurements. The continuous measurements using the time domain reflectometry (TDR) probes remain unchanged.

Neutron moisture measurements were performed this quarter. TDR measurements and precipitation quantities were recorded twice a day to a Campbell Scientific datalogger during the quarter. The TDR data, a discussion of moisture trends over time, and a discussion of the relationship between precipitation and moisture content are included in Appendix C.

Erosion-control BMPs were inspected following precipitation events and remain in good condition.

2.8.2 TA-50

SWMUs 50-004(c) and 50-011(a). No activities occurred at these SWMUs this quarter. The Laboratory received authorization basis approval for the pumphouse project, and the third round of sampling is anticipated during the third quarter of FY2004.

MDA C. Responses to NMED comments on Revision 1 of the investigation work plan and historical investigation report for MDA C were submitted to NMED in January 2004.

2.8.3 TA-54

MDA G. The investigation work plan and historical investigation report for MDA G were submitted to NMED September 30, 2003.

A conceptual design was completed for phased construction of the Area G cover. The 1999 baseline cost estimate for the 65-acre cover will be updated in the third quarter based on a revised conceptual design.

MDA H. The environmental assessment for MDA H was completed and a public meeting will be held in April 2004. Historical cost information on Laboratory remediation projects was submitted to NMED.

MDA L. Revision 1 of the investigation work plan and historical investigation report for MDA L were submitted to NMED December 23, 2003.

A draft report was completed on multiple drum failure simulations, which examines the probable effects of 55-gal. drums of trichloroethane failing in the subsurface and creating a sudden impulse of volatile organic compounds. The model will be used to evaluate long-term monitoring requirements and vapor extraction systems.

Pore-Gas Monitoring. The quarterly pore-gas monitoring at MDA G and MDA L was completed as required by Module VIII of the Laboratory's Hazardous Waste Facility Permit. The field-screening information and final analytical data for the first quarter of FY2004 is presented in Appendix D of this report.

2.9 Corrective Action Strategy — Project Team Leader: Richard Mirenda

2.9.1 Science-Based Monitoring Stewardship

Progress made on the three elements included in the science-based monitoring stewardship task is summarized below.

2.9.1.1 Risk-Based Vision Development and Maintenance

Team members participated in conference calls with the DOE Headquarters review team to resolve comments on the draft risk-based end-state vision document and completed interim DOE-Headquarters milestones. The team leader began responding formally to public comments received on the draft vision document, which was distributed for public review during the first quarter of FY2004. Team members worked with project team leaders to complete the hazard-specific maps, conceptual exposure models, and current risk status for potential release site (PRS) aggregates using the RCRA Human Health environmental indicator worksheets. Team members began the design of a web site as a public resource for risk-based corrective action information, using the Presidential/Congressional Committee's framework for risk assessment and risk management as a point of departure to other non-Laboratory references.

2.9.1.2 Long-Term Environmental Stewardship Transition Planning

The task leader participated in RRES Emergency Management System (EMS) planning and implementation meetings and land transfer meetings. The task leader developed the facility integration

process, featuring a worksheet for documenting interviews with NNSA facility managers to formally address integration and transition issues to clarifying "active" PRS ownership, and conducted interviews with TA-50 facility management personnel.

RRES-RS staff members continue to incorporate peer review comments on a document addressing the technical strategy for long-term environmental stewardship at the Laboratory.

2.9.1.3 Science-Based Risk Reduction

The Groundwater Modeling and Decision Analysis Team members met weekly. From those meetings, the team developed several approaches for US Environmental Protection Agency (EPA) "Risk Assessment Guidance for Superfund, Volume 3 Part A: Process for Conducting Probabilistic Risk Assessment" (RAGS3) (EPA 1999, 67598) Tier 1 groundwater pathway risk assessments for MDAs H and C, including alternative fracture versus matrix flow algorithms based on interflow trench data and fracture-mapping data. In addition, the team coordinated the planning of Los Alamos/Pueblo EPA RAGS3 Tier 1 groundwater pathway risk assessment with the Los Alamos and Pueblo Canyon investigation report team. The team developed a methodology for weighting stochastic groundwater plume calculations calculated for the EPA RAGS3 Tier 3 groundwater pathway risk assessment for perchlorate, nitrate, and tritium, based on relative correlation with new groundwater data.

2.9.2 Data Quality

Data quality activities for the second quarter of FY2004 include the following:

- Provided comments on the draft standard operating procedure (SOP) for collecting and submitting x-y coordinates for sampling locations.
- Developed and provided a template for upload of locations and coordinate information.
- Continued soliciting (from team leaders) the missing x-y coordinates for sample data.
- Began reviewing procedures assigned to the team to determine if updates are required or if procedures are missing.
- Began a pilot study to review previously submitted RFI reports against the ER database (ERDB) to evaluate completeness and accuracy of data sets in the ERDB. This is necessary because the data have been migrated from Oracle to SQL Server, and the number and types of fields maintained has changed over the years.

In addition, the data stewardship team continued to design and improve the external database web page to provide administrative authorities and other stakeholders real-time access to data.

2.9.3 Peer Review Team

Team members coordinated and participated in peer reviews for RRES-RS documents this quarter, as needed.

2.9.4 Data Validation

Data verifiers and validators completed the verification and validation of 68 request suite combinations during the quarter. Data validators remained current with incoming data packages. The process consists of validating external laboratory data packages, based on the EPA's National Functional Guidelines. Data

validators also assisted with the assignment and review of reporting qualifiers and reason codes for preparation of data sets as well as addressing duplicate sample analytes in the ERDB.

Data verifiers created 68 electronic data deliverables for MDA P Phase I data. These electronic deliverables were verified and validated through the verification/validation module. Team members developed a quality procedure (QP), LANL-ER-QP-5.13, R0, for the analytical data verification/validation process.

2.9.5 Data Stewardship

2.9.5.1 Integrated Information Management System Support

The Data Stewardship Team continued to work with the Information Management Team to design and implement the Integrated Information Management System. The system consists, in part, of software tools intended to ensure consistency and accuracy in data and information management and to allow tracking and traceability of environmental data. In this quarter, the Data Stewardship Team continued to provide technical support for the development and implementation of the Sample Tracking Application; Verification and Validation Application; and the Spatial Mapping, Analysis, and Reporting Tool (SMART) Application.

2.9.5.2 Data Stewardship and Reporting

The Data Stewardship Team continued to deliver quality data sets to meet RRES-RS future needs. The team continued to make progress with the cleanup of legacy data. Data stewards also continued optimizing the data process.

Data Set Preparation. Team members prepared and delivered 18 electronic data sets for RRES-RS data users and RRES Division requests. In addition, 12 new sampling events were documented, and the required field paperwork for 263 samples was generated.

Data Management and Legacy Data Cleanup. Data management and legacy data cleanup activities continued this quarter. Data stewards generated the tables for the locations that do not have x-y coordinates in ERDB and distributed the tables to the responsible project team leaders so the missing coordinates can be added. The data stewards continued work on other types of global data cleanup, such as the removal of duplicate records in the ERDB, before use with the new SMART software. A field data information review of 7226 sample records was performed using LANL-ER Desk Instruction (DI) 4.26, "Legacy Field Data Review Process," and the new field data quality assurance screen in the Sample Management Office (SMO) application. In addition to the legacy records reviewed, 7 new sample events were moved to "field complete," indicating that all 265 samples in the events had been accounted for and reviewed per LANL-ER-DI-4.26. Data stewards also uploaded and/or updated x-y coordinates for 67 legacy sampling locations and updated sample to location assignments for 60 legacy samples.

2.9.6 Risk Assessment

Personnel from the Human Health and Ecological Risk Assessment Teams participated in the peer reviews for the MDA T investigation work plan, addendum to the Middle Mortandad and Ten Site Aggregate SAP, the investigation work plan for TA-16-340 (Fishladder Seep), and the Los Alamos and Pueblo Canyons investigation report.

2.9.6.1 Human Health Risk

Human health risk team activities for the second quarter include the following:

- provided support to the Los Alamos and Pueblo Canyons watershed investigation report team regarding human health and data quality issues,
- reviewed the NMED's revision to their technical background document for development of soil screening levels,
- began revision of the standard human health risk assessment scenario document for RRES-RS project,
- reviewed the site conceptual model document from Risk Assessment Corporation, and
- provided a human health risk assessment for the airport drainages to DOE as part of an interim measures report.

2.9.6.2 Ecological Risk

Ecological risk team activities for the second quarter include the following:

- provided a letter with corrections to the Ecorisk Database, Version 2.0 (LANL 2003, 80117), to users of the database;
- participated in discussions on ecological risk assessment with Risk Assessment Corporation;
- supported and reviewed the ecological risk assessment portion of the Los Alamos and Pueblo Canyons investigation report;
- conducted and provided a screening ecological risk assessment to DOE for the airport drainages as part of an interim measures report; and
- conducted a final review, and edit of the ecological preliminary remediation goals document.

2.9.6.3 Ecological Risk Database

Team members continued to conduct literature searches for primary inhalation toxicity references for volatile organic compounds in mammals. Literature searches were also done for chromium, arsenic, polycyclic aromatic hydrocarbons, and high explosives. Team members reviewed studies on volatile organic compounds and inhalation exposure to develop toxicity reference values (TRVs) for inhalation ecological screening levels (ESLs).

Work continued on the tiered TRV development process for the database. Team members compiled a detailed appendix addressing the primary toxicity study evaluation, in preparation for writing the document on tiered TRV development methods. The team leader also assisted ecological risk team members in compiling information from the database for reports.

The final version of the Ecorisk Database, Version 2.0, on CD-ROM was distributed to internal and external users. Team members updated the Ecorisk database EPA ecological soil screening level (EcoSSL) Tier 1 TRVs and associated ESLs based on updates to the EPA EcoSSL values. Team members also prepared and distributed the memo, "Revisions to Ecorisk Database Version 2.0, Data–TRVs and ESLs" (February 11, 2004).

2.9.7 Native American Risk

In the second quarter, the team discussed and planned training and sampling events with Department of Environmental and Cultural Preservation personnel at San Ildefonso Pueblo. The update of the Appendix A memorandum of understanding on environmental sampling for 2004 was also discussed with San Ildefonso department personnel.

2.10 Regulatory Compliance — Project Team Leader: Phillip Noll

No monthly meetings were held with NMED this quarter.

Personnel conducted peer and technical reviews of the following documents this quarter:

- final draft of the MDA H environmental assessment;
- draft Laboratory Implementation Requirement 404-00-05.3, "Radioactive Waste Management";
- revision 1 of the Mortandad Canyon groundwater work plan;
- MDA T investigation work plan [SWMU 21-016(a)-99];
- investigation work plan for the TA-16-340 Complex;
- addendum to the SAP for the Middle Mortandad/Ten Site Aggregate;
- Los Alamos and Pueblo Canyons investigation report;
- accelerated corrective action work plan for the East Gate Laboratory at TA-19; and
- investigation and remediation report for SWMU 53-002(a)-99 (inactive waste impoundments) and AOC 53-008 (storage area).

Other document review activities included completing reviews of waste characterization strategy forms for planned field activities; revising LANL-ER-QP-5.8 and LANL-ER-QP-5.9 dealing with discovery of new SWMUs and AOCs and new releases from SWMUs, respectively; performing regulatory reviews of the following chapters of the SWMU report: TAs-1, -5, -6, -8, -9, -14, -15, -23, -36, -60, and -61; contributing to the integrated work document being developed for geodetic surveying tasks at the TA-19 accelerated corrective action; and continuing to work on the SOP for coordinating and evaluating geodetic surveys.

2.10.1 Waste Management and Waste Minimization

Waste characterization and management activities (data reduction, compilation and assessment, report preparation, and waste profiling and containerization) continued for borehole core archived at the Field Support Facility. Staff also prepared for the management and disposal of approximately 2 yd^3 of soil to be removed during the planned accelerated corrective action at SWMU 19-001-99.

2.10.2 Stakeholder Involvement

2.10.2.1 Outreach Activities

Communications continue with the Northern New Mexico Citizen's Advisory Board on several environmental issues. Staff attended waste management, environmental monitoring, and environmental restoration subcommittee meetings this quarter.

Staff planned and implemented all logistics for the public meeting regarding the DOE risk-based end-state vision document on Wednesday, January 7, 2004. The vision document describes a process of ensuring protection of human health and the environment for planned land use; encourages public involvement; ensures that environmental protection extends beyond DOE Office of Environmental Management completion; and defines cleanup goals (necessary for planning and budget). Staff advertised the public meeting in local newspapers and created a mailer that was distributed to more than 900 citizens in northern New Mexico. Staff also coordinated the production of three poster presentations. More than 75 people attended the meeting.

Communications staff also accomplished the following activities this quarter:

- completed the MDA H focus group initiative and received the final report in February 2004;
- assisted Groundwater Protection Program personnel in preparing for a groundwater workshop held in early March 2004;
- prepared briefing materials for the RRES-RS Deputy Project Director to brief John Lehman of DOE/NNSA and Jonathan Epstein of Laboratory management;
- attended the Laboratory's Trails Committee meeting to discuss trail use at the Laboratory;
- attended the Los Alamos Historical Document Retrieval and Assessment Project public meeting sponsored by the Centers for Disease Control; and
- responded to 10 public inquiries regarding RRES-RS project activities.

2.10.2.2 Virtual Library/Public Reading Room

Staff continued to work with the Laboratory's information management expert to redesign the existing RRES-RS project web site to provide both internal and external sites. The external site should be completed this summer. Currently, Virtual Library information is accessible only to internal staff because the NNSA decision is still pending regarding what types of documents can be available to the public on the external web pages. Documents may not be accessible in the Virtual Library to external audiences because of the strict guidelines NNSA has set regarding documents on the Internet.

RRES-RS project staff delivered the following documents to the Community Relations Office Public Reading Room: the January and February CMS status reports for SWMU 16-021(c)-99, the 260 outfall; the Phase III RFI report for SWMU 16-021(c)-99; the response to the NOD for the Phase III RFI report for SWMU 16-021(c)-99; and the revision to the NOD response to the Phase IIII RFI report for SWMU 16-021(c)-99.

2.10.3 PRS Deliverable Information Management

2.10.3.1 Compliance Schedule Tracking

Staff continues to track the deliverables due to the various stakeholders on a monthly basis.

2.10.3.2 SWMU Report

The SWMU report remains in the final review process.

2.11 Land Transfer — Project Team Leader (Acting): Terry Rust

Staff members continue to participate as members of the Laboratory's Land Transfer Team and the DOE's Land Transfer Project Office Team by attending regularly scheduled land transfer working group meetings and responding to information requests. These teams are responsible for the activities leading up to the final transfer of Laboratory property.

On January 20, 2004, NMED concurred with DOE supporting conveyance and transfer documentation that all remedial action necessary has been completed on Subparcel A-7, which is located at the airport.

On March 2, 2004, DOE received the electronic copy of a letter from the EPA that indicated that both Subparcels A-7 and A-8 (DP Road South) are suitable for conveyance and transfer. This letter also indicated that EPA believes additional sampling is required at Subparcel A-15 [including SWMU 21-013(d)-99]. More information on the SWMUs and AOCs located on these sub-parcels can be found in Sections 2.1, Townsites, and 2.7, TA-21 Non-Material Disposal Areas.

2.12 Documentation and Tracking — Project Team Leader: Stephen Bolivar

2.12.1 Information Management

The primary focus of Information Management personnel is business process reengineering. This effort focuses on four main activities: rebuilding ERDB (completed); developing a series of applications for the SMO work, which are used to enter the data into the database (completed); developing a SMART Application, which is used to retrieve data from the database; and developing GeoPro, which is an application used to track modeling input and output parameters. Development efforts this quarter focused on completing the first phase of SMART. It was placed on the production server and is now being tested by users. SMART applications are used to produce data for evaluation, in a web-based environment. The Phase I portion of this application allows user-determined data pulls and provides the ability to select and display a sample event in a geographic information system (GIS) format (map), all on a desktop environment. This application, recently used in an Emergency Operations Center wildfire exercise, in conjunction with site experts, provided real-time contaminant information as a wildfire spread across laboratory property. New RRES Division software documentation requirements, including requirements, design, and test documents, were completed and provided with the release.

A follow-up data request submitted by the Risk Assessment Corporation was completed. The latest release primarily updates changes to the database, such as the addition of new samples, and addresses a few clarification issues.

2.12.2 Records Management

Staff added more than 79 new documents to the Records Processing Facility (RPF) database; the RPF now contains more than 234,000 documents available for query. The review and scanning backlog (60 boxes) consists of records that individuals have delivered to the RPF. Most of these documents have been previously captured, but staff must verify there are no uncaptured project records in these containers. Six (10%) of the boxes have been examined. Staff handled 57 walk-in-requests, 211 email requests, 3 phone requests; performed 238 record retrievals; transferred 119 documents to the public-share folder, and provided 121 hard-copy or compact disk copies of requested documents. SMO personnel are scanning more than 10,000 data packages to meet DOE dual-storage requirements. To date, 95% of the legacy documents have been scanned electronically, with completion of all legacy documents scheduled for next quarter. A process improvement was incorporated whereby data

packages, once scanned, are shipped directly to the Laboratory's Information and Records Management Group. Two shipments (80 boxes each) were sent this month.

A total of 324 roles of film are being transferred to electronic media as part of the new scanning process. Deliverables are being received periodically, and the effort is approximately 40% complete. When completed, the scanned historical documents will be available for electronic viewing.

Staff continue to review the steps needed to convert to a Lotus domino.doc software package. RRES Division is requiring this package to establish a formal electronic-records tracking system. The latest effort, which involves establishing a schema for filing project records, will be completed next quarter.

2.12.3 Sample Management Office

The SMO issued 26 field data groups (number of discrete samples) and had 65 customers this quarter. Personnel handled and shipped 1424 containers. These totals are approximately 50% below the five-year average but only 20% below the two-year average. This reduction is the result of budget uncertainties and the corresponding delay in starting new fieldwork. The effort to scan 10,000 SMO legacy analytical data packages is 95% complete and will be completed by next quarter. As part of process improvement, these scanned data packages are being shipped directly to the Laboratory's Information Management Group, reducing the RPF workload. These files, after scanning, become electronically available.

Efforts to move all equipment from the Field Support Facility building are more than 95% complete. Only some shop equipment remains, and staff are working with Laboratory regulators to proceed in a timely and safe manner. The yard and storage areas have been 100% cleared, and the SMO has relocated to the Pueblo Complex, established a new drop point, and are in full production at the new facility.

2.12.4 Computer Support

Computer support personnel received 293 service requests this quarter, and 18 remain open. As part of a 4-year maintenance plan, the last 12 aging computer systems were replaced. The computer support team was asked to transfer from the old service request system to a new tracking system called Remedy. For the last 5 years, 7009 requests were submitted into the old system; of those, only 36 remain open. In March, all computer support staff became CCN-2 personnel, the Laboratory's desktop support group. This move will offer better professional opportunities for staff, and hopefully will reduce program costs. The move is transparent to users; the services remain the same. Several security patches dealing with a recent rash of viruses and vulnerabilities against Microsoft Systems were employed. A new log on each server was added and will help keep track of modifications in case someone needs to trouble-shoot an issue when support staff are not present.

2.12.5 Geographic Information System

Users from 10 unique groups accessed the flat-file repository and/or relational database management system to view spatial data. The RRES-RS GIS teams and Earth and Environmental Sciences Division's Cartographic Laboratory (GISLab) produced 52 map products and/or figures. Thirty maps were created by GISLab; 12 produced by the Laboratory's Office of Environmental Information Management (RRES-OEIM) GIS unit, and 10 by the RRES-RS GIS team. The RRES-OEIM GIS team is a new group being piloted to produce quality products in a timely manner. If successful, and the team has been to date, costs will be reduced and efficiencies will be increased. New feature themes were produced this quarter, including radiological environmental sites, which capture the 254 radiological sites, and a new version of the land-transfer feature class, for survey networks.

2.13 Facility Integration and Site Identification — Project Team Leader: Roy Bohn

Personnel continued to meet with the Laboratory's Infrastructure Projects Group (FWO-IP), D&D, and Program Management (PM) Division staff to provide information, regulatory status, current data and location maps and to recommend various approaches to address numerous issues associated with PRSs located at sites where D&D and construction/land development activities are planned.

RRES-RS Facility Integration staff continued to participate in the development and implementation of the Laboratory's Environmental Management System (EMS) to meet or exceed applicable environmental and natural resource laws and regulations while enhancing cost and mission performance in accordance with DOE Order 450.1, "Environmental Protection Program." This order derives directly from Executive Order 13148 (April 2000), "Greening the Government through Leadership in Environmental Management," requiring all federal agencies to implement an EMS. DOE Order 450.1 also mandates that the EMS be integrated with existing Integrated Safety Management Systems established in accordance with DOE Order 450.4, "Safety Management System Policy," by December 2005. The EMS will establish a single, defined safety and environmental management system that integrates environment, safety and health requirements into the work planning and execution processes to effectively protect site workers, the public, and the environment. RRES-RS Facility Integration personnel participated on several EMS Element Teams consisting of representatives from divisions throughout the Laboratory to document EMS elements already in place at the Laboratory and to develop implementation plans for those EMS elements not yet in place at the Laboratory. Personnel also continued to assist in the development of the Laboratory's EMS web page.

Facility Integration personnel also performed the following activities this quarter:

- Participated in the review of approximately 81 Excavation Permit Requests, 10 PR-IDs, and 14 structure-sitings; 29 field sites visits were conducted as part of these reviews.
- Provided comments on the final review draft of the Laboratory's revised Comprehensive Site Planning LIR 210-01-01, which is intended to be the implementing document for the new PR-ID process (will replace the ESH-ID process).

2.13.1 New Construction at TA-03

RRES-RS personnel attended meetings and site visits with RRES stormwater staff and construction staff at the planned location of a new gas turbine and installation of major utility lines within the boundary of SWMU 03-012(b)-00. Issues discussed included results from samples collected during utility potholing activities in late November and early December 2003 and issues and requirements for working within a SWMU boundary.

RRES-RS Facility Integration personnel continued to support the Perimeter Road Project by meeting with the project leaders for construction of the road and have identified several PRSs that may be impacted by the project.

RRES-RS Facility Integration personnel continued to support construction of the new National Security Sciences Building at TA-03, which will impact several PRSs.

Support continued for the Gateway Parking Structure project planned for construction in the western portion of the former Asphalt Batch Plant site at TA-03. PRS locations and coordinates (where available) were supplied to the Laboratory's PM Division to ensure all proximate PRSs were avoided during planned geotechnical drilling activities and future construction activities.

2.13.2 New Construction at TA-33

RRES-RS Facility Integration personnel continued to meet with FWO-IP and TA-33 management staff to provide information, regulatory status, current data and location maps, and recommended approaches to address numerous issues associated with PRSs located at the planned locations of new security fences, buildings, parking lots, bunker, and utility upgrades.

2.13.3 New Construction at TA-60

RRES-RS Facility Integration staff worked with FWO Division and construction staff on the expansion of an equipment storage area to be located on the northeast corner of structure 60-0178, the salt shed, on Sigma Mesa in close proximity to a portion of SWMU 60-002, a storage area.

2.13.4 D&D at TA-16

Laboratory Environmental Characterization and Remediation Group (RRES-ECR) personnel met with FWO-IP concerning the planned D&D of TA-16-340, the former high explosives processing facility. During the excavation permit review process, RRES-RS found that 12 PRSs might be impacted by D&D activities.

RRES-RS project staff documented activities completed to characterize the petroleum-contaminated soil discovered in an excavation adjacent to Building 16-7, and corresponding analytical results.

2.14 Surface Water Programs and BMPs — Project Team Leader: Steve Veenis

2.14.1 BMP Installation, Inspection, and Maintenance

Staff continued to support the development of integrated work documents for maintenance and repair work at all PRSs, including those within Dynamic Experimentation (DX), FWO, and Nuclear Materials Technology (NMT) Division boundaries. Staff also continued revising the SWMU Stormwater Pollution Prevention Plan appendices.

Quarterly inspections of BMPs began at more than 140 SWMUs, and a review of several AOCs was completed.

Staff also

- met with the RRES-ECR Data Management Team to compile existing soil/sediment data at SWMUs and AOCs under consideration for the Individual Permit application,
- provided GIS map support for sites that require stormwater monitoring,
- worked with the Laboratory's Ecology Group (RRES-ECO) to determine National Environmental Policy Act requirements for the Individual Permit application,
- continued efforts on database redesign that will be used to track progress on sampling, erosion controls, and GIS maps, and
- reviewed 80 AOCs to update the LANL-ER-SOP-2.01 surface water site assessments.

2.14.2 Surface Water Quality

This quarter, staff completed the updated cost estimate related to implementing the Federal Facility Compliance Agreement for FY2004 through FY2007.

Staff continued progress on development of the SWMU Storm Water Pollution Prevention Plan that will provide the detail on methods to monitor stormwater runoff from SWMUs and to control erosion at SWMUs during the transition period between now and the issuance of the Individual Permit for the SWMUs.

Staff continues field preparation for the selection of appropriate sample locations in Los Alamos, Pueblo, Cañada del Buey, and Mortandad Canyons.

3.0 REFERENCES

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NMED (New Mexico Environment Department), April 4, 2003. "Change in Moisture Monitoring Frequency at Technical Area (TA) 49, Material Disposal Area (MDA) AB, Los Alamos National Laboratory (LANL)," NMED memorandum to R. Erickson (DOE-LAAO Area Manager) from J. Young (NMED-HWB Permits Management Program Project Lead), Santa Fe, New Mexico. (NMED 2003, 76023)

Appendix A

Transducer Data from MW-1 at SWMU 03-010(a)
Second Quarter, Fiscal Year 2004

Table A-1
Transducer Data from MW-1, 12/31/03–2/19/04

Date	Time of Day	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
12/31/2003	18:00:00	0	56.63	4.213	22.454	0
1/1/2004	0:00:00	21600	56.63	4.25	22.417	0
1/1/2004	6:00:00	43200	56.63	4.251	22.416	0
1/1/2004	12:00:00	64800	56.63	4.247	22.420	0
1/1/2004	18:00:00	86400	56.63	4.306	22.361	0
1/2/2004	0:00:00	108000	56.63	4.372	22.295	0
1/2/2004	6:00:00	129600	56.63	4.365	22.302	0
1/2/2004	12:00:00	151200	56.63	4.365	22.302	0
1/2/2004	18:00:00	172800	56.63	4.349	22.318	0
1/3/2004	0:00:00	194400	56.65	4.341	22.326	0
1/3/2004	6:00:00	216000	56.65	4.327	22.340	0
1/3/2004	12:00:00	237600	56.65	4.316	22.351	0
1/3/2004	18:00:00	259200	56.65	4.296	22.371	0
1/4/2004	0:00:00	280800	56.65	4.281	22.386	0
1/4/2004	6:00:00	302400	56.65	4.263	22.404	0
1/4/2004	12:00:00	324000	56.65	4.254	22.413	0
1/4/2004	18:00:00	345600	56.65	4.238	22.429	0
1/5/2004	0:00:00	367200	56.65	4.228	22.439	0
1/5/2004	6:00:00	388800	56.65	4.209	22.458	0
1/5/2004	12:00:00	410400	56.65	4.189	22.478	0
1/5/2004	18:00:00	432000	56.65	4.162	22.505	0
1/6/2004	0:00:00	453600	56.65	4.137	22.530	0
1/6/2004	6:00:00	475200	56.65	4.105	22.562	0
1/6/2004	12:00:00	496800	56.65	4.08	22.587	0
1/6/2004	18:00:00	518400	56.67	4.047	22.620	0
1/7/2004	0:00:00	540000	56.67	4.019	22.648	0
1/7/2004	6:00:00	561600	56.67	3.99	22.677	0
1/7/2004	12:00:00	583200	56.67	3.972	22.695	0
1/7/2004	18:00:00	604800	56.67	3.939	22.728	0
1/8/2004	0:00:00	626400	56.67	3.907	22.760	0
1/8/2004	6:00:00	648000	56.67	3.874	22.793	0
1/8/2004	12:00:00	669600	56.67	3.839	22.828	0
1/8/2004	18:00:00	691200	56.67	3.806	22.861	0
1/9/2004	0:00:00	712800	56.67	3.776	22.891	0
1/9/2004	6:00:00	734400	56.7	3.742	22.925	0
1/9/2004	12:00:00	756000	56.7	3.71	22.957	0
1/9/2004	18:00:00	777600	56.7	3.675	22.992	0
1/10/2004	0:00:00	799200	56.7	3.639	23.028	0
1/10/2004	6:00:00	820800	56.7	3.603	23.064	0

Table A-1 (continued)

Date	Time of Day	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
1/10/2004	12:00:00	842400	56.7	3.57	23.097	0
1/10/2004	18:00:00	864000	56.7	3.535	23.132	0
1/11/2004	0:00:00	885600	56.7	3.502	23.165	0
1/11/2004	6:00:00	907200	56.72	3.467	23.200	0
1/11/2004	12:00:00	928800	56.7	3.432	23.235	0
1/11/2004	18:00:00	950400	56.72	3.387	23.280	0
1/12/2004	0:00:00	972000	56.72	3.333	23.334	0
1/12/2004	6:00:00	993600	56.72	3.281	23.386	0
1/12/2004	12:00:00	1015200	56.72	3.237	23.430	0
1/12/2004	18:00:00	1036800	56.72	3.188	23.479	0
1/13/2004	0:00:00	1058400	56.72	3.151	23.516	0
1/13/2004	6:00:00	1080000	56.72	3.115	23.552	0
1/13/2004	12:00:00	1101600	56.72	3.085	23.582	0
1/13/2004	18:00:00	1123200	56.72	3.052	23.615	0
1/14/2004	0:00:00	1144800	56.72	3.018	23.649	0
1/14/2004	6:00:00	1166400	56.74	2.98	23.687	0
1/14/2004	12:00:00	1188000	56.74	2.942	23.725	0
1/14/2004	18:00:00	1209600	56.74	2.91	23.757	0
1/15/2004	0:00:00	1231200	56.74	2.895	23.772	0
1/15/2004	6:00:00	1252800	56.74	2.866	23.801	0
1/15/2004	12:00:00	1274400	56.74	2.827	23.840	0.05
1/15/2004	18:00:00	1296000	56.74	2.796	23.871	0
1/16/2004	0:00:00	1317600	56.74	4.718	21.949	0
1/16/2004	6:00:00	1339200	56.74	4.998	21.669	0
1/16/2004	12:00:00	1360800	56.77	5.072	21.595	0
1/16/2004	18:00:00	1382400	56.77	5.072	21.595	0
1/17/2004	0:00:00	1404000	56.74	5.014	21.653	0
1/17/2004	6:00:00	1425600	56.77	4.949	21.718	0
1/17/2004	12:00:00	1447200	56.77	4.903	21.764	0
1/17/2004	18:00:00	1468800	56.77	4.859	21.808	0
1/18/2004	0:00:00	1490400	56.77	4.82	21.847	0
1/18/2004	6:00:00	1512000	56.77	4.787	21.880	0
1/18/2004	12:00:00	1533600	56.77	4.758	21.909	0
1/18/2004	18:00:00	1555200	56.77	4.726	21.941	0
1/19/2004	0:00:00	1576800	56.77	4.693	21.974	0
1/19/2004	6:00:00	1598400	56.77	4.661	22.006	0
1/19/2004	12:00:00	1620000	56.77	4.629	22.038	0
1/19/2004	18:00:00	1641600	56.77	4.594	22.073	0
1/20/2004	0:00:00	1663200	56.79	4.566	22.101	0
1/20/2004	6:00:00	1684800	56.77	4.53	22.137	0
1/20/2004	12:00:00	1706400	56.79	4.509	22.158	0.25

Table A-1 (continued)

Date	Time of Day	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
1/20/2004	18:00:00	1728000	56.79	4.976	21.691	0
1/21/2004	0:00:00	1749600	56.79	5.473	21.194	0
1/21/2004	6:00:00	1771200	56.79	5.791	20.876	0
1/21/2004	12:00:00	1792800	56.79	6.127	20.540	0.1
1/21/2004	18:00:00	1814400	56.79	6.396	20.271	0
1/22/2004	0:00:00	1836000	56.79	6.504	20.163	0
1/22/2004	6:00:00	1857600	56.79	6.444	20.223	0
1/22/2004	12:00:00	1879200	56.79	6.314	20.353	0
1/22/2004	18:00:00	1900800	56.79	6.424	20.243	0
1/23/2004	0:00:00	1922400	56.79	6.504	20.163	0
1/23/2004	6:00:00	1944000	56.79	6.411	20.256	0
1/23/2004	12:00:00	1965600	56.81	6.28	20.387	0
1/23/2004	18:00:00	1987200	56.81	6.294	20.373	0
1/24/2004	0:00:00	2008800	56.81	6.369	20.298	0
1/24/2004	6:00:00	2030400	56.81	6.299	20.368	0
1/24/2004	12:00:00	2052000	56.79	6.2	20.467	0
1/24/2004	18:00:00	2073600	56.81	6.176	20.491	0
1/25/2004	0:00:00	2095200	56.81	6.244	20.423	0
1/25/2004	6:00:00	2116800	56.81	6.194	20.473	0
1/25/2004	12:00:00	2138400	56.81	6.169	20.498	0
1/25/2004	18:00:00	2160000	56.81	6.371	20.296	0
1/26/2004	0:00:00	2181600	56.81	6.418	20.249	0
1/26/2004	6:00:00	2203200	56.81	6.321	20.346	0
1/26/2004	12:00:00	2224800	56.81	6.191	20.476	0
1/26/2004	18:00:00	2246400	56.81	6.134	20.533	0
1/27/2004	0:00:00	2268000	56.81	6.058	20.609	0
1/27/2004	6:00:00	2289600	56.81	5.94	20.727	0
1/27/2004	12:00:00	2311200	56.81	5.824	20.843	0
1/27/2004	18:00:00	2332800	56.81	5.694	20.973	0
1/28/2004	0:00:00	2354400	56.81	5.579	21.088	0
1/28/2004	6:00:00	2376000	56.81	5.471	21.196	0
1/28/2004	12:00:00	2397600	56.81	5.374	21.293	0
1/28/2004	18:00:00	2419200	56.81	5.283	21.384	0
1/29/2004	0:00:00	2440800	56.81	5.206	21.461	0
1/29/2004	6:00:00	2462400	56.81	5.13	21.537	0
1/29/2004	12:00:00	2484000	56.81	5.068	21.599	0
1/29/2004	18:00:00	2505600	56.81	5.004	21.663	0
1/30/2004	0:00:00	2527200	56.81	4.96	21.707	0
1/30/2004	6:00:00	2548800	56.81	4.92	21.747	0
1/30/2004	12:00:00	2570400	56.81	4.89	21.777	0
1/30/2004	18:00:00	2592000	56.81	4.858	21.809	0

Table A-1 (continued)

Date	Time of Day	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
1/31/2004	0:00:00	2613600	56.81	4.831	21.836	0
1/31/2004	6:00:00	2635200	56.81	4.808	21.859	0
1/31/2004	12:00:00	2656800	56.81	4.787	21.880	0
1/31/2004	18:00:00	2678400	56.81	4.76	21.907	0.01
2/1/2004	0:00:00	2700000	56.83	4.733	21.934	0
2/1/2004	6:00:00	2721600	56.81	4.71	21.957	0
2/1/2004	12:00:00	2743200	56.81	4.683	21.984	0
2/1/2004	18:00:00	2764800	56.81	4.955	21.712	0
2/2/2004	0:00:00	2786400	56.81	5.285	21.382	0
2/2/2004	6:00:00	2808000	56.81	5.36	21.307	0
2/2/2004	12:00:00	2829600	56.81	5.312	21.355	0
2/2/2004	18:00:00	2851200	56.81	5.284	21.383	0
2/3/2004	0:00:00	2872800	56.81	5.246	21.421	0
2/3/2004	6:00:00	2894400	56.81	5.196	21.471	0
2/3/2004	12:00:00	2916000	56.81	5.151	21.516	0
2/3/2004	18:00:00	2937600	56.81	5.095	21.572	0.45
2/4/2004	0:00:00	2959200	56.81	5.217	21.450	0
2/4/2004	6:00:00	2980800	56.81	5.585	21.082	0
2/4/2004	12:00:00	3002400	56.81	6.022	20.645	0
2/4/2004	18:00:00	3024000	56.81	6.383	20.284	0
2/5/2004	0:00:00	3045600	56.81	6.589	20.078	0
2/5/2004	6:00:00	3067200	56.81	6.626	20.041	0
2/5/2004	12:00:00	3088800	56.81	6.554	20.113	0
2/5/2004	18:00:00	3110400	56.81	6.643	20.024	0
2/6/2004	0:00:00	3132000	56.83	6.702	19.965	0
2/6/2004	6:00:00	3153600	56.81	6.629	20.038	0
2/6/2004	12:00:00	3175200	56.83	6.5	20.167	0.02
2/6/2004	18:00:00	3196800	56.81	6.558	20.109	0
2/7/2004	0:00:00	3218400	56.83	6.647	20.020	0
2/7/2004	6:00:00	3240000	56.81	6.574	20.093	0
2/7/2004	12:00:00	3261600	56.83	6.454	20.213	0
2/7/2004	18:00:00	3283200	57.06	6.533	20.134	0
2/8/2004	0:00:00	3304800	56.83	6.606	20.061	0
2/8/2004	6:00:00	3326400	56.83	6.528	20.139	0
2/8/2004	12:00:00	3348000	56.83	6.407	20.260	0
2/8/2004	18:00:00	3369600	56.83	6.439	20.228	0
2/9/2004	0:00:00	3391200	56.83	6.493	20.174	0
2/9/2004	6:00:00	3412800	56.83	6.42	20.247	0
2/9/2004	12:00:00	3434400	56.83	6.319	20.348	0
2/9/2004	18:00:00	3456000	56.83	6.308	20.359	0
2/10/2004	0:00:00	3477600	56.81	6.347	20.320	0

Table A-1 (continued)

Date	Time of Day	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
2/10/2004	6:00:00	3499200	56.81	6.286	20.381	0
2/10/2004	12:00:00	3520800	56.81	6.195	20.472	0
2/10/2004	18:00:00	3542400	56.81	6.211	20.456	0
2/11/2004	0:00:00	3564000	56.81	6.338	20.329	0
2/11/2004	6:00:00	3585600	56.81	6.302	20.365	0
2/11/2004	12:00:00	3607200	56.81	6.212	20.455	0
2/11/2004	18:00:00	3628800	56.81	6.123	20.544	0.47
2/12/2004	0:00:00	3650400	56.81	6.079	20.588	0
2/12/2004	6:00:00	3672000	56.81	6.211	20.456	0
2/12/2004	12:00:00	3693600	56.81	6.477	20.190	0.15
2/12/2004	18:00:00	3715200	56.81	6.667	20.000	0
2/13/2004	0:00:00	3736800	56.81	6.778	19.889	0
2/13/2004	6:00:00	3758400	56.81	6.809	19.858	0
2/13/2004	12:00:00	3780000	56.79	6.745	19.922	0
2/13/2004	18:00:00	3801600	56.79	6.78	19.887	0
2/14/2004	0:00:00	3823200	56.79	6.813	19.854	0
2/14/2004	6:00:00	3844800	56.79	6.754	19.913	0
2/14/2004	12:00:00	3866400	56.79	6.634	20.033	0
2/14/2004	18:00:00	3888000	56.79	6.716	19.951	0
2/15/2004	0:00:00	3909600	56.79	6.812	19.855	0
2/15/2004	6:00:00	3931200	56.79	6.849	19.818	0
2/15/2004	12:00:00	3952800	56.79	6.805	19.862	0
2/15/2004	18:00:00	3974400	56.79	6.852	19.815	0
2/16/2004	0:00:00	3996000	56.79	6.885	19.782	0
2/16/2004	6:00:00	4017600	56.79	6.828	19.839	0
2/16/2004	12:00:00	4039200	56.77	6.687	19.980	0
2/16/2004	18:00:00	4060800	56.77	6.727	19.940	0
2/17/2004	0:00:00	4082400	56.77	6.792	19.875	0
2/17/2004	6:00:00	4104000	56.77	6.741	19.926	0
2/17/2004	12:00:00	4125600	56.77	6.609	20.058	0
2/17/2004	18:00:00	4147200	56.77	6.672	19.995	0
2/18/2004	0:00:00	4168800	56.77	6.791	19.876	0
2/18/2004	6:00:00	4190400	56.77	6.792	19.875	0
2/18/2004	12:00:00	4212000	56.74	6.712	19.955	0
2/18/2004	18:00:00	4233600	56.74	6.83	19.837	0
2/19/2004	0:00:00	4255200	56.74	6.921	19.746	0
2/19/2004	6:00:00	4276800	56.74	6.876	19.791	0

Table A-2
Transducer Data from MW-1, 2/20/04–3/25/04

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
2/20/2004	12:00:00	0	56.74	6.312	20.355	0
2/20/2004	13:00:00	3600	56.74	6.293	20.374	0
2/20/2004	14:00:00	7200	56.74	6.277	20.390	0
2/20/2004	15:00:00	10800	56.74	6.259	20.408	0
2/20/2004	16:00:00	14400	56.74	6.242	20.425	0
2/20/2004	17:00:00	18000	56.74	6.225	20.442	0
2/20/2004	18:00:00	21600	56.74	6.209	20.458	0
2/20/2004	19:00:00	25200	56.74	6.191	20.476	0
2/20/2004	20:00:00	28800	56.74	6.174	20.493	0
2/20/2004	21:00:00	32400	56.74	6.159	20.508	0
2/20/2004	22:00:00	36000	56.74	6.142	20.525	0
2/20/2004	23:00:00	39600	56.74	6.128	20.539	0
2/21/2004	0:00:00	43200	56.74	6.116	20.551	0
2/21/2004	1:00:00	46800	56.72	6.103	20.564	0
2/21/2004	2:00:00	50400	56.72	6.091	20.576	0
2/21/2004	3:00:00	54000	56.72	6.079	20.588	0
2/21/2004	4:00:00	57600	56.72	6.066	20.601	0
2/21/2004	5:00:00	61200	56.74	6.058	20.609	0
2/21/2004	6:00:00	64800	56.72	6.053	20.614	0.12
2/21/2004	7:00:00	68400	56.72	6.058	20.609	0
2/21/2004	8:00:00	72000	56.72	6.07	20.597	0
2/21/2004	9:00:00	75600	56.72	6.092	20.575	0
2/21/2004	10:00:00	79200	56.72	6.125	20.542	0
2/21/2004	11:00:00	82800	56.72	6.158	20.509	0
2/21/2004	12:00:00	86400	56.72	6.202	20.465	0
2/21/2004	13:00:00	90000	56.72	6.249	20.418	0
2/21/2004	14:00:00	93600	56.72	6.306	20.361	0
2/21/2004	15:00:00	97200	56.72	6.36	20.307	0
2/21/2004	16:00:00	100800	56.72	6.405	20.262	0
2/21/2004	17:00:00	104400	56.72	6.442	20.225	0
2/21/2004	18:00:00	108000	56.72	6.471	20.196	0
2/21/2004	19:00:00	111600	56.72	6.497	20.170	0
2/21/2004	20:00:00	115200	56.72	6.518	20.149	0
2/21/2004	21:00:00	118800	56.72	6.54	20.127	0
2/21/2004	22:00:00	122400	56.72	6.565	20.102	0
2/21/2004	23:00:00	126000	56.72	6.585	20.082	0
2/22/2004	0:00:00	129600	56.72	6.607	20.060	0.03
2/22/2004	1:00:00	133200	56.72	6.629	20.038	0
2/22/2004	2:00:00	136800	56.72	6.648	20.019	0
2/22/2004	3:00:00	140400	56.72	6.663	20.004	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
2/22/2004	4:00:00	144000	56.72	6.679	19.988	0
2/22/2004	5:00:00	147600	56.72	6.687	19.980	0
2/22/2004	6:00:00	151200	56.72	6.693	19.974	0
2/22/2004	7:00:00	154800	56.7	6.696	19.971	0
2/22/2004	8:00:00	158400	56.7	6.693	19.974	0
2/22/2004	9:00:00	162000	56.7	6.688	19.979	0
2/22/2004	10:00:00	165600	56.72	6.679	19.988	0
2/22/2004	11:00:00	169200	56.7	6.666	20.001	0
2/22/2004	12:00:00	172800	56.7	6.666	20.001	0
2/22/2004	13:00:00	176400	56.7	6.678	19.989	0
2/22/2004	14:00:00	180000	56.7	6.696	19.971	0
2/22/2004	15:00:00	183600	56.7	6.712	19.955	0
2/22/2004	16:00:00	187200	56.7	6.724	19.943	0
2/22/2004	17:00:00	190800	56.7	6.734	19.933	0
2/22/2004	18:00:00	194400	56.7	6.737	19.930	0
2/22/2004	19:00:00	198000	56.7	6.737	19.930	0
2/22/2004	20:00:00	201600	56.7	6.735	19.932	0
2/22/2004	21:00:00	205200	56.7	6.727	19.940	0
2/22/2004	22:00:00	208800	56.7	6.719	19.948	0
2/22/2004	23:00:00	212400	56.7	6.709	19.958	0
2/23/2004	0:00:00	216000	56.7	6.692	19.975	0.14
2/23/2004	1:00:00	219600	56.7	6.678	19.989	0
2/23/2004	2:00:00	223200	56.7	6.656	20.011	0
2/23/2004	3:00:00	226800	56.7	6.634	20.033	0
2/23/2004	4:00:00	230400	56.7	6.61	20.057	0
2/23/2004	5:00:00	234000	56.7	6.583	20.084	0
2/23/2004	6:00:00	237600	56.67	6.559	20.108	0
2/23/2004	7:00:00	241200	56.7	6.533	20.134	0
2/23/2004	8:00:00	244800	56.7	6.505	20.162	0
2/23/2004	9:00:00	248400	56.67	6.482	20.185	0
2/23/2004	10:00:00	252000	56.67	6.456	20.211	0
2/23/2004	11:00:00	255600	56.67	6.433	20.234	0
2/23/2004	12:00:00	259200	56.67	6.409	20.258	0
2/23/2004	13:00:00	262800	56.67	6.39	20.277	0
2/23/2004	14:00:00	266400	56.67	6.365	20.302	0
2/23/2004	15:00:00	270000	56.67	6.34	20.327	0
2/23/2004	16:00:00	273600	56.67	6.318	20.349	0
2/23/2004	17:00:00	277200	56.67	6.292	20.375	0
2/23/2004	18:00:00	280800	56.67	6.266	20.401	0
2/23/2004	19:00:00	284400	56.67	6.243	20.424	0
2/23/2004	20:00:00	288000	56.67	6.222	20.445	0
2/23/2004	21:00:00	291600	56.67	6.201	20.466	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
2/23/2004	22:00:00	295200	56.67	6.182	20.485	0
2/23/2004	23:00:00	298800	56.67	6.167	20.500	0.83
2/24/2004	0:00:00	302400	56.67	6.165	20.502	0
2/24/2004	1:00:00	306000	56.67	6.183	20.484	0
2/24/2004	2:00:00	309600	56.67	6.217	20.450	0
2/24/2004	3:00:00	313200	56.67	6.253	20.414	0
2/24/2004	4:00:00	316800	56.67	6.291	20.376	0
2/24/2004	5:00:00	320400	56.67	6.33	20.337	0
2/24/2004	6:00:00	324000	56.67	6.371	20.296	0
2/24/2004	7:00:00	327600	56.67	6.411	20.256	0
2/24/2004	8:00:00	331200	56.67	6.447	20.220	0
2/24/2004	9:00:00	334800	56.65	6.481	20.186	0
2/24/2004	10:00:00	338400	56.67	6.515	20.152	0
2/24/2004	11:00:00	342000	56.67	6.548	20.119	0
2/24/2004	12:00:00	345600	56.65	6.584	20.083	0
2/24/2004	13:00:00	349200	56.56	6.62	20.047	0
2/24/2004	14:00:00	352800	56.56	6.653	20.014	0
2/24/2004	15:00:00	356400	56.56	6.677	19.990	0
2/24/2004	16:00:00	360000	56.58	6.696	19.971	0
2/24/2004	17:00:00	363600	56.58	6.72	19.947	0
2/24/2004	18:00:00	367200	56.61	6.738	19.929	0
2/24/2004	19:00:00	370800	56.56	6.757	19.910	0
2/24/2004	20:00:00	374400	56.58	6.769	19.898	0
2/24/2004	21:00:00	378000	56.61	6.781	19.886	0
2/24/2004	22:00:00	381600	56.61	6.794	19.873	0
2/24/2004	23:00:00	385200	56.61	6.805	19.862	0
2/25/2004	0:00:00	388800	56.63	6.816	19.851	0
2/25/2004	1:00:00	392400	56.63	6.829	19.838	0
2/25/2004	2:00:00	396000	56.63	6.839	19.828	0
2/25/2004	3:00:00	399600	56.63	6.85	19.817	0
2/25/2004	4:00:00	403200	56.63	6.861	19.806	0
2/25/2004	5:00:00	406800	56.63	6.869	19.798	0
2/25/2004	6:00:00	410400	56.63	6.874	19.793	0
2/25/2004	7:00:00	414000	56.63	6.881	19.786	0
2/25/2004	8:00:00	417600	56.63	6.885	19.782	0
2/25/2004	9:00:00	421200	56.63	6.891	19.776	0
2/25/2004	10:00:00	424800	56.63	6.895	19.772	0
2/25/2004	11:00:00	428400	56.63	6.903	19.764	0
2/25/2004	12:00:00	432000	56.63	6.91	19.757	0
2/25/2004	13:00:00	435600	56.63	6.917	19.750	0
2/25/2004	14:00:00	439200	56.63	6.927	19.740	0
2/25/2004	15:00:00	442800	56.63	6.947	19.720	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
2/25/2004	16:00:00	446400	56.54	6.963	19.704	0
2/25/2004	17:00:00	450000	56.56	6.976	19.691	0
2/25/2004	18:00:00	453600	56.58	6.993	19.674	0
2/25/2004	19:00:00	457200	56.61	6.99	19.677	0
2/25/2004	20:00:00	460800	56.61	6.994	19.673	0
2/25/2004	21:00:00	464400	56.61	6.996	19.671	0
2/25/2004	22:00:00	468000	56.61	7.002	19.665	0
2/25/2004	23:00:00	471600	56.63	7.01	19.657	0
2/26/2004	0:00:00	475200	56.61	7.019	19.648	0
2/26/2004	1:00:00	478800	56.61	7.022	19.645	0
2/26/2004	2:00:00	482400	56.61	7.029	19.638	0
2/26/2004	3:00:00	486000	56.63	7.032	19.635	0
2/26/2004	4:00:00	489600	56.63	7.033	19.634	0
2/26/2004	5:00:00	493200	56.61	7.033	19.634	0
2/26/2004	6:00:00	496800	56.61	7.032	19.635	0
2/26/2004	7:00:00	500400	56.61	7.024	19.643	0
2/26/2004	8:00:00	504000	56.61	7.016	19.651	0
2/26/2004	9:00:00	507600	56.61	7.01	19.657	0
2/26/2004	10:00:00	511200	56.61	7.001	19.666	0
2/26/2004	11:00:00	514800	56.61	6.999	19.668	0
2/26/2004	12:00:00	518400	56.61	6.996	19.671	0
2/26/2004	13:00:00	522000	56.61	6.997	19.670	0
2/26/2004	14:00:00	525600	56.61	7.003	19.664	0
2/26/2004	15:00:00	529200	56.61	7.025	19.642	0
2/26/2004	16:00:00	532800	56.54	7.038	19.629	0
2/26/2004	17:00:00	536400	56.54	7.046	19.621	0
2/26/2004	18:00:00	540000	56.56	7.049	19.618	0
2/26/2004	19:00:00	543600	56.58	7.052	19.615	0
2/26/2004	20:00:00	547200	56.58	7.053	19.614	0
2/26/2004	21:00:00	550800	56.58	7.055	19.612	0
2/26/2004	22:00:00	554400	56.58	7.058	19.609	0
2/26/2004	23:00:00	558000	56.58	7.057	19.610	0
2/27/2004	0:00:00	561600	56.58	7.05	19.617	0
2/27/2004	1:00:00	565200	56.58	7.047	19.620	0
2/27/2004	2:00:00	568800	56.58	7.042	19.625	0
2/27/2004	3:00:00	572400	56.58	7.037	19.630	0
2/27/2004	4:00:00	576000	56.58	7.023	19.644	0
2/27/2004	5:00:00	579600	56.58	7.012	19.655	0
2/27/2004	6:00:00	583200	56.58	6.996	19.671	0
2/27/2004	7:00:00	586800	56.58	6.983	19.684	0
2/27/2004	8:00:00	590400	56.58	6.965	19.702	0
2/27/2004	9:00:00	594000	56.58	6.946	19.721	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
2/27/2004	10:00:00	597600	56.58	6.929	19.738	0
2/27/2004	11:00:00	601200	56.58	6.91	19.757	0
2/27/2004	12:00:00	604800	56.58	6.901	19.766	0
2/27/2004	13:00:00	608400	56.58	6.9	19.767	0
2/27/2004	14:00:00	612000	56.58	6.906	19.761	0
2/27/2004	15:00:00	615600	56.58	6.911	19.756	0
2/27/2004	16:00:00	619200	56.58	6.922	19.745	0
2/27/2004	17:00:00	622800	56.58	6.934	19.733	0
2/27/2004	18:00:00	626400	56.58	6.941	19.726	0
2/27/2004	19:00:00	630000	56.58	6.949	19.718	0
2/27/2004	20:00:00	633600	56.58	6.955	19.712	0
2/27/2004	21:00:00	637200	56.58	6.96	19.707	0
2/27/2004	22:00:00	640800	56.58	6.963	19.704	0
2/27/2004	23:00:00	644400	56.58	6.97	19.697	0
2/28/2004	0:00:00	648000	56.58	6.973	19.694	0
2/28/2004	1:00:00	651600	56.58	6.974	19.693	0
2/28/2004	2:00:00	655200	56.58	6.971	19.696	0
2/28/2004	3:00:00	658800	56.58	6.967	19.700	0
2/28/2004	4:00:00	662400	56.56	6.952	19.715	0
2/28/2004	5:00:00	666000	56.58	6.942	19.725	0
2/28/2004	6:00:00	669600	56.58	6.922	19.745	0
2/28/2004	7:00:00	673200	56.58	6.911	19.756	0
2/28/2004	8:00:00	676800	56.56	6.89	19.777	0
2/28/2004	9:00:00	680400	56.56	6.874	19.793	0
2/28/2004	10:00:00	684000	56.56	6.857	19.810	0
2/28/2004	11:00:00	687600	56.56	6.844	19.823	0
2/28/2004	12:00:00	691200	56.56	6.839	19.828	0
2/28/2004	13:00:00	694800	56.56	6.841	19.826	0
2/28/2004	14:00:00	698400	56.56	6.844	19.823	0
2/28/2004	15:00:00	702000	56.56	6.849	19.818	0
2/28/2004	16:00:00	705600	56.56	6.853	19.814	0
2/28/2004	17:00:00	709200	56.56	6.858	19.809	0
2/28/2004	18:00:00	712800	56.56	6.86	19.807	0
2/28/2004	19:00:00	716400	56.56	6.861	19.806	0
2/28/2004	20:00:00	720000	56.56	6.863	19.804	0
2/28/2004	21:00:00	723600	56.56	6.852	19.815	0
2/28/2004	22:00:00	727200	56.56	6.849	19.818	0
2/28/2004	23:00:00	730800	56.56	6.835	19.832	0
2/29/2004	0:00:00	734400	56.56	6.825	19.842	0
2/29/2004	1:00:00	738000	56.56	6.807	19.860	0
2/29/2004	2:00:00	741600	56.56	6.791	19.876	0
2/29/2004	3:00:00	745200	56.56	6.772	19.895	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
2/29/2004	4:00:00	748800	56.56	6.747	19.920	0
2/29/2004	5:00:00	752400	56.54	6.72	19.947	0
2/29/2004	6:00:00	756000	56.54	6.698	19.969	0
2/29/2004	7:00:00	759600	56.54	6.668	19.999	0
2/29/2004	8:00:00	763200	56.54	6.64	20.027	0
2/29/2004	9:00:00	766800	56.54	6.613	20.054	0
2/29/2004	10:00:00	770400	56.54	6.584	20.083	0
2/29/2004	11:00:00	774000	56.54	6.555	20.112	0
2/29/2004	12:00:00	777600	56.54	6.529	20.138	0
2/29/2004	13:00:00	781200	56.54	6.505	20.162	0
2/29/2004	14:00:00	784800	56.54	6.502	20.165	0.01
2/29/2004	15:00:00	788400	56.54	6.52	20.147	0
2/29/2004	16:00:00	792000	56.54	6.547	20.120	0
2/29/2004	17:00:00	795600	56.54	6.577	20.090	0
2/29/2004	18:00:00	799200	56.54	6.607	20.060	0
2/29/2004	19:00:00	802800	56.54	6.632	20.035	0
2/29/2004	20:00:00	806400	56.54	6.646	20.021	0
2/29/2004	21:00:00	810000	56.54	6.656	20.011	0
2/29/2004	22:00:00	813600	56.54	6.658	20.009	0
2/29/2004	23:00:00	817200	56.54	6.652	20.015	0
3/1/2004	0:00:00	820800	56.54	6.643	20.024	0
3/1/2004	1:00:00	824400	56.52	6.631	20.036	0
3/1/2004	2:00:00	828000	56.54	6.618	20.049	0
3/1/2004	3:00:00	831600	56.52	6.602	20.065	0
3/1/2004	4:00:00	835200	56.52	6.585	20.082	0
3/1/2004	5:00:00	838800	56.52	6.56	20.107	0
3/1/2004	6:00:00	842400	56.52	6.535	20.132	0
3/1/2004	7:00:00	846000	56.52	6.511	20.156	0
3/1/2004	8:00:00	849600	56.52	6.489	20.178	0
3/1/2004	9:00:00	853200	56.52	6.469	20.198	0
3/1/2004	10:00:00	856800	56.52	6.442	20.225	0
3/1/2004	11:00:00	860400	56.52	6.421	20.246	0
3/1/2004	12:00:00	864000	56.52	6.4	20.267	0
3/1/2004	13:00:00	867600	56.52	6.381	20.286	0
3/1/2004	14:00:00	871200	56.52	6.361	20.306	0
3/1/2004	15:00:00	874800	56.52	6.339	20.328	0
3/1/2004	16:00:00	878400	56.52	6.319	20.348	0
3/1/2004	17:00:00	882000	56.52	6.302	20.365	0
3/1/2004	18:00:00	885600	56.49	6.282	20.385	0
3/1/2004	19:00:00	889200	56.52	6.261	20.406	0
3/1/2004	20:00:00	892800	56.49	6.247	20.420	0
3/1/2004	21:00:00	896400	56.49	6.226	20.441	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/1/2004	22:00:00	900000	56.52	6.208	20.459	0
3/1/2004	23:00:00	903600	56.49	6.195	20.472	0
3/2/2004	0:00:00	907200	56.49	6.179	20.488	0
3/2/2004	1:00:00	910800	56.49	6.164	20.503	0
3/2/2004	2:00:00	914400	56.49	6.15	20.517	0
3/2/2004	3:00:00	918000	56.49	6.136	20.531	0
3/2/2004	4:00:00	921600	56.49	6.118	20.549	0
3/2/2004	5:00:00	925200	56.49	6.101	20.566	0
3/2/2004	6:00:00	928800	56.49	6.087	20.580	0
3/2/2004	7:00:00	932400	56.49	6.071	20.596	0
3/2/2004	8:00:00	936000	56.49	6.054	20.613	0
3/2/2004	9:00:00	939600	56.49	6.038	20.629	0
3/2/2004	10:00:00	943200	56.49	6.024	20.643	0
3/2/2004	11:00:00	946800	56.49	6.012	20.655	0
3/2/2004	12:00:00	950400	56.49	6.002	20.665	0
3/2/2004	13:00:00	954000	56.49	6.012	20.655	0
3/2/2004	14:00:00	957600	56.47	6.051	20.616	0.22
3/2/2004	15:00:00	961200	56.49	6.101	20.566	0
3/2/2004	16:00:00	964800	56.47	6.175	20.492	0
3/2/2004	17:00:00	968400	56.47	6.244	20.423	0
3/2/2004	18:00:00	972000	56.47	6.302	20.365	0
3/2/2004	19:00:00	975600	56.42	6.359	20.308	0
3/2/2004	20:00:00	979200	56.36	6.413	20.254	0
3/2/2004	21:00:00	982800	56.38	6.458	20.209	0
3/2/2004	22:00:00	986400	56.4	6.503	20.164	0
3/2/2004	23:00:00	990000	56.42	6.544	20.123	0
3/3/2004	0:00:00	993600	56.42	6.581	20.086	0.06
3/3/2004	1:00:00	997200	56.4	6.616	20.051	0
3/3/2004	2:00:00	1000800	56.4	6.649	20.018	0
3/3/2004	3:00:00	1004400	56.38	6.68	19.987	0
3/3/2004	4:00:00	1008000	56.38	6.704	19.963	0
3/3/2004	5:00:00	1011600	56.38	6.724	19.943	0
3/3/2004	6:00:00	1015200	56.38	6.744	19.923	0
3/3/2004	7:00:00	1018800	56.22	6.766	19.901	0
3/3/2004	8:00:00	1022400	56.33	6.784	19.883	0
3/3/2004	9:00:00	1026000	56.38	6.802	19.865	0
3/3/2004	10:00:00	1029600	56.4	6.818	19.849	0
3/3/2004	11:00:00	1033200	56.4	6.831	19.836	0
3/3/2004	12:00:00	1036800	56.42	6.847	19.820	0
3/3/2004	13:00:00	1040400	56.42	6.863	19.804	0
3/3/2004	14:00:00	1044000	56.36	6.888	19.779	0
3/3/2004	15:00:00	1047600	56.13	6.918	19.749	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/3/2004	16:00:00	1051200	56.15	6.933	19.734	0
3/3/2004	17:00:00	1054800	56.29	6.947	19.720	0
3/3/2004	18:00:00	1058400	56.33	6.959	19.708	0
3/3/2004	19:00:00	1062000	56.36	6.968	19.699	0
3/3/2004	20:00:00	1065600	56.38	6.978	19.689	0
3/3/2004	21:00:00	1069200	56.4	6.979	19.688	0
3/3/2004	22:00:00	1072800	56.4	6.979	19.688	0
3/3/2004	23:00:00	1076400	56.4	6.97	19.697	0
3/4/2004	0:00:00	1080000	56.4	6.968	19.699	0
3/4/2004	1:00:00	1083600	56.4	6.961	19.706	0
3/4/2004	2:00:00	1087200	56.4	6.959	19.708	0.53
3/4/2004	3:00:00	1090800	56.4	6.962	19.705	0
3/4/2004	4:00:00	1094400	56.4	6.968	19.699	0
3/4/2004	5:00:00	1098000	56.4	6.971	19.696	0
3/4/2004	6:00:00	1101600	56.4	6.975	19.692	0
3/4/2004	7:00:00	1105200	56.4	6.982	19.685	0
3/4/2004	8:00:00	1108800	56.4	6.985	19.682	0
3/4/2004	9:00:00	1112400	56.4	6.99	19.677	0
3/4/2004	10:00:00	1116000	56.4	6.991	19.676	0
3/4/2004	11:00:00	1119600	56.4	6.993	19.674	0
3/4/2004	12:00:00	1123200	56.4	7	19.667	0
3/4/2004	13:00:00	1126800	56.4	7.014	19.653	0
3/4/2004	14:00:00	1130400	56.4	7.008	19.659	0
3/4/2004	15:00:00	1134000	56.4	7.022	19.645	0
3/4/2004	16:00:00	1137600	56.4	7.032	19.635	0
3/4/2004	17:00:00	1141200	56.4	7.045	19.622	0
3/4/2004	18:00:00	1144800	56.4	7.063	19.604	0
3/4/2004	19:00:00	1148400	56.4	7.074	19.593	0
3/4/2004	20:00:00	1152000	56.33	7.087	19.580	0
3/4/2004	21:00:00	1155600	56.31	7.1	19.567	0
3/4/2004	22:00:00	1159200	56.29	7.108	19.559	0
3/4/2004	23:00:00	1162800	56.31	7.114	19.553	0
3/5/2004	0:00:00	1166400	56.31	7.118	19.549	0.02
3/5/2004	1:00:00	1170000	56.33	7.116	19.551	0
3/5/2004	2:00:00	1173600	56.33	7.119	19.548	0
3/5/2004	3:00:00	1177200	56.36	7.111	19.556	0
3/5/2004	4:00:00	1180800	56.38	7.108	19.559	0
3/5/2004	5:00:00	1184400	56.38	7.099	19.568	0
3/5/2004	6:00:00	1188000	56.38	7.091	19.576	0
3/5/2004	7:00:00	1191600	56.38	7.08	19.587	0
3/5/2004	8:00:00	1195200	56.38	7.066	19.601	0
3/5/2004	9:00:00	1198800	56.38	7.054	19.613	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/5/2004	10:00:00	1202400	56.38	7.035	19.632	0
3/5/2004	11:00:00	1206000	56.38	7.024	19.643	0
3/5/2004	12:00:00	1209600	56.38	7.013	19.654	0
3/5/2004	13:00:00	1213200	56.38	7.007	19.660	0
3/5/2004	14:00:00	1216800	56.38	7.003	19.664	0
3/5/2004	15:00:00	1220400	56.38	7.004	19.663	0
3/5/2004	16:00:00	1224000	56.38	7.001	19.666	0
3/5/2004	17:00:00	1227600	56.38	7.001	19.666	0
3/5/2004	18:00:00	1231200	56.38	7	19.667	0
3/5/2004	19:00:00	1234800	56.38	6.998	19.669	0
3/5/2004	20:00:00	1238400	56.38	6.992	19.675	0
3/5/2004	21:00:00	1242000	56.38	6.985	19.682	0
3/5/2004	22:00:00	1245600	56.38	6.987	19.680	0
3/5/2004	23:00:00	1249200	56.38	6.984	19.683	0
3/6/2004	0:00:00	1252800	56.38	6.979	19.688	0
3/6/2004	1:00:00	1256400	56.36	6.968	19.699	0
3/6/2004	2:00:00	1260000	56.36	6.961	19.706	0
3/6/2004	3:00:00	1263600	56.36	6.942	19.725	0
3/6/2004	4:00:00	1267200	56.36	6.927	19.740	0
3/6/2004	5:00:00	1270800	56.36	6.906	19.761	0
3/6/2004	6:00:00	1274400	56.36	6.884	19.783	0
3/6/2004	7:00:00	1278000	56.36	6.862	19.805	0
3/6/2004	8:00:00	1281600	56.36	6.837	19.830	0
3/6/2004	9:00:00	1285200	56.36	6.807	19.860	0
3/6/2004	10:00:00	1288800	56.36	6.785	19.882	0
3/6/2004	11:00:00	1292400	56.36	6.76	19.907	0
3/6/2004	12:00:00	1296000	56.36	6.748	19.919	0
3/6/2004	13:00:00	1299600	56.36	6.753	19.914	0
3/6/2004	14:00:00	1303200	56.36	6.767	19.900	0
3/6/2004	15:00:00	1306800	56.36	6.787	19.880	0
3/6/2004	16:00:00	1310400	56.36	6.808	19.859	0
3/6/2004	17:00:00	1314000	56.36	6.828	19.839	0
3/6/2004	18:00:00	1317600	56.36	6.848	19.819	0
3/6/2004	19:00:00	1321200	56.33	6.866	19.801	0
3/6/2004	20:00:00	1324800	56.33	6.878	19.789	0
3/6/2004	21:00:00	1328400	56.33	6.892	19.775	0
3/6/2004	22:00:00	1332000	56.36	6.907	19.760	0
3/6/2004	23:00:00	1335600	56.33	6.918	19.749	0
3/7/2004	0:00:00	1339200	56.33	6.921	19.746	0
3/7/2004	1:00:00	1342800	56.33	6.92	19.747	0
3/7/2004	2:00:00	1346400	56.33	6.919	19.748	0
3/7/2004	3:00:00	1350000	56.33	6.914	19.753	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/7/2004	4:00:00	1353600	56.33	6.903	19.764	0
3/7/2004	5:00:00	1357200	56.33	6.894	19.773	0
3/7/2004	6:00:00	1360800	56.33	6.88	19.787	0
3/7/2004	7:00:00	1364400	56.33	6.864	19.803	0
3/7/2004	8:00:00	1368000	56.33	6.846	19.821	0
3/7/2004	9:00:00	1371600	56.33	6.829	19.838	0
3/7/2004	10:00:00	1375200	56.33	6.809	19.858	0
3/7/2004	11:00:00	1378800	56.33	6.791	19.876	0
3/7/2004	12:00:00	1382400	56.33	6.781	19.886	0
3/7/2004	13:00:00	1386000	56.33	6.788	19.879	0
3/7/2004	14:00:00	1389600	56.33	6.802	19.865	0
3/7/2004	15:00:00	1393200	56.31	6.821	19.846	0
3/7/2004	16:00:00	1396800	56.31	6.844	19.823	0
3/7/2004	17:00:00	1400400	56.31	6.87	19.797	0
3/7/2004	18:00:00	1404000	56.31	6.897	19.770	0
3/7/2004	19:00:00	1407600	56.31	6.922	19.745	0
3/7/2004	20:00:00	1411200	56.31	6.946	19.721	0
3/7/2004	21:00:00	1414800	56.31	6.965	19.702	0
3/7/2004	22:00:00	1418400	56.31	6.983	19.684	0
3/7/2004	23:00:00	1422000	56.31	6.994	19.673	0
3/8/2004	0:00:00	1425600	56.31	7	19.667	0
3/8/2004	1:00:00	1429200	56.31	7.004	19.663	0
3/8/2004	2:00:00	1432800	56.31	7.004	19.663	0
3/8/2004	3:00:00	1436400	56.31	7	19.667	0
3/8/2004	4:00:00	1440000	56.31	6.995	19.672	0
3/8/2004	5:00:00	1443600	56.31	6.986	19.681	0
3/8/2004	6:00:00	1447200	56.31	6.978	19.689	0
3/8/2004	7:00:00	1450800	56.31	6.969	19.698	0
3/8/2004	8:00:00	1454400	56.31	6.954	19.713	0
3/8/2004	9:00:00	1458000	56.29	6.942	19.725	0
3/8/2004	10:00:00	1461600	56.29	6.927	19.740	0
3/8/2004	11:00:00	1465200	56.29	6.912	19.755	0
3/8/2004	12:00:00	1468800	56.29	6.894	19.773	0
3/8/2004	13:00:00	1472400	56.29	6.876	19.791	0
3/8/2004	14:00:00	1476000	56.29	6.877	19.790	0
3/8/2004	15:00:00	1479600	56.29	6.89	19.777	0
3/8/2004	16:00:00	1483200	56.29	6.917	19.750	0
3/8/2004	17:00:00	1486800	56.29	6.942	19.725	0
3/8/2004	18:00:00	1490400	56.29	6.967	19.700	0
3/8/2004	19:00:00	1494000	56.29	6.993	19.674	0
3/8/2004	20:00:00	1497600	56.29	7.017	19.650	0
3/8/2004	21:00:00	1501200	56.29	7.037	19.630	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/8/2004	22:00:00	1504800	56.29	7.053	19.614	0
3/8/2004	23:00:00	1508400	56.29	7.068	19.599	0
3/9/2004	0:00:00	1512000	56.27	7.073	19.594	0
3/9/2004	1:00:00	1515600	56.27	7.074	19.593	0
3/9/2004	2:00:00	1519200	56.27	7.076	19.591	0
3/9/2004	3:00:00	1522800	56.27	7.072	19.595	0
3/9/2004	4:00:00	1526400	56.27	7.068	19.599	0
3/9/2004	5:00:00	1530000	56.27	7.058	19.609	0
3/9/2004	6:00:00	1533600	56.27	7.05	19.617	0
3/9/2004	7:00:00	1537200	56.27	7.042	19.625	0
3/9/2004	8:00:00	1540800	56.27	7.03	19.637	0
3/9/2004	9:00:00	1544400	56.27	7.019	19.648	0
3/9/2004	10:00:00	1548000	56.27	7.009	19.658	0
3/9/2004	11:00:00	1551600	56.27	6.998	19.669	0
3/9/2004	12:00:00	1555200	56.27	6.987	19.680	0
3/9/2004	13:00:00	1558800	56.27	6.981	19.686	0
3/9/2004	14:00:00	1562400	56.27	6.986	19.681	0
3/9/2004	15:00:00	1566000	56.24	7.001	19.666	0
3/9/2004	16:00:00	1569600	56.27	7.025	19.642	0
3/9/2004	17:00:00	1573200	56.24	7.048	19.619	0
3/9/2004	18:00:00	1576800	56.24	7.071	19.596	0
3/9/2004	19:00:00	1580400	56.24	7.094	19.573	0
3/9/2004	20:00:00	1584000	56.24	7.119	19.548	0
3/9/2004	21:00:00	1587600	56.24	7.136	19.531	0
3/9/2004	22:00:00	1591200	56.24	7.152	19.515	0
3/9/2004	23:00:00	1594800	56.24	7.163	19.504	0
3/10/2004	0:00:00	1598400	56.24	7.174	19.493	0
3/10/2004	1:00:00	1602000	56.24	7.178	19.489	0
3/10/2004	2:00:00	1605600	56.24	7.18	19.487	0
3/10/2004	3:00:00	1609200	56.24	7.175	19.492	0
3/10/2004	4:00:00	1612800	56.22	7.169	19.498	0
3/10/2004	5:00:00	1616400	56.22	7.162	19.505	0
3/10/2004	6:00:00	1620000	56.22	7.153	19.514	0
3/10/2004	7:00:00	1623600	56.22	7.145	19.522	0
3/10/2004	8:00:00	1627200	56.22	7.132	19.535	0
3/10/2004	9:00:00	1630800	56.22	7.121	19.546	0
3/10/2004	10:00:00	1634400	56.22	7.109	19.558	0
3/10/2004	11:00:00	1638000	56.22	7.096	19.571	0
3/10/2004	12:00:00	1641600	56.22	7.082	19.585	0
3/10/2004	13:00:00	1645200	56.22	7.07	19.597	0
3/10/2004	14:00:00	1648800	56.2	7.054	19.613	0
3/10/2004	15:00:00	1652400	56.2	7.039	19.628	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/10/2004	16:00:00	1656000	56.2	7.032	19.635	0
3/10/2004	17:00:00	1659600	56.2	7.034	19.633	0
3/10/2004	18:00:00	1663200	56.2	7.036	19.631	0
3/10/2004	19:00:00	1666800	56.2	7.039	19.628	0
3/10/2004	20:00:00	1670400	56.2	7.039	19.628	0
3/10/2004	21:00:00	1674000	56.2	7.042	19.625	0
3/10/2004	22:00:00	1677600	56.2	7.042	19.625	0
3/10/2004	23:00:00	1681200	56.2	7.042	19.625	0
3/11/2004	0:00:00	1684800	56.2	7.042	19.625	0
3/11/2004	1:00:00	1688400	56.17	7.038	19.629	0
3/11/2004	2:00:00	1692000	56.17	7.034	19.633	0
3/11/2004	3:00:00	1695600	56.17	7.03	19.637	0
3/11/2004	4:00:00	1699200	56.17	7.022	19.645	0
3/11/2004	5:00:00	1702800	56.17	7.011	19.656	0
3/11/2004	6:00:00	1706400	56.17	6.999	19.668	0
3/11/2004	7:00:00	1710000	56.17	6.985	19.682	0
3/11/2004	8:00:00	1713600	56.17	6.971	19.696	0
3/11/2004	9:00:00	1717200	56.17	6.956	19.711	0
3/11/2004	10:00:00	1720800	56.17	6.938	19.729	0
3/11/2004	11:00:00	1724400	56.15	6.919	19.748	0
3/11/2004	12:00:00	1728000	56.15	6.898	19.769	0
3/11/2004	13:00:00	1731600	56.15	6.878	19.789	0
3/11/2004	14:00:00	1735200	56.15	6.857	19.810	0
3/11/2004	15:00:00	1738800	56.15	6.833	19.834	0
3/11/2004	16:00:00	1742400	56.15	6.81	19.857	0
3/11/2004	17:00:00	1746000	56.15	6.786	19.881	0
3/11/2004	18:00:00	1749600	56.15	6.76	19.907	0
3/11/2004	19:00:00	1753200	56.15	6.741	19.926	0
3/11/2004	20:00:00	1756800	56.15	6.719	19.948	0
3/11/2004	21:00:00	1760400	56.15	6.699	19.968	0
3/11/2004	22:00:00	1764000	56.15	6.679	19.988	0
3/11/2004	23:00:00	1767600	56.13	6.663	20.004	0
3/12/2004	0:00:00	1771200	56.13	6.644	20.023	0
3/12/2004	1:00:00	1774800	56.13	6.626	20.041	0
3/12/2004	2:00:00	1778400	56.13	6.612	20.055	0
3/12/2004	3:00:00	1782000	56.13	6.597	20.070	0
3/12/2004	4:00:00	1785600	56.13	6.58	20.087	0
3/12/2004	5:00:00	1789200	56.13	6.566	20.101	0
3/12/2004	6:00:00	1792800	56.13	6.549	20.118	0
3/12/2004	7:00:00	1796400	56.13	6.533	20.134	0
3/12/2004	8:00:00	1800000	56.13	6.521	20.146	0
3/12/2004	9:00:00	1803600	56.13	6.506	20.161	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/12/2004	10:00:00	1807200	56.13	6.491	20.176	0
3/12/2004	11:00:00	1810800	56.13	6.482	20.185	0
3/12/2004	12:00:00	1814400	56.13	6.472	20.195	0
3/12/2004	13:00:00	1818000	56.11	6.462	20.205	0
3/12/2004	14:00:00	1821600	56.11	6.45	20.217	0
3/12/2004	15:00:00	1825200	56.11	6.437	20.230	0
3/12/2004	16:00:00	1828800	56.11	6.426	20.241	0
3/12/2004	17:00:00	1832400	56.11	6.415	20.252	0
3/12/2004	18:00:00	1836000	56.11	6.401	20.266	0
3/12/2004	19:00:00	1839600	56.11	6.391	20.276	0
3/12/2004	20:00:00	1843200	56.11	6.379	20.288	0
3/12/2004	21:00:00	1846800	56.11	6.368	20.299	0
3/12/2004	22:00:00	1850400	56.11	6.361	20.306	0
3/12/2004	23:00:00	1854000	56.11	6.353	20.314	0
3/13/2004	0:00:00	1857600	56.11	6.347	20.320	0
3/13/2004	1:00:00	1861200	56.11	6.338	20.329	0
3/13/2004	2:00:00	1864800	56.08	6.335	20.332	0
3/13/2004	3:00:00	1868400	56.11	6.328	20.339	0
3/13/2004	4:00:00	1872000	56.08	6.322	20.345	0
3/13/2004	5:00:00	1875600	56.08	6.311	20.356	0
3/13/2004	6:00:00	1879200	56.08	6.303	20.364	0
3/13/2004	7:00:00	1882800	56.08	6.293	20.374	0
3/13/2004	8:00:00	1886400	56.08	6.287	20.380	0
3/13/2004	9:00:00	1890000	56.08	6.281	20.386	0
3/13/2004	10:00:00	1893600	56.08	6.275	20.392	0
3/13/2004	11:00:00	1897200	56.08	6.268	20.399	0
3/13/2004	12:00:00	1900800	56.08	6.263	20.404	0
3/13/2004	13:00:00	1904400	56.08	6.258	20.409	0
3/13/2004	14:00:00	1908000	56.08	6.25	20.417	0
3/13/2004	15:00:00	1911600	56.08	6.24	20.427	0
3/13/2004	16:00:00	1915200	56.06	6.23	20.437	0
3/13/2004	17:00:00	1918800	56.06	6.219	20.448	0
3/13/2004	18:00:00	1922400	56.06	6.213	20.454	0
3/13/2004	19:00:00	1926000	56.06	6.201	20.466	0
3/13/2004	20:00:00	1929600	56.06	6.187	20.480	0
3/13/2004	21:00:00	1933200	56.06	6.174	20.493	0
3/13/2004	22:00:00	1936800	56.06	6.167	20.500	0
3/13/2004	23:00:00	1940400	56.06	6.158	20.509	0
3/14/2004	0:00:00	1944000	56.06	6.147	20.520	0
3/14/2004	1:00:00	1947600	56.06	6.139	20.528	0
3/14/2004	2:00:00	1951200	56.06	6.133	20.534	0
3/14/2004	3:00:00	1954800	56.06	6.127	20.540	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/14/2004	4:00:00	1958400	56.04	6.118	20.549	0
3/14/2004	5:00:00	1962000	56.06	6.111	20.556	0
3/14/2004	6:00:00	1965600	56.04	6.106	20.561	0
3/14/2004	7:00:00	1969200	56.04	6.097	20.570	0
3/14/2004	8:00:00	1972800	56.04	6.09	20.577	0
3/14/2004	9:00:00	1976400	56.04	6.086	20.581	0
3/14/2004	10:00:00	1980000	56.04	6.083	20.584	0
3/14/2004	11:00:00	1983600	56.04	6.078	20.589	0
3/14/2004	12:00:00	1987200	56.04	6.074	20.593	0
3/14/2004	13:00:00	1990800	56.04	6.07	20.597	0
3/14/2004	14:00:00	1994400	56.04	6.069	20.598	0
3/14/2004	15:00:00	1998000	56.04	6.061	20.606	0
3/14/2004	16:00:00	2001600	56.04	6.055	20.612	0
3/14/2004	17:00:00	2005200	56.04	6.048	20.619	0
3/14/2004	18:00:00	2008800	56.04	6.041	20.626	0
3/14/2004	19:00:00	2012400	56.02	6.036	20.631	0
3/14/2004	20:00:00	2016000	56.02	6.027	20.640	0
3/14/2004	21:00:00	2019600	56.02	6.022	20.645	0
3/14/2004	22:00:00	2023200	56.02	6.016	20.651	0
3/14/2004	23:00:00	2026800	56.02	6.015	20.652	0
3/15/2004	0:00:00	2030400	56.02	6.009	20.658	0
3/15/2004	1:00:00	2034000	56.02	6.003	20.664	0
3/15/2004	2:00:00	2037600	56.02	6	20.667	0
3/15/2004	3:00:00	2041200	56.02	5.995	20.672	0
3/15/2004	4:00:00	2044800	56.02	5.988	20.679	0
3/15/2004	5:00:00	2048400	56.02	5.983	20.684	0
3/15/2004	6:00:00	2052000	56.02	5.979	20.688	0
3/15/2004	7:00:00	2055600	56.02	5.974	20.693	0
3/15/2004	8:00:00	2059200	56.02	5.963	20.704	0
3/15/2004	9:00:00	2062800	56.02	5.958	20.709	0
3/15/2004	10:00:00	2066400	56.02	5.954	20.713	0
3/15/2004	11:00:00	2070000	56.02	5.949	20.718	0
3/15/2004	12:00:00	2073600	55.99	5.946	20.721	0
3/15/2004	13:00:00	2077200	56.02	5.941	20.726	0
3/15/2004	14:00:00	2080800	55.99	5.934	20.733	0
3/15/2004	15:00:00	2084400	55.99	5.926	20.741	0
3/15/2004	16:00:00	2088000	55.99	5.917	20.750	0
3/15/2004	17:00:00	2091600	55.99	5.91	20.757	0
3/15/2004	18:00:00	2095200	55.99	5.899	20.768	0
3/15/2004	19:00:00	2098800	55.99	5.894	20.773	0
3/15/2004	20:00:00	2102400	55.99	5.886	20.781	0
3/15/2004	21:00:00	2106000	55.99	5.88	20.787	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/15/2004	22:00:00	2109600	55.99	5.871	20.796	0
3/15/2004	23:00:00	2113200	55.99	5.865	20.802	0
3/16/2004	0:00:00	2116800	55.99	5.859	20.808	0
3/16/2004	1:00:00	2120400	55.99	5.855	20.812	0
3/16/2004	2:00:00	2124000	55.99	5.85	20.817	0
3/16/2004	3:00:00	2127600	55.99	5.848	20.819	0
3/16/2004	4:00:00	2131200	55.99	5.842	20.825	0
3/16/2004	5:00:00	2134800	55.97	5.829	20.838	0
3/16/2004	6:00:00	2138400	55.97	5.819	20.848	0
3/16/2004	7:00:00	2142000	55.99	5.812	20.855	0
3/16/2004	8:00:00	2145600	55.97	5.807	20.860	0
3/16/2004	9:00:00	2149200	55.97	5.799	20.868	0
3/16/2004	10:00:00	2152800	55.97	5.793	20.874	0
3/16/2004	11:00:00	2156400	55.97	5.787	20.880	0
3/16/2004	12:00:00	2160000	55.97	5.782	20.885	0
3/16/2004	13:00:00	2163600	55.97	5.776	20.891	0
3/16/2004	14:00:00	2167200	55.97	5.77	20.897	0
3/16/2004	15:00:00	2170800	55.97	5.761	20.906	0
3/16/2004	16:00:00	2174400	55.97	5.754	20.913	0
3/16/2004	17:00:00	2178000	55.97	5.748	20.919	0
3/16/2004	18:00:00	2181600	55.97	5.742	20.925	0
3/16/2004	19:00:00	2185200	55.97	5.732	20.935	0
3/16/2004	20:00:00	2188800	55.97	5.725	20.942	0
3/16/2004	21:00:00	2192400	55.97	5.718	20.949	0
3/16/2004	22:00:00	2196000	55.97	5.71	20.957	0
3/16/2004	23:00:00	2199600	55.97	5.706	20.961	0
3/17/2004	0:00:00	2203200	55.95	5.696	20.971	0
3/17/2004	1:00:00	2206800	55.97	5.692	20.975	0
3/17/2004	2:00:00	2210400	55.97	5.684	20.983	0
3/17/2004	3:00:00	2214000	55.97	5.679	20.988	0
3/17/2004	4:00:00	2217600	55.97	5.671	20.996	0
3/17/2004	5:00:00	2221200	55.97	5.662	21.005	0
3/17/2004	6:00:00	2224800	55.97	5.653	21.014	0
3/17/2004	7:00:00	2228400	55.97	5.645	21.022	0
3/17/2004	8:00:00	2232000	55.95	5.639	21.028	0
3/17/2004	9:00:00	2235600	55.95	5.633	21.034	0
3/17/2004	10:00:00	2239200	55.95	5.628	21.039	0
3/17/2004	11:00:00	2242800	55.95	5.622	21.045	0
3/17/2004	12:00:00	2246400	55.95	5.612	21.055	0
3/17/2004	13:00:00	2250000	55.95	5.61	21.057	0
3/17/2004	14:00:00	2253600	55.95	5.599	21.068	0
3/17/2004	15:00:00	2257200	55.95	5.591	21.076	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/17/2004	16:00:00	2260800	55.95	5.583	21.084	0
3/17/2004	17:00:00	2264400	55.95	5.574	21.093	0
3/17/2004	18:00:00	2268000	55.95	5.567	21.100	0
3/17/2004	19:00:00	2271600	55.95	5.558	21.109	0
3/17/2004	20:00:00	2275200	55.95	5.55	21.117	0
3/17/2004	21:00:00	2278800	55.95	5.542	21.125	0
3/17/2004	22:00:00	2282400	55.95	5.532	21.135	0
3/17/2004	23:00:00	2286000	55.95	5.528	21.139	0
3/18/2004	0:00:00	2289600	55.95	5.519	21.148	0
3/18/2004	1:00:00	2293200	55.95	5.511	21.156	0
3/18/2004	2:00:00	2296800	55.95	5.503	21.164	0
3/18/2004	3:00:00	2300400	55.95	5.495	21.172	0
3/18/2004	4:00:00	2304000	55.95	5.486	21.181	0
3/18/2004	5:00:00	2307600	55.92	5.479	21.188	0
3/18/2004	6:00:00	2311200	55.95	5.469	21.198	0
3/18/2004	7:00:00	2314800	55.95	5.46	21.207	0
3/18/2004	8:00:00	2318400	55.92	5.452	21.215	0
3/18/2004	9:00:00	2322000	55.92	5.445	21.222	0
3/18/2004	10:00:00	2325600	55.92	5.437	21.230	0
3/18/2004	11:00:00	2329200	55.92	5.43	21.237	0
3/18/2004	12:00:00	2332800	55.92	5.425	21.242	0
3/18/2004	13:00:00	2336400	55.92	5.42	21.247	0
3/18/2004	14:00:00	2340000	55.92	5.412	21.255	0
3/18/2004	15:00:00	2343600	55.92	5.404	21.263	0
3/18/2004	16:00:00	2347200	55.92	5.4	21.267	0
3/18/2004	17:00:00	2350800	55.92	5.39	21.277	0
3/18/2004	18:00:00	2354400	55.92	5.381	21.286	0
3/18/2004	19:00:00	2358000	55.92	5.375	21.292	0
3/18/2004	20:00:00	2361600	55.92	5.367	21.300	0
3/18/2004	21:00:00	2365200	55.92	5.359	21.308	0
3/18/2004	22:00:00	2368800	55.92	5.354	21.313	0
3/18/2004	23:00:00	2372400	55.92	5.347	21.320	0
3/19/2004	0:00:00	2376000	55.92	5.341	21.326	0
3/19/2004	1:00:00	2379600	55.92	5.335	21.332	0
3/19/2004	2:00:00	2383200	55.92	5.331	21.336	0
3/19/2004	3:00:00	2386800	55.92	5.324	21.343	0
3/19/2004	4:00:00	2390400	55.92	5.319	21.348	0
3/19/2004	5:00:00	2394000	55.92	5.31	21.357	0
3/19/2004	6:00:00	2397600	55.92	5.302	21.365	0
3/19/2004	7:00:00	2401200	55.92	5.297	21.370	0
3/19/2004	8:00:00	2404800	55.92	5.292	21.375	0
3/19/2004	9:00:00	2408400	55.92	5.283	21.384	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/19/2004	10:00:00	2412000	55.9	5.279	21.388	0
3/19/2004	11:00:00	2415600	55.92	5.275	21.392	0
3/19/2004	12:00:00	2419200	55.92	5.271	21.396	0
3/19/2004	13:00:00	2422800	55.92	5.269	21.398	0
3/19/2004	14:00:00	2426400	55.92	5.266	21.401	0
3/19/2004	15:00:00	2430000	55.92	5.26	21.407	0
3/19/2004	16:00:00	2433600	55.92	5.251	21.416	0
3/19/2004	17:00:00	2437200	55.92	5.246	21.421	0
3/19/2004	18:00:00	2440800	55.9	5.239	21.428	0
3/19/2004	19:00:00	2444400	55.9	5.234	21.433	0
3/19/2004	20:00:00	2448000	55.92	5.227	21.440	0
3/19/2004	21:00:00	2451600	55.9	5.223	21.444	0
3/19/2004	22:00:00	2455200	55.92	5.218	21.449	0
3/19/2004	23:00:00	2458800	55.9	5.21	21.457	0
3/20/2004	0:00:00	2462400	55.9	5.205	21.462	0
3/20/2004	1:00:00	2466000	55.9	5.202	21.465	0
3/20/2004	2:00:00	2469600	55.9	5.198	21.469	0
3/20/2004	3:00:00	2473200	55.92	5.194	21.473	0
3/20/2004	4:00:00	2476800	55.9	5.188	21.479	0
3/20/2004	5:00:00	2480400	55.9	5.182	21.485	0
3/20/2004	6:00:00	2484000	55.9	5.174	21.493	0
3/20/2004	7:00:00	2487600	55.9	5.169	21.498	0
3/20/2004	8:00:00	2491200	55.9	5.165	21.502	0
3/20/2004	9:00:00	2494800	55.9	5.157	21.510	0
3/20/2004	10:00:00	2498400	55.9	5.154	21.513	0
3/20/2004	11:00:00	2502000	55.9	5.15	21.517	0
3/20/2004	12:00:00	2505600	55.9	5.147	21.520	0
3/20/2004	13:00:00	2509200	55.9	5.143	21.524	0
3/20/2004	14:00:00	2512800	55.9	5.14	21.527	0
3/20/2004	15:00:00	2516400	55.9	5.136	21.531	0
3/20/2004	16:00:00	2520000	55.9	5.133	21.534	0
3/20/2004	17:00:00	2523600	55.9	5.124	21.543	0
3/20/2004	18:00:00	2527200	55.9	5.117	21.550	0
3/20/2004	19:00:00	2530800	55.9	5.112	21.555	0
3/20/2004	20:00:00	2534400	55.9	5.108	21.559	0
3/20/2004	21:00:00	2538000	55.9	5.104	21.563	0
3/20/2004	22:00:00	2541600	55.9	5.1	21.567	0
3/20/2004	23:00:00	2545200	55.9	5.095	21.572	0
3/21/2004	0:00:00	2548800	55.9	5.091	21.576	0
3/21/2004	1:00:00	2552400	55.9	5.085	21.582	0
3/21/2004	2:00:00	2556000	55.9	5.083	21.584	0
3/21/2004	3:00:00	2559600	55.9	5.078	21.589	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/21/2004	4:00:00	2563200	55.9	5.072	21.595	0
3/21/2004	5:00:00	2566800	55.9	5.069	21.598	0
3/21/2004	6:00:00	2570400	55.9	5.061	21.606	0
3/21/2004	7:00:00	2574000	55.9	5.058	21.609	0
3/21/2004	8:00:00	2577600	55.9	5.054	21.613	0
3/21/2004	9:00:00	2581200	55.9	5.048	21.619	0
3/21/2004	10:00:00	2584800	55.9	5.047	21.620	0
3/21/2004	11:00:00	2588400	55.9	5.046	21.621	0
3/21/2004	12:00:00	2592000	55.9	5.045	21.622	0
3/21/2004	13:00:00	2595600	55.9	5.042	21.625	0
3/21/2004	14:00:00	2599200	55.9	5.039	21.628	0
3/21/2004	15:00:00	2602800	55.9	5.038	21.629	0
3/21/2004	16:00:00	2606400	55.9	5.034	21.633	0
3/21/2004	17:00:00	2610000	55.9	5.027	21.640	0
3/21/2004	18:00:00	2613600	55.9	5.024	21.643	0
3/21/2004	19:00:00	2617200	55.9	5.018	21.649	0
3/21/2004	20:00:00	2620800	55.9	5.011	21.656	0
3/21/2004	21:00:00	2624400	55.9	5.008	21.659	0
3/21/2004	22:00:00	2628000	55.9	5.005	21.662	0
3/21/2004	23:00:00	2631600	55.88	5.003	21.664	0
3/22/2004	0:00:00	2635200	55.9	5	21.667	0
3/22/2004	1:00:00	2638800	55.9	4.995	21.672	0
3/22/2004	2:00:00	2642400	55.9	4.991	21.676	0
3/22/2004	3:00:00	2646000	55.9	4.989	21.678	0
3/22/2004	4:00:00	2649600	55.9	4.983	21.684	0
3/22/2004	5:00:00	2653200	55.9	4.977	21.690	0
3/22/2004	6:00:00	2656800	55.9	4.974	21.693	0
3/22/2004	7:00:00	2660400	55.9	4.969	21.698	0
3/22/2004	8:00:00	2664000	55.9	4.965	21.702	0
3/22/2004	9:00:00	2667600	55.9	4.962	21.705	0
3/22/2004	10:00:00	2671200	55.9	4.96	21.707	0
3/22/2004	11:00:00	2674800	55.9	4.958	21.709	0
3/22/2004	12:00:00	2678400	55.9	4.956	21.711	0
3/22/2004	13:00:00	2682000	55.9	4.952	21.715	0
3/22/2004	14:00:00	2685600	55.9	4.948	21.719	0
3/22/2004	15:00:00	2689200	55.88	4.946	21.721	0
3/22/2004	16:00:00	2692800	55.88	4.942	21.725	0
3/22/2004	17:00:00	2696400	55.9	4.939	21.728	0
3/22/2004	18:00:00	2700000	55.9	4.933	21.734	0
3/22/2004	19:00:00	2703600	55.88	4.93	21.737	0
3/22/2004	20:00:00	2707200	55.9	4.924	21.743	0
3/22/2004	21:00:00	2710800	55.88	4.918	21.749	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/22/2004	22:00:00	2714400	55.88	4.916	21.751	0
3/22/2004	23:00:00	2718000	55.9	4.912	21.755	0
3/23/2004	0:00:00	2721600	55.9	4.91	21.757	0
3/23/2004	1:00:00	2725200	55.88	4.906	21.761	0
3/23/2004	2:00:00	2728800	55.9	4.904	21.763	0
3/23/2004	3:00:00	2732400	55.9	4.897	21.770	0
3/23/2004	4:00:00	2736000	55.88	4.895	21.772	0
3/23/2004	5:00:00	2739600	55.9	4.888	21.779	0
3/23/2004	6:00:00	2743200	55.9	4.885	21.782	0
3/23/2004	7:00:00	2746800	55.9	4.879	21.788	0
3/23/2004	8:00:00	2750400	55.9	4.876	21.791	0
3/23/2004	9:00:00	2754000	55.88	4.872	21.795	0
3/23/2004	10:00:00	2757600	55.88	4.866	21.801	0
3/23/2004	11:00:00	2761200	55.88	4.865	21.802	0
3/23/2004	12:00:00	2764800	55.9	4.862	21.805	0.02
3/23/2004	13:00:00	2768400	55.88	4.86	21.807	0
3/23/2004	14:00:00	2772000	55.88	4.862	21.805	0
3/23/2004	15:00:00	2775600	55.88	4.874	21.793	0
3/23/2004	16:00:00	2779200	55.9	4.931	21.736	0
3/23/2004	17:00:00	2782800	55.88	4.981	21.686	0
3/23/2004	18:00:00	2786400	55.9	5.04	21.627	0
3/23/2004	19:00:00	2790000	55.9	5.089	21.578	0
3/23/2004	20:00:00	2793600	55.88	5.135	21.532	0
3/23/2004	21:00:00	2797200	55.88	5.177	21.490	0
3/23/2004	22:00:00	2800800	55.88	5.202	21.465	0
3/23/2004	23:00:00	2804400	55.88	5.221	21.446	0
3/24/2004	0:00:00	2808000	55.88	5.232	21.435	0
3/24/2004	1:00:00	2811600	55.88	5.242	21.425	0
3/24/2004	2:00:00	2815200	55.88	5.245	21.422	0
3/24/2004	3:00:00	2818800	55.88	5.248	21.419	0
3/24/2004	4:00:00	2822400	55.9	5.245	21.422	0
3/24/2004	5:00:00	2826000	55.88	5.242	21.425	0
3/24/2004	6:00:00	2829600	55.88	5.239	21.428	0
3/24/2004	7:00:00	2833200	55.88	5.233	21.434	0
3/24/2004	8:00:00	2836800	55.88	5.23	21.437	0
3/24/2004	9:00:00	2840400	55.88	5.226	21.441	0
3/24/2004	10:00:00	2844000	55.88	5.223	21.444	0
3/24/2004	11:00:00	2847600	55.88	5.222	21.445	0
3/24/2004	12:00:00	2851200	55.88	5.216	21.451	0
3/24/2004	13:00:00	2854800	55.88	5.213	21.454	0
3/24/2004	14:00:00	2858400	55.88	5.213	21.454	0
3/24/2004	15:00:00	2862000	55.88	5.209	21.458	0

Table A-2 (continued)

Date	Time	Elapsed Time (sec)	Water Temperature (°F)	Water Depth (ft)	Water Depth from Top of Casing (ft)	TA-6 Weather Station Data Precipitation (in.)
3/24/2004	16:00:00	2865600	55.88	5.203	21.464	0
3/24/2004	17:00:00	2869200	55.88	5.2	21.467	0
3/24/2004	18:00:00	2872800	55.88	5.196	21.471	0
3/24/2004	19:00:00	2876400	55.88	5.192	21.475	0
3/24/2004	20:00:00	2880000	55.88	5.186	21.481	0
3/24/2004	21:00:00	2883600	55.88	5.183	21.484	0
3/24/2004	22:00:00	2887200	55.88	5.185	21.482	0
3/24/2004	23:00:00	2890800	55.88	5.18	21.487	0
3/25/2004	0:00:00	2894400	55.88	5.174	21.493	0
3/25/2004	1:00:00	2898000	55.88	5.174	21.493	0
3/25/2004	2:00:00	2901600	55.88	5.17	21.497	0
3/25/2004	3:00:00	2905200	55.88	5.165	21.502	0
3/25/2004	4:00:00	2908800	55.88	5.158	21.509	0
3/25/2004	5:00:00	2912400	55.88	5.155	21.512	0
3/25/2004	6:00:00	2916000	55.88	5.15	21.517	0
3/25/2004	7:00:00	2919600	55.88	5.147	21.520	0
3/25/2004	8:00:00	2923200	55.88	5.145	21.522	0

Appendix B

DP Canyon Quarterly Inspection Report
Second Quarter, Fiscal Year 2004

DP Canyon Inspection Report
March 31, 2004

Introduction: Regular inspections are conducted to assess the status of two petroleum hydrocarbon seeps in DP Canyon. These seeps, which are downgradient from Solid Waste Management Unit 21-029 (DP Tank Farm), are referred to as the upstream and downstream seeps (Figure 1). The frequency of the inspections has been reduced to quarterly, following nearly four years of monthly or semimonthly inspections. The results of these inspections are used to document any changes in the petroleum hydrocarbon seep areas in relation to seasonal changes and recent precipitation.

Date: March 31, 2004

Time: 11:30 a.m.

Personnel: Becky Coel-Roback and Jared Lyman

Weather: 65 °C, dry, sunny, and still

Precipitation: 2.16 in., approximate total since the December inspection (source: Los Alamos National Laboratory Weather Machine).

Presence of standing or running water: At the time of the March inspection, there was no flow coming from the culverts at the head of the canyon and no running water at either of the seep areas. There was some standing water at the upstream seep location and no water at all at the downstream seep location.

Location and intensity of odors, staining, or sheen (see Figure 1 for locations):

	Air	Water	Soil/Sediment
Upstream Location	No petroleum hydrocarbon odor in air	Petroleum hydrocarbon sheen on standing water	Petroleum hydrocarbon odor and sheen in disturbed sediments
Downstream Location	Faint petroleum hydrocarbon odor in air	No water present during March inspection	Petroleum hydrocarbon odor in disturbed sediments

Photographs: The photographs on the following pages were taken during the site visit (see Figure 1 for locations).

Location 1, canyon head. There was no flow from either culvert during the March 2004 inspection.

Location 2, upstream location. Some sheen was noted on standing water during the March 2004 inspection.

Location 3, upstream location. During the March 2004 inspection, sheen and odor were noted on disturbed sediments.

Location 4, upstream location. Stream channel, looking downstream from sample location 21-11136

Location 5, downstream location. There was no running or standing water during the March 2004 inspection.

Location 6, downstream location. Faint petroleum hydrocarbon odors were noted in air and sediment during the March 2004 inspection.

Location 7, downstream location. Stream channel, looking downstream from sample location 21-11176

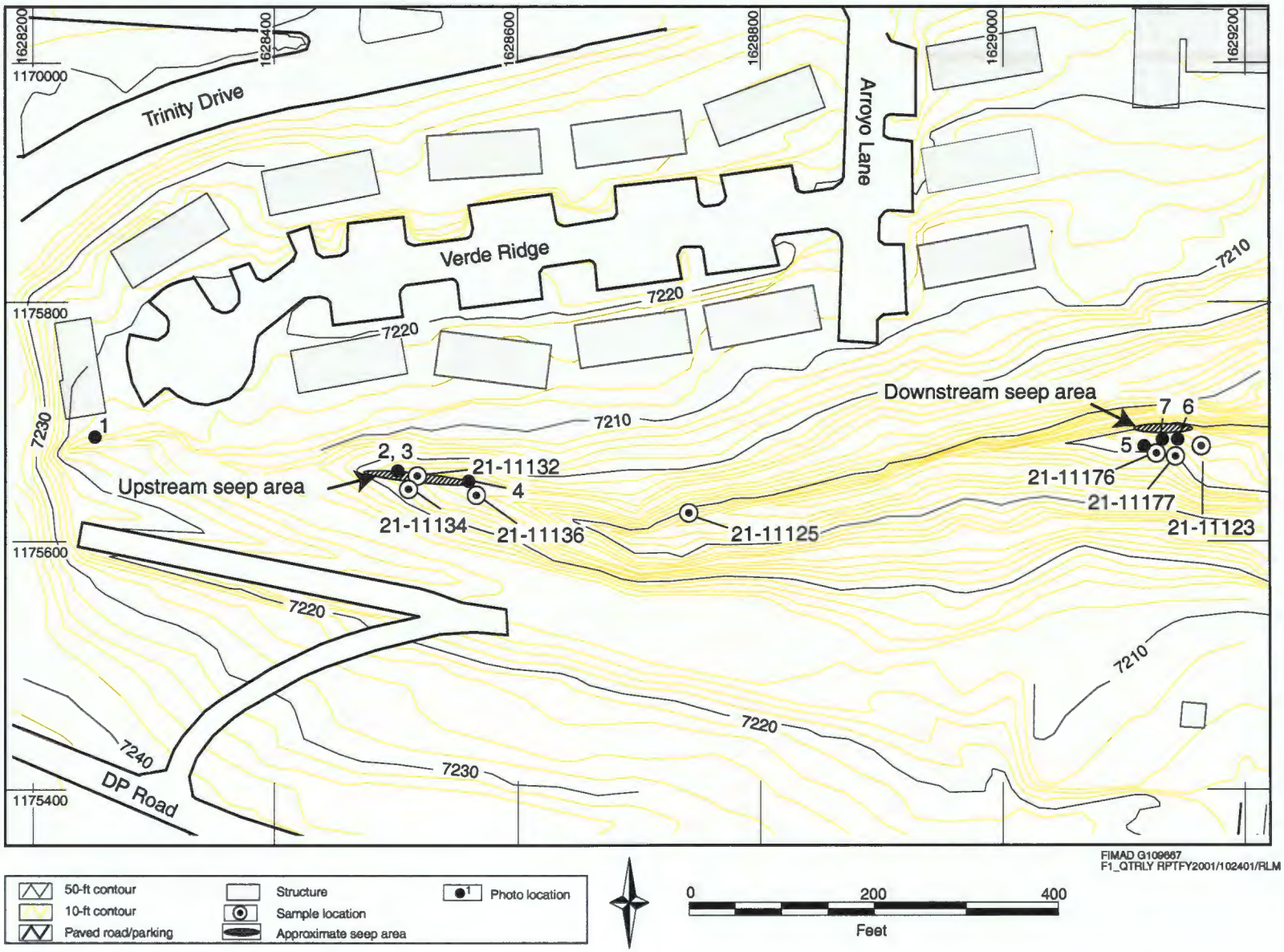


Figure 1. DP Tank Farm photo locations, seep areas, and sampling locations

Appendix C

Quarterly Moisture-Monitoring Report
Second Quarter, Fiscal Year 2004
Technical Area 49, Material Disposal Area AB

QUARTERLY MOISTURE-MONITORING REPORT
SECOND QUARTER, FISCAL YEAR 2004
TECHNICAL AREA 49
MATERIAL DISPOSAL AREA AB

Risk Reduction and Environmental Stewardship–Remediation Services

Los Alamos National Laboratory

May 2004

CONTENTS

1.0 INTRODUCTION C-1

2.0 MOISTURE-MONITORING RESULTS C-3

2.1 Neutron Logging C-3

2.2 TDR and Precipitation Measurements C-3

3.0 MOISTURE-MONITORING RESULTS AND DATA ANALYSIS C-5

3.1 Introduction C-5

3.2 Correlation between TDR Measurements and Precipitation Events C-5

3.3 TDR and Neutron Comparisons C-5

3.4 Student t-Test of Neutron Data C-5

4.0 CONCLUSIONS C-6

5.0 RECOMMENDATIONS C-6

6.0 REFERENCES C-8

ATTACHMENT 1 NEUTRON MOISTURE MEASUREMENTS 1-1

ATTACHMENT 2 TIME VERSUS MOISTURE CONTENT PLOTS 2-1

ATTACHMENT 3 CONDITION OF EVAPOTRANSPIRATION COVER 3-1

List of Figures

Figure 1 Location of instrumentation and neutron access holes on XY plane at TA-49 ..... C-2
Figure 2 TDR measurements compared with neutron measurements at neutron access hole 10046, which is in close proximity and at the same corresponding depths as TDR1 ..... C-4
Figure 3 TDR measurements compared with neutron measurements at neutron access hole 10048, which is in close proximity and at the same corresponding depth as TDR3 ..... C-4
Figure 4 TA-49 neutron access holes C-7
Figure 1-1 Neutron probe moisture measurements for neutron access holes TH-1 and TH-2 1-1
Figure 1-2 Neutron probe moisture measurements for neutron access holes TH-3 and TH-4 1-2
Figure 1-3 Neutron probe moisture measurements for neutron access holes TH-5 and 2A-0 1-3
Figure 1-4 Neutron probe moisture measurements for neutron access holes 2A-Y and 2B-Y 1-4
Figure 1-5 Neutron probe moisture measurements for neutron access holes 49-10046 and 49-10047 1-5
Figure 1-6 Neutron probe moisture measurements for neutron access hole 49-10048 and 1M-3 1-6
Figure 1-7 Neutron probe moisture measurements for neutron access hole 1M-3A and 2M-3 1-6
Figure 1-8 Neutron probe moisture measurements for neutron access hole 4M-4 and 5M-1 1-6
Figure 1-9 Neutron probe moisture measurements for neutron access hole 49-2901 1-9
Figure 2-1 Trend plot of neutron moisture measurements, neutron access hole TH-1 2-1
Figure 2-2 Trend plot of neutron moisture measurements, neutron access hole TH-2 2-2
Figure 2-3 Trend plot of neutron moisture measurements, neutron access hole TH-3 2-3
Figure 2-4 Trend plot of neutron moisture measurements, neutron access hole TH-4 2-4
Figure 2-5 Trend plot of neutron moisture measurements, neutron access hole TH-5 2-5
Figure 2-6 Trend plot of neutron moisture measurements, neutron access hole 2A-O 2-6
Figure 2-7 Trend plot of neutron moisture measurements, neutron access hole 2A-Y 2-7
Figure 2-8 Trend plot of neutron moisture measurements, neutron access hole 2B-Y 2-8
Figure 2-9 Trend plot of neutron moisture measurements, neutron access hole 49-10046 2-9
Figure 2-10 Trend plot of neutron moisture measurements, neutron access hole 49-10047 2-10
Figure 2-11 Trend plot of neutron moisture measurements, neutron access hole 49-10048 2-11
Figure 3-1 Photo of evapotranspiration cover from outside Area 2 3-1
Figure 3-2 Photo of evapotranspiration cover from outside Area 2 3-1
Figure 3-3 Close-up of evapotranspiration cover showing growth coming through cover 3-2
Figure 3-4 Close-up of evapotranspiration cover showing growth coming through cover 3-2

List of Tables

Table 1 TDR Array Descriptions 2
Table 2 Results of the Student T-test Analysis, Based on a 95% Confidence Interval 5
Table 3 Previously Drilled Neutron Access Holes Found in TA-49 and Recommended for Logging 7

1.0 INTRODUCTION

The TA-49 moisture-monitoring system began collecting data in March of 2000 to assess the performance of the MDA AB Area 2 cover with respect to maintaining and/or reducing subsurface moisture content. The Area 2 cover was installed after the historical asphalt pad was removed during an interim measure (IM) implemented in 1998 at the direction of New Mexico Environment Department Hazardous and Radioactive Materials Bureau (NMED-HRMB). The area was covered with soil, gravel, and a bio-barrier as part of stabilization activities. The IM was conducted to address concerns arising from moisture accumulation beneath the asphalt pad.

In 1998–1999, the IM and associated best management practice (BMP) activities conducted at Area 2 included the following:

- installation of a run-on diversion channel to the west of Area 2;
- removal of the asphalt cover over Area 2;
- surface regrading of Area 2 to eliminate surface-water ponding;
- grouting and abandonment of CH-2 and the two 150-ft-deep RFI neutron access holes;
- installation of an evapotranspiration (ET) cover composed of crushed tuff monofill with topsoil and covered with a steel mesh bio-barrier;
- installation of a silt fence surrounding the ET cover to control both erosion and contaminant transport; and
- seeding the ET cover with shallow-rooting grasses.

For details on the 1998–1999 BMP at Area 2, refer to Environmental Restoration Project (1998, 59166; 1998, 63041; and 1999, 63919).

In February 2000, a moisture-monitoring system was installed to monitor the ET cover at Area 2. Three shallow neutron logging access tubes were installed through the ET cover, and time domain reflectometry (TDR) probes were installed at two depths and at two locations in the ET cover. The TDR probes were wired into a Campbell Scientific, Inc., datalogger for automated measurements. The moisture-monitoring system utilizes three neutron access holes, four TDR probes, and a rain gauge to evaluate moisture content and relative changes within and beneath the new cover material. Additionally, eight neutron access holes located in the surrounding area are monitored monthly for moisture content. These neutron access holes characterize the moisture content of undisturbed areas immediately adjacent to the cover area. It is anticipated that the new cover material will behave similarly to native undisturbed areas by restoring the semi-arid, moisture limited, near-surface environment.

Monthly moisture monitoring began at the site in March of 2000. Monitoring is performed in accordance with ER-SOP-7.05, Rev. 1, "Subsurface Moisture Measurements Using a Neutron Probe." Neutron logging is performed with a dedicated CPN 503DR probe the last two workdays of each month to provide a consistent data set for trend analysis. The TDR probes record moisture content measurements twice a day. The two TDR arrays are located adjacent to neutron access holes 49-10046 and -10048 for data comparison and confirmation. The TDR arrays consist of a shallow TDR probe positioned horizontally just beneath the surface soil (approximately 6 in.), and a TDR probe positioned vertically beneath the cover materials at 10 ft and 6 ft, respectively. The shallow TDR probes are positioned to detect infiltration through the topsoil. A rain gauge was located at the surface of the cover near neutron access hole 49-10046 in order to monitor levels of precipitation at the site. Continuous measurement of site precipitation, and the 12-hour TDR data, characterizes the cover's infiltration response to rain events. Figure 1 shows the locations of neutron access

holes, TDR probes, the cover, and the gopher barrier boundary. Table 1 gives the corresponding depths of the TDR probes.

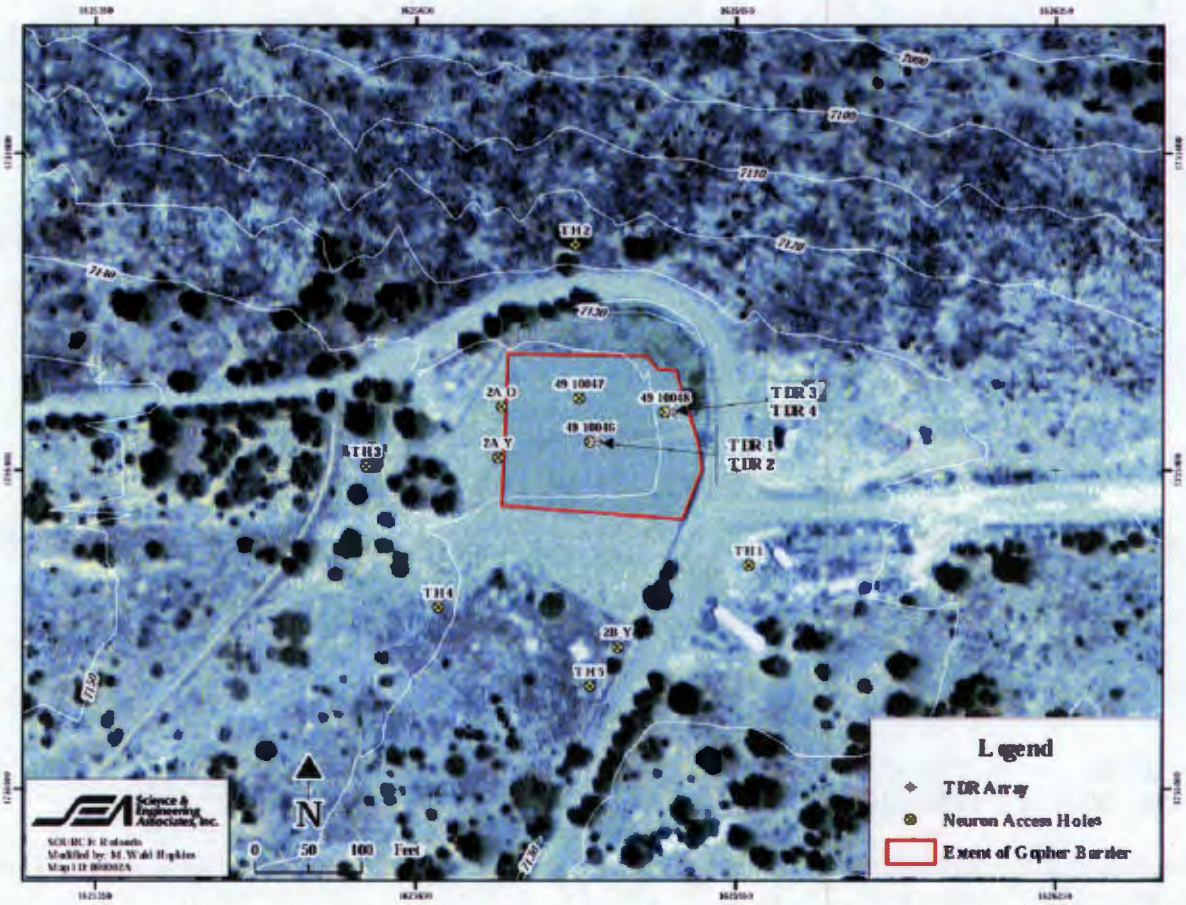


Figure 1. Location of instrumentation and neutron access holes on XY plane at TA-49, MDA AB Area 2

Table 1
TDR Array Descriptions

TDR Number	Array Type	Depth (ft)
TDR1	Vertical, within soil overlaying Bandelier Tuff	6
TDR2	Horizontal, at bottom of topsoil	0.5
TDR3	Vertical, within El Cajete pumice formation	10
TDR4	Horizontal, at bottom of topsoil	0.5

In January and March of 2004, neutron moisture measurements were performed at neutron access holes TH-2, TH-3, TH-4, TH-5, 2A-O, 2A-Y, 2B-Y, 10046, 10047, 10048, 1M-3, 1M-3A, 2M-3, 5M-1, 4M-4, and 49-2901 (March only). TDR measurements and precipitation quantities were recorded twice a day to a Campbell Scientific datalogger over the same period. This report will include a discussion of moisture trends over time, a comparison of moisture results from the neutron probe and the TDR instruments, and a discussion of the relationship between precipitation and moisture content.

2.0 MOISTURE-MONITORING RESULTS

2.1 Neutron Logging

Neutron-logging events occurred on January 27, 28, and 29, and on March 17, 19, and 22. Results for January and March were compared to the average from April 2000 to September 2003. Logging was performed with a dedicated CPN 503DR probe at all neutron access holes. The neutron counts from each of the 16 monitoring holes were recorded into a spreadsheet, and corresponding volumetric moisture content was calculated for each. Plots of volumetric moisture content for each sampling period and all of the access holes are shown in Attachment 1. Second quarter data for neutron access holes TH-2, TH-3, TH-4, TH-5, 2A-O, 2A-Y, 2B-Y, 10046, 10047, and 10048 are shown compared to the average for each hole from 2000 to fourth quarter 2003. There was no data collected first quarter 2004. All the data for the five "M" holes (1M-3, 1M-3A, 2M-3, 5M-1, 4M-4) are presented in Attachment 1.

The 700-ft deep neutron access hole, 49-2901, is located near TH-1 (Figure 4). Psychrometers and the positive pressure membrane were removed from the hole this quarter; the hole was then neutron logged and capped. The hole is 8 in. in diameter with a 3-ft steel stickup. This is the first quarter that 49-2901 has been neutron logged as part of the TA-49 moisture monitoring program. The data from this borehole are presented in Attachment 1.

2.2 TDR and Precipitation Measurements

TDR measurements and precipitation quantities were collected uninterrupted (except 2/11/2004 through 2/19/2004 due to program issues) twice a day through the second quarter 2004 and were recorded to a Campbell Scientific datalogger. The Campbell Scientific datalogger was programmed to record a timestamp, temperature, TDR raw frequencies, and precipitation in inches. The program converts raw frequency to volumetric moisture content and then records the data (both raw and converted) to a *.dat file. Figures 2 and 3 display the moisture content and precipitation measurements since installation in April 2000 through March 2004. On December 9, 2003, TDR's 1 and 2 stopped recording data due to the wires being disrupted by gophers. This was fixed on January 29, 2004. The cumulative precipitation was calculated from the on-site rain gauge from August 2000 to April 30, 2001. On May 1, 2001, it became apparent that the rain gauge was not functioning because debris was blocking the instrument. Therefore, from May 1, 2001, to date, precipitation data have been obtained from the Laboratory TA-49 weather station.

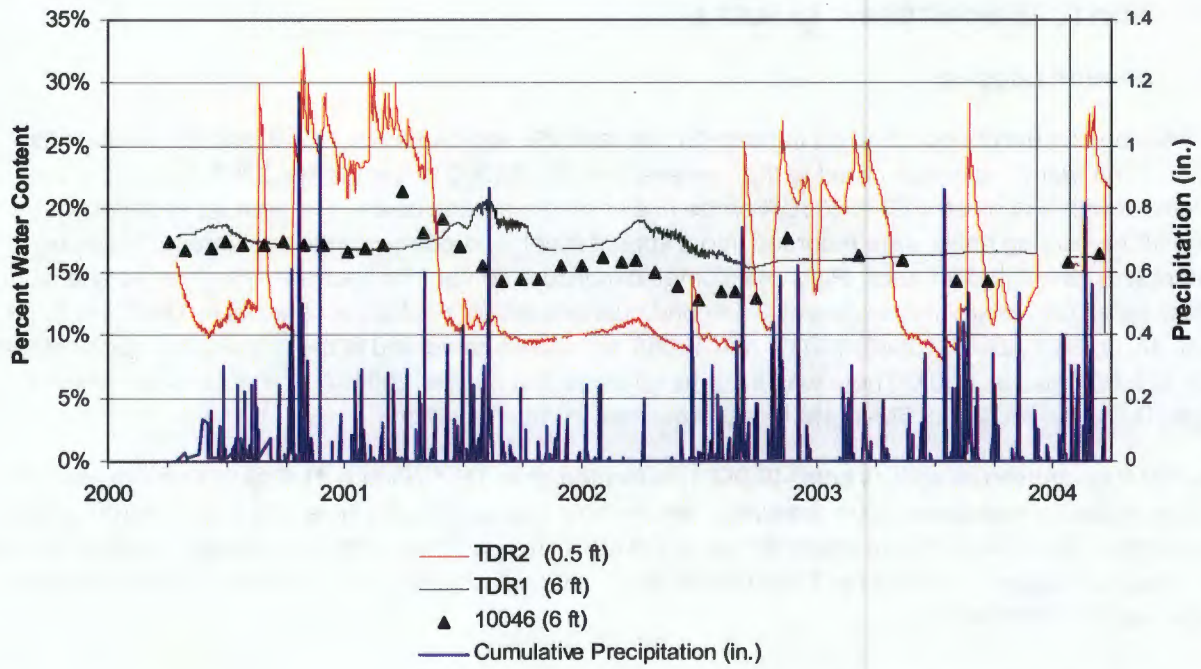


Figure 2. **TDR measurements compared with neutron measurements at neutron access hole 10046, which is in close proximity and at the same corresponding depths as TDR1**

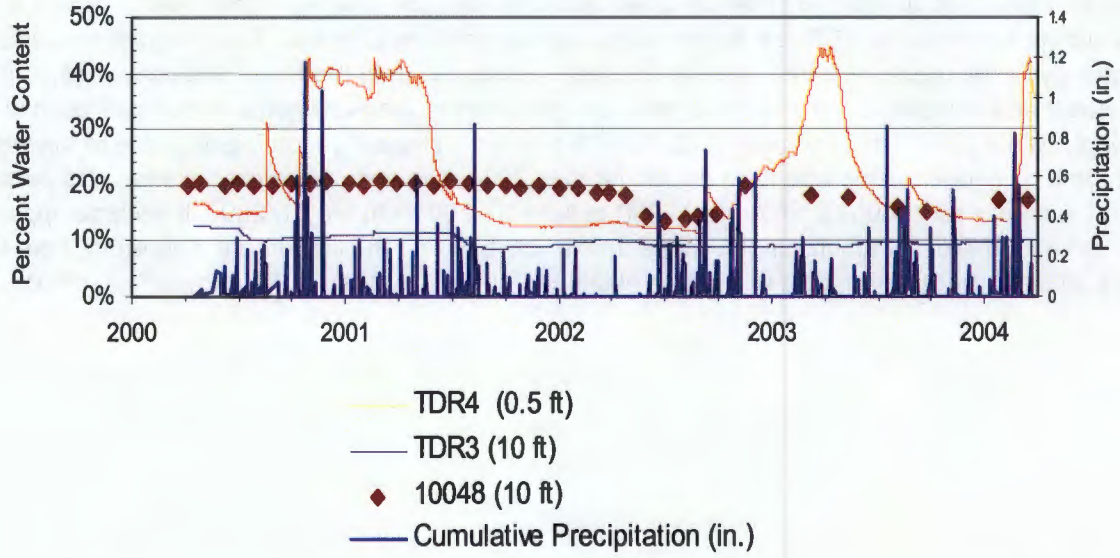


Figure 3. **TDR measurements compared with neutron measurements at neutron access hole 10048, which is in close proximity and at the same corresponding depth as TDR3**

3.0 MOISTURE-MONITORING RESULTS AND DATA ANALYSIS

3.1 Introduction

TDR and neutron data from April 2000 to March 2004 show fluctuations in volumetric moisture content near the surface. Measurements below the surface indicate that most of the moisture trends are relatively steady, while a few trends have decreased (Attachment 1). Table 3 shows the student t-test tracking these trends. Trend plots of time versus moisture content were created for specific depth intervals (Attachment 2).

3.2 Correlation between TDR Measurements and Precipitation Events

The results of the shallow TDR probes at 0.5 ft have ranged from between 8 and 25% (TDR 2) and 10 to 45% (TDR 4) moisture content. This is due to precipitation seeping into the first few feet of soil. In contrast, the results of deeper TDR probes have remained constant through the quarter ranging from between 15 and 20% for TDR 1 (6 ft) and 8 to 12% for TDR 3 (10 ft).

3.3 TDR and Neutron Comparisons

The moisture-monitoring system is performing as expected with consistent results between TDR arrays and neutron logging. Figures 2 and 3 display the deep TDR data associated with neutron access holes 49-10046 and -10048 respectively. The neutron probe data from the same depth as the deep TDR probes are also shown. The measurements are in agreement, differing by less than 2%.

3.4 Student t-Test of Neutron Data

A student t-test analysis was performed to statistically track trends in moisture over time for each of the neutron access holes. The student t-test evaluates the significance of an apparent trend based on a selected confidence interval. For the purpose of this analysis, a 95% confidence interval was selected.

As of March 2004, 39 months of data events were available for statistical analysis of 11 monitoring holes. See Table 2 for the results of the student t-test analyses for each of these neutron access holes. The trending analysis results show that moisture levels have decreased since measurements began in April 2000.

Table 2
Results of the Student t-Test Analysis, Based on a 95% Confidence Interval

Neutron Access Hole Number	Moisture Trending Results
TH-1	Analysis shows a decreasing moisture trend from 1 to 110 ft.
TH-2	Analysis shows a decreasing moisture trend from 6 to 104 ft.
TH-3	Analysis shows a decreasing moisture trend from 1 to 5 ft, 51 to 108 ft.
TH-4	Analysis shows a decreasing moisture trend from 1 to 10 ft, 21 to 25 ft, and 31 to 85 ft.
TH-5	Analysis shows a decreasing moisture trend from 1 to 114 ft.
2B-Y	Analysis shows no significant change in moisture trends.
2A-Y	Analysis shows no significant change in moisture trends.
2A-O	Analysis shows a decreasing moisture trend from 6 to 20 ft, and increasing moisture trend from 41 to 59 ft.
49-10046	Analysis shows a decreasing moisture trend from 5 to 13 ft.
49-10047	Analysis shows a decreasing moisture trend from 5 to 12 ft.
49-10048	Analysis shows a decreasing moisture trend from 3 to 12 ft.

In addition to the student t-test analyses, trend plots of time vs. moisture content for specific depth intervals in neutron access holes are shown in Figures 2-1 through 2-11 in Attachment 2.

4.0 CONCLUSIONS

The neutron log and TDR data indicate that the behavior of subsurface moisture levels fluctuate in the near surface (< 10 ft) and remain constant at greater depth as expected for a moisture-limited semi-arid climate. The precipitation at TA-49 has been a little above average, 3.85 in. from January through March 2004 (weather.com 2004). The moisture levels of the cover at the majority of the locations have decreased when compared to the average moisture levels from 3rd quarter 2000 to 4th quarter 2003. The shallow TDR probes have shown moisture content responses to relatively small rainfall events, while the deeper probes (> 6 ft) have remained constant. This can be attributed to precipitation events detected in the near-surface with no deep infiltration. The data from neutron access holes 10047 and 10048 show that the moisture content of the cover has decreased from the surface to the bottom of each neutron access hole. In neutron access holes adjacent to the cover (TH-3, TH-4, and TH-5), the moisture levels have decreased from the surface to the bottom. The data from two of the moderate depth neutron access holes (< 60 ft) surrounding the cover (2A-Y and 2B-Y) have not provided significant changes in moisture content; however, during the fourth quarter of 2003 and the second quarter of 2004, 2B-Y showed a slight decrease of moisture near the surface.

The cover over area 2 has shown substantial growth of vegetation. Attachment 3 includes photos taken of the area 2 cover during the second quarter of 2004. Photos of the cover will be taken each quarter to document and show the condition and the vegetation growth of the cover.

5.0 RECOMMENDATIONS

The TA-49 moisture-monitoring system was installed to assess the performance of the MDA AB Area 2 cover with respect to maintaining and/or reducing subsurface moisture content. The Area 2 cover was installed as part of the 1998 IM to address concerns arising from moisture accumulation beneath the former asphalt pad on top of the test shafts. The routine moisture monitoring and site inspections conducted since March 2000 have shown the IM to be successful in eliminating run-on, reducing surface-water ponding, and promoting evapotranspiration. This is evidenced by the reduction and/or stabilization of the subsurface moisture content within the covered area. Additionally, the increased vegetation, site BMPs, and steel-mesh bio-barrier have controlled runoff, erosion, and bio-intrusion, thus reducing the potential for contaminant migration and cover degradation.

MDA G at TA-54 is a mesa-top setting similar to MDA AB. Routine moisture monitoring has been performed at MDA G for more than 10 years. The results have indicated that very little, if any, detectable changes in moisture content occur below the near-surface environment and that any significant changes or trends are effectively captured by bimonthly monitoring. The moisture-monitoring results for the past 48 months at MDA AB have been consistent with those from MDA G. Measurements of the moisture content within the Bandelier Tuff at both mesa-top sites indicate that seasonal precipitation results in little, if any, deep infiltration. The current frequency of TDR measurements will continue to monitor the performance of the cover materials.

There are three additional neutron access holes at TA-49 located across the site (Figure 4) that are not currently neutron logged. These neutron access holes are listed in Table 3. Monitoring of these neutron access holes, along with the five for which monitoring began August 2003, will provide a more comprehensive data set of the moisture trends across TA-49. These holes have been identified and are considered to be in good condition for neutron logging. The melted casing will be cut away from two of the neutron access holes, 9-M2 and 9M-4, and their condition will then be noted.

Table 3
Previously Drilled Neutron Access Holes Found in TA-49 and Recommended for Logging

Neutron Access Hole ID	Condition	Depth from Top of Casing	Diameter of Casing	Y Coordinate	X Coordinate
9M-2	Casing melted	Unknown	2-in. PVC	1754574.50	1625811.19
9M-4	Casing melted	Unknown	2-in. PVC	1754518.73	1626037.78
4M-1	Good	Unknown	2-in. PVC	1753794.24	1625605

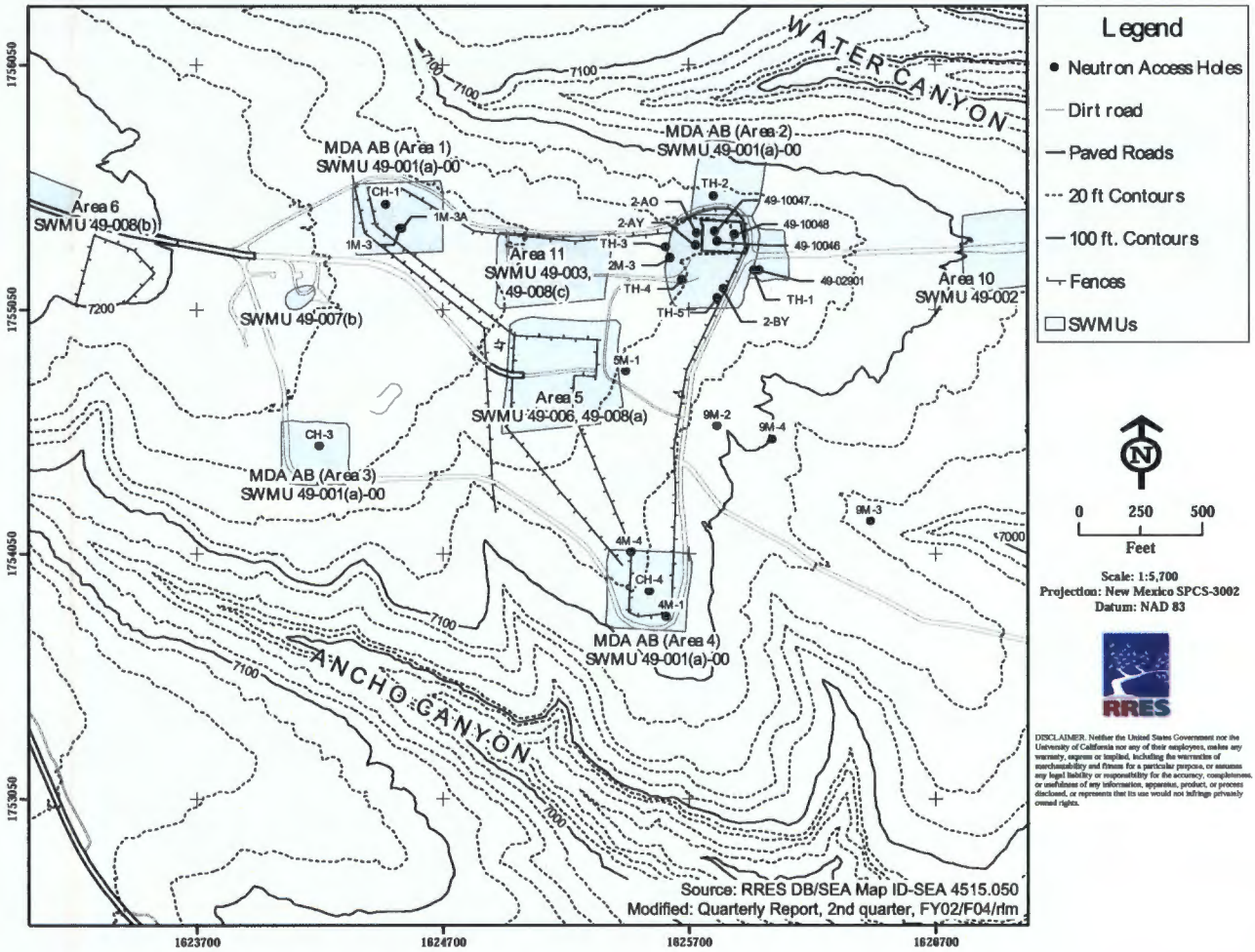


Figure 4. TA-49 neutron access holes

6.0 REFERENCES

Environmental Restoration Project, June 1998. "Stabilization Plan for Implementing Interim Measures and Best Management Practices at Potential Release Sites 49-001 (b, c, d, and g)," Los Alamos National Laboratory document LA-UR-98-1534, Los Alamos, New Mexico. (Environmental Restoration Project 1998, 59166)

Environmental Restoration Project, September 1998. "Best Management Practices Report for Installation of Stabilization Measures at Potential Release Sites 49-001(b, c, d, and g)," Los Alamos National Laboratory document LA-UR-98-4170, Los Alamos, New Mexico. (Environmental Restoration Project 1998, 63041)

Environmental Restoration Project, August 1999. "Interim Measures Report for Potential Release Sites 49-001(b), 49-001(c), 49-001(d), 49-001(g)," Los Alamos National Laboratory document LA-UR-99-2169, Los Alamos, New Mexico. (Environmental Restoration Project 1999, 63919)

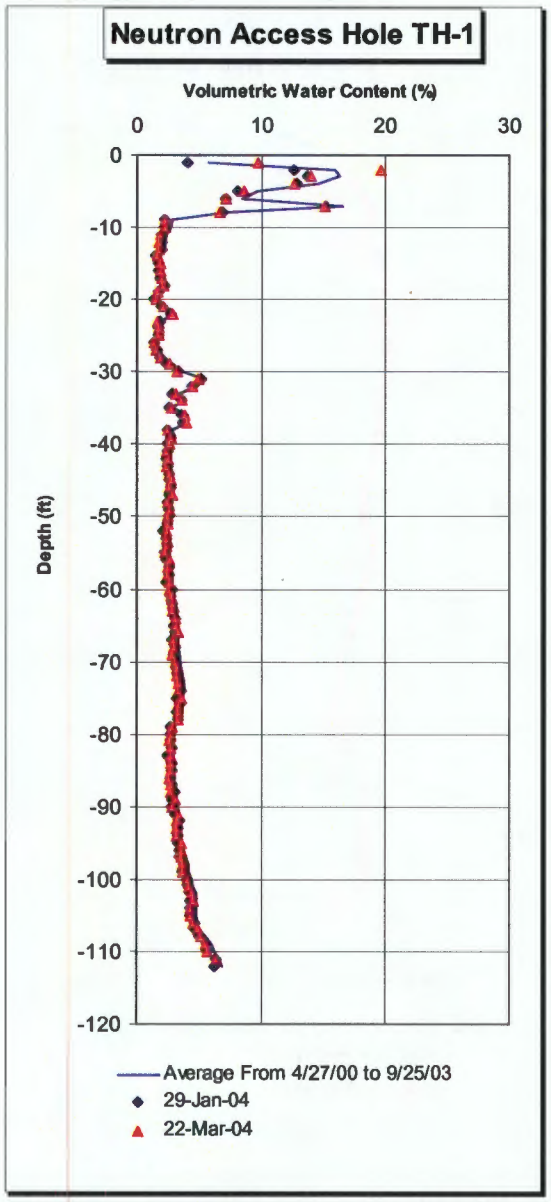
weather.com. 2004. http://www.weather.com

RRES-R (Risk Reduction and Environmental Stewardship—Remediation), April 2003. "Change in Moisture-Monitoring Frequency at TA-49, MDA AB, LANL" Los Alamos National Laboratory moisture monitoring report 16.200.01, Los Alamos, New Mexico. (RRES-R 2003, 76023)

Attachment 1

Neutron Moisture Measurements

ATTACHMENT 1 NEUTRON MOISTURE MEASUREMENTS



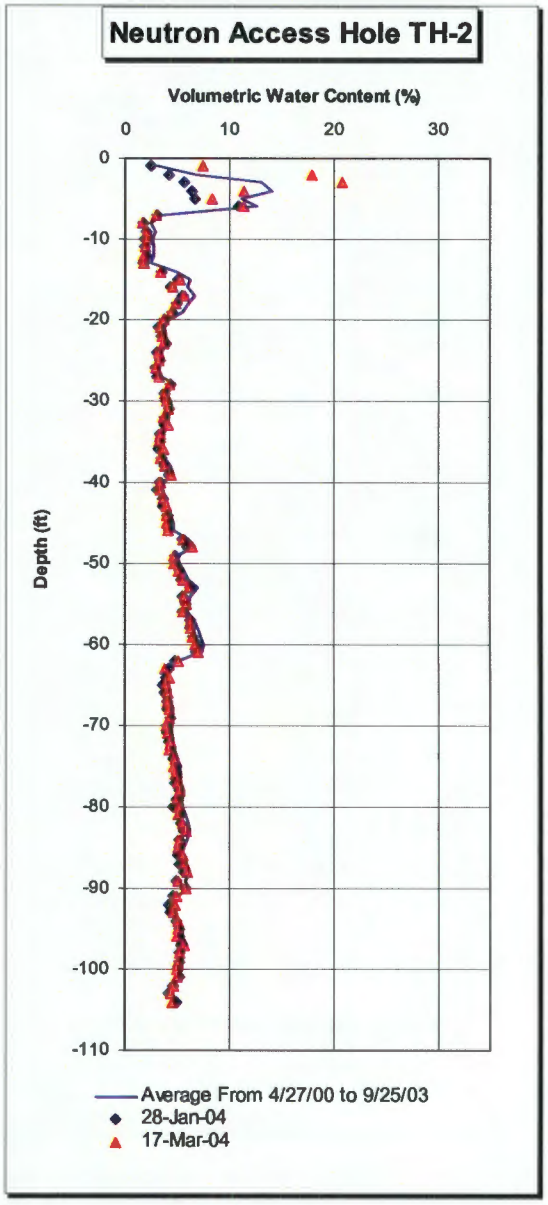


Figure 1-1. Neutron probe moisture measurements for neutron access holes TH-1 and TH-2

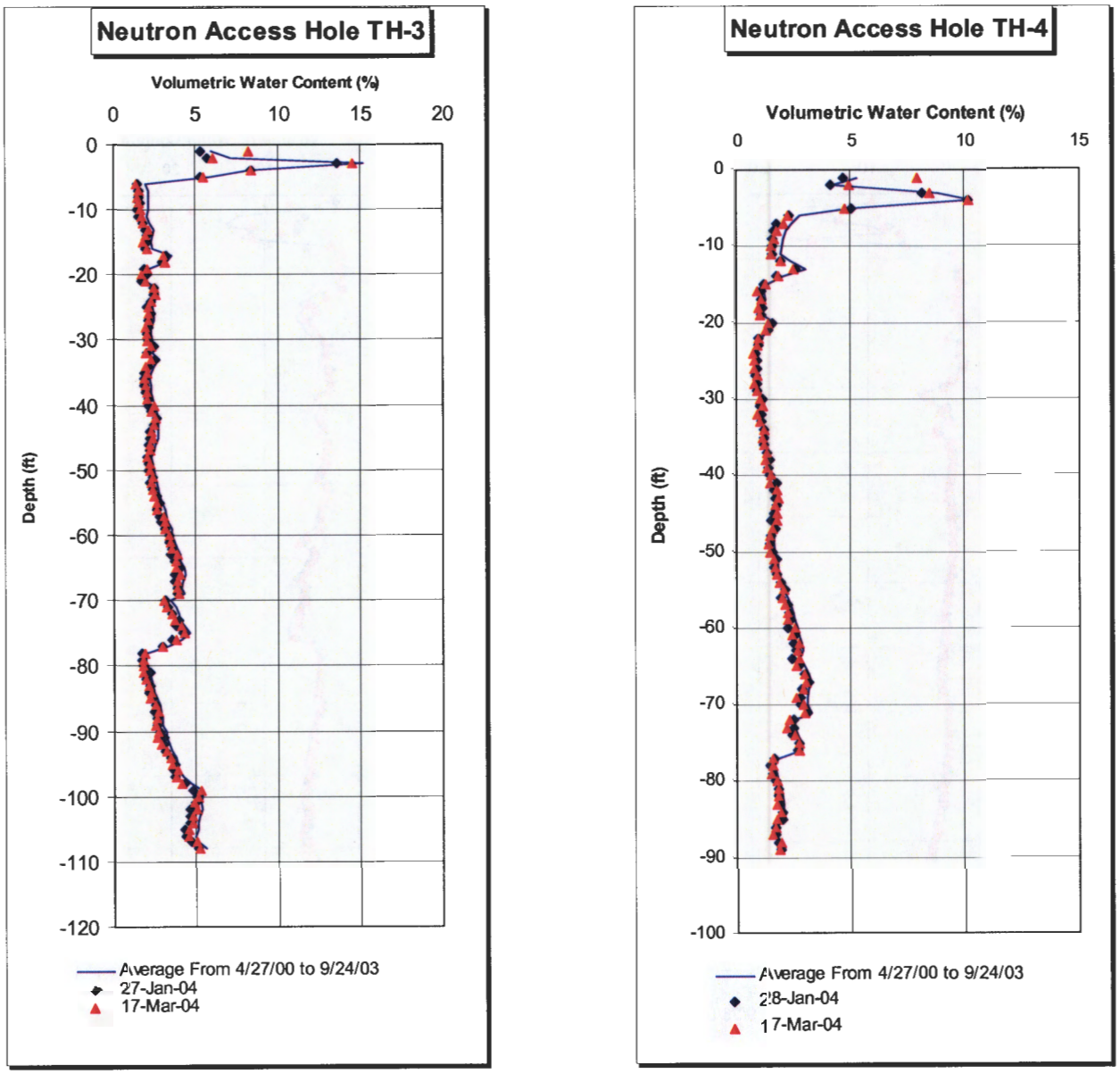


Figure 1-2. Neutron probe moisture measurements for neutron access holes TH-3 and TH-4

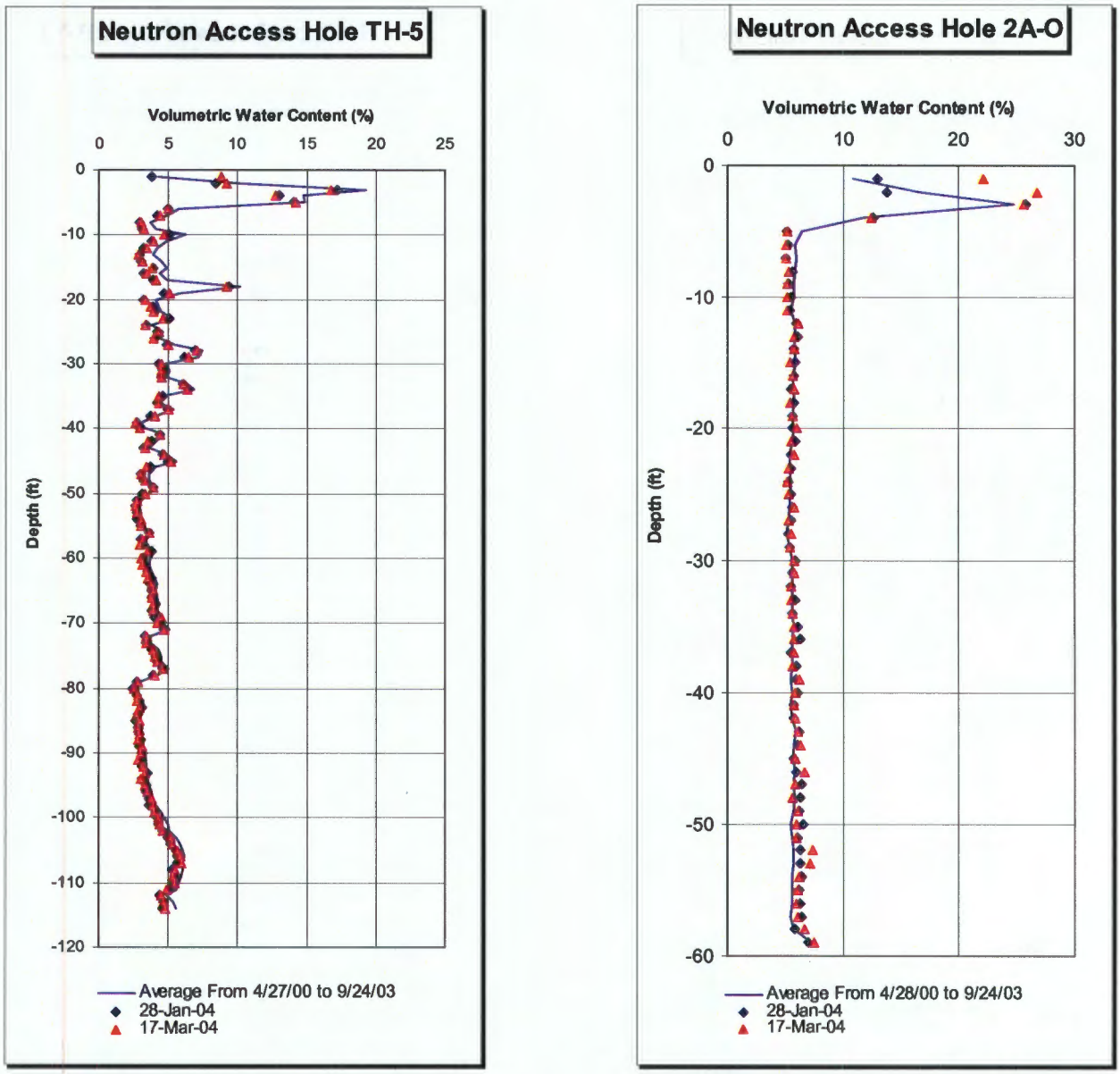


Figure 1-3. Neutron probe moisture measurements for neutron access holes TH-5 and 2A-0

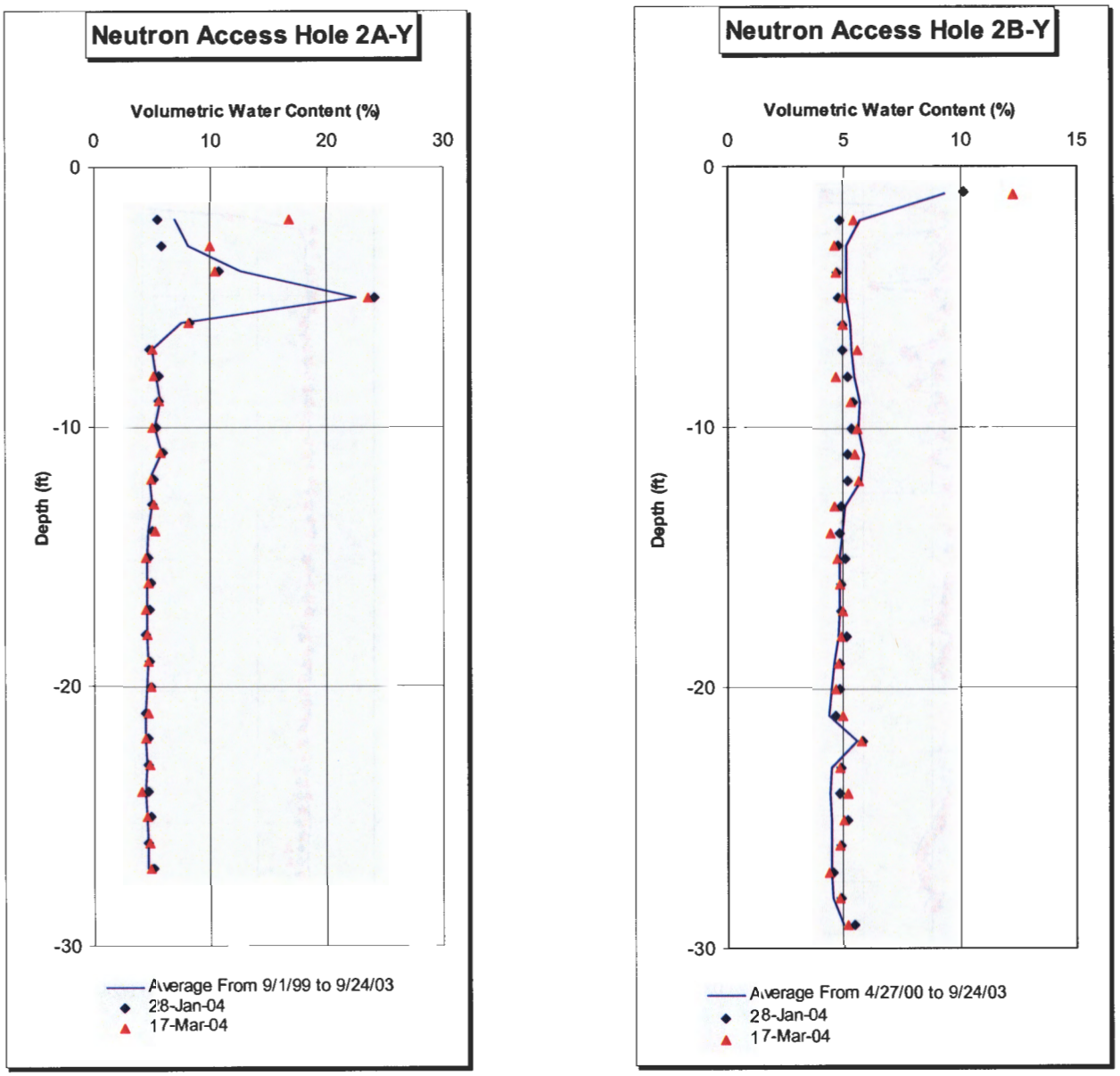


Figure 1-4. Neutron probe moisture measurements for neutron access holes 2A-Y and 2B-Y

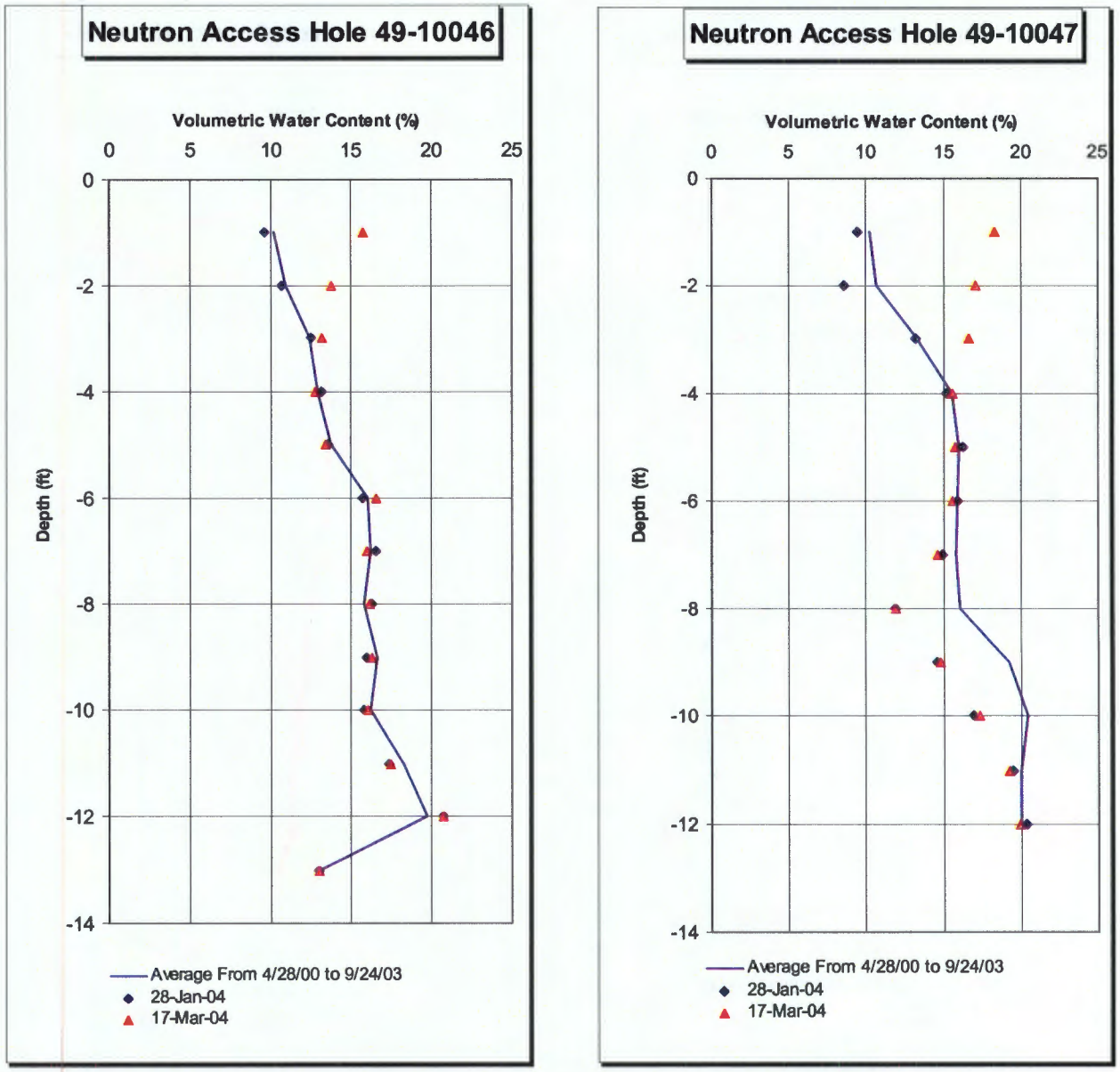


Figure 1-5. Neutron probe moisture measurements for neutron access holes 49-10046 and 49-10047

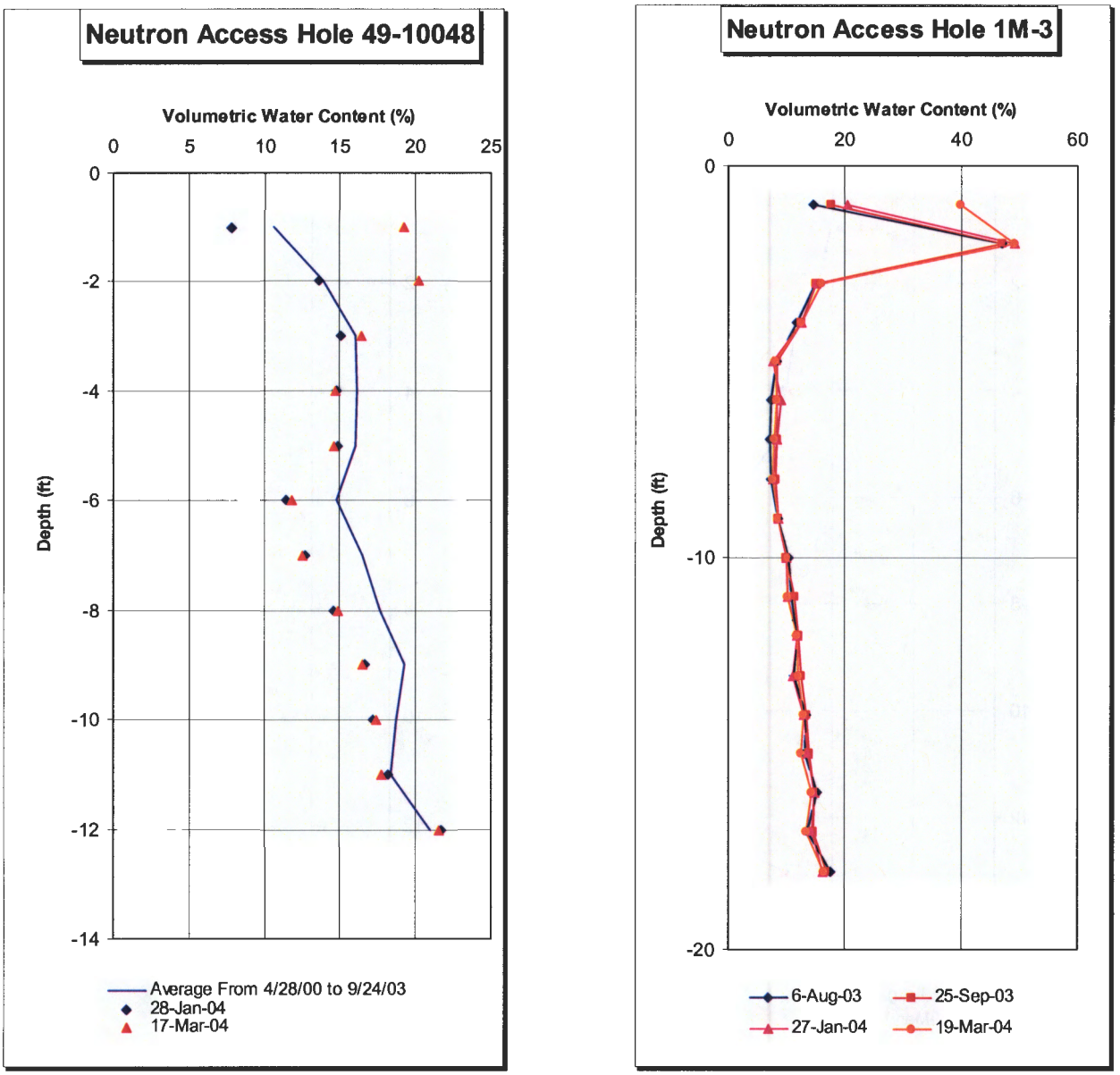


Figure 1-6. Neutron probe moisture measurements for neutron access holes 49-10048 and 1M-3

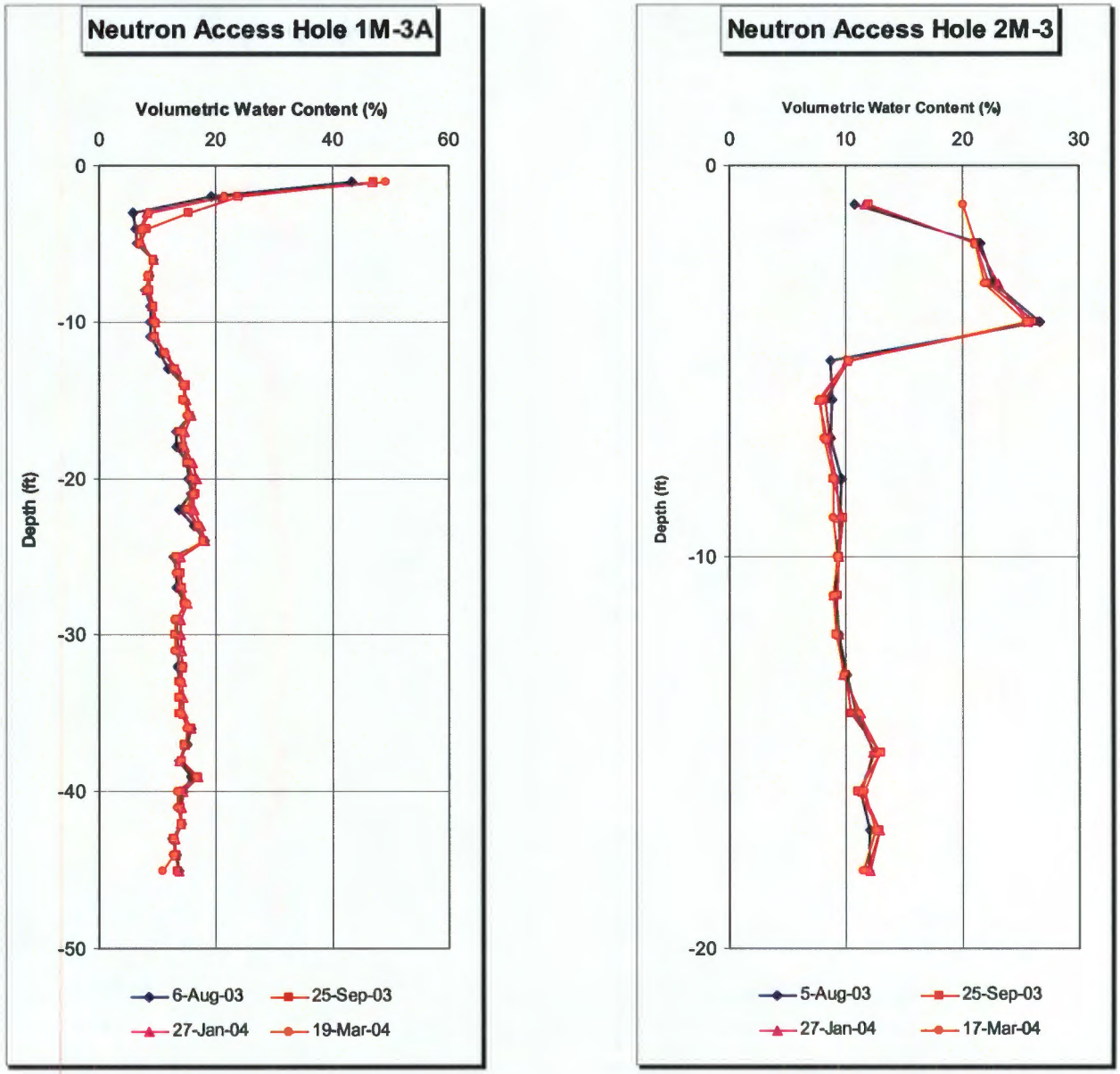


Figure 1-7. Neutron probe moisture measurements for neutron access holes 1M-3A and 2M-3

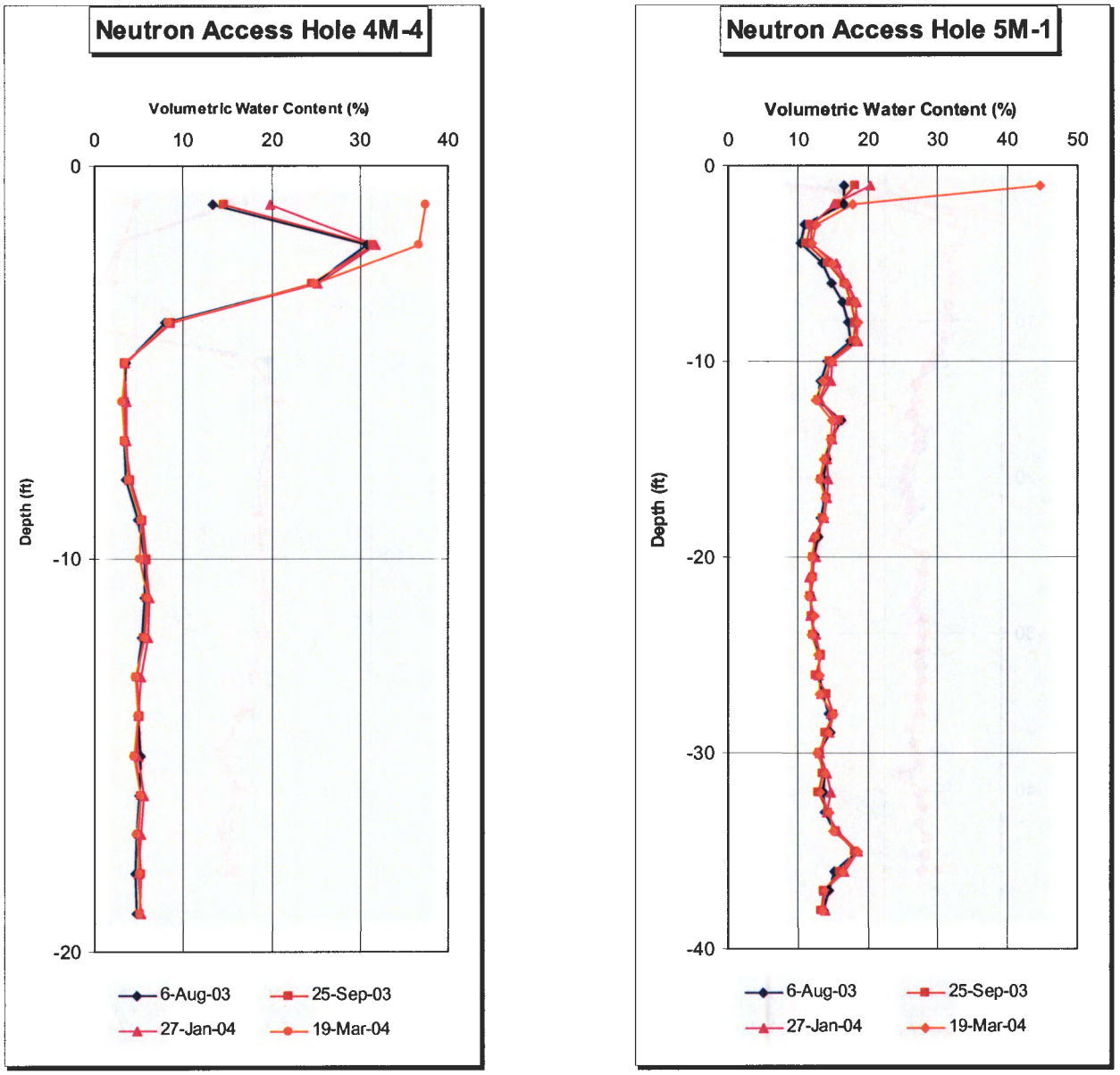


Figure 1-8. Neutron probe moisture measurements for neutron access holes 4M-4 and 5M-1

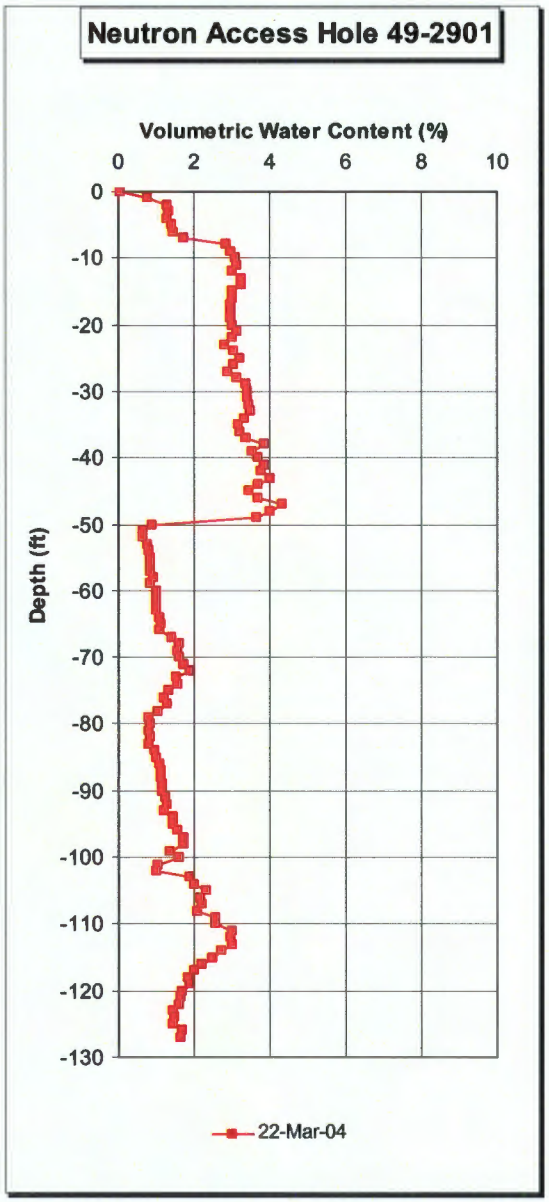


Figure 1-9. Neutron probe moisture measurements for neutron access hole 49-2901

Attachment 2

Time Versus Moisture Content Plots

ATTACHMENT 2 TIME VERSUS MOISTURE CONTENT PLOTS

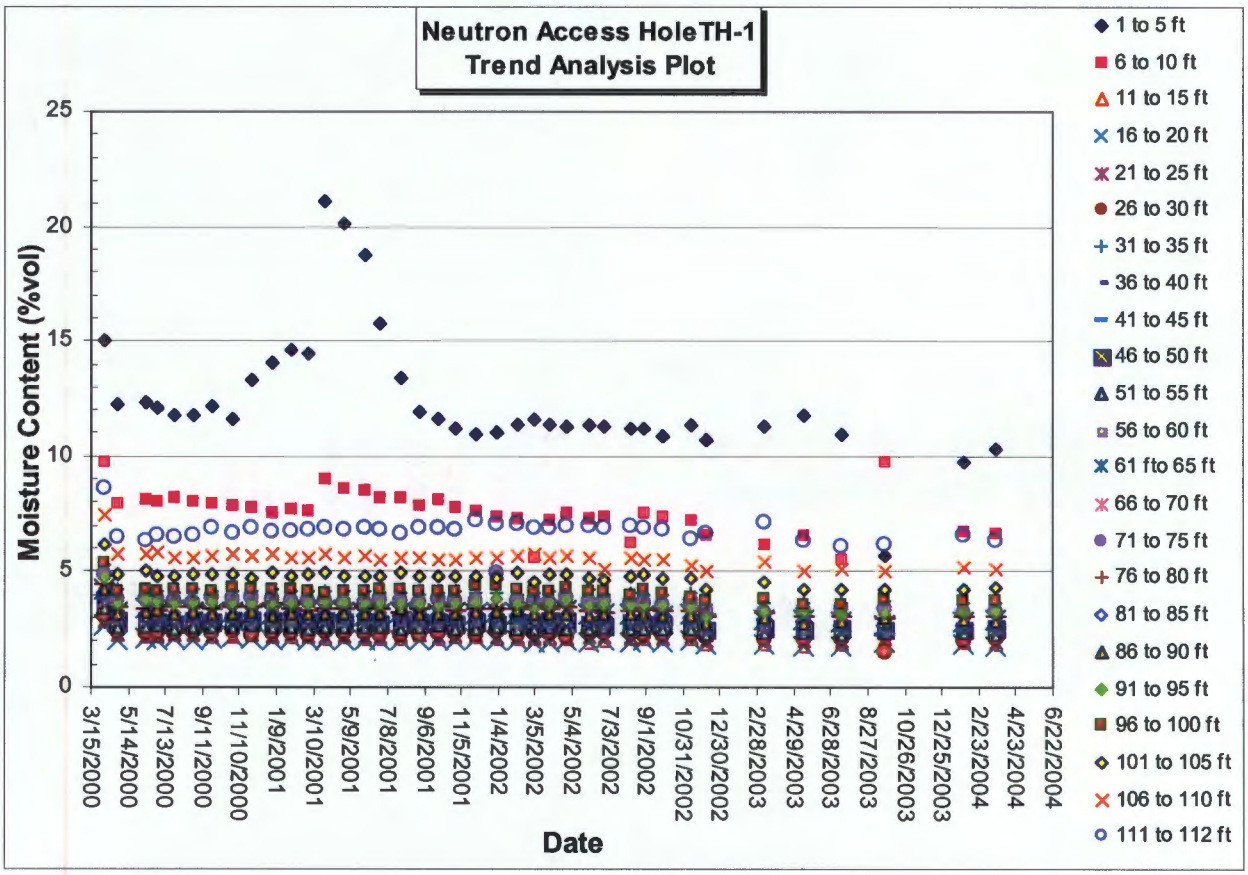


Figure 2-1. Trend plot of neutron moisture measurements, neutron access hole TH-1

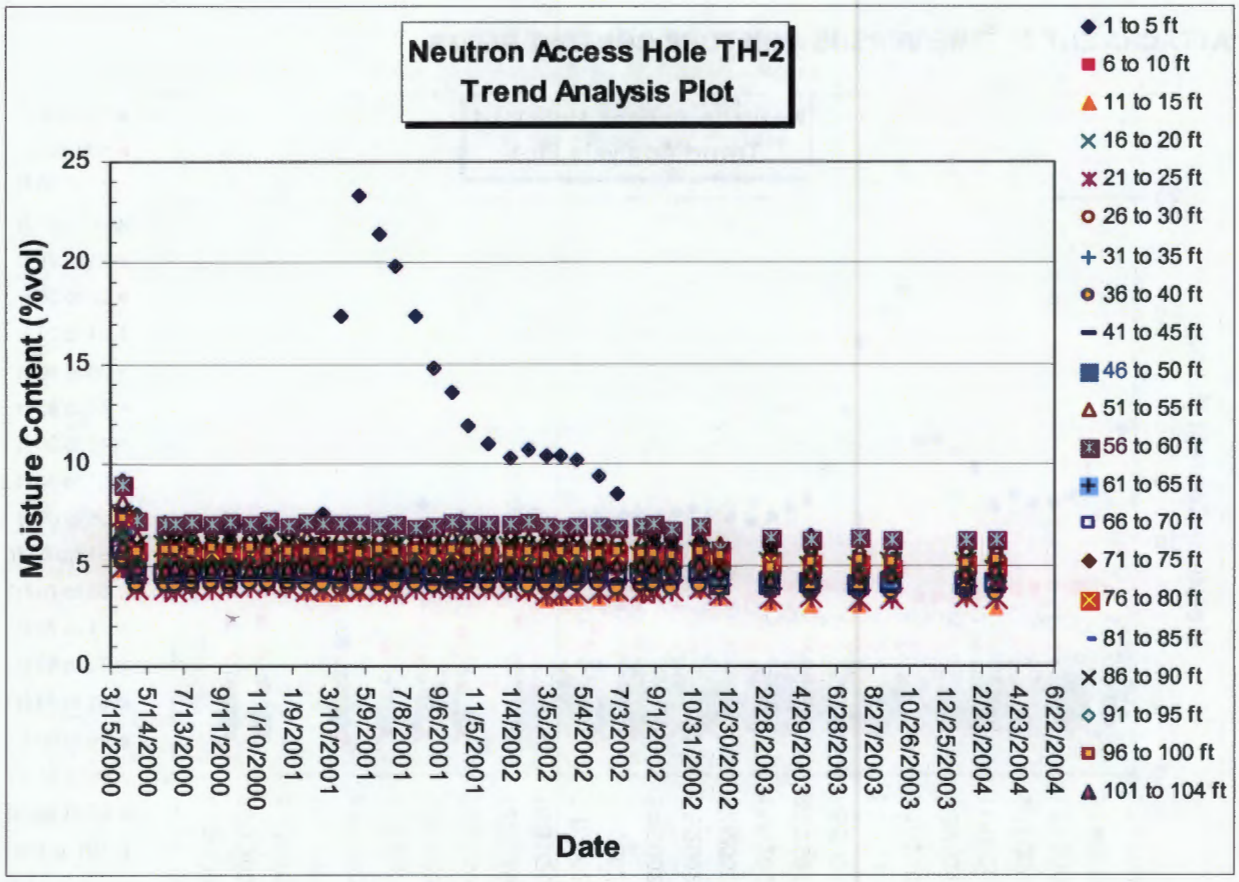


Figure 2-2. Trend plot of neutron moisture measurements, neutron access hole TH-2

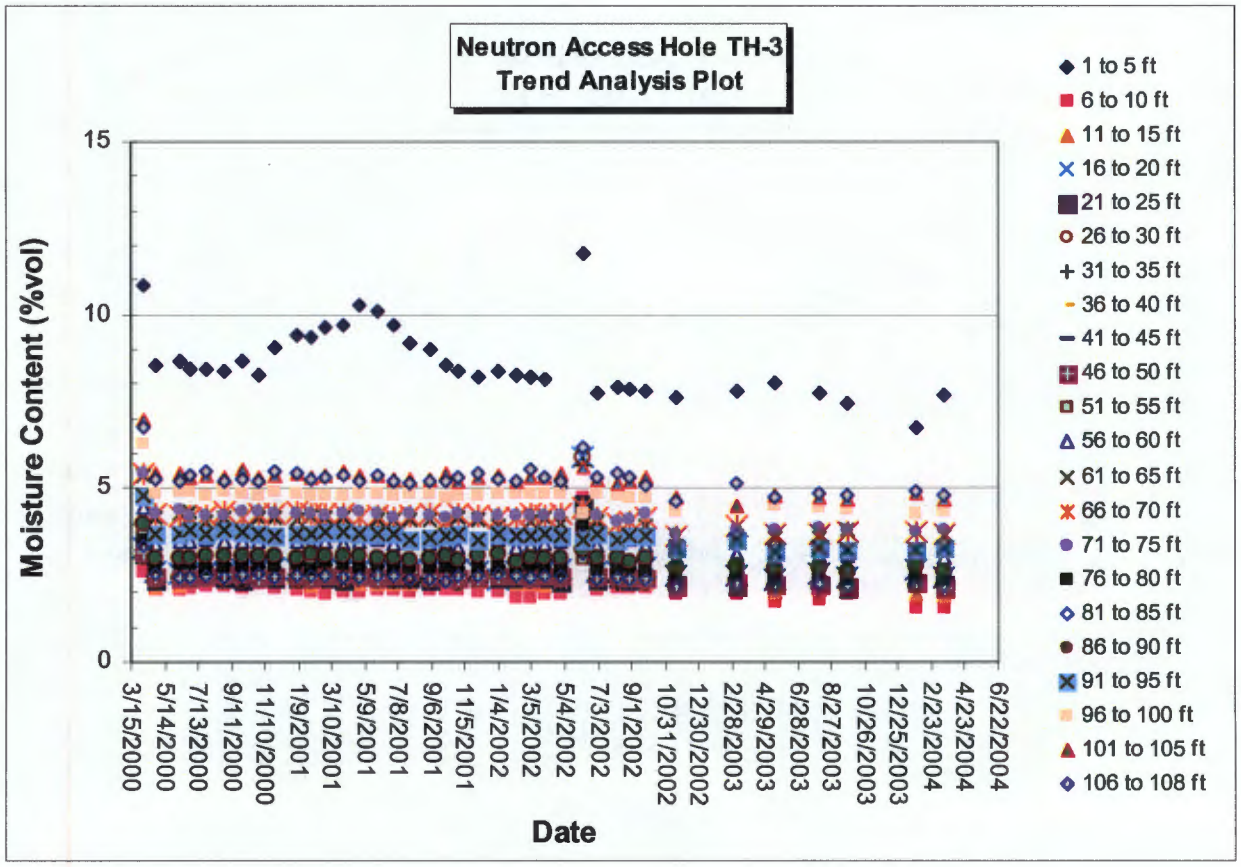


Figure 2-3. Trend plot of neutron moisture measurements, neutron access hole TH-3

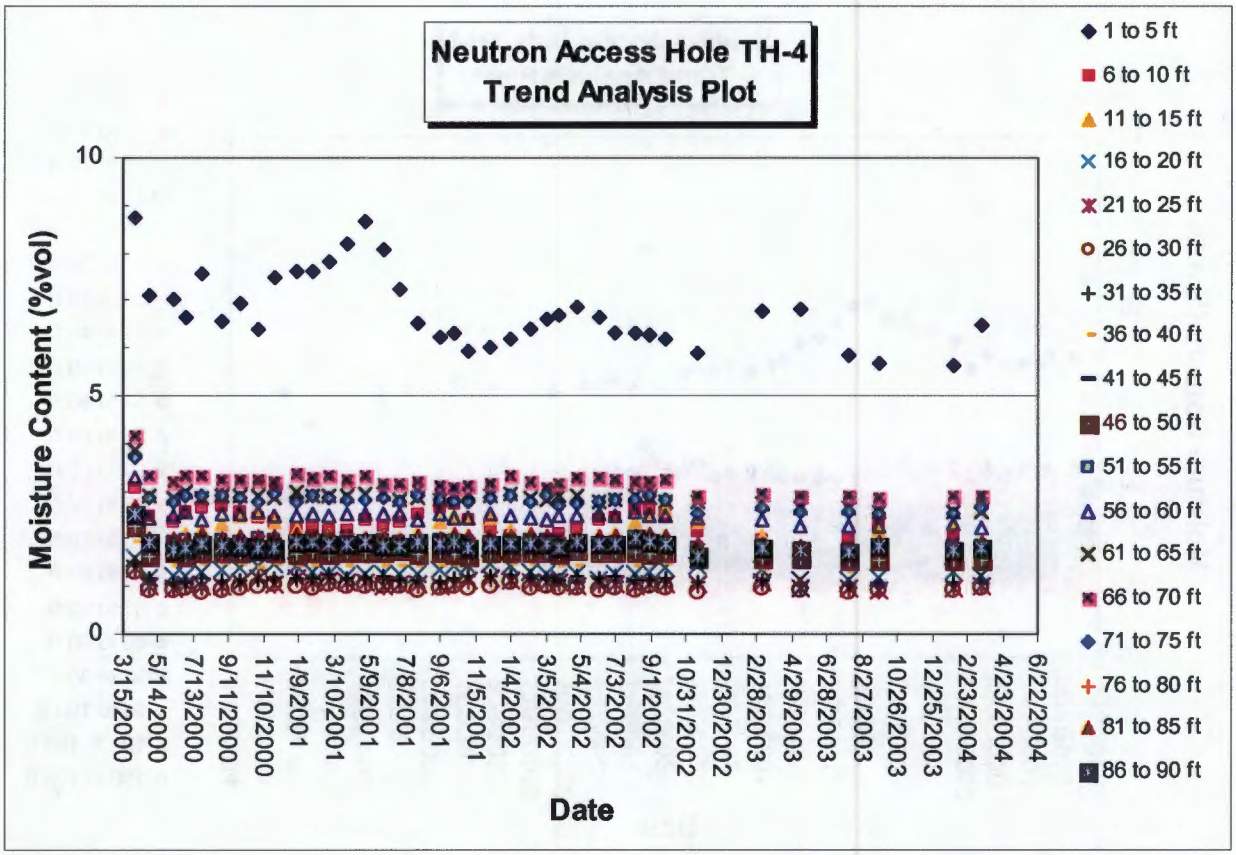


Figure 2-4. Trend plot of neutron moisture measurements, neutron access hole TH-4

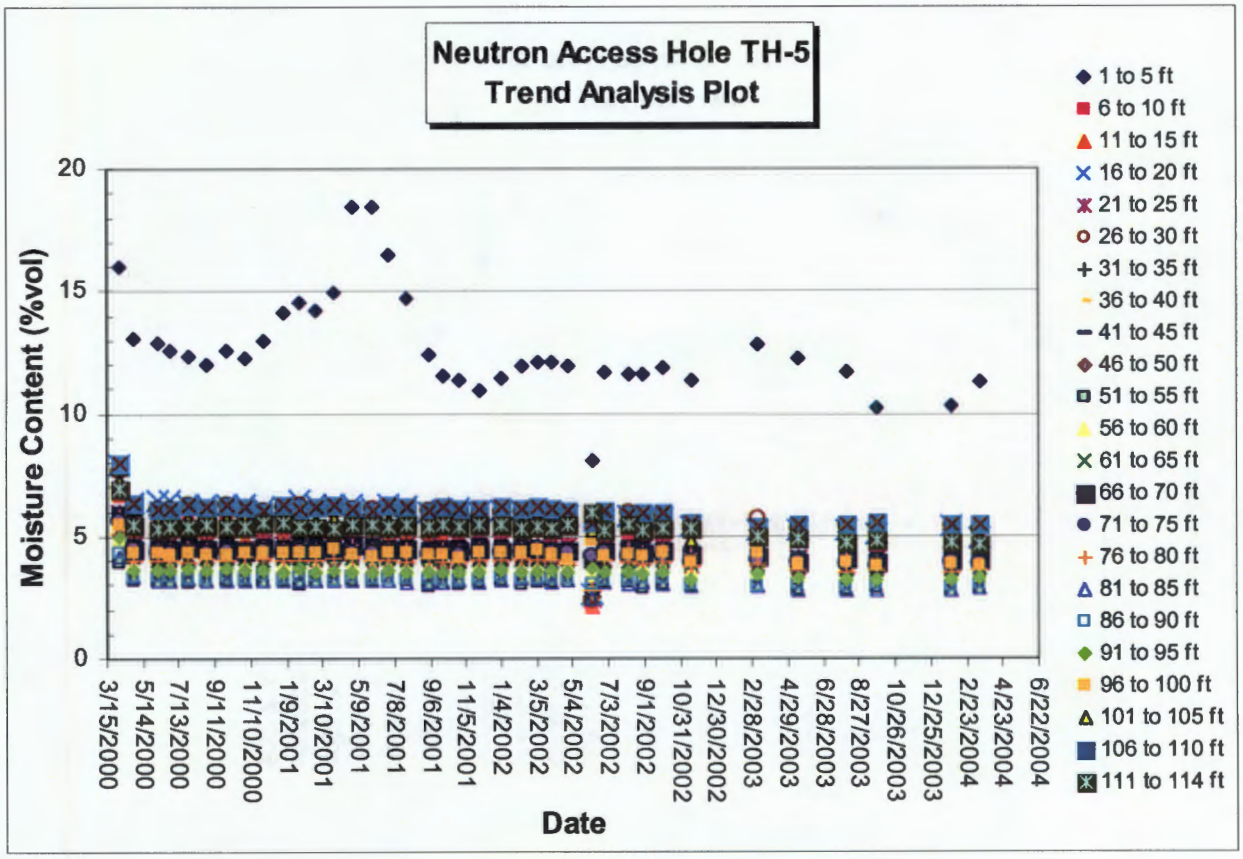


Figure 2-5. Trend plot of neutron moisture measurements, neutron access hole TH-5

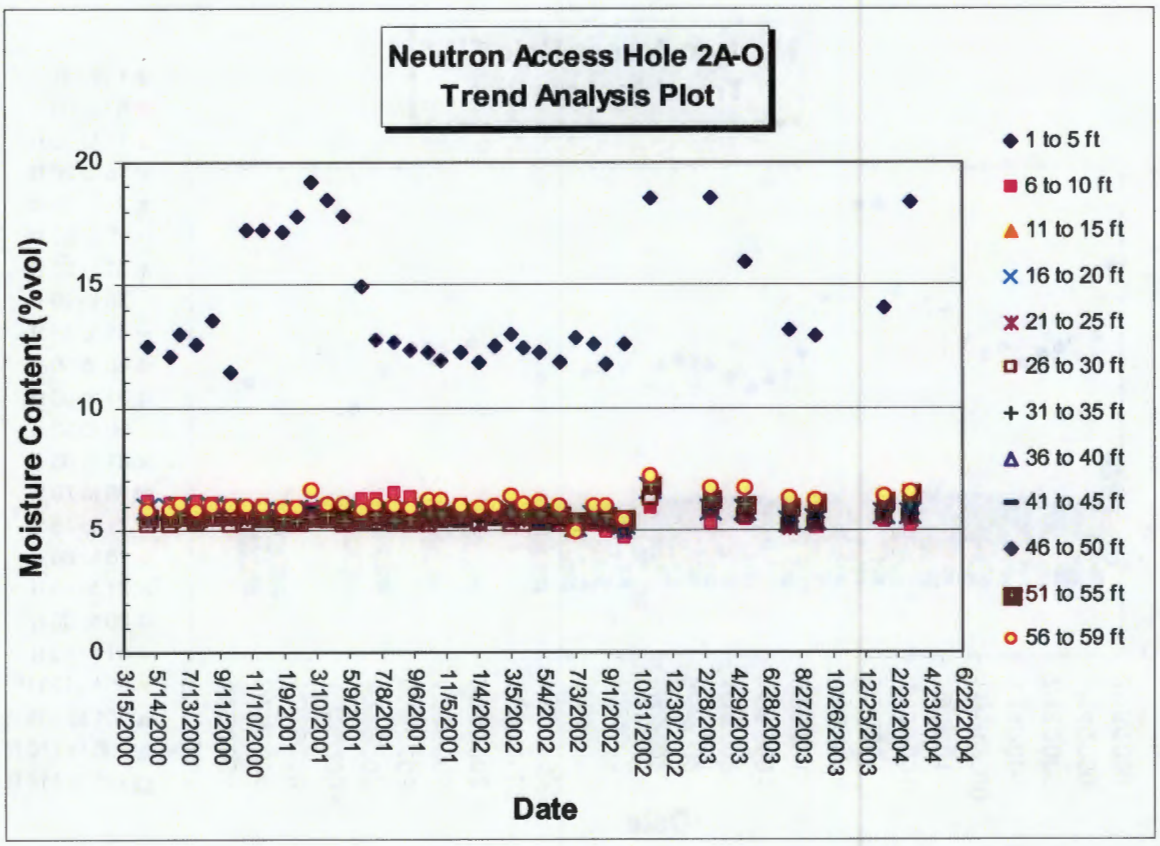


Figure 2-6. Trend plot of neutron moisture measurements, neutron access hole 2A-O

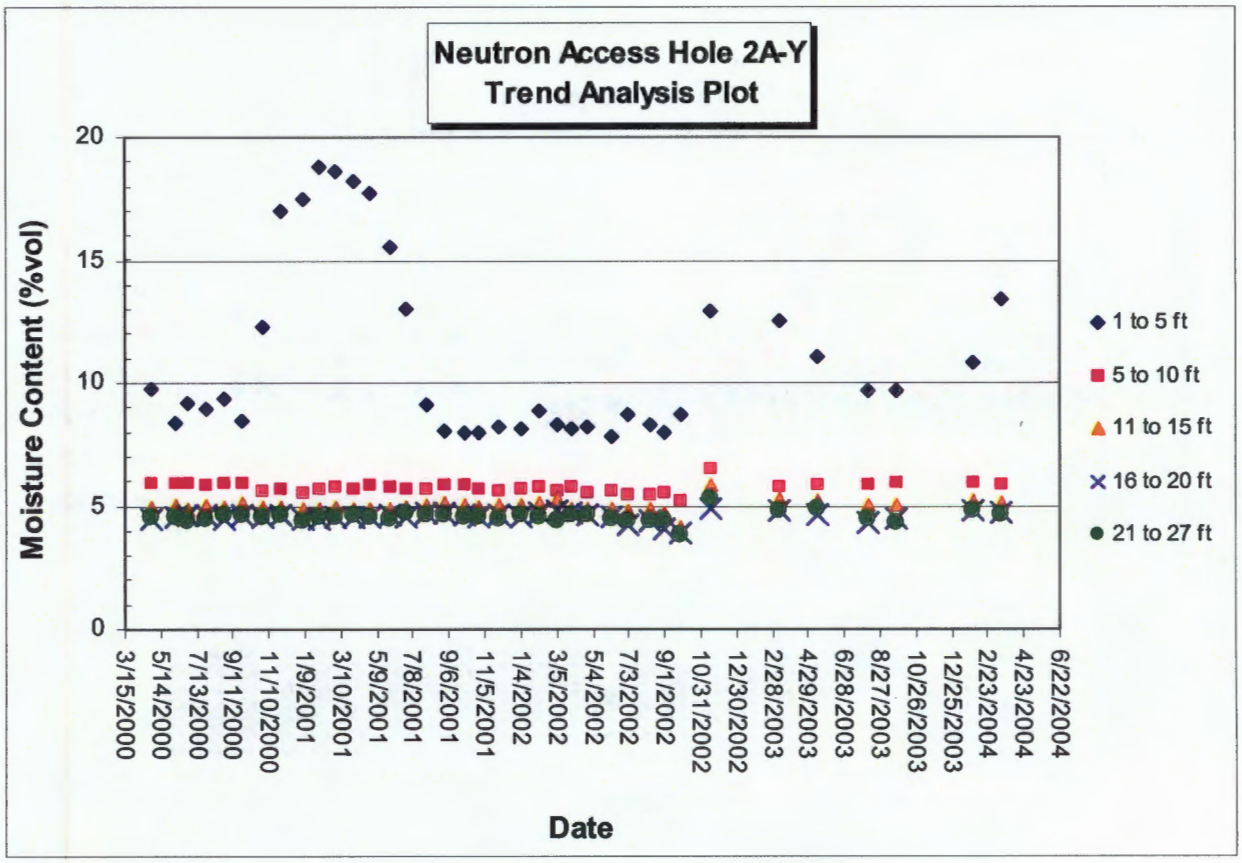


Figure 2-7. Trend plot of neutron moisture measurements, neutron access hole 2A-Y

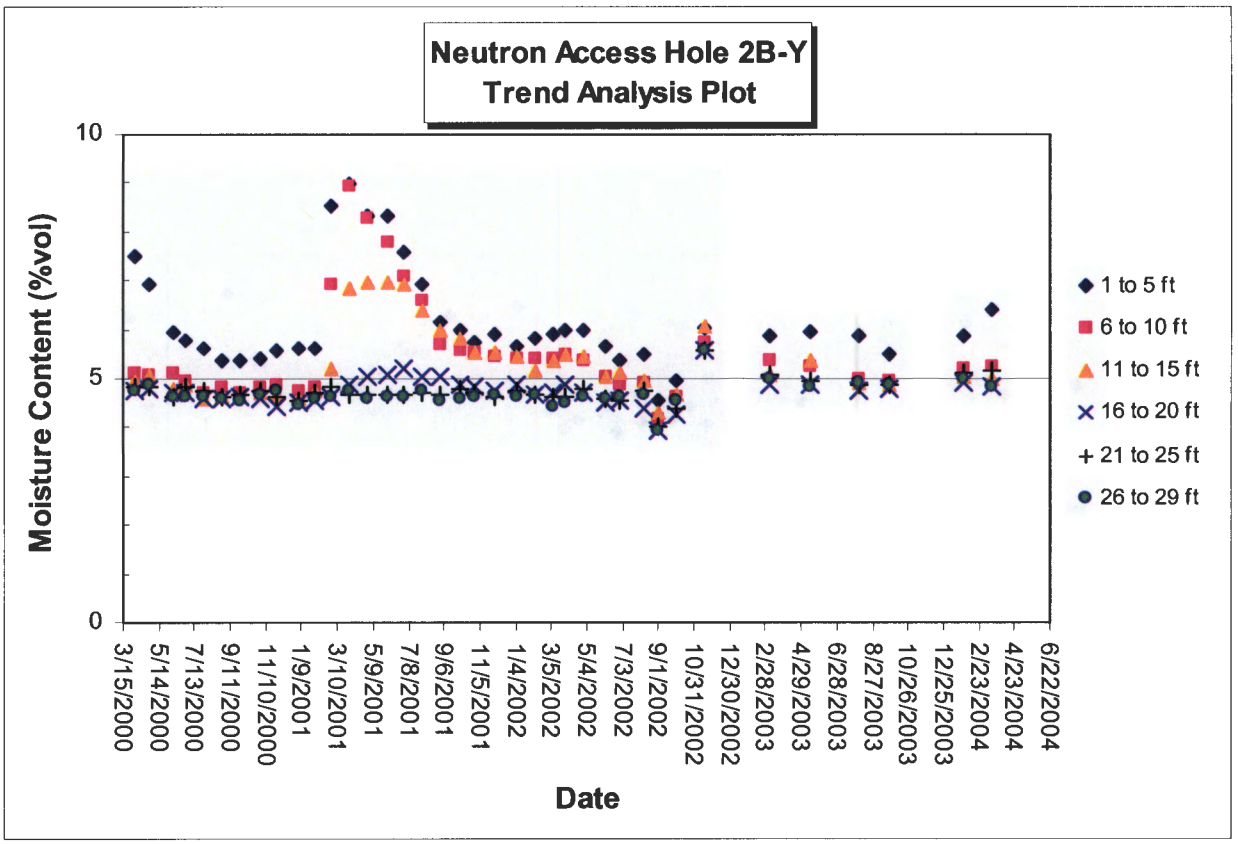


Figure 2-8. Trend plot of neutron moisture measurements, neutron access hole 2B-Y

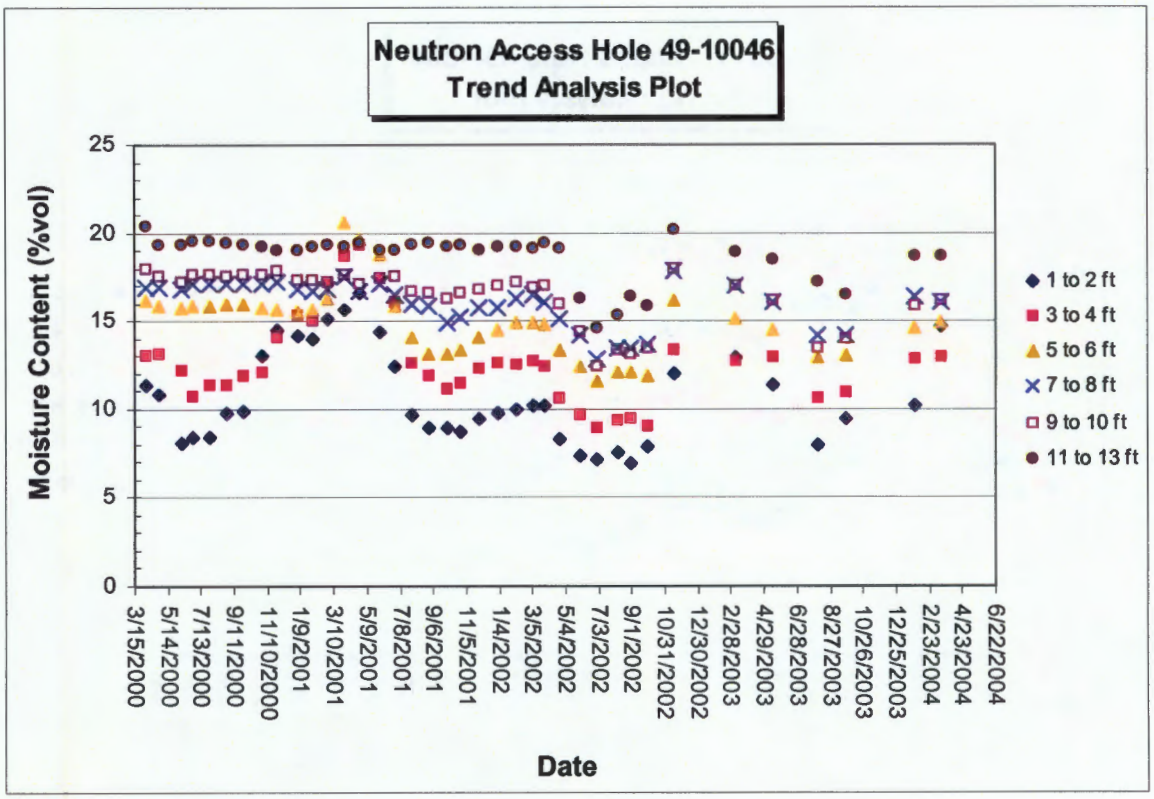


Figure 2-9. Trend plot of neutron moisture measurements, neutron access hole 49-10046

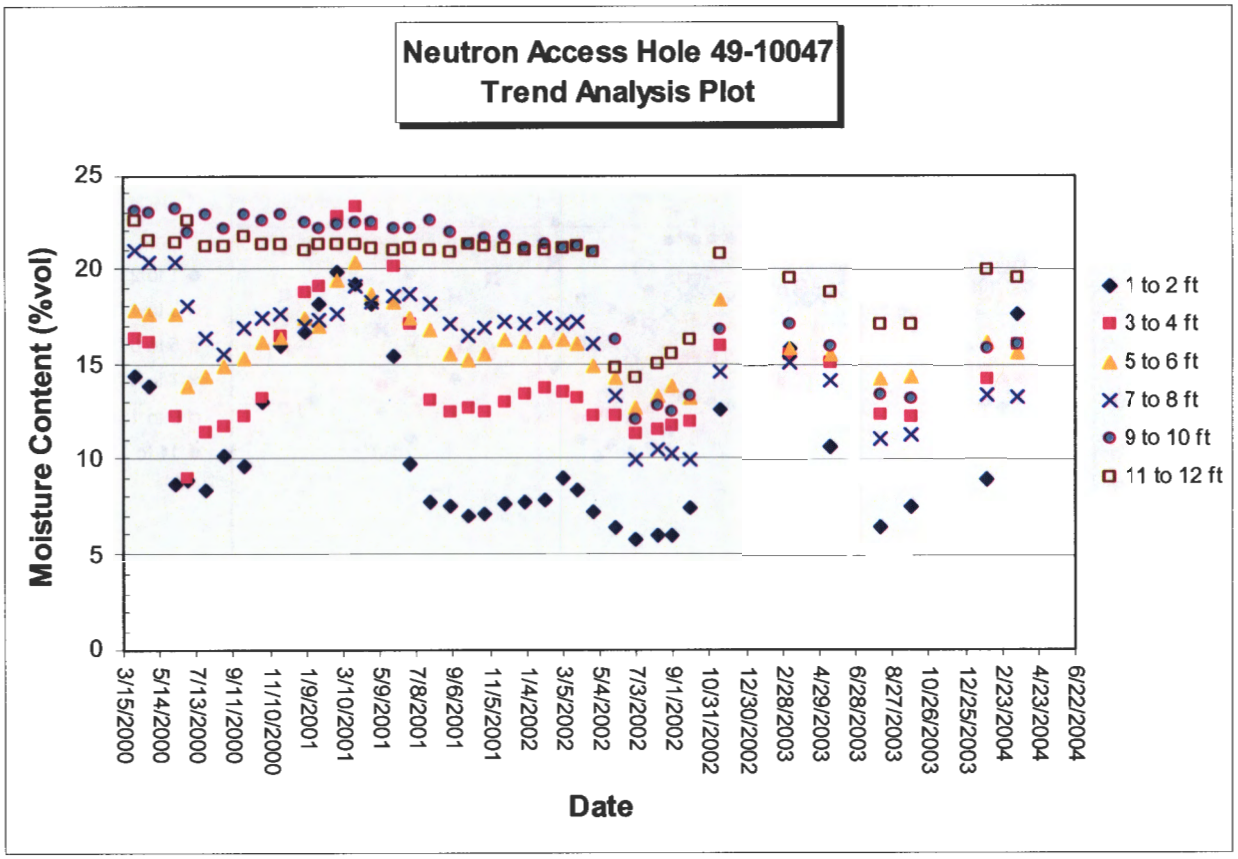


Figure 2-10. Trend plot of neutron moisture measurements, neutron access hole 49-10047

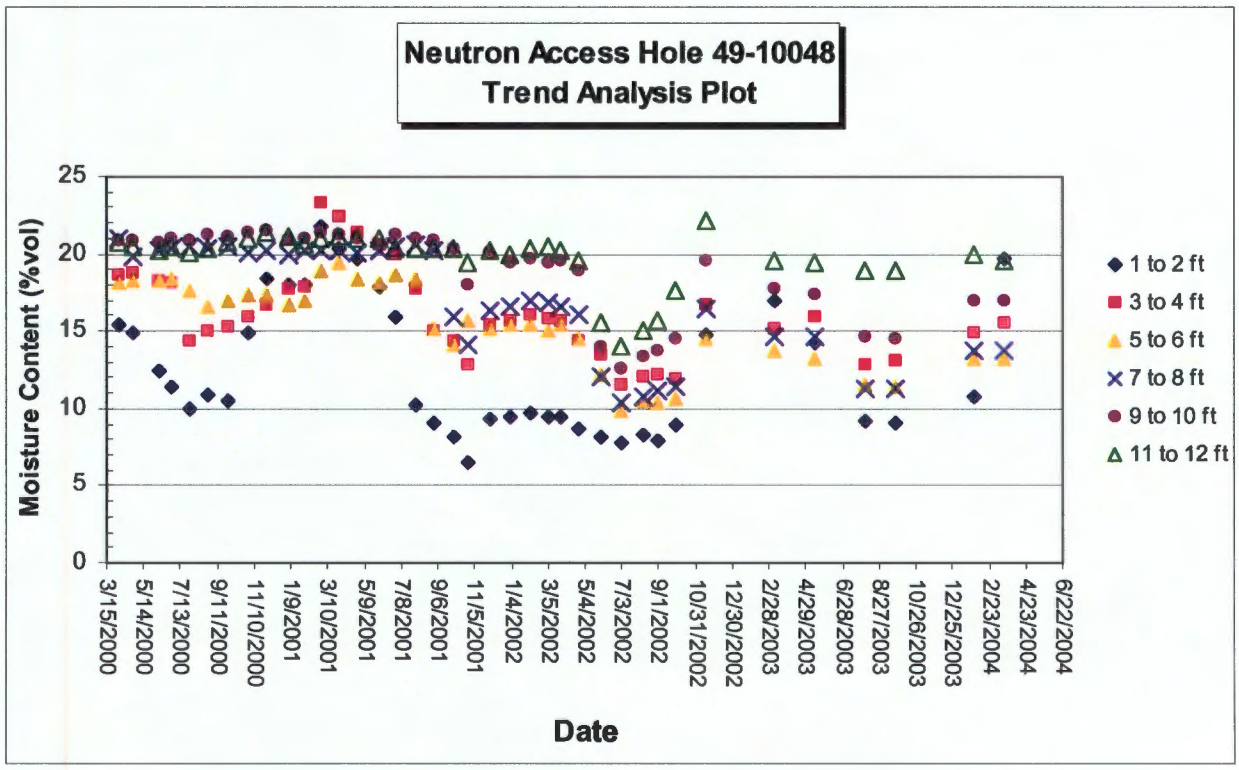


Figure 2-11. Trend plot of neutron moisture measurements, neutron access hole 49-10048

Attachment 3

Condition of Evapotranspiration (ET) Cover

Figure 3.1. Photo of evapotranspiration cover from outside Area 2

Figure 3.2. Photo of evapotranspiration cover from outside Area 2

Figure 3.3. Close-up of evapotranspiration cover showing growth coming through cover

Figure 3.4. Close-up of evapotranspiration cover showing growth coming through cover

Appendix D

Quarterly Pore-Gas Sampling at
Technical Area 54, Material Disposal Areas L and G
Second Quarter Fiscal Year 2004

PORE-GAS SAMPLING AT TECHNICAL AREA 54 MATERIAL DISPOSAL AREAS L AND G SECOND QUARTER FISCAL YEAR 2004

Risk Reduction and Environmental Stewardship—Remediation Services

Los Alamos National Laboratory

May 2004

CONTENTS

1.0 INTRODUCTION D-1
1.1 Sampling Plan Requirements D-1
1.2 Sampling Purpose D-1

2.0 SECOND-QUARTER SAMPLING D-2
2.1 Sampling Event D-2
2.2 Sampling Results D-2
2.3 Evaluation of Quality Assurance Samples D-2

3.0 FIRST-QUARTER SAMPLING D-4
3.1 Sampling Event D-4
3.2 Sampling Results D-4
3.3 Evaluation of Quality Assurance Samples D-4

REFERENCES D-6

List of Tables

Table 2-1 Summary of Sampling Event, Second Quarter of FY 2004 ..... D-3
Table 3-1 Summary of Sampling Event, First Quarter of FY 2003 ..... D-5
Table 3-2 Results of Sampling Event, First Quarter of FY 2003 ..... D-6
Table 3-3 Duplicate Sample Results Comparison on the Well 54-2009 Sampling Port D-8

1.0 INTRODUCTION

This report discusses second quarter subsurface pore-gas sampling at Los Alamos National Laboratory (the Laboratory), Technical Area (TA) 54. Monitoring at TA-54 is required by Module VIII of the Laboratory's Hazardous Waste Facility Permit in Section C.5, "Unsaturated Zone Monitoring" (EPA 1990, 1585). The approved plan (Davis 1993, 38812) for pore-gas sampling at TA-54 is described in the Laboratory's response (Glatzmaier 1993, 30987) to an Environmental Protection Agency (EPA) notice of deficiency (Driscoll 1992, 3849.3) addressing the Laboratory's Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan for TA-54 (LANL 1992, 7669).

1.1 Sampling Plan Requirements

Twenty-eight Risk Reduction and Environmental Stewardship Division–Remediation Services (RRES–RS) Project wells are available for pore-gas sampling at TA-54. The sampling and analysis plan requires the collection of samples from 12 wells each quarter. These 12 samples are collected for analysis of volatile organic compounds (VOCs). Of these 12 samples, 7 are to be selected from a list of 10 wells located at Material Disposal Area (MDA) L, and 2 are to be selected from a list of 4 wells located at MDA G. Thus, 9 of the 12 samples collected each quarter are constrained to a defined set of 14 wells. This leaves 3 samples per quarter that may be distributed among the remaining 14 available RRES-RS Project pore-gas sampling wells or the boreholes provided by the TA-54 Area G Performance Assessment Maintenance Group (PAMG) wells.

The SUMMA canister sampling method is currently being used with analysis by EPA Method TO-14 (gas chromatography/mass spectrometry) (EPA 1999, 70063). SUMMA canister samples are drawn from one of the several sampling ports available at each well. Table 4 in Appendix F of the fourth-quarter report for Fiscal Year (FY) 2000 (Environmental Restoration Project 2000, 70064) lists the reasons for selecting ports to be sampled.

Before the required sampling is performed, all available wells (RRES-RS Project wells and PAMG wells) are screened with a Type 1302 Brüel and Kjaer multigas monitor. Each port is purged and monitored with field instruments until CO_2 levels have stabilized at values representative of subsurface pore-gas conditions and is then screened for four VOCs (1,1,1-trichloroethane, trichloroethene, perchloroethene, and Freon-11).

Three types of field quality assurance (QA) samples are collected and analyzed. These three samples include a duplicate sample, an equipment blank of zero-grade air (zero-grade air is a common term for air that is certified to be free from VOC contamination) or nitrogen drawn through the sampling apparatus in the working area, and a performance evaluation sample/calibration gas sample taken from a tank of a certified gas mixture. Laboratory QA for EPA Method TO-14 includes internal standards, surrogates, replicates, blanks, laboratory control samples, and reference standards.

1.2 Sampling Purpose

The purpose of the pore-gas sampling at TA-54 MDAs L and G is threefold:

- to identify changes in contaminant concentrations at the perimeter of the relatively well-characterized plume at MDA L as an indicator of outward plume expansion (i.e., extent);
- to monitor for contaminants and changes in contaminant concentration distributions within the plumes at MDAs L and G as an indicator of changes warranting further attention (i.e., nature); and
- to monitor wells for data-gap needs for future modeling and trend analyses.

2.0 SECOND-QUARTER SAMPLING

2.1 Sampling Event

Sampling for the second quarter of FY 2004 (January through March) was conducted during the period of February 10 through February 26. Analytical results for the second quarter will be reported in the third quarter report.

Table 2-1 identifies the wells sampled (from the list of all wells available) and lists the port at each well from which the SUMMA canister sample was drawn. Twelve wells were sampled in accordance with the approved sampling plan. Nine wells at MDA L were sampled, including eight from the defined list. Three wells at MDA G were sampled, including two from the defined list of wells. The two QA samples (field duplicate and equipment blank) were collected as planned. In total, thirteen samples were collected for laboratory analysis.

2.2 Sampling Results

Both the field screening and analytical sampling for MDAs G and L were finished by February 26. Field-screening results for second quarter are available upon request. Analytical results for the second quarter will be reported in the third quarter report.

2.3 Evaluation of Quality Assurance Samples

Field duplicate sample. A field duplicate sample is drawn from the same port on a well immediately after the original sample. The field duplicate was collected on well 54-2009 at the 62-ft sampling port.

Field equipment blank. A field equipment blank sample documents the effectiveness of equipment purges between samples. A sample was collected by drawing zero-grade air through the sample train after the normal purge performed before each sample. The field equipment blank was taken in the immediate vicinity of 54-2009 at ground level.

Calibration gas sample (performance evaluation sample). A calibration gas sample was drawn into a SUMMA canister and submitted to the analytical laboratory for analysis. The calibration gas contained 100 ppmv of trichloroethane (TCA), 50 ppmv of trichloroethylene (TCE), and 10 ppmv of tetrachloroethene (PCE). The results of the analysis for sample MD54-04-52978 will be reported in the third quarter report.

Table 2-1
Summary of Sampling Event, Second Quarter of FY 2004

Well ID	Site	On Defined Sampling List (Y/N)	Number of Ports Screened	Depths of Screened Ports (ft)	Depth of Port Sampled (ft)	Sample ID
54-1015	MDA L	N	7	39.5, 164.3, 307.6, 338.3, 382.3, 426.2, 461.4	338	MD54-04-52969
54-1016	MDA L	N	4	31, 162, 274, 336	—	n/a
54-1107	PAMG	N	n/a	Well needs repair	—	n/a
54-1110	PAM G	N	0	Not screened (lack of time)	—	n/a
54-1111	PAMG	N	0	Not screened (lack of time)	—	n/a
54-1117	PAMG	N	0	Not screened (lack of time)	—	n/a
54-1121	PAMG	N	0	Not screened (lack of time)	—	n/a
54-2002	MDA L	Y	8	40, 60, 100, 120, 140, 157, 180, 200	100	MD54-04-52970
54-1126	MDA G	N	0	Not screened (lack of time)	—	n/a
54-1128	MDA G	N	0	Well needs repair	—	n/a
54-2009	MDA G	Y	3	37, 62, 92	62 62	MD54-04-52979 MD54-04-52977
54-2010	MDA G	Y	3	30, 53, 95	95	MD54-04-52971
54-2012	MDA L	Y	1	28	—	n/a
54-2013	MDA L	N	1	43	—	n/a
54-2014	MDA L	N	2	13, 86	—	n/a
54-2016	MDA L	N	2	18, 31	—	n/a
54-2020	MDA L	N	10	20, 40, 60, 80, 95, 120, 140, 160, 180, 200	—	n/a
54-2021	MDA L	Y	10	20, 40, 60, 80, 100, 120 140, 160, 180, 200	100	MD54-04-52967
54-2022	MDA L	Y	10	20, 40, 60, 80, 100, 120, 140, 160, 180, 200	80	MD54-04-52966
54-2023	MDA L	Y	9	20, 40, 80, 100, 120, 140, 159, 180, 200	159	MD54-04-52965
54-2024	MDA L	N	0	Not screened (lack of time)	—	n/a
54-2025	MDA L	N	4	20, 60, 100, 160	—	n/a
54-2026	MDA L	Y	6	20, 60, 100, 160, 200, 215	160	MD54-04-52972
54-2027	MDA L	N	5	20, 60, 100, 160, 200	—	n/a
54-2028	MDA L	N	7	20, 60, 100, 160, 200, 220, 250	—	n/a
54-2029	MDA L	Y	8	20, 60, 100, 160, 200, 220, 260, 288	100	MD54-04-52968
54-2030	MDA L	Y	6	20, 60, 100, 160, 200, 220	100	MD54-04-52975
54-2031	MDA L	Y	7	20, 60, 100, 160, 200, 220, 260	—	n/a
54-2032	MDA G	Y	0	Not screened (lack of time)	—	n/a
54-2033	MDA G	Y	8	20, 60, 100, 160, 200, 220, 260, 277	100	MD54-04-52974
54-2034	MDA L	Y	7	20, 60, 100, 160, 200, 220, 260	60	MD54-04-52973
54-2087	MDA L	N	4	13, 31, 46, 86	—	n/a
54-2088	MDA L	N	4	13, 31, 46, 86	—	n/a
54-2089	MDA L	N	4	13, 31, 46, 86	—	n/a
54-22116	MDA G	N	0	Not screened (lack of time)	—	n/a
Total wells sampled					12	
MDA L defined list wells sampled (7 expected)					8	
MDA G defined list wells sampled (2 expected)					3	
PAMG wells sampled					0	
QA samples taken					1 field duplicate	1 equipment blank

3.0 FIRST-QUARTER SAMPLING

3.1 Sampling Event

Sampling for the first quarter of FY 2004 (October through December) was conducted during the period of December 10 through December 17. Analytical results were not available for the first quarter report and are now reported in this quarterly report (Table 3-2).

Table 3-1 identifies the wells sampled (from the list of all wells available) and lists the port at each well from which the SUMMA canister sample was drawn. Twelve wells were sampled in accordance with the approved sampling plan. Nine wells at MDA L were sampled, including eight from the defined list. Three wells at MDA G were sampled, including two from the defined list of wells and one from PAMG wells. The two QA samples (field duplicate and equipment blank) were collected as planned. In total, thirteen samples were collected for laboratory analysis.

3.2 Sampling Results

Both the field screening and analytical sampling for MDAs G and L were finished by December 23. Field-screening results for first quarter are available upon request. Analytical results for the first quarter are reported in Table 3-2.

3.3 Evaluation of Quality Assurance Samples

Field duplicate sample. A field duplicate sample is drawn from the same port on a well immediately after the original sample. The field duplicate was collected on well 54-2009 at the 62-ft sampling port (Table 3-3).

Field equipment blank. A field equipment blank sample documents the effectiveness of equipment purges between samples. A sample was collected by drawing zero-grade air through the sample train after the normal purge performed before each sample. The field equipment blank was taken in the immediate vicinity of 54-2009 at ground level.

Calibration gas sample (performance evaluation sample). A calibration gas sample was drawn into a SUMMA canister and submitted to the analytical laboratory for analysis. The calibration gas contained 100 ppmv of TCA, 50 ppmv of TCE, and 10 ppmv of PCE.

Table 3-1
Summary of Sampling Event, First Quarter of FY 2004

Well ID	Site	On Defined Sampling List (Y/N)	Number of Ports Screened	Depths of Screened Ports (ft)	Depth of Port Sampled (ft)	Sample ID
54-1015	MDA L	N	7	39.5, 164.3, 307.6, 338.3, 382.3, 426.2, 461.4	338	MD54-04-52704
54-1016	MDA L	N	4	31, 162, 274, 336	—	n/a
54-1107	PAMG	N	n/a	Well needs repair	—	n/a
54-1110	PAM G	N	0	Not screened (lack of time)	—	n/a
54-1111	PAMG	N	0	Not screened (lack of time)	—	n/a
54-1117	PAMG	N	0	Not screened (lack of time)	—	n/a
54-1121	PAMG	N	7	20, 26, 62, 70, 76, 98, 121	98	MD54-04-52702
54-2002	MDA L	Y	8	40, 60, 100, 120, 140, 157, 180, 200	100	MD54-04-52705
54-1126	MDA G	N	0	Not screened (lack of time)	—	n/a
54-1128	MDA G	N	0	Not screened (lack of time)	—	n/a
54-2009	MDA G	Y	2	37, 62	62 62	MD54-04-52711 MD54-04-52712
54-2010	MDA G	Y	0	Not screened (lack of time)	—	n/a
54-2012	MDA L	Y	1	28	28	MD54-04-52710
54-2013	MDA L	N	1	43	—	n/a
54-2014	MDA L	N	0	Not screened (lack of time)	—	n/a
54-2016	MDA L	N	0	Not screened (lack of time)	—	n/a
54-2020	MDA L	N	10	20, 40, 60, 80, 95, 120, 140, 160, 180, 200	—	n/a
54-2021	MDA L	Y	9	20, 40, 60, 80, 100, 140, 160, 180, 200	—	n/a
54-2022	MDA L	Y	10	20, 40, 60, 80, 100, 120, 140, 160, 180, 200	80	MD54-04-52701
54-2023	MDA L	Y	9	20, 40, 80, 100, 120, 140, 159, 180, 200	159	MD54-04-52706
54-2024	MDA L	N	10	20, 40, 60, 80, 100, 120, 140, 160, 180, 200	—	n/a
54-2025	MDA L	N	3	20, 100, 160	—	n/a
54-2026	MDA L	Y	6	20, 60, 100, 160, 200, 215	160	MD54-04-52707
54-2027	MDA L	N	4	20, 60, 100, 200	—	n/a
54-2028	MDA L	N	7	20, 60, 100, 160, 200, 220, 250	—	n/a
54-2029	MDA L	Y	8	20, 60, 100, 160, 200, 220, 260, 288	100	MD54-04-52703
54-2030	MDA L	Y	0	Not screened (lack of time)	—	n/a
54-2031	MDA L	Y	6	20, 60, 100, 160, 200, 260	100	MD54-04-52709
54-2032	MDA G	Y	4	20, 60, 100, 156	156	MD54-04-52700
54-2033	MDA G	Y	0	Not screened (lack of time)	—	n/a
54-2034	MDA L	Y	7	20, 60, 100, 160, 200, 220, 260	60	MD54-04-52708
54-2087	MDA L	N	0	Not screened (lack of time)	—	n/a
54-2088	MDA L	N	0	Not screened (lack of time)	—	n/a
54-2089	MDA L	N	0	Not screened (lack of time)	—	n/a
54-22116	MDA G	N	0	Not screened (lack of time)	—	n/a
Total wells sampled					12	
MDA L defined list wells sampled (7 expected)					8	
MDA G defined list wells sampled (2 expected)					2	
PAMG wells sampled					1	
QA samples taken					1 field duplicate	1 equipment blank

Table 3.2
Results of Sampling Event, First Quarter FY 2004

Location ID	Sample ID	Sample Concentration (ppbv)	Depth (ft)	Analyte	Analyte Code
54-01015	MD54-04-52704	12	338	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-01015	MD54-04-52704	2.1	338	Dichloroethane[1,1-]	75-34-3
54-01015	MD54-04-52704	22	338	Dichloroethene[1,1-]	75-35-4
54-01015	MD54-04-52704	23	338	Propanol[2-]	67-63-0
54-01015	MD54-04-52704	3.4	338	Trichlorofluoromethane	75-69-4
54-01015	MD54-04-52704	4.5	338	Dichlorodifluoromethane	75-71-8
54-01015	MD54-04-52704	4.7	338	Tetrachloroethene	127-18-4
54-01015	MD54-04-52704	44	338	Trichloroethane[1,1,1-]	71-55-6
54-01015	MD54-04-52704	6.6	338	Trichloroethene	79-01-6
54-01121	MD54-04-52702	180	100	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-01121	MD54-04-52702	1900	100	Trichloroethene	79-01-6
54-01121	MD54-04-52702	3200	100	Dichloroethane[1,1-]	75-34-3
54-01121	MD54-04-52702	38000	100	Trichloroethane[1,1,1-]	71-55-6
54-01121	MD54-04-52702	7400	100	Dichloroethene[1,1-]	75-35-4
54-01121	MD54-04-52702	880	100	Tetrachloroethene	127-18-4
54-02002	MD54-04-52705	1100	100	Carbon Tetrachloride	56-23-5
54-02002	MD54-04-52705	1100	100	Xylene[1,2-]	95-47-6
54-02002	MD54-04-52705	13000	100	Dichloroethene[1,1-]	75-35-4
54-02002	MD54-04-52705	13000	100	Dichloropropane[1,2-]	78-87-5
54-02002	MD54-04-52705	13000	100	Trichlorofluoromethane	75-69-4
54-02002	MD54-04-52705	18000	100	Methylene Chloride	75-09-2
54-02002	MD54-04-52705	1900	100	Xylene[1,3-]+Xylene[1,4-]	Xylene[1,3 and 1,4]
54-02002	MD54-04-52705	300000	100	Trichloroethane[1,1,1-]	71-55-6
54-02002	MD54-04-52705	37000	100	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02002	MD54-04-52705	5200	100	Toluene	108-88-3
54-02002	MD54-04-52705	5300	100	Dichloroethane[1,1-]	75-34-3
54-02002	MD54-04-52705	7200	100	Dichloroethane[1,2-]	107-06-2
54-02002	MD54-04-52705	72000	100	Trichloroethene	79-01-6
54-02002	MD54-04-52705	7400	100	Chloroform	67-66-3
54-02002	MD54-04-52705	8100	100	Tetrachloroethene	127-18-4
54-02002	MD54-04-52705	9600	100	Tetrahydrofuran	109-99-9
54-02009	MD54-04-52711	2100	62	Dichloroethane[1,1-]	75-34-3
54-02009	MD54-04-52711	3200	62	Dichloroethene[1,1-]	75-35-4
54-02009	MD54-04-52711	46000	62	Trichloroethane[1,1,1-]	71-55-6
54-02009	MD54-04-52711	510	62	Trichloroethene	79-01-6

Table 3.2 (continued)

Location ID	Sample ID	Sample Concentration (ppbv)	Depth (ft)	Analyte	Analyte Code
54-02009	MD54-04-52711	680	62	Tetrachloroethene	127-18-4
54-02009	MD54-04-52712	2200	62	Dichloroethane[1,1-]	75-34-3
54-02009	MD54-04-52712	360	62	Trichloroethene	79-01-6
54-02009	MD54-04-52712	3900	62	Dichloroethene[1,1-]	75-35-4
54-02009	MD54-04-52712	50000	62	Trichloroethane[1,1,1-]	71-55-6
54-02009	MD54-04-52712	780	62	Tetrachloroethene	127-18-4
54-02012	MD54-04-52710	11000	28	Trichlorofluoromethane	75-69-4
54-02012	MD54-04-52710	13000	28	Toluene	108-88-3
54-02012	MD54-04-52710	140000	28	Dichloroethane[1,2-]	107-06-2
54-02012	MD54-04-52710	140000	28	Methylene Chloride	75-09-2
54-02012	MD54-04-52710	16000	28	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02012	MD54-04-52710	1800000	28	Trichloroethane[1,1,1-]	71-55-6
54-02012	MD54-04-52710	23000	28	Dichloroethene[1,1-]	75-35-4
54-02012	MD54-04-52710	36000	28	Tetrachloroethene	127-18-4
54-02012	MD54-04-52710	450000	28	Trichloroethene	79-01-6
54-02012	MD54-04-52710	61000	28	Dichloroethane[1,1-]	75-34-3
54-02012	MD54-04-52710	8000	28	Dichlorodifluoromethane	75-71-8
54-02022	MD54-04-52701	1100	80	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02022	MD54-04-52701	160000	80	Trichloroethane[1,1,1-]	71-55-6
54-02022	MD54-04-52701	29000	80	Trichloroethene	79-01-6
54-02022	MD54-04-52701	3000	80	Dichloroethane[1,1-]	75-34-3
54-02022	MD54-04-52701	3400	80	Dichloroethane[1,2-]	107-06-2
54-02022	MD54-04-52701	3600	80	Tetrachloroethene	127-18-4
54-02022	MD54-04-52701	3800	80	Methylene Chloride	75-09-2
54-02022	MD54-04-52701	5000	80	Dichloroethene[1,1-]	75-35-4
54-02022	MD54-04-52701	710	80	Dichlorodifluoromethane	75-71-8
54-02023	MD54-04-52706	110	159	Carbon Tetrachloride	56-23-5
54-02023	MD54-04-52706	160	159	Dichlorodifluoromethane	75-71-8
54-02023	MD54-04-52706	160	159	Methylene Chloride	75-09-2
54-02023	MD54-04-52706	1600	159	Dichloroethene[1,1-]	75-35-4
54-02023	MD54-04-52706	16000	159	Trichloroethane[1,1,1-]	71-55-6
54-02023	MD54-04-52706	170	159	Dichloroethane[1,1-]	75-34-3
54-02023	MD54-04-52706	350	159	Tetrachloroethene	127-18-4
54-02023	MD54-04-52706	4000	159	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02023	MD54-04-52706	5000	159	Trichloroethene	79-01-6
54-02023	MD54-04-52706	670	159	Trichlorofluoromethane	75-69-4

Table 3.2 (continued)

Location ID	Sample ID	Sample Concentration (ppbv)	Depth (ft)	Analyte	Analyte Code
54-02026	MD54-04-52707	130	160	Trichlorofluoromethane	75-69-4
54-02026	MD54-04-52707	20	160	Dichloroethane[1,1-]	75-34-3
54-02026	MD54-04-52707	25	160	Carbon Tetrachloride	56-23-5
54-02026	MD54-04-52707	270	160	Dichloroethene[1,1-]	75-35-4
54-02026	MD54-04-52707	2700	160	Trichloroethane[1,1,1-]	71-55-6
54-02026	MD54-04-52707	300	160	Tetrahydrofuran	109-99-9
54-02026	MD54-04-52707	41	160	Dichlorodifluoromethane	75-71-8
54-02026	MD54-04-52707	51	160	Methylene Chloride	75-09-2
54-02026	MD54-04-52707	760	160	Trichloroethene	79-01-6
54-02026	MD54-04-52707	820	160	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02026	MD54-04-52707	89	160	Tetrachloroethene	127-18-4
54-02029	MD54-04-52703	14	100	Dichlorodifluoromethane	75-71-8
54-02029	MD54-04-52703	26	100	Tetrachloroethene	127-18-4
54-02029	MD54-04-52703	260	100	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02029	MD54-04-52703	260	100	Trichloroethene	79-01-6
54-02029	MD54-04-52703	28	100	Chloroform	67-66-3
54-02029	MD54-04-52703	42	100	Trichlorofluoromethane	75-69-4
54-02029	MD54-04-52703	5.8	100	Methylene Chloride	75-09-2
54-02029	MD54-04-52703	62	100	Dichloroethene[1,1-]	75-35-4
54-02029	MD54-04-52703	7.1	100	Carbon Tetrachloride	56-23-5
54-02029	MD54-04-52703	7.4	100	Dichloroethane[1,1-]	75-34-3
54-02029	MD54-04-52703	950	100	Trichloroethane[1,1,1-]	71-55-6
54-02031	MD54-04-52709	1200	100	Tetrachloroethene	127-18-4
54-02031	MD54-04-52709	1600	100	Dichloroethene[1,1-]	75-35-4
54-02031	MD54-04-52709	1900	100	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02031	MD54-04-52709	200	100	Dichlorodifluoromethane	75-71-8
54-02031	MD54-04-52709	28000	100	Trichloroethane[1,1,1-]	71-55-6
54-02031	MD54-04-52709	310	100	Trichlorofluoromethane	75-69-4
54-02031	MD54-04-52709	330	100	Dichloroethane[1,2-]	107-06-2
54-02031	MD54-04-52709	340	100	Methylene Chloride	75-09-2
54-02031	MD54-04-52709	600	100	Dichloroethane[1,1-]	75-34-3
54-02031	MD54-04-52709	8500	100	Trichloroethene	79-01-6
54-02032	MD54-04-52700	180	156	Trichloroethene	79-01-6
54-02032	MD54-04-52700	2200	156	Dichloroethene[1,1-]	75-35-4
54-02032	MD54-04-52700	38	156	Dichlorodifluoromethane	75-71-8
54-02032	MD54-04-52700	550	156	Tetrachloroethene	127-18-4
54-02032	MD54-04-52700	59	156	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1

Table 3.2 (continued)

Location ID	Sample ID	Sample Concentration (ppbv)	Depth (ft)	Analyte	Analyte Code
54-02032	MD54-04-52700	7800	156	Trichloroethane[1,1,1-]	71-55-6
54-02032	MD54-04-52700	850	156	Dichloroethane[1,1-]	75-34-3
54-02034	MD54-04-52708	1200	60	Trichloroethene	79-01-6
54-02034	MD54-04-52708	170	60	Propanol[2-]	67-63-0
54-02034	MD54-04-52708	210	60	Dichloroethene[1,1-]	75-35-4
54-02034	MD54-04-52708	35	60	Methylene Chloride	75-09-2
54-02034	MD54-04-52708	35	60	Trichlorofluoromethane	75-69-4
54-02034	MD54-04-52708	40	60	Dichlorodifluoromethane	75-71-8
54-02034	MD54-04-52708	40	60	Dichloroethane[1,2-]	107-06-2
54-02034	MD54-04-52708	5400	60	Trichloroethane[1,1,1-]	71-55-6
54-02034	MD54-04-52708	61	60	Tetrachloroethene	127-18-4
54-02034	MD54-04-52708	84	60	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02034	MD54-04-52708	98	60	Dichloroethane[1,1-]	75-34-3

Table 3-3
Duplicate Sample Results Comparison for Well 54-2009 at the 62-ft Sampling Port

Analyte	Sample MD54-03-52711[a] (ppmv[b])	Sample MD54-03-52712[a] (ppmv)	RPD[c]
Dichloroethane[1,1-]	2.1	2.2	4.6
Dichloroethene[1,1-]	3.2	3.9	19.7
Trichloroethane[1,1,1-]	46	50	8.3
Trichloroethene	0.51	0.36	34.5
Tetrachloroethene	0.68	0.78	13.7

[a] Detection Limit = 0.18 ppmv
[b] ppmv = Parts per million by volume
[c] Relative percent difference

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