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From Science to Solutions

March 1, 2010

Ms. Yolande Norman
U.S. Nuclear Regulatory Commission (NRC)
Mailstop T-8 F-5
Washington, DC 20555-0001

Dear Ms. Norman:

In accordance with the U.S. Army Jefferson Proving Ground License SUB-1435 requirements, and at the U.S. Army's request, Science Applications International Corporation (SAIC) is submitting six hard copies and 4 electronic copies on compact disk-read only memory (CD-ROM) of the Radiation Monitoring Report for License SUB-1435 Jefferson Proving Ground, Summary of Results for the October 2009 Environmental Sampling Event.

Please contact Mr. Paul Cloud at (410) 436-2381, e-mail address: paul.d.cloud@us.army.mil or the undersigned at (703) 375-2074, e-mail address: skibinskij@saic.com if you have any questions.

Sincerely,

Joseph N. Skibinski

cc: Paul Cloud
Brooks Evens
SAIC Central Records Project File (transmittal memo only)

RADIATION MONITORING REPORT
FOR LICENSE SUB-1435
JEFFERSON PROVING GROUND

Summary of Results for
October 2009 Sampling Event

FINAL

Submitted to:

U.S. Department of Army
Installation Support Management Agency
Aberdeen Proving Ground, Maryland

Prepared by:

Science Applications International Corporation
Reston, Virginia

February 2010

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
DQO	Data Quality Objective
DU	Depleted Uranium
ERM	Environmental Radiation Monitoring
ERMP	Environmental Radiation Monitoring Program
I.D.	Identification
JPG	Jefferson Proving Ground
LCL	Lower Control Limit
mS/cm	MilliSiemens per Centimeter
NRC	Nuclear Regulatory Commission
pCi/g	Picocuries per Gram
pCi/L	Picocuries per Liter
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAIC	Science Applications International Corporation
SOP	Standard Operating Procedure
UCL	Upper Control Limit

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1. INTRODUCTION

Environmental monitoring activities are being conducted at Jefferson Proving Ground (JPG), Madison, Indiana, to ensure that depleted uranium (DU), present within the DU Impact Area as a result of the Army's past DU testing program, does not pose a threat to human health and the environment through inadvertent or unanticipated release or migration. The Environmental Radiation Monitoring Program (ERMP), described in the standard operating procedure (SOP) in Appendix A (CHPPM 2000), is designed to meet the requirements of applicable Federal and state regulations, including Nuclear Regulatory Commission (NRC) regulations and requirements under Radioactive Materials License SUB-1435 (NRC 1988).

The overall goals of JPG's ERMP are to provide:

- A historical and current perspective of DU levels in various media
- A timely indication of the magnitude and extent of any DU release or migration from past operations.

This report summarizes the methodology, results, and conclusions of the October 2009 sampling event, which is the second of two planned sampling events in 2009 for this biannual program. The sampling requirements and approach are presented in Section 2. The results of the multimedia sampling event are presented and discussed in Section 3. Historical data from the ERMP are discussed in Section 4. Conclusions and recommendations are summarized in Section 5. References cited are identified in Section 6. The appendices of this report include the SOP (Appendix A), field logbook (Appendix B), and data validation summary (Appendix C). All tables and figures are presented at the end of their respective sections.

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2. SAMPLING REQUIREMENTS AND APPROACH

The ERMP (U.S. Army 2000) specifies the U.S. Army Center for Health Promotion and Preventive Medicine's (CHPPM's) protocol for the collection and analysis of 11 groundwater, 8 surface water, 8 sediment, and 4 soil samples (with appropriate duplicates) in the DU Impact Area. The plan has been approved by the NRC and is described in an SOP, which is provided in Appendix A. Science Applications International Corporation (SAIC) executes the plan and reports the findings in an effort to fulfill the Army's responsibilities for monitoring under NRC Radioactive Material License SUB-1435.

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3. RESULTS

An SAIC field crew prepared for and conducted sampling at JPG in October 2009. Appendix B contains a copy of the field logbook, which documents environmental monitoring report field activities during the sampling effort.

No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, or elevated radiation levels) were observed during the sampling effort.

The sample locations for the groundwater, surface water, sediment, and soil samples are depicted in Figure 3-1. Sections 3.1 through 3.4 summarize the sampling results for each medium, respectively. The results of the data validation are presented in Appendix C. All data were determined to meet data quality objectives (DQOs) and criteria presented in the SOP (as provided in Appendix A). Environmental data with a negative value for the total uranium concentrations are conservatively carried forward as being zero (0).

3.1 GROUNDWATER

The concentrations of total dissolved uranium in groundwater at the 11 monitoring wells plus 1 duplicate sample are presented in Table 3-1. Water quality parameter measurements are presented in Table 3-2. Total uranium concentrations of the October 2009 groundwater samples ranged from 0.13 picocuries per liter (pCi/L) to 3.69 pCi/L with an average concentration of 1.34 pCi/L.

In addition to the individual isotopic concentrations, Table 3-1 presents the U-238/U-234 ratios for each sample, which ranged from 0.36 ± 0.30 to 1.52 ± 0.13. A U-238/U-234 ratio of 3 or less is representative of natural uranium, whereas higher ratios are potentially indicative of DU (U.S. Army 2002). For the purposes of this report, samples with U-238/U-234 ratios in excess of 3 are investigated further to validate if the sample is representative of DU or natural uranium. No sample exceeded this criterion.

3.2 SURFACE WATER

The concentrations of total dissolved uranium in surface water at eight sampling locations plus one duplicate sample are presented in Table 3-3. Water quality parameter measurements are presented in Table 3-4. Total uranium concentrations ranged from 0.07 (non-detect) to 0.36 pCi/L, with an average concentration of 0.20 pCi/L. Total uranium was not detected above the reported sample quantitation limit in samples from locations SW-DU-003 and SW-DU-004. In addition, the activity of U-234 in SW-DU-006 and SW-DU-007 was below the reported sample quantitation limits; thus, the U-238/U-234 ratio could not be reported for these sample locations. The U-238/U-234 ratios for samples with detectible U-238 and U-234 ranged from 1.24 ± 0.09 to 2.50 ± 0.13. As no result had a U-238/U-234 ratio exceeding 3, no additional investigations were required and it is concluded that no sample exhibited evidence of the potential presence of DU.

3.3 SEDIMENT

The concentrations of total uranium in sediment at eight sampling locations plus one duplicate sample are presented in Table 3-5. Sediment samples were collected at the same locations as surface water samples, as shown in Figure 3-1. Total uranium concentrations ranged from 0.28 to 1.67 picocuries per gram (pCi/g), with an average concentration of 0.96 pCi/g. The U-238/U-234 ratio for the samples ranged from 1.00 ± 0.13 to 1.67 ± 0.07.

As indicated by the relatively low total uranium results and the U-238/U-234 ratios, there is no evidence of the potential presence of DU in the sediment samples.

3.4 SOIL

The concentrations of total uranium in surface soil at four surface soil sample locations plus one duplicate sample are presented in Table 3-6. Total uranium concentrations ranged from 1.33 to 2.07 with an average concentration of 1.66 pCi/g. The U-238/U-234 ratios ranged from 0.90 ± 0.23 to 1.25 ± 0.18.

As indicated by the relatively low total uranium results and the U-238/U-234 ratios, there is no evidence of the potential presence of DU in the surface soil samples.

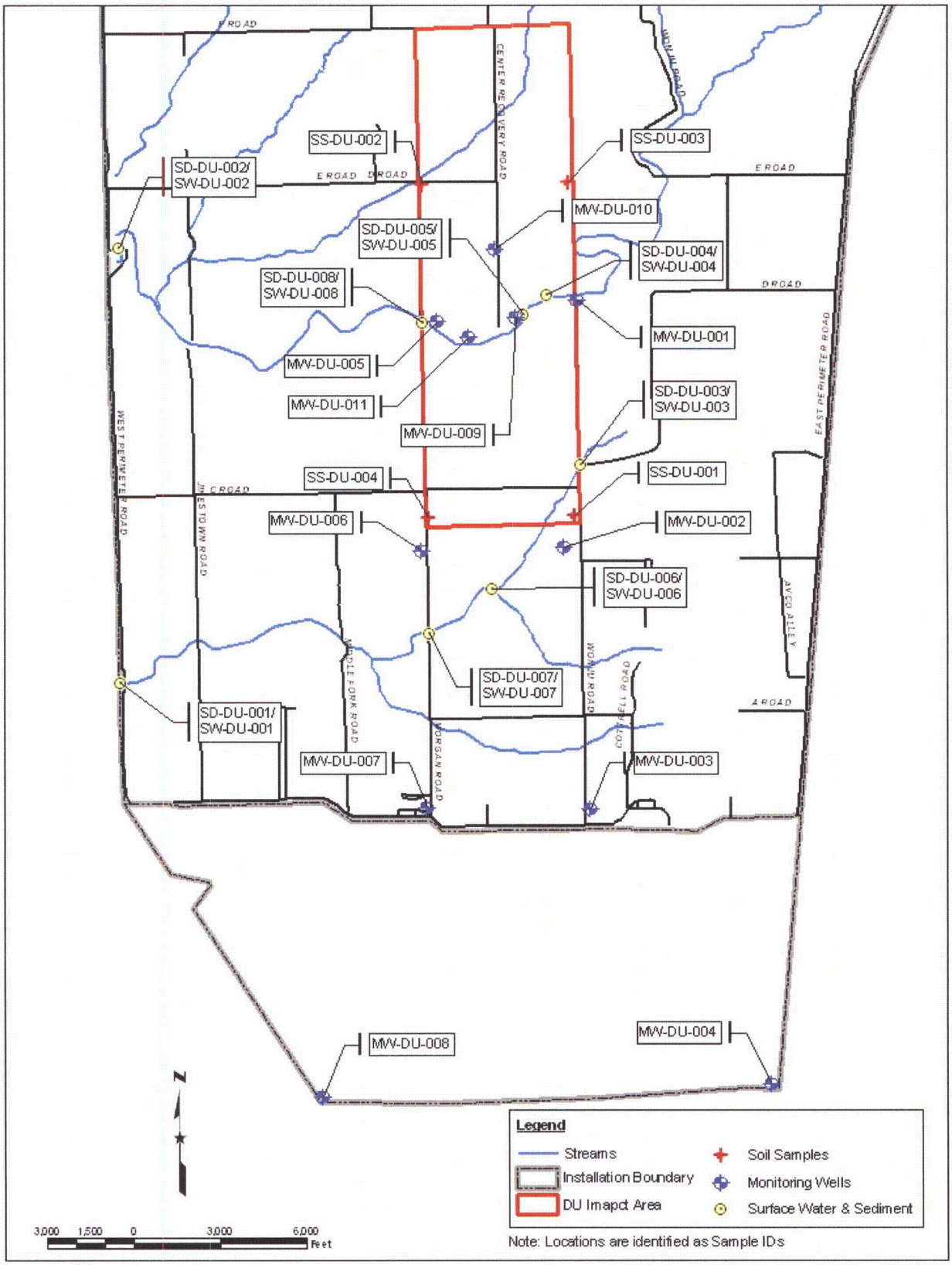

Figure 3-1. Sampling Locations for the JPG ERM Program

Table 3-1. Uranium in Groundwater
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/L)
MW01	MW-DU-001	U-234	0.113 J
MW01	MW-DU-001	U-235	-0.0084 U
MW01	MW-DU-001	U-238	0.172 J
		Total Uranium	**0.28**
		U-238/U-234 Ratio[b]	1.52
MW02	MW-DU-002	U-234	1.19
MW02	MW-DU-002	U-235	0.046 J
MW02	MW-DU-002	U-238	0.59
		Total Uranium	**1.83**
		U-238/U-234 Ratio[b]	0.50
MW03	MW-DU-003	U-234	0.53
MW03	MW-DU-003	U-235	0.041 U
MW03	MW-DU-003	U-238	0.31
		Total Uranium	**0.88**
		U-238/U-234 Ratio[b]	0.58
MW04	MW-DU-004	U-234	0.28
MW04	MW-DU-004	U-235	0.0 U
MW04	MW-DU-004	U-238	0.31
		Total Uranium	**0.59**
		U-238/U-234 Ratio[b]	1.11
MW05	MW-DU-005	U-234	0.191
MW05	MW-DU-005	U-235	0.025 U
MW05	MW-DU-005	U-238	0.129 J
		Total Uranium	**0.35**
		U-238/U-234 Ratio[b]	0.68
MW06	MW-DU-006	U-234	1.85
MW06	MW-DU-006	U-235	0.105 J
MW06	MW-DU-006	U-238	1.73
		Total Uranium	**3.69**
		U-238/U-234 Ratio[b]	0.94
MW07	MW-DU-007	U-234	1.06
MW07	MW-DU-007	U-235	0.059 U
MW07	MW-DU-007	U-238	0.70
		Total Uranium	**1.82**
		U-238/U-234 Ratio[b]	0.66
MW07D	MW-DU-007D	U-234	1.12
MW07D	MW-DU-007D	U-235	0.072 U
MW07D	MW-DU-007D	U-238	0.53
		Total Uranium	**1.72**
		U-238/U-234 Ratio[b]	0.47
MW08	MW-DU-008	U-234	0.35
MW08	MW-DU-008	U-235	-0.0032 U
MW08	MW-DU-008	U-238	0.31
		Total Uranium	**0.66**
		U-238/U-234 Ratio[b]	0.89

Table 3-1. Uranium in Groundwater
Jefferson Proving Ground, Madison, Indiana (Continued)

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/L)
MW09	MW-DU-009	U-234	1.08
MW09	MW-DU-009	U-235	0.051 J
MW09	MW-DU-009	U-238	0.42
		Total Uranium	**1.55**
		U-238/U-234 Ratio[b]	0.39
MW010	MW-DU-010	U-234	1.87
MW010	MW-DU-010	U-235	0.017 U
MW010	MW-DU-010	U-238	0.68
		Total Uranium	**2.57**
		U-238/U-234 Ratio[b]	0.36
MW011	MW-DU-011	U-234	0.068 J
MW011	MW-DU-011	U-235	-0.0028 U
MW011	MW-DU-011	U-238	0.061 J
		Total Uranium	**0.13**
		U-238/U-234 Ratio[b]	0.90

[a] Represents sample designation developed in previous sampling programs.
[b] Unitless.
J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.
U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

Table 3-2. Groundwater Water Quality Parameters and Exposure Readings
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	pH	Temp (°C)	Conductivity (Siemens/cm)	Dissolved Oxygen (mg/L)	Rad (µR/hr)
MW01	MW-DU-001	6.60	14.5	0.606	--[b]	6
MW02	MW-DU-002	6.25	13.9	0.793	--[b]	5
MW03	MW-DU-003	6.35	14.6	0.774	--[b]	6
MW04	MW-DU-004	6.08	14.9	0.679	--[b]	4
MW05	MW-DU-005	6.35	13.8	4.03	--[b]	5
MW06	MW-DU-006	7.25	13.2	0.731	--[b]	5
MW07	MW-DU-007	7.17	15.7	0.832	--[b]	5
MW08	MW-DU-008	6.64	13.2	0.564	--[b]	6
MW09	MW-DU-009	6.48	15.4	11.1	--[b]	5
MW10	MW-DU-0010	7.05	14.4	0.815	--[b]	5
MW11	MW-DU-0011	7.23	14.7	0.562	--[b]	7

[a] Represents sample designation developed in previous sampling programs.
[b] Dissolved oxygen not measured.

Table 3-3. Uranium in Surface Water
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/L)
SWS01	SW-DU-001	U-234	0.070 J
SWS01	SW-DU-001	U-235	0.047 J
SWS01	SW-DU-001	U-238	0.087 J
		Total Uranium	**0.20**
		U-238/U-234 Ratio[b]	1.24
SWS02	SW-DU-002	U-234	0.097 J
SWS02	SW-DU-002	U-235	0.0 U
SWS02	SW-DU-002	U-238	0.23
		Total Uranium	**0.33**
		U-238/U-234 Ratio[b]	2.37
SWS03	SW-DU-003	U-234	0.085 J
SWS03	SW-DU-003	U-235	-0.0034 U
SWS03	SW-DU-003	U-238	0.0 U
		Total Uranium	**ND**
		U-238/U-234 Ratio[b]	ND
SWS04	SW-DU-004	U-234	0.064 U
SWS04	SW-DU-004	U-235	0.011 U
SWS04	SW-DU-004	U-238	0.039 U
		Total Uranium	**ND**
		U-238/U-234 Ratio[b]	ND
SWS05	SW-DU-005	U-234	0.134 J
SWS05	SW-DU-005	U-235	0.019 U
SWS05	SW-DU-005	U-238	0.18
		Total Uranium	**0.33**
		U-238/U-234 Ratio[b]	1.34
SWS06	SW-DU-006	U-234	0.045 U
SWS06	SW-DU-006	U-235	0.017 U
SWS06	SW-DU-006	U-238	0.106 J
		Total Uranium	**0.17**
		U-238/U-234 Ratio[b]	ND
SWS06D	SW-DU-006D	U-234	-0.002 U
SWS06D	SW-DU-006D	U-235	-0.0056 U
SWS06D	SW-DU-006D	U-238	0.080 J
		Total Uranium	**0.07**
		U-238/U-234 Ratio[b]	ND
SWS07	SW-DU-007	U-234	0.018 U
SWS07	SW-DU-007	U-235	0.012 U
SWS07	SW-DU-007	U-238	0.084 J
		Total Uranium	**0.11**
		U-238/U-234 Ratio[b]	ND
SWS08	SWS-DU-008	U-234	0.104 J
SWS08	SWS-DU-008	U-235	-0.0025 U
SWS08	SWS-DU-008	U-238	0.26
		Total Uranium	**0.36**
		U-238/U-234 Ratio[b]	2.50

Table 3-3. Uranium in Surface Water
Jefferson Proving Ground, Madison, Indiana (Continued)

[a] Represents sample designation developed in previous sampling programs.
[b] Unitless.
J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.
ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.
U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantitation limit.

Table 3-4. Surface Water Quality Parameters and Exposure Readings
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation*	Sample I.D.	pH	Temp (°C)	Conductivity (milliSiemens/cm)	Dissolved Oxygen (mg/L)	Rad (µR/hr)
SWS01	SW-DU-001	6.90	11.9	0.287	10.82	5
SWS02	SW-DU-002	7.03	11.2	0.261	10.71	4
SWS03	SW-DU-003	6.75	11.2	0.086	9.25	7
SWS04	SW-DU-004	5.95	11.8	0.253	10.56	5
SWS05	SW-DU-005	6.54	12.6	0.178	9.82	6
SWS06	SW-DU-006	5.96	11.7	0.114	10.05	6
SWS07	SW-DU-007	6.22	13.0	0.143	11.01	5
SWS08	SW-DU-008	6.29	13.1	0.219	10.01	6

*Represents sample designation developed in previous sampling programs.

Table 3-5. Uranium in Sediment
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/g)
SES01	SD-DU-001	U-234	0.47
SES01	SD-DU-001	U-235	0.014 U
SES01	SD-DU-001	U-238	0.52
		Total Uranium	**1.00**
		U-238/U-234 Ratio[b]	1.11
SES02	SD-DU-002	U-234	0.368
SES02	SD-DU-002	U-235	0.031 J
SES02	SD-DU-002	U-238	0.496
		Total Uranium	**0.90**
		U-238/U-234 Ratio[b]	1.35
SES03	SD-DU-003	U-234	0.80
SES03	SD-DU-003	U-235	0.034 J
SES03	SD-DU-003	U-238	0.84
		Total Uranium	**1.67**
		U-238/U-234 Ratio[b]	1.05
SES04	SD-DU-004	U-234	0.332
SES04	SD-DU-004	U-235	0.016 U
SES04	SD-DU-004	U-238	0.41
		Total Uranium	**0.75**

Table 3-5. Uranium in Sediment
Jefferson Proving Ground, Madison, Indiana (Continued)

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/g)
		U-238/U-234 Ratio[b]	1.27
SES05	SD-DU-005	U-234	0.103
SES05	SD-DU-005	U-235	0.003 U
SES05	SD-DU-005	U-238	0.172
		Total Uranium	**0.28**
		U-238/U-234 Ratio[b]	1.67
SES05D	SD-DU-005D	U-234	0.126
SES05D	SD-DU-005D	U-235	0.019 U
SES05D	SD-DU-005D	U-238	0.178
		Total Uranium	**0.32**
		U-238/U-234 Ratio[b]	1.41
SES06	SD-DU-006	U-234	0.440
SES06	SD-DU-006	U-235	0.035 J
SES06	SD-DU-006	U-238	0.441
		Total Uranium	**0.92**
		U-238/U-234 Ratio[b]	1.00
SES07	SD-DU-007	U-234	0.62
SES07	SD-DU-007	U-235	0.034 J
SES07	SD-DU-007	U-238	0.75
		Total Uranium	**1.40**
		U-238/U-234 Ratio[b]	1.21
SES08	SD-DU-008	U-234	0.467
SES08	SD-DU-008	U-235	0.027 J
SES08	SD-DU-008	U-238	0.68
		Total Uranium	**1.17**
		U-238/U-234 Ratio[b]	1.46

[a] Represents sample designation developed in previous sampling programs.
[b] Unitless.
J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.
U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantitation limit.

Table 3-6. Uranium in Surface Soil
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/g)
SOS01	SS-DU-001	U-234	0.80
SOS01	SS-DU-001	U-235	0.034 J
SOS01	SS-DU-001	U-238	0.77
		Total Uranium	**1.60**
		U-238/U-234 Ratio[b]	0.96
SOS02	SS-DU-002	U-234	1.01
SOS02	SS-DU-002	U-235	0.053 J
SOS02	SS-DU-002	U-238	1.01
		Total Uranium	**2.07**
		U-238/U-234 Ratio[b]	1.00
SOS02D	SS-DU-002D	U-234	0.99
SOS02D	SS-DU-002D	U-235	0.045 J
SOS02D	SS-DU-002D	U-238	0.89
		Total Uranium	**1.93**
		U-238/U-234 Ratio[b]	0.90
SOS03	SS-DU-003	U-234	0.63
SOS03	SS-DU-003	U-235	0.034 J
SOS03	SS-DU-003	U-238	0.67
		Total Uranium	**1.33**
		U-238/U-234 Ratio[b]	1.06
SOS04	SS-DU-004	U-234	0.59
SOS04	SS-DU-004	U-235	0.052 J
SOS04	SS-DU-004	U-238	0.74
		Total Uranium	**1.38**
		U-238/U-234 Ratio[b]	1.25

[a] Represents sample designation developed in previous sampling programs.
[b] Unitless.
J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.

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4. HISTORICAL DATA ASSESSMENT AND TREND ANALYSIS

Historical data from the ERMP are reviewed and discussed in this section in the context of existing action levels and corrective actions for environmental media documented in the SOP for the Environmental Radiation Monitoring (ERM). The SOP action levels and associated corrective actions are provided in Table 4-1.

Table 4-1. Action Levels and Corrective Actions for Total Uranium in Environmental Media Jefferson Proving Ground, Madison, Indiana

Medium	Total Uranium Action Level	Corrective Action
Groundwater and Surface Water	≥ 150 pCi/L*	Resample. If activity verified, notify NRC and assess results. The findings and recommended corrective actions will be documented for the Army's Radiation Control Committee. The Committee will provide recommendations to the Commander based on its evaluation.
	Less than 150 pCi/L	No action.
Soil and Sediment:		
Perimeter and Background Samples	≥ 35 pCi/g	Collect five additional samples in a 1-meter grid. If average activity exceeds 35 pCi/g, decontaminate to 35 pCi/g.
	Less than 35 pCi/g	No corrective action.

* Effluent concentration limit for uranium is 300 pCi/L in Title 10, CFR, Part 20 (10 CFR 20), Appendix B, Table 2, Column 2.
Source: U.S. Army 1999 and CHPPM 2000 (see Appendix A, pages A-6 and A-7).

An assessment of historical trends for ERMP data was first provided in the April 2006 Radiation Monitoring Report (SAIC 2006). That assessment focused on available sampling data for groundwater, surface water, sediment, and soil since 1998. Quality assurance/quality control (QA/QC) records for data collected prior to 1998 were not available to support the trend analyses. In addition, there were changes to analytical methods that were implemented beginning in December 2004.[1] Therefore, while historical data are reported since 1998, trend analyses included in this ERM report address the time period from December 2004 to the present. Surface water and groundwater results for the April 2004 sampling event also were not trended, given that the results were provided in units of micrograms per liter rather than pCi/L.

As noted above, the April 2006 Radiation Monitoring Report (SAIC 2006) provided detailed information about the trending methods employed and why certain data were or were not included in the initial trend analysis. To avoid confusion, that information is not repeated in this report. This report section re-examines the ERMP data for historical trends following the addition of the ERMP data collected during the October 2009 sampling event. Stated numbers of samples and summary statistics are based on data generated since December 2004 (when laboratory analytical methods were revised and standardized).

4.1 GROUNDWATER

For 118 discrete samples available from 11 monitoring wells (MW01 to MW11) during the period from 2004 through October 2009, the average total uranium activity-concentration is 1.40 pCi/L, the standard deviation is 1.11 pCi/L, and the maximum detected activity-concentration is 5.27 pCi/L. The activity-concentrations at each well are well below the 150 pCi/L action level for groundwater.

[1] Total uranium is now analyzed by alpha spectroscopy using American Society for Testing and Materials (ASTM) Method D3972-90M rather than the fluorometry and gamma spectroscopy methods applied previously.

Data for each monitoring well are summarized in run charts, as shown in Figures 4-1 through 4-11. Total uranium results are displayed along with each measurement's associated error bars. The error bars are expressed at 1.96 standard deviations and represent a 95 percent confidence interval. Where trend lines are provided, the associated coefficient of correlation also is provided (the R^2 value listed on each figure). An R^2 value that approaches 1.0 suggests a strong relationship between the sample results and the sampling dates. The figures for all 11 individual monitoring wells indicate no significant trends. In addition, no monitoring wells exhibited trend lines with R^2 values greater than 0.5 (i.e., somewhat significant).

In addition to the aforementioned run charts (Figures 4-1 through 4-11), individual variable control charts were created in April 2006 for each monitoring well, with the upper control limit (UCL) and the lower control limit (LCL) defined at 3 standard deviations above or below the mean. The control charts were created to determine if any single sample result warranted further examination. These control charts were re-examined in this report. All total uranium results at each sampling location for the October 2009 sampling effort were within 2 standard deviations of the mean concentration. An example individual control chart is provided in Figure 4-12.

The 11 monitoring wells also were examined in aggregate to determine if some wells or particular sampling events were distinctive. A simple individual control chart was created using the pooled data for all monitoring wells and all data collected after December 2004 (Figure 4-13).

Figure 4-13 indicates four points that lie above the UCL applicable to the full data set. Each of the four points is for MW-DU-006. Clearly, this well has exhibited (and continues to exhibit) total uranium results exceeding that of the other wells but, based on the slope of the trend line, generally exhibits decreasing activity. The U-238/U-234 ratio for each of these samples continues to suggest that DU is not a likely cause. This well will continue to be monitored closely.

4.2 SURFACE WATER

For 96 discrete samples available from 8 surface water sampling locations (SW01 to SW08) during the period from 2004 through October 2009, the average total uranium activity-concentration is 0.56 pCi/L, the standard deviation is 0.97 pCi/L, and the maximum detected activity-concentration is 6.91 pCi/L. The activity-concentrations at each sample location are well below the 150 pCi/L action level for surface water.

Data for each surface water sampling location are summarized in run charts, as shown in Figures 4-14 through 4-21. Total uranium results are displayed along with each measurement's associated error bars. The error bars are expressed at 1.96 standard deviations and represent a 95 percent confidence interval. Where trend lines are provided, the associated coefficient of correlation also is provided (the R^2 value listed on each figure). As noted in Section 4.1, an R^2 value that approaches 1.0 suggests a strong relationship between the sample results and the sampling dates. The figures for all eight individual surface water sampling locations indicate no significant trends. In addition, none of the samples exhibited trend lines with R^2 values greater than 0.5 (i.e., somewhat significant).

The eight surface water sampling locations also were examined in aggregate to determine if some locations or particular sampling events were distinctive. A simple individual control chart was created using the pooled data for all surface water sampling locations and all data collected after December 2004 (Figure 4-22).

Figure 4-22 indicates that only data points from SW-DU-005 exceeded the UCL or were below the LCL. SW-DU-005 exhibited total uranium concentrations of 2.95, 6.26, and 6.91 in October 2005, October 2007, and October 2008, respectively, with each of these concentrations exceeding the UCL. The result for October 2009 sampling (0.33 pCi/L) fell below the UCL. SW-DU-005 will continue to be

monitored closely. No other surface water location exceeded the UCL and, in fact, all of the surface water concentrations for the October 2009 sampling event were below the mean.

Although the U-238/U-234 isotopic ratio was 7.02 for location SW-DU-005 for the October 2008 sampling, the ratio for the October 2009 sampling is 1.34. In addition, the total uranium concentration of this sample location (0.33 pCi/L) was significantly lower this sampling event. Nonetheless, given that the results of this sampling location are historically higher than would be expected, they will continue to be closely monitored.

4.3 SEDIMENT

For 107 discrete samples available from 8 sediment sampling locations (SD01 to SD08) during the period from 2004 through October 2009, the average total uranium activity-concentration is 1.00 pCi/g, the standard deviation is 0.54 pCi/g, and the maximum detected activity-concentration is 2.80 pCi/g. The activity-concentrations at each location are well below the 35 pCi/g action level.

Data for each sediment sampling location are summarized in run charts, as shown in Figures 4-23 through 4-30. Total uranium results are displayed along with each measurement's associated error bars. The error bars are expressed at 1.96 standard deviations and represent a 95 percent confidence interval. Where trend lines are provided, the associated coefficient of correlation also is provided (the R^2 value listed on each figure). As noted in Section 4.1, an R^2 value that approaches 1.0 suggests a strong relationship between the sample results and the sampling dates. The figures for all eight individual sediment sampling locations indicate no significant trends.

The eight sediment sampling locations also were examined in aggregate to determine if some locations or particular sampling events were distinctive. None of the samples exhibited trend lines with R^2 values greater than 0.5 (i.e., somewhat significant).

A simple individual control chart was created using the pooled data for all sediment sampling locations and all data collected after December 2004 (Figure 4-31). Figure 4-31 indicates no new points above the UCL or below the LCL. The October 2009 sediment sampling results vary around the mean, as expected.

4.4 SOILS

For 61 discrete samples available from 4 surface soil sampling locations (SS01 to SS04) during the period from 2004 through October 2009, the average total uranium activity-concentration is 1.62 pCi/g, the standard deviation is 0.28 pCi/g, and the maximum detected activity-concentration is 2.25 pCi/g. The activity-concentrations at each location are well below the action level of 35 pCi/g. The October 2009 surface soil sampling results vary around the mean, as expected.

Data for each surface soil sampling location are summarized in run charts, as shown in Figures 4-32 through 4-35. Total uranium results are displayed along with each measurement's associated error bars. The error bars are expressed at 1.96 standard deviations and represent a 95 percent confidence interval. Where trend lines are provided, the associated coefficient of correlation also is provided (the R^2 value listed on each figure). As noted in Section 4.1, an R^2 value that approaches 1.0 suggests a strong relationship between the sample results and the sampling dates. The figures for all four individual surface soil sampling locations indicate no significant trends. Surface soil sampling location SS-DU-002 exhibited trend lines with an R^2 value of 0.63. R^2 values greater than 0.5 indicate that the correlation is somewhat significant. The slope of the trend line for SS-DU-002 suggests a possible increase in the total uranium concentration at this location; thus, results from this location will continue to be monitored closely.

The four surface soil sampling locations also were examined in aggregate to determine if some locations or particular sampling events were distinctive. A simple individual control chart was created using the pooled data for all surface soil sampling locations and all data collected after December 2004 (Figure 4-36). As data are added to the control chart, the UCL, mean, and LCL are automatically recalculated. Figure 4-36 reflects that one point, the result for SS-DU-002 (i.e., 0.36 pCi/g), fell below the LCL for a previous sampling event (October 2008). A single low result has no immediate significance to the project. In addition, no sampling points for the October 2009 sampling event exceeded the UCL or were below the LCL.

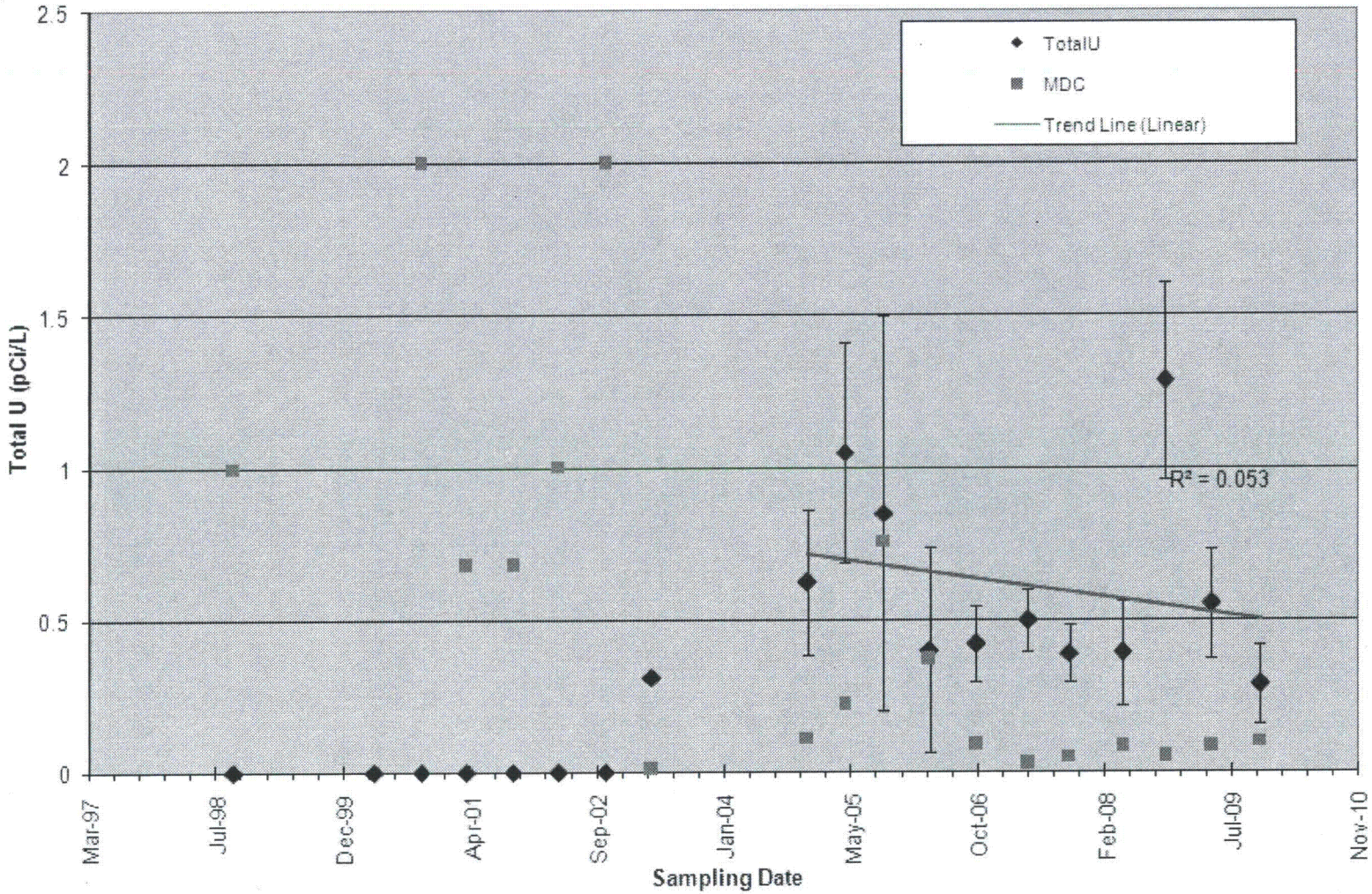


Figure 4-1. Total Uranium in MW-DU-001 (1998-2009)

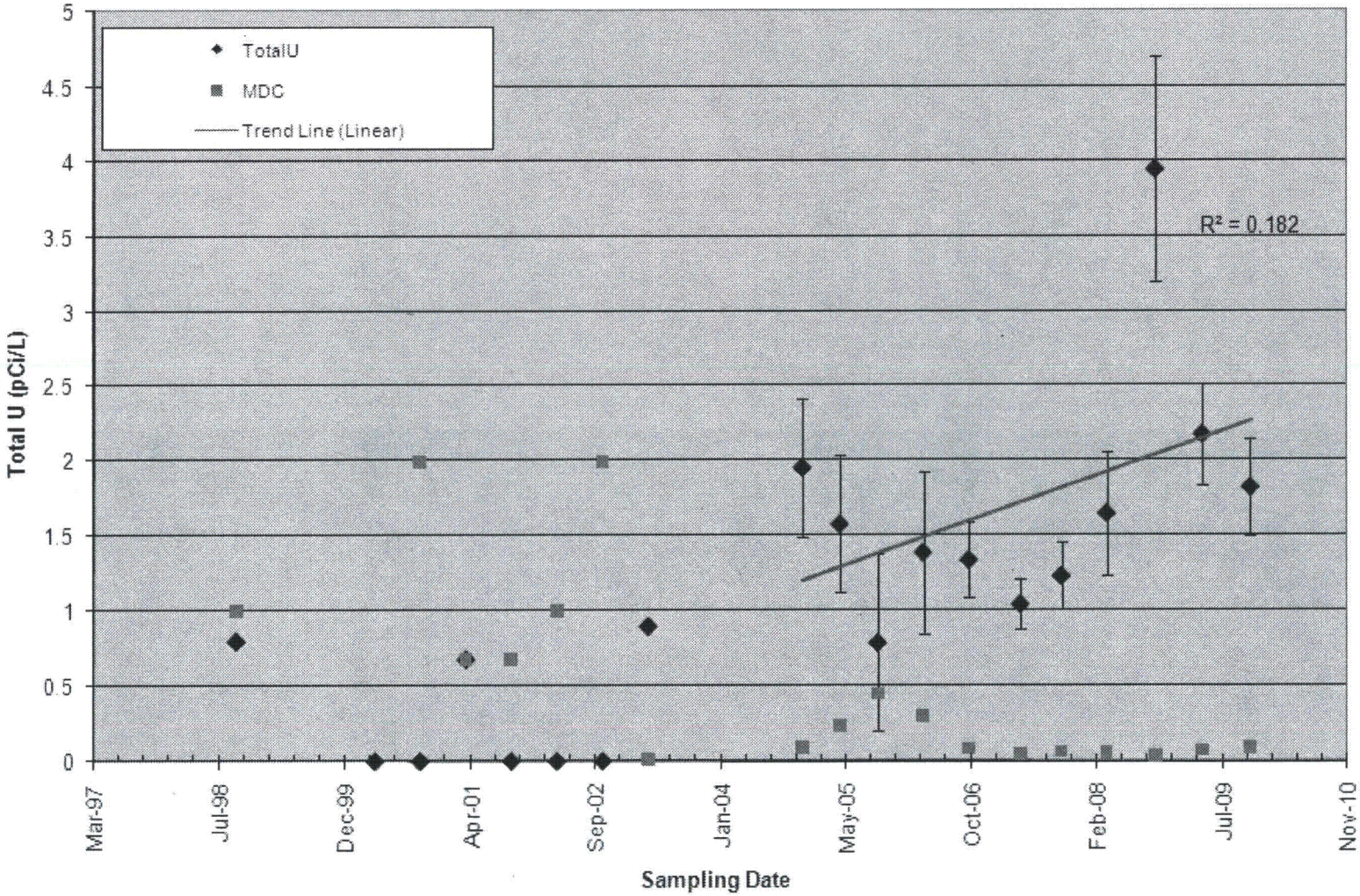


Figure 4-2. Total Uranium in MW-DU-002 (1998-2009)

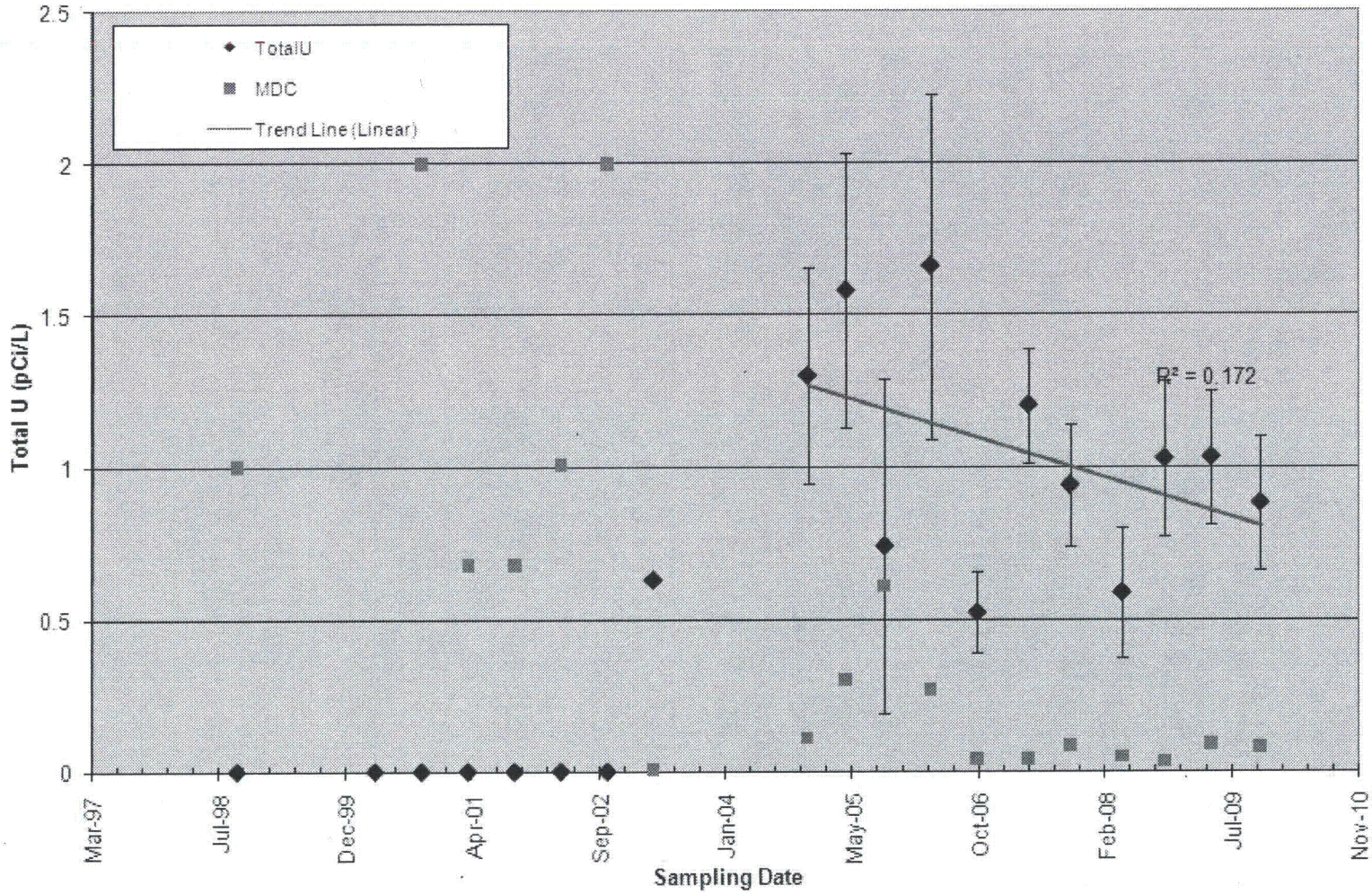


Figure 4-3. Total Uranium in MW-DU-003 (1998-2009)

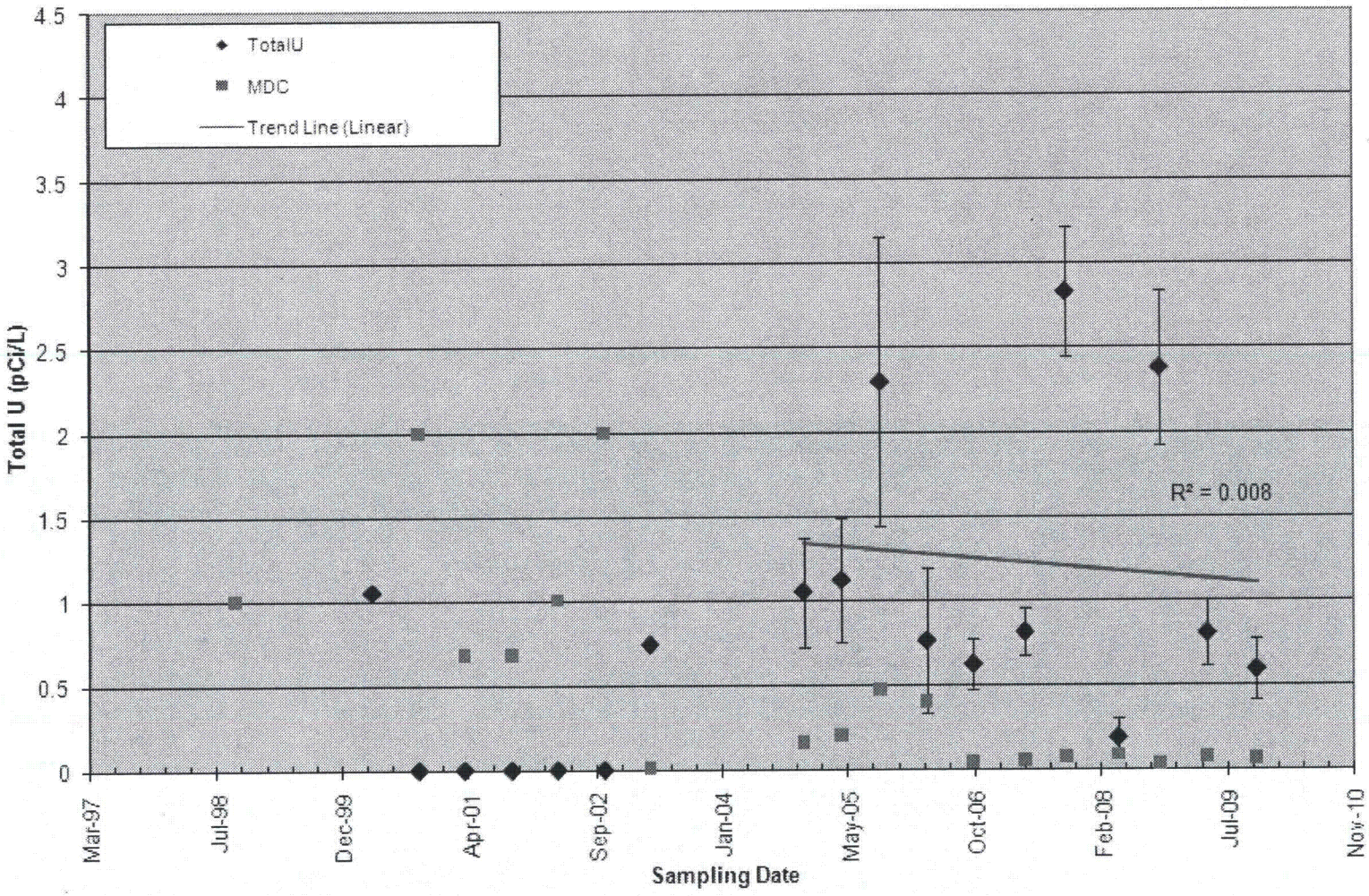


Figure 4-4. Total Uranium in MW-DU-004 (1998-2009)

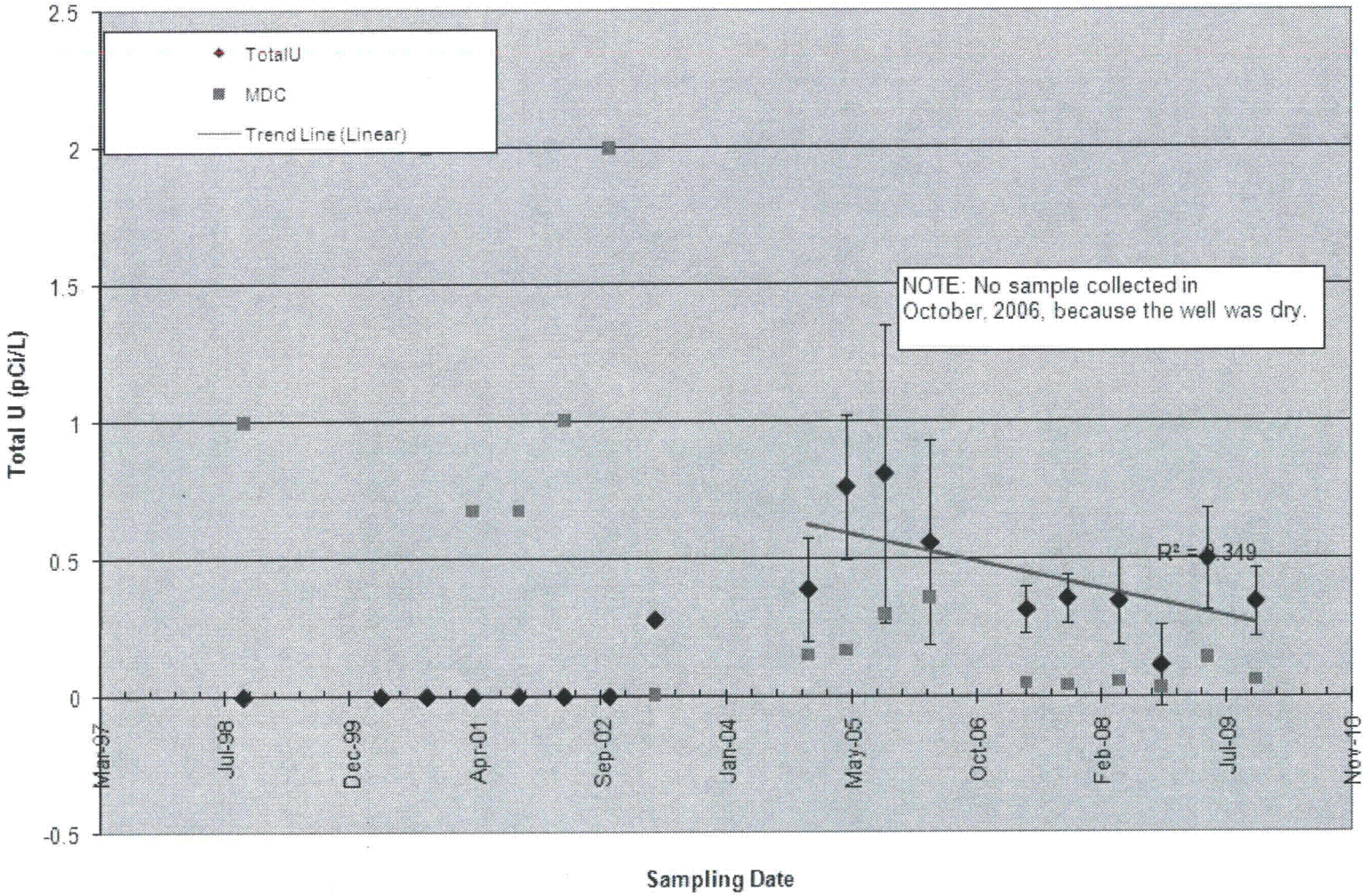
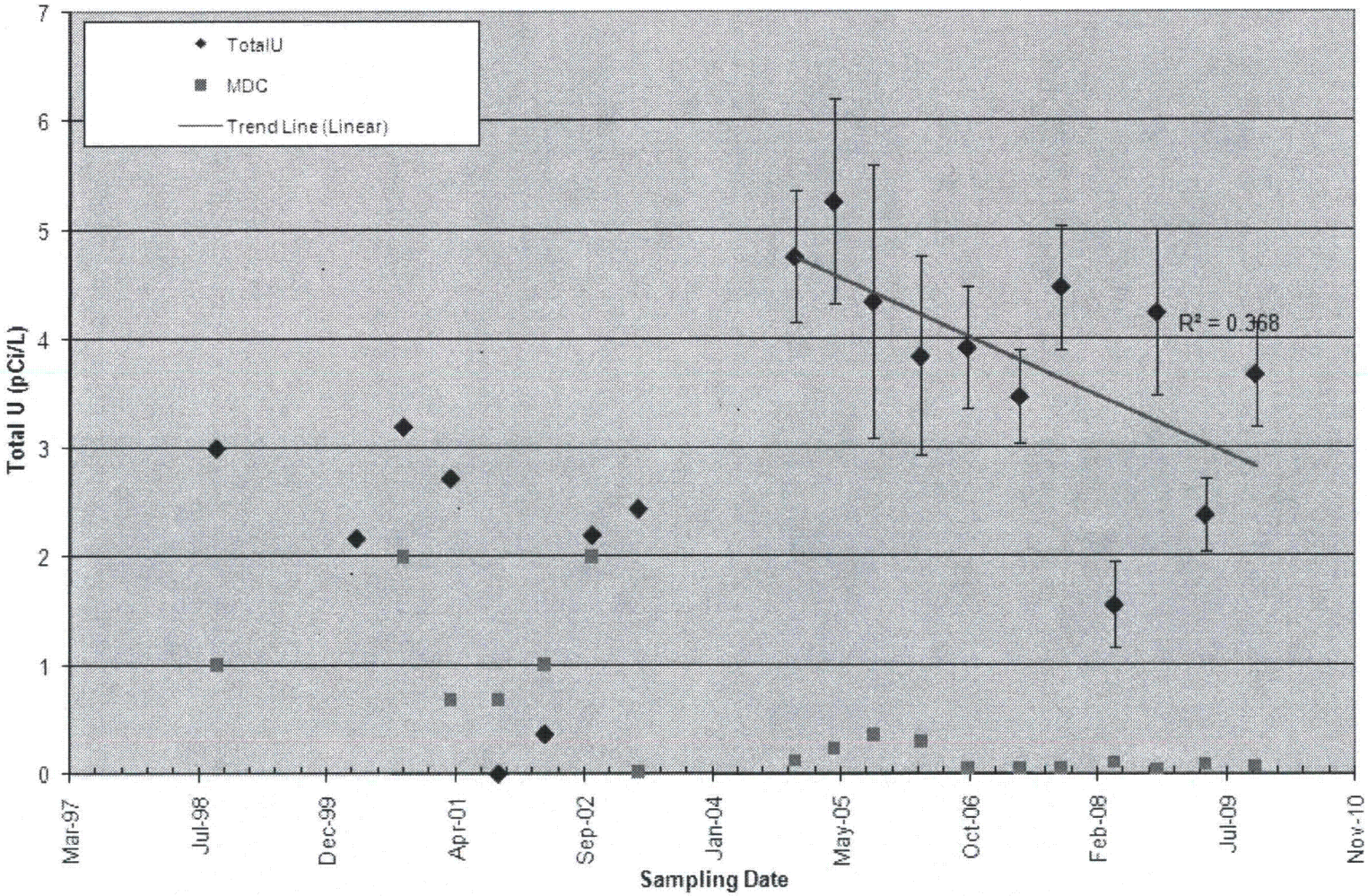


Figure 4-5. Total Uranium in MW-DU-005 (1998-2009)



NOTE: No sample was collected in October 2006 because the well was dry.

Figure 4-6. Total Uranium in MW-DU-006 (1998-2009)

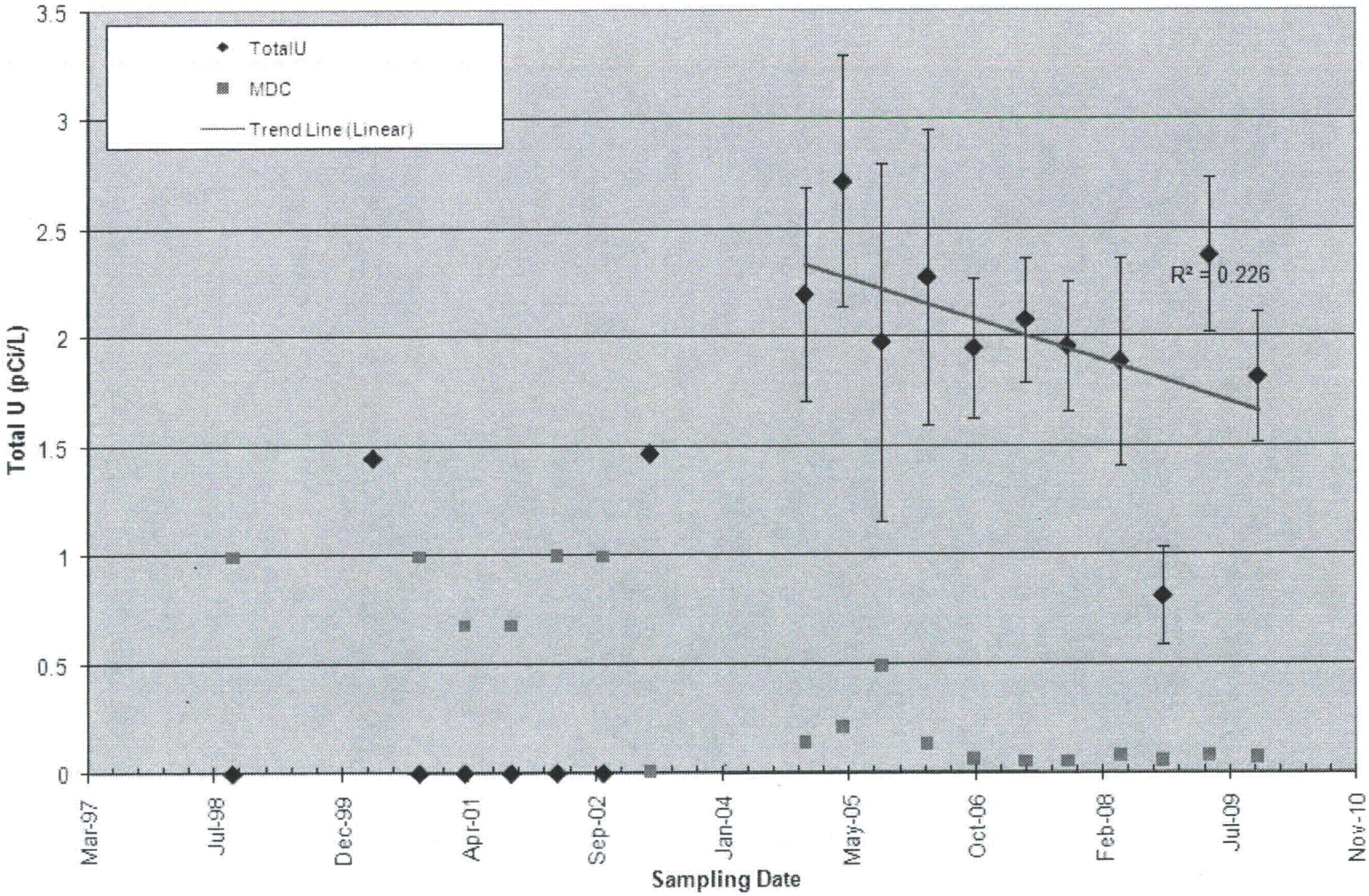


Figure 4-7. Total Uranium in MW-DU-007 (1998-2009)

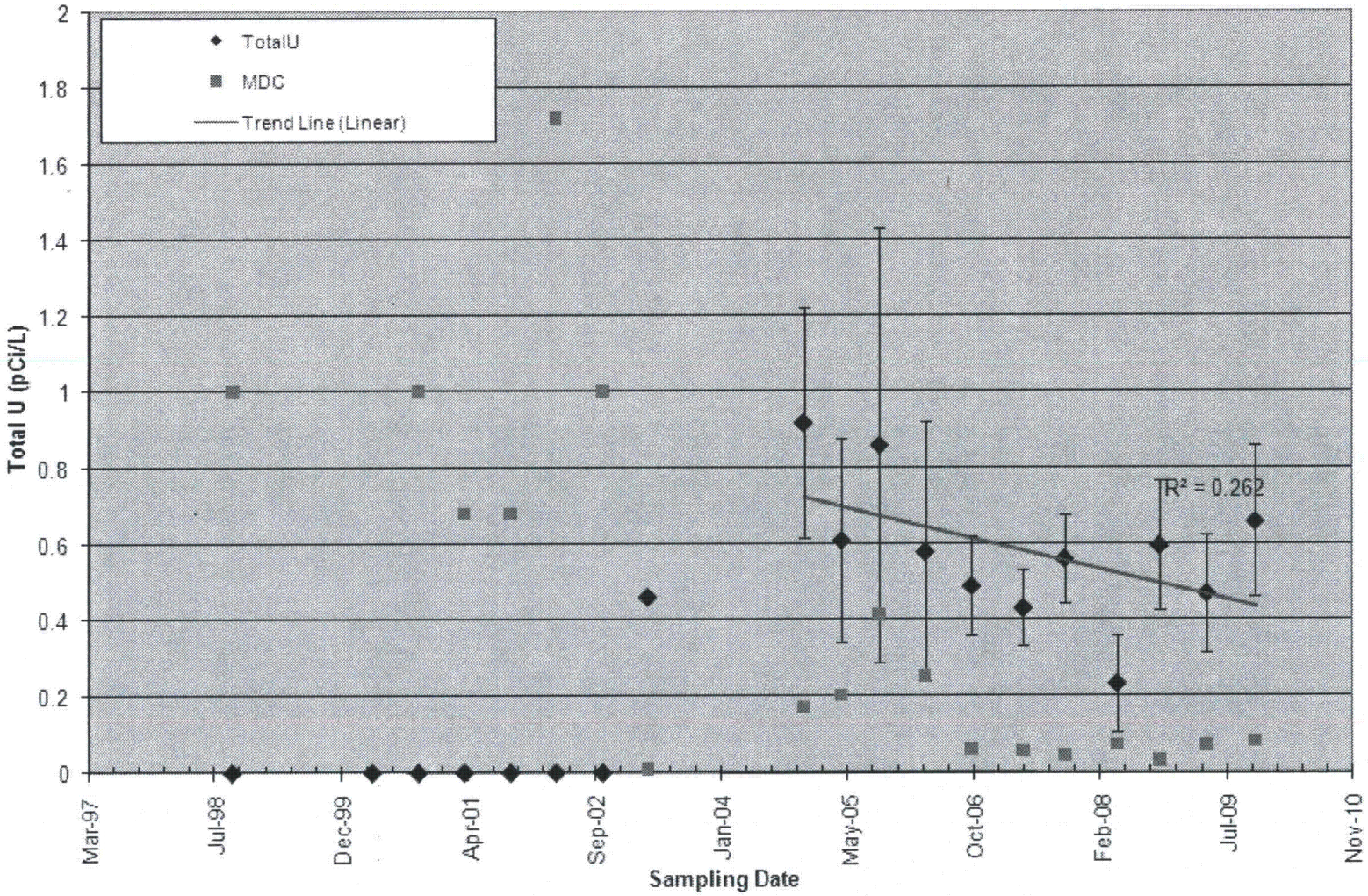


Figure 4-8. Total Uranium in MW-DU-008 (1998-2009)

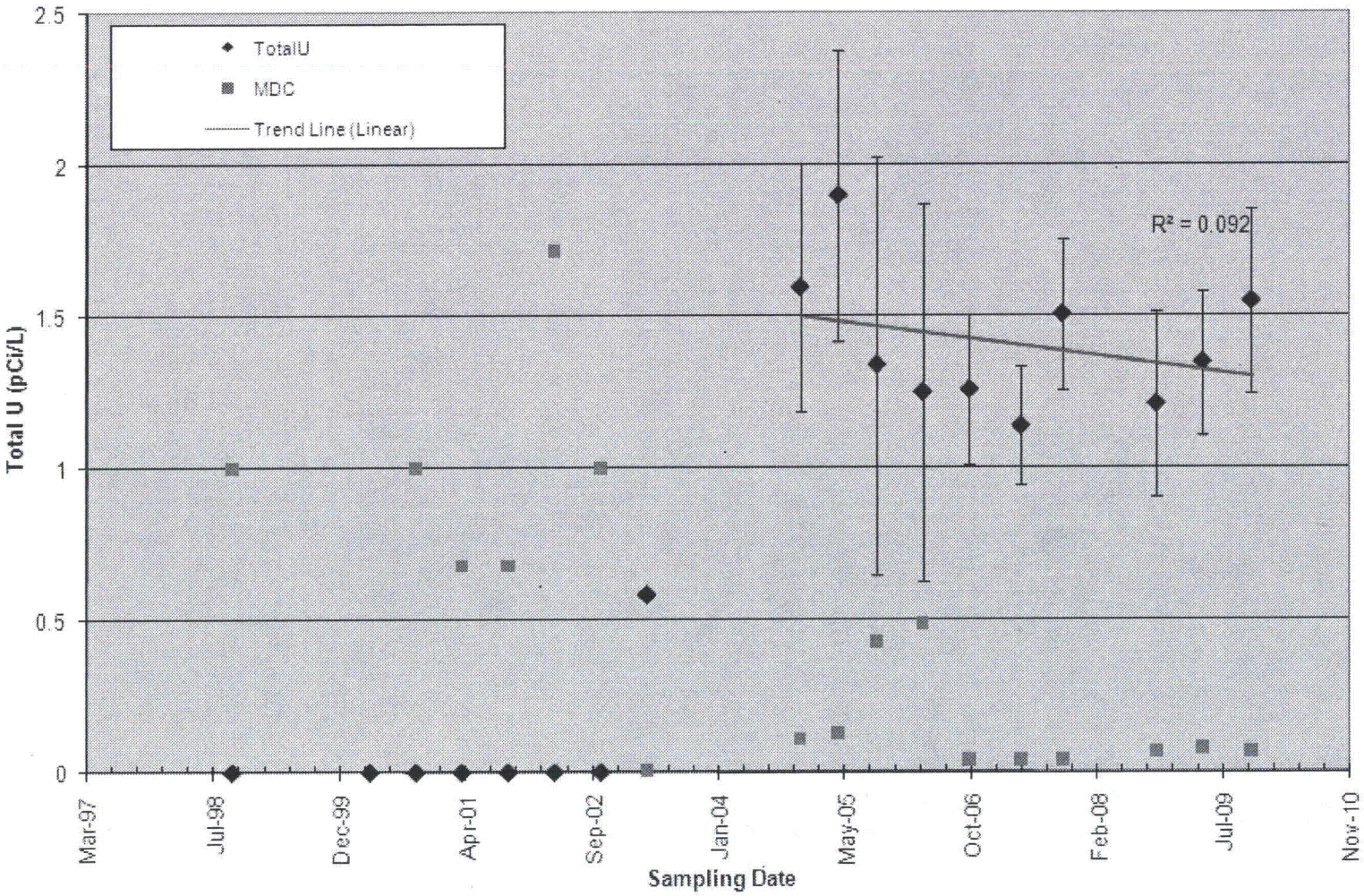


Figure 4-9. Total Uranium in MW-DU-009 (1998-2009)

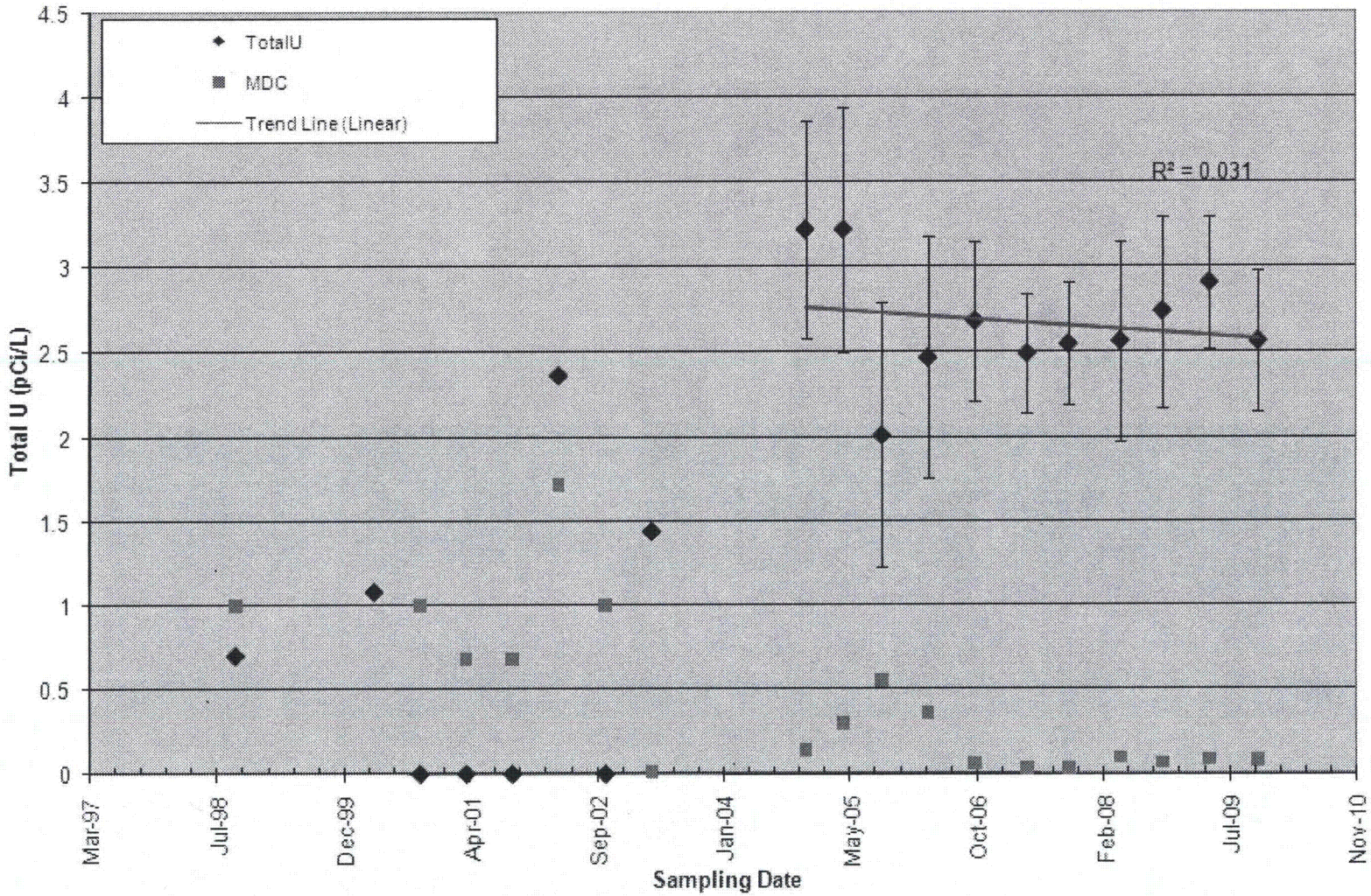
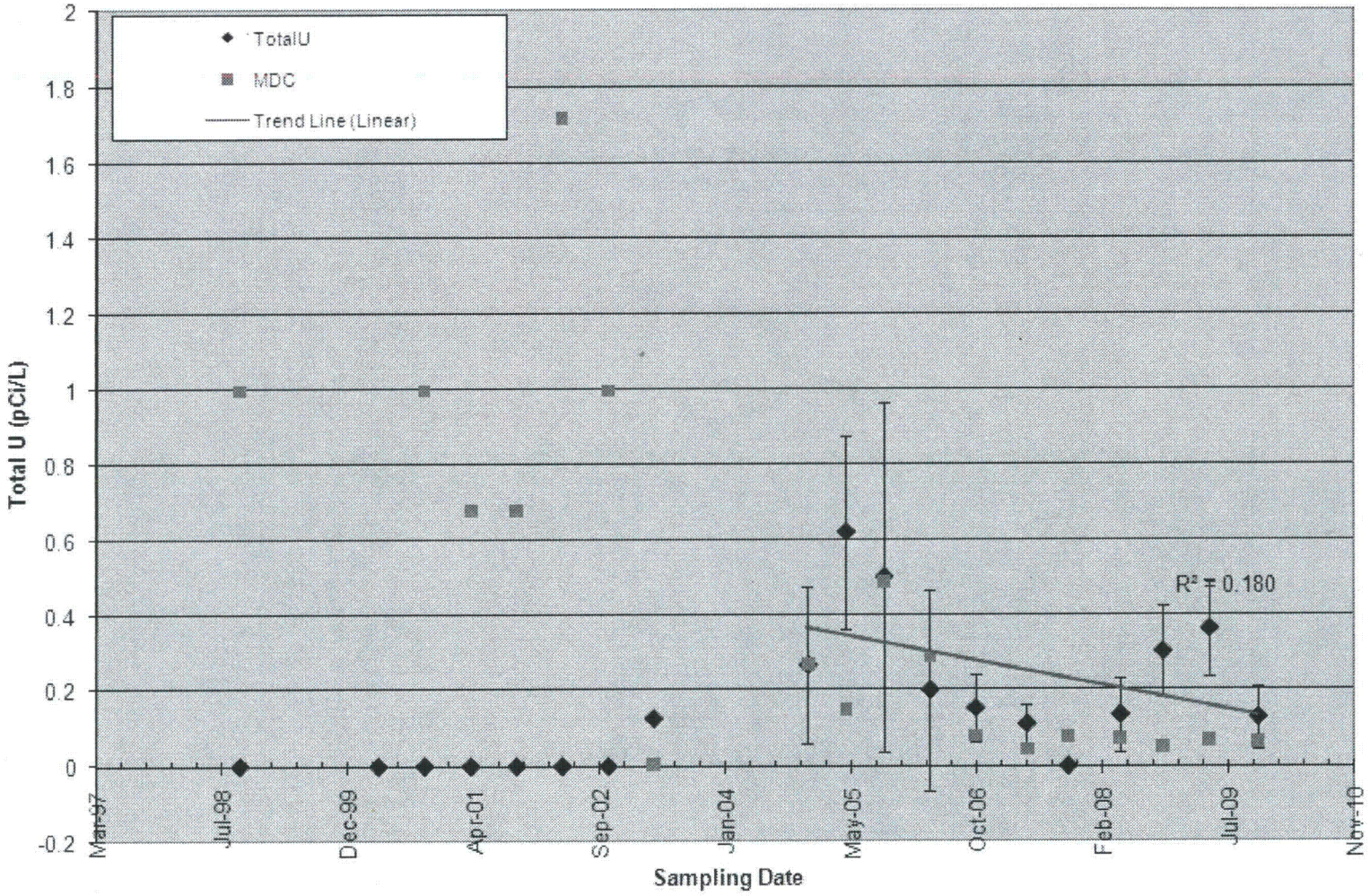


Figure 4-10. Total Uranium in MW-DU-010 (1998-2009)



NOTE: Uranium was not detected in the October 2007 sample.

Figure 4-11. Total Uranium in MW-DU-011 (1998-2009)

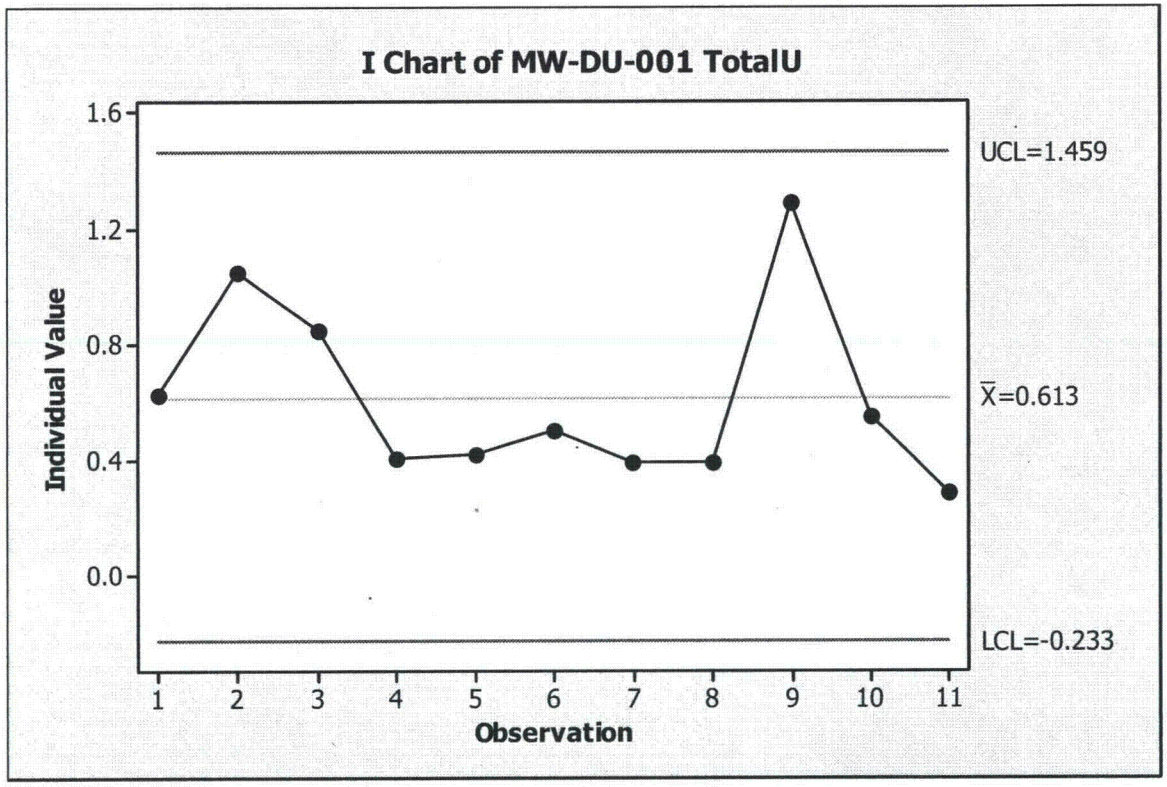


Figure 4-12. Variable Control Chart for Total Uranium in MW-DU-001 (2004-2009)

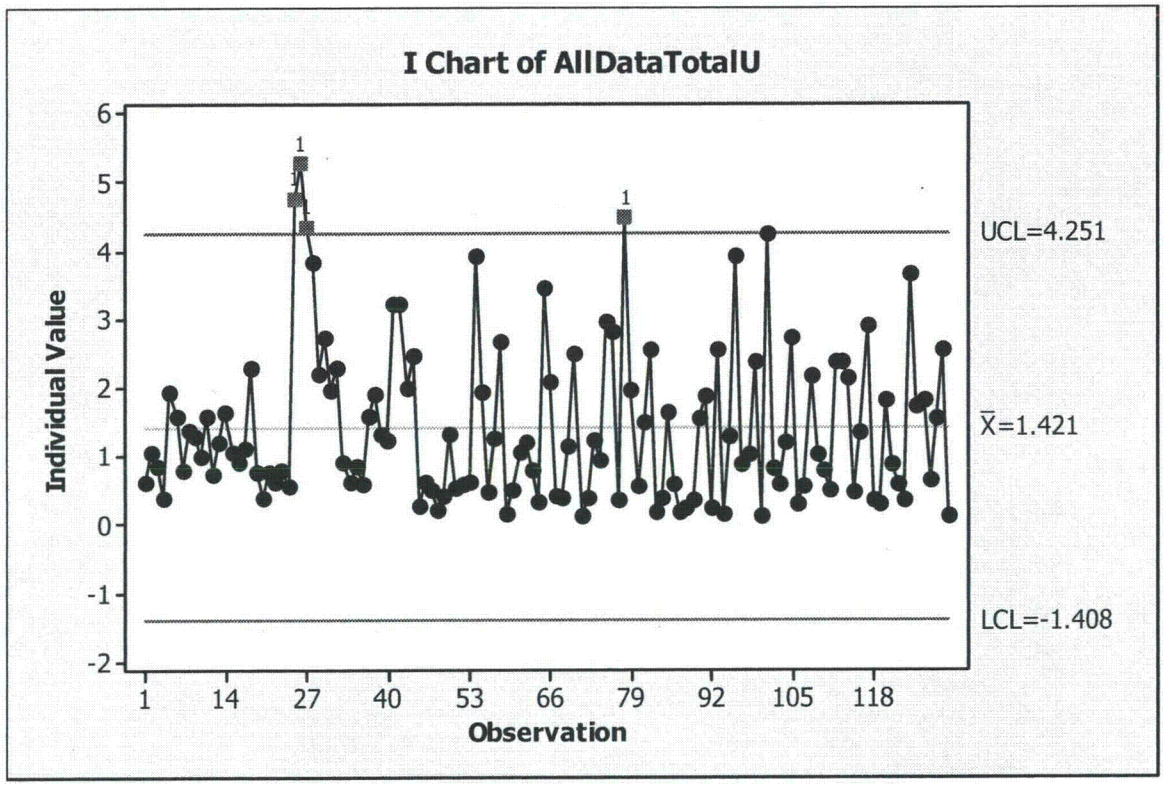


Figure 4-13. Control Chart for All Monitoring Well Data (2004-2009)

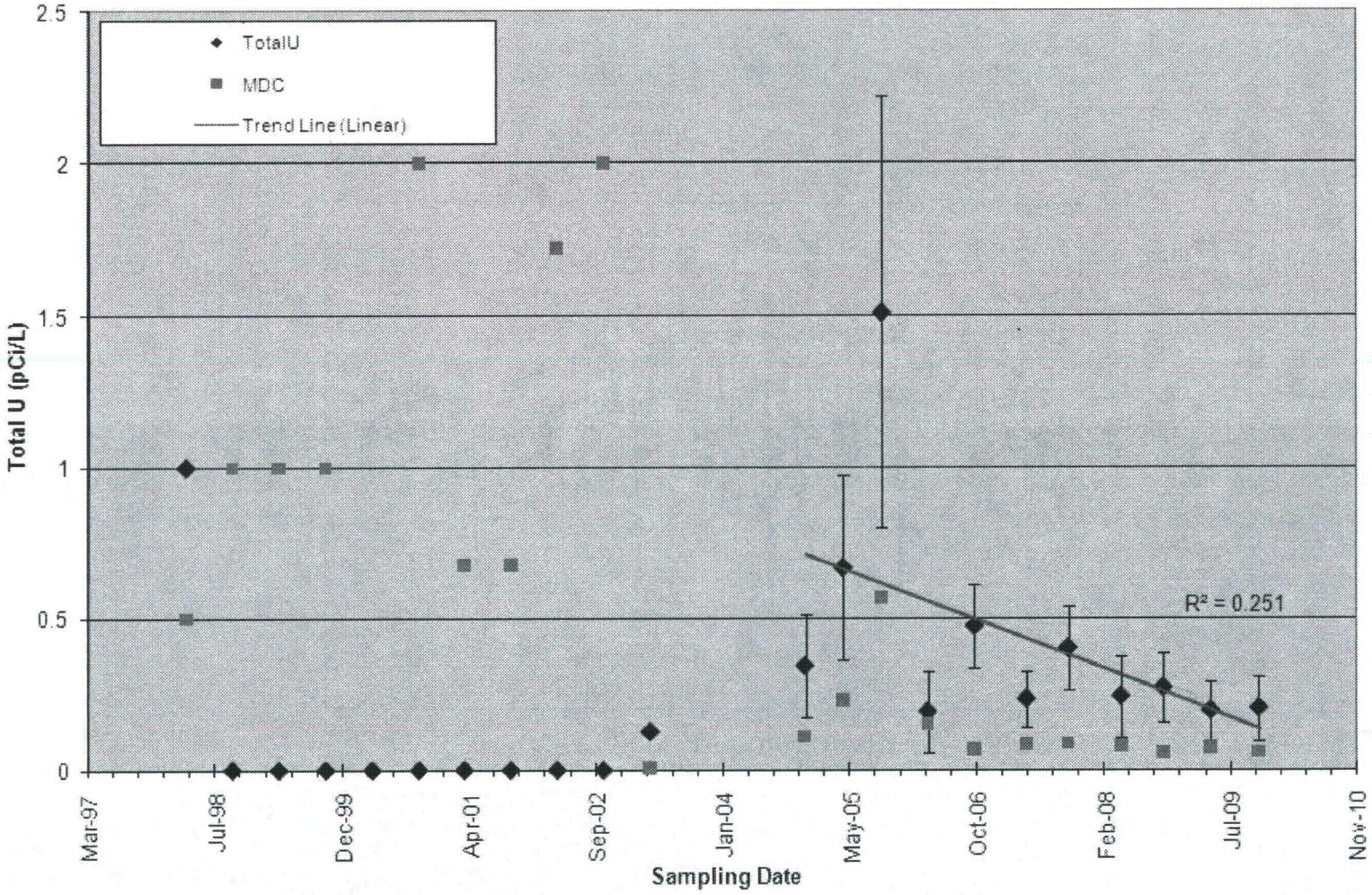


Figure 4-14. Total Uranium in SW-DU-001 (1998-2009)

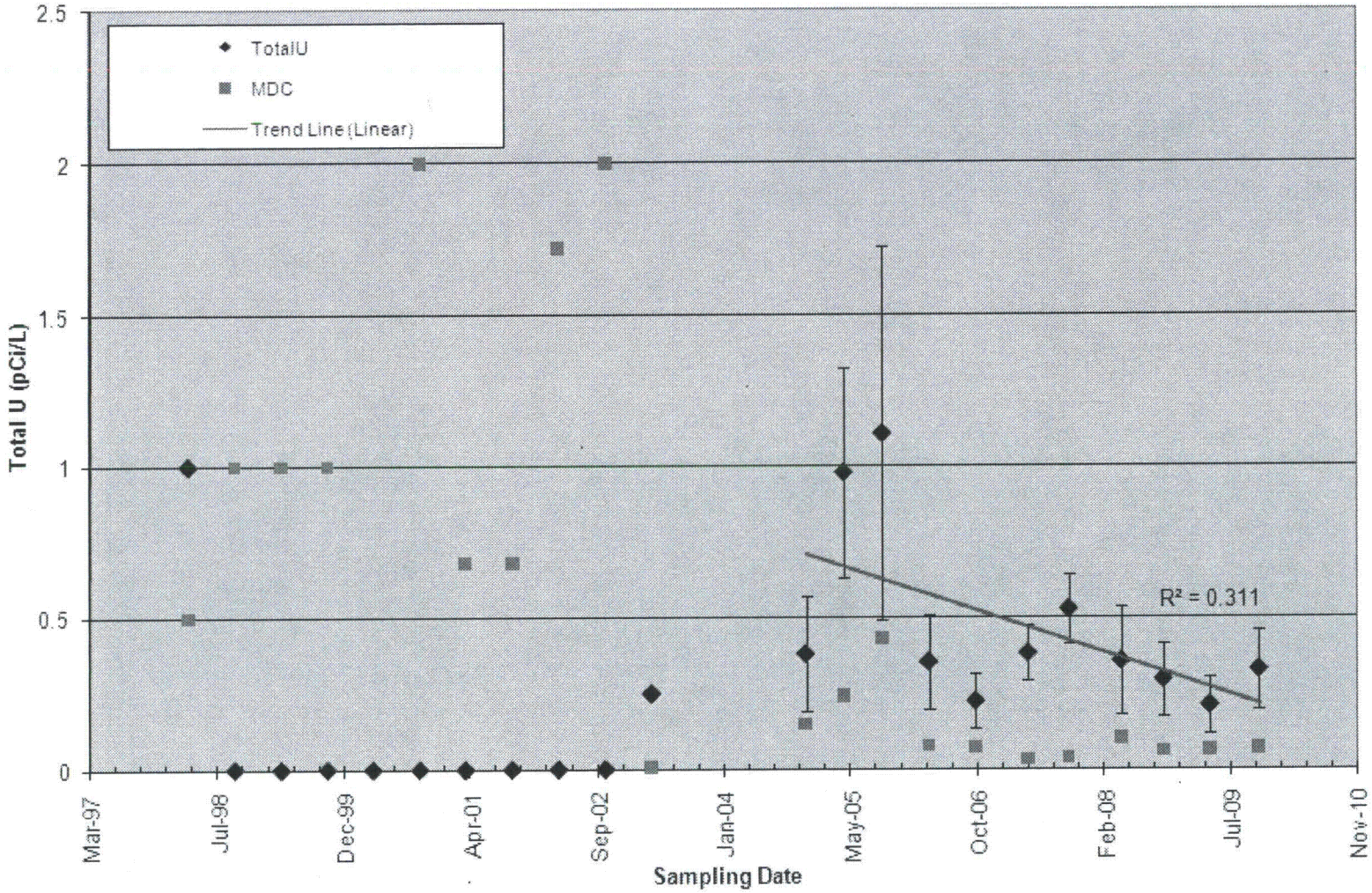
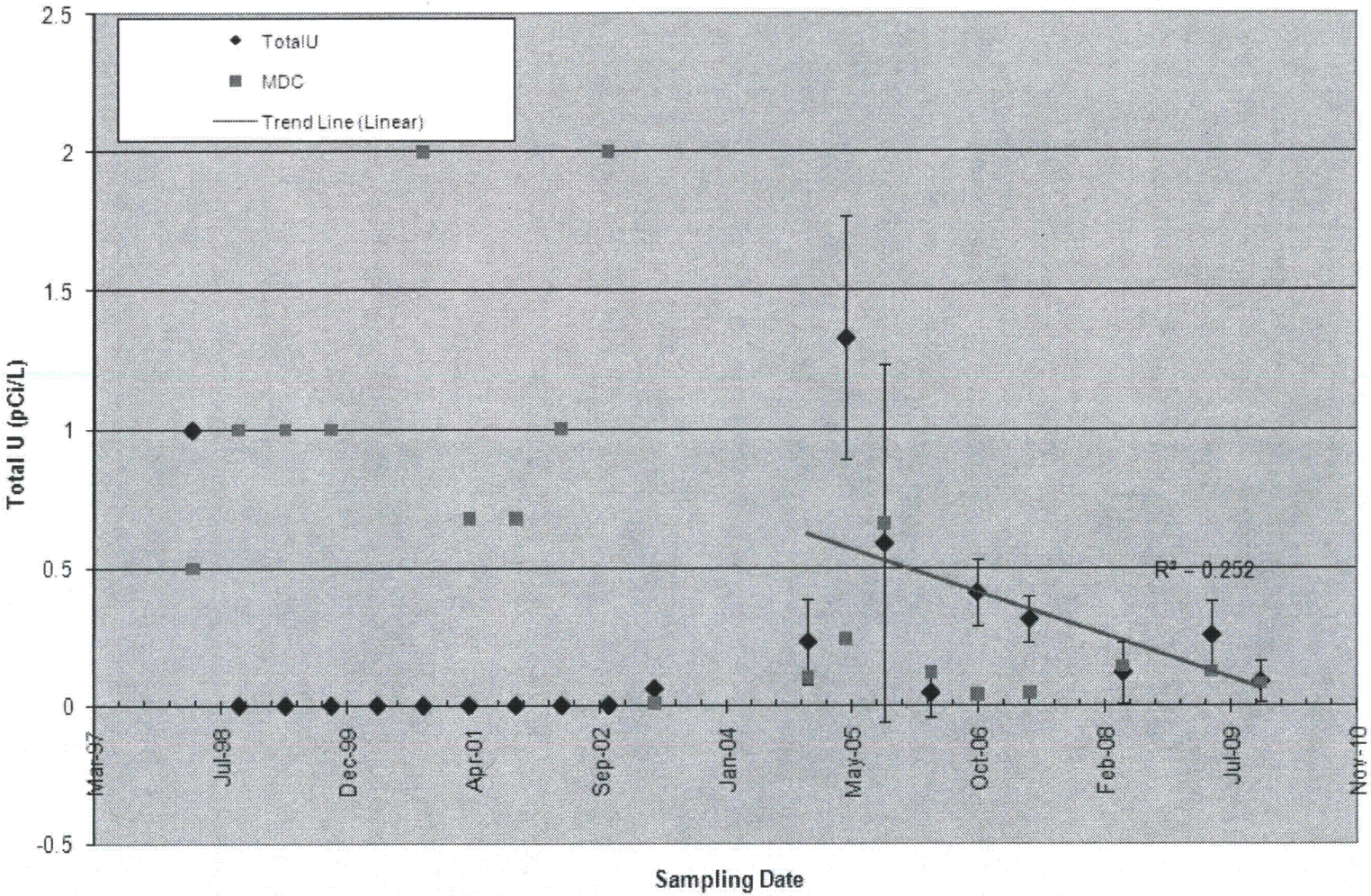


Figure 4-15. Total Uranium in SW-DU-002 (1998-2009)



NOTE: No sample collected in October 2007 or October 2008 as the creek was dry.

Figure 4-16. Total Uranium in SW-DU-003 (1998-2009)

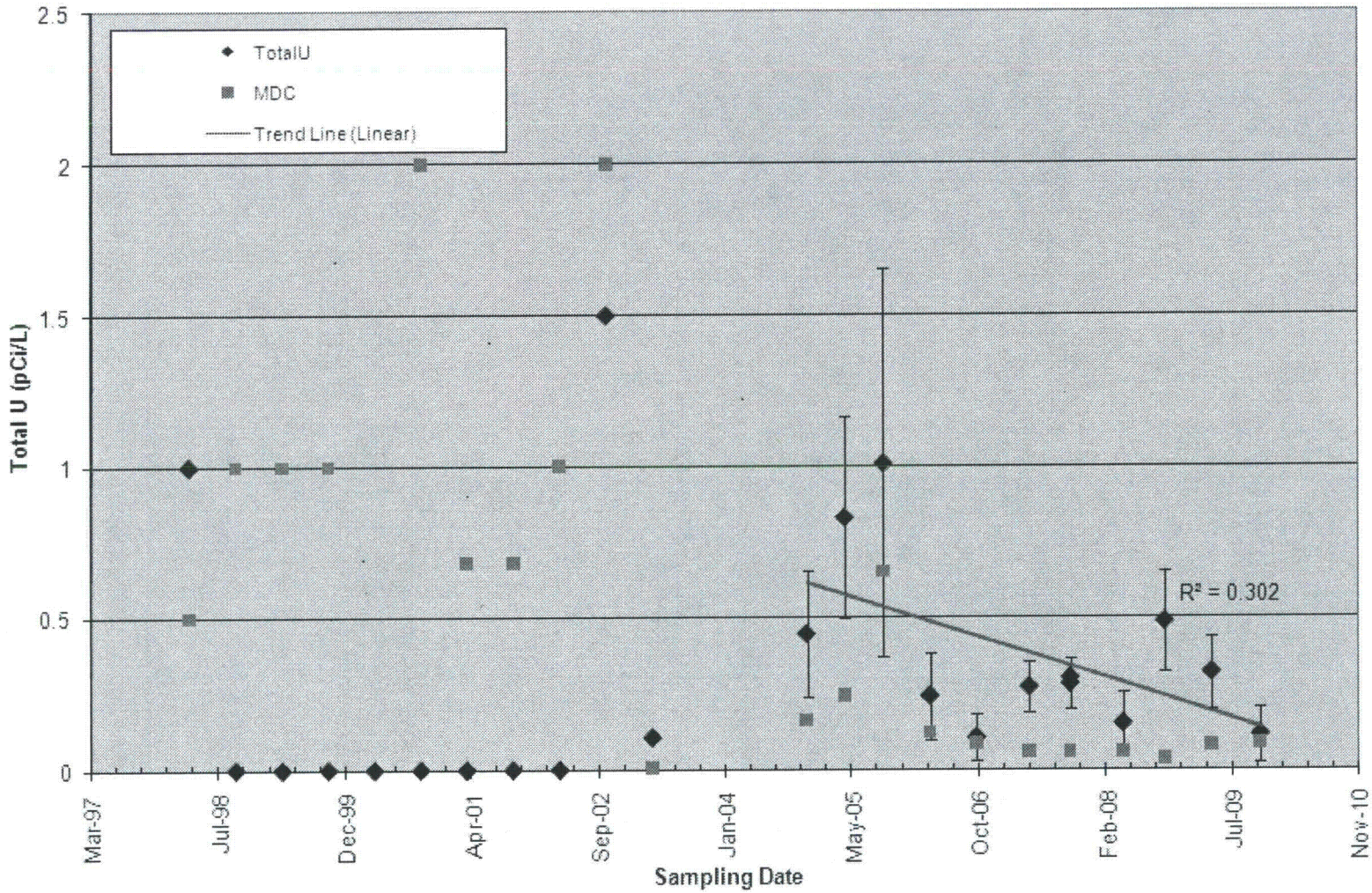
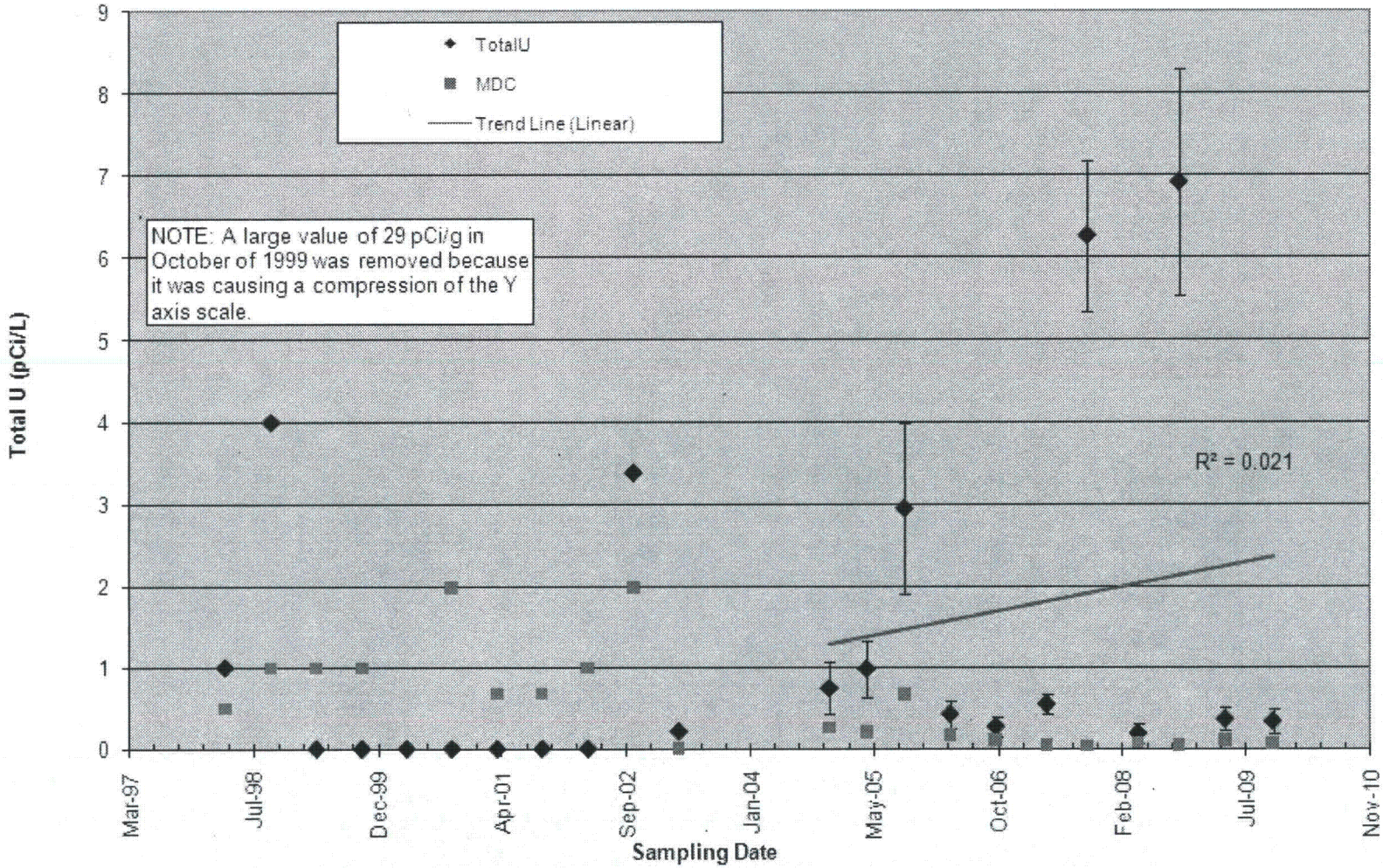
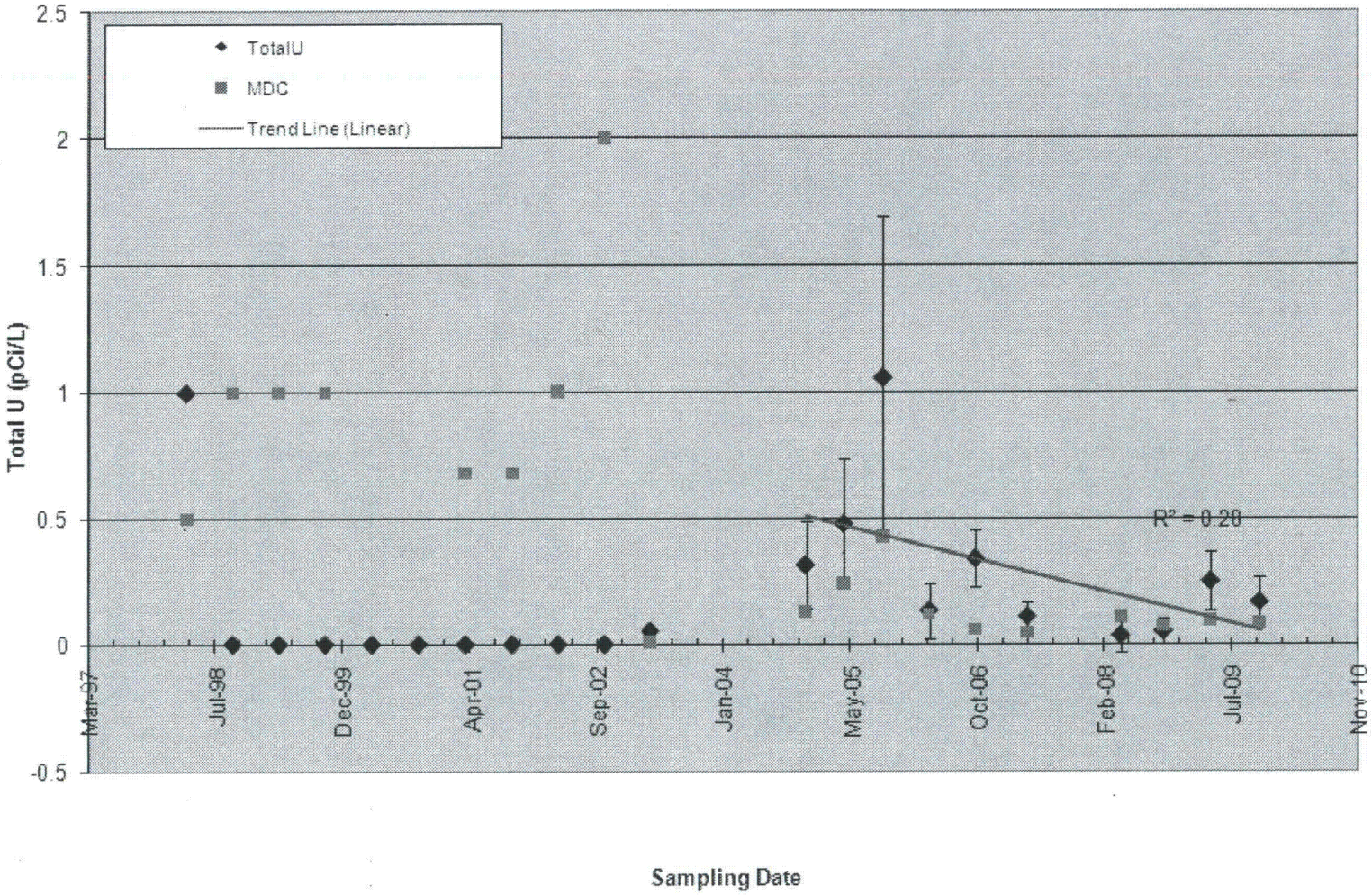


Figure 4-17. Total Uranium in SW-DU-004 (1998-2009)



NOTE: A large value of 29 pCi/g in October 1999 was removed because it was causing a compression of the Y axis scale.

Figure 4-18. Total Uranium in SW-DU-005 (1998-2009)



NOTE: No sample collected in October 2007 as the creek was dry.

Figure 4-19. Total Uranium in SW-DU-006 (1998-2009)

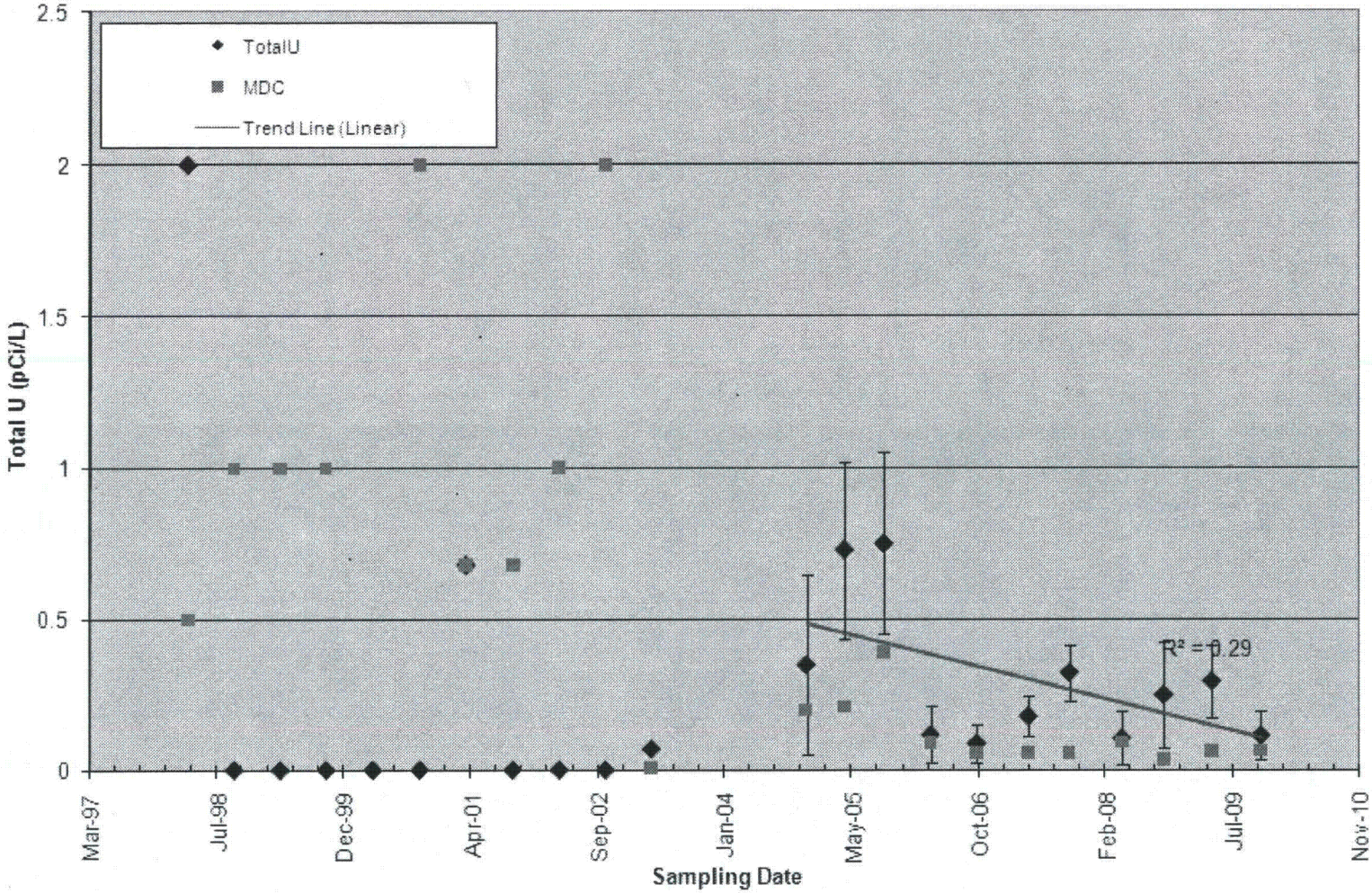


Figure 4-20. Total Uranium in SW-DU-007 (1998-2009)

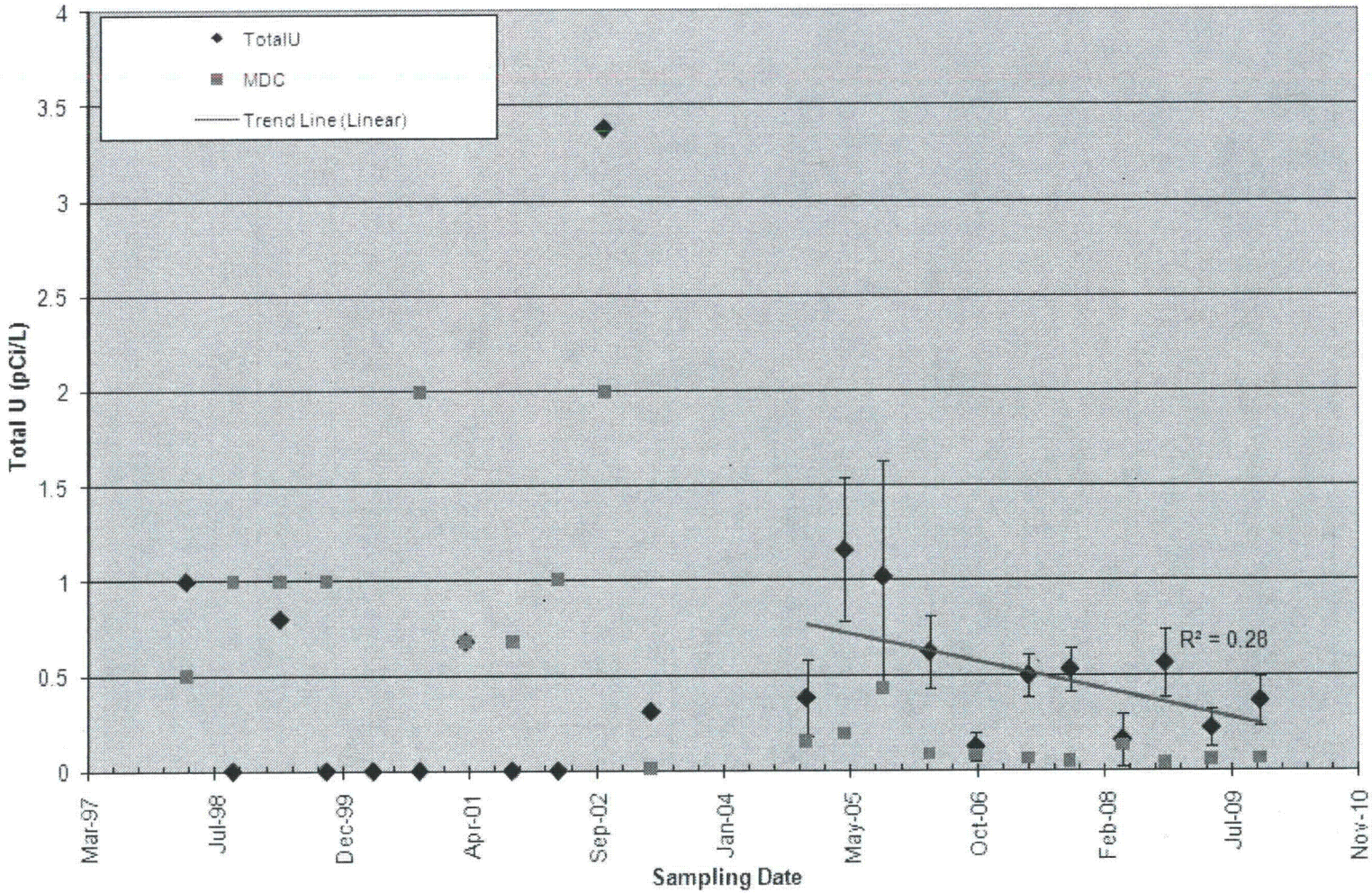


Figure 4-21. Total Uranium in SW-DU-008 (1998-2009)

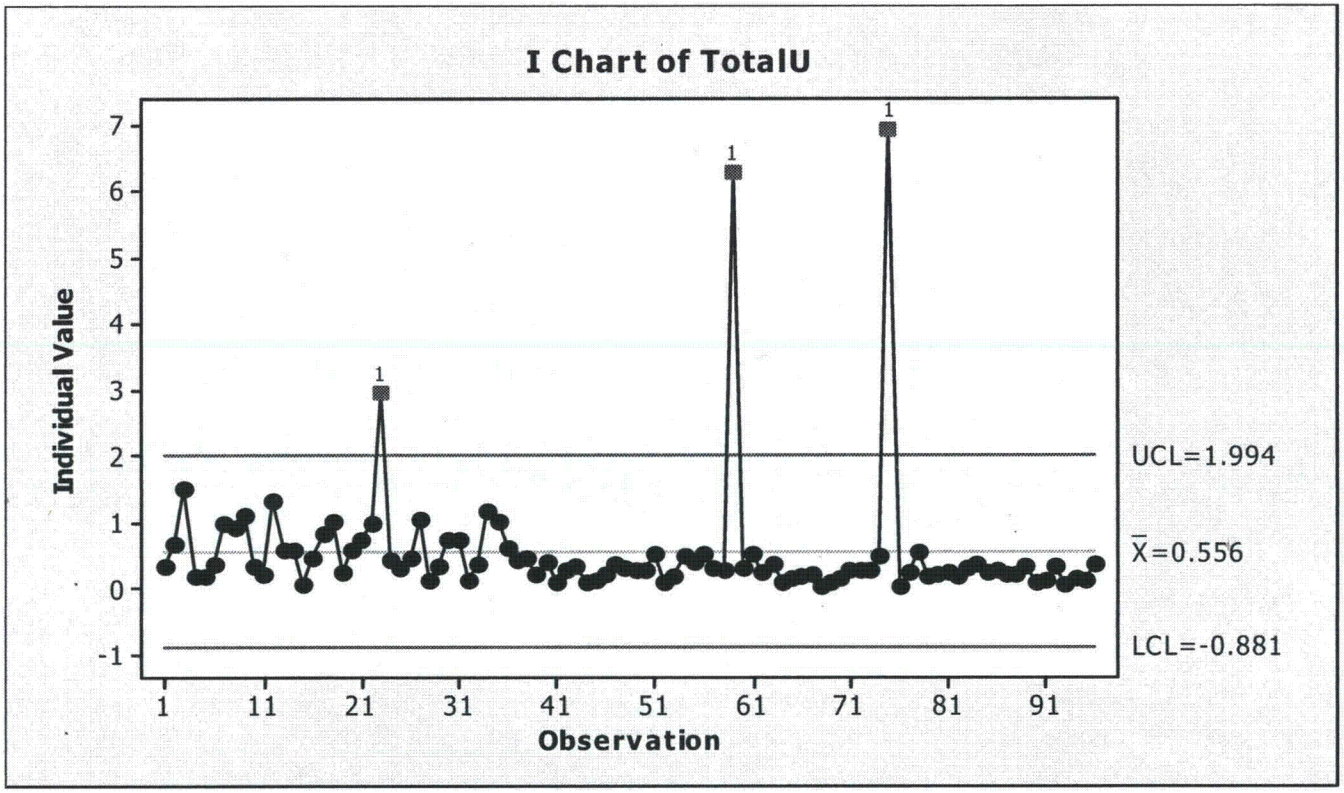


Figure 4-22. Control Chart for All Surface Water Data (2004-2009)

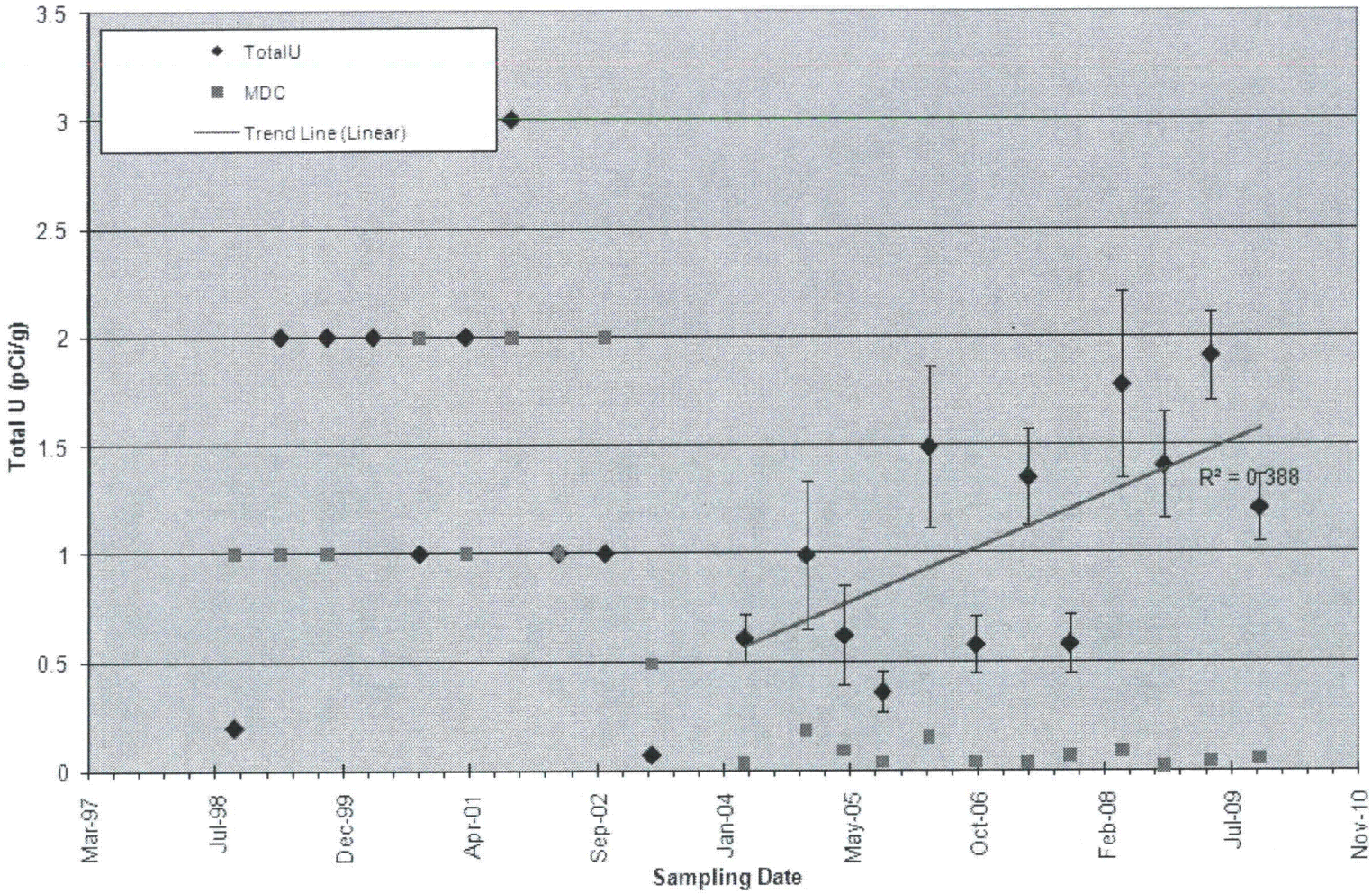


Figure 4-23. Total Uranium in SD-DU-001 (1998-2009)

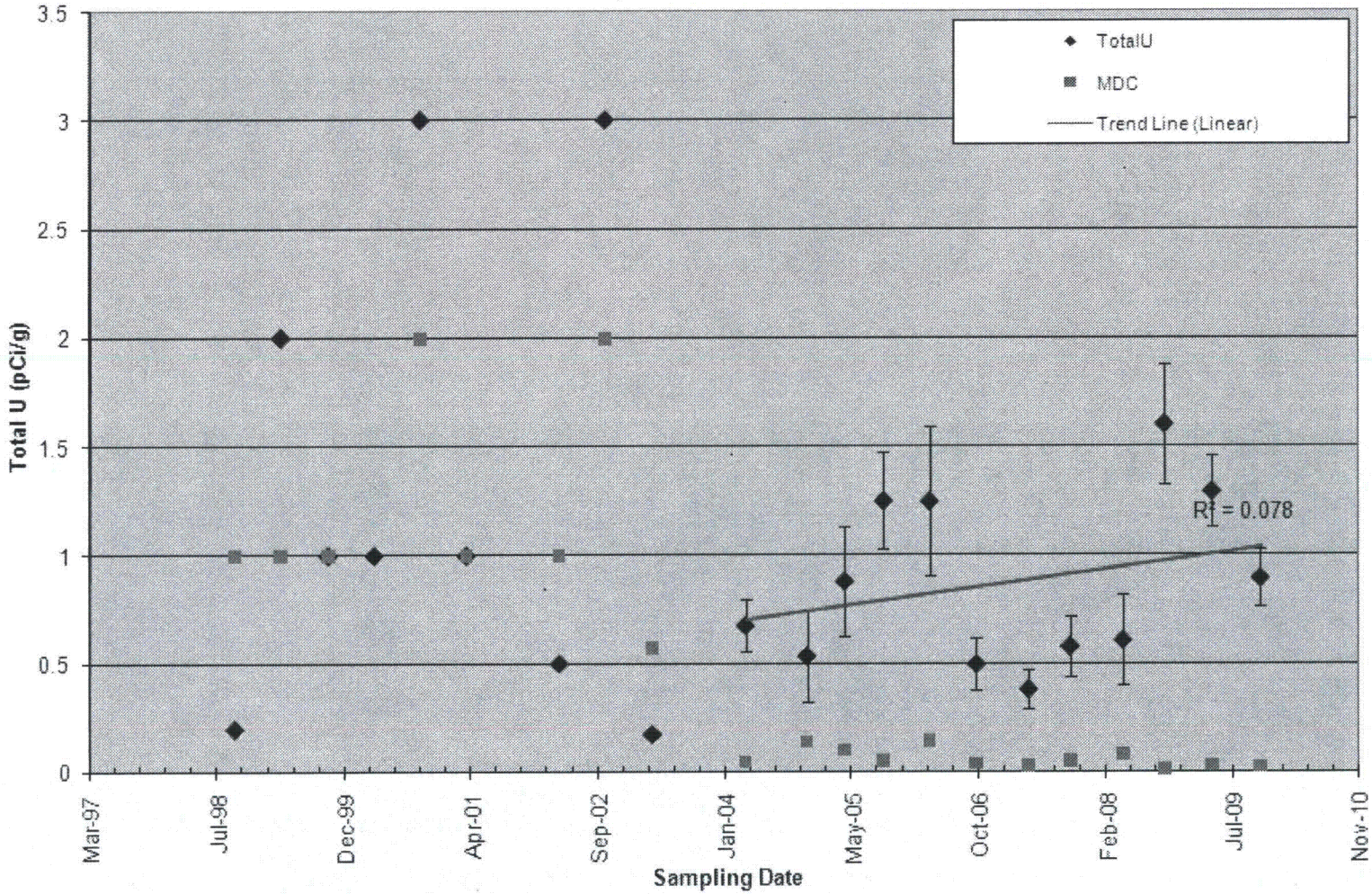


Figure 4-24. Total Uranium in SD-DU-002 (1998-2009)

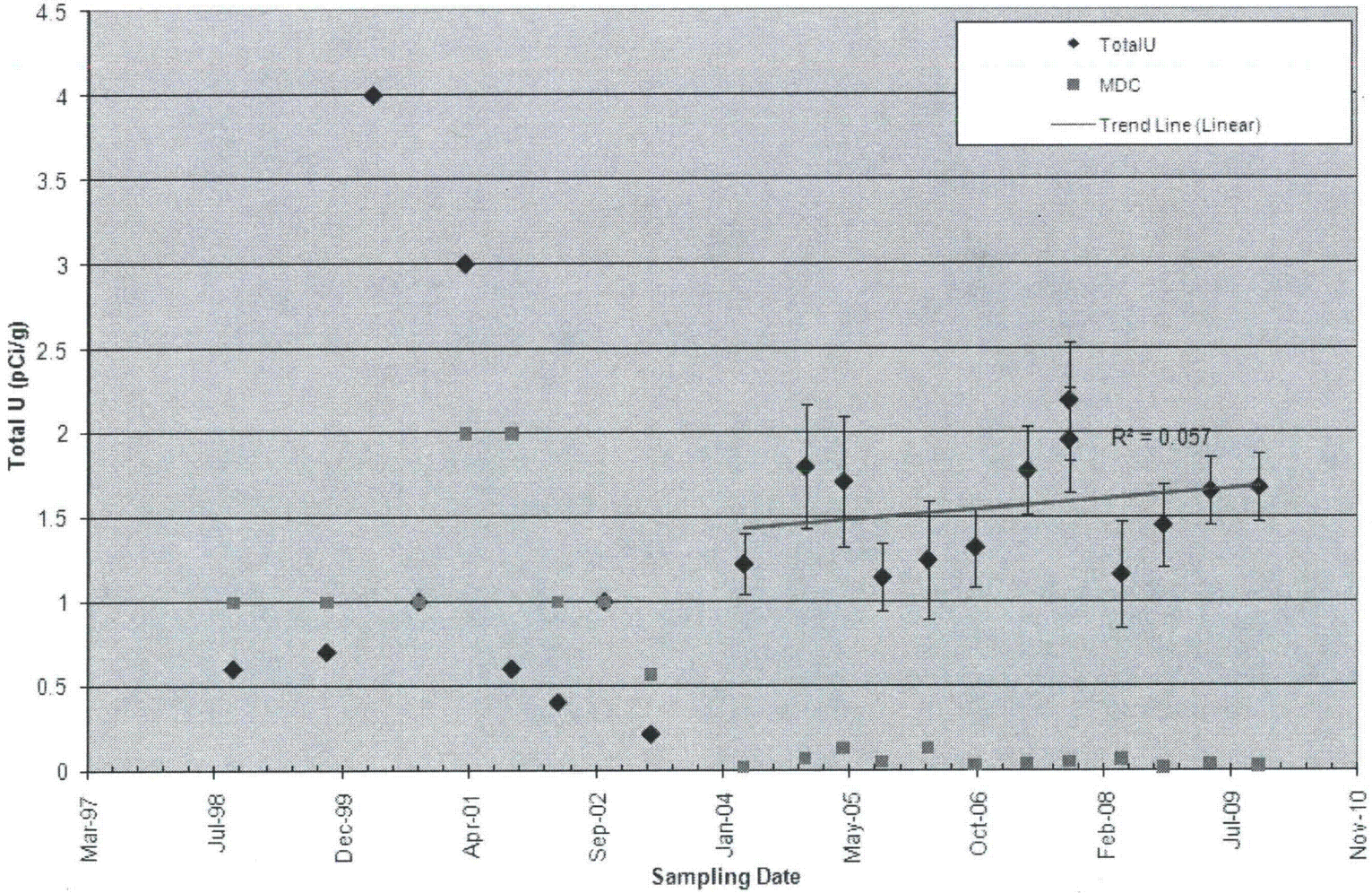


Figure 4-25. Total Uranium in SD-DU-003 (1998-2009)

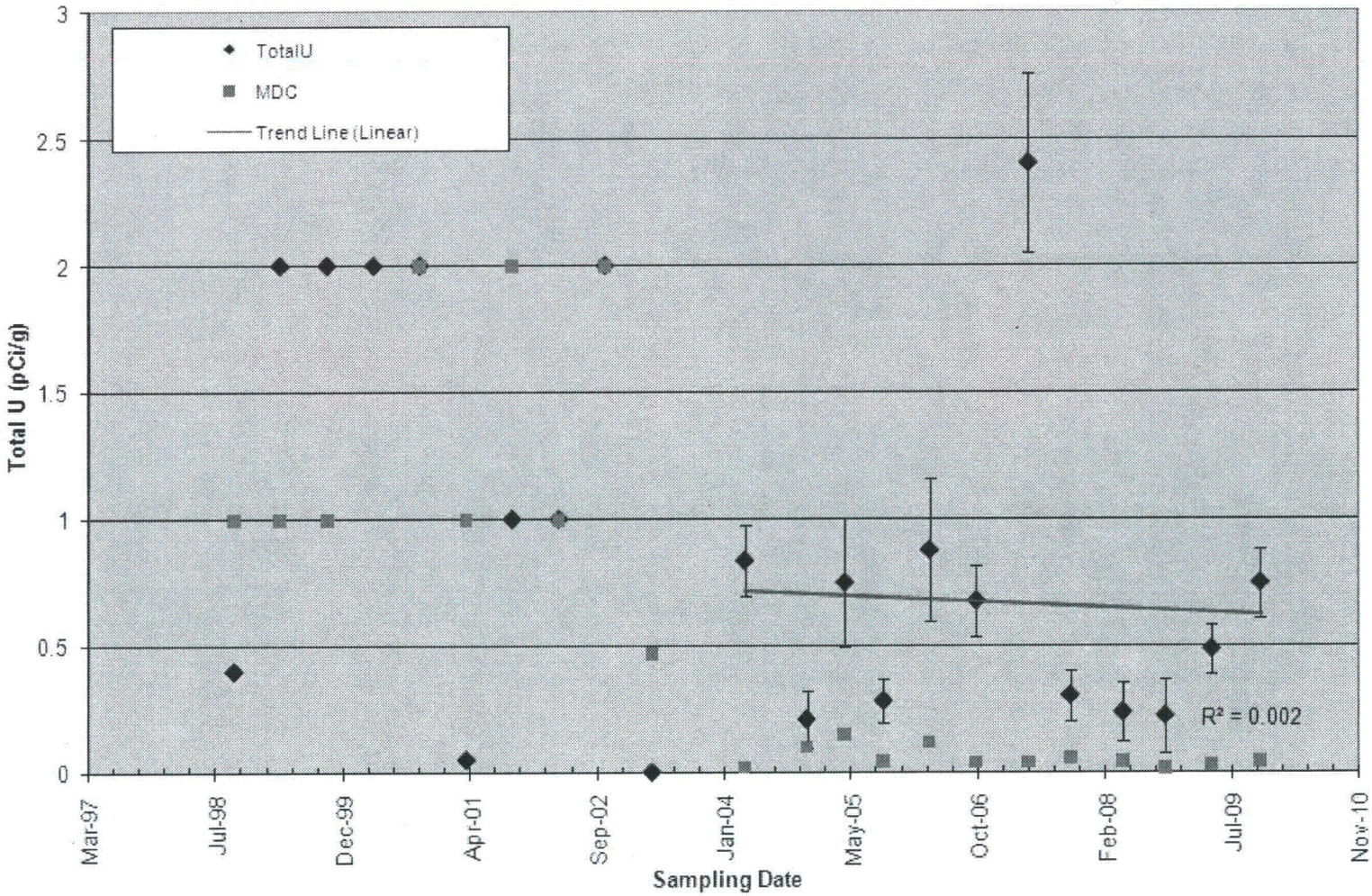


Figure 4-26. Total Uranium in SD-DU-004 (1998-2009)

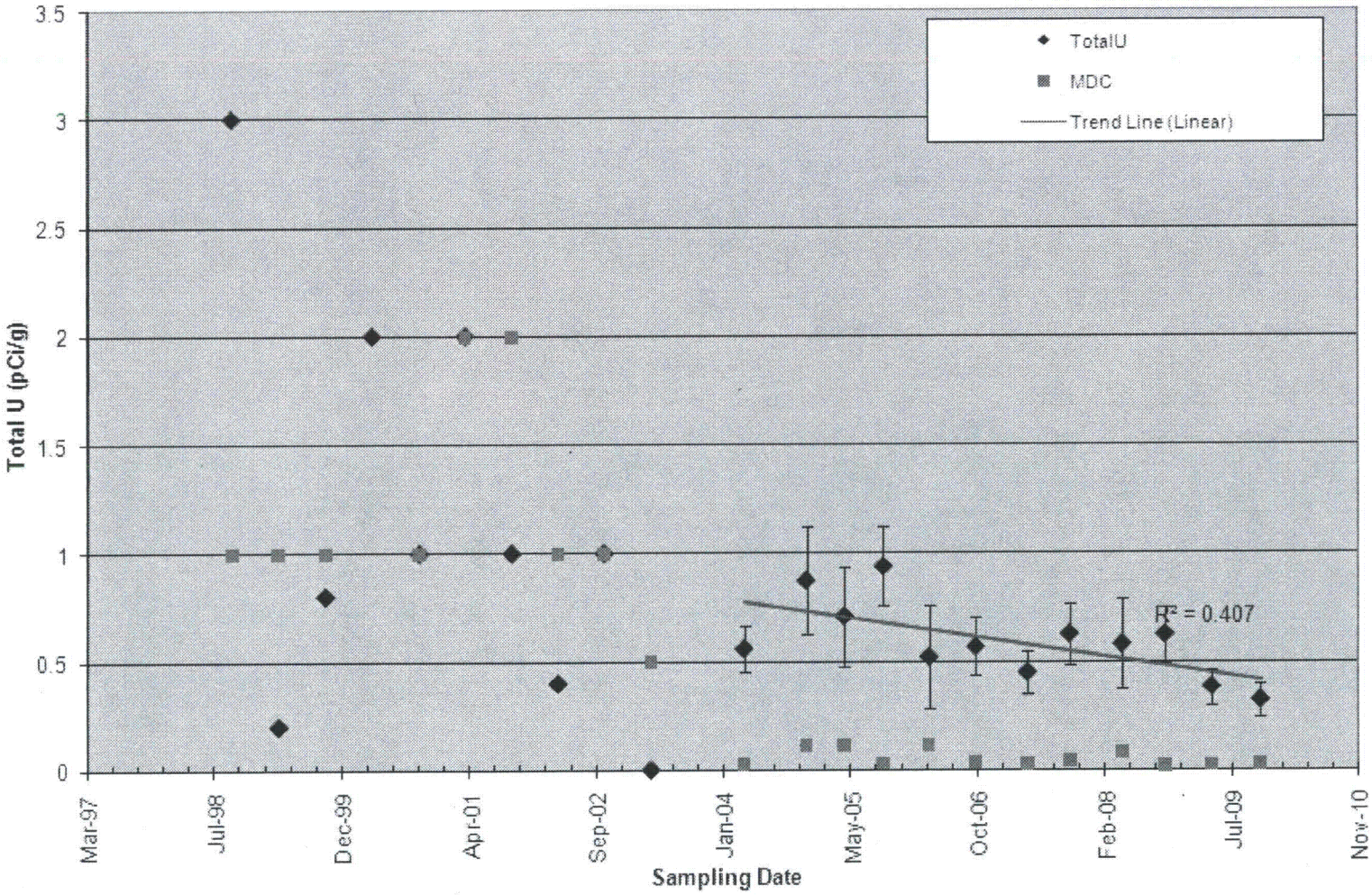


Figure 4-27. Total Uranium in SD-DU-005 (1998-2009)

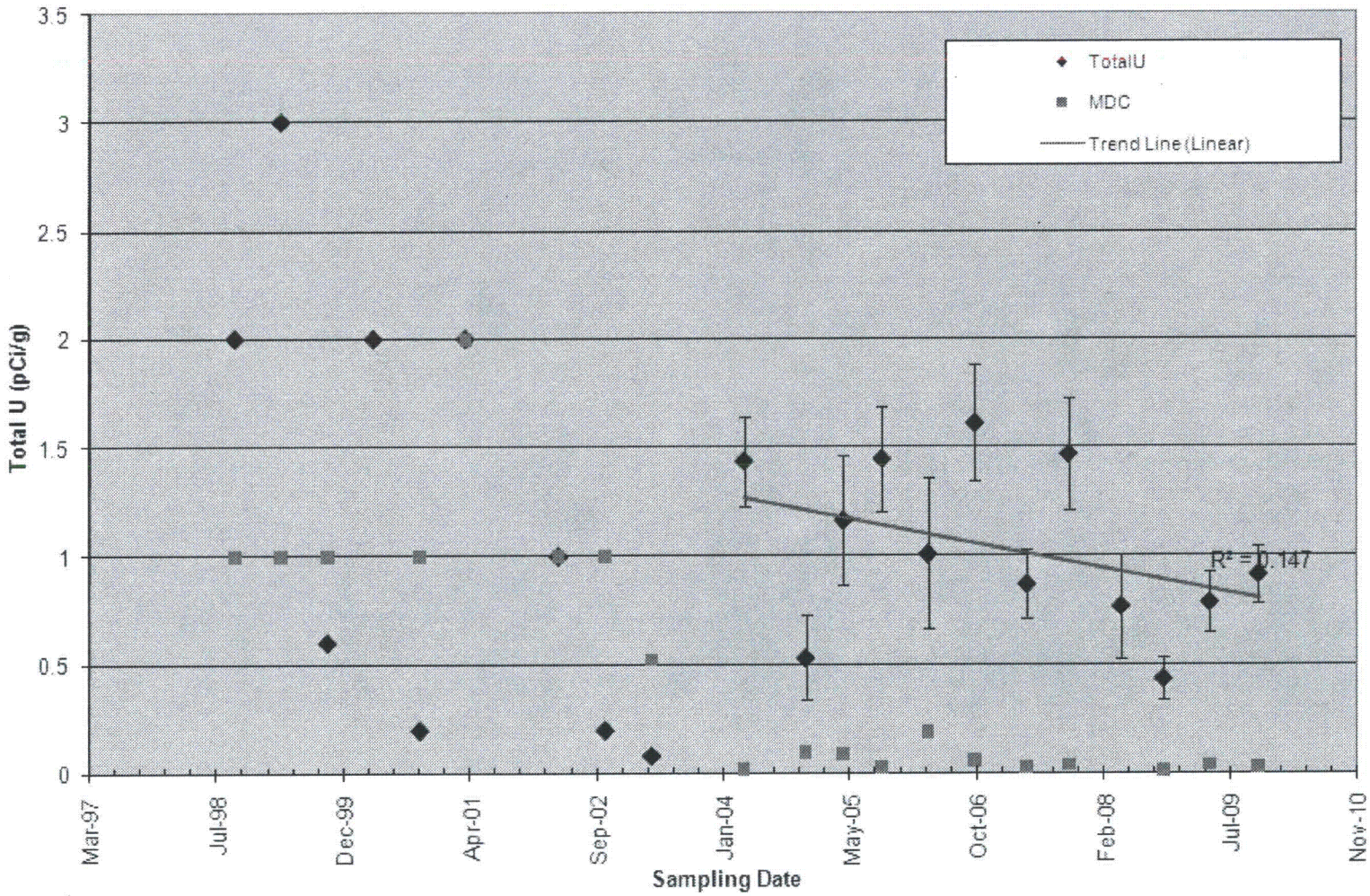


Figure 4-28. Total Uranium in SD-DU-006 (1998-2009)

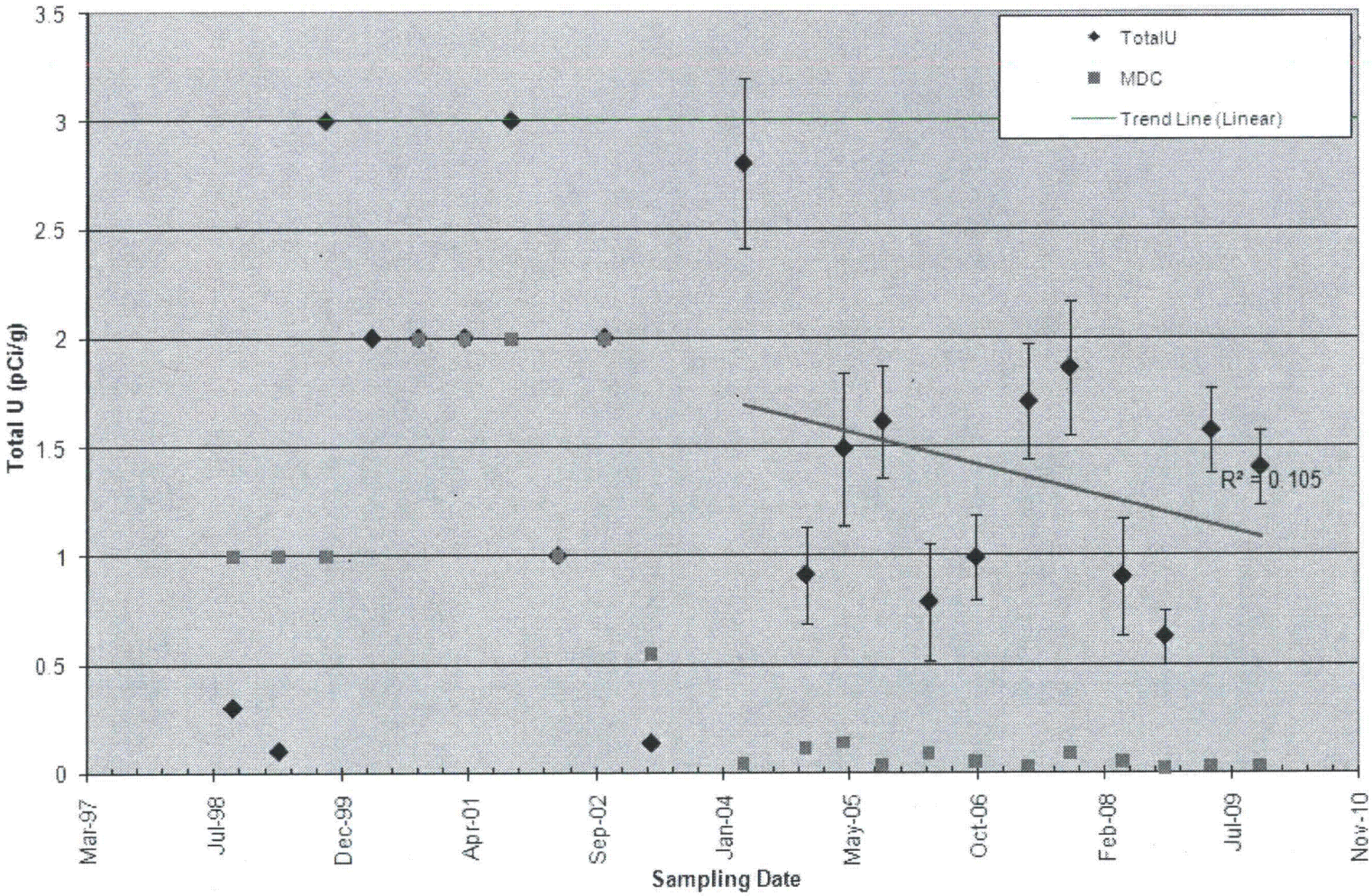


Figure 4-29. Total Uranium in SD-DU-007 (1998-2009)

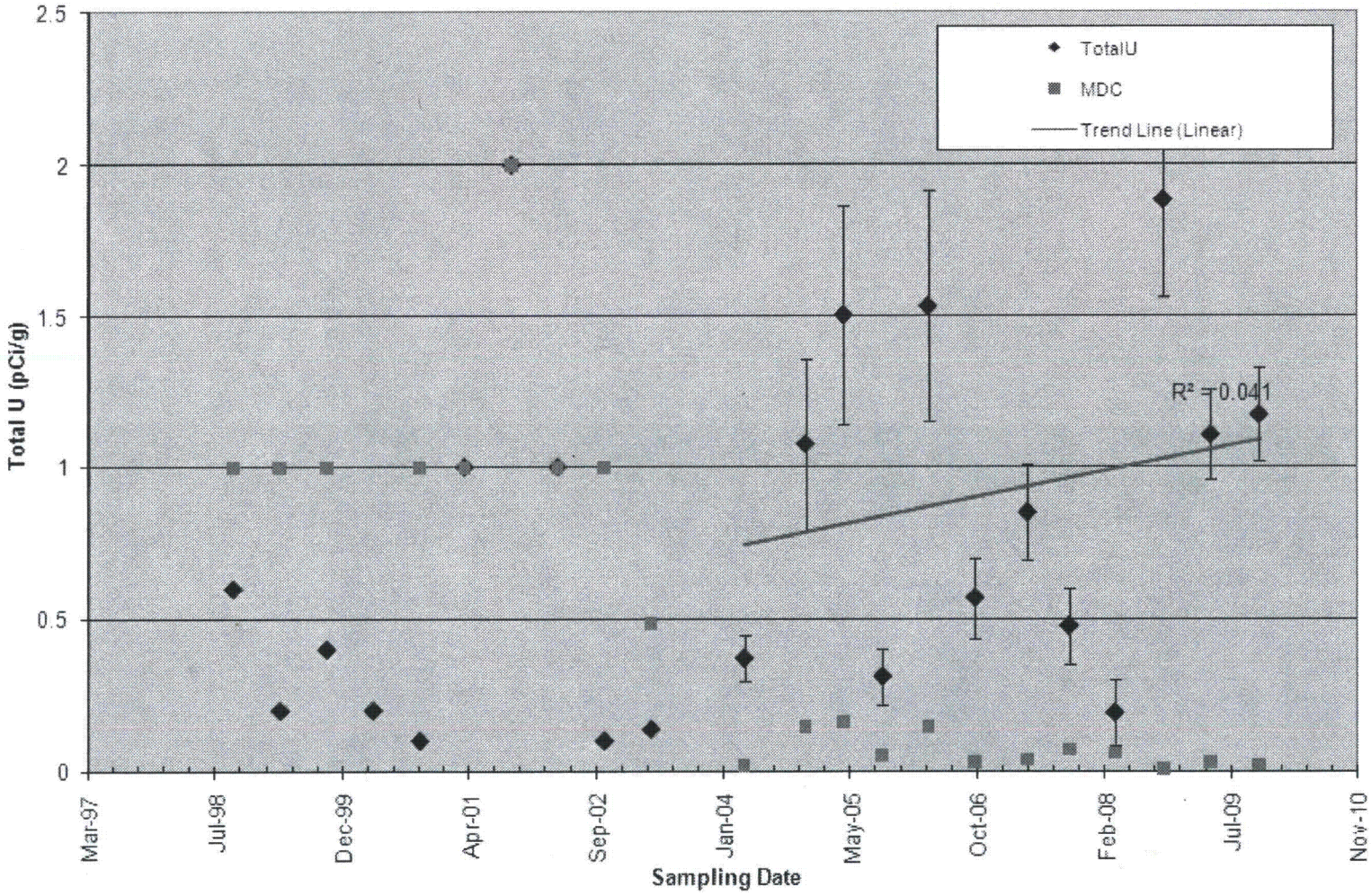


Figure 4-30. Total Uranium in SD-DU-008 (1998-2009)

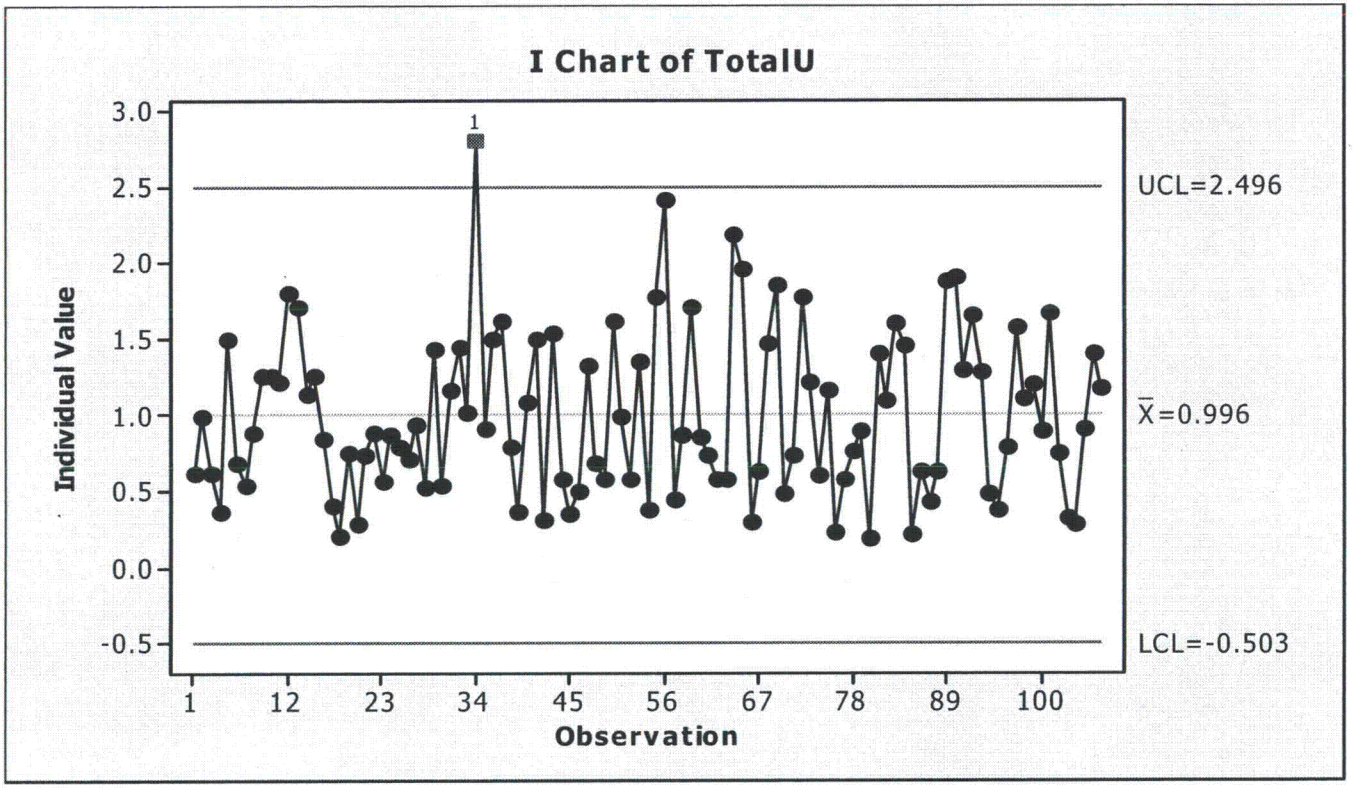


Figure 4-31. Control Chart for All Sediment Data (2004-2009)

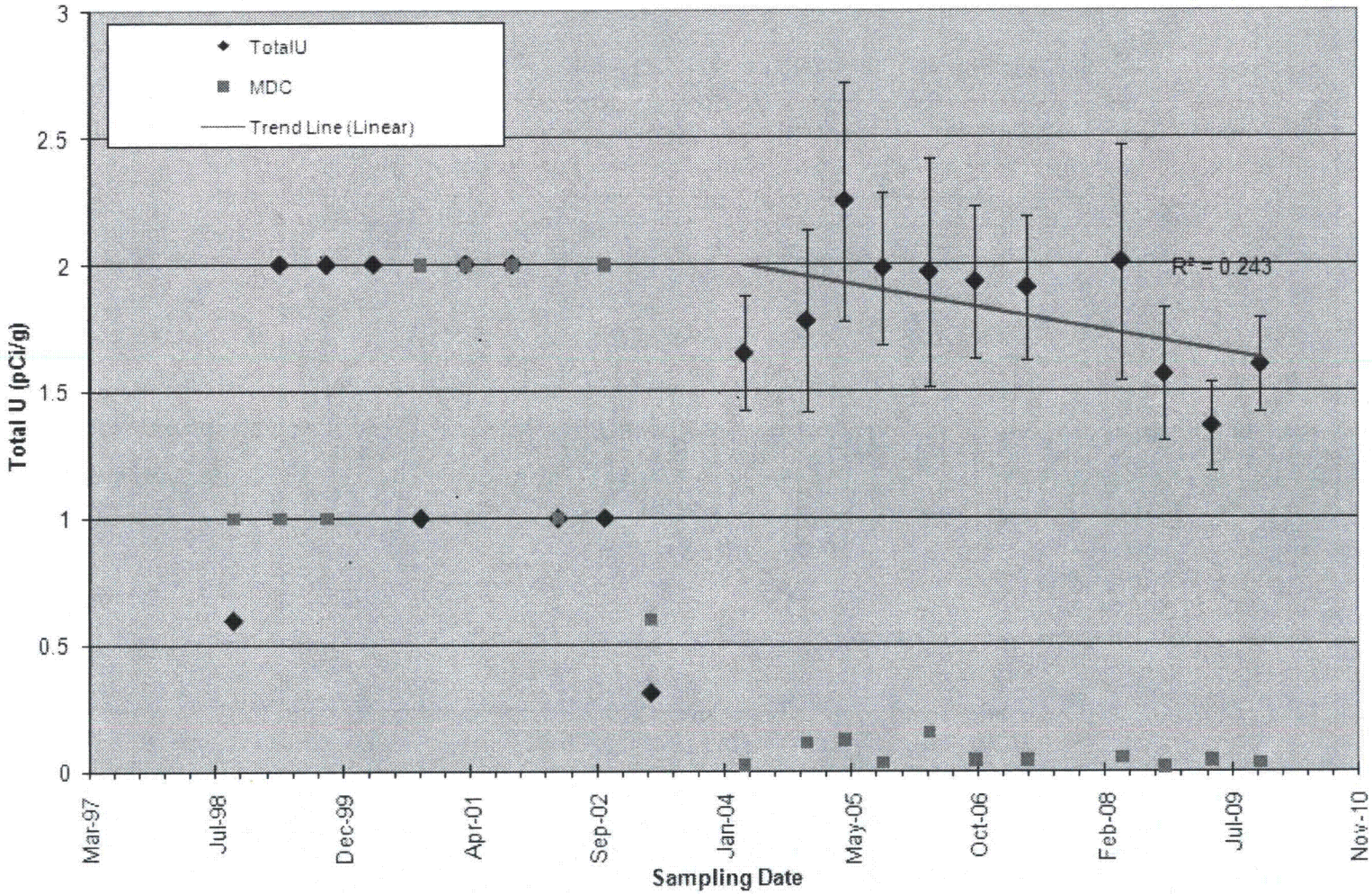


Figure 4-32. Total Uranium in SS-DU-001 (1998-2009)

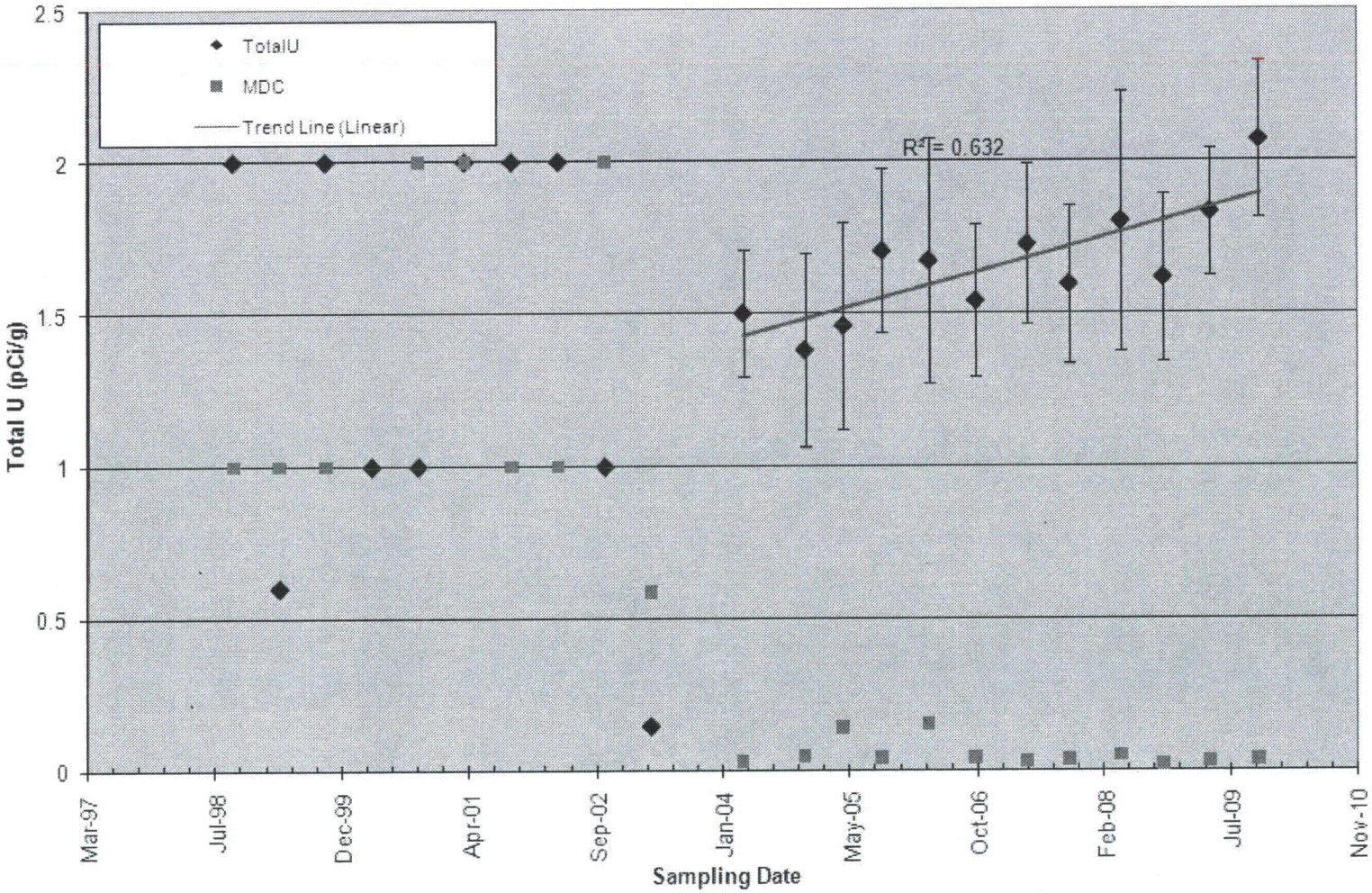


Figure 4-33. Total Uranium in SS-DU-002 (1998-2009)

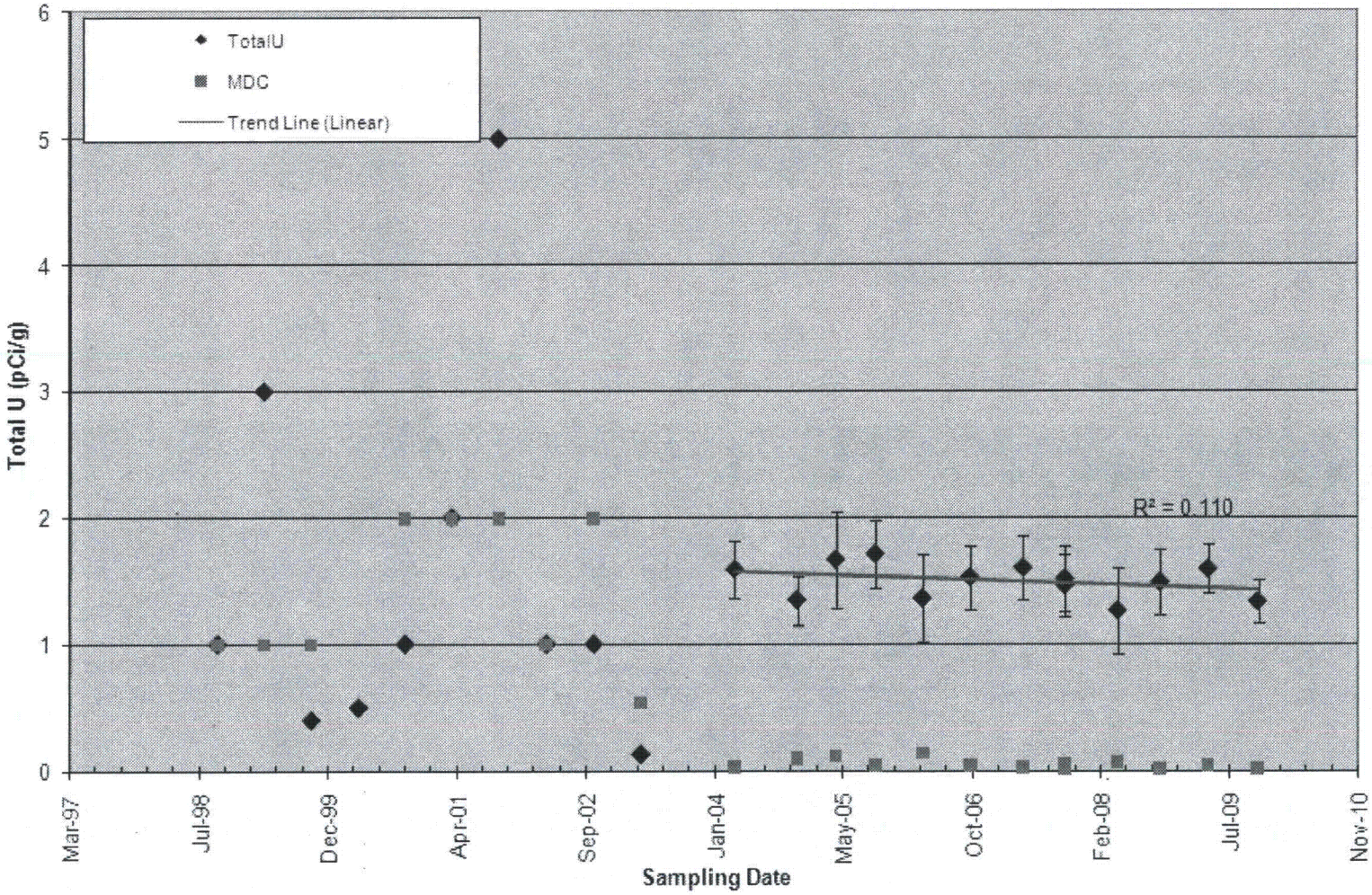


Figure 4-34. Total Uranium in SS-DU-003 (1998-2009)

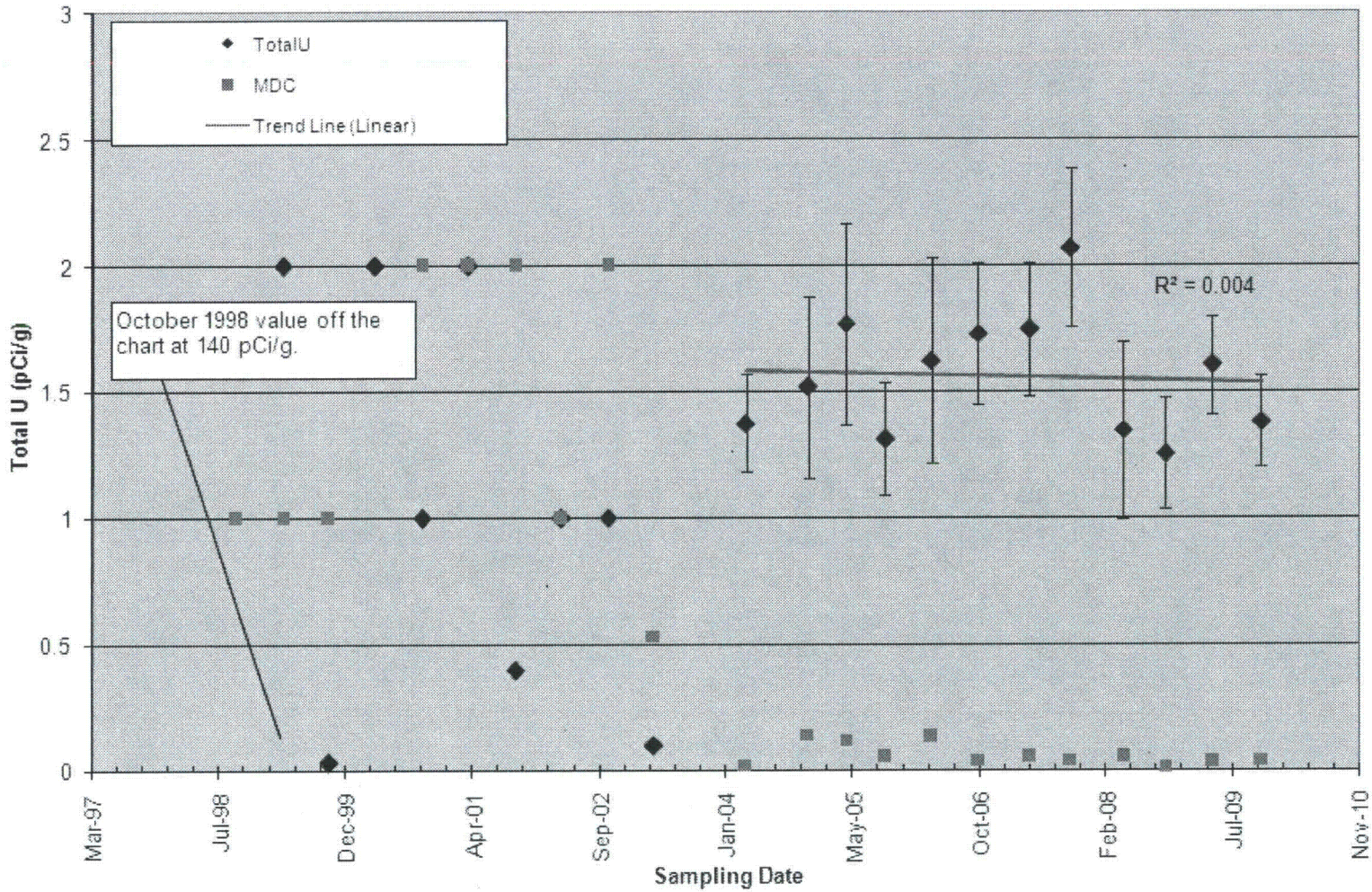


Figure 4-35. Total Uranium in SS-DU-004 (1998-2009)

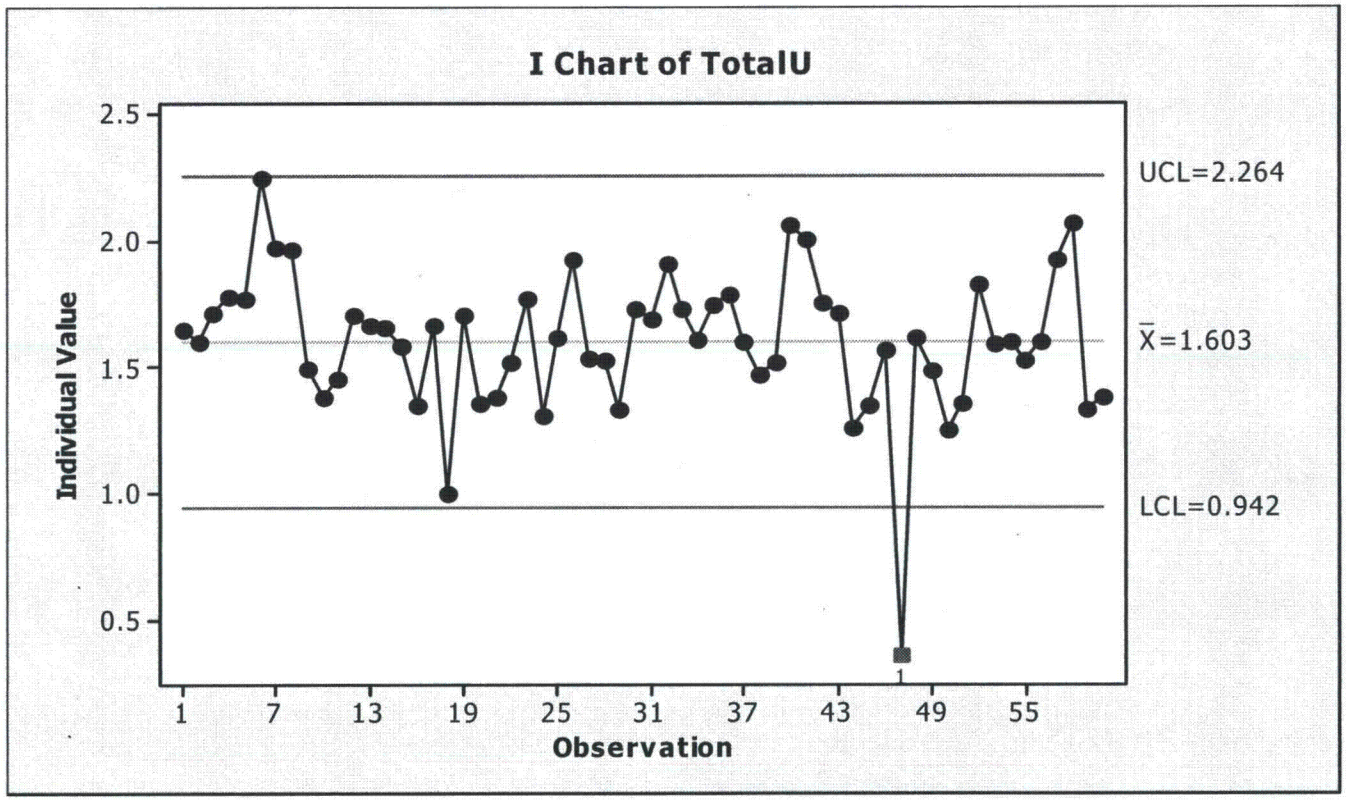


Figure 4-36. Control Chart for All Surface Soil Data (2004-2009)

5. CONCLUSIONS AND RECOMMENDATIONS

The October 2009 sampling event was conducted in accordance with the SOP (CHPPM 2000); and all data were determined to comply with the requirements of the Quality Assurance Project Plan (QAPP) (see Appendix A). The environmental media sample results are generally a small fraction of the action levels (see Table 4-1) established in the SOP. For the purposes of this report, samples with U-238/U-234 ratios in excess of 3 are investigated further to validate whether a sample result is representative of DU or natural uranium. No ratios exceeding 3 were encountered for any sample collected as part of the October 2009 sampling event. Trend analysis completed reflected that surface soil location SS-DU-002 exhibited an R^2 value of 0.63 indicating that the upward trend at this location was somewhat significant, and will, therefore, continue to be monitored closely. No action levels defined in the Army's license were exceeded. Future environmental monitoring will continue to be completed in accordance with the SOP.

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6. REFERENCES

CHPPM (U.S. Army Center for Health Promotion and Preventative Medicine). 2000. Standard Operating Procedure, Depleted Uranium Sampling Program, Environmental Radiation Monitoring Program. SOP No. OHP 40-2. 10 March.

CFR (Code of Federal Regulations). 2008. 10 CFR 20. Energy. Nuclear Regulatory Commission. Standards for Protection Against Radiation.

NRC (Nuclear Regulatory Commission). 1988. License Number SUB-1435 and Subsequent Amendments, Jefferson Proving Ground, Madison, Indiana. U.S. Army, TECOM, Aberdeen Proving Ground, Maryland. 8 May.

SAIC (Science Applications International Corporation). 2006. Radiation Monitoring Report for License SUB-1435 Jefferson Proving Ground, Summary of Results for 10-13 April 2006 Sampling Event. Final. October.

U.S. Army. 1999. U.S. Army Test and Evaluation Command, Environmental Radiation Monitoring (ERM) Plan for Jefferson Proving Ground. Memorandum to Mr. Larry W. Camper, Chief, Decommissioning Branch, Division of Waste Management, Office of Nuclear Material Safety and Safeguards, United States Nuclear Regulatory Commission, Washington, DC 20555-001 from Dal M. Nett, Chief, Safety Division, Directorate for Mission Support.

U.S. Army. 2000. Standing Operating Procedure, Depleted Uranium Sampling Program, Environmental Radiation Monitoring Program, Jefferson Proving Ground, Madison, Indiana. MCHB-TS-OH. SOP No. OHP 40-2. Effective date, 10 March 2000.

U.S. Army. 2002. Decommissioning Plan for License SUB-1435. Jefferson Proving Ground, Madison, Indiana. Prepared for the U.S. Army SBCCOM by SAIC. June.

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APPENDIX A
STANDARD OPERATING PROCEDURE

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SOP No. OHP 40-2

Effective Date 10 Mar 00
Date Removed from Service _____

STANDING OPERATING PROCEDURE

Depleted Uranium Sampling Program
Environmental Radiation Monitoring Program
Jefferson Proving Ground, Madison, IN

This SOP supersedes, in its entirety, the SOP of the same name dated April 1998.

1. **Purpose.** This Standing Operating Procedure (SOP) prescribes policies, responsibilities, and procedures for administration and execution of the Health Physics Program (HPP), USACHPPM support of the Soldier and Biological Chemical Command (SBCCOM) biannual Environmental Radiation Monitoring (ERM) Program conducted at the Jefferson Proving Ground, Madison, Indiana.

2. **Authority.**

a. US Nuclear Regulatory Commission License No. SUB-1435.

b. Program Services Meeting, 14 September 1999, between SBCCOM and HPP, USACHPPM.

3. **Scope.** This SOP applies to Health Physics Program personnel performing the collection of environmental samples in support of the ERM.

4. **Definitions, Abbreviations.** A list of terms and abbreviations used in this SOP can be found in Annex A.

5. **Forms, Labels, and Worksheets.** A sample of all forms, sample labels, and sample collection worksheets can be found in Annex B.

6. **Point(s) of Contact for Program Coordination:**

a. **Soldier and Biological Chemical Command**
Ms. Joyce Kuykendall, SBCCOM Health Physicist
Comm: 410-436-7118
DSN : 584-7118
email: joyce.kuykendall@sbccom.apgea.army.mil

b. **US Army Center for Health Promotion and Preventive Medicine**
Health Physics Program (Pgm 26)
Comm: 410-436-3502
DSN : 584-3502
fax : 410-436-8261/8263

Radiologic, Classic and Clinical Chemistry Division (RCCCD)
Comm: 410-436-3983/8235
DSN: 584-8235

c. **Jefferson Proving Ground**
Mr. Ken Knouf, Site Manager
Mr. Phil Mann
Ms. Yvette Hayes
Comm: 812-273-2551/2522/6075

7. **Survey Coordination.**

a. Pre-Survey Coordination: 60 days prior to scheduled sample date.

1) Initial Coordination: - made through the SBCCOM Health Physicist. Close coordination with the site management team at JPG will be required to ensure support will be onsite at the time of sampling.

2) USACHPPM HPP Program Assistant, (410) 436-1303,(if call from the Edgewood Arsenal: 5-1303) will be contacted to initiate travel orders. Due to the nature of the sampling program, a four-wheel drive vehicle is required to perform this project. The project and associated report number will be 26-MA-8260-R#-YY. The R# will be a "1" for the October and "2" for the April survey, and the YY will be the current fiscal year.

3) Prepare CHPPM Form 330-R-E (Request for Laboratory Services. (See Annex B) This form can be found on the USACHPPM Web Site or through intranet FormFlow program. Current DLS Test Codes being used are as follows:

Evaluations for Uranium in Soils for the soil and sediment samples, DLS Test Code: 803; STD Method: G-002.

Evaluations for Uranium in Water for the ground and surface water samples, DLS Test Code: 586; STD Method: U-002.

Note: Sample containers for all medium except soils, are provided by SBCCOM and will be onsite however sample labels should be requested from the lab.

Ensure that sample bags, labels and coolers are shipped to the following address:

US Army Jefferson Proving Ground
1661 West J.P.G. Niblo Road (Bldg. 125)
Madison, IN 47250
(812) 273-2551

4) Request for instrumentation to support the sampling program should be made no later than 30 days prior to the scheduled departure date.

Radiation detection instrumentation and soil sampling tools will be coordinated through the HPP Instrumentation Coordinator, ext. 8228. Electronic message will be used for coordination.

Water Quality Instrumentation (pH meter, temperature, and conductivity) will be coordinated through the Surface Water and Waste Water Program (Pgm 32) at extension 3310/4211.

5) Final coordination for project should be completed no later than 14 days prior to departure date.

Contact the site management personnel at JPG and schedule dates for purging of wells prior to arrival. Purging should be accomplished no later than the Friday preceding and no earlier than 14 days prior to the scheduled start date of the sampling visit.

b. Field instrument quality control. Upon receipt of field instruments from the HPP Instrument Coordinator and the Surface Water and Waste Water Program, appropriate instrument quality control checks will be conducted to ensure proper operation prior to departure.

1) Radiation detection instrumentation will be checked for response against a radiation check source. This check source should also be shipped to the survey site for instrument verification on

site. The radiation check source used need not be a calibrated source as instrument response is the parameter being evaluated.

2) Water quality instruments should also be verified using guidance provided by water program personnel. At a minimum, verify the accuracy of the pH meter using the certified pH solution packets.

8. **Sample Collection.** Four separate sample matrixes will be collected in support of the ERM. Methodologies for sampling can be found in US Army Environmental Hygiene Agency (the predecessor to USACHPPM) Technical Guide 155, Environmental Sampling Guide, February 1993.

a. Ground Water Samples. A total of 11 monitoring wells have been established to be used for the Environmental Monitoring Program. Wells are indicated on the ground water sample map (figure 1, Anne C) using an alphanumeric code containing the letters MW and a two digit sample number (01-11).

1) Sample will be collected using a new hand bailer for each sample. Care will be taken when lowering the bailer into the well to prevent unnecessary aeration or contamination of the sample.

2) A total quantity to be collected will be 1 US gallon.

3) A portion of the first bailer full of water will be placed into a clean beaker, or other suitable container, and an evaluation of radiation level, temperature, pH and conductivity will be conducted and recorded.

4) Sample information will be recorded on the Ground Water Sample Collection Worksheet. (Annex B)

5) Samples will not be filtered or persevered in the field.

b. Soil Samples. A total of 4 soil samples will be collected, one from each corner of the trapezoidal impact area. Sample locations are indicated on the soil sample map (figure 2, Annex C).

1) Sample will be collected using a new or properly cleaned scoop, trowel, or other suitable tool. Sample will be placed in a self sealing (Ziploc®) bag.

2) A sample quantity of approximately 1000 grams will be collected.

3) Radiation dose rate measurements will be taken at 1 meter above the sample location and recorded on the Soil Sample Collection Worksheet (Annex B).

c. Surface Water Samples. A total of 8 sample locations have been identified for the collection of water sample from the two creeks that run through the DU impact area (figure 3, Annex C).

1) Sample will be collected using the grab method. Sample container will be positioned pointing upstream and below the surface of the water.

2) A sample quantity of 1 US gallon will be collected.

3) Radiation dose rate measurements will be taken at 1 meter above the sample location and recorded on the Surface Water Sample Worksheet (Annex B).

4) Water sample will not be filtered or preserved in the field.

d. Sediment Sample. A total of 8 sample locations have been identified for the collection of sediment samples from the two creeks that run through the DU impact area. Sediment samples will be collected at the sites selected for surface water collection (figure 3, Annex C).

1) Sample will be collected using a new or properly cleaned scoop, trowel, or other suitable tool. Sample will be placed in a glass sample jar.

2) Sediment sample will be collected only after the water sample has been collected.

3) While a sediment sample is usually considered a solid sample matrix, a certain amount of water is expected in the sample. The sample should not be drained of water that is collected as part of the sample.

4) Radiation dose rate measurements will be taken at 1 meter above the sample location and recorded on the Sediment Sample Worksheet (Annex B).

9. **Sample Management.** Since sample collected are in support of NRC License commitments, chain-of-custody procedures will be followed.

a. Samples will be secured from unauthorized access during the period of sampling.

b. Prior to shipment of samples to USACHPPM, a properly completed CHPPM Form 235-R-E, Chain of Custody Record (Annex B), will be placed in each shipping container. Survey personnel will maintain a copy of the Chain of Custody Record for verification of sample transport.

c. Water samples must reach RCCCD no later than 4 days from the time of sampling. To ensure this time frame is met and that the laboratory has time to filter and preserve the sample if necessary, water samples should be collected on the first day of the sampling trip and shipped the following day. It is not necessary to ship the water, sediments, and soils together.

10. **Sample Analysis.** Sample analysis of all environmental samples will be performed through the USACHPPM RCCCD.

a. Samples will be analyzed in accordance with RCCCD established protocols and procedures. All environmental samples will be coordinated with the SBCCOM RPO for disposal instructions.

1) Water samples will be analyzed fluorometrically for dissolved total uranium.

2) Soil and sediment samples will be analyzed using gamma spectroscopy, keying on the isotopic peaks of the Thorium-234. The thorium is the daughter of U-238 and is considered to be in equilibrium therefore the activity would be equal.

b. The QC for laboratory instruments will be performed by RCCCD.

c. Reports of analysis will be forwarded to the USACHPPM project officer responsible for requesting the sampling. Electronic as well as hard copy reports will be requested.

11. **Action Levels.** Every effort will be made to maintain radiation exposures and releases of radioactive and non-radioactive toxic metals to unrestricted areas as low as is reasonable achievable (ALARA).

a. The following criteria for the restricted area will be used to limit DU exposure. (Limits were established in the NRC Approved ERM)

SOIL:

- Perimeter and background samples:

  ≤ 35 pCi/g - no corrective action.

  > 35 pCi/g - collect 5 additional samples in a 1 meter square grid. If average > 35 pCi/g is confirmed, recommendation to decontaminate soil to ≤ 35 pCi/g will be made to the SBCCOM RPO.

- Sample locations along the lines of fire:

  < 100 pCi/g - no corrective action

  100-300 pCi/g - collect 5 additional samples in a 1 meter square grid. If average > 100 pCi/g is confirmed, investigate to determine reason for the high level.

  > 300 pCi/g - collect 5 additional samples in a 1 meter square grid. If average > 300 pCi/g is confirmed, investigate to determine reason for the high level and immediately notify the SBCCOM RPO to initiate notification to the NRC.

WATER:

- Uranium limit established in 10 CFR 2, Annex B is 3.0×10^{-1} pCi/ml

  < 1.5×10^{-1} pCi/ml - no corrective action.

  > 1.5×10^{-1} pCi/ml - resample; if results above 1.5×10^{-1} pCi/ml is confirmed, investigate to determine reason for the high level and immediately notify the SBCCOM RPO to initiate notification to the NRC.

b. Basis for Action. If any of the action levels are exceeded, an evaluation of cause will be performed by the SBCCOM RPO. The RPO will provide a report of findings to the RCC. Based on their determination, recommendations to the commander on corrective action will be made.

GARY J. MATCEK
MAJ, MS
Program Manager, Health Physics Program

ANNEX A

DEFINITIONS AND ABBREVIATION

1. **Definitions:**

a. **Action Level:** The numerical value that will cause the decision maker to choose one of the alternative actions. The action level may be a regulatory standard or may be a level set to ensure that corrective action is initiated before regulatory standards are met.

b. **Area:** A general term referring to any portion of a site, up to and including the entire site.

c. **Background Sample:** A sample collected from an area similar to the one being studied, but in an area thought to be free of contaminant of concern.

d. **Calibration:** Comparison of a measurement standard, instrument, or item with a standard or instrument of higher accuracy to detect and quantify inaccuracies and to report or eliminate those inaccuracies by adjustments.

e. **Chain-of-Custody:** Documentation of the possession and handling of a sample from the time it is collected to the final disposition.

f. **Detection Limit:** The lowest concentration at which given analytical procedures can identify.

e. **Duplicate Samples:** Samples collected simultaneously from the same source, under identical conditions, into separate containers.

g. **Ground Water Sample:** A sample of water taken from an established monitoring well.

h. **Preservation:** Techniques which retard physical and/or chemical changes in a sample after it has been collected.

i. **Quality Assurance:** A monitoring program which ensures the production of quality data and identifies and quantifies all sources of error associated with each step of the sampling and analytical effort.

j. **Sample:** A part or selection from a medium located in a survey area that represents the quality or quantity of a given parameter or nature of the whole area.

k. **Sediment:** A sample of the mineral and/or organic matter deposited by surface waters.

l. **Soil Sample:** A sample of the soil taken from the first 15 centimeters (6 inches) of surface soil.

m. **Split Sample:** A sample, which has been portioned into two or more containers from a single sample container.

n. **Surface Water:** Water found above the surface of the soil, particularly water contained in creeks and streams.

2. **Abbreviations:**

a.	DU	Depleted Uranium
b.	ERM	Environmental Radiation Monitoring Program
c.	g	gram
d.	HPP	Health Physics Program
e.	JPG	Jefferson Proving Ground
f.	ml	milliliter
g.	NRC	Nuclear Regulatory Commission
h.	pCi	pico-Curie

i.	QC	Quality Control
j.	RCCCD	Radiologic, Classic and Clinical Chemistry Division
k.	RPO	Radiation Protection Officer
l.	SBCCOM	Soldier and Biological, Chemical Command
m.	SOP	Standing Operating Procedure
n.	USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine

ANNEX B

FORMS, LABELS AND WORKSHEETS

Request for Laboratory Services

Directorate of Laboratory Sciences
REQUEST FOR LABORATORY SERVICES

PLEASE PRINT OR TYPE ALL REQUESTED INFORMATION

For DLS Use Only
LIMS JOB#
Date Received

PART 1: PROJECT INFORMATION

1. DATE OF REQUEST: 08/03/2000
2. PROJECT #: (CHPPM only) 26 MA 8260 XO#
3. FUND SOURCE: ☐ P84 ☐ DERA ☐ OTHER Supplemental *(Specify)*
4. DIVISION/PROGRAM: Health Physics Program
5. INSTALLATION: Jefferson Proving Ground
6. STATE WHERE SAMPLES TO BE COLLECTED: Indiana
7. NAME OF PROJECT OFFICER(s): Mr. David Collins
   TELEPHONE: (410) 436-3502 FAX# (410) 436-8261
   E-MAIL: david.collins@apg.amedd.army.mil
8. NAME OF SAMPLE COLLECTOR: Mr David Collins
9. PROJECT DESCRIPTION/OBJECTIVE *(Screen, Monitoring, Regulatory or Health Concern, Etc.)*:
   Sampling required as part of the Environmental Radiation Monitoring Plan
10. SAMPLE OR SITE HISTORY (High Toxicity, Etc):
    DU Firing Range
11. PROJECT COORDINATOR/DLS TECHNICAL CONSULTANT - Was project coordinated with DLS? ☒ YES ☐ NO
    Name of Person in DLS: Mr. Gary Wright ext. 8235

PART 2: TURNAROUND TIME REQUESTED

1. DATE RESULTS REQUIRED:
2. INDICATE THE APPROPRIATE SAMPLE OR PROJECT DESIGNATION:
   ☒ STANDARD
   (Note: All samples are routinely processed as Standard Analyses Unless Arrangements Have Been Made with DLS for High-Priority or Top-Priority Analyses.)
   ☐ HIGH-PRIORITY ☐ TOP-PRIORITY
   (Note: High-Priority and Top-Priority Requests should be Coordinated with DLS and are Subject to Cost Surcharges.)

PART 3: REPORT DISTRIBUTION OPTIONS

1. REPORT RESULTS BY: *(Indicate Preference)*
   ☒ cc:MAIL/E-MAIL TO ADDRESS: david.collins@apg.amedd.army.mil
   ☐ FAX TO *(Write Fax#)*:
   ☒ MAIL:

REQUESTED BY: Mr. David Collins
PRINT NAME: SIGNATURE:
(Note: Signature Required if Submitted by Hard Copy)

CHPPM Form 330-R-E, 1 May 96, (MCHB-DC-LLI) Replaces AEHA Form 330-R, Jul 93, which is obsolete.

Figure B-1a

PART 4: PROJECT COORDINATION INFORMATION

1. DATE SAMPLES TO ARRIVE AT DLS: 12/04/2000

(Note: Prior Arrangements Must Be Made with SML for Samples That Will Arrive Outside of Routine Duty Hours which are M-F 0730 -1700)

Special Comments: Samples will arrive from the field without preservation or filtration.

2. SPECIAL HANDLING REQUIREMENTS:

[x] CHAIN-OF-CUSTODY (COC)

[ ] SAFETY CONSIDERATION/HAZARDOUS MATERIALS (Specify):

[x] ANALYSES WITH SHORT-HOLDING TIMES (List Specific Analyses):
Filter water samples and test for dissolved U-238, No preservative add in the field.

[ ] OTHER (Specify):

3. SAMPLE COLLECTION KIT:

DATE REQUIRED: 07/04/2000

CHECK PREFERENCE:

[ ] 1. TO BE PICKED UP AT DLS BY PROJECT OFFICER

[x] 2. SHIP TO: 3 large coolers and bags for soil samples need to be shipped to site

(Please include Bldg # and Phone #)

U.S. Army Helferson Proving Ground
1661 West J.P.G. Niblo Road (Bldg 125)
Madison, IN 47250
(812) 273-2551

PART 5: SAMPLE ANALYSIS INFORMATION

DLS TEST CODE	PROCEDURE DESCRIPTION	STD METHOD	MATRIX	NUMBER OF SAMPLES	SPECIAL REQUIREMENTS/COMMENTS (REQUESTS FOR EXTRA BLANKS OR
803	Uranium in Soil	G-002	Soil	5	Soil
586	Uranium in Water	U-002	Water	9	Surface Water (1 gal Cubitainer)
803	Uranium in Soil	G-002	Soil	9	Sediment
586	Uranium in Water	U-002	Water	12	Ground Water (1 gal Cubitainer)

Table May Be Continued on Next Page if Additional Space is Required.

Figure B-1b

Sample Labels

Below is an example of a label to placed on each sample container.

PROJECT #:
INSTALLATION:
POC:
SAMPLE #:
DATE COLLECTED:
TIME COLLECTED:
SAMPLE PRESERVED:
ANALYSIS REQUIRED:

Figure B-2

Effective Date _____
Date Removed from Service _____

JEFFERSON PROVING GROUND
DU SAMPLING PROGRAM
PROJECT NUMBER: 26-MA-R_-8260-__

GROUND WATER SAMPLES						
Sample ID	Sample Date	Exposure Reading (µR/hr)	Sample Locations	Comments		
				pH	Temp (°C)	Conductivity (µMHOS)
MW01			Well @ D-Road and Wonju Road (perimeter DU impact area)			
MW02			Well between C-Road & Wonju Road (perimeter DU impact area)			
MW03			Well between A-Road & gate on Wonju Road (perimeter DU impact area)			
MW04			Well on South Perimeter Rd. (Along south border of JPG)			
MW05			Well @ D-Road & Morgan Road (across Bridge No. 13) perimeter DU impact area			
MW06			Well @ C-Road & Morgan Road (perimeter DU impact area)			

Effective Date _____
Date Removed from Service _____

JEFFERSON PROVING GROUND
DU SAMPLING PROGRAM
PROJECT NUMBER: 26-MA-R_-8260-__

GROUND WATER SAMPLES						
Sample ID	Sample Date	Exposure Reading (µR/hr)	Sample Locations	Comments		
				pH	Temp (°C)	Conductivity (µMHOS)
MW07			Well @ Oakdale School House on Morgan Road (perimeter DU impact area)			
MW08			Well @ Southwest Corner of JPG (Along south border of JPG)			
MW09			Well @ D-Road and Bridge No. 22 (inside DU impact area)			
MW10			Well on Center Recovery Road (inside DU impact area)			
MW11			Well on D-Road between Morgan and C Recovery Road (inside impact area)			
MW12			Duplicate or Split Sample _____			

Effective Date _____
Date Removed from Service _____

JEFFERSON PROVING GROUND
DU SAMPLING PROGRAM
PROJECT NUMBER: 26-MA-R_-8260-__

SOIL SAMPLES				
Sample ID	Sample Date	Exposure Reading (µR/hr)	Sample Locations	JPG ID Code
SOS1			Vicinity at intersection of C-Road and Wonju Road)	(S44)
SOS2			Vicinity at intersection of E-Road and Morgan Road	(S48)
SOS3			0.5 miles east of intersection at C-Road & East Recovery Road	(S43)
SOS4			Corner of Morgan Road and C-Road	(S47)
SOS5			Duplicate or Split of ____	
SOS6			Well on south perimeter road along south border of JPG	B-1
SOS7			West Perimeter Road at Fork Creek	B-3
SOS8			South Perimeter Road of JPG	B-5
SOS9			Well on SW Corner of JPG	B-6

NOTE: Per letter from the NRC dated 7 Sep 99, soil sample locations S6 and S8 that were previously sampled will no longer require sampling. No other changes to the ERM Plan have been approved.

Effective Date _____
Date Removed from Service _____

JEFFERSON PROVING GROUND
DU SAMPLING PROGRAM
PROJECT NUMBER: 26-MA-R_-8260-__

SURFACE WATER SAMPLES				
Sample ID	Sample Date	Exposure Reading (µR/hr)	Sample Locations	JPG ID Code
SWS1			West Perimeter Road Middle Fork Creek (exits JPG property)	SWBS (M1)
SWS2			Big Creek (exits JPG property)	SWBN (M2)
SWS3			Wonju Road Middle Fork Creek (enters DU impact area)	SWSE (M3)
SWS4			Big Creek (enters DU impact area)	SWNE (M4)
SWS5			Bridge No. 22 Big Creek	SWM (M5)
SWS6			Line of Fire Middle Fork Creek	SWS (M6)
SWS7			Bridge No. 12 @ Morgan Road Middle Fork Creek	SWSW (M7)
SWS8			Bridge No. 13 @ Morgan Road Big Creek	SWNW (M8)
SWS9			Duplicate or Split of SWS_	SWNE (M4)

SOP No. OHP 40-2

Effective Date _____
Date Removed from Service _____

JEFFERSON PROVING GROUND
DU SAMPLING PROGRAM
PROJECT NUMBER: 26-MA-R_-8260-__

SEDIMENT SAMPLES				
Sample ID	Sample Date	Exposure Reading (µR/hr)	Sample Locations	JPG ID Code
SES1			West Perimeter Road Middle Fork Creek (exits JPG property)	(M1)
SES2			Big Creek (exits JPG property)	(M2)
SES3			Wonju Road Middle Fork Creek (enters DU impact area)	(M3)
SES4			Big Creek (enters DU impact area)	(M4)
SES5			Bridge No. 22 Big Creek	(M5)
SES6			Line of Fire Middle Fork Creek	(M6)
SES7			Bridge No. 12 @ Morgan Road Middle Fork Creek	(M7)
SES8			Bridge No. 13 @ Morgan Road Big Creek	(M8)
SES9			Duplicate or Split of SES_	(M4)

ANNEX C

SAMPLE LOCATION MAPS

Jefferson Proving Ground: DU Sampling
GROUNDWATER MONITORING WELLS

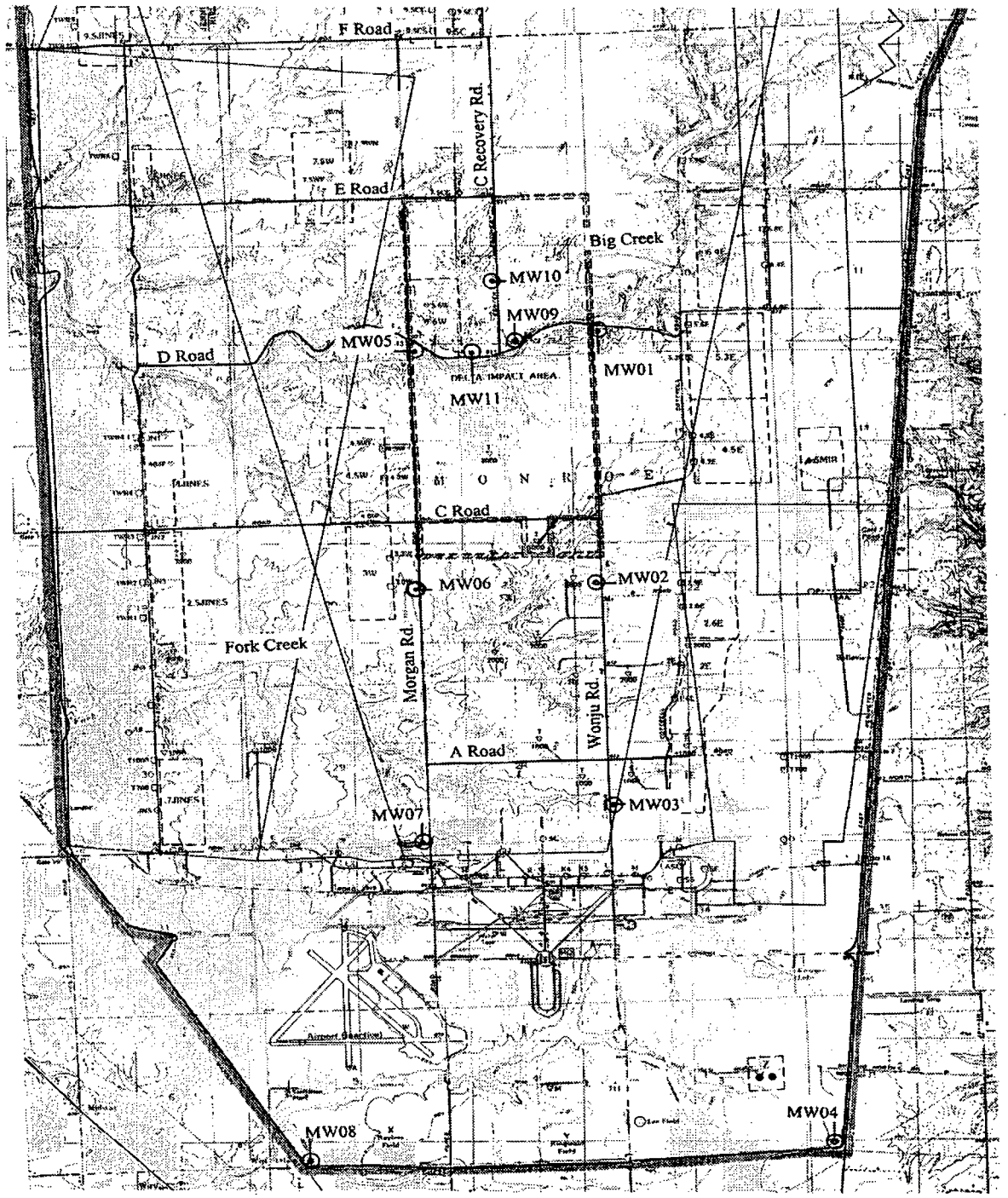

Figure 1: Groundwater samples (Sept. 1997)

Jefferson Proving Ground: DU Sampling
SOIL SAMPLES

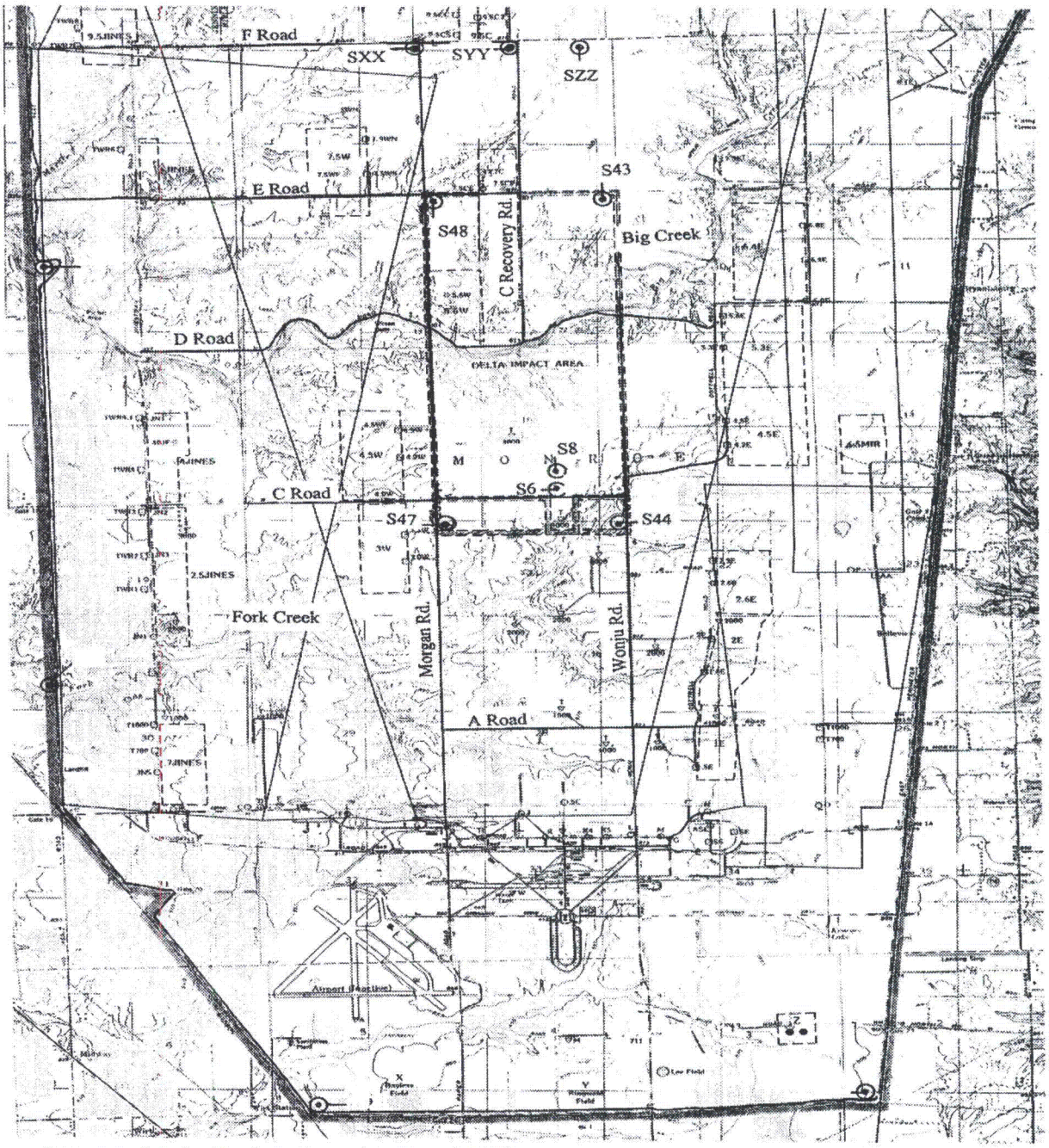

Figure 2: Soil Samples (Sept. 1997)

Jefferson Proving Ground: DU Sampling
SURFACEWATER & SEDIMENT SAMPLES

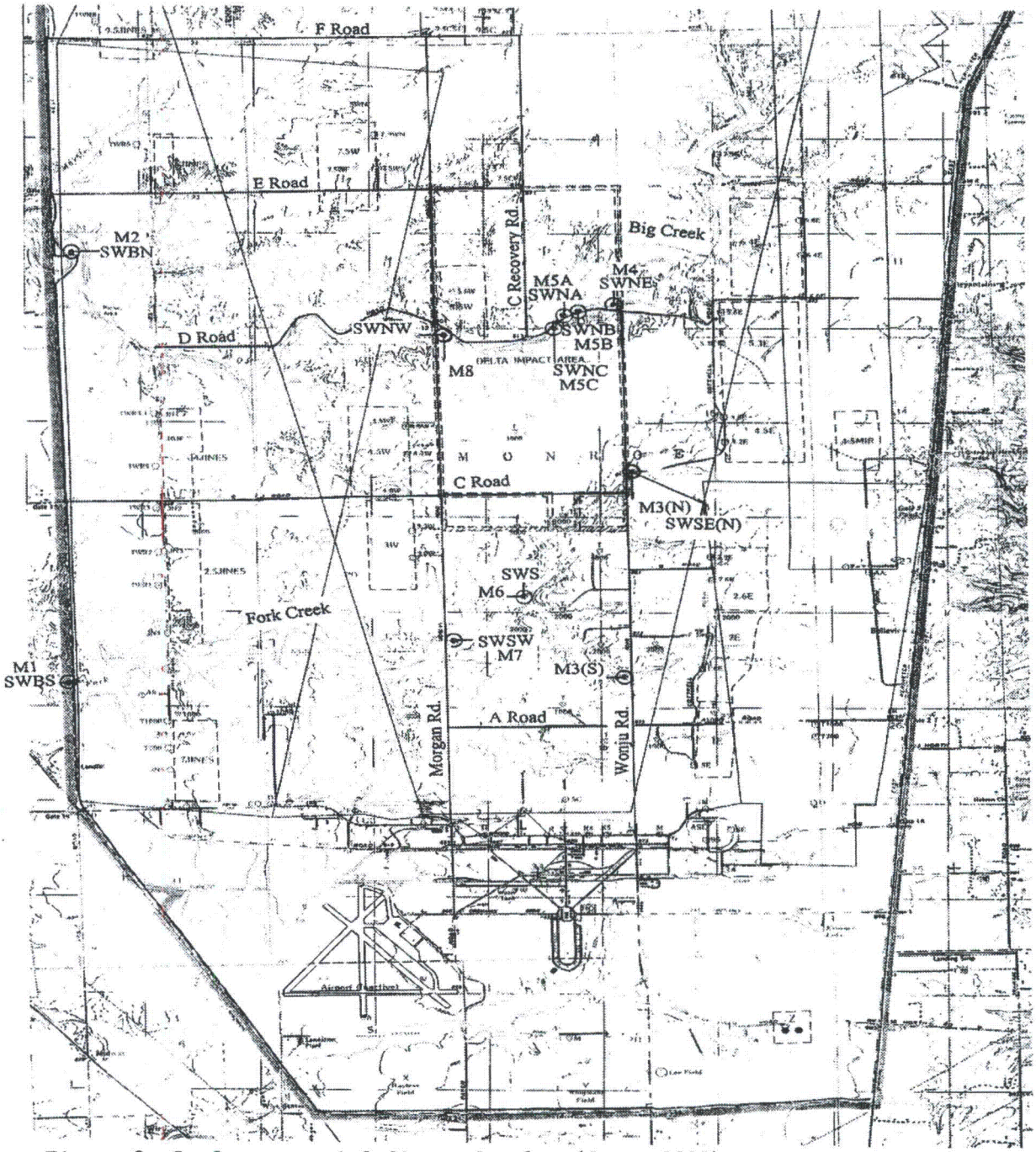

Figure 3: Surfacewater & Sediment Samples (Sept. 1997)

APPENDIX B
FIELD LOGBOOK

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Jefferson Proving Ground 10/26/09
ERM Sampling
Mobilization

0700 Simon Fong (SAIC) left Dulles Int'l Airport for Cincinnati Int'l Airport.

0830 Arrived at Cincinnati. Getting rental vehicle and driving to Madison, Indiana.

0900 Arrived at Madison, Indiana. Getting some sample management supplies at Walmart.

1400 Arrived at Madison, IN motel. Meet next day at Jefferson Proving Ground field office (Bldg. 125) at 0700.

SF 10/26/09

10/26/09

Jefferson Proving Ground 10/27/09
ERM Sampling
Well Sampling, MW-DU-003

0635 Simon Fong (SAIC) left motel for Jefferson Proving Ground.

0655 Arrived at Bldg. 125 (field office) at Jefferson Proving Ground. Weather today is going to be in 60s with 60% chance of rain in afternoon and 90% chance of rain in evening. Cloudy day.

0700 Met up with Dave Lawson (SAIC), Matt Logan (SAIC), and Mike Sutherland (SAIC) at field office. Organizing sample coolers from Test America. Also gathering items required for sampling.

0825 Simon, Mike, Dave, and Matt leave the field office to start ERM Sampling.

0830 Arrived at MW-DU-003. The initial water level at MW-DU-003 is 7.93 feet BLS. The water quality parameters at MW-DU-003 are:
pH = 6.35
Conductivity = 0.774 S/m
Turbidity = 1.3 NTU
Temperature = 14.6 °C

10/27/09

Jefferson Proving Ground 10/27/09
ERM Sampling
Well Sampling, MW-DU-003, MW-DU-002, MW-DU-001

0840 Collect sample MW-DU-003 (at MW-3) (SAIC 12E) for Total/Isotopic Uranium (2, 1L plastic - unpreserved and unfiltered in field) using a disposable bailer. The background dose rate at MW-3 is 6 micro R/hr. The RAD background at well MW-3 is 44 cpm. The RAD screen for sample bottles is 37 cpm.

0852 Arrived at MW-DU-002. Matt is downloading troll.

0910 Arrived at MW-DU-001. The initial water level at MW-DU-001 is 9.75 feet BPVC. The water quality parameters at MW-DU-001 are:
pH = 6.60
Conductivity = 0.606 S/cm
Turbidity = 3.4 NTU
Temperature = 14.5°C

0915 Collect sample MW-DU-001 (at MW-1) (SAIC 12E) for Total/Isotopic Uranium (2, 1L plastic - unpreserved and unfiltered in field) using a disposable bailer. The background dose rate at MW-1 is 6 micro R/hr. The RAD background at well MW-1 is 44 cpm. The RAD screen for sample bottles is 37 cpm.

[illegible] 10/27/09

Jefferson Proving Ground 10/27/09
ERM Sampling
Well Sampling, MW-DU-005, MW-DU-011

0936 Arrived at MW-DU-005. The initial water level at MW-DU-005 is 15.72 feet BPVC. The water quality parameters at MW-DU-001 are
pH = 6.35
Conductivity = 4.03 S/cm
Turbidity = 18.7 NTU
Temperature = 13.8°C

0940 Collect sample MW-DU-005 (at MW-5) (SAIC 12E) for Total/Isotopic Uranium (2, 1L plastic - unpreserved and unfiltered in field) using a disposable bailer. The background dose rate at MW-5 is 5 micro R/hr. The RAD background at well MW-5 is 45 cpm. The RAD screen for sample bottles is 35 cpm.

1010 Arrived at MW-DU-011. The initial water level at MW-DU-011 is 6.90 feet BPVC. The water quality parameters at MW-DU-011 are
pH = 7.23
Conductivity = 0.562 S/cm
Turbidity = 1.4 NTU
Temperature = 14.7°C

[illegible] 10/27/09

Jefferson Proving Ground 10/27/09

ERM Sampling

Well Sampling MW-DU-011, MW-DU-009, MW-DU-010

1017 Collect sample MW-DU-011 (at MW-11) (SA3K12E) for Total/Isotopic Uranium (2, 1L plastic - unpreserved and unfiltered in field) using a disposable bailer. The background dose rate at MW-11 is 7 microR/hr. The RAD background at well MW-11 is 42 cpm. The RAD screen for sample bottles is 55 cpm.

1028 Arrived at MW-9. Matt is downloading the troll.

1043 Arrived at MW-DU-010. The initial water level at MW-DU-010 is 1.76 feet BPVC. The water quality parameters at MW-DU-010 are:

pH = 7.05

Conductivity = 0.815 S/cm

Turbidity = 5.5 NTU

Temperature = 14.4 °C

1048 Collect sample MW-DU-010 (at MW-10) (SA3K12E) for Total/Isotopic Uranium (2, 1L plastic - unpreserved and unfiltered in field) using a disposable bailer. The background dose rate at MW-10 is 5 microR/hr. The RAD background at well MW-10 is 50 cpm. The RAD screen for sample bottles is 42 cpm.

10/27/09

Jefferson Proving Ground 10/27/09

ERM Sampling

Well Sampling MW-DU-006, MW-DU-007

1117 Arrived at MW-6. Taking a lunch break.

1135 The initial water level at MW-DU-006 is 35.24 feet BPVC. The water quality parameters at MW-DU-006 are:

pH = 7.25

Conductivity = 0.731 S/cm

Turbidity = 30.5 NTU

Temperature = 13.2 °C

1140 Collect sample MW-DU-006 (at MW-6) (SA3K12E) for Total/Isotopic Uranium (2, 1L plastic - unpreserved and unfiltered in field) using a disposable bailer. The background dose rate at MW-6 is 5 microR/hr. The RAD background at well MW-6 is 34 cpm. The RAD screen for sample bottles is 40 cpm.

1153 Arrived at MW-7. The initial water level at MW-DU-007 is 8.36 feet BPVC. The water quality parameters at MW-DU-007 are:

pH = 7.17

Conductivity = 0.832 S/cm

Turbidity = 42.1

Temperature = 15.7 °C

10/27/09

Jefferson Proving Ground 10/27/09

ERM Sampling

Well Sampling, MW-DU-007, MW-DU-004, MW-DU-008

1200 Collect sample MW-DU-007 (at MW-7) (SAIC12E) and duplicate (SAIC12DE) for Total/Isotopic Uranium (2, 1L-plastic unpreserved and unfiltered in field) using a disposable bailer. The background dose rate at MW-7 is 5 microR/hr. The RAD background at well MW-7 is 50 cpm. The RAD screen for sample bottles is 44 cpm.

1228 Arrived at MW-DU-004. The initial water level at MW-DU-004 is 3.92 feet BPVC. The water quality parameters at MW-DU-004 are:

pH = 6.08

Conductivity = 0.679 S/cm

Turbidity = 11.6 NTU

Temperature = 14.9 °C

1235 Collect sample MW-DU-004 (at MW-4) (SAIC12E) for Total/Isotopic Uranium (2, 1L plastic-unpreserved and unfiltered in field) using a disposable bailer. The background dose rate at MW-4 is 4 microR/hr. The RAD background at well MW-4 is 54 cpm. The RAD screen for sample bottles is 38 cpm.

1251 Arrived at MW-DU-008. The initial water level at MW-DU-008 is 23.54 feet BPVC. The water-quality parameters at MW-DU-008 are:

[illegible] 10/27/09

Jefferson Proving Ground 10/27/09

ERM Sampling

Well Sampling, MW-DU-008, Sediment/surface Water Sampling

pH = 6.64

Conductivity = 0.564 S/cm

Turbidity = 0.0 NTU

Temperature = 13.2 °C

1256 Collect sample MW-DU-008 (at MW-8) (SAIC12E) for Total/Isotopic Uranium (2, 1L plastic-unpreserved and unfiltered in field) using a disposable bailer. The background dose rate at MW-8 is 6 microR/hr. The RAD background at well MW-8 is 60 cpm. The RAD screen for sample bottles is 47 cpm.

1315 Arrived at field office. Gathering items for surface water / sediment sampling.

1330 Arrived at SD-DU-001 / SW-DU-001.

1340 Collect surface water SW-DU-001 (SAIC12E) for Total/Isotopic Uranium. Rain storm has arrived

1345 Collect sediment sample SD-DU-001 (SAIC12E) for Total/Isotopic Uranium.

1400 Arrived at SD-DU-002 / SW-DU-002.

1405 Collect surface water SW-DU-002 (SAIC12E) for Total/Isotopic Uranium.

1415 Collect sediment sample SD-DU-002 (SAIC12E) for Total/Isotopic Uranium.

1440 Arrived at field office. Sample management.

1500 Leave field office. Meet next day at 0730 at field office

[illegible] 10/27/09

Jefferson Proving Ground 10/28/09

ERM Sampling

~~Sediment / Surface Water Sampling~~ ERM Well Purge Table

SF 10/27/09

(From Ken Knouf notes)

Well ID	Date of Purge	Purge Start Time	Purge End Time	Number of Bottles	Notes/Weather
MW-3	10/22/09	0847	0900	26	well purged dry
MW-1	10/22/09	0920	0930	16	well purged dry
MW-4	10/22/09	1002	1012	16	well purged dry
MW-8	10/22/09	1026	1030	4	well purged dry
MW-7	10/22/09	1220	1236	30	well not purged dry
MW-6	10/22/09	1242	1256	16	well purged dry
MW-5	10/22/09	1420	1435	14	well purged dry
MW-11	10/23/09	0917	930	23	well purged dry
MW-10	10/23/09	0942	954	26	well purged dry
MW-2	10/27/09	1550	1550	9	well purged dry
MW-9	10/27/09	1628	1632	6	well purged dry

10/28/09

Jefferson Proving Ground 10/28/09

ERM Sampling

Sediment/Surface water Sampling, Well Sampling MW-DU-002

0700 Simon Fong (SAIC) left Madison, Ind enroute for Jefferson Proving Ground.

0720 Arrived at Jefferson Proving Ground Bldg. 125. Checking on samples collected yesterday. Loading equipment to vehicle

0800 Leave field office. Weather today is overcast with chance of showers. Hgts in upper 50s.

0825 Arrived at entrance path to SD-DU-006/ SW-DU-006.

0850 Collect surface water SW-DU-006 (SAIC/ZE) for Total / Isotopic Uranium. Also collect duplicate (MW-120B)

0900 Collect sediment SD-DU-006 (SAIC/ZE) for Total / Isotopic Uranium.

0930 Arrived at MW-DU-002. The initial water level at MW-DU-002 (without bail) is 9.54 Ref @ PVC. The water quality parameters at MW-DU-002 are

pH = 6.25

conductivity = 0.793 S/cm

Turbidity = 11.5 NTU

Temperature = 13.9 °C

10/28/09

Jefferson Proving Ground 10/28/09

ERM Sampling

Well Sampling MW-DU-002 and sediment/surface water sampling

0937 Collect sample MW-DU-002 (SAIL12E) (at MW-2) for Total/Isotopic Uranium (2, 1L plastic - unpreserved and unfiltered in field) using a disposable bailer. The background dose rate at MW-2 is 5 microR/hr. The RAD background at MW-2 is 40 cpm. The RAD screen for sample bottles is 44 cpm.

1007 Collect surface soil SS-DU-001 (SAIL12E) for Total/Isotopic Uranium.

1035 Collect surface water SW-DU-003 (SAIL11E) for Total/Isotopic Uranium.

1046 Collect sediment SD-DU-003 (SAIL12E) for Total/Isotopic Uranium.

1125 Lunch break

1140 Arrived at entrance to SW-DU-004/SD-DU-004

1148 Noticed that the creek is flowing extremely fast. Unable to collect samples today. Going back to vehicle.

1235 Collect surface soil SS-DU-003 (SAIL12E) for Total/Isotopic Uranium. Got off path and asked for help from Army Corps. Biologist

1400 Downloading trolls at monitoring wells.

1505 Arrived at MW-DU-009. The initial water level at MW-DU-009 is 40.72 feet BAVC. But, first, Matt is going to check on surface water/sediment at SW-DU-005/SD-DU-005.

10/28/09

Jefferson Proving Ground 10/28/09

ERM Sampling

Sediment/Surface Water Sampling

1530 Collect surface water SW-DU-005 (SAIL12E) for Total/Isotopic Uranium.

1535 Collect sediment SD-DU-005 (SAIL12E) for Total/Isotopic Uranium. Also collect duplicate sample (SAIL12DE).

1550 Downloading trolls at monitoring wells.

1615 Collect Surface soil SS-DU-002 (SAIL12E) and duplicate (SAIL12DE) for Total/Isotopic Uranium.

1640 Downloading trolls at monitoring wells.

1735 Arrived back at field office. Sample Management.

1745 Leave field office. Meet next day at field office at 0730.

10/28/09

Jefferson Proving Ground 10/29/09

ERM Sampling

Stream Gauging, Surface water / sediment sampling

0700 Simon Fong (SAIC) left Madison, IN enroute for Jefferson Proving Ground.

0730 Arrived at Bldg. 125, field office at Jefferson Proving Ground. Organizing items for stream gauging / sampling. Weather today is cool with patches of fog. Highs in 60s. No precipitation is expected until evening

0755 Leave field office. Start stream gauging and velocity measurements. Also downloading trolls.

0950 Collect surface water SW-DU-004 (SAIC12E) for Total / Isotopic Uranium.

0955 Collect sediment SD-DU-004 (SAIC12E) for Total / Isotopic Uranium.

1015 Downloading trolls, doing background scans at purge water blue drums at ERM wells.

1100 Lunch break

1115 Continue with stream gauging / velocity measurements and sampling.

1125 Collect surface water SW-DU-007 (SAIC12E) for Total / Isotopic Uranium.

1130 Collect sediment SD-DU-007 (SAIC 12E) for Total / Isotopic Uranium.

10/29/09

Jefferson Proving Ground 10/29/09

ERM Sampling

Surface Water / sediment sampling, Stream Gauging

1210 Collect surface soil SS-DU-004 (SAIC12E) for Total / Isotopic Uranium.

1305 Collect surface water SW-DU-008 (SAIC12E) for Total / Isotopic Uranium.

1310 Collect sediment SD-DU-008 (SAIC 12E) for Total / Isotopic Uranium.

1325 Cave measurements / troll downloads.

1418 Arrived at MW-DU-009. The initial water level at MW-DU-009 is 37.[illegible] feet BPVC. The water quality parameters at MW-DU-009 are:

pH = 6.48

Conductivity = 11.1 mS/cm

Turbidity = 115 NTU

Temperature = 15.4°C

1420 Collect sample MW-DU-009 (at MW-9) (SAIC12E for Total / Isotopic Uranium (2, 1L plastic-unpreserved and unfiltered in field) using a disposable bailer. The background dose rate at MW-9 is 5 microR/hr. The RAD background at well MW-9 is 29 cpm. The RAD screen for sample bottles is 24 cpm.

1430 Continue with stream gauging.

10/29/09

Jefferson Proving Ground 10/29/09
ERM Sampling
Sample Management / Demobilization

1520 Leave MW-9 area for field office.
1600 Arrived at field office. Unloading equipment and sample management. Also, organizing field office.
1700 Leave field office with 3 sample coolers for Test America - St. Louis. Simon is going to ship coolers tomorrow enroute to airport. Simon is also demobilizing from Jefferson Proving Ground on 10/30/09. The lab has been contacted about the ERM samples and it should be expecting them.

SF 10/29/09

J-B 10/29/09

SAMPLE LOG SHEET

PROJECT NAME: JPG **PROJECT NO:**

SAMPLE ID NUMBER: SD/SW-DU-001 DATE COLLECTED (MM/DD/YY): 10-27-09

TIME: 1340 / 1345

SW/SD

SAMPLING LOCATION CODE: _____

DESCRIPTION: SW / sediment sample

SAMPLING POINT CODE: _____

DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____:_____ TO _____ BLS

SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Cloudy, light rain 55°F ACTIVITIES IN AREA: _____

FIELD OBSERVATIONS: Water sample dipped directly from stream, W side of bridge on West Perimeter. Sed sample collected ~20 feet upstream of bridge on N bank, silty seds w/ v. fn sand moist. Lab

background, 38cpm dose 5 uR/hr

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	43	cpm		
TEMPERATURE:	11.9	°C		
pH:	6.90	std units		
CONDUCTIVITY:	0.287	mS/cm		
REDOX:	~~0.38~~ 193	mV		
DO:	10.82	mg/L		
ORGANIC VAPORS:	–	–		
TURBIDITY:	6.3	NTU		
OTHER dose:	5	uR/hr		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO

IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: _____ (Signature) QC Checked By: _____ (Signature)

SAMPLE LOG SHEET

PROJECT NAME: JPG **PROJECT NO:**

SAMPLE ID NUMBER: SD/SW-DU-002 DATE COLLECTED (MM/DD/YY): 10.27.09
TIME: 1405/1415
SW/SD

SAMPLING LOCATION CODE: _____
DESCRIPTION: SW1 sediment sample

SAMPLING POINT CODE: _____
DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____:_____ TO _____ BLS
SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Cloudy / light rain 55°F ACTIVITIES IN AREA: _____
FIELD OBSERVATIONS: Water sample dipped directly from stream east side of bridge. Vfn sand, silt sed collected ~ 30' upstream of bridge on N side of bank. Wet.

background 27 cpm.

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	53	cpm		
TEMPERATURE:	11.2	°C		
pH:	7.03	pH units		
CONDUCTIVITY:	0.261	mS/cm		
REDOX:	193	mV		
DO:	10.71	mg/L		
ORGANIC VAPORS:	—	—		
TURBIDITY:	3.5	NTU		
OTHER dose:	4	uR/hr		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: [signature] QC Checked By: _____
(Signature) (Signature)

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SD/SW-DU-003 DATE COLLECTED (MM/DD/YY): 10-28-09

TIME: 1035 / 1040

SW/SD

SAMPLING LOCATION CODE: _____

DESCRIPTION: SW / sediment sample

SAMPLING POINT CODE: _____

DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____:_____ TO _____ BLS

SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Light rain 50°F ACTIVITIES IN AREA: _____

FIELD OBSERVATIONS: Heavy rain, creek at high stage, ½"-1" last night. Collected water directly from stream. Sediment [illegible] sand, some organics. Collected E of bridge on [illegible].

background = 47 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	47	cpm		
TEMPERATURE:	11.2	°C		
pH:	6.75	Std. units		
CONDUCTIVITY:	0.086	mS/cm		
REDOX:	+178	mV		
DO:	9.25	mg/L		
ORGANIC VAPORS:	—	—		
TURBIDITY:	48.7	NTU		
OTHER dose :	7	μR/hr		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: [signature] QC Checked By: _____
(Signature) (Signature)

SAMPLE LOG SHEET

PROJECT NAME: JPG **PROJECT NO:**

SAMPLE ID NUMBER: SD/SW-DU-004 DATE COLLECTED (MM/DD/YY): 10-29-09

TIME: 0950/0955 SW/SD

SAMPLING LOCATION CODE: _____

DESCRIPTION: SW / sediment sample

SAMPLING POINT CODE: _____

DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____ : _____ TO _____ BLS

SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Sunny 60°F ACTIVITIES IN AREA: _____

FIELD OBSERVATIONS: Stream in recession from rain Tuesday night. Water dipped directly from stream. Collected silty clay, some v/fn sand, saturated. On S bank of creek, just upstream of stilling well

background: 36 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	48	cpm		
TEMPERATURE:	11.8	°C		
pH:	5.95	std units		
CONDUCTIVITY:	0.253	mS/cm		
REDOX:	276	mV		
DO:	10.50	mg/L		
ORGANIC VAPORS:	–	–		
TURBIDITY:	26.3	NTU		
OTHER dose :	5	uR/hr		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO

IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: [signature] (Signature) QC Checked By: _____ (Signature)

SAMPLE LOG SHEET

PROJECT NAME: JPG **PROJECT NO:**

SAMPLE ID NUMBER: SD/SW-DU-005 DATE COLLECTED (MM/DD/YY): 10-28-09
TIME: 1530/1535
SW/SD
Dup of SW

SAMPLING LOCATION CODE: _____
DESCRIPTION: SW / sediment sample

SAMPLING POINT CODE: _____
DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____ : _____ TO _____ BLS
SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Cloudy 60°F ACTIVITIES IN AREA: _____
FIELD OBSERVATIONS: Stream stage receding after rain last night. Collected water and sed sample on E side of concrete bridge on D-road. Water dipped directly from stream. Sats are tr. red sand w/ some gravel. Saturated

Background = 36 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	39	cpm		
TEMPERATURE:	12.6	°C		
pH:	6.54	pH unit		
CONDUCTIVITY:	0.178	mS/cm		
REDOX:	337	mV		
DO:	9.82	mg/L		
ORGANIC VAPORS:	—	—		
TURBIDITY:	75.3	NTU		
OTHER dose:	6	nR/hr		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: [signature] QC Checked By: _____
(Signature) (Signature)

SAMPLE LOG SHEET

PROJECT NAME: JPG **PROJECT NO:**

SAMPLE ID NUMBER: SD1SW-OU-006 DATE COLLECTED (MM/DD/YY): 10-28-09

TIME: 0850/0900

SW/SD Dup of water

SAMPLING LOCATION CODE: _____

DESCRIPTION: SW 1 sediment sample

SAMPLING POINT CODE: _____

DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____:_____ TO _____ BLS

SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Cloudy 50°F ACTIVITIES IN AREA: _____

FIELD OBSERVATIONS: Heavy rain overnight ~ 1/8" - 1" creek at high stage. Samples collected where trib from NE enters trib from E. Upstream of normal location ≈ 30' due to high stage. Waters dipped directly from stream. V fn sand w/ silt, some organics, saturated

background 31cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	40	cpm		
TEMPERATURE:	11.7	°C		
pH:	5.96	std units		
CONDUCTIVITY:	0.114	mS/cm		
REDOX:	268	mV		
DO:	6.05	mg/L		
ORGANIC VAPORS:	–	ppm		
TURBIDITY:	41.0	NTU		
OTHER dose:	6	mR/hr		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO

IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: [signature] (Signature) QC Checked By: _____ (Signature)

SAMPLE LOG SHEET

PROJECT NAME: JPG **PROJECT NO:**

SAMPLE ID NUMBER: SD/SW-DU-0057 DATE COLLECTED (MM/DD/YY): 10-29-09

TIME: 1125/1130

SW/SD

SAMPLING LOCATION CODE: _____

DESCRIPTION: SW / sediment sample

SAMPLING POINT CODE: _____

DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____:_____ TO _____ BLS

SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Sunny 60°F ACTIVITIES IN AREA: _____

FIELD OBSERVATIONS: Creek in section from rain Tuesday night. Water dipped directly from stream, W side of bridge on Morgan. Collected silty seds w/ gravel on W side of bridge.

background: 31 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	47	cpm		
TEMPERATURE:	13.0	°C		
pH:	6.22	std units		
CONDUCTIVITY:	0.143	mS/cm		
REDOX:	220	mV		
DO:	11.01	mg/L		
ORGANIC VAPORS:	-	-		
TURBIDITY:	37.5	NTU		
OTHER dose:	5	uR/hr		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: _____ (Signature) QC Checked By: _____ (Signature)

SAMPLE LOG SHEET

PROJECT NAME: JPG **PROJECT NO:**

SAMPLE ID NUMBER: SD/SW-DJ-008 DATE COLLECTED (MM/DD/YY): 10-29-09
TIME: 1305/1310
SW/SD

SAMPLING LOCATION CODE: _____
DESCRIPTION: SW1 sediment sample

SAMPLING POINT CODE: _____
DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____:_____TO _____BLS
SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Partly cloudy 60°F ACTIVITIES IN AREA: _____
FIELD OBSERVATIONS: Flow obstructed by debris jam at bridge on Mesa and D Road. South side of bridge has collapsed. Water dropped directly from stream E of bridge. 1/4 sand. Silt w/ some gravel collected on N bank of creek E of bridge

background

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	49	cpm		
TEMPERATURE:	13.1	°C		
pH:	6.34	SU units		
CONDUCTIVITY:	0.219	mS/cm		
REDOX:	233	mV		
DO:	10.01	mg/L		
ORGANIC VAPORS:	—	—		
TURBIDITY:	29.7	NTU		
OTHER dose:	6	uR/hr		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: [signature] QC Checked By: _____
(Signature) (Signature)

SAMPLE LOG SHEET

PROJECT NAME: JPG **PROJECT NO:**

SAMPLE ID NUMBER: SS-DU-001 DATE COLLECTED (MM/DD/YY): 10-28-09
TIME: 1007

SAMPLING LOCATION CODE: _____
DESCRIPTION: Surface soil sample

SAMPLING POINT CODE: _____
DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____:_____TO _____BLS
SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Cloudy 50°F ACTIVITIES IN AREA: _____
FIELD OBSERVATIONS: Collected silty soil w/ sand, coal material, moist just N of southern boundary of DU area W of Wanglu Rd

background = 51 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	39	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER dose:	7	uR/hr		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: _____ QC Checked By: _____
(Signature) (Signature)

SAMPLE LOG SHEET

PROJECT NAME: JPG **PROJECT NO:**

SAMPLE ID NUMBER: SS-DU-002 DATE COLLECTED (MM/DD/YY): 10-28-09

TIME: 1615

Dup of SS

SAMPLING LOCATION CODE: _____

DESCRIPTION: Surface soil

SAMPLING POINT CODE: _____

DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____:_____ TO _____ BLS

SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Cloudy 60°F ACTIVITIES IN AREA: _____

FIELD OBSERVATIONS: Collected silty clay, moist E of Rodsign for Morgan and E. Road

background = 46 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	51	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER dose:	6	mR/hr		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO

IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: [signature] QC Checked By: _____

(Signature) (Signature)

SAMPLE LOG SHEET

PROJECT NAME: JPG **PROJECT NO:**

SAMPLE ID NUMBER: SS-OU-003 DATE COLLECTED (MM/DD/YY): 10-28-09
TIME: 1235

SAMPLING LOCATION CODE: _____
DESCRIPTION: Surface soil

SAMPLING POINT CODE: _____
DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____:_____ TO _____ BLS
SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Cloudy 60°F ACTIVITIES IN AREA: _____
FIELD OBSERVATIONS: Organic sandy silt w/ root material, moist. Just W of Eastern side of OU impact area. Take service road from E. Road after crossing big creek.

background = 40 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	45	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER dose:	6	mR/hr		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: [signature] QC Checked By: _____
(Signature) (Signature)

SAMPLE LOG SHEET

PROJECT NAME: JPG **PROJECT NO:**

SAMPLE ID NUMBER: SS-OU-004 DATE COLLECTED (MM/DD/YY): 10-29-09
TIME: 1210

SAMPLING LOCATION CODE: _____
DESCRIPTION: Surface soil

SAMPLING POINT CODE: _____
DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____:_____ TO _____ BLS
SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Sunny 60°F ACTIVITIES IN AREA: _____
FIELD OBSERVATIONS: Collected silty organic soil, wet just N of southern limit of OU area E of Wangia Road.

background 41 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	79	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER dose:	6	uR/hr		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: [signature] QC Checked By: _____
(Signature) (Signature)

APPENDIX C
DATA VALIDATION SUMMARY

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C. DATA VALIDATION SUMMARY

C.1 TestAmerica SDG F9J310148

This report contains the results from the data validation technical review for the Jefferson Proving Ground (JPG) Environmental Radiation Monitoring (ERM) October 2009 samples and analyses that are associated with the above-referenced laboratory and sample delivery group (SDG) number. These data points have been selected for data validation, and the sample data summary sheets on the following pages specifically identify the samples and analyses associated with this validation review.

The JPG validation technical review was conducted in accordance with the U.S. Environmental Protection Agency (USEPA) *Contract Laboratory Program* (CLP) *National Functional Guidelines for Inorganic Data Review* (July 2002) and Science Applications International Corporation (SAIC) Quality Assurance Technical Procedure (QATP) No. TP-DM-300-7, *Data Validation* (Revision 0, 2/2004). The validation technical review was based on the information and documentation supplied by the associated laboratory. The analyses were evaluated against criteria established in the related analytical procedures and the JPG data quality requirements.

The attachment to this report provides the sample data summary sheets for the samples associated with the above-referenced SDGs. These summary sheets identify the analytical values and the qualifiers for each sample and parameter. The attachment also outlines the validation qualifiers and reason codes used in the validation of the data.

Report Summary	
Total Number of Samples	35
Total Number of Data Points	140
Total Number of Rejected Data Points	0
Percent Completeness (approval to rejection ratio)	100%

C.1.1 ANALYTICAL CATEGORY: RADIOCHEMICAL

- Uranium-234 (U-234), Uranium-235 (U-235), and Uranium-238 (U-238) were determined by alpha spectrometry (DOE HASL-300 Methods Compendium A-01-R). Total uranium was calculated using a published specific activity value for U-238 and assuming all the mass originates from U-238.

- All samples were analyzed with SDG F9J310148.

1. The following items (as applicable) have been addressed during the validation review:

    - Sample custody, integrity, and preservation
    - Sample handling and preparation
    - Holding times
    - Instrument calibration and performance
    - Dilution factors
    - Detection limits
    - Laboratory background and carry-over
    - Overall assessment of the data
    - Quality control (QC)
        - Calibration checks and background
        - Preparation blanks
        - Laboratory control samples
        - Field blanks (if available)
        - Field duplicates (if available)
        - Chemical yield (tracer recovery)
        - Laboratory duplicates

2. The above items were found to be acceptable, except as follows:

- ***Overall Assessment of Data***—U-234, U-235, and U-238 sample data with results greater than the minimum detectable concentration (MDC) were qualified as estimated, *J*, reason code 37 in instances where the associated error was greater than 50 percent of the sample result.

The attached sample data summary for soil and water samples provides the qualifiers and the appropriate validation code for all samples.

SAMPLE INDEX	
Laboratory: **Test America Laboratories, Inc.**	*SDG #:* **F9J310148**

Client Sample I.D.	Laboratory Sample I.D.	Date Collected	Analyses Performed
MW-DU-001 SAIC12E	F9J310148-006	10/27/09	Total and Isotopic Uranium
MW-DU-002 SAIC12E	F9J310148-009	10/28/09	Total and Isotopic Uranium
MW-DU-003 SAIC12E	F9J310148-005	10/27/09	Total and Isotopic Uranium
MW-DU-004 SAIC12E	F9J310148-007	10/27/09	Total and Isotopic Uranium
MW-DU-005 SAIC12E	F9J310148-001	10/27/09	Total and Isotopic Uranium
MW-DU-006 SAIC12E	F9J310148-002	10/27/09	Total and Isotopic Uranium
MW-DU-007 SAIC12E	F9J310148-003	10/27/09	Total and Isotopic Uranium
MW-DU-007 SAIC12DE	F9J310148-004	10/27/09	Total and Isotopic Uranium
MW-DU-008 SAIC12E	F9J310148-008	10/27/09	Total and Isotopic Uranium
MW-DU-009 SAIC12E	F9J310148-012	10/29/09	Total and Isotopic Uranium
MW-DU-010 SAIC12E	F9J310148-010	10/27/09	Total and Isotopic Uranium
MW-DU-011 SAIC12E	F9J310148-011	10/27/09	Total and Isotopic Uranium
SW-DU-001 SAIC12E	F9J310148-013	10/27/09	Total and Isotopic Uranium
SW-DU-002 SAIC12E	F9J310148-015	10/27/09	Total and Isotopic Uranium
SW-DU-003 SAIC11E	F9J310148-021	10/28/09	Total and Isotopic Uranium
SW-DU-004 SAIC12E	F9J310148-029	10/29/09	Total and Isotopic Uranium
SW-DU-005 SAIC12E	F9J310148-024	10/28/09	Total and Isotopic Uranium
SW-DU-006 SAIC12E	F9J310148-017	10/28/09	Total and Isotopic Uranium
SW-DU-006 SAIC12DE	F9J310148-018	10/28/09	Total and Isotopic Uranium
SW-DU-007 SAIC12E	F9J310148-031	10/29/09	Total and Isotopic Uranium
SW-DU-008 SAIC12E	F9J310148-034	10/29/09	Total and Isotopic Uranium
SS-DU-001 SAIC12E	F9J310148-020	10/28/09	Total and Isotopic Uranium
SS-DU-002 SAIC12E	F9J310148-027	10/28/09	Total and Isotopic Uranium
SS-DU-002 SAIC12DE	F9J310148-028	10/28/09	Total and Isotopic Uranium
SS-DU-003 SAIC12E	F9J310148-023	10/28/09	Total and Isotopic Uranium
SS-DU-004 SAIC12E	F9J310148-033	10/29/09	Total and Isotopic Uranium
SD-DU-001 SAIC12E	F9J310148-014	10/27/09	Total and Isotopic Uranium
SD-DU-002 SAIC12E	F9J310148-016	10/27/09	Total and Isotopic Uranium
SD-DU-003 SAIC12E	F9J310148-022	10/28/09	Total and Isotopic Uranium
SD-DU-004 SAIC12E	F9J310148-030	10/29/09	Total and Isotopic Uranium
SD-DU-005 SAIC12E	F9J310148-025	10/28/09	Total and Isotopic Uranium
SD-DU-005 SAIC12DE	F9J310148-026	10/28/09	Total and Isotopic Uranium
SD-DU-006 SAIC12E	F9J310148-019	10/28/09	Total and Isotopic Uranium
SD-DU-007 SAIC12E	F9J310148-032	10/29/09	Total and Isotopic Uranium
SD-DU-008 SAIC12E	F9J310148-035	10/29/09	Total and Isotopic Uranium

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ATTACHMENT

JEFFERSON PROVING GROUND
SAMPLE DATA SUMMARY SHEETS

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SAMPLE DATA SUMMARY – SOILS	
Laboratory:	*SDG #:*
Test America Laboratories, Inc.	**F9J310148**

Isotopic Uranium ASTM D3972-90M							
Sample I.D.	**Analyte**	**Result**	**Error**	**MDC**	**Units**	**Qualifier**	**Reason Code**
SS-DU-001 SAIC12E	U-234	0.80	0.13	0.03	pCi/g		
SS-DU-001 SAIC12E	U-235	0.034	0.028	0.028	pCi/g	J	37
SS-DU-001 SAIC12E	U-238	0.77	0.13	0.02	pCi/g		
SS-DU-001 SAIC12E	Total U	2.29	0.39	0.07	µg/g		
SS-DU-002 SAIC12E	U-234	1.01	0.18	0.03	pCi/g		
SS-DU-002 SAIC12E	U-235	0.053	0.042	0.036	pCi/g	J	37
SS-DU-002 SAIC12E	U-238	1.01	0.18	0.03	pCi/g		
SS-DU-002 SAIC12E	Total U	3.02	0.54	0.09	µg/g		
SS-DU-002 SAIC12DE	U-234	0.99	0.17	0.04	pCi/g		
SS-DU-002 SAIC12DE	U-235	0.045	0.039	0.042	pCi/g	J	37
SS-DU-002 SAIC12DE	U-238	0.89	0.16	0.03	pCi/g		
SS-DU-002 SAIC12DE	Total U	2.67	0.48	0.10	µg/g		
SS-DU-003 SAIC12E	U-234	0.63	0.12	0.02	pCi/g		
SS-DU-003 SAIC12E	U-235	0.034	0.028	0.015	pCi/g	J	37
SS-DU-003 SAIC12E	U-238	0.67	0.12	0.01	pCi/g		
SS-DU-003 SAIC12E	Total U	2.01	0.37	0.04	µg/g		
SS-DU-004 SAIC12E	U-234	0.59	0.12	0.04	pCi/g		
SS-DU-004 SAIC12E	U-235	0.052	0.036	0.033	pCi/g	J	37
SS-DU-004 SAIC12E	U-238	0.74	0.13	0.04	pCi/g		
SS-DU-004 SAIC12E	Total U	2.23	0.39	0.11	µg/g		
SD-DU-001 SAIC12E	U-234	0.47	0.10	0.05	pCi/g		
SD-DU-001 SAIC12E	U-235	0.014	0.020	0.031	pCi/g	U	
SD-DU-001 SAIC12E	U-238	0.52	0.11	0.03	pCi/g		
SD-DU-001 SAIC12E	Total U	1.56	0.32	0.09	µg/g		
SD-DU-002 SAIC12E	U-234	0.368	0.084	0.019	pCi/g		
SD-DU-002 SAIC12E	U-235	0.031	0.025	0.014	pCi/g	J	37
SD-DU-002 SAIC12E	U-238	0.496	0.0996	0.024	pCi/g		
SD-DU-002 SAIC12E	Total U	1.49	0.30	0.07	µg/g		
SD-DU-003 SAIC12E	U-234	0.80	0.14	0.02	pCi/g		
SD-DU-003 SAIC12E	U-235	0.034	0.029	0.027	pCi/g	J	37

Isotopic Uranium ASTM D3972-90M							
Sample I.D.	Analyte	Result	Error	MDC	Units	Qualifier	Reason Code
SD-DU-003 SAIC12E	U-238	0.84	0.14	0.01	pCi/g		
SD-DU-003 SAIC12E	Total U	2.51	0.43	0.04	µg/g		
SD-DU-004 SAIC12E	U-234	0.332	0.089	0.044	pCi/g		
SD-DU-004 SAIC12E	U-235	0.016	0.023	0.035	pCi/g	U	
SD-DU-004 SAIC12E	U-238	0.41	0.10	0.03	pCi/g		
SD-DU-004 SAIC12E	Total U	1.23	0.30	0.10	µg/g		
SD-DU-005 SAIC12E	U-234	0.103	0.042	0.021	pCi/g		
SD-DU-005 SAIC12E	U-235	0.003	0.011	0.027	pCi/g	U	
SD-DU-005 SAIC12E	U-238	0.172	0.055	0.018	pCi/g		
SD-DU-005 SAIC12E	Total U	0.51	0.16	0.06	µg/g		
SD-DU-005 SAIC12DE	U-234	0.126	0.048	0.025	pCi/g		
SD-DU-005 SAIC12DE	U-235	0.019	0.021	0.024	pCi/g	U	
SD-DU-005 SAIC12DE	U-238	0.178	0.057	0.019	pCi/g		
SD-DU-005 SAIC12DE	Total U	0.54	0.17	0.06	µg/g		
SD-DU-006 SAIC12E	U-234	0.440	0.092	0.026	pCi/g		
SD-DU-006 SAIC12E	U-235	0.035	0.027	0.014	pCi/g	J	37
SD-DU-006 SAIC12E	U-238	0.441	0.092	0.021	pCi/g		
SD-DU-006 SAIC12E	Total U	1.33	0.27	0.06	µg/g		
SD-DU-007 SAIC12E	U-234	0.62	0.11	0.03	pCi/g		
SD-DU-007 SAIC12E	U-235	0.034	0.028	0.028	pCi/g	J	37
SD-DU-007 SAIC12E	U-238	0.75	0.13	0.03	pCi/g		
SD-DU-007 SAIC12E	Total U	2.26	0.39	0.09	µg/g		
SD-DU-008 SAIC12E	U-234	0.467	0.098	0.023	pCi/g		
SD-DU-008 SAIC12E	U-235	0.027	0.024	0.015	pCi/g	J	37
SD-DU-008 SAIC12E	U-238	0.68	0.12	0.01	pCi/g		
SD-DU-008 SAIC12E	Total U	2.05	0.37	0.04	µg/g		

SAMPLE DATA SUMMARY – WATERS	
Laboratory:	*SDG #:*
Test America Laboratories, Inc.	**F9J310148**

Isotopic Uranium ASTM D3972-90M							
Sample I.D.	**Analyte**	**Result**	**Error**	**MDC**	**Units**	**Qualifier**	**Reason Code**
MW-DU-001 SAIC12E	U-234	0.113	0.085	0.10	pCi/L	J	37
MW-DU-001 SAIC12E	U-235	-0.0084	0.0097	0.081	pCi/L	U	
MW-DU-001 SAIC12E	U-238	0.172	0.098	0.088	pCi/L	J	37
MW-DU-001 SAIC12E	Total U	0.51	0.29	0.27	µg/L		
MW-DU-002 SAIC12E	U-234	1.19	0.26	0.09	pCi/L		
MW-DU-002 SAIC12E	U-235	0.046	0.053	0.042	pCi/L	J	37
MW-DU-002 SAIC12E	U-238	0.59	0.18	0.06	pCi/L		
MW-DU-002 SAIC12E	Total U	1.77	0.53	0.18	µg/L		
MW-DU-003 SAIC12E	U-234	0.53	0.17	0.08	pCi/L		
MW-DU-003 SAIC12E	U-235	0.041	0.055	0.077	pCi/L	U	
MW-DU-003 SAIC12E	U-238	0.31	0.13	0.08	pCi/L		
MW-DU-003 SAIC12E	Total U	0.95	0.39	0.25	µg/L		
MW-DU-004 SAIC12E	U-234	0.28	0.12	0.06	pCi/L		
MW-DU-004 SAIC12E	U-235	0.0	0.014	0.043	pCi/L	U	
MW-DU-004 SAIC12E	U-238	0.31	0.13	0.03	pCi/L		
MW-DU-004 SAIC12E	Total U	0.92	0.38	0.11	µg/L		
MW-DU-005 SAIC12E	U-234	0.191	0.094	0.059	pCi/L		
MW-DU-005 SAIC12E	U-235	0.025	0.039	0.058	pCi/L	U	
MW-DU-005 SAIC12E	U-238	0.129	0.076	0.046	pCi/L	J	37
MW-DU-005 SAIC12E	Total U	0.39	0.23	0.14	µg/L		
MW-DU-006 SAIC12E	U-234	1.85	0.34	0.06	pCi/L		
MW-DU-006 SAIC12E	U-235	0.105	0.082	0.066	pCi/L	J	37
MW-DU-006 SAIC12E	U-238	1.73	0.33	0.05	pCi/L		
MW-DU-006 SAIC12E	Total U	5.19	0.97	0.16	µg/L		
MW-DU-007 SAIC12E	U-234	1.06	0.23	0.07	pCi/L		
MW-DU-007 SAIC12E	U-235	0.059	0.061	0.072	pCi/L	U	
MW-DU-007 SAIC12E	U-238	0.70	0.18	0.06	pCi/L		
MW-DU-007 SAIC12E	Total U	2.12	0.55	0.18	µg/L		
MW-DU-007 SAIC12DE	U-234	1.12	0.26	0.09	pCi/L		
MW-DU-007 SAIC12DE	U-235	0.072	0.071	0.077	pCi/L	U	
MW-DU-007 SAIC12DE	U-238	0.53	0.17	0.07	pCi/L		
MW-DU-007 SAIC12DE	Total U	1.61	0.51	0.22	µg/L		
MW-DU-008 SAIC12E	U-234	0.35	0.14	0.08	pCi/L		
MW-DU-008 SAIC12E	U-235	-0.0032	0.0065	0.073	pCi/L	U	

Isotopic Uranium ASTM D3972-90M							
Sample I.D.	Analyte	Result	Error	MDC	Units	Qualifier	Reason Code
MW-DU-008 SAIC12E	U-238	0.31	0.14	0.07	pCi/L		
MW-DU-008 SAIC12E	Total U	0.92	0.40	0.22	µg/L		
MW-DU-009 SAIC12E	U-234	1.08	0.26	0.07	pCi/L		
MW-DU-009 SAIC12E	U-235	0.051	0.059	0.046	pCi/L	J	37
MW-DU-009 SAIC12E	U-238	0.42	0.15	0.06	pCi/L		
MW-DU-009 SAIC12E	Total U	1.26	0.46	0.17	µg/L		
MW-DU-010 SAIC12E	U-234	1.87	0.36	0.08	pCi/L		
MW-DU-010 SAIC12E	U-235	0.017	0.035	0.047	pCi/L	U	
MW-DU-010 SAIC12E	U-238	0.68	0.20	0.08	pCi/L		
MW-DU-010 SAIC12E	Total U	2.02	0.61	0.23	µg/L		
MW-DU-011 SAIC12E	U-234	0.068	0.060	0.060	pCi/L	J	37
MW-DU-011 SAIC12E	U-235	-0.0028	0.0057	0.064	pCi/L	U	
MW-DU-011 SAIC12E	U-238	0.061	0.055	0.033	pCi/L	J	37
MW-DU-011 SAIC12E	Total U	0.18	0.16	0.10	µg/L		
SW-DU-001 SAIC12E	U-234	0.070	0.062	0.061	pCi/L	J	37
SW-DU-001 SAIC12E	U-235	0.047	0.054	0.042	pCi/L	J	37
SW-DU-001 SAIC12E	U-238	0.087	0.066	0.034	pCi/L	J	37
SW-DU-001 SAIC12E	Total U	0.28	0.20	0.10	µg/L		
SW-DU-002 SAIC12E	U-234	0.097	0.071	0.053	pCi/L	J	37
SW-DU-002 SAIC12E	U-235	0.0	0.013	0.042	pCi/L	U	
SW-DU-002 SAIC12E	U-238	0.23	0.11	0.07	pCi/L		
SW-DU-002 SAIC12E	Total U	0.68	0.33	0.20	µg/L		
SW-DU-003 SAIC11E	U-234	0.085	0.072	0.062	pCi/L	J	37
SW-DU-003 SAIC11E	U-235	-0.0034	0.0068	0.077	pCi/L	U	
SW-DU-003 SAIC11E	U-238	0.0	0.013	0.039	pCi/L	U	
SW-DU-003 SAIC11E	Total U	-0.002	0.038	0.12	µg/L	U	
SW-DU-004 SAIC12E	U-234	0.064	0.063	0.068	pCi/L	U	
SW-DU-004 SAIC12E	U-235	0.011	0.036	0.085	pCi/L	U	
SW-DU-004 SAIC12E	U-238	0.039	0.049	0.059	pCi/L	U	
SW-DU-004 SAIC12E	Total U	0.12	0.15	0.18	µg/L	U	
SW-DU-005 SAIC12E	U-234	0.134	0.092	0.065	pCi/L	J	37
SW-DU-005 SAIC12E	U-235	0.019	0.038	0.051	pCi/L	U	
SW-DU-005 SAIC12E	U-238	0.18	0.11	0.04	pCi/L		
SW-DU-005 SAIC12E	Total U	0.55	0.32	0.12	µg/L		
SW-DU-006 SAIC12E	U-234	0.045	0.057	0.081	pCi/L	U	
SW-DU-006 SAIC12E	U-235	0.017	0.035	0.047	pCi/L	U	
SW-DU-006 SAIC12E	U-238	0.106	0.080	0.068	pCi/L	J	37
SW-DU-006 SAIC12E	Total U	0.32	0.24	0.20	µg/L		
SW-DU-006 SAIC12DE	U-234	-0.002	0.027	0.079	pCi/L	U	

Isotopic Uranium ASTM D3972-90M							
Sample I.D.	**Analyte**	**Result**	**Error**	**MDC**	**Units**	**Qualifier**	**Reason Code**
SW-DU-006 SAIC12DE	U-235	-0.0056	0.0080	0.074	pCi/L	U	
SW-DU-006 SAIC12DE	U-238	0.080	0.064	0.059	pCi/L	J	37
SW-DU-006 SAIC12DE	Total U	0.24	0.19	0.18	µg/L		
SW-DU-007 SAIC12E	U-234	0.018	0.036	0.066	pCi/L	U	
SW-DU-007 SAIC12E	U-235	0.012	0.031	0.065	pCi/L	U	
SW-DU-007 SAIC12E	U-238	0.084	0.065	0.052	pCi/L	J	37
SW-DU-007 SAIC12E	Total U	0.25	0.20	0.16	µg/L		
SW-DU-008 SAIC12E	U-234	0.104	0.069	0.053	pCi/L	J	37
SW-DU-008 SAIC12E	U-235	-0.0025	0.0051	0.057	pCi/L	U	
SW-DU-008 SAIC12E	U-238	0.26	0.11	0.05	pCi/L		
SW-DU-008 SAIC12E	Total U	0.76	0.32	0.14	µg/L		

KEY TO THE DATA VALIDATION QUALIFIERS

QUALIFIERS	
U	Indicates that the data met all quality assurance/quality control (QA/QC) requirements, and that the radionuclide was analyzed for but was not detected above the reported sample quantitation limit.
J	Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.
UJ	Indicates that the radionuclide was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
N	The analysis indicates the presence of a radionuclide for which there is presumptive evidence to make a "tentative identification."
R	Indicates that the sample results for the radionuclide are rejected or unusable due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the radionuclide cannot be verified.

Data Validation Reason Code

37 Associated error was greater than 50 percent of the sample result.