Reports

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Date: November 15, 2004
Refer To: ER2004-0645

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

RECEIVED
NOV 2004
NMED Hazardous
Waste Bureau

SUBJECT: QUARTERLY TECHNICAL REPORT FOR JULY–SEPTEMBER 2004

Dear Mr. Young:

Enclosed are two copies of the Remediation Services Quarterly Technical Report, July–September 2004. The 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) 667-0808 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/MS/jr

Enclosure: 1) Quarterly Technical Report for July–September 2004 (ER2004-0567)
2) Certification

8227

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CERTIFICATION

CERTIFICATION BY THE ENVIRONMENTAL STEWARDSHIP–REMEDIATION SERVICES (ENV–RS) PROJECT TECHNICAL REPRESENTATIVES

DOCUMENT TITLE: QUARTERLY TECHNICAL REPORT FOR JULY–SEPTEMBER 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: 11/10/04

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

or

_____ Date: _____

Ken Hargis, Acting Division Leader
Environmental Stewardship Division
Los Alamos National Laboratory

_____ Date: 11/10/04

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-04-7387
November 2004
ER2004-0567

LIBRARY COPY

Quarterly Technical Report July–September 2004

Los Alamos
NATIONAL LABORATORY
Los Alamos NM 87545

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Produced by Risk Reduction and Environmental Stewardship–Remediation Services

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LIST OF ACRONYMS AND ABBREVIATIONS

AOC	area of concern
B&K	Brüel and Kjaer
BMP	best management practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CME	corrective measures evaluation
COPEC	chemicals of potential ecological concern
D&D	decontamination and decommissioning
DI	Desk Instruction
DOE	U.S. Department of Energy
DOE–HQ	U.S. Department of Energy–Headquarters
DSA	documented safety analysis
EM	Office of Environmental Management (DOE)
EMS	Environmental Management System
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration Project
ERDB	Environmental Restoration Database
ESL	ecological screening level
ET	evapotranspiration
FFCA	Federal Facility Compliance Agreement
FMU	Facility Management Unit
FWO	Facilities and Waste Operations Division
FWO-IP	Facilities and Waste Operations Division–Infrastructure Project
FY	fiscal year
GIS	Geographic Information System
HE	high explosives
HSWA	Hazardous and Solid Waste Amendments
IM	Information Management (Laboratory division)
IM	interim measure
ISM	Integrated Safety Management
Laboratory	Los Alamos National Laboratory
LIR	Laboratory Implementation Requirement
MDA	material disposal area

NEPA	National Environment Policy Act
NMED	New Mexico Environment Department
NMED-HWB	New Mexico Environment Department–Hazardous Waste Bureau
NMED-HRMB	New Mexico Environment Department–Hazardous and Radioactive Materials Bureau
NMED-SWQB	New Mexico Environment Department–Surface Water Quality Bureau
NNMCAB	Northern New Mexico Citizens Advisory Board
NNSA	National Nuclear Security Administration
NOD	notice of deficiency
NSSB	National Security Science Building
NTISV	nontraditional in situ vitrification
PAMG	Performance Assessment Maintenance Group
PCE	tetrachloroethene
PM	Program Management (Laboratory division)
PM-DS	Program Management–Deployed Staff
ppbv	parts per billion by volume
ppmv	parts per million by volume
PR-ID	permit and requirement identification
PRS	potential release site
PTSE	primary toxicity study evaluation
QA	quality assurance
QP	quality procedure
RAC	Risk Assessment Corporation
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RPF	Records Processing Facility
RRES	Risk Reduction and Environmental Stewardship 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 Environmental Information Management
RRES-RS	Risk Reduction and Environmental Stewardship Division–Remediation Services
RSI	request for supplemental information
SAP	sampling and analysis plan

SMART	spatial mapping, analysis, and reporting tool
SMO	Sample Management Office
SOP	standard operating procedure
SOW	statement of work
SR	sample round
SSL	soil screening level
SWAT	Storm Water Assessment Team
SWMP	Storm Water Monitoring Plan
SWMU	solid waste management unit
SWPPP	Stormwater Pollution Prevention Plan
TA	technical area
TCA	1,1,1-trichloroethane
TCE	trichloroethene
TDR	time domain reflectometry
TRV	toxicity reference value
VCA	voluntary corrective action
VCM	voluntary corrective measure
VOC	volatile organic compound
WCSF	Waste Characterization Strategy Form

QUARTERLY TECHNICAL REPORT

JULY–SEPTEMBER 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 824

POTENTIAL WASTE: 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, 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

This quarter, the team supported, and participated in, the Los Alamos Inter-Departmental Review Committee (IDRC), the Solid Waste Management (SWMU) Working Group, as well as the Los Alamos County for land transfer, private property development, Los Alamos community development, and other issues affecting non-Department of Energy (DOE).

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). A Notice of Deficiency (NOD) on the voluntary corrective action (VCA) completion report for SWMUs 00-030(a), 00-030(b)-00, and 00-033(a) and Areas of Concern (AOCs) 00-029(a,b,c) and 00-010(a,b) and for the interim action at SWMU 21-021-99 required supplemental sampling at select locations. Sampling and selected soil removal were completed, and the sites have been restored and the field team demobilized.

Confirmation sampling at AOC 00-027 has been completed, the site restored to preremediation conditions, and the field team demobilized.

2.1.2 TA-01

Preliminary procurement activities have begun in anticipation of the reinvestigation and additional corrective action activities at the former TA-01 area.

2.1.3 TA-19

Fieldwork has been completed at former TA-19, and the site has been restored and the field team demobilized.

2.1.4 TA-73

SWMU 73-002. A statement of work (SOW) for DOE contractors to plan and execute the remedial action at SWMU 73-002 was prepared, reviewed, and submitted to the Los Alamos Site Office.

2.1.5 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): Procurement activities are in progress to execute the groundwater investigation work plan at SWMU 03-010(a). No new work has been conducted at this site since last quarter.

Newly Identified SWMU 03-013(i): In June 2004, the RRES-RS project identified a new SWMU in TA-03 (SWMU 03-013[i]), and submitted a notification to the New Mexico Environment Department (NMED), as required by Module VIII of the Laboratory's Hazardous Waste Facility Permit. This site consists of soil contaminated with hydraulic oil released from Buildings 03-246 and 03-247, which are an inactive cable testing facility. As a result of the notification, NMED requested that the Laboratory prepare a SWMU assessment plan. This plan was prepared during the fourth quarter of fiscal year (FY) 2004 and submitted to NMED on September 30, 2004. The plan presents a description and history of the site, results of previous investigations, planned activities, and a sampling and analysis plan (SAP). Buildings 03-246 and 03-247 are scheduled to undergo demolition and removal in FY2005. At that time, all oil-contaminated soil will be removed, and confirmatory sampling will be conducted as specified in the SWMU assessment plan.

2.2.2 Middle Mortandad/Ten Site Aggregate

Middle Mortandad and Ten Site Aggregate Field Investigation: The investigation fieldwork, as described in the Middle Mortandad/Ten Site Aggregate and supplemental SAPs, began in late August. Team members involved in this fieldwork effort participated in mandatory security training and procedures reviews/upgrades.

A new standard operating procedure (SOP) for field screening for volatile organic compounds (VOCs) using a photoionization detector was written and peer reviewed before it is implemented in the field. By the end of the quarter (September 30, 2004), approximately 80% of the borehole sampling and 20% of the shallow subsurface and sediment sampling within the TA-35 area was completed. Within TAs-04, -05, -52, and -63, nearly a third of the canyon transect sampling was completed. Drilling activities listed in the SAP will begin in the first quarter of FY2005.

SWMU 53-002(a)-99, Northern and Southern Surface Impoundments: RRES-RS personnel are awaiting NMED comments on or approval of the investigation and remediation report for SWMU 53-002(a)-99 and AOC 53-008 (LANL 2004, 85221), which was delivered to NMED on January 30, 2004.

2.2.4 Facility Integration Activities

During the fourth quarter of FY 2004, Industrial Sites Team members responded to approximately 115 requests for excavation permits, 37 permit and requirement identification (PR-ID) questionnaires, 10 structure-siting requests, and numerous facility inquiries about new construction projects. The team worked with facility managers on ongoing projects and planned construction projects collocated with SWMUs and AOCs by attending meetings, conducting field visits, and providing information. Section 2.13 further describes the activities undertaken this quarter.

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

Field activities associated with the High-Explosives Production Sites Team were minimal during this quarter.

2.3.1 TA-16

260 Outfall: The TA-16-260 Outfall Corrective Action Team continued fieldwork, data analysis, and NOD response activities in support of the corrective measures evaluation (CME) at SWMU 16-021(c)-99 (the 260 Outfall). Hydrogeology studies and high-performance team activities also continued this quarter.

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 the canyon dried out early in the quarter and then became wet again during the August and September monsoons. Late in the quarter, surface flow in Cañon de Valle extended from near the Burning Ground spring area to just past Material Disposal Area (MDA) P, the typical disposition of surface flow in the canyon during low-flow conditions. All five alluvial wells in Cañon de Valle contained water during the second half of this quarter; the uppermost well was dry in the first half of the quarter. Surface flow was present in Martin Spring Canyon during August. Both Martin Spring and SWSC Spring were flowing in August and September. A small subsidiary seep appeared near Martin Spring during August. The Fishladder seep was dry throughout the reporting period. The 90s Line pond was wet during August and September. The Cañon de Valle headwaters were saturated, and a small new spring continued to flow in the headwaters region. The intermediate depth wells were dry. Quarterly sampling in the Cañon de Valle alluvial system was completed in July at the above locations containing water.

Deep well CdV-R-15-3 was sampled during July. Field parameters were consistent with previous sampling rounds.

Three intermediate-depth boreholes continued to be monitored. The first borehole, CdV-16-1(i), located in Cañon de Valle, will be sampled in the first quarter of FY2005. The second borehole, CdV-16-2(i), was drilled east of the TA-16 Burning Ground to a 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. Another borehole, CdV-6-3(i), was drilled southeast of TA-16-340 to a depth of approximately 1400 ft. No water was observed in this borehole during drilling; therefore, this borehole will not be completed as a well. Water-level measurements in CdV-16-2(i) suggest little water is being produced in the borehole, but similar measurements in CdV-16-3(i) suggest water is present with extremely slow infiltration.

An approval with modifications for the Phase III Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) report for SWMU 16-021(c)-99 was received in late June 2004. A response to this approval letter was submitted to NMED on July 23, 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. No new activity related to this report occurred during this quarter.

2.3.1.3 Surface Water

Best management practices (BMPs) at SWMU 16-021(c)-99 were inspected and maintained. Jute matting located in the TA-16-260 drainage required repairs, which will be completed during the first quarter of FY2005.

2.3.2 TA-16

340 Complex (Fishladder) and HE Ponds: 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) and Phase II characterization activities for soils, tuff, and alluvial groundwater associated with SWMUs at the 340 Complex. NMED approved this work plan on June 28, 2004. Preparations for the readiness review for this project and for the TA-16 Ponds continued during the fourth quarter of FY2004.

2.3.3 MDA P Closure

The MDA P and Flash Pad 387 closure certification report was submitted to NMED on 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 on November 26, 2003. A response to an NMED request for supplemental information (RSI) for the closure certification report was submitted on May 14, 2004. RRES-RS personnel are awaiting NMED comments on or approval of the RSI response.

2.4 Canyon Investigations — Project Team Leader: Danny Katzman

2.4.1 Los Alamos and Pueblo Canyons

The Los Alamos and Pueblo Canyons investigation report was submitted to the NMED on April 30, 2004, and comments were due from the NMED by August 31, 2004. RRES-RS personnel are awaiting comments on or approval of the investigation report.

2.4.2 Mortandad Canyon

The Laboratory began implementing the approved groundwater work plan for Mortandad Canyon (LANL 2003, 79557) in September 2004. Results from the groundwater investigation and investigations of sediment and biota in Mortandad Canyon (described below) will be integrated into an investigation report for Mortandad Canyon currently due to the NMED in June 2006.

2.4.2.1 Sediment Investigation

Phase 2 sediment investigations in the Mortandad Canyon watershed during the fourth quarter included sediment sampling in reaches E-1, M-2, M-3, and M-4, located in Effluent and Mortandad Canyons downstream of the TA-50 radioactive liquid waste treatment facility outfall. Sixty-seven sediment samples were collected from these reaches and submitted to off-site analytical laboratories. This sampling effort concludes the planned Phase 2 sediment sampling in the Mortandad Canyon watershed.

2.4.2.2 Surface and Alluvial Groundwater Investigation

In accordance with the approved Mortandad Canyon groundwater work plan (LANL 2004, 82613), installation of alluvial groundwater monitoring wells in Mortandad Canyon began in September. Eight new alluvial monitoring wells are planned. Surface water sampling sites have been selected and are described in detail in the approved groundwater work plan (LANL 2004, 82613). Sampling of alluvial groundwater and surface water will be conducted concurrently and is planned to begin after completion and development of all planned alluvial wells in early FY2005. Sixteen boreholes to determine detailed contaminant characterization from core are also planned and described in the approved groundwater work plan. Sampling of core for moisture and tritium will be conducted as core is collected from the borehole. Sampling for other analytes will be conducted immediately following core curation.

2.4.2.3 Intermediate and Regional Groundwater Investigation

Installation of boreholes R-33 and R-34 in Mortandad Canyon began in the fourth quarter and will be completed in early FY2005. Installation of intermediate-depth groundwater monitoring wells, described in the revision of the groundwater work plan for Mortandad Canyon (LANL 2004, 82613), is planned to begin in the first quarter of FY2005 and to be completed during the second quarter of FY2005.

2.4.2.4 Biota Investigation

Development of a biota plan for Mortandad Canyon is planned for the first quarter of FY2005. The plan will present the approach for characterizing potential adverse ecological effects associated with chemicals of potential ecological concern (COPECs) identified from the sediment, surface water, and alluvial groundwater investigations conducted to date in Mortandad Canyon. The plan will be submitted as an update to the initial biota plan that was included in the approved work plan for Mortandad Canyon, dated September 1997.

2.4.2.5 Infiltration Investigation

The primary goal of the infiltration study is to quantify subsurface fluxes in the zones from the land surface to the zone below the alluvial aquifer to better understand the rates of water and contaminant movement in the various parts of Mortandad Canyon. Downhole equipment for monitoring infiltration will be installed into characterization boreholes drilled in September and October 2004 and described in section 2.4.2.2 of

this report. Target installation areas were selected according to existing hydrologic and contaminant information as well as recent geophysical surveys. Fourth quarter activities include installing equipment to complete drilling activities.

2.5 Deep Groundwater Wells — Project Team Leader: John McCann

Drilling activities this quarter include the initiation of work at wells R-33 and R-34 in Mortandad Canyon and continuation of the drilling effort at well R-11. Well R-34 was drilled this quarter, and work continues on the scope for wells R-33 and R-11.

Aquifer test analysis results were published for the combined report for intermediate well R-9i and regional wells R-13, R-19, and R-22. The aquifer test analysis was published for R-14. Reports on aquifer test analysis results for regional wells R-16, R-20, and R-32 will be released in the first quarter of FY2005.

Groundwater sampling activities for the regional and intermediate wells are as follows. The upper screen from well R-5 accessing intermediate groundwater was sampled in September. Regional aquifer sampling was performed in July at CdV-R-15-3 and R-14. Regional wells R-5, R-20, R-21, R-23, and R-32 were sampled during September.

Hydrochemical groundwater data from regional wells R-12 (sample round [SR] 7); R-14 (SR 2); R-21 (SR 1); R-23 (SR 3); and R-31 (SR 3) are reported this quarter (Appendix A). Only data from screen 2 at R-31 are reported because of mechanical difficulties with the sample collection system. Organic chemical results for well R-23 and R-31 are undergoing a focused validation.

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

SWMU 21-014, MDA A, and General's Tanks. An investigation work plan and historical investigation report are currently being developed for MDA A. Planning activities to sample the contents of the General's Tanks, categorized as containing Hazard Category 2 nuclear facility inventories, are being undertaken by AEA Technologies through a DOE contract. The atmosphere in the tanks must be controlled before accessing the tank contents. Access is being planned around their proprietary technology. The potential for using the same technology for full removal or in situ grouting is also being assessed by AEA. The documented safety analysis (DSA) incorporating these approaches 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.

SWMU 21-015 (MDA B). The investigation work plan for MDA B, submitted to NMED on June 30, 2004, proposes to characterize the contents of the landfill within the MDA and sampling bedrock immediately below the disposal trenches. The proposed investigation activities will provide information to identify corrective action alternatives. The Laboratory is awaiting NMED's comments on or approval of the MDA B investigation work plan.

SWMU 21-016(a)-99 (MDA T). An investigation work plan for MDA T was submitted to NMED on February 29, 2004. A notice of disapproval of the plan was received from NMED on September 30, 2004. The Laboratory is currently addressing the comments in the notice.

SWMU 21-017(a)-99 (MDA U). An investigation work plan and historical investigation report are currently being prepared for MDA U. These documents will be submitted to NMED on November 30, 2004.

SWMU 21-018(a)-99 (MDA V). The investigation work plan for this SWMU was submitted to NMED on June 30, 2004. The plan proposed both characterization and remediation activities for MDA V and the remainder of the SWMU. A notice of disapproval of the investigation work plan was received from NMED on September 14, 2004.

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

SWMU 21-011(k) VCM Activities. Personnel are awaiting comments on or approval of the voluntary correction measure (VCM) report documenting field activities at the 21-011(k) outfall, which was submitted to NMED at the end of October 2003. 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. NMED sent an email on July 8, 2004, approving the Laboratory's response to the second NOD, which was received on April 29, 2004. The resampling was conducted in September, and analytical results are pending.

SWMU 21-018(a)-99 NTISV Hot Demonstration at MDA V. Personnel are awaiting comments on or approval of 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 21-029 DP Tank Farm. The quarterly site inspection at the two hydrocarbon seep areas in DP Canyon was conducted at the end of September 2004. The inspection report for the fourth 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. The investigation work plan for the DP Site Aggregate Area at TA- 21 was submitted to NMED on August 31, 2004. Work continues on the progress report that will provide additional data, now being collected and compiled, for the corrective action sites. Radiological and geophysical surveys are currently being conducted at the corrective action sites to refine the scope of the planned removal actions.

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

SWMU 49-001(a)-00, MDA AB, Areas 2, 2A, and 2B. Moisture monitoring continued at this site during the fourth 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. Continuous measurements using the time domain reflectometry (TDR) probes remain unchanged.

Neutron moisture measurements were performed this quarter. During the quarter, TDR measurements and precipitation quantities were recorded twice a day to a Campbell Scientific datalogger. 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 were undertaken at these SWMUs this quarter. The Laboratory received authorization-basis approval for the pumphouse project, and the third round of sampling was completed during the fourth quarter of FY2004.

SWMU 50-009, MDA C. The Laboratory is awaiting comments on or approval of the update to the MDA C investigation work plan, which was submitted to NMED in January 2004.

2.8.3 TA-54

SWMU 54-013(b)-99, MDA G. The investigation work plan and historical investigation report for MDA G were submitted to NMED on September 30, 2003. To adhere to NMED requirements for the organization of work plans, the MDA G work plan was reformatted and submitted to NMED on June 14, 2004. On September 14, 2004, the Laboratory received a notice of disapproval from NMED.

SWMU 54-004, MDA H. DOE completed the environmental assessment for MDA H with a finding of no significant impact for the corrective measure options specified in the MDA H corrective measures study.

SWMU 54-006, MDA L. The revised MDA L investigation work plan was submitted to NMED on December 23, 2003. On September 28, 2004, the Laboratory received NMED's approval of the work plan with modifications.

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 are presented in Appendix D of this report.

2.9 Corrective Action Strategy — Project Leader: Richard Mirenda

2.9.1 Science-Based Monitoring Stewardship

The progress 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

The Laboratory prepared a revised draft and is ready to finalize the revision according to guidance from DOE-Headquarters (HQ), which is anticipated pending the outcome of DOE-HQ's Risk-Based End State workshop in October 2004.

2.9.1.2 Long-Term Environmental Stewardship Transition Planning

Personnel participated in RRES Division Office website redesign planning and implementation meetings and land transfer meetings. Task-team members have worked with NNSA personnel to incorporate information regarding long-term environmental stewardship site information into the NNSA ten-year comprehensive site plan.

Personnel continued to incorporate peer review comments on a document addressing the technical strategy for long-term environmental stewardship at the Laboratory.

Personnel continued to participate as a member of the Trails Working Group established by the Environmental Assessment pursuant to the National Environmental Policy Act (NEPA).

Personnel began revitalization and revision of an externally oriented stewardship- and risk-related webpage that will coordinate with the redesign of the RRES Division external website.

2.9.1.3 Science-Based Risk Reduction

The Laboratory conducted a second groundwater-pathway risk assessment to address stakeholder concerns about the potential for fractures beneath MDA H to transport hazardous and/or radiological constituents in waste disposed of at MDA H to the regional water supply aquifer. This concern was raised by stakeholders who reviewed the baseline risk assessment conducted as part of the CMS for MDA H (LANL 2003, 76039). The CMS evaluated alternative remedies designed to mitigate the potential release and transport processes and pathways identified in the baseline risk assessment. The purpose of the second assessment was to determine whether the alternative conceptual model of fracture-supplemented transport could result in groundwater-pathway risks that require evaluating remedies different from those indicated by the baseline risk assessment and/or additional characterization of the potential for fracture flow. The supplemental analysis shows that contaminants are transported faster, but in lesser amounts, through fractures in rock than through rock matrix under the conditions modeled. The second risk assessment indicates that fractures are not likely to result in contaminant concentrations in drinking water in excess of risk-based standards established by the U.S. Environmental Protection Agency (EPA). In light of these results, the MDA H CMS will evaluate alternative remedies in terms of their ability to protect against both matrix-only and matrix/fracture transport.

The Laboratory developed a quantitative risk-based decision-support tool to aid in making characterization, remediation, and monitoring decisions to address nitrate, tritium, and perchlorate contamination in groundwater originating from former discharges of treated wastewater from the radioactive liquid waste treatment facility in Mortandad Canyon. The decision-support tool uses the results of a probabilistic risk assessment of groundwater transport of contaminants in Mortandad Canyon to drinking-water supply wells. The risk assessment uses results of 1000 Monte Carlo realizations (for three alternative conceptual models) of contaminant transport through the vadose zone and saturated zone, which quantitatively capture the current state of knowledge regarding contaminant inventory uncertainty, geohydrologic heterogeneity, groundwater flow paths, pumping rates, etc. The decision-support tool uses statistical correlations that relate the sensitivity of human-health risk (calculated using standard EPA drinking-water scenarios) to groundwater-model parameters to assess the relative value of alternative risk-management decisions (e.g., additional characterization, monitoring, source reduction, etc.).

2.9.2 Data Quality

Data-quality activities for the fourth quarter of FY2004 included the following:

- finalized SOP for collecting and submitting *x-y* coordinates for sampling locations,
- continued tracking missing *x-y* coordinates for sample data by team leaders, and
- continued work on a pilot study to review previously submitted RFI reports against the Environmental Restoration Database (ERDB) to evaluate the completeness and accuracy of data sets in the ERDB.

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 39 request numbers during the quarter. Data validators remained current with incoming data packages. The process consists of validating external laboratory data packages, based on EPA's National Functional Guidelines. Team members follow quality procedure (QP-) 5.13, Rev. 0, "Analytical Data Verification/Validation Process." Data validators also assisted with the assignment and review of reporting qualifiers and reason codes for preparing data sets as well as addressing duplicate sample analytes in the ERDB.

For the data cleanup effort, data verifiers reviewed three reports: (1) the RFI report for SWMU 0-030(g), February 2001; (2) the RFI report for AOC 49-008(b) at TA-49 (potential area of surface contamination at Area 6 East), September 2002; and (3) the Phase III RFI report for SWMU 16-021(c)-99. The review consisted of a two-step verification process. First, a comparison of data package hard copy Form 1s to data currently being stored in the ERDB was reviewed to ensure the hard-copy data package coincides with the ERDB. Second, analytical data within the submitted report was compared to the ERDB. This exercise sought to demonstrate the consistency between data reported on hard copy Form 1s from the analytical laboratories and the ERDB.

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. This quarter, the Data Stewardship Team continued to provide technical support for developing, testing, and implementing 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 20 electronic data sets requested by RRES-RS data users and RRES Division. In addition, 11 new sampling events were documented, and the required field paperwork was generated for 770 samples.

Data Management and Legacy Data Cleanup. Data management and legacy data cleanup activities continued this quarter. 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 12 legacy sample records and 3338 Sample Management Office (SMO) event sample records was performed using RRES Desk Instruction (DI) 4.26, "Review of Sample Field Data." In

addition, three new sample events were moved to "field complete," indicating that all 80 samples in the events had been accounted for and reviewed in accordance with DI-4.26. Data stewards also uploaded and/or updated *x-y* coordinates and other location information for 232 sampling locations.

2.9.6 Risk Assessment

Personnel from the Human Health and Ecological Risk Assessment teams participated in peer reviews for the DP Site Aggregate investigation work plan, the fracture facilitated transport and groundwater pathway risk assessment for MDA H, and the revised "Screening Level Ecological Risk Assessment Methods."

2.9.6.1 Human Health Risk

Human health risk team activities for the fourth quarter included the following:

- provided comments on the background and risk assessment documents from the Risk Assessment Corporation (RAC);
- continued revising the "Standard Human Health Risk Assessment Scenarios" document for the RRES-RS project;
- continued revising the "Human Health Risk-Based Screening Methodology" report to include calculations of recreational soil-screening levels (SSLs) for the RRES-RS project;
- reviewed spreadsheets of the human health risk-assessment scenarios; and
- provided input for and reviewed responses to NMED comments on the MDA G and MDA V investigation work plans.

2.9.6.2 Ecological Risk

Ecological risk team activities for the fourth quarter included the following:

- reviewed toxicity reference value (TRV) summaries as part of the annual update to the ECORISK Database; and
- submitted two abstracts for poster presentations at the Society of Environmental Toxicology and Chemistry 2004 Fourth World Congress Meeting in Portland, Oregon; both were accepted.

2.9.6.3 Ecological Risk Database

This quarter, team members continued to review literature for toxicity information, conduct primary toxicity study evaluations (PTSEs) on literature reviewed, and update TRV summary reports.

Work continued on the tiered TRVs development process for the ECORISK Database, which includes detailed information on the PTSE process for the tier 1, 2, 3, and 4 TRVs as well as information on literature searches and retrievals and TRV derivation.

Team members began to develop an ecological screening level (ESL) history report that will contain ESLs from all releases of the ECORISK Database for comparison purposes. This exercise was used to address comments from NMED regarding previous versions of ESLs in reports. This report will be incorporated into release 2.1 of the ECORISK Database.

Team members compiled the most current versions (format and data) of all ECORISK Database tables in preparation for the calculation and documentation of ESLs contained in revision 2.1. The team also added

all current geometric mean TRVs to the ESL calculation spreadsheet and updated critical stage TRVs in ESL calculation spreadsheet.

Finally, team members prepared and distributed version 2.1 of the ECORISK Database to project risk assessors.

2.9.7 Native American Risk

Department of Environmental and Cultural Preservation personnel at San Ildefonso Pueblo submitted soil and vegetation samples through the SMO as part of ongoing sampling of San Ildefonso lands.

2.10 Regulatory Compliance — Project Team Leader: Phillip Noll

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

- "An Alternate Groundwater-Pathway Risk Assessment for MDA H," prepared for the MDA H Focus Group (earlier iteration, entitled "Supplemental Groundwater-Pathway Risk Assessment for MDA H, Fracture-Facilitated Contaminant Transport," reviewed in July 2004);
- "Screening Level Ecological Risk Assessment Methods, Revision 2";
- "Revised Phase III RFI Report for SWMU 16-021(c)-99, the TA-16-260 Outfall";
- "DP Site Aggregate Area Investigation Work Plan";
- "Field Implementation Plan for TA-21 Site-Wide Geophysical and Radiological Surveys";
- "Sample Analysis Plan for Installation and Sampling of Regional Wells R-6 and R-14 and Intermediate Well LAOI-3.2";
- "Characterization Well R-25 Geochemistry Report"; and
- "Response to NMED Comments on the Phase III RFI Report for SWMU 16-021(c)-99, the TA-16-260 Outfall."

2.10.1 Waste Management and Waste Minimization

RRES-RS personnel participated in the review and revision of numerous Waste Characterization Strategy Forms (WCSFs) for upcoming field investigations. The purpose of the WCSF is to ensure that the appropriate waste management requirements are incorporated into the planning phase of any RRES-RS activities that potentially generate waste and to ensure that an approved characterization strategy exists for each waste stream before it is generated. The WCSFs prepared during this quarter included anticipated waste generation for the TA-16-340 Complex and investigation-derived waste for sampling in TA-35, Middle Mortandad Canyon.

2.10.2 Stakeholder Involvement

2.10.2.1 Outreach Activities

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

The communications staff planned, coordinated, and set up the Groundwater Protection Program quarterly public poster session held on July 13, 2004.

The communications staff also researched, composed, and finalized an access agreement for Los Alamos County for BMP field work to take place at SWMU 45-004.

2.10.2.2 Virtual Library/Public Reading Room

Personnel continued to work with the Laboratory's information management expert to redesign the existing RRES-RS project website to provide both internal and external sites. Currently, documents in the Virtual Library are accessible only to internal staff because the NNSA decision regarding the types of documents that can be made available to the public on the external web pages is still pending.

2.10.3 PRS Deliverable Information Management

2.10.3.1 Compliance Schedule Tracking

Personnel continued 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 pending the resolution of issues related to the proposed NMED Consent Order.

2.11 Land Transfer — Project Team Leader: Terry Rust

Personnel continue to participate on 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 requests for information. These teams are responsible for the activities leading to the final transfer of Laboratory property.

Personnel completed Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 120(h) reports for the conveyance of the DP Road-3 East Subparcel (map designation A-10) and submitted it to RRES–Ecology Group (RRES-ECO). RRES-ECO also requested a CERCLA 120(h) report for the three preservation easements located on the TA-74 South land transfer parcel (map designation A-18).

Personnel reviewed land transfer survey boundaries for multiple land transfer parcels and provided an RRES-RS review of the document for the demolition of the DOE-Los Alamos Area Office building.

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 re-engineering. This effort focuses on four main activities: rebuilding ERDB (completed); developing a series of applications for the SMO to enter data into the database (completed); developing a SMART application to retrieve data from the database (application now in final development phase and module testing); and developing a GeoPro application to track modeling input and output parameters. Development efforts this quarter focused on a

new web release of SMART, which included bug fixes, graphic enhancements, a report application update, and new charting capability. One hundred and thirty Geographical Information System (GIS) themes were identified and reduced to the thirty-two most used themes, which will become available in the next SMART release. In addition, GIS spatial is now pulled directly from the appropriate source (e.g., Facilities and Waste Operations [FWO]) rather than hosted out of the Pueblo Complex. Staff prepared formal training class documentation and will transfer the SMART application to NMED Oversight Bureau pending final RRES Division approval. 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 GIS format (map) on a desktop environment.

Personnel also presented a GIS applications paper at the annual ESRI conference; created an email contact list; and divided the database into two data marts, one for reportable data (data that has gone through a formal quality assurance check), and one for unreportable data (data that has not yet gone through a quality assurance check). This architecture increases the speed of the application. A brown bag lunch presentation was held to discuss how the database works. Several data releases and a demonstration of SMART were provided to RAC personnel.

2.12.2 Records Management

Personnel added 729 new documents to the Records Processing Facility (RPF) database; the RPF now contains more than 245,480 documents available for query. Staff handled over 100 walk-in, email, and phone requests, which resulted in 739 queries. Staff also performed 485 record retrievals (up from 309 the previous quarter). SMO personnel completed scanning more than 10,000 legacy data packages (over 700 boxes) to meet DOE dual-storage requirements. To date, all legacy documents have been scanned electronically and are now available on the internal web. Two shipments (80 boxes each) were sent to Information Management (IM-) 9 this quarter.

A total of 324 rolls of film are being transferred to electronic media by a subcontractor as part of the new scanning process. Deliverables are being received periodically, and the effort is approximately 50% complete. A quality-control problem was recently identified, and the subcontractor agreed to fix the problem at their expense. The subcontractor still expects to complete the conversion by the end of the calendar year. When completed, the scanned historical documents will be available for electronic viewing. Staff is also reviewing the final taxonomy for transferring all documents into the Division required domino.doc system.

2.12.3 Sample Management Office

The SMO issued 47 field data groups (number of discrete samples) and had 498 customers this quarter. Personnel handled and shipped 6203 containers. These totals are well above the five-year quarterly average of 4882 and the two-year average of 4358. The increase results in part from several budget issues. In addition, NMED approval of several work plans and heavy seasonal rains caused field workloads to increase dramatically. The SMO shipped over 14,000 containers this year, a 40% increase over the amount shipped last year.

Field Support Facility staff have been characterizing legacy borehole samples and moving the appropriate core into B21 and B12 waste containers. For the thirty-six boxes of legacy samples identified, only 72 individual containers remain to be disposed.

2.12.4 Computer Support

Computer support personnel received 394 service requests this quarter. For the year, 1603 requests have been submitted, and 22 remain open. This rate is a 30% increase over the number of requests submitted last year. The increase is attributed to personnel recording "hallway" fixes that were not captured previously. A four-year maintenance plan, previously developed for aging computer systems, was also developed for servers and printers. Hostmaster, an online database that matches user machine IDs with current IP addresses at the Pueblo Complex, malfunctioned and was repaired. A new backup unit with a longer life expectancy than existing backup units was installed. To fix several security vulnerabilities, staff took over the 135 subnets used by subcontractors.

2.12.5 Geographic Information System

Users from ten unique groups accessed the flat-file repository and/or relational database management system to view spatial data. The RRES-RS GIS teams produced 230 map products and/or figures as a result of 42 service requests. Updated feature themes this quarter include ER Project Locations and potential release sites (PRS) polygons. Updated SWMUs include 16-025(f2), 63-001(a), 63-001(b), and AOC 05-001(c). A new PRS 03-013(i) was added to the database, and a new fault theme map was added. The point count of ERDB (the environmental database) nonzero coordinates increased to 18,497. An SOP titled Map Layout and Design Elements was prepared and distributed for comment.

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

Personnel continued to meet with the Laboratory's FWO–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 where D&D and construction/land development activities are planned.

RRES-RS Facility Integration staff continued to participate in the development of the Laboratory's Environmental Management System (EMS) in accordance with DOE Order 450.1 to ensure RRES-RS issues are adequately and consistently addressed by the system. Staff continued to assist with finalizing and implementing the environmental aspect identification procedure and assisted in revising the Laboratory's Integrated Safety Management (ISM) Description Document to ensure it will adequately substantiate integration of the EMS within the ISM for the purposes of forthcoming third-party audits. In addition, RRES-RS Facility Integration staff continued to participate in developing and testing the new Laboratory-wide automated job hazard analysis tool to ensure all RRES-RS PRS issues are adequately addressed. The new hazard identification tool will be implemented throughout the Laboratory in October and November 2004.

Facility Integration personnel also performed the following activities this quarter:

- participated in the review of approximately 115 excavation permit requests, 37 PR-IDs, and 10 structure-siting requests and conducted 50 field site visits as part of these reviews;
- participated in the review of 34 Laboratory construction projects to ensure all applicable environmental requirements were addressed;
- reviewed maps, the PRS database, and work plans to determine whether any SWMUs/AOCs will be affected by the D&D of structures/buildings planned for FY2005 and FY2006;
- continued participation by RRES-RS Facility Integration personnel in the final revisions to the Excavation Permit Laboratory Implementation Requirement (LIR) and Comprehensive Site

Planning LIR to address how PRSs will be identified for all types of work activities such as utility locates and outdoor research activities to new buildings. Both documents were finalized in the fourth quarter of FY2004; and

- continued to compile information on building and Facility Management Unit (FMU) associations for each active PRS to support Active Facility Integration efforts. This process will be used to help clarify and formalize ownership and budgets needed to complete the Office of Environmental Management (EM) activities and reconcile the baseline and PRS database.

2.13.1 D&D at TA-03

RRES-RS personnel continued to meet with RRES storm water staff and FWO 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. The final design and location of specific turbine components were discussed in relation to the requirements for working within a SWMU boundary. Excavation activities began in June 2004 to install the new utility lines. Installation and construction of the gas turbine and its components are scheduled to begin in early FY2005.

RRES-RS Facility Integration personnel continued to support the Security Perimeter Road Project and adjoining Gateway Parking Lot project by meeting with the project leaders about the road construction and conducting numerous site visits to confirm which PRSs may be impacted by the project. An accelerated corrective action work plan is being drafted to address three in-progress PRSs in the direct path of this project [SWMUs 61-002 and 03-029 and AOC 03-001(i)]. The remediation of these PRSs is planned for the first two quarters of FY2005.

RRES-RS Facility Integration personnel continued to meet with FWO-IP and PM Division staff regarding the removal and replacement of the Radio Shop at TA-03 (Building 03-23). The Radio Shop is located in the path of the new Security Perimeter Road; therefore, the structure will be removed and a new Radio Shop constructed at a location south of the current location within TA-03. The installation of a new electrical conduit for the new building will intersect a PRS [SWMU 03-009(i)]; Facility Integration staff will ensure that impact to the PRS are minimal.

RRES-RS Facility Integration personnel continued to support construction of the National Security Sciences Building (NSSB) parking structure east of the Otowi Building at TA-03 by conducting several site visits with the FWO-IP Group to ensure that new storm drains from the parking structure discharging to SWMU 03-013(a)-00 do not adversely impact the PRS.

The SWMU 03-013(i) assessment plan was submitted to NMED on September 30, 2004. This site will be remediated in FY2005 when the structures are decommissioned before the construction of the new DOE office building.

2.13.2 New Construction at TA-03

RRES-RS Facility Integration personnel continued to meet with FWO-IP and TA-03 facility 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 refurbishments, and utility upgrades.

2.13.3 D&D at TA-16

RRES-RS staff continued integration activities with FWO-IP by attending weekly meetings to address PRSs that may be impacted by FY2004 D&D projects and to ensure all applicable environmental requirements were addressed. Ongoing D&D projects include

- D&D of Buildings 21-1, 21-228, and 21-402,
- D&D of Building 16-370,
- D&D of the TA-16 340 Complex,
- D&D of structures 06-1 through 06-9, and
- D&D of buildings/structures at TA-15, The Hollow.

2.13.4 New Construction at TA-16

RRES-RS Facility Integration staff continued to meet with ESA and PM-Deployed Staff (DS) and their subcontractors on the work associated with the installation of new utilities, storm-water drainage channels and a retention basin, contractor material lay-down areas, and the demolition of old fences and installation of new fences in support of the TA-16 Weapons Campus Project. Several PRSs may be impacted by the planned excavation and construction activities. Numerous site visits were conducted with the PM-DS project manager and subcontractors to confirm the location of PRSs in the field and to discuss options for completing the work while minimizing impacts to PRSs.

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

2.14.1 BMP Installation, Inspection, and Maintenance

This quarter, the following tasks were undertaken:

- continued support of ER-SOP 2.01, "Surface Water Site Assessments," updating of the Storm Water Tracking System database, and initiation of the development phase of using Trimble Explorer hand-held global positioning system units to conduct field inspections.
- completion of the final engineering design for the Hillside 137 storm water diversion project, with field work scheduled to begin in October 2004. The excavation permit and PR-ID have been submitted, the 401/404 application has been submitted, the site access agreement has been obtained, and the Storm Water Pollution Prevention Plan (SWPPP) has been completed.
- completion of BMP maintenance and repair work at TA-03, TA-11, TA-15, 16-003(f), MDA P, 21-018(b-c), and 73-002, including installation of rock check dams and wattles.
- Annual Site Compliance Evaluation inspections at 130 SWMU/AOCs.

2.14 Surface Water Quality

<u>Individual Permit Application:</u>

Personnel met with EPA Region VI Permitting Branch in Dallas, Texas, to discuss a path forward for the Individual Permit Application. Also, EPA Region VI Permitting staff toured the Laboratory and held additional discussions regarding an individual permit application.

Personnel continued efforts with the RRES–Environmental Characterization and Remediation (RRES-ECR) Data Management Team to compile existing soil/sediment data for SWMU/AOCs under consideration for the individual permit application and to support the storm water monitoring effort. This process is about 70% complete.

Personnel continued efforts with RRES–Office of Environmental Information Management (RRES-OEIM) to provide GIS map support for sites requiring storm water monitoring. These maps will be provided as attachments to the individual permit application.

Implementation of Federal Facility Compliance Agreement/EPA Schedule Order:

The Laboratory received comments from NMED regarding the submittal of the Draft Storm Water Monitoring Plan (SWMP). Laboratory staff and legal counsel reviewed the comments and prepared a formal written response. The SWMP provides the watershed-scale detail for how the Laboratory's telemetry-based storm-water monitoring stations will be used to help implement the Federal Facility Compliance Agreement (FFCA) and/or the EPA Schedule Order during the transition period between now and the issuance of the Individual Permit.

Personnel continued progress on development of the SWMU Storm Water Pollution Prevention Plan (SWPP). Appendix 6 of the plan, which provides site-specific details on how the Laboratory intends to monitor storm water runoff from SWMUs/AOCs, was submitted to the NMED and EPA on July 1, 2004, for review and comment. The Laboratory received comments from NMED regarding the submission of the Draft SWMU/SWPPP. Laboratory staff and legal counsel reviewed the comments and prepared a formal written response.

Personnel collected 112 samples at selected locations (42 locations covering 62 SWMU/AOCs) within Los Alamos, Pueblo, Cañada del Buey, and Mortandad Canyons. Data from sample collection is pending but is expected in October 2004.

Laboratory personnel, NMED, and EPA are continuing discussions regarding the final language of the FFCA. Remaining issues involve developing water screening action levels and using data averaging and endpoints to monitor on a site-specific scale.

Other activities this quarter included the following:

- completion of an estimate for stream bank stabilization in Pueblo Canyon.
- meetings between the Surface Water Assessment Team (SWAT) and personnel from the Laboratory, DOE, NMED–Hazardous Waste Bureau (NMED–HWB), NMED–Surface Water Quality Bureau (NMED–SWQB), and NMED–Oversight Bureau, to discuss issues associated with surface water.
- support to FMUs regarding erosion controls and SWPPP modifications.
- participation in the SWMU Working Group with Los Alamos County.
- development of an Umbrella Storm Water Pollution Prevention Plan (SWPP) for all remedial activities greater than one acre in size. All future RRES–RS projects will fall under this plan.

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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

Groundwater Sampling Results,
Wells R-12, R-14, R-21, R-23, and R-31,
Fourth Quarter, Fiscal Year 2004

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Table A-1
Samples Taken at Wells

Sample ID	Depth (ft)	Field Preparation	Alkalinity (as -$CaCO_3$)	Alpha Spectroscopy	Anions[a]	Cyanide (total)	Gamma Spectrometry	Gross Alpha/Beta	Tritium	High Explosives	Isotopic Radionuclides	Metals	Nitrite-Nitrate (as N)	Phosphorous	Polychlorinated Biphenyls	Perchlorate	Pesticides	Semivolatile Organic Compounds	Technetium-99	Total Kjeldahl Nitrogen	Low-Level Tritium	Volatile Organic Compounds
R-12, Round 7, Screen 1																						
GU0405G12R101	468.1	NF[b]	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—[c]	X	—	X
R-12, Round 7, Screen 3																						
GU0405G12R301	810.8	NF	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—	X	—	X
R-14, Round 2, Screen 1																						
GF0407G14R101	1204.5	F[d]	X	—	X	—	—	—	—	—	—	X	X	X	—	X	—	—	—	X	—	—
GU0407G14R101	1204.5	NF	X	X	—	X	X	X	X	X	X	X	X	X	X	—	X	X	X	X	—	X
UU0407G14R101	1204.5	NF	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—
R-14, Round 2, Screen 2																						
GF0407G14R201	1288.5	F	X	—	X	—	—	—	—	—	—	X	X	X	—	X	—	—	—	X	—	—
GU0407G14R201	1288.5	NF	X	X	—	X	X	X	X	X	X	X	X	X	X	—	X	X	X	X	—	X
UU0407G14R201	1288.5	NF	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—
R-21, Round 1, Screen 1																						
GF04030G21R01	888.8–906.8	F	X	—	X	—	—	—	—	—	—	X	X	X	—	X	—	—	—	X	—	—
GU04030G21R01	888.8–906.8	NF	X	X	—	X	X	X	X	X	X	X	X	X	X	—	X	X	X	X	—	X
UU04030G21R01	888.8–906.8	NF	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—
R-23, Round 3, Screen 1																						
GF04060GR2301	816.0–832.3	F	X	—	X	—	—	—	—	—	—	X	X	X	—	X	—	—	—	X	—	—
GU04060GR2301	816.0–832.3	NF	X	X	—	X	X	X	X	X	X	—	—	—	X	—	X	X	X	—	—	X
UU04060GR2301	816.0–832.3	NF	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—

Table A-1 (continued)

Sample ID	Depth (ft)	Field Preparation	Alkalinity (as -$CaCO_3$)	Alpha Spectroscopy	Anions[a]	Cyanide (total)	Gamma Spectrometry	Gross Alpha/Beta	Tritium	High Explosives	Isotopic Radionuclides	Metals	Nitrite-Nitrate (as N)	Phosphorous	Polychlorinated Biphenyls	Perchlorate	Pesticides	Semivolatile Organic Compounds	Technetium-99	Total Kjeldahl Nitrogen	Low-Level Tritium	Volatile Organic Compounds
R-31, Round 3, Screen 2																						
GF0403G31R201	532.2	F	X	—	X	—	—	—	—	—	—	X	X	X	—	X	—	—	—	X	—	—
GU0403G31R201	532.2	NF	X	—	—	X	—	—	—	X	—	X	X	X	X	—	X	X	X	X	—	X
UU0403G31R201	532.2	NF	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—

[a] Anions = Ammonia, bromide, chloride, fluoride, nitrate/nitrite, oxalate, perchlorate, sulfate.
[b] NF = Nonfiltered.
[c] — = Not available or not applicable.
[d] F = Filtered.

Table A-2
Well R-12 Screen 1 Seventh Round Sample Results: Data Summary for Inorganic Chemicals

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Field Parameter												
Field Alkalinity (total as $CaCO_3$)	1	468.1	6/2/2004	NF[e]	—[f]	—	—	—	—	—	—	—
Dissolved Oxygen	1	468.1	6/2/2004	NF	—	—	—	—	—	—	—	—
pH	1	468.1	6/2/2004	NF	—	—	—	—	>6 & <9	0/1	>6 & <9	0/1
Specific Conductance (µS/cm)	1	468.1	6/2/2004	NF	1	1	110	—	—	0/1	—	0/1
Temperature (°C)	1	468.1	6/2/2004	NF	—	—	—	—	—	0/1	—	0/1
Turbidity (NTU[g])	1	468.1	6/2/2004	NF	—	—	—	—	—	0/1	—	0/1
Analyte												
Alkalinity (total as $CaCO_3$)	1	468.1	6/2/2004	NF	1	1	34100	—	—	—	—	—
Aluminum	1	468.1	6/2/2004	NF	1	1	82.1	—	—	—	—	—
Antimony	1	468.1	6/2/2004	NF	1	0	—	0.28	—	—	—	—
Arsenic	1	468.1	6/2/2004	NF	1	0	—	2.24	—	—	—	—
Barium	1	468.1	6/2/2004	NF	1	1	33.7	—	—	—	—	—
Beryllium	1	468.1	6/2/2004	NF	1	0	—	0.158	—	—	—	—
Boron	1	468.1	6/2/2004	NF	1	1	77	—	—	—	—	—
Cadmium	1	468.1	6/2/2004	NF	1	0	—	0.04	—	—	—	—
Calcium	1	468.1	6/2/2004	NF	1	1	3610	—	—	—	—	—
Chloride	1	468.1	6/2/2004	NF	1	1	10300	—	—	—	—	—
Chromium	1	468.1	6/2/2004	NF	1	1	0.528	—	—	—	—	—
Cobalt	1	468.1	6/2/2004	NF	1	0	—	0.541	—	—	—	—
Copper	1	468.1	6/2/2004	NF	1	1	3.77	—	—	—	—	—
Fluoride	1	468.1	6/2/2004	NF	1	1	660	—	—	—	—	—
Iron	1	468.1	6/2/2004	NF	1	1	205	—	—	—	—	—
Lead	1	468.1	6/2/2004	NF	1	1	3.12	—	—	—	—	—
Magnesium	1	468.1	6/2/2004	NF	1	1	496	—	—	—	—	—

Table A-2 (continued)

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Manganese	1	468.1	6/2/2004	NF	1	1	68.1	—	—	—	—	—
Mercury	1	468.1	6/2/2004	NF	1	0	—	0.0472	2	0/1	2	0/1
Molybdenum	1	468.1	6/2/2004	NF	1	1	15.7	—	—	—	—	—
Nickel	1	468.1	6/2/2004	NF	1	1	2.28	—	—	—	—	—
Nitrate + Nitrite (as N)	1	468.1	6/2/2004	NF	1	0	—	10	—	—	—	—
Perchlorate	1	468.1	6/2/2004	NF	1	0	—	0.05	—	—	—	—
Phosphorus (total as P)	1	468.1	6/2/2004	NF	1	1	335	—	—	—	—	—
Potassium	1	468.1	6/2/2004	NF	1	1	1980	—	—	—	—	—
Selenium	1	468.1	6/2/2004	NF	1	1	4.81	—	—	—	—	—
Silicon Dioxide	1	468.1	6/2/2004	NF	1	1	15000	—	—	—	—	—
Silver	1	468.1	6/2/2004	NF	1	0	—	0.835	—	—	—	—
Sodium	1	468.1	6/2/2004	NF	1	1	20800	—	—	—	—	—
Strontium	1	468.1	6/2/2004	NF	1	1	17.4	—	—	—	—	—
Sulfate	1	468.1	6/2/2004	NF	1	0	—	193	—	—	—	—
Thallium	1	468.1	6/2/2004	NF	1	0	—	0.02	—	—	—	—
Tin	1	468.1	6/2/2004	NF	1	0	—	3.26	—	—	—	—
Total Dissolved Solids	1	468.1	6/2/2004	NF	1	1	71000	—	—	—	—	—
Uranium	1	468.1	6/2/2004	NF	1	1	0.026	—	—	—	—	—
Vanadium	1	468.1	6/2/2004	NF	1	0	—	0.606	—	—	—	—
Zinc	1	468.1	6/2/2004	NF	1	1	4.48	—	—	—	—	—

[a] The static water level for the regional aquifer at R-12 was 805 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

Table A-3
Well R-12 Screen 3 Seventh Round Sample Results: Data Summary for Inorganic Chemicals

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Field Parameter												
Field Alkalinity (total as $CaCO_3$)	3	810.8	6/3/2004	NF[e]	—[f]	—	—	—	—	—	—	—
Dissolved Oxygen	3	810.8	6/3/2004	NF	—	—	—	—	—	—	—	—
pH	3	810.8	6/3/2004	NF	—	—	—	—	>6 & <9	0/1	>6 & <9	0/1
Specific Conductance (µS/cm)	3	810.8	6/3/2004	NF	1	1	285	—	—	0/1	—	0/1
Temperature (°C)	3	810.8	6/3/2004	NF	—	—	—	—	—	0/1	—	0/1
Turbidity (NTU[g])	3	810.8	6/3/2004	NF	—	—	—	—	—	0/1	—	0/1
Analyte												
Alkalinity (total as $CaCO_3$)	3	810.8	6/3/2004	NF	1	1	168000	—	—	—	—	—
Aluminum	3	810.8	6/3/2004	NF	1	1	15.6	—	—	—	—	—
Antimony	3	810.8	6/3/2004	NF	1	0	—	0.28	—	—	—	—
Arsenic	3	810.8	6/3/2004	NF	1	0	—	2.24	—	—	—	—
Barium	3	810.8	6/3/2004	NF	1	1	141	—	—	—	—	—
Beryllium	3	810.8	6/3/2004	NF	1	0	—	0.158	—	—	—	—
Boron	3	810.8	6/3/2004	NF	1	1	60.7	—	—	—	—	—
Cadmium	3	810.8	6/3/2004	NF	1	0	—	0.04	—	—	—	—
Calcium	3	810.8	6/3/2004	NF	1	1	32900	—	—	—	—	—
Chloride	3	810.8	6/3/2004	NF	1	1	9190	—	—	—	—	—
Chromium	3	810.8	6/3/2004	NF	1	1	2.98	—	—	—	—	—
Cobalt	3	810.8	6/3/2004	NF	1	1	0.569	—	—	—	—	—
Copper	3	810.8	6/3/2004	NF	1	1	1.76	—	—	—	—	—
Fluoride	3	810.8	6/3/2004	NF	1	1	389	—	—	—	—	—
Iron	3	810.8	6/3/2004	NF	1	1	316	—	—	—	—	—
Lead	3	810.8	6/3/2004	NF	1	1	0.059	—	—	—	—	—
Magnesium	3	810.8	6/3/2004	NF	1	1	9150	—	—	—	—	—

Table A-3 (continued)

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Manganese	3	810.8	6/3/2004	NF	1	1	201	—	—	—	—	—
Mercury	3	810.8	6/3/2004	NF	1	0	—	0.0472	2	0/1	2	0/1
Molybdenum	3	810.8	6/3/2004	NF	1	1	5.02	—	—	—	—	—
Nickel	3	810.8	6/3/2004	NF	1	1	2.69	—	—	—	—	—
Nitrate + Nitrite (as N)	3	810.8	6/3/2004	NF	1	0	—	10	—	—	—	—
Perchlorate	3	810.8	6/3/2004	NF	1	1	0.05	—	—	—	—	—
Phosphorus (total as P)	3	810.8	6/3/2004	NF	1	1	63	—	—	—	—	—
Potassium	3	810.8	6/3/2004	NF	1	1	4050	—	—	—	—	—
Selenium	3	810.8	6/3/2004	NF	1	0	—	2.81	—	—	—	—
Silicon Dioxide	3	810.8	6/3/2004	NF	1	1	58300	—	—	—	—	—
Silver	3	810.8	6/3/2004	NF	1	0	—	0.835	—	—	—	—
Sodium	3	810.8	6/3/2004	NF	1	1	20400	—	—	—	—	—
Strontium	3	810.8	6/3/2004	NF	1	1	213	—	—	—	—	—
Sulfate	3	810.8	6/3/2004	NF	1	1	9150	—	—	—	—	—
Thallium	3	810.8	6/3/2004	NF	1	0	—	0.02	—	—	—	—
Tin	3	810.8	6/3/2004	NF	1	0	—	3.26	—	—	—	—
Total Dissolved Solids	3	810.8	6/3/2004	NF	1	1	221000	—	—	—	—	—
Uranium	3	810.8	6/3/2004	NF	1	1	1.39	—	—	—	—	—
Vanadium	3	810.8	6/3/2004	NF	1	0	—	0.606	—	—	—	—
Zinc	3	810.8	6/3/2004	NF	1	1	3.11	—	—	—	—	—

[a] The static water level for the regional aquifer at R-12 was 805 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

Table A-4
Well R-12 Screen 1 Seventh Round Sample Results: Data Summary for Detected Organic Chemicals

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Benzoic acid	1	468.1	6/2/2004	NF[e]	1	1	19.7	—[f]	—	—	—	—

[a] The static water level for the regional aquifer at R-12 was 805 ft when the well was drilled.
[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.
[c] NMED = New Mexico Environment Department.
[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.
[e] NF = Nonfiltered.
[f] — = Not available or not applicable.

Table A-5
Well R-12 Screen 3 Seventh Round Sample Results: Data Summary for Detected Organic Chemicals

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
No organic chemicals reported above detection limit	3	—[e]	—	—	—	—	—	—	—	—	—	—

[a] The static water level for the regional aquifer at R-12 was 805 ft when the well was drilled.
[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.
[c] NMED = New Mexico Environment Department.
[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.
[e] — = Not available or not applicable.

Table A-6
Well R-12 Screen 1 Seventh Round Sample Results: Data Summary for Radionuclides

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (pCi/L)	Nondetected Value (pCi/L)	Drinking Water MCL[b] (pCi/L)	Frequency of Detects > Drinking Water MCL
Americium-241	1	468.1	6/2/2004	NF[c]	1	0	—[d]	0.00223	—	—
Cesium-137	1	468.1	6/2/2004	NF	1	0	—	0.612	—	—
Gross Alpha Radiation	1	468.1	6/2/2004	NF	1	0	—	–0.0733	15	—
Gross Beta Radiation	1	468.1	6/2/2004	NF	1	0	—	0.183	—	—
Plutonium-238	1	468.1	6/2/2004	NF	1	0	—	–0.00441	—	—
Plutonium-239/240	1	468.1	6/2/2004	NF	1	0	—	0	—	—
Strontium-90	1	468.1	6/2/2004	NF	1	0	—	0.0991	8	—
Tritium	1	468.1	6/2/2004	NF	1	0	—	–34.4	20000	—
Uranium-234	1	468.1	6/2/2004	NF	1	0	—	0.0389	—	—
Uranium-235/236	1	468.1	6/2/2004	NF	1	0	—	0.0312	—	—
Uranium-238	1	468.1	6/2/2004	NF	1	0	—	0.0519	—	—

[a] The static water level for the regional aquifer at R-12 was 805 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NF = Nonfiltered.

[d] — = Not available or not applicable.

Table A-7
Well R-12 Screen 3 Seventh Round Sample Results: Data Summary for Radionuclides

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (pCi/L)	Nondetected Value (pCi/L)	Drinking Water MCL[b] (pCi/L)	Frequency of Detects > Drinking Water MCL
Americium-241	3	810.8	6/3/2004	NF[c]	1	0	—[d]	–0.0048	—	—
Cesium-137	3	810.8	6/3/2004	NF	1	0	—	4.83	—	—
Gross alpha	3	810.8	6/3/2004	NF	1	0	—	0.641	15	—
Gross beta	3	810.8	6/3/2004	NF	1	1	2.65	—	—	—
Plutonium-238	3	810.8	6/3/2004	NF	1	0	—	–0.0108	—	—
Plutonium-239/240	3	810.8	6/3/2004	NF	1	0	—	0.00216	—	—
Strontium-90	3	810.8	6/3/2004	NF	1	0	—	0.0776	8	—
Tritium	3	810.8	6/3/2004	NF	1	0	—	–103	20000	—
Uranium-234	3	810.8	6/3/2004	NF	1	1	0.854	—	—	—
Uranium-235/236	3	810.8	6/3/2004	NF	1	1	0.164	—	—	—
Uranium-238	3	810.8	6/3/2004	NF	1	1	0.431	—	—	—

[a] The static water level for the regional aquifer at R-12 was 805 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NF = Nonfiltered.

[d] — = Not available or not applicable.

Table A-8
Well R-14 Screen 1 Second Round Sample Results: Data Summary for Inorganic Chemicals

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Field Parameter												
Field Alkalinity (total as $CaCO_3$)	1	1205	7/12/2004	NF[e]	—[f]	—	—	—	—	—	—	—
Dissolved Oxygen	1	1205	7/12/2004	NF	—	—	—	—	—	—	—	—
pH	1	1205	7/12/2004	NF	—	—	—	—	>6 & <9	0/1	>6 & <9	0/1
Specific Conductance (µS/cm)	1	1205	7/12/2004	NF	—	—	—	—	—	0/1	—	0/1
Temperature (°C)	1	1205	7/12/2004	NF	—	—	—	—	—	0/1	—	0/1
Turbidity (NTU[g])	1	1205	7/12/2004	NF	—	—	—	—	—	0/1	—	0/1
Analyte												
Alkalinity (total as $CaCO_3$)	1	1205	7/12/2004	F[h]	1	1	63600	—	—	—	—	—
Aluminum	1	1205	7/12/2004	F	1	0	—	14.7	—	—	5000	0/1
Aluminum	1	1205	7/12/2004	NF	1	1	29.8	—	—	—	—	—
Ammonia (as N)	1	1205	7/12/2004	F	1	0	—	15.9	—	—	—	—
Ammonia (as N)	1	1205	7/12/2004	NF	1	0	—	15.9	—	—	—	—
Antimony	1	1205	7/12/2004	F	1	0	—	0.28	6	0/1	—	—
Antimony	1	1205	7/12/2004	NF	1	0	—	0.28	—	—	—	—
Arsenic	1	1205	7/12/2004	F	1	0	—	2.2	10	0/1	100	0/1
Arsenic	1	1205	7/12/2004	NF	1	0	—	2.2	—	—	—	—
Barium	1	1205	7/12/2004	F	1	1	48.6	—	2000	0/1	1000	0/1
Barium	1	1205	7/12/2004	NF	1	1	49.3	—	—	—	—	—
Beryllium	1	1205	7/12/2004	F	1	0	—	0.08	4	0/1	—	—
Beryllium	1	1205	7/12/2004	NF	1	0	—	0.08	—	—	—	—
Boron	1	1205	7/12/2004	F	1	1	13.9	—	—	—	750	0/1
Boron	1	1205	7/12/2004	NF	1	1	9.69	—	—	—	—	—
Bromide	1	1205	7/12/2004	F	1	0	—	97.8	—	—	—	—
Cadmium	1	1205	7/12/2004	F	1	0	—	0.04	5	0/1	10	0/1
Cadmium	1	1205	7/12/2004	NF	1	0	—	0.04	—	—	—	—
Calcium	1	1205	7/12/2004	F	1	1	11500	—	—	—	—	—
Calcium	1	1205	7/12/2004	NF	1	1	11500	—	—	—	—	—

Table A-8 (continued)

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Chloride	1	1205	7/12/2004	F	1	1	1720	—	—	—	250000	0/1
Chromium	1	1205	7/12/2004	F	1	1	1.91	—	100	0/1	50	0/1
Chromium	1	1205	7/12/2004	NF	1	1	6.73	—	100	0/1	—	—
Cobalt	1	1205	7/12/2004	F	1	1	0.729	—	—	—	50	0/1
Cobalt	1	1205	7/12/2004	NF	1	1	0.765	—	—	—	—	—
Copper	1	1205	7/12/2004	F	1	0	—	1.4	1300	0/1	1000	0/1
Copper	1	1205	7/12/2004	NF	1	0	—	1.4	—	—	—	—
Fluoride	1	1205	7/12/2004	F	1	1	241	—	4000	0/1	1.6	0/1
Iron	1	1205	7/12/2004	F	1	1	105	—	—	—	1000	0/1
Iron	1	1205	7/12/2004	NF	1	1	170	—	—	—	—	—
Lead	1	1205	7/12/2004	F	1	1	0.05	—	15	0/1	50	0/1
Lead	1	1205	7/12/2004	NF	1	1	0.08	—	—	—	—	—
Magnesium	1	1205	7/12/2004	F	1	1	3350	—	—	—	—	—
Magnesium	1	1205	7/12/2004	NF	1	1	3340	—	—	—	—	—
Manganese	1	1205	7/12/2004	F	1	1	78.1	—	—	—	200	0/1
Manganese	1	1205	7/12/2004	NF	1	1	81.8	—	—	—	—	—
Mercury	1	1205	7/12/2004	F	1	0	—	0.047	2	0/1	2	0/1
Mercury	1	1205	7/12/2004	NF	1	0	—	0.047	2	0/1	2	0/1
Molybdenum	1	1205	7/12/2004	F	1	1	1.4	—	—	—	1000	0/1
Molybdenum	1	1205	7/12/2004	NF	1	1	1.74	—	—	—	—	—
Nickel	1	1205	7/12/2004	F	1	0	—	0.69	100	0/1	200	0/1
Nickel	1	1205	7/12/2004	NF	1	1	3.64	—	—	—	—	—
Nitrate + Nitrite (as N)	1	1205	7/12/2004	F	1	1	30	—	10000	0/1	10	0/1
Nitrate + Nitrite (as N)	1	1205	7/12/2004	NF	1	1	30	—	—	—	—	—
Perchlorate	1	1205	7/12/2004	NF	1	1	0.12	—	—	—	—	—
Phosphorus (as PO_4)	1	1205	7/12/2004	F	1	1	334	—				
Phosphorus (total as P)	1	1205	7/12/2004	F	1	1	195	—	—	—	—	—
Phosphorus (total as P)	1	1205	7/12/2004	NF	1	1	184	—				
Potassium	1	1205	7/12/2004	F	1	1	1950	—	—	—	—	—
Potassium	1	1205	7/12/2004	NF	1	1	1880	—	—	—	—	—
Selenium	1	1205	7/12/2004	F	1	0	—	2.8	50	0/1	50	0/1

Table A-8 (continued)

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Selenium	1	1205	7/12/2004	NF	1	0	—	2.8	—	—	—	—
Silicon Dioxide	1	1205	7/12/2004	F	1	1	33500	—	—	—	—	—
Silicon Dioxide	1	1205	7/12/2004	NF	1	1	35500	—	—	—	—	—
Silver	1	1205	7/12/2004	F	1	0	—	0.84	—	—	50	0/1
Silver	1	1205	7/12/2004	NF	1	0	—	0.84	—	—	—	—
Sodium	1	1205	7/12/2004	F	1	1	10800	—	—	—	—	—
Sodium	1	1205	7/12/2004	NF	1	1	10500	—	—	—	—	—
Strontium	1	1205	7/12/2004	F	1	1	61.2	—	—	—	—	—
Strontium	1	1205	7/12/2004	NF	1	1	60.8	—	—	—	—	—
Sulfate	1	1205	7/12/2004	F	1	1	1850	—	—	—	600000	0/1
Thallium	1	1205	7/12/2004	F	1	1	0.353	—	2	0/1	—	—
Thallium	1	1205	7/12/2004	NF	1	1	0.048	—	—	—	—	—
Total Kjeldahl Nitrogen	1	1205	7/12/2004	F	1	0	—	44	—	—	—	—
Total Kjeldahl Nitrogen	1	1205	7/12/2004	NF	1	0	—	44	—	—	—	—
Uranium	1	1205	7/12/2004	F	1	1	0.459	—	30	0/1	5000	0/1
Uranium	1	1205	7/12/2004	NF	1	1	0.478	—	—	—	—	—
Vanadium	1	1205	7/12/2004	F	1	1	4.66	—	—	—	—	—
Vanadium	1	1205	7/12/2004	NF	1	1	3.79	—	—	—	—	—
Zinc	1	1205	7/12/2004	F	1	1	3.77	—	—	—	10000	0/1
Zinc	1	1205	7/12/2004	NF	1	1	4.93	—	—	—	—	—

[a] The static water level for the regional aquifer at R-14 was 1182 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

Table A-9
Well R-14 Screen 2 Second Round Sample Results: Data Summary for Inorganic Chemicals

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Field Parameter												
Field Alkalinity (total as $CaCO_3$)	2	1289	7/14/2004	NF[e]	—[f]	—	—	—	—	—	—	—
Dissolved Oxygen	2	1289	7/14/2004	NF	—	—	—	—	—	—	—	—
pH	2	1289	7/14/2004	NF	—	—	—	—	>6 & <9	0/1	>6 & <9	0/1
Specific Conductance (µS/cm)	2	1289	7/14/2004	NF	—	—	—	—	—	0/1	—	0/1
Temperature (°C)	2	1289	7/14/2004	NF	—	—	—	—	—	0/1	—	0/1
Turbidity (NTU[g])	2	1289	7/14/2004	NF	—	—	—	—	—	0/1	—	0/1
Analyte												
Alkalinity (total as $CaCO_3$)	2	1289	7/14/2004	F[h]	1	1	58500	—	—	—	5000	0/1
Aluminum	2	1289	7/14/2004	F	1	0	—	14.7	—	—	—	—
Aluminum	2	1289	7/14/2004	NF	1	1	27.1	—	—	—	—	—
Ammonia (as N)	2	1289	7/14/2004	F	1	1	57	—	—	—	—	—
Ammonia (as N)	2	1289	7/14/2004	NF	1	1	51	—	6	0/1	—	—
Antimony	2	1289	7/14/2004	F	1	0	—	0.28	—	—	—	—
Antimony	2	1289	7/14/2004	NF	1	0	—	0.28	10	0/1	100	0/1
Arsenic	2	1289	7/14/2004	F	1	1	3.47	—	—	—	—	—
Arsenic	2	1289	7/14/2004	NF	1	1	6.16	—	2000	0/1	1000	0/1
Barium	2	1289	7/14/2004	F	1	1	39.7	—	—	—	—	—
Barium	2	1289	7/14/2004	NF	1	1	68.3	—	4	0/1	—	—
Beryllium	2	1289	7/14/2004	F	1	0	—	0.08	—	—	—	—
Beryllium	2	1289	7/14/2004	NF	1	0	—	0.08	—	—	750	0/1
Boron	2	1289	7/14/2004	F	1	1	17.9	—	—	—	—	—
Boron	2	1289	7/14/2004	NF	1	1	17.8	—	—	—	—	—
Bromide	2	1289	7/14/2004	F	1	0	—	97.8	5	0/1	10	0/1
Cadmium	2	1289	7/14/2004	F	1	0	—	0.04	—	—	—	—
Cadmium	2	1289	7/14/2004	NF	1	0	—	0.04	—	—	—	—
Calcium	2	1289	7/14/2004	F	1	1	10200	—	—	—	—	—
Calcium	2	1289	7/14/2004	NF	1	1	9960	—	—	—	250000	0/1

Table A-9 (continued)

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Chloride	2	1289	7/14/2004	F	1	1	1940	—	100	0/1	50	0/1
Chromium	2	1289	7/14/2004	F	1	1	0.596	—	100	0/1	—	—
Chromium	2	1289	7/14/2004	NF	1	1	2.64	—	—	—	50	0/1
Cobalt	2	1289	7/14/2004	F	1	0	—	0.54	—	—	—	—
Cobalt	2	1289	7/14/2004	NF	1	0	—	0.54	1300	0/1	1000	0/1
Copper	2	1289	7/14/2004	F	1	0	—	1.4	—	—	—	—
Copper	2	1289	7/14/2004	NF	1	0	—	1.4	—	—	—	—
Fluoride	2	1289	7/14/2004	F	1	1	389	—	4000	0/1	1.6	0/1
Iron	2	1289	7/14/2004	F	1	1	2640	—	—	—	1000	0/1
Iron	2	1289	7/14/2004	NF	1	1	4450	—	—	—	—	—
Lead	2	1289	7/14/2004	F	1	1	0.067	—	15	0/1	50	0/1
Lead	2	1289	7/14/2004	NF	1	1	0.312	—	—	—	—	—
Magnesium	2	1289	7/14/2004	F	1	1	2550	—	—	—	—	—
Magnesium	2	1289	7/14/2004	NF	1	1	2500	—	—	—	—	—
Manganese	2	1289	7/14/2004	F	1	1	354	—	—	—	200	0/1
Manganese	2	1289	7/14/2004	NF	1	1	364	—	—	—	—	—
Mercury	2	1289	7/14/2004	F	1	0	—	0.047	2	0/1	2	0/1
Mercury	2	1289	7/14/2004	NF	1	0	—	0.047	2	0/1	2	0/1
Molybdenum	2	1289	7/14/2004	F	1	1	2.86	—	—	—	1000	0/1
Molybdenum	2	1289	7/14/2004	NF	1	1	3.12	—	—	—	—	—
Nickel	2	1289	7/14/2004	F	1	1	2.6	—	100	0/1	200	0/1
Nickel	2	1289	7/14/2004	NF	1	1	2.44	—	—	—	—	—
Nitrate + Nitrite (as N)	2	1289	7/14/2004	F	1	0	—	10	10000	0/1	10	0/1
Nitrate + Nitrite (as N)	2	1289	7/14/2004	NF	1	0	—	10	—	—	—	—
Perchlorate	2	1289	7/14/2004	NF	1	0	—	0.05	—	—	—	—
Phosphorus (as PO_4)	2	1289	7/14/2004	F	1	1	378	—	—	—	—	—
Phosphorus (total as P)	2	1289	7/14/2004	F	1	1	668	—	—	—	—	—
Phosphorus (total as P)	2	1289	7/14/2004	NF	1	1	933	—	—	—	—	—
Potassium	2	1289	7/14/2004	F	1	1	1580	—	—	—	—	—
Potassium	2	1289	7/14/2004	NF	1	1	1560	—	—	—	—	—
Selenium	2	1289	7/14/2004	F	1	0	—	2.8	50	0/1	50	0/1
Selenium	2	1289	7/14/2004	NF	1	0	—	2.8	—	—	—	—

Table A-9 (continued)

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Silicon Dioxide	2	1289	7/14/2004	F	1	1	36000	—	—	—	—	—
Silicon Dioxide	2	1289	7/14/2004	NF	1	1	33300	—	—	—	—	—
Silver	2	1289	7/14/2004	F	1	0	—	0.84	—	—	50	0/1
Silver	2	1289	7/14/2004	NF	1	0	—	0.84	—	—	—	—
Sodium	2	1289	7/14/2004	NF	1	1	14700	—	—	—	—	—
Sodium	2	1289	7/14/2004	F	1	1	15000	—	—	—	—	—
Strontium	2	1289	7/14/2004	F	1	1	68.2	—	—	—	—	—
Strontium	2	1289	7/14/2004	NF	1	1	68.3	—	—	—	—	—
Sulfate	2	1289	7/14/2004	F	1	1	1410	—	—	—	600000	0/1
Thallium	2	1289	7/14/2004	F	1	1	0.392	—	2	0/1	—	—
Thallium	2	1289	7/14/2004	NF	1	1	0.134	—	—	—	—	—
Total Kjeldahl Nitrogen	2	1289	7/14/2004	F	1	1	66	—	—	—	—	—
Total Kjeldahl Nitrogen	2	1289	7/14/2004	NF	1	1	118	—	—	—	—	—
Uranium	2	1289	7/14/2004	F	1	1	0.038	—	30	0/1	5000	0/1
Uranium	2	1289	7/14/2004	NF	1	1	0.066	—	—	—	—	—
Vanadium	2	1289	7/14/2004	F	1	1	1.24	—	—	—	—	—
Vanadium	2	1289	7/14/2004	NF	1	1	2.14	—	—	—	—	—
Zinc	2	1289	7/14/2004	F	1	1	6.05	—	—	—	10000	0/1
Zinc	2	1289	7/14/2004	NF	1	1	10.5	—	—	—	—	—

[a] The static water level for the regional aquifer at R-14 was 1182 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

Table A-10
Well R-14 Screen 1 Second Round Sample Results: Data Summary for Detected Organic Chemicals

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Total Organic Carbon	1	1205	7/12/2004	NF	1	1	523	—[e]	—	—	—	—

[a] The static water level for the regional aquifer at R-14 was 1182 ft when the well was drilled.
[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.
[c] NMED = New Mexico Environment Department.
[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.
[e] — = Not available or not applicable.

Table A-11
Well R-14 Screen 2 Second Round Sample Results: Data Summary for Detected Organic Chemicals

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Total Organic Carbon	2	1289	7/14/2004	NF	1	1	1860	—	—	—	—	—

[a] The static water level for the regional aquifer at R-14 was 1182 ft when the well was drilled.
[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.
[c] NMED = New Mexico Environment Department.
[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.
[e] — = Not available or not applicable.

Table A-12
Well R-14 Screen 1 Second Round Sample Results: Data Summary for Radionuclides

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (pCi/L)	Nondetected Value (pCi/L)	Drinking Water MCL[b] (pCi/L)	Frequency of Detects > Drinking Water MCL
Americium-241	1	1204.5	7/12/2004	NF[c]	1	0	—[d]	–0.00196	—	—
Cesium-137	1	1204.5	7/12/2004	NF	1	0	—	4.2	—	—
Plutonium-238	1	1204.5	7/12/2004	NF	1	0	—	–0.00248	—	—
Plutonium-239/240	1	1204.5	7/12/2004	NF	1	0	—	0.00744	—	—
Strontium-90	1	1204.5	7/12/2004	NF	1	0	—	–0.0579	8	0/1
Technetium-99	1	1204.5	7/12/2004	NF	1	0	—	–1.37	—	—
Tritium	1	1204.5	7/12/2004	NF	1	1	0.32	—	20000	0/1
Uranium-234	1	1204.5	7/12/2004	NF	1	1	0.335	—	—	—
Uranium-235/236	1	1204.5	7/12/2004	NF	1	1	0.0822	—	—	—
Uranium-238	1	1204.5	7/12/2004	NF	1	1	0.178	—	—	—

[a] The static water level for the regional aquifer at R-14 was 1182 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NF = Nonfiltered.

[d] — = Not available or not applicable.

Table A-13
Well R-14 Screen 2 Second Round Sample Results: Data Summary for Radionuclides

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (pCi/L)	Nondetected Value (pCi/L)	Drinking Water MCL[b] (pCi/L)	Frequency of Detects > Drinking Water MCL
Americium-241	2	1288.5	7/14/2004	NF[c]	1	0	—[d]	0.0139	—	—
Cesium-137	2	1288.5	7/14/2004	NF	1	0	—	2.12	—	—
Plutonium-238	2	1288.5	7/14/2004	NF	1	0	—	0.00176	—	—
Plutonium-239/240	2	1288.5	7/14/2004	NF	1	0	—	0.00528	—	—
Strontium-90	2	1288.5	7/14/2004	NF	1	0	—	0.062	8	0/1
Technetium-99	2	1288.5	7/14/2004	NF	1	0	—	–2.99	—	—
Tritium	2	1288.5	7/14/2004	NF	1	1	–0.06	—	20000	—
Uranium-234	2	1288.5	7/14/2004	NF	1	0	—	0.111	—	—
Uranium-235/236	2	1288.5	7/14/2004	NF	1	0	—	0.0666	—	—
Uranium-238	2	1288.5	7/14/2004	NF	1	0	—	0.0554	—	—

[a] The static water level for the regional aquifer at R-14 was 1182 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NF = Nonfiltered.

[d] — = Not available or not applicable.

Table A-14
Well R-21 Screen 1 First Round Sample Results: Data Summary for Inorganic Chemicals

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Field Parameter												
Field Alkalinity (total as $CaCO_3$)	1	888.8–906.8	3/31/2004	NF[e]	—[f]	—	—	—	—	—	—	—
Dissolved Oxygen	1	888.8–906.8	3/31/2004	NF	—	—	—	—	—	—	—	—
pH	1	888.8–906.8	3/31/2004	NF	—	—	—	—	>6 & <9	0/1	>6 & <9	0/1
Specific Conductance (µS/cm)	1	888.8–906.8	3/31/2004	NF	—	—	—	—	—	0/1	—	0/1
Temperature (°C)	1	888.8–906.8	3/31/2004	NF	—	—	—	—	—	0/1	—	0/1
Turbidity (NTU[g])	1	888.8–906.8	3/31/2004	NF	—	—	—	—	—	0/1	—	0/1
Analyte												
Alkalinity (total as $CaCO_3$)	1	888.8–906.8	3/31/2004	F[h]	1	1	57000	—	—	—	—	—
Aluminum	1	888.8–906.8	3/31/2004	F	1	0	—	14.7	—	—	5000	0/1
Aluminum	1	888.8–906.8	3/31/2004	NF	1	0	—	14.7	—	—	—	—
Ammonia (as N)	1	888.8–906.8	3/31/2004	F	1	0	—	15.9	—	—	—	—
Ammonia (as N)	1	888.8–906.8	3/31/2004	NF	1	0	—	31.8	—	—	—	—
Antimony	1	888.8–906.8	3/31/2004	F	1	0	—	0.28	6	0/1	—	—
Antimony	1	888.8–906.8	3/31/2004	NF	1	0	—	0.28	—	—	—	—
Arsenic	1	888.8–906.8	3/31/2004	F	1	1	2.26	—	10	0/1	100	0/1
Arsenic	1	888.8–906.8	3/31/2004	NF	1	0	—	2.24	—	—	—	—
Barium	1	888.8–906.8	3/31/2004	F	1	1	15.6	—	2000	0/1	1000	0/1
Barium	1	888.8–906.8	3/31/2004	NF	1	1	14.8	—	—	—	—	—
Beryllium	1	888.8–906.8	3/31/2004	F	1	0	—	0.08	4	0/1	—	—
Beryllium	1	888.8–906.8	3/31/2004	NF	1	0	—	0.08	—	—	—	—
Boron	1	888.8–906.8	3/31/2004	F	1	1	10.1	—	—	—	750	0/1
Boron	1	888.8–906.8	3/31/2004	NF	1	1	7.77	—	—	—	—	—
Bromide	1	888.8–906.8	3/31/2004	F	1	0	—	97.8	—	—	—	—
Cadmium	1	888.8–906.8	3/31/2004	F	1	0	—	0.04	5	0/1	10	0/1
Cadmium	1	888.8–906.8	3/31/2004	NF	1	0	—	0.04	—	—	—	—
Calcium	1	888.8–906.8	3/31/2004	F	1	1	11400	—	—	—	—	—
Calcium	1	888.8–906.8	3/31/2004	NF	1	1	10900	—	—	—	—	—

Table A-14 (continued)

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Chloride	1	888.8–906.8	3/31/2004	F	1	1	1980	—	—	—	250000	0/1
Chromium	1	888.8–906.8	3/31/2004	F	1	1	1.78	—	100	0/1	50	0/1
Chromium	1	888.8–906.8	3/31/2004	NF	1	1	1.05	—	—	—	—	—
Cobalt	1	888.8–906.8	3/31/2004	F	1	1	0.791	—	—	—	50	0/1
Cobalt	1	888.8–906.8	3/31/2004	NF	1	0	—	0.541	—	—	—	—
Copper	1	888.8–906.8	3/31/2004	F	1	0	—	1.39	1300	0/1	1000	0/1
Copper	1	888.8–906.8	3/31/2004	NF	1	0	—	1.39	—	—	—	—
Fluoride	1	888.8–906.8	3/31/2004	F	1	1	348	—	4000	0/1	1.6	0/1
Iron	1	888.8–906.8	3/31/2004	F	1	1	23.1	—	—	—	1000	0/1
Iron	1	888.8–906.8	3/31/2004	NF	1	1	20.5	—	—	—	—	—
Lead	1	888.8–906.8	3/31/2004	F	1	1	0.123	—	15	0/1	50	0/1
Lead	1	888.8–906.8	3/31/2004	NF	1	1	0.137	—	—	—	—	—
Magnesium	1	888.8–906.8	3/31/2004	F	1	1	2950	—	—	—	—	—
Magnesium	1	888.8–906.8	3/31/2004	NF	1	1	2810	—	—	—	—	—
Manganese	1	888.8–906.8	3/31/2004	F	1	1	8.73	—	—	—	200	0/1
Manganese	1	888.8–906.8	3/31/2004	NF	1	1	8.47	—	—	—	—	—
Mercury	1	888.8–906.8	3/31/2004	F	1	0	—	0.0472	—	—	—	—
Mercury	1	888.8–906.8	3/31/2004	NF	1	0	—	0.0472	2	0/1	2	0/1
Molybdenum	1	888.8–906.8	3/31/2004	F	1	1	3.85	—	—	—	1000	0/1
Molybdenum	1	888.8–906.8	3/31/2004	NF	1	1	3.67	—	—	—	—	—
Nickel	1	888.8–906.8	3/31/2004	F	1	0	—	0.69	100	0/1	200	0/1
Nickel	1	888.8–906.8	3/31/2004	NF	1	0	—	0.69	—	—	—	—
Nitrate + Nitrite (as N)	1	888.8–906.8	3/31/2004	F	1	1	320	—	—	—	10	0/1
Nitrate + Nitrite (as N)	1	888.8–906.8	3/31/2004	NF	1	1	320	—	10000	0/1	10000	0/1
Perchlorate	1	888.8–906.8	3/31/2004	NF	1	1	0.299	—	—	—	—	—
Phosphorus (as PO_4)	1	888.8–906.8	3/31/2004	F	1	0	—	151	—	—	—	—
Phosphorus (total as P)	1	888.8–906.8	3/31/2004	F	1	0	—	11	—	—	—	—
Phosphorus (total as P)	1	888.8–906.8	3/31/2004	NF	1	1	37	—	—	—	—	—
Potassium	1	888.8–906.8	3/31/2004	F	1	1	1740	—	—	—	—	—
Potassium	1	888.8–906.8	3/31/2004	NF	1	1	1690	—	—	—	—	—
Selenium	1	888.8–906.8	3/31/2004	F	1	1	7.86	—	50	0/1	50	0/1
Selenium	1	888.8–906.8	3/31/2004	NF	1	0	—	2.81	—	—	—	—

Table A-14 (continued)

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Silicon Dioxide	1	888.8–906.8	3/31/2004	F	1	1	71700	—	—	—	—	—
Silicon Dioxide	1	888.8–906.8	3/31/2004	NF	1	1	68300	—	—	—	—	—
Silver	1	888.8–906.8	3/31/2004	F	1	0	—	0.835	—	—	50	0/1
Silver	1	888.8–906.8	3/31/2004	NF	1	0	—	0.835	—	—	—	—
Sodium	1	888.8–906.8	3/31/2004	F	1	1	10600	—	—	—	—	—
Sodium	1	888.8–906.8	3/31/2004	NF	1	1	10100	—	—	—	—	—
Strontium	1	888.8–906.8	3/31/2004	F	1	1	45.1	—	—	—	—	—
Strontium	1	888.8–906.8	3/31/2004	NF	1	1	42.9	—	—	—	—	—
Sulfate	1	888.8–906.8	3/31/2004	F	1	1	2320	—	—	—	600000	0/1
Thallium	1	888.8–906.8	3/31/2004	F	1	1	0.297	—	2	0/1	—	—
Thallium	1	888.8–906.8	3/31/2004	NF	1	1	0.078	—	—	—	—	—
Total Kjeldahl Nitrogen	1	888.8–906.8	3/31/2004	F	1	1	344	—	—	—	—	—
Total Kjeldahl Nitrogen	1	888.8–906.8	3/31/2004	NF	1	1	425	—	—	—	—	—
Uranium	1	888.8–906.8	3/31/2004	F	1	1	0.401	—	30	0/1	5000	0/1
Uranium	1	888.8–906.8	3/31/2004	NF	1	1	0.415	—	—	—	—	—
Vanadium	1	888.8–906.8	3/31/2004	F	1	1	5.28	—	—	—	—	—
Vanadium	1	888.8–906.8	3/31/2004	NF	1	1	5.52	—	—	—	—	—
Zinc	1	888.8–906.8	3/31/2004	F	1	1	7.58	—	—	—	10000	0/1
Zinc	1	888.8–906.8	3/31/2004	NF	1	1	5.81	—	—	—	—	—

[a] The static water level for the regional aquifer at R-21 was 803 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

Table A-15
Well R-21 Screen 1 First Round Sample Results: Data Summary for Detected Organic Chemicals

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Total Organic Carbon	1	888.8–906.8	3/31/2004	NF	1	1	366	—[e]	—	—	—	—

[a] The static water level for the regional aquifer at R-21 was 803 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] — = Not available or not applicable.

Table A-16
Well R-21 Screen 1 First Round Sample Results: Data Summary for Radionuclides

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (pCi/L)	Nondetected Value (pCi/L)	Drinking Water MCL[b] (pCi/L)	Frequency of Detects > Drinking Water MCL
Americium-241	1	888.8–906.8	3/31/2004	NF[c]	1	0	—[d]	0.00652	—	—
Cesium-137	1	888.8–906.8	3/31/2004	NF	1	0	—	0.146	—	—
Plutonium-238	1	888.8–906.8	3/31/2004	NF	1	0	—	0.0139	15	—
Plutonium-239/240	1	888.8–906.8	3/31/2004	NF	1	0	—	0.00697	—	—
Strontium-90	1	888.8–906.8	3/31/2004	NF	1	0	—	–0.0166	8	—
Technetium-99	1	888.8–906.8	3/31/2004	NF	1	0	—	0.393	—	—
Tritium	1	888.8–906.8	3/31/2004	NF	1	1	0.06	—	20000	—
Uranium-234	1	888.8–906.8	3/31/2004	NF	1	1	0.253	—	—	—
Uranium-235/236	1	888.8–906.8	3/31/2004	NF	1	1	0.0355	—	—	—
Uranium-238	1	888.8–906.8	3/31/2004	NF	1	1	0.102	—	—	—

[a] The static water level for the regional aquifer at R-21 was 803 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NF = Nonfiltered.

[d] — = Not available or not applicable.

Table A-17
Well R-23 Screen 1 Third Round Sample Results: Data Summary for Inorganic Chemicals

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Field Parameter												
Field Alkalinity (total as $CaCO_3$)	1	816.0–832.3	6/29/2004	NF[e]	—[f]	—	—	—	—	—	—	—
Dissolved Oxygen	1	816.0–832.3	6/29/2004	NF	—	—	—	—	—	—	—	—
pH	1	816.0–832.3	6/29/2004	NF	—	—	—	—	>6 & <9	0/1	>6 & <9	0/1
Specific Conductance (µS/cm)	1	816.0–832.3	6/29/2004	NF	—	—	—	—	—	0/1	—	0/1
Temperature (°C)	1	816.0–832.3	6/29/2004	NF	—	—	—	—	—	0/1	—	0/1
Turbidity (NTU[g])	1	816.0–832.3	6/29/2004	NF	—	—	—	—	—	0/1	—	0/1
Analyte												
Alkalinity (total as $CaCO_3$)	1	816.0–832.3	6/29/2004	F[h]	1	1	85800	—	—	—	—	—
Aluminum	1	816.0–832.3	6/29/2004	F	1	1	21.9	—	—	—	5000	0/1
Aluminum	1	816.0–832.3	6/29/2004	NF	1	1	24.4	—	—	—	—	—
Ammonia (as N)	1	816.0–832.3	6/29/2004	F	1	0	—	15.9	—	—	—	—
Ammonia (as N)	1	816.0–832.3	6/29/2004	NF	1	0	—	15.9	—	—	—	—
Antimony	1	816.0–832.3	6/29/2004	F	1	0	—	0.28	6	0/1	—	—
Antimony	1	816.0–832.3	6/29/2004	NF	1	0	—	0.28	—	—	—	—
Arsenic	1	816.0–832.3	6/29/2004	F	1	0	—	2.24	10	0/1	100	0/1
Arsenic	1	816.0–832.3	6/29/2004	NF	1	0	—	2.24	—	—	—	—
Barium	1	816.0–832.3	6/29/2004	F	1	1	29.1	—	2000	0/1	1000	0/1
Barium	1	816.0–832.3	6/29/2004	NF	1	1	31.8	—	—	—	—	—
Beryllium	1	816.0–832.3	6/29/2004	F	1	0	—	0.08	4	0/1	—	—
Beryllium	1	816.0–832.3	6/29/2004	NF	1	0	—	0.08	—	—	—	—
Boron	1	816.0–832.3	6/29/2004	F	1	1	19.9	—	—	—	750	0/1
Boron	1	816.0–832.3	6/29/2004	NF	1	1	16.5	—	—	—	—	—
Bromide	1	816.0–832.3	6/29/2004	F	1	0	—	97.8	—	—	—	—
Cadmium	1	816.0–832.3	6/29/2004	F	1	0	—	0.04	5	0/1	10	0/1
Cadmium	1	816.0–832.3	6/29/2004	NF	1	0	—	0.04	—	—	—	—
Calcium	1	816.0–832.3	6/29/2004	F	1	1	17800	—	—	—	—	—
Calcium	1	816.0–832.3	6/29/2004	NF	1	1	17700	—	—	—	—	—

Table A-17 (continued)

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Chloride	1	816.0–832.3	6/29/2004	F	1	1	4000	—	—	—	250000	0/1
Chromium	1	816.0–832.3	6/29/2004	F	1	1	1.99	—	100	0/1	50	0/1
Chromium	1	816.0–832.3	6/29/2004	NF	1	1	2.01	—	—	—	—	—
Cobalt	1	816.0–832.3	6/29/2004	F	1	0	—	0.541	—	—	50	0/1
Cobalt	1	816.0–832.3	6/29/2004	NF	1	0	—	0.541	—	—	—	—
Copper	1	816.0–832.3	6/29/2004	F	1	1	1.4	—	1300	0/1	1000	0/1
Copper	1	816.0–832.3	6/29/2004	NF	1	0	—	1.39	—	—	—	—
Fluoride	1	816.0–832.3	6/29/2004	F	1	1	394	—	4000	0/1	1.6	0/1
Iron	1	816.0–832.3	6/29/2004	F	1	0	—	12.6	—	—	1000	0/1
Iron	1	816.0–832.3	6/29/2004	NF	1	1	49.1	—	—	—	—	—
Lead	1	816.0–832.3	6/29/2004	F	1	1	1.45	—	15	0/1	50	0/1
Lead	1	816.0–832.3	6/29/2004	NF	1	1	3.73	—	—	—	—	—
Magnesium	1	816.0–832.3	6/29/2004	F	1	1	4420	—	—	—	—	—
Magnesium	1	816.0–832.3	6/29/2004	NF	1	1	4410	—	—	—	—	—
Manganese	1	816.0–832.3	6/29/2004	F	1	1	9.96	—	—	—	200	0/1
Manganese	1	816.0–832.3	6/29/2004	NF	1	1	94.2	—	—	—	—	—
Mercury	1	816.0–832.3	6/29/2004	F	1	0	—	0.0472	—	—	—	—
Mercury	1	816.0–832.3	6/29/2004	NF	1	0	—	0.0472	2	0/1	2	0/1
Molybdenum	1	816.0–832.3	6/29/2004	F	1	1	1.66	—	—	—	1000	0/1
Molybdenum	1	816.0–832.3	6/29/2004	NF	1	1	1.53	—	—	—	—	—
Nickel	1	816.0–832.3	6/29/2004	F	1	0	—	0.69	100	0/1	200	0/1
Nickel	1	816.0–832.3	6/29/2004	NF	1	0	—	0.69	—	—	—	—
Nitrate + Nitrite (as N)	1	816.0–832.3	6/29/2004	F	1	1	940	—	—	—	10	0/1
Nitrate + Nitrite (as N)	1	816.0–832.3	6/29/2004	NF	1	1	970	—	10000	0/1	10000	0/1
Perchlorate	1	816.0–832.3	6/29/2004	NF	1	1	0.352	—	—	—	—	—
Phosphorus (as PO_4)	1	816.0–832.3	6/29/2004	F	1	0	—	151	—	—	—	—
Phosphorus (total as P)	1	816.0–832.3	6/29/2004	F	1	1	28	—	—	—	—	—
Phosphorus (total as P)	1	816.0–832.3	6/29/2004	NF	1	1	23	—	—	—	—	—
Potassium	1	816.0–832.3	6/29/2004	F	1	1	1850	—	—	—	—	—
Potassium	1	816.0–832.3	6/29/2004	NF	1	1	1840	—	—	—	—	—
Selenium	1	816.0–832.3	6/29/2004	F	1	0	—	2.81	50	0/1	50	0/1

Table A-17 (continued)

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Selenium	1	816.0–832.3	6/29/2004	NF	1	0	—	2.81	—	—	—	—
Silicon Dioxide	1	816.0–832.3	6/29/2004	F	1	1	24100	—	—	—	—	—
Silicon Dioxide	1	816.0–832.3	6/29/2004	NF	1	1	23500	—	—	—	—	—
Silver	1	816.0–832.3	6/29/2004	F	1	0	—	0.835	—	—	50	0/1
Silver	1	816.0–832.3	6/29/2004	NF	1	0	—	0.835	—	—	—	—
Sodium	1	816.0–832.3	6/29/2004	F	1	1	11800	—	—	—	—	—
Sodium	1	816.0–832.3	6/29/2004	NF	1	1	11800	—	—	—	—	—
Strontium	1	816.0–832.3	6/29/2004	F	1	1	85.2	—	—	—	—	—
Strontium	1	816.0–832.3	6/29/2004	NF	1	1	85.7	—	—	—	—	—
Sulfate	1	816.0–832.3	6/29/2004	F	1	1	6110	—	—	—	600000	0/1
Thallium	1	816.0–832.3	6/29/2004	F	1	1	0.332	—	2	0/1	—	—
Thallium	1	816.0–832.3	6/29/2004	NF	1	1	0.074	—	—	—	—	—
Total Kjeldahl Nitrogen	1	816.0–832.3	6/29/2004	F	1	0	—	44	—	—	—	—
Total Kjeldahl Nitrogen	1	816.0–832.3	6/29/2004	NF	1	0	—	44	—	—	—	—
Uranium	1	816.0–832.3	6/29/2004	F	1	1	0.651	—	30	0/1	5000	0/1
Uranium	1	816.0–832.3	6/29/2004	NF	1	1	0.659	—	—	—	—	—
Vanadium	1	816.0–832.3	6/29/2004	F	1	1	6.17	—	—	—	—	—
Vanadium	1	816.0–832.3	6/29/2004	NF	1	1	6.43	—	—	—	—	—
Zinc	1	816.0–832.3	6/29/2004	F	1	1	12	—	—	—	10000	0/1
Zinc	1	816.0–832.3	6/29/2004	NF	1	1	10.5	—	—	—	—	—

[a] The static water level for the regional aquifer at R-23 was 829 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

Table A-18
Well R-23 Screen 1 Third Round Sample Results: Data Summary for Detected Organic Chemicals

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
DDE[4,4'-][e]	1	816.0–832.3	6/29/2004	NF[f]	1	1	0.034	—[g]	—	—	—	—
DDT[4,4'-][e]	1	816.0–832.3	6/29/2004	NF	1	1	0.046	—	—	—	—	—
Total Organic Carbon	1	816.0–832.3	6/29/2004	NF	1	1	590	—	—	—	—	—

[a] The static water level for the regional aquifer at R-23 was 829 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] DDE [4,4'-] and DDT[4,4'-] are suspect and are undergoing a focused validation.

[f] NF = Nonfiltered.

[g] — = Not available or not applicable.

Table A-19
Well R-23 Screen 1 Third Round Sample Results: Data Summary for Radionuclides

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (pCi/L)	Nondetected Value (pCi/L)	Drinking Water MCL[b] (pCi/L)	Frequency of Detects > Drinking Water MCL
Americium-241	1	816.0–832.3	6/29/2004	NF[c]	1	0	—[d]	0	—	—
Cesium-137	1	816.0–832.3	6/29/2004	NF	1	0	—	0.672	—	—
Plutonium-238	1	816.0–832.3	6/29/2004	NF	1	0	—	0.00835	—	—
Plutonium-239/240	1	816.0–832.3	6/29/2004	NF	1	0	—	0.00209	—	—
Strontium-90	1	816.0–832.3	6/29/2004	NF	1	0	—	–0.169	8	—
Technetium-99	1	816.0–832.3	6/29/2004	NF	1	0	—	–1.62	—	—
Tritium	1	816.0–832.3	6/29/2004	NF	1	1	–0.1	—	20000	—
Uranium-234	1	816.0–832.3	6/29/2004	NF	1	1	0.398	—	—	—
Uranium-235/236	1	816.0–832.3	6/29/2004	NF	1	1	0.0439	—	—	—
Uranium-238	1	816.0–832.3	6/29/2004	NF	1	1	0.171	—	—	—

[a] The static water level for the regional aquifer at R-23 was 829 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NF = Nonfiltered.

[d] — = Not available or not applicable.

Table A-20
Well R-31 Screen 2 Third Round Sample Results: Data Summary for Inorganic Chemicals

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Field Parameter												
Field Alkalinity (total as $CaCO_3$)	2	532.2	3/18/2004	NF[e]	—[f]	—	—	—	—	—	—	—
Dissolved Oxygen	2	532.2	3/18/2004	NF	—	—	—	—	—	—	—	—
pH	2	532.2	3/18/2004	NF	—	—	—	—	>6 & <9	0/1	>6 & <9	0/1
Specific Conductance (µS/cm)	2	532.2	3/18/2004	NF	—	—	—	—	—	0/1	—	0/1
Temperature (°C)	2	532.2	3/18/2004	NF	—	—	—	—	—	0/1	—	0/1
Turbidity (NTU[g])	2	532.2	3/18/2004	NF	—	—	—	—	—	0/1	—	0/1
Analyte												
Alkalinity (total as $CaCO_3$)	2	532.2	3/18/2004	F[h]	1	1	274000	—	—	—	—	—
Aluminum	2	532.2	3/18/2004	F	1	1	20.6	—	—	—	5000	0/1
Aluminum	2	532.2	3/18/2004	NF	1	0	—	14.7	—	—	—	—
Ammonia (as N)	2	532.2	3/18/2004	F	1	1	422	—	—	—	—	—
Ammonia (as N)	2	532.2	3/18/2004	NF	1	1	410	—	—	—	—	—
Antimony	2	532.2	3/18/2004	F	1	0	—	0.28	6	0/1	—	—
Antimony	2	532.2	3/18/2004	NF	1	0	—	0.28	—	—	—	—
Arsenic	2	532.2	3/18/2004	F	1	1	2.61	—	10	0/1	100	0/1
Arsenic	2	532.2	3/18/2004	NF	1	0	—	2.24	—	—	—	—
Barium	2	532.2	3/18/2004	F	1	1	322	—	2000	0/1	1000	0/1
Barium	2	532.2	3/18/2004	NF	1	1	326	—	—	—	—	—
Beryllium	2	532.2	3/18/2004	F	1	0	—	0.08	4	0/1	—	—
Beryllium	2	532.2	3/18/2004	NF	1	0	—	0.08	—	—	—	—
Boron	2	532.2	3/18/2004	F	1	1	22.6	—	—	—	750	0/1
Boron	2	532.2	3/18/2004	NF	1	1	26	—	—	—	—	—
Bromide	2	532.2	3/18/2004	F	1	0	—	97.8	—	—	—	—
Cadmium	2	532.2	3/18/2004	F	1	0	—	0.04	5	0/1	10	0/1
Cadmium	2	532.2	3/18/2004	NF	1	0	—	0.04	—	—	—	—
Calcium	2	532.2	3/18/2004	F	1	1	56300	—	—	—	—	—
Calcium	2	532.2	3/18/2004	NF	1	1	55100	—	—	—	—	—

Table A-20 (continued)

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Chloride	2	532.2	3/18/2004	F	1	1	2330	—	—	—	250000	0/1
Chromium	2	532.2	3/18/2004	F	1	0	—	0.503	100	0/1	50	0/1
Chromium	2	532.2	3/18/2004	NF	1	1	0.851	—	—	—	—	—
Cobalt	2	532.2	3/18/2004	F	1	1	0.574	—	—	—	50	0/1
Cobalt	2	532.2	3/18/2004	NF	1	1	1.59	—	—	—	—	—
Copper	2	532.2	3/18/2004	F	1	0	—	1.39	1300	0/1	1000	0/1
Copper	2	532.2	3/18/2004	NF	1	0	—	1.39	—	—	—	—
Fluoride	2	532.2	3/18/2004	F	1	1	350	—	4000	0/1	1.6	0/1
Iron	2	532.2	3/18/2004	F	1	1	746	—	—	—	1000	0/1
Iron	2	532.2	3/18/2004	NF	1	1	2530	—	—	—	—	—
Lead	2	532.2	3/18/2004	F	1	1	0.125	—	15	0/1	50	0/1
Lead	2	532.2	3/18/2004	NF	1	1	0.128	—	—	—	—	—
Magnesium	2	532.2	3/18/2004	F	1	1	16700	—	—	—	—	—
Magnesium	2	532.2	3/18/2004	NF	1	1	16200	—	—	—	—	—
Manganese	2	532.2	3/18/2004	F	1	1	1760	—	—	—	200	0/1
Manganese	2	532.2	3/18/2004	NF	1	1	1820	—	—	—	—	—
Mercury	2	532.2	3/18/2004	F	1	0	—	0.0472	—	—	—	—
Mercury	2	532.2	3/18/2004	NF	1	0	—	0.0472	2	0/1	2	0/1
Molybdenum	2	532.2	3/18/2004	F	1	1	52.8	—	—	—	1000	0/1
Molybdenum	2	532.2	3/18/2004	NF	1	1	56.4	—	—	—	—	—
Nickel	2	532.2	3/18/2004	F	1	1	6.39	—	100	0/1	200	0/1
Nickel	2	532.2	3/18/2004	NF	1	1	7.15	—	—	—	—	—
Nitrate + Nitrite (as N)	1	532.2	3/18/2004	F	1	0	—	10	—	—	10	0/1
Nitrate + Nitrite (as N)	1	532.2	3/18/2004	NF	1	0	—	10	10000	0/1	10000	0/1
Perchlorate	2	532.2	3/18/2004	NF	1	0	—	0.05	—	—	—	—
Phosphorus (as PO_4)	2	532.2	3/18/2004	F	1	1	338	—	—	—	—	—
Phosphorus (total as P)	2	532.2	3/18/2004	F	1	1	19	—	—	—	—	—
Phosphorus (total as P)	2	532.2	3/18/2004	NF	1	1	71	—	—	—	—	—
Potassium	2	532.2	3/18/2004	F	1	1	4890	—	—	—	—	—
Potassium	2	532.2	3/18/2004	NF	1	1	4720	—	—	—	—	—
Selenium	2	532.2	3/18/2004	F	1	0	—	2.81	50	0/1	50	0/1
Selenium	2	532.2	3/18/2004	NF	1	0	—	2.81	—	—	—	—

Table A-20 (continued)

Parameter and Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Silicon Dioxide	2	532.2	3/18/2004	F	1	1	30200	—	—	—	—	—
Silicon Dioxide	2	532.2	3/18/2004	NF	1	1	30100	—	—	—	—	—
Silver	2	532.2	3/18/2004	F	1	0	—	0.835	—	—	50	0/1
Silver	2	532.2	3/18/2004	NF	1	0	—	0.835	—	—	—	—
Sodium	2	532.2	3/18/2004	F	1	1	26900	—	—	—	—	—
Sodium	2	532.2	3/18/2004	NF	1	1	25900	—	—	—	—	—
Strontium	2	532.2	3/18/2004	F	1	1	310	—	—	—	—	—
Strontium	2	532.2	3/18/2004	NF	1	1	306	—	—	—	—	—
Sulfate	2	532.2	3/18/2004	F	1	0	—	193	—	—	600000	0/1
Thallium	2	532.2	3/18/2004	F	1	1	0.326	—	2	0/1	—	—
Thallium	2	532.2	3/18/2004	NF	1	1	0.033	—	—	—	—	—
Total Kjeldahl Nitrogen	2	532.2	3/18/2004	F	1	1	1280	—	—	—	—	—
Total Kjeldahl Nitrogen	2	532.2	3/18/2004	NF	1	1	1450	—	—	—	—	—
Uranium	2	532.2	3/18/2004	F	1	1	1	—	30	0/1	5000	0/1
Uranium	2	532.2	3/18/2004	NF	1	1	0.998	—	—	—	—	—
Vanadium	2	532.2	3/18/2004	F	1	0	—	0.606	—	—	—	—
Vanadium	2	532.2	3/18/2004	NF	1	0	—	0.606	—	—	—	—
Zinc	2	532.2	3/18/2004	F	1	1	2.53	—	—	—	10000	0/1
Zinc	2	532.2	3/18/2004	NF	1	1	4.23	—	—	—	—	—

[a] The static water level for the regional aquifer at R-31 was 829 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

[g] NTU = Nephelometric turbidity unit.

[h] F = Filtered.

Table A-21
Well R-31 Screen 2 Third Round Sample Results: Data Summary for Detected Organic Chemicals

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Nondetected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Cyanide (total)	2	532.2	3/18/2004	NF[e]	1	1	2.34	—[f]	—	—	—	—
Bis(2-ethylhexyl)phthalate	2	532.2	3/18/2004	NF	1	1	4	—	—	—	—	—
DDD[4,4'-]	2	532.2	3/18/2004	NF	1	1	0.107	—	—	—	—	—
DDE[4,4'-]	2	532.2	3/18/2004	NF	1	1	0.0222	—	—	—	—	—
DDT[4,4'-]	2	532.2	3/18/2004	NF	1	1	2.26	—	—	—	—	—
Heptachlor	2	532.2	3/18/2004	NF	1	1	0.00962	—	0.4	0/1	—	—
Nitrotoluene[2-]	2	532.2	3/18/2004	NF	1	1	1.6	—	—	—	—	—
Total Organic Carbon	2	532.2	3/18/2004	NF	1	1	6230	—	—	—	—	—

[a] The static water level for the regional aquifer at R-31 was 829 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

Table A-22
Well R-31 Screen 2 Third Round Sample Results: Data Summary for Radionuclides

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (pCi/L)	Nondetected Value (pCi/L)	Drinking Water MCL[b] (pCi/L)	Frequency of Detects > Drinking Water MCL
Cesium-137	2	532.2	3/18/2004	NF[c]	1	0	—[d]	0.736	—	—
Americium-241	2	532.2	3/18/2004	NF	1	0	—	–0.00219	—	—
Iodine-129	2	532.2	3/18/2004	NF	1	0	—	0.0828	—	—
Plutonium-238	2	532.2	3/18/2004	NF	1	0	—	1.91E-09	—	—
Plutonium-239/240	2	532.2	3/18/2004	NF	1	0	—	0.002	—	—
Strontium-90	2	532.2	3/18/2004	NF	1	0	—	–0.0055	8	—
Technetium-99	2	532.2	3/18/2004	NF	1	0	—	–0.733	—	—
Tritium	2	532.2	3/18/2004	NF	1	1	0.351	—	20000	—
Uranium 233, 234	2	532.2	3/18/2004	NF	1	1	0.494	—	—	—
Uranium-235/236	2	532.2	3/18/2004	NF	1	0	—	0.0344	—	—
Uranium-238	2	532.2	3/18/2004	NF	1	1	0.309	—	—	—

[a] The static water level for the regional aquifer at R-31 was 829 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NF = Nonfiltered.

[d] — = Not available or not applicable.

Appendix B

DP Canyon Quarterly Inspection Report,
Fourth Quarter, Fiscal Year 2004

DP Canyon Quarterly Inspection Report
September 29, 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: September 29, 2004

Time: 3:00 p.m.

Personnel: Becky Coel-Roback, Jared Lyman, and John Wilcox

Weather: 54 °C, light rain, cloudy, and breezy

Precipitation: 5.58 in., approximate total since the June inspection (Source: Los Alamos National Laboratory Weather Machine).

Presence of standing or running water: At the time of the September inspection, there was a trickle of water coming from the north culvert at the head of the canyon. There was slight flow and abundant standing water at both the upstream and downstream seep areas. There was evidence of recent heavy flows and erosion in the drainage, including fresh boulders and debris at the downstream seep area.

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

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

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

Location 1, canyon head. There was a trickle of water from the north culvert during the September 2004 inspection.

Location 2, upstream location. There was some sheen on standing water during the September 2004 inspection.

Location 3, upstream location. During the September 2004 inspection, there was sheen and odor in disturbed sediments.

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

Location 5, downstream location. During the September 2004 inspection, faint petroleum hydrocarbon odors were observed in disturbed sediments.

Location 6, downstream location. Changes to the stream channel as a result of recent heavy rains were obvious during the September 2004 inspection.

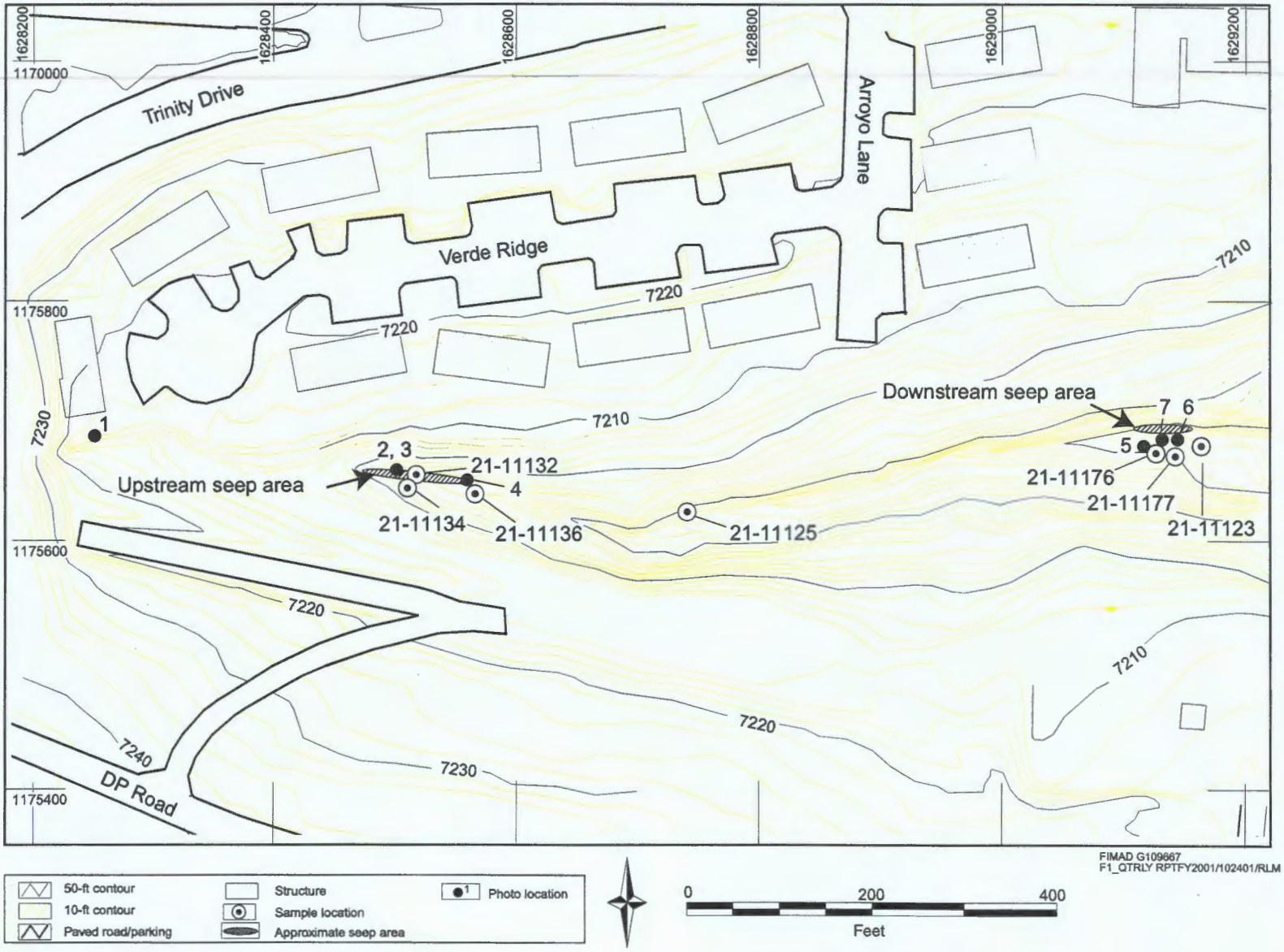

Figure 1. DP Tank Farm photo location, sump area, and sampling locations

Appendix C

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

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

Risk Reduction and Environmental Stewardship–Environmental Characterization and Remediation

Los Alamos National Laboratory

November 2004

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1.0 INTRODUCTION

The moisture-monitoring system at Technical Area (TA-) 49 began collecting data in March 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 about 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 Resource Conservation and Recovery Act facility investigation (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 documents produced by the former Environmental Restoration Project (LANL 1998, 59166; LANL 1998, 63041; and LANL 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 used 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 bimonthly (monthly until the first quarter of fiscal year [FY] 2002) 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. Six additional access holes located across the TA-49 site, where monitoring began in the fourth quarter of 2003, provide a more comprehensive data set of the moisture trends across TA-49.

Moisture monitoring began at the site in March of 2000. Monitoring is performed in accordance with LANL-ER-SOP-7.05, Rev. 1, "Subsurface Moisture Measurements Using a Neutron Probe." Neutron logging is performed with a dedicated CPN 503DR probe at the end of every other month to provide a consistent data set for trend analysis (it was performed at the end of every month from March 2000 to November 2002). The TDR probes record moisture content measurements twice a day. The two TDR arrays are located adjacent to neutron access holes 49-10046 and 49-10048 for data comparison and confirmation. The TDR arrays consist of a shallow TDR probe positioned horizontally 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 to monitor levels of precipitation at the site. Continuous measurement of site precipitation and the 12-hour TDR data characterize infiltration response of the cover 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.

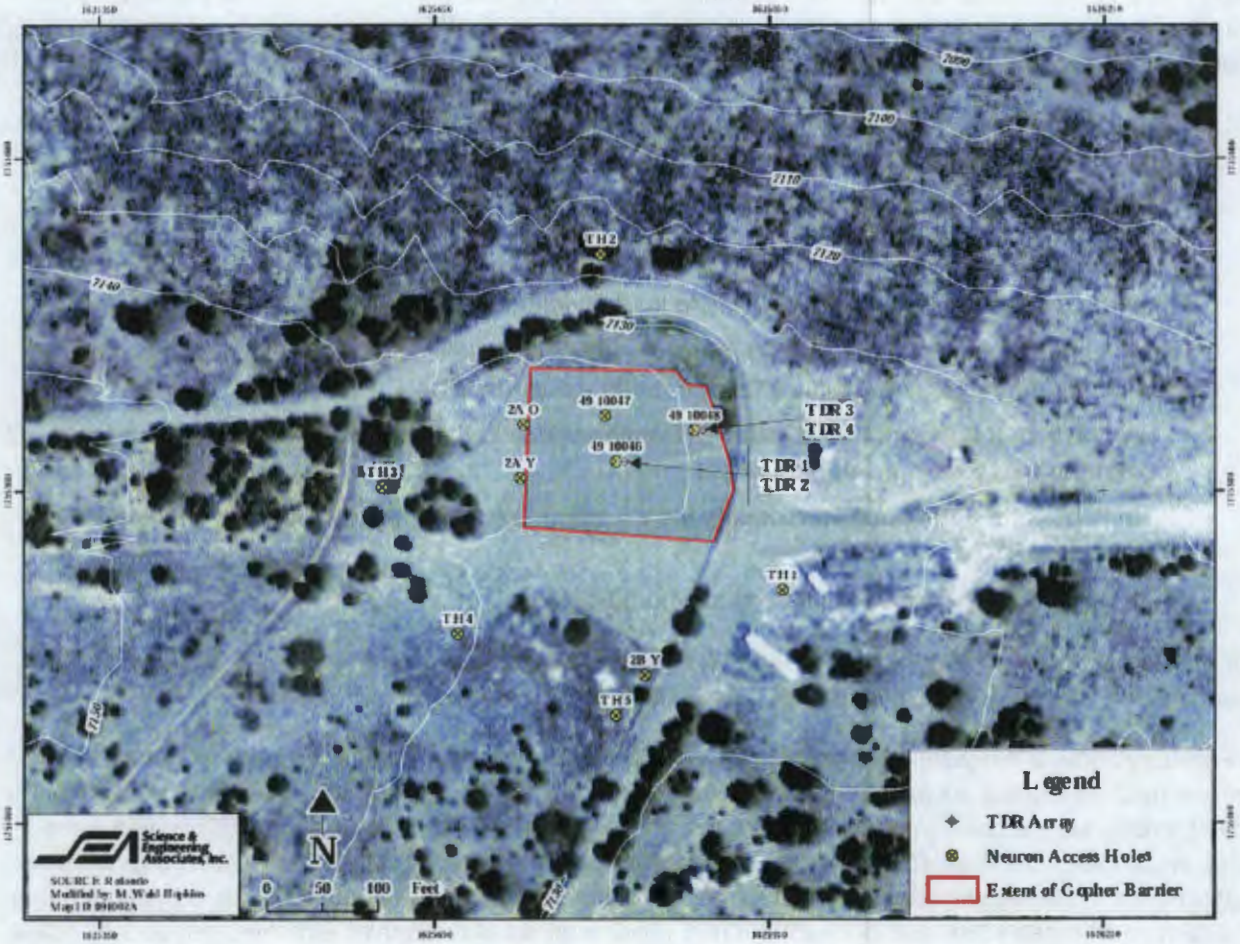

Figure 1. Location of instrumentation and neutron access holes on *XY* plane at TA-49, MDA AB Area 2

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 September 2004, two separate neutron moisture measurements were performed at neutron access holes TH-1, 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, 4M-3, and 49-2901. TDR measurements and precipitation quantities were recorded twice a day to a Campbell Scientific datalogger over the same period. This report discusses moisture trends over time, compares moisture results from the neutron probe with the TDR instruments, and discusses the relationship between precipitation and moisture content.

2.0 MOISTURE-MONITORING RESULTS

2.1 Neutron Logging

Neutron-logging events occurred on September 1, 2 and September 27, 28, 2004. Results for September 2004 were compared to the average from April 2000 to May 2004. Logging was performed with a dedicated CPN 503DR probe at all neutron access holes. The neutron counts from each of the 17 monitoring holes were recorded into a spreadsheet, and the 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. Fourth quarter data for neutron access holes TH-1, TH-2, TH-3, TH-4, TH-5, 2A-O, 2A-Y, 2B-Y, 10046, 10047, and 10048 is shown compared to the average for each hole from 2000 to third quarter 2004. All the data for the six "M" holes (1M-3, 1M-3A, 2M-3, 5M-1, 4M-3, 4M-4) are presented in Attachment 1.

The 700 ft deep neutron access hole, 49-2901, is located near TH-1 (Figure 2). Psychrometers and the positive pressure membrane were removed from the hole during second quarter 2004, after which the hole was neutron logged and capped. The hole is 8 in. in diameter with a 3 ft steel stickup. Access hole 49-2901 has been neutron logged down to 130 ft for three quarters as part of the TA-49 moisture monitoring program. Data from this borehole is presented in Attachment 1.

2.2 TDR and Precipitation Measurements

TDR measurements and precipitation quantities were collected uninterrupted (except between February 11 and 19, 2004, when the datalogger program malfunctioned) twice a day through the fourth quarter 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 3 and 4 present the moisture content and precipitation measurements from April 2000, when the datalogger was installed, through September 2004. At the end of the quarter, it was discovered that since September 3, 2004, TDR 1 shorted out as a result of damage by gophers. It will be repaired next quarter. Precipitation data have been obtained from the Laboratory's TA-49 weather station.

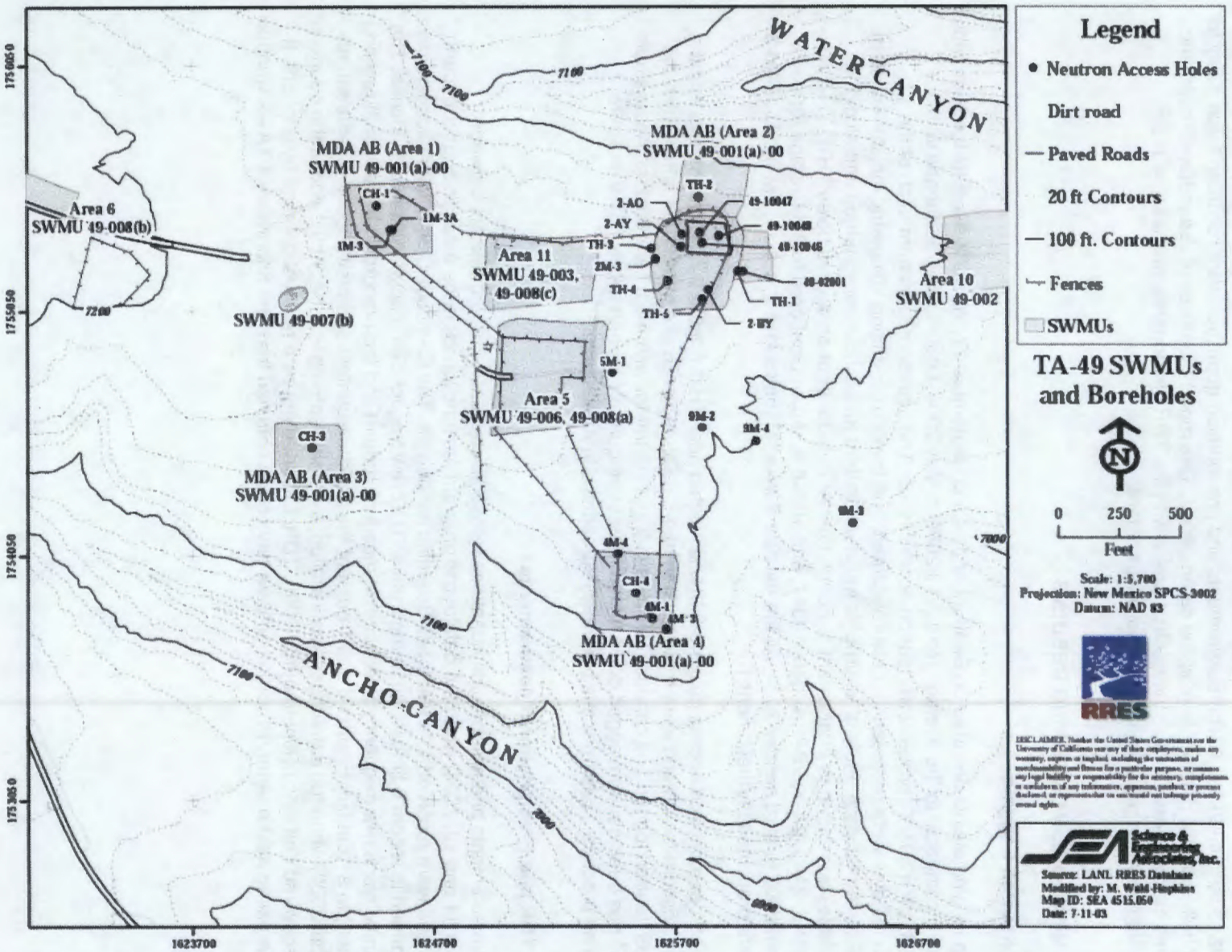

Figure 2. TA-49 neutron access holes

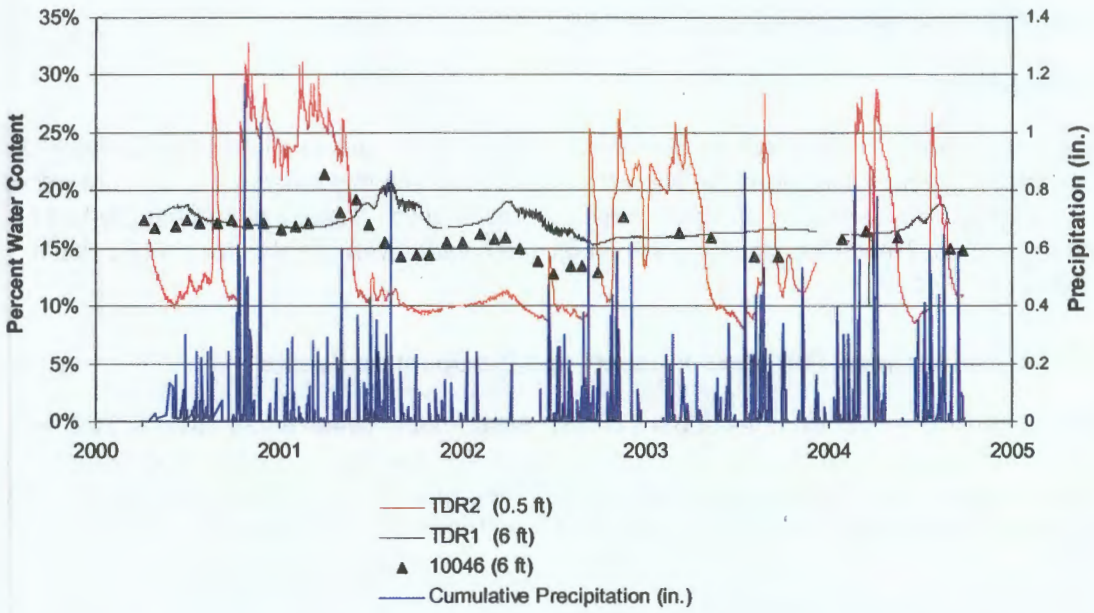

Figure 3. **TDR measurements compared with neutron measurements at neutron access hole 49-10046, which is in close proximity and at the same corresponding depth as TDR1**

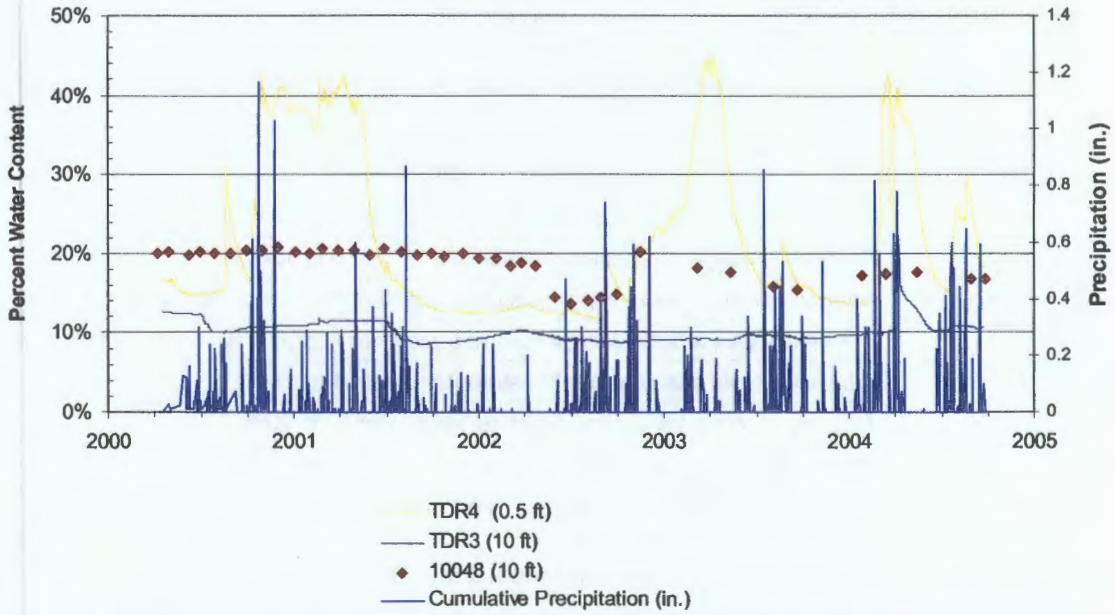

Figure 4. **TDR measurements compared with neutron measurements at neutron access hole 49-10048, which is in close proximity and at the same corresponding depth as TDR3**

3.0 MOISTURE-MONITORING RESULTS AND DATA ANALYSIS

3.1 Introduction

TDR and neutron data from April 2000 to September 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 2 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 28% (TDR 2) and 10 to 45% (TDR 4) moisture content from moisture infiltrating the first few feet of soil during and after precipitation events. 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 15% 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 3 and 4 show the deep TDR data associated with neutron access holes 49-10046 and 49-10048 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%.

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 111 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, 41 to 108 ft.
TH-4	Analysis shows a decreasing moisture trend from 1 to 10 ft, and 16 to 90 ft.
TH-5	Analysis shows a decreasing moisture trend from 1 to 114 ft.
2B-Y	Analysis shows a increasing moisture trend from 21 to 29 ft.
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 46 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 7 to 12 ft.
49-10048	Analysis shows a decreasing moisture trend from 3 to 12 ft.
1M-3	Analysis shows no significant change in moisture trends.
1M-3A	Analysis shows no significant change in moisture trends.
2M-3	Analysis shows a decreasing moisture trend from 6 to 15 ft.
4M-4	Analysis shows no significant change in moisture trends.
5M-1	Analysis shows a decreasing moisture trend from 16 to 20 ft.

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 September 2004, 42 months of data events were available for statistical analysis for 11 monitoring holes in Area 2. Table 2 presents 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. The five "M" neutron access holes spread across TA-49, for which logging began in the fourth quarter of 2003, are included in this table. Seven months of data for statistical analysis are available for these holes.

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 2-16 in Attachment 2.

4.0 CONCLUSIONS

Analysis of the moisture monitoring data collected over the past year has resulted in the following conclusions:

- The neutron log and TDR data indicate that 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 below average, 5.63 in. from July 2004 through September 2004 (source: www.weather.com).
- The moisture levels within the cover at the majority of the locations have decreased when compared to the average moisture levels from third quarter 2000 to fourth quarter 2004. The shallow TDR probes have shown moisture content responses to relatively small rainfall events, while the deeper probes (>6 ft) have remained constant. This finding can be attributed to precipitation events detected in the near-surface with no deep infiltration.
- The data from neutron access holes 49-10046, 49-10047 and 49-10048 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, TH-5), the moisture levels have decreased from the surface to the bottom.
- The data from moderate depth neutron access hole (<60 ft) bordering the cover (2A-Y) has not yielded a significant change in moisture content.
- The cover over Area 2 has shown substantial growth of vegetation. Photographs of the Area 2 cover during the fourth quarter of 2004 are included in Attachment 3.
- Significant vegetative growth over the past year has increased the number and size of undesirable plants (deep-rooted, radionuclide-scavenging) on the Area 2 cover.
- Damage to the TDR data collection system indicates that gophers are present and active within Area 2.

5.0 RECOMMENDATIONS

Routine moisture monitoring and site inspections conducted since March 2000 have shown the 1998 IM to be successful in eliminating run-on, reducing surface-water ponding, and promoting ET. This finding is supported by the reduction and/or stabilization of the subsurface moisture content within the covered area. The increased vegetation, site BMPs, and steel-mesh bio-barrier have controlled runoff, erosion, and bio-intrusion (with the exception of the recent gopher activity at borehole 49-01006), thus reducing the potential for contaminant migration and cover degradation. However, because of the increasing age of the cover and the erosion control measures at Area 2, the physical condition should be monitored more closely and small maintenance projects implemented to avoid significant deterioration.

Statistical analysis of the moisture monitoring data over the past four years indicates stable and decreasing moisture trends in the deep boreholes surrounding the Area 2 cover. Significant variability in subsurface moisture content has only been observed in the TDR data and reflected the neutron measurements at shallow depths in boreholes through, or directly adjacent to, the cover. These results indicate that the performance of the cover is best monitored through continuous TDR data collection, coupled with periodic collection of neutron probe data to provide a correlation for TDR data, and allow for analysis of the deep hydrogeological stability of Area 2.

Therefore, the following activities are recommended for the continued stewardship of Area 2 at TA-49:

- Continuous TDR data acquisition for monitoring infiltration through the ET cover.
- Quarterly neutron logging of the current suite of boreholes to ensure the deep hydrogeological stability of Area 2.
- Completion of quarterly inspections of the ET cover, bio-barrier, and erosion control structures at Area 2. Repair of gopher barrier to prevent further bio-intrusion; routine cutting back of undesirable plant to limit growth. Repair of any other deficiencies noted in Area A to maintain site stability.

6.0 REFERENCES

LANL (Los Alamos National Laboratory), 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. (LANL 1998, 59166)

LANL (Los Alamos National Laboratory), 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. (LANL 1998, 63041)

LANL (Los Alamos National Laboratory), 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. (LANL 1999, 63919)

Attachment 1

Neutron Moisture Measurements

ATTACHMENT 1 NEUTRON MOISTURE MEASUREMENTS

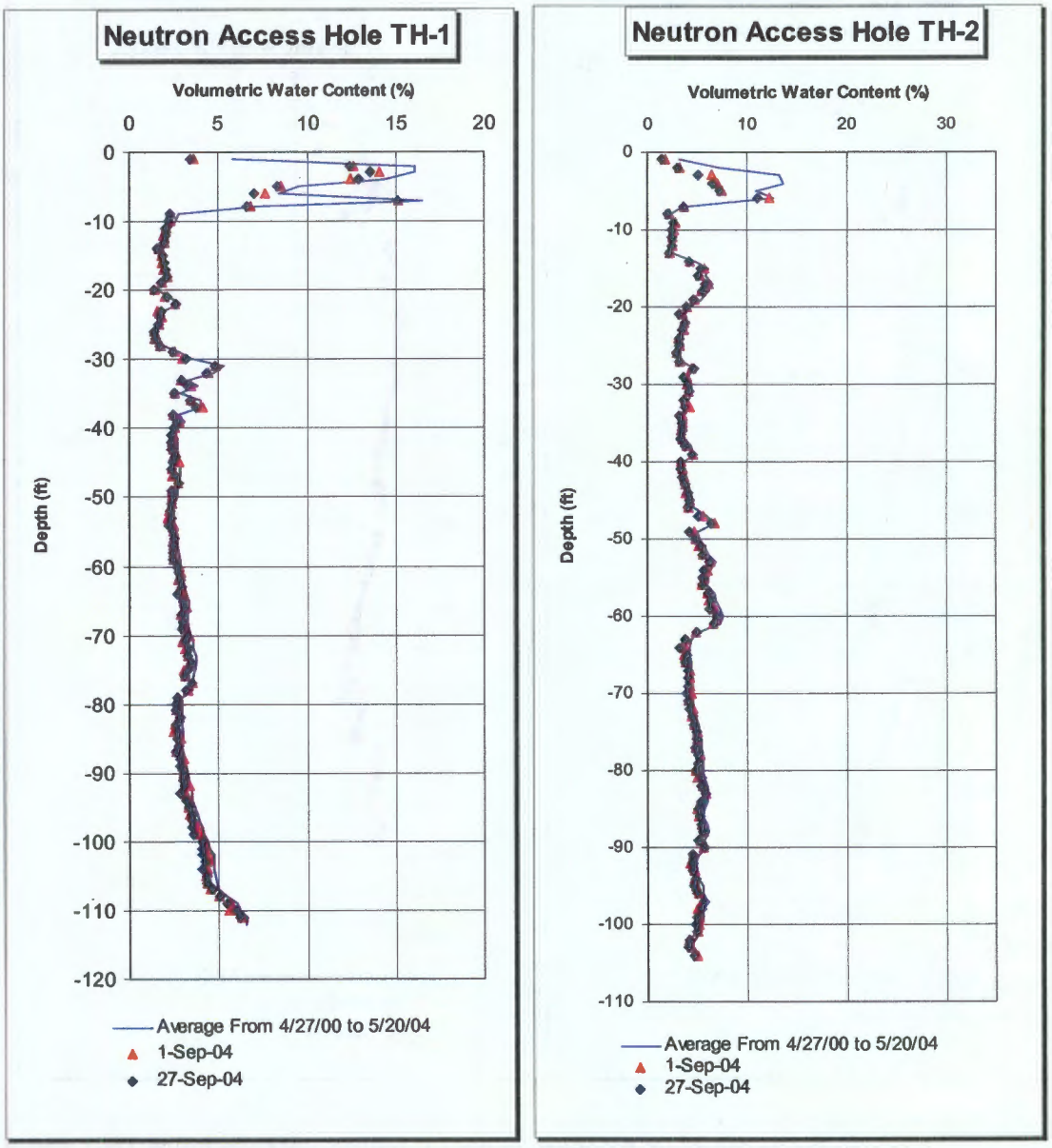

Figure 1-1. Neutron probe moisture measurements for neutron access holes TH-1 and TH-2

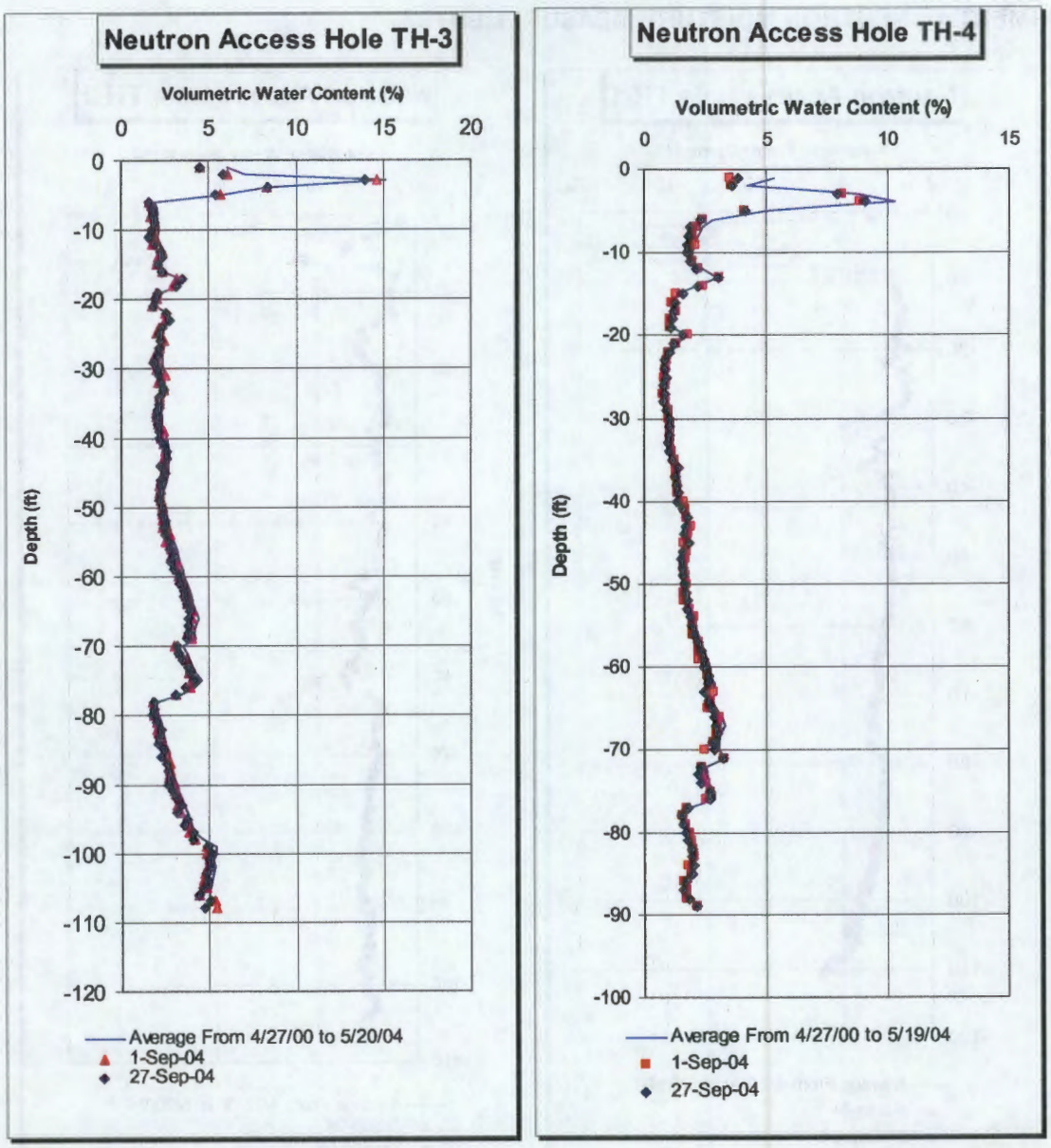

Figure 1-2. Neutron probe moisture measurements for neutron access holes TH-3 and TH-4

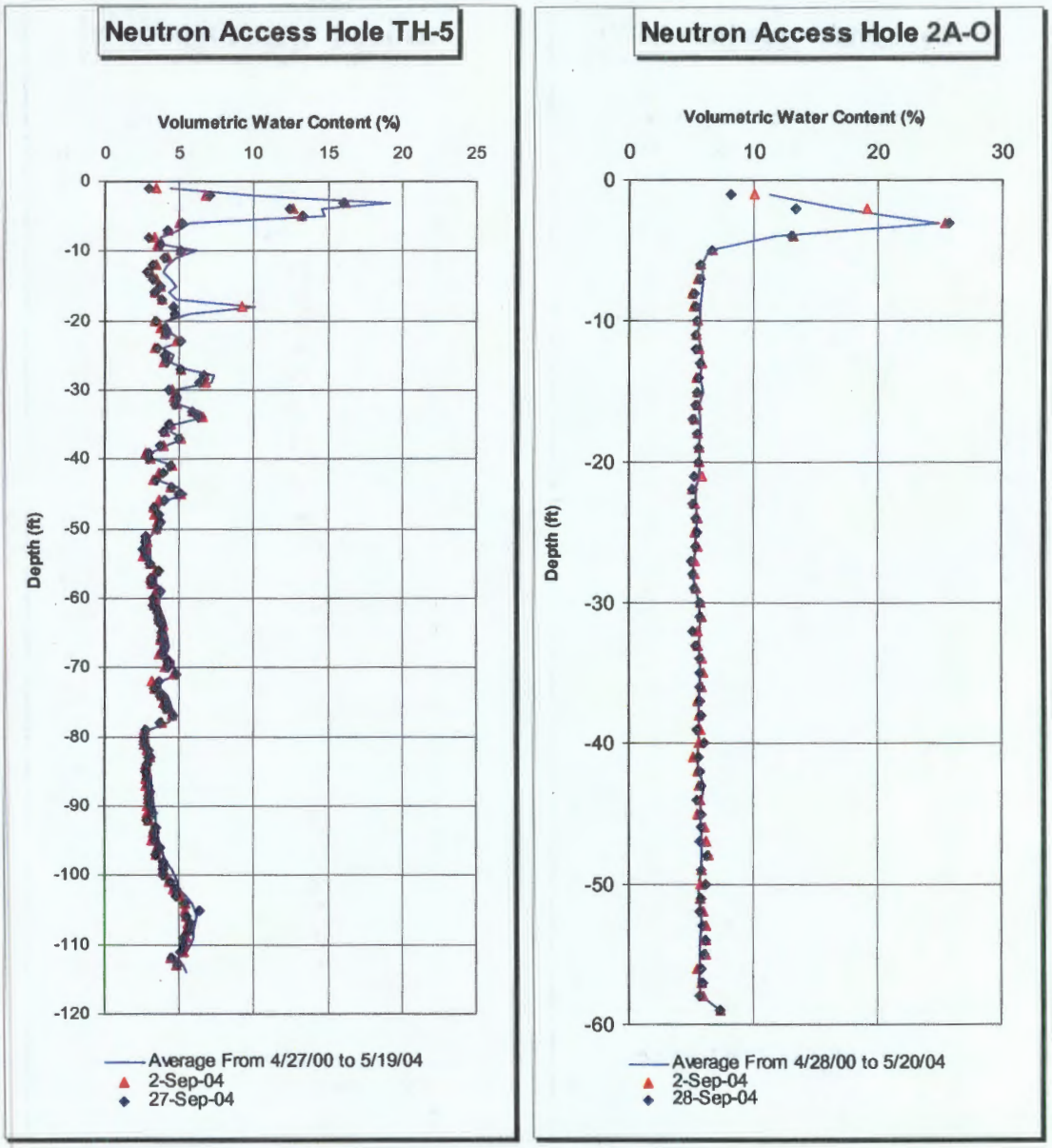

Figure 1-3. Neutron probe moisture measurements for neutron access holes TH-5 and 2A-0

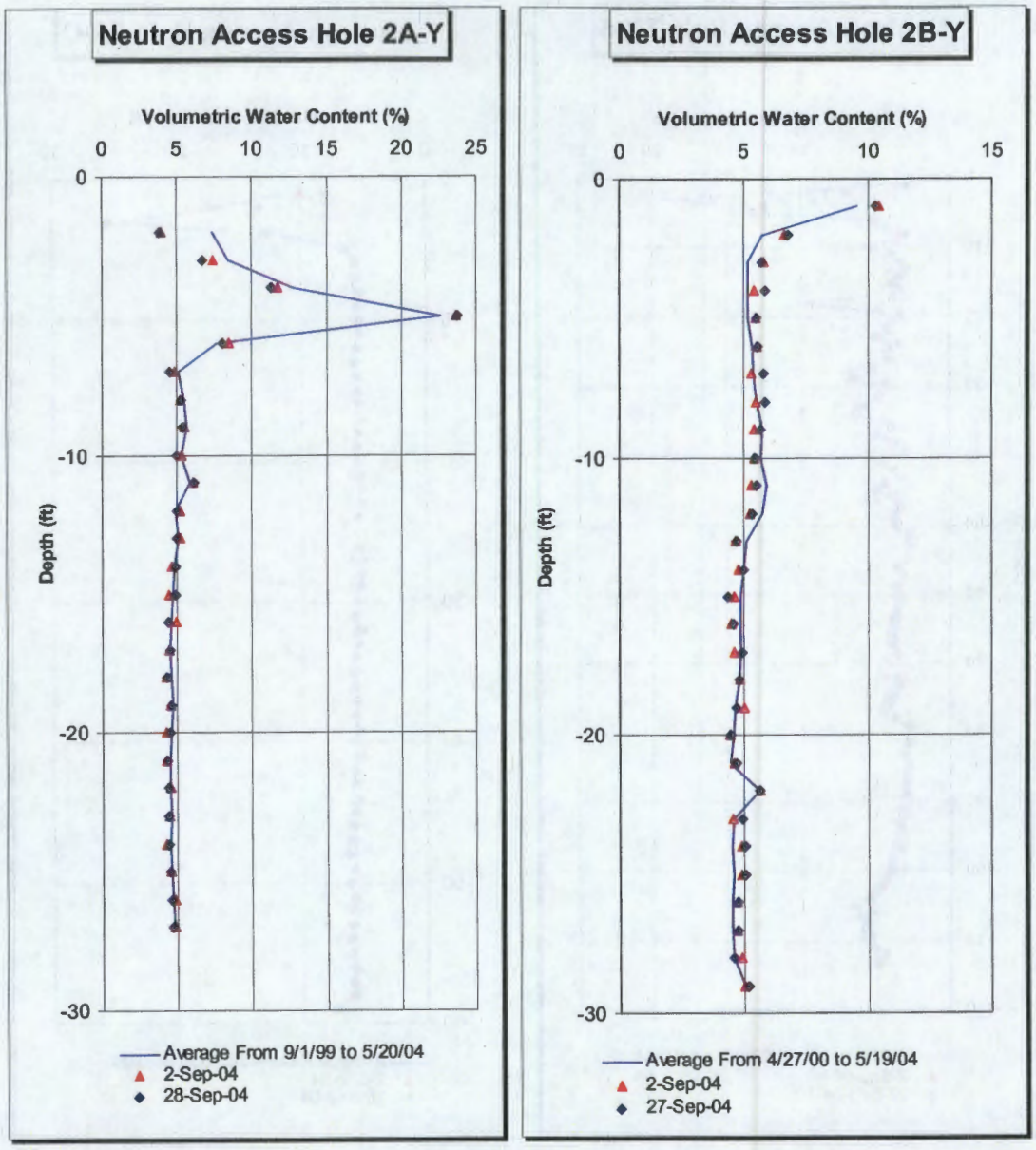

Figure 1-4. Neutron probe moisture measurements for neutron access holes 2A-Y and 2B-Y

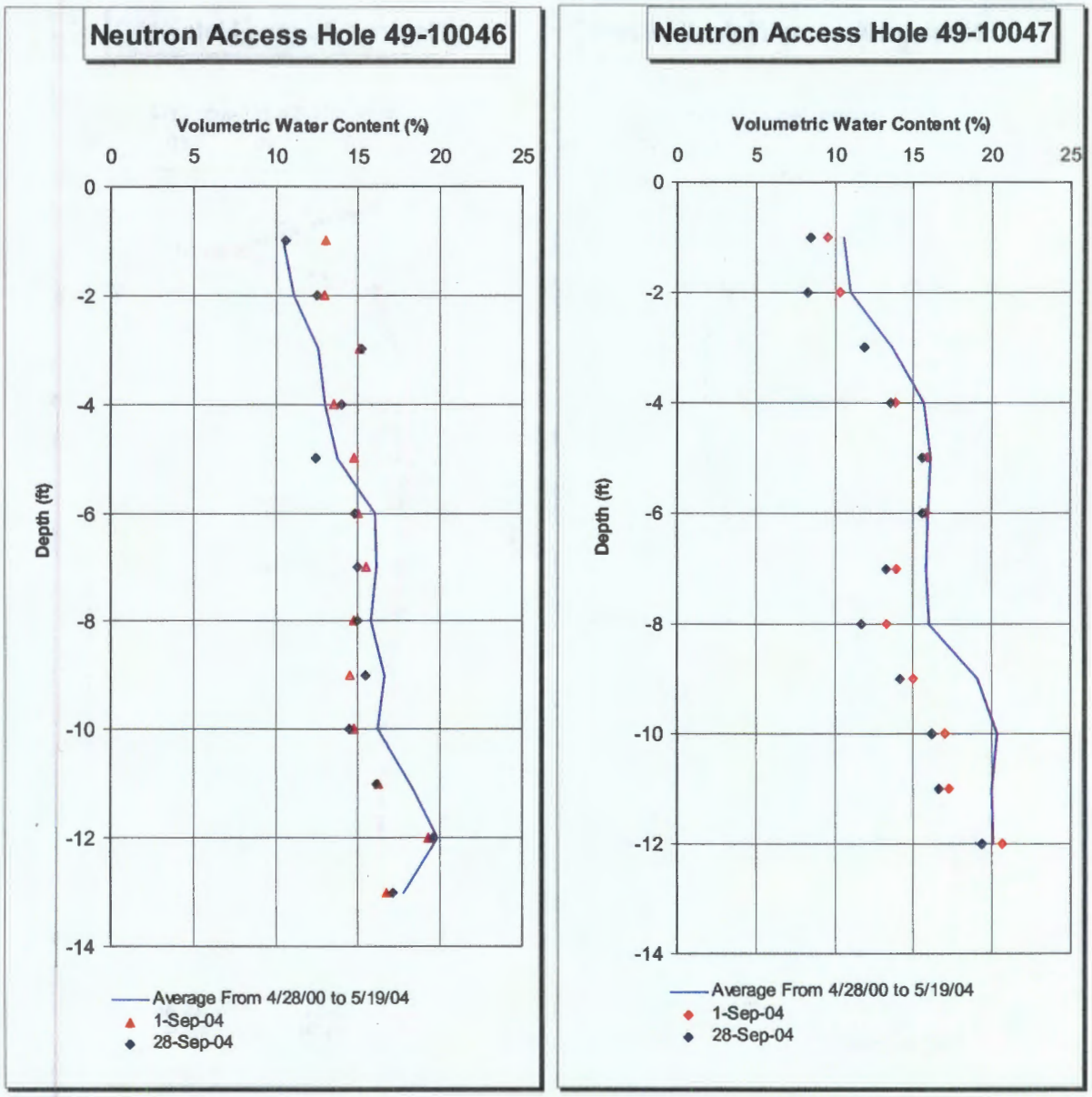

Figure 1-5. Neutron probe moisture measurements for neutron access holes 49-10046 and 49-10047

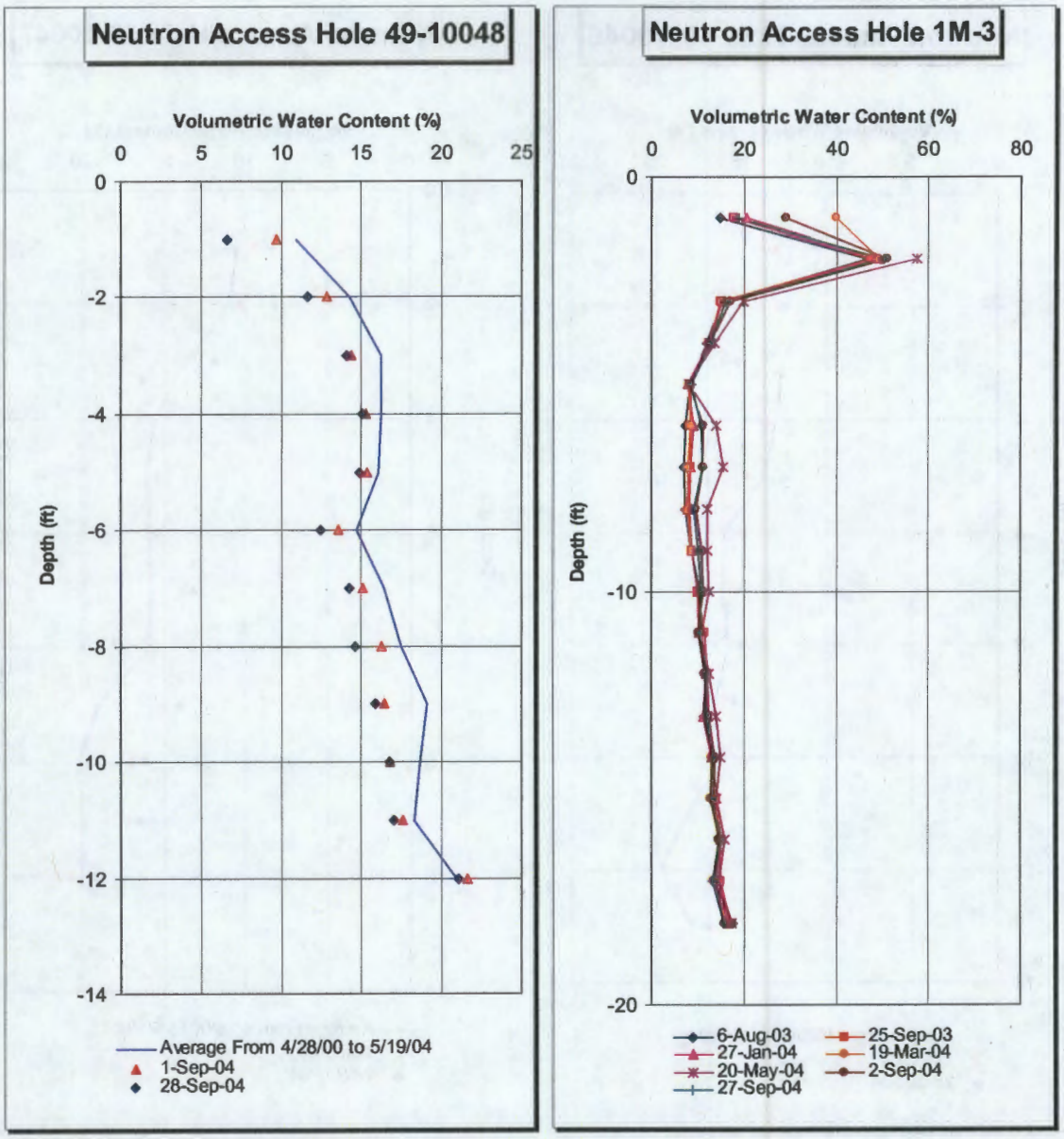

Figure 1-6. Neutron probe moisture measurements for neutron access holes 49-10048 and 1M-3

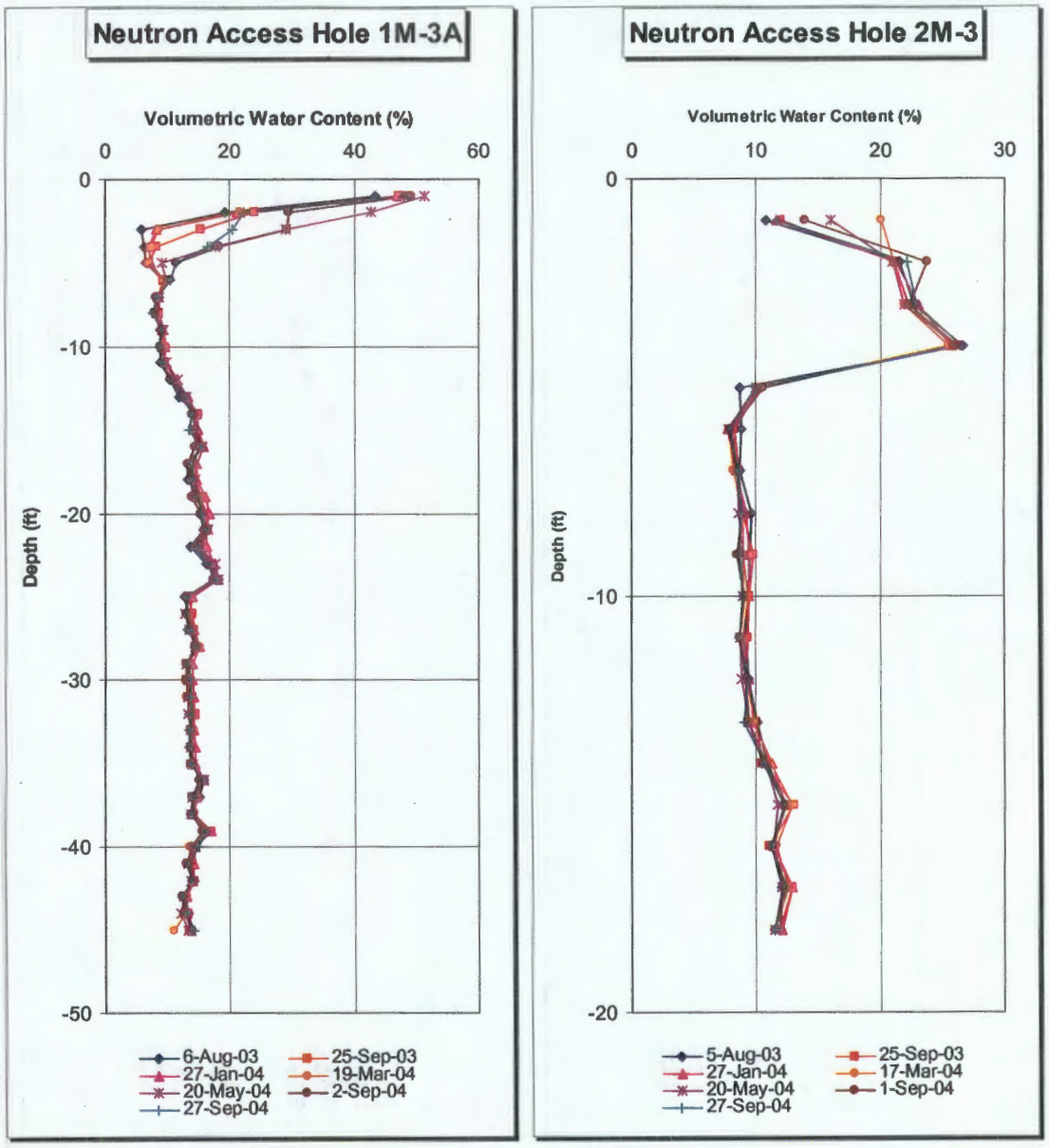

Figure 1-7. Neutron probe moisture measurements for neutron access holes 1M-3A and 2M-3

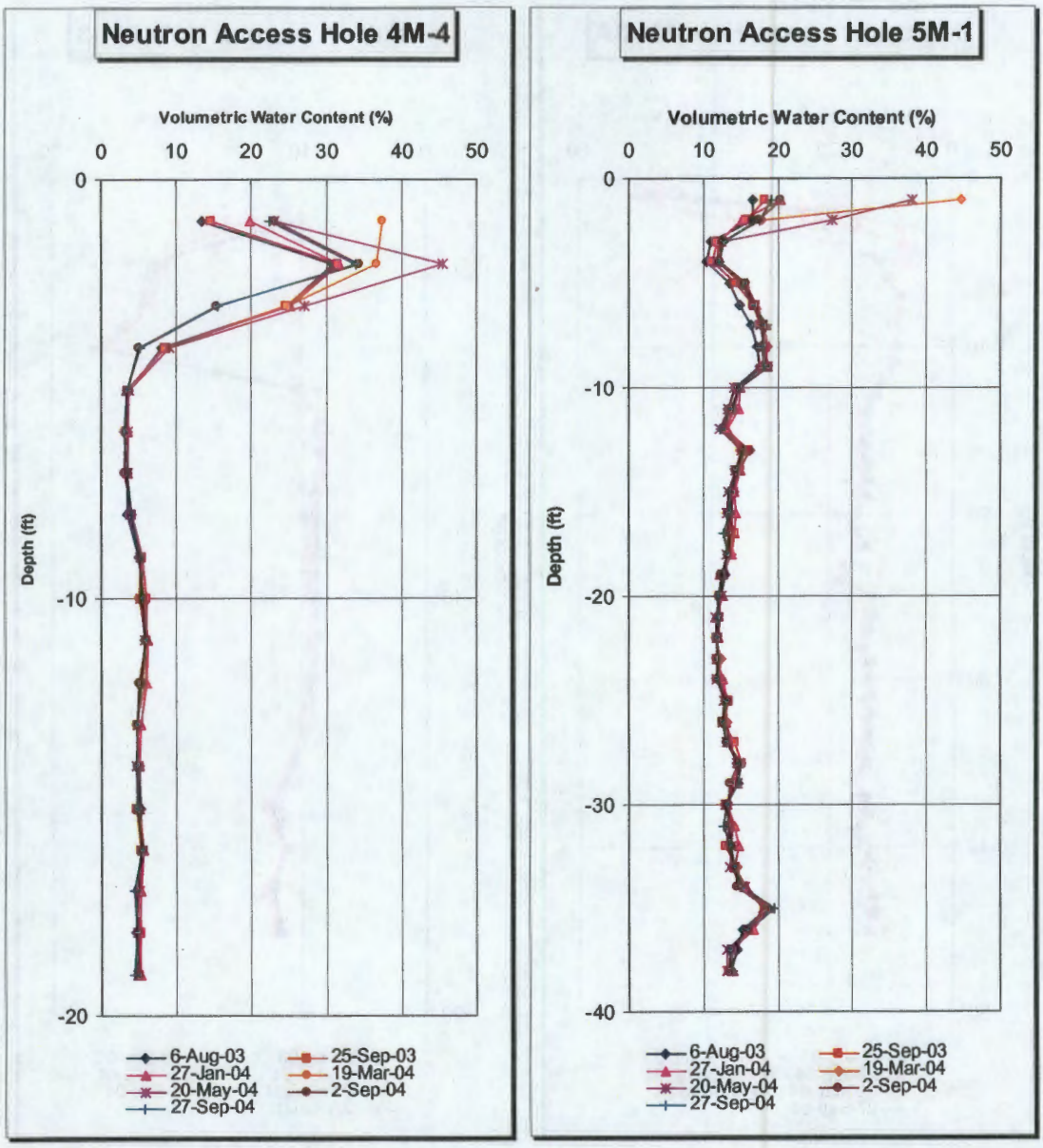

Figure 1-8. Neutron probe moisture measurements for neutron access holes 4M-4 and 5M-1

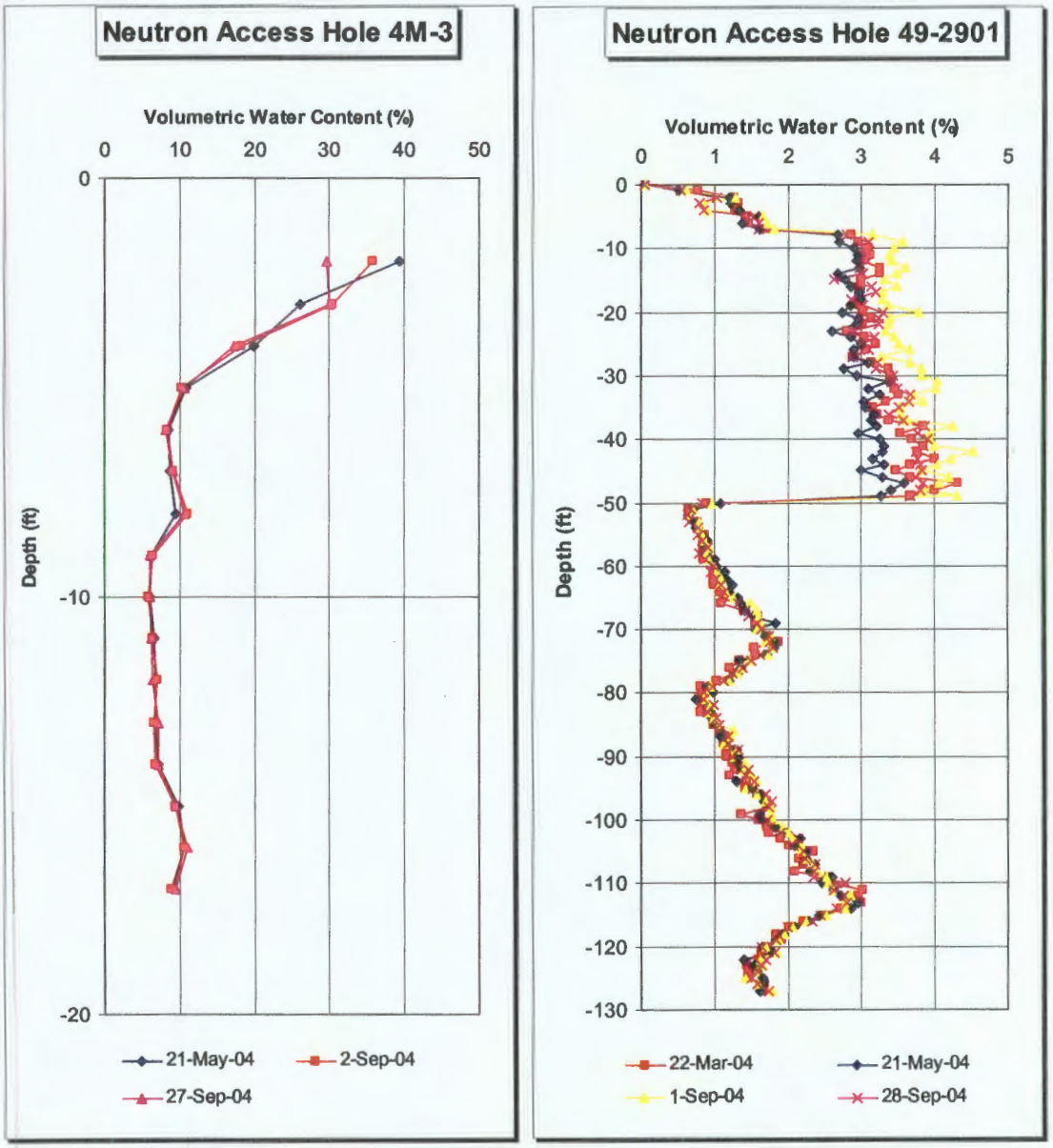

Figure 1-9. Neutron probe moisture measurements for neutron access holes 4M-3 and 49-2901

Attachment 2

Time Versus Moisture Content Plots

ATTACHMENT 2 TIME VERSUS MOISTURE CONTENT PLOTS

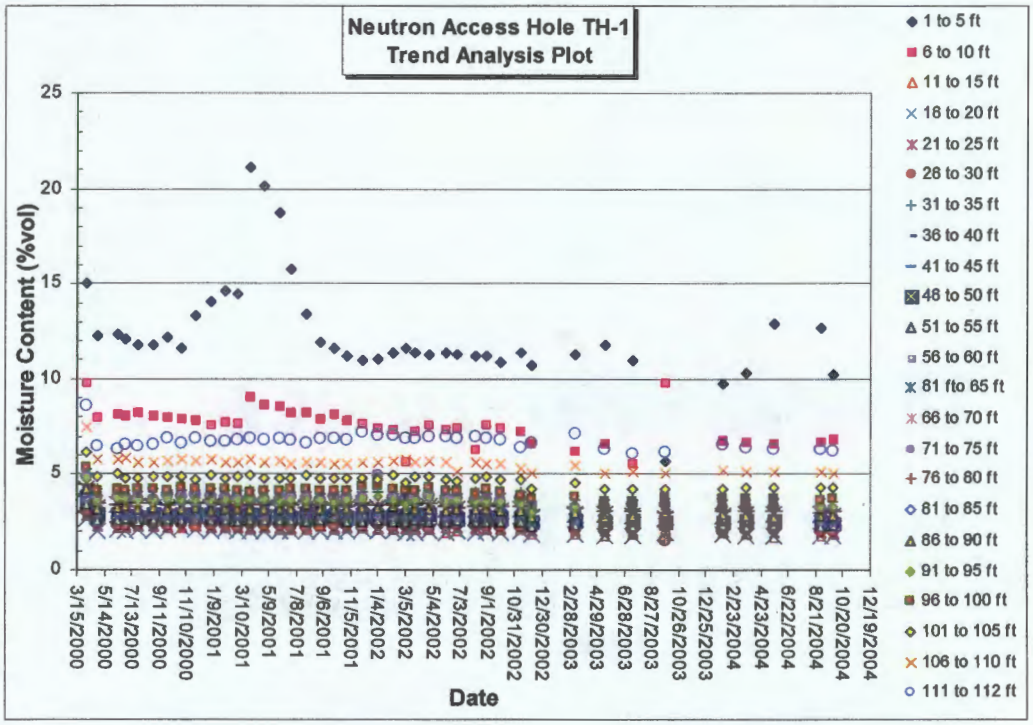

Figure 2-1. Trend plot of neutron moisture measurements, neutron access hole TH-1

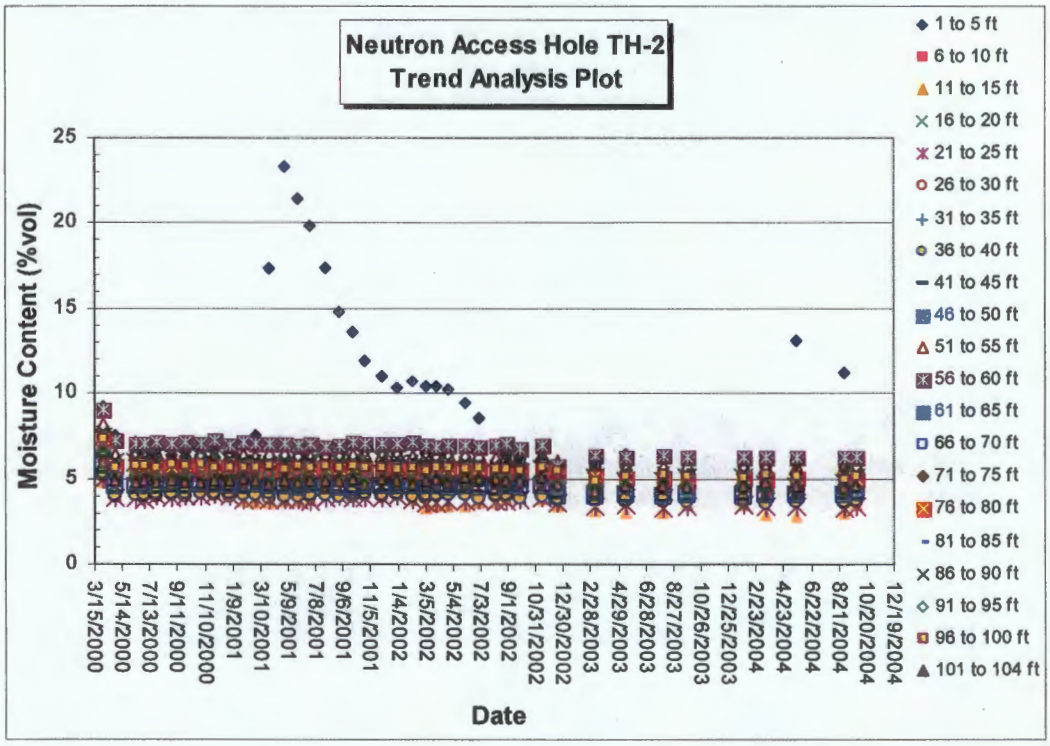

Figure 2-2. Trend plot of neutron moisture measurements, neutron access hole TH-2

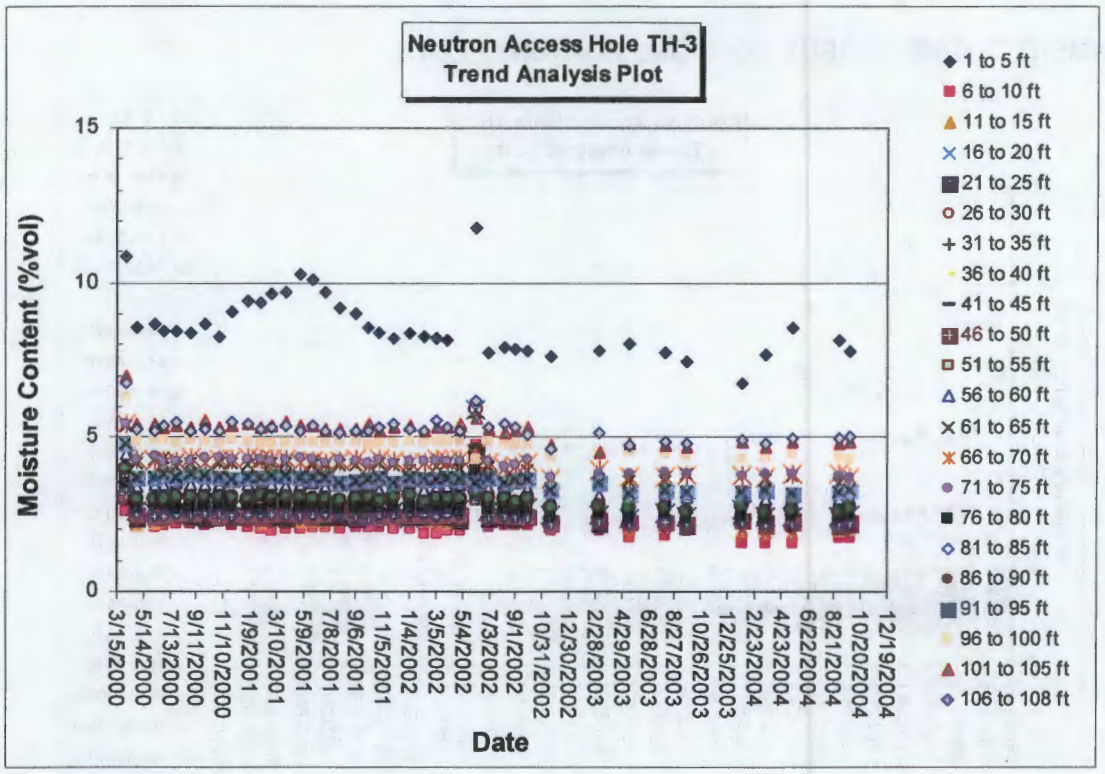

Figure 2-3. Trend plot of neutron moisture measurements, neutron access hole TH-3

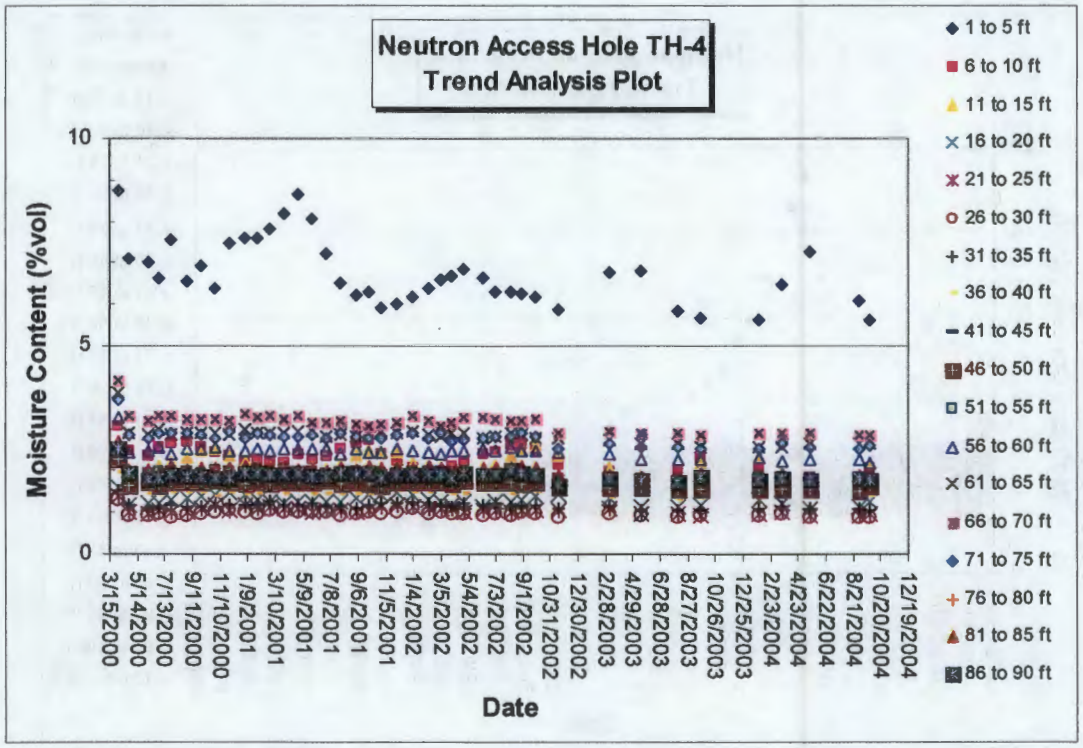

Figure 2-4. Trend plot of neutron moisture measurements, neutron access hole TH-4

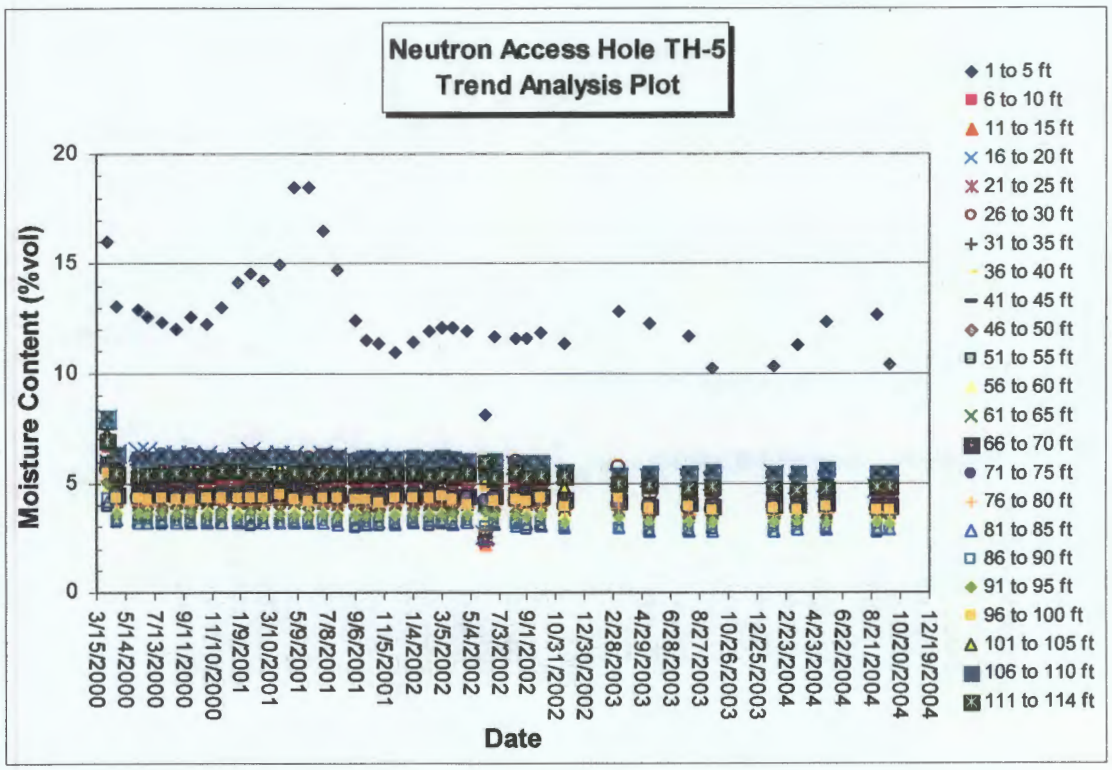

Figure 2-5. Trend plot of neutron moisture measurements, neutron access hole TH-5

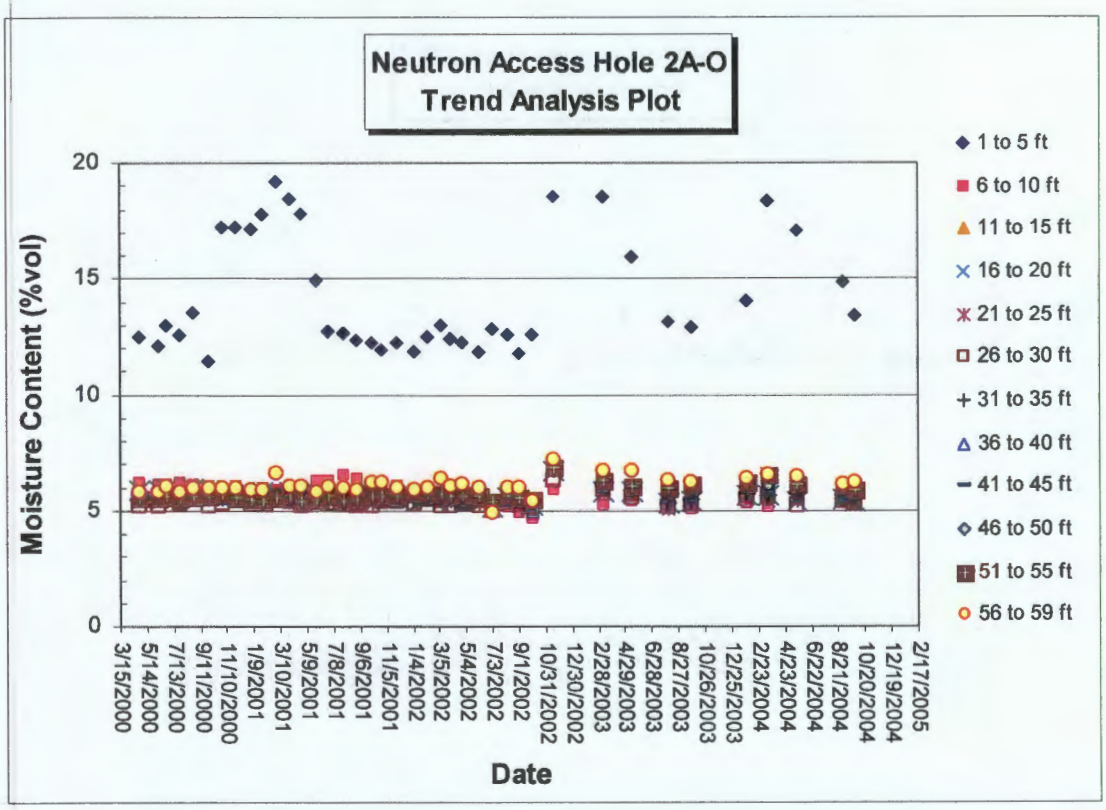

Figure 2-6. Trend plot of neutron moisture measurements, neutron access hole 2A-O

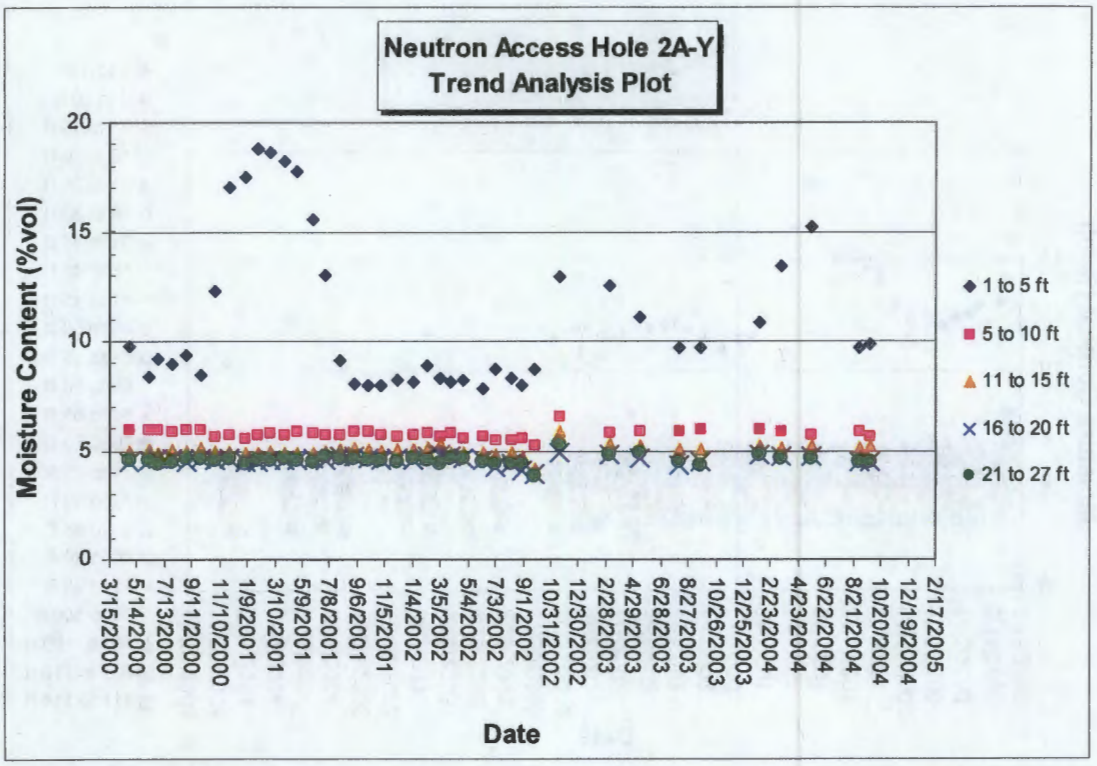

Figure 2-7. Trend plot of neutron moisture measurements, neutron access hole 2A-Y

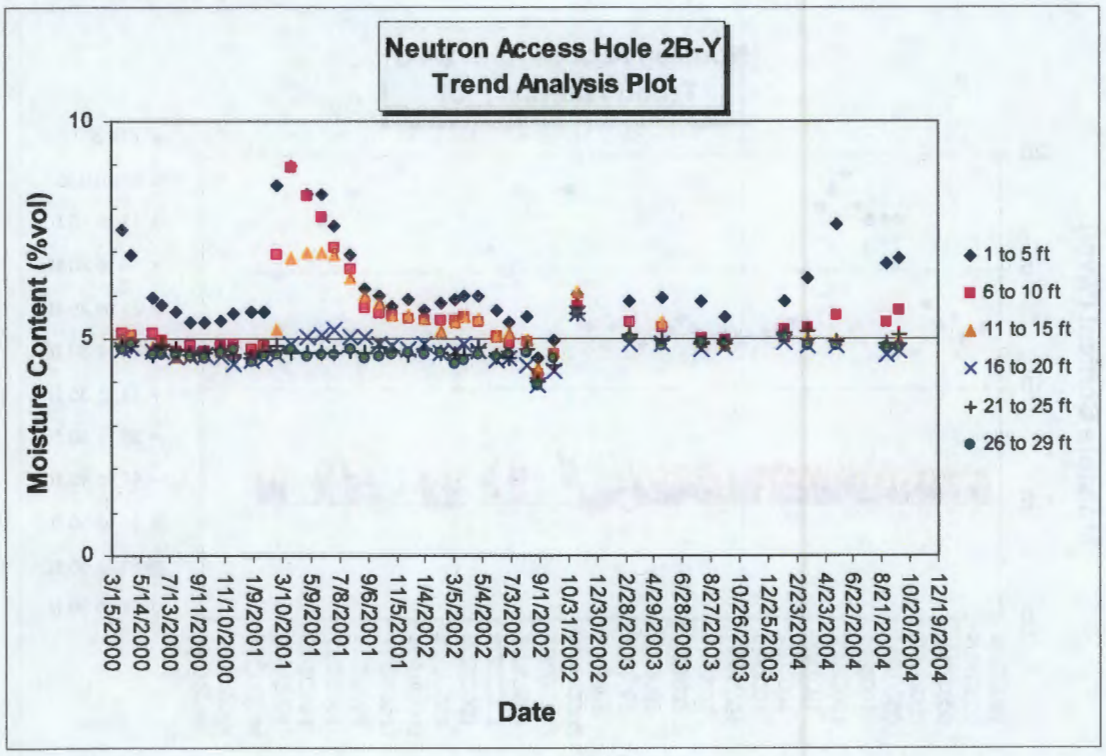

Figure 2-8. Trend plot of neutron moisture measurements, neutron access hole 2B-Y

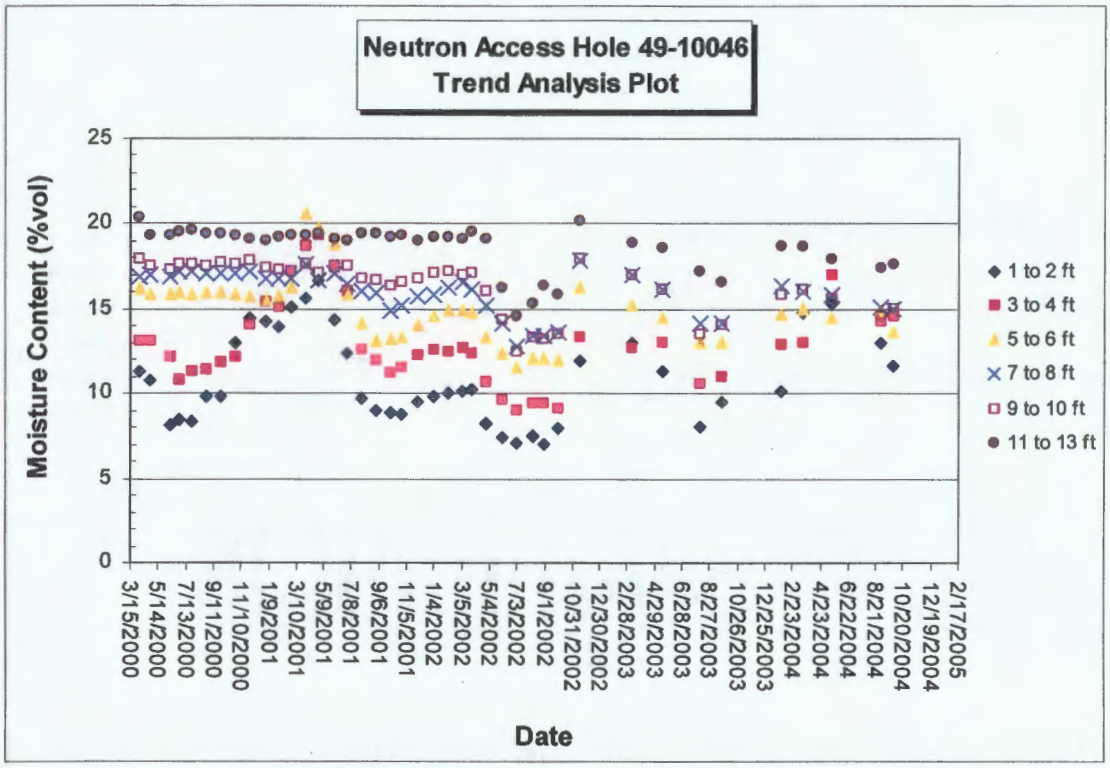

Figure 2-9. Trend plot of neutron moisture measurements, neutron access hole 49-10046

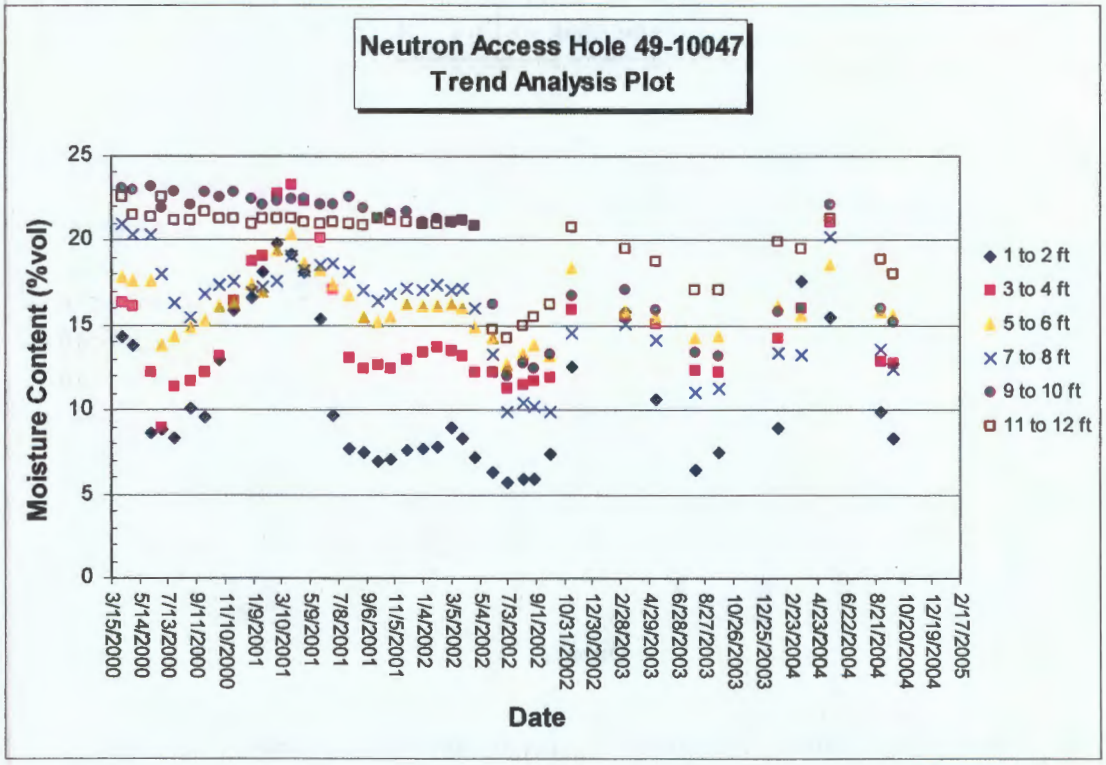

Figure 2-10. Trend plot of neutron moisture measurements, neutron access hole 49-10047

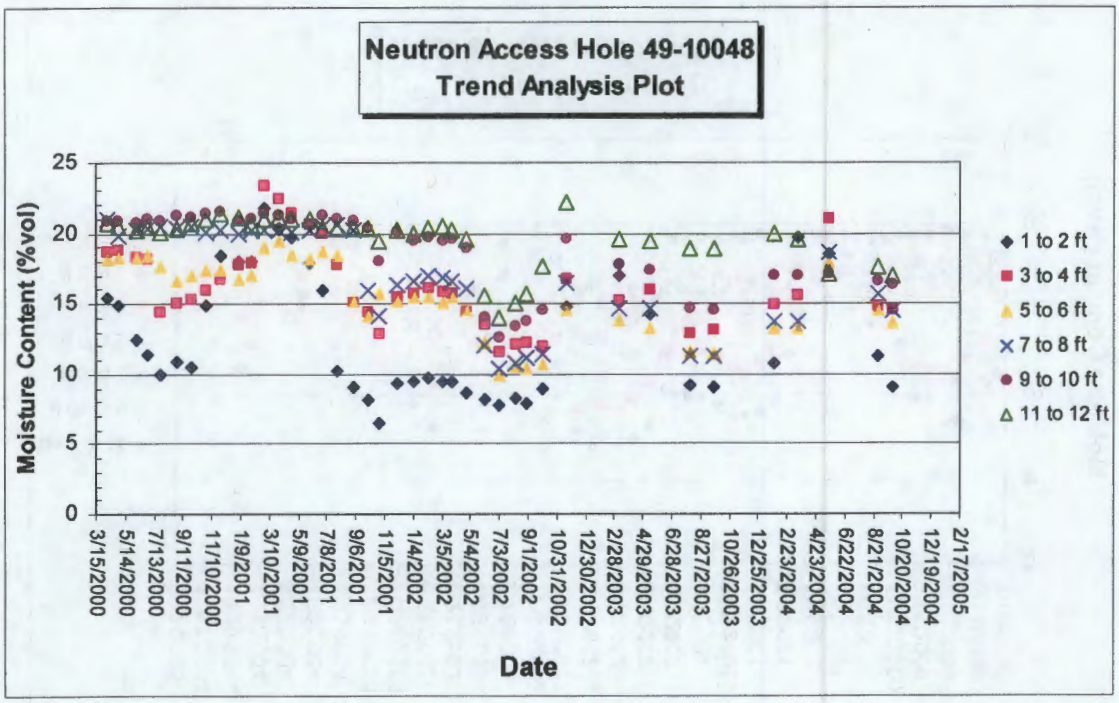

Figure 2-11. Trend plot of neutron moisture measurements, neutron access hole 49-10048

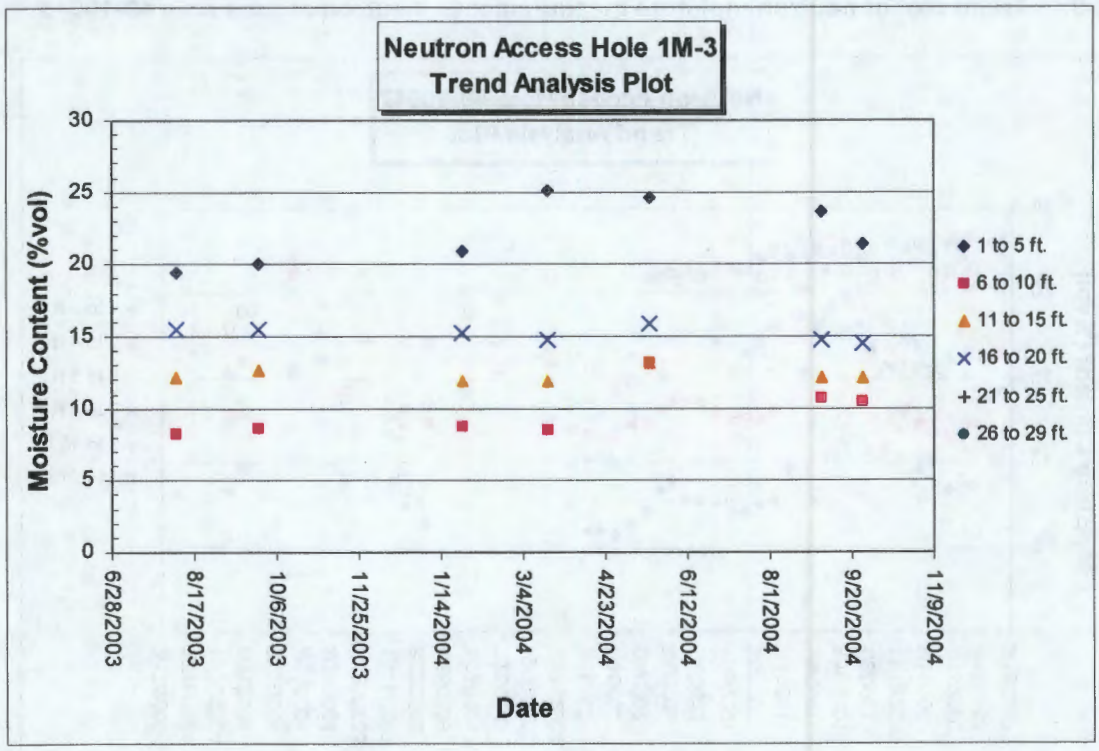

Figure 2-12. Trend plot of neutron moisture measurements, neutron access hole 1M-3

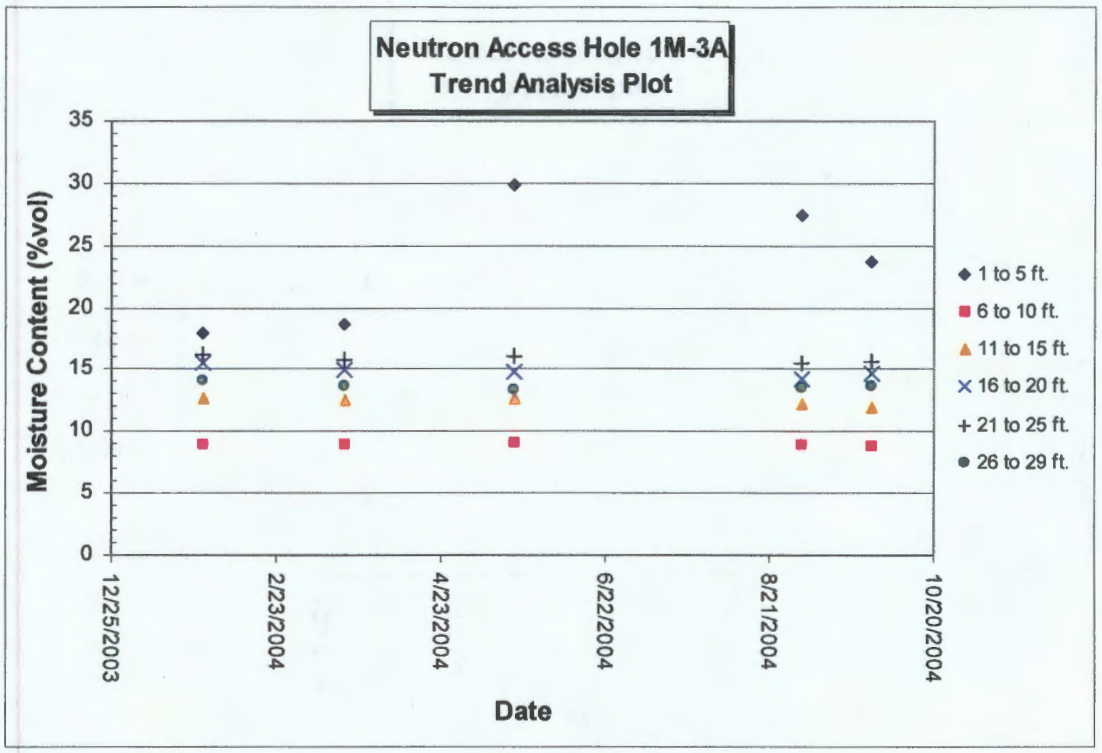

Figure 2-13. Trend plot of neutron moisture measurements, neutron access hole 1M-3A

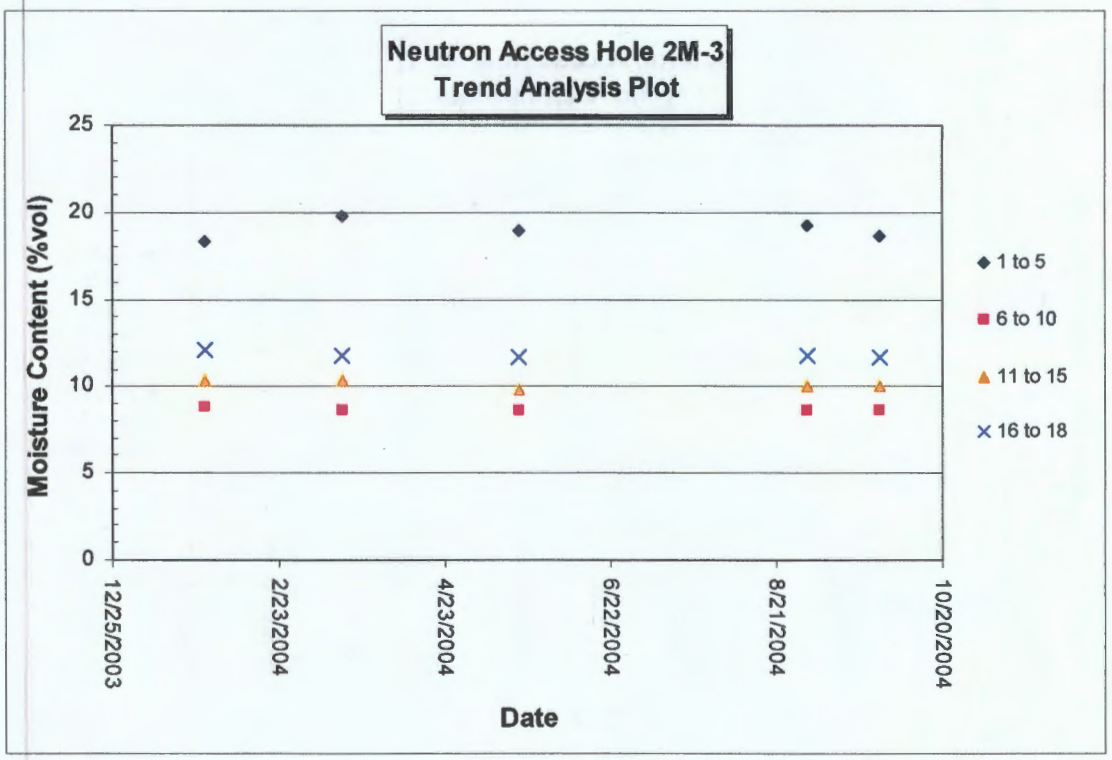

Figure 2-14. Trend plot of neutron moisture measurements, neutron access hole 2M-3

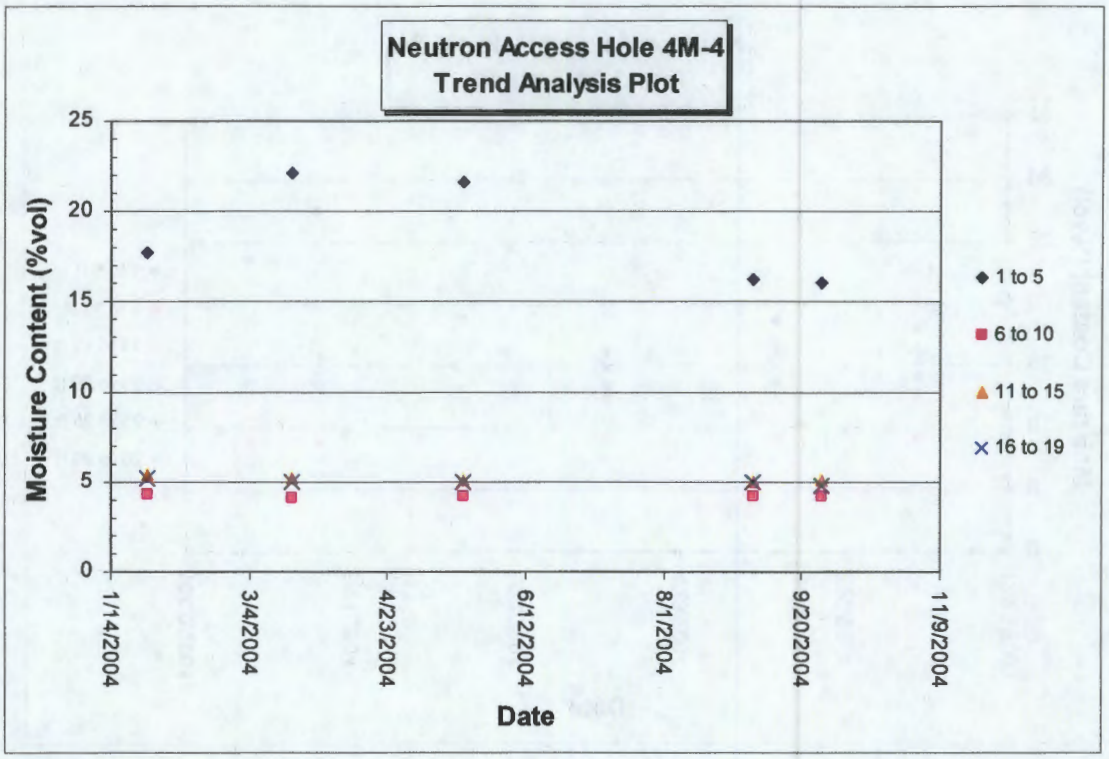

Figure 2-15. Trend plot of neutron moisture measurements, neutron access hole 4M-4

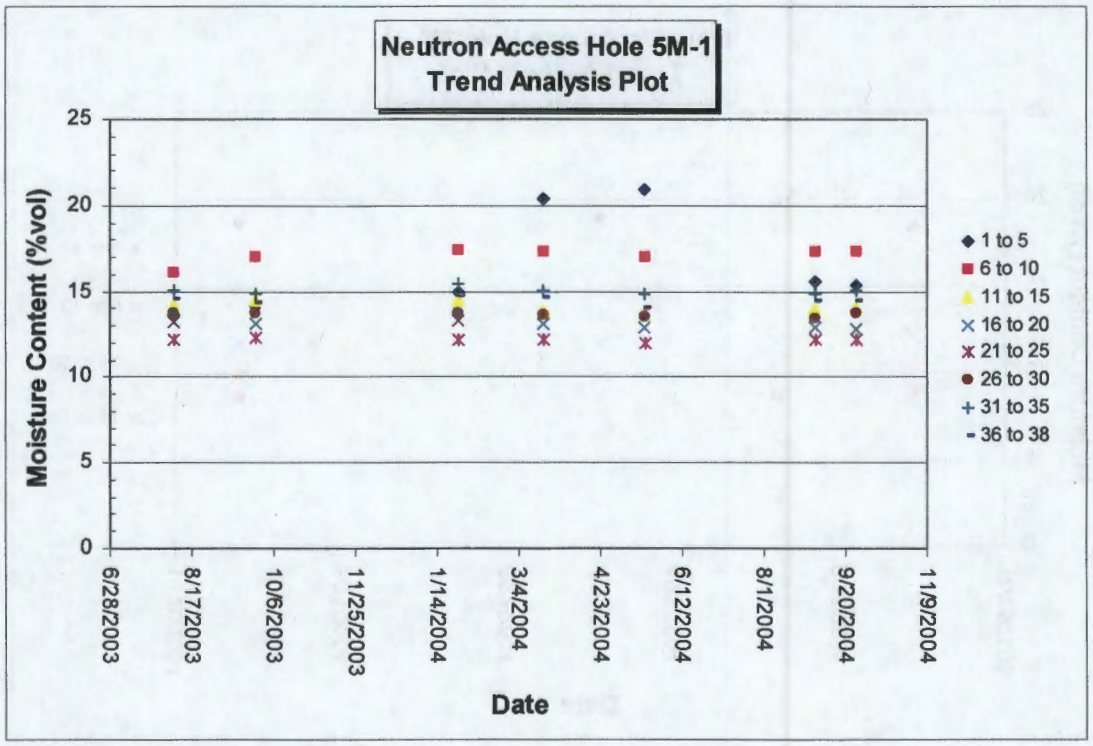

Figure 2-16. Trend plot of neutron moisture measurements, neutron access hole 5M-1

Attachment 3

Condition of Evapotranspiration (ET) Cover

Figure 3.1. Photo of ET cover from outside Area 2

Figure 3.2. Photo of ET cover from inside fence of Area 2

Figure 3.3. Close up of ET cover showing growth coming through cover

Figure 3.4. Close up of ET cover showing growth coming through cover

Appendix D

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

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QUARTERLY PORE-GAS SAMPLING REPORT
FOURTH QUARTER, FISCAL YEAR 2004
TECHNICAL AREA 54, MATERIAL DISPOSAL AREAS L AND G

Risk Reduction and Environmental Stewardship–Remediation Services

Los Alamos National Laboratory

November 2004

1.0 INTRODUCTION

This report discusses fourth quarter 2004 subsurface pore-gas sampling at Los Alamos National Laboratory (the Laboratory), Technical Area (TA) 54; it also presents a review of the data for fiscal year (FY) 2004. 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, 01585). 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 facility investigation (RFI) work plan for TA-54 (LANL 1992, 07669).

1.1 Sampling Plan Requirements

Twenty-eight Risk Reduction and Environmental Stewardship–Remediation Services (RRES–RS) project wells are available for pore-gas sampling at TA-54. The sampling and analysis plan requires collecting samples from 12 wells each quarter to analyze volatile organic compounds (VOCs). Of these 12 samples, 7 are selected from a list of 10 wells located at Material Disposal Area (MDA) L, and 2 are 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. The remaining 3 samples per quarter that may be collected from the remaining 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 per LANL-ER-SOP-06.31, Sampling of Subatmospheric Air. Table 4 in Appendix F of the fourth quarter report for FY2000 (LANL 2000, 70064) lists the ports to be sampled to establish trends near the source and at the plume boundaries. Results from these locations are evaluated in Section 5.0. All results for SUMMA canister samples are reported in parts per billion by volume (ppbv).

Before the required sampling is performed, all available wells (RRES-RS project wells and PAMG wells) are screened with a Brüel and Kjaer (B&K) multigas monitor, Type 1302. Each port is purged and monitored with field instruments until carbon dioxide levels have stabilized at values representative of subsurface pore-gas conditions and is then screened for four VOCs: 1,1,1-trichloroethane (TCA); trichloroethene (TCE); perchloroethene; and Freon-11. The multigas monitor measures concentrations down to one part per million volume (ppmv). All results and data analysis of multigas monitor data are reported in ppmv.

Three types of field quality assurance (QA) samples are collected and analyzed. These three samples include (1) a duplicate sample; (2) 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 (3) 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 FOURTH-QUARTER SAMPLING

2.1 Sampling Event

Sampling for the fourth quarter of FY2004 (July through September) was conducted from July 7 through September 15, 2004.

Table 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. Eleven wells were sampled in accordance with the approved sampling plan. One SUMMA canister was not under negative pressure and, therefore, could not be used for sampling. Seven wells at MDA L were sampled, including seven from the above-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, fourteen samples were collected for laboratory analysis. These analytical results are reported in Table 2.

A total of 35 wells were screened with the B&K (224 ports). These are listed in Table 1. Field-screening results are available upon request and are summarized in Figures 1-22 and 1-28.

2.2 Sampling Results

Well 54-02002 consistently shows the highest VOC concentrations detected in the SUMMA samples at a depth of 100 ft. This well is situated close to a source area, so this result is expected. This quarter, TCA, TCE, and tetrachloroethene (PCE) were measured at concentrations of 660,000 ppbv, 140,000 ppbv, and 13,000 ppbv, respectively, twice the value for all measurements made in the previous 16 quarters. B&K field screening of this well were measured at concentrations equivalent to screening results from previous quarters. The normal B&K readings indicate that no release occurred and that the high readings are the result of an analytical error. This port will be sampled again next quarter with a duplicate to confirm the reading. Results from all other sampled wells were consistent with data from previous sampling events.

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 54-02009 at the 62-ft sampling port. Table 3 presents the field duplicate results.

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 54-02009 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 101.8 ppmv of TCA, 50.9 ppmv of TCE, and 10.1 ppmv of PCE. The results of the analysis for sample MD54-04-53535 were 96 ppmv (94%) for TCA, 51 ppmv (100%) for TCE, and 10 ppmv (100%) for PCE.

Table 1
Summary of Sampling Event, Fourth Quarter of FY 2004

Well ID	Site	On Defined Sampling List	# 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	—	n/a[a]
54-1016	MDA L	N	3	31, 162, 274	—	n/a
54-1107	PAMG	N	6	20, 44.5, 56.5, 74, 91, 100	—	n/a
54-1110	PAM G	N	6	20, 48, 60, 70, 85, 90	—	n/a
54-1111	PAMG	N	7	20, 39.5, 50, 70, 78, 100, 139	50	MD54-04-53522
54-1115	PAMG	N	6	7.9, 26.5, 40.8, 53, 63.6, 68.9	—	n/a
54-1117	PAMG	N	6	20, 31.5, 55, 73, 82, 85	—	n/a
54-1121	PAMG	N	7	20, 26, 61.5, 70, 76, 98, 121	—	n/a
54-2002	MDA L	Y	9	40, 60, 80, 100, 120, 140, 157, 180, 200	100	MD54-04-53525
54-1126	MDA G	N	0	Not screened, fence blocking access to well	—	n/a
54-1128	MDA G	N	5	7.5, 15, 20, 30, 39	—	n/a
54-2009	MDA G	Y	3	37, 62, 92	62 62	MD54-04-53526 MD54-04-53534
54-2010	MDA G	Y	3	30, 53, 95	95	MD54-04-53527
54-2012	MDA L	Y	3	8, 28, 42	28	MD54-04-53528
54-2013	MDA L	N	3	20, 43, 63	—	n/a
54-2014	MDA L	N	4	13, 31, 46, 86	—	n/a
54-2016	MDA L	N	1	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	MD54-04-53529
54-2022	MDA L	Y	10	20, 40, 60, 80, 100, 120, 140, 160, 180, 200	—	n/a
54-2023	MDA L	Y	10	20, 40, 60, 80, 100, 120, 140, 159, 180, 200	159	MD54-04-53530
54-2024	MDA L	N	10	20, 40, 60, 80, 100, 120, 140, 160, 180, 200	—	n/a
54-2025	MDA L	N	5	20, 60, 100, 160, 190	—	n/a
54-2026	MDA L	Y	6	20, 60, 100, 160, 200, 215	160	MD54-04-53531
54-2027	MDA L	N	7	20, 60, 100, 160, 200, 220, 250	—	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	—	n/a
54-2030	MDA L	Y	7	20, 60, 100, 160, 200, 220, 243	100	MD54-04-53523
54-2031	MDA L	Y	7	20, 60, 100, 160, 200, 220, 260	—	n/a
54-2032	MDA G	Y	5	20, 60, 100, 130, 156	—	n/a
54-2033	MDA G	Y	8	20, 60, 100, 160, 200, 220, 260, 277	100	MD54-04-53532
54-2034	MDA L	Y	8	20, 60, 100, 160, 200, 220, 260, 300	60	MD54-04-53533
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	15	28, 46, 64, 82, 100, 118, 136, 154, 172, 190, 208, 226, 244, 262, 280[b]	—	n/a
Total wells sampled					11	
MDA L defined list wells sampled (7 expected)					7	
MDA G defined list wells sampled (2 expected)					3	
QA samples taken					1 field duplicate	1 equipment blank

[a] n/a = Not analyzed.
[b] Distance from well head, horizontal well.

Table 2
Summary of Sampling Event, Fourth Quarter FY2004

Location ID	Sample ID	Sample Concentration (ppbv)	Depth (ft)	Analyte	Analyte Code
54-01111	MD54-04-53522	36	50	Dichloroethane[1,1-]	75-34-3
54-01111	MD54-04-53522	140	50	Dichloroethene[1,1-]	75-35-4
54-01111	MD54-04-53522	57	50	Methylene Chloride	75-09-2
54-01111	MD54-04-53522	25	50	Tetrachloroethene	127-18-4
54-01111	MD54-04-53522	1000	50	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-01111	MD54-04-53522	2900	50	Trichloroethane[1,1,1-]	71-55-6
54-01111	MD54-04-53522	29	50	Trichloroethene	79-01-6
54-01111	MD54-04-53522	9.4	50	Trichlorofluoromethane	75-69-4
54-02002	MD54-04-53525	2400	100	Carbon Tetrachloride	56-23-5
54-02002	MD54-04-53525	14000	100	Chloroform	67-66-3
54-02002	MD54-04-53525	11000	100	Dichloroethane[1,1-]	75-34-3
54-02002	MD54-04-53525	14000	100	Dichloroethane[1,2-]	107-06-2
54-02002	MD54-04-53525	26000	100	Dichloroethene[1,1-]	75-35-4
54-02002	MD54-04-53525	27000	100	Dichloropropane[1,2-]	78-87-5
54-02002	MD54-04-53525	32000	100	Methylene Chloride	75-09-2
54-02002	MD54-04-53525	13000	100	Tetrachloroethene	127-18-4
54-02002	MD54-04-53525	7800	100	Toluene	108-88-3
54-02002	MD54-04-53525	66000	100	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02002	MD54-04-53525	660000	100	Trichloroethane[1,1,1-]	71-55-6
54-02002	MD54-04-53525	140000	100	Trichloroethene	79-01-6
54-02002	MD54-04-53525	21000	100	Trichlorofluoromethane	75-69-4
54-02002	MD54-04-53525	2000	100	Xylene[1,2-]	95-47-6
54-02002	MD54-04-53525	2700	100	Xylene[1,3-]+Xylene[1,4-]	Xylene[1,3 and 1,4]
54-02009	MD54-04-53526	2700	62	Dichloroethane[1,1-]	75-34-3
54-02009	MD54-04-53526	7200	62	Dichloroethene[1,1-]	75-35-4
54-02009	MD54-04-53526	760	62	Tetrachloroethene	127-18-4
54-02009	MD54-04-53526	60000	62	Trichloroethane[1,1,1-]	71-55-6
54-02009	MD54-04-53526	440	62	Trichloroethene	79-01-6
54-02009	MD54-04-53534	2600	62	Dichloroethane[1,1-]	75-34-3
54-02009	MD54-04-53534	7800	62	Dichloroethene[1,1-]	75-35-4
54-02009	MD54-04-53534	770	62	Tetrachloroethene	127-18-4
54-02009	MD54-04-53534	58000	62	Trichloroethane[1,1,1-]	71-55-6
54-02009	MD54-04-53534	430	62	Trichloroethene	79-01-6
54-02010	MD54-04-53527	700	95	Dichloroethane[1,1-]	75-34-3
54-02010	MD54-04-53527	2600	95	Dichloroethene[1,1-]	75-35-4
54-02010	MD54-04-53527	190	95	Tetrachloroethene	127-18-4
54-02010	MD54-04-53527	1200	95	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02010	MD54-04-53527	15000	95	Trichloroethane[1,1,1-]	71-55-6
54-02010	MD54-04-53527	270	95	Trichloroethene	79-01-6
54-02010	MD54-04-53527	460	95	Trichlorofluoromethane	75-69-4

Table 2 (continued)

Location ID	Sample ID	Sample Concentration (ppbv)	Depth (ft)	Analyte	Analyte Code
54-02012	MD54-04-53528	62000	28	Dichloroethane[1,1-]	75-34-3
54-02012	MD54-04-53528	73000	28	Dichloroethane[1,2-]	107-06-2
54-02012	MD54-04-53528	28000	28	Dichloroethene[1,1-]	75-35-4
54-02012	MD54-04-53528	65000	28	Methylene Chloride	75-09-2
54-02012	MD54-04-53528	46000	28	Tetrachloroethene	127-18-4
54-02012	MD54-04-53528	13000	28	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02012	MD54-04-53528	1600000	28	Trichloroethane[1,1,1-]	71-55-6
54-02012	MD54-04-53528	430000	28	Trichloroethene	79-01-6
54-02012	MD54-04-53528	5300	28	Trichlorofluoromethane	75-69-4
54-02021	MD54-04-53529	2100	100	Dichloroethane[1,1-]	75-34-3
54-02021	MD54-04-53529	2000	100	Dichloroethane[1,2-]	107-06-2
54-02021	MD54-04-53529	4000	100	Dichloroethene[1,1-]	75-35-4
54-02021	MD54-04-53529	1900	100	Methylene Chloride	75-09-2
54-02021	MD54-04-53529	1400	100	Tetrachloroethene	127-18-4
54-02021	MD54-04-53529	1200	100	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02021	MD54-04-53529	110000	100	Trichloroethane[1,1,1-]	71-55-6
54-02021	MD54-04-53529	19000	100	Trichloroethene	79-01-6
54-02023	MD54-04-53530	140	159	Carbon Tetrachloride	56-23-5
54-02023	MD54-04-53530	580	159	Chloroform	67-66-3
54-02023	MD54-04-53530	210	159	Dichloroethane[1,1-]	75-34-3
54-02023	MD54-04-53530	2000	159	Dichloroethene[1,1-]	75-35-4
54-02023	MD54-04-53530	180	159	Methylene Chloride	75-09-2
54-02023	MD54-04-53530	390	159	Tetrachloroethene	127-18-4
54-02023	MD54-04-53530	4500	159	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02023	MD54-04-53530	22000	159	Trichloroethane[1,1,1-]	71-55-6
54-02023	MD54-04-53530	6000	159	Trichloroethene	79-01-6
54-02023	MD54-04-53530	810	159	Trichlorofluoromethane	75-69-4
54-02026	MD54-04-53531	32	160	Carbon Tetrachloride	56-23-5
54-02026	MD54-04-53531	120	160	Chloroform	67-66-3
54-02026	MD54-04-53531	36	160	Dichloroethane[1,1-]	75-34-3
54-02026	MD54-04-53531	32	160	Dichloroethane[1,2-]	107-06-2
54-02026	MD54-04-53531	840	160	Dichloroethene[1,1-]	75-35-4
54-02026	MD54-04-53531	58	160	Methylene Chloride	75-09-2
54-02026	MD54-04-53531	140	160	Tetrachloroethene	127-18-4
54-02026	MD54-04-53531	1100	160	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02026	MD54-04-53531	3800	160	Trichloroethane[1,1,1-]	71-55-6
54-02026	MD54-04-53531	1100	160	Trichloroethene	79-01-6
54-02026	MD54-04-53531	170	160	Trichlorofluoromethane	75-69-4
54-02030	MD54-04-53523	18	100	Carbon Tetrachloride	56-23-5
54-02030	MD54-04-53523	90	100	Chloroform	67-66-3
54-02030	MD54-04-53523	17	100	Dichloroethane[1,1-]	75-34-3
54-02030	MD54-04-53523	170	100	Dichloroethene[1,1-]	75-35-4
54-02030	MD54-04-53523	66	100	Tetrachloroethene	127-18-4

Table 2 (continued)

Location ID	Sample ID	Sample Concentration (ppbv)	Depth (ft)	Analyte	Analyte Code
54-02030	MD54-04-53523	560	100	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02030	MD54-04-53523	2600	100	Trichloroethane[1,1,1-]	71-55-6
54-02030	MD54-04-53523	550	100	Trichloroethene	79-01-6
54-02030	MD54-04-53523	89	100	Trichlorofluoromethane	75-69-4
54-02033	MD54-04-53532	33	100	Dichlorodifluoromethane	75-71-8
54-02033	MD54-04-53532	4.9	100	Dichloroethene[1,1-]	75-34-3
54-02033	MD54-04-53532	1.5	100	Methylene Chloride	75-09-2
54-02033	MD54-04-53532	14	100	Tetrachloroethene	127-18-4
54-02033	MD54-04-53532	22	100	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02033	MD54-04-53532	32	100	Trichloroethane[1,1,1-]	71-55-6
54-02033	MD54-04-53532	1.8	100	Trichloroethene	79-01-6
54-02033	MD54-04-53532	50	100	Trichlorofluoromethane	75-69-4
54-02034	MD54-04-53533	110	60	Dichloroethane[1,1-]	75-34-3
54-02034	MD54-04-53533	41	60	Dichloroethane[1,2-]	107-06-2
54-02034	MD54-04-53533	350	60	Dichloroethene[1,1-]	75-35-4
54-02034	MD54-04-53533	37	60	Methylene Chloride	75-09-2
54-02034	MD54-04-53533	66	60	Tetrachloroethene	127-18-4
54-02034	MD54-04-53533	78	60	Trichloro-1,2,2-trifluoroethane[1,1,2-]	76-13-1
54-02034	MD54-04-53533	6400	60	Trichloroethane[1,1,1-]	71-55-6
54-02034	MD54-04-53533	1300	60	Trichloroethene	79-01-6
54-02034	MD54-04-53533	35	60	Trichlorofluoromethane	75-69-4

Table 3
Field Duplicate Sample Results Comparison (Well 54-02009, 62 ft)

Analyte	Sample MD54-04-53526[a] (ppbv[b])	Sample MD54-04-53534[c] (ppbv[b])	RPD[d]
Dichloroethane[1,1-]	2700	2600	3.7
Dichloroethene[1,1-]	7200	7800	8
Tetrachloroethene	760	770	1.3
Trichloroethane[1,1,1-]	60000	58000	3.4
Trichloroethene	440	430	2.3

[a] Detection limit = 220 ppbv
[b] ppbv = parts per billion by volume
[c] Detection limit = 180 ppbv
[d] RPD = relative percent difference

4.0 REVIEW OF SCREENING DATA FOR PREVIOUS 24 QUARTERS

All available ports were screened with the B&K multigas monitor every quarter during the last 24 quarters, except the first quarter of FY2002, when the equipment failed, and the first quarter of FY2004, when the B&K screening gave a false reading of TCA concentrations because the calibration levels were set too low at the factory.

Analytical laboratory results and field-screening measurements indicated higher concentrations of TCA near the source area and at the plume boundaries than any other VOC. Therefore, B&K screening results of TCA concentrations have been used to develop three-dimensional visualizations representative of VOC plume extent.

Figures 1-1 through 1-22 in Attachment 1 present the quarterly results of the three-dimensional visualization for MDA L for FY1999 through FY2004. There are no figures for the first quarter of FY2002 or first quarter of FY2004 because of equipment failure. Complete screening of all available boreholes began for FY1999; earlier screening data sets lack sufficient spatial measurements to allow meaningful interpolation for visualization.

TCA concentration contours for 10, 100, and 500 ppmv are represented on the figures. The 10-ppmv contour represents the lower limit of the field-screening data reliability (5 ppmv to 10 ppmv). The first figure of each set gives an aerial view of the plume contours at 60 ft below the mesa top and identifies the borehole locations. Cross-section A-A' is perpendicular to the mesa, and cross section B-B' is along the middle of the mesa parallel to the sides. The structures are current operational facilities. The second and third figures of each set depict the plume contours across transects A-A' and B-B'.

The figures indicate that the VOC plume, as represented by TCA screening data, has been near a steady condition since the first quarter of FY1999. The extent of the plume along transect A-A' is bounded by the mesa sides. Screening results also indicate that the 10-ppmv contour has remained relatively constant at a depth, nominally 650 ft above the regional groundwater table. The maximum TCA concentrations represented by the 500-ppmv contour are coincident with the disposal shafts and pits of MDA L and have remained steady since FY1999. The aerial figures show that the lateral extent of the MDA L plume is constrained by the extensive array of vapor-monitoring boreholes.

Figures 1-23 through 1-28 show the results of the three-dimensional visualizations of 24 quarters of monitoring at MDA G for FY1999 through FY2004. The results of the first quarter of FY2002 and the first quarter of FY2004 are not shown because the equipment failed. The results of second quarter FY2004 are not shown because time constrains precluded monitoring many of the wells at MDA G. A three-dimensional visualization, similar to that for MDA L, was initiated to evaluate the extent of VOCs at MDA G. However, to date, the spatial and temporal data are insufficient for meaningful three-dimensional interpretation. Further sampling of all the MDA G boreholes is anticipated to fill this data need.

5.0 TRENDS ESTABLISHED USING ANALYTICAL RESULTS FROM SUMMA CANISTERS

Wells 54-02002 and 54-02009 were selected to establish trends of TCA from 1997 to 2004 near the source areas of MDA L and MDA G respectively. Well 54-02002 has a total of 17 sampling events at 100 ft and 54-02009 has a total of 22 sampling events at 62 ft. These wells had the highest number of analytical samples taken since 1997. Well 54-02002 is located just southeast of the disposal shafts located in MDA L and consistently has the highest concentration of TCA, along with well 54-05012 (located along side the shafts in MDA L sampled at 28 ft (Figure 1). Well 54-02009 is located just south of disposal units 1 and 3 in the southeast corner of MDA G.

Both wells showed a decreasing trend of TCA over time until this last quarter. Well 54-02002 had readings double the usual value of TCA when sampled fourth quarter FY2004 (Figure 2). This reading was not included in the trend and is a lone point on the graph. Field screening with the B&K did not confirm an increase as concentrations were equivalent to that of previous quarters. This port will be sampled again next quarter to verify the measurement.

Since TCA degrades into 1,1-dichlorethene by elimination or 1,1-dichlorethane by reductive dechlorination. These analytes were also trended to observe degradation. 1,1-dichlorethene, detected in well 54-02002, shows an increasing trend, while 1,1-Dichlorethane shows a slope of almost zero (0.17) with a very slight increasing trend (Figure 3). In well 54-02009, 1,1-dichlorethane shows a decreasing trends while 1,1-dichlorethene shows a slightly increasing trend (Figure 4). Student t-test analysis, based on 95% confidence interval, also show the concentration of the analytes TCE and PCE decreasing at both wells over this period.

Wells 54-02002, 54-02009 and 54-02012 will continue to be monitored to establish trends. Other wells will continue to be sampled to develop a statistically meaningful data set for trend analysis.

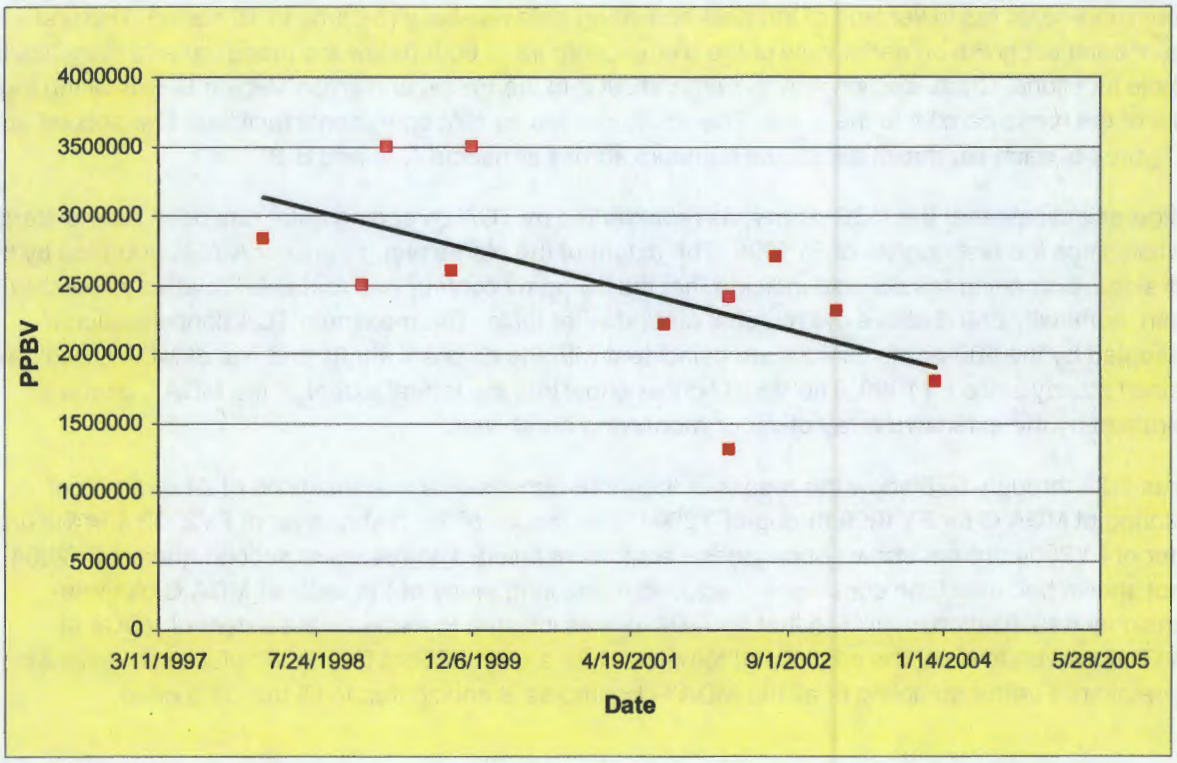

Figure 1. TCA trends of well 54-02012

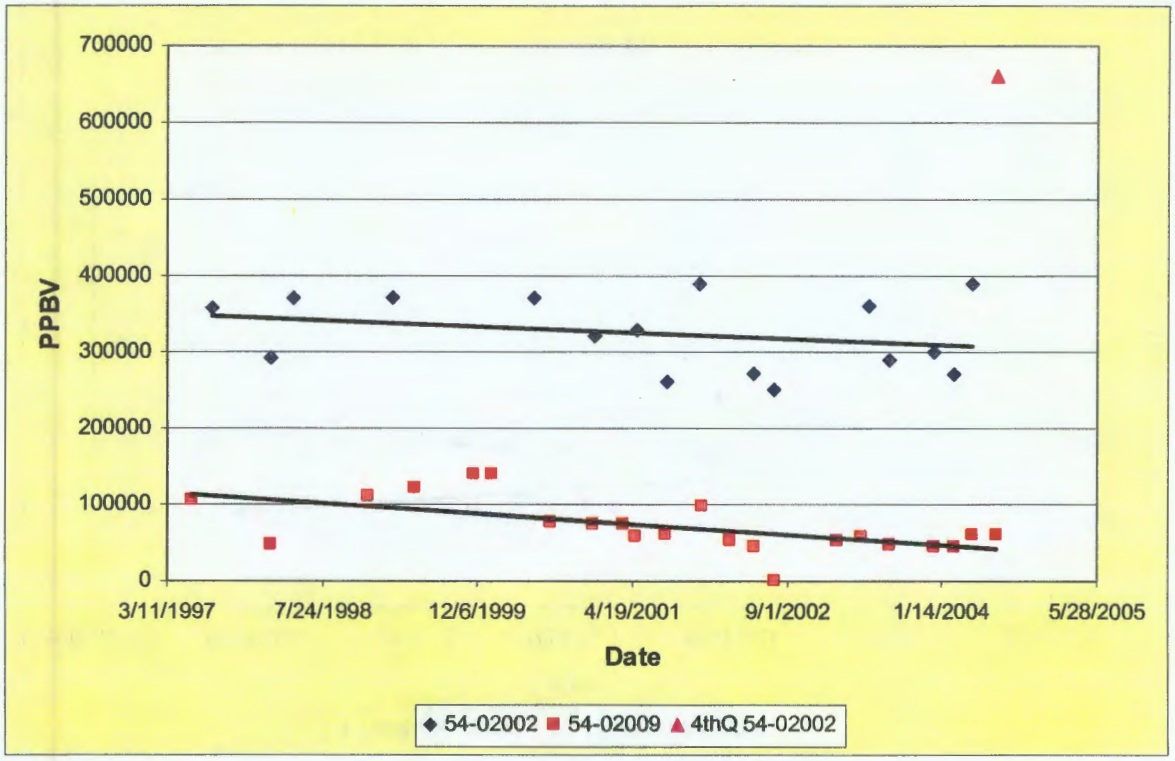

Figure 2. TCA trends of wells 54-02002 and 54-02009

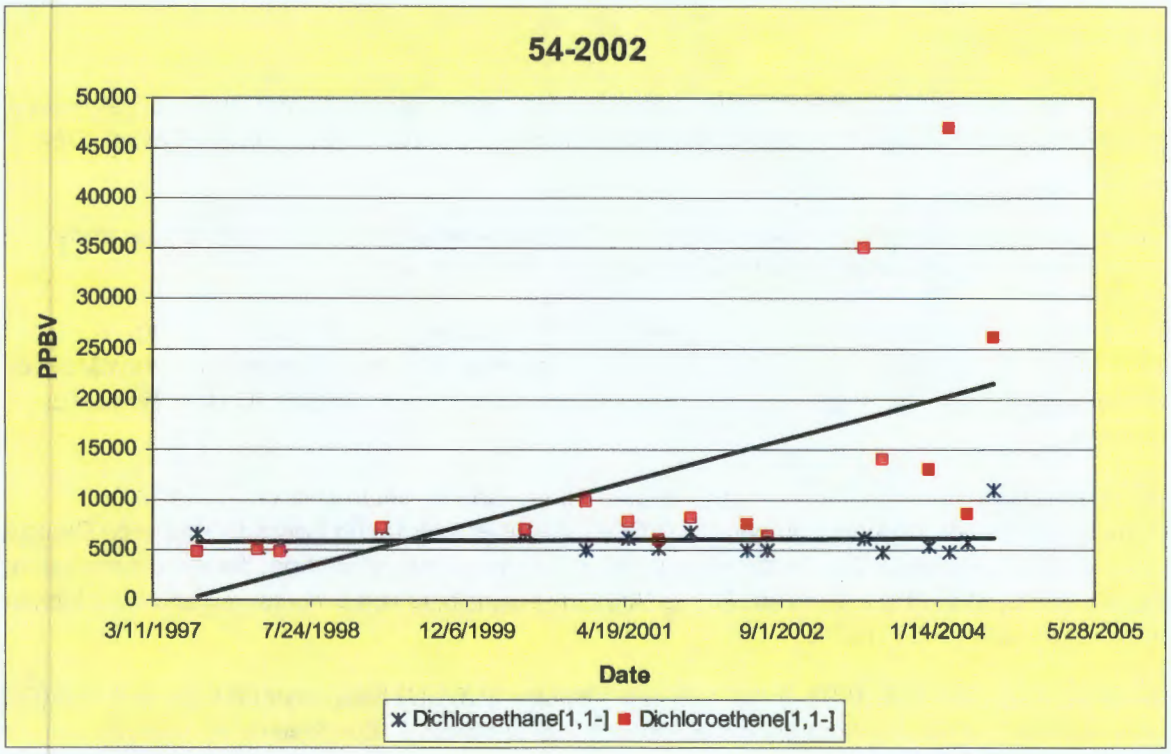

Figure 3. Trends of 1,1-dichloroethane and 1,1-dichloroethene of well 54-02002

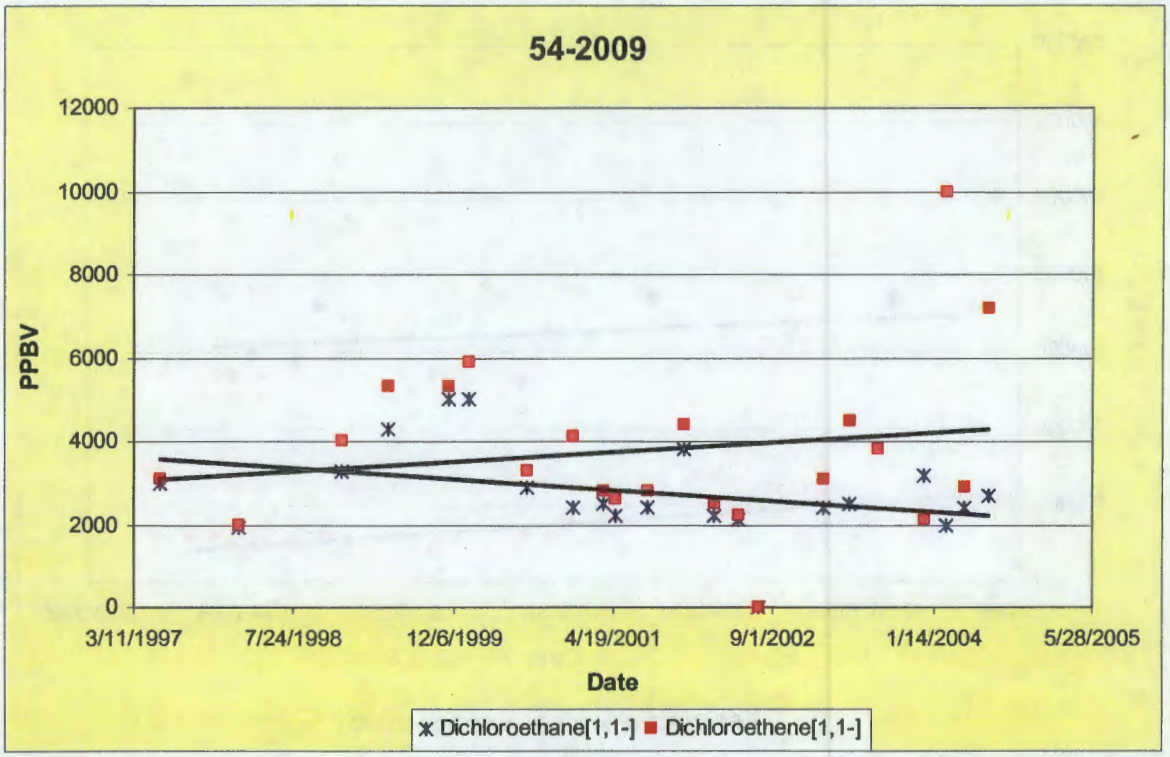

Figure 4. Trends of 1,1-dichloroethane and 1,1-dichloroethene of well 54-02009

6.0 REFERENCES

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ATTACHMENT 1
QUARTERLY FIELD-SCREENING RESULTS

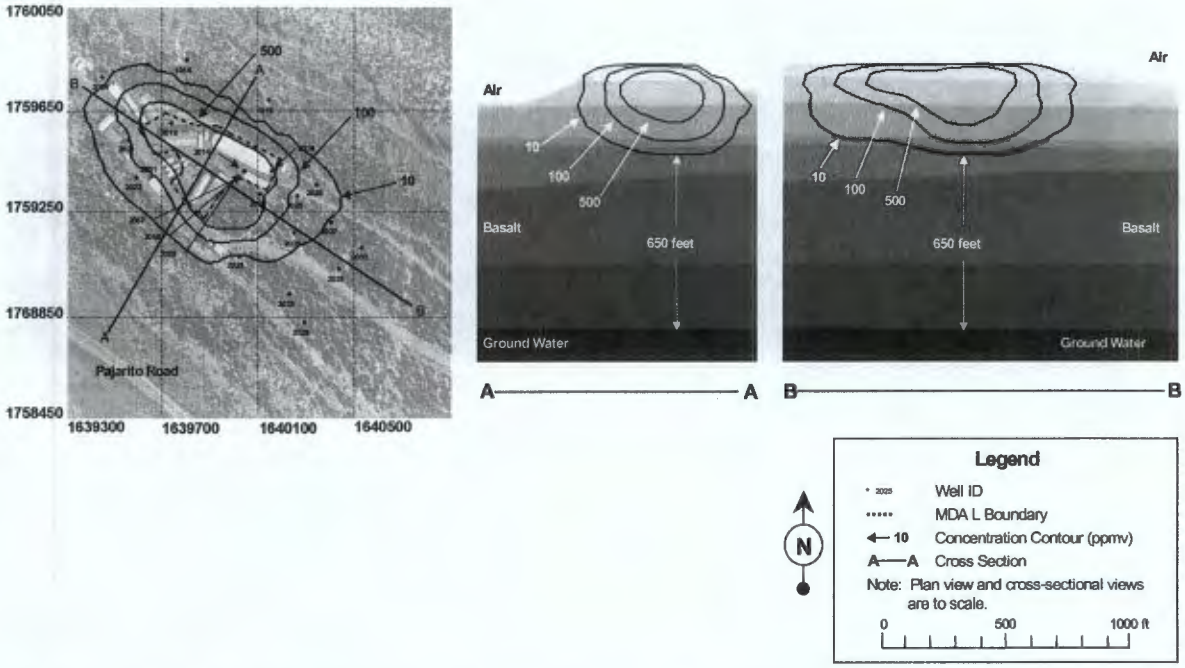


Figure 1-1. MDA L pore-gas sampling, 1st quarter 1999

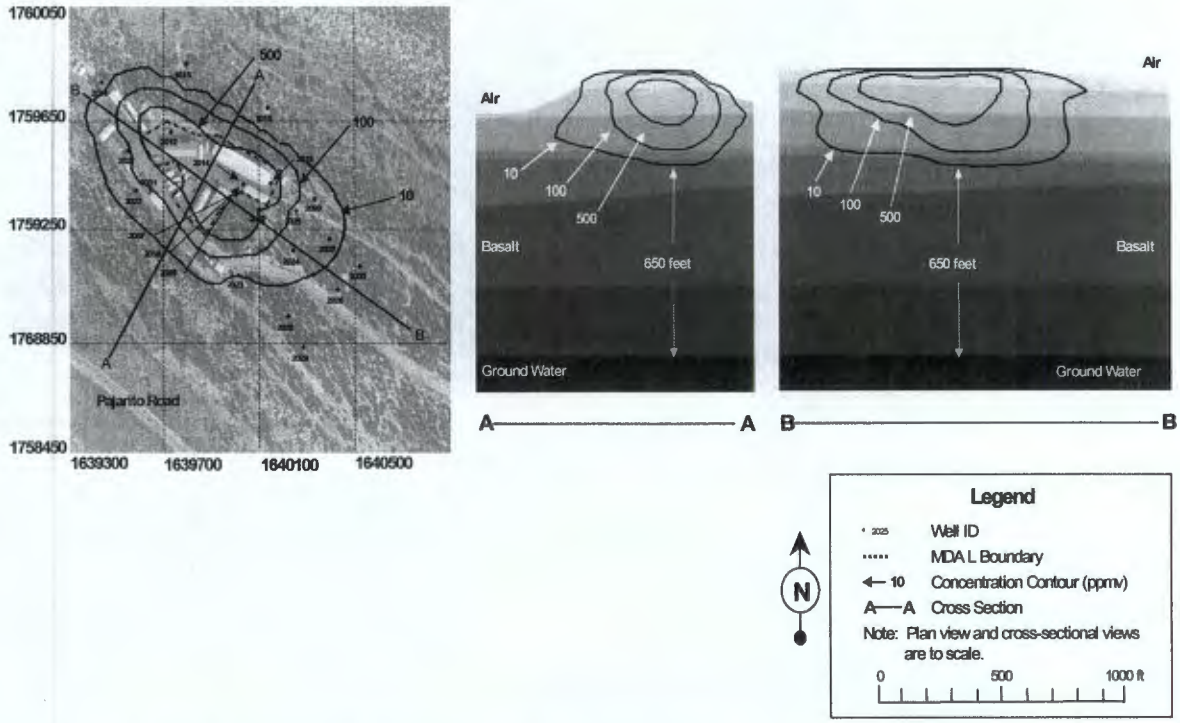


Figure 1-2. MDA L pore-gas sampling, 2nd quarter 1999

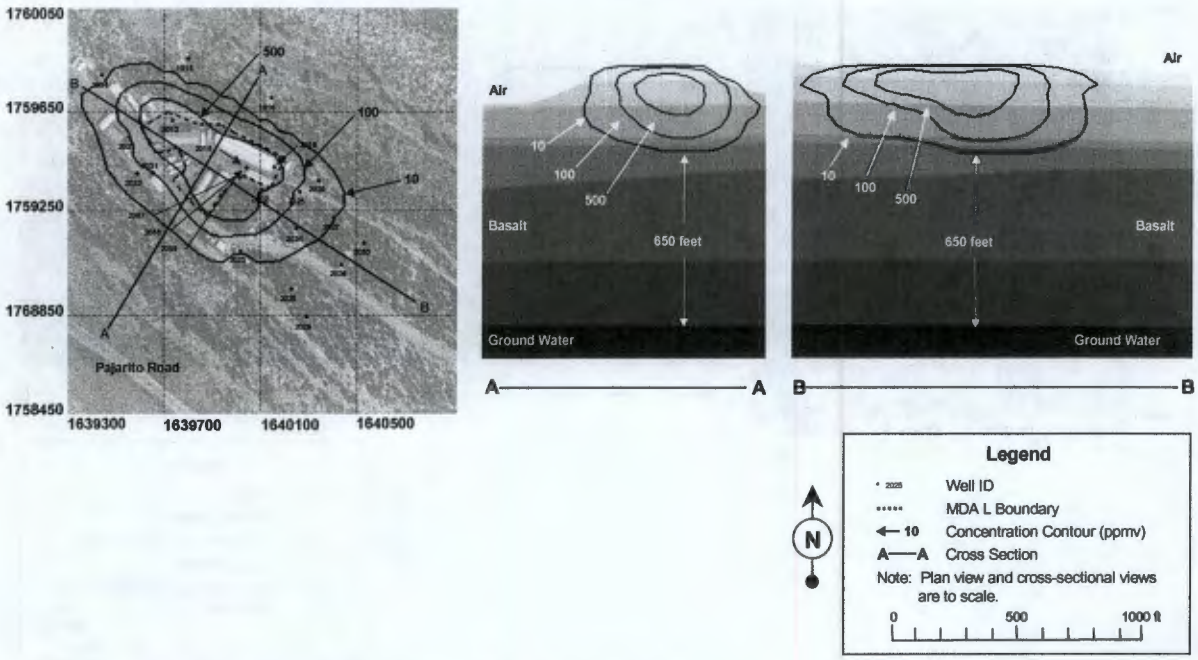


Figure 1-3. MDA L pore-gas sampling, 3rd quarter 1999

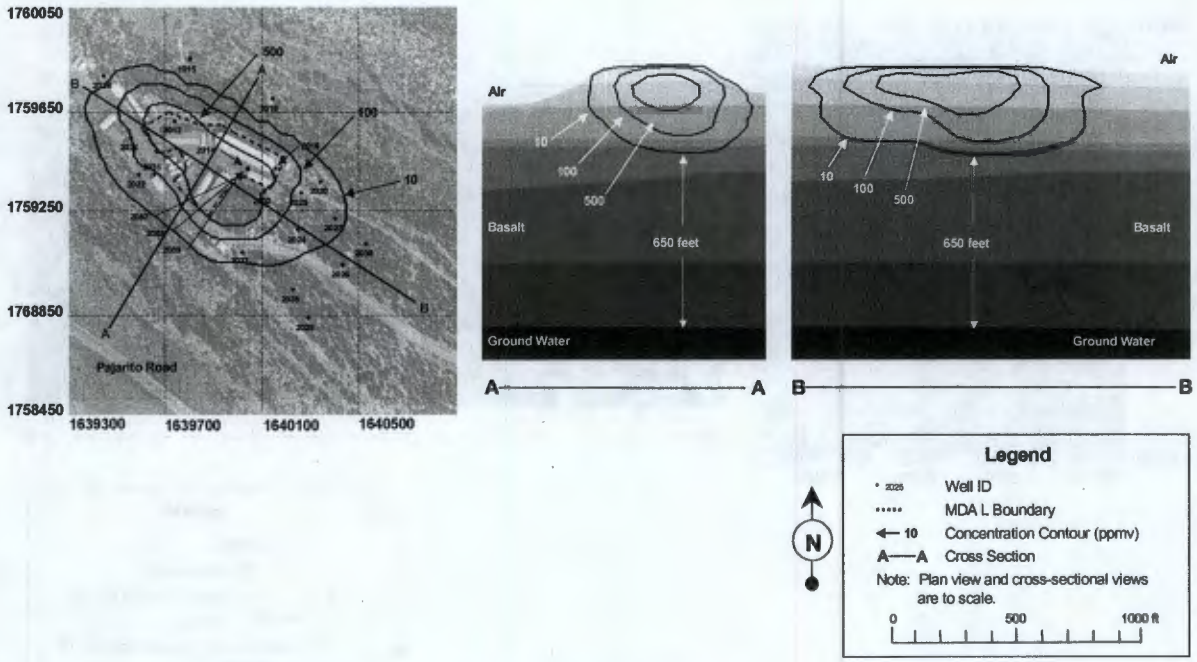


Figure 1-4. MDA L pore-gas sampling, 4th quarter 1999

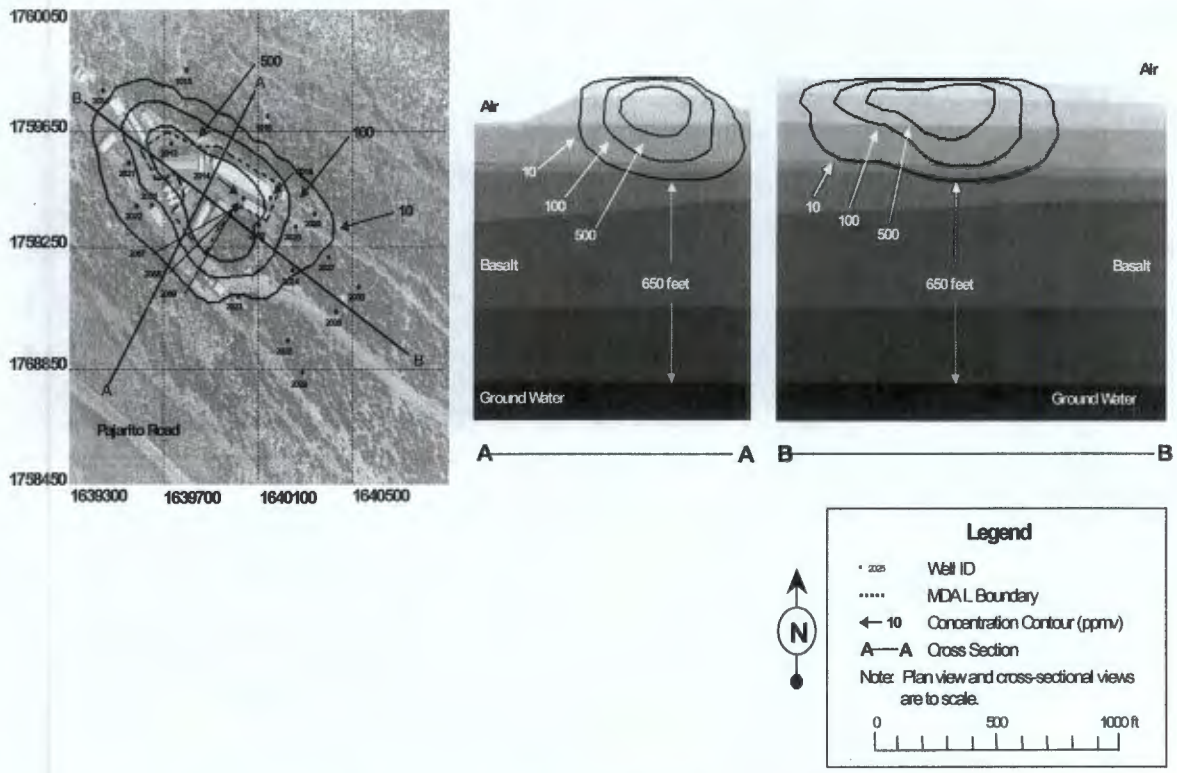


Figure 1-5. MDA L pore-gas sampling, 1st quarter 2000

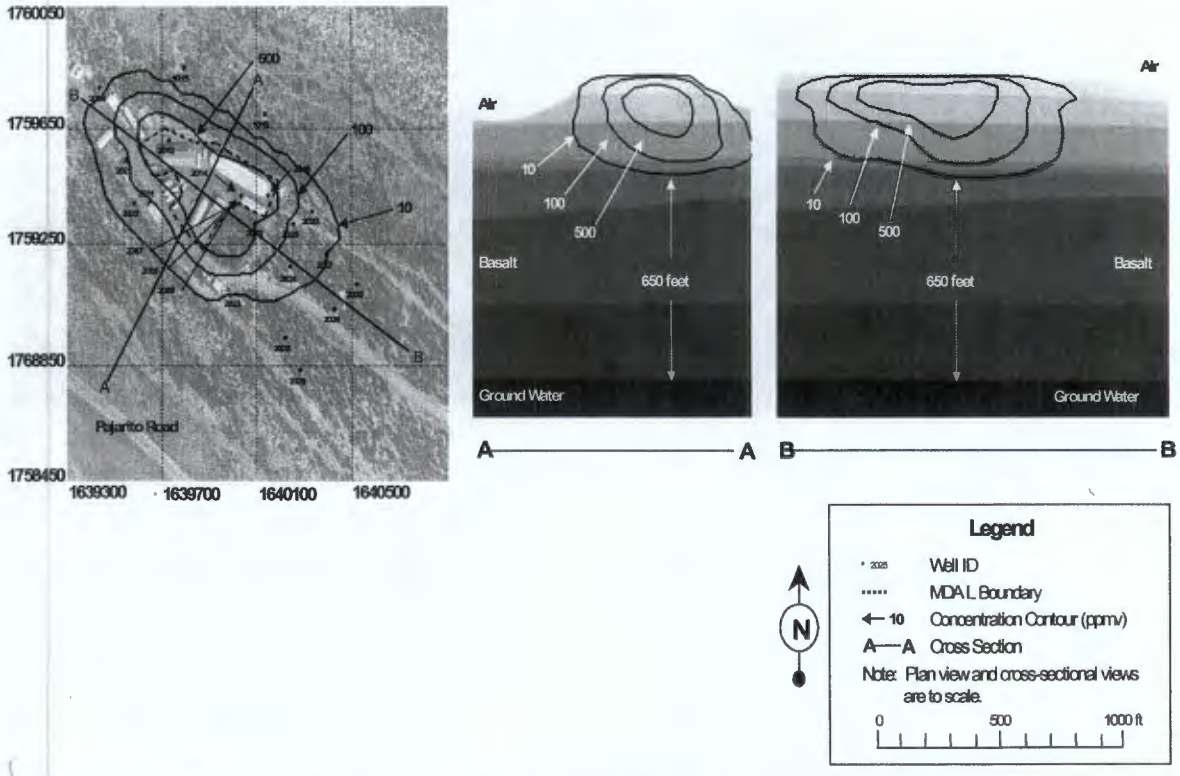


Figure 1-6. MDA L pore-gas sampling, 2nd quarter 2000

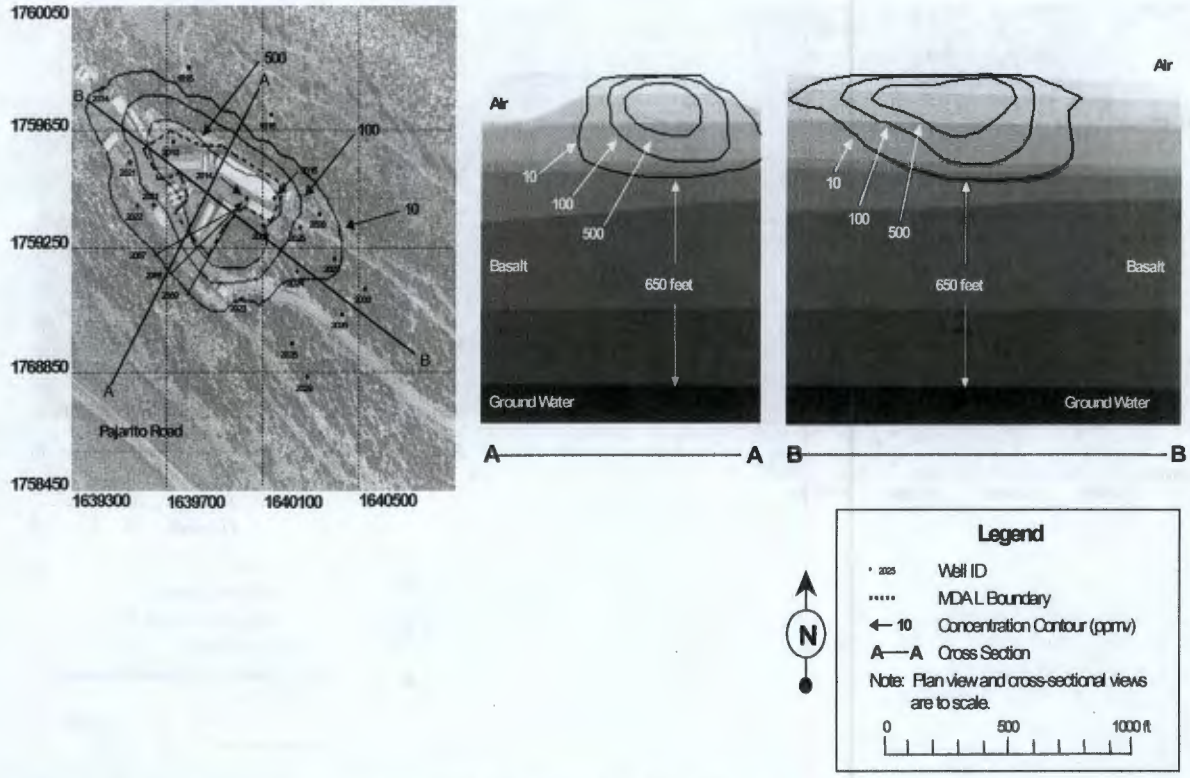


Figure 1-7. MDA L pore-gas sampling, 3rd Quarter 2000

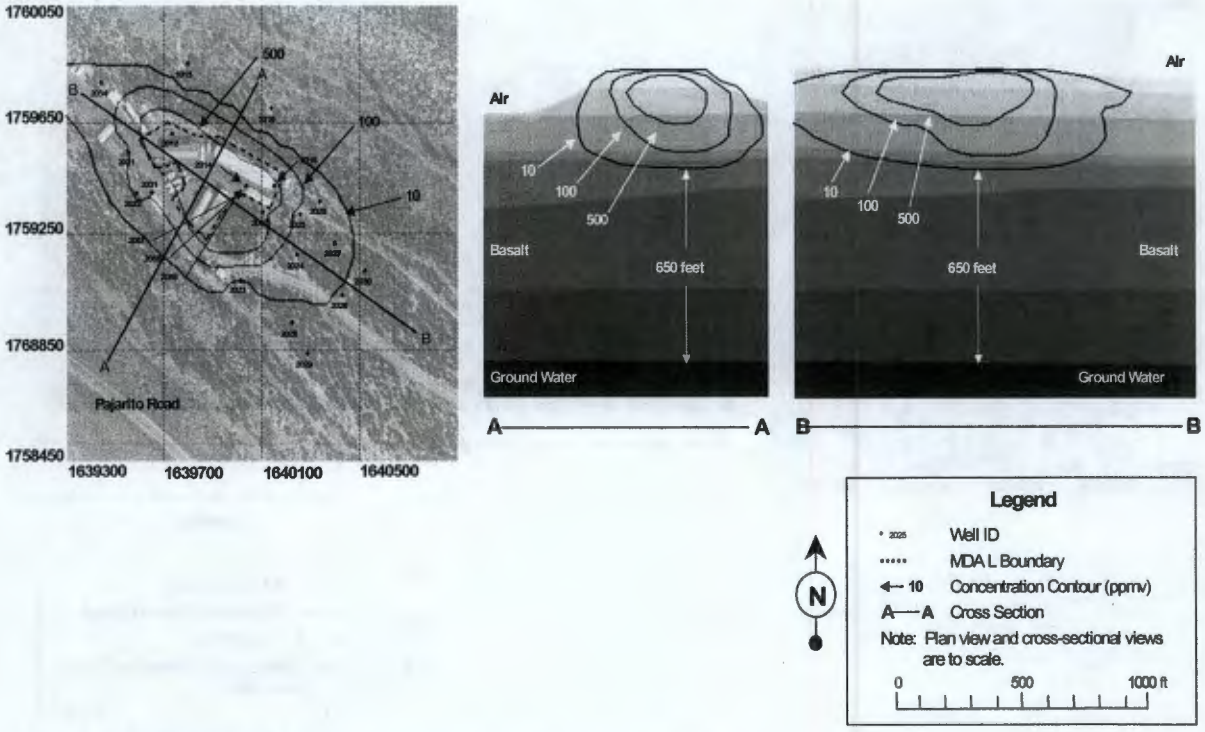


Figure 1-8. MDA L pore-gas sampling, 4th quarter 2000

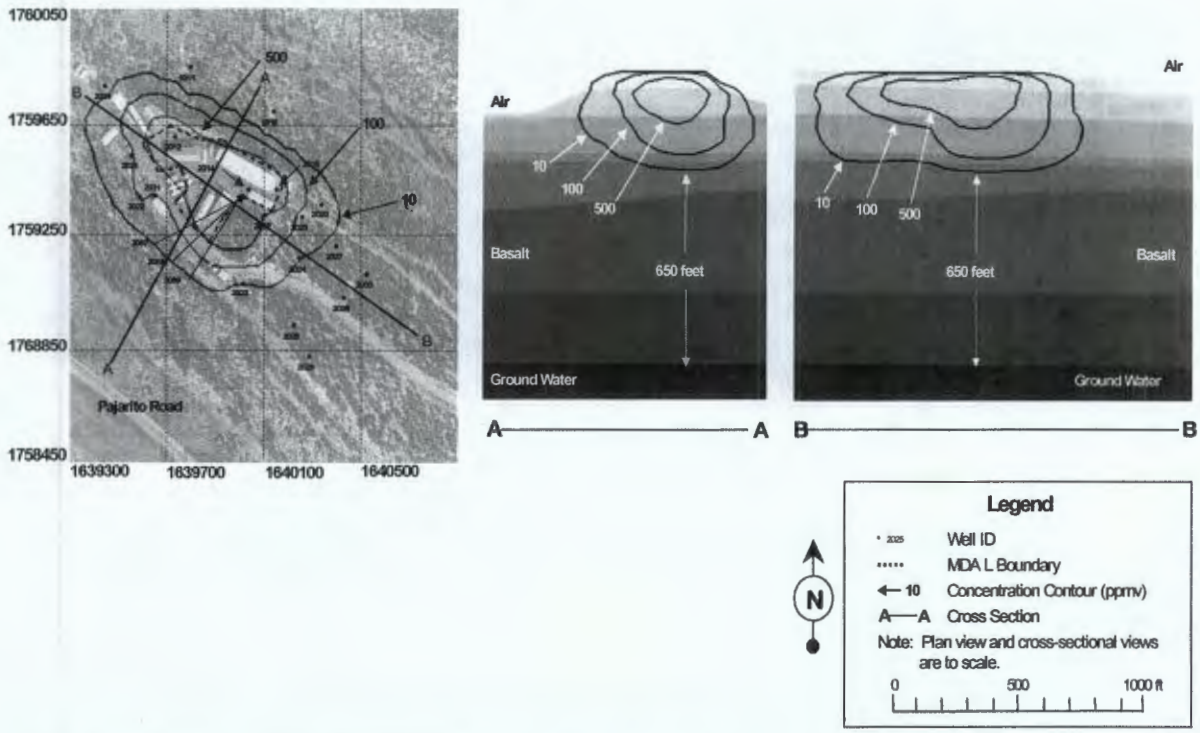
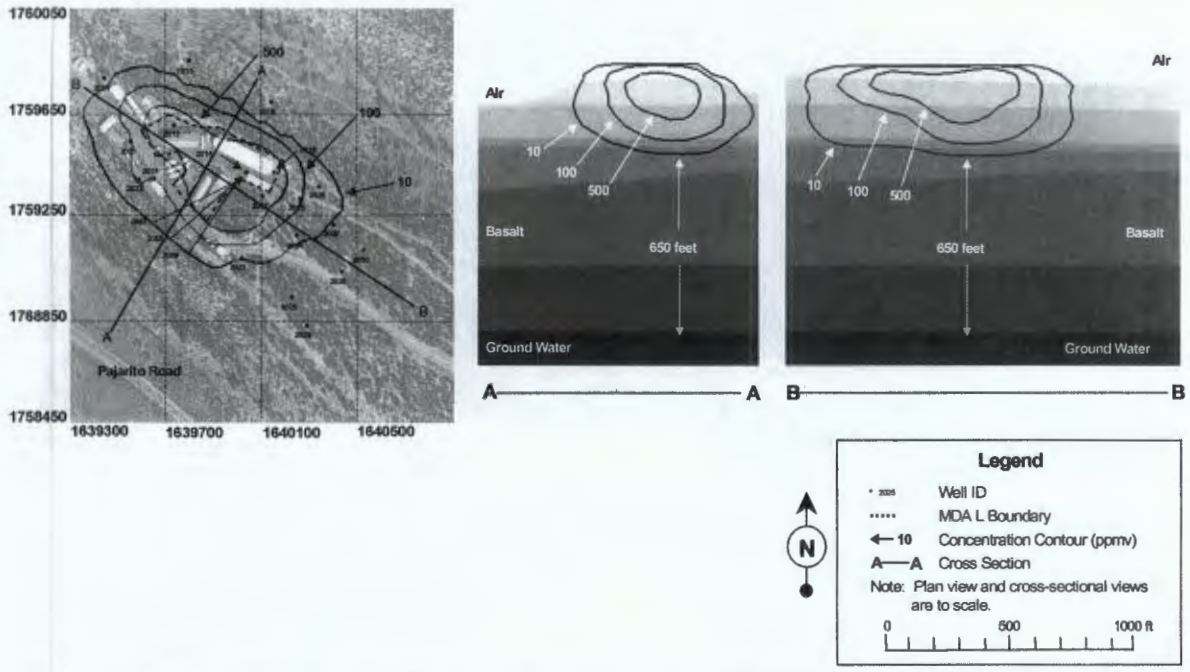
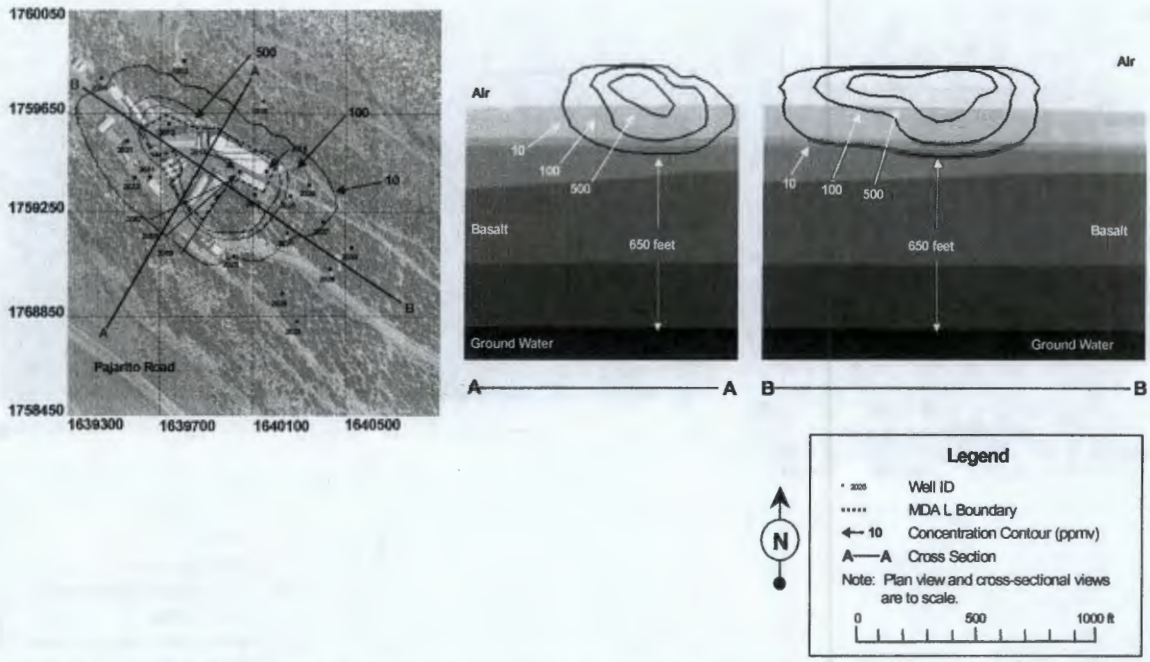


Figure 1-9. MDA L pore-gas sampling, 1st quarter 2001



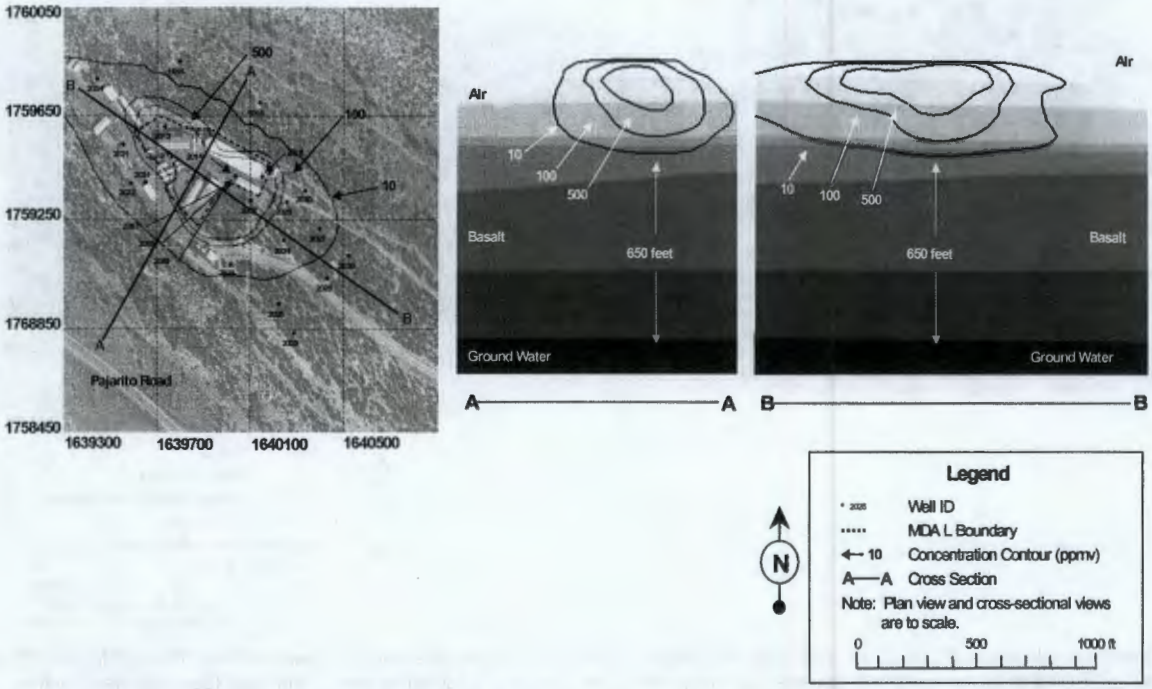
Data from boreholes 2087, 2088, and 2089 will be omitted from the pore-gas sampling analysis from Q2-2002 forward. It was determined that these wells had soil gas interaction from port to port in addition to interaction from the subsurface to the atmosphere because of the way the wells were constructed. Well 2014, which is located in close proximity to 2087, 2088, and 2089 can be used in the future to capture the soil gas data for that same location.

Figure 1-10. MDA L pore-gas sampling, 2nd quarter 2001



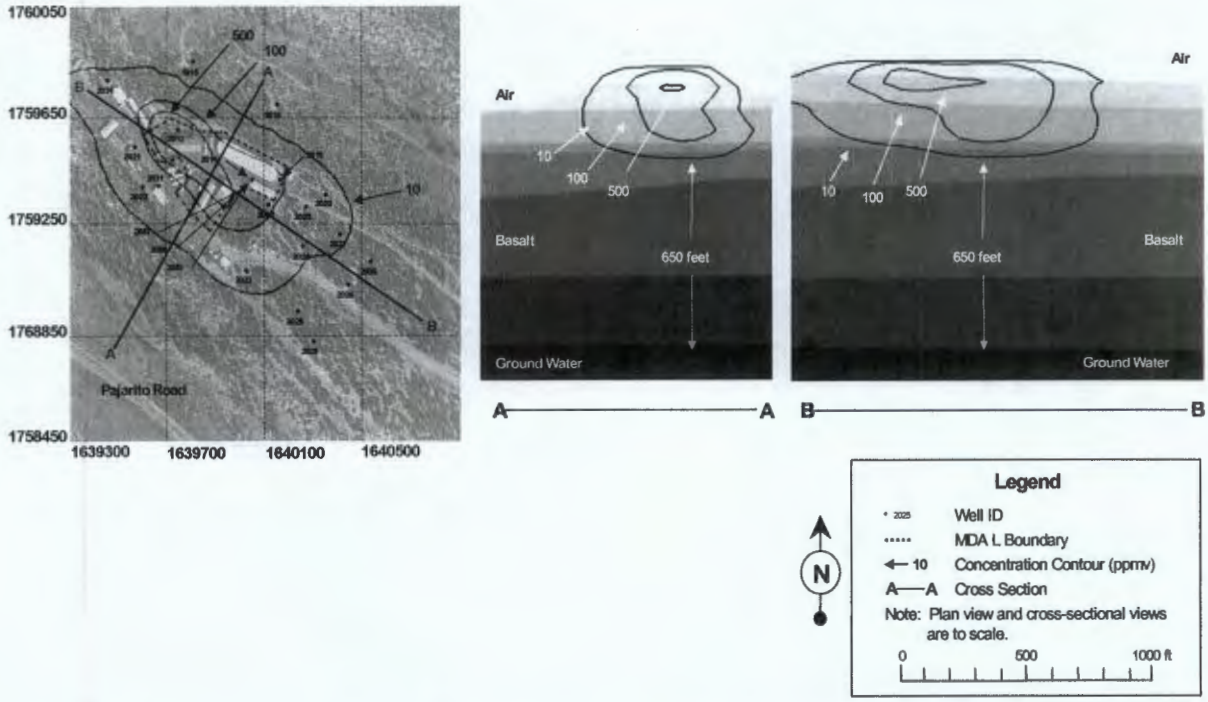
Data from boreholes 2087, 2088, and 2089 will be omitted from the pore-gas sampling analysis from Q2-2002 forward. It was determined that these wells had soil gas interaction from port to port in addition to interaction from the subsurface to the atmosphere because of the way the wells were constructed. Well 2014, which is located in close proximity to 2087, 2088, and 2089 can be used in the future to capture the soil gas data for that same location.

Figure 1-11. MDA L pore-gas sampling, 3rd quarter 2001



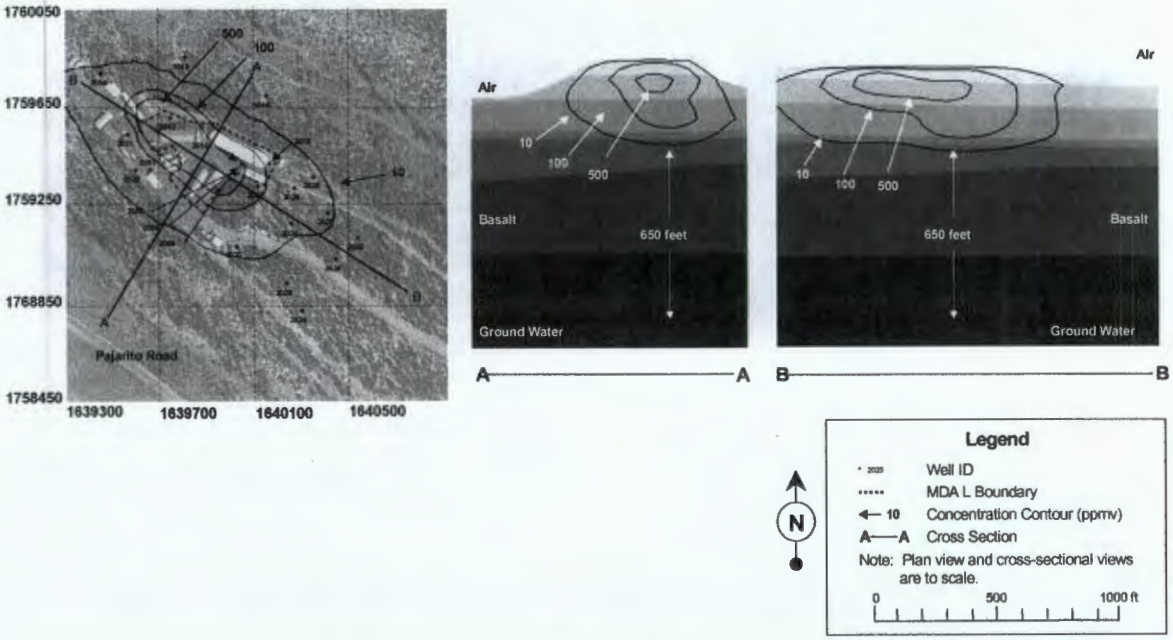
Data from boreholes 2087, 2088, and 2089 will be omitted from the pore-gas sampling analysis from Q2-2002 forward. It was determined that these wells had soil gas interaction from port to port in addition to interaction from the subsurface to the atmosphere because of the way the wells were constructed. Well 2014, which is located in close proximity to 2087, 2088, and 2089 can be used in the future to capture the soil gas data for that same location

Figure 1-12. MDA L pore-gas sampling, 4th quarter 2001



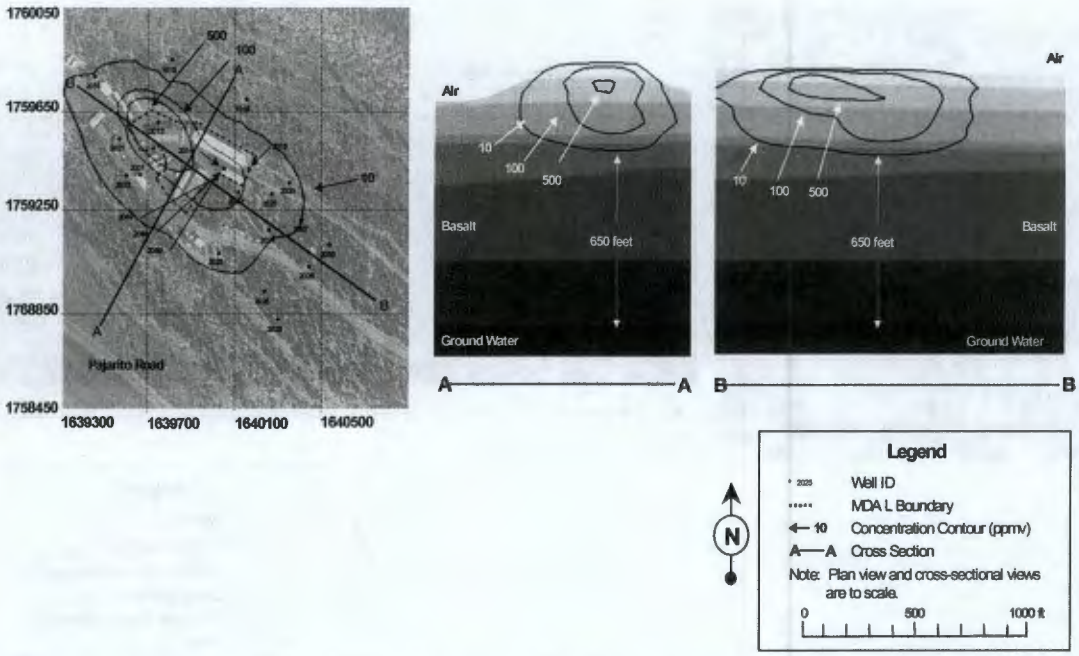
Data from boreholes 2087, 2088, and 2089 will be omitted from the pore-gas sampling analysis from Q2-2002 forward. It was determined that these wells had soil gas interaction from port to port in addition to interaction from the subsurface to the atmosphere because of the way the wells were constructed. Well 2014, which is located in close proximity to 2087, 2088, and 2089 can be used in the future to capture the soil gas data for that same location.

Figure 1-13. MDA L pore-gas sampling, 2nd quarter 2002



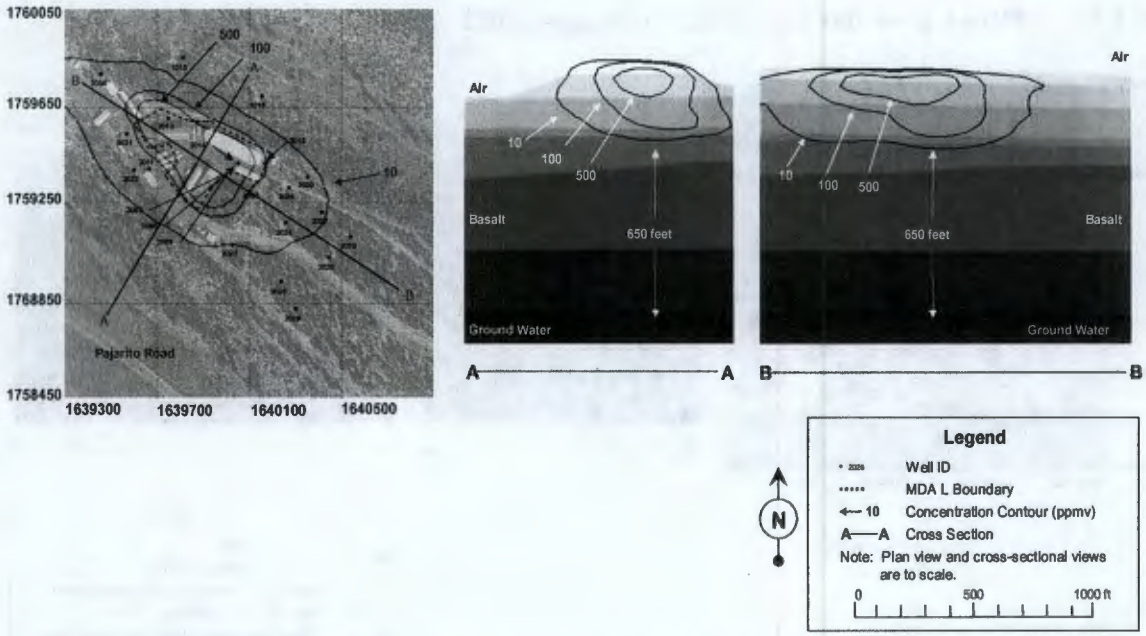
Data from boreholes 2087, 2088, and 2089 will be omitted from the pore-gas sampling analysis from Q2-2002 forward. It was determined that these wells had soil gas interaction from port to port in addition to interaction from the subsurface to the atmosphere because of the way the wells were constructed. Well 2014, which is located in close proximity to 2087, 2088, and 2089 can be used in the future to capture the soil gas data for that same location.

Figure 1-14. MDA L pore-gas sampling, 3rd quarter 2002



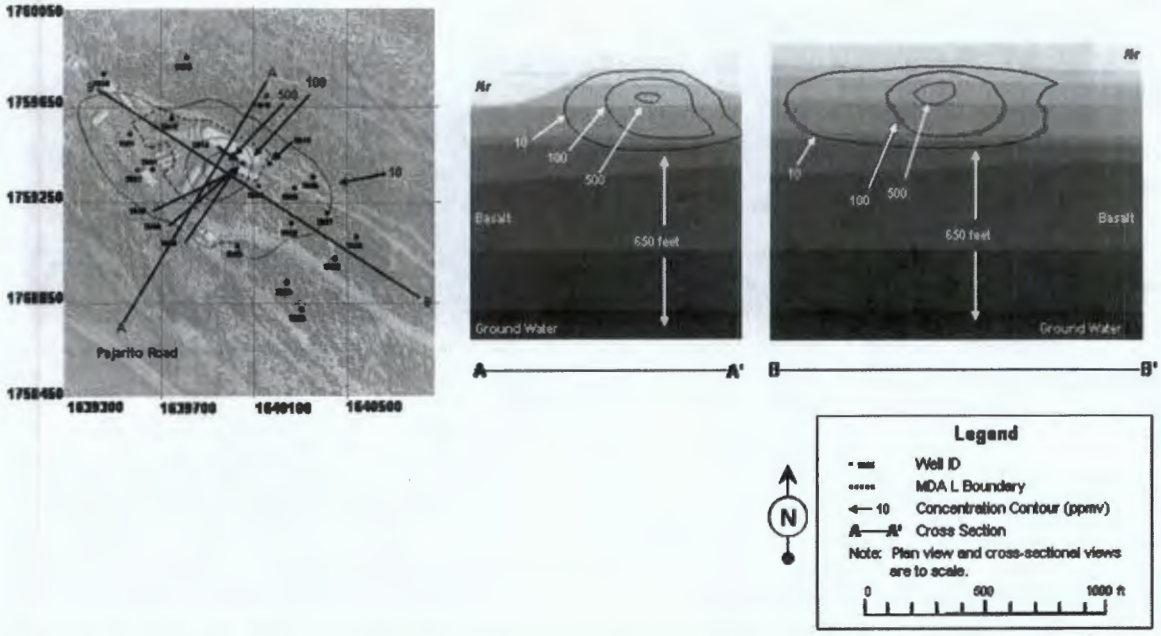
*Data from boreholes 2087, 2088, and 2089 will be omitted from the pore-gas sampling analysis from Q2-2002 forward. It was determined that these wells had soil gas interaction from port to port in addition to interaction from the subsurface to the atmosphere because of the way the wells were constructed. Well 2014, which is located in close proximity to 2087, 2088, and 2089 can be used in the future to capture the soil gas data for that same location.

Figure 1-15. MDA L pore-gas sampling, 4th quarter 2002



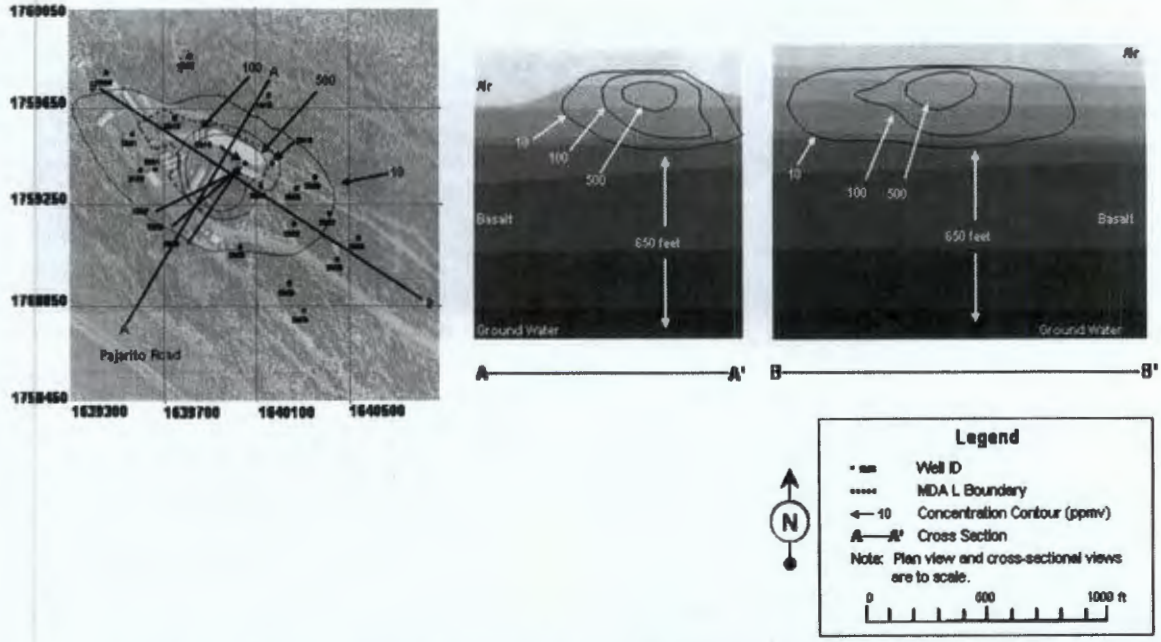
* Well 2014, which has historically shown the highest concentration of TCA had blocked ports this quarter. Therefore borehole 2089, one of the three wells that was omitted from the 2002 data analysis due to poor construction, was selected as a replacement for borehole 2014. Borehole 2089 was chosen as the best replacement for 2014 because it was close in proximity to 2014 and it was constructed in a better manner than 2087 and 2088. Data from boreholes 2087 and 2088 was not used in this analysis. Well 2014 will be monitored closely in the coming months to determine if the blockage noted this quarter was temporary (i.e., caused by frozen condensation) or is a permanent blockage. It is important to note that two wells are slated to be drilled in 2003 at MDA L and will be located in close proximity to well 2014.

Figure 1-16. MDA L pore-gas sampling, 1st quarter 2003



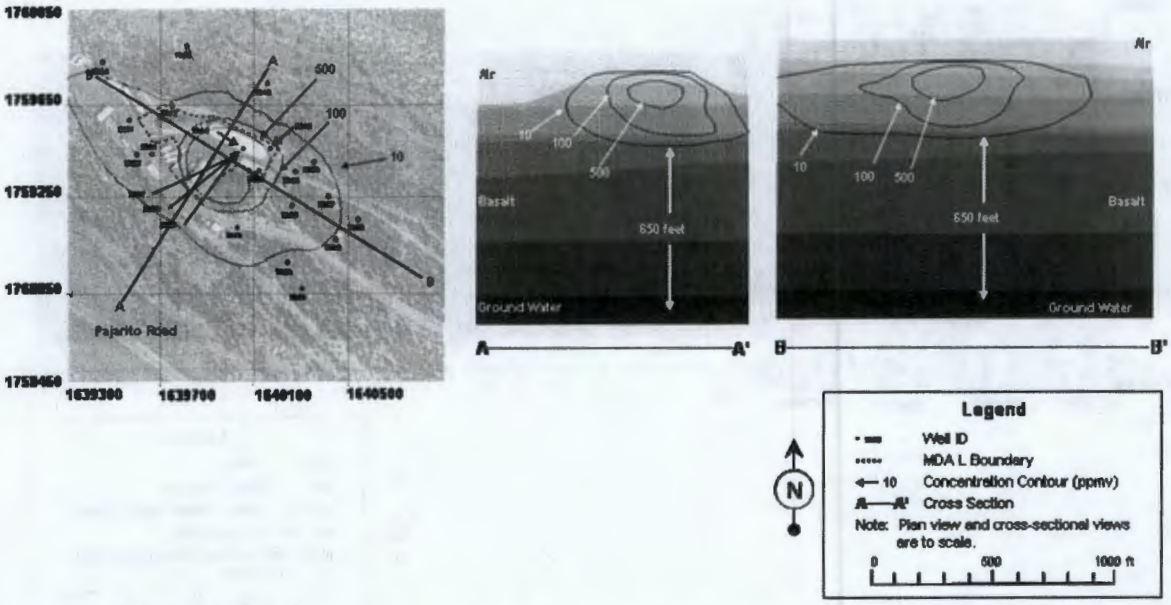
* Well 2014, which has historically shown the highest concentration of TCA had blocked ports this quarter. Therefore borehole 2089, one of the three wells that was omitted from the 2002 data analysis due to poor construction, was selected as a replacement for borehole 2014. Borehole 2089 was chosen as the best replacement for 2014 because it was close in proximity to 2014 and it was constructed in a better manner than 2087 and 2088. Data from boreholes 2087 and 2088 was not used in this analysis.

Figure 1-17. MDA L pore-gas sampling, 2nd quarter 2003



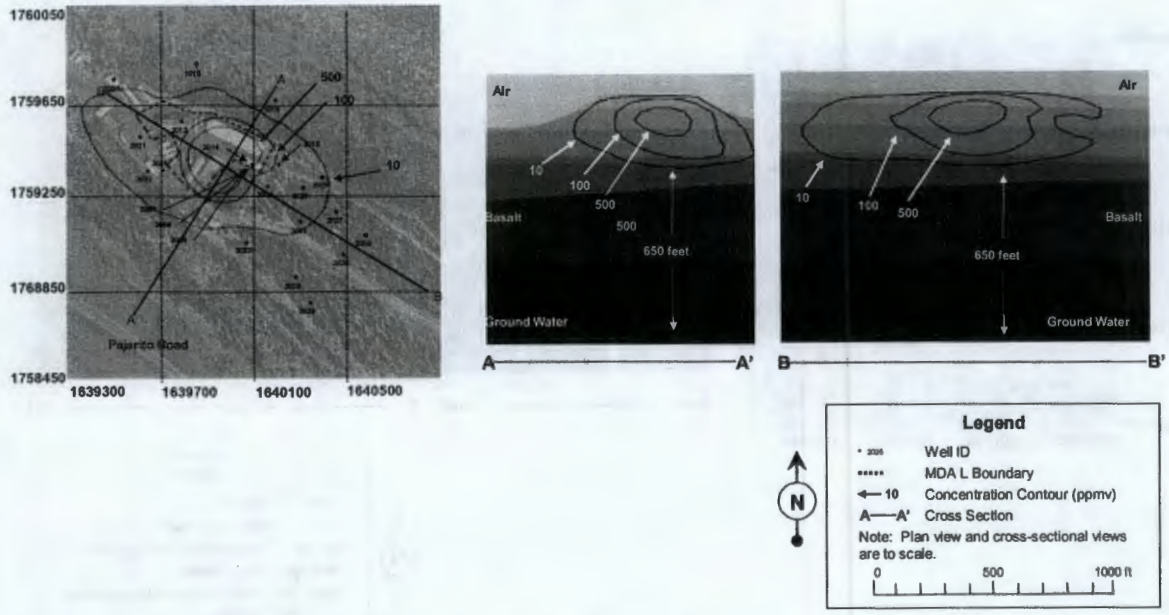
* Well 2014, which has historically shown the highest concentration of TCA had blocked ports this quarter. Therefore borehole 2089, one of the three wells that was omitted from the 2002 data analysis due to poor construction, was selected as a replacement for borehole 2014. Borehole 2089 was chosen as the best replacement for 2014 because it was close in proximity to 2014 and it was constructed in a better manner than 2087 and 2088. The data for 2089 was averaged for this quarter using 9 previous quarters. The averages were used due to the uncommonly low readings on this well for this quarter. Data from boreholes 2087 and 2088 was not used in this analysis.

Figure 1-18. MDA L pore-gas sampling, 3rd quarter 2003



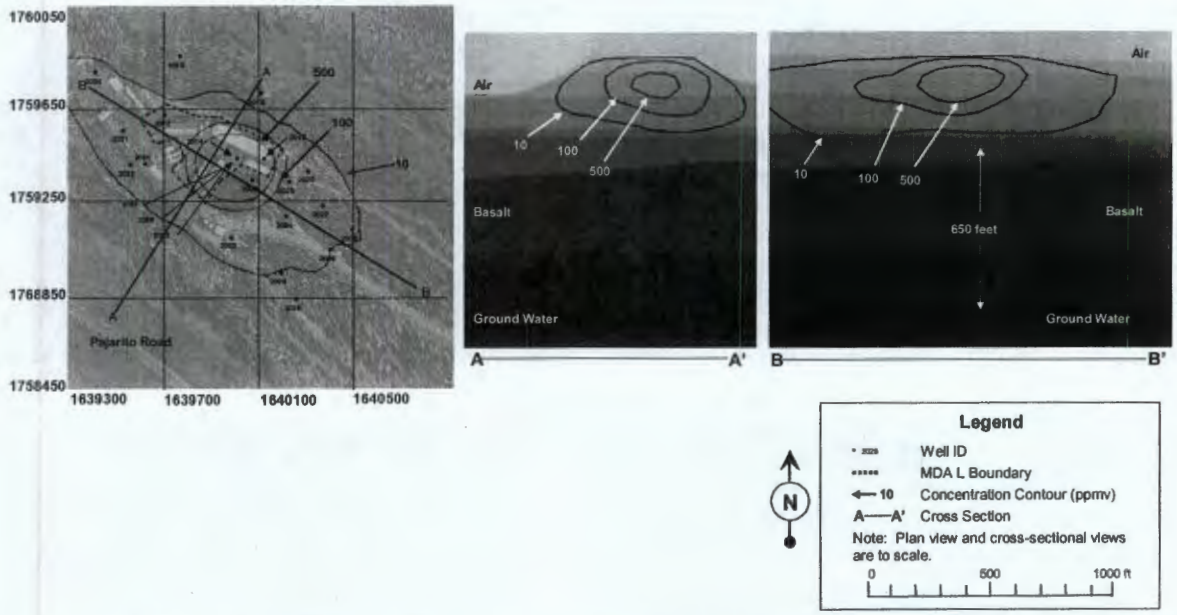
* Well 2014, which has historically shown the highest concentration of TCA had blocked ports this quarter. Therefore borehole 2089, one of the three wells that was omitted from the 2002 data analysis due to poor construction, was selected as a replacement for borehole 2014. Borehole 2089 was chosen as the best replacement for 2014 because it was close in proximity to 2014 and it was constructed in a better manner than 2087 and 2088. Data from boreholes 2087 and 2088 was not used in this analysis.

Figure 1-19. MDA L pore-gas sampling, 4th quarter 2003



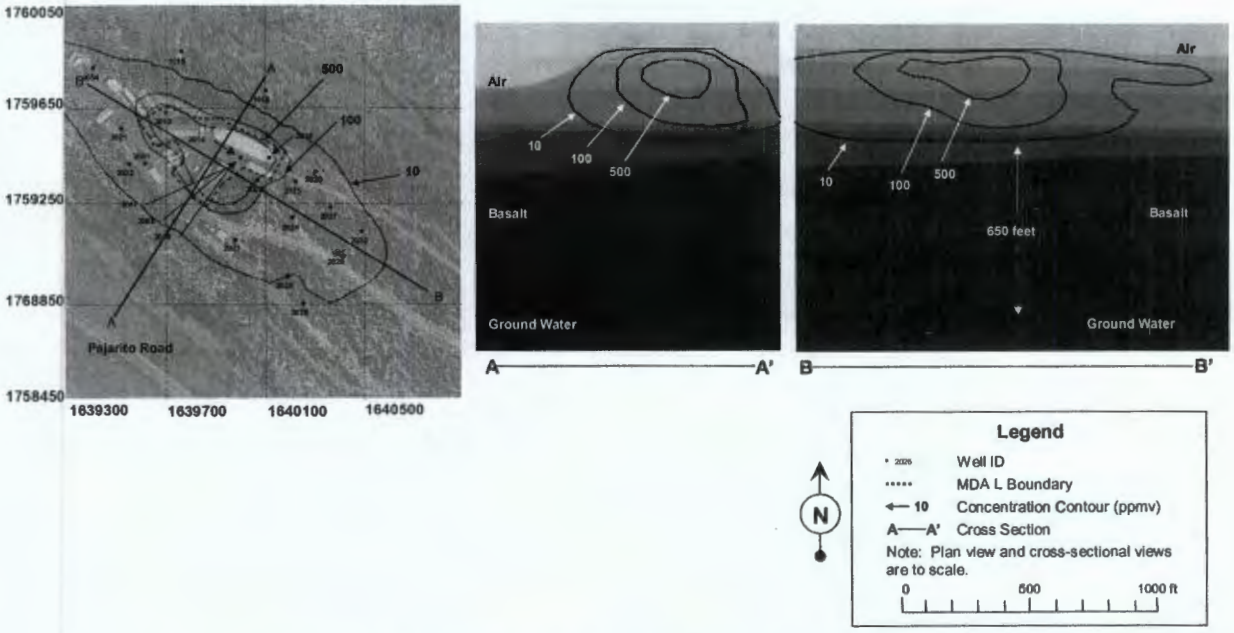
* Well 2014, which has historically shown the highest concentration of TCA had blocked ports this quarter. Therefore borehole 2089, one of the three wells that was omitted from the 2002 data analysis due to poor construction, was selected as a replacement for borehole 2014. Borehole 2089 was chosen as the best replacement for 2014 because it was close in proximity to 2014 and it was constructed in a better manner than 2087 and 2088. Data from boreholes 2087 and 2088 was not used in this analysis.

Figure 1-20. MDA L pore-gas sampling, 2nd quarter 2004



* Well 2014, which has historically shown the highest concentration of TCA had blocked ports this quarter. Therefore borehole 2089, one of the three wells that was omitted from the 2002 data analysis due to poor construction, was selected as a replacement for borehole 2014. Borehole 2089 was chosen as the best replacement for 2014 because it was close in proximity to 2014 and it was constructed in a better manner than 2087 and 2088. Data from boreholes 2087 and 2088 was not used in this analysis.

Figure 1-21. MDA L pore-gas sampling, 3rd quarter 2004



* Borehole 2089, one of the three wells that was omitted from the 2002 data analysis due to poor construction, was selected as a replacement for borehole 2014 which has blocked ports. Borehole 2089 was chosen as the best replacement for 2014 because it was close in proximity to 2014 and it was constructed in a better manner than 2087 and 2088. Data from boreholes 2087 and 2088 was not used in this analysis.

Figure 1-22. MDA L pore-gas sampling, 4th quarter 2004

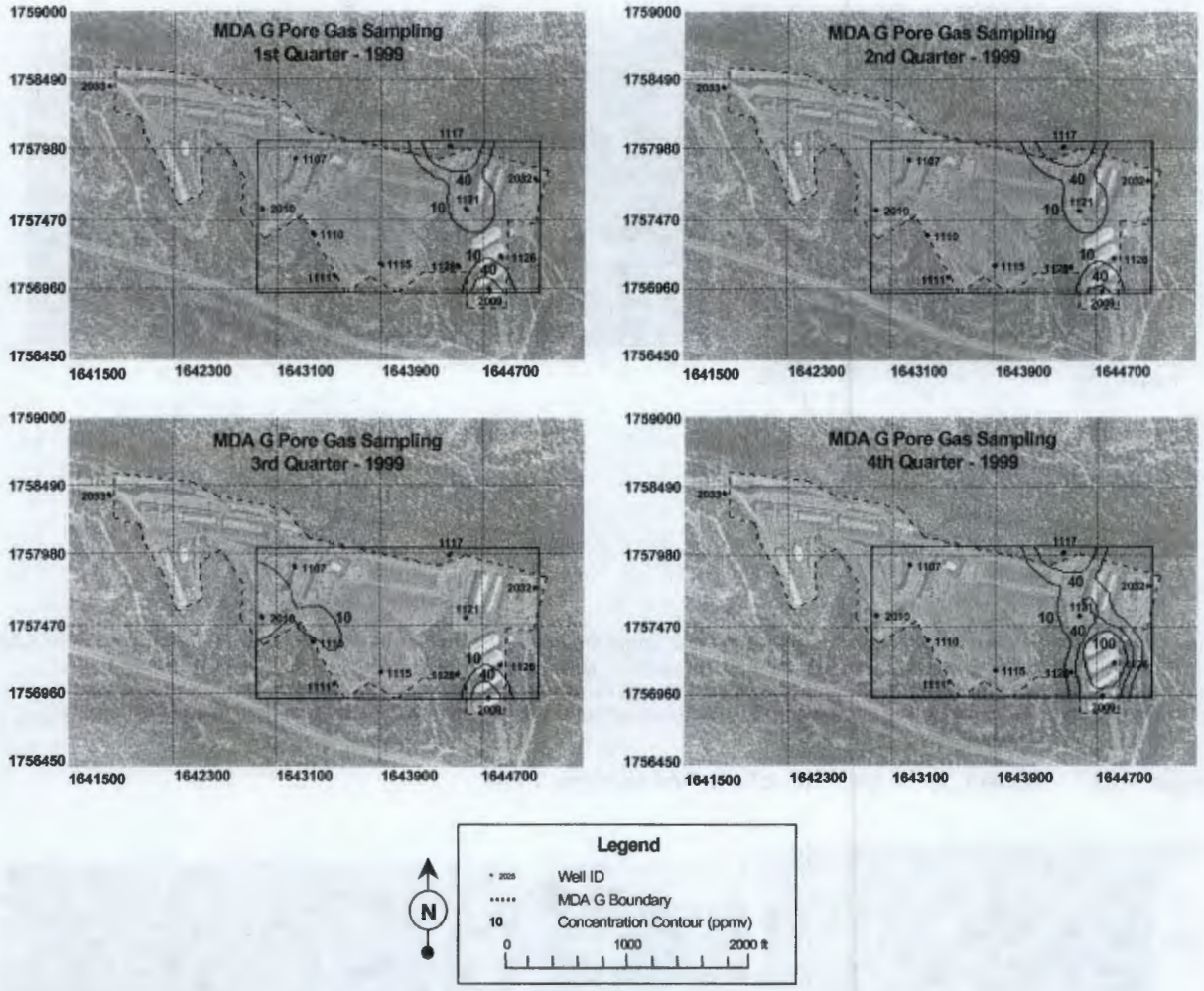
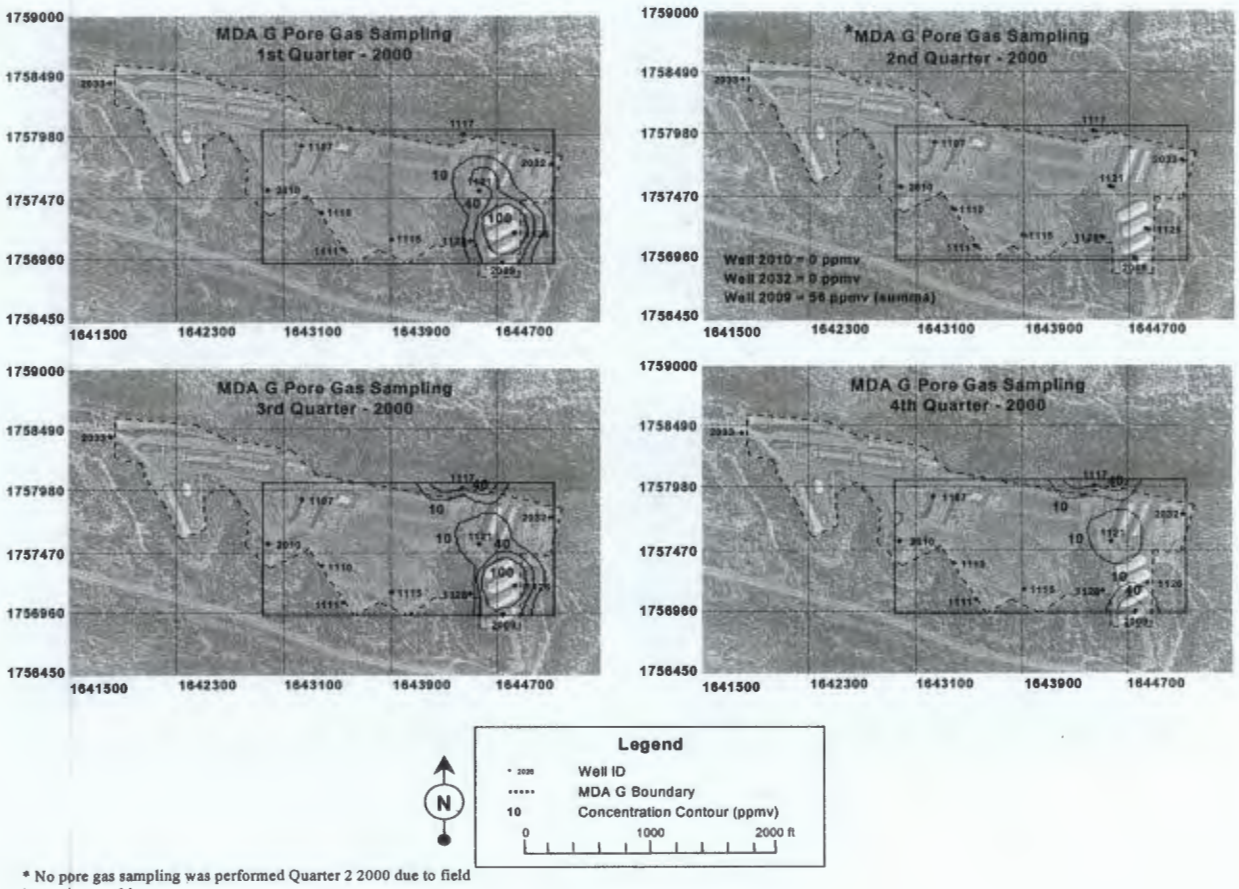


Figure 1-23. MDA G pore-gas sampling, 1999



* No pore gas sampling was performed Quarter 2 2000 due to field instrument problems.

Figure 1-24. MDA G pore-gas sampling, 2000

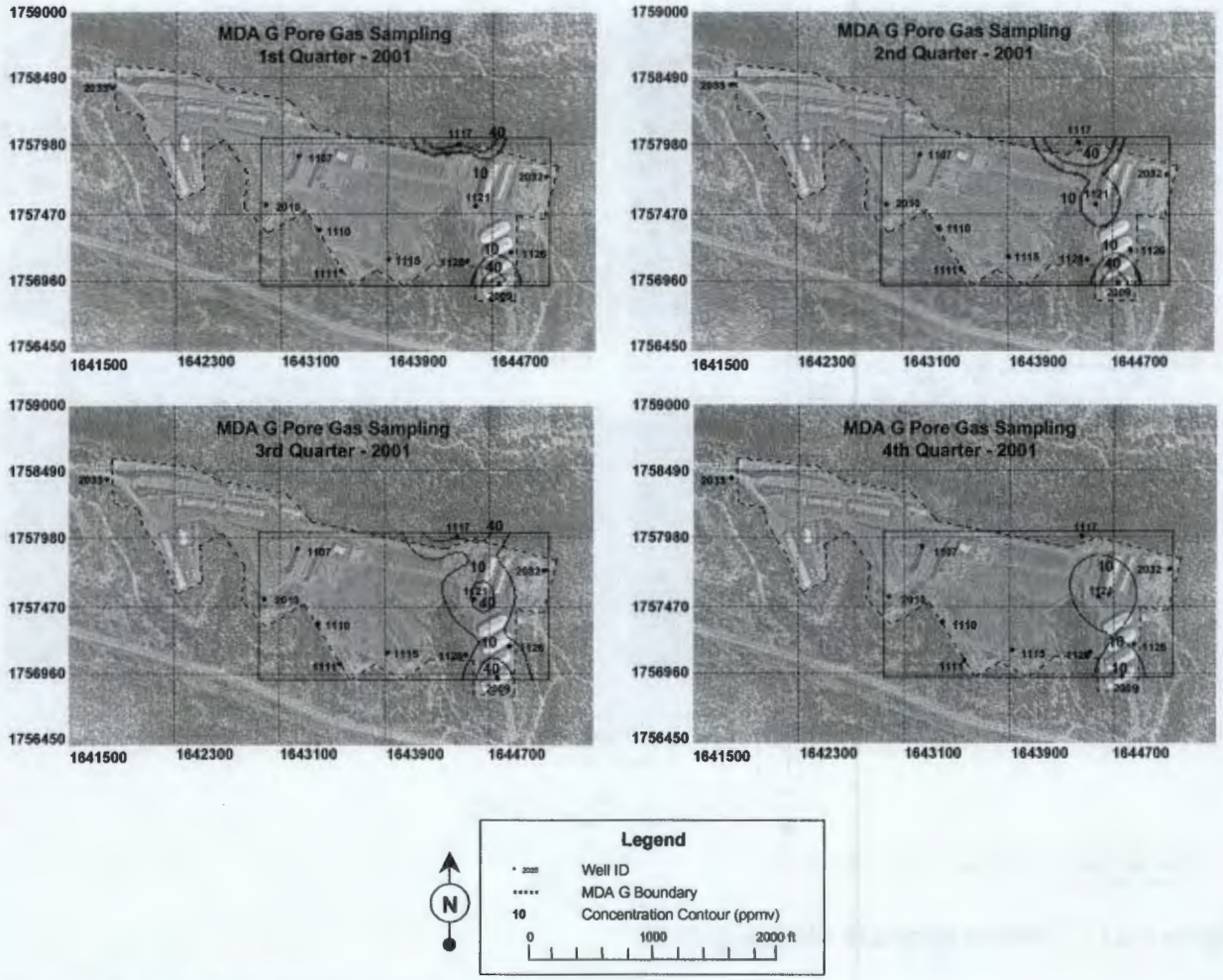
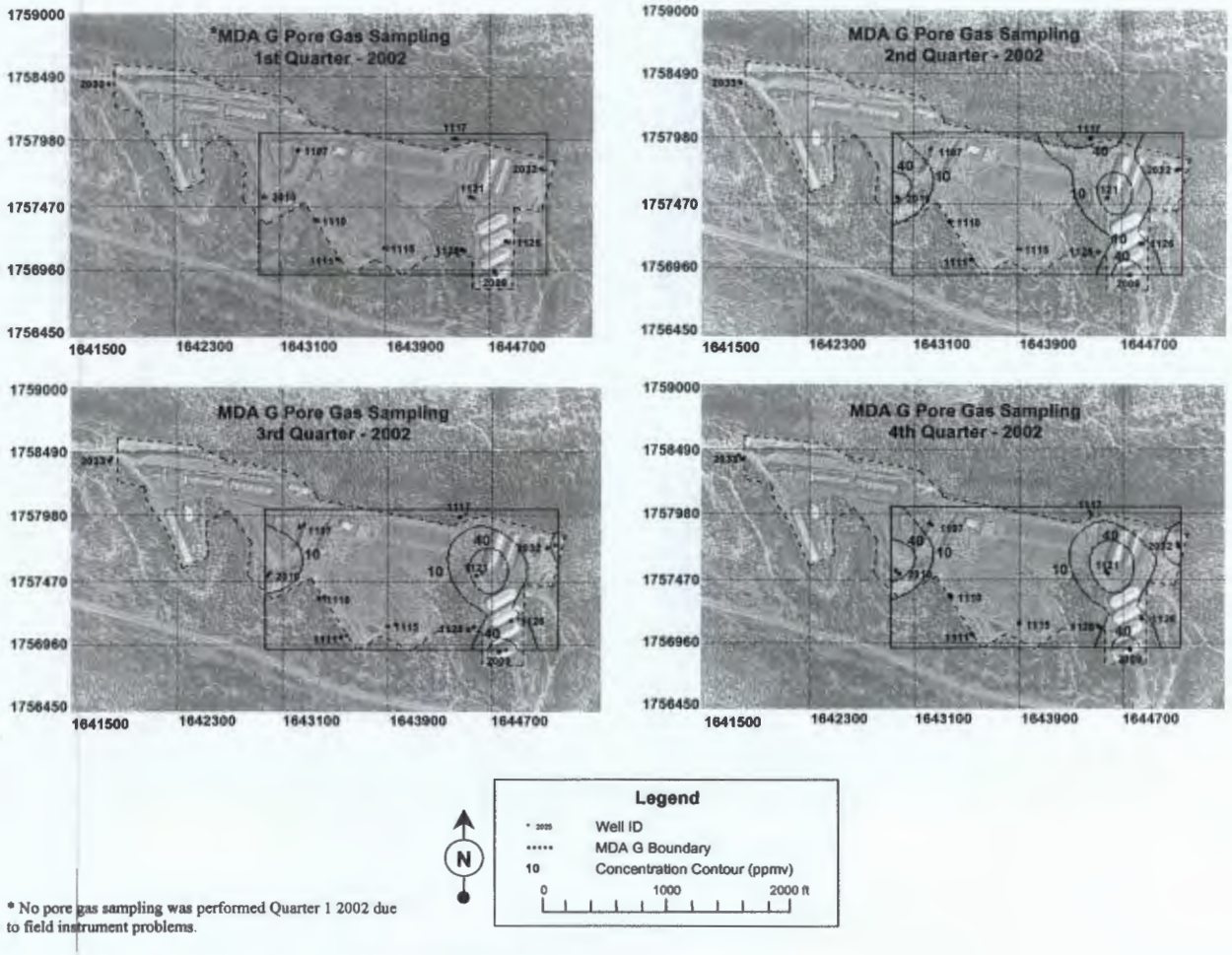


Figure 1-25. MDA G pore-gas sampling, 2001



* No pore gas sampling was performed Quarter 1 2002 due to field instrument problems.

Figure 1-26. MDA G pore-gas sampling, 2002

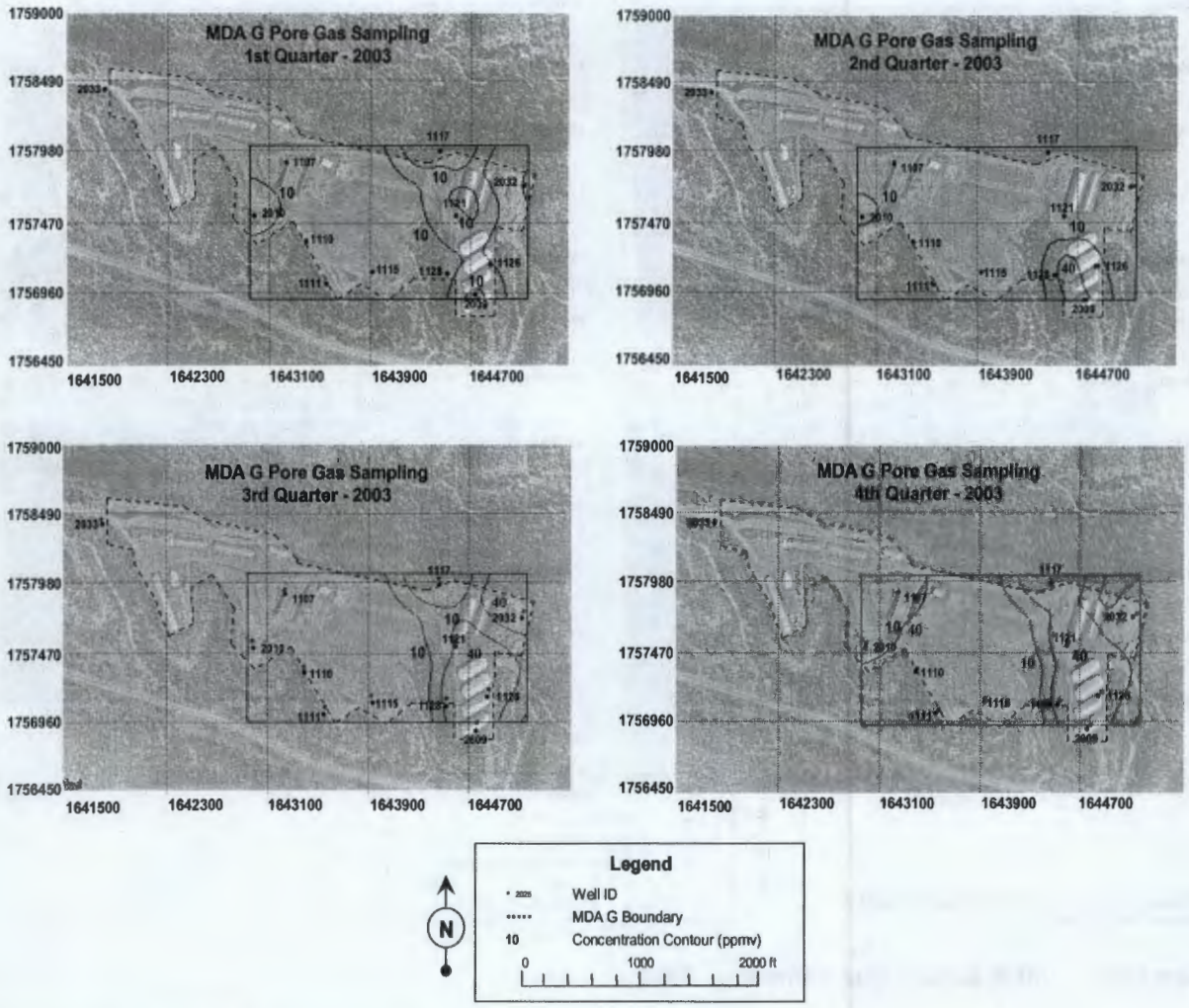


Figure 1-27. MDA G pore-gas sampling, 2003

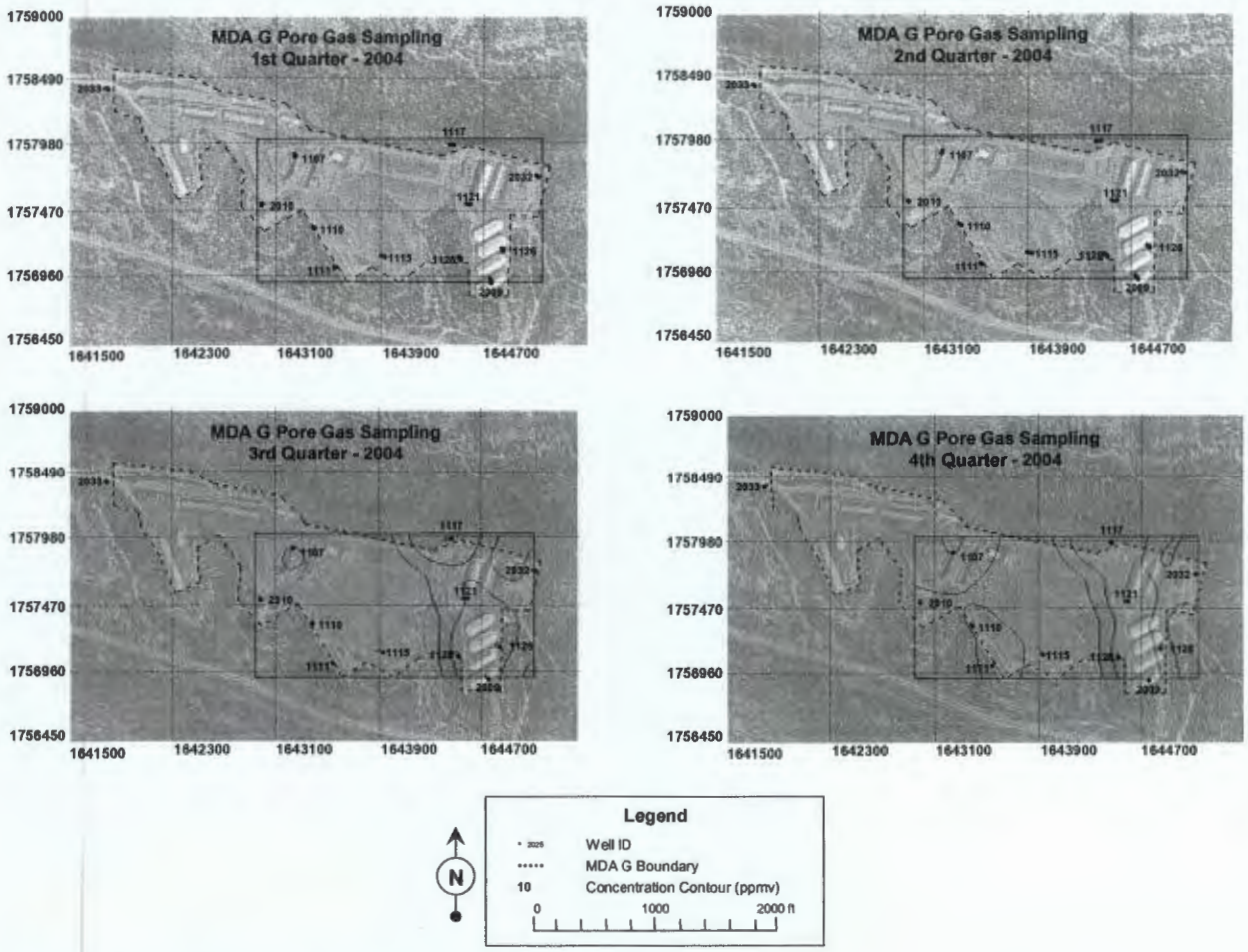


Figure 1-28. MDA G pore-gas sampling, 2004