Draft
Resource Conservation and Recovery Act Facility Investigation/ Remedial Investigation Report Operable Unit 3 (Offsite Areas)

U.S. Department of Energy
Rocky Flats Environmental Technology Site
Golden, Colorado

Environmental Restoration

Volume III of III
October 1995

OU03-000420

APPENDIX C

SUMMARY OF SAMPLES COLLECTED AND ANALYSES REQUESTED

Appendix C contains tables summarizing the samples collected and laboratory analyses performed for each sample by medium. Tables are included for the following media:

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- Subsurface Soil (Trench samples)
- Surface Water
- Sediment
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- Biota (Aquatic, Vegetation, and Small Mammal samples)

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Table C-1a
Summary of Surface Soil Samples
Sampling Method: CDH Method

Station ID	QC Type	Sample Number	Analysis	Date Collected	Comments
PT12592		SS04000CH	Radionuclides (Total)	02-Jun-93	
PT12692		SS04002CH	Radionuclides (Total)	02-Jun-93	
PT12792		SS04004CH	Radionuclides (Total)	27-Jan-93	
PT12892		SS04006CH	Radionuclides (Total)	08-Apr-93	
PT12992		SS04008CH	Radionuclides (Total)	08-Apr-93	
PT13092		SS04010CH	Radionuclides (Total)	28-May-93	
PT13192		SS04012CH	Radionuclides (Total)	23-Feb-93	
PT13292		SS04014CH	Radionuclides (Total)	23-Feb-93	
PT13392		SS04016CH	Radionuclides (Total)	05-Feb-93	
PT13392	RNS	SS04616CH	Radionuclides (Total)	05-Feb-93	
PT13492		SS04018CH	Radionuclides (Total)	24-Feb-93	
PT13492	RNS	SS04618CH	Radionuclides (Total)	24-Feb-93	
PT13592		SS04020CH	Rad Screen	09-Feb-93	
PT13592		SS04020CH	Radionuclides (Total)	09-Feb-93	Stoller
PT13592	RNS	SS04620CH	Radionuclides (Total)	09-Feb-93	Stoller
PT13792		SS04024CH	Radionuclides (Total)	01-Feb-93	
PT14092		SS04030CH	Radionuclides (Total)	25-Jun-92	
PT14092	Dup	SS04530CH	Radionuclides (Total)	25-Jun-92	
PT14192		SS04032CH	Radionuclides (Total)	01-Jul-92	
PT14292		SS04034CH	Radionuclides (Total)	30-Jun-92	
PT14392		SS04036CH	Radionuclides (Total)	06-Jul-92	
PT14492		SS04038CH	Radionuclides (Total)	02-Apr-93	
PT14592		SS04040CH	Radionuclides (Total)	27-May-93	
PT14692		SS04042CH	Radionuclides (Total)	28-May-93	
PT14792		SS04044CH	Radionuclides (Total)	02-Feb-93	
PT14892		SS04046CH	Radionuclides (Total)	26-Feb-93	
PT14892	Dup	SS04546CH	Radionuclides (Total)	26-Feb-93	
PT14992		SS04048CH	Radionuclides (Total)	25-Jan-93	
PT15092		SS04050CH	Radionuclides (Total)	25-Jan-93	
PT15192		SS04052CH	Radionuclides (Total)	02-Jul-92	
PT15292		SS04054CH	Radionuclides (Total)	26-Jan-93	
PT15392		SS04056CH	Radionuclides (Total)	06-Jul-92	
PT15492		SS04058CH	Radionuclides (Total)	09-Jul-92	
PT15592		SS04060CH	Radionuclides (Total)	08-Feb-93	
PT15692		SS04062CH	Radionuclides (Total)	22-Feb-93	
PT15792		SS04064CH	Radionuclides (Total)	24-Feb-93	
PT15892		SS04066CH	Radionuclides (Total)	28-Jul-92	
PT15992		SS04068CH	Radionuclides (Total)	30-Jul-92	
PT16092		SS04070CH	Radionuclides (Total)	31-Jul-92	
PT16092	Dup	SS04570CH	Radionuclides (Total)	31-Jul-92	
PT16192		SS04072CH	Radionuclides (Total)	26-Jan-93	
PT16192	Dup	SS04572CH	Radionuclides (Total)	26-Jan-93	
PT16292		SS04074CH	Radionuclides (Total)	08-Jul-92	
PT16392		SS04076CH	Radionuclides (Total)	09-Jul-92	
PT16492		SS04078CH	Radionuclides (Total)	09-Feb-93	

Table C-1a
Summary of Surface Soil Samples
Sampling Method: CDH Method

Station ID	QC Type	Sample Number	Analysis	Date Collected	Comments
PT16592		SS04080CH	Radionuclides (Total)	05-Apr-93	
PT16692		SS04082CH	Radionuclides (Total)	02-Apr-93	
PT16792		SS04084CH	Radionuclides (Total)	29-Jul-92	
PT16992		SS04088CH	Radionuclides (Total)	26-Jun-92	
PT17092		SS04090CH	Radionuclides (Total)	10-Jul-92	
PT17092	Dup	SS04590CH	Radionuclides (Total)	10-Jul-92	
PT17192		SS04092CH	Radionuclides (Total)	05-Apr-93	
PT17292		SS04094CH	Radionuclides (Total)	07-Apr-93	
PT17392		SS04096CH	Radionuclides (Total)	03-Aug-92	
PT17492		SS04098CH	Radionuclides (Total)	04-Jun-93	
PT17692		SS04102CH	Radionuclides (Total)	22-Jul-92	
PT17792		SS04104CH	Radionuclides (Total)	22-Jul-92	
PT17992		SS04108CH	Radionuclides (Total)	28-Jan-93	
PT18592		SS04122CH	Radionuclides (Total)	02-Jul-92	
PT18692		SS04124CH	Radionuclides (Total)	23-Jul-92	
PT18792		SS04126CH	Radionuclides (Total)	22-Jan-93	
PT18892		SS04128CH	Radionuclides (Total)	06-Apr-93	
PT18992		SS04130CH	Radionuclides (Total)	06-Apr-93	
PT19092		SS04132CH	Radionuclides (Total)	08-Feb-93	
PT19192		SS04134CH	Radionuclides (Total)	01-Apr-93	
PT19292		SS04136CH	Radionuclides (Total)	01-Apr-93	
PT19392		SS04138CH	Radionuclides (Total)	07-Apr-93	
PT19492		SS04140CH	Radionuclides (Total)	24-May-93	
PT19492	Dup	SS04540CH	Radionuclides (Total)	24-May-93	
PT19592		SS04142CH	Radionuclides (Total)	26-May-93	
PT19592	Dup	SS04542CH	Radionuclides (Total)	26-May-93	
PT19592	RNS	SS04642CH	Radionuclides (Total)	26-May-93	
PT19692		SS04144CH	Radionuclides (Total)	27-May-93	

Table C-1b
Summary of Surface Soil Samples
Sampling Method: Modified Hazel Method

Station ID	QC Type	Sample Number	Analysis	Date Collected	Comments
PT12592		SS04001CH	Radionuclides (Total)	02-Jun-93	
PT12692		SS04003CH	Radionuclides (Total)	02-Jun-93	
PT12792		SS04005CH	Radionuclides (Total)	27-Jan-93	
PT12892		SS04007CH	Radionuclides (Total)	08-Apr-93	
PT12992		SS04009CH	Radionuclides (Total)	08-Apr-93	
PT13092		SS04011CH	Radionuclides (Total)	27-May-93	
PT13192		SS04013CH	Radionuclides (Total)	23-Feb-93	
PT13292		SS04015CH	Radionuclides (Total)	23-Feb-93	
PT13392		SS04017CH	Radionuclides (Total)	05-Feb-93	
PT13392	RNS	SS04617CH	Radionuclides (Total)	05-Feb-93	
PT13492		SS04019CH	Radionuclides (Total)	24-Feb-93	
PT13492	RNS	SS04619CH	Radionuclides (Total)	24-Feb-93	
PT13592		SS04021CH	RAD SCREEN	09-Feb-93	
PT13592		SS04021CH	Radionuclides (Total)	09-Feb-93	Stoller
PT13592	RNS	SS04621CH	Radionuclides (Total)	09-Feb-93	Stoller
PT13792		SS04025CH	Radionuclides (Total)	01-Feb-93	
PT14092		SS04031CH	Radionuclides (Total)	26-Jun-92	
PT14092	Dup	SS04531CH	Radionuclides (Total)	26-Jun-92	
PT14192		SS04033CH	Radionuclides (Total)	06-Jul-92	
PT14292		SS04035CH	Radionuclides (Total)	30-Jun-92	
PT14392		SS04037CH	Radionuclides (Total)	07-Jul-92	
PT14492		SS04039CH	Radionuclides (Total)	02-Apr-93	
PT14592		SS04041CH	Radionuclides (Total)	27-May-93	
PT14692		SS04043CH	Radionuclides (Total)	28-May-93	
PT14792		SS04045CH	Radionuclides (Total)	02-Feb-93	
PT14892		SS04047CH	Radionuclides (Total)	26-Feb-93	
PT14892	Dup	SS04547CH	Radionuclides (Total)	26-Feb-93	
PT14992		SS04049CH	Radionuclides (Total)	25-Jan-93	
PT15092		SS04051CH	Radionuclides (Total)	25-Jan-93	
PT15192		SS04053CH	Radionuclides (Total)	07-Jul-92	
PT15292		SS04055CH	Radionuclides (Total)	26-Jan-93	
PT15392		SS04057CH	Radionuclides (Total)	07-Jul-92	
PT15492		SS04059CH	Radionuclides (Total)	09-Jul-92	
PT15592		SS04061CH	Radionuclides (Total)	08-Feb-93	
PT15692		SS04063CH	Radionuclides (Total)	22-Feb-93	
PT15792		SS04065CH	Radionuclides (Total)	24-Feb-93	
PT15892		SS04067CH	Radionuclides (Total)	28-Jul-92	
PT15992		SS04069CH	Radionuclides (Total)	30-Jul-92	
PT16092		SS04071CH	Radionuclides (Total)	31-Jul-92	
PT16092	Dup	SS04571CH	Radionuclides (Total)	31-Jul-92	
PT16192		SS04073CH	Radionuclides (Total)	26-Jan-93	
PT16192	Dup	SS04573CH	Radionuclides (Total)	26-Jan-93	
PT16292		SS04075CH	Radionuclides (Total)	08-Jul-92	
PT16392		SS04077CH	Radionuclides (Total)	09-Jul-92	
PT16392		SS04127CH	Radionuclides (Total)	24-Sep-92	S Bamberg/RA Add'l RF Plot

Table C-1b
Summary of Surface Soil Samples
Sampling Method: Modified Hazel Method

Station ID	QC Type	Sample Number	Analysis	Date Collected	Comments
PT16492		SS04079CH	Radionuclides (Total)	09-Feb-93	
PT16592		SS04081CH	Radionuclides (Total)	05-Apr-93	
PT16692		SS04083CH	Radionuclides (Total)	02-Apr-93	
PT16792		SS04085CH	Radionuclides (Total)	29-Jul-92	
PT16992		SS04089CH	Radionuclides (Total)	26-Jun-92	
PT17092		SS04091CH	Radionuclides (Total)	10-Jul-92	
PT17092	Dup	SS04591CH	Radionuclides (Total)	10-Jul-92	
PT17192		SS04093CH	Radionuclides (Total)	05-Apr-93	
PT17292		SS04095CH	Radionuclides (Total)	07-Apr-93	
PT17392		SS04097CH	Radionuclides (Total)	03-Aug-92	
PT17492		SS04099CH	Radionuclides (Total)	04-Jun-93	
PT17692		SS04103CH	Radionuclides (Total)	22-Jul-92	
PT17792		SS04105CH	Radionuclides (Total)	22-Jul-92	
PT17992		SS04109CH	Radionuclides (Total)	28-Jan-93	
PT18592		SS04123CH	Radionuclides (Total)	07-Jul-92	
PT18692		SS04125CH	Radionuclides (Total)	23-Jul-92	
PT18792		SS04127CH	Radionuclides (Total)	22-Jan-93	
PT18892		SS04129CH	Radionuclides (Total)	06-Apr-93	
PT18992		SS04131CH	Radionuclides (Total)	06-Apr-93	
PT19092		SS04133CH	Radionuclides (Total)	08-Feb-93	
PT19192		SS04135CH	Radionuclides (Total)	01-Apr-93	
PT19292		SS04137CH	Radionuclides (Total)	01-Apr-93	
PT19392		SS04139CH	Radionuclides (Total)	07-Apr-93	
PT19492		SS04141CH	Radionuclides (Total)	24-May-93	
PT19492	Dup	SS04541CH	Radionuclides (Total)	24-May-93	
PT19592		SS04143CH	Radionuclides (Total)	26-May-93	
PT19592	Dup	SS04543CH	Radionuclides (Total)	26-May-93	
PT19592	RNS	SS04643CH	Radionuclides (Total)	26-May-93	
PT19692		SS04145CH	Radionuclides (Total)	27-May-93	

Table C-2
Summary of Soil Trench Samples

Station ID	QC Type	Sample Number	Depth (cm)	Analysis	Date Collected	Comments
TR02792		TR02001CH	96	Radionuclides (Total)	26-Oct-92	
TR02792		TR02002CH	72	Radionuclides (Total)	26-Oct-92	
TR02792		TR02003CH	48	Radionuclides (Total)	26-Oct-92	
TR02792		TR02004CH	36	Radionuclides (Total)	26-Oct-92	
TR02792		TR02005CH	24	Radionuclides (Total)	26-Oct-92	
TR02792	Dup	TR02006CH	0-3	Radionuclides (Total)	26-Oct-92	
TR02792		TR02007CH	18	Radionuclides (Total)	26-Oct-92	
TR02792		TR02008CH	0-3	Radionuclides (Total)	26-Oct-92	
TR02792		TR02009CH	3-6	Radionuclides (Total)	26-Oct-92	
TR02792		TR02010CH	6-9	Radionuclides (Total)	26-Oct-92	
TR02792		TR02011CH	9-12	Radionuclides (Total)	26-Oct-92	
TR02792	RNS	TR02013CH		Radionuclides (Total)	26-Oct-92	Water
TR02792		TR02300CH	0-8	Bulk Density	26-Oct-92	
TR02792		TR02300CH	0-8	Clay Minerals	26-Oct-92	
TR02792		TR02300CH	0-8	Gen Soil Parameters	26-Oct-92	
TR02792		TR02300CH	0-8	Specific Surface	26-Oct-92	
TR02792		TR02301CH	7-38	Bulk Density	26-Oct-92	
TR02792		TR02301CH	7-38	Clay Minerals	26-Oct-92	
TR02792		TR02301CH	7-38	Gen Soil Parameters	26-Oct-92	
TR02792		TR02301CH	7-38	Specific Surface	26-Oct-92	
TR02792		TR02302CH	38-80	Bulk Density	26-Oct-92	
TR02792		TR02302CH	38-80	Clay Minerals	26-Oct-92	
TR02792		TR02302CH	38-80	Gen Soil Parameters	26-Oct-92	
TR02792		TR02302CH	38-80	Specific Surface	26-Oct-92	
TR02792		TR02303CH	110	Bulk Density	26-Oct-92	
TR02792		TR02303CH	110	Clay Minerals	26-Oct-92	
TR02792		TR02303CH	110	Gen Soil Parameters	26-Oct-92	
TR02792		TR02303CH	110	Specific Surface	26-Oct-92	
TR02792	Dup	TR02305CH	0-8	Bulk Density	26-Oct-92	
TR02792	Dup	TR02305CH	0-8	Clay Minerals	26-Oct-92	
TR02792	Dup	TR02305CH	0-8	Gen Soil Parameters	26-Oct-92	
TR02792	Dup	TR02305CH	0-8	Specific Surface	26-Oct-92	
TR02892		TR02020CH	96	Radionuclides (Total)	23-Oct-92	
TR02892		TR02021CH	72	Radionuclides (Total)	23-Oct-92	
TR02892		TR02022CH	48	Radionuclides (Total)	23-Oct-92	
TR02892		TR02023CH	36	Radionuclides (Total)	23-Oct-92	
TR02892		TR02024CH	24	Radionuclides (Total)	23-Oct-92	
TR02892	Dup	TR02025CH	0-3	Radionuclides (Total)	23-Oct-92	
TR02892		TR02026CH	18	Radionuclides (Total)	23-Oct-92	
TR02892		TR02027CH	0-3	Radionuclides (Total)	23-Oct-92	
TR02892		TR02028CH	3-6	Radionuclides (Total)	23-Oct-92	
TR02892		TR02029CH	6-9	Radionuclides (Total)	23-Oct-92	
TR02892		TR02030CH	9-12	Radionuclides (Total)	23-Oct-92	
TR02892	RNS	TR02032CH		Radionuclides (Total)	23-Oct-92	Water
TR02892		TR02306CH	0-10	Bulk Density	23-Oct-92	
TR02892		TR02306CH	0-10	Clay Minerals	23-Oct-92	
TR02892		TR02306CH	0-10	Gen Soil Parameters	23-Oct-92	
TR02892		TR02306CH	0-10	Specific Surface	23-Oct-92	
TR02892		TR02307CH	10-42	Bulk Density	23-Oct-92	
TR02892		TR02307CH	10-42	Clay Minerals	23-Oct-92	
TR02892		TR02307CH	10-42	Gen Soil Parameters	23-Oct-92	
TR02892		TR02307CH	10-42	Specific Surface	23-Oct-92	
TR02892		TR02308CH	42-104	Bulk Density	23-Oct-92	
TR02892		TR02308CH	42-104	Clay Minerals	23-Oct-92	
TR02892		TR02308CH	42-104	Gen Soil Parameters	23-Oct-92	
TR02892		TR02308CH	42-104	Specific Surface	23-Oct-92	
TR02892		TR02309CH	104-111	Bulk Density	23-Oct-92	
TR02892		TR02309CH	104-111	Clay Minerals	23-Oct-92	
TR02892		TR02309CH	104-111	Gen Soil Parameters	23-Oct-92	

Table C-2
Summary of Soil Trench Samples

Station ID	QC Type	Sample Number	Depth (cm)	Analysis	Date Collected	Comments
TR02892		TR02309CH	104-111	Specific Surface	23-Oct-92	
TR02992		TR02039CH	96	Radionuclides (Total)	27-Oct-92	
TR02992		TR02040CH	72	Radionuclides (Total)	27-Oct-92	
TR02992		TR02041CH	48	Radionuclides (Total)	27-Oct-92	
TR02992		TR02042CH	36	Radionuclides (Total)	27-Oct-92	
TR02992		TR02043CH	24	Radionuclides (Total)	27-Oct-92	
TR02992	Dup	TR02044CH	0-3	Radionuclides (Total)	27-Oct-92	
TR02992		TR02045CH	18	Radionuclides (Total)	27-Oct-92	
TR02992		TR02046CH	0-3	Radionuclides (Total)	27-Oct-92	
TR02992		TR02047CH	3-6	Radionuclides (Total)	27-Oct-92	
TR02992		TR02048CH	6-9	Radionuclides (Total)	27-Oct-92	
TR02992		TR02049CH	72	KROTIVINA	27-Oct-92	Add'l Sample for I. Liator/EG&G
TR02992		TR02050CH	9-12	Radionuclides (Total)	27-Oct-92	
TR02992	RNS	TR02051CH		Radionuclides (Total)	27-Oct-92	Water
TR02992		TR02312CH	0-7.5	Bulk Density	27-Oct-92	
TR02992		TR02312CH	0-7.5	Clay Minerals	27-Oct-92	
TR02992		TR02312CH	0-7.5	Gen Soil Parameters	27-Oct-92	
TR02992		TR02312CH	0-7.5	Specific Surface	27-Oct-92	
TR02992		TR02313CH	7.5-15	Bulk Density	27-Oct-92	
TR02992		TR02313CH	7.5-15	Clay Minerals	27-Oct-92	
TR02992		TR02313CH	7.5-15	Gen Soil Parameters	27-Oct-92	
TR02992		TR02313CH	7.5-15	Specific Surface	27-Oct-92	
TR02992		TR02314CH	15-26	Bulk Density	27-Oct-92	
TR02992		TR02314CH	15-26	Clay Minerals	27-Oct-92	
TR02992		TR02314CH	15-26	Gen Soil Parameters	27-Oct-92	
TR02992		TR02314CH	15-26	Specific Surface	27-Oct-92	
TR02992		TR02315CH	26-41	Bulk Density	27-Oct-92	
TR02992		TR02315CH	26-41	Clay Minerals	27-Oct-92	
TR02992		TR02315CH	26-41	Gen Soil Parameters	27-Oct-92	
TR02992		TR02315CH	26-41	Specific Surface	27-Oct-92	
TR02992		TR02316CH	41-100	Bulk Density	27-Oct-92	
TR02992		TR02316CH	41-100	Clay Minerals	27-Oct-92	
TR02992		TR02316CH	41-100	Gen Soil Parameters	27-Oct-92	
TR02992		TR02316CH	41-100	Specific Surface	27-Oct-92	
TR02992	Dup	TR02317CH	41-100	Bulk Density	27-Oct-92	
TR02992	Dup	TR02317CH	41-100	Clay Minerals	27-Oct-92	
TR02992	Dup	TR02317CH	41-100	Gen Soil Parameters	27-Oct-92	
TR02992	Dup	TR02317CH	41-100	Specific Surface	27-Oct-92	
TR02992		TR02378CH	100-119	Bulk Density	27-Oct-92	
TR02992		TR02378CH	100-119	Clay Minerals	27-Oct-92	
TR02992		TR02378CH	100-119	Gen Soil Parameters	27-Oct-92	
TR02992		TR02378CH	100-119	Specific Surface	27-Oct-92	
TR03092		TR02058CH	96	Radionuclides (Total)	23-Oct-92	
TR03092		TR02059CH	72	Radionuclides (Total)	23-Oct-92	
TR03092		TR02060CH	48	Radionuclides (Total)	23-Oct-92	
TR03092		TR02061CH	36	Radionuclides (Total)	23-Oct-92	
TR03092		TR02062CH	24	Radionuclides (Total)	23-Oct-92	
TR03092	Dup	TR02063CH	0-3	Radionuclides (Total)	23-Oct-92	
TR03092		TR02064CH	18	Radionuclides (Total)	23-Oct-92	
TR03092		TR02065CH	0-3	Radionuclides (Total)	23-Oct-92	
TR03092		TR02066CH	3-6	Radionuclides (Total)	23-Oct-92	
TR03092		TR02067CH	6-9	Radionuclides (Total)	23-Oct-92	
TR03092		TR02068CH	9-12	Radionuclides (Total)	23-Oct-92	
TR03092	RNS	TR02070CH		Radionuclides (Total)	23-Oct-92	Water
TR03092		TR02318CH	0-10	Bulk Density	23-Oct-92	
TR03092		TR02318CH	0-10	Clay Minerals	23-Oct-92	
TR03092		TR02318CH	0-10	Gen Soil Parameters	23-Oct-92	

Table C-2
Summary of Soil Trench Samples

Station ID	QC Type	Sample Number	Depth (cm)	Analysis	Date Collected	Comments
TR03092		TR02318CH	0-10	Specific Surface	23-Oct-92	
TR03092		TR02319CH	10-38	Bulk Density	23-Oct-92	
TR03092		TR02319CH	10-38	Clay Minerals	23-Oct-92	
TR03092		TR02319CH	10-38	Gen Soil Parameters	23-Oct-92	
TR03092		TR02319CH	10-38	Specific Surface	23-Oct-92	
TR03092		TR02320CH	38-48	Bulk Density	23-Oct-92	
TR03092		TR02320CH	38-48	Clay Minerals	23-Oct-92	
TR03092		TR02320CH	38-48	Gen Soil Parameters	23-Oct-92	
TR03092		TR02320CH	38-48	Specific Surface	23-Oct-92	
TR03092		TR02321CH	48-75	Bulk Density	23-Oct-92	
TR03092		TR02321CH	48-75	Clay Minerals	23-Oct-92	
TR03092		TR02321CH	48-75	Gen Soil Parameters	23-Oct-92	
TR03092		TR02321CH	48-75	Specific Surface	23-Oct-92	
TR03092		TR02322CH	75-110	Bulk Density	23-Oct-92	
TR03092		TR02322CH	75-110	Clay Minerals	23-Oct-92	
TR03092		TR02322CH	75-110	Gen Soil Parameters	23-Oct-92	
TR03092		TR02322CH	75-110	Specific Surface	23-Oct-92	
TR03192		TR02077CH	96	Radionuclides (Total)	22-Oct-92	
TR03192		TR02078CH	72	Radionuclides (Total)	22-Oct-92	
TR03192		TR02079CH	48	Radionuclides (Total)	22-Oct-92	
TR03192		TR02080CH	36	Radionuclides (Total)	22-Oct-92	
TR03192		TR02081CH	24	Radionuclides (Total)	22-Oct-92	
TR03192	Dup	TR02082CH	0-3	Radionuclides (Total)	22-Oct-92	
TR03192		TR02083CH	18	Radionuclides (Total)	22-Oct-92	
TR03192		TR02084CH	0-3	Radionuclides (Total)	22-Oct-92	
TR03192		TR02085CH	3-6	Radionuclides (Total)	22-Oct-92	
TR03192		TR02086CH	6-9	Radionuclides (Total)	22-Oct-92	
TR03192		TR02087CH	9-12	Radionuclides (Total)	22-Oct-92	
TR03192	RNS	TR02089CH		Radionuclides (Total)	22-Oct-92	Water
TR03192		TR02324CH	0-12	Bulk Density	22-Oct-92	
TR03192		TR02324CH	0-12	Clay Minerals	22-Oct-92	
TR03192		TR02324CH	0-12	Gen Soil Parameters	22-Oct-92	
TR03192		TR02324CH	0-12	Specific Surface	22-Oct-92	
TR03192		TR02325CH	12-47	Bulk Density	22-Oct-92	
TR03192		TR02325CH	12-47	Clay Minerals	22-Oct-92	
TR03192		TR02325CH	12-47	Gen Soil Parameters	22-Oct-92	
TR03192		TR02325CH	12-47	Specific Surface	22-Oct-92	
TR03192	Dup	TR02326CH	12-47	Bulk Density	22-Oct-92	
TR03192	Dup	TR02326CH	12-47	Clay Minerals	22-Oct-92	
TR03192	Dup	TR02326CH	12-47	Gen Soil Parameters	22-Oct-92	
TR03192	Dup	TR02326CH	12-47	Specific Surface	22-Oct-92	
TR03192		TR02327CH	47-107	Bulk Density	22-Oct-92	
TR03192		TR02327CH	47-107	Clay Minerals	22-Oct-92	
TR03192		TR02327CH	47-107	Gen Soil Parameters	22-Oct-92	
TR03192		TR02327CH	47-107	Specific Surface	22-Oct-92	
TR03192		TR02328CH	107-120	Bulk Density	22-Oct-92	
TR03192		TR02328CH	107-120	Clay Minerals	22-Oct-92	
TR03192		TR02328CH	107-120	Gen Soil Parameters	22-Oct-92	
TR03192		TR02328CH	107-120	Specific Surface	22-Oct-92	
TR03292		TR02096CH	96	Radionuclides (Total)	27-Oct-92	
TR03292		TR02097CH	72	Radionuclides (Total)	27-Oct-92	
TR03292		TR02098CH	48	Radionuclides (Total)	27-Oct-92	
TR03292		TR02099CH	36	Radionuclides (Total)	27-Oct-92	
TR03292		TR02100CH	24	Radionuclides (Total)	27-Oct-92	
TR03292	Dup	TR02101CH	0-3	Radionuclides (Total)	27-Oct-92	
TR03292		TR02102CH	18	Radionuclides (Total)	27-Oct-92	
TR03292		TR02103CH	0-3	Radionuclides (Total)	27-Oct-92	
TR03292		TR02104CH	3-6	Radionuclides (Total)	27-Oct-92	
TR03292		TR02105CH	6-9	Radionuclides (Total)	27-Oct-92	

Table C-2
Summary of Soil Trench Samples

Station ID	QC Type	Sample Number	Depth (cm)	Analysis	Date Collected	Comments
TR03292		TR02106CH	9-12	Radionuclides (Total)	27-Oct-92	
TR03292	RNS	TR02108CH		Radionuclides (Total)	27-Oct-92	
TR03292		TR02330CH	0-7	Bulk Density	27-Oct-92	
TR03292		TR02330CH	0-7	Clay Minerals	27-Oct-92	
TR03292		TR02330CH	0-7	Gen Soil Parameters	27-Oct-92	
TR03292		TR02330CH	0-7	Specific Surface	27-Oct-92	
TR03292		TR02331CH	7-64	Bulk Density	27-Oct-92	
TR03292		TR02331CH	7-64	Clay Minerals	27-Oct-92	
TR03292		TR02331CH	7-64	Gen Soil Parameters	27-Oct-92	
TR03292		TR02331CH	7-64	Specific Surface	27-Oct-92	
TR03292		TR02332CH	64-110	Bulk Density	27-Oct-92	
TR03292		TR02332CH	64-110	Clay Minerals	27-Oct-92	
TR03292		TR02332CH	64-110	Gen Soil Parameters	27-Oct-92	
TR03292		TR02332CH	64-110	Specific Surface	27-Oct-92	
TR03392		TR02115CH	96	Radionuclides (Total)	22-Oct-92	
TR03392		TR02116CH	72	Radionuclides (Total)	22-Oct-92	
TR03392		TR02117CH	48	Radionuclides (Total)	22-Oct-92	
TR03392		TR02118CH	36	Radionuclides (Total)	22-Oct-92	
TR03392		TR02119CH	24	Radionuclides (Total)	22-Oct-92	
TR03392	Dup	TR02120CH	0-3	Radionuclides (Total)	22-Oct-92	
TR03392		TR02121CH	18	Radionuclides (Total)	22-Oct-92	
TR03392		TR02122CH	0-3	Radionuclides (Total)	22-Oct-92	
TR03392		TR02123CH	3-6	Radionuclides (Total)	22-Oct-92	
TR03392		TR02124CH	6-9	Radionuclides (Total)	22-Oct-92	
TR03392		TR02125CH	9-12	Radionuclides (Total)	22-Oct-92	
TR03392	RNS	TR02127CH		Radionuclides (Total)	22-Oct-92	Water
TR03392		TR02336CH	0-12	Bulk Density	22-Oct-92	
TR03392		TR02336CH	0-12	Clay Minerals	22-Oct-92	
TR03392		TR02336CH	0-12	Gen Soil Parameters	22-Oct-92	
TR03392		TR02336CH	0-12	Specific Surface	22-Oct-92	
TR03392		TR02337CH	12-29	Bulk Density	22-Oct-92	
TR03392		TR02337CH	12-29	Clay Minerals	22-Oct-92	
TR03392		TR02337CH	12-29	Gen Soil Parameters	22-Oct-92	
TR03392		TR02337CH	12-29	Specific Surface	22-Oct-92	
TR03392		TR02338CH	29-82	Bulk Density	22-Oct-92	
TR03392		TR02338CH	29-82	Clay Minerals	22-Oct-92	
TR03392		TR02338CH	29-82	Gen Soil Parameters	22-Oct-92	
TR03392		TR02338CH	29-82	Specific Surface	22-Oct-92	
TR03392	Dup	TR02339CH	29-82	Bulk Density	22-Oct-92	
TR03392	Dup	TR02339CH	29-82	Clay Minerals	22-Oct-92	
TR03392	Dup	TR02339CH	29-82	Gen Soil Parameters	22-Oct-92	
TR03392	Dup	TR02339CH	29-82	Specific Surface	22-Oct-92	
TR03392		TR02340CH	82-110	Bulk Density	22-Oct-92	
TR03392		TR02340CH	82-110	Clay Minerals	22-Oct-92	
TR03392		TR02340CH	82-110	Gen Soil Parameters	22-Oct-92	
TR03392		TR02340CH	82-110	Specific Surface	22-Oct-92	
TR03492		TR02134CH	96	Radionuclides (Total)	21-Oct-92	
TR03492		TR02135CH	72	Radionuclides (Total)	21-Oct-92	
TR03492		TR02136CH	48	Radionuclides (Total)	21-Oct-92	
TR03492		TR02137CH	36	Radionuclides (Total)	21-Oct-92	
TR03492		TR02138CH	24	Radionuclides (Total)	21-Oct-92	
TR03492	Dup	TR02139CH	0-3	Radionuclides (Total)	21-Oct-92	
TR03492		TR02140CH	18	Radionuclides (Total)	21-Oct-92	
TR03492		TR02141CH	0-3	Radionuclides (Total)	21-Oct-92	
TR03492		TR02142CH	3-6	Radionuclides (Total)	21-Oct-92	
TR03492		TR02143CH	6-9	Radionuclides (Total)	21-Oct-92	
TR03492		TR02144CH	9-12	Radionuclides (Total)	21-Oct-92	
TR03492	RNS	TR02146CH		Radionuclides (Total)	21-Oct-92	Water
TR03492		TR02342CH	0-14	Bulk Density	21-Oct-92	

Table C-2
Summary of Soil Trench Samples

Station ID	QC Type	Sample Number	Depth (cm)	Analysis	Date Collected	Comments
TR03492		TR02342CH	0-14	Clay Minerals	21-Oct-92	
TR03492		TR02342CH	0-14	Gen Soil Parameters	21-Oct-92	
TR03492		TR02342CH	0-14	Specific Surface	21-Oct-92	
TR03492		TR02343CH	14-56	Bulk Density	21-Oct-92	
TR03492		TR02343CH	14-56	Clay Minerals	21-Oct-92	
TR03492		TR02343CH	14-56	Gen Soil Parameters	21-Oct-92	
TR03492		TR02343CH	14-56	Specific Surface	21-Oct-92	
TR03492		TR02344CH	56-96	Bulk Density	21-Oct-92	Split Horizon Part 1
TR03492		TR02344CH	56-96	Clay Minerals	21-Oct-92	Split Horizon Part 1
TR03492		TR02344CH	56-96	Gen Soil Parameters	21-Oct-92	Split Horizon Part 1
TR03492		TR02344CH	56-96	Specific Surface	21-Oct-92	Split Horizon Part 1
TR03492		TR02345CH	56-96	Bulk Density	21-Oct-92	Split Horizon Part 2
TR03492		TR02345CH	56-96	Clay Minerals	21-Oct-92	Split Horizon Part 2
TR03492		TR02345CH	56-96	Gen Soil Parameters	21-Oct-92	Split Horizon Part 2
TR03492		TR02345CH	56-96	Specific Surface	21-Oct-92	Split Horizon Part 2
TR03492		TR02346CH	96-110	Bulk Density	21-Oct-92	
TR03492		TR02346CH	96-110	Clay Minerals	21-Oct-92	
TR03492		TR02346CH	96-110	Gen Soil Parameters	21-Oct-92	
TR03492		TR02346CH	96-110	Specific Surface	21-Oct-92	
TR03592		TR02153CH	96	Radionuclides (Total)	19-Oct-92	
TR03592		TR02154CH	72	Radionuclides (Total)	19-Oct-92	
TR03592		TR02155CH	48	Radionuclides (Total)	19-Oct-92	
TR03592		TR02156CH	36	Radionuclides (Total)	19-Oct-92	
TR03592		TR02157CH	24	Radionuclides (Total)	19-Oct-92	
TR03592	Dup	TR02158CH	0-3	Radionuclides (Total)	19-Oct-92	
TR03592		TR02159CH	18	Radionuclides (Total)	19-Oct-92	
TR03592		TR02160CH	0-3	Radionuclides (Total)	19-Oct-92	
TR03592		TR02161CH	3-6	Radionuclides (Total)	19-Oct-92	
TR03592		TR02162CH	6-9	Radionuclides (Total)	19-Oct-92	
TR03592		TR02163CH	9-12	Radionuclides (Total)	19-Oct-92	
TR03592	RNS	TR02165CH		Radionuclides (Total)	19-Oct-92	Water
TR03592		TR02348CH	0-6	Bulk Density	19-Oct-92	
TR03592		TR02348CH	0-6	Clay Minerals	19-Oct-92	
TR03592		TR02348CH	0-6	Gen Soil Parameters	19-Oct-92	
TR03592		TR02348CH	0-6	Specific Surface	19-Oct-92	
TR03592		TR02349CH	6-19	Bulk Density	19-Oct-92	
TR03592		TR02349CH	6-19	Clay Minerals	19-Oct-92	
TR03592		TR02349CH	6-19	Gen Soil Parameters	19-Oct-92	
TR03592		TR02349CH	6-19	Specific Surface	19-Oct-92	
TR03592		TR02350CH	19-43	Bulk Density	19-Oct-92	
TR03592		TR02350CH	19-43	Clay Minerals	19-Oct-92	
TR03592		TR02350CH	19-43	Gen Soil Parameters	19-Oct-92	
TR03592		TR02350CH	19-43	Specific Surface	19-Oct-92	
TR03592		TR02351CH	43-60	Bulk Density	19-Oct-92	
TR03592		TR02351CH	43-60	Clay Minerals	19-Oct-92	
TR03592		TR02351CH	43-60	Gen Soil Parameters	19-Oct-92	
TR03592		TR02351CH	43-60	Specific Surface	19-Oct-92	
TR03592		TR02352CH	60-74	Bulk Density	19-Oct-92	
TR03592		TR02352CH	60-74	Clay Minerals	19-Oct-92	
TR03592		TR02352CH	60-74	Gen Soil Parameters	19-Oct-92	
TR03592		TR02352CH	60-74	Specific Surface	19-Oct-92	
TR03592		TR02353CH	74-110	Bulk Density	19-Oct-92	
TR03592		TR02353CH	74-110	Clay Minerals	19-Oct-92	
TR03592		TR02353CH	74-110	Gen Soil Parameters	19-Oct-92	
TR03592		TR02353CH	74-110	Specific Surface	19-Oct-92	
TR03592	Dup	TR02366CH	74-110	Bulk Density	19-Oct-92	
TR03592	Dup	TR02366CH	74-110	Clay Minerals	19-Oct-92	
TR03592	Dup	TR02366CH	74-110	Gen Soil Parameters	19-Oct-92	
TR03592	Dup	TR02366CH	74-110	Specific Surface	19-Oct-92	

Table C-2
Summary of Soil Trench Samples

Station ID	QC Type	Sample Number	Depth (cm)	Analysis	Date Collected	Comments
TR03692		TR02172CH	96	Radionuclides (Total)	26-Oct-92	
TR03692		TR02173CH	72	Radionuclides (Total)	26-Oct-92	
TR03692		TR02174CH	48	Radionuclides (Total)	26-Oct-92	
TR03692		TR02175CH	36	Radionuclides (Total)	26-Oct-92	
TR03692		TR02176CH	24	Radionuclides (Total)	26-Oct-92	
TR03692	Dup	TR02177CH	0-3	Radionuclides (Total)	26-Oct-92	
TR03692		TR02178CH	18	Radionuclides (Total)	26-Oct-92	
TR03692		TR02179CH	0-3	Radionuclides (Total)	26-Oct-92	
TR03692		TR02180CH	3-6	Radionuclides (Total)	26-Oct-92	
TR03692		TR02181CH	6-9	Radionuclides (Total)	26-Oct-92	
TR03692		TR02182CH	9-12	Radionuclides (Total)	26-Oct-92	
TR03692	RNS	TR02184CH		Radionuclides (Total)	26-Oct-92	Water
TR03692		TR02354CH	0-6	Bulk Density	26-Oct-92	
TR03692		TR02354CH	0-6	Clay Minerals	26-Oct-92	
TR03692		TR02354CH	0-6	Gen Soil Parameters	26-Oct-92	
TR03692		TR02354CH	0-6	Specific Surface	26-Oct-92	
TR03692		TR02355CH	7-24	Bulk Density	26-Oct-92	
TR03692		TR02355CH	7-24	Clay Minerals	26-Oct-92	
TR03692		TR02355CH	7-24	Gen Soil Parameters	26-Oct-92	
TR03692		TR02355CH	7-24	Specific Surface	26-Oct-92	
TR03692		TR02356CH	24-52	Bulk Density	26-Oct-92	Split Horizon Part 1
TR03692		TR02356CH	24-52	Clay Minerals	26-Oct-92	Split Horizon Part 1
TR03692		TR02356CH	24-52	Gen Soil Parameters	26-Oct-92	Split Horizon Part 1
TR03692		TR02356CH	24-52	Specific Surface	26-Oct-92	Split Horizon Part 1
TR03692		TR02357CH	52-92	Bulk Density	26-Oct-92	
TR03692		TR02357CH	52-92	Clay Minerals	26-Oct-92	
TR03692		TR02357CH	52-92	Gen Soil Parameters	26-Oct-92	
TR03692		TR02357CH	52-92	Specific Surface	26-Oct-92	
TR03692		TR02358CH	92-112	Bulk Density	26-Oct-92	
TR03692		TR02358CH	92-112	Clay Minerals	26-Oct-92	
TR03692		TR02358CH	92-112	Gen Soil Parameters	26-Oct-92	
TR03692		TR02358CH	92-112	Specific Surface	26-Oct-92	
TR03692		TR02370CH	24-52	Bulk Density	26-Oct-92	Split Horizon Part 2
TR03692		TR02370CH	24-52	Clay Minerals	26-Oct-92	Split Horizon Part 2
TR03692		TR02370CH	24-52	Gen Soil Parameters	26-Oct-92	Split Horizon Part 2
TR03692		TR02370CH	24-52	Specific Surface	26-Oct-92	Split Horizon Part 2
TR03792		TR02191CH	96	Radionuclides (Total)	20-Oct-92	
TR03792		TR02192CH	72	Radionuclides (Total)	20-Oct-92	
TR03792		TR02193CH	48	Radionuclides (Total)	20-Oct-92	
TR03792		TR02194CH	36	Radionuclides (Total)	20-Oct-92	
TR03792		TR02195CH	24	Radionuclides (Total)	20-Oct-92	
TR03792	Dup	TR02196CH	0-3	Radionuclides (Total)	20-Oct-92	
TR03792		TR02197CH	18	Radionuclides (Total)	20-Oct-92	
TR03792		TR02198CH	0-3	Radionuclides (Total)	20-Oct-92	
TR03792		TR02199CH	3-6	Radionuclides (Total)	20-Oct-92	
TR03792		TR02200CH	6-9	Radionuclides (Total)	20-Oct-92	
TR03792		TR02201CH	9-12	Radionuclides (Total)	20-Oct-92	
TR03792	RNS	TR02203CH		Radionuclides (Total)	20-Oct-92	Water
TR03792		TR02360CH	0-8	Bulk Density	20-Oct-92	
TR03792		TR02360CH	0-8	Clay Minerals	20-Oct-92	
TR03792		TR02360CH	0-8	Gen Soil Parameters	20-Oct-92	
TR03792		TR02360CH	0-8	Specific Surface	20-Oct-92	
TR03792		TR02361CH	8-25	Bulk Density	20-Oct-92	
TR03792		TR02361CH	8-25	Clay Minerals	20-Oct-92	
TR03792		TR02361CH	8-25	Gen Soil Parameters	20-Oct-92	
TR03792		TR02361CH	8-25	Specific Surface	20-Oct-92	
TR03792		TR02362CH	25-51	Bulk Density	20-Oct-92	
TR03792		TR02362CH	25-51	Clay Minerals	20-Oct-92	
TR03792		TR02362CH	25-51	Gen Soil Parameters	20-Oct-92	

Table C-2
Summary of Soil Trench Samples

Station ID	QC Type	Sample Number	Depth (cm)	Analysis	Date Collected	Comments
TR03792		TR02362CH	25-51	Specific Surface	20-Oct-92	
TR03792		TR02363CH	51-82	Bulk Density	20-Oct-92	
TR03792		TR02363CH	51-82	Clay Minerals	20-Oct-92	
TR03792		TR02363CH	51-82	Gen Soil Parameters	20-Oct-92	
TR03792		TR02363CH	51-82	Specific Surface	20-Oct-92	
TR03792		TR02364CH	82-120	Bulk Density	20-Oct-92	
TR03792		TR02364CH	82-120	Clay Minerals	20-Oct-92	
TR03792		TR02364CH	82-120	Gen Soil Parameters	20-Oct-92	
TR03792		TR02364CH	82-120	Specific Surface	20-Oct-92	

Table C-3
Summary of Drainage/Ditch Surface Water Samples

Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Comments
SW00192			SW01938WCU3	AM241	05-Jun-92	
SW00192			SW01938WCU3	Chlorine	05-Jun-92	
SW00192			SW01938WCU3	CN	05-Jun-92	
SW00192			SW01938WCU3	CO3 Carbonate	05-Jun-92	
SW00192			SW01938WCU3	Fluoride	05-Jun-92	
SW00192			SW01938WCU3	Gross Alpha	05-Jun-92	
SW00192			SW01938WCU3	Gross Beta	05-Jun-92	
SW00192			SW01938WCU3	H2S	05-Jun-92	
SW00192			SW01938WCU3	HCO3 BICarbonate	05-Jun-92	
SW00192			SW01938WCU3	MET (A) CLP	05-Jun-92	
SW00192			SW01938WCU3	MET (S) CLP	05-Jun-92	
SW00192			SW01938WCU3	NH3 AS N	05-Jun-92	
SW00192			SW01938WCU3	NO3/NO2	05-Jun-92	
SW00192			SW01938WCU3	O Phos.	05-Jun-92	
SW00192			SW01938WCU3	Oil/Grease	05-Jun-92	
SW00192			SW01938WCU3	Phos.	05-Jun-92	
SW00192			SW01938WCU3	Plutonium-239/-240	05-Jun-92	
SW00192			SW01938WCU3	SO4 Sulfate	05-Jun-92	
SW00192			SW01938WCU3	TDS	05-Jun-92	
SW00192			SW01938WCU3	Triazine and Atrizine Analysis	05-Jun-92	
SW00192			SW01938WCU3	Triazines 619	05-Jun-92	
SW00192			SW01938WCU3	TSS	05-Jun-92	
SW00192			SW01938WCU3	U-ISO	05-Jun-92	
SW00192		LR	SW01938WCU3LR	AM241	05-Jun-92	
SW00192		LR	SW01938WCU3LR	Gross Alpha	05-Jun-92	
SW00192		LR	SW01938WCU3LR	Gross Beta	05-Jun-92	
SW00192		LR	SW01938WCU3LR	Plutonium-239/-240	05-Jun-92	
SW00192		LR	SW01938WCU3LR	U-ISO	05-Jun-92	
SW00192			SW01938WCU3MS	Chlorine	05-Jun-92	
SW00192			SW01938WCU3MS	CN	05-Jun-92	
SW00192			SW01938WCU3MS	CO3 Carbonate	05-Jun-92	
SW00192			SW01938WCU3MS	Fluoride	05-Jun-92	
SW00192			SW01938WCU3MS	H2S	05-Jun-92	
SW00192			SW01938WCU3MS	HCO3 BICarbonate	05-Jun-92	
SW00192			SW01938WCU3MS	MET (A) CLP	05-Jun-92	
SW00192			SW01938WCU3MS	MET (S) CLP	05-Jun-92	
SW00192			SW01938WCU3MS	NH3 AS N	05-Jun-92	
SW00192			SW01938WCU3MS	NO3/NO2	05-Jun-92	
SW00192			SW01938WCU3MS	O Phos.	05-Jun-92	
SW00192			SW01938WCU3MS	Oil/Grease	05-Jun-92	
SW00192			SW01938WCU3MS	Phos.	05-Jun-92	
SW00192			SW01938WCU3MS	SO4 Sulfate	05-Jun-92	
SW00192			SW01938WCU3MS	TDS	05-Jun-92	
SW00192			SW01938WCU3MS	Triazine and Atrizine Analysis	05-Jun-92	
SW00192			SW01938WCU3MS	Triazines 619	05-Jun-92	

Table C-3
Summary of Drainage/Ditch Surface Water Samples

Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Comments
SW00192			SW01938WCU3MS	TSS	05-Jun-92	
SW00192		Dup	SW80218WCU3	AM241	05-Jun-92	
SW00192		Dup	SW80218WCU3	Chlorine	05-Jun-92	
SW00192		Dup	SW80218WCU3	CN	05-Jun-92	
SW00192		Dup	SW80218WCU3	CO3 Carbonate	05-Jun-92	
SW00192		Dup	SW80218WCU3	Fluoride	05-Jun-92	
SW00192		Dup	SW80218WCU3	Gross Alpha	05-Jun-92	
SW00192		Dup	SW80218WCU3	Gross Beta	05-Jun-92	
SW00192		Dup	SW80218WCU3	H2S	05-Jun-92	
SW00192		Dup	SW80218WCU3	HCO3 BICarbonate	05-Jun-92	
SW00192		Dup	SW80218WCU3	MET (A) CLP	05-Jun-92	
SW00192		Dup	SW80218WCU3	MET (S) CLP	05-Jun-92	
SW00192		Dup	SW80218WCU3	NH3 AS N	05-Jun-92	
SW00192		Dup	SW80218WCU3	NO3/NO2	05-Jun-92	
SW00192		Dup	SW80218WCU3	O Phos.	05-Jun-92	
SW00192		Dup	SW80218WCU3	Oil/Grease	05-Jun-92	
SW00192		Dup	SW80218WCU3	Phos.	05-Jun-92	
SW00192		Dup	SW80218WCU3	Plutonium-239/-240	05-Jun-92	
SW00192		Dup	SW80218WCU3	SO4 Sulfate	05-Jun-92	
SW00192		Dup	SW80218WCU3	TDS	05-Jun-92	
SW00192		Dup	SW80218WCU3	Triazine and Atrizine Analysis	05-Jun-92	
SW00192		Dup	SW80218WCU3	Triazines 619	05-Jun-92	
SW00192		Dup	SW80218WCU3	TSS	05-Jun-92	
SW00192		Dup	SW80218WCU3	U-ISO	05-Jun-92	
SW00192		RNS	SW80219WCU3	AM241	05-Jun-92	
SW00192		RNS	SW80219WCU3	Chlorine	05-Jun-92	
SW00192		RNS	SW80219WCU3	CN	05-Jun-92	
SW00192		RNS	SW80219WCU3	CO3 Carbonate	05-Jun-92	
SW00192		RNS	SW80219WCU3	Fluoride	05-Jun-92	
SW00192		RNS	SW80219WCU3	Gross Alpha	05-Jun-92	
SW00192		RNS	SW80219WCU3	Gross Beta	05-Jun-92	
SW00192		RNS	SW80219WCU3	H2S	05-Jun-92	
SW00192		RNS	SW80219WCU3	HCO3 BICarbonate	05-Jun-92	
SW00192		RNS	SW80219WCU3	MET (A) CLP	05-Jun-92	
SW00192		RNS	SW80219WCU3	MET (S) CLP	05-Jun-92	
SW00192		RNS	SW80219WCU3	NH3 AS N	05-Jun-92	
SW00192		RNS	SW80219WCU3	NO3/NO2	05-Jun-92	
SW00192		RNS	SW80219WCU3	O Phos.	05-Jun-92	
SW00192		RNS	SW80219WCU3	Oil/Grease	05-Jun-92	
SW00192		RNS	SW80219WCU3	Phos.	05-Jun-92	
SW00192		RNS	SW80219WCU3	Plutonium-239/-240	05-Jun-92	
SW00192		RNS	SW80219WCU3	SO4 Sulfate	05-Jun-92	
SW00192		RNS	SW80219WCU3	TDS	05-Jun-92	
SW00192		RNS	SW80219WCU3	Triazine and Atrizine Analysis	05-Jun-92	
SW00192		RNS	SW80219WCU3	Triazines 619	05-Jun-92	

Table C-3
Summary of Drainage/Ditch Surface Water Samples

Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Comments
SW00192		RNS	SW80219WCU3	TSS	05-Jun-92	
SW00192		RNS	SW80219WCU3	U-ISO	05-Jun-92	
SW00292			SW01939WCU3	AM241	09-Jun-92	
SW00292			SW01939WCU3	Chlorine	09-Jun-92	
SW00292			SW01939WCU3	CN	09-Jun-92	
SW00292			SW01939WCU3	CO3 Carbonate	09-Jun-92	
SW00292			SW01939WCU3	Fluoride	09-Jun-92	
SW00292			SW01939WCU3	Gross Alpha	09-Jun-92	
SW00292			SW01939WCU3	Gross Beta	09-Jun-92	
SW00292			SW01939WCU3	H2S	09-Jun-92	
SW00292			SW01939WCU3	HCO3 BICarbonate	09-Jun-92	
SW00292			SW01939WCU3	MET (A) CLP	09-Jun-92	
SW00292			SW01939WCU3	MET (S) CLP	09-Jun-92	
SW00292			SW01939WCU3	NH3 AS N	09-Jun-92	
SW00292			SW01939WCU3	O Phos.	09-Jun-92	
SW00292			SW01939WCU3	Oil/Grease	09-Jun-92	
SW00292			SW01939WCU3	Phos.	09-Jun-92	
SW00292			SW01939WCU3	Plutonium-239/-240	09-Jun-92	
SW00292			SW01939WCU3	SO4 Sulfate	09-Jun-92	
SW00292			SW01939WCU3	TDS	09-Jun-92	
SW00292			SW01939WCU3	Triazines 619	09-Jun-92	
SW00292			SW01939WCU3	TSS	09-Jun-92	
SW00292			SW01939WCU3	U-ISO	09-Jun-92	
SW00292	WN-3		SW07002CH	Cyanide (Total)	10-Jul-92	
SW00292	WN-3		SW07002CH	Herbicides (Atrazine & Simazine)	18-Jul-92	
SW00292	WN-3		SW07002CH	Major Anions	10-Jul-92	
SW00292	WN-3		SW07002CH	Metals (DISSOLVED)	10-Jul-92	
SW00292	WN-3		SW07002CH	Metals (Total)	10-Jul-92	
SW00292	WN-3		SW07002CH	Oil & Grease	10-Jul-92	
SW00292	WN-3		SW07002CH	OrthoPhosPhate	10-Jul-92	
SW00292	WN-3		SW07002CH	Radionuclides (DISSOLVED)	10-Jul-92	
SW00292	WN-3		SW07002CH	Radionuclides (Total)	10-Jul-92	
SW00292	WN-3		SW07002CH	Sulfide	10-Jul-92	
SW00292	WN-3		SW07002CH	Total Phos, NH4, NO2, NO3	10-Jul-92	
SW00292	WN-3	RNS	SW07006CH	Cyanide (Total)	10-Jul-92	
SW00292	WN-3	RNS	SW07006CH	Major Anions	10-Jul-92	
SW00292	WN-3	RNS	SW07006CH	Metals (DISSOLVED)	10-Jul-92	
SW00292	WN-3	RNS	SW07006CH	Metals (Total)	10-Jul-92	
SW00292	WN-3	RNS	SW07006CH	Oil & Grease	10-Jul-92	
SW00292	WN-3	RNS	SW07006CH	OrthoPhosPhate	10-Jul-92	
SW00292	WN-3	RNS	SW07006CH	Radionuclides (DISSOLVED)	10-Jul-92	
SW00292	WN-3	RNS	SW07006CH	Radionuclides (Total)	10-Jul-92	
SW00292	WN-3	RNS	SW07006CH	Sulfide	10-Jul-92	
SW00292	WN-3	RNS	SW07006CH	Total Phos, NH4, NO2, NO3	10-Jul-92	
SW00392	WO-2		SW07001CH	Cyanide (Total)	13-Jul-92	

Table C-3
Summary of Drainage/Ditch Surface Water Samples

Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected.	Comments
SW00392	WO-2		SW07001CH	Herbicides (Atrazine & Simazine)	13-Jul-92	
SW00392	WO-2		SW07001CH	Major Anions	13-Jul-92	
SW00392	WO-2		SW07001CH	Metals (DISSOLVED)	13-Jul-92	
SW00392	WO-2		SW07001CH	Metals (Total)	13-Jul-92	
SW00392	WO-2		SW07001CH	Oil & Grease	13-Jul-92	
SW00392	WO-2		SW07001CH	OrthoPhosPhate	13-Jul-92	
SW00392	WO-2		SW07001CH	Radionuclides (DISSOLVED)	13-Jul-92	
SW00392	WO-2		SW07001CH	Radionuclides (Total)	13-Jul-92	
SW00392	WO-2		SW07001CH	Sulfide	13-Jul-92	
SW00392	WO-2		SW07001CH	Total Phos, NH4, NO2, NO3	13-Jul-92	
SW00392	WO-2	Dup	SW07003CH	Cyanide (Total)	13-Jul-92	
SW00392	WO-2	Dup	SW07003CH	Herbicides (Atrazine & Simazine)	18-Jul-92	
SW00392	WO-2	Dup	SW07003CH	Major Anions	13-Jul-92	
SW00392	WO-2	Dup	SW07003CH	Metals (DISSOLVED)	13-Jul-92	
SW00392	WO-2	Dup	SW07003CH	Metals (Total)	13-Jul-92	
SW00392	WO-2	Dup	SW07003CH	Oil & Grease	13-Jul-92	
SW00392	WO-2	Dup	SW07003CH	OrthoPhosPhate	13-Jul-92	
SW00392	WO-2	Dup	SW07003CH	Radionuclides (DISSOLVED)	13-Jul-92	
SW00392	WO-2	Dup	SW07003CH	Radionuclides (Total)	13-Jul-92	
SW00392	WO-2	Dup	SW07003CH	Sulfide	13-Jul-92	
SW00392	WO-2	Dup	SW07003CH	Total Phos, NH4, NO2, NO3	13-Jul-92	
SW00692			SW01940WCU3	AM241	09-Jun-92	
SW00692			SW01940WCU3	Chlorine	09-Jun-92	
SW00692			SW01940WCU3	CN	09-Jun-92	
SW00692			SW01940WCU3	CO3 Carbonate	09-Jun-92	
SW00692			SW01940WCU3	Fluoride	09-Jun-92	
SW00692			SW01940WCU3	Gross Alpha	09-Jun-92	
SW00692			SW01940WCU3	Gross Beta	09-Jun-92	
SW00692			SW01940WCU3	H2S	09-Jun-92	
SW00692			SW01940WCU3	HCO3 BICarbonate	09-Jun-92	
SW00692			SW01940WCU3	MET (A) CLP	09-Jun-92	
SW00692			SW01940WCU3	MET (S) CLP	09-Jun-92	
SW00692			SW01940WCU3	NH3 AS N	09-Jun-92	
SW00692			SW01940WCU3	NO3/NO2	09-Jun-92	
SW00692			SW01940WCU3	O Phos.	09-Jun-92	
SW00692			SW01940WCU3	Oil/Grease	09-Jun-92	
SW00692			SW01940WCU3	Phos.	09-Jun-92	
SW00692			SW01940WCU3	Plutonium-239/-240	09-Jun-92	
SW00692			SW01940WCU3	SO4 Sulfate	09-Jun-92	
SW00692			SW01940WCU3	TDS	09-Jun-92	
SW00692			SW01940WCU3	Triazines 619	09-Jun-92	
SW00692			SW01940WCU3	TSS	09-Jun-92	
SW00692			SW01940WCU3	U-ISO	09-Jun-92	
SW00692			SW01940WCU3MS	AM241	09-Jun-92	
SW00692			SW01940WCU3MS	Chlorine	09-Jun-92	

Table C-3
Summary of Drainage/Ditch Surface Water Samples

Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Comments
SW00692			SW01940WCU3MS	CN	09-Jun-92	
SW00692			SW01940WCU3MS	CO3 Carbonate	09-Jun-92	
SW00692			SW01940WCU3MS	Fluoride	09-Jun-92	
SW00692			SW01940WCU3MS	Gross Alpha	09-Jun-92	
SW00692			SW01940WCU3MS	Gross Beta	09-Jun-92	
SW00692			SW01940WCU3MS	H2S	09-Jun-92	
SW00692			SW01940WCU3MS	HCO3 BICarbonate	09-Jun-92	
SW00692			SW01940WCU3MS	MET (A) CLP	09-Jun-92	
SW00692			SW01940WCU3MS	MET (S) CLP	09-Jun-92	
SW00692			SW01940WCU3MS	NH3 AS N	09-Jun-92	
SW00692			SW01940WCU3MS	NO3/NO2	09-Jun-92	
SW00692			SW01940WCU3MS	O Phos.	09-Jun-92	
SW00692			SW01940WCU3MS	Oil/Grease	09-Jun-92	
SW00692			SW01940WCU3MS	Phos.	09-Jun-92	
SW00692			SW01940WCU3MS	Plutonium-239/-240	09-Jun-92	
SW00692			SW01940WCU3MS	SO4 Sulfate	09-Jun-92	
SW00692			SW01940WCU3MS	TDS	09-Jun-92	
SW00692			SW01940WCU3MS	Triazines 619	09-Jun-92	
SW00692			SW01940WCU3MS	TSS	09-Jun-92	
SW00692			SW01940WCU3MS	U-ISO	09-Jun-92	
SW00692		Dup	SW80220WCU3	AM241	09-Jun-92	
SW00692		Dup	SW80220WCU3	Chlorine	09-Jun-92	
SW00692		Dup	SW80220WCU3	CN	09-Jun-92	
SW00692		Dup	SW80220WCU3	CO3 Carbonate	09-Jun-92	
SW00692		Dup	SW80220WCU3	Fluoride	09-Jun-92	
SW00692		Dup	SW80220WCU3	Gross Alpha	09-Jun-92	
SW00692		Dup	SW80220WCU3	Gross Beta	09-Jun-92	
SW00692		Dup	SW80220WCU3	H2S	09-Jun-92	
SW00692		Dup	SW80220WCU3	HCO3 BICarbonate	09-Jun-92	
SW00692		Dup	SW80220WCU3	MET (A) CLP	09-Jun-92	
SW00692		Dup	SW80220WCU3	MET (S) CLP	09-Jun-92	
SW00692		Dup	SW80220WCU3	NH3 AS N	09-Jun-92	
SW00692		Dup	SW80220WCU3	O Phos.	09-Jun-92	
SW00692		Dup	SW80220WCU3	Oil/Grease	09-Jun-92	
SW00692		Dup	SW80220WCU3	Phos.	09-Jun-92	
SW00692		Dup	SW80220WCU3	Plutonium-239/-240	09-Jun-92	
SW00692		Dup	SW80220WCU3	SO4 Sulfate	09-Jun-92	
SW00692		Dup	SW80220WCU3	TDS	09-Jun-92	
SW00692		Dup	SW80220WCU3	Triazines 619	09-Jun-92	
SW00692		Dup	SW80220WCU3	TSS	09-Jun-92	
SW00692		Dup	SW80220WCU3	U-ISO	09-Jun-92	
SW00692		RNS	SW80221WCU3	AM241	09-Jun-92	
SW00692		RNS	SW80221WCU3	Chlorine	09-Jun-92	
SW00692		RNS	SW80221WCU3	CN	09-Jun-92	
SW00692		RNS	SW80221WCU3	CO3 Carbonate	09-Jun-92	

Table C-3
Summary of Drainage/Ditch Surface Water Samples

Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Comments
SW00692		RNS	SW80221WCU3	Fluoride	09-Jun-92	
SW00692		RNS	SW80221WCU3	Gross Alpha	09-Jun-92	
SW00692		RNS	SW80221WCU3	Gross Beta	09-Jun-92	
SW00692		RNS	SW80221WCU3	H2S	09-Jun-92	
SW00692		RNS	SW80221WCU3	HCO3 BICarbonate	09-Jun-92	
SW00692		RNS	SW80221WCU3	MET (A) CLP	09-Jun-92	
SW00692		RNS	SW80221WCU3	MET (S) CLP	09-Jun-92	
SW00692		RNS	SW80221WCU3	NH3 AS N	09-Jun-92	
SW00692		RNS	SW80221WCU3	O Phos.	09-Jun-92	
SW00692		RNS	SW80221WCU3	Oil/Grease	09-Jun-92	
SW00692		RNS	SW80221WCU3	Phos.	09-Jun-92	
SW00692		RNS	SW80221WCU3	Plutonium-239/-240	09-Jun-92	
SW00692		RNS	SW80221WCU3	SO4 Sulfate	09-Jun-92	
SW00692		RNS	SW80221WCU3	TDS	09-Jun-92	
SW00692		RNS	SW80221WCU3	Triazines 619	09-Jun-92	
SW00692		RNS	SW80221WCU3	TSS	09-Jun-92	
SW00692		RNS	SW80221WCU3	U-ISO	09-Jun-92	
SW00792			SW01941WCU3	AM241	23-Oct-92	
SW00792			SW01941WCU3	Chlorine	23-Oct-92	
SW00792			SW01941WCU3	CN	23-Oct-92	
SW00792			SW01941WCU3	CO3 Carbonate	23-Oct-92	
SW00792			SW01941WCU3	Fluoride	23-Oct-92	
SW00792			SW01941WCU3	Gross Alpha	23-Oct-92	
SW00792			SW01941WCU3	Gross Beta	23-Oct-92	
SW00792			SW01941WCU3	H2S	23-Oct-92	
SW00792			SW01941WCU3	HCO3 BICarbonate	23-Oct-92	
SW00792			SW01941WCU3	MET (A) CLP	23-Oct-92	
SW00792			SW01941WCU3	MET (S) CLP	23-Oct-92	
SW00792			SW01941WCU3	NH3 AS N	23-Oct-92	
SW00792			SW01941WCU3	NO3/NO2	23-Oct-92	
SW00792			SW01941WCU3	O Phos.	23-Oct-92	
SW00792			SW01941WCU3	Oil/Grease	23-Oct-92	
SW00792			SW01941WCU3	Phos.	23-Oct-92	
SW00792			SW01941WCU3	Plutonium-239/-240	23-Oct-92	
SW00792			SW01941WCU3	SO4 Sulfate	23-Oct-92	
SW00792			SW01941WCU3	TDS	23-Oct-92	
SW00792			SW01941WCU3	Triazines 619	23-Oct-92	
SW00792			SW01941WCU3	TSS	23-Oct-92	
SW00792			SW01941WCU3	U-ISO	23-Oct-92	
SW00792	WO-3	RNS	SW07004CH	Cyanide (Total)	09-Jul-92	
SW00792	WO-3	RNS	SW07004CH	Major Anions	09-Jul-92	
SW00792	WO-3	RNS	SW07004CH	Metals (DISSOLVED)	09-Jul-92	
SW00792	WO-3	RNS	SW07004CH	Metals (Total)	09-Jul-92	
SW00792	WO-3	RNS	SW07004CH	Oil & Grease	09-Jul-92	
SW00792	WO-3	RNS	SW07004CH	OrthoPhosPhate	09-Jul-92	

Table C-3
Summary of Drainage/Ditch Surface Water Samples

Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Comments
SW00792	WO-3	RNS	SW07004CH	Radionuclides (DISSOLVED)	09-Jul-92	
SW00792	WO-3	RNS	SW07004CH	Radionuclides (Total)	09-Jul-92	
SW00792	WO-3	RNS	SW07004CH	Sulfide	09-Jul-92	
SW00792	WO-3	RNS	SW07004CH	Total Phos, NH4, NO2, NO3	09-Jul-92	
SW00792	WO-3		SW07005CH	Cyanide (Total)	09-Jul-92	
SW00792	WO-3		SW07005CH	Herbicides (Atrazine & Simazine)	18-Jul-92	
SW00792	WO-3		SW07005CH	Major Anions	09-Jul-92	
SW00792	WO-3		SW07005CH	Metals (DISSOLVED)	09-Jul-92	
SW00792	WO-3		SW07005CH	Metals (Total)	09-Jul-92	
SW00792	WO-3		SW07005CH	Oil & Grease	09-Jul-92	
SW00792	WO-3		SW07005CH	OrthoPhosPhate	09-Jul-92	
SW00792	WO-3		SW07005CH	Radionuclides (DISSOLVED)	09-Jul-92	
SW00792	WO-3		SW07005CH	Radionuclides (Total)	09-Jul-92	
SW00792	WO-3		SW07005CH	Sulfide	09-Jul-92	
SW00792	WO-3		SW07005CH	Total Phos, NH4, NO2, NO3	09-Jul-92	
SW00892			SW01942WCU3	AM241	23-Oct-92	
SW00892			SW01942WCU3	Chlorine	23-Oct-92	
SW00892			SW01942WCU3	CN	23-Oct-92	
SW00892			SW01942WCU3	CO3 Carbonate	23-Oct-92	
SW00892			SW01942WCU3	Fluoride	23-Oct-92	
SW00892			SW01942WCU3	Gross Alpha	23-Oct-92	
SW00892			SW01942WCU3	Gross Beta	23-Oct-92	
SW00892			SW01942WCU3	H2S	23-Oct-92	
SW00892			SW01942WCU3	HCO3 BICarbonate	23-Oct-92	
SW00892			SW01942WCU3	MET (A) CLP	23-Oct-92	
SW00892			SW01942WCU3	MET (S) CLP	23-Oct-92	
SW00892			SW01942WCU3	NH3 AS N	23-Oct-92	
SW00892			SW01942WCU3	NO3/NO2	23-Oct-92	
SW00892			SW01942WCU3	O Phos.	23-Oct-92	
SW00892			SW01942WCU3	Oil/Grease	23-Oct-92	
SW00892			SW01942WCU3	Phos.	23-Oct-92	
SW00892			SW01942WCU3	Plutonium-239/-240	23-Oct-92	
SW00892			SW01942WCU3	SO4 Sulfate	23-Oct-92	
SW00892			SW01942WCU3	TDS	23-Oct-92	
SW00892			SW01942WCU3	Triazines 619	23-Oct-92	
SW00892			SW01942WCU3	TSS	23-Oct-92	
SW00892			SW01942WCU3	U-ISO	23-Oct-92	

Table C-4a
Summary of Reservoir Surface Water Samples
LAKE Data Group
Reservoir: IHSS 200

Collocated	Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Collocated with:
Y	SW01392			SW07104CH	CYANIDE (TOTAL)	31-Aug-92	Sediment Core SED08592
Y	SW01392			SW07104CH	HERBICIDES (ATRAZINE & SIMAZINE)	31-Aug-92	Sediment Core SED08592
Y	SW01392			SW07104CH	MAJOR ANIONS / WATER QUALITY	31-Aug-92	Sediment Core SED08592
Y	SW01392			SW07104CH	METALS (DISSOLVED)	31-Aug-92	Sediment Core SED08592
Y	SW01392			SW07104CH	METALS (TOTAL)	31-Aug-92	Sediment Core SED08592
Y	SW01392			SW07104CH	ORTHOPHOSPHATE	31-Aug-92	Sediment Core SED08592
Y	SW01392			SW07104CH	RADIONUCLIDES (DISSOLVED)	31-Aug-92	Sediment Core SED08592
Y	SW01392			SW07104CH	RADIONUCLIDES (TOTAL)	31-Aug-92	Sediment Core SED08592
Y	SW01392			SW07104CH	SULFIDE	31-Aug-92	Sediment Core SED08592
Y	SW01392			SW07104CH	TOTAL PHOS, NH4, NO2, NO3	31-Aug-92	Sediment Core SED08592
Y	SW01492			SW07105CH	CYANIDE (TOTAL)	01-Sep-92	Sediment Core SED08692
Y	SW01492			SW07105CH	HERBICIDES (ATRAZINE & SIMAZINE)	01-Sep-92	Sediment Core SED08692
Y	SW01492			SW07105CH	MAJOR ANIONS / WATER QUALITY	01-Sep-92	Sediment Core SED08692
Y	SW01492			SW07105CH	METALS (DISSOLVED)	01-Sep-92	Sediment Core SED08692
Y	SW01492			SW07105CH	METALS (TOTAL)	01-Sep-92	Sediment Core SED08692
Y	SW01492			SW07105CH	ORTHOPHOSPHATE	01-Sep-92	Sediment Core SED08692
Y	SW01492			SW07105CH	RADIONUCLIDES (DISSOLVED)	01-Sep-92	Sediment Core SED08692
Y	SW01492			SW07105CH	RADIONUCLIDES (TOTAL)	01-Sep-92	Sediment Core SED08692
Y	SW01492			SW07105CH	SULFIDE	01-Sep-92	Sediment Core SED08692
Y	SW01492			SW07105CH	TOTAL PHOS, NH4, NO2, NO3	01-Sep-92	Sediment Core SED08692
Y	SW01592			SW07106CH	CYANIDE (TOTAL)	01-Sep-92	Sediment Core SED08792
Y	SW01592			SW07106CH	HERBICIDES (ATRAZINE & SIMAZINE)	01-Sep-92	Sediment Core SED08792
Y	SW01592			SW07106CH	MAJOR ANIONS / WATER QUALITY	01-Sep-92	Sediment Core SED08792
Y	SW01592			SW07106CH	METALS (DISSOLVED)	01-Sep-92	Sediment Core SED08792
Y	SW01592			SW07106CH	METALS (TOTAL)	01-Sep-92	Sediment Core SED08792
Y	SW01592			SW07106CH	ORTHOPHOSPHATE	01-Sep-92	Sediment Core SED08792
Y	SW01592			SW07106CH	RADIONUCLIDES (DISSOLVED)	01-Sep-92	Sediment Core SED08792
Y	SW01592			SW07106CH	RADIONUCLIDES (TOTAL)	01-Sep-92	Sediment Core SED08792
Y	SW01592			SW07106CH	SULFIDE	01-Sep-92	Sediment Core SED08792
Y	SW01592			SW07106CH	TOTAL PHOS, NH4, NO2, NO3	01-Sep-92	Sediment Core SED08792
Y	SW01692			SW07107CH	CYANIDE (TOTAL)	02-Sep-92	Sediment Core SED09192
Y	SW01692			SW07107CH	HERBICIDES (ATRAZINE & SIMAZINE)	02-Sep-92	Sediment Core SED09192
Y	SW01692			SW07107CH	MAJOR ANIONS / WATER QUALITY	02-Sep-92	Sediment Core SED09192
Y	SW01692			SW07107CH	METALS (DISSOLVED)	02-Sep-92	Sediment Core SED09192
Y	SW01692			SW07107CH	METALS (TOTAL)	02-Sep-92	Sediment Core SED09192
Y	SW01692			SW07107CH	ORTHOPHOSPHATE	02-Sep-92	Sediment Core SED09192
Y	SW01692			SW07107CH	RADIONUCLIDES (DISSOLVED)	02-Sep-92	Sediment Core SED09192
Y	SW01692			SW07107CH	RADIONUCLIDES (TOTAL)	02-Sep-92	Sediment Core SED09192
Y	SW01692			SW07107CH	SULFIDE	02-Sep-92	Sediment Core SED09192
Y	SW01692			SW07107CH	TOTAL PHOS, NH4, NO2, NO3	02-Sep-92	Sediment Core SED09192
Y	SW01792			SW07108CH	CYANIDE (TOTAL)	15-Sep-92	Sediment Core SED09292
Y	SW01792			SW07108CH	HERBICIDES (ATRAZINE & SIMAZINE)	15-Sep-92	Sediment Core SED09292
Y	SW01792			SW07108CH	MAJOR ANIONS / WATER QUALITY	15-Sep-92	Sediment Core SED09292
Y	SW01792			SW07108CH	METALS (DISSOLVED)	15-Sep-92	Sediment Core SED09292
Y	SW01792			SW07108CH	METALS (TOTAL)	15-Sep-92	Sediment Core SED09292
Y	SW01792			SW07108CH	ORTHOPHOSPHATE	15-Sep-92	Sediment Core SED09292
Y	SW01792			SW07108CH	RADIONUCLIDES (DISSOLVED)	15-Sep-92	Sediment Core SED09292
Y	SW01792			SW07108CH	RADIONUCLIDES (TOTAL)	15-Sep-92	Sediment Core SED09292
Y	SW01792			SW07108CH	SULFIDE	15-Sep-92	Sediment Core SED09292
Y	SW01792			SW07108CH	TOTAL PHOS, NH4, NO2, NO3	15-Sep-92	Sediment Core SED09292
	SW02192	WN-11		SW07007CH	CYANIDE (TOTAL)	15-Jul-92	
	SW02192	WN-11		SW07007CH	HERBICIDES (ATRAZINE & SIMAZINE)	15-Jul-92	

Table C-4a
Summary of Reservoir Surface Water Samples
LAKE Data Group
Reservoir: IHSS 200

Collocated	Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Collocated with:
	SW02192	WN-11		SW07007CH	MAJOR ANIONS	15-Jul-92	
	SW02192	WN-11		SW07007CH	METALS (DISSOLVED)	15-Jul-92	
	SW02192	WN-11		SW07007CH	METALS (TOTAL)	15-Jul-92	
	SW02192	WN-11		SW07007CH	OIL & GREASE	15-Jul-92	
	SW02192	WN-11		SW07007CH	ORTHOPHOSPHATE	15-Jul-92	
	SW02192	WN-11		SW07007CH	RADIONUCLIDES (DISSOLVED)	15-Jul-92	
	SW02192	WN-11		SW07007CH	RADIONUCLIDES (TOTAL)	15-Jul-92	
	SW02192	WN-11		SW07007CH	SULFIDE	15-Jul-92	
	SW02192	WN-11		SW07007CH	TOTAL PHOS, NH4, NO2, NO3	15-Jul-92	
	SW02192	WN-11		SW07205CH	CYANIDE (TOTAL)	02-Oct-92	
	SW02192	WN-11		SW07205CH	HERBICIDES (ATRAZINE & SIMAZINE)	02-Oct-92	
	SW02192	WN-11		SW07205CH	MAJOR ANIONS / WATER QUALITY	02-Oct-92	
	SW02192	WN-11		SW07205CH	METALS (DISSOLVED)	02-Oct-92	
	SW02192	WN-11		SW07205CH	METALS (TOTAL)	02-Oct-92	
	SW02192	WN-11		SW07205CH	OIL & GREASE	02-Oct-92	
	SW02192	WN-11		SW07205CH	ORTHOPHOSPHATE	02-Oct-92	
	SW02192	WN-11		SW07205CH	RADIONUCLIDES (DISSOLVED)	02-Oct-92	
	SW02192	WN-11		SW07205CH	RADIONUCLIDES (TOTAL)	02-Oct-92	
	SW02192	WN-11		SW07205CH	SULFIDE	02-Oct-92	
	SW02192	WN-11		SW07205CH	TOTAL PHOS, NH4, NO2, NO3	02-Oct-92	
	SW02192	WN-11		SW07205CH	TRITIUM	02-Oct-92	
	SW02292	WN-12		SW07008CH	CYANIDE (TOTAL)	15-Jul-92	
	SW02292	WN-12		SW07008CH	HERBICIDES (ATRAZINE & SIMAZINE)	15-Jul-92	
	SW02292	WN-12		SW07008CH	MAJOR ANIONS	15-Jul-92	
	SW02292	WN-12		SW07008CH	METALS (DISSOLVED)	15-Jul-92	
	SW02292	WN-12		SW07008CH	METALS (TOTAL)	15-Jul-92	
	SW02292	WN-12		SW07008CH	OIL & GREASE	15-Jul-92	
	SW02292	WN-12		SW07008CH	ORTHOPHOSPHATE	15-Jul-92	
	SW02292	WN-12		SW07008CH	RADIONUCLIDES (DISSOLVED)	15-Jul-92	
	SW02292	WN-12		SW07008CH	RADIONUCLIDES (TOTAL)	15-Jul-92	
	SW02292	WN-12		SW07008CH	SULFIDE	15-Jul-92	
	SW02292	WN-12		SW07008CH	TOTAL PHOS, NH4, NO2, NO3	15-Jul-92	
	SW02292	WN-12		SW07206CH	CYANIDE (TOTAL)	02-Oct-92	
	SW02292	WN-12		SW07206CH	HERBICIDES (ATRAZINE & SIMAZINE)	02-Oct-92	
	SW02292	WN-12		SW07206CH	MAJOR ANIONS / WATER QUALITY	02-Oct-92	
	SW02292	WN-12		SW07206CH	METALS (DISSOLVED)	02-Oct-92	
	SW02292	WN-12		SW07206CH	METALS (TOTAL)	02-Oct-92	
	SW02292	WN-12		SW07206CH	OIL & GREASE	02-Oct-92	
	SW02292	WN-12		SW07206CH	ORTHOPHOSPHATE	02-Oct-92	
	SW02292	WN-12		SW07206CH	RADIONUCLIDES (DISSOLVED)	02-Oct-92	
	SW02292	WN-12		SW07206CH	RADIONUCLIDES (TOTAL)	02-Oct-92	
	SW02292	WN-12		SW07206CH	SULFIDE	02-Oct-92	
	SW02292	WN-12		SW07206CH	TOTAL PHOS, NH4, NO2, NO3	02-Oct-92	
	SW02292	WN-12		SW07206CH	TRITIUM	02-Oct-92	
	SW02392			SW07009CH	CYANIDE (TOTAL)	16-Jul-92	
	SW02392			SW07009CH	HERBICIDES (ATRAZINE & SIMAZINE)	16-Jul-92	
	SW02392			SW07009CH	MAJOR ANIONS	16-Jul-92	
	SW02392			SW07009CH	METALS (DISSOLVED)	16-Jul-92	
	SW02392			SW07009CH	METALS (TOTAL)	16-Jul-92	
	SW02392			SW07009CH	OIL & GREASE	16-Jul-92	
	SW02392			SW07009CH	ORTHOPHOSPHATE	16-Jul-92	
	SW02392			SW07009CH	RADIONUCLIDES (DISSOLVED)	16-Jul-92	
	SW02392			SW07009CH	RADIONUCLIDES (TOTAL)	16-Jul-92	

Table C-4a
Summary of Reservoir Surface Water Samples
LAKE Data Group
Reservoir: IHSS 200

Collocated	Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Collocated with:
	SW02392			SW07009CH	SULFIDE	16-Jul-92	
	SW02392			SW07009CH	TOTAL PHOS, NH4, NO2, NO3	16-Jul-92	
	SW02392			SW07207CH	CYANIDE (TOTAL)	02-Oct-92	
	SW02392			SW07207CH	HERBICIDES (ATRAZINE & SIMAZINE)	02-Oct-92	
	SW02392			SW07207CH	MAJOR ANIONS / WATER QUALITY	02-Oct-92	
	SW02392			SW07207CH	METALS (DISSOLVED)	02-Oct-92	
	SW02392			SW07207CH	METALS (TOTAL)	02-Oct-92	
	SW02392			SW07207CH	OIL & GREASE	02-Oct-92	
	SW02392			SW07207CH	ORTHOPHOSPHATE	02-Oct-92	
	SW02392			SW07207CH	RADIONUCLIDES (DISSOLVED)	02-Oct-92	
	SW02392			SW07207CH	RADIONUCLIDES (TOTAL)	02-Oct-92	
	SW02392			SW07207CH	SULFIDE	02-Oct-92	
	SW02392			SW07207CH	TOTAL PHOS, NH4, NO2, NO3	02-Oct-92	
	SW02392			SW07207CH	TRITIUM	02-Oct-92	
	SW02492			SW07010CH	CYANIDE (TOTAL)	16-Jul-92	
	SW02492			SW07010CH	HERBICIDES (ATRAZINE & SIMAZINE)	16-Jul-92	
	SW02492			SW07010CH	MAJOR ANIONS	16-Jul-92	
	SW02492			SW07010CH	METALS (DISSOLVED)	16-Jul-92	
	SW02492			SW07010CH	METALS (TOTAL)	16-Jul-92	
	SW02492			SW07010CH	OIL & GREASE	16-Jul-92	
	SW02492			SW07010CH	ORTHOPHOSPHATE	16-Jul-92	
	SW02492			SW07010CH	RADIONUCLIDES (DISSOLVED)	16-Jul-92	
	SW02492			SW07010CH	RADIONUCLIDES (TOTAL)	16-Jul-92	
	SW02492			SW07010CH	SULFIDE	16-Jul-92	
	SW02492			SW07010CH	TOTAL PHOS, NH4, NO2, NO3	16-Jul-92	
	SW02492			SW07208CH	CYANIDE (TOTAL)	02-Oct-92	
	SW02492			SW07208CH	HERBICIDES (ATRAZINE & SIMAZINE)	02-Oct-92	
	SW02492			SW07208CH	MAJOR ANIONS / WATER QUALITY	02-Oct-92	
	SW02492			SW07208CH	METALS (DISSOLVED)	02-Oct-92	
	SW02492			SW07208CH	METALS (TOTAL)	02-Oct-92	
	SW02492			SW07208CH	OIL & GREASE	02-Oct-92	
	SW02492			SW07208CH	ORTHOPHOSPHATE	02-Oct-92	
	SW02492			SW07208CH	RADIONUCLIDES (DISSOLVED)	02-Oct-92	
	SW02492			SW07208CH	RADIONUCLIDES (TOTAL)	02-Oct-92	
	SW02492			SW07208CH	SULFIDE	02-Oct-92	
	SW02492			SW07208CH	TOTAL PHOS, NH4, NO2, NO3	02-Oct-92	
	SW02492			SW07208CH	TRITIUM	02-Oct-92	
	SW02592	WN-13		SW07011CH	CYANIDE (TOTAL)	16-Jul-92	
	SW02592	WN-13		SW07011CH	HERBICIDES (ATRAZINE & SIMAZINE)	16-Jul-92	
	SW02592	WN-13		SW07011CH	MAJOR ANIONS	16-Jul-92	
	SW02592	WN-13		SW07011CH	METALS (DISSOLVED)	16-Jul-92	
	SW02592	WN-13		SW07011CH	METALS (TOTAL)	16-Jul-92	
	SW02592	WN-13		SW07011CH	OIL & GREASE	16-Jul-92	
	SW02592	WN-13		SW07011CH	ORTHOPHOSPHATE	16-Jul-92	
	SW02592	WN-13		SW07011CH	RADIONUCLIDES (DISSOLVED)	16-Jul-92	
	SW02592	WN-13		SW07011CH	RADIONUCLIDES (TOTAL)	16-Jul-92	
	SW02592	WN-13		SW07011CH	SULFIDE	16-Jul-92	
	SW02592	WN-13		SW07011CH	TOTAL PHOS, NH4, NO2, NO3	16-Jul-92	
	SW02592	WN-13		SW07209CH	CYANIDE (TOTAL)	02-Oct-92	
	SW02592	WN-13		SW07209CH	HERBICIDES (ATRAZINE & SIMAZINE)	02-Oct-92	
	SW02592	WN-13		SW07209CH	MAJOR ANIONS / WATER QUALITY	02-Oct-92	
	SW02592	WN-13		SW07209CH	METALS (DISSOLVED)	02-Oct-92	
	SW02592	WN-13		SW07209CH	METALS (TOTAL)	02-Oct-92	

Table C-4a
Summary of Reservoir Surface Water Samples
LAKE Data Group
Reservoir: IHSS 200

Collocated	Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Collocated with:
	SW02592	WN-13		SW07209CH	OIL & GREASE	02-Oct-92	
	SW02592	WN-13		SW07209CH	ORTHOPHOSPHATE	02-Oct-92	
	SW02592	WN-13		SW07209CH	RADIONUCLIDES (DISSOLVED)	02-Oct-92	
	SW02592	WN-13		SW07209CH	RADIONUCLIDES (TOTAL)	02-Oct-92	
	SW02592	WN-13		SW07209CH	SULFIDE	02-Oct-92	
	SW02592	WN-13		SW07209CH	TOTAL PHOS, NH4, NO2, NO3	02-Oct-92	
	SW02592	WN-13		SW07209CH	TRITIUM	02-Oct-92	
	SW02592	WN-13	BB	SW07234CH	TRITIUM	02-Oct-92	

Table C-4b
Summary of Reservoir Surface Water Samples
LAKE Data Group
Reservoir: IHSS 201

llocated	Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Collocated with
Y	SW00992			SW07100CH	CYANIDE (TOTAL)	08-Sep-92	Sediment Core SED08192
Y	SW00992			SW07100CH	HERBICIDES (ATRAZINE & SIMAZINE)	08-Sep-92	Sediment Core SED08192
Y	SW00992			SW07100CH	MAJOR ANIONS / WATER QUALITY	08-Sep-92	Sediment Core SED08192
Y	SW00992			SW07100CH	METALS (DISSOLVED)	08-Sep-92	Sediment Core SED08192
Y	SW00992			SW07100CH	METALS (TOTAL)	08-Sep-92	Sediment Core SED08192
Y	SW00992			SW07100CH	ORTHOPHOSPHATE	08-Sep-92	Sediment Core SED08192
Y	SW00992			SW07100CH	RADIONUCLIDES (DISSOLVED)	08-Sep-92	Sediment Core SED08192
Y	SW00992			SW07100CH	RADIONUCLIDES (TOTAL)	08-Sep-92	Sediment Core SED08192
Y	SW00992			SW07100CH	SULFIDE	08-Sep-92	Sediment Core SED08192
Y	SW00992			SW07100CH	TOTAL PHOS, NH4, NO2, NO3	08-Sep-92	Sediment Core SED08192
Y	SW01092			SW07101CH	CYANIDE (TOTAL)	09-Sep-92	Sediment Core SED08292
Y	SW01092			SW07101CH	HERBICIDES (ATRAZINE & SIMAZINE)	09-Sep-92	Sediment Core SED08292
Y	SW01092			SW07101CH	MAJOR ANIONS / WATER QUALITY	09-Sep-92	Sediment Core SED08292
Y	SW01092			SW07101CH	METALS (DISSOLVED)	09-Sep-92	Sediment Core SED08292
Y	SW01092			SW07101CH	METALS (TOTAL)	09-Sep-92	Sediment Core SED08292
Y	SW01092			SW07101CH	ORTHOPHOSPHATE	09-Sep-92	Sediment Core SED08292
Y	SW01092			SW07101CH	RADIONUCLIDES (DISSOLVED)	09-Sep-92	Sediment Core SED08292
Y	SW01092			SW07101CH	RADIONUCLIDES (TOTAL)	09-Sep-92	Sediment Core SED08292
Y	SW01092			SW07101CH	SULFIDE	09-Sep-92	Sediment Core SED08292
Y	SW01092			SW07101CH	TOTAL PHOS, NH4, NO2, NO3	09-Sep-92	Sediment Core SED08292
Y	SW01192			SW07102CH	CYANIDE (TOTAL)	08-Sep-92	Sediment Core SED08392
Y	SW01192			SW07102CH	HERBICIDES (ATRAZINE & SIMAZINE)	08-Sep-92	Sediment Core SED08392
Y	SW01192			SW07102CH	MAJOR ANIONS / WATER QUALITY	08-Sep-92	Sediment Core SED08392
Y	SW01192			SW07102CH	METALS (DISSOLVED)	08-Sep-92	Sediment Core SED08392
Y	SW01192			SW07102CH	METALS (TOTAL)	08-Sep-92	Sediment Core SED08392
Y	SW01192			SW07102CH	ORTHOPHOSPHATE	08-Sep-92	Sediment Core SED08392
Y	SW01192			SW07102CH	RADIONUCLIDES (DISSOLVED)	08-Sep-92	Sediment Core SED08392
Y	SW01192			SW07102CH	RADIONUCLIDES (TOTAL)	08-Sep-92	Sediment Core SED08392
Y	SW01192			SW07102CH	SULFIDE	08-Sep-92	Sediment Core SED08392
Y	SW01192			SW07102CH	TOTAL PHOS, NH4, NO2, NO3	08-Sep-92	Sediment Core SED08392
Y	SW01292			SW07103CH	CYANIDE (TOTAL)	09-Sep-92	Sediment Core SED08492
Y	SW01292			SW07103CH	HERBICIDES (ATRAZINE & SIMAZINE)	09-Sep-92	Sediment Core SED08492
Y	SW01292			SW07103CH	MAJOR ANIONS / WATER QUALITY	09-Sep-92	Sediment Core SED08492
Y	SW01292			SW07103CH	METALS (DISSOLVED)	09-Sep-92	Sediment Core SED08492
Y	SW01292			SW07103CH	METALS (TOTAL)	09-Sep-92	Sediment Core SED08492
Y	SW01292			SW07103CH	ORTHOPHOSPHATE	09-Sep-92	Sediment Core SED08492
Y	SW01292			SW07103CH	RADIONUCLIDES (DISSOLVED)	09-Sep-92	Sediment Core SED08492
Y	SW01292			SW07103CH	RADIONUCLIDES (TOTAL)	09-Sep-92	Sediment Core SED08492
Y	SW01292			SW07103CH	SULFIDE	09-Sep-92	Sediment Core SED08492
Y	SW01292			SW07103CH	TOTAL PHOS, NH4, NO2, NO3	09-Sep-92	Sediment Core SED08492
	SW03192	WO-14		SW07022CH	CYANIDE (TOTAL)	27-Jul-92	
	SW03192	WO-14		SW07022CH	HERBICIDES (ATRAZINE & SIMAZINE)	27-Jul-92	
	SW03192	WO-14		SW07022CH	MAJOR ANIONS	27-Jul-92	
	SW03192	WO-14		SW07022CH	METALS (DISSOLVED)	27-Jul-92	
	SW03192	WO-14		SW07022CH	METALS (TOTAL)	27-Jul-92	
	SW03192	WO-14		SW07022CH	OIL & GREASE	27-Jul-92	
	SW03192	WO-14		SW07022CH	ORTHOPHOSPHATE	27-Jul-92	
	SW03192	WO-14		SW07022CH	RADIONUCLIDES (DISSOLVED)	27-Jul-92	
	SW03192	WO-14		SW07022CH	RADIONUCLIDES (TOTAL)	27-Jul-92	
	SW03192	WO-14		SW07022CH	SULFIDE	27-Jul-92	
	SW03192	WO-14		SW07022CH	TOTAL PHOS, NH4, NO2, NO3	27-Jul-92	
	SW03192	WO-14		SW07219CH	CYANIDE (TOTAL)	13-Oct-92	

Table C-4b
Summary of Reservoir Surface Water Samples
LAKE Data Group
Reservoir: IHSS 201

Collocated	Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Collocated with
	SW03192	WO-14		SW07219CH	HERBICIDES (ATRAZINE & SIMAZINE)	13-Oct-92	
	SW03192	WO-14		SW07219CH	MAJOR ANIONS / WATER QUALITY	13-Oct-92	
	SW03192	WO-14		SW07219CH	METALS (DISSOLVED)	13-Oct-92	
	SW03192	WO-14		SW07219CH	METALS (TOTAL)	13-Oct-92	
	SW03192	WO-14		SW07219CH	OIL & GREASE	13-Oct-92	
	SW03192	WO-14		SW07219CH	ORTHOPHOSPHATE	13-Oct-92	
	SW03192	WO-14		SW07219CH	RADIONUCLIDES (DISSOLVED)	13-Oct-92	
	SW03192	WO-14		SW07219CH	RADIONUCLIDES (TOTAL)	13-Oct-92	
	SW03192	WO-14		SW07219CH	SULFIDE	13-Oct-92	
	SW03192	WO-14		SW07219CH	TOTAL PHOS, NH4, NO2, NO3	13-Oct-92	
	SW03192	WO-14	DUP	SW07220CH	CYANIDE (TOTAL)	13-Oct-92	
	SW03192	WO-14	DUP	SW07220CH	HERBICIDES (ATRAZINE & SIMAZINE)	13-Oct-92	
	SW03192	WO-14	DUP	SW07220CH	MAJOR ANIONS / WATER QUALITY	13-Oct-92	
	SW03192	WO-14	DUP	SW07220CH	METALS (DISSOLVED)	13-Oct-92	
	SW03192	WO-14	DUP	SW07220CH	METALS (TOTAL)	13-Oct-92	
	SW03192	WO-14	DUP	SW07220CH	OIL & GREASE	13-Oct-92	
	SW03192	WO-14	DUP	SW07220CH	ORTHOPHOSPHATE	13-Oct-92	
	SW03192	WO-14	DUP	SW07220CH	RADIONUCLIDES (DISSOLVED)	13-Oct-92	
	SW03192	WO-14	DUP	SW07220CH	RADIONUCLIDES (TOTAL)	13-Oct-92	
	SW03192	WO-14	DUP	SW07220CH	SULFIDE	13-Oct-92	
	SW03192	WO-14	DUP	SW07220CH	TOTAL PHOS, NH4, NO2, NO3	13-Oct-92	
	SW03292	WO-15		SW07023CH	CYANIDE (TOTAL)	30-Jul-92	
	SW03292	WO-15		SW07023CH	HERBICIDES (ATRAZINE & SIMAZINE)	30-Jul-92	
	SW03292	WO-15		SW07023CH	MAJOR ANIONS	30-Jul-92	
	SW03292	WO-15		SW07023CH	METALS (DISSOLVED)	30-Jul-92	
	SW03292	WO-15		SW07023CH	METALS (TOTAL)	30-Jul-92	
	SW03292	WO-15		SW07023CH	OIL & GREASE	30-Jul-92	
	SW03292	WO-15		SW07023CH	ORTHOPHOSPHATE	30-Jul-92	
	SW03292	WO-15		SW07023CH	RADIONUCLIDES (DISSOLVED)	30-Jul-92	
	SW03292	WO-15		SW07023CH	RADIONUCLIDES (TOTAL)	30-Jul-92	
	SW03292	WO-15		SW07023CH	SULFIDE	30-Jul-92	
	SW03292	WO-15		SW07023CH	TOTAL PHOS, NH4, NO2, NO3	30-Jul-92	
	SW03292	WO-15	DUP	SW07027CH	CYANIDE (TOTAL)	30-Jul-92	
	SW03292	WO-15	DUP	SW07027CH	HERBICIDES (ATRAZINE & SIMAZINE)	30-Jul-92	
	SW03292	WO-15	DUP	SW07027CH	MAJOR ANIONS	30-Jul-92	
	SW03292	WO-15	DUP	SW07027CH	METALS (DISSOLVED)	30-Jul-92	
	SW03292	WO-15	DUP	SW07027CH	METALS (TOTAL)	30-Jul-92	
	SW03292	WO-15	DUP	SW07027CH	OIL & GREASE	30-Jul-92	
	SW03292	WO-15	DUP	SW07027CH	ORTHOPHOSPHATE	30-Jul-92	
	SW03292	WO-15	DUP	SW07027CH	RADIONUCLIDES (DISSOLVED)	30-Jul-92	
	SW03292	WO-15	DUP	SW07027CH	RADIONUCLIDES (TOTAL)	30-Jul-92	
	SW03292	WO-15	DUP	SW07027CH	SULFIDE	30-Jul-92	
	SW03292	WO-15	DUP	SW07027CH	TOTAL PHOS, NH4, NO2, NO3	30-Jul-92	
	SW03292	WO-15		SW07221CH	CYANIDE (TOTAL)	14-Oct-92	
	SW03292	WO-15		SW07221CH	HERBICIDES (ATRAZINE & SIMAZINE)	14-Oct-92	
	SW03292	WO-15		SW07221CH	MAJOR ANIONS / WATER QUALITY	14-Oct-92	
	SW03292	WO-15		SW07221CH	METALS (DISSOLVED)	14-Oct-92	
	SW03292	WO-15		SW07221CH	METALS (TOTAL)	14-Oct-92	
	SW03292	WO-15		SW07221CH	OIL & GREASE	14-Oct-92	
	SW03292	WO-15		SW07221CH	ORTHOPHOSPHATE	14-Oct-92	
	SW03292	WO-15		SW07221CH	RADIONUCLIDES (DISSOLVED)	14-Oct-92	
	SW03292	WO-15		SW07221CH	RADIONUCLIDES (TOTAL)	14-Oct-92	
	SW03292	WO-15		SW07221CH	SULFIDE	14-Oct-92	

Table C-4b
Summary of Reservoir Surface Water Samples
LAKE Data Group
Reservoir: IHSS 201

Collocated	Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Collocated with
	SW03292	WO-15		SW07221CH	TOTAL PHOS, NH4, NO2, NO3	14-Oct-92	
	SW03392	WO-17		SW07024CH	CYANIDE (TOTAL)	27-Jul-92	
	SW03392	WO-17		SW07024CH	HERBICIDES (ATRAZINE & SIMAZINE)	27-Jul-92	
	SW03392	WO-17		SW07024CH	MAJOR ANIONS	27-Jul-92	
	SW03392	WO-17		SW07024CH	METALS (DISSOLVED)	27-Jul-92	
	SW03392	WO-17		SW07024CH	METALS (TOTAL)	27-Jul-92	
	SW03392	WO-17		SW07024CH	OIL & GREASE	27-Jul-92	
	SW03392	WO-17		SW07024CH	ORTHOPHOSPHATE	27-Jul-92	
	SW03392	WO-17		SW07024CH	RADIONUCLIDES (DISSOLVED)	27-Jul-92	
	SW03392	WO-17		SW07024CH	RADIONUCLIDES (TOTAL)	27-Jul-92	
	SW03392	WO-17		SW07024CH	SULFIDE	27-Jul-92	
	SW03392	WO-17		SW07024CH	TOTAL PHOS, NH4, NO2, NO3	27-Jul-92	
	SW03392	WO-17		SW07222CH	CYANIDE (TOTAL)	13-Oct-92	
	SW03392	WO-17		SW07222CH	HERBICIDES (ATRAZINE & SIMAZINE)	13-Oct-92	
	SW03392	WO-17		SW07222CH	MAJOR ANIONS / WATER QUALITY	13-Oct-92	
	SW03392	WO-17		SW07222CH	METALS (DISSOLVED)	13-Oct-92	
	SW03392	WO-17		SW07222CH	METALS (TOTAL)	13-Oct-92	
	SW03392	WO-17		SW07222CH	OIL & GREASE	13-Oct-92	
	SW03392	WO-17		SW07222CH	ORTHOPHOSPHATE	13-Oct-92	
	SW03392	WO-17		SW07222CH	RADIONUCLIDES (DISSOLVED)	13-Oct-92	
	SW03392	WO-17		SW07222CH	RADIONUCLIDES (TOTAL)	13-Oct-92	
	SW03392	WO-17		SW07222CH	SULFIDE	13-Oct-92	
	SW03392	WO-17		SW07222CH	TOTAL PHOS, NH4, NO2, NO3	13-Oct-92	
	SW03492			SW07025CH	CYANIDE (TOTAL)	28-Jul-92	
	SW03492			SW07025CH	HERBICIDES (ATRAZINE & SIMAZINE)	28-Jul-92	
	SW03492			SW07025CH	MAJOR ANIONS	28-Jul-92	
	SW03492			SW07025CH	METALS (DISSOLVED)	28-Jul-92	
	SW03492			SW07025CH	METALS (TOTAL)	28-Jul-92	
	SW03492			SW07025CH	OIL & GREASE	28-Jul-92	
	SW03492			SW07025CH	ORTHOPHOSPHATE	28-Jul-92	
	SW03492			SW07025CH	RADIONUCLIDES (DISSOLVED)	28-Jul-92	
	SW03492			SW07025CH	RADIONUCLIDES (TOTAL)	28-Jul-92	
	SW03492			SW07025CH	SULFIDE	28-Jul-92	
	SW03492			SW07025CH	TOTAL PHOS, NH4, NO2, NO3	28-Jul-92	
	SW03492			SW07224CH	CYANIDE (TOTAL)	13-Oct-92	
	SW03492			SW07224CH	HERBICIDES (ATRAZINE & SIMAZINE)	13-Oct-92	
	SW03492			SW07224CH	MAJOR ANIONS / WATER QUALITY	13-Oct-92	
	SW03492			SW07224CH	METALS (DISSOLVED)	13-Oct-92	
	SW03492			SW07224CH	METALS (TOTAL)	13-Oct-92	
	SW03492			SW07224CH	OIL & GREASE	13-Oct-92	
	SW03492			SW07224CH	ORTHOPHOSPHATE	13-Oct-92	
	SW03492			SW07224CH	RADIONUCLIDES (DISSOLVED)	13-Oct-92	
	SW03492			SW07224CH	RADIONUCLIDES (TOTAL)	13-Oct-92	
	SW03492			SW07224CH	SULFIDE	13-Oct-92	
	SW03492			SW07224CH	TOTAL PHOS, NH4, NO2, NO3	13-Oct-92	
	SW03592	WO-16		SW07026CH	CYANIDE (TOTAL)	28-Jul-92	STRAT: 0-1 FT
	SW03592	WO-16		SW07026CH	HERBICIDES (ATRAZINE & SIMAZINE)	28-Jul-92	STRAT: 0-1 FT
	SW03592	WO-16		SW07026CH	MAJOR ANIONS	28-Jul-92	STRAT: 0-1 FT
	SW03592	WO-16		SW07026CH	METALS (DISSOLVED)	28-Jul-92	STRAT: 0-1 FT
	SW03592	WO-16		SW07026CH	METALS (TOTAL)	28-Jul-92	STRAT: 0-1 FT
	SW03592	WO-16		SW07026CH	OIL & GREASE	28-Jul-92	STRAT: 0-1 FT
	SW03592	WO-16		SW07026CH	ORTHOPHOSPHATE	28-Jul-92	STRAT: 0-1 FT
	SW03592	WO-16		SW07026CH	RADIONUCLIDES (DISSOLVED)	28-Jul-92	STRAT: 0-1 FT

Table C-4b
Summary of Reservoir Surface Water Samples
LAKE Data Group
Reservoir: IHSS 201

Collocated	Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Collocated with
	SW03592	WO-16		SW07026CH	RADIONUCLIDES (TOTAL)	28-Jul-92	STRAT: 0-1 FT
	SW03592	WO-16		SW07026CH	SULFIDE	28-Jul-92	STRAT: 0-1 FT
	SW03592	WO-16		SW07026CH	TOTAL PHOS, NH4, NO2, NO3	28-Jul-92	STRAT: 0-1 FT
	SW03592	WO-16		SW07028CH	CYANIDE (TOTAL)	28-Jul-92	STRAT: 25-30 FT
	SW03592	WO-16		SW07028CH	HERBICIDES (ATRAZINE & SIMAZINE)	28-Jul-92	STRAT: 25-30 FT
	SW03592	WO-16		SW07028CH	MAJOR ANIONS	28-Jul-92	STRAT: 25-30 FT
	SW03592	WO-16		SW07028CH	METALS (DISSOLVED)	28-Jul-92	STRAT: 25-30 FT
	SW03592	WO-16		SW07028CH	METALS (TOTAL)	28-Jul-92	STRAT: 25-30 FT
	SW03592	WO-16		SW07028CH	OIL & GREASE	28-Jul-92	STRAT: 25-30 FT
	SW03592	WO-16		SW07028CH	ORTHOPHOSPHATE	28-Jul-92	STRAT: 25-30 FT
	SW03592	WO-16		SW07028CH	RADIONUCLIDES (DISSOLVED)	28-Jul-92	STRAT: 25-30 FT
	SW03592	WO-16		SW07028CH	RADIONUCLIDES (TOTAL)	28-Jul-92	STRAT: 25-30 FT
	SW03592	WO-16		SW07028CH	SULFIDE	28-Jul-92	STRAT: 25-30 FT
	SW03592	WO-16		SW07028CH	TOTAL PHOS, NH4, NO2, NO3	28-Jul-92	STRAT: 25-30 FT
	SW03592	WO-16		SW07029CH	CYANIDE (TOTAL)	28-Jul-92	STRAT: 75 FT
	SW03592	WO-16		SW07029CH	HERBICIDES (ATRAZINE & SIMAZINE)	28-Jul-92	STRAT: 75 FT
	SW03592	WO-16		SW07029CH	MAJOR ANIONS	28-Jul-92	STRAT: 75 FT
	SW03592	WO-16		SW07029CH	METALS (DISSOLVED)	28-Jul-92	STRAT: 75 FT
	SW03592	WO-16		SW07029CH	METALS (TOTAL)	28-Jul-92	STRAT: 75 FT
	SW03592	WO-16		SW07029CH	OIL & GREASE	28-Jul-92	STRAT: 75 FT
	SW03592	WO-16		SW07029CH	ORTHOPHOSPHATE	28-Jul-92	STRAT: 75 FT
	SW03592	WO-16		SW07029CH	RADIONUCLIDES (DISSOLVED)	28-Jul-92	STRAT: 75 FT
	SW03592	WO-16		SW07029CH	RADIONUCLIDES (TOTAL)	28-Jul-92	STRAT: 75 FT
	SW03592	WO-16		SW07029CH	SULFIDE	28-Jul-92	STRAT: 75 FT
	SW03592	WO-16		SW07029CH	TOTAL PHOS, NH4, NO2, NO3	28-Jul-92	STRAT: 75 FT
	SW03592	WO-16		SW07225CH	CYANIDE (TOTAL)	14-Oct-92	
	SW03592	WO-16		SW07225CH	HERBICIDES (ATRAZINE & SIMAZINE)	14-Oct-92	
	SW03592	WO-16		SW07225CH	MAJOR ANIONS / WATER QUALITY	14-Oct-92	
	SW03592	WO-16		SW07225CH	METALS (DISSOLVED)	14-Oct-92	
	SW03592	WO-16		SW07225CH	METALS (TOTAL)	14-Oct-92	
	SW03592	WO-16		SW07225CH	OIL & GREASE	14-Oct-92	
	SW03592	WO-16		SW07225CH	ORTHOPHOSPHATE	14-Oct-92	
	SW03592	WO-16		SW07225CH	RADIONUCLIDES (DISSOLVED)	13-Oct-92	
	SW03592	WO-16		SW07225CH	RADIONUCLIDES (TOTAL)	14-Oct-92	
	SW03592	WO-16		SW07225CH	SULFIDE	14-Oct-92	
	SW03592	WO-16		SW07225CH	TOTAL PHOS, NH4, NO2, NO3	14-Oct-92	

Table C-4c
Summary of Reservoir Surface Water Samples
LAKE Data Group
Reservoir: IHSS 202

llocated	Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Collocated with:
Y	SW01892			SW07109CH	CYANIDE (TOTAL)	14-Sep-92	Sediment Core SED08892
Y	SW01892			SW07109CH	HERBICIDES (ATRAZINE & SIMAZINE)	14-Sep-92	Sediment Core SED08892
Y	SW01892			SW07109CH	MAJOR ANIONS / WATER QUALITY	14-Sep-92	Sediment Core SED08892
Y	SW01892			SW07109CH	METALS (DISSOLVED)	14-Sep-92	Sediment Core SED08892
Y	SW01892			SW07109CH	METALS (TOTAL)	14-Sep-92	Sediment Core SED08892
Y	SW01892			SW07109CH	ORTHOPHOSPHATE	14-Sep-92	Sediment Core SED08892
Y	SW01892			SW07109CH	RADIONUCLIDES (DISSOLVED)	14-Sep-92	Sediment Core SED08892
Y	SW01892			SW07109CH	RADIONUCLIDES (TOTAL)	14-Sep-92	Sediment Core SED08892
Y	SW01892			SW07109CH	SULFIDE	14-Sep-92	Sediment Core SED08892
Y	SW01892			SW07109CH	TOTAL PHOS, NH4, NO2, NO3	14-Sep-92	Sediment Core SED08892
Y	SW01992			SW07110CH	CYANIDE (TOTAL)	14-Sep-92	Sediment Core SED08892
Y	SW01992			SW07110CH	HERBICIDES (ATRAZINE & SIMAZINE)	14-Sep-92	Sediment Core SED08892
Y	SW01992			SW07110CH	MAJOR ANIONS / WATER QUALITY	14-Sep-92	Sediment Core SED08892
Y	SW01992			SW07110CH	METALS (DISSOLVED)	14-Sep-92	Sediment Core SED08892
Y	SW01992			SW07110CH	METALS (TOTAL)	14-Sep-92	Sediment Core SED08892
Y	SW01992			SW07110CH	ORTHOPHOSPHATE	14-Sep-92	Sediment Core SED08892
Y	SW01992			SW07110CH	RADIONUCLIDES (DISSOLVED)	14-Sep-92	Sediment Core SED08892
Y	SW01992			SW07110CH	RADIONUCLIDES (TOTAL)	14-Sep-92	Sediment Core SED08892
Y	SW01992			SW07110CH	SULFIDE	14-Sep-92	Sediment Core SED08892
Y	SW01992			SW07110CH	TOTAL PHOS, NH4, NO2, NO3	14-Sep-92	Sediment Core SED08892
Y	SW02092			SW07111CH	CYANIDE (TOTAL)	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07111CH	MAJOR ANIONS / WATER QUALITY	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07111CH	METALS (DISSOLVED)	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07111CH	METALS (TOTAL)	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07111CH	ORTHOPHOSPHATE	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07111CH	RADIONUCLIDES (DISSOLVED)	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07111CH	RADIONUCLIDES (TOTAL)	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07111CH	SULFIDE	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07111CH	TOTAL PHOS, NH4, NO2, NO3	14-Sep-92	Sediment Core SED09092
Y	SW02092		DUP	SW07112CH	CYANIDE (TOTAL)	14-Sep-92	Sediment Core SED09092
Y	SW02092		DUP	SW07112CH	HERBICIDES (ATRAZINE & SIMAZINE)	14-Sep-92	Sediment Core SED09092
Y	SW02092		DUP	SW07112CH	MAJOR ANIONS / WATER QUALITY	14-Sep-92	Sediment Core SED09092
Y	SW02092		DUP	SW07112CH	METALS (DISSOLVED)	14-Sep-92	Sediment Core SED09092
Y	SW02092		DUP	SW07112CH	METALS (TOTAL)	14-Sep-92	Sediment Core SED09092
Y	SW02092		DUP	SW07112CH	ORTHOPHOSPHATE	14-Sep-92	Sediment Core SED09092
Y	SW02092		DUP	SW07112CH	RADIONUCLIDES (DISSOLVED)	14-Sep-92	Sediment Core SED09092
Y	SW02092		DUP	SW07112CH	RADIONUCLIDES (TOTAL)	14-Sep-92	Sediment Core SED09092
Y	SW02092		DUP	SW07112CH	SULFIDE	14-Sep-92	Sediment Core SED09092
Y	SW02092		DUP	SW07112CH	TOTAL PHOS, NH4, NO2, NO3	14-Sep-92	Sediment Core SED09092
Y	SW02092		RNS	SW07113CH	CYANIDE (TOTAL)	14-Sep-92	Sediment Core SED09092
Y	SW02092		RNS	SW07113CH	HERBICIDES (ATRAZINE & SIMAZINE)	14-Sep-92	Sediment Core SED09092
Y	SW02092		RNS	SW07113CH	MAJOR ANIONS / WATER QUALITY	14-Sep-92	Sediment Core SED09092
Y	SW02092		RNS	SW07113CH	METALS (DISSOLVED)	14-Sep-92	Sediment Core SED09092
Y	SW02092		RNS	SW07113CH	METALS (TOTAL)	14-Sep-92	Sediment Core SED09092
Y	SW02092		RNS	SW07113CH	ORTHOPHOSPHATE	14-Sep-92	Sediment Core SED09092
Y	SW02092		RNS	SW07113CH	RADIONUCLIDES (DISSOLVED)	14-Sep-92	Sediment Core SED09092
Y	SW02092		RNS	SW07113CH	RADIONUCLIDES (TOTAL)	14-Sep-92	Sediment Core SED09092
Y	SW02092		RNS	SW07113CH	SULFIDE	14-Sep-92	Sediment Core SED09092
Y	SW02092		RNS	SW07113CH	TOTAL PHOS, NH4, NO2, NO3	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07114CH	CYANIDE (TOTAL)	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07114CH	HERBICIDES (ATRAZINE & SIMAZINE)	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07114CH	MAJOR ANIONS / WATER QUALITY	14-Sep-92	Sediment Core SED09092

Table C-4c
Summary of Reservoir Surface Water Samples
LAKE Data Group
Reservoir: IHSS 202

Collocated	Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Collocated with:
Y	SW02092			SW07114CH	METALS (DISSOLVED)	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07114CH	METALS (TOTAL)	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07114CH	ORTHOPHOSPHATE	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07114CH	RADIONUCLIDES (DISSOLVED)	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07114CH	RADIONUCLIDES (TOTAL)	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07114CH	SULFIDE	14-Sep-92	Sediment Core SED09092
Y	SW02092			SW07114CH	TOTAL PHOS, NH4, NO2, NO3	14-Sep-92	Sediment Core SED09092
Y	SW02092		FB	SW07115CH	METALS (TOTAL)	14-Sep-92	Sediment Core SED09092
Y	SW02092		FB	SW07115CH	RADIONUCLIDES (TOTAL)	14-Sep-92	Sediment Core SED09092
	SW02692	WO-11		SW07012CH	CYANIDE (TOTAL)	20-Jul-92	
	SW02692	WO-11		SW07012CH	HERBICIDES (ATRAZINE & SIMAZINE)	20-Jul-92	
	SW02692	WO-11		SW07012CH	MAJOR ANIONS	20-Jul-92	
	SW02692	WO-11		SW07012CH	METALS (DISSOLVED)	20-Jul-92	
	SW02692	WO-11		SW07012CH	METALS (TOTAL)	20-Jul-92	
	SW02692	WO-11		SW07012CH	OIL & GREASE	20-Jul-92	
	SW02692	WO-11		SW07012CH	ORTHOPHOSPHATE	20-Jul-92	
	SW02692	WO-11		SW07012CH	RADIONUCLIDES (DISSOLVED)	20-Jul-92	
	SW02692	WO-11		SW07012CH	RADIONUCLIDES (TOTAL)	20-Jul-92	
	SW02692	WO-11		SW07012CH	SULFIDE	20-Jul-92	
	SW02692	WO-11		SW07012CH	TOTAL PHOS, NH4, NO2, NO3	20-Jul-92	
	SW02692	WO-11		SW07012CH	VOC	20-Jul-92	
	SW02692	WO-11		SW07210CH	CYANIDE (TOTAL)	08-Oct-92	
	SW02692	WO-11		SW07210CH	HERBICIDES (ATRAZINE & SIMAZINE)	08-Oct-92	
	SW02692	WO-11		SW07210CH	MAJOR ANIONS / WATER QUALITY	08-Oct-92	
	SW02692	WO-11		SW07210CH	METALS (DISSOLVED)	08-Oct-92	
	SW02692	WO-11		SW07210CH	METALS (TOTAL)	08-Oct-92	
	SW02692	WO-11		SW07210CH	OIL & GREASE	08-Oct-92	
	SW02692	WO-11		SW07210CH	ORTHOPHOSPHATE	08-Oct-92	
	SW02692	WO-11		SW07210CH	RADIONUCLIDES (DISSOLVED)	08-Oct-92	
	SW02692	WO-11		SW07210CH	RADIONUCLIDES (TOTAL)	08-Oct-92	
	SW02692	WO-11		SW07210CH	SULFIDE	08-Oct-92	
	SW02692	WO-11		SW07210CH	TOTAL PHOS, NH4, NO2, NO3	08-Oct-92	
	SW02692	WO-11		SW07210CH	VOA	08-Oct-92	
	SW02692	WO-11	FB	SW07211CH	CYANIDE (TOTAL)	08-Oct-92	
	SW02692	WO-11	FB	SW07211CH	HERBICIDES (ATRAZINE & SIMAZINE)	08-Oct-92	
	SW02692	WO-11	FB	SW07211CH	MAJOR ANIONS / WATER QUALITY	08-Oct-92	
	SW02692	WO-11	FB	SW07211CH	METALS (TOTAL)	08-Oct-92	
	SW02692	WO-11	FB	SW07211CH	OIL & GREASE	08-Oct-92	
	SW02692	WO-11	FB	SW07211CH	ORTHOPHOSPHATE	08-Oct-92	
	SW02692	WO-11	FB	SW07211CH	RADIONUCLIDES (TOTAL)	08-Oct-92	
	SW02692	WO-11	FB	SW07211CH	SULFIDE	08-Oct-92	
	SW02692	WO-11	FB	SW07211CH	TOTAL PHOS, NH4, NO2, NO3	08-Oct-92	
	SW02692	WO-11	FB	SW07211CH	TRITIUM	08-Oct-92	
	SW02692	WO-11	TB	SW07212CH	VOA	06-Oct-92	
	SW02692	WO-11	RNS	SW07213CH	CYANIDE (TOTAL)	08-Oct-92	
	SW02692	WO-11	RNS	SW07213CH	HERBICIDES (ATRAZINE & SIMAZINE)	08-Oct-92	
	SW02692	WO-11	RNS	SW07213CH	MAJOR ANIONS / WATER QUALITY	08-Oct-92	
	SW02692	WO-11	RNS	SW07213CH	METALS (DISSOLVED)	08-Oct-92	
	SW02692	WO-11	RNS	SW07213CH	METALS (TOTAL)	08-Oct-92	
	SW02692	WO-11	RNS	SW07213CH	OIL & GREASE	08-Oct-92	
	SW02692	WO-11	RNS	SW07213CH	ORTHOPHOSPHATE	08-Oct-92	
	SW02692	WO-11	RNS	SW07213CH	RADIONUCLIDES (DISSOLVED)	08-Oct-92	
	SW02692	WO-11	RNS	SW07213CH	RADIONUCLIDES (TOTAL)	08-Oct-92	

Table C-4c
Summary of Reservoir Surface Water Samples
LAKE Data Group
Reservoir: IHSS 202

Collocated	Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Collocated with:
	SW02692	WO-11	RNS	SW07213CH	SULFIDE	08-Oct-92	
	SW02692	WO-11	RNS	SW07213CH	TOTAL PHOS, NH4, NO2, NO3	08-Oct-92	
	SW02692	WO-11	RNS	SW07213CH	VOA	08-Oct-92	
	SW02792	WO-12		SW07013CH	CYANIDE (TOTAL)	20-Jul-92	
	SW02792	WO-12		SW07013CH	HERBICIDES (ATRAZINE & SIMAZINE)	20-Jul-92	
	SW02792	WO-12		SW07013CH	MAJOR ANIONS	20-Jul-92	
	SW02792	WO-12		SW07013CH	METALS (DISSOLVED)	20-Jul-92	
	SW02792	WO-12		SW07013CH	METALS (TOTAL)	20-Jul-92	
	SW02792	WO-12		SW07013CH	OIL & GREASE	20-Jul-92	
	SW02792	WO-12		SW07013CH	ORTHOPHOSPHATE	20-Jul-92	
	SW02792	WO-12		SW07013CH	RADIONUCLIDES (DISSOLVED)	20-Jul-92	
	SW02792	WO-12		SW07013CH	RADIONUCLIDES (TOTAL)	20-Jul-92	
	SW02792	WO-12		SW07013CH	SULFIDE	20-Jul-92	
	SW02792	WO-12		SW07013CH	TOTAL PHOS, NH4, NO2, NO3	20-Jul-92	
	SW02792	WO-12		SW07013CH	VOC	20-Jul-92	
	SW02792	WO-12		SW07214CH	CYANIDE (TOTAL)	08-Oct-92	
	SW02792	WO-12		SW07214CH	HERBICIDES (ATRAZINE & SIMAZINE)	08-Oct-92	
	SW02792	WO-12		SW07214CH	MAJOR ANIONS / WATER QUALITY	08-Oct-92	
	SW02792	WO-12		SW07214CH	METALS (DISSOLVED)	08-Oct-92	
	SW02792	WO-12		SW07214CH	METALS (TOTAL)	08-Oct-92	
	SW02792	WO-12		SW07214CH	OIL & GREASE	08-Oct-92	
	SW02792	WO-12		SW07214CH	ORTHOPHOSPHATE	08-Oct-92	
	SW02792	WO-12		SW07214CH	RADIONUCLIDES (DISSOLVED)	08-Oct-92	
	SW02792	WO-12		SW07214CH	RADIONUCLIDES (TOTAL)	08-Oct-92	
	SW02792	WO-12		SW07214CH	SULFIDE	08-Oct-92	
	SW02792	WO-12		SW07214CH	TOTAL PHOS, NH4, NO2, NO3	08-Oct-92	
	SW02792	WO-12		SW07214CH	VOA	08-Oct-92	
	SW02792	WO-12	DUP	SW07215CH	CYANIDE (TOTAL)	08-Oct-92	
	SW02792	WO-12	DUP	SW07215CH	HERBICIDES (ATRAZINE & SIMAZINE)	08-Oct-92	
	SW02792	WO-12	DUP	SW07215CH	MAJOR ANIONS / WATER QUALITY	08-Oct-92	
	SW02792	WO-12	DUP	SW07215CH	METALS (DISSOLVED)	08-Oct-92	
	SW02792	WO-12	DUP	SW07215CH	METALS (TOTAL)	08-Oct-92	
	SW02792	WO-12	DUP	SW07215CH	OIL & GREASE	08-Oct-92	
	SW02792	WO-12	DUP	SW07215CH	ORTHOPHOSPHATE	08-Oct-92	
	SW02792	WO-12	DUP	SW07215CH	RADIONUCLIDES (DISSOLVED)	08-Oct-92	
	SW02792	WO-12	DUP	SW07215CH	RADIONUCLIDES (TOTAL)	08-Oct-92	
	SW02792	WO-12	DUP	SW07215CH	SULFIDE	08-Oct-92	
	SW02792	WO-12	DUP	SW07215CH	TOTAL PHOS, NH4, NO2, NO3	08-Oct-92	
	SW02792	WO-12	DUP	SW07215CH	VOA	08-Oct-92	
	SW02892			SW07014CH	CYANIDE (TOTAL)	20-Jul-92	
	SW02892			SW07014CH	HERBICIDES (ATRAZINE & SIMAZINE)	20-Jul-92	
	SW02892			SW07014CH	MAJOR ANIONS	20-Jul-92	
	SW02892			SW07014CH	METALS (DISSOLVED)	20-Jul-92	
	SW02892			SW07014CH	METALS (TOTAL)	20-Jul-92	
	SW02892			SW07014CH	OIL & GREASE	20-Jul-92	
	SW02892			SW07014CH	ORTHOPHOSPHATE	20-Jul-92	
	SW02892			SW07014CH	RADIONUCLIDES (DISSOLVED)	20-Jul-92	
	SW02892			SW07014CH	RADIONUCLIDES (TOTAL)	20-Jul-92	
	SW02892			SW07014CH	SULFIDE	20-Jul-92	
	SW02892			SW07014CH	TOTAL PHOS, NH4, NO2, NO3	20-Jul-92	
	SW02892			SW07014CH	VOC	20-Jul-92	
	SW02892			SW07216CH	CYANIDE (TOTAL)	08-Oct-92	
	SW02892			SW07216CH	HERBICIDES (ATRAZINE & SIMAZINE)	08-Oct-92	

Table C-4c
Summary of Reservoir Surface Water Samples
LAKE Data Group
Reservoir: IHSS 202

Collocated	Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Collocated with:
	SW02892			SW07216CH	MAJOR ANIONS / WATER QUALITY	08-Oct-92	
	SW02892			SW07216CH	METALS (DISSOLVED)	08-Oct-92	
	SW02892			SW07216CH	METALS (TOTAL)	08-Oct-92	
	SW02892			SW07216CH	OIL & GREASE	08-Oct-92	
	SW02892			SW07216CH	ORTHOPHOSPHATE	08-Oct-92	
	SW02892			SW07216CH	RADIONUCLIDES (DISSOLVED)	08-Oct-92	
	SW02892			SW07216CH	RADIONUCLIDES (TOTAL)	08-Oct-92	
	SW02892			SW07216CH	SULFIDE	08-Oct-92	
	SW02892			SW07216CH	TOTAL PHOS, NH4, NO2, NO3	08-Oct-92	
	SW02892			SW07216CH	VOA	08-Oct-92	
	SW02992			SW07015CH	CYANIDE (TOTAL)	20-Jul-92	
	SW02992			SW07015CH	HERBICIDES (ATRAZINE & SIMAZINE)	20-Jul-92	
	SW02992			SW07015CH	MAJOR ANIONS	20-Jul-92	
	SW02992			SW07015CH	METALS (DISSOLVED)	20-Jul-92	
	SW02992			SW07015CH	METALS (TOTAL)	20-Jul-92	
	SW02992			SW07015CH	OIL & GREASE	20-Jul-92	
	SW02992			SW07015CH	ORTHOPHOSPHATE	20-Jul-92	
	SW02992			SW07015CH	RADIONUCLIDES (DISSOLVED)	20-Jul-92	
	SW02992			SW07015CH	RADIONUCLIDES (TOTAL)	20-Jul-92	
	SW02992			SW07015CH	SULFIDE	20-Jul-92	
	SW02992			SW07015CH	TOTAL PHOS, NH4, NO2, NO3	20-Jul-92	
	SW02992			SW07015CH	VOC	20-Jul-92	
	SW02992			SW07217CH	CYANIDE (TOTAL)	08-Oct-92	
	SW02992			SW07217CH	HERBICIDES (ATRAZINE & SIMAZINE)	08-Oct-92	
	SW02992			SW07217CH	MAJOR ANIONS / WATER QUALITY	08-Oct-92	
	SW02992			SW07217CH	METALS (DISSOLVED)	08-Oct-92	
	SW02992			SW07217CH	METALS (TOTAL)	08-Oct-92	
	SW02992			SW07217CH	OIL & GREASE	08-Oct-92	
	SW02992			SW07217CH	ORTHOPHOSPHATE	08-Oct-92	
	SW02992			SW07217CH	RADIONUCLIDES (DISSOLVED)	08-Oct-92	
	SW02992			SW07217CH	RADIONUCLIDES (TOTAL)	08-Oct-92	
	SW02992			SW07217CH	SULFIDE	08-Oct-92	
	SW02992			SW07217CH	TOTAL PHOS, NH4, NO2, NO3	08-Oct-92	
	SW02992			SW07217CH	VOA	08-Oct-92	
	SW03092	WO-13		SW07016CH	CYANIDE (TOTAL)	21-Jul-92	
	SW03092	WO-13		SW07016CH	HERBICIDES (ATRAZINE & SIMAZINE)	21-Jul-92	
	SW03092	WO-13		SW07016CH	MAJOR ANIONS	21-Jul-92	
	SW03092	WO-13		SW07016CH	METALS (DISSOLVED)	21-Jul-92	
	SW03092	WO-13		SW07016CH	METALS (TOTAL)	21-Jul-92	
	SW03092	WO-13		SW07016CH	OIL & GREASE	21-Jul-92	
	SW03092	WO-13		SW07016CH	ORTHOPHOSPHATE	21-Jul-92	
	SW03092	WO-13		SW07016CH	RADIONUCLIDES (DISSOLVED)	21-Jul-92	
	SW03092	WO-13		SW07016CH	RADIONUCLIDES (TOTAL)	21-Jul-92	
	SW03092	WO-13		SW07016CH	SULFIDE	21-Jul-92	
	SW03092	WO-13		SW07016CH	TOTAL PHOS, NH4, NO2, NO3	21-Jul-92	
	SW03092	WO-13		SW07016CH	VOC	21-Jul-92	
	SW03092	WO-13	DUP	SW07017CH	CYANIDE (TOTAL)	21-Jul-92	
	SW03092	WO-13	DUP	SW07017CH	HERBICIDES (ATRAZINE & SIMAZINE)	21-Jul-92	
	SW03092	WO-13	DUP	SW07017CH	MAJOR ANIONS	21-Jul-92	
	SW03092	WO-13	DUP	SW07017CH	METALS (DISSOLVED)	21-Jul-92	
	SW03092	WO-13	DUP	SW07017CH	METALS (TOTAL)	21-Jul-92	
	SW03092	WO-13	DUP	SW07017CH	OIL & GREASE	21-Jul-92	
	SW03092	WO-13	DUP	SW07017CH	ORTHOPHOSPHATE	21-Jul-92	

Table C-4c
Summary of Reservoir Surface Water Samples
LAKE Data Group
Reservoir: IHSS 202

Collocated	Sample Location	Work Plan ID	QC Type	Sample Number	Analysis	Date Collected	Collocated with:
	SW03092	WO-13	DUP	SW07017CH	RADIONUCLIDES (DISSOLVED)	21-Jul-92	
	SW03092	WO-13	DUP	SW07017CH	RADIONUCLIDES (TOTAL)	21-Jul-92	
	SW03092	WO-13	DUP	SW07017CH	SULFIDE	21-Jul-92	
	SW03092	WO-13	DUP	SW07017CH	TOTAL PHOS, NH4, NO2, NO3	21-Jul-92	
	SW03092	WO-13	DUP	SW07017CH	VOC	21-Jul-92	
	SW03092	WO-13	FB	SW07018CH	METALS (TOTAL)	21-Jul-92	
	SW03092	WO-13	FB	SW07018CH	RADIONUCLIDES (TOTAL)	21-Jul-92	
	SW03092	WO-13	TB	SW07019CH	VOC	21-Jul-92	
	SW03092	WO-13	RNS	SW07021CH	CYANIDE (TOTAL)	21-Jul-92	
	SW03092	WO-13	RNS	SW07021CH	HERBICIDES (ATRAZINE & SIMAZINE)	21-Jul-92	
	SW03092	WO-13	RNS	SW07021CH	MAJOR ANIONS	21-Jul-92	
	SW03092	WO-13	RNS	SW07021CH	METALS (TOTAL)	21-Jul-92	
	SW03092	WO-13	RNS	SW07021CH	OIL & GREASE	21-Jul-92	
	SW03092	WO-13	RNS	SW07021CH	ORTHOPHOSPHATE	21-Jul-92	
	SW03092	WO-13	RNS	SW07021CH	RADIONUCLIDES (DISSOLVED)	21-Jul-92	
	SW03092	WO-13	RNS	SW07021CH	SULFIDE	21-Jul-92	
	SW03092	WO-13	RNS	SW07021CH	TOTAL PHOS, NH4, NO2, NO3	21-Jul-92	
	SW03092	WO-13	RNS	SW07021CH	VOC	21-Jul-92	
	SW03092	WO-13		SW07218CH	CYANIDE (TOTAL)	08-Oct-92	
	SW03092	WO-13		SW07218CH	HERBICIDES (ATRAZINE & SIMAZINE)	08-Oct-92	
	SW03092	WO-13		SW07218CH	MAJOR ANIONS / WATER QUALITY	08-Oct-92	
	SW03092	WO-13		SW07218CH	METALS (DISSOLVED)	08-Oct-92	
	SW03092	WO-13		SW07218CH	METALS (TOTAL)	08-Oct-92	
	SW03092	WO-13		SW07218CH	OIL & GREASE	08-Oct-92	
	SW03092	WO-13		SW07218CH	ORTHOPHOSPHATE	08-Oct-92	
	SW03092	WO-13		SW07218CH	RADIONUCLIDES (DISSOLVED)	08-Oct-92	
	SW03092	WO-13		SW07218CH	RADIONUCLIDES (TOTAL)	08-Oct-92	
	SW03092	WO-13		SW07218CH	SULFIDE	08-Oct-92	
	SW03092	WO-13		SW07218CH	TOTAL PHOS, NH4, NO2, NO3	08-Oct-92	
	SW03092	WO-13		SW07218CH	VOA	08-Oct-92	

Table C-5
Summary of Nearshore Sediment Samples (Grab and Core Samples)

Location Code	Sample Number	Sample Analysis	Date Collected	Depth From	Depth To	Depth Unit	Grab/ Core	QC Code
SED03592	SD00386WCU3	AM241	02-Jun-92				GRAB	REAL
SED03592	SD00386WCU3	CS137 BY GAMMA OR RADIOCESIUM	02-Jun-92				GRAB	REAL
SED03592	SD00386WCU3	GROSS ALPHA	02-Jun-92				GRAB	REAL
SED03592	SD00386WCU3	GROSS BETA	02-Jun-92				GRAB	REAL
SED03592	SD00386WCU3	MET (A) CLP	02-Jun-92				GRAB	REAL
SED03592	SD00386WCU3	MET (S) CLP	02-Jun-92				GRAB	REAL
SED03592	SD00386WCU3	PLUTONIUM 239/240	02-Jun-92				GRAB	REAL
SED03592	SD00386WCU3	SR89/90	02-Jun-92				GRAB	REAL
SED03592	SD00386WCU3	U-ISO	02-Jun-92				GRAB	REAL
SED03692	SD00360WCU3	AM241	04-Jun-92				GRAB	REAL
SED03692	SD00360WCU3	CS137 BY GAMMA OR RADIOCESIUM	04-Jun-92				GRAB	REAL
SED03692	SD00360WCU3	GROSS ALPHA	04-Jun-92				GRAB	REAL
SED03692	SD00360WCU3	GROSS BETA	04-Jun-92				GRAB	REAL
SED03692	SD00360WCU3	MET (A) CLP	04-Jun-92				GRAB	REAL
SED03692	SD00360WCU3	MET (S) CLP	04-Jun-92				GRAB	REAL
SED03692	SD00360WCU3	PLUTONIUM 239/240	04-Jun-92				GRAB	REAL
SED03692	SD00360WCU3	SIEVE TEST (GRAIN SIZE)	04-Jun-92				GRAB	REAL
SED03692	SD00360WCU3	SPECIFIC DENSITY	04-Jun-92				GRAB	REAL
SED03692	SD00360WCU3	SR89/90	04-Jun-92				GRAB	REAL
SED03692	SD00360WCU3	TOC	04-Jun-92				GRAB	REAL
SED03692	SD00360WCU3	U-ISO	04-Jun-92				GRAB	REAL
SED03692	SD00430WCU3	AM241	04-Jun-92	0	1	IN	CORE	REAL
SED03692	SD00430WCU3	PLUTONIUM 239/240	04-Jun-92	0	1	IN	CORE	REAL
SED03692	SD00430WCU3	U-ISO	04-Jun-92	0	1	IN	CORE	REAL
SED03692	SD00431WCU3	AM241	04-Jun-92	1	2	IN	CORE	REAL
SED03692	SD00431WCU3	PLUTONIUM 239/240	04-Jun-92	1	2	IN	CORE	REAL
SED03692	SD00431WCU3	U-ISO	04-Jun-92	1	2	IN	CORE	REAL
SED03692	SD00432WCU3	AM241	04-Jun-92	2	3	IN	CORE	REAL
SED03692	SD00432WCU3	PLUTONIUM 239/240	04-Jun-92	2	3	IN	CORE	REAL
SED03692	SD00432WCU3	U-ISO	04-Jun-92	2	3	IN	CORE	REAL
SED03692	SD00433WCU3	AM241	04-Jun-92	3	4	IN	CORE	REAL
SED03692	SD00433WCU3	PLUTONIUM 239/240	04-Jun-92	3	4	IN	CORE	REAL
SED03692	SD00433WCU3	U-ISO	04-Jun-92	3	4	IN	CORE	REAL
SED03692	SD00434WCU3	AM241	04-Jun-92	4	5	IN	CORE	REAL
SED03692	SD00434WCU3	PLUTONIUM 239/240	04-Jun-92	4	5	IN	CORE	REAL
SED03692	SD00434WCU3	U-ISO	04-Jun-92	4	5	IN	CORE	REAL
SED03692	SD00435WCU3	AM241	04-Jun-92	5	6	IN	CORE	REAL
SED03692	SD00435WCU3	PLUTONIUM 239/240	04-Jun-92	5	6	IN	CORE	REAL
SED03692	SD00435WCU3	U-ISO	04-Jun-92	5	6	IN	CORE	REAL
SED03692	SW80212WCU3	AM241	04-Jun-92				GRAB	DUP
SED03692	SW80212WCU3	CS137 BY GAMMA OR RADIOCESIUM	04-Jun-92				GRAB	DUP
SED03692	SW80212WCU3	GROSS ALPHA	04-Jun-92				GRAB	DUP
SED03692	SW80212WCU3	GROSS BETA	04-Jun-92				GRAB	DUP
SED03692	SW80212WCU3	MET (A) CLP	04-Jun-92				GRAB	DUP
SED03692	SW80212WCU3	MET (S) CLP	04-Jun-92				GRAB	DUP
SED03692	SW80212WCU3	PLUTONIUM 239/240	04-Jun-92				GRAB	DUP
SED03692	SW80212WCU3	SR89/90	04-Jun-92				GRAB	DUP
SED03692	SW80212WCU3	U-ISO	04-Jun-92				GRAB	DUP
SED03692	SW80213WCU3	AM241	04-Jun-92				GRAB	RNS
SED03692	SW80213WCU3	CS137 BY GAMMA OR RADIOCESIUM	04-Jun-92				GRAB	RNS
SED03692	SW80213WCU3	GROSS ALPHA	04-Jun-92				GRAB	RNS
SED03692	SW80213WCU3	GROSS BETA	04-Jun-92				GRAB	RNS
SED03692	SW80213WCU3	MET (A) CLP	04-Jun-92				GRAB	RNS
SED03692	SW80213WCU3	MET (S) CLP	04-Jun-92				GRAB	RNS

Table C-5
Summary of Nearshore Sediment Samples (Grab and Core Samples)

Location Code	Sample Number	Sample Analysis	Date Collected	Depth From	Depth To	Depth Unit	Grab/ Core	QC Code
SED03692	SW80213WCU3	NO3/NO2	04-Jun-92				GRAB	RNS
SED03692	SW80213WCU3	PEST CLP	04-Jun-92				GRAB	RNS
SED03692	SW80213WCU3	PH	04-Jun-92				GRAB	RNS
SED03692	SW80213WCU3	PLUTONIUM 239/240	04-Jun-92				GRAB	RNS
SED03692	SW80213WCU3	SEMI V 625 REG.	04-Jun-92				GRAB	RNS
SED03692	SW80213WCU3	SR89/90	04-Jun-92				GRAB	RNS
SED03692	SW80213WCU3	TRITIUM(H3)	04-Jun-92				GRAB	RNS
SED03692	SW80213WCU3	U-ISO	04-Jun-92				GRAB	RNS
SED03692	SW80213WCU3	VOA CLP	04-Jun-92				GRAB	RNS
SED03792	SD00361WCU3	AM241	04-Jun-92				GRAB	REAL
SED03792	SD00361WCU3	CS137 BY GAMMA OR RADIOCESIUM	04-Jun-92				GRAB	REAL
SED03792	SD00361WCU3	GROSS ALPHA	04-Jun-92				GRAB	REAL
SED03792	SD00361WCU3	GROSS BETA	04-Jun-92				GRAB	REAL
SED03792	SD00361WCU3	MET (A) CLP	04-Jun-92				GRAB	REAL
SED03792	SD00361WCU3	MET (S) CLP	04-Jun-92				GRAB	REAL
SED03792	SD00361WCU3	PLUTONIUM 239/240	04-Jun-92				GRAB	REAL
SED03792	SD00361WCU3	SR89/90	04-Jun-92				GRAB	REAL
SED03792	SD00361WCU3	U-ISO	04-Jun-92				GRAB	REAL
SED03892	SD00461WCU3	AM241	13-Nov-92				GRAB	REAL
SED03892	SD00461WCU3	GROSS ALPHA	13-Nov-92				GRAB	REAL
SED03892	SD00461WCU3	GROSS BETA	13-Nov-92				GRAB	REAL
SED03892	SD00461WCU3	MET (A) CLP	13-Nov-92				GRAB	REAL
SED03892	SD00461WCU3	MET (S) CLP	13-Nov-92				GRAB	REAL
SED03892	SD00461WCU3	PLUTONIUM 239/240	13-Nov-92				GRAB	REAL
SED03892	SD00461WCU3	U-ISO	13-Nov-92				GRAB	REAL
SED03992	SD00363WCU3	AM241	05-Jun-92				GRAB	REAL
SED03992	SD00363WCU3	GROSS ALPHA	05-Jun-92				GRAB	REAL
SED03992	SD00363WCU3	GROSS BETA	05-Jun-92				GRAB	REAL
SED03992	SD00363WCU3	MET (A) CLP	05-Jun-92				GRAB	REAL
SED03992	SD00363WCU3	MET (S) CLP	05-Jun-92				GRAB	REAL
SED03992	SD00363WCU3	PLUTONIUM 239/240	05-Jun-92				GRAB	REAL
SED03992	SD00363WCU3	SPECIFIC DENSITY	05-Jun-92				GRAB	REAL
SED03992	SD00363WCU3	TOC	05-Jun-92				GRAB	REAL
SED03992	SD00363WCU3	U-ISO	05-Jun-92				GRAB	REAL
SED03992	SD00436WCU3	AM241	05-Jun-92	0	1	IN	CORE	REAL
SED03992	SD00436WCU3	PLUTONIUM 239/240	05-Jun-92	0	1	IN	CORE	REAL
SED03992	SD00436WCU3	U-ISO	05-Jun-92	0	1	IN	CORE	REAL
SED03992	SD00437WCU3	AM241	05-Jun-92	1	2	IN	CORE	REAL
SED03992	SD00437WCU3	PLUTONIUM 239/240	05-Jun-92	1	2	IN	CORE	REAL
SED03992	SD00437WCU3	U-ISO	05-Jun-92	1	2	IN	CORE	REAL
SED03992	SD00438WCU3	AM241	05-Jun-92	2	3	IN	CORE	REAL
SED03992	SD00438WCU3	PLUTONIUM 239/240	05-Jun-92	2	3	IN	CORE	REAL
SED03992	SD00438WCU3	U-ISO	05-Jun-92	2	3	IN	CORE	REAL
SED03992	SD00439WCU3	AM241	05-Jun-92	3	4	IN	CORE	REAL
SED03992	SD00439WCU3	PLUTONIUM 239/240	05-Jun-92	3	4	IN	CORE	REAL
SED03992	SD00439WCU3	U-ISO	05-Jun-92	3	4	IN	CORE	REAL
SED03992	SD00440WCU3	AM241	05-Jun-92	4	5	IN	CORE	REAL
SED03992	SD00440WCU3	PLUTONIUM 239/240	05-Jun-92	4	5	IN	CORE	REAL
SED03992	SD00440WCU3	U-ISO	05-Jun-92	4	5	IN	CORE	REAL
SED03992	SD00441WCU3	AM241	05-Jun-92	5	6	IN	CORE	REAL
SED03992	SD00441WCU3	PLUTONIUM 239/240	05-Jun-92	5	6	IN	CORE	REAL
SED03992	SD00441WCU3	U-ISO	05-Jun-92	5	6	IN	CORE	REAL
SED03992	SW80214WCU3	AM241	05-Jun-92				GRAB	DUP
SED03992	SW80214WCU3	GROSS ALPHA	05-Jun-92				GRAB	DUP

Table C-5
Summary of Nearshore Sediment Samples (Grab and Core Samples)

Location Code	Sample Number	Sample Analysis	Date Collected	Depth From	Depth To	Depth Unit	Grab/ Core	QC Code
SED03992	SW80214WCU3	GROSS BETA	05-Jun-92				GRAB	DUP
SED03992	SW80214WCU3	MET (A) CLP	05-Jun-92				GRAB	DUP
SED03992	SW80214WCU3	MET (S) CLP	05-Jun-92				GRAB	DUP
SED03992	SW80214WCU3	PLUTONIUM 239/240	05-Jun-92				GRAB	DUP
SED03992	SW80214WCU3	U-ISO	05-Jun-92				GRAB	DUP
SED03992	SW80215WCU3	AM241	05-Jun-92				GRAB	RNS
SED03992	SW80215WCU3	GROSS ALPHA	05-Jun-92				GRAB	RNS
SED03992	SW80215WCU3	GROSS BETA	05-Jun-92				GRAB	RNS
SED03992	SW80215WCU3	MET (A) CLP	05-Jun-92				GRAB	RNS
SED03992	SW80215WCU3	MET (S) CLP	05-Jun-92				GRAB	RNS
SED03992	SW80215WCU3	NO3/NO2	05-Jun-92				GRAB	RNS
SED03992	SW80215WCU3	PEST CLP	05-Jun-92				GRAB	RNS
SED03992	SW80215WCU3	PH	05-Jun-92				GRAB	RNS
SED03992	SW80215WCU3	PLUTONIUM 239/240	05-Jun-92				GRAB	RNS
SED03992	SW80215WCU3	SEMI V 625 REG.	05-Jun-92				GRAB	RNS
SED03992	SW80215WCU3	TRITIUM(H3)	05-Jun-92				GRAB	RNS
SED03992	SW80215WCU3	U-ISO	05-Jun-92				GRAB	RNS
SED03992	SW80215WCU3	VOA CLP	05-Jun-92				GRAB	RNS
SED04092	SD00462WCU3	AM241	13-Nov-92				GRAB	REAL
SED04092	SD00462WCU3	GROSS ALPHA	13-Nov-92				GRAB	REAL
SED04092	SD00462WCU3	GROSS BETA	13-Nov-92				GRAB	REAL
SED04092	SD00462WCU3	MET (A) CLP	13-Nov-92				GRAB	REAL
SED04092	SD00462WCU3	MET (S) CLP	13-Nov-92				GRAB	REAL
SED04092	SD00462WCU3	PLUTONIUM 239/240	13-Nov-92				GRAB	REAL
SED04092	SD00462WCU3	U-ISO	13-Nov-92				GRAB	REAL
SED04192	SD00365WCU3	AM241	09-Jun-92				GRAB	REAL
SED04192	SD00365WCU3	GROSS ALPHA	09-Jun-92				GRAB	REAL
SED04192	SD00365WCU3	GROSS BETA	09-Jun-92				GRAB	REAL
SED04192	SD00365WCU3	MET (A) CLP	09-Jun-92				GRAB	REAL
SED04192	SD00365WCU3	MET (S) CLP	09-Jun-92				GRAB	REAL
SED04192	SD00365WCU3	PLUTONIUM 239/240	09-Jun-92				GRAB	REAL
SED04192	SD00365WCU3	U-ISO	09-Jun-92				GRAB	REAL
SED04292	SD00366WCU3	AM241	09-Jun-92				GRAB	REAL
SED04292	SD00366WCU3	GROSS ALPHA	09-Jun-92				GRAB	REAL
SED04292	SD00366WCU3	GROSS BETA	09-Jun-92				GRAB	REAL
SED04292	SD00366WCU3	MET (A) CLP	09-Jun-92				GRAB	REAL
SED04292	SD00366WCU3	MET (S) CLP	09-Jun-92				GRAB	REAL
SED04292	SD00366WCU3	PLUTONIUM 239/240	09-Jun-92				GRAB	REAL
SED04292	SD00366WCU3	U-ISO	09-Jun-92				GRAB	REAL
SED04392	SD00367WCU3	AM241	05-Jun-92				GRAB	REAL
SED04392	SD00367WCU3	GROSS ALPHA	05-Jun-92				GRAB	REAL
SED04392	SD00367WCU3	GROSS BETA	05-Jun-92				GRAB	REAL
SED04392	SD00367WCU3	MET (A) CLP	05-Jun-92				GRAB	REAL
SED04392	SD00367WCU3	MET (S) CLP	05-Jun-92				GRAB	REAL
SED04392	SD00367WCU3	PLUTONIUM 239/240	05-Jun-92				GRAB	REAL
SED04392	SD00367WCU3	U-ISO	05-Jun-92				GRAB	REAL
SED04492	SD00368WCU3	AM241	05-Jun-92				GRAB	REAL
SED04492	SD00368WCU3	GROSS ALPHA	05-Jun-92				GRAB	REAL
SED04492	SD00368WCU3	GROSS BETA	05-Jun-92				GRAB	REAL
SED04492	SD00368WCU3	MET (A) CLP	05-Jun-92				GRAB	REAL
SED04492	SD00368WCU3	MET (S) CLP	05-Jun-92				GRAB	REAL
SED04492	SD00368WCU3	PLUTONIUM 239/240	05-Jun-92				GRAB	REAL
SED04492	SD00368WCU3	SIEVE TEST (GRAIN SIZE)	05-Jun-92				GRAB	REAL
SED04492	SD00368WCU3	TOC	05-Jun-92				GRAB	REAL

Table C-5
Summary of Nearshore Sediment Samples (Grab and Core Samples)

Location Code	Sample Number	Sample Analysis	Date Collected	Depth From	Depth To	Depth Unit	Grab/ Core	QC Code
SED04492	SD00368WCU3	U-ISO	05-Jun-92				GRAB	REAL
SED04492	SD00442WCU3	AM241	05-Jun-92	0	1	IN	CORE	REAL
SED04492	SD00442WCU3	PLUTONIUM 239/240	05-Jun-92	0	1	IN	CORE	REAL
SED04492	SD00442WCU3	U-ISO	05-Jun-92	0	1	IN	CORE	REAL
SED04492	SD00443WCU3	AM241	05-Jun-92	1	2	IN	CORE	REAL
SED04492	SD00443WCU3	PLUTONIUM 239/240	05-Jun-92	1	2	IN	CORE	REAL
SED04492	SD00443WCU3	U-ISO	05-Jun-92	1	2	IN	CORE	REAL
SED04492	SD00444WCU3	AM241	05-Jun-92	2	3	IN	CORE	REAL
SED04492	SD00444WCU3	PLUTONIUM 239/240	05-Jun-92	2	3	IN	CORE	REAL
SED04492	SD00444WCU3	U-ISO	05-Jun-92	2	3	IN	CORE	REAL
SED04492	SD00445WCU3	AM241	05-Jun-92	3	4	IN	CORE	REAL
SED04492	SD00445WCU3	PLUTONIUM 239/240	05-Jun-92	3	4	IN	CORE	REAL
SED04492	SD00445WCU3	U-ISO	05-Jun-92	3	4	IN	CORE	REAL
SED04492	SD00446WCU3	AM241	05-Jun-92	4	5	IN	CORE	REAL
SED04492	SD00446WCU3	PLUTONIUM 239/240	05-Jun-92	4	5	IN	CORE	REAL
SED04492	SD00446WCU3	U-ISO	05-Jun-92	4	5	IN	CORE	REAL
SED04492	SD00447WCU3	AM241	05-Jun-92	5	6	IN	CORE	REAL
SED04492	SD00447WCU3	PLUTONIUM 239/240	05-Jun-92	5	6	IN	CORE	REAL
SED04492	SD00447WCU3	U-ISO	05-Jun-92	5	6	IN	CORE	REAL
SED04492	SW80216WCU3	AM241	05-Jun-92				GRAB	DUP
SED04492	SW80216WCU3	GROSS ALPHA	05-Jun-92				GRAB	DUP
SED04492	SW80216WCU3	GROSS BETA	05-Jun-92				GRAB	DUP
SED04492	SW80216WCU3	MET (A) CLP	05-Jun-92				GRAB	DUP
SED04492	SW80216WCU3	MET (S) CLP	05-Jun-92				GRAB	DUP
SED04492	SW80216WCU3	PLUTONIUM 239/240	05-Jun-92				GRAB	DUP
SED04492	SW80216WCU3	U-ISO	05-Jun-92				GRAB	DUP
SED04492	SW80217WCU3	AM241	05-Jun-92				GRAB	RNS
SED04492	SW80217WCU3	GROSS ALPHA	05-Jun-92				GRAB	RNS
SED04492	SW80217WCU3	GROSS BETA	05-Jun-92				GRAB	RNS
SED04492	SW80217WCU3	MET (A) CLP	05-Jun-92				GRAB	RNS
SED04492	SW80217WCU3	MET (S) CLP	05-Jun-92				GRAB	RNS
SED04492	SW80217WCU3	NO3/NO2	05-Jun-92				GRAB	RNS
SED04492	SW80217WCU3	PEST CLP	05-Jun-92				GRAB	RNS
SED04492	SW80217WCU3	PH	05-Jun-92				GRAB	RNS
SED04492	SW80217WCU3	PLUTONIUM 239/240	05-Jun-92				GRAB	RNS
SED04492	SW80217WCU3	SEMI V 625 REG.	05-Jun-92				GRAB	RNS
SED04492	SW80217WCU3	TRITIUM(H3)	05-Jun-92				GRAB	RNS
SED04492	SW80217WCU3	U-ISO	05-Jun-92				GRAB	RNS
SED04492	SW80217WCU3	VOA CLP	05-Jun-92				GRAB	RNS
SED04592	SD00389WCU3	AM241	03-Jun-92				GRAB	REAL
SED04592	SD00389WCU3	CS137 BY GAMMA OR RADIOCESIUM	03-Jun-92				GRAB	REAL
SED04592	SD00389WCU3	GROSS ALPHA	03-Jun-92				GRAB	REAL
SED04592	SD00389WCU3	GROSS BETA	03-Jun-92				GRAB	REAL
SED04592	SD00389WCU3	MET (A) CLP	03-Jun-92				GRAB	REAL
SED04592	SD00389WCU3	MET (S) CLP	03-Jun-92				GRAB	REAL
SED04592	SD00389WCU3	PLUTONIUM 239/240	03-Jun-92				GRAB	REAL
SED04592	SD00389WCU3	SR89/90	03-Jun-92				GRAB	REAL
SED04592	SD00389WCU3	U-ISO	03-Jun-92				GRAB	REAL
SED04692	SD00388WCU3	AM241	03-Jun-92				GRAB	REAL
SED04692	SD00388WCU3	CS137 BY GAMMA OR RADIOCESIUM	03-Jun-92				GRAB	REAL
SED04692	SD00388WCU3	GROSS ALPHA	03-Jun-92				GRAB	REAL
SED04692	SD00388WCU3	GROSS BETA	03-Jun-92				GRAB	REAL
SED04692	SD00388WCU3	MET (A) CLP	03-Jun-92				GRAB	REAL
SED04692	SD00388WCU3	MET (S) CLP	03-Jun-92				GRAB	REAL

Table C-5
Summary of Nearshore Sediment Samples (Grab and Core Samples)

Location Code	Sample Number	Sample Analysis	Date Collected	Depth From	Depth To	Depth Unit	Grab/ Core	QC Code
SED04692	SD00388WCU3	PLUTONIUM 239/240	03-Jun-92				GRAB	REAL
SED04692	SD00388WCU3	SR89/90	03-Jun-92				GRAB	REAL
SED04692	SD00388WCU3	U-ISO	03-Jun-92				GRAB	REAL
SED04792	SD00387WCU3	AM241	03-Jun-92				GRAB	REAL
SED04792	SD00387WCU3	CS137 BY GAMMA OR RADIOCESIUM	03-Jun-92				GRAB	REAL
SED04792	SD00387WCU3	GROSS ALPHA	03-Jun-92				GRAB	REAL
SED04792	SD00387WCU3	GROSS BETA	03-Jun-92				GRAB	REAL
SED04792	SD00387WCU3	MET (A) CLP	03-Jun-92				GRAB	REAL
SED04792	SD00387WCU3	MET (S) CLP	03-Jun-92				GRAB	REAL
SED04792	SD00387WCU3	PLUTONIUM 239/240	03-Jun-92				GRAB	REAL
SED04792	SD00387WCU3	SR89/90	03-Jun-92				GRAB	REAL
SED04792	SD00387WCU3	U-ISO	03-Jun-92				GRAB	REAL
SED04892	SD00385WCU3	AM241	02-Jun-92				GRAB	REAL
SED04892	SD00385WCU3	CS137 BY GAMMA OR RADIOCESIUM	02-Jun-92				GRAB	REAL
SED04892	SD00385WCU3	GROSS ALPHA	02-Jun-92				GRAB	REAL
SED04892	SD00385WCU3	GROSS BETA	02-Jun-92				GRAB	REAL
SED04892	SD00385WCU3	MET (A) CLP	02-Jun-92				GRAB	REAL
SED04892	SD00385WCU3	MET (S) CLP	02-Jun-92				GRAB	REAL
SED04892	SD00385WCU3	PLUTONIUM 239/240	02-Jun-92				GRAB	REAL
SED04892	SD00385WCU3	SR89/90	02-Jun-92				GRAB	REAL
SED04892	SD00385WCU3	U-ISO	02-Jun-92				GRAB	REAL
SED04992	SD00384WCU3	AM241	02-Jun-92				GRAB	REAL
SED04992	SD00384WCU3	CS137 BY GAMMA OR RADIOCESIUM	02-Jun-92				GRAB	REAL
SED04992	SD00384WCU3	GROSS ALPHA	02-Jun-92				GRAB	REAL
SED04992	SD00384WCU3	GROSS BETA	02-Jun-92				GRAB	REAL
SED04992	SD00384WCU3	MET (A) CLP	02-Jun-92				GRAB	REAL
SED04992	SD00384WCU3	MET (S) CLP	02-Jun-92				GRAB	REAL
SED04992	SD00384WCU3	PLUTONIUM 239/240	02-Jun-92				GRAB	REAL
SED04992	SD00384WCU3	SIEVE TEST (GRAIN SIZE)	02-Jun-92				GRAB	REAL
SED04992	SD00384WCU3	SPECIFIC DENSITY	02-Jun-92				GRAB	REAL
SED04992	SD00384WCU3	SR89/90	02-Jun-92				GRAB	REAL
SED04992	SD00384WCU3	TOC	02-Jun-92				GRAB	REAL
SED04992	SD00384WCU3	U-ISO	02-Jun-92				GRAB	REAL
SED04992	SD00418WCU3	AM241	02-Jun-92	0	1	IN	CORE	REAL
SED04992	SD00418WCU3	PLUTONIUM 239/240	02-Jun-92	0	1	IN	CORE	REAL
SED04992	SD00418WCU3	U-ISO	02-Jun-92	0	1	IN	CORE	REAL
SED04992	SD00419WCU3	AM241	02-Jun-92	1	2	IN	CORE	REAL
SED04992	SD00419WCU3	PLUTONIUM 239/240	02-Jun-92	1	2	IN	CORE	REAL
SED04992	SD00419WCU3	U-ISO	02-Jun-92	1	2	IN	CORE	REAL
SED04992	SD00420WCU3	AM241	02-Jun-92	2	3	IN	CORE	REAL
SED04992	SD00420WCU3	PLUTONIUM 239/240	02-Jun-92	2	3	IN	CORE	REAL
SED04992	SD00420WCU3	U-ISO	02-Jun-92	2	3	IN	CORE	REAL
SED04992	SD00421WCU3	AM241	02-Jun-92	3	4	IN	CORE	REAL
SED04992	SD00421WCU3	PLUTONIUM 239/240	02-Jun-92	3	4	IN	CORE	REAL
SED04992	SD00421WCU3	U-ISO	02-Jun-92	3	4	IN	CORE	REAL
SED04992	SD00422WCU3	AM241	02-Jun-92	4	5	IN	CORE	REAL
SED04992	SD00422WCU3	PLUTONIUM 239/240	02-Jun-92	4	5	IN	CORE	REAL
SED04992	SD00422WCU3	U-ISO	02-Jun-92	4	5	IN	CORE	REAL
SED04992	SD00423WCU3	AM241	02-Jun-92	5	6	IN	CORE	REAL
SED04992	SD00423WCU3	PLUTONIUM 239/240	02-Jun-92	5	6	IN	CORE	REAL
SED04992	SD00423WCU3	U-ISO	02-Jun-92	5	6	IN	CORE	REAL
SED04992	SW80208WCU3	AM241	02-Jun-92				GRAB	DUP
SED04992	SW80208WCU3	CS137 BY GAMMA OR RADIOCESIUM	02-Jun-92				GRAB	DUP
SED04992	SW80208WCU3	GROSS ALPHA	02-Jun-92				GRAB	DUP

Table C-5
Summary of Nearshore Sediment Samples (Grab and Core Samples)

Location Code	Sample Number	Sample Analysis	Date Collected	Depth From	Depth To	Depth Unit	Grab/ Core	QC Code
SED04992	SW80208WCU3	GROSS BETA	02-Jun-92				GRAB	DUP
SED04992	SW80208WCU3	MET (A) CLP	02-Jun-92				GRAB	DUP
SED04992	SW80208WCU3	MET (S) CLP	02-Jun-92				GRAB	DUP
SED04992	SW80208WCU3	PLUTONIUM 239/240	02-Jun-92				GRAB	DUP
SED04992	SW80208WCU3	SR89/90	02-Jun-92				GRAB	DUP
SED04992	SW80208WCU3	U-ISO	02-Jun-92				GRAB	DUP
SED04992	SW80209WCU3	AM241	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	CS137 BY GAMMA OR RADIOCESIUM	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	GROSS ALPHA	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	GROSS BETA	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	MET (A) CLP	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	MET (S) CLP	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	NO3/NO2	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	PEST CLP	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	PH	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	PLUTONIUM 239/240	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	SEMI V 625 REG.	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	SR89/90	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	TRITIUM(H3)	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	U-ISO	02-Jun-92				GRAB	RNS
SED04992	SW80209WCU3	VOA CLP	02-Jun-92				GRAB	RNS
SED05592	SD00348WCU3	AM241	13-May-92				GRAB	REAL
SED05592	SD00348WCU3	CS137 BY GAMMA OR RADIOCESIUM	13-May-92				GRAB	REAL
SED05592	SD00348WCU3	GROSS ALPHA	13-May-92				GRAB	REAL
SED05592	SD00348WCU3	GROSS BETA	13-May-92				GRAB	REAL
SED05592	SD00348WCU3	MET (A) CLP	13-May-92				GRAB	REAL
SED05592	SD00348WCU3	MET (S) CLP	13-May-92				GRAB	REAL
SED05592	SD00348WCU3	PLUTONIUM 239/240	13-May-92				GRAB	REAL
SED05592	SD00348WCU3	SR89/90	13-May-92				GRAB	REAL
SED05592	SD00348WCU3	U-ISO	13-May-92				GRAB	REAL
SED05692	SD00344WCU3	AM241	12-May-92				GRAB	REAL
SED05692	SD00344WCU3	CS137 BY GAMMA OR RADIOCESIUM	12-May-92				GRAB	REAL
SED05692	SD00344WCU3	GROSS ALPHA	12-May-92				GRAB	REAL
SED05692	SD00344WCU3	GROSS BETA	12-May-92				GRAB	REAL
SED05692	SD00344WCU3	MET (A) CLP	12-May-92				GRAB	REAL
SED05692	SD00344WCU3	MET (S) CLP	12-May-92				GRAB	REAL
SED05692	SD00344WCU3	PLUTONIUM 239/240	12-May-92				GRAB	REAL
SED05692	SD00344WCU3	SR89/90	12-May-92				GRAB	REAL
SED05692	SD00344WCU3	U-ISO	12-May-92				GRAB	REAL
SED05792	SD00352WCU3	AM241	14-May-92				GRAB	REAL
SED05792	SD00352WCU3	CS137 BY GAMMA OR RADIOCESIUM	14-May-92				GRAB	REAL
SED05792	SD00352WCU3	GROSS ALPHA	14-May-92				GRAB	REAL
SED05792	SD00352WCU3	GROSS BETA	14-May-92				GRAB	REAL
SED05792	SD00352WCU3	MET (A) CLP	14-May-92				GRAB	REAL
SED05792	SD00352WCU3	MET (S) CLP	14-May-92				GRAB	REAL
SED05792	SD00352WCU3	PLUTONIUM 239/240	14-May-92				GRAB	REAL
SED05792	SD00352WCU3	SPECIFIC DENSITY	14-May-92				GRAB	REAL
SED05792	SD00352WCU3	SR89/90	14-May-92				GRAB	REAL
SED05792	SD00352WCU3	TOC	14-May-92				GRAB	REAL
SED05792	SD00352WCU3	U-ISO	14-May-92				GRAB	REAL
SED05792	SD00400WCU3	AM241	14-May-92	0	1	IN	CORE	REAL
SED05792	SD00400WCU3	PLUTONIUM 239/240	14-May-92	0	1	IN	CORE	REAL
SED05792	SD00400WCU3	U-ISO	14-May-92	0	1	IN	CORE	REAL
SED05792	SD00401WCU3	AM241	14-May-92	1	2	IN	CORE	REAL

Table C-5
Summary of Nearshore Sediment Samples (Grab and Core Samples)

Location Code	Sample Number	Sample Analysis	Date Collected	Depth From	Depth To	Depth Unit	Grab/ Core	QC Code
SED05792	SD00401WCU3	PLUTONIUM 239/240	14-May-92	1	2	IN	CORE	REAL
SED05792	SD00401WCU3	U-ISO	14-May-92	1	2	IN	CORE	REAL
SED05792	SD00402WCU3	AM241	14-May-92	2	3	IN	CORE	REAL
SED05792	SD00402WCU3	PLUTONIUM 239/240	14-May-92	2	3	IN	CORE	REAL
SED05792	SD00402WCU3	U-ISO	14-May-92	2	3	IN	CORE	REAL
SED05792	SD00403WCU3	AM241	14-May-92	3	4	IN	CORE	REAL
SED05792	SD00403WCU3	PLUTONIUM 239/240	14-May-92	3	4	IN	CORE	REAL
SED05792	SD00403WCU3	U-ISO	14-May-92	3	4	IN	CORE	REAL
SED05792	SD00404WCU3	AM241	14-May-92	4	5	IN	CORE	REAL
SED05792	SD00404WCU3	PLUTONIUM 239/240	14-May-92	4	5	IN	CORE	REAL
SED05792	SD00404WCU3	U-ISO	14-May-92	4	5	IN	CORE	REAL
SED05792	SD00405WCU3	AM241	14-May-92	5	6	IN	CORE	REAL
SED05792	SD00405WCU3	PLUTONIUM 239/240	14-May-92	5	6	IN	CORE	REAL
SED05792	SD00405WCU3	U-ISO	14-May-92	5	6	IN	CORE	REAL
SED05892	SD00345WCU3	AM241	12-May-92				GRAB	REAL
SED05892	SD00345WCU3	CS137 BY GAMMA OR RADIOCESIUM	12-May-92				GRAB	REAL
SED05892	SD00345WCU3	GROSS ALPHA	12-May-92				GRAB	REAL
SED05892	SD00345WCU3	GROSS BETA	12-May-92				GRAB	REAL
SED05892	SD00345WCU3	MET (A) CLP	12-May-92				GRAB	REAL
SED05892	SD00345WCU3	MET (S) CLP	12-May-92				GRAB	REAL
SED05892	SD00345WCU3	PLUTONIUM 239/240	12-May-92				GRAB	REAL
SED05892	SD00345WCU3	SR89/90	12-May-92				GRAB	REAL
SED05892	SD00345WCU3	U-ISO	12-May-92				GRAB	REAL
SED05892	SW80200WCU3	AM241	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	CS137 BY GAMMA OR RADIOCESIUM	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	GROSS ALPHA	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	GROSS BETA	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	MET (A) CLP	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	MET (S) CLP	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	NO3/NO2	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	PEST CLP	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	PH	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	PLUTONIUM 239/240	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	SEMI V 625 REG.	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	SR89/90	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	TRITIUM(H3)	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	U-ISO	12-May-92				GRAB	RNS
SED05892	SW80200WCU3	VOA CLP	12-May-92				GRAB	RNS
SED05892	SW80201WCU3	AM241	12-May-92				GRAB	DUP
SED05892	SW80201WCU3	CS137 BY GAMMA OR RADIOCESIUM	12-May-92				GRAB	DUP
SED05892	SW80201WCU3	GROSS ALPHA	12-May-92				GRAB	DUP
SED05892	SW80201WCU3	GROSS BETA	12-May-92				GRAB	DUP
SED05892	SW80201WCU3	MET (A) CLP	12-May-92				GRAB	DUP
SED05892	SW80201WCU3	MET (S) CLP	12-May-92				GRAB	DUP
SED05892	SW80201WCU3	PLUTONIUM 239/240	12-May-92				GRAB	DUP
SED05892	SW80201WCU3	SR89/90	12-May-92				GRAB	DUP
SED05892	SW80201WCU3	U-ISO	12-May-92				GRAB	DUP
SED05992	SD00346WCU3	AM241	12-May-92				GRAB	REAL
SED05992	SD00346WCU3	CS137 BY GAMMA OR RADIOCESIUM	12-May-92				GRAB	REAL
SED05992	SD00346WCU3	GROSS ALPHA	12-May-92				GRAB	REAL
SED05992	SD00346WCU3	GROSS BETA	12-May-92				GRAB	REAL
SED05992	SD00346WCU3	MET (A) CLP	12-May-92				GRAB	REAL
SED05992	SD00346WCU3	MET (S) CLP	12-May-92				GRAB	REAL
SED05992	SD00346WCU3	PLUTONIUM 239/240	12-May-92				GRAB	REAL

Table C-5
Summary of Nearshore Sediment Samples (Grab and Core Samples)

Location Code	Sample Number	Sample Analysis	Date Collected	Depth From	Depth To	Depth Unit	Grab/ Core	QC Code
SED05992	SD00346WCU3	SR89/90	12-May-92				GRAB	REAL
SED05992	SD00346WCU3	U-ISO	12-May-92				GRAB	REAL
SED06092	SD00347WCU3	AM241	12-May-92				GRAB	REAL
SED06092	SD00347WCU3	CS137 BY GAMMA OR RADIOCESIUM	12-May-92				GRAB	REAL
SED06092	SD00347WCU3	GROSS ALPHA	12-May-92				GRAB	REAL
SED06092	SD00347WCU3	GROSS BETA	12-May-92				GRAB	REAL
SED06092	SD00347WCU3	MET (A) CLP	12-May-92				GRAB	REAL
SED06092	SD00347WCU3	MET (S) CLP	12-May-92				GRAB	REAL
SED06092	SD00347WCU3	PLUTONIUM 239/240	12-May-92				GRAB	REAL
SED06092	SD00347WCU3	SR89/90	12-May-92				GRAB	REAL
SED06092	SD00347WCU3	U-ISO	12-May-92				GRAB	REAL
SED06192	SD00353WCU3	AM241	14-May-92				GRAB	REAL
SED06192	SD00353WCU3	CS137 BY GAMMA OR RADIOCESIUM	14-May-92				GRAB	REAL
SED06192	SD00353WCU3	GROSS ALPHA	14-May-92				GRAB	REAL
SED06192	SD00353WCU3	GROSS BETA	14-May-92				GRAB	REAL
SED06192	SD00353WCU3	MET (A) CLP	14-May-92				GRAB	REAL
SED06192	SD00353WCU3	MET (S) CLP	14-May-92				GRAB	REAL
SED06192	SD00353WCU3	PLUTONIUM 239/240	14-May-92				GRAB	REAL
SED06192	SD00353WCU3	SIEVE TEST (GRAIN SIZE)	14-May-92				GRAB	REAL
SED06192	SD00353WCU3	SR89/90	14-May-92				GRAB	REAL
SED06192	SD00353WCU3	TOC	14-May-92				GRAB	REAL
SED06192	SD00353WCU3	U-ISO	14-May-92				GRAB	REAL
SED06192	SD00406WCU3	AM241	14-May-92	0	1	IN	CORE	REAL
SED06192	SD00406WCU3	PLUTONIUM 239/240	14-May-92	0	1	IN	CORE	REAL
SED06192	SD00406WCU3	U-ISO	14-May-92	0	1	IN	CORE	REAL
SED06192	SD00407WCU3	AM241	14-May-92	1	2	IN	CORE	REAL
SED06192	SD00407WCU3	PLUTONIUM 239/240	14-May-92	1	2	IN	CORE	REAL
SED06192	SD00407WCU3	U-ISO	14-May-92	1	2	IN	CORE	REAL
SED06192	SD00408WCU3	AM241	14-May-92	2	3	IN	CORE	REAL
SED06192	SD00408WCU3	PLUTONIUM 239/240	14-May-92	2	3	IN	CORE	REAL
SED06192	SD00408WCU3	U-ISO	14-May-92	2	3	IN	CORE	REAL
SED06192	SD00409WCU3	AM241	14-May-92	3	4	IN	CORE	REAL
SED06192	SD00409WCU3	PLUTONIUM 239/240	14-May-92	3	4	IN	CORE	REAL
SED06192	SD00409WCU3	U-ISO	14-May-92	3	4	IN	CORE	REAL
SED06192	SD00410WCU3	AM241	14-May-92	4	5	IN	CORE	REAL
SED06192	SD00410WCU3	PLUTONIUM 239/240	14-May-92	4	5	IN	CORE	REAL
SED06192	SD00410WCU3	U-ISO	14-May-92	4	5	IN	CORE	REAL
SED06192	SD00411WCU3	AM241	14-May-92	5	6	IN	CORE	REAL
SED06192	SD00411WCU3	PLUTONIUM 239/240	14-May-92	5	6	IN	CORE	REAL
SED06192	SD00411WCU3	U-ISO	14-May-92	5	6	IN	CORE	REAL
SED06292	SD00354WCU3	AM241	14-May-92				GRAB	REAL
SED06292	SD00354WCU3	CS137 BY GAMMA OR RADIOCESIUM	14-May-92				GRAB	REAL
SED06292	SD00354WCU3	GROSS ALPHA	14-May-92				GRAB	REAL
SED06292	SD00354WCU3	GROSS BETA	14-May-92				GRAB	REAL
SED06292	SD00354WCU3	MET (A) CLP	14-May-92				GRAB	REAL
SED06292	SD00354WCU3	MET (S) CLP	14-May-92				GRAB	REAL
SED06292	SD00354WCU3	PLUTONIUM 239/240	14-May-92				GRAB	REAL
SED06292	SD00354WCU3	SR89/90	14-May-92				GRAB	REAL
SED06292	SD00354WCU3	U-ISO	14-May-92				GRAB	REAL
SED06392	SD00355WCU3	AM241	14-May-92				GRAB	REAL
SED06392	SD00355WCU3	CS137 BY GAMMA OR RADIOCESIUM	14-May-92				GRAB	REAL
SED06392	SD00355WCU3	GROSS ALPHA	14-May-92				GRAB	REAL
SED06392	SD00355WCU3	GROSS BETA	14-May-92				GRAB	REAL
SED06392	SD00355WCU3	MET (A) CLP	14-May-92				GRAB	REAL

Table C-5
Summary of Nearshore Sediment Samples (Grab and Core Samples)

Location Code	Sample Number	Sample Analysis	Date Collected	Depth From	Depth To	Depth Unit	Grab/ Core	QC Code
SED06392	SD00355WCU3	MET (S) CLP	14-May-92				GRAB	REAL
SED06392	SD00355WCU3	PLUTONIUM 239/240	14-May-92				GRAB	REAL
SED06392	SD00355WCU3	SR89/90	14-May-92				GRAB	REAL
SED06392	SD00355WCU3	U-ISO	14-May-92				GRAB	REAL
SED06492	SD00356WCU3	AM241	18-May-92				GRAB	REAL
SED06492	SD00356WCU3	CS137 BY GAMMA OR RADIOCESIUM	18-May-92				GRAB	REAL
SED06492	SD00356WCU3	GROSS ALPHA	18-May-92				GRAB	REAL
SED06492	SD00356WCU3	GROSS BETA	18-May-92				GRAB	REAL
SED06492	SD00356WCU3	MET (A) CLP	18-May-92				GRAB	REAL
SED06492	SD00356WCU3	MET (S) CLP	18-May-92				GRAB	REAL
SED06492	SD00356WCU3	PLUTONIUM 239/240	18-May-92				GRAB	REAL
SED06492	SD00356WCU3	SR89/90	18-May-92				GRAB	REAL
SED06492	SD00356WCU3	U-ISO	18-May-92				GRAB	REAL
SED06592	SD00357WCU3	AM241	18-May-92				GRAB	REAL
SED06592	SD00357WCU3	CS137 BY GAMMA OR RADIOCESIUM	18-May-92				GRAB	REAL
SED06592	SD00357WCU3	GROSS ALPHA	18-May-92				GRAB	REAL
SED06592	SD00357WCU3	GROSS BETA	18-May-92				GRAB	REAL
SED06592	SD00357WCU3	MET (A) CLP	18-May-92				GRAB	REAL
SED06592	SD00357WCU3	MET (S) CLP	18-May-92				GRAB	REAL
SED06592	SD00357WCU3	PLUTONIUM 239/240	18-May-92				GRAB	REAL
SED06592	SD00357WCU3	SR89/90	18-May-92				GRAB	REAL
SED06592	SD00357WCU3	U-ISO	18-May-92				GRAB	REAL
SED06692	SD00358WCU3	AM241	18-May-92				GRAB	REAL
SED06692	SD00358WCU3	CS137 BY GAMMA OR RADIOCESIUM	18-May-92				GRAB	REAL
SED06692	SD00358WCU3	GROSS ALPHA	18-May-92				GRAB	REAL
SED06692	SD00358WCU3	GROSS BETA	18-May-92				GRAB	REAL
SED06692	SD00358WCU3	MET (A) CLP	18-May-92				GRAB	REAL
SED06692	SD00358WCU3	MET (S) CLP	18-May-92				GRAB	REAL
SED06692	SD00358WCU3	PLUTONIUM 239/240	18-May-92				GRAB	REAL
SED06692	SD00358WCU3	SIEVE TEST (GRAIN SIZE)	18-May-92				GRAB	REAL
SED06692	SD00358WCU3	SPECIFIC DENSITY	18-May-92				GRAB	REAL
SED06692	SD00358WCU3	SR89/90	18-May-92				GRAB	REAL
SED06692	SD00358WCU3	TOC	18-May-92				GRAB	REAL
SED06692	SD00358WCU3	U-ISO	18-May-92				GRAB	REAL
SED06692	SD00412WCU3	AM241	18-May-92	0	1	IN	CORE	REAL
SED06692	SD00412WCU3	PLUTONIUM 239/240	18-May-92	0	1	IN	CORE	REAL
SED06692	SD00412WCU3	U-ISO	18-May-92	0	1	IN	CORE	REAL
SED06692	SD00413WCU3	AM241	18-May-92	1	2	IN	CORE	REAL
SED06692	SD00413WCU3	PLUTONIUM 239/240	18-May-92	1	2	IN	CORE	REAL
SED06692	SD00413WCU3	U-ISO	18-May-92	1	2	IN	CORE	REAL
SED06692	SD00414WCU3	AM241	18-May-92	2	3	IN	CORE	REAL
SED06692	SD00414WCU3	PLUTONIUM 239/240	18-May-92	2	3	IN	CORE	REAL
SED06692	SD00414WCU3	U-ISO	18-May-92	2	3	IN	CORE	REAL
SED06692	SD00415WCU3	AM241	18-May-92	3	4	IN	CORE	REAL
SED06692	SD00415WCU3	PLUTONIUM 239/240	18-May-92	3	4	IN	CORE	REAL
SED06692	SD00415WCU3	U-ISO	18-May-92	3	4	IN	CORE	REAL
SED06692	SD00416WCU3	AM241	18-May-92	4	5	IN	CORE	REAL
SED06692	SD00416WCU3	PLUTONIUM 239/240	18-May-92	4	5	IN	CORE	REAL
SED06692	SD00416WCU3	U-ISO	18-May-92	4	5	IN	CORE	REAL
SED06692	SD00417WCU3	AM241	18-May-92	5	6	IN	CORE	REAL
SED06692	SD00417WCU3	PLUTONIUM 239/240	18-May-92	5	6	IN	CORE	REAL
SED06692	SD00417WCU3	U-ISO	18-May-92	5	6	IN	CORE	REAL
SED06792	SD00350WCU3	AM241	13-May-92				GRAB	REAL
SED06792	SD00350WCU3	CS137 BY GAMMA OR RADIOCESIUM	13-May-92				GRAB	REAL

Table C-5
Summary of Nearshore Sediment Samples (Grab and Core Samples)

Location Code	Sample Number	Sample Analysis	Date Collected	Depth From	Depth To	Depth Unit	Grab/ Core	QC Code
SED06792	SD00350WCU3	GROSS ALPHA	13-May-92				GRAB	REAL
SED06792	SD00350WCU3	GROSS BETA	13-May-92				GRAB	REAL
SED06792	SD00350WCU3	MET (A) CLP	13-May-92				GRAB	REAL
SED06792	SD00350WCU3	MET (S) CLP	13-May-92				GRAB	REAL
SED06792	SD00350WCU3	PLUTONIUM 239/240	13-May-92				GRAB	REAL
SED06792	SD00350WCU3	SR89/90	13-May-92				GRAB	REAL
SED06792	SD00350WCU3	U-ISO	13-May-92				GRAB	REAL
SED06892	SD00349WCU3	AM241	13-May-92				GRAB	REAL
SED06892	SD00349WCU3	CS137 BY GAMMA OR RADIOCESIUM	13-May-92				GRAB	REAL
SED06892	SD00349WCU3	GROSS ALPHA	13-May-92				GRAB	REAL
SED06892	SD00349WCU3	GROSS BETA	13-May-92				GRAB	REAL
SED06892	SD00349WCU3	MET (A) CLP	13-May-92				GRAB	REAL
SED06892	SD00349WCU3	MET (S) CLP	13-May-92				GRAB	REAL
SED06892	SD00349WCU3	PLUTONIUM 239/240	13-May-92				GRAB	REAL
SED06892	SD00349WCU3	SR89/90	13-May-92				GRAB	REAL
SED06892	SD00349WCU3	U-ISO	13-May-92				GRAB	REAL
SED06992	SD00351WCU3	AM241	13-May-92				GRAB	REAL
SED06992	SD00351WCU3	CS137 BY GAMMA OR RADIOCESIUM	13-May-92				GRAB	REAL
SED06992	SD00351WCU3	GROSS ALPHA	13-May-92				GRAB	REAL
SED06992	SD00351WCU3	GROSS BETA	13-May-92				GRAB	REAL
SED06992	SD00351WCU3	MET (A) CLP	13-May-92				GRAB	REAL
SED06992	SD00351WCU3	MET (S) CLP	13-May-92				GRAB	REAL
SED06992	SD00351WCU3	PLUTONIUM 239/240	13-May-92				GRAB	REAL
SED06992	SD00351WCU3	SR89/90	13-May-92				GRAB	REAL
SED06992	SD00351WCU3	U-ISO	13-May-92				GRAB	REAL
SED06992	SW80202WCU3	AM241	13-May-92				GRAB	DUP
SED06992	SW80202WCU3	CS137 BY GAMMA OR RADIOCESIUM	13-May-92				GRAB	DUP
SED06992	SW80202WCU3	GROSS ALPHA	13-May-92				GRAB	DUP
SED06992	SW80202WCU3	GROSS BETA	13-May-92				GRAB	DUP
SED06992	SW80202WCU3	MET (A) CLP	13-May-92				GRAB	DUP
SED06992	SW80202WCU3	MET (S) CLP	13-May-92				GRAB	DUP
SED06992	SW80202WCU3	PLUTONIUM 239/240	13-May-92				GRAB	DUP
SED06992	SW80202WCU3	SR89/90	13-May-92				GRAB	DUP
SED06992	SW80202WCU3	U-ISO	13-May-92				GRAB	DUP
SED06992	SW80203WCU3	AM241	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	CS137 BY GAMMA OR RADIOCESIUM	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	GROSS ALPHA	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	GROSS BETA	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	MET (A) CLP	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	MET (S) CLP	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	NO3/NO2	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	PEST CLP	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	PH	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	PLUTONIUM 239/240	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	SEMI V 625 REG.	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	SR89/90	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	TRITIUM(H3)	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	U-ISO	13-May-92				GRAB	RNS
SED06992	SW80203WCU3	VOA CLP	13-May-92				GRAB	RNS
SED07592	SD00374WCU3	AM241	13-Jul-92				GRAB	REAL
SED07592	SD00374WCU3	GROSS ALPHA	13-Jul-92				GRAB	REAL
SED07592	SD00374WCU3	GROSS BETA	13-Jul-92				GRAB	REAL
SED07592	SD00374WCU3	MET (A) CLP	13-Jul-92				GRAB	REAL
SED07592	SD00374WCU3	MET (S) CLP	13-Jul-92				GRAB	REAL

Table C-5
Summary of Nearshore Sediment Samples (Grab and Core Samples)

Location Code	Sample Number	Sample Analysis	Date Collected	Depth From	Depth To	Depth Unit	Grab/ Core	QC Code
SED07592	SD00374WCU3	PLUTONIUM 239/240	13-Jul-92				GRAB	REAL
SED07592	SD00374WCU3	RAD SCREEN	13-Jul-92				GRAB	REAL
SED07592	SD00374WCU3	SIEVE TEST (GRAIN SIZE)	13-Jul-92				GRAB	REAL
SED07592	SD00374WCU3	SPECIFIC DENSITY	13-Jul-92				GRAB	REAL
SED07592	SD00374WCU3	TOC	13-Jul-92				GRAB	REAL
SED07592	SD00374WCU3	U-ISO	13-Jul-92				GRAB	REAL
SED07592	SD00374WCU3	VOA CLP	13-Jul-92				GRAB	REAL
SED07592	SD00448WCU3	AM241	13-Jul-92	0	1	IN	CORE	REAL
SED07592	SD00448WCU3	PLUTONIUM 239/240	13-Jul-92	0	1	IN	CORE	REAL
SED07592	SD00448WCU3	U-ISO	13-Jul-92	0	1	IN	CORE	REAL
SED07592	SD00449WCU3	AM241	13-Jul-92	1	2	IN	CORE	REAL
SED07592	SD00449WCU3	PLUTONIUM 239/240	13-Jul-92	1	2	IN	CORE	REAL
SED07592	SD00449WCU3	U-ISO	13-Jul-92	1	2	IN	CORE	REAL
SED07592	SD00450WCU3	AM241	13-Jul-92	2	3	IN	CORE	REAL
SED07592	SD00450WCU3	PLUTONIUM 239/240	13-Jul-92	2	3	IN	CORE	REAL
SED07592	SD00450WCU3	U-ISO	13-Jul-92	2	3	IN	CORE	REAL
SED07592	SD00451WCU3	AM241	13-Jul-92	3	4	IN	CORE	REAL
SED07592	SD00451WCU3	PLUTONIUM 239/240	13-Jul-92	3	4	IN	CORE	REAL
SED07592	SD00451WCU3	U-ISO	13-Jul-92	3	4	IN	CORE	REAL
SED07592	SD00452WCU3	AM241	13-Jul-92	4	5	IN	CORE	REAL
SED07592	SD00452WCU3	PLUTONIUM 239/240	13-Jul-92	4	5	IN	CORE	REAL
SED07592	SD00452WCU3	U-ISO	13-Jul-92	4	5	IN	CORE	REAL
SED07592	SD00453WCU3	AM241	13-Jul-92	5	6	IN	CORE	REAL
SED07592	SD00453WCU3	PLUTONIUM 239/240	13-Jul-92	5	6	IN	CORE	REAL
SED07592	SD00453WCU3	U-ISO	13-Jul-92	5	6	IN	CORE	REAL
SED07592	SW80228WCU3	AM241	13-Jul-92				GRAB	RNS
SED07592	SW80228WCU3	DISS MET (A) CLP	13-Jul-92				GRAB	RNS
SED07592	SW80228WCU3	DISS MET (S) CLP	13-Jul-92				GRAB	RNS
SED07592	SW80228WCU3	GROSS ALPHA	13-Jul-92				GRAB	RNS
SED07592	SW80228WCU3	GROSS BETA	13-Jul-92				GRAB	RNS
SED07592	SW80228WCU3	MET (A) CLP	13-Jul-92				GRAB	RNS
SED07592	SW80228WCU3	MET (S) CLP	13-Jul-92				GRAB	RNS
SED07592	SW80228WCU3	PLUTONIUM 239/240	13-Jul-92				GRAB	RNS
SED07592	SW80228WCU3	RAD SCREEN	13-Jul-92				GRAB	RNS
SED07592	SW80228WCU3	U-ISO	13-Jul-92				GRAB	RNS
SED07592	SW80228WCU3	VOA CLP	13-Jul-92				GRAB	RNS
SED07592	SW80229WCU3	AM241	13-Jul-92				GRAB	DUP
SED07592	SW80229WCU3	GROSS ALPHA	13-Jul-92				GRAB	DUP
SED07592	SW80229WCU3	GROSS BETA	13-Jul-92				GRAB	DUP
SED07592	SW80229WCU3	MET (A) CLP	13-Jul-92				GRAB	DUP
SED07592	SW80229WCU3	MET (S) CLP	13-Jul-92				GRAB	DUP
SED07592	SW80229WCU3	PLUTONIUM 239/240	13-Jul-92				GRAB	DUP
SED07592	SW80229WCU3	RAD SCREEN	13-Jul-92				GRAB	DUP
SED07592	SW80229WCU3	U-ISO	13-Jul-92				GRAB	DUP
SED07592	SW80229WCU3	VOA CLP	13-Jul-92				GRAB	DUP
SED07692	SD00375WCU3	AM241	13-Jul-92				GRAB	REAL
SED07692	SD00375WCU3	GROSS ALPHA	13-Jul-92				GRAB	REAL
SED07692	SD00375WCU3	GROSS BETA	13-Jul-92				GRAB	REAL
SED07692	SD00375WCU3	MET (A) CLP	13-Jul-92				GRAB	REAL
SED07692	SD00375WCU3	MET (S) CLP	13-Jul-92				GRAB	REAL
SED07692	SD00375WCU3	PLUTONIUM 239/240	13-Jul-92				GRAB	REAL
SED07692	SD00375WCU3	RAD SCREEN	13-Jul-92				GRAB	REAL
SED07692	SD00375WCU3	U-ISO	13-Jul-92				GRAB	REAL
SED07692	SD00375WCU3	VOA CLP	13-Jul-92				GRAB	REAL

Table C-5
Summary of Nearshore Sediment Samples (Grab and Core Samples)

Location Code	Sample Number	Sample Analysis	Date Collected	Depth From	Depth To	Depth Unit	Grab/ Core	QC Code
SED07792	SD00376WCU3	AM241	13-Jul-92				GRAB	REAL
SED07792	SD00376WCU3	GROSS ALPHA	13-Jul-92				GRAB	REAL
SED07792	SD00376WCU3	GROSS BETA	13-Jul-92				GRAB	REAL
SED07792	SD00376WCU3	MET (A) CLP	13-Jul-92				GRAB	REAL
SED07792	SD00376WCU3	MET (S) CLP	13-Jul-92				GRAB	REAL
SED07792	SD00376WCU3	PLUTONIUM 239/240	13-Jul-92				GRAB	REAL
SED07792	SD00376WCU3	RAD SCREEN	13-Jul-92				GRAB	REAL
SED07792	SD00376WCU3	U-ISO	13-Jul-92				GRAB	REAL
SED07792	SD00376WCU3	VOA CLP	13-Jul-92				GRAB	REAL
SED07892	SD00377WCU3	AM241	13-Jul-92				GRAB	REAL
SED07892	SD00377WCU3	GROSS ALPHA	13-Jul-92				GRAB	REAL
SED07892	SD00377WCU3	GROSS BETA	13-Jul-92				GRAB	REAL
SED07892	SD00377WCU3	MET (A) CLP	13-Jul-92				GRAB	REAL
SED07892	SD00377WCU3	MET (S) CLP	13-Jul-92				GRAB	REAL
SED07892	SD00377WCU3	PLUTONIUM 239/240	13-Jul-92				GRAB	REAL
SED07892	SD00377WCU3	RAD SCREEN	13-Jul-92				GRAB	REAL
SED07892	SD00377WCU3	U-ISO	13-Jul-92				GRAB	REAL
SED07892	SD00377WCU3	VOA CLP	13-Jul-92				GRAB	REAL

Table C-6a
Summary of Reservoir Grab Samples

Location Code	Work Plan ID	Sample Number	Sample Analysis	Date Collected
SED09492	SS48	SD06100CH	METALS / CYANIDE	04-Sep-92
SED09492	SS48	SD06100CH	RADIONUCLIDES	04-Sep-92
SED09492	WO-14	SD06016CH	METALS / CYANIDE	29-Jul-92
SED09492	WO-14	SD06016CH	RADIONUCLIDES	29-Jul-92
SED09492	WO-14	SD06016CH	SPECIFIC GRAVITY / GRAIN SIZE	29-Jul-92
SED09492	WO-14	SD06016CH	TOC	29-Jul-92
SED09492	WO-14	SD06213CH	METALS / CYANIDE	13-Oct-92
SED09492	WO-14	SD06213CH	RADIONUCLIDES	13-Oct-92
SED09592	SS33	SD06101CH	METALS / CYANIDE	03-Sep-92
SED09592	SS33	SD06101CH	RADIONUCLIDES	03-Sep-92
SED09592	WO-15	SD06017CH	METALS / CYANIDE	30-Jul-92
SED09592	WO-15	SD06017CH	RADIONUCLIDES	30-Jul-92
SED09592	WO-15	SD06214CH	METALS / CYANIDE	13-Oct-92
SED09592	WO-15	SD06214CH	RADIONUCLIDES	13-Oct-92
SED09592	WO-15	SD06214CH	SPECIFIC GRAVITY / GRAIN SIZE	13-Oct-92
SED09592	WO-15	SD06214CH	TOC	13-Oct-92
SED09692	SS6	SD06102CH	METALS / CYANIDE	03-Sep-92
SED09692	SS6	SD06102CH	RADIONUCLIDES	03-Sep-92
SED09692	WO-17	SD06018CH	METALS / CYANIDE	29-Jul-92
SED09692	WO-17	SD06018CH	RADIONUCLIDES	29-Jul-92
SED09692	WO-17	SD06215CH	METALS / CYANIDE	13-Oct-92
SED09692	WO-17	SD06215CH	RADIONUCLIDES	13-Oct-92
SED09792	SS10	SD06103CH	METALS / CYANIDE	04-Sep-92
SED09792	SS10	SD06103CH	RADIONUCLIDES	04-Sep-92
SED09792	WO-16	SD06019CH	METALS / CYANIDE	05-Aug-92
SED09792	WO-16	SD06019CH	RADIONUCLIDES	05-Aug-92
SED09792	WO-16	SD06216CH	METALS / CYANIDE	13-Oct-92
SED09792	WO-16	SD06216CH	RADIONUCLIDES	13-Oct-92
SED09892	SS29	SD06104CH	METALS / CYANIDE	04-Sep-92
SED09892	SS29	SD06104CH	RADIONUCLIDES	04-Sep-92
SED09992	SS47	SD06105CH	METALS / CYANIDE	03-Sep-92
SED09992	SS47	SD06105CH	RADIONUCLIDES	03-Sep-92
SED10092	SS12	SD06106CH	METALS / CYANIDE	04-Sep-92
SED10092	SS12	SD06106CH	RADIONUCLIDES	04-Sep-92
SED10192	SS17	SD06107CH	METALS / CYANIDE	04-Sep-92
SED10192	SS17	SD06107CH	RADIONUCLIDES	04-Sep-92
SED10292	SS9	SD06108CH	METALS / CYANIDE	04-Sep-92
SED10292	SS9	SD06108CH	RADIONUCLIDES	04-Sep-92
SED10392	SS8	SD06109CH	METALS / CYANIDE	04-Sep-92
SED10392	SS8	SD06109CH	RADIONUCLIDES	04-Sep-92
SED10392	SS8	SD06109CH	SPECIFIC GRAVITY / GRAIN SIZE	04-Sep-92
SED10392	SS8	SD06109CH	TOC	04-Sep-92
SED10392	SS8	SD06110CH	METALS / CYANIDE	04-Sep-92
SED10392	SS8	SD06110CH	RADIONUCLIDES	04-Sep-92
SED10492	SS45	SD06111CH	METALS / CYANIDE	04-Sep-92
SED10492	SS45	SD06111CH	RADIONUCLIDES	04-Sep-92
SED10492	SS45	SD06111CH	SPECIFIC GRAVITY / GRAIN SIZE	04-Sep-92

Table C-6a
Summary of Reservoir Grab Samples

Location Code	Work Plan ID	Sample Number	Sample Analysis	Date Collected
SED10492	SS45	SD06111CH	TOC	04-Sep-92
SED10592	SS35	SD06112CH	METALS / CYANIDE	03-Sep-92
SED10592	SS35	SD06112CH	RADIONUCLIDES	03-Sep-92
SED10692	SS52	SD06113CH	METALS / CYANIDE	04-Sep-92
SED10692	SS52	SD06113CH	RADIONUCLIDES	04-Sep-92
SED10792	SS42	SD06114CH	METALS / CYANIDE	03-Sep-92
SED10792	SS42	SD06114CH	RADIONUCLIDES	03-Sep-92
SED10892	SS26	SD06115CH	METALS / CYANIDE	04-Sep-92
SED10892	SS26	SD06115CH	RADIONUCLIDES	04-Sep-92
SED10992	SS30	SD06116CH	METALS / CYANIDE	04-Sep-92
SED10992	SS30	SD06116CH	RADIONUCLIDES	04-Sep-92
SED11092	SS1	SD06117CH	METALS / CYANIDE	03-Sep-92
SED11092	SS1	SD06117CH	RADIONUCLIDES	03-Sep-92
SED11192	SS38	SD06118CH	METALS / CYANIDE	03-Sep-92
SED11192	SS38	SD06118CH	RADIONUCLIDES	03-Sep-92
SED11292	SS37	SD06119CH	METALS / CYANIDE	03-Sep-92
SED11292	SS37	SD06119CH	RADIONUCLIDES	03-Sep-92
SED11392	SS40	SD06120CH	METALS / CYANIDE	03-Sep-92
SED11392	SS40	SD06120CH	RADIONUCLIDES	03-Sep-92
SED11392	SS40	SD06121CH	METALS / CYANIDE	03-Sep-92
SED11392	SS40	SD06121CH	RADIONUCLIDES	03-Sep-92
SED11392	SS40	SD06122CH	CYANIDE	03-Sep-92
SED11392	SS40	SD06122CH	METALS	03-Sep-92
SED11392	SS40	SD06122CH	RADIONUCLIDES	03-Sep-92
SED11492	SS22	SD06124CH	METALS / CYANIDE	03-Sep-92
SED11492	SS22	SD06124CH	RADIONUCLIDES	03-Sep-92
SED11492	SS22	SD06124CH	SPECIFIC GRAVITY / GRAIN SIZE	03-Sep-92
SED11492	SS22	SD06124CH	TOC	03-Sep-92
SED11592	SS25	SD06125CH	METALS / CYANIDE	04-Sep-92
SED11592	SS25	SD06125CH	RADIONUCLIDES	04-Sep-92
SED11692	SS16	SD06126CH	METALS / CYANIDE	04-Sep-92
SED11692	SS16	SD06126CH	RADIONUCLIDES	04-Sep-92
SED11792	SS11	SD06127CH	METALS / CYANIDE	04-Sep-92
SED11792	SS11	SD06127CH	RADIONUCLIDES	04-Sep-92
SED11892	SS36	SD06128CH	METALS / CYANIDE	04-Sep-92
SED11892	SS36	SD06128CH	RADIONUCLIDES	04-Sep-92
SED12592	WN-11	SD06006CH	METALS / CYANIDE	14-Jul-92
SED12592	WN-11	SD06006CH	RADIONUCLIDES	14-Jul-92
SED12592	WN-11	SD06205CH	METALS / CYANIDE	29-Sep-92
SED12592	WN-11	SD06205CH	RADIONUCLIDES	29-Sep-92
SED12592	WN-11	SD06205CH	SPECIFIC GRAVITY / GRAIN SIZE	29-Sep-92
SED12592	WN-11	SD06205CH	TOC	29-Sep-92
SED12692	WN-12	SD06007CH	METALS / CYANIDE	14-Jul-92
SED12692	WN-12	SD06007CH	RADIONUCLIDES	14-Jul-92
SED12692	WN-12	SD06007CH	SPECIFIC GRAVITY / GRAIN SIZE	14-Jul-92
SED12692	WN-12	SD06007CH	TOC	14-Jul-92
SED12692	WN-12	SD06206CH	METALS / CYANIDE	29-Sep-92

Table C-6a
Summary of Reservoir Grab Samples

Location Code	Work Plan ID	Sample Number	Sample Analysis	Date Collected
SED12692	WN-12	SD06206CH	RADIONUCLIDES	29-Sep-92
SED12792	WN-13	SD06008CH	METALS / CYANIDE	14-Jul-92
SED12792	WN-13	SD06008CH	RADIONUCLIDES	14-Jul-92
SED12792	WN-13	SD06207CH	METALS / CYANIDE	29-Sep-92
SED12792	WN-13	SD06207CH	RADIONUCLIDES	29-Sep-92
SED12892	SS1	SD06132CH	METALS / CYANIDE	27-Aug-92
SED12892	SS1	SD06132CH	RADIONUCLIDES	27-Aug-92
SED12992	SS2	SD06133CH	METALS / CYANIDE	27-Aug-92
SED12992	SS2	SD06133CH	RADIONUCLIDES	27-Aug-92
SED13092	SS3	SD06134CH	METALS / CYANIDE	27-Aug-92
SED13092	SS3	SD06134CH	RADIONUCLIDES	27-Aug-92
SED13192	SS4	SD06135CH	METALS / CYANIDE	27-Aug-92
SED13192	SS4	SD06135CH	RADIONUCLIDES	27-Aug-92
SED13292	SS8	SD06136CH	METALS / CYANIDE	27-Aug-92
SED13292	SS8	SD06136CH	RADIONUCLIDES	27-Aug-92
SED13392	SS9	SD06137CH	METALS / CYANIDE	27-Aug-92
SED13392	SS9	SD06137CH	RADIONUCLIDES	27-Aug-92
SED13492	SS13	SD06138CH	METALS / CYANIDE	27-Aug-92
SED13492	SS13	SD06138CH	RADIONUCLIDES	27-Aug-92
SED13492	SS13	SD06139CH	METALS / CYANIDE	27-Aug-92
SED13492	SS13	SD06139CH	RADIONUCLIDES	27-Aug-92
SED13592	SS14	SD06140CH	METALS / CYANIDE	28-Aug-92
SED13592	SS14	SD06140CH	RADIONUCLIDES	28-Aug-92
SED13592	SS14	SD06140CH	SPECIFIC GRAVITY / GRAIN SIZE	28-Aug-92
SED13592	SS14	SD06140CH	TOC	28-Aug-92
SED13692	SS16	SD06141CH	METALS / CYANIDE	27-Aug-92
SED13692	SS16	SD06141CH	RADIONUCLIDES	27-Aug-92
SED13792	SS18	SD06142CH	METALS / CYANIDE	27-Aug-92
SED13792	SS18	SD06142CH	RADIONUCLIDES	27-Aug-92
SED13892	SS31	SD06143CH	METALS / CYANIDE	02-Sep-92
SED13892	SS31	SD06143CH	RADIONUCLIDES	02-Sep-92
SED13992	SS26	SD06144CH	METALS / CYANIDE	27-Aug-92
SED13992	SS26	SD06144CH	RADIONUCLIDES	27-Aug-92
SED14092	SS27	SD06145CH	METALS / CYANIDE	27-Aug-92
SED14092	SS27	SD06145CH	RADIONUCLIDES	27-Aug-92
SED14192	SS28	SD06146CH	METALS / CYANIDE	27-Aug-92
SED14192	SS28	SD06146CH	RADIONUCLIDES	27-Aug-92
SED14292	SS29	SD06147CH	METALS / CYANIDE	28-Aug-92
SED14292	SS29	SD06147CH	RADIONUCLIDES	28-Aug-92
SED14292	SS29	SD06151CH	CYANIDE	28-Aug-92
SED14292	SS29	SD06151CH	METALS	28-Aug-92
SED14292	SS29	SD06151CH	RADIONUCLIDES	28-Aug-92
SED14392	SS32	SD06148CH	METALS / CYANIDE	27-Aug-92
SED14392	SS32	SD06148CH	RADIONUCLIDES	27-Aug-92
SED14492	SS36	SD06149CH	METALS / CYANIDE	28-Aug-92
SED14492	SS36	SD06149CH	RADIONUCLIDES	28-Aug-92
SED14492	SS36	SD06150CH	METALS / CYANIDE	28-Aug-92

Table C-6a
Summary of Reservoir Grab Samples

Location Code	Work Plan ID	Sample Number	Sample Analysis	Date Collected
SED14492	SS36	SD06150CH	RADIONUCLIDES	28-Aug-92
SED14592	SS35	SD06131CH	METALS / CYANIDE	02-Sep-92
SED14592	SS35	SD06131CH	RADIONUCLIDES	02-Sep-92
SED14692	SS41	SD06129CH	METALS / CYANIDE	02-Sep-92
SED14692	SS41	SD06129CH	RADIONUCLIDES	02-Sep-92
SED14692	SS41	SD06129CH	SPECIFIC GRAVITY / GRAIN SIZE	02-Sep-92
SED14692	SS41	SD06129CH	TOC	02-Sep-92
SED14792	SS33	SD06130CH	METALS / CYANIDE	02-Sep-92
SED14792	SS33	SD06130CH	RADIONUCLIDES	02-Sep-92
SED15192		SD06153CH	METALS / CYANIDE	10-Sep-92
SED15192		SD06153CH	RADIONUCLIDES	10-Sep-92
SED15192		SD06153CH	SPECIFIC GRAVITY / GRAIN SIZE	10-Sep-92
SED15192		SD06153CH	TOC	10-Sep-92
SED15192		SD06153CH	VOC	10-Sep-92
SED15192	WO-11	BI03807CH	TOXICITY	13-Aug-92
SED15192	WO-11	BI03808CH	TOXICITY-1	10-Aug-92
SED15192	WO-11	BI03808CH	TOXICITY-1	12-Aug-92
SED15192	WO-11	BI03808CH	TOXICITY-1	14-Aug-92
SED15192	WO-11	SD06009CH	METALS / CYANIDE	22-Jul-92
SED15192	WO-11	SD06009CH	RADIONUCLIDES	22-Jul-92
SED15192	WO-11	SD06009CH	SPECIFIC GRAVITY / GRAIN SIZE	22-Jul-92
SED15192	WO-11	SD06009CH	TOC	22-Jul-92
SED15192	WO-11	SD06009CH	VOC	22-Jul-92
SED15192	WO-11	SD06033CH	SPECIFIC GRAVITY / GRAIN SIZE	13-Aug-92
SED15192	WO-11	SD06033CH	TOC	13-Aug-92
SED15192	WO-11	SD06208CH	METALS / CYANIDE	06-Oct-92
SED15192	WO-11	SD06208CH	RADIONUCLIDES	06-Oct-92
SED15192	WO-11	SD06208CH	VOA	06-Oct-92
SED15192	WO-11	SD06217CH	METALS / CYANIDE	06-Oct-92
SED15192	WO-11	SD06217CH	RADIONUCLIDES	06-Oct-92
SED15192	WO-11	SD06217CH	SPECIFIC GRAVITY / GRAIN SIZE	06-Oct-92
SED15192	WO-11	SD06217CH	TOC	06-Oct-92
SED15292	WO-12	BI03809CH	TOXICITY	13-Aug-92
SED15292	WO-12	BI03810CH	TOXICITY-1	10-Aug-92
SED15292	WO-12	BI03810CH	TOXICITY-1	12-Aug-92
SED15292	WO-12	BI03810CH	TOXICITY-1	14-Aug-92
SED15292	WO-12	SD06010CH	METALS / CYANIDE	22-Jul-92
SED15292	WO-12	SD06010CH	RADIONUCLIDES	22-Jul-92
SED15292	WO-12	SD06010CH	VOC	22-Jul-92
SED15292	WO-12	SD06034CH	SPECIFIC GRAVITY / GRAIN SIZE	13-Aug-92
SED15292	WO-12	SD06034CH	TOC	13-Aug-92
SED15292	WO-12	SD06209CH	METALS / CYANIDE	06-Oct-92
SED15292	WO-12	SD06209CH	RADIONUCLIDES	06-Oct-92
SED15292	WO-12	SD06209CH	SPECIFIC GRAVITY / GRAIN SIZE	06-Oct-92
SED15292	WO-12	SD06209CH	TOC	06-Oct-92
SED15292	WO-12	SD06209CH	VOA	06-Oct-92
SED15292	WO-12	SD06210CH	VOA	06-Oct-92

Table C-6a
Summary of Reservoir Grab Samples

Location Code	Work Plan ID	Sample Number	Sample Analysis	Date Collected
SED15292	WO-12	SD06211CH	CYANIDE	06-Oct-92
SED15292	WO-12	SD06211CH	METALS	06-Oct-92
SED15292	WO-12	SD06211CH	RADIONUCLIDES	06-Oct-92
SED15392		SD06155CH	METALS / CYANIDE	10-Sep-92
SED15392		SD06155CH	RADIONUCLIDES	10-Sep-92
SED15392		SD06155CH	VOC	10-Sep-92
SED15392	WO-13	SD06011CH	METALS / CYANIDE	22-Jul-92
SED15392	WO-13	SD06011CH	RADIONUCLIDES	22-Jul-92
SED15392	WO-13	SD06011CH	VOC	22-Jul-92
SED15392	WO-13	SD06013CH	METALS / CYANIDE	22-Jul-92
SED15392	WO-13	SD06013CH	RADIONUCLIDES	22-Jul-92
SED15392	WO-13	SD06013CH	VOC	22-Jul-92
SED15392	WO-13	SD06014CH	CYANIDE	22-Jul-92
SED15392	WO-13	SD06014CH	METALS	22-Jul-92
SED15392	WO-13	SD06014CH	RADIONUCLIDES	22-Jul-92
SED15392	WO-13	SD06014CH	VOC	22-Jul-92
SED15392	WO-13	SD06212CH	METALS / CYANIDE	06-Oct-92
SED15392	WO-13	SD06212CH	RADIONUCLIDES	06-Oct-92
SED15392	WO-13	SD06212CH	VOA	06-Oct-92
SED15492		SD06156CH	METALS / CYANIDE	10-Sep-92
SED15492		SD06156CH	RADIONUCLIDES	10-Sep-92
SED15592		SD06157CH	METALS / CYANIDE	10-Sep-92
SED15592		SD06157CH	RADIONUCLIDES	10-Sep-92
SED15692		SD06158CH	METALS / CYANIDE	10-Sep-92
SED15692		SD06158CH	RADIONUCLIDES	10-Sep-92
SED15792		SD06159CH	METALS / CYANIDE	10-Sep-92
SED15792		SD06159CH	RADIONUCLIDES	10-Sep-92
SED15892		SD06160CH	METALS / CYANIDE	10-Sep-92
SED15892		SD06160CH	RADIONUCLIDES	10-Sep-92
SED15992		SD06161CH	METALS / CYANIDE	10-Sep-92
SED15992		SD06161CH	RADIONUCLIDES	10-Sep-92
SED16092		SD06162CH	METALS / CYANIDE	10-Sep-92
SED16092		SD06162CH	RADIONUCLIDES	10-Sep-92
SED16092		SD06163CH	METALS / CYANIDE	10-Sep-92
SED16092		SD06163CH	RADIONUCLIDES	10-Sep-92
SED16192		SD06154CH	METALS / CYANIDE	10-Sep-92
SED16192		SD06154CH	RADIONUCLIDES	10-Sep-92
SED16192		SD06154CH	VOC	10-Sep-92

Table C-6b
Summary of Vertical Sediment Cores from Reservoirs

Location Code	Sample Number	Depth From	Depth To	Depth Unit	Sample Analysis	Date Collected
SED08192	SD06400CH	0	2	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06400CH	0	2	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06401CH	2	4	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06401CH	2	4	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06402CH	4	6	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06402CH	4	6	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06403CH	6	8	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06403CH	6	8	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06404CH	8	10	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06404CH	8	10	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06405CH	10	12	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06405CH	10	12	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06406CH	12	14	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06406CH	12	14	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06407CH	14	16	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06407CH	14	16	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06408CH	16	18	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06408CH	16	18	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06409CH	18	20	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06409CH	18	20	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06410CH	18	20	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06410CH	18	20	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06411CH	20	22	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06411CH	20	22	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06412CH	22	24	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06412CH	22	24	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06413CH	24	26	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06413CH	24	26	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06414CH	26	28	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06414CH	26	28	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06415CH	28	30	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06415CH	28	30	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06416CH	30	32	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06416CH	30	32	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08192	SD06417CH	32	34	IN	METALS / CYANIDE	08-Sep-92
SED08192	SD06417CH	32	34	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08292	SD06429CH	0	2	IN	METALS / CYANIDE	09-Sep-92
SED08292	SD06429CH	0	2	IN	RADIONUCLIDES, CS137, PO210	09-Sep-92
SED08292	SD06430CH	2	4	IN	METALS / CYANIDE	09-Sep-92
SED08292	SD06430CH	2	4	IN	RADIONUCLIDES, CS137, PO210	09-Sep-92
SED08292	SD06431CH	4	6	IN	METALS / CYANIDE	09-Sep-92
SED08292	SD06431CH	4	6	IN	RADIONUCLIDES, CS137, PO210	09-Sep-92
SED08292	SD06432CH	6	8	IN	METALS / CYANIDE	09-Sep-92
SED08292	SD06432CH	6	8	IN	RADIONUCLIDES, CS137, PO210	09-Sep-92
SED08392	SD06458CH	0	2	IN	METALS / CYANIDE	08-Sep-92

Table C-6b
Summary of Vertical Sediment Cores from Reservoirs

Location Code	Sample Number	Depth From	Depth To	Depth Unit	Sample Analysis	Date Collected
SED08392	SD06458CH	0	2	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08392	SD06459CH	2	4	IN	METALS / CYANIDE	08-Sep-92
SED08392	SD06459CH	2	4	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08392	SD06460CH	4	6	IN	METALS / CYANIDE	08-Sep-92
SED08392	SD06460CH	4	6	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08392	SD06461CH	6	8	IN	METALS / CYANIDE	08-Sep-92
SED08392	SD06461CH	6	8	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08392	SD06462CH	8	10	IN	METALS / CYANIDE	08-Sep-92
SED08392	SD06462CH	8	10	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08392	SD06463CH	10	12	IN	METALS / CYANIDE	08-Sep-92
SED08392	SD06463CH	10	12	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08392	SD06464CH	12	14	IN	METALS / CYANIDE	08-Sep-92
SED08392	SD06464CH	12	14	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08392	SD06465CH	14	16	IN	METALS / CYANIDE	08-Sep-92
SED08392	SD06465CH	14	16	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08392	SD06466CH	16	18	IN	METALS / CYANIDE	08-Sep-92
SED08392	SD06466CH	16	18	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08392	SD06467CH	18	20	IN	METALS / CYANIDE	08-Sep-92
SED08392	SD06467CH	18	20	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08392	SD06468CH	18	20	IN	METALS / CYANIDE	08-Sep-92
SED08392	SD06468CH	18	20	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08392	SD06469CH	20	22	IN	METALS / CYANIDE	08-Sep-92
SED08392	SD06469CH	20	22	IN	RADIONUCLIDES, CS137, PO210	08-Sep-92
SED08392	SD06480CH	WATER			CYANIDE	08-Sep-92
SED08392	SD06480CH	WATER			METALS	08-Sep-92
SED08392	SD06480CH	WATER			RADIONUCLIDES	08-Sep-92
SED08492	SD06487CH	0	2	IN	METALS / CYANIDE	09-Sep-92
SED08492	SD06487CH	0	2	IN	RADIONUCLIDES, CS137, PO210	09-Sep-92
SED08492	SD06488CH	2	4	IN	METALS / CYANIDE	09-Sep-92
SED08492	SD06488CH	2	4	IN	RADIONUCLIDES, CS137, PO210	09-Sep-92
SED08492	SD06489CH	4	6	IN	METALS / CYANIDE	09-Sep-92
SED08492	SD06489CH	4	6	IN	RADIONUCLIDES, CS137, PO210	09-Sep-92
SED08492	SD06490CH	6	8	IN	METALS / CYANIDE	09-Sep-92
SED08492	SD06490CH	6	8	IN	RADIONUCLIDES, CS137, PO210	09-Sep-92
SED08592	SD06516CH	0	2	IN	METALS / CYANIDE	31-Aug-92
SED08592	SD06516CH	0	2	IN	RADIONUCLIDES, CS137, PO210	31-Aug-92
SED08592	SD06517CH	2	4	IN	METALS / CYANIDE	31-Aug-92
SED08592	SD06517CH	2	4	IN	RADIONUCLIDES, CS137, PO210	31-Aug-92
SED08592	SD06518CH	4	6	IN	METALS / CYANIDE	31-Aug-92
SED08592	SD06518CH	4	6	IN	RADIONUCLIDES, CS137, PO210	31-Aug-92
SED08592	SD06519CH	6	8	IN	METALS / CYANIDE	31-Aug-92
SED08592	SD06519CH	6	8	IN	RADIONUCLIDES, CS137, PO210	31-Aug-92
SED08592	SD06520CH	8	10	IN	METALS / CYANIDE	31-Aug-92
SED08592	SD06520CH	8	10	IN	RADIONUCLIDES, CS137, PO210	31-Aug-92
SED08592	SD06521CH	8	10	IN	METALS / CYANIDE	31-Aug-92

Table C-6b
Summary of Vertical Sediment Cores from Reservoirs

Location Code	Sample Number	Depth From	Depth To	Depth Unit	Sample Analysis	Date Collected
SED08592	SD06521CH	8	10	IN	RADIONUCLIDES, CS137, PO210	31-Aug-92
SED08592	SD06522CH	10	12	IN	METALS / CYANIDE	31-Aug-92
SED08592	SD06522CH	10	12	IN	RADIONUCLIDES, CS137, PO210	31-Aug-92
SED08592	SD06523CH	12	14	IN	METALS / CYANIDE	31-Aug-92
SED08592	SD06523CH	12	14	IN	RADIONUCLIDES, CS137, PO210	31-Aug-92
SED08692	SD06545CH	0	2	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06545CH	0	2	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06546CH	2	4	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06546CH	2	4	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06547CH	4	6	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06547CH	4	6	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06548CH	4	6	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06548CH	4	6	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06549CH	6	8	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06549CH	6	8	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06550CH	8	10	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06550CH	8	10	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06551CH	10	12	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06551CH	10	12	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06552CH	12	14	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06552CH	12	14	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06553CH	14	16	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06553CH	14	16	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06554CH	16	18	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06554CH	16	18	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06555CH	18	20	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06555CH	18	20	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06556CH	20	22	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06556CH	20	22	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06557CH	22	24	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06557CH	22	24	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06558CH	24	26	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06558CH	24	26	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06559CH	26	28	IN	METALS / CYANIDE	01-Sep-92
SED08692	SD06559CH	26	28	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08692	SD06567CH	WATER			CYANIDE	01-Sep-92
SED08692	SD06567CH	WATER			METALS	01-Sep-92
SED08692	SD06567CH	WATER			RADIONUCLIDES	01-Sep-92
SED08792	SD06574CH	0	2	IN	METALS / CYANIDE	01-Sep-92
SED08792	SD06574CH	0	2	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08792	SD06575CH	2	4	IN	METALS / CYANIDE	01-Sep-92
SED08792	SD06575CH	2	4	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08792	SD06576CH	4	6	IN	METALS / CYANIDE	01-Sep-92
SED08792	SD06576CH	4	6	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08792	SD06577CH	6	8	IN	METALS / CYANIDE	01-Sep-92

Table C-6b
Summary of Vertical Sediment Cores from Reservoirs

Location Code	Sample Number	Depth From	Depth To	Depth Unit	Sample Analysis	Date Collected
SED08792	SD06577CH	6	8	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08792	SD06578CH	8	10	IN	METALS / CYANIDE	01-Sep-92
SED08792	SD06578CH	8	10	IN	RADIONUCLIDES, CS137, PO210	01-Sep-92
SED08892	SD06661CH	0	2	IN	METALS / CYANIDE	14-Sep-92
SED08892	SD06661CH	0	2	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08892	SD06662CH	2	4	IN	METALS / CYANIDE	14-Sep-92
SED08892	SD06662CH	2	4	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08892	SD06663CH	4	6	IN	METALS / CYANIDE	14-Sep-92
SED08892	SD06663CH	4	6	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08892	SD06664CH	6	8	IN	METALS / CYANIDE	14-Sep-92
SED08892	SD06664CH	6	8	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08892	SD06665CH	8	10	IN	METALS / CYANIDE	14-Sep-92
SED08892	SD06665CH	8	10	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08892	SD06666CH	10	12	IN	METALS / CYANIDE	14-Sep-92
SED08892	SD06666CH	10	12	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08892	SD06667CH	12	14	IN	METALS / CYANIDE	14-Sep-92
SED08892	SD06667CH	12	14	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08892	SD06668CH	14	16	IN	METALS / CYANIDE	14-Sep-92
SED08892	SD06668CH	14	16	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08892	SD06669CH	16	18	IN	METALS / CYANIDE	14-Sep-92
SED08892	SD06669CH	16	18	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08892	SD06670CH	18	20	IN	METALS / CYANIDE	14-Sep-92
SED08892	SD06670CH	18	20	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08892	SD06671CH	18	20	IN	METALS / CYANIDE	14-Sep-92
SED08892	SD06671CH	18	20	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08992	SD06690CH	0	2	IN	METALS / CYANIDE	14-Sep-92
SED08992	SD06690CH	0	2	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08992	SD06691CH	2	4	IN	METALS / CYANIDE	14-Sep-92
SED08992	SD06691CH	2	4	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08992	SD06692CH	4	6	IN	METALS / CYANIDE	14-Sep-92
SED08992	SD06692CH	4	6	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08992	SD06693CH	6	8	IN	METALS / CYANIDE	14-Sep-92
SED08992	SD06693CH	6	8	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08992	SD06694CH	6	8	IN	METALS / CYANIDE	14-Sep-92
SED08992	SD06694CH	6	8	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08992	SD06695CH	8	10	IN	METALS / CYANIDE	14-Sep-92
SED08992	SD06695CH	8	10	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08992	SD06696CH	10	12	IN	METALS / CYANIDE	14-Sep-92
SED08992	SD06696CH	10	12	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08992	SD06697CH	12	14	IN	METALS / CYANIDE	14-Sep-92
SED08992	SD06697CH	12	14	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08992	SD06698CH	14	16	IN	METALS / CYANIDE	14-Sep-92
SED08992	SD06698CH	14	16	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED08992	SD06699CH	16	18	IN	METALS / CYANIDE	14-Sep-92
SED08992	SD06699CH	16	18	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92

Table C-6b
Summary of Vertical Sediment Cores from Reservoirs

Location Code	Sample Number	Depth From	Depth To	Depth Unit	Sample Analysis	Date Collected
SED09092	SD06719CH	0	2	IN	METALS / CYANIDE	14-Sep-92
SED09092	SD06719CH	0	2	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED09092	SD06720CH	2	4	IN	METALS / CYANIDE	14-Sep-92
SED09092	SD06720CH	2	4	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED09092	SD06721CH	4	6	IN	METALS / CYANIDE	14-Sep-92
SED09092	SD06721CH	4	6	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED09092	SD06722CH	6	8	IN	METALS / CYANIDE	14-Sep-92
SED09092	SD06722CH	6	8	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED09092	SD06723CH	8	10	IN	METALS / CYANIDE	14-Sep-92
SED09092	SD06723CH	8	10	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED09092	SD06724CH	10	12	IN	METALS / CYANIDE	14-Sep-92
SED09092	SD06724CH	10	12	IN	RADIONUCLIDES, CS137, PO210	14-Sep-92
SED09192	SD06603CH	0	2	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06603CH	0	2	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06604CH	2	4	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06604CH	2	4	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06605CH	4	6	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06605CH	4	6	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06606CH	6	8	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06606CH	6	8	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06607CH	8	10	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06607CH	8	10	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06608CH	10	12	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06608CH	10	12	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06609CH	12	14	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06609CH	12	14	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06610CH	14	16	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06610CH	14	16	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06611CH	16	18	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06611CH	16	18	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06612CH	18	20	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06612CH	18	20	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06613CH	18	20	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06613CH	18	20	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06614CH	20	22	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06614CH	20	22	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06615CH	22	24	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06615CH	22	24	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06616CH	24	26	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06616CH	24	26	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06617CH	26	28	IN	METALS / CYANIDE	02-Sep-92
SED09192	SD06617CH	26	28	IN	RADIONUCLIDES, CS137, PO210	02-Sep-92
SED09192	SD06625CH	WATER			CYANIDE	02-Sep-92
SED09192	SD06625CH	WATER			METALS	02-Sep-92
SED09192	SD06625CH	WATER			RADIONUCLIDES	02-Sep-92

Table C-6b
Summary of Vertical Sediment Cores from Reservoirs

Location Code	Sample Number	Depth From	Depth To	Depth Unit	Sample Analysis	Date Collected
SED09292	SD06632CH	0	2	IN	METALS / CYANIDE	15-Sep-92
SED09292	SD06632CH	0	2	IN	RADIONUCLIDES, CS137, PO210	15-Sep-92
SED09292	SD06633CH	2	4	IN	METALS / CYANIDE	15-Sep-92
SED09292	SD06633CH	2	4	IN	RADIONUCLIDES, CS137, PO210	15-Sep-92
SED09292	SD06634CH	4	6	IN	METALS / CYANIDE	15-Sep-92
SED09292	SD06634CH	4	6	IN	RADIONUCLIDES, CS137, PO210	15-Sep-92
SED09292	SD06635CH	6	8	IN	METALS / CYANIDE	15-Sep-92
SED09292	SD06635CH	6	8	IN	RADIONUCLIDES, CS137, PO210	15-Sep-92
SED09292	SD06636CH	8	10	IN	METALS / CYANIDE	15-Sep-92
SED09292	SD06636CH	8	10	IN	RADIONUCLIDES, CS137, PO210	15-Sep-92
SED09292	SD06637CH	10	12	IN	METALS / CYANIDE	15-Sep-92
SED09292	SD06637CH	10	12	IN	RADIONUCLIDES, CS137, PO210	15-Sep-92
SED09292	SD06654CH	WATER			CYANIDE	15-Sep-92
SED09292	SD06654CH	WATER			METALS	15-Sep-92
SED09292	SD06654CH	WATER			RADIONUCLIDES	15-Sep-92

Table C-7
Summary of Groundwater Sampling

Location Code	Sample Number	Sample Analysis	Date Collected
49192	GW30000CH	MAJOR ANIONS	29-Jan-93
49192	GW30000CH	METALS (FILTERED)	29-Jan-93
49192	GW30000CH	METALS (TOTAL)	29-Jan-93
49192	GW30000CH	NO3/NO2	29-Jan-93
49192	GW30000CH	PLUTONIUM, AMERICIUM	29-Jan-93
49192	GW30000CH	URANIUM (FILTERED)	29-Jan-93
49292	GW30025CH	MAJOR ANIONS	28-Jan-93
49292	GW30025CH	METALS (FILTERED)	28-Jan-93
49292	GW30025CH	METALS (TOTAL)	28-Jan-93
49292	GW30025CH	NO3/NO2	28-Jan-93
49292	GW30025CH	PLUTONIUM, AMERICIUM	28-Jan-93
49292	GW30025CH	URANIUM (FILTERED)	28-Jan-93
49292	GW30055CH	MAJOR ANIONS	28-Jan-93
49292	GW30055CH	METALS (FILTERED)	28-Jan-93
49292	GW30055CH	METALS (TOTAL)	28-Jan-93
49292	GW30055CH	NO3/NO2	28-Jan-93
49292	GW30055CH	PLUTONIUM, AMERICIUM	28-Jan-93
49292	GW30055CH	URANIUM (FILTERED)	28-Jan-93
49292	GW30056CH	MAJOR ANIONS	28-Jan-93
49292	GW30056CH	METALS (FILTERED)	28-Jan-93
49292	GW30056CH	METALS (TOTAL)	28-Jan-93
49292	GW30056CH	NO3/NO2	28-Jan-93
49292	GW30056CH	PLUTONIUM, AMERICIUM	28-Jan-93
49292	GW30056CH	URANIUM (FILTERED)	28-Jan-93
49292	GW30057CH	MAJOR ANIONS	28-Jan-93
49292	GW30057CH	METALS (FILTERED)	28-Jan-93
49292	GW30057CH	METALS (TOTAL)	28-Jan-93
49292	GW30057CH	NO3/NO2	28-Jan-93
49292	GW30057CH	PLUTONIUM, AMERICIUM	28-Jan-93
49292	GW30057CH	URANIUM (FILTERED)	28-Jan-93
49292	GW30058CH	MAJOR ANIONS	28-Jan-93
49292	GW30058CH	METALS (FILTERED)	28-Jan-93
49292	GW30058CH	METALS (TOTAL)	28-Jan-93
49292	GW30058CH	NO3/NO2	28-Jan-93

Table C-8
Summary of Mammal Samples

Location Code	Sample Number	Sample Analysis	Number of Mice	Date Collected
BI000392	BI03306CH	RADS	1	13-Aug-92
BI000392	BI03307CH	RADS	1	29-Jul-92
BI000392	BI03308CH	RADS	3	29-Jul-92
BI000492	BI03339CH	RADS	2	08-Aug-92
BI000492	BI03340CH	RADS	2	08-Aug-92
BI000492	BI03341CH	RADS	2	08-Aug-92
BI000592	BI03330CH	RADS	1	17-Jul-92
BI000592	BI03331CH	RADS	1	17-Jul-92
BI000592	BI03332CH	RADS	1	17-Jul-92
BI000692	BI03333CH	RADS	1	30-Jul-92
BI000692	BI03334CH	RADS	2	30-Jul-92
BI000692	BI03335CH	RADS	2	30-Jul-92
BI000792	BI03315CH	RADS	1	13-Aug-92
BI000792	BI03316CH	RADS	1	13-Aug-92
BI000792	BI03317CH	RADS	1	13-Aug-92
BI000892	BI03336CH	RADS	1	17-Jul-92
BI000892	BI03337CH	RADS	2	17-Jul-92
BI000892	BI03338CH	RADS	2	17-Jul-92
BI001092	BI03309CH	RADS	2	09-Aug-92
BI001092	BI03310CH	RADS	2	09-Aug-92
BI001092	BI03311CH	RADS	3	09-Aug-92
BI001192	BI03327CH	RADS	2	28-Jul-92
BI001192	BI03328CH	RADS	3	28-Jul-92
BI001192	BI03329CH	RADS	3	28-Jul-92
BI001292	BI03300CH	RADS	1	28-Jul-92
BI001292	BI03301CH	RADS	1	28-Jul-92
BI001292	BI03302CH	RADS	1	28-Jul-92
BI001292	BI03303CH	RADS	1	28-Jul-92
BI001292	BI03304CH	RADS	1	28-Jul-92
BI001292	BI03305CH	RADS	2	28-Jul-92
BI001492	BI03312CH	RADS	1	29-Jul-92
BI001492	BI03313CH	RADS	1	29-Jul-92
BI001492	BI03314CH	RADS	1	29-Jul-92
BI001892	BI03321CH	RADS	2	29-Jul-92
BI001892	BI03322CH	RADS	2	29-Jul-92
BI001892	BI03323CH	RADS	2	29-Jul-92
BI001992	BI03318CH	RADS	2	14-Aug-92
BI001992	BI03319CH	RADS	1	14-Aug-92
BI001992	BI03320CH	RADS	2	14-Aug-92
BI002092	BI03324CH	RADS	1	13-Aug-92
BI002092	BI03325CH	RADS	1	13-Aug-92
BI002092	BI03326CH	RADS	1	13-Aug-92

Table C-9
Summary of Vegetation Samples

Location Code	Sample Number	Sample Analysis	Date Collected
BI001292	BI03056CH	Rads	20-Jul-92
BI001292	BI03057CH	Rads	20-Jul-92
BI001292	BI03058CH	Rads	20-Jul-92
BI001292	BI03059CH	Rads	20-Jul-92
BI001292	BI03060CH	Rads	20-Jul-92
BI001492	BI03066CH	Rads	27-Jul-92
BI001492	BI03067CH	Rads	27-Jul-92
BI001492	BI03068CH	Rads	27-Jul-92
BI001492	BI03069CH	Rads	27-Jul-92
BI001492	BI03070CH	Rads	27-Jul-92
BI001892	BI03086CH	Rads	21-Jul-92
BI001892	BI03089CH	Rads	21-Jul-92
BI001892	BI03090CH	Rads	21-Jul-92
BI001992	BI03091CH	Rads	06-Aug-92
BI001992	BI03092CH	Rads	06-Aug-92
BI001992	BI03093CH	Rads	06-Aug-92
BI001992	BI03094CH	Rads	06-Aug-92
BI001992	BI03095CH	Rads	06-Aug-92
BI002092	BI03096CH	Rads	07-Aug-92
BI002092	BI03097CH	Rads	07-Aug-92
BI002092	BI03098CH	Rads	07-Aug-92
BI002092	BI03099CH	Rads	07-Aug-92
BI002092	BI03100CH	Rads	07-Aug-92

Table C-10
Summary of Fish Tissue Sampling

Location Code	Work Plan ID	Sample Number	Tissue Code	Common Group	Analysis Bottle Code	Date Collected
LINDSEY POND						
LINDSEY	REF	BI03720CH	WB	6	RA, RB, RC, M	08-Oct-92
LINDSEY	REF	BI03721CH	WB	6	RA, RB, RC, M	08-Oct-92
LINDSEY	REF	BI03722CH	M	7	RA, RB, RC, M	08-Oct-92
LINDSEY	REF	BI03723CH	M	7	RA, RB, RC, M	08-Oct-92
GREAT WESTERN RESERVOIR						
BI017192	WN-11	BI03724CH	WBX	1	RA, RB, RC, M	14-Jul-92
BI017192	WN-11	BI03725CH	WBX	1	RA, RB, RC, M	14-Jul-92
BI017192	WN-11	BI03726CH	WBX	1	RA, RB, RC, M	30-Sep-92
BI017192	WN-11	BI03728CH	WB	3	RA, RB, RC, M	30-Sep-92
BI017192	WN-11	BI03729CH	MIN	4	RA, RB, RC, M	15-Jul-92
BI017192	WN-11	BI03730CH	MIN	4	RA, RB, RC, M	30-Sep-92
BI017292	WN-11	BI03727CH	WB	3	RA, RB, RC, M	14-Jul-92
BI017292	WN-12	BI03732CH	WBX	1	RA, RB, RC, M	14-Jul-92
BI017292	WN-12	BI03733CH	WBX	1	RA, RB, RC, M	30-Sep-92
BI017292	WN-12	BI03734CH	WB	3	RA, RB, RC, M	11-Jul-92
BI017292	WN-12	BI03735CH	WB	3	RA, RB, RC, M	30-Sep-92
BI017292	WN-12	BI03736CH	WB	3	RA, RB, RC, M	30-Sep-92
BI017292	WN-12	BI03737CH	MIN	4	RA, RB, RC, M	15-Jul-92
BI017292	WN-12	BI03738CH	MIN	4	RA, RB, RC, M	30-Sep-92
BI017392	WN-13	BI03739CH	WBX	1	RA, RB, RC, M	30-Sep-92
BI017392	WN-13	BI03740CH	WB	2	RA, RB, RC, M	14-Jul-92
BI017392	WN-13	BI03741CH	WB	3	RA, RB, RC, M	14-Jul-92
BI017392	WN-13	BI03742CH	WB	3	RA, RB, RC, M	30-Sep-92
BI017392	WN-13	BI03743CH	MIN	4	RA, RB, RC, M	30-Sep-92
MOWER RESERVOIR						
BI017692	WO-11	BI03744CH	WB	3	RA, RB, RC, M	22-Jul-92
BI017692	WO-11	BI03746CH	WB	6	RA, RB, RC, M	17-Jul-92
BI017692	WO-11	BI03747CH	WB	6	RA, RB, RC, M	08-Oct-92
BI017692	WO-11	BI03748CH	M/R	7	RA, RB, RC, M	22-Jul-92
BI017692	WO-11	BI03749CH	M/R	7	RA, RB, RC, M	08-Oct-92
BI017692	WO-11	BI03750CH	M/L	7	RA, RB, RC, M	08-Oct-92
BI017692	WO-11	BI03751CH	M/R	7	RA, RB, RC, M	07-Oct-92
BI017692	WO-11	BI03752CH	M/L	7	RA, RB, RC, M	07-Oct-92
BI017792	WO-12	BI03753CH	WB	6	RA, RB, RC, M	22-Jul-92

Table C-10
Summary of Fish Tissue Sampling

Location Code	Work Plan ID	Sample Number	Tissue Code	Common Group	Analysis Bottle Code	Date Collected
BI017792	WO-12	BI03754CH	WB	6	RA, RB, RC, M	22-Jul-92
BI017792	WO-12	BI03755CH	WB	6	RA, RB, RC, M	07-Oct-92
BI017792	WO-12	BI03756CH	M/R	7	RA, RB, RC, M	07-Oct-92
BI017792	WO-12	BI03757CH	M/L	7	RA, RB, RC, M	17-Jul-92
BI017792	WO-12	BI03758CH	M/L	7	RA, RB, RC, M	07-Oct-92
STANDLEY LAKE						
BI018192	WO-14	BI03759CH	WB	2	RA, RB, RC, M	19-Oct-92
BI018192	WO-14	BI03760CH	WB	2	RA, RB, RC, M	14-Oct-92
BI018192	WO-14	BI03761CH	WB	2	RA, RB, RC, M	30-Jul-92
BI018192	WO-14	BI03762CH	WB	3	RA, RB, RC, M	14-Oct-92
BI018192	WO-14	BI03764CH	WB	8	RA, RB, RC, M	14-Oct-92
BI018192	WO-14	BI03765CH	WB	8	RA, RB, RC, M	29-Jul-92
BI018192	WO-14	BI03766CH	M	9	RA, RB, RC, M	14-Oct-92
BI018192	WO-14	BI03767CH	WB	10	RA, RB, RC, M	13-Oct-92
BI018192	WO-14	BI03768CH	WBX	10	RA, RB, RC, M	13-Oct-92
BI018192	WO-14	BI03769CH	WB	11	RA, RB, RC, M	14-Oct-92
BI018292	WO-15	BI03770CH	WBX	1	RA, RB, RC, M	19-Oct-92
BI018292	WO-15	BI03771CH	WB	2	RA, RB, RC, M	14-Oct-92
BI018292	WO-15	BI03772CH	WB	2	RA, RB, RC, M	30-Jul-92
BI018292	WO-15	BI03773CH	WB	3	RA, RB, RC, M	14-Oct-92
BI018292	WO-15	BI03774CH	WB	8	RA, RB, RC, M	14-Oct-92
BI018292	WO-15	BI03775CH	WB	8	RA, RB, RC, M	30-Jul-92
BI018292	WO-15	BI03776CH	M	9	RA, RB, RC, M	14-Oct-92
BI018292	WO-15	BI03777CH	WB	10	RA, RB, RC, M	19-Oct-92
BI018292	WO-15	BI03778CH	WB	10	RA, RB, RC, M	30-Jul-92
BI018292	WO-15	BI03779CH	WBX	10	RA, RB, RC, M	14-Oct-92
BI018292	WO-15	BI03780CH	WB	11	RA, RB, RC, M	19-Oct-92
BI018392	WO-17	BI03781CH	WB	2	RA, RB, RC, M	19-Oct-92
BI018392	WO-17	BI03782CH	WB	2	RA, RB, RC, M	30-Jul-92
BI018392	WO-17	BI03783CH	WB	3	RA, RB, RC, M	19-Oct-92
BI018392	WO-17	BI03784CH	WB	8	RA, RB, RC, M	30-Jul-92
BI018492	WO-16	BI03785CH	WBX	1	RA, RB, RC, M	30-Jul-92
BI018492	WO-16	BI03786CH	WB	3	RA, RB, RC, M	14-Oct-92
BI018492	WO-16	BI03787CH	WB	8	RA, RB, RC, M	31-Jul-92
BI018492	WO-16	BI03788CH	WB	10	RA, RB, RC, M	31-Jul-92

Table C-10
Summary of Fish Tissue Sampling

Location Code	Work Plan ID	Sample Number	Tissue Code	Common Group	Analysis Bottle Code	Date Collected
BI018492	WO-16	BI03789CH	WB	10	RA, RB, RC, M	14-Oct-92
BI018492	WO-16	BI03790CH	WB	10	RA, RB, RC, M	14-Oct-92

Table C-11
Summary of Benthos Sampling

Location Code	Work Plan ID	Matrix	Sample Number	Sample Analysis	Date Collected
WALNUT CREEK					
BI015192	WN-3 O	BENTHOS	BI03600CH	SPEC. / ENUM.	08-Jul-92
BI015192	WN-3 R1	BENTHOS	BI03601CH	SPEC. / ENUM.	08-Jul-92
BI015192	WN-3 R2	BENTHOS	BI03602CH	SPEC. / ENUM.	08-Jul-92
WOMAN CREEK					
BI015292	WO-2 O	BENTHOS	BI03603CH	SPEC. / ENUM.	13-Jul-92
BI015292	WO-2 R1	BENTHOS	BI03604CH	SPEC. / ENUM.	13-Jul-92
BI015292	WO-2 R2	BENTHOS	BI03605CH	SPEC. / ENUM.	13-Jul-92
BIG DRY CREEK					
BI015392	WO-3 O	BENTHOS	BI03606CH	SPEC. / ENUM.	09-Jul-92
BI015392	WO-3 R1	BENTHOS	BI03607CH	SPEC. / ENUM.	09-Jul-92
BI015392	WO-3 R2	BENTHOS	BI03608CH	SPEC. / ENUM.	09-Jul-92
GREAT WESTERN RESERVOIR					
BI017192	WN-11 O	BENTHOS	BI03562CH	SPEC. / ENUM.	29-Sep-92
BI017192	WN-11 O	BENTHOS	BI03609CH	SPEC. / ENUM.	11-Jul-92
BI017192	WN-11 R1	BENTHOS	BI03563CH	SPEC. / ENUM.	29-Sep-92
BI017192	WN-11 R1	BENTHOS	BI03610CH	SPEC. / ENUM.	11-Jul-92
BI017192	WN-11 R2	BENTHOS	BI03564CH	SPEC. / ENUM.	29-Sep-92
BI017192	WN-11 R2	BENTHOS	BI03611CH	SPEC. / ENUM.	11-Jul-92
BI017292	WN-12 O	BENTHOS	BI03565CH	SPEC. / ENUM.	29-Sep-92
BI017292	WN-12 O	BENTHOS	BI03612CH	SPEC. / ENUM.	11-Jul-92
BI017292	WN-12 R1	BENTHOS	BI03566CH	SPEC. / ENUM.	29-Sep-92
BI017292	WN-12 R1	BENTHOS	BI03613CH	SPEC. / ENUM.	11-Jul-92
BI017292	WN-12 R2	BENTHOS	BI03567CH	SPEC. / ENUM.	29-Sep-92
BI017292	WN-12 R2	BENTHOS	BI03614CH	SPEC. / ENUM.	11-Jul-92
BI017392	WN-13 O	BENTHOS	BI03568CH	SPEC. / ENUM.	29-Sep-92
BI017392	WN-13 O	BENTHOS	BI03615CH	SPEC. / ENUM.	11-Jul-92
BI017392	WN-13 R1	BENTHOS	BI03569CH	SPEC. / ENUM.	29-Sep-92
BI017392	WN-13 R1	BENTHOS	BI03616CH	SPEC. / ENUM.	11-Jul-92
BI017392	WN-13 R2	BENTHOS	BI03570CH	SPEC. / ENUM.	29-Sep-92
BI017392	WN-13 R2	BENTHOS	BI03617CH	SPEC. / ENUM.	11-Jul-92
MOWER RESERVOIR					
BI017692	WO-11 O	BENTHOS	BI03571CH	SPEC. / ENUM.	06-Oct-92
BI017692	WO-11 O	BENTHOS	BI03574CH	SPEC. / ENUM.	06-Oct-92
BI017692	WO-11 O	BENTHOS	BI03618CH	SPEC. / ENUM.	17-Jul-92
BI017692	WO-11 O	BENTHOS	BI03621CH	SPEC. / ENUM.	17-Jul-92
BI017692	WO-11 R1	BENTHOS	BI03572CH	SPEC. / ENUM.	06-Oct-92

Table C-11
Summary of Benthos Sampling

Location Code	Work Plan ID	Matrix	Sample Number	Sample Analysis	Date Collected
BI017692	WO-11 R1	BENTHOS	BI03575CH	SPEC. / ENUM.	06-Oct-92
BI017692	WO-11 R1	BENTHOS	BI03619CH	SPEC. / ENUM.	17-Jul-92
BI017692	WO-11 R1	BENTHOS	BI03622CH	SPEC. / ENUM.	17-Jul-92
BI017692	WO-11 R2	BENTHOS	BI03573CH	SPEC. / ENUM.	06-Oct-92
BI017692	WO-11 R2	BENTHOS	BI03576CH	SPEC. / ENUM.	06-Oct-92
BI017692	WO-11 R2	BENTHOS	BI03620CH	SPEC. / ENUM.	17-Jul-92
BI017692	WO-11 R2	BENTHOS	BI03623CH	SPEC. / ENUM.	17-Jul-92
BI017792	WO-12 O	BENTHOS	BI03577CH	SPEC. / ENUM.	06-Oct-92
BI017792	WO-12 O	BENTHOS	BI03624CH	SPEC. / ENUM.	17-Jul-92
BI017792	WO-12 R1	BENTHOS	BI03578CH	SPEC. / ENUM.	06-Oct-92
BI017792	WO-12 R1	BENTHOS	BI03625CH	SPEC. / ENUM.	17-Jul-92
BI017792	WO-12 R2	BENTHOS	BI03579CH	SPEC. / ENUM.	06-Oct-92
BI017792	WO-12 R2	BENTHOS	BI03626CH	SPEC. / ENUM.	17-Jul-92
BI017892	WO-13 O	BENTHOS	BI03580CH	SPEC. / ENUM.	06-Oct-92
BI017892	WO-13 O	BENTHOS	BI03627CH	SPEC. / ENUM.	17-Jul-92
BI017892	WO-13 R1	BENTHOS	BI03581CH	SPEC. / ENUM.	06-Oct-92
BI017892	WO-13 R1	BENTHOS	BI03628CH	SPEC. / ENUM.	17-Jul-92
BI017892	WO-13 R2	BENTHOS	BI03582CH	SPEC. / ENUM.	06-Oct-92
BI017892	WO-13 R2	BENTHOS	BI03629CH	SPEC. / ENUM.	17-Jul-92
STANDLEY LAKE					
BI018192	WO-14 O	BENTHOS	BI03583CH	SPEC. / ENUM.	13-Oct-92
BI018192	WO-14 O	BENTHOS	BI03630CH	SPEC. / ENUM.	29-Jul-92
BI018192	WO-14 O	BENTHOS	BI03633CH	SPEC. / ENUM.	29-Jul-92
BI018192	WO-14 R1	BENTHOS	BI03584CH	SPEC. / ENUM.	13-Oct-92
BI018192	WO-14 R1	BENTHOS	BI03631CH	SPEC. / ENUM.	29-Jul-92
BI018192	WO-14 R1	BENTHOS	BI03634CH	SPEC. / ENUM.	29-Jul-92
BI018192	WO-14 R2	BENTHOS	BI03585CH	SPEC. / ENUM.	13-Oct-92
BI018192	WO-14 R2	BENTHOS	BI03632CH	SPEC. / ENUM.	29-Jul-92
BI018192	WO-14 R2	BENTHOS	BI03635CH	SPEC. / ENUM.	29-Jul-92
BI018292	WO-15 O	BENTHOS	BI03586CH	SPEC. / ENUM.	13-Oct-92
BI018292	WO-15 O	BENTHOS	BI03636CH	SPEC. / ENUM.	30-Jul-92
BI018292	WO-15 R1	BENTHOS	BI03587CH	SPEC. / ENUM.	13-Oct-92
BI018292	WO-15 R1	BENTHOS	BI03637CH	SPEC. / ENUM.	30-Jul-92
BI018292	WO-15 R2	BENTHOS	BI03588CH	SPEC. / ENUM.	13-Oct-92
BI018292	WO-15 R2	BENTHOS	BI03638CH	SPEC. / ENUM.	30-Jul-92
BI018392	WO-17 O	BENTHOS	BI03589CH	SPEC. / ENUM.	13-Oct-92
BI018392	WO-17 O	BENTHOS	BI03639CH	SPEC. / ENUM.	29-Jul-92
BI018392	WO-17 R1	BENTHOS	BI03590CH	SPEC. / ENUM.	13-Oct-92

Table C-11
Summary of Benthos Sampling

Location Code	Work Plan ID	Matrix	Sample Number	Sample Analysis	Date Collected
BI018392	WO-17 R1	BENTHOS	BI03640CH	SPEC. / ENUM.	29-Jul-92
BI018392	WO-17 R2	BENTHOS	BI03591CH	SPEC. / ENUM.	13-Oct-92
BI018392	WO-17 R2	BENTHOS	BI03641CH	SPEC. / ENUM.	29-Jul-92
BI018492	WO-16 O	BENTHOS	BI03592CH	SPEC. / ENUM.	14-Oct-92
BI018492	WO-16 O	BENTHOS	BI03642CH	SPEC. / ENUM.	05-Aug-92
BI018492	WO-16 R1	BENTHOS	BI03593CH	SPEC. / ENUM.	14-Oct-92
BI018492	WO-16 R1	BENTHOS	BI03643CH	SPEC. / ENUM.	05-Aug-92
BI018492	WO-16 R2	BENTHOS	BI03594CH	SPEC. / ENUM.	14-Oct-92
BI018492	WO-16 R2	BENTHOS	BI03644CH	SPEC. / ENUM.	05-Aug-92

Table C-12
Summary of Periphyton Sampling

Location Code	Matrix	Sample Number	Sample Analysis	Date Collected	Comments
GREAT WESTERN RESERVOIR					
BI019192	PERIPHYTON	BI03650CH	ALGAL DENSITY / BIOMASS / TAXONOMY	11-Sep-92	REFERENCE SITE
BI019292	PERIPHYTON	BI03651CH	ALGAL DENSITY / BIOMASS / TAXONOMY	11-Sep-92	
BI019392	PERIPHYTON	BI03652CH	ALGAL DENSITY / BIOMASS / TAXONOMY	11-Sep-92	
MOWER RESERVOIR					
BI019492	PERIPHYTON	BI03653CH	ALGAL DENSITY / BIOMASS / TAXONOMY	11-Sep-92	
BI019592	PERIPHYTON	BI03654CH	ALGAL DENSITY / BIOMASS / TAXONOMY	11-Sep-92	
BI019692	PERIPHYTON	BI03655CH	ALGAL DENSITY / BIOMASS / TAXONOMY	11-Sep-92	
STANDLEY LAKE					
BI019792	PERIPHYTON	BI03656CH	ALGAL DENSITY / BIOMASS / TAXONOMY	11-Sep-92	
BI019892	PERIPHYTON	BI03657CH	ALGAL DENSITY / BIOMASS / TAXONOMY	11-Sep-92	
BI019992	PERIPHYTON	BI03658CH	ALGAL DENSITY / BIOMASS / TAXONOMY	11-Sep-92	

Table C-13
Summary of Bioassay Sampling

Location Code	Work Plan ID	Matrix	Sample Number	Sample Analysis	Date Collected
WALNUT CREEK					
SED00392	WN-3	SED	BI03803CH	TOXICITY	13-Aug-92
SED00392	WN-3	SED	SD06031CH	SPECIFIC GRAVITY / GRAIN SIZE	13-Aug-92
SED00392	WN-3	SED	SD06031CH	TOC	13-Aug-92
SED00392	WN-3	SW	BI03804CH	TOXICITY-1	10-Aug-92
SED00392	WN-3	SW	BI03804CH	TOXICITY-1	12-Aug-92
SED00392	WN-3	SW	BI03804CH	TOXICITY-1	14-Aug-92
SED00392	WN-3	SW	BI03814CH	TOXICITY-2	02-Sep-92
SED00392	WN-3	SW	BI03814CH	TOXICITY-2	03-Sep-92
SED00392	WN-3	SW	BI03814CH	TOXICITY-2	04-Sep-92
USGS STA. CODE					
SED01392		SED	BI03811CH	TOXICITY	13-Aug-92
SED01392		SED	SD06035CH	SPECIFIC GRAVITY / GRAIN SIZE	13-Aug-92
SED01392		SED	SD06035CH	TOC	13-Aug-92
SED01392		SW	BI03812CH	TOXICITY-1	10-Aug-92
SED01392		SW	BI03812CH	TOXICITY-1	12-Aug-92
SED01392		SW	BI03812CH	TOXICITY-1	14-Aug-92
SED01392		SW	BI03816CH	TOXICITY-2	02-Sep-92
SED01392		SW	BI03816CH	TOXICITY-2	03-Sep-92
SED01392		SW	BI03816CH	TOXICITY-2	04-Sep-92
WOMAN CREEK					
SED02092	WO-2	SED	BI03805CH	TOXICITY	13-Aug-92
SED02092	WO-2	SED	SD06032CH	SPECIFIC GRAVITY / GRAIN SIZE	13-Aug-92
SED02092	WO-2	SED	SD06032CH	TOC	13-Aug-92
SED02092	WO-2	SW	BI03806CH	TOXICITY-1	10-Aug-92
SED02092	WO-2	SW	BI03806CH	TOXICITY-1	12-Aug-92
SED02092	WO-2	SW	BI03806CH	TOXICITY-1	14-Aug-92
SED02092	WO-2	SW	BI03815CH	TOXICITY-2	02-Sep-92
SED02092	WO-2	SW	BI03815CH	TOXICITY-2	03-Sep-92
SED02092	WO-2	SW	BI03815CH	TOXICITY-2	04-Sep-92
BIG DRY CREEK					
SED02592	WO-3	SED	BI03801CH	TOXICITY	13-Aug-92
SED02592	WO-3	SED	SD06030CH	SPECIFIC GRAVITY / GRAIN SIZE	13-Aug-92
SED02592	WO-3	SED	SD06030CH	TOC	13-Aug-92

Table C-13
Summary of Bioassay Sampling

Location Code	Work Plan ID	Matrix	Sample Number	Sample Analysis	Date Collected
SED02592	WO-3	SW	BI03802CH	TOXICITY-1	10-Aug-92
SED02592	WO-3	SW	BI03802CH	TOXICITY-1	12-Aug-92
SED02592	WO-3	SW	BI03802CH	TOXICITY-1	14-Aug-92
MOWER RESERVOIR					
SED15192	WO-11	SED	BI03807CH	TOXICITY	13-Aug-92
SED15192	WO-11	SED	SD06033CH	SPECIFIC GRAVITY / GRAIN SIZE	13-Aug-92
SED15192	WO-11	SED	SD06033CH	TOC	13-Aug-92
SED15192	WO-11	SW	BI03808CH	TOXICITY-1	10-Aug-92
SED15192	WO-11	SW	BI03808CH	TOXICITY-1	12-Aug-92
SED15192	WO-11	SW	BI03808CH	TOXICITY-1	14-Aug-92
SED15292	WO-12	SED	BI03809CH	TOXICITY	13-Aug-92
SED15292	WO-12	SED	SD06034CH	SPECIFIC GRAVITY / GRAIN SIZE	13-Aug-92
SED15292	WO-12	SED	SD06034CH	TOC	13-Aug-92
SED15292	WO-12	SW	BI03810CH	TOXICITY-1	10-Aug-92
SED15292	WO-12	SW	BI03810CH	TOXICITY-1	12-Aug-92
SED15292	WO-12	SW	BI03810CH	TOXICITY-1	14-Aug-92
REFERENCE STATION					
SEDREF92		SED	BI03813CH	TOXICITY	13-Aug-92
SEDREF92		SED	SD06036CH	SPECIFIC GRAVITY / GRAIN SIZE	13-Aug-92
SEDREF92		SED	SD06036CH	TOC	13-Aug-92

APPENDIX D

OU 3 SUMMARY STATISTICS AND BACKGROUND SUMMARY STATISTICS BY ANALYTE

Appendix D presents a statistical summary of OU 3 data and benchmark data for soil, sediment, surface water, and groundwater. The summary statistics for each analyte by IHSS and type include: number of detects, number of samples, frequency of detection, minimum and maximum nondetected values, minimum and maximum detected values, arithmetic mean, standard deviation, and coefficient of variation.

Following is a list of summary statistics of OU 3 data with a comparison to benchmark data. The tables are grouped by media, IHSS, and type (lake or creek).

Table D-1	Summary Statistics for OU 3 Surface Sediments; Comparison to Benchmark Data
Table D-2	Summary Statistics for OU 3 Subsurface Sediments; Comparison to Benchmark Data
Table D-3	Summary Statistics for OU 3 Surface Water; Comparison to Benchmark Data
Table D-4	Summary Statistics for OU 3 Groundwater; Comparison to Benchmark Data
Table D-5	RFP OU 3 Trench Data Summary Statistics
Table D-6	IHSS 199 RFI/RI Surface-Soil Samples
Table D-7	Remedy Lands Surface-Soil Samples

Table D-1
SUMMARY STATISTICS FOR OU 3 SURFACE SEDIMENTS
COMPARISON TO BENCHMARK DATA

Chemical Name	Unit	Data Source	Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean	Standard Deviation	Coefficient of Variation
METALS														
ALUMINUM	mg/kg	BGCR	CREEK	B	59	59	1.00			549.00	25200.00	5887.610	4912.73	
ALUMINUM	mg/kg	IHSS 200	CREEK	S	8	8	1.00			2220.00	13800.00	8233.750	3848.05	0.47
ALUMINUM	mg/kg	IHSS 201	CREEK	S	14	14	1.00			1900.00	33200.00	8030.714	7958.47	0.99
ALUMINUM	mg/kg	IHSS 202	CREEK	S	4	4	1.00			9110.00	15200.00	11227.500	2718.15	0.24
ALUMINUM	mg/kg	LOWRY	CREEK	B							32100.00	13959.330	7080.88	
ALUMINUM	mg/kg	CC-BM	LAKE	B						96700.00	96700.00			
ALUMINUM	mg/kg	IHSS 200	LAKE	S	36	36	1.00			4530.00	20800.00	10910.833	4212.31	0.39
ALUMINUM	mg/kg	IHSS 201	LAKE	S	43	43	1.00			852.00	23500.00	9834.814	6623.01	0.67
ALUMINUM	mg/kg	IHSS 202	LAKE	S	15	15	1.00			7480.00	18300.00	14370.000	3096.10	0.22
ANTIMONY	mg/kg	BGCR	CREEK	B						0.80	12.40	3.290	2.73	
ANTIMONY	mg/kg	IHSS 200	CREEK	S	5	8	0.63	1.80	2.40	6.50	11.30	6.469	3.84	0.59
ANTIMONY	mg/kg	IHSS 201	CREEK	S	1	13	0.08	2.30	6.70	6.40	6.40	3.708	1.60	0.43
ANTIMONY	mg/kg	IHSS 202	CREEK	S	1	4	0.25	5.25	6.15	16.50	16.50	8.300	5.48	0.66
ANTIMONY	mg/kg	IHSS 200	LAKE	S	6	15	0.40	2.40	3.10	5.90	13.20	5.017	3.49	0.70
ANTIMONY	mg/kg	IHSS 201	LAKE	S	3	21	0.14	1.75	7.55	4.90	6.90	3.181	1.72	0.54
ANTIMONY	mg/kg	IHSS 202	LAKE	S	1	6	0.17	4.60	44.40	17.30	17.30	14.858	15.23	1.03
ARSENIC	mg/kg	BGCR	CREEK	B	53	59	0.90			0.20	17.30	2.410	2.45	
ARSENIC	mg/kg	IHSS 200	CREEK	S	8	8	1.00			3.70	9.40	5.313	1.85	0.35
ARSENIC	mg/kg	IHSS 201	CREEK	S	14	14	1.00			2.20	7.80	4.764	1.53	0.32
ARSENIC	mg/kg	IHSS 202	CREEK	S	4	4	1.00			3.00	6.80	4.875	1.56	0.32
ARSENIC	mg/kg	LOWRY	CREEK	B							16.50	4.810	3.95	
ARSENIC	mg/kg	CC-BM	LAKE	B						5.57	5.57			
ARSENIC	mg/kg	IHSS 200	LAKE	S	36	36	1.00			2.60	9.40	4.906	1.46	0.30
ARSENIC	mg/kg	IHSS 201	LAKE	S	43	43	1.00			1.20	17.70	6.963	4.34	0.62
ARSENIC	mg/kg	IHSS 202	LAKE	S	15	15	1.00			2.20	10.40	5.147	1.96	0.38
ARSENIC	mg/kg	RMNP-BM (L. Husted)	LAKE	B								2.500	0.20	
ARSENIC	mg/kg	RMNP-BM (L. Louise)	LAKE	B								2.500	0.30	
ARSENIC	mg/kg	RMNP-BM (L. Haiyaha)	LAKE	B								8.400	0.20	
ARSENIC	mg/kg	RMNP-BM (The Loch)	LAKE	B								1.400	0.20	
BARIUM	mg/kg	BGCR	CREEK	B	57	57	1.00			10.60	244.00	77.910	56.38	
BARIUM	mg/kg	IHSS 200	CREEK	S	8	8	1.00			78.60	243.00	136.713	50.49	0.37
BARIUM	mg/kg	IHSS 201	CREEK	S	14	14	1.00			85.00	329.00	150.714	59.75	0.40

Table D-1
SUMMARY STATISTICS FOR OU 3 SURFACE SEDIMENTS
COMPARISON TO BENCHMARK DATA

Chemical Name	Unit	Data Source	Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean	Standard Deviation	Coefficient of Variation
BARIUM	mg/kg	IHSS 202	CREEK	S	4	4	1.00			81.50	296.00	150.950	100.64	0.67
BARIUM	mg/kg	LOWRY	CREEK	B							440.00	220.640	76.59	
BARIUM	mg/kg	CC-BM	LAKE	B						591.00	591.00			
BARIUM	mg/kg	IHSS 200	LAKE	S	36	36	1.00			38.20	190.00	128.989	38.71	0.30
BARIUM	mg/kg	IHSS 201	LAKE	S	43	43	1.00			10.80	196.00	101.372	56.65	0.56
BARIUM	mg/kg	IHSS 202	LAKE	S	15	15	1.00			103.00	250.00	173.000	47.92	0.28
BERYLLIUM	mg/kg	BGCR	CREEK	B	27	57	0.47			1.50	1.30	0.660	1.69	
BERYLLIUM	mg/kg	IHSS 200	CREEK	S	8	8	1.00			0.24	1.60	0.851	0.38	0.45
BERYLLIUM	mg/kg	IHSS 201	CREEK	S	14	14	1.00			0.22	1.50	0.577	0.31	0.54
BERYLLIUM	mg/kg	IHSS 202	CREEK	S	3	3	1.00			0.41	1.40	0.783	0.54	0.69
BERYLLIUM	mg/kg	LOWRY	CREEK	B							2.10	1.040	0.48	
BERYLLIUM	mg/kg	CC-BM	LAKE	B						4.03	4.03			
BERYLLIUM	mg/kg	IHSS 200	LAKE	S	36	36	1.00			0.37	1.40	0.850	0.27	0.31
BERYLLIUM	mg/kg	IHSS 201	LAKE	S	39	43	0.91	0.06	0.07	0.15	1.60	0.700	0.47	0.67
BERYLLIUM	mg/kg	IHSS 202	LAKE	S	13	14	0.93	1.00	1.00	0.54	1.50	1.061	0.27	0.25
BERYLLIUM	mg/kg	RMNP-BM (L. Husted)	LAKE	B								3.900	1.00	
BERYLLIUM	mg/kg	RMNP-BM (L. Louise)	LAKE	B								5.000	3.00	
BERYLLIUM	mg/kg	RMNP-BM (L. Haiyaha)	LAKE	B								9.300	1.10	
BERYLLIUM	mg/kg	RMNP-BM (The Loch)	LAKE	B								7.400	1.30	
CADMIUM	mg/kg	BGCR	CREEK	B	6	51	0.12			0.13	1.30	0.540	0.36	
CADMIUM	mg/kg	IHSS 200	CREEK	S	3	8	0.38	0.22	0.31	0.41	1.60	0.590	0.57	0.96
CADMIUM	mg/kg	IHSS 201	CREEK	S	7	14	0.50	0.21	0.75	0.77	6.30	1.802	1.79	0.99
CADMIUM	mg/kg	IHSS 202	CREEK	S		4		0.47	0.95			0.593	0.24	0.40
CADMIUM	mg/kg	LOWRY	CREEK	B							3.80	1.040	0.99	
CADMIUM	mg/kg	CC-BM	LAKE	B						0.05	0.05			
CADMIUM	mg/kg	IHSS 200	LAKE	S	14	36	0.39	0.20	0.45	0.58	1.70	0.568	0.43	0.76
CADMIUM	mg/kg	IHSS 201	LAKE	S	22	37	0.59	0.18	0.30	0.54	5.00	1.719	1.60	0.93
CADMIUM	mg/kg	IHSS 202	LAKE	S		8		0.35	3.95			0.986	1.22	1.23
CADMIUM	mg/kg	RMNP-BM (L. Husted)	LAKE	B								0.700	0.04	
CADMIUM	mg/kg	RMNP-BM (L. Louise)	LAKE	B								0.500	0.30	
CADMIUM	mg/kg	RMNP-BM (L. Haiyaha)	LAKE	B								0.340	0.03	
CADMIUM	mg/kg	RMNP-BM (The Loch)	LAKE	B								0.320	0.05	
CALCIUM	mg/kg	BGCR	CREEK	B	58	59	0.98			93.50	17100.00	3658.240	4663.60	
CALCIUM	mg/kg	IHSS 200	CREEK	S	8	8	1.00			1570.00	18300.00	7762.500	5522.52	0.71

Table D-1
SUMMARY STATISTICS FOR OU 3 SURFACE SEDIMENTS
COMPARISON TO BENCHMARK DATA

Chemical Name	Unit	Data Source	Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean	Standard Deviation	Coefficient of Variation
CALCIUM	mg/kg	IHSS 201	CREEK	S	14	14	1.00			911.00	75000.00	13887.214	20983.28	1.51
CALCIUM	mg/kg	IHSS 202	CREEK	S	4	4	1.00			6480.00	59400.00	22077.500	25024.06	1.13
CALCIUM	mg/kg	CC-BM	LAKE	B						12.00	12.00			
CALCIUM	mg/kg	IHSS 200	LAKE	S	36	36	1.00			3260.00	33900.00	7465.000	5909.62	0.79
CALCIUM	mg/kg	IHSS 201	LAKE	S	43	43	1.00			427.00	90100.00	8091.930	14021.39	1.73
CALCIUM	mg/kg	IHSS 202	LAKE	S	15	15	1.00			7050.00	42000.00	15209.333	8374.69	0.55
CALCIUM	mg/kg	RMNP-BM (L. Husted)	LAKE	B								26.000	1.00	
CALCIUM	mg/kg	RMNP-BM (L. Louise)	LAKE	B								34.100	0.10	
CALCIUM	mg/kg	RMNP-BM (L. Haiyaha)	LAKE	B								54.000	5.00	
CALCIUM	mg/kg	RMNP-BM (The Loch)	LAKE	B								47.000	6.00	
CESIUM	mg/kg	BGCR	CREEK	B	10	56	0.18				157.00	69.290	63.88	
CESIUM	mg/kg	IHSS 200	CREEK	S		8		44.95	66.50			53.381	8.03	0.15
CESIUM	mg/kg	IHSS 201	CREEK	S	3	14	0.21	6.95	104.50	3.10	19.90	40.850	32.84	0.80
CESIUM	mg/kg	IHSS 202	CREEK	S	3	4	0.75	126.50	126.50	1.80	2.00	33.050	62.30	1.89
CESIUM	mg/kg	IHSS 200	LAKE	S	9	36	0.25	6.90	78.50	14.10	29.70	36.006	26.06	0.72
CESIUM	mg/kg	IHSS 201	LAKE	S		37		5.80	71.00			26.968	25.39	0.94
CESIUM	mg/kg	IHSS 202	LAKE	S	1	9	0.11	1.25	15.75	69.80	69.80	14.744	21.57	1.46
CHROMIUM	mg/kg	BGCR	CREEK	B	47	59	0.80			0.48	29.70	8.130	7.42	
CHROMIUM	mg/kg	IHSS 200	CREEK	S	6	8	0.75	0.19	0.27	2.40	12.70	4.894	4.61	0.94
CHROMIUM	mg/kg	IHSS 201	CREEK	S	14	14	1.00			2.70	31.90	8.807	7.14	0.81
CHROMIUM	mg/kg	IHSS 202	CREEK	S	4	4	1.00			6.80	17.00	12.650	5.12	0.41
CHROMIUM	mg/kg	LOWRY	CREEK	B							22.90	12.350	5.54	
CHROMIUM	mg/kg	IHSS 200	LAKE	S	36	36	1.00			3.70	19.80	10.947	3.79	0.35
CHROMIUM	mg/kg	IHSS 201	LAKE	S	40	43	0.93	0.22	0.24	0.89	21.40	9.897	6.91	0.70
CHROMIUM	mg/kg	IHSS 202	LAKE	S	14	15	0.93	4.40	4.40	5.10	22.10	14.800	5.14	0.35
COBALT	mg/kg	BGCR	CREEK	B	43	59	0.23			0.30	15.00	5.040	3.29	
COBALT	mg/kg	IHSS 200	CREEK	S	8	8	1.00			4.50	23.30	11.250	6.00	0.53
COBALT	mg/kg	IHSS 201	CREEK	S	14	14	1.00			2.90	10.90	7.900	2.20	0.28
COBALT	mg/kg	IHSS 202	CREEK	S	4	4	1.00			6.30	9.60	7.825	1.36	0.17
COBALT	mg/kg	LOWRY	CREEK	B							14.00	9.200	2.86	
COBALT	mg/kg	CC-BM	LAKE	B						21.30	21.30			
COBALT	mg/kg	IHSS 200	LAKE	S	36	36	1.00			3.50	13.50	8.664	2.03	0.23
COBALT	mg/kg	IHSS 201	LAKE	S	43	43	1.00			1.30	13.20	7.049	3.53	0.50
COBALT	mg/kg	IHSS 202	LAKE	S	14	15	0.93	5.85	5.85	4.40	15.30	8.357	2.55	0.31

Table D-1
SUMMARY STATISTICS FOR OU 3 SURFACE SEDIMENTS
COMPARISON TO BENCHMARK DATA

Chemical Name	Unit	Data Source	Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean	Standard Deviation	Coefficient of Variation
COPPER	mg/kg	BGCR	CREEK	B	43	59	0.73			10.15	36.70	10.150	7.86	
COPPER	mg/kg	IHSS 200	CREEK	S	8	8	1.00			8.90	37.50	20.525	8.20	0.40
COPPER	mg/kg	IHSS 201	CREEK	S	14	14	1.00			12.90	52.30	30.293	13.27	0.44
COPPER	mg/kg	IHSS 202	CREEK	S	4	4	1.00			7.30	18.20	11.125	4.83	0.43
COPPER	mg/kg	LOWRY	CREEK	B							48.30	17.580	8.98	
COPPER	mg/kg	CC-BM	LAKE	B						43.40	43.40			
COPPER	mg/kg	IHSS 200	LAKE	S	36	36	1.00			8.10	129.00	48.567	37.57	0.77
COPPER	mg/kg	IHSS 201	LAKE	S	43	43	1.00			1.20	183.00	67.919	64.90	0.96
COPPER	mg/kg	IHSS 202	LAKE	S	14	15	0.93	11.65	11.65	11.10	50.10	26.797	12.47	0.47
CYANIDE	mg/kg	IHSS 201	CREEK	S		3		0.330	0.445			0.382	0.058	
CYANIDE	mg/kg	IHSS 201	LAKE	S		21		0.305	1.250			0.440	0.199	
CYANIDE	mg/kg	IHSS 200	LAKE	S		21		0.70	0.800			0.526	0.150	
CYANIDE	mg/kg	IHSS 202	LAKE	S		6		0.600	0.90			0.767	0.121	
IRON	mg/kg	BGCR	CREEK	B	59	59	1.00			1040.00	31400.00	8852.630	6263.19	
IRON	mg/kg	IHSS 200	CREEK	S	8	8	1.00			9430.00	51700.00	25816.250	14443.51	0.56
IRON	mg/kg	IHSS 201	CREEK	S	14	14	1.00			5670.00	26600.00	15397.857	5232.17	0.34
IRON	mg/kg	IHSS 202	CREEK	S	4	4	1.00			14300.00	27000.00	19200.000	5832.67	0.30
IRON	mg/kg	CC-BM	LAKE	B						49700.00	49700.00			
IRON	mg/kg	IHSS 200	LAKE	S	36	36	1.00			4670.00	53900.00	16888.333	8712.93	0.52
IRON	mg/kg	IHSS 201	LAKE	S	43	43	1.00			3100.00	28300.00	14866.512	6835.61	0.46
IRON	mg/kg	IHSS 202	LAKE	S	15	15	1.00			10800.00	48000.00	19886.667	8631.99	0.43
IRON	mg/kg	RMNP-BM (L. Husted)	LAKE	B								1600.000	40.00	
IRON	mg/kg	RMNP-BM (L. Louise)	LAKE	B								2400.000	100.00	
IRON	mg/kg	RMNP-BM (L. Haiyaha)	LAKE	B								6200.000	900.00	
IRON	mg/kg	RMNP-BM (The Loch)	LAKE	B								2300.000	300.00	
LEAD	mg/kg	BGCR	CREEK	B	59	59	1.00			2.10	244.00	22.020	36.79	
LEAD	mg/kg	IHSS 200	CREEK	S	8	8	1.00			5.30	36.20	18.513	9.36	0.51
LEAD	mg/kg	IHSS 201	CREEK	S	14	14	1.00			17.20	91.40	38.450	21.06	0.55
LEAD	mg/kg	IHSS 202	CREEK	S	4	4	1.00			12.30	21.60	16.775	3.81	0.23
LEAD	mg/kg	LOWRY	CREEK	B							380.00	28.290	66.79	
LEAD	mg/kg	CC-BM	LAKE	B						55.00	55.00			
LEAD	mg/kg	IHSS 200	LAKE	S	36	36	1.00			13.00	88.20	31.372	18.61	0.59
LEAD	mg/kg	IHSS 201	LAKE	S	43	43	1.00			2.90	317.00	63.747	67.11	1.05
LEAD	mg/kg	IHSS 202	LAKE	S	15	15	1.00			14.50	40.80	29.987	7.75	0.26
LEAD	mg/kg	RMNP-BM (L. Husted)	LAKE	B										
LEAD	mg/kg	RMNP-BM (L. Louise)	LAKE	B								43.000	0.00	

Table D-1
SUMMARY STATISTICS FOR OU 3 SURFACE SEDIMENTS
COMPARISON TO BENCHMARK DATA

Chemical Name	Unit	Data Source	Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean	Standard Deviation	Coefficient of Variation
LEAD	mg/kg	RMNP-BM (L. Haiyaha)	LAKE	B								26.000	2.00	
LEAD	mg/kg	RMNP-BM (The Loch)	LAKE	B								14.000	2.00	
LITHIUM	mg/kg	BGCR	CREEK	B	41	57	0.72			1.15	20.20	7.480	5.26	
LITHIUM	mg/kg	IHSS 200	CREEK	S	8	8	1.00			1.80	11.50	6.650	3.19	0.48
LITHIUM	mg/kg	IHSS 201	CREEK	S	14	14	1.00			2.10	34.60	8.207	8.31	1.01
LITHIUM	mg/kg	IHSS 202	CREEK	S	4	4	1.00			7.10	16.20	9.475	4.49	0.47
LITHIUM	mg/kg	IHSS 200	LAKE	S	36	36	1.00			3.10	17.60	8.958	3.09	0.34
LITHIUM	mg/kg	IHSS 201	LAKE	S	42	43	0.98	0.24	0.24	0.53	17.10	7.529	4.84	0.64
LITHIUM	mg/kg	IHSS 202	LAKE	S	14	15	0.93	7.95	7.95	7.00	13.90	11.017	2.37	0.22
MAGNESIUM	mg/kg	BGCR	CREEK	B	54	59	0.92			125.50	5850.00	1473.770	1252.57	
MAGNESIUM	mg/kg	IHSS 200	CREEK	S	8	8	1.00			684.00	4180.00	2305.500	1039.53	0.45
MAGNESIUM	mg/kg	IHSS 201	CREEK	S	14	14	1.00			595.00	9480.00	2531.071	2234.40	0.88
MAGNESIUM	mg/kg	IHSS 202	CREEK	S	4	4	1.00			2270.00	4460.00	2887.500	1053.58	0.36
MAGNESIUM	mg/kg	IHSS 200	LAKE	S	36	36	1.00			1280.00	5140.00	2871.667	791.80	0.28
MAGNESIUM	mg/kg	IHSS 201	LAKE	S	43	43	1.00			197.00	6430.00	2683.442	1632.54	0.61
MAGNESIUM	mg/kg	IHSS 202	LAKE	S	15	15	1.00			2480.00	5040.00	4064.000	662.17	0.16
MANGANESE	mg/kg	BGCR	CREEK	B	58	59	0.98			9.00	1280.00	227.820	215.48	
MANGANESE	mg/kg	IHSS 200	CREEK	S	8	8	1.00			155.00	1550.00	684.000	526.56	0.77
MANGANESE	mg/kg	IHSS 201	CREEK	S	14	14	1.00			83.50	4450.00	1706.179	1447.03	0.85
MANGANESE	mg/kg	IHSS 202	CREEK	S	4	4	1.00			238.00	1170.00	548.000	423.63	0.77
MANGANESE	mg/kg	LOWRY	CREEK	B							1560.00	605.100	281.36	
MANGANESE	mg/kg	CC-BM	LAKE	B						739.00	739.00			
MANGANESE	mg/kg	IHSS 200	LAKE	S	36	36	1.00			40.50	813.00	425.914	211.90	0.50
MANGANESE	mg/kg	IHSS 201	LAKE	S	43	43	1.00			89.60	2080.00	595.379	592.16	0.99
MANGANESE	mg/kg	IHSS 202	LAKE	S	15	15	1.00			148.00	925.00	297.800	194.93	0.65
MERCURY	mg/kg	BGCR	CREEK	B	2	49	0.04			0.01	0.05	0.080	0.06	
MERCURY	mg/kg	IHSS 200	CREEK	S		8		0.03	0.07			0.046	0.01	0.25
MERCURY	mg/kg	IHSS 201	CREEK	S	3	14	0.21	0.03	0.08	0.08	0.14	0.061	0.03	0.51
MERCURY	mg/kg	IHSS 202	CREEK	S		4		0.03	0.11			0.045	0.04	0.89
MERCURY	mg/kg	LOWRY	CREEK	B							0.29	0.080	0.06	
MERCURY	mg/kg	CC-BM	LAKE	B						0.06	0.06			
MERCURY	mg/kg	IHSS 200	LAKE	S	4	36	0.11	0.03	0.08	0.10	0.20	0.063	0.03	0.51
MERCURY	mg/kg	IHSS 201	LAKE	S	18	42	0.43	0.00	0.10	0.08	0.60	0.116	0.12	1.06
MERCURY	mg/kg	IHSS 202	LAKE	S	1	8	0.13	0.04	0.23	0.10	0.10	0.081	0.06	0.77

Table D-1
SUMMARY STATISTICS FOR OU 3 SURFACE SEDIMENTS
COMPARISON TO BENCHMARK DATA

Chemical Name	Unit	Data Source	Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean	Standard Deviation	Coefficient of Variation
MERCURY	mg/kg	RMNP-BM (L. Husted)	LAKE	B								0.030	0.01	
MERCURY	mg/kg	RMNP-BM (L. Louise)	LAKE	B								0.065	0.01	
MERCURY	mg/kg	RMNP-BM (L. Haiyaha)	LAKE	B								0.050	0.00	
MERCURY	mg/kg	RMNP-BM (The Loch)	LAKE	B								0.040	0.01	
MOLYBDENUM	mg/kg	BGCR	CREEK	B	16	58	0.28			0.33	9.60	4.470	5.23	
MOLYBDENUM	mg/kg	IHSS 200	CREEK	S	6	8	0.75	0.80	0.80	3.60	17.90	7.838	6.30	0.80
MOLYBDENUM	mg/kg	IHSS 201	CREEK	S	6	14	0.43	0.35	2.30	1.60	6.70	2.379	1.87	0.78
MOLYBDENUM	mg/kg	IHSS 202	CREEK	S		4		1.80	2.10			1.900	0.14	0.07
MOLYBDENUM	mg/kg	CC-BM	LAKE	B						22.00	22.00			
MOLYBDENUM	mg/kg	IHSS 200	LAKE	S	23	36	0.64	0.24	0.85	0.58	13.30	3.077	3.47	1.13
MOLYBDENUM	mg/kg	IHSS 201	LAKE	S	20	37	0.54	0.20	1.25	0.69	7.70	1.910	2.17	1.14
MOLYBDENUM	mg/kg	IHSS 202	LAKE	S		8		0.42	15.40			3.389	5.02	1.48
NICKEL	mg/kg	BGCR	CREEK	B	39	57	0.68			0.65	25.60	6.750	5.38	
NICKEL	mg/kg	IHSS 200	CREEK	S	8	8	1.00			10.00	72.70	25.200	20.31	0.81
NICKEL	mg/kg	IHSS 201	CREEK	S	13	14	0.93	3.15	3.15	8.60	22.60	14.811	5.53	0.37
NICKEL	mg/kg	IHSS 202	CREEK	S	3	4	0.75	3.55	3.55	14.90	16.90	12.588	6.09	0.48
NICKEL	mg/kg	LOWRY	CREEK	B							131.00	15.450	22.29	
NICKEL	mg/kg	CC-BM	LAKE	B						26.20	26.20			
NICKEL	mg/kg	IHSS 200	LAKE	S	36	36	1.00			5.70	22.70	15.725	3.96	0.25
NICKEL	mg/kg	IHSS 201	LAKE	S	40	43	0.93	1.20	1.35	3.40	23.70	12.338	6.64	0.54
NICKEL	mg/kg	IHSS 202	LAKE	S	12	15	0.80	4.85	29.90	10.50	29.20	17.087	6.70	0.39
NICKEL	mg/kg	RMNP-BM (L. Husted)	LAKE	B								9.600	0.20	
NICKEL	mg/kg	RMNP-BM (L. Louise)	LAKE	B								10.000	0.00	
NICKEL	mg/kg	RMNP-BM (L. Haiyaha)	LAKE	B								12.300	0.60	
NICKEL	mg/kg	RMNP-BM (The Loch)	LAKE	B								18.000	2.00	
POTASSIUM	mg/kg	BGCR	CREEK	B	43	58	0.24			57.00	3770.00	835.340	749.42	
POTASSIUM	mg/kg	IHSS 200	CREEK	S	8	8	1.00			548.00	2090.00	1210.375	579.40	0.48
POTASSIUM	mg/kg	IHSS 201	CREEK	S	14	14	1.00			549.00	8390.00	1794.857	1993.05	1.11
POTASSIUM	mg/kg	IHSS 202	CREEK	S	4	4	1.00			1210.00	2760.00	1745.000	691.40	0.40
POTASSIUM	mg/kg	CC-BM	LAKE	B						15100.00	15100.00			
POTASSIUM	mg/kg	IHSS 200	LAKE	S	36	36	1.00			402.00	2700.00	1573.750	598.93	0.38
POTASSIUM	mg/kg	IHSS 201	LAKE	S	43	43	1.00			183.00	3630.00	1734.512	1138.91	0.66
POTASSIUM	mg/kg	IHSS 202	LAKE	S	14	15	0.93	2755.00	2755.00	1370.00	3450.00	2777.000	639.00	0.23
SELENIUM	mg/kg	BGCR	CREEK	B	13	58	0.22			0.10	2.90	0.420		
SELENIUM	mg/kg	IHSS 200	CREEK	S	6	8	0.75	0.11	0.11	0.44	0.77	0.487	0.26	0.53

Table D-1
SUMMARY STATISTICS FOR OU 3 SURFACE SEDIMENTS
COMPARISON TO BENCHMARK DATA

Chemical Name	Unit	Data Source	Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean	Standard Deviation	Coefficient of Variation
SELENIUM	mg/kg	IHSS 201	CREEK	S	3	14	0.21	0.10	0.60	1.50	2.20	0.598	0.74	1.24
SELENIUM	mg/kg	IHSS 202	CREEK	S		4		0.11	0.28			0.190	0.07	0.36
SELENIUM	mg/kg	CC-BM	LAKE	B						1.10	1.10			
SELENIUM	mg/kg	IHSS 200	LAKE	S	13	22	0.59	0.10	1.10	0.24	4.00	0.888	1.04	1.17
SELENIUM	mg/kg	IHSS 201	LAKE	S	9	32	0.28	0.10	3.55	0.18	4.50	0.892	1.02	1.15
SELENIUM	mg/kg	IHSS 202	LAKE	S	3	11	0.27	0.15	1.60	1.90	5.70	1.723	2.00	1.16
SELENIUM	mg/kg	RMNP-BM (L. Husted)	LAKE	B								1.800	0.10	
SELENIUM	mg/kg	RMNP-BM (L. Louise)	LAKE	B								1.200	0.10	
SELENIUM	mg/kg	RMNP-BM (L. Haiyaha)	LAKE	B								1.800	0.40	
SELENIUM	mg/kg	RMNP-BM (The Loch)	LAKE	B								1.100	0.30	
SILICON	mg/kg	BGCR	CREEK	B	19	19	1.00				1450.00	331.530	362.31	
SILICON	mg/kg	IHSS 200	CREEK	S	8	8	1.00			128.00	1020.00	459.125	365.62	0.80
SILICON	mg/kg	IHSS 201	CREEK	S	8	8	1.00			281.00	3290.00	1167.500	937.25	0.80
SILICON	mg/kg	IHSS 202	CREEK	S	1	1	1.00			412.00	412.00	412.000		
SILICON	mg/kg	IHSS 200	LAKE	S	15	15	1.00			115.00	650.00	237.667	125.31	0.53
SILICON	mg/kg	IHSS 201	LAKE	S	13	13	1.00			82.00	396.00	197.308	79.13	0.40
SILVER	mg/kg	BGCR	CREEK	B	2	54	0.04			0.20	3.40	0.660	0.52	
SILVER	mg/kg	IHSS 200	CREEK	S	7	8	0.88	0.26	0.26	1.20	4.00	2.382	1.35	0.57
SILVER	mg/kg	IHSS 201	CREEK	S	8	14	0.57	0.25	0.75	0.79	2.10	0.942	0.58	0.62
SILVER	mg/kg	IHSS 202	CREEK	S	1	4	0.25	0.43	0.43	1.90	1.90	0.796	0.74	0.92
SILVER	mg/kg	CC-BM	LAKE	B						0.05	0.05			
SILVER	mg/kg	IHSS 200	LAKE	S	28	36	0.78	0.26	0.95	1.10	6.00	1.917	1.13	0.59
SILVER	mg/kg	IHSS 201	LAKE	S	31	35	0.89	0.23	0.50	0.48	7.70	1.995	1.77	0.89
SILVER	mg/kg	IHSS 202	LAKE	S	2	8	0.25	0.60	3.60	1.50	1.90	1.400	0.99	0.71
SODIUM	mg/kg	BGCR	CREEK	B	47	59	0.80			162.00	637.00	161.470	136.80	
SODIUM	mg/kg	IHSS 200	CREEK	S	8	8	1.00			57.70	2490.00	535.588	811.75	1.52
SODIUM	mg/kg	IHSS 201	CREEK	S	14	14	1.00			51.50	1610.00	286.107	412.13	1.44
SODIUM	mg/kg	IHSS 202	CREEK	S	4	4	1.00			193.00	533.00	291.500	161.71	0.55
SODIUM	mg/kg	IHSS 200	LAKE	S	36	36	1.00			43.20	997.00	268.389	240.31	0.90
SODIUM	mg/kg	IHSS 201	LAKE	S	43	43	1.00			26.00	509.00	138.735	96.81	0.70
SODIUM	mg/kg	IHSS 202	LAKE	S	15	15	1.00			171.00	1080.00	369.333	210.39	0.57
STRONTIUM	mg/kg	BGCR	CREEK	B	48	58	0.83			2.80	421.00	36.380	59.87	
STRONTIUM	mg/kg	IHSS 200	CREEK	S	8	8	1.00			15.00	91.30	55.375	27.23	0.49
STRONTIUM	mg/kg	IHSS 201	CREEK	S	14	14	1.00			18.30	227.00	67.286	61.12	0.91

Table D-1
SUMMARY STATISTICS FOR OU 3 SURFACE SEDIMENTS
COMPARISON TO BENCHMARK DATA

Chemical Name	Unit	Data Source	Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean	Standard Deviation	Coefficient of Variation
STRONTIUM	mg/kg	IHSS 202	CREEK	S	4	4	1.00			35.80	349.00	131.225	147.15	1.12
STRONTIUM	mg/kg	CC-BM	LAKE	B						202.00	202.00			
STRONTIUM	mg/kg	IHSS 200	LAKE	S	36	36	1.00			26.70	154.00	57.828	24.19	0.42
STRONTIUM	mg/kg	IHSS 201	LAKE	S	43	43	1.00			2.80	423.00	49.812	62.01	1.24
STRONTIUM	mg/kg	IHSS 202	LAKE	S	15	15	1.00			47.10	190.00	82.813	32.39	0.39
THALLIUM	mg/kg	BGCR	CREEK	B	2	50	0.04				0.40	0.300	0.23	
THALLIUM	mg/kg	IHSS 200	CREEK	S		8		0.16	0.23			0.199	0.02	0.12
THALLIUM	mg/kg	IHSS 201	CREEK	S	2	14	0.14	0.12	0.75	0.28	0.38	0.256	0.16	0.63
THALLIUM	mg/kg	IHSS 202	CREEK	S	1	4	0.25	0.11	0.43	0.25	0.25	0.223	0.15	0.68
THALLIUM	mg/kg	IHSS 200	LAKE	S	1	36	0.03	0.18	1.30	0.95	0.95	0.398	0.26	0.66
THALLIUM	mg/kg	IHSS 201	LAKE	S		38		0.23	1.95			0.481	0.40	0.83
THALLIUM	mg/kg	IHSS 202	LAKE	S		8		0.15	1.20			0.656	0.48	0.74
TIN	mg/kg	BGCR	CREEK	B	16	54	0.30				27.10	7.640	6.09	
TIN	mg/kg	IHSS 200	CREEK	S		4		0.85	1.95			1.413	0.59	0.42
TIN	mg/kg	IHSS 201	CREEK	S		13		1.30	8.70			2.781	1.92	0.69
TIN	mg/kg	IHSS 202	CREEK	S		3		4.95	6.95			6.250	1.13	0.18
TIN	mg/kg	LOWRY	CREEK	B							15.50	13.670	2.02	
TIN	mg/kg	IHSS 200	LAKE	S	7	33	0.21	0.80	4.05	2.60	6.10	1.964	1.30	0.66
TIN	mg/kg	IHSS 201	LAKE	S	20	36	0.56	0.80	5.75	2.00	10.40	3.192	2.34	0.73
TIN	mg/kg	IHSS 202	LAKE	S	5	11	0.45	1.95	58.00	16.40	51.40	22.968	19.41	0.84
VANADIUM	mg/kg	BGCR	CREEK	B	53	57	0.93			2.00	73.00	18.330	14.30	
VANADIUM	mg/kg	IHSS 200	CREEK	S	8	8	1.00			16.10	87.70	33.913	22.62	0.67
VANADIUM	mg/kg	IHSS 201	CREEK	S	14	14	1.00			11.20	60.90	26.029	12.11	0.47
VANADIUM	mg/kg	IHSS 202	CREEK	S	4	4	1.00			28.70	51.10	37.400	9.70	0.26
VANADIUM	mg/kg	LOWRY	CREEK	B							72.90	33.310	11.66	
VANADIUM	mg/kg	CC-BM	LAKE	B						115.00	115.00			
VANADIUM	mg/kg	IHSS 200	LAKE	S	36	36	1.00			9.10	70.70	31.839	13.49	0.42
VANADIUM	mg/kg	IHSS 201	LAKE	S	43	43	1.00			4.90	50.00	24.300	12.17	0.50
VANADIUM	mg/kg	IHSS 202	LAKE	S	15	15	1.00			18.60	114.00	42.987	21.53	0.50
VANADIUM	mg/kg	RMNP-BM (L. Husted)	LAKE	B								27.300	0.10	
VANADIUM	mg/kg	RMNP-BM (L. Louise)	LAKE	B								35.000	6.00	
VANADIUM	mg/kg	RMNP-BM (L. Haiyaha)	LAKE	B								55.000	6.00	
VANADIUM	mg/kg	RMNP-BM (The Loch)	LAKE	B								43.000	3.00	

Table D-1
SUMMARY STATISTICS FOR OU 3 SURFACE SEDIMENTS
COMPARISON TO BENCHMARK DATA

Chemical Name	Unit	Data Source	Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean	Standard Deviation	Coefficient of Variation
ZINC	mg/kg	BGCR	CREEK	B	55	58.00	0.95			3.25	155.00	43.770	30.23	
ZINC	mg/kg	IHSS 200	CREEK	S	8	8	1.00			46.70	460.00	149.113	134.24	0.90
ZINC	mg/kg	IHSS 201	CREEK	S	14	14	1.00			53.00	1170.00	422.243	384.51	0.91
ZINC	mg/kg	IHSS 202	CREEK	S	4	4	1.00			44.60	56.60	49.475	5.31	0.11
ZINC	mg/kg	LOWRY	CREEK	B							726.00	76.750	124.61	
ZINC	mg/kg	CC-BM	LAKE	B						158.00	158.00			
ZINC	mg/kg	IHSS 200	LAKE	S	36	36	1.00			28.50	540.00	195.339	145.76	0.75
ZINC	mg/kg	IHSS 201	LAKE	S	43	43	1.00			9.00	1120.00	425.593	392.51	0.92
ZINC	mg/kg	IHSS 202	LAKE	S	15	15	1.00			40.50	193.00	81.247	34.67	0.43
ZINC	mg/kg	RMNP-BM (L. Husted)	LAKE	B								117.000	2.00	
ZINC	mg/kg	RMNP-BM (L. Louise)	LAKE	B								125.000	3.00	
ZINC	mg/kg	RMNP-BM (L. Haiyaha)	LAKE	B								72.000	4.00	
ZINC	mg/kg	RMNP-BM (The Loch)	LAKE	B								95.000	9.00	
RADIONUCLIDES														
AMERICIUM-241	pCi/g	BGCR	CREEK	B	59	59	1.00			-0.01	0.82	0.070	0.19	
AMERICIUM-241	pCi/g	IHSS 200	CREEK	S	5	5	1.00			0.00	0.06	0.017	0.02	1.43
AMERICIUM-241	pCi/g	IHSS 201	CREEK	S	13	13	1.00			0.00	0.08	0.022	0.03	1.19
AMERICIUM-241	pCi/g	IHSS 202	CREEK	S	4	4	1.00			0.02	0.05	0.030	0.01	0.39
AMERICIUM-241	pCi/g	IHSS 200	LAKE	S	34	34	1.00			0.01	0.21	0.043	0.05	1.20
AMERICIUM-241	pCi/g	IHSS 201	LAKE	S	39	39	1.00			0.00	0.11	0.017	0.02	1.36
AMERICIUM-241	pCi/g	IHSS 202	LAKE	S	15	15	1.00			0.01	0.09	0.049	0.03	0.52
CESIUM-136	pCi/g	BGCR	CREEK	B							1.50	0.260		
CESIUM-137	pCi/g	IHSS 200	CREEK	S	6	6	1.00			0.05	0.57	0.179	0.21	1.15
CESIUM-137	pCi/g	IHSS 200	LAKE	S	14	14	1.00			0.03	0.19	0.080	0.05	0.66
CESIUM-137	pCi/g	IHSS 201	LAKE	S		8						0.048	0.00	0.10
GROSS ALPHA	pCi/g	BGCR	CREEK	B	45	45	1.00			2.92	72.00	22.980	0.38	
GROSS ALPHA	pCi/g	IHSS 200	CREEK	S	8	8	1.00			15.00	28.00	19.849	4.49	0.23
GROSS ALPHA	pCi/g	IHSS 201	CREEK	S	14	14	1.00			8.30	33.00	18.513	6.66	0.36
GROSS ALPHA	pCi/g	IHSS 202	CREEK	S	4	4	1.00			17.00	43.00	25.900	12.12	0.47
GROSS ALPHA	pCi/g	IHSS 200	LAKE	S	34	34	1.00			3.80	37.00	24.269	7.74	0.32
GROSS ALPHA	pCi/g	IHSS 201	LAKE	S	42	42	1.00			4.40	39.00	19.034	7.81	0.41
GROSS ALPHA	pCi/g	IHSS 202	LAKE	S	15	15	1.00			15.13	84.00	32.578	17.61	0.54
GROSS BETA	pCi/g	BGCR	CREEK	B	43	43	1.00				59.00	35.350	20.46	

Table D-1
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COMPARISON TO BENCHMARK DATA

Chemical Name	Unit	Data Source	Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean	Standard Deviation	Coefficient of Variation
GROSS BETA	pCi/g	IHSS 200	CREEK	S	8	8	1.00			20.00	37.56	26.839	5.93	0.22
GROSS BETA	pCi/g	IHSS 201	CREEK	S	14	14	1.00			17.00	36.00	27.541	4.48	0.16
GROSS BETA	pCi/g	IHSS 202	CREEK	S	4	4	1.00			20.00	31.00	23.250	5.25	0.23
GROSS BETA	pCi/g	IHSS 200	LAKE	S	34	34	1.00			9.20	37.50	25.050	4.93	0.20
GROSS BETA	pCi/g	IHSS 201	LAKE	S	42	42	1.00			8.80	56.61	25.961	8.69	0.33
GROSS BETA	pCi/g	IHSS 202	LAKE	S	15	15	1.00			27.00	53.00	32.987	6.70	0.20
PLUTONIUM-239/240	pCi/g	BGCR	CREEK	B	42	42	1.00			0.00	2.36	0.170	0.59	
PLUTONIUM-239/240	pCi/g	IHSS 200	CREEK	S	8	8	1.00			0.00	0.55	0.156	0.20	1.29
PLUTONIUM-239/240	pCi/g	IHSS 201	CREEK	S	14	14	1.00			-0.01	0.47	0.082	0.16	1.97
PLUTONIUM-239/240	pCi/g	IHSS 202	CREEK	S	4	4	1.00			0.05	0.17	0.091	0.06	0.60
PLUTONIUM-239/240	pCi/g	BGCR	LAKE	B						0.02	0.13	0.130		
PLUTONIUM-239/240	pCi/g	IHSS 200	LAKE	S	87	87	1.00			0.00	3.30	0.267	0.59	2.23
PLUTONIUM-239/240	pCi/g	IHSS 201	LAKE	S	105	105	1.00			-0.02	0.55	0.033	0.06	1.81
PLUTONIUM-239/240	pCi/g	IHSS 202	LAKE	S	15	15	1.00			0.03	0.49	0.291	0.16	0.57
RADIUM-226	pCi/g	BGCR	CREEK	B	21	21	1.00			0.43	1.80	0.850	0.36	
RADIUM-226	pCi/g	IHSS 200	CREEK	S	6	6	1.00			0.85	1.20	1.067	0.15	0.14
RADIUM-226	pCi/g	IHSS 200	LAKE	S	14	14	1.00			0.84	2.20	1.124	0.34	0.30
RADIUM-226	pCi/g	IHSS 201	LAKE	S	8	8	1.00			0.28	1.40	0.790	0.35	0.44
RADIUM-228	pCi/g	IHSS 200	CREEK	S	6	6	1.00			0.97	1.70	1.328	0.23	0.18
RADIUM-228	pCi/g	IHSS 200	LAKE	S	14	14	1.00			0.92	2.20	1.444	0.37	0.26
RADIUM-228	pCi/g	IHSS 201	LAKE	S	8	8	1.00			0.31	1.60	1.000	0.49	0.49
STRONTIUM-89/90	pCi/g	BGCR	CREEK	B	43	43	1.00			-0.60	1.17	0.210	0.27	
STRONTIUM-89/90	pCi/g	IHSS 200	CREEK	S	6	6	1.00			0.13	0.30	0.220	0.08	0.37
STRONTIUM-89/90	pCi/g	IHSS 200	LAKE	S	13	13	1.00			0.11	0.57	0.309	0.14	0.46
STRONTIUM-89/90	pCi/g	IHSS 201	LAKE	S	8	8	1.00			0.14	0.72	0.326	0.19	0.57
TRITIUM	pCi/L	BGCR	CREEK	B	41	41	1.00			-23.20	380.00	155.870	91.83	
TRITIUM	pCi/L	IHSS 200	CREEK	S	3	3	1.00			-81.00	170.00	51.930	126.16	2.43
TRITIUM	pCi/L	IHSS 201	CREEK	S	4	4	1.00			77.00	159.60	112.015	39.34	0.35
TRITIUM	pCi/L	IHSS 200	LAKE	S	9	9	1.00			-36.00	160.90	76.244	78.21	1.03
URANIUM-233/234	pCi/g	BGCR	CREEK	B	47	47	1.00			0.14	4.50	1.680	1.15	
URANIUM-233/234	pCi/g	IHSS 200	CREEK	S	7	7	1.00			0.94	2.66	1.369	0.58	0.43
URANIUM-233/234	pCi/g	IHSS 201	CREEK	S	14	14	1.00			0.62	4.70	1.452	1.03	0.71

Table D-1
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COMPARISON TO BENCHMARK DATA

Chemical Name	Unit	Data Source	Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean	Standard Deviation	Coefficient of Variation
URANIUM-233/234	pCi/g	IHSS 202	CREEK	S	4	4	1.00			0.96	2.09	1.288	0.54	0.42
URANIUM-233/234	pCi/g	BM	LAKE	B						5.51	226.40	11.400		
URANIUM-233/234	pCi/g	IHSS 200	LAKE	S	35	35	1.00			5.40	5.40		0.83	0.62
URANIUM-233/234	pCi/g	IHSS 201	LAKE	S	37	37	1.00			0.22	2.67	1.238	0.72	0.58
URANIUM-233/234	pCi/g	IHSS 202	LAKE	S	15	15	1.00			0.66	3.50	1.407	0.63	0.45
URANIUM-235	pCi/g	BGCR	CREEK	B	49	49	1.00			0.40	0.19	0.060	0.05	
URANIUM-235	pCi/g	IHSS 200	CREEK	S	7	7	1.00			0.03	0.20	0.072	0.06	0.86
URANIUM-235	pCi/g	IHSS 201	CREEK	S	14	14	1.00			0.03	0.20	0.078	0.04	0.58
URANIUM-235	pCi/g	IHSS 202	CREEK	S	4	4	1.00			0.06	0.14	0.085	0.04	0.44
URANIUM-235	pCi/g	BM	LAKE	B						5.51		11.400		
URANIUM-235	pCi/g	IHSS 200	LAKE	S	35	35	1.00			0.01	0.56	0.071	0.09	1.29
URANIUM-235	pCi/g	IHSS 201	LAKE	S	37	37	1.00			0.00	0.12	0.045	0.03	0.75
URANIUM-235	pCi/g	IHSS 202	LAKE	S	15	15	1.00			0.01	0.17	0.064	0.04	0.68
URANIUM-238	pCi/g	BGCR	CREEK	B	30	30	1.00			0.27	3.82	1.400		
URANIUM-238	pCi/g	IHSS 200	CREEK	S	7	7	1.00			0.87	2.23	1.400	0.51	0.36
URANIUM-238	pCi/g	IHSS 201	CREEK	S	14	14	1.00			0.62	3.90	1.339	0.84	0.63
URANIUM-238	pCi/g	IHSS 202	CREEK	S	4	4	1.00			0.79	2.15	1.205	0.63	0.53
URANIUM-238	pCi/g	BM	LAKE	B						5.51		11.400		
URANIUM-238	pCi/g	IHSS 200	LAKE	S	35	35	1.00			0.31	4.40	1.339	0.70	0.52
URANIUM-238	pCi/g	IHSS 201	LAKE	S	37	37	1.00			0.20	2.42	1.223	0.70	0.57
URANIUM-238	pCi/g	IHSS 202	LAKE	S	15	15	1.00			0.86	3.30	1.502	0.57	0.38

BGCR = Background Geochemical Characterization Report (DOE, 1993c).
CC-BM = Cherry Creek Reservoir Surface Sediment (n=1) CCBA, 1994.
RMNP-BM = Rocky Mountain National Park Lakes Surface Sediment Data (Heit, et al., 1984).
RMNP-BMS = Rocky Mountain National Park Lakes Subsurface Sediment Data (Heit, et al., 1984).
Lowry = Lowry Landfill Site Background Data (Stream Sediment) (EPA, 1992a).
BM = Marston Lake, Ralston Reservoir, Sterling Quad, Greeley Quad, Surface Sediment Data.

IHSS = Individual Hazardous Substance Site.
B = Background.
S = OU 3 (onsite).

Table D-2
SUMMARY STATISTICS FOR GREAT WESTERN RESERVOIR SUBSURFACE SEDIMENTS
COMPARISON TO BENCHMARK DATA

Chemical Name	Units	DATA SOURCE		Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Arithmetic Mean	Standard Deviation	Coefficient of Variation
METALS															
ALUMINUM	mg/kg	OU 3	IHSS 200	LAKE	S	46	46	1.00			6340.00	26100.00	13893.70	5457.02	0.39
ALUMINUM	mg/kg	CC-BM	CC-BM	LAKE	B						96700.00	96700.00			
ALUMINUM	mg/kg	BGCR		CREEK	B	59	59	1.00			549.00	25200.00	5887.610	4912.73	
ALUMINUM	mg/kg	LOWRY	LOWRY	CREEK	B							32100.00	13959.330	7080.88	
ARSENIC	mg/kg	OU 3	IHSS 200	LAKE	S	46	46	1.00			3.60	10.40	6.49	1.67	0.26
ARSENIC	mg/kg	CC-BM		LAKE	B						5.57	5.57			
ARSENIC	mg/kg	BGCR		CREEK	B	53	59	0.90			0.20	17.30	2.410	2.45	
ARSENIC	mg/kg	RMNP-BMS	L.HUSTED	LAKE	B								0.790	0.05	
ARSENIC	mg/kg	RMNP-BMS	L.LOUISE	LAKE	B								1.000		
ARSENIC	mg/kg	LOWRY		CREEK	B							16.50	4.810	3.95	
ARSENIC	mg/kg	RMNP-BM	L.HUSTED	LAKE	B								2.50	0.200	
ARSENIC	mg/kg	RMNP-BM	L.LOUISE	LAKE	B								2.50	0.300	
ARSENIC	mg/kg	RMNP-BM	L.HAIYAHA	LAKE	B								8.40	0.200	
ARSENIC	mg/kg	RMNP-BM	THE LOCH	LAKE	B								1.40	0.200	
BARIUM	mg/kg	OU 3	IHSS 200	LAKE	S	46	46	1.00			81.90	205.00	161.61	28.96	0.18
BARIUM	mg/kg	CC-BM		LAKE	B						591.00	591.00			
BARIUM	mg/kg	BGCR		CREEK	B	57	57	1.00			10.60	244.00	77.910	56.38	
BARIUM	mg/kg	LOWRY		CREEK	B							440.00	220.640	76.59	
BERYLLIUM	mg/kg	OU 3	IHSS 200	LAKE	S	46	46	1.00			0.53	2.30	1.13	0.33	0.29
BERYLLIUM	mg/kg	CC-BM		LAKE	B						4.03	4.03			
BERYLLIUM	mg/kg	BGCR		CREEK	B	27	57	0.47			1.50	1.30	0.660	1.69	
BERYLLIUM	mg/kg	RMNP-BMS	L.HUSTED	LAKE	B								3.900	0.30	
BERYLLIUM	mg/kg	RMNP-BMS	L.LOUISE	LAKE	B								7.400		
BERYLLIUM	mg/kg	LOWRY		CREEK	B								2.10	1.04	
BERYLLIUM	mg/kg	RMNP-BM	L.HUSTED	LAKE	B								3.90	1.00	
BERYLLIUM	mg/kg	RMNP-BM	L.LOUISE	LAKE	B								5.00	3.00	
BERYLLIUM	mg/kg	RMNP-BM	L.HAIYAHA	LAKE	B								9.30	1.10	
BERYLLIUM	mg/kg	RMNP-BM	THE LOCH	LAKE	B								7.40	1.30	
CADMIUM	mg/kg	OU 3	IHSS 200	LAKE	S	22	46	0.48	0.38	0.81	0.59	2.60	0.74	0.62	0.84
CADMIUM	mg/kg	CC-BM		LAKE	B										
CADMIUM	mg/kg	BGCR		CREEK	B	6	51	0.12			0.13	1.30	0.540	0.36	
CADMIUM	mg/kg	RMNP-BMS	L.HUSTED	LAKE	B								0.320	0.07	
CADMIUM	mg/kg	RMNP-BMS	L.LOUISE	LAKE	B								0.090		
CADMIUM	mg/kg	LOWRY		CREEK	B							3.80	1.040	0.99	
CADMIUM	mg/kg	RMNP-BM	L.HUSTED	LAKE	B								0.700	0.04	
CADMIUM	mg/kg	RMNP-BM	L.LOUISE	LAKE	B								0.500	0.20	
CADMIUM	mg/kg	RMNP-BM	L.HAIYAHA	LAKE	B								0.340	0.03	
CADMIUM	mg/kg	RMNP-BM	THE LOCH	LAKE	B								0.320	0.05	
CALCIUM	mg/kg	OU 3	IHSS 200	LAKE	S	46	46	1.00			3900.00	15400.00	7568.70	2482.67	0.33
CALCIUM	mg/kg	CC-BM		LAKE	B										
CALCIUM	mg/kg	BGCR		CREEK	B	58	59	0.98			93.50	17100.00	3658.240	4663.60	

Table D-2
SUMMARY STATISTICS FOR GREAT WESTERN RESERVOIR SUBSURFACE SEDIMENTS
COMPARISON TO BENCHMARK DATA

Chemical Name	Units	DATA SOURCE		Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Arithmetic Mean	Standard Deviation	Coefficient of Variation
CALCIUM	mg/kg	RMNP-BMS	L.HUSTED	LAKE	B								12.000	2.00	
CALCIUM	mg/kg	RMNP-BMS	L.LOUISE	LAKE	B								26.500		
CALCIUM	mg/kg	RMNP-BM	L.HUSTED	LAKE	B								26.000	1.00	
CALCIUM	mg/kg	RMNP-BM	L.LOUISE	LAKE	B								34.100	0.10	
CALCIUM	mg/kg	RMNP-BM	L.HAIYAHA	LAKE	B								54.000	5.00	
CALCIUM	mg/kg	RMNP-BM	THE LOCH	LAKE	B								47.000	6.00	
CESIUM	mg/kg	IHSS 200		LAKE	S	26	46	0.57	12.70	27.40	12.70	39.20	16.74	7.64	0.46
CESIUM	mg/kg	BGCR		CREEK	B	10	56	0.18				157.00	69.290	63.88	
CHROMIUM	mg/kg	IHSS 200		LAKE	S	46	46	1.00			6.80	28.10	15.03	5.50	0.37
CHROMIUM	mg/kg	BGCR		CREEK	B	47	59	0.80			0.48	29.70	8.130	7.42	
CHROMIUM	mg/kg	LOWRY		CREEK	B							22.90	12.350	5.54	
COBALT	mg/kg	IHSS 200		LAKE	S	46	46	1.00			5.90	12.20	9.35	1.38	0.15
COBALT	mg/kg	CC-BM		LAKE	B						21.30	21.30			
COBALT	mg/kg	BGCR		CREEK	B	43	59	0.73			0.30	15.00	5.040	3.29	
COBALT	mg/kg	LOWRY		CREEK	B							14.00	9.200	2.86	
COPPER	mg/kg	IHSS 200		LAKE	S	46	46	1.00			15.80	311.00	94.69	78.64	0.83
COPPER	mg/kg	CC-BM		LAKE	B						43.40	43.40			
COPPER	mg/kg	BGCR		CREEK	B	43	59	0.73			10.15	36.70	10.150	7.86	
COPPER	mg/kg	LOWRY		CREEK	B							48.30	17.580	8.98	
CYANIDE	mg/kg	IHSS 200		LAKE	S		46	0.00	0.34	0.75			0.491	0.20	
IRON	mg/kg	IHSS 200		LAKE	S	46	46	1.00			9330.00	25600.00	17028.91	4005.91	0.24
IRON	mg/kg	CC-BM		LAKE	B						49700.00	49700.00			
IRON	mg/kg	BGCR		CREEK	B	59	59	1.00			1040.00	31400.00	8852.630	6263.19	
IRON	mg/kg	RMNP-BMS	L.HUSTED	LAKE	B								1100.000	100.00	
IRON	mg/kg	RMNP-BMS	L.LOUISE	LAKE	B								1900.000		
IRON	mg/kg	RMNP-BM	L.HUSTED	LAKE	B								1600.000	40.00	
IRON	mg/kg	RMNP-BM	L.LOUISE	LAKE	B								2400.000	100.00	
IRON	mg/kg	RMNP-BM	L.HAIYAHA	LAKE	B								6200.000	900.00	
IRON	mg/kg	RMNP-BM	THE LOCH	LAKE	B								2300.000	300.00	
LEAD	mg/kg	IHSS 200		LAKE	S	46	46	1.00			14.50	126.00	47.21	27.02	0.57
LEAD	mg/kg	CC-BM		LAKE	B						55.00	55.00			
LEAD	mg/kg	BGCR		CREEK	B	59	59	1.00			2.10	244.00	22.020	36.79	
LEAD	mg/kg	RMNP-BMS	L.HUSTED	LAKE	B								10.000	7.00	
LEAD	mg/kg	RMNP-BMS	L.LOUISE	LAKE	B								14.000		
LEAD	mg/kg	LOWRY		CREEK	B							380.00	28.290	66.79	
LEAD	mg/kg	RMNP-BM	L.HUSTED	LAKE	B										
LEAD	mg/kg	RMNP-BM	L.LOUISE	LAKE	B								43.000	0.00	
LEAD	mg/kg	RMNP-BM	L.HAIYAHA	LAKE	B								26.000	2.00	
LEAD	mg/kg	RMNP-BM	THE LOCH	LAKE	B								14.000	2.00	
LITHIUM	mg/kg	IHSS 200		LAKE	S	46	46	1.00			5.40	19.60	11.66	3.90	0.33
LITHIUM	mg/kg	BGCR		CREEK	B	41	57	0.72			1.15	20.20	7.480	5.26	

Table D-2
SUMMARY STATISTICS FOR GREAT WESTERN RESERVOIR SUBSURFACE SEDIMENTS
COMPARISON TO BENCHMARK DATA

Chemical Name	Units	DATA SOURCE		Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Arithmetic Mean	Standard Deviation	Coefficient of Variation
MAGNESIUM	mg/kg	IHSS 200		LAKE	S	46	46	1.00			1850.00	5080.00	3340.22	842.84	0.25
MAGNESIUM	mg/kg	BGCR		CREEK	B	54	59	0.92			125.50	5850.00	1473.770	1252.57	
MANGANESE	mg/kg	IHSS 200		LAKE	S	46	46	1.00			153.00	772.00	363.80	158.99	0.44
MANGANESE	mg/kg	CC-BM		LAKE	B						739.00	739.00			
MANGANESE	mg/kg	BGCR		CREEK	B	58	59	0.98			9.00	1280.00	227.820	215.48	
MANGANESE	mg/kg			CREEK	B							1560.00	605.100	281.36	
MERCURY	mg/kg	IHSS 200		LAKE	S	34	46	0.74	0.06	0.10	0.07	0.30	0.15	0.09	0.58
MERCURY	mg/kg	CC-BM		LAKE	B						0.06	0.06			
MERCURY	mg/kg	BGCR		CREEK	B	2	49	0.04			0.01	0.05	0.080	0.06	
MERCURY	mg/kg	RMNP-BMS	L.HUSTED	LAKE	B								0.030		
MERCURY	mg/kg	RMNP-BMS	L.LOUISE	LAKE	B								0.050		
MERCURY	mg/kg	LOWRY		CREEK	B							0.29	0.080	0.06	
MERCURY	mg/kg	RMNP-BM	L.HUSTED	LAKE	B								0.030	0.01	
MERCURY	mg/kg	RMNP-BM	L.LOUISE	LAKE	B								0.065	0.01	
MERCURY	mg/kg	RMNP-BM	L.HAIYAHA	LAKE	B								0.050	0.00	
MERCURY	mg/kg	RMNP-BM	THE LOCH	LAKE	B								0.040	0.01	
MOLYBDENUM	mg/kg	IHSS 200		LAKE	S	13	46	0.28	0.43	0.93	0.84	5.00	0.87	1.11	1.28
MOLYBDENUM	mg/kg	CC-BM		LAKE	B						22.00	22.00			
MOLYBDENUM	mg/kg	BGCR		CREEK	B	16	58	0.28			0.33	9.60	4.470	5.23	
NICKEL	mg/kg	IHSS 200		LAKE	S	46	46	1.00			11.20	23.60	17.24	2.81	0.16
NICKEL	mg/kg	CC-BM		LAKE	B						26.20	26.20			
NICKEL	mg/kg	BGCR		CREEK	B	39	57	0.68			0.65	25.60	6.750	5.38	
NICKEL	mg/kg	RMNP-BMS	L.HUSTED	LAKE	B								4.200	0.08	
NICKEL	mg/kg	RMNP-BMS	L.LOUISE	LAKE	B								9.000		
NICKEL	mg/kg	LOWRY		CREEK	B							131.00	15.450	22.29	
NICKEL	mg/kg	RMNP-BM	L.HUSTED	LAKE	B								9.600	0.20	
NICKEL	mg/kg	RMNP-BM	L.LOUISE	LAKE	B								10.000	0.00	
NICKEL	mg/kg	RMNP-BM	L.HAIYAHA	LAKE	B								12.300	0.60	
NICKEL	mg/kg	RMNP-BM	THE LOCH	LAKE	B								18.000	2.00	
POTASSIUM	mg/kg	IHSS 200		LAKE	S	46	46	1.00			973.00	4000.00	2155.07	804.89	0.37
POTASSIUM	mg/kg	CC-BM		LAKE	B						15100.00	15100.00			
POTASSIUM	mg/kg	BGCR		CREEK	B	43	58	0.74			57.00	3770.00	835.340	749.42	
SELENIUM	mg/kg	IHSS 200		LAKE	S	5	46	0.11	0.83	1.90	0.86	2.45	0.75	0.32	0.43
SELENIUM	mg/kg	CC-BM		LAKE	B						1.10	1.10			
SELENIUM	mg/kg	BGCR		CREEK	B	13	58	0.22			0.10	2.90	0.420	0.56	
SELENIUM	mg/kg	RMNP-BMS	L.HUSTED	LAKE	B								0.900	0.20	
SELENIUM	mg/kg	RMNP-BMS	L.LOUISE	LAKE	B								0.760		
SELENIUM	mg/kg	RMNP-BM	L.HUSTED	LAKE	B								1.800	0.10	
SELENIUM	mg/kg	RMNP-BM	L.LOUISE	LAKE	B								1.200	0.10	
SELENIUM	mg/kg	RMNP-BM	L.HAIYAHA	LAKE	B								1.800	0.40	
SELENIUM	mg/kg	RMNP-BM	THE LOCH	LAKE	B								1.100	0.30	
SILVER	mg/kg	IHSS 200		LAKE	S	35	46	0.76	0.92	1.90	1.00	16.50	3.48	3.85	1.11
SILVER	mg/kg	CC-BM		LAKE	B						0.05	0.05			

Table D-2
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COMPARISON TO BENCHMARK DATA

Chemical Name	Units	DATA SOURCE		Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Arithmetic Mean	Standard Deviation	Coefficient of Variation
SILVER	mg/kg	BGCR		CREEK	B	2	54	0.04			0.20	3.40	0.660	0.52	
SODIUM	mg/kg	IHSS 200		LAKE	S	46	46	1.00			74.60	224.00	136.05	29.69	0.22
SODIUM	mg/kg	BGCR		CREEK	B	47	54	0.80			162.00	637.00	161.470	136.80	
STRONTIUM	mg/kg	IHSS 200		LAKE	S	46	46	1.00			35.00	88.40	61.05	12.54	0.21
STRONTIUM	mg/kg	CC-BM		LAKE	B						202.00	202.00			
STRONTIUM	mg/kg	BGCR		CREEK	B	48	58	0.83			2.80	421.00	36.380	59.87	
THALLIUM	mg/kg	IHSS 200		LAKE	S		46		0.36	1.20			0.35	0.12	0.35
THALLIUM	mg/kg	BGCR		CREEK	B	2	50	0.04				0.40	0.300	0.23	
TIN	mg/kg	IHSS 200		LAKE	S	17	46	0.37	1.60	3.30	1.70	6.00	2.16	1.47	0.68
TIN	mg/kg	BGCR		CREEK	B	16	54	0.30				27.10	7.640	6.09	
TIN	mg/kg	LOWRY		CREEK	B							15.50	13.670	2.02	
VANADIUM	mg/kg	IHSS 200		LAKE	S	46	46	1.00			17.20	60.40	36.11	11.28	0.31
VANADIUM	mg/kg	CC-BM		LAKE	B						115.00	115.00			
VANADIUM	mg/kg	BGCR		CREEK	B	53	57	0.93			2.00	73.00	18.330	14.30	
VANADIUM	mg/kg	RMNP-BMS	L.HUSTED	LAKE	B								15.000	3.00	
VANADIUM	mg/kg	RMNP-BMS	L.LOUISE	LAKE	B								32.800		
VANADIUM	mg/kg	LOWRY		CREEK	B							72.90	33.310	11.66	
VANADIUM	mg/kg	RMNP-BM	L.HUSTED	LAKE	B								27.300	0.10	
VANADIUM	mg/kg	RMNP-BM	L.LOUISE	LAKE	B								35.000	6.00	
VANADIUM	mg/kg	RMNP-BM	L.HAIYAHA	LAKE	B								55.000	6.00	
VANADIUM	mg/kg	RMNP-BM	THE LOCH	LAKE	B								43.000	3.00	
ZINC	mg/kg	IHSS 200		LAKE	S	46	46	1.00			46.20	480.00	186.65	108.62	0.58
ZINC	mg/kg	CC-BM		LAKE	B						158.00	158.00			
ZINC	mg/kg	BGCR		CREEK	B	55	58.00	0.95			3.25	155.00	43.770	30.23	
ZINC	mg/kg	RMNP-BMS	L.HUSTED	LAKE	B								80.000	13.00	
ZINC	mg/kg	RMNP-BMS	L.LOUISE	LAKE	B								155.000		
ZINC	mg/kg	LOWRY		CREEK	B							726.00	76.750	124.61	
ZINC	mg/kg	RMNP-BM	L.HUSTED	LAKE	B								117.000	2.00	
ZINC	mg/kg	RMNP-BM	L.LOUISE	LAKE	B								125.000	3.00	
ZINC	mg/kg	RMNP-BM	L.HAIYAHA	LAKE	B								72.000	4.00	
ZINC	mg/kg	RMNP-BM	THE LOCH	LAKE	B								95.000	9.00	
RADIONUCLIDES															
AMERICIUM-241	pCi/g	OU 3	IHSS 200	LAKE	S	40	40	1.00			0.00	1.02	0.24	0.31	1.31
AMERICIUM-241	pCi/g		BGCR	CREEK	B	35	35	1.00			-0.01	0.82	0.070	0.19	
PLUTONIUM-239/240	pCi/g	OU 3	IHSS 200	LAKE	S	60	60	1.00			0.00	4.03	0.73	1.07	1.46
PLUTONIUM-239/240	pCi/g		BGCR	CREEK	B	42	42	1.00			0.00	2.36	0.170	0.59	
PLUTONIUM-239/240	pCi/g		BM	LAKE	B						0.02	0.13	0.130		
PLUTONIUM-239/241	pCi/g	HR-BM	HALLIGAN	LAKE	B						0.02	0.05			
PLUTONIUM-239/242	pCi/g	WL-BM	WELLINGTON	LAKE	B						0.07	0.19			
POLONIUM-210	pCi/g	OU 3	IHSS 200	LAKE	S	41	41	1.00			1.05	3.14	2.00	0.53	0.26

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COMPARISON TO BENCHMARK DATA

Chemical Name	Units	DATA SOURCE		Lake or Creek	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Arithmetic Mean	Standard Deviation	Coefficient of Variation
URANIUM-233/234	pCi/g	OU 3	IHSS 200	LAKE	S	64	64	1.00			0.75	3.90	1.32	0.41	0.31
URANIUM-233/234	pCi/g		BGCR	CREEK	B	47	47	1.00			0.14	4.50	1.680	1.15	
URANIUM-233/234	pCi/g		BM	LAKE	B						5.51	11.400			
URANIUM-235	pCi/g	OU 3	IHSS 200	LAKE	S	64	64	1.00			-0.01	0.21	0.06	0.04	0.64
URANIUM-235	pCi/g		BGCR	CREEK	B	49	49	1.00			0.40	0.19	0.060	0.05	
URANIUM-235	pCi/g		BM	LAKE	B						5.51	11.400			
URANIUM-238	pCi/g	OU 3	IHSS 200	LAKE	S	64	64	1.00			0.72	3.30	1.37	0.37	0.27
URANIUM-238	pCi/g		BGCR	CREEK	B	36	36	1.00			0.27	3.82	1.400	1.03	
URANIUM-238	pCi/g		BM	LAKE	B						5.51	11.400			

B = Background.
BGCR = Background Geochemical Characterization Report (DOE, 1993c).
BM = Marston Lake, Ralston Reservoir, Sterling Quad, Greeley Quad, Surface Sediment Data.
CC-BM = Cherry Creek Reservoir Surface Sediment (n = 1) (CCBA, 1994).
HR-BM = Halligan Reservoir Subsurface Sediment Data (Cohen et al., 1990).
ndividual Hazardous Substance Site.
Lowry = Lowry Landfill Site Background Data (Stream Sediment) (EPA, 1992a).
RMNP-BM = Rocky Mountain National Park Lakes Surface Sediment Data (Heit, et al., 1984)
RMNP-BMS = Rocky Mountain National Park Lakes Subsurface Sediment Data (Heit, et al., 1984)
S = OU 3 (onsite).
WL-BM = Wellington Lake Subsurface Sediment Data (Cohen et al., 1990).

TABLE D-3
COMPARISON TO BENCHMARK DATA–SURFACE WATER

NOTE:
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean*	Standard Deviation	Coefficient of Variation
METALS														
DISSOLVED-METALS	ALUMINUM	µg/L	BGCR	B	56	133	0.42	9.00	454.00	13.30	1050.00	87.33	160.32	1.84
DISSOLVED-METALS	ALUMINUM	µg/L	CREEK	S	2	3	0.67	17.30	17.30	455.00	739.00	400.88	368.17	0.92
DISSOLVED-METALS	ALUMINUM	µg/L	200	S	12	16	0.75	14.70	17.30	15.20	3230.00	448.56	938.07	2.09
DISSOLVED-METALS	ALUMINUM	µg/L	201	S	12	17	0.71	14.70	17.30	16.40	455.00	70.16	140.78	2.01
DISSOLVED-METALS	ALUMINUM	µg/L	202	S	5	13	0.38	14.70	17.30	17.50	47.80	16.35	14.61	0.89
TOTAL-METALS	ALUMINUM	µg/L	BGCR	B	106	139	0.76	18.70	988.00	25.00	6560.00	758.89	1360.09	1.79
TOTAL-METALS	ALUMINUM	µg/L	CREEK	S	8	8	1.00			344.00	1990.00	1042.88	668.61	0.64
TOTAL-METALS	ALUMINUM	µg/L	200	S	19	19	1.00			32.20	4260.00	1402.48	1035.07	0.74
TOTAL-METALS	ALUMINUM	µg/L	201	S	20	20	1.00			65.20	1540.00	404.47	358.02	0.88
TOTAL-METALS	ALUMINUM	µg/L	202	S	13	13	1.00			25.90	196.00	92.55	55.66	0.60
TOTAL-METALS	ALUMINUM	µg/L	BM-LK	B		126					2627.00	187-665		
DISSOLVED-METALS	ANTIMONY	µg/L	BGCR	B	20	91	0.22	7.50	104.00	7.50	35.10	15.91	10.14	0.64
DISSOLVED-METALS	ANTIMONY	µg/L	CREEK	S	0	2	0.00	16.50	16.50			8.25		
DISSOLVED-METALS	ANTIMONY	µg/L	200	S		16		14.80	16.50			7.77	0.44	0.06
DISSOLVED-METALS	ANTIMONY	µg/L	201	S		17		14.80	16.50			7.80	0.44	0.06
DISSOLVED-METALS	ANTIMONY	µg/L	202	S		13		14.80	16.50			7.73	0.43	0.06
TOTAL-METALS	ANTIMONY	µg/L	BGCR	B	13	119	0.11	7.00	60.00	7.30	54.80	14.28	9.72	0.68
TOTAL-METALS	ANTIMONY	µg/L	CREEK	S	0	8	0.00	14.80	19.80			8.66	1.09	0.13
TOTAL-METALS	ANTIMONY	µg/L	200	S		19		14.80	19.80			8.11	0.89	0.11
TOTAL-METALS	ANTIMONY	µg/L	201	S		20		14.80	16.50			7.78	0.43	0.06
TOTAL-METALS	ANTIMONY	µg/L	202	S		13		14.80	16.50			7.73	0.43	0.06
TOTAL-METALS	ANTIMONY	µg/L	BM-LK	B		46					86.00			
DISSOLVED-METALS	ARSENIC	µg/L	BGCR	B	4	93	0.04	0.70	10.00	0.90	1.60	1.27	1.26	1.00
DISSOLVED-METALS	ARSENIC	µg/L	CREEK	S	0	3	0.00	2.60	2.60			1.30		
DISSOLVED-METALS	ARSENIC	µg/L	200	S	3	16	0.19	1.90	2.90	2.40	2.40	1.46	0.51	0.35
DISSOLVED-METALS	ARSENIC	µg/L	201	S	1	18	0.06	1.90	3.20	2.90	2.90	1.36	0.46	0.34
DISSOLVED-METALS	ARSENIC	µg/L	202	S	13	13	1.00			2.90	6.30	4.14	0.99	0.24
DISSOLVED-METALS	ARSENIC	µg/L	BM-CR	B		16		5.00	5.00					
DISSOLVED-METALS	ARSENIC	µg/L	BM-LK	B		5					1.00			
TOTAL-METALS	ARSENIC	µg/L	BGCR	B	15	110	0.14	0.50	11.50	1.00	2.90	1.59	1.55	0.98
TOTAL-METALS	ARSENIC	µg/L	CREEK	S	3	8	0.38	2.60	3.20	0.70	1.30	1.25	0.31	0.25
TOTAL-METALS	ARSENIC	µg/L	200	S	6	19	0.32	1.90	2.90	0.70	2.90	1.32	0.59	0.44
TOTAL-METALS	ARSENIC	µg/L	201	S		20		2.20	3.20			1.45	0.18	0.13
TOTAL-METALS	ARSENIC	µg/L	202	S	13	13	1.00			3.10	6.60	4.92	0.94	0.19
TOTAL-METALS	ARSENIC	µg/L	BM-CR	B		18		5.00	5.00					
TOTAL-METALS	ARSENIC	µg/L	BM-LK	B		106					10.00			
DISSOLVED-METALS	BARIUM	µg/L	BGCR	B	102	144	0.71	24.50	200.00	18.80	391.00	48.63	34.98	0.72
DISSOLVED-METALS	BARIUM	µg/L	CREEK	S	3	3	1.00			20.70	43.10	28.40	12.74	0.45
DISSOLVED-METALS	BARIUM	µg/L	200	S	16	16	1.00			20.70	48.90	37.01	6.39	0.17
DISSOLVED-METALS	BARIUM	µg/L	201	S	18	18	1.00			21.40	43.10	35.11	4.18	0.12
DISSOLVED-METALS	BARIUM	µg/L	202	S	13	13	1.00			20.30	31.40	24.69	3.31	0.13
TOTAL-METALS	BARIUM	µg/L	BGCR	B	112	131	0.85	45.50	200.00	26.40	306.00	63.69	31.66	0.50
TOTAL-METALS	BARIUM	µg/L	CREEK	S	8	8	1.00			25.40	80.10	37.84	18.36	0.49
TOTAL-METALS	BARIUM	µg/L	200	S	19	19	1.00			27.00	80.10	43.09	11.49	0.27
TOTAL-METALS	BARIUM	µg/L	201	S	20	20	1.00			25.40	44.50	35.89	4.52	0.13
TOTAL-METALS	BARIUM	µg/L	202	S	13	13	1.00			20.40	34.70	25.98	3.60	0.14
TOTAL-METALS	BARIUM	µg/L	BM-LK	B		75					250.00	47-103		
DISSOLVED-METALS	BERYLLIUM	µg/L	BGCR	B	8	89	0.09	0.20	8.00	0.65	17.00	1.08	1.88	1.74
DISSOLVED-METALS	BERYLLIUM	µg/L	CREEK	S	0	3	0.00	0.40	0.40			0.20		
DISSOLVED-METALS	BERYLLIUM	µg/L	200	S		16		0.30	0.40			0.17	0.03	0.15
DISSOLVED-METALS	BERYLLIUM	µg/L	201	S		18		0.30	0.40			0.18	0.03	0.15
DISSOLVED-METALS	BERYLLIUM	µg/L	202	S		13		0.30	0.40			0.17	0.03	0.15
TOTAL-METALS	BERYLLIUM	µg/L	BGCR	B	9	115	0.08	0.20	5.00	0.60	4.80	0.78	0.87	1.12
TOTAL-METALS	BERYLLIUM	µg/L	CREEK	S	1	8	0.13	0.30	0.60	0.36	0.36	0.25	0.07	0.29
TOTAL-METALS	BERYLLIUM	µg/L	200	S	1	19	0.05	0.30	0.60	0.40	0.40	0.20	0.07	0.35

TABLE D-3
COMPARISON TO BENCHMARK DATA–SURFACE WATER

NOTE:
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean*	Standard Deviation	Coefficient of Variation
TOTAL-METALS	BERYLLIUM	µg/L	201	S	1	20	0.05	0.30	0.40	0.36	0.36	0.18	0.05	0.27
TOTAL-METALS	BERYLLIUM	µg/L	202	S		13		0.30	0.40			0.17	0.03	0.15
TOTAL-METALS	BERYLLIUM	µg/L	BM-LK	B		42			2.00					
DISSOLVED-METALS	CADMIUM	µg/L	BGCR	B	5	77	0.06	1.40	5.00	2.30	3.50	1.77	0.62	0.35
DISSOLVED-METALS	CADMIUM	µg/L	CREEK	S	1	3	0.33	1.40	1.40	2.50	2.50	1.30	1.04	0.80
DISSOLVED-METALS	CADMIUM	µg/L	200	S	1	16	0.06	1.40	1.50	1.50	1.50	0.78	0.19	0.25
DISSOLVED-METALS	CADMIUM	µg/L	201	S	2	18	0.11	1.40	1.50	2.50	2.50	0.93	0.57	0.62
DISSOLVED-METALS	CADMIUM	µg/L	202	S	1	13	0.08	1.40	1.50	1.80	1.80	0.82	0.30	0.36
DISSOLVED-METALS	CADMIUM	µg/L	BM-CR	B		33		1.00	5.00		2.50			
TOTAL-METALS	CADMIUM	µg/L	BM-LK	B		142		0.10			7.00	0.23-1.33		
TOTAL-METALS	CADMIUM	µg/L	BGCR	B	3	108	0.03	1.40	5.00	2.60	4.20	1.69	0.68	0.40
TOTAL-METALS	CADMIUM	µg/L	CREEK	S	3	8	0.38	1.40	2.30	2.40	2.80	1.47	0.93	0.63
TOTAL-METALS	CADMIUM	µg/L	200	S	3	19	0.16	1.40	2.30	1.90	2.80	1.02	0.64	0.63
TOTAL-METALS	CADMIUM	µg/L	201	S	1	20	0.05	1.40	1.50	2.40	2.40	0.81	0.37	0.46
TOTAL-METALS	CADMIUM	µg/L	202	S	2	13	0.15	1.40	1.50	4.00	9.00	1.62	2.39	1.48
DISSOLVED-METALS	CALCIUM	µg/L	BGCR	B	153	153	1.00			6760.00	79300.00	24056.86	10904.89	0.45
DISSOLVED-METALS	CALCIUM	µg/L	CREEK	S	3	3	1.00			13900.00	27200.00	18566.67	7484.87	0.40
DISSOLVED-METALS	CALCIUM	µg/L	200	S	16	16	1.00			13900.00	22000.00	19156.25	1822.44	0.10
DISSOLVED-METALS	CALCIUM	µg/L	201	S	18	18	1.00			14600.00	27200.00	23127.78	2520.46	0.11
DISSOLVED-METALS	CALCIUM	µg/L	202	S	13	13	1.00			11200.00	14200.00	12792.31	1028.32	0.08
TOTAL-METALS	CALCIUM	µg/L	BGCR	B	153	153	1.00			5505.75	74600.00	24071.96	10675.23	0.44
TOTAL-METALS	CALCIUM	µg/L	CREEK	S	8	8	1.00			11000.00	47200.00	21212.50	12141.48	0.57
TOTAL-METALS	CALCIUM	µg/L	200	S	19	19	1.00			11000.00	47200.00	19621.05	7339.13	0.37
TOTAL-METALS	CALCIUM	µg/L	201	S	20	20	1.00			12600.00	26100.00	22085.00	3340.39	0.15
TOTAL-METALS	CALCIUM	µg/L	202	S	13	13	1.00			11100.00	13900.00	12676.92	840.79	0.07
TOTAL-METALS	CALCIUM	µg/L	BM-LK	B	41						72000.00	33290-37380		
DISSOLVED-METALS	CESIUM	µg/L	BGCR	B	9	97	0.09	2.00	2500.00	60.00	200.00	355.86	281.41	0.79
DISSOLVED-METALS	CESIUM	µg/L	CREEK	S	0	3	0.00	50.00	50.00			25.00		
DISSOLVED-METALS	CESIUM	µg/L	200	S	4	16	0.25	50.00	50.00	50.00	60.00	31.88	12.50	0.39
DISSOLVED-METALS	CESIUM	µg/L	201	S	5	18	0.28	50.00	50.00	50.00	80.00	34.72	17.19	0.50
DISSOLVED-METALS	CESIUM	µg/L	202	S	4	13	0.31	50.00	50.00	50.00	80.00	36.54	19.51	0.53
TOTAL-METALS	CESIUM	µg/L	BGCR	B	10	120	0.08	2.00	2500.00	50.00	400.00	241.78	184.80	0.76
TOTAL-METALS	CESIUM	µg/L	CREEK	S	0	8	0.00	50.00	500.00			109.38	116.45	1.06
TOTAL-METALS	CESIUM	µg/L	200	S	5	19	0.26	50.00	500.00	50.00	90.00	69.21	82.15	1.19
TOTAL-METALS	CESIUM	µg/L	201	S		20		50.00	50.00			25.00		
TOTAL-METALS	CESIUM	µg/L	202	S	3	13	0.23	50.00	50.00	50.00	80.00	33.85	17.93	0.53
DISSOLVED-METALS	CHROMIUM	µg/L	BGCR	B	9	89	0.10	2.00	20.00	2.10	14.80	3.24	2.69	0.83
DISSOLVED-METALS	CHROMIUM	µg/L	CREEK	S	0	3	0.00	3.70	3.70			1.85		
DISSOLVED-METALS	CHROMIUM	µg/L	200	S		16		2.60	3.70			1.54	0.28	0.18
DISSOLVED-METALS	CHROMIUM	µg/L	201	S	1	18	0.06	2.60	3.70	3.80	3.80	1.71	0.59	0.34
DISSOLVED-METALS	CHROMIUM	µg/L	202	S	1	13	0.08	2.60	3.70	3.40	3.40	1.67	0.59	0.35
DISSOLVED-METALS	CHROMIUM	µg/L	BM-CR	B		14		5.00	5.00					
DISSOLVED-METALS	CHROMIUM	µg/L	BM-LK	B		5					8.00			
TOTAL-METALS	CHROMIUM	µg/L	BM-CR	B		18		5.00	5.00		5.00			
TOTAL-METALS	CHROMIUM	µg/L	BM-LK	B		145				1.00	36.00	1.52-3.67		
TOTAL-METALS	CHROMIUM	µg/L	BGCR	B	19	120	0.16	2.00	13.50	2.10	18.90	3.64	2.98	0.82
TOTAL-METALS	CHROMIUM	µg/L	CREEK	S	1	8	0.13	2.00	3.70	2.90	2.90	1.59	0.66	0.41
TOTAL-METALS	CHROMIUM	µg/L	200	S	2	19	0.11	2.00	3.70	4.30	4.40	1.72	0.97	0.57
TOTAL-METALS	CHROMIUM	µg/L	201	S	2	20	0.10	2.60	3.70	2.80	2.90	1.70	0.48	0.28
TOTAL-METALS	CHROMIUM	µg/L	202	S	1	13	0.08	2.60	3.70	65.80	65.80	6.47	17.83	2.75
DISSOLVED-METALS	COBALT	µg/L	BGCR	B	3	86	0.03	2.00	50.00	2.40	4.60	4.88	6.26	1.28
DISSOLVED-METALS	COBALT	µg/L	CREEK	S	0	3	0.00	2.30	2.30			1.15		
DISSOLVED-METALS	COBALT	µg/L	200	S	1	16	0.06	1.30	2.30	1.90	1.90	0.95	0.36	0.38
DISSOLVED-METALS	COBALT	µg/L	201	S		18		1.30	2.30			0.90	0.26	0.29
DISSOLVED-METALS	COBALT	µg/L	202	S	1	13	0.08	1.30	2.30	1.80	1.80	0.93	0.36	0.39
TOTAL-METALS	COBALT	µg/L	BGCR	B	8	116	0.07	2.00	50.00	2.70	7.90	5.35	8.07	1.51

TABLE D-3
COMPARISON TO BENCHMARK DATA–SURFACE WATER

NOTE:
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean[a]	Standard Deviation	Coefficient of Variation
TOTAL-METALS	COBALT	µg/L	CREEK	S	0	8	0.00	1.30	2.70			1.10	0.29	0.27
TOTAL-METALS	COBALT	µg/L	200	S	3	19	0.16	1.30	2.70	1.50	2.60	1.14	0.47	0.42
TOTAL-METALS	COBALT	µg/L	201	S	2	20	0.10	1.30	2.30	1.30	1.90	0.97	0.34	0.35
TOTAL-METALS	COBALT	µg/L	202	S		13		1.30	2.30			0.84	0.25	0.30
TOTAL-METALS	COBALT	µg/L	BM-LK	B		5					4.00	1.00		
DISSOLVED-METALS	COPPER	µg/L	BGCR	B	48	124	0.39	2.00	25.70	2.40	28.00	6.07	5.12	0.84
DISSOLVED-METALS	COPPER	µg/L	CREEK	S	2	3	0.67	2.40	2.40	5.50	8.10	4.93	3.48	0.71
DISSOLVED-METALS	COPPER	µg/L	200	S	9	16	0.56	1.90	2.40	2.00	9.40	3.15	2.67	0.85
DISSOLVED-METALS	COPPER	µg/L	201	S	6	18	0.33	1.90	2.40	1.90	8.10	1.77	1.66	0.94
DISSOLVED-METALS	COPPER	µg/L	202	S	5	12	0.42	1.90	2.40	2.10	4.50	1.94	1.19	0.62
DISSOLVED-METALS	COPPER	µg/L	BM-CR	B		34		1.00			49.00			
TOTAL-METALS	COPPER	µg/L	BM-LK	B		166		1.00			31.00	2.5-5.97		
TOTAL-METALS	COPPER	µg/L	BGCR	B	47	121	0.39	2.00	25.60	2.60	15.50	5.35	4.21	0.79
TOTAL-METALS	COPPER	µg/L	CREEK	S	7	8	0.88	2.30	2.30	5.80	20.90	13.24	7.40	0.56
TOTAL-METALS	COPPER	µg/L	200	S	13	15	0.87	1.90	2.30	4.30	20.90	9.25	6.35	0.69
TOTAL-METALS	COPPER	µg/L	201	S	16	17	0.94	1.90	1.90	2.80	16.50	5.84	4.25	0.73
TOTAL-METALS	COPPER	µg/L	202	S	3	13	0.23	1.90	2.40	2.20	4.50	1.58	1.11	0.70
TOTAL-METALS	CYANIDE	µg/L	BGCR	B	2	25	0.08	1.50	20.00	2.00	2.50	2.50	2.72	1.09
TOTAL-METALS	CYANIDE	µg/L	200	S		15		10.00	10.00			5.00		
TOTAL-METALS	CYANIDE	µg/L	201	S	1	16	0.063	10.00	10.00	21.50	21.50	6.03	4.13	
TOTAL-METALS	CYANIDE	µg/L	202	S		13		10.00	10.00			5.00		
DISSOLVED-METALS	IRON	µg/L	BGCR	B	107	152	0.70	3.00	316.00	9.30	1060.00	145.45	177.80	1.22
DISSOLVED-METALS	IRON	µg/L	CREEK	S	3	3	1.00			19.80	228.00	122.27	104.14	0.85
DISSOLVED-METALS	IRON	µg/L	200	S	12	15	0.80	4.00	16.30	6.60	572.00	93.62	144.89	1.55
DISSOLVED-METALS	IRON	µg/L	201	S	12	15	0.80	16.30	16.30	11.00	228.00	36.10	54.28	1.50
DISSOLVED-METALS	IRON	µg/L	202	S	13	13	1.00			7.00	71.10	35.46	22.08	0.62
DISSOLVED-METALS	IRON	µg/L	BM-CR	B		33		10.00			1900.00			
DISSOLVED-METALS	IRON	µg/L	BM-LK	B		20					80.00			
TOTAL-METALS	IRON	µg/L	BM-CR	B		35		10.00			3300.00			
TOTAL-METALS	IRON	µg/L	BM-LK	B		191		10.00			1643.00	233-631		
TOTAL-METALS	IRON	µg/L	BGCR	B	147	157	0.94	82.75	478.00	9.70	26300.00	1281.17	2865.13	2.27
TOTAL-METALS	IRON	µg/L	CREEK	S	8	8	1.00			453.00	2340.00	1218.88	719.98	0.59
TOTAL-METALS	IRON	µg/L	200	S	19	19	1.00			40.70	2340.00	1115.04	685.21	0.61
TOTAL-METALS	IRON	µg/L	201	S	20	20	1.00			37.70	1150.00	401.56	332.31	0.83
TOTAL-METALS	IRON	µg/L	202	S	13	13	1.00			56.50	328.00	156.69	75.05	0.48
DISSOLVED-METALS	LEAD	µg/L	BGCR	B	25	112	0.22	0.40	13.10	0.70	7.20	1.29	1.22	0.94
DISSOLVED-METALS	LEAD	µg/L	CREEK	S	3	3	1.00			3.60	10.20	5.93	3.70	0.62
DISSOLVED-METALS	LEAD	µg/L	200	S	16	16	1.00			1.20	5.80	3.15	1.26	0.40
DISSOLVED-METALS	LEAD	µg/L	201	S	9	18	0.50	1.00	2.20	2.10	10.20	2.65	2.61	0.99
DISSOLVED-METALS	LEAD	µg/L	202	S	12	13	0.92	1.90	1.90	2.10	11.40	4.20	2.72	0.65
DISSOLVED-METALS	LEAD	µg/L	BM-CR	B		33		1.00			14.00			
TOTAL-METALS	LEAD	µg/L	BM-LK	B		125				1.00	888.00	2.75-86		
TOTAL-METALS	LEAD	µg/L	BGCR	B	52	131	0.40	0.70	11.60	0.80	21.00	1.94	2.32	1.20
TOTAL-METALS	LEAD	µg/L	CREEK	S	8	8	1.00			0.90	11.00	7.89	3.81	0.48
TOTAL-METALS	LEAD	µg/L	200	S	19	19	1.00			0.90	18.50	7.04	4.49	0.64
TOTAL-METALS	LEAD	µg/L	201	S	17	20	0.85	2.00	2.70	2.50	10.70	4.34	2.89	0.67
TOTAL-METALS	LEAD	µg/L	202	S	13	13	1.00			2.40	37.20	7.22	9.78	1.35
DISSOLVED-METALS	LITHIUM	µg/L	BGCR	B	51	118	0.43	1.00	101.00	1.30	12.80	15.97	20.53	1.29
DISSOLVED-METALS	LITHIUM	µg/L	CREEK	S	3	3	1.00			5.80	12.00	7.80	3.55	0.45
DISSOLVED-METALS	LITHIUM	µg/L	200	S	15	16	0.94	3.70	3.70	3.80	8.20	5.58	1.52	0.27
DISSOLVED-METALS	LITHIUM	µg/L	201	S	18	18	1.00			5.90	12.00	7.65	1.41	0.18
DISSOLVED-METALS	LITHIUM	µg/L	202	S	13	13	1.00			6.50	10.80	8.22	1.34	0.16
TOTAL-METALS	LITHIUM	µg/L	BGCR	B	59	126	0.47	2.00	100.00	2.00	15.50	11.76	17.38	1.48
TOTAL-METALS	LITHIUM	µg/L	CREEK	S	7	7	1.00			3.50	11.10	7.40	2.54	0.34
TOTAL-METALS	LITHIUM	µg/L	200	S	18	18	1.00			3.50	8.70	6.34	1.45	0.23
TOTAL-METALS	LITHIUM	µg/L	201	S	20	20	1.00			4.90	11.10	7.72	1.63	0.21

TABLE D-3
COMPARISON TO BENCHMARK DATA--SURFACE WATER

NOTE:
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean*	Standard Deviation	Coefficient of Variation
TOTAL-METALS	LITHIUM	µg/L	202	S	13	13	1.00			5.20	9.40	7.29	1.35	0.19
TOTAL-METALS	LITHIUM	µg/L	BM-LK	B		16					8.00	4.38		
DISSOLVED-METALS	MAGNESIUM	µg/L	BGCR	B	133	149	0.89	3300.00	5000.00	1890.00	17800.00	5004.04	1987.74	0.40
DISSOLVED-METALS	MAGNESIUM	µg/L	CREEK	S	3	3	1.00			3080.00	6310.00	4303.33	1751.69	0.41
DISSOLVED-METALS	MAGNESIUM	µg/L	200	S	16	16	1.00			3080.00	4320.00	3941.88	273.31	0.07
DISSOLVED-METALS	MAGNESIUM	µg/L	201	S	18	18	1.00			3520.00	6310.00	5331.11	546.30	0.10
DISSOLVED-METALS	MAGNESIUM	µg/L	202	S	13	13	1.00			5930.00	7160.00	6627.69	452.59	0.07
DISSOLVED-METALS	MAGNESIUM	µg/L	BM-LK	B		33					66000.00	8760.00		
TOTAL-METALS	MAGNESIUM	µg/L	BGCR	B	134	146	0.92	4100.00	5000.00	1870.00	16600.00	5125.31	1924.26	0.38
TOTAL-METALS	MAGNESIUM	µg/L	CREEK	S	8	8	1.00			2940.00	11100.00	5297.50	2771.48	0.52
TOTAL-METALS	MAGNESIUM	µg/L	200	S	19	19	1.00			2940.00	11100.00	4328.42	1689.44	0.39
TOTAL-METALS	MAGNESIUM	µg/L	201	S	20	20	1.00			3450.00	6480.00	5338.00	596.74	0.11
TOTAL-METALS	MAGNESIUM	µg/L	202	S	13	13	1.00			5820.00	7340.00	6568.46	586.74	0.09
TOTAL-METALS	MAGNESIUM	µg/L	BM-LK	B		98					27000.00	9400-17600		
DISSOLVED-METALS	MANGANESE	µg/L	BGCR	B	115	148	0.78	0.94	15.00	1.00	353.00	28.47	47.75	1.68
DISSOLVED-METALS	MANGANESE	µg/L	CREEK	S	3	3	1.00			4.80	63.10	42.00	32.31	0.77
DISSOLVED-METALS	MANGANESE	µg/L	200	S	16	16	1.00			0.90	94.20	19.01	31.20	1.64
DISSOLVED-METALS	MANGANESE	µg/L	201	S	14	18	0.78	0.90	0.90	1.60	1570.00	118.88	372.43	3.13
DISSOLVED-METALS	MANGANESE	µg/L	202	S	13	13	1.00			2.70	7.90	4.85	1.73	0.36
DISSOLVED-METALS	MANGANESE	µg/L	BM-CR	B		33		5.00			1800.00			
DISSOLVED-METALS	MANGANESE	µg/L	BM-LK	B		20					31.00			
TOTAL-METALS	MANGANESE	µg/L	BM-LK	B		197					400.00	43.22-216.5		
TOTAL-METALS	MANGANESE	µg/L	BGCR	B	138	151	0.91	1.30	15.00	1.00	4060.00	87.07	343.53	3.95
TOTAL-METALS	MANGANESE	µg/L	CREEK	S	8	8	1.00			97.00	307.00	169.00	70.21	
TOTAL-METALS	MANGANESE	µg/L	200	S	19	19	1.00			6.80	210.00	71.51	66.18	0.93
TOTAL-METALS	MANGANESE	µg/L	201	S	20	20	1.00			5.50	1580.00	155.99	357.73	2.29
TOTAL-METALS	MANGANESE	µg/L	202	S	13	13	1.00			11.80	37.00	21.96	8.28	0.38
TOTAL-METALS	MANGANESE	µg/L	BM-CR	B		35		5.00			1800.00			
DISSOLVED-METALS	MERCURY	µg/L	BGCR	B	8	82	0.10	0.10	0.20	0.22	0.44	0.12	0.07	0.59
DISSOLVED-METALS	MERCURY	µg/L	CREEK	S		3		0.20	0.20			0.10		
DISSOLVED-METALS	MERCURY	µg/L	200	S	5	16	0.31	0.20	0.20	0.13	0.13	0.11	0.01	0.13
DISSOLVED-METALS	MERCURY	µg/L	201	S		18		0.10	0.20			0.09	0.02	0.27
DISSOLVED-METALS	MERCURY	µg/L	202	S	2	13	0.15	0.10	0.20	0.20	0.20	0.10	0.05	0.54
DISSOLVED-METALS	MERCURY	µg/L	BM-CR	B		34		0.10			0.20			
TOTAL-METALS	MERCURY	µg/L	BM-LK	B		112		0.10			9.00	0.05-0.36		
TOTAL-METALS	MERCURY	µg/L	BGCR	B	9	122	0.07	0.10	0.42	0.20	1.40	0.13	0.16	1.21
TOTAL-METALS	MERCURY	µg/L	CREEK	S	2	8	0.25	0.20	0.20	0.12	0.12	0.11	0.01	0.09
TOTAL-METALS	MERCURY	µg/L	200	S		19		0.10	0.20			0.09	0.02	0.26
TOTAL-METALS	MERCURY	µg/L	201	S	3	20	0.15	0.10	0.20	0.12	0.82	0.13	0.16	1.28
TOTAL-METALS	MERCURY	µg/L	202	S	2	13	0.15	0.10	0.20	0.20	0.30	0.10	0.07	0.69
DISSOLVED-METALS	MOLYBDENUM	µg/L	BGCR	B	14	92	0.15	2.00	500.00	2.50	23.40	33.19	49.35	1.49
DISSOLVED-METALS	MOLYBDENUM	µg/L	CREEK	S	3	3	1.00			3.40	6.60	4.77	1.65	0.35
DISSOLVED-METALS	MOLYBDENUM	µg/L	200	S	16	16	1.00			2.00	7.00	4.64	1.49	0.32
DISSOLVED-METALS	MOLYBDENUM	µg/L	201	S	18	18	1.00			2.70	8.80	5.17	1.44	0.28
DISSOLVED-METALS	MOLYBDENUM	µg/L	202	S	2	13	0.15	1.70	2.70	2.70	3.10	1.36	0.73	0.54
TOTAL-METALS	MOLYBDENUM	µg/L	BGCR	B	12	125	0.10	2.00	100.00	2.10	20.30	12.13	17.41	1.44
TOTAL-METALS	MOLYBDENUM	µg/L	CREEK	S	6	8	0.75	3.50	3.50	3.50	7.40	4.53	2.07	0.46
TOTAL-METALS	MOLYBDENUM	µg/L	200	S	17	19	0.89	3.50	3.50	3.60	8.20	5.08	1.61	0.32
TOTAL-METALS	MOLYBDENUM	µg/L	201	S	20	20	1.00			3.30	7.70	5.29	1.35	0.25
TOTAL-METALS	MOLYBDENUM	µg/L	202	S	5	13	0.38	1.70	2.70	1.90	4.40	1.78	1.00	0.56
TOTAL-METALS	MOLYBDENUM	µg/L	BM-LK	B		20					60.00	8.35		
DISSOLVED-METALS	NICKEL	µg/L	BGCR	B	4	85	0.05	3.00	40.00	6.20	21.80	7.47	5.58	0.75
DISSOLVED-METALS	NICKEL	µg/L	CREEK	S	0	3	0.00	6.00	6.00			3.00		
DISSOLVED-METALS	NICKEL	µg/L	200	S	1	16	0.06	2.60	6.00	3.50	3.50	2.18	0.92	0.42
DISSOLVED-METALS	NICKEL	µg/L	201	S	3	18	0.17	2.60	6.00	2.80	3.40	2.44	0.84	0.34
DISSOLVED-METALS	NICKEL	µg/L	202	S	2	13	0.15	2.60	6.00	2.90	6.60	2.48	1.50	0.60

TABLE D-3
COMPARISON TO BENCHMARK DATA–SURFACE WATER

NOTE:
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean°	Standard Deviation	Coefficient of Variation
DISSOLVED-METALS	NICKEL	µg/L	BM-CR	B		34		10.00			20.00			
DISSOLVED-METALS	NICKEL	µg/L	BM-LK	B		20					10.00			
TOTAL-METALS	NICKEL	µg/L	BM-LK	B		123		10.00			25.00	3.0-6.3		
TOTAL-METALS	NICKEL	µg/L	BGCR	B	15	120	0.13	3.00	40.00	3.80	12.80	7.11	5.88	0.83
TOTAL-METALS	NICKEL	µg/L	CREEK	S	1	8	0.13	2.60	11.20	2.80	2.80	3.74	1.64	0.44
TOTAL-METALS	NICKEL	µg/L	200	S	6	19	0.32	2.60	11.20	2.70	6.50	3.32	1.59	0.48
TOTAL-METALS	NICKEL	µg/L	201	S	5	20	0.25	2.60	6.00	2.80	33.10	4.18	6.89	1.65
TOTAL-METALS	NICKEL	µg/L	202	S	4	13	0.31	2.60	6.00	2.80	23.00	4.56	6.02	1.32
DISSOLVED-METALS	PHOSPHORUS	µg/L	BGCR	B	4	6	0.67	80.00	296.00	102.00	398.00	163.50	122.37	0.75
TOTAL-METALS	PHOSPHORUS	µg/L	BGCR	B	1	6	0.17	101.00	456.00	157.00	157.00	110.42	68.30	0.62
DISSOLVED-METALS	POTASSIUM	µg/L	BGCR	B	86	125	0.69	390.00	5000.00	402.00	6800.00	1612.34	1011.90	0.63
DISSOLVED-METALS	POTASSIUM	µg/L	CREEK	S	3	3	1.00			1130.00	2170.00	1626.67	521.57	0.32
DISSOLVED-METALS	POTASSIUM	µg/L	200	S	16	16	1.00			1130.00	2030.00	1559.38	181.38	0.12
DISSOLVED-METALS	POTASSIUM	µg/L	201	S	18	18	1.00			1580.00	2170.00	1858.33	122.87	0.07
DISSOLVED-METALS	POTASSIUM	µg/L	202	S	13	13	1.00			141.00	640.00	412.77	202.77	0.49
TOTAL-METALS	POTASSIUM	µg/L	BGCR	B	93	128	0.73	380.00	5000.00	493.00	6700.00	1817.03	1058.86	0.58
TOTAL-METALS	POTASSIUM	µg/L	CREEK	S	8	8	1.00			1260.00	6390.00	2611.25	1621.01	0.62
TOTAL-METALS	POTASSIUM	µg/L	200	S	19	19	1.00			1340.00	6390.00	2051.05	1105.88	0.54
TOTAL-METALS	POTASSIUM	µg/L	201	S	20	20	1.00			1260.00	2370.00	1913.50	235.85	0.12
TOTAL-METALS	POTASSIUM	µg/L	202	S	13	13	1.00			147.00	740.00	420.31	211.72	0.50
TOTAL-METALS	POTASSIUM	µg/L	BM-LK	B		35					11000.00	2150-6900		
DISSOLVED-METALS	SELENIUM	µg/L	BGCR	B	7	84	0.08	0.80	20.00	0.85	8.60	1.58	1.72	1.09
DISSOLVED-METALS	SELENIUM	µg/L	CREEK	S	1	3	0.33	3.70	3.70	3.90	3.90	2.53	1.18	0.47
DISSOLVED-METALS	SELENIUM	µg/L	200	S		16		2.90	3.80			1.71	0.20	0.12
DISSOLVED-METALS	SELENIUM	µg/L	201	S	3	18	0.17	2.80	3.90	3.00	3.90	2.05	0.75	0.37
DISSOLVED-METALS	SELENIUM	µg/L	202	S	1	13	0.08	2.90	3.80	3.00	3.00	1.64	0.43	0.26
DISSOLVED-METALS	SELENIUM	µg/L	BM-CR	B		16		5.00						
TOTAL-METALS	SELENIUM	µg/L	BM-CR	B		18		5.00						
TOTAL-METALS	SELENIUM	µg/L	BM-LK	B		103		1.00			5.00			
TOTAL-METALS	SELENIUM	µg/L	BGCR	B	7	120	0.06	0.80	20.00	0.80	6.20	1.27	1.19	0.93
TOTAL-METALS	SELENIUM	µg/L	CREEK	S	0	8	0.00	0.80	3.90			1.33	0.77	0.58
TOTAL-METALS	SELENIUM	µg/L	200	S		19		0.80	3.80			1.47	0.50	0.34
TOTAL-METALS	SELENIUM	µg/L	201	S	1	20	0.05	2.80	3.90	5.30	5.30	2.06	0.77	0.38
TOTAL-METALS	SELENIUM	µg/L	202	S		13		2.90	3.80			1.66	0.20	0.12
DISSOLVED-METALS	SILICON	µg/L	200	S	16	16	1.00			469.00	3100.00	1413.06	782.73	0.55
DISSOLVED-METALS	SILICON	µg/L	CREEK	S	3	3	1.00			1240.00	3390.00	2576.67	1166.63	0.45
DISSOLVED-METALS	SILICON	µg/L	201	S	18	18	1.00			865.00	3390.00	1459.33	619.80	0.42
DISSOLVED-METALS	SILICON	µg/L	202	S	13	13	1.00			410.00	3330.00	1476.69	1154.47	0.78
TOTAL-METALS	SILICON	µg/L	BGCR	B	67	67	1.00			690.00	15200.00	6076.23	3377.17	0.56
TOTAL-METALS	SILICON	µg/L	CREEK	S	8	8	1.00			928.00	7770.00	4097.25	2484.62	0.61
TOTAL-METALS	SILICON	µg/L	200	S	19	19	1.00			544.00	7770.00	2469.89	2107.20	0.85
TOTAL-METALS	SILICON	µg/L	201	S	20	20	1.00			928.00	4040.00	1636.95	880.01	0.54
TOTAL-METALS	SILICON	µg/L	202	S	13	13	1.00			348.00	3250.00	1345.23	1107.18	0.82
DISSOLVED-METALS	SILVER	µg/L	BGCR	B	9	98	0.09	2.00	30.00	2.60	9.20	2.75	2.72	0.99
DISSOLVED-METALS	SILVER	µg/L	CREEK	S	1	3	0.33	2.30	2.30	3.80	3.80	2.03	1.53	0.75
DISSOLVED-METALS	SILVER	µg/L	200	S	5	16	0.31	2.30	3.60	2.50	3.80	2.04	0.65	0.32
DISSOLVED-METALS	SILVER	µg/L	201	S		14		2.30	3.60			1.38	0.32	0.23
DISSOLVED-METALS	SILVER	µg/L	202	S		13		2.30	3.60			1.55	0.33	0.21
DISSOLVED-METALS	SILVER	µg/L	BM-CR	B		34		0.10			6.00			
TOTAL-METALS	SILVER	µg/L	BM-LK	B		114		0.10			3.00			
TOTAL-METALS	SILVER	µg/L	BGCR	B	14	116	0.12	2.00	10.00	2.10	7.20	2.49	1.56	0.63
TOTAL-METALS	SILVER	µg/L	CREEK	S	0	8	0.00	2.10	3.60			1.28	0.33	0.26
TOTAL-METALS	SILVER	µg/L	200	S		19		2.10	3.60			1.44	0.35	0.24
TOTAL-METALS	SILVER	µg/L	201	S		16		2.30	3.60			1.43	0.33	0.23
TOTAL-METALS	SILVER	µg/L	202	S		13		2.30	3.60			1.55	0.33	0.21

TABLE D-3
COMPARISON TO BENCHMARK DATA–SURFACE WATER

NOTE:
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Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean*	Standard Deviation	Coefficient of Variation
DISSOLVED-METALS	SODIUM	µg/L	BGCR	B	151	152	0.99	17100.00	17100.00	4190.00	44700.00	17045.66	7281.65	0.43
DISSOLVED-METALS	SODIUM	µg/L	CREEK	S	3	3	1.00			5370.00	14200.00	8946.67	4647.65	0.52
DISSOLVED-METALS	SODIUM	µg/L	200	S	16	16	1.00			5370.00	8610.00	7980.00	745.48	0.09
DISSOLVED-METALS	SODIUM	µg/L	201	S	18	18	1.00			7270.00	14200.00	11770.56	1326.77	0.11
DISSOLVED-METALS	SODIUM	µg/L	202	S	13	13	1.00			27100.00	32500.00	29761.54	1875.07	0.06
TOTAL-METALS	SODIUM	µg/L	BGCR	B	154	155	0.99	5000.00	5000.00	3700.00	45400.00	16568.90	7500.07	0.45
TOTAL-METALS	SODIUM	µg/L	CREEK	S	8	8	1.00			4810.00	40000.00	12688.00	11709.00	0.92
TOTAL-METALS	SODIUM	µg/L	200	S	19	19	1.00			4810.00	40000.00	9351.05	7531.34	0.81
TOTAL-METALS	SODIUM	µg/L	201	S	20	20	1.00			6940.00	415000.00	31817.00	90201.58	2.84
TOTAL-METALS	SODIUM	µg/L	202	S	13	13	1.00			27000.00	31200.00	29076.92	1494.52	0.05
TOTAL-METALS	SODIUM	µg/L	BM-LK	B		36					54000.00	12600-54000		
DISSOLVED-METALS	STRONTIUM	µg/L	BGCR	B	112	138	0.81	100.00	1000.00	39.90	438.00	190.86	145.58	0.76
DISSOLVED-METALS	STRONTIUM	µg/L	CREEK	S	3	3	1.00			96.20	189.00	129.07	51.98	0.40
DISSOLVED-METALS	STRONTIUM	µg/L	200	S	16	16	1.00			96.20	147.00	130.45	13.03	0.10
DISSOLVED-METALS	STRONTIUM	µg/L	201	S	18	18	1.00			102.00	189.00	159.00	16.95	0.11
DISSOLVED-METALS	STRONTIUM	µg/L	202	S	13	13	1.00			114.00	137.00	124.62	7.54	0.06
TOTAL-METALS	STRONTIUM	µg/L	BGCR	B	117	135	0.87	100.00	1000.00	37.40	408.00	177.31	130.50	0.74
TOTAL-METALS	STRONTIUM	µg/L	CREEK	S	8	8	1.00			77.90	306.00	150.61	77.86	0.52
TOTAL-METALS	STRONTIUM	µg/L	200	S	19	19	1.00			77.90	306.00	135.66	45.80	0.34
TOTAL-METALS	STRONTIUM	µg/L	201	S	20	20	1.00			98.40	186.00	157.42	17.74	0.11
TOTAL-METALS	STRONTIUM	µg/L	202	S	13	13	1.00			114.00	132.00	122.69	6.01	0.05
TOTAL-METALS	STRONTIUM	µg/L	BM-LK	B		16					456.00	248.94		
DISSOLVED-METALS	THALLIUM	µg/L	BGCR	B	2	97	0.02	0.90	15.00	1.20	1.20	1.63	1.48	0.90
DISSOLVED-METALS	THALLIUM	µg/L	CREEK	S	0	3	0.00	0.90	0.90			0.45		
DISSOLVED-METALS	THALLIUM	µg/L	200	S		16		0.90	4.30			1.82	0.48	0.26
DISSOLVED-METALS	THALLIUM	µg/L	201	S		18		0.90	1.60			0.64	0.12	0.19
DISSOLVED-METALS	THALLIUM	µg/L	202	S		13		0.90	4.50			1.16	0.69	0.60
TOTAL-METALS	THALLIUM	µg/L	BGCR	B	3	124	0.02	0.60	40.00	1.60	3.40	1.68	2.15	1.28
TOTAL-METALS	THALLIUM	µg/L	CREEK	S	0	8	0.00	0.90	1.80			0.67	0.21	0.31
TOTAL-METALS	THALLIUM	µg/L	200	S		19		0.90	4.30			1.68	0.56	0.33
TOTAL-METALS	THALLIUM	µg/L	201	S		20		0.90	1.60			0.64	0.11	0.18
TOTAL-METALS	THALLIUM	µg/L	202	S		13		0.90	4.50			1.23	0.77	0.62
TOTAL-METALS	THALLIUM	µg/L	BM-LK	B		18					12.00			
DISSOLVED-METALS	TIN	µg/L	BGCR	B	17	98	0.17	9.30	136.00	10.80	72.40	27.74	21.15	0.76
DISSOLVED-METALS	TIN	µg/L	CREEK	S	0	3	0.00	12.50	12.50			6.25		
DISSOLVED-METALS	TIN	µg/L	200	S		16		6.20	12.50			4.48	1.61	0.36
DISSOLVED-METALS	TIN	µg/L	201	S	5	17	0.29	6.20	12.50	6.30	13.70	7.01	3.09	0.44
DISSOLVED-METALS	TIN	µg/L	202	S	1	13	0.08	6.20	12.50	8.10	8.10	4.70	1.88	0.40
TOTAL-METALS	TIN	µg/L	BGCR	B	18	118	0.15	7.00	136.00	11.00	180.00	19.61	22.01	1.12
TOTAL-METALS	TIN	µg/L	CREEK	S	0	8	0.00	6.20	12.50			4.88	1.31	0.27
TOTAL-METALS	TIN	µg/L	200	S	3	19	0.16	6.20	12.50	7.00	9.70	5.41	2.08	0.38
TOTAL-METALS	TIN	µg/L	201	S		20		6.20	12.50			4.52	1.61	0.36
TOTAL-METALS	TIN	µg/L	202	S	1	13	0.08	6.20	12.50	6.50	6.50	4.57	1.68	0.36
DISSOLVED-METALS	VANADIUM	µg/L	BGCR	B	13	106	0.12	2.00	50.00	2.00	12.10	4.20	5.55	1.32
DISSOLVED-METALS	VANADIUM	µg/L	CREEK	S	0	3	0.00	3.30	3.30			1.65	0.00	0.00
DISSOLVED-METALS	VANADIUM	µg/L	200	S	2	16	0.13	2.50	3.30	2.70	3.40	1.65	0.59	0.36
DISSOLVED-METALS	VANADIUM	µg/L	201	S		18		2.50	3.30			1.45	0.21	0.14
DISSOLVED-METALS	VANADIUM	µg/L	202	S	6	13	0.46	2.50	3.30	2.90	6.10	2.76	1.59	0.58
TOTAL-METALS	VANADIUM	µg/L	BGCR	B	33	120	0.28	2.00	60.00	2.00	18.20	6.64	8.22	1.24
TOTAL-METALS	VANADIUM	µg/L	CREEK	S	2	8	0.25	2.50	3.50	3.80	4.80	2.29	1.28	0.56
TOTAL-METALS	VANADIUM	µg/L	200	S	10	19	0.53	2.50	3.50	2.80	8.00	3.15	2.08	0.66
TOTAL-METALS	VANADIUM	µg/L	201	S	1	20	0.05	2.50	3.30	3.80	3.80	1.56	0.56	0.36
TOTAL-METALS	VANADIUM	µg/L	202	S	6	13	0.46	2.50	3.30	2.50	6.40	2.60	1.56	0.60
DISSOLVED-METALS	ZINC	µg/L	BGCR	B	86	138	0.62	1.70	44.00	2.40	111.50	14.08	18.21	1.29
DISSOLVED-METALS	ZINC	µg/L	CREEK	S	3	3	1.00			13.30	44.90	28.00	15.91	0.57
DISSOLVED-METALS	ZINC	µg/L	200	S	8	16	0.50	5.70	10.10	5.80	30.40	10.63	9.35	0.88

TABLE D-3
COMPARISON TO BENCHMARK DATA–SURFACE WATER

NOTE:
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean*	Standard Deviation	Coefficient of Variation
DISSOLVED-METALS	ZINC	µg/L	201	S	12	18	0.67	5.70	10.10	7.00	44.90	11.74	9.49	0.81
DISSOLVED-METALS	ZINC	µg/L	202	S	8	13	0.62	5.70	10.10	5.70	143.00	18.46	37.80	2.05
DISSOLVED-METALS	ZINC	µg/L	BM-CR	B		34		5.00			670.00			
DISSOLVED-METALS	ZINC	µg/L	BM-LK	B		20					20.00			
TOTAL-METALS	ZINC	µg/L	BM-LK	B		144				1.00	89.00	16.48-27		
TOTAL-METALS	ZINC	µg/L	BGCR	B	104	151	0.69	1.70	60.40	1.90	480.00	32.74	62.29	1.90
TOTAL-METALS	ZINC	µg/L	CREEK	S	8	8	1.00			15.00	158.00	91.58	59.59	0.65
TOTAL-METALS	ZINC	µg/L	200	S	19	19	1.00			13.80	158.00	48.46	44.32	0.91
TOTAL-METALS	ZINC	µg/L	201	S	17	20	0.85	10.10	10.10	12.80	184.00	38.60	47.49	1.23
TOTAL-METALS	ZINC	µg/L	202	S	7	13	0.54	5.70	10.10	6.60	18.00	8.18	5.49	0.67
RADIONUCLIDES														
DISSOLVED-RADS	AMERICIUM-241	pCi/L	BGCR	B	34	34	1.00			-0.010	0.500	0.070	0.129	1.83
DISSOLVED-RADS	AMERICIUM-241	pCi/L	CREEK	S	3	3	1.00			-0.002	0.003	0.001	0.003	3.77
DISSOLVED-RADS	AMERICIUM-241	pCi/L	200	S	14	14	1.00			-0.003	0.018	0.004	0.005	1.56
DISSOLVED-RADS	AMERICIUM-241	pCi/L	201	S	14	14	1.00			-0.004	0.013	0.003	0.005	1.39
DISSOLVED-RADS	AMERICIUM-241	pCi/L	202	S	12	12	1.00			-0.019	0.116	0.013	0.034	2.63
TOTAL-RADS	AMERICIUM-241	pCi/L	BGCR	B	106	106	1.00			-0.021	0.038	0.004	0.008	1.93
TOTAL-RADS	AMERICIUM-241	pCi/L	BM-LK	B		48					0.117	(-)0.013-0.019		
TOTAL-RADS	AMERICIUM-241	pCi/L	CREEK	S	5	5	1.00			-0.001	0.007	0.004	0.003	0.78
TOTAL-RADS	AMERICIUM-241	pCi/L	200	S	16	16	1.00			-0.005	0.017	0.005	0.005	1.00
TOTAL-RADS	AMERICIUM-241	pCi/L	201	S	17	17	1.00			-0.001	0.026	0.006	0.007	1.04
TOTAL-RADS	AMERICIUM-241	pCi/L	202	S	12	12	1.00			0.000	0.017	0.006	0.005	0.86
DISSOLVED-RADS	GROSS ALPHA	pCi/L	BGCR	B	60	60	1.00			-1.380	5.000	0.687	1.123	1.63
DISSOLVED-RADS	GROSS ALPHA	pCi/L	200	S	16	16	1.00			-0.420	2.700	0.485	0.716	1.48
DISSOLVED-RADS	GROSS ALPHA	pCi/L	201	S	15	15	1.00			-0.580	1.400	0.782	0.473	0.60
DISSOLVED-RADS	GROSS ALPHA	pCi/L	202	S	12	12	1.00			-0.130	1.900	0.496	0.545	1.10
TOTAL-RADS	GROSS ALPHA	pCi/L	BGCR	B	85	85	1.00			-2.000	13.000	1.513	2.238	1.48
TOTAL-RADS	GROSS ALPHA	pCi/L	200	S	15	15	1.00			0.072	2.200	1.124	0.727	0.65
TOTAL-RADS	GROSS ALPHA	pCi/L	201	S	15	15	1.00			0.440	1.900	1.178	0.489	0.41
TOTAL-RADS	GROSS ALPHA	pCi/L	202	S	11	11	1.00			-0.250	1.200	0.520	0.445	0.86
DISSOLVED-RADS	GROSS BETA	pCi/L	BGCR	B	61	61	1.00			-0.676	41.820	4.687	6.777	1.45
DISSOLVED-RADS	GROSS BETA	pCi/L	200	S	16	16	1.00			0.080	2.900	1.621	0.831	0.51
DISSOLVED-RADS	GROSS BETA	pCi/L	201	S	15	15	1.00			-0.140	4.300	1.955	1.025	0.52
DISSOLVED-RADS	GROSS BETA	pCi/L	202	S	12	12	1.00			-0.250	2.100	0.782	0.735	0.98
TOTAL-RADS	GROSS BETA	pCi/L	BGCR	B	82	82	1.00			-0.400	36.000	4.552	5.520	1.21
TOTAL-RADS	GROSS BETA	pCi/L	200	S	18	18	1.00			0.270	4.700	2.776	1.304	0.47
TOTAL-RADS	GROSS BETA	pCi/L	201	S	20	20	1.00			-0.010	4.300	2.177	1.108	0.51
TOTAL-RADS	GROSS BETA	pCi/L	202	S	13	13	1.00			-2.100	3.000	0.821	1.421	1.73
DISSOLVED-RADS	PLUTONIUM-239/240	pCi/L	BGCR	B	36	36	1.00			-0.123	0.900	0.116	0.204	1.76
DISSOLVED-RADS	PLUTONIUM-239/240	pCi/L	BM-LK	B		55					0.206	0.004-0.016		
DISSOLVED-RADS	PLUTONIUM-239/240	pCi/L	CREEK	S	2	2	1.00			0.004	0.006	0.005	0.001	0.28
DISSOLVED-RADS	PLUTONIUM-239/240	pCi/L	200	S	9	9	1.00			-0.003	0.002	0.000	0.002	-7.82
DISSOLVED-RADS	PLUTONIUM-239/240	pCi/L	201	S	13	13	1.00			-0.002	0.009	0.002	0.003	1.30
DISSOLVED-RADS	PLUTONIUM-239/240	pCi/L	202	S	10	10	1.00			-0.001	0.003	0.001	0.001	1.91
TOTAL-RADS	PLUTONIUM-239/240	pCi/L	BGCR	B	105	105	1.00			-0.016	0.048	0.004	0.008	1.96
TOTAL-RADS	PLUTONIUM-239/240	pCi/L	CREEK	S	7	7	1.00			-0.001	0.001	0.000	0.001	2.65
TOTAL-RADS	PLUTONIUM-239/240	pCi/L	200	S	13	13	1.00			-0.001	0.005	0.002	0.002	0.80
TOTAL-RADS	PLUTONIUM-239/240	pCi/L	201	S	19	19	1.00			0.000	0.009	0.002	0.002	1.08
TOTAL-RADS	PLUTONIUM-239/240	pCi/L	202	S	12	12	1.00			-0.005	0.030	0.005	0.010	1.84
TOTAL-RADS	TRITIUM	pCi/L	BGCR	B	73	73	1.00			-800.000	751.000	75.705	209.217	2.76
TOTAL-RADS	TRITIUM	pCi/L	BM-LK	B		60					147.000	(-)19-147		
TOTAL-RADS	TRITIUM	pCi/L	200	S	5	5	1.00			-29.100	144.300	47.776	83.228	1.74
DISSOLVED-RADS	URANIUM-233/234	pCi/L	BGCR	B	55	55	1.00			-0.016	1.800	0.359	0.365	1.01
DISSOLVED-RADS	URANIUM-233/234	pCi/L	CREEK	S	2	2	1.00			0.480	0.480	0.480		
DISSOLVED-RADS	URANIUM-233/234	pCi/L	200	S	12	12	1.00			0.140	0.560	0.418	0.124	0.30

TABLE D-3
COMPARISON TO BENCHMARK DATA–SURFACE WATER

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean*	Standard Deviation	Coefficient of Variation
NOTE:														
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))														
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))														
DISSOLVED-RADS	URANIUM-233/234	pCi/L	201	S	12	12	1.00			0.430	1.200	0.741	0.227	0.31
DISSOLVED-RADS	URANIUM-233/234	pCi/L	202	S	10	10	1.00			0.170	0.699	0.350	0.182	0.52
TOTAL-RADS	URANIUM-233/234	pCi/L	BGCR	B	79	79	1.00			-0.007	3.213	0.488	0.550	1.13
TOTAL-RADS	URANIUM-233/234	pCi/L	BM-LK	B		56					2.100	0.32-1.3		
TOTAL-RADS	URANIUM-233/234	pCi/L	CREEK	S	6	6	1.00			0.078	1.273	0.693	0.532	0.77
TOTAL-RADS	URANIUM-233/234	pCi/L	200	S	12	12	1.00			0.190	1.200	0.609	0.313	0.51
TOTAL-RADS	URANIUM-233/234	pCi/L	201	S	20	20	1.00			0.078	1.300	0.749	0.354	0.47
TOTAL-RADS	URANIUM-233/234	pCi/L	202	S	13	13	1.00			0.080	0.820	0.388	0.238	0.61
DISSOLVED-RADS	URANIUM-235	pCi/L	BGCR	B	56	56	1.00			-0.018	0.895	0.140	0.203	1.45
DISSOLVED-RADS	URANIUM-235	pCi/L	CREEK	S	2	2	1.00			0.000	0.310	0.155	0.219	1.41
DISSOLVED-RADS	URANIUM-235	pCi/L	200	S	12	12	1.00			-0.081	0.510	0.072	0.168	2.33
DISSOLVED-RADS	URANIUM-235	pCi/L	201	S	12	12	1.00			-0.004	0.710	0.146	0.257	1.76
DISSOLVED-RADS	URANIUM-235	pCi/L	202	S	10	10	1.00			-0.198	0.140	0.020	0.094	4.73
TOTAL-RADS	URANIUM-235	pCi/L	BGCR	B	75	75	1.00			-0.030	0.376	0.049	0.075	1.52
TOTAL-RADS	URANIUM-235	pCi/L	BM-LK	B		8					0.100			
TOTAL-RADS	URANIUM-235	pCi/L	CREEK	S	6	6	1.00			0.000	0.170	0.081	0.075	0.92
TOTAL-RADS	URANIUM-235	pCi/L	200	S	12	12	1.00			-0.039	0.410	0.082	0.125	1.53
TOTAL-RADS	URANIUM-235	pCi/L	201	S	20	20	1.00			-0.021	0.270	0.070	0.074	1.06
TOTAL-RADS	URANIUM-235	pCi/L	202	S	13	13	1.00			-0.028	0.145	0.032	0.059	1.83
DISSOLVED-RADS	URANIUM-238	pCi/L	BGCR	B	55	55	1.00			0.000	1.700	0.277	0.270	0.98
DISSOLVED-RADS	URANIUM-238	pCi/L	BM-LK	B	10						2.000	0.910		
DISSOLVED-RADS	URANIUM-238	pCi/L	CREEK	S	2	2	1.00			0.380	0.410	0.395	0.021	0.05
DISSOLVED-RADS	URANIUM-238	pCi/L	200	S	12	12	1.00			-0.046	0.580	0.296	0.186	0.63
DISSOLVED-RADS	URANIUM-238	pCi/L	201	S	12	12	1.00			-0.043	0.730	0.408	0.236	0.58
DISSOLVED-RADS	URANIUM-238	pCi/L	202	S	10	10	1.00			-0.255	0.420	0.135	0.193	1.43
TOTAL-RADS	URANIUM-238	pCi/L	BGCR	B	55	55	1.00			0.000	1.820	0.384	0.432	1.18
TOTAL-RADS	URANIUM-238	pCi/L	BM-LK	B		56					5.500	0.28-1.49		
TOTAL-RADS	URANIUM-238	pCi/L	CREEK	S	6	6	1.00			-0.022	0.870	0.524	0.333	0.64
TOTAL-RADS	URANIUM-238	pCi/L	200	S	12	12	1.00			-0.024	0.870	0.433	0.225	0.52
TOTAL-RADS	URANIUM-238	pCi/L	201	S	20	20	1.00			-0.022	1.100	0.618	0.292	0.47
TOTAL-RADS	URANIUM-238	pCi/L	202	S	12	12	1.00			0.091	0.650	0.285	0.168	0.59

*For benchmark data, range of means is presented.
B = Background.
BGCR = Background Geochemical Characterization Report (1993c).
S = OU 3 (onsite).

TABLE D-3
COMPARISON TO BENCHMARK DATA–SURFACE WATER

NOTE:
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean*	Standard Deviation	Coefficient of Variation
METALS														
DISSOLVED-METALS	ALUMINUM	µg/L	BGCR	B	56	133	0.42	9.00	454.00	13.30	1050.00	87.33	160.32	1.84
DISSOLVED-METALS	ALUMINUM	µg/L	CREEK	S	2	3	0.67	17.30	17.30	455.00	739.00	400.88	368.17	0.92
DISSOLVED-METALS	ALUMINUM	µg/L	200	S	12	16	0.75	14.70	17.30	15.20	3230.00	448.56	938.07	2.09
DISSOLVED-METALS	ALUMINUM	µg/L	201	S	12	17	0.71	14.70	17.30	16.40	455.00	70.16	140.78	2.01
DISSOLVED-METALS	ALUMINUM	µg/L	202	S	5	13	0.38	14.70	17.30	17.50	47.80	16.35	14.61	0.89
TOTAL-METALS	ALUMINUM	µg/L	BGCR	B	106	139	0.76	18.70	988.00	25.00	6560.00	758.89	1360.09	1.79
TOTAL-METALS	ALUMINUM	µg/L	CREEK	S	8	8	1.00			344.00	1990.00	1042.88	668.61	0.64
TOTAL-METALS	ALUMINUM	µg/L	200	S	19	19	1.00			32.20	4260.00	1402.48	1035.07	0.74
TOTAL-METALS	ALUMINUM	µg/L	201	S	20	20	1.00			65.20	1540.00	404.47	356.02	0.88
TOTAL-METALS	ALUMINUM	µg/L	202	S	13	13	1.00			25.90	196.00	92.55	55.66	0.60
TOTAL-METALS	ALUMINUM	µg/L	BM-LK	B		126					2627.00	187-665		
DISSOLVED-METALS	ANTIMONY	µg/L	BGCR	B	20	91	0.22	7.50	104.00	7.50	35.10	15.91	10.14	0.64
DISSOLVED-METALS	ANTIMONY	µg/L	CREEK	S	0	2	0.00	16.50	16.50			8.25		
DISSOLVED-METALS	ANTIMONY	µg/L	200	S		16		14.80	16.50			7.77	0.44	0.06
DISSOLVED-METALS	ANTIMONY	µg/L	201	S		17		14.80	16.50			7.80	0.44	0.06
DISSOLVED-METALS	ANTIMONY	µg/L	202	S		13		14.80	16.50			7.73	0.43	0.06
TOTAL-METALS	ANTIMONY	µg/L	BGCR	B	13	119	0.11	7.00	60.00	7.30	54.80	14.28	9.72	0.68
TOTAL-METALS	ANTIMONY	µg/L	CREEK	S	0	8	0.00	14.80	19.80			8.66	1.09	0.13
TOTAL-METALS	ANTIMONY	µg/L	200	S		19		14.80	19.80			8.11	0.89	0.11
TOTAL-METALS	ANTIMONY	µg/L	201	S		20		14.80	16.50			7.78	0.43	0.06
TOTAL-METALS	ANTIMONY	µg/L	202	S		13		14.80	16.50			7.73	0.43	0.06
TOTAL-METALS	ANTIMONY	µg/L	BM-LK	B		46					86.00			
DISSOLVED-METALS	ARSENIC	µg/L	BGCR	B	4	93	0.04	0.70	10.00	0.90	1.60	1.27	1.26	1.00
DISSOLVED-METALS	ARSENIC	µg/L	CREEK	S	0	3	0.00	2.60	2.60			1.30		
DISSOLVED-METALS	ARSENIC	µg/L	200	S	3	16	0.19	1.90	2.90	2.40	2.40	1.46	0.51	0.35
DISSOLVED-METALS	ARSENIC	µg/L	201	S	1	18	0.06	1.90	3.20	2.90	2.90	1.36	0.46	0.34
DISSOLVED-METALS	ARSENIC	µg/L	202	S	13	13	1.00			2.90	6.30	4.14	0.99	0.24
DISSOLVED-METALS	ARSENIC	µg/L	BM-CR	B		16		5.00	5.00					
DISSOLVED-METALS	ARSENIC	µg/L	BM-LK	B		5					1.00			
TOTAL-METALS	ARSENIC	µg/L	BGCR	B	15	110	0.14	0.50	11.50	1.00	2.90	1.59	1.55	0.98
TOTAL-METALS	ARSENIC	µg/L	CREEK	S	3	8	0.38	2.60	3.20	0.70	1.30	1.25	0.31	0.25
TOTAL-METALS	ARSENIC	µg/L	200	S	6	19	0.32	1.90	2.90	0.70	2.90	1.32	0.59	0.44
TOTAL-METALS	ARSENIC	µg/L	201	S		20		2.20	3.20			1.45	0.18	0.13
TOTAL-METALS	ARSENIC	µg/L	202	S	13	13	1.00			3.10	6.60	4.92	0.94	0.19
TOTAL-METALS	ARSENIC	µg/L	BM-CR	B		18		5.00	5.00					
TOTAL-METALS	ARSENIC	µg/L	BM-LK	B		106					10.00			
DISSOLVED-METALS	BARIUM	µg/L	BGCR	B	102	144	0.71	24.50	200.00	18.80	391.00	48.63	34.98	0.72
DISSOLVED-METALS	BARIUM	µg/L	CREEK	S	3	3	1.00			20.70	43.10	28.40	12.74	0.45
DISSOLVED-METALS	BARIUM	µg/L	200	S	16	16	1.00			20.70	48.90	37.01	6.39	0.17
DISSOLVED-METALS	BARIUM	µg/L	201	S	18	18	1.00			21.40	43.10	35.11	4.18	0.12
DISSOLVED-METALS	BARIUM	µg/L	202	S	13	13	1.00			20.30	31.40	24.69	3.31	0.13
TOTAL-METALS	BARIUM	µg/L	BGCR	B	112	131	0.85	45.50	200.00	26.40	306.00	63.69	31.66	0.50
TOTAL-METALS	BARIUM	µg/L	CREEK	S	8	8	1.00			25.40	80.10	37.84	18.36	0.49
TOTAL-METALS	BARIUM	µg/L	200	S	19	19	1.00			27.00	80.10	43.09	11.49	0.27
TOTAL-METALS	BARIUM	µg/L	201	S	20	20	1.00			25.40	44.50	35.89	4.52	0.13
TOTAL-METALS	BARIUM	µg/L	202	S	13	13	1.00			20.40	34.70	25.98	3.60	0.14
TOTAL-METALS	BARIUM	µg/L	BM-LK	B		75					250.00	47-103		
DISSOLVED-METALS	BERYLLIUM	µg/L	BGCR	B	8	89	0.09	0.20	8.00	0.65	17.00	1.08	1.88	1.74
DISSOLVED-METALS	BERYLLIUM	µg/L	CREEK	S	0	3	0.00	0.40	0.40			0.20		
DISSOLVED-METALS	BERYLLIUM	µg/L	200	S		16		0.30	0.40			0.17	0.03	0.15
DISSOLVED-METALS	BERYLLIUM	µg/L	201	S		18		0.30	0.40			0.18	0.03	0.15
DISSOLVED-METALS	BERYLLIUM	µg/L	202	S		13		0.30	0.40			0.17	0.03	0.15
TOTAL-METALS	BERYLLIUM	µg/L	BGCR	B	9	115	0.08	0.20	5.00	0.60	4.80	0.78	0.87	1.12
TOTAL-METALS	BERYLLIUM	µg/L	CREEK	S	1	8	0.13	0.30	0.60	0.36	0.36	0.25	0.07	0.29
TOTAL-METALS	BERYLLIUM	µg/L	200	S	1	19	0.05	0.30	0.60	0.40	0.40	0.20	0.07	0.35

TABLE D-3
COMPARISON TO BENCHMARK DATA--SURFACE WATER

NOTE:
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean*	Standard Deviation	Coefficient of Variation
TOTAL-METALS	BERYLLIUM	µg/L	201	S	1	20	0.05	0.30	0.40	0.36	0.36	0.18	0.05	0.27
TOTAL-METALS	BERYLLIUM	µg/L	202	S		13		0.30	0.40			0.17	0.03	0.15
TOTAL-METALS	BERYLLIUM	µg/L	BM-LK	B		42			2.00					
DISSOLVED-METALS	CADMIUM	µg/L	BGCR	B	5	77	0.06	1.40	5.00	2.30	3.50	1.77	0.62	0.35
DISSOLVED-METALS	CADMIUM	µg/L	CREEK	S	1	3	0.33	1.40	1.40	2.50	2.50	1.30	1.04	0.80
DISSOLVED-METALS	CADMIUM	µg/L	200	S	1	16	0.06	1.40	1.50	1.50	1.50	0.78	0.19	0.25
DISSOLVED-METALS	CADMIUM	µg/L	201	S	2	18	0.11	1.40	1.50	2.50	2.50	0.93	0.57	0.62
DISSOLVED-METALS	CADMIUM	µg/L	202	S	1	13	0.08	1.40	1.50	1.80	1.80	0.82	0.30	0.36
DISSOLVED-METALS	CADMIUM	µg/L	BM-CR	B		33		1.00	5.00		2.50			
TOTAL-METALS	CADMIUM	µg/L	BM-LK	B		142		0.10			7.00	0.23-1.33		
TOTAL-METALS	CADMIUM	µg/L	BGCR	B	3	108	0.03	1.40	5.00	2.60	4.20	1.69	0.68	0.40
TOTAL-METALS	CADMIUM	µg/L	CREEK	S	3	8	0.38	1.40	2.30	2.40	2.80	1.47	0.93	0.63
TOTAL-METALS	CADMIUM	µg/L	200	S	3	19	0.16	1.40	2.30	1.90	2.80	1.02	0.64	0.63
TOTAL-METALS	CADMIUM	µg/L	201	S	1	20	0.05	1.40	1.50	2.40	2.40	0.81	0.37	0.46
TOTAL-METALS	CADMIUM	µg/L	202	S	2	13	0.15	1.40	1.50	4.00	9.00	1.62	2.39	1.48
DISSOLVED-METALS	CALCIUM	µg/L	BGCR	B	153	153	1.00			6760.00	79300.00	24056.86	10904.89	0.45
DISSOLVED-METALS	CALCIUM	µg/L	CREEK	S	3	3	1.00			13900.00	27200.00	18566.67	7484.87	0.40
DISSOLVED-METALS	CALCIUM	µg/L	200	S	16	16	1.00			13900.00	22000.00	19156.25	1822.44	0.10
DISSOLVED-METALS	CALCIUM	µg/L	201	S	18	18	1.00			14600.00	27200.00	23127.78	2520.46	0.11
DISSOLVED-METALS	CALCIUM	µg/L	202	S	13	13	1.00			11200.00	14200.00	12792.31	1028.32	0.08
TOTAL-METALS	CALCIUM	µg/L	BGCR	B	153	153	1.00			5505.75	74600.00	24071.96	10675.23	0.44
TOTAL-METALS	CALCIUM	µg/L	CREEK	S	8	8	1.00			11000.00	47200.00	21212.50	12141.48	0.57
TOTAL-METALS	CALCIUM	µg/L	200	S	19	19	1.00			11000.00	47200.00	19621.05	7339.13	0.37
TOTAL-METALS	CALCIUM	µg/L	201	S	20	20	1.00			12600.00	26100.00	22085.00	3340.39	0.15
TOTAL-METALS	CALCIUM	µg/L	202	S	13	13	1.00			11100.00	13900.00	12676.92	840.79	0.07
TOTAL-METALS	CALCIUM	µg/L	BM-LK	B	41						72000.00	33290-37380		
DISSOLVED-METALS	CESIUM	µg/L	BGCR	B	9	97	0.09	2.00	2500.00	60.00	200.00	355.86	281.41	0.79
DISSOLVED-METALS	CESIUM	µg/L	CREEK	S	0	3	0.00	50.00	50.00			25.00		
DISSOLVED-METALS	CESIUM	µg/L	200	S	4	16	0.25	50.00	50.00	50.00	60.00	31.88	12.50	0.39
DISSOLVED-METALS	CESIUM	µg/L	201	S	5	18	0.28	50.00	50.00	50.00	60.00	34.72	17.19	0.50
DISSOLVED-METALS	CESIUM	µg/L	202	S	4	13	0.31	50.00	50.00	50.00	80.00	36.54	19.51	0.53
TOTAL-METALS	CESIUM	µg/L	BGCR	B	10	120	0.08	2.00	2500.00	50.00	400.00	241.78	184.80	0.76
TOTAL-METALS	CESIUM	µg/L	CREEK	S	0	8	0.00	50.00	500.00			109.38	116.45	1.06
TOTAL-METALS	CESIUM	µg/L	200	S	5	19	0.26	50.00	500.00	50.00	90.00	69.21	82.15	1.19
TOTAL-METALS	CESIUM	µg/L	201	S		20		50.00	50.00			25.00		
TOTAL-METALS	CESIUM	µg/L	202	S	3	13	0.23	50.00	50.00	50.00	80.00	33.85	17.93	0.53
DISSOLVED-METALS	CHROMIUM	µg/L	BGCR	B	9	89	0.10	2.00	20.00	2.10	14.80	3.24	2.69	0.83
DISSOLVED-METALS	CHROMIUM	µg/L	CREEK	S	0	3	0.00	3.70	3.70			1.85		
DISSOLVED-METALS	CHROMIUM	µg/L	200	S		16		2.60	3.70			1.54	0.28	0.18
DISSOLVED-METALS	CHROMIUM	µg/L	201	S	1	18	0.06	2.60	3.70	3.80	3.80	1.71	0.59	0.34
DISSOLVED-METALS	CHROMIUM	µg/L	202	S	1	13	0.08	2.60	3.70	3.40	3.40	1.67	0.59	0.35
DISSOLVED-METALS	CHROMIUM	µg/L	BM-CR	B		14		5.00	5.00					
DISSOLVED-METALS	CHROMIUM	µg/L	BM-LK	B		5					8.00			
TOTAL-METALS	CHROMIUM	µg/L	BM-CR	B		18		5.00	5.00		5.00			
TOTAL-METALS	CHROMIUM	µg/L	BM-LK	B		145				1.00	36.00	1.52-3.67		
TOTAL-METALS	CHROMIUM	µg/L	BGCR	B	19	120	0.16	2.00	13.50	2.10	18.90	3.64	2.98	0.82
TOTAL-METALS	CHROMIUM	µg/L	CREEK	S	1	8	0.13	2.00	3.70	2.90	2.90	1.59	0.66	0.41
TOTAL-METALS	CHROMIUM	µg/L	200	S	2	19	0.11	2.00	3.70	4.30	4.40	1.72	0.97	0.57
TOTAL-METALS	CHROMIUM	µg/L	201	S	2	20	0.10	2.60	3.70	2.80	2.90	1.70	0.48	0.28
TOTAL-METALS	CHROMIUM	µg/L	202	S	1	13	0.08	2.60	3.70	65.80	65.80	6.47	17.83	2.75
DISSOLVED-METALS	COBALT	µg/L	BGCR	B	3	86	0.03	2.00	50.00	2.40	4.60	4.88	6.26	1.28
DISSOLVED-METALS	COBALT	µg/L	CREEK	S	0	3	0.00	2.30	2.30			1.15		
DISSOLVED-METALS	COBALT	µg/L	200	S	1	16	0.06	1.30	2.30	1.90	1.90	0.95	0.36	0.38
DISSOLVED-METALS	COBALT	µg/L	201	S		18		1.30	2.30			0.90	0.26	0.29
DISSOLVED-METALS	COBALT	µg/L	202	S	1	13	0.08	1.30	2.30	1.80	1.80	0.93	0.36	0.39
TOTAL-METALS	COBALT	µg/L	BGCR	B	8	116	0.07	2.00	50.00	2.70	7.90	5.35	8.07	1.51

TABLE D-3
COMPARISON TO BENCHMARK DATA--SURFACE WATER

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean*	Standard Deviation	Coefficient of Variation
NOTE:														
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))														
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))														
TOTAL-METALS	COBALT	µg/L	CREEK	S	0	8	0.00	1.30	2.70			1.10	0.29	0.27
TOTAL-METALS	COBALT	µg/L	200	S	3	19	0.16	1.30	2.70	1.50	2.60	1.14	0.47	0.42
TOTAL-METALS	COBALT	µg/L	201	S	2	20	0.10	1.30	2.30	1.30	1.90	0.97	0.34	0.35
TOTAL-METALS	COBALT	µg/L	202	S		13		1.30	2.30			0.84	0.25	0.30
TOTAL-METALS	COBALT	µg/L	BM-LK	B		5					4.00	1.00		
DISSOLVED-METALS	COPPER	µg/L	BGCR	B	48	124	0.39	2.00	25.70	2.40	28.00	6.07	5.12	0.84
DISSOLVED-METALS	COPPER	µg/L	CREEK	S	2	3	0.67	2.40	2.40	5.50	8.10	4.93	3.48	0.71
DISSOLVED-METALS	COPPER	µg/L	200	S	9	16	0.56	1.90	2.40	2.00	9.40	3.15	2.67	0.85
DISSOLVED-METALS	COPPER	µg/L	201	S	6	18	0.33	1.90	2.40	1.90	8.10	1.77	1.66	0.94
DISSOLVED-METALS	COPPER	µg/L	202	S	5	12	0.42	1.90	2.40	2.10	4.50	1.94	1.19	0.62
DISSOLVED-METALS	COPPER	µg/L	BM-CR	B		34		1.00			49.00			
TOTAL-METALS	COPPER	µg/L	BM-LK	B		166		1.00			31.00	2.5-5.97		
TOTAL-METALS	COPPER	µg/L	BGCR	B	47	121	0.39	2.00	25.60	2.60	15.50	5.35	4.21	0.79
TOTAL-METALS	COPPER	µg/L	CREEK	S	7	8	0.88	2.30	2.30	5.80	20.90	13.24	7.40	0.56
TOTAL-METALS	COPPER	µg/L	200	S	13	15	0.87	1.90	2.30	4.30	20.90	9.25	6.35	0.69
TOTAL-METALS	COPPER	µg/L	201	S	16	17	0.94	1.90	1.90	2.80	16.50	5.84	4.25	0.73
TOTAL-METALS	COPPER	µg/L	202	S	3	13	0.23	1.90	2.40	2.20	4.50	1.58	1.11	0.70
TOTAL-METALS	CYANIDE	µg/L	BGCR	B	2	25	0.08	1.50	20.00	2.00	2.50	2.50	2.72	1.09
TOTAL-METALS	CYANIDE	µg/L	200	S		15		10.00	10.00			5.00		
TOTAL-METALS	CYANIDE	µg/L	201	S	1	16	0.063	10.00	10.00	21.50	21.50	6.03	4.13	
TOTAL-METALS	CYANIDE	µg/L	202	S		13		10.00	10.00			5.00		
DISSOLVED-METALS	IRON	µg/L	BGCR	B	107	152	0.70	3.00	316.00	9.30	1060.00	145.45	177.80	1.22
DISSOLVED-METALS	IRON	µg/L	CREEK	S	3	3	1.00			19.80	228.00	122.27	104.14	0.85
DISSOLVED-METALS	IRON	µg/L	200	S	12	15	0.80	4.00	16.30	6.60	572.00	93.62	144.89	1.55
DISSOLVED-METALS	IRON	µg/L	201	S	12	15	0.80	16.30	16.30	11.00	228.00	36.10	54.28	1.50
DISSOLVED-METALS	IRON	µg/L	202	S	13	13	1.00			7.00	71.10	35.46	22.08	0.62
DISSOLVED-METALS	IRON	µg/L	BM-CR	B		33		10.00			1900.00			
DISSOLVED-METALS	IRON	µg/L	BM-LK	B		20					80.00			
TOTAL-METALS	IRON	µg/L	BM-CR	B		35		10.00			3300.00			
TOTAL-METALS	IRON	µg/L	BM-LK	B		191		10.00			1643.00	233-631		
TOTAL-METALS	IRON	µg/L	BGCR	B	147	157	0.94	82.75	478.00	9.70	26300.00	1261.17	2865.13	2.27
TOTAL-METALS	IRON	µg/L	CREEK	S	8	8	1.00			453.00	2340.00	1218.88	719.98	0.59
TOTAL-METALS	IRON	µg/L	200	S	19	19	1.00			40.70	2340.00	1115.04	685.21	0.61
TOTAL-METALS	IRON	µg/L	201	S	20	20	1.00			37.70	1150.00	401.56	332.31	0.83
TOTAL-METALS	IRON	µg/L	202	S	13	13	1.00			56.50	328.00	156.69	75.05	0.48
DISSOLVED-METALS	LEAD	µg/L	BGCR	B	25	112	0.22	0.40	13.10	0.70	7.20	1.29	1.22	0.94
DISSOLVED-METALS	LEAD	µg/L	CREEK	S	3	3	1.00			3.60	10.20	5.93	3.70	0.62
DISSOLVED-METALS	LEAD	µg/L	200	S	16	16	1.00			1.20	5.80	3.15	1.26	0.40
DISSOLVED-METALS	LEAD	µg/L	201	S	9	18	0.50	1.00	2.20	2.10	10.20	2.65	2.61	0.99
DISSOLVED-METALS	LEAD	µg/L	202	S	12	13	0.92	1.90	1.90	2.10	11.40	4.20	2.72	0.65
DISSOLVED-METALS	LEAD	µg/L	BM-CR	B		33		1.00			14.00			
TOTAL-METALS	LEAD	µg/L	BM-LK	B		125				1.00	888.00	2.75-86		
TOTAL-METALS	LEAD	µg/L	BGCR	B	52	131	0.40	0.70	11.60	0.80	21.00	1.94	2.32	1.20
TOTAL-METALS	LEAD	µg/L	CREEK	S	8	8	1.00			0.90	11.00	7.89	3.81	0.48
TOTAL-METALS	LEAD	µg/L	200	S	19	19	1.00			0.90	18.50	7.04	4.49	0.64
TOTAL-METALS	LEAD	µg/L	201	S	17	20	0.85	2.00	2.70	2.50	10.70	4.34	2.89	0.67
TOTAL-METALS	LEAD	µg/L	202	S	13	13	1.00			2.40	37.20	7.22	9.78	1.35
DISSOLVED-METALS	LITHIUM	µg/L	BGCR	B	51	118	0.43	1.00	101.00	1.30	12.80	15.97	20.53	1.29
DISSOLVED-METALS	LITHIUM	µg/L	CREEK	S	3	3	1.00			5.80	12.00	7.90	3.55	0.45
DISSOLVED-METALS	LITHIUM	µg/L	200	S	15	16	0.94	3.70	3.70	3.80	8.20	5.58	1.52	0.27
DISSOLVED-METALS	LITHIUM	µg/L	201	S	18	18	1.00			5.90	12.00	7.65	1.41	0.18
DISSOLVED-METALS	LITHIUM	µg/L	202	S	13	13	1.00			6.50	10.60	8.22	1.34	0.16
TOTAL-METALS	LITHIUM	µg/L	BGCR	B	59	126	0.47	2.00	100.00	2.00	15.50	11.76	17.38	1.48
TOTAL-METALS	LITHIUM	µg/L	CREEK	S	7	7	1.00			3.50	11.10	7.40	2.54	0.34
TOTAL-METALS	LITHIUM	µg/L	200	S	18	18	1.00			3.50	8.70	6.34	1.45	0.23
TOTAL-METALS	LITHIUM	µg/L	201	S	20	20	1.00			4.90	11.10	7.72	1.63	0.21

TABLE D-3
COMPARISON TO BENCHMARK DATA--SURFACE WATER

NOTE:
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean*	Standard Deviation	Coefficient of Variation
TOTAL-METALS	LITHIUM	µg/L	202	S	13	13	1.00			5.20	9.40	7.29	1.35	0.19
TOTAL-METALS	LITHIUM	µg/L	BM-LK	B		16					8.00	4.38		
DISSOLVED-METALS	MAGNESIUM	µg/L	BGCR	B	133	149	0.89	3300.00	5000.00	1890.00	17800.00	5004.04	1987.74	0.40
DISSOLVED-METALS	MAGNESIUM	µg/L	CREEK	S	3	3	1.00			3080.00	6310.00	4303.33	1751.69	0.41
DISSOLVED-METALS	MAGNESIUM	µg/L	200	S	16	16	1.00			3080.00	4320.00	3941.88	273.31	0.07
DISSOLVED-METALS	MAGNESIUM	µg/L	201	S	18	18	1.00			3520.00	6310.00	5331.11	546.30	0.10
DISSOLVED-METALS	MAGNESIUM	µg/L	202	S	13	13	1.00			5930.00	7160.00	6627.69	452.59	0.07
DISSOLVED-METALS	MAGNESIUM	µg/L	BM-LK	B		33					66000.00	8760.00		
TOTAL-METALS	MAGNESIUM	µg/L	BGCR	B	134	146	0.92	4100.00	5000.00	1870.00	16600.00	5125.31	1924.26	0.38
TOTAL-METALS	MAGNESIUM	µg/L	CREEK	S	8	8	1.00			2940.00	11100.00	5297.50	2771.48	0.52
TOTAL-METALS	MAGNESIUM	µg/L	200	S	19	19	1.00			2940.00	11100.00	4328.42	1689.44	0.39
TOTAL-METALS	MAGNESIUM	µg/L	201	S	20	20	1.00			3450.00	6480.00	5338.00	596.74	0.11
TOTAL-METALS	MAGNESIUM	µg/L	202	S	13	13	1.00			5820.00	7340.00	6568.46	586.74	0.09
TOTAL-METALS	MAGNESIUM	µg/L	BM-LK	B		98					27000.00	9400-17600		
DISSOLVED-METALS	MANGANESE	µg/L	BGCR	B	115	148	0.78	0.94	15.00	1.00	353.00	28.47	47.75	1.68
DISSOLVED-METALS	MANGANESE	µg/L	CREEK	S	3	3	1.00			4.80	63.10	42.00	32.31	0.77
DISSOLVED-METALS	MANGANESE	µg/L	200	S	16	16	1.00			0.90	94.20	19.01	31.20	1.64
DISSOLVED-METALS	MANGANESE	µg/L	201	S	14	18	0.78	0.90	0.90	1.60	1570.00	118.88	372.43	3.13
DISSOLVED-METALS	MANGANESE	µg/L	202	S	13	13	1.00			2.70	7.90	4.85	1.73	0.36
DISSOLVED-METALS	MANGANESE	µg/L	BM-CR	B		33		5.00			1800.00			
DISSOLVED-METALS	MANGANESE	µg/L	BM-LK	B		20					31.00			
TOTAL-METALS	MANGANESE	µg/L	BM-LK	B		197					400.00	43.22-216.5		
TOTAL-METALS	MANGANESE	µg/L	BGCR	B	138	151	0.91	1.30	15.00	1.00	4060.00	87.07	343.53	3.95
TOTAL-METALS	MANGANESE	µg/L	CREEK	S	8	8	1.00			97.00	307.00	169.00	70.21	
TOTAL-METALS	MANGANESE	µg/L	200	S	19	19	1.00			6.80	210.00	71.51	66.18	0.93
TOTAL-METALS	MANGANESE	µg/L	201	S	20	20	1.00			5.50	1580.00	155.99	357.73	2.29
TOTAL-METALS	MANGANESE	µg/L	202	S	13	13	1.00			11.80	37.00	21.96	8.28	0.38
TOTAL-METALS	MANGANESE	µg/L	BM-CR	B		35		5.00			1800.00			
DISSOLVED-METALS	MERCURY	µg/L	BGCR	B	8	82	0.10	0.10	0.20	0.22	0.44	0.12	0.07	0.59
DISSOLVED-METALS	MERCURY	µg/L	CREEK	S		3		0.20	0.20			0.10		
DISSOLVED-METALS	MERCURY	µg/L	200	S	5	16	0.31	0.20	0.20	0.13	0.13	0.11	0.01	0.13
DISSOLVED-METALS	MERCURY	µg/L	201	S		18		0.10	0.20			0.09	0.02	0.27
DISSOLVED-METALS	MERCURY	µg/L	202	S	2	13	0.15	0.10	0.20	0.20	0.20	0.10	0.05	0.54
DISSOLVED-METALS	MERCURY	µg/L	BM-CR	B		34		0.10			0.20			
TOTAL-METALS	MERCURY	µg/L	BM-LK	B		112		0.10			9.00	0.05-0.36		
TOTAL-METALS	MERCURY	µg/L	BGCR	B	9	122	0.07	0.10	0.42	0.20	1.40	0.13	0.16	1.21
TOTAL-METALS	MERCURY	µg/L	CREEK	S	2	8	0.25	0.20	0.20	0.12	0.12	0.11	0.01	0.09
TOTAL-METALS	MERCURY	µg/L	200	S		19		0.10	0.20			0.09	0.02	0.26
TOTAL-METALS	MERCURY	µg/L	201	S	3	20	0.15	0.10	0.20	0.12	0.82	0.13	0.16	1.28
TOTAL-METALS	MERCURY	µg/L	202	S	2	13	0.15	0.10	0.20	0.20	0.30	0.10	0.07	0.69
DISSOLVED-METALS	MOLYBDENUM	µg/L	BGCR	B	14	92	0.15	2.00	500.00	2.50	23.40	33.19	49.35	1.49
DISSOLVED-METALS	MOLYBDENUM	µg/L	CREEK	S	3	3	1.00			3.40	6.60	4.77	1.65	0.35
DISSOLVED-METALS	MOLYBDENUM	µg/L	200	S	16	16	1.00			2.00	7.00	4.64	1.49	0.32
DISSOLVED-METALS	MOLYBDENUM	µg/L	201	S	18	18	1.00			2.70	8.80	5.17	1.44	0.28
DISSOLVED-METALS	MOLYBDENUM	µg/L	202	S	2	13	0.15	1.70	2.70	2.70	3.10	1.36	0.73	0.54
TOTAL-METALS	MOLYBDENUM	µg/L	BGCR	B	12	125	0.10	2.00	100.00	2.10	20.30	12.13	17.41	1.44
TOTAL-METALS	MOLYBDENUM	µg/L	CREEK	S	6	8	0.75	3.50	3.50	3.50	7.40	4.53	2.07	0.46
TOTAL-METALS	MOLYBDENUM	µg/L	200	S	17	19	0.89	3.50	3.50	3.60	8.20	5.08	1.61	0.32
TOTAL-METALS	MOLYBDENUM	µg/L	201	S	20	20	1.00			3.30	7.70	5.29	1.35	0.25
TOTAL-METALS	MOLYBDENUM	µg/L	202	S	5	13	0.38	1.70	2.70	1.90	4.40	1.78	1.00	0.56
TOTAL-METALS	MOLYBDENUM	µg/L	BM-LK	B		20					60.00	8.35		
DISSOLVED-METALS	NICKEL	µg/L	BGCR	B	4	85	0.05	3.00	40.00	6.20	21.80	7.47	5.58	0.75
DISSOLVED-METALS	NICKEL	µg/L	CREEK	S	0	3	0.00	6.00	6.00			3.00		
DISSOLVED-METALS	NICKEL	µg/L	200	S	1	16	0.06	2.60	6.00	3.50	3.50	2.18	0.92	0.42
DISSOLVED-METALS	NICKEL	µg/L	201	S	3	18	0.17	2.60	6.00	2.80	3.40	2.44	0.84	0.34
DISSOLVED-METALS	NICKEL	µg/L	202	S	2	13	0.15	2.60	6.00	2.90	6.60	2.48	1.50	0.60

TABLE D-3
COMPARISON TO BENCHMARK DATA–SURFACE WATER

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean*	Standard Deviation	Coefficient of Variation
NOTE:														
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))														
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))														
DISSOLVED-METALS	NICKEL	µg/L	BM-CR	B		34		10.00			20.00			
DISSOLVED-METALS	NICKEL	µg/L	BM-LK	B		20					10.00			
TOTAL-METALS	NICKEL	µg/L	BM-LK	B		123		10.00			25.00	3.0-6.3		
TOTAL-METALS	NICKEL	µg/L	BGCR	B	15	120	0.13	3.00	40.00	3.80	12.80	7.11	5.88	0.83
TOTAL-METALS	NICKEL	µg/L	CREEK	S	1	8	0.13	2.60	11.20	2.80	2.80	3.74	1.64	0.44
TOTAL-METALS	NICKEL	µg/L	200	S	6	19	0.32	2.60	11.20	2.70	6.50	3.32	1.59	0.48
TOTAL-METALS	NICKEL	µg/L	201	S	5	20	0.25	2.60	6.00	2.80	33.10	4.18	6.89	1.65
TOTAL-METALS	NICKEL	µg/L	202	S	4	13	0.31	2.60	6.00	2.80	23.00	4.56	6.02	1.32
DISSOLVED-METALS	PHOSPHORUS	µg/L	BGCR	B	4	6	0.67	80.00	296.00	102.00	398.00	163.50	122.37	0.75
TOTAL-METALS	PHOSPHORUS	µg/L	BGCR	B	1	6	0.17	101.00	456.00	157.00	157.00	110.42	68.30	0.62
DISSOLVED-METALS	POTASSIUM	µg/L	BGCR	B	86	125	0.69	390.00	5000.00	402.00	6800.00	1612.34	1011.90	0.63
DISSOLVED-METALS	POTASSIUM	µg/L	CREEK	S	3	3	1.00			1130.00	2170.00	1626.67	521.57	0.32
DISSOLVED-METALS	POTASSIUM	µg/L	200	S	16	16	1.00			1130.00	2030.00	1559.38	181.38	0.12
DISSOLVED-METALS	POTASSIUM	µg/L	201	S	18	18	1.00			1580.00	2170.00	1858.33	122.87	0.07
DISSOLVED-METALS	POTASSIUM	µg/L	202	S	13	13	1.00			141.00	840.00	412.77	202.77	0.49
TOTAL-METALS	POTASSIUM	µg/L	BGCR	B	93	128	0.73	380.00	5000.00	493.00	6700.00	1817.03	1058.86	0.58
TOTAL-METALS	POTASSIUM	µg/L	CREEK	S	8	8	1.00			1260.00	6390.00	2611.25	1621.01	0.62
TOTAL-METALS	POTASSIUM	µg/L	200	S	19	19	1.00			1340.00	6390.00	2051.05	1105.88	0.54
TOTAL-METALS	POTASSIUM	µg/L	201	S	20	20	1.00			1260.00	2370.00	1913.50	235.85	0.12
TOTAL-METALS	POTASSIUM	µg/L	202	S	13	13	1.00			147.00	740.00	420.31	211.72	0.50
TOTAL-METALS	POTASSIUM	µg/L	BM-LK	B		35					11000.00	2150-6900		
DISSOLVED-METALS	SELENIUM	µg/L	BGCR	B	7	84	0.08	0.80	20.00	0.85	8.60	1.58	1.72	1.09
DISSOLVED-METALS	SELENIUM	µg/L	CREEK	S	1	3	0.33	3.70	3.70	3.90	3.90	2.53	1.18	0.47
DISSOLVED-METALS	SELENIUM	µg/L	200	S		16		2.90	3.80			1.71	0.20	0.12
DISSOLVED-METALS	SELENIUM	µg/L	201	S	3	18	0.17	2.80	3.90	3.00	3.90	2.05	0.75	0.37
DISSOLVED-METALS	SELENIUM	µg/L	202	S	1	13	0.08	2.90	3.80	3.00	3.00	1.64	0.43	0.26
DISSOLVED-METALS	SELENIUM	µg/L	BM-CR	B		16		5.00						
TOTAL-METALS	SELENIUM	µg/L	BM-CR	B		18		5.00						
TOTAL-METALS	SELENIUM	µg/L	BM-LK	B		103		1.00			5.00			
TOTAL-METALS	SELENIUM	µg/L	BGCR	B	7	120	0.06	0.80	20.00	0.80	6.20	1.27	1.19	0.93
TOTAL-METALS	SELENIUM	µg/L	CREEK	S	0	8	0.00	0.80	3.90			1.33	0.77	0.58
TOTAL-METALS	SELENIUM	µg/L	200	S		19		0.80	3.80			1.47	0.50	0.34
TOTAL-METALS	SELENIUM	µg/L	201	S	1	20	0.05	2.80	3.90	5.30	5.30	2.06	0.77	0.38
TOTAL-METALS	SELENIUM	µg/L	202	S		13		2.90	3.80			1.66	0.20	0.12
DISSOLVED-METALS	SILICON	µg/L	200	S	16	16	1.00			469.00	3100.00	1413.06	782.73	0.55
DISSOLVED-METALS	SILICON	µg/L	CREEK	S	3	3	1.00			1240.00	3390.00	2576.67	1166.63	0.45
DISSOLVED-METALS	SILICON	µg/L	201	S	18	18	1.00			865.00	3390.00	1459.33	619.80	0.42
DISSOLVED-METALS	SILICON	µg/L	202	S	13	13	1.00			410.00	3330.00	1476.69	1154.47	0.78
TOTAL-METALS	SILICON	µg/L	BGCR	B	67	67	1.00			690.00	15200.00	6076.23	3377.17	0.56
TOTAL-METALS	SILICON	µg/L	CREEK	S	8	8	1.00			928.00	7770.00	4097.25	2484.62	0.61
TOTAL-METALS	SILICON	µg/L	200	S	19	19	1.00			544.00	7770.00	2469.89	2107.20	0.85
TOTAL-METALS	SILICON	µg/L	201	S	20	20	1.00			928.00	4040.00	1636.95	880.01	0.54
TOTAL-METALS	SILICON	µg/L	202	S	13	13	1.00			348.00	3250.00	1345.23	1107.18	0.82
DISSOLVED-METALS	SILVER	µg/L	BGCR	B	9	98	0.09	2.00	30.00	2.60	9.20	2.75	2.72	0.99
DISSOLVED-METALS	SILVER	µg/L	CREEK	S	1	3	0.33	2.30	2.30	3.80	3.80	2.03	1.53	0.75
DISSOLVED-METALS	SILVER	µg/L	200	S	5	16	0.31	2.30	3.60	2.50	3.80	2.04	0.65	0.32
DISSOLVED-METALS	SILVER	µg/L	201	S		14		2.30	3.60			1.38	0.32	0.23
DISSOLVED-METALS	SILVER	µg/L	202	S		13		2.30	3.60			1.55	0.33	0.21
DISSOLVED-METALS	SILVER	µg/L	BM-CR	B		34		0.10			6.00			
TOTAL-METALS	SILVER	µg/L	BM-LK	B		114		0.10			3.00			
TOTAL-METALS	SILVER	µg/L	BGCR	B	14	116	0.12	2.00	10.00	2.10	7.20	2.49	1.56	0.63
TOTAL-METALS	SILVER	µg/L	CREEK	S	0	8	0.00	2.10	3.60			1.28	0.33	0.26
TOTAL-METALS	SILVER	µg/L	200	S		19		2.10	3.60			1.44	0.35	0.24
TOTAL-METALS	SILVER	µg/L	201	S		16		2.30	3.60			1.43	0.33	0.23
TOTAL-METALS	SILVER	µg/L	202	S		13		2.30	3.60			1.55	0.33	0.21

TABLE D-3
COMPARISON TO BENCHMARK DATA–SURFACE WATER

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean[a]	Standard Deviation	Coefficient of Variation
NOTE:														
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))														
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))														
DISSOLVED-METALS	SODIUM	µg/L	BGCR	B	151	152	0.99	17100.00	17100.00	4190.00	44700.00	17045.66	7281.65	0.43
DISSOLVED-METALS	SODIUM	µg/L	CREEK	S	3	3	1.00			5370.00	14200.00	8946.67	4847.65	0.52
DISSOLVED-METALS	SODIUM	µg/L	200	S	16	16	1.00			5370.00	8610.00	7980.00	745.48	0.09
DISSOLVED-METALS	SODIUM	µg/L	201	S	18	18	1.00			7270.00	14200.00	11770.56	1326.77	0.11
DISSOLVED-METALS	SODIUM	µg/L	202	S	13	13	1.00			27100.00	32500.00	29761.54	1875.07	0.06
TOTAL-METALS	SODIUM	µg/L	BGCR	B	154	155	0.99	5000.00	5000.00	3700.00	45400.00	16568.90	7500.07	0.45
TOTAL-METALS	SODIUM	µg/L	CREEK	S	8	8	1.00			4610.00	40000.00	12688.00	11709.00	0.92
TOTAL-METALS	SODIUM	µg/L	200	S	19	19	1.00			4610.00	40000.00	9351.05	7531.34	0.81
TOTAL-METALS	SODIUM	µg/L	201	S	20	20	1.00			6940.00	415000.00	31817.00	90201.58	2.84
TOTAL-METALS	SODIUM	µg/L	202	S	13	13	1.00			27000.00	31200.00	29076.92	1494.52	0.05
TOTAL-METALS	SODIUM	µg/L	BM-LK	B		38					54000.00	12600-54000		
DISSOLVED-METALS	STRONTIUM	µg/L	BGCR	B	112	138	0.81	100.00	1000.00	39.90	438.00	190.86	145.58	0.76
DISSOLVED-METALS	STRONTIUM	µg/L	CREEK	S	3	3	1.00			96.20	189.00	129.07	51.98	0.40
DISSOLVED-METALS	STRONTIUM	µg/L	200	S	16	16	1.00			96.20	147.00	130.45	13.03	0.10
DISSOLVED-METALS	STRONTIUM	µg/L	201	S	18	18	1.00			102.00	189.00	159.00	16.95	0.11
DISSOLVED-METALS	STRONTIUM	µg/L	202	S	13	13	1.00			114.00	137.00	124.62	7.54	0.06
TOTAL-METALS	STRONTIUM	µg/L	BGCR	B	117	135	0.87	100.00	1000.00	37.40	408.00	177.31	130.50	0.74
TOTAL-METALS	STRONTIUM	µg/L	CREEK	S	8	8	1.00			77.90	306.00	150.61	77.86	0.52
TOTAL-METALS	STRONTIUM	µg/L	200	S	19	19	1.00			77.90	306.00	135.66	45.80	0.34
TOTAL-METALS	STRONTIUM	µg/L	201	S	20	20	1.00			98.40	186.00	157.42	17.74	0.11
TOTAL-METALS	STRONTIUM	µg/L	202	S	13	13	1.00			114.00	132.00	122.69	6.01	0.05
TOTAL-METALS	STRONTIUM	µg/L	BM-LK	B		16					456.00	248.94		
DISSOLVED-METALS	THALLIUM	µg/L	BGCR	B	2	97	0.02	0.90	15.00	1.20	1.20	1.63	1.48	0.90
DISSOLVED-METALS	THALLIUM	µg/L	CREEK	S	0	3	0.00	0.90	0.90			0.45		
DISSOLVED-METALS	THALLIUM	µg/L	200	S		18		0.90	4.30			1.82	0.48	0.26
DISSOLVED-METALS	THALLIUM	µg/L	201	S		18		0.90	1.60			0.64	0.12	0.19
DISSOLVED-METALS	THALLIUM	µg/L	202	S		13		0.90	4.50			1.16	0.69	0.60
TOTAL-METALS	THALLIUM	µg/L	BGCR	B	3	124	0.02	0.60	40.00	1.60	3.40	1.68	2.15	1.28
TOTAL-METALS	THALLIUM	µg/L	CREEK	S	0	8	0.00	0.90	1.80			0.67	0.21	0.31
TOTAL-METALS	THALLIUM	µg/L	200	S		19		0.90	4.30			1.68	0.56	0.33
TOTAL-METALS	THALLIUM	µg/L	201	S		20		0.90	1.60			0.64	0.11	0.18
TOTAL-METALS	THALLIUM	µg/L	202	S		13		0.90	4.50			1.23	0.77	0.62
TOTAL-METALS	THALLIUM	µg/L	BM-LK	B		18					12.00			
DISSOLVED-METALS	TIN	µg/L	BGCR	B	17	98	0.17	9.30	136.00	10.80	72.40	27.74	21.15	0.76
DISSOLVED-METALS	TIN	µg/L	CREEK	S	0	3	0.00	12.50	12.50			6.25		
DISSOLVED-METALS	TIN	µg/L	200	S		16		6.20	12.50			4.48	1.61	0.36
DISSOLVED-METALS	TIN	µg/L	201	S	5	17	0.29	6.20	12.50	6.30	13.70	7.01	3.09	0.44
DISSOLVED-METALS	TIN	µg/L	202	S	1	13	0.08	6.20	12.50	8.10	8.10	4.70	1.86	0.40
TOTAL-METALS	TIN	µg/L	BGCR	B	18	118	0.15	7.00	136.00	11.00	180.00	19.61	22.01	1.12
TOTAL-METALS	TIN	µg/L	CREEK	S	0	8	0.00	6.20	12.50			4.88	1.31	0.27
TOTAL-METALS	TIN	µg/L	200	S	3	19	0.16	6.20	12.50	7.00	9.70	5.41	2.08	0.38
TOTAL-METALS	TIN	µg/L	201	S		20		6.20	12.50			4.52	1.61	0.36
TOTAL-METALS	TIN	µg/L	202	S	1	13	0.08	6.20	12.50	6.50	6.50	4.57	1.66	0.36
DISSOLVED-METALS	VANADIUM	µg/L	BGCR	B	13	106	0.12	2.00	50.00	2.00	12.10	4.20	5.55	1.32
DISSOLVED-METALS	VANADIUM	µg/L	CREEK	S	0	3	0.00	3.30	3.30			1.65	0.00	0.00
DISSOLVED-METALS	VANADIUM	µg/L	200	S	2	16	0.13	2.50	3.30	2.70	3.40	1.65	0.59	0.36
DISSOLVED-METALS	VANADIUM	µg/L	201	S		18		2.50	3.30			1.45	0.21	0.14
DISSOLVED-METALS	VANADIUM	µg/L	202	S	6	13	0.46	2.50	3.30	2.90	6.10	2.76	1.59	0.58
TOTAL-METALS	VANADIUM	µg/L	BGCR	B	33	120	0.28	2.00	60.00	2.00	18.20	6.64	8.22	1.24
TOTAL-METALS	VANADIUM	µg/L	CREEK	S	2	8	0.25	2.50	3.50	3.80	4.80	2.29	1.28	0.56
TOTAL-METALS	VANADIUM	µg/L	200	S	10	19	0.53	2.50	3.50	2.80	8.00	3.15	2.08	0.66
TOTAL-METALS	VANADIUM	µg/L	201	S	1	20	0.05	2.50	3.30	3.80	3.80	1.56	0.56	0.36
TOTAL-METALS	VANADIUM	µg/L	202	S	6	13	0.46	2.50	3.30	2.50	6.40	2.60	1.56	0.60
DISSOLVED-METALS	ZINC	µg/L	BGCR	B	86	138	0.62	1.70	44.00	2.40	111.50	14.08	18.21	1.29
DISSOLVED-METALS	ZINC	µg/L	CREEK	S	3	3	1.00			13.30	44.90	28.00	15.91	0.57
DISSOLVED-METALS	ZINC	µg/L	200	S	8	16	0.50	5.70	10.10	5.80	30.40	10.63	9.35	0.88

TABLE D-3
COMPARISON TO BENCHMARK DATA–SURFACE WATER

NOTE:
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean*	Standard Deviation	Coefficient of Variation
DISSOLVED-METALS	ZINC	µg/L	201	S	12	18	0.67	5.70	10.10	7.00	44.90	11.74	9.49	0.81
DISSOLVED-METALS	ZINC	µg/L	202	S	8	13	0.62	5.70	10.10	5.70	143.00	18.46	37.80	2.05
DISSOLVED-METALS	ZINC	µg/L	BM-CR	B		34		5.00			670.00			
DISSOLVED-METALS	ZINC	µg/L	BM-LK	B		20					20.00			
TOTAL-METALS	ZINC	µg/L	BM-LK	B		144				1.00	89.00	16.48-27		
TOTAL-METALS	ZINC	µg/L	BGCR	B	104	151	0.69	1.70	60.40	1.90	480.00	32.74	62.29	1.90
TOTAL-METALS	ZINC	µg/L	CREEK	S	8	8	1.00			15.00	158.00	91.58	59.59	0.65
TOTAL-METALS	ZINC	µg/L	200	S	19	19	1.00			13.80	158.00	48.46	44.32	0.91
TOTAL-METALS	ZINC	µg/L	201	S	17	20	0.85	10.10	10.10	12.80	184.00	38.60	47.49	1.23
TOTAL-METALS	ZINC	µg/L	202	S	7	13	0.54	5.70	10.10	6.60	18.00	8.18	5.49	0.67
RADIONUCLIDES														
DISSOLVED-RADS	AMERICIUM-241	pCi/L	BGCR	B	34	34	1.00			-0.010	0.500	0.070	0.129	1.83
DISSOLVED-RADS	AMERICIUM-241	pCi/L	CREEK	S	3	3	1.00			-0.002	0.003	0.001	0.003	3.77
DISSOLVED-RADS	AMERICIUM-241	pCi/L	200	S	14	14	1.00			-0.003	0.018	0.004	0.005	1.56
DISSOLVED-RADS	AMERICIUM-241	pCi/L	201	S	14	14	1.00			-0.004	0.013	0.003	0.005	1.39
DISSOLVED-RADS	AMERICIUM-241	pCi/L	202	S	12	12	1.00			-0.019	0.116	0.013	0.034	2.63
TOTAL-RADS	AMERICIUM-241	pCi/L	BGCR	B	106	106	1.00			-0.021	0.038	0.004	0.008	1.93
TOTAL-RADS	AMERICIUM-241	pCi/L	BM-LK	B		48					0.117	(-)0.013-0.019		
TOTAL-RADS	AMERICIUM-241	pCi/L	CREEK	S	5	5	1.00			-0.001	0.007	0.004	0.003	0.78
TOTAL-RADS	AMERICIUM-241	pCi/L	200	S	16	16	1.00			-0.005	0.017	0.005	0.005	1.00
TOTAL-RADS	AMERICIUM-241	pCi/L	201	S	17	17	1.00			-0.001	0.026	0.006	0.007	1.04
TOTAL-RADS	AMERICIUM-241	pCi/L	202	S	12	12	1.00			0.000	0.017	0.006	0.005	0.86
DISSOLVED-RADS	GROSS ALPHA	pCi/L	BGCR	B	60	60	1.00			-1.380	5.000	0.687	1.123	1.63
DISSOLVED-RADS	GROSS ALPHA	pCi/L	200	S	16	16	1.00			-0.420	2.700	0.485	0.716	1.48
DISSOLVED-RADS	GROSS ALPHA	pCi/L	201	S	15	15	1.00			-0.580	1.400	0.782	0.473	0.60
DISSOLVED-RADS	GROSS ALPHA	pCi/L	202	S	12	12	1.00			-0.130	1.900	0.496	0.545	1.10
TOTAL-RADS	GROSS ALPHA	pCi/L	BGCR	B	85	85	1.00			-2.000	13.000	1.513	2.238	1.48
TOTAL-RADS	GROSS ALPHA	pCi/L	200	S	15	15	1.00			0.072	2.200	1.124	0.727	0.65
TOTAL-RADS	GROSS ALPHA	pCi/L	201	S	15	15	1.00			0.440	1.900	1.178	0.489	0.41
TOTAL-RADS	GROSS ALPHA	pCi/L	202	S	11	11	1.00			-0.250	1.200	0.520	0.445	0.86
DISSOLVED-RADS	GROSS BETA	pCi/L	BGCR	B	61	61	1.00			-0.676	41.820	4.687	6.777	1.45
DISSOLVED-RADS	GROSS BETA	pCi/L	200	S	16	16	1.00			0.080	2.900	1.621	0.831	0.51
DISSOLVED-RADS	GROSS BETA	pCi/L	201	S	15	15	1.00			-0.140	4.300	1.955	1.025	0.52
DISSOLVED-RADS	GROSS BETA	pCi/L	202	S	12	12	1.00			-0.250	2.100	0.762	0.735	0.96
TOTAL-RADS	GROSS BETA	pCi/L	BGCR	B	82	82	1.00			-0.400	36.000	4.552	5.520	1.21
TOTAL-RADS	GROSS BETA	pCi/L	200	S	18	18	1.00			0.270	4.700	2.776	1.304	0.47
TOTAL-RADS	GROSS BETA	pCi/L	201	S	20	20	1.00			-0.010	4.300	2.177	1.108	0.51
TOTAL-RADS	GROSS BETA	pCi/L	202	S	13	13	1.00			-2.100	3.000	0.821	1.421	1.73
DISSOLVED-RADS	PLUTONIUM-239/240	pCi/L	BGCR	B	36	36	1.00			-0.123	0.900	0.116	0.204	1.76
DISSOLVED-RADS	PLUTONIUM-239/240	pCi/L	BM-LK	B		55					0.206	0.004-0.016		
DISSOLVED-RADS	PLUTONIUM-239/240	pCi/L	CREEK	S	2	2	1.00			0.004	0.006	0.005	0.001	0.28
DISSOLVED-RADS	PLUTONIUM-239/240	pCi/L	200	S	9	9	1.00			-0.003	0.002	0.000	0.002	-7.82
DISSOLVED-RADS	PLUTONIUM-239/240	pCi/L	201	S	13	13	1.00			-0.002	0.009	0.002	0.003	1.30
DISSOLVED-RADS	PLUTONIUM-239/240	pCi/L	202	S	10	10	1.00			-0.001	0.003	0.001	0.001	1.91
TOTAL-RADS	PLUTONIUM-239/240	pCi/L	BGCR	B	105	105	1.00			-0.016	0.048	0.004	0.008	1.96
TOTAL-RADS	PLUTONIUM-239/240	pCi/L	CREEK	S	7	7	1.00			-0.001	0.001	0.000	0.001	2.65
TOTAL-RADS	PLUTONIUM-239/240	pCi/L	200	S	13	13	1.00			-0.001	0.005	0.002	0.002	0.80
TOTAL-RADS	PLUTONIUM-239/240	pCi/L	201	S	19	19	1.00			0.000	0.009	0.002	0.002	1.08
TOTAL-RADS	PLUTONIUM-239/240	pCi/L	202	S	12	12	1.00			-0.005	0.030	0.005	0.010	1.84
TOTAL-RADS	TRITIUM	pCi/L	BGCR	B	73	73	1.00			-800.000	751.000	75.705	209.217	2.76
TOTAL-RADS	TRITIUM	pCi/L	BM-LK	B		60					147.000	(-)19-147		
TOTAL-RADS	TRITIUM	pCi/L	200	S	5	5	1.00			-29.100	144.300	47.776	83.228	1.74
DISSOLVED-RADS	URANIUM-233/234	pCi/L	BGCR	B	55	55	1.00			-0.016	1.800	0.359	0.365	1.01
DISSOLVED-RADS	URANIUM-233/234	pCi/L	CREEK	S	2	2	1.00			0.480	0.480	0.480		
DISSOLVED-RADS	URANIUM-233/234	pCi/L	200	S	12	12	1.00			0.140	0.560	0.418	0.124	0.30

TABLE D-3
COMPARISON TO BENCHMARK DATA–SURFACE WATER

Main Test Group Code	Chemical Name	New Unit	Data Source	Area	Number of Detects	Number of Samples	Frequency of Detection	Minimum Nondetected Value	Maximum Nondetected Value	Minimum Detected value	Maximum Detected Value	Mean*	Standard Deviation	Coefficient of Variation
NOTE:														
BM-CR = Benchmark Stream Values (Ralston Creek, Croke Canal, Farmer's Highline canal (Arvada, 1994))														
BM-LK = Benchmark Lakes/Reservoir Values (Chatfield Reservoir, Cherry Creek, Bear Creek Lake, and Harriman Lake (Arvada, 1994; EPA, 1993 and 1994))														
DISSOLVED-RADS	URANIUM-233/234	pCi/L	201	S	12	12	1.00			0.430	1.200	0.741	0.227	0.31
DISSOLVED-RADS	URANIUM-233/234	pCi/L	202	S	10	10	1.00			0.170	0.699	0.350	0.182	0.52
TOTAL-RADS	URANIUM-233/234	pCi/L	BGCR	B	79	79	1.00			-0.007	3.213	0.486	0.550	1.13
TOTAL-RADS	URANIUM-233/234	pCi/L	BM-LK	B		56					2.100	0.32-1.3		
TOTAL-RADS	URANIUM-233/234	pCi/L	CREEK	S	6	6	1.00			0.078	1.273	0.693	0.532	0.77
TOTAL-RADS	URANIUM-233/234	pCi/L	200	S	12	12	1.00			0.190	1.200	0.609	0.313	0.51
TOTAL-RADS	URANIUM-233/234	pCi/L	201	S	20	20	1.00			0.078	1.300	0.749	0.354	0.47
TOTAL-RADS	URANIUM-233/234	pCi/L	202	S	13	13	1.00			0.080	0.820	0.388	0.238	0.61
DISSOLVED-RADS	URANIUM-235	pCi/L	BGCR	B	56	56	1.00			-0.018	0.895	0.140	0.203	1.45
DISSOLVED-RADS	URANIUM-235	pCi/L	CREEK	S	2	2	1.00			0.000	0.310	0.155	0.219	1.41
DISSOLVED-RADS	URANIUM-235	pCi/L	200	S	12	12	1.00			-0.081	0.510	0.072	0.168	2.33
DISSOLVED-RADS	URANIUM-235	pCi/L	201	S	12	12	1.00			-0.004	0.710	0.146	0.257	1.76
DISSOLVED-RADS	URANIUM-235	pCi/L	202	S	10	10	1.00			-0.198	0.140	0.020	0.094	4.73
TOTAL-RADS	URANIUM-235	pCi/L	BGCR	B	75	75	1.00			-0.030	0.376	0.049	0.075	1.52
TOTAL-RADS	URANIUM-235	pCi/L	BM-LK	B		8					0.100			
TOTAL-RADS	URANIUM-235	pCi/L	CREEK	S	6	6	1.00			0.000	0.170	0.081	0.075	0.92
TOTAL-RADS	URANIUM-235	pCi/L	200	S	12	12	1.00			-0.039	0.410	0.082	0.125	1.53
TOTAL-RADS	URANIUM-235	pCi/L	201	S	20	20	1.00			-0.021	0.270	0.070	0.074	1.06
TOTAL-RADS	URANIUM-235	pCi/L	202	S	13	13	1.00			-0.028	0.145	0.032	0.059	1.83
DISSOLVED-RADS	URANIUM-238	pCi/L	BGCR	B	55	55	1.00			0.000	1.700	0.277	0.270	0.98
DISSOLVED-RADS	URANIUM-238	pCi/L	BM-LK	B	10						2.000	0.910		
DISSOLVED-RADS	URANIUM-238	pCi/L	CREEK	S	2	2	1.00			0.380	0.410	0.395	0.021	0.05
DISSOLVED-RADS	URANIUM-238	pCi/L	200	S	12	12	1.00			-0.046	0.580	0.296	0.186	0.63
DISSOLVED-RADS	URANIUM-238	pCi/L	201	S	12	12	1.00			-0.043	0.730	0.408	0.236	0.58
DISSOLVED-RADS	URANIUM-238	pCi/L	202	S	10	10	1.00			-0.255	0.420	0.135	0.193	1.43
TOTAL-RADS	URANIUM-238	pCi/L	BGCR	B	55	55	1.00			0.000	1.820	0.364	0.432	1.18
TOTAL-RADS	URANIUM-238	pCi/L	BM-LK	B		56					5.500	0.28-1.49		
TOTAL-RADS	URANIUM-238	pCi/L	CREEK	S	6	6	1.00			-0.022	0.870	0.524	0.333	0.64
TOTAL-RADS	URANIUM-238	pCi/L	200	S	12	12	1.00			-0.024	0.870	0.433	0.225	0.52
TOTAL-RADS	URANIUM-238	pCi/L	201	S	20	20	1.00			-0.022	1.100	0.618	0.292	0.47
TOTAL-RADS	URANIUM-238	pCi/L	202	S	12	12	1.00			0.091	0.650	0.285	0.168	0.59

*For benchmark data, range of means is presented.
B = Background.
BGCR = Background Geochemical Characterization Report (1993c).
S = OU 3 (onsite).

Table D-4

Comparison to Benchmark Data--Groundwater

Well No.	Test Group	Parameter	Unit	No. Of Detects	No. of Samples	Freq. of Detect	Min. Nondetect	Max. Nondetect	Max. Nondetect	Min. Detect	Max. Detect	Arith. Mean	Stand. Dev.	m + 2s	Upper Geo Chem. Min	Upper Geo Chem Max	Upper Geo. Chem. Mean	Std. Dev.	Mean Plus 2 SD	Min Lower Geo	Max Lower Geo	Mean Lower Geo	Std. Dev.	Mean Plus 2 SD	Min (Dragun)	Max (Dragun)	Standard (1)
49192	DMETAL	ALUMINUM	ug/L	1	8	0.13	13.0	40.0	20	47.1	47.1	16.231	13.249	42.730	2.5	1036	59.52	87.29	234.1	3	256	48.81	44.02	136.85	<5	1000	5000 (sg)
49292	DMETAL	ALUMINUM	ug/L		8		13.0	40.0	20					0.000	2.5	1036	59.52	87.29	234.1	3	256	48.81	44.02	136.85	<5	1000	5000 (sg)
49192	TMETAL	ALUMINUM	ug/L	8	8	1.00				965	23400	8499.375	9254.575	27008.525	22.6	19950	2742.8	4248.73	11240	11	11700	1792	2773.43	7338.86	<5	1000	
49292	TMETAL	ALUMINUM	ug/L	5	8	0.63	24.1	46.8	23	28.2	338	72.019	108.713	289.445	22.6	19950	2742.8	4248.73	11240	11	11700	1792	2773.43	7338.86	<5	1000	
49192	TRADS	AMERICIUM-241	pCi/L	7	7	1.00				0	0.021	0.007	0.008	0.023	-0.01	0.1	0.01	0.01	0.03	0	0.1	0.01	0.02	0.05			
49292	TRADS	AMERICIUM-241	pCi/L	7	7	1.00				0.00121	0.01	0.005	0.003	0.011	-0.01	0.1	0.01	0.01	0.03	0	0.1	0.01	0.02	0.05			
49192	DMETAL	ANTIMONY	ug/L	2	8	0.25	13.0	36.0	18	17.3	69.8	22.013	27.836	77.685	3	54.1	17.34	11.1	39.54	4	35.65	15.5	9.17	33.84			
49292	DMETAL	ANTIMONY	ug/L		8		13.0	36.0	18					0.000	3	54.1	17.34	11.1	39.54	4	35.65	15.5	9.17	33.84			
49192	TMETAL	ANTIMONY	ug/L	1	8	0.13	13.0	36.0	18	27.5	27.5	12.750	7.231	27.212	3.6	86.6	19.19	12.85	44.89	3.5	41.3	15.62	10.4	36.42			
49292	TMETAL	ANTIMONY	ug/L		8		13.0	36.0	18					0.000	3.6	86.6	19.19	12.85	44.89	3.5	41.3	15.62	10.4	36.42			
49192	DMETAL	ARSENIC	ug/L	1	8	0.13	1.0	3.0	1.5	1	1	0.813	0.372	1.557	0.4	15	1.63	1.84	5.31	0.4	6.2	2.41	1.7	5.81	<1	30	50 (dw)
49292	DMETAL	ARSENIC	ug/L	6	8	0.75	2.0	3.0	1.5	2	25	5.138	8.070	21.278	0.4	15	1.63	1.84	5.31	0.4	6.2	2.41	1.7	5.81	<1	30	50 (dw)
49192	TMETAL	ARSENIC	ug/L	5	8	0.63	1.7	3.0	1.5	2.3	6.9	2.994	2.130	7.253	0.35	5	1.95	1.71	5.37	0.35	7	2.76	2.02	6.8	<1	30	
49292	TMETAL	ARSENIC	ug/L	5	8	0.63	2.0	3.0	1.5	2.7	3.8	2.525	1.071	4.668	0.35	5	1.95	1.71	5.37	0.35	7	2.76	2.02	6.8	<1	30	
49192	DMETAL	BARIUM	ug/L	6	8	0.75	16.0	23.0	12	24.2	55	28.838	15.310	59.458	14.75	203	83.42	34.56	152.5	34.8	132.5	84.18	21.79	127.76	10	500	1000 (dw)
49292	DMETAL	BARIUM	ug/L	7	8	0.88	16.0	16.0	8	29.3	35	28.625	8.504	45.633	14.75	203	83.42	34.56	152.5	34.8	132.5	84.18	21.79	127.76	10	500	1000 (dw)
49192	TMETAL	BARIUM	ug/L	8	8	1.00				34.8	168	80.300	59.329	198.957	25.9	317	102.44	45.37	193.2	61.5	303	113.95	51.97	217.89	10	500	
49292	TMETAL	BARIUM	ug/L	8	8	1.00				29.3	38.5	32.913	3.323	39.558	25.9	317	102.44	45.37	193.2	61.5	303	113.95	51.97	217.89	10	500	
49192	DMETAL	BERYLLIUM	ug/L		8		1.0	1.0	0.5					0.000	0.15	4	1.01	0.83	2.67	0.3	2.5	0.9	0.73	2.36	<10	10	
49292	DMETAL	BERYLLIUM	ug/L		8		1.0	1.0	0.5					0.000	0.15	4	1.01	0.83	2.67	0.3	2.5	0.9	0.73	2.36	<10	10	
49192	TMETAL	BERYLLIUM	ug/L	4	8	0.50	1.0	1.0	0.5	1.1	1.6	0.913	0.473	1.859	0.4	4.8	1.07	0.87	2.81	0.3	2.5	0.86	0.74	2.34	<10	10	
49292	TMETAL	BERYLLIUM	ug/L		8		1.0	1.0	0.5					0.000	0.4	4.8	1.07	0.87	2.81	0.3	2.5	0.86	0.74	2.34	<10	10	
49192	DMETAL	CADMIUM	ug/L		8		2.0	4.0	2					0.000	0.5	8.6	1.73	1.26	4.25	0.5	7.5	1.76	1.33	4.42	<1	1	
49292	DMETAL	CADMIUM	ug/L		8		2.0	4.0	2					0.000	0.5	8.6	1.73	1.26	4.25	0.5	7.5	1.76	1.33	4.42	<1	1	
49192	TMETAL	CADMIUM	ug/L	1	8	0.13	2.0	4.0	2	2.8	2.8	1.663	0.595	2.853	0.5	11.1	1.64	1.29	4.22	0.5	3.5	1.45	0.75	2.95	<1	1	
49292	TMETAL	CADMIUM	ug/L		8		2.0	4.0	2					0.000	0.5	11.1	1.64	1.29	4.22	0.5	3.5	1.45	0.75	2.95	<1	1	
49192	DMETAL	CALCIUM	ug/L	8	8	1.00				267000	4E+05	313375.000	26597.194	366569.387	15150	184000	55414.6	32564.1	1E+05	8190	79400	34535.8	23552.8	81641.4	<500000	500000	
49292	DMETAL	CALCIUM	ug/L	8	8	1.00				84900	98100	88312.500	4348.542	97009.585	15150	184000	55414.6	32564.1	1E+05	8190	79400	34535.8	23552.8	81641.4	<500000	500000	
49192	TMETAL	CALCIUM	ug/L	8	8	1.00				273000	4E+05	314250.000	26762.180	367774.360	15950	186000	55030.2	31667.8	1E+05	10800	91900	36382	23881.5	84144.94	<500000	500000	
49292	TMETAL	CALCIUM	ug/L	8	8	1.00				82200	99100	88975.000	5312.989	99600.979	15950	186000	55030.2	31667.8	1E+05	10800	91900	36382	23881.5	84144.94	<500000	500000	
49192	DMETAL	CESIUM	ug/L	2	5	0.40	12.0	36.0	18	26	38	20.500	12.135	44.769	2	2500	202.2	285.69	773.6	2	500	160.88	179.94	520.76			
49292	DMETAL	CESIUM	ug/L	2	6	0.33	12.0	36.0	18	18	41	18.500	11.958	42.417	2	2500	202.2	285.69	773.6	2	500	160.88	179.94	520.76			
49192	TMETAL	CESIUM	ug/L	2	8	0.25	12.0	50.0	25	25	50	19.938	14.216	48.370	2	500	154.42	198.79	552	2	500	131.59	175.16	481.91			
49292	TMETAL	CESIUM	ug/L		5		12.0	36.0	18					0.000	2	500	154.42	198.79	552	2	500	131.59	175.16	481.91			
49192	DMETAL	CHROMIUM	ug/L		8		2.0	4.0	2					0.000	1	23.2	4.84	3.8	12.44	1	15.5	3.97	3.15	10.27	<1	5	
49292	DMETAL	CHROMIUM	ug/L		8		2.0	4.0	2					0.000	1	23.2	4.84	3.8	12.44	1	15.5	3.97	3.15	10.27	<1	5	
49192	TMETAL	CHROMIUM	ug/L	5	8	0.63	4.0	5.2	2.6	3.7	29	11.038	11.048	33.134	1	31.65	7.01	6.68	20.37	1	21.4	5.25	4.61	14.47	<1	5	
49292	TMETAL	CHROMIUM	ug/L	1	8	0.13	3.0	4.0	2	2.5	2.5	1.813	0.372	2.557	1	31.65	7.01	6.68	20.37	1	21.4	5.25	4.61	14.47	<1	5	
49192	DMETAL	COBALT	ug/L		8		3.0	6.0	3					0.000	1	29	6.6	9.04	24.68	1	25	5.16	7.88	20.92	<10	10	
49292	DMETAL	COBALT	ug/L		8		3.0	6.0	3					0.000	1	29	6.6	9.04	24.68	1	25	5.16	7.88	20.92	<10	10	
49192	TMETAL	COBALT	ug/L	4	8	0.50	3.0	6.0	3	5.3	16.6	6.400	5.665	17.730	1	39.4	7.64	9.67	26.98	1	25	5.55	8.18	21.91	<10	10	
49292	TMETAL	COBALT	ug/L		8		3.0	6.0	3					0.000	1	39.4	7.64	9.67	26.98	1	25	5.55	8.18	21.91	<10	10	
49192	DMETAL	COPPER	ug/L	2	8	0.25	2.0	4.0	2	3	3.8	1.850	1.073	3.996	0.5	20.9	5.01	4.42	13.85	0.5	12.5	4.17	3.83	11.83	<1	30	1000(sec)
49292	DMETAL	COPPER	ug/L	1	8	0.13	2.0	4.0	2	2.7	2.7	1.463	0.674	2.810	0.5	20.9	5.01	4.42	13.85	0.5	12.5	4.17	3.83	11.83	<1	30	1000(sec)
49192	TMETAL	COPPER	ug/L	8	8	1.00				4.8	39.7	16.350	13.776	43.901	1	105	10.67	12.21	35.09	1	125	11.99	21.82	55.63	<1	30	
49292	TMETAL	COPPER	ug/L	2	8	0.25	2.0	4.0	2	4.4	4.9	2.038	1.654	5.346	1	105	10.67	12.21	35.09	1	125	11.99	21.82	55.63	<1	30	
49192	DMETAL	IRON	ug/L	6	7	0.86	3.2	3.2	1.6	50.9	464	262.071	179.968	622.008	1	1106.5	56.26	113.44	283.1	1.5	181	33.67	35.32	104.31	10	10000	300 (sec)
49292	DMETAL	IRON	ug/L	8	8	1.00				498	715	617.625	78.249	774.122	1	1106.5	56.26	113.44	283.1	1.5	181	33.67	35.32	104.31	10	10000	300 (sec)

Table D-4

Comparison to Benchmark Data--Groundwater

Well No.	Test Group	Parameter	Unit	No. Of Detects	No. of Samples	Freq. of Detect	Min. Nondetect	Max. Nondetect	Max. Nondetect	Min. Detect	Max. Detect	Arith. Mean	Stand. Dev.	m + 2s	Upper Geo Chem. Min	Upper Geo Chem Max	Upper Geo. Chem. Mean	Std. Dev.	Mean Plus 2 SD	Min Lower Geo	Max Lower Geo	Mean Lower Geo	Std. Dev.	Mean Plus 2 SD	Min (Dragun)	Max (Dragun)	Standard (1)
49192	TMETAL	IRON	ug/L	8	8	1.00				2210	27100	11575.000	11442.736	34460.471	6.5	27100	3017.34	4994.5	13006	9.8	16900	2239.92	3697.44	9634.8	10	10000	
49292	TMETAL	IRON	ug/L	8	8	1.00				753	1300	898.500	174.585	1247.670	6.5	27100	3017.34	4994.5	13006	9.8	16900	2239.92	3697.44	9634.8	10	10000	
49192	DMETAL	LEAD	ug/L	1	8	0.13	1.0	2.0	1	2.6	2.6	0.888	0.728	2.343	0.2	64	1.59	4.71	11.01	0.4	41.6	1.8	5.27	12.34	<15	15	50 (dw)
49292	DMETAL	LEAD	ug/L	1	8	0.13	1.0	2.0	1	5.8	5.8	1.288	1.837	4.962	0.2	64	1.59	4.71	11.01	0.4	41.6	1.8	5.27	12.34	<15	15	50 (dw)
49192	TMETAL	LEAD	ug/L	7	8	0.88	2.0	2.0	1	1.8	20.1	7.888	7.722	23.332	0.5	25	3.26	3.64	10.54	0.5	17.7	3.82	4.29	12.4	<15	15	
49292	TMETAL	LEAD	ug/L	1	8	0.13	1.0	2.0	1	1.7	1.7	0.775	0.437	1.648	0.5	25	3.26	3.64	10.54	0.5	17.7	3.82	4.29	12.4	<15	15	
49192	DMETAL	LITHIUM	ug/L	8	8	1.00				346	483	420.375	49.814	520.003	0.5	250	33.95	54.3	142.6	2	104	38.53	27.84	94.21	1	150	2500 (ag)
49292	DMETAL	LITHIUM	ug/L	8	8	1.00				67.8	81.4	75.675	4.722	85.119	0.5	250	33.95	54.3	142.6	2	104	38.53	27.84	94.21	1	150	2500 (ag)
49192	TMETAL	LITHIUM	ug/L	8	8	1.00				349	465	420.500	38.998	498.496	1.1	266	33.75	48.76	131.3	6.2	106	40.69	29.29	99.27	1	150	
49292	TMETAL	LITHIUM	ug/L	8	8	1.00				72.2	78.6	74.850	2.056	78.961	1.1	266	33.75	48.76	131.3	6.2	106	40.69	29.29	99.27	1	150	
49192	DMETAL	MAGNESIUM	ug/L	8	8	1.00				51200	88400	78587.500	11892.908	102373.315	2120	46300	10038.3	8309	26656	1720	16400	6072.16	4067.56	14207.28	<400000	400000	
49292	DMETAL	MAGNESIUM	ug/L	8	8	1.00				21200	23800	22000.000	858.570	23717.140	2120	46300	10038.3	8309	26656	1720	16400	6072.16	4067.56	14207.28	<400000	400000	
49192	TMETAL	MAGNESIUM	ug/L	8	8	1.00				55300	97700	80487.500	12075.292	104638.084	2230	47900	10315.6	7956.43	26229	1950	19700	6679.46	5030.81	16741.08	<400000	400000	
49292	TMETAL	MAGNESIUM	ug/L	8	8	1.00				20700	24300	22087.500	1133.185	24353.869	2230	47900	10315.6	7956.43	26229	1950	19700	6679.46	5030.81	16741.08	<400000	400000	
49192	DMETAL	MANGANESE	ug/L	8	8	1.00				187	377	293.250	59.341	411.932	0.5	440	27.47	67.43	162.3	0.5	30.2	9.29	7.24	23.77	<1	1000	50 (sec)
49292	DMETAL	MANGANESE	ug/L	8	8	1.00				53.2	64.9	58.800	4.920	68.640	0.5	440	27.47	67.43	162.3	0.5	30.2	9.29	7.24	23.77	<1	1000	50 (sec)
49192	TMETAL	MANGANESE	ug/L	8	8	1.00				327	959	485.250	227.264	939.779	0.5	584	79.59	108.18	296	1	710	61.87	125.21	312.29	<1	1000	
49292	TMETAL	MANGANESE	ug/L	8	8	1.00				52.8	70.2	60.113	5.717	71.546	0.5	584	79.59	108.18	296	1	710	61.87	125.21	312.29	<1	1000	
49192	DMETAL	MERCURY	ug/L		8		0.2	0.2	0.1					0.000	0.05	0.69	0.11	0.07	0.25	0.05	1.2	0.13	0.15	0.43			
49292	DMETAL	MERCURY	ug/L		8		0.2	0.2	0.1					0.000	0.05	0.69	0.11	0.07	0.25	0.05	1.2	0.13	0.15	0.43			
49192	TMETAL	MERCURY	ug/L		8		0.2	0.2	0.1					0.000	0.1	0.27	0.12	0.04	0.2	0.1	0.24	0.13	0.05	0.23			
49292	TMETAL	MERCURY	ug/L		8		0.2	0.2	0.1					0.000	0.1	0.27	0.12	0.04	0.2	0.1	0.24	0.13	0.05	0.23			
49192	DMETAL	MOLYBDENUM	ug/L	1	8	0.13	4.0	15.0	7.5	9.8	9.8	4.663	2.913	10.488	1	114	19.64	33.94	87.52	1	100	16.88	27.01	70.88	<1	30	100 (ag)
49292	DMETAL	MOLYBDENUM	ug/L	1	8	0.13	4.0	15.0	7.5	5.1	5.1	4.163	1.998	8.158	1	114	19.64	33.94	87.52	1	100	16.88	27.01	70.88	<1	30	100 (ag)
49192	TMETAL	MOLYBDENUM	ug/L		8		5.0	16.0	8					0.000	1	100	24.09	39.47	103	1	100	18.59	33.45	85.49	<1	30	
49292	TMETAL	MOLYBDENUM	ug/L	1	8	0.13	4.0	15.0	7.5	10.2	10.2	5.200	2.673	10.546	1	100	24.09	39.47	103	1	100	18.59	33.45	85.49	<1	30	
49192	DMETAL	NICKEL	ug/L	1	8	0.13	5.0	14.0	7	9.6	9.6	4.888	2.444	9.775	1	35.8	7.01	7.18	21.37	1	20	5.81	6.26	18.33	<10	50	200 (ag)
49292	DMETAL	NICKEL	ug/L		8		5.0	14.0	7					0.000	1	35.8	7.01	7.18	21.37	1	20	5.81	6.26	18.33	<10	50	200 (ag)
49192	TMETAL	NICKEL	ug/L	2	8	0.25	6.0	33.1	17	24	30.3	11.669	10.633	32.935	1	71.6	10.58	9.49	29.56	1	24.5	8.7	7.25	23.2	<10	50	
a150	TMETAL	NICKEL	ug/L		8		5.0	14.0	7					0.000	1	71.6	10.58	9.49	29.56	1	24.5	8.7	7.25	23.2	<10	50	
49192	TRADS	PLUTONIUM-239/240	pCi/L	7	7	1.00				-0.013	0.085	0.011	0.033	0.078	-0.01	0.22	0	0.02	0.04	0	0.05	0	0.01	0.02			
49292	TRADS	PLUTONIUM-239/240	pCi/L	7	7	1.00				-0.00101	0.001	0.000	0.001	0.002	-0.01	0.22	0	0.02	0.04	0	0.05	0	0.01	0.02			
49192	DMETAL	POTASSIUM	ug/L	8	8	1.00				8890	11300	10090.000	871.452	11832.904	160	8110	1371.5	1069.01	3510	366	5800	2731.18	1612.39	5955.96	1000	10000	
49292	DMETAL	POTASSIUM	ug/L	8	8	1.00				2890	4020	3575.000	386.153	4347.306	160	8110	1371.5	1069.01	3510	366	5800	2731.18	1612.39	5955.96	1000	10000	
49192	TMETAL	POTASSIUM	ug/L	8	8	1.00				10200	14800	11925.000	1737.609	15400.218	243	8370	1731.21	1176.59	4084	516	6870	2846.38	1725.69	6297.76	1000	10000	
49292	TMETAL	POTASSIUM	ug/L	7	8	0.88	4090.0	4090.0	2050	3210	3830	3430.625	597.151	4624.926	243	8370	1731.21	1176.59	4084	516	6870	2846.38	1725.69	6297.76	1000	10000	
49292	DRAD	RADIUM-226	pCi/L	1	1	1.00	0.0	0.0		0.7	0.7	0.700		0.700	0.06	0.53	0.26	0.11	0.48	0.47	2.98	1.72	1.78	5.28			
49192	DMETAL	SELENIUM	ug/L		8		1.0	3.0	1.5					0.000	0.5	173	5.58	19.07	43.72	0.5	6	1.34	1.09	3.52	<1	10	10 (dw)
49292	DMETAL	SELENIUM	ug/L	1	8	0.13	1.0	3.0	1.5	1.5	1.5	0.969	0.388	1.745	0.5	173	5.58	19.07	43.72	0.5	6	1.34	1.09	3.52	<1	10	10 (dw)
49192	TMETAL	SELENIUM	ug/L	2	8	0.25	1.0	10.0	5	1.6	1.6	2.150	1.798	5.747	0.5	203	4.57	18.64	41.85	0.5	2.5	1.19	0.63	2.45	<1	10	
49292	TMETAL	SELENIUM	ug/L		8		1.0	3.0	1.5					0.000	0.5	203	4.57	18.64	41.85	0.5	2.5	1.19	0.63	2.45	<1	10	
49192	DMETAL	SILICON	ug/L	8	8	1.00				5840	6700	6355.000	276.922	6908.844	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5000	100000	
49292	DMETAL	SILICON	ug/L	8	8	1.00				4760	5510	5287.500	233.162	5733.823	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5000	100000	
49192	TMETAL	SILICON	ug/L	8	8	1.00				8140	53600	23485.000	18505.896	60496.793	4399	51650	15565	10797.3	37160	3720	29500	9427.5	6631.12	22689.74	5000	100000	
49292	TMETAL	SILICON	ug/L	8	8	1.00				5110	6260	5535.000	432.633	6400.266	4399	51650	15565	10797.3	37160	3720	29500	9427.5	6631.12	22689.74	5000	100000	
49192	DMETAL	SILVER	ug/L	1	8	0.13	3.0	13.0	6.5	6.4	6.4	2.800	2.260	7.319	1	11.8	2.84	2.12	7.08	1	9.4	2.69	2.01	6.71	<5	5	50 (dw)
49292	DMETAL	SILVER	ug/L		8		3.0	13.0	6.5					0.000	1	11.8	2.84	2.12	7.08	1	9.4	2.69	2.01	6.71	<5	5	50 (dw)
49192	TMETAL	SILVER	ug/L		8		3.0	5.0	2.5					0.000	1	10	2.35	1.8	5.95	1	10	2.19	2.03	6.25	<5	5	

Table D-4

Comparison to Benchmark Data--Groundwater

Well No.	Test Group	Parameter	Unit	No. Of Detects	No. of Samples	Freq. of Detect	Min. Nondetect	Max. Nondetect	Max. Nondetect	Min. Detect	Max. Detect	Arith. Mean	Stand. Dev.	m + 2s	Upper Geo Chem. Min	Upper Geo Chem Max	Upper Geo. Chem. Mean	Std. Dev.	Mean Plus 2 SD	Min Lower Geo	Max Lower Geo	Mean Lower Geo	Std. Dev.	Mean Plus 2 SD	Min (Dragun)	Max (Dragun)	Standard (1)
49292	TMETAL	SILVER	ug/L		8		3.0	5.0	2.5					0.000	1	10	2.35	1.8	5.95	1	10	2.19	2.03	6.25	<5	5	
49192	DMETAL	SODIUM	ug/L	8	8	1.00				425000	6E+05	497000.000	39122.518	575245.036	2500	252000	32013	43667.7	1E+05	11000	452000	142013	135522	413055.8	<1000000	1000000	
49292	DMETAL	SODIUM	ug/L	8	8	1.00				243000	3E+05	262500.000	10915.258	284330.516	2500	252000	32013	43667.7	1E+05	11000	452000	142013	135522	413055.8	<1000000	1000000	
49192	TMETAL	SODIUM	ug/L	8	8	1.00				403000	5E+05	488000.000	40482.801	568965.601	2500	194000	30081.9	40019.7	1E+05	11500	434000	139228	134404	408036.7	<1000000	1000000	
49292	TMETAL	SODIUM	ug/L	8	8	1.00				258000	3E+05	262875.000	3642.507	270160.014	2500	194000	30081.9	40019.7	1E+05	11500	434000	139228	134404	408036.7	<1000000	1000000	
49192	DMETAL	STRONTIUM	ug/L	8	8	1.00				3860	5390	4892.500	483.876	5860.251	50	1910	323.6	303.58	930.8	89.5	1140	383.02	294.27	971.56	100	4000	
49292	DMETAL	STRONTIUM	ug/L	8	8	1.00				1090	1290	1163.750	60.695	1285.141	50	1910	323.6	303.58	930.8	89.5	1140	383.02	294.27	971.56	100	4000	
49192	TMETAL	STRONTIUM	ug/L	8	8	1.00				3860	5590	4873.750	495.723	5865.196	58.1	1770	312.61	271.09	854.8	100	1170	399.78	312.58	1024.94	100	4000	
49292	TMETAL	STRONTIUM	ug/L	8	8	1.00				1090	1280	1160.000	71.114	1302.227	58.1	1770	312.61	271.09	854.8	100	1170	399.78	312.58	1024.94	100	4000	
49192	DMETAL	THALLIUM	ug/L		8		1.0	4.0	2					0.000	0.3	5	1.64	1.63	4.9	0.3	10	1.72	1.87	5.46			
49292	DMETAL	THALLIUM	ug/L	1	8	0.13	1.0	4.0	2	1.2	1.2	1.025	0.602	2.229	0.3	5	1.64	1.63	4.9	0.3	10	1.72	1.87	5.46			
49192	TMETAL	THALLIUM	ug/L		8		1.0	4.0	2					0.000	0.45	5	1.67	1.76	5.19	0.45	5	1.4	1.5	4.4			
49292	TMETAL	THALLIUM	ug/L		8		1.0	4.0	2					0.000	0.45	5	1.67	1.76	5.19	0.45	5	1.4	1.5	4.4			
49192	DMETAL	TIN	ug/L	3	8	0.38	10.0	13.0	6.5	36.9	46.1	19.150	18.463	56.077	2	340	30.96	37.34	105.6	4.7	100	23.07	25.3	73.67	<200	200	
49292	DMETAL	TIN	ug/L	3	8	0.38	10.0	13.0	6.5	31.2	46.3	17.550	16.671	50.892	2	340	30.96	37.34	105.6	4.7	100	23.07	25.3	73.67	<200	200	
49192	TMETAL	TIN	ug/L	2	8	0.25	10.0	29.0	15	38.4	47.8	16.275	17.018	50.312	4.7	100	33.88	35.33	104.5	4.7	100	27.46	31.18	89.82	<200	200	
49292	TMETAL	TIN	ug/L		8		10.0	29.0	15					0.000	4.7	100	33.88	35.33	104.5	4.7	100	27.46	31.18	89.82	<200	200	
49192	DRADS	URANIUM-233/234	pCi/L	6	6	1.00				0.26	4.84	2.750	1.556	5.861	-0.02	199.5	6.23	23.94	54.11	-0.01	15.33	1.64	2.85	7.34			
49292	DRADS	URANIUM-233/234	pCi/L	6	6	1.00				0.3117	1.2	0.694	0.322	1.338	-0.02	199.5	6.23	23.94	54.11	-0.01	15.33	1.64	2.85	7.34			
49192	TRADS	URANIUM-233/234	pCi/L	2	2	1.00				3.4	4.6	4.000	0.849	5.697	0	164	15.62	38.75	93.12	0.15	1.52	0.77	0.57	1.91			
49292	TRADS	URANIUM-233/234	pCi/L	2	2	1.00				0.64	0.87	0.755	0.163	1.080	0	164	15.62	38.75	93.12	0.15	1.52	0.77	0.57	1.91			
49192	DRADS	URANIUM-235	pCi/L	6	6	1.00				0.028	0.29	0.135	0.117	0.368	-0.04	4.8	0.2	0.64	1.48	-0.04	0.23	0.03	0.06	0.15			
49292	DRADS	URANIUM-235	pCi/L	6	6	1.00				-0.025	0.18	0.063	0.075	0.213	-0.04	4.8	0.2	0.64	1.48	-0.04	0.23	0.03	0.06	0.15			
49192	TRADS	URANIUM-235	pCi/L	2	2	1.00				0.12	0.2	0.160	0.057	0.273	-0.02	6.29	0.62	1.38	3.38	0	0.04	0.03	0.02	0.07			
49292	TRADS	URANIUM-235	pCi/L	2	2	1.00				0	0.083	0.042	0.059	0.159	-0.02	6.29	0.62	1.38	3.38	0	0.04	0.03	0.02	0.07			
49192	DRADS	URANIUM-238	pCi/L	6	6	1.00				0.26	2.5	1.653	0.916	3.485	-0.04	135.6	4.77	17.71	40.19	-0.18	8.01	0.77	1.53	3.83			
49292	DRADS	URANIUM-238	pCi/L	6	6	1.00				0.1341	0.7	0.466	0.226	0.917	-0.04	135.6	4.77	17.71	40.19	-0.18	8.01	0.77	1.53	3.83			
49192	TRADS	URANIUM-238	pCi/L	2	2	1.00				2.1	4.2	3.150	1.485	6.120	0	108	10.84	27.73	66.3	0.17	0.53	0.35	0.26	0.87			
49292	TRADS	URANIUM-238	pCi/L	2	2	1.00				0.7	0.91	0.805	0.148	1.102	0	108	10.84	27.73	66.3	0.17	0.53	0.35	0.26	0.87			
49192	DMETAL	VANADIUM	ug/L		8		2.0	14.0	7					0.000	0.6	50	7.92	8.73	25.38	0.5	25	6.71	7.6	21.91	<1	10	
49292	DMETAL	VANADIUM	ug/L		8		2.0	14.0	7					0.000	0.6	50	7.92	8.73	25.38	0.5	25	6.71	7.6	21.91	<1	10	
49192	TMETAL	VANADIUM	ug/L	4	8	0.50	2.0	14.0	7	6.2	70.2	25.756	29.488	84.732	1	123	13.81	14.09	41.99	0.5	46.7	10.43	11.26	32.95	<1	10	
49292	TMETAL	VANADIUM	ug/L		8		2.0	14.0	7					0.000	1	123	13.81	14.09	41.99	0.5	46.7	10.43	11.26	32.95	<1	10	
49192	DMETAL	ZINC	ug/L	3	8	0.38	2.0	3.0	1.5	5.6	47.6	8.319	16.029	40.378	1	137	14.03	17.87	49.77	1	80.9	10.96	10.2	31.36	<10	2000	5000 (sec)
49292	DMETAL	ZINC	ug/L	3	8	0.38	3.0	10.7	5.4	3.1	16.5	4.800	4.974	14.748	1	137	14.03	17.87	49.77	1	80.9	10.96	10.2	31.36	<10	2000	5000 (sec)
49192	TMETAL	ZINC	ug/L	8	8	1.00				18.2	158	63.200	58.033	179.266	4.2	498	37.16	49.8	136.8	5	189	52.45	51.31	155.07	<10	2000	
49292	TMETAL	ZINC	ug/L	3	8	0.38	2.0	12.6	6.3	9.5	20.5	6.950	6.686	20.323	4.2	498	37.16	49.8	136.8	5	189	52.45	51.31	155.07	<10	2000	

(1) Colorado Basic Standards--(dw) drinking water, (sec) secondary, (ag) agricultural.

(a) Boyles et al.

(b) Lowry Landfill background data.

Notes:

CDPHE Screen Report/Draft 2/Table B4.

DMETAL = Dissolved metal (filtered).

TMETAL = Total metal (unfiltered).

Table D-5
RFP OU 3 Trench Data Summary Statistics

RFP OU 3 Trench Data Summary Statistics

Parameter	Units	Area	N	Nondetect Rate	Nondetect Rate Comb.	Mean	Std. Dev.	Minimum	Maximum	Median	Normal P Value	Lognor P Value
Americium-241	pCi/g	B	16	0.0625	0.017544	0.01884	0.01080	-0.00300	0.04046	0.0195	0.88203	0.8858
Americium-241	pCi/g	S	41	0	0.017544	0.03092	0.05352	-0.00177	0.2723	0.00774	0	0
Plutonium-239, -240	pCi/g	B	20	0	0	0.05355	0.02051	0.02600	0.1	0.04874	0.14829	0.15815
Plutonium-239, -240	pCi/g	S	81	0	0	0.11824	0.26739	-0.00574	1.593	0.0139	0	0
Uranium-233, -234	pCi/g	B	15	0	0	1.15361	0.15327	0.92190	1.472	1.2	0.36733	0.3747
Uranium-233, -234	pCi/g	S	75	0	0	1.00945	0.36642	0.26400	2.015	0.92	0.51836	0.74854
Uranium-235	pCi/g	B	15	0.066667	0.011111	0.04772	0.03509	0.01062	0.1393	0.04	0.05449	0.06428
Uranium-235	pCi/g	S	75	0	0.011111	0.05124	0.05217	-0.00761	0.3551	0.03788	0	0
Uranium-238	pCi/g	B	15	0	0	1.19193	0.19308	0.89890	1.521	1.2	0.77575	0.76366
Uranium-238	pCi/g	S	75	0	0	0.99294	0.35683	0.30500	2.147	0.957	0.34776	0.83153

Summary Statistics for OU 3 Trench and Surface-Soil Data

Americium-241	pCi/g	B	16	0.0625	0.046667	0.01884	0.0108	-0.003	0.04046	0.0195	0.88203	0.8858
Americium-241	pCi/g	S	134	0.044776	0.046667	0.06257	0.08454	-0.002	0.52	0.02655	0	0
Plutonium-239, -240	pCi/g	B	20	0	0	0.05355	0.02051	0.026	0.1	0.04874	0.14829	0.15815
Plutonium-239, -240	pCi/g	S	190	0	0	0.35653	0.7007	-0.00574	6.468	0.06229	0	0
Uranium-233, -234	pCi/g	B	15	0	0	1.15361	0.15327	0.9219	1.472	1.2	0.36733	0.3747
Uranium-233, -234	pCi/g	S	135	0	0	1.01127	0.32098	0.264	2.1395	0.955	0.07916	0.6789
Uranium-235	pCi/g	B	15	0.06667	0.026667	0.04772	0.03509	0.01062	0.1393	0.04	0.05449	0.06428
Uranium-235	pCi/g	S	135	0.022222	0.026667	0.05026	0.0416	-0.00761	0.3551	0.0435	0	0
Uranium-238	pCi/g	B	15	0	0	1.19193	0.19308	0.8989	1.521	1.2	0.77575	0.76366
Uranium-238	pCi/g	S	135	0	0	1.01311	0.31345	0.305	2.147	1.001	0.01188	0.45155

Table D-6
RFP OU 3 Trench Data Summary Statistics

Test Group	T/D	Chemical Name	Units	No. of Detects	No. of Samples	Detect. Frequency	Minimum Nondetect	Maximum Nondetect	Minimum Detected	Maximum Detected	Arithmetic Mean	Geometric Mean	Standard Deviation	Normal 95% UCL (1)	Lognormal 95% UCL (2)*
Radionuclide	T	Americium-241	pCi/g	57.000	57.000	1.000			-0.002	0.520	0.035	0.017	0.072	0.051	0.090*
Radionuclide	T	Plutonium-238	pCi/g	4.000	4.000	1.000			0.001	0.004	0.002	0.002	0.001	0.004	0.022
Radionuclide	T	Plutonium-239, -240	pCi/g	61.000	61.000	1.000			0.008	2.950	0.158	0.570	0.400	0.245	0.188
Radionuclide	T	Uranium-233, -234	pCi/g	60.000	60.000	1.000			0.530	2.140	1.104	0.986	0.256	1.070	1.067
Radionuclide	T	Uranium-235	pCi/g	60.000	60.000	1.000			0.013	0.124	0.049	0.044	0.023	0.054	0.055
Radionuclide	T	Uranium-238	pCi/g	60.000	60.000	1.000			0.670	2.132	1.038	1.013	0.250	1.093	1.090

Notes:

Concentration/activity values should be considered significant to only two placeds.
RFI/RI surface-soil results are the averages of the results for samples collected by the CDH and the RFP (MHM) methods.
T/D = Total (unfiltered)/Dissolved (filtered).
(1) Normal 95% UCL is the 95% Upper Confidence Limit under the assumption that the distribution is Normal. Uses t-Statistics.
(2) Lognormal 95% UCL is the 95% Upper Confidence Limit under the assumption that the distribution is lognormal. Uses h-Statistics.
*An asterisk in this column indicates that the Lognormal 95% UCL was computed on a data set containing nonpositive values. SInce the natural log of each values is required for the calculation, a value of 0.00001 was substituted (for this calculation only). The actual meaning of this result is questionable.

Table D-7
RFP OU 3 Trench Data Summary Statistics

Test Group	T/D	Chemical Name	Units	No. of Detects	No. of Samples	Detect. Frequency	Minimum Nondetect	Maximum Nondetect	Minimum Detected	Maximum Detected	Arithmetic Mean	Geometric Mean	Standard Deviation	Normal 95% UCL (1)	Lognormal 95% UCL (2)*
Radionuclide	T	Americium-241	pCi/g	57	57	1.000			-0.002	0.520	0.035	0.017	0.072	0.051	.090*
Radionuclide	T	Plutonium-238	pCi/g	04	04	1.000			0.001	0.004	0.002	0.002	0.001	0.004	0.022
Radionuclide	T	Plutonium-239, -240	pCi/g	61	61	1.000			0.008	2.950	0.158	0.570	0.400	0.245	0.188
Radionuclide	T	Uranium-233, -234	pCi/g	60	60	1.000			0.530	2.140	1.101	0.986	0.256	1.070	1.067
Radionuclide	T	Uranium-235	pCi/g	60	60	1.000			0.013	0.124	0.049	0.044	0.023	0.054	0.055
Radionuclide	T	Uranium-238	pCi/g	60	60	1.000			0.670	2.132	1.038	1.013	0.250	1.093	1.090

Notes:

Concentration/activity values should be considered significant to only two places.
RFI/RI surface-soil results are the averages of the results for samples collected by the CDH and the RFP (MHM) methods.
T/D = Total (unfiltered)/Dissolved (filtered).
(1) Normal 95% UCL is the 95% Upper Confidence Limit under the assumption that the distribution is Normal. Uses t-Statistics.
(2) Lognormal 95% UCL is the 95% Upper Confidence Limit under the assumption that the distribution is lognormal. Uses h-Statistics.
*An asterisk in this column indicates that the Lognormal 95% UCL was computed on a data set containing nonpositive values. Since the natural log of each values is required for the calculation, a value of 0.00001 was substituted (for this calculation only). The actual meaning of this result is questionable.

APPENDIX E

SUMMARY OF THE OU 3 ANALYTICAL RESULTS

1 of 4
3 Diskettes

Appendix E contains the summary of the OU 3 analytical results. The OU 3 database is provided on diskette. The files are in DBase IV and ASCII and contain analytical data for all media sampled (surface soil, trench soil, surface sediment, subsurface sediment, surface water, groundwater, and biota). Table E-1 lists the field names and a description of the information contained in each field for the Data Analysis Table. This table does not include any rejected data (i.e., records coded as "rejected" by the independent data validators) or quality control sample data. The memorandum included in this appendix provides addtional information on how the data are grouped in the database, which was given to the EPA and CDPHE.

The preparation of the OU 3 database is described in Appendix F including procedures for extracting OU 3 data from the Rocky Flats Environmental Database System (RFEDS), cleanup of RFEDS data, and data evaluation protocols used to develop the Data Analysis Table.

Table E-1 OU 3 Database Field Name Definitions

Table E-1
OU 3 Database Field Name Definitions

Field Name	Definition
Main Test Group Code	Chemical group code created by CH2M Hill; one code per analytical method.
General Test Group Code	General test that was performed on the sample; code created by CH2M Hill.
Chemical Name	Analyte name.
Analysis Date	Date chemical analysis was performed.
New Result	Analytical result; validated result if available.
Adj Result	Adjusted result = One-half of the **RESULT FIELD** value (for nondetects only).
New Unit	Unit associated with the result value.
New Error	Error term associated with radionuclide results.
New Detect Limit	Detection Limit (Detection limit = Instrument detection limit for OU 3 metals data Detection limit = Instrument detection limit or CRDL for BGCR metals data.)
New Qualifier	Includes the qualifiers assigned by the laboratories and the data validators.
Lab Disposition	If analytical results could not be transmitted, a reason disposition code is indicated.
Validation	Validation codes assigned by the data validators. If the field is blank, the record has not been validated.
Reason 1, Reason 2, Reason 3, Reason 4	Explanation for validation codes.
Depth From	Upper boundary of a sediment core segment.
Depth To	Lower boundary of a sediment core segment.
Depth Unit	Unit for sediment core segments.
Detect	The detect field marks records that contain a "U" in the **NEW QUALIFIER** field as a nondetect. Example: NEW QUALIFIER → DETECT UJ → U J → BLANK UU → U • → BLANK B → BLANK UJ → U

Table E-1 (continued)

Field Name	Definition
Adj Detect	Adjusted detect: Reflects application of EG&G data analysis protocols. All radionuclides are designated as detects (i.e., **ADJ DETECT** field is BLANK); all B-qualified metals and water-quality records are designated as detects. All other records with a "U" in the **DETECT** field are designated as nondetects (i.e., **ADJ DETECT** field contains a "U").
Method	Method used to collect a surface soil sample (CDH or MHM).
Setlock Flag	Flags a record as belonging to the SETLOCK data set (i.e., 1984 sediment data).
IHSS	Individual Hazardous Substance Site number
DGTYPE	Data grouping designation (e.g. CREEK, LAKE, PLOT, TRENCH).
DGGRABCORE	Data grouping designation for sediment samples indicating if GRAB or CORE sample.
DGSOIL	Data grouping designation for surface-soil samples indicating if sample was located in the Remedy Lands area.
Area	Denotes if the record is background (B) or OU 3 site (S) data.

MEMORANDUM

CH2M HILL

TO: Diane Niedzwiecki/CDPHE

Bonnie Lavelle/EPA

COPIES: Mark Buddy/RMRS

FROM: Julie Reynolds/CH2M HILL

DATE: July 6, 1995

SUBJECT: Database for Operable Unit 3, Rocky Flats Environmental Technology Site

PROJECT: 108628.X1.08

Attached are 3 diskettes containing the database for Operable Unit 3 (OU 3), Rocky Flats Environmental Technology Site. The following files are included on the diskettes:

NB061094.db: Background data from the Background Geochemical Characterization Report

DB09194.db: Field sampling data from RFI/RI sampling conducted by CH2M HILL

JS012694.db: Jefferson County Remedy Acreage soil data

O1041594.db: Rock Creek background soil data

DA091994.db: Data analysis table used for summary statistics and data analysis tasks for the RFI/RI report including the Human Health Risk Assessment and Ecological Evaluation (this table contains records from the four tables listed above; records were selected for inclusion in this table based on protocols described in Appendix A of Technical Memorandum No. 4, Human Health Risk Assessment, Chemicals of Concern Identification, Operable Unit 3)

Each file is provided for your use in two different formats: dBase IV (FoxPro compatible) and ASCII (quote-delimited, comma-separated).

The first four files listed above have two fields that can be used to link them to the Data Analysis table (DA091994.db): 1) CURRENT SEQ which is a sequence number for each record in the table and 2) DA TABLE SEQ that indicates the corresponding sequence number for the record in the Data Analysis table; a "0" in this field indicates the record was not used in the Data Analysis table.

The Data Analysis table has three fields that can be used to link to the source tables: 1) CURRENT SEQ which is a sequence number for each record in the Data Analysis table, 2) SOURCE TABLE which indicates which of the four tables the record came from, and 3) SOURCE SEQ which indicates the sequence number of the record in the source table.

APPENDIX F

OU 3 DATABASE PROTOCOLS

F1.0 INTRODUCTION

The OU 3 database was developed to store and organize the data from environmental sampling programs at Rocky Flats and the surrounding area that were used to prepare the RFI/RI, including the Human Health Risk Assessment and the Ecological Risk Assessment, for OU 3. The OU 3 database is composed of data from the following sources:

- Rocky Flats Environmental Database System (RFEDS)
- The 1983/84 Sediment Sampling Investigations data (DOE, 1991)
- Rock Creek Background Soil Samples (DOE, 1993a)
- Jefferson County Sampling Area Soil Samples (received from RFEDS)
- Background Geochemical Characterization Report (DOE, 1993b)
- Benchmark-Survey Data for Sample Points and Polygons

These sources provided the data sets in various formats; therefore, different procedures were used, depending on the data source, to prepare the data for use in the OU 3 database. This appendix describes the procedures followed for each data set.

The OU 3 database is managed according to the Data Management Plan (DOE, 1993c) developed for the RFI/RI of OU 3. The Data Management Plan describes in detail the data management system for the project, and includes procedures for data management staff, computer hardware and software, data models and organization, data management, and data users.

The remainder of Appendix F describes the overall structure of the OU 3 database, data preparation steps, and quality control (QC) checks that were performed to generate the tables for the OU 3 database. Appendix F is organized into the following sections:

- OU 3 Database Structure
- RFEDS Data Preparation
- Additional Data Input
- Data Analysis Table
- Quality Control Checks

F2.0 OU 3 DATABASE STRUCTURE

The database management system uses a relational data model, where the data accessed by users are contained in a number of separate tables, but are related through one or more key fields. Tables were created for data sets from each of the sources listed above. Additionally, a Data Evaluation table was created to statistically compare OU 3 data and background data and to calculate summary statistics and risk estimates. The Data Evaluation table contains fields that reflect the application of data-evaluation protocols specified by EG&G (EG&G, 1994).

The OU 3 database was designed as a set of independent Paradox (DOS Version 4.0 RDMS) tables containing fields of data. These tables can be linked through key fields (i.e., selected fields that are common to two or more tables). Figure F-1 presents an organization diagram of the OU 3 database. Table F-1 summarizes the OU 3 database structure and describes the contents of each Paradox table. Figure F-2 lists the fields contained in each table and shows relationships between the tables. Table F-2 contains definitions of the various fields.

In addition to the Paradox tables, OU 3 data are contained in ARC/INFO files to be used for producing Geographical Information System (GIS) plots of analytical results and sample locations. Analytical result and sample location data were transferred to ARC/INFO using ASCII comma-separated files.

F3.0 RFEDS DATA PREPARATION

Rocky Mountain Remediation Services (RMRS) maintains the RFEDS. The majority of data records in the OU 3 database were extracted by EG&G from RFEDS as ASCII text fixed-field files. EG&G began with an initial extraction of data from RFEDS on December 17, 1992, and throughout the duration of the project added periodic RFEDS extractions containing updated and additional records. The final extraction of RFEDS data for the Draft RFI/RI report was on February 15, 1994. All extractions, including those prior to February 15, 1994 (i.e., December 17, 1992; January 20, 1993; February 10, 1993; March 17, 1993; Figure F-1 April 1, 1993; May 5, 1993; June 10, 1993; September 16, 1993; November 16, 1993) were imported from the text files into Paradox on February 16, 1994 to create the OU 3 database for the Draft RFI/RI report. The steps necessary to import and prepare RFEDS data for the OU 3 database are described in detail below.

1. Convert RFEDS data-extraction files to ASCII separated/delimited format.

2. Import the extraction into Paradox.

3. Correct database inconsistencies, and separate data that will not be used in quantitative data-analysis tasks.

4. Identify and resolve redundant data records.

5. Assemble the main cleaned-up table (without resolved problem records).

6. Produce potential problem records report.

7. Review potential problem records report, and select records to be added back to the main table.

8. Add selected record(s) from the review process back to the main table.

9. Copy main table to OU 3 database directory for Rocky Flats.

10. Notify persons using the OU 3 database of updated main table.

Note: In the description of preparation steps below, names of database fields are shown in all uppercase bold letters (e.g., CHEMICAL NAME, MAIN TEST GROUP CODE, and NEW RESULT).

STEP 1 - Convert RFEDS data-extraction files to ASCII separated/delimited format.

Table F-1
OU 3 Database Structure

Paradox Table Name	Paradox Table Description
DA{date}.db	Data for the statistical background comparison tests and other data analysis tasks. Contains original sample data from tables DT012694, JT012694, NB012694 (excluding outliers as identified in the BGCR), and OT012694. Surface-soil sampling results (CDPHE and MHM methods) are averaged for each location. Contains fields that reflect EG&G data analysis protocols for nondetects. Rejected data (Validation = R) and QC data are not included.
DG{date}.db	Sample locations (OU 3 and background) and data-grouping information.
DB{date}.db	Original and QC data from RFEDS.
DT{date}.db	Original data only from RFEDS.
DQ{date}.db	QC data only from RFEDS.
JS{date}.db	Jefferson County Sampling Area surface-soil data (original and QC data).
JT{date}.db	Jefferson County Sampling Area surface-soil data (original data only).
JQ{date}.db	Jefferson County Sampling Area surface-soil data (QC data only).
NB{date}.db	BGCR data for selected sample locations (nonseep sediment and surface-water locations; weathered claystone monitoring well locations-original data only). Outliers, as identified in the BGCR, are included.
O1{date}.db	Rock Creek Background Soil data from OU 1 RI Report (original and QC data).
OT{date}.db	Rock Creek Background Soil data from OU 1 RI Report (original data only).
OQ{date}.db	Rock Creek Background Soil data from OU 1 RI Report (QC data only).
ST{date}.db	Sample tracking information.
FW{date}.db	Field-water quality data associated with BIO samples.
CL{date}.db	Matrix of collocated samples (e.g., collocated BIO, SW, and SED samples).

Note:

{date} = Each Paradox table filename includes the date on which the table was created and/or modified. Therefore, the most current tables were clearly identified and used for data manipulations. For example, Paradox file DA081094.db was modified on August 10, 1994.

Table F-2
OU 3 Database Field Name Definitions

Field Name	Definition
DA Table	
LOCATION CODE	Indicates environmental medium/physical location; can be more than one LOCATION CODE at the same physical location. Example: BI100092 <-- Biology Location SD100092 <-- Sediment Location SW100092 <-- Surface Water Location are all at the same physical location.
SAMPLE TYPE	Designates environmental sample medium.
SAMPLE QC CODE	Codes a record as a REAL (i.e., original sample) or QC sample (e.g., DUP, FB).
SAMPLE NUMBER	Unique code designating a single sample taken at a LOCATION CODE position; can be more than one sample number for a LOCATION CODE.
SAMPLE DATE	Date sample was collected.
DRY	Denotes if sediment sample was dry at the time of collection.
RESULT TYPE	Codes a record as an original sample result (i.e., TRG = target) or a lab QC record (e.g., REP).
RFEDS TEST GROUP CODE	General chemical group code supplied by RFEDS; can be more than one RFEDS TEST GROUP CODE for an analytical method.
MAIN TEST GROUP CODE	Chemical group code; one code per analytical method.
GENERAL TEST GROUP CODE	General test that was performed on the sample.
CHEMICAL NAME	Analyte name.
ANALYSIS DATE	Date chemical analysis was performed.
NEW RESULT	Analytical result; validated result if available.
ADJ RESULT	Adjusted result = One-half of the RESULT FIELD value (for nondetects only).
NEW UNIT	Unit associated with the result value.
NEW ERROR	Error term associated with radionuclide results.
NEW DETECT LIMIT	Detection limit (Detection limit = Instrument detection limit for OU 3 metals data Detection limit = Instrument detection limit or CRDL for BGCR metals data)
NEW QUALIFIER	Includes the qualifiers assigned by the laboratories and the data validators.
LAB DISPOSITION	If analytical results could not be transmitted, a reason disposition code is indicated.
VALIDATION	Validation codes assigned by the data validators. If the field is blank, the record has not been validated.
REASON1, REASON2, REASON3, REASON4	Explanation for validation codes.

Table F-2 (continued)

Field Name	Definition
DA Table	
DEPTH FROM	Upper boundary of a sediment core or pit trench segment.
DEPTH TO	Lower boundary of a sediment core or pit trench segment.
DEPTH UNIT	Unit for sediment core or pit trench segments.
DETECT	The detect field marks records that contain a 'U' in the NEW QUALIFIER field as a nondetect. Example: NEW QUALIFIER → Detect UJ → U J → BLANK UU → U • → BLANK B → BLANK UJ → U
ADJ DETECT	Adjusted detect: Reflects application of EG&G data analysis protocols. All radionuclides are designated as detects (i.e., ADJ DETECT field is BLANK); all B-qualified metals and water quality records are designated as detects. All other records with a "U" in the DETECT field are designated as nondetects (i.e., ADJ DETECT field contains a "U").
METHOD	Method used to collect a surface-soil sample (CDH or MHM).
84/85 SED FLAG	Flags a record as belonging to the 1984/85 Sediment Sampling Investigations data set.
IHSS	Individual Hazardous Substance Site number.
DGTYPE	Data grouping designation (e.g., CREEK, LAKE, PLOT, TRENCH).
DG GRAB CORE	Data grouping designation for sediment samples indicating if GRAB or CORE sample.
DGSOIL	Data grouping designation for surface-soil samples indicating if sample was located in the Remedy Lands area.
AREA	Denotes if the record is background (B) or OU 3 site (S) data.
Additional Fields - DG Table	
CL TABLE ENTRY	Indicates if additional information for the record is available in the collocated sample table.
DG NEAR SHORE	Data grouping designation for sediment samples.
DG CREEK NEAR SHORE	Data grouping designation for sediment samples.

Table F-2 (continued)

Field Name	Definition
DG MISC	Miscellaneous data grouping designation-empty field.
DG EXPO COV	Data grouping designation for sediment sample locations-exposed vs. covered with water.
GIS ID	I.D. code from ARC/INFO GIS data files.
GIS SAMPLE LOCATION	GIS map location.
LOCATION GROUP	General geographic location group.
DESCRIPTION	Description of sample location based on medium and geographic location.

The RFEDS data extraction format is ASCII column-delimited (i.e., text files that consist of fields that are of a fixed length). Because Paradox cannot import column-delimited ASCII files, the column-delimited RFEDS data files are converted to ASCII separated/delimited (DAT) files using a general-purpose conversion program written in PASCAL. ASCII separated/delimited files are text files that consist of fields separated by a special character, usually a comma. Additionally, the alpha fields are delimited with a special character (i.e., quotation marks for these data). Alpha fields are delimited with a special delimiter character for fields that require the special separator character as part of the alpha string (e.g., chemical names that contain commas).

STEP 2 - Import the extraction into Paradox.

Using a custom script called IMPORTEX.SC, the DAT files are imported into Paradox. The imported data from the initial RFEDS extraction are put into a temporary table. The temporary table is then restructured to match the structure of the main raw data table, and the SEQUENCE ID field is used to link the temporary and main raw data tables. The temporary table records are then added to the main raw database table. The process is repeated for each extraction. Records from the source table (i.e., temporary table with RFEDS data) replace records in the destination table (i.e., main raw data table) if the SEQUENCE ID in the source table record already exists in the destination table. If the records from the source table are not in the destination table, then the records from the source table are added to the destination table.

STEP 3 - Correct database inconsistencies and separate data that will not be used in quantitative data-analysis tasks.

Using a script named XCLEANUP.SC, the data are preprocessed to correct any inconsistencies found in the RFEDS data, such as the following:

- CHEMICAL NAME inconsistencies
- RFEDS TEST GROUP CODE name inconsistencies
- Obsolete RFEDS TEST GROUP CODE names
- Unit inconsistencies

- Multiple fields of analytical data for one record (i.e., data received from RFEDS contain fields for laboratory results and corrected results from the data-validation subcontractor; some records contain both laboratory and corrected results).

Additionally, the preprocessing step accomplishes the following:

- Separation of historical data (i.e., pre-1992 data that tend to have QC problems) from OU 3 sampling program data; historical data will be used qualitatively in the RFI/RI report.

- Separation of QC data from original sample data; QC data will be used in the RFI/RI report to evaluate quality of the data; only original data will be used for all other quantitative data-analysis tasks.

- Removal of data for any samples not associated with the OU 3 field investigation.

XCLEANUP.SC performs the following operations:

Separation of Historical Data

Historical data are identified by the following Location Codes:

SW001 through SW004
SED001 through SED004
GS001 through GS004

These data are removed from the main raw-data table and placed into a separate table for use in the RFI/RI report.

Separation of QC Data

QC data are identified using the SAMPLE QC CODE field:

Any samples with codes in the SAMPLE QC CODE field other than REAL, BLANK, or UNK (i.e., unknown) are considered to be QC samples.

QC data are also identified using the RESULT TYPE field:

Any samples with codes in the RESULT TYPE field other than TRG, DIL, BLANK, or UNK are considered to be QC samples.

Data identified as QC samples are removed from the main raw data table and placed into a temporary table for further processing.

Separation of Non-OU 3 Field Investigation Data:

The OU 3 field investigation data are identified by the following suffixes in entries in the SAMPLE NUMBER field:

- CH
- WCU3 or WC

Records with suffixes in the SAMPLE NUMBER field other than those listed above are not included in the OU 3 database.

Inconsistencies in Analyte Names

Inconsistencies in analyte names (i.e., multiple names for the same chemical) found in the RFEDS data are corrected so that each chemical is listed by only one name in the OU 3 database as shown in Table F-3.

Obsolete RFEDS TEST GROUP CODES

Obsolete codes in the RFEDS TEST GROUP CODE field consist of the following:

- PDMETCLP
- PDMETNOCLP

Any records with the codes listed above in the RFEDS TEST GROUP CODE field are removed from the main raw data table. RFEDS replaces these codes with new codes. Therefore, if records with test group codes of PDMETCLP and PDMETNOCLP remain in the table, they represent duplicate records.

Unit Inconsistencies

Any inconsistencies in units for a particular medium and test group code are converted to the appropriate consistent units (e.g., all results for dissolved metals analyses are expressed in units of mg/L). This step is performed so that data for one chemical can be combined for quantitative data-analysis tasks such as calculation of summary statistics.

Table F-3
Chemical Name Inconsistencies

Multiple Chemical Names	Changed to
RADIONUCLIDES	
GROSS ALPHA - DISSOLVED GROSS ALPHA - SUSPENDED GROSS ALPHA PARTICLE ACTIVITY	GROSS ALPHA
GROSS BETA - DISSOLVED GROSS BETA - SUSPENDED GROSS BETA PARTICLE ACTIVITY	GROSS BETA
PLUTONIUM 239 PLUTONIUM 239/240	PLUTONIUM- 239, -240
URANIUM 233, 234 URANIUM 234	URANIUM -233, -234
WATER QUALITY	
CYANIDE CYANIDE, AMENABLE CYANIDES (SOLUBLE SALTS...)	CYANIDE
HEXAVALENT CHROMIUM CHROMIUM VI	HEXAVALENT CHROMIUM
NITRATE/NITRITE NITRATE/NITRITE (HISTORICAL...)	NITRATE/NITRITE
ORTHOPHOSPHATE PARATHION, ETHYL (INCORRECT CAS NUMBER CAUSED THIS TO BE LABELED INCORRECTLY - VERIFIED BY BETH MONTANO/EG&G)	ORTHOPHOSPHATE
SOLIDS, NONVOLATILE SUSPENDED TOTAL DISSOLVED SOLIDS	TOTAL DISSOLVED SOLIDS
TOTAL SOLIDS TOTAL SUSPENDED SOLIDS	TOTAL SUSPENDED SOLIDS
BICARBONATE BICARBONATE AS $CACO_3$	BICARBONATE AS $CACO_3$
CARBONATE CARBONATE AS $CACO_3$	CARBONATE AS $CACO_3$
ALKALINITY AS $CACO_3$ TOTAL ALKALINITY	ALKALINITY AS $CACO_3$

Note:

a = BICARBONATE AS $CACO_3$ = BICARBONATE * 1.22

Multiple Fields of Analytical Data

The main raw data table can contain data from the laboratory and from the data validation subcontractor for the same record. Validated data, if available, are placed in the OU 3 database. The following fields contain corresponding data from the two sources:

LABORATORY	DATA VALIDATORS
RESULT	V RESULT
QUALIFIER	V QUAL
UNIT	V UNIT
DETECT LIMIT	V DETECT
ERROR	—NO FIELD—

The protocols listed below are used to incorporate data from the laboratory and data validators:

- If the V RESULT field in the RFEDS data contains a result, then the value from V RESULT is placed in a new field (i.e., NEW RESULT) in the OU 3 database.

- If the V RESULT field in the RFEDS data is blank, the value in the RESULT field is placed in the NEW RESULT field in the OU 3 database.

- The UNIT, DETECT LIMIT, and ERROR fields are treated the same as the V RESULT and RESULT fields. NEW UNIT, NEW DETECT LIMIT, and NEW ERROR fields were created in the OU 3 database to contain the data selected by the protocol described above.

- The QUALIFIER and V QUAL fields from the RFEDS data are concatenated in a NEW QUALIFIER field in the OU 3 database.

The NEW RESULT, NEW UNIT, NEW DETECT LIMIT, NEW ERROR, and NEW QUALIFIER fields are used for quantitative data-analysis tasks.

Inconsistencies in the RFEDS TEST GROUP CODES

The RFEDS data contain multiple codes in the TEST GROUP CODE field for the same general group of chemicals. Two new fields were created in the OU 3 database, MAIN TEST GROUP CODE and GENERAL TEST GROUP CODE, to standardize the grouping of chemicals into main sample preparation/analytical method categories (e.g., DMETAL-CLP-NONCLP refers to dissolved metals) and general chemical categories (e.g., METALS refers to both dissolved and total metal analyses), respectively. Table F-4 summarizes codes used in the RFEDS TEST GROUP CODE field and corresponding codes in the MAIN TEST GROUP CODE and GENERAL TEST GROUP CODE fields in the OU 3 database.

Table F-4
RFEDS Test Group Code Inconsistencies

RFEDS Test Group Code	Main Test Group Code	General Test Group Code
BNACLP	SVOA-ORG-CLP	SVOAS
CLHERB615	CL-HERB-EPA615	PESTICIDES
DMETADD	DMETAL-CLP-NONCLP	METALS
DIOX613	DIOX-PEST-EPA613	PESTICIDES
DPEST613	DIOX-PEST-EPA613	PESTICIDES
DMETCLPTAL	DMETAL-CLP-NONCLP	METALS
DMETNOCLP	DMETAL-CLP-NONCLP	METALS
DRADS	DISSOLVED-RADS	RADIONUCLIDES
DMETCLP	DMETAL-CLP-NONCLP	METALS
DSMETCLP	DMETAL-CLP-NONCLP	METALS
METADD	METAL-CLP-NONCLP	METALS
RFIN	WATER-QUALITY	WATER-QUALITY
METCLP	METAL-CLP-NONCLP	METALS
PAHCOM610	PAH-PEST-PCB-EPA610	PESTICIDES
PEST608	OCLPEST-EPA608	PESTICIDES
PESTCLP	PESTICIDE-CLP	PESTICIDES
PHPEST610	PAH-PEST-PCB-EPA610	PESTICIDES
PSTCLPTCL	PESTICIDE-CLP	PESTICIDES
PSTPCB508	PEST-PCB-EPA508	PESTICIDES
RFME	METAL-CLP-NONCLP	METALS
RFMS	DMETAL-CLP-NONCLP	METALS
RFPP	PESTICIDE-CLP	PESTICIDES
SMETCLP	METAL-CLP-NONCLP	METALS
RFRA	TOTAL-RADS	RADIONUCLIDES
SELCOM625	SVOA-ORG-CLP	SVOAS
RFVO	VOA-ORG-CLP	VOAS
SELCO502.2	VOA-EPA502.2	VOAS
RFSV	SVOA-ORG-CLP	SVOAS
TRADS	TOTAL-RADS	RADIONUCLIDES
RFRS	DISSOLVED-RADS	RADIONUCLIDES
TRIPES619	TRIPEST-EPA619	TRIPESTICIDES
SMETNOCLP	METAL-CLP-NONCLP	METALS
SVOCLPTCL	SVOA-ORG-CLP	SVOAS
SMETCLPTCL	METAL-CLP-NONCLP	METALS
VOA502.2	VOA-EPA502.2	VOAS
VOACLP	VOA-ORG-CLP	VOAS
VOCCLPTCL	VOA-ORG-CLP	VOAS
WQPL	WATER-QUALITY	WATER-QUALITY
OCLPEST608	OCLPEST-EPA608	PESTICIDES

STEP 4 - Identify and resolve redundant data records.

Step 4 of the cleanup process is designed to identify and remove redundant records from the OU 3 database and also uses the script XCLEANUP.SC. Step 4 includes the following procedures:

A. The main table is broken into subsets (i.e., Radionuclides, Metals, Volatile Organic Compounds, Pesticides, and Water-Quality parameters), and the algorithm described below is performed for each subset of data. For each subset, additional tables are created (i.e., a KEEP table for records that will be retained in the OU 3 database and REJECT tables) that require further processing.

B. The records in the subset table to be processed are sorted in the following order:

1. SAMPLE NUMBER
2. CHEMICAL NAME
3. MAIN TEST GROUP CODE

C. As each subset table is parsed, all records having the same entries in the SAMPLE NUMBER, CHEMICAL NAME, and MAIN TEST GROUP CODE fields are copied to a temporary table. When the entries in the SAMPLE NUMBER, CHEMICAL NAME, and MAIN TEST GROUP CODE fields change, processing moves to Step 4-D, 4-F, or 4-G, depending on the type of records contained in the temporary table. When processing returns to Step 4-C, it continues with the next group of records having the same SAMPLE NUMBER, CHEMICAL NAME, MAIN TEST GROUP CODE, until all records have been processed.

D. If the temporary table includes one validated record, the following protocols are used:

- The records in the temporary table are placed in a REJECT table if the NEW RESULT field (and ERROR field if the Radionuclides subset table is being processed) is blank for all records.

- The validated record is placed in the KEEP table if the NEW RESULT field of the validated record contains a value. All nonvalidated records in the temporary table are placed in a REJECT table.

Processing returns to Step 4-C.

E. If the temporary table includes more than one validated record, the following protocols are used:

- One of the validated records is placed in the KEEP table if the validated records have identical values in the NEW RESULT field. All other validated and nonvalidated records are deleted.

- If the RESULTS field of the records in the temporary table are not identical or are blank, all records in the temporary table are placed in a REJECT table.

Processing returns to Step 4-C.

F. If the temporary table contains one nonvalidated record, the following protocols are used:

- The record is placed in the KEEP table if the RESULT field (and ERROR field if the Radionuclides subset table is being processed) is not blank.
- The record is placed in a REJECT table if the RESULT field is blank.

Processing returns to Step 4-C.

G. If the temporary table contains more than one nonvalidated record, the following protocols are used:

- One of the nonvalidated records is placed in the KEEP table if the values in the RESULT field (and ERROR field if the Radionuclides subset table is being processed) are identical.
- All of the records in the temporary table are placed in a REJECT table if the RESULT fields are not identical or blank.

Processing returns to Step 4-C.

Tables that are created by Step 4 include:

RADS.db	Radionuclide subset table
RDKEEP.db	KEEP table for the Radionuclides subset
RDREJ61.db	Radionuclides REJECT table (validated record; RESULT and/or ERROR field is blank)
RDREJ62.db	Radionuclides REJECT table (one validated record kept; all corresponding nonvalidated records placed in this table)
RDREJ63.db	Radionuclides REJECT table (more than one validated record; no duplicate results; all records rejected)
RDREJ64.db	Radionuclides REJECT table (one nonvalidated record rejected; RESULT field blank)
RDREJ65.db	Radionuclides REJECT table (more than one nonvalidated record; no duplicate results; all records rejected)

Step 4 is also followed to create corresponding tables for the Metals, Volatile Organic Compounds, Pesticides, and Water-Quality parameters.

STEP 5 - Assemble the main cleaned-up table.

In Step 5 of the cleanup process, all of the KEEP tables are assembled into one table (i.e., DT{date}.db.; {date} indicates the date when the table was assembled or updated).

STEP 6 - Produce potential problem records report.

Hardcopy reports of the rejected records are made from the REJECT tables for each subset of data (e.g., Radionuclides, Metals, etc.). These reports are used to resolve problems with data records.

STEP 7 - Resolve problem records.

EG&G data-management staff review data-problem reports and resolve the problem or redundant records. The following list summarizes the resolution of the types of data problems found after importing RFEDS data extractions on February 16, 1994:

- Blank RESULT field for Cesium-137: These records were nondetects and the value presented in the DETECTION LIMIT field should also be used in the RESULT field.
- Blank ERROR field for Plutonium-239, -240: EG&G provided value.
- Redundant nonvalidated records for Total Organic Carbon analysis: EG&G provided RFEDS ID number of the records to be retained in the OU 3 database; other records for the same sample number were deleted.
- Nonvalidated results for surface soil samples: EG&G used nonvalidated records; validation could take from 1 to 6 months.

The following protocols are used for redundant validated records:

- If analysis dates are different for redundant records, the record with the most recent date is selected for the OU 3 database.
- If the analysis dates are the same for redundant records, selection of the record to be used in the OU 3 database is based on the Reason Codes associated with the Validation Codes.

STEP 8 - Create final database tables.

Corrected problem records and records selected from a group of redundant records for use in the OU 3 database are added to the DT{date}.db table.

STEP 9 - Copy main table to the OU 3 database directory for Rocky Flats.

The updated DT{date}.db table is copied to the OU 3 database directory for Rocky Flats.

STEP 10 - Notify persons using OU 3 database of updated main table.

Persons using OU 3 data are notified of the new table with a DATABASE UPDATE form.

Steps 3 through 10 are repeated with a modified cleanup script using QC data that were separated from original sample data during the cleanup process. The DQ{date}.db table is then created using cleaned-up QC data.

F4.0 ADDITIONAL DATA INPUT

Additional data were entered into the OU 3 database to supplement the data extracted from RFEDS, including data from the following sources:

- The 1984/85 Sediment Sampling Investigation (DOE, 1991), Attachments 1 and 2 contain a discussion of analyses performed to determine the usability of these data in the RFI/RI report for OU 3.
- Background Soil Samples from Rock Creek (DOE, 1993a).
- Soil Samples for the Sampling Area in Jefferson County.
- Background Geochemical Characterization Report (DOE, 1993b).
- Benchmark-Survey Data for Points and Polygons.

These additional data were received in various formats, and different procedures were used to prepare the data for use in the OU 3 database, depending on the source. Table F-5 summarizes the dates received, format, and types of data and data preparation procedures for each of these sources.

F5.0 DATA ANALYSIS TABLE

The Data Analysis table (DA{date}.db) is composed of records from the DT{date}.db, JT{date}.db, OT{date}.db, and NB{date}.db tables. Additionally, the DA{date}.db table contains fields that reflect application of data-evaluation protocols. This section describes the data-evaluation protocols and outlines the procedures used to prepare the DA{date}.db table.

F5.1 Data Evaluation Protocols

The data-evaluation protocols for the Draft RFI/RI report are based on Guidance for Data Usability in Risk Assessments (EPA, 1990) and a guidance memorandum from EG&G (EG&G, 1994, included as Attachment 3). The eleven protocols described in this section are the data manipulation rules that were applied to prepare the DA{date}.db table for quantitative data analysis tasks. The protocols were designed to identify and eliminate data considered unacceptable for quantitative data analysis (e.g., data rejected as a result of data validation). Additionally, the protocols provide for consistent treatment of nondetects, QC samples, and other specific categories of data in the quantitative data analyses.

Table F-5
Additional Data Sources

Source Name	Format	Description	Preparation
Jefferson County Sampling Area Soil Data (extracted from RFEDS)	ASCII file (Column-delimited)	Surface-soil sampling results for 47 sample locations; Am-241 and Pu-239, -240	1. Convert data to comma-separated/ alpha field-delimited files. 2. Import files to Paradox. 3. Run data through preprocessing and cleanup scripts. 4. Create Paradox tables for data users (JT{date}.db-original samples, JQ{date}.db-QC samples, and JS{date{.db}-all samples).
Background Geochemical Characterization Report Data (DOE, 1993b)	ASCII files (Column delimited)	Background data for stream, surface water, stream sediments, and groundwater	1. Convert data to comma-separated/ alpha field-delimited files. 2. Import files to Paradox. 3. Remove seep locations, correct inconsistent units/chemical names. 4. Create Paradox table (NB{date}.db).
1983/84 Sediment Sampling Investigations Data (DOE,1991)	Hardcopy data	1984 Sediment data for IHSS 200 and IHSS 201	1. Enter data into Paradox. 2. Perform 100% QC check of Paradox data against hardcopy data. 3. Create table of data (SL {date} .db).
Background Soil Data From Rock Creek (DOE, 1993a)	Hardcopy tables	Background surface-soil data for 18 locations; radionuclides	1. Enter data into Excel. 2. Perform 100% QC check fo Excel output against hardcopy data. 3. Import data to Paradox. 4. Create Paradox tables for data users (OT {date}, db-original samples, OQ {data}, db-QC samples, and O1 {date}. db-all samples.
Benchmark-Survey Data	ASCII Files (Comma-separated)	Survey coordinates for sample points and polygons (surface-soil plots)	1. Import data into Paradox. 2. Convert coordinates to state plane coordinates. 3. Create table for points (BP{data}.db). 4. Create table for polygons (BY{date}.db).

F5.1.1 Nonvalidated Data

Any nonvalidated data in the OU 3 database were included in the DA{date}.db table and were used for quantitative data-analysis tasks for the Draft RFI/RI report. A total of 1,082 records in the OU 3 database used for the COC selection process (7 percent) were nonvalidated.

F5.1.2 Validated or Qualified Data

All data qualified with a "J," and any other qualifiers except those with an "R," in the VALIDATION or NEW QUALIFIER fields were included in the DA{date}.db table and were used in the quantitative data analysis tasks for the Draft RFI/RI report. Validated data flagged with an "R" in the VALIDATION field or nonvalidated data flagged with an "R" in the NEW QUALIFIER field were not included in the DA{date}.db table and, therefore, were not used in any quantitative data analyses tasks for the Draft RFI/RI report. Data flagged with an "R" are rejected because they did not meet performance requirements in the sample or in the associated QC samples. The R-qualified data may be used qualitatively in the RFI/RI report, if appropriate.

F5.1.3 QC Samples

All QC samples (e.g., trip blanks, field duplicates, laboratory replicates) were removed from the DA{date}.db table and were not used for quantitative analysis tasks for the RFI/RI report. The QC data were used to evaluate precision, accuracy, representativeness, comparability, and completeness (PARCC) under the RFI/RI Task 4.

F5.1.4 Treatment of Detects or Nondetects for Inorganic Parameters

Analytical results for metals and water-quality parameters were treated as detects if the following conditions applied:

- The NEW QUALIFIER field is blank.
- A sample is not qualified with a "U" in the NEW QUALIFIER field. A sample qualified with a "U" is a nondetect and is below the instrument detection limit.
- A sample is qualified with a "B" in the NEW QUALIFIER field. The "B" qualifier signifies that the analytical result was below the contract-required reporting limit (CRDL) but above the instrument detection limit (IDL). B-qualified data are considered to be detects and are used as such.

F5.1.5 Treatment of Nondetects for Volatiles, Semivolatiles, Pesticides, and PCBs

When applying any parametric analytical test, one-half of the reported analytical result (the NEW RESULT field in the database) was used for organic samples flagged with a "U" in the NEW QUALIFIER field. All data flagged with a "U" were counted as nondetects when performing detection frequency calculations.

When applying any nonparametric analytical test, the reported analytical result (the NEW RESULT field in the database) was used for organic samples flagged with a "U" in the NEW QUALIFIER field.

F5.1.6 Treatment of Nondetects for Radionuclides

DOE Order 5400.1 provides guidance on the treatment of radionuclide results at or below the detection limit. The DOE order states: "All of the actual values, including those that are negative, should be included in the statistical analyses. Practices such as assigning a zero, the detect limit value, or some in-between value to the below-detectable data point, or discarding those data points can severely bias the resulting parameter estimates and should be avoided. ... Data from censored distributions are more amenable to standard statistical analyses than are those from truncated distributions ...."

Based on the DOE guidance, all radionuclide results were treated as detects for quantitative data-analysis tasks except for calculation of detection frequency. For calculating detection frequency, all results flagged with a "U" in the NEW QUALIFIER field were counted as nondetects.

F5.1.7 Treatment of Negative and Zero Results for Radionuclides

Based on DOE Order 5400.1, all radionuclides results, including negative and zero values, were used in quantitative data-analysis tasks. For statistical tests requiring log-transformations of the radionuclide results (e.g., background statistical comparison tests), the distributions of results for a particular analyte for both OU 3 data and background data were shifted by adding a constant value to each result so that all results were positive. This shift was performed because calculation of the natural log of zero or negative values results in an error. Therefore, negative and zero values could not be included in the comparison test when log-transformation was required, if the shift was not performed.

F5.1.8 Treatment of Error

The impact of the ERROR reported for the radionuclide parameters will be discussed in the RFI/RI Uncertainty Section. In cases where the ERROR is greater than or equal to 0.5 times the NEW RESULT value, there is less confidence in the reported result and a higher degree of uncertainty. For example, if the ERROR is subtracted from the result, the reported value may be less than the detection limit. Data that fall in this category will be identified but not altered for quantitative data-analysis tasks.

F5.1.9 Treatment of Outliers

An outlier is an extreme observation that does not conform to the pattern established by other observations and is unlikely to be a valid member of the population of interest. An outlier may be the result of an incorrectly read, recorded, or transcribed measurement; an incorrect calculation; an error in documentation (field or laboratory); or an actual environmental condition. To evaluate the presence of outliers, the following procedure was applied to the analytes, by sample type, for the sediment, surface-water, and groundwater background data in the Background Geochemical Characterization Report (DOE, 1993b) only (this screening process was not applied to OU 3 data):

1. Anomalous data were flagged.

2. These flagged values were examined, then checked individually if judged to be geochemically questionable. Each flagged outlier was evaluated with respect to the historical trend of the data for that specific location, as well as laboratory conditions such as matrix interference, in an attempt to determine why the datum was aberrant.

3. If the outlier resulted in a correctable error, the value was changed, and the correct value was included in the data set. Data that were believed to have resulted from laboratory contamination (e.g., acetone "hits"), irresolvable transcription errors, or other noncorrectable errors that gave results not thought to be representative of background were excluded from subsequent statistical analyses.

Outliers listed in Appendix E of the Background Geochemical Characterization Report have been excluded from the DA{date}.db table of the OU 3 database and therefore, were not used in statistical comparison tests.

F5.1.10 Averaging of Analytical Results for Surface-Soil Samples Collected Using Different Methods

Surface-soil samples were collected by two different methods: the Colorado Department of Public Health and Environment (CDPHE) method and the Rocky Flats/Modified Hazel method (MHM). The paired t-test at the 95 percent confidence level showed that the results from these two methods were not significantly different (see Attachment 4 for a detailed discussion of the statistical analysis). Therefore, results of the two methods for a sample location were averaged and this mean value for the sample location was entered into the DA{date}.db table of the OU 3 database in the NEW RESULT field for use in quantitative data-analysis tasks.

F5.2 PREPARATION OF DATA-ANALYSIS TABLES

The following procedures were used to prepare the DA{date}.db table:

1. A copy of the DT{date}.db table was named DT2DA.db.

2. The "Rejected" (VALIDATION field contains an "R") data records were removed from the DT2DA.db table.

3. The units were checked for consistency.

4. The codes in the CHEMICAL NAME field were checked for consistency.

5. A DETECT field was added to the table. The DETECT field indicates if a record is a nondetect (U) or a detect ([BLANK]). If the NEW QUALIFIER field contained a "U," then the DETECT field for the corresponding record contains a "U;" otherwise, the DETECT field was left blank.

6. An AREA field was added to the table. The AREA field denotes if the record is background (B) or OU 3 site (S) data. For the DT2DA.db table, the AREA field was set to "S" to denote that it is OU 3 site data.

7. The data from the DT2DA.db table were inserted into the DA{date}.db table. Procedures 1 through 7 were repeated for the JT{date}.db, OT{date}.db, and NB{date}.db tables. After all tables were combined into the DA{date}.db table, the following procedures were performed:

8. The DA{date}.db table was checked for overall consistency of units.

9. The DA{date}.db table was checked for overall consistency of codes in the CHEMICAL NAME field.

10. Fields from the data grouping table (DG{date}.db) were added to the DA{date}.db table. Using the LOCATION CODE field as a link from the DA{date}.db to the DG{date}.db, the IHSS, DG TYPE, DG GRAB CORE, and DG SOIL were linked into the DA{date}.db table.

11. New fields (i.e., ADJ DETECT and ADJ RESULT), based on the data-evaluation protocols, were set up in the DA{date}.db table. The values in the DETECT and NEW RESULT fields were copied into the ADJ DETECT and ADJ RESULT fields so that both sets of fields contained the same data. The ADJ fields were then adjusted to reflect application of the data-evaluation protocols, and the original fields were not changed.

12. For all radionuclide records, the ADJ DETECT field was set to a [BLANK] value to denote the record as a detect value.

13. For all metal records, if the NEW QUALIFIER field contained a "B," then the ADJ DETECT field value was set to a [BLANK] value to denote the record as a detect.

14. For all records that contained a "U" in the ADJ DETECT field after completing procedures 12 and 13, the value in the ADJ RESULT field was replaced with a proxy value (i.e., one-half of the value in the NEW RESULT field).

15. The updated DA{date}.db table was copied to a separate directory.

16. Persons using OU 3 data were notified of the updated DA{date}.db table with a DATABASE UPDATE form.

F6.0 QUALITY CONTROL CHECKS

The following QC checks were performed to verify the completeness and consistency of the OU 3 database:

- A QC audit of the ST{date}.db table was performed using printouts of the original source data. Any error or inconsistencies found in the ST{date}.db table were corrected.

- A list of missing data (i.e., data requested from the laboratories but not contained in the DT{date}.db or DQ{date}.db tables) was produced by comparing the ST{date}.db table (i.e., sample tracking matrix that contains all requested analyses for each sample number) to the DT{date}.db and the DQ{date}.db tables. The records listed on the missing data list were checked against the RFEDS data received from EG&G to verify that all data received from RFEDS were imported into the OU 3 database.

- SAMPLE LOCATION codes in the DB{date}.db, DG{date}.db, and DA{date}.db tables for OU 3 field-investigation data were compared to SAMPLE LOCATION codes in the ST{date}.db table. No inconsistencies were found between SAMPLE LOCATION codes in the tables.

- The DA{date}.db and DB{date}.db tables were checked for consistency of analytical result units for each CHEMICAL NAME. Records with inconsistent units were corrected.

- The DA{date}.db table was queried to verify that it did not contain any QC samples or R-validated or qualified data. No QC samples or R-validated or qualified data were found.

- The DA{date}.db table was queried to verify that it contained data for the following SAMPLE TYPES only: SS-surface-soil plots, PT-pit trench soil samples, SW-surface water, SD-sediment, GW-groundwater, and BI-biota. These SAMPLE TYPES were found along with several records with "UN" (unknown) in the SAMPLE TYPE field. The records with "UN" were corrected.

- Sample locations contained in the DG{date}.db table for each medium were checked against the GIS plots to verify all sample-location data were transferred to ARC/INFO. Sample locations were found to be consistent between the DG{date}.db table and the GIS plots.

- Ten percent of the analytical data displayed on the GIS plots were checked against the NEW RESULT field in the DA{date}.db table for corresponding sample locations to verify that the analytical data were accurately transferred to ARC/INFO. No errors were found in the analytical data on the GIS plots.

Additionally, a QC check of the cleanup script was performed using a sample data set that contained historical data, QC data, and redundant records. No errors were found in the data set after cleanup; historical records and QC data were separated, and redundant records were placed into the appropriate REJECT tables, as described in Subsection F-3.0.

F7.0 REFERENCES

DOE, 1991, *Final Historical Information Summary and Preliminary Health Risk Assessment,* Operable Unit No. 3-Sites 200-202, April.

DOE, 1993, *Remedial Investigation Report for Operable Unit Number 1.*

DOE, 1993b, *Background Geochemical Characterization Report,* September.

DOE, 1993c, *Data Management Plan, Task 5, RFI/RI Report for Operable Unit No. 3,* April.

EG&G, 1994, *Practical Suggestions for Users of RFEDS Data,* March.

EPA, 1990, *Guidance for Data Usability in Risk Assessments, Interim Final,* EPA/540/6-90/008, Office of Emergency and Remedial Response, Washington, D.C., October.

Attachment 1
SAS Results of RFP OU 3 CHPHE and RFP Soil Data
1 of 5

---------- REPNAMEC=AMERICIUM-241 ----------

Univariate Procedure

Variable=DIFF

=CDH-RFP

Moments

N	57	Sum Wgts	57
Mean	0.000332	Sum	0.0189
Std Dev	0.042788	Variance	0.001831
Skewness	0.1072	Kurtosis	11.03164
USS	0.10253	CSS	0.102524
CV	12904.22	Std Mean	0.005667
T:Mean=0	0.058507	Pr>|T|	0.9536
Num ^= 0	52	Num > 0	27
M(Sign)	1	Pr>=|M|	0.8899
Sgn Rank	50	Pr>=|S|	0.6533

Quantiles(Def=5)

100% Max	0.18	99%	0.18
75% Q3	0.006	95%	0.0297
50% Med	0	90%	0.0239
25% Q1	-0.005	10%	-0.018
0% Min	-0.1703	5%	-0.059
		1%	-0.1703
Range	0.3503		
Q3-Q1	0.011		
Mode	0		

Extremes

Lowest	Obs	Highest	Obs
-0.1703(	54)	0.025(	10)
-0.127(	55)	0.0271(	53)
-0.059(	34)	0.0297(	42)
-0.021(	56)	0.123(	48)
-0.021(	44)	0.18(	13)

---------- REPNAMEC=PLUTONIUM-239/240 ----------

Univariate Procedure

Variable=DIFF

Moments

N	61	Sum Wgts	61
Mean	0.039848	Sum	2.4307
Std Dev	0.185206	Variance	0.034301
Skewness	3.659651	Kurtosis	15.00187
USS	2.154938	CSS	2.058081
CV	464.7871	Std Mean	0.023713
T:Mean=0	1.680393	Pr>|T|	0.0981
Num ^= 0	57	Num > 0	28
M(Sign)	-0.5	Pr>=|M|	1.0000
Sgn Rank	-3.5	Pr>=|S|	0.9781

Quantiles(Def=5)

100% Max	0.91	99%	0.91
75% Q3	0.019	95%	0.3
50% Med	0	90%	0.16
25% Q1	-0.0178	10%	-0.048
0% Min	-0.234	5%	-0.0741
		1%	-0.234
Range	1.144		
Q3-Q1	0.0368		
Mode	0		

Extremes

Lowest	Obs	Highest	Obs
-0.234(	57)	0.22(	60)
-0.147(	59)	0.3(	15)
-0.0871(	25)	0.436(	32)
-0.0741(	44)	0.9(	14)
-0.07(	26)	0.91(	24)

---------- REPNAMEC=URANIUM-233/234 ----------

Univariate Procedure

Variable=DIFF

Moments

N	60	Sum Wgts	60
Mean	0.074562	Sum	4.4737
Std Dev	0.226697	Variance	0.051391
Skewness	-0.27565	Kurtosis	-0.37912
USS	3.365658	CSS	3.032092
CV	304.0392	Std Mean	0.029266
T:Mean=0	2.547687	Pr>|T|	0.0135
Num ^= 0	58	Num > 0	38
M(Sign)	9	Pr>=|M|	0.0247
Sgn Rank	315	Pr>=|S|	0.0134

Quantiles(Def=5)

100% Max	0.5	99%	0.5
75% Q3	0.2365	95%	0.41
50% Med	0.09	90%	0.38
25% Q1	-0.085	10%	-0.2015
0% Min	-0.501	5%	-0.31
		1%	-0.501
Range	1.001		
Q3-Q1	0.3215		
Mode	0.09		

Extremes

Lowest	Obs	Highest	Obs
-0.501(	48)	0.4(	14)
-0.4(	46)	0.4(	18)
-0.37(	16)	0.42(	35)
-0.25(	21)	0.45(	1)
-0.23(	53)	0.5(	50)

---------- REPNAMEC=URANIUM-235 ----------

Univariate Procedure

Variable=DIFF

Moments

N	60	Sum Wgts	60
Mean	0.00342	Sum	0.2052
Std Dev	0.039842	Variance	0.001587
Skewness	-0.02913	Kurtosis	3.619726
USS	0.094356	CSS	0.093655
CV	1164.964	Std Mean	0.005144
T:Mean=0	0.664911	Pr>|T|	0.5087
Num ^= 0	56	Num > 0	29
M(Sign)	1	Pr>=|M|	0.8939
Sgn Rank	81	Pr>=|S|	0.5137

Quantiles(Def=5)

100% Max	0.128	99%	0.128
75% Q3	0.021	95%	0.0785
50% Med	0	90%	0.0444
25% Q1	-0.01225	10%	-0.04
0% Min	-0.143	5%	-0.0501
		1%	-0.143
Range	0.271		
Q3-Q1	0.03325		
Mode	0		

Extremes

Lowest	Obs	Highest	Obs
-0.143(	44)	0.057(	6)
-0.053(	13)	0.064(	28)
-0.051(	10)	0.093(	49)
-0.0492(	43)	0.093(	8)
-0.048(	34)	0.128(	29)

---------- REPNAMEC=URANIUM-238 ----------

Univariate Procedure

Variable=DIFF

Moments

N	60	Sum Wgts	60
Mean	0.076765	Sum	4.6059
Std Dev	0.244698	Variance	0.059877
Skewness	0.775055	Kurtosis	3.110143
USS	3.886322	CSS	3.53275
CV	318.7625	Std Mean	0.03159
T:Mean=0	2.430012	Pr>|T|	0.0182
Num ^= 0	55	Num > 0	36
M(Sign)	8.5	Pr>=|M|	0.0300
Sgn Rank	286	Pr>=|S|	0.0151

Quantiles(Def=5)

100% Max	1.01	99%	1.01
75% Q3	0.20045	95%	0.45
50% Med	0.0794	90%	0.344
25% Q1	-0.0835	10%	-0.19
0% Min	-0.56	5%	-0.28
		1%	-0.56
Range	1.57		
Q3-Q1	0.28395		
Mode	0		

Extremes

Lowest	Obs	Highest	Obs
-0.56(	35)	0.37(	2)
-0.35(	26)	0.44(	34)
-0.3(	46)	0.46(	13)
-0.26(	47)	0.65(	59)
-0.2(	19)	1.01(	50)

Attachment 2
Statistical Comparison of 1983/1984 Sediment Data and RFI/RI Sediment Data

Note: The 1983/1984 sediment data are referred to as "Setlock historical" data in this memorandum.

MEMORANDUM CH2M HILL

TO: Amy Lange/DEN

COPIES: Mike Bedan/DEN
Robert Scrimo/DEN

FROM: Susan Blake/DEN

DATE: July 23, 1993

SUBJECT: Statistical Comparison of Setlock and RFEDS Data

PROJECT: DEN30181.X1.08

The Setlock historical plutonium 239/240 sediment data for Standley Lake and Great Western Reservior (GWR) has been statistically compared to the RFEDS plutonium 239/240 sediment sample data to determine if there is a significant difference in the means of the data sets. For the Standley Lake sediment data, there is not a significant difference in the means of the Setlock and RFEDS data sets at a 95% confidence level. The data could be combined for future data analysis. For the GWR sediment data, there is a significant difference in the means of the data sets. The GWR Setlock plutonium data should not be used for future data analysis.

The following describes the analytical method used. The data analyzed are shown in Attachment 1 to this memo. For four of the Standley Lake sample locations (SED09492, SED09592, SED09692, and SED09792) there are three RFEDS samples. In order to do a statistical t-test paired by location (as requested by EG&G), there needs to be one Setlock and one RFEDS sample value per location analyzed. To accomodate this, the RFEDS data was summarized two different ways. One way was to use the one RFEDS value at each of the four locations that was sampled in the same time frame as the other RFEDS data used (see column STRFRES in Attachment 1). The other way was to average the three RFEDS values at each of the four sample locations with more than one RFEDS value (see column RFEDSAV in Attachment 1).

A t-test for paired comparisons was performed determine if there is a significant difference between the Setlock and RFEDS data. This comparison tests whether the mean of sample differences between pairs of data is significantly different from zero. The standard error over which this hypothesis is tested is the standard error of the mean difference.

Attachment 2 shows the results of three comparisons using SYSTAT software:

Standley Setlock vs. RFEDS (for same date samples at the four locations)
Standley Setlock vs. RFEDS (for average samples at the four locations)
GWR Setlock vs. RFEDS.

For each comparison, a probability is shown. This is the probability of seeing such a difference in the means of the two data sets given that the null hypothesis of the difference in the means being significantly different from zero is true. If the probability is high we do not reject the null hypothesis and conclude there is no significant difference in the means. If the probability is low, we reject the null hypothesis and conclude there is a significant difference in the means of the data sets.

For the Standley Lake comparisons it did not matter what sample values were used for the four locations with multiple RFEDS samples. Both comparisons showed the means are not significantly different with 95% confidence (PROB=0.530, 0.529). The GWR comparison shows the means to be significantly different with 95% confidence (PROB=0.026).

A review of the summary statistics for each of the data groups shown in Attachment 2 reflects these conclusions. The mean of the Standley Lake Setlock data (0.061) is not much different from the RFEDS data summarized two different ways (0.045). The mean of the GWR Setlock data (0.239) appears to be greater than the GWR RFEDS data (0.094).

The Standley Lake Setlock data can be appropriately combined with the RFEDS data for future data analysis. The GWR Setlock data should not be used for further data analysis.

RF OU 3 SETLOCK[illegible] SAMPLE DATA

ATTACHMENT

SET LOC	RFEDS LO	SET RES	RFEDS RE	SETSTAN	RFSTAN	STSETRE	STRFRES	RFEDSAV	SETGWR	RFGWR	GWRSETR	GWRRFRE
SL-48	SED09492	0.047	0.00692	SL-48	SED09492	0.047	0.0241	0.02	GWR-EG01	SED12892	0.078	0.046
SL-48	SED09492	0.047	0.029	SL-33	SED09592	0.014	0.0186	0.0272	GWR-EG03	SED13092	0.064	0.0419
SL-48	SED09492	0.047	0.02409	SL-06	SED09692	0	0.013	0.0125	GWR-EG04	SED13192	0.056	0.106
SL-33	SED09592	0.014	0.017	SL-10	SED09792	0.05	0.0181	0.0131	GWR-EG09	SED13392	0.406	0.0827
SL-33	SED09592	0.014	0.0186	SL-29	SED09892	0.067	0.1895	0.1895	GWR-EG13	SED13492	0.237	0.103
SL-33	SED09592	0.014	0.04598	SL-47	SED09992	0.041	0.0599	0.0599	GWR-EG14	SED13592	0.278	0.14
SL-06	SED09692	0	0.01	SL-12	SED10092	0.005	0.0325	0.0325	GWR-EG16	SED13692	0.237	0.119
SL-06	SED09692	0	0.013	SL-17	SED10192	0.057	0.0391	0.0391	GWR-EG18	SED13792	0.157	0.106
SL-06	SED09692	0	0.01438	SL-09	SED10292	0.041	0.0324	0.0324	GWR-EG26	SED13992	0.407	0.0939
SL-10	SED09792	0.05	0.00212	SL-08	SED10392	0.029	0.0377	0.0377	GWR-EG28	SED14192	0.024	0.025
SL-10	SED09792	0.05	0.019	SL-45	SED10492	0.071	0.0367	0.0367	GWR-EG32	SED14392	0.14	0.125
SL-10	SED09792	0.05	0.01809	SL-35	SED10592	0.553	0.0726	0.0726	GWR-EG36	SED14492	0.013	0.0143
SL-29	SED09892	0.067	0.1895	SL-52	SED10692	0.027	0.0267	0.0267	GWR-EG35	SED14592	0.991	0.1533
SL-47	SED09992	0.041	0.0599	SL-42	SED10792	0.079	0.0447	0.0447	GWR-EG41	SED14692	0.065	0.0667
SL-12	SED10092	0.005	0.03251	SL-26	SED10892	0.018	0.017	0.017	GWR-EG33	SED14792	0.43	0.1872
SL-17	SED10192	0.057	0.03912	SL-30	SED10992	0.069	0.144	0.144				
SL-09	SED10292	0.041	0.03241	SL-01	SED11092	0	0.0011	0.0011				
SL-08	SED10392	0.029	0.03769	SL-38	SED11192	0.02	0.0153	0.0153				
SL-45	SED10492	0.071	0.03668	SL-37	SED11292	0.023	0.0599	0.0599				
SL-35	SED10592	0.553	0.0726	SL-40	SED11392	0.014	0.0117	0.0117				
SL-52	SED10692	0.027	0.02671									
SL-42	SED10792	0.079	0.0447									
SL-26	SED10892	0.018	0.01697									
SL-30	SED10992	0.069	0.144									
SL-01	SED11092	0	0.00112									
SL-38	SED11192	0.02	0.0153									
SL-37	SED11292	0.023	0.0599									
SL-40	SED11392	0.014	0.0117									
GWR-EG01	SED12892	0.078	0.046									
GWR-EG03	SED13092	0.064	0.0419									
GWR-EG04	SED13192	0.056	0.106									
GWR-EG09	SED13392	0.406	0.0827									
GWR-EG13	SEC13492	0.237	0.103									
GWR-EG14	SED13592	0.278	0.14									
GWR-EG16	SED13692	0.237	0.119									
GWR-EG18	SED13792	0.157	0.106									
GWR-EG26	SED13992	0.407	0.0939									
GWR-EG28	SED14192	0.024	0.025									
GWR-EG32	SED14392	0.14	0.125									
GWR-EG36	SED14492	0.013	0.0143									
GWR-EG35	SED14592	0.991	0.1533									
GWR-EG41	SED14692	0.065	0.06668									
GWR-EG33	SED14792	0.43	0.1872									

ATTACHMENT 2

PAIRED T-TEST OF SETLOCK DATA TO RFEDS SAMPLE DATA
7/23/93 1:17:30 PM A:\SET2.SYS

	STSETRES	STRFRES	RFEDSAVG
N OF CASES	20	20	20
MINIMUM	0.000	0.001	0.001
MAXIMUM	0.553	0.190	0.190
MEAN	0.061	0.045	0.045
STANDARD DEV	0.118	0.046	0.046

	GWRSETRE	GWRRFRES
N OF CASES	15	15
MINIMUM	0.013	0.014
MAXIMUM	0.991	0.187
MEAN	0.239	0.094
STANDARD DEV	0.253	0.049

PAIRED SAMPLES T-TEST ON STSETRES VS STRFRES WITH 20 CASES

N DIFFERENCE = 0.017
SD DIFFERENCE = 0.115
T = 0.640 DF = 19 PROB = 0.530

PAIRED SAMPLES T-TEST ON STSETRES VS RFEDSAVG WITH 20 CASES

MEAN DIFFERENCE = 0.017
SD DIFFERENCE = 0.116
T = 0.641 DF = 19 PROB = 0.529

PAIRED SAMPLES T-TEST ON GWRSETRE VS GWRRFRES WITH 15 CASES

MEAN DIFFERENCE = 0.145
SD DIFFERENCE = 0.225
T = 2.498 DF = 14 PROB = 0.026

Attachment 3
Revision to Statistical Comparison fo 1983/1984 Sediment Data and RFI/RI Sediment Data

Note: The 1983/1984 sediment data are referred to as "Setlock historical" data in this memorandum.

CH2M HILL

MEMORANDUM

TO: Michael Guillaume/EG&G

COPIES: Greg Williams/IT CORP
Karen Wiemelt/CH2M HILL
Amy Lange/CH2M HILL
Mike Bedan/CH2M HILL

FROM: Susan Blake/CH2M HILL

DATE: November 10, 1993

SUBJECT: Revision to Statistical Comparison of Setlock and OU3 RFI/RI Data

PROJECT: DEN30181.X1.08

INTRODUCTION/PURPOSE

The Setlock historical plutonium 239/240 sediment data for Standley Lake and Great Western Reservior (GWR) are statistically compared to the OU3 RFI/RI plutonium 239/240 sediment sample data to determine if it is appropriate to combine the Setlock data with the OU3 RFI/RI data for further data analysis.

This memorandum is a revision to the original analysis performed in July (reference memorandum dated 7/23/93). The original analysis was performed using a paired t-test. The OU 3 Work Plan (reference 21100-WP-OU3.1, section 6, revision 1, p. 29) specifies that the analysis will be performed using another type of paired analysis; referred to in the Work Plan as the Sign test. However, the statistical test described in the OU 3 Work Plan is known as the Wilcoxon signed rank test. There is another statistical test for paired data called the Sign test but it is not the test described in the Work Plan. The Sign test is less efficient than other statistical tests for detecting true differences between data sets (Snedecor and Cochran, 1989). Therefore, the paired t-test and Wilcoxon signed rank test are used for this analysis. This memorandum summarizes the results of the paired t-test and Wilcoxon signed rank test.

APPROACH

The hypothesis tested is that the Setlock historical plutonium activity levels are greater than or equal to the OU3 RFI/RI plutonium activity levels. The Setlock and OU3 RFI/RI data are matched by sample location and therefore treated as paired data. The null hypothesis is that the median of the population of paired differences is equal to zero. The alternative hypothesis is the median difference is not equal to zero.

If the null hypothesis is not rejected (i.e., the median differences equal zero), then it is concluded that the Setlock historical data are not significantly different from the OU3 RFI/RI sample data and the data are combined for further analysis. If the null hypothesis is rejected, then it is concluded that the Setlock data are significantly different from the OU3 RFI/RI sample data. Further analysis would then be performed to determine if the Setlock data are significantly higher or lower than the OU3 RFI/RI data. If the Setlock data are significantly higher the data are still combined with the OU3 RFI/RI data for further analysis. This approach is conservative in that higher historical plutonium activity levels will increase the OU3 RFI/RI activity levels. If the Setlock data would be significantly lower than the OU3 RFI/RI data a reevaluation of the data would be performed as this would be an unexpected result.

Two different types of statistical comparisons for paired data are performed. The paired t-test is a parametric test that assumes the population of the differences in the pairs are normally distributed and compares the mean of the population of paired differences to zero. (In a normal distribution the mean is the same as the median.)

The Wilcoxon signed rank test is a nonparametric test that makes no distributional assumptions about the data. This test determines whether the median of the population of paired differences is equal to zero. The test is more efficient than the t-test for detecting differences in the two groups of data when the data are not normally distributed. The Wilcoxon signed rank test is also appropriate for when the population of the paired differences in the data have heavy-tailed distributions and contain outliers (Snedecor and Cochran, 1989).

The comparison approach is the same whether using a paired t-test or Wilcoxon signed rank test. For each comparison, a probability is shown. This is the probability of observing the results of the two data sets given the null hypothesis that there is no difference in the medians (means) is true. If the probability is high, we do not reject the null hypothesis and conclude there is no significant difference in the medians. If the probability is low, we reject the null hypothesis and conclude there is a significant difference in the medians of the data sets.

ANALYSIS

The GWR and Standley Lake sediment plutonium data are shown in Tables 1 and 2, respectively. In Table 2, four of the Standley Lake sample locations (SED09492, SED09592, SED09692, and SED0972) have three OU3 RFI/RI samples per location which were collected on different dates. In order to perform a statistical test with

data paired by location, there needs to be one Setlock and one OU3 RFI/RI sample value per location analyzed. To accomodate this, the OU3 RFI/RI data are summarized two different ways. One way is to use the one OU3 RFI/RI value at each of the four locations that was sampled in the same time frame as the other OU3 RFI/RI data used. The other way is to average the three OU3 RFI/RI values at each of the four sample locations. These two ways of summarizing the data for analysis are shown in Table 2. Not all of the Setlock plutonium data available are used in these analyses. Only those samples which have a corresponding OU3 RFI/RI sample are used.

TABLE 1. GWR SEDIMENT PLUTONIUM ACTIVITY DATA

SETLOCK SAMPLE #	OU3 RFI/RI SAMPLE #	SETLOCK (pCi/g)	OU3 RFI/RI (pCi/g)
GWR-EG01	SED12892	0.078	0.0460
GWR-EG03	SED13092	0.064	0.0419
GWR-EG04	SED13192	0.056	0.1060
GWR-EG09	SED13392	0.406	0.0827
GWR-EG13	SED13492	0.237	0.1030
GWR-EG14	SED13592	0.278	0.1400
GWR-EG16	SED13692	0.237	0.1190
GWR-EG18	SED13792	0.157	0.1060
GWR-EG26	SED13992	0.407	0.0939
GWR-EG28	SED14192	0.024	0.0250
GWR-EG32	SED14392	0.140	0.1250
GWR-EG36	SED14492	0.013	0.0143
GWR-EG35	SED14592	0.991	0.1533
GWR-EG41	SED14692	0.065	0.0667
GWR-EG33	SED14792	0.430	0.1872

TABLE 2. STANDLEY LAKE SEDIMENT PLUTONIUM ACTIVITY DATA

SETLOCK SAMPLE#	OU3 RFI/RI SAMPLE#	SETLOCK (pCi/g)	OU3 RFI/RI (pCi/g)	OU3 RFI/RI. same date	OU3 RFI/RI. avg
SL-48	SED09492	0.047	0.00692, 0.029, 0.02409	0.02409	0.0200
SL-33	SED09592	0.014	0.017, 0.0186, 0.04598	0.0186	0.0272
SL-06	SED09692	0.000	0.01, 0.013, 0.01438	0.0130	0.0125
SL-10	SED09792	0.050	0.00212, 0.019, 0.01809	0.01809	0.0131
SL-29	SED09892	0.067	0.1895	0.1895	0.1895
SL-47	SED09992	0.041	0.0599	0.0599	0.0599
SL-12	SED10092	0.005	0.0325	0.0325	0.0325
SL-17	SED10192	0.057	0.0391	0.0391	0.0391
SL-09	SED10292	0.041	0.0324	0.0324	0.0324
SL-08	SED10392	0.029	0.0377	0.0377	0.0377
SL-45	SED10492	0.071	0.0367	0.0367	0.0367
SL-35	SED10592	0.553	0.0726	0.0726	0.0726
SL-52	SED10692	0.027	0.0267	0.0267	0.0267
SL-42	SED10792	0.079	0.0447	0.0447	0.0447
SL-26	SED10892	0.018	0.0170	0.0170	0.0170
SL-30	SED10992	0.069	0.1440	0.1440	0.1440
SL-01	SED11092	0.000	0.0011	0.0011	0.0011
SL-38	SED11192	0.020	0.0153	0.0153	0.0153
SL-37	SED11292	0.023	0.0599	0.0599	0.0599
SL-40	SED11392	0.014	0.0117	0.0117	0.0117

The paired t-test and Wilcoxon signed rank test are used to make the following comparisons:

GWR Setlock vs. GWR OU3 RFI/RI
Standley Setlock vs. Standley OU3 RFI/RI (same date samples)
Standley Setlock vs. Standley OU3 RFI/RI (average samples).

The results of the paired t-test are shown in Table 3. The mean and standard deviation of the differences are shown for each comparison. These statistics are used to calculate a T-statistic that is used with the degrees of freedom (equal to the number of samples minus one) to determine the probability of seeing such a result given the null hypothesis that the mean of the differences is zero.

TABLE 3. RESULTS OF PAIRED T-TEST

COMPARISON	DIFF MEAN	DIFF SD	T-STAT	DF	PROB	DIFF?
GWR Setlock vs. OU3 RFI/RI	0.145	0.225	2.498	14	0.026	YES
Standley Setlock vs. OU3 RFI/RI, same date samples	0.017	0.115	0.640	19	0.530	NO
Standley Setlock vs. OU3 RFI/RI, avg of samples	0.017	0.116	0.641	19	0.529	NO

The GWR comparison shows the means to be significantly different with 95% confidence (i.e., PROB=0.026 is less than 0.05). For the Standley Lake comparisons it does not matter what sample values are used for the four locations with multiple OU3 RFI/RI samples. Both comparisons show the means are not significantly different with 95% confidence (i.e., PROB=0.530, 0.529 are greater than 0.05).

Table 4 shows the results of the Wilcoxon signed ranks test. This nonparametric approach calculates a Z-statistic based on ranks of the data. This Z-statistic is used to determine a probability using normal approximation. This is the probability of seeing such a result given the null hypothesis that the median of the paired differences is zero.

TABLE 4. RESULTS OF WILCOXON SIGNED RANKS TEST

COMPARISON	Z-STATISTIC	PROBABILITY	DIFFERENCE?
GWR Setlock vs. OU3 RFI/RI	-2.669	0.008	YES
Standley Setlock vs. OU3 RFI/RI, same date samples	-0.075	0.940	NO
Standley Setlock vs. OU3 RFI/RI, avg of samples	-0.019	0.985	NO

The GWR comparison shows the medians to be significantly different with 95% confidence (PROB=0.008 is less than 0.05). For the Standley Lake comparisons it does not matter what sample values are used for the four locations with multiple OU3 RFI/RI samples. Both comparisons show the medians are not significantly different with 95% confidence (PROB=0.940, 0.985 greater than 0.05).

A review of the summary statistics for each of the data groups shown in Table 5 reflects these conclusions. The mean and median of the Standley Lake Setlock data are not much different from the OU3 RFI/RI data summarized two different ways. The mean and median of the GWR Setlock data appear to be greater than the GWR OU3 RFI/RI data.

TABLE 5. SUMMARY STATISTICS FOR SETLOCK AND OU3 RFI/RI DATA

STATISTIC	STANLEY SETLOCK	STANLEY OU3 RFI/RI (same date)	STANLEY OU3 RFI/RI (avg)	GWR SETLOCK	GWR OU3 RFI/RI
No. of cases	20	20	20	15	15
Minimum	0.000	0.001	0.001	0.013	0.014
Maximum	0.553	0.190	0.192	0.991	0.187
Mean	0.061	0.045	0.045	0.239	0.094
Median	0.035	0.032	0.032	0.157	0.103
Std. Dev.	0.118	0.046	0.046	0.253	0.049

CONCLUSION/SUMMARY

The Setlock data are compared with the OU3 RFI/RI data for Standley Lake and Great Western Reservoir using two different statistical tests (paired t-test and Wilcoxon signed rank test). Both statistical tests show no significance difference in the Setlock and OU3 RFI/RI data for Standley Lake at 95% confidence. Both statistical tests results show a significant difference in the Setlock and OU3 RFI/RI data for Great Western Reservoir at 95% confidence. However, the mean and median activity level of the GWR Setlock plutonium data are higher than the GWR OU3 RFI/RI plutonium data.

Based on these results, the Setlock data for both GWR and Standley Lake can be appropriately combined with the OU3 RFI/RI data for future data analyses.

Attachment 4
Practical Suggestions for Users of RFEDS Data

NOTE: The only background data that should be used (for OUs 3 through 16) in the OU v. Background comparisons, are those ASCII files dated 9-30-93 or later. Previous information regarding instrument detection limits, and earlier file generations of the background data should be discarded.

PRACTICAL SUGGESTIONS FOR USERS OF RFEDS DATA (3-28-94)

The standard RFEDS output format changed on February 21, 1994. The old output format is given here as Appendix A; the new output format is given here as Appendix B.

In general, there are actually three related issues that may arise for users of RFEDS data:

(1) How to deal with multiple detection limits
(2) How to treat non-detects
(3) How to perform data cleanup

1.0 MULTIPLE DETECTION LIMITS

The standard reporting format for RFEDS data (through 1993) gives one field for the reported detection limit. Unfortunately, this one field may contain either of three variables; the instrument detection limit (IDL), the method detection limit (MDL), or the contract-required detection/quantitation limit (CRDL/CRQL). The significance of these three different types of detection limits is that, for inorganic analytes (i.e., metals and water-quality parameters), the CRDL may be one to two orders of magnitude greater than the corresponding IDL for a particular analyte.

The "Gansecki rule" was proposed (in EPA comments on the *1990 Background Geochemical Characterization Report*) as an attempt to eliminate the high-value non-detects from the data set. The "Gansecki rule" calls for exclusion of all non-detects greater than two times the minimum reporting limit; however, this "rule" has come under criticism as arbitrary and possibly not technically defensible.

1.1 Summary and Recommendations

* Decisions based on a graphical review of the data distribution are thought to be more technically defensible than the general application of an arbitrary rule (i.e. the "Gansecki rule"), even if the "rule" comes from EPA comments. The use of professional judgement and technically arguable reasoning are recommended in place of the "Gansecki rule." It is incumbent upon the data users to document all steps in their analysis of RFEDS data.

  EG&G will review the graphics jointly with the subcontractor, and provide guidance at this point in the data analysis.

* The values of CRDLs for metals, as given in EPA SOW for Inorganics Analysis, should be compared with the data set to ascertain what percentage of the data is reported as the value of the CRDL (see Table 1). EG&G will review the data jointly with the subcontractor, and give directions on how to proceed.

Table 1: INORGANIC TARGET ANALYTE LIST (TAL)

Analyte	CRDL (ug/L)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

2.0 TREATMENT OF NON-DETECTS

For those data sets containing censored data, the method of replacement affects the value obtained for the mean and upper confidence limit (UCL). The mean and skewness generally increase in deviation from the true values, as the proportion of non-detects increases. The deviation from true mean value is also greater as the amount of skewness increases. Maximum Likelihood Estimation (MLE) generally does a better job of estimating skewness than does simple substitution.

Sanford *et al.* (1993) tested the "accuracy" of different replacement methods for non-detects, evaluating the accuracy of different methods by the root mean square error and by a scoring system. Sanford *et al.* (1993) concluded that the performance of the different replacement methods were, as follows:

SCORING OF DIFFERENT REPLACEMENT METHODS

	MLE	Simple Sub.	Drop Non-detects
40% Non-detects	93%	89%	64%
80% Non-detects	61%	54%	29%

Therefore, for as much as 80-percent non-detects, simple substitution and MLE have been shown to have similar "strength" (see Sanford *et al.*, 1993). In cases with greater than 80-percent non-detects, the results obtained from simple substitution and MLE may be quite different, and can lead to different — possibly opposite — conclusions.

Certainly the *worst* possible treatment of non-detects is to drop them from the data set (Helsel, 1990; Sanford *et al.*, 1993). Non-detects should NEVER be excluded from any statistical comparison of OU versus background data.

Given the cumulative uncertainties throughout the processes of sampling and chemical analysis, the possible error introduced by using simple substitution rather than using MLE replacement of non-detects is probably acceptable. The standard practice for treatment of non-detects, as given in EPA statistical guidance for RCRA sites (1989, 1992), calls for simple substitution using ½ the detection limit, for non-detect rates of as much as 15 percent.

2.2 Summary and Recommendations

* Data for which all unit designations are blank, should be deleted from the working data set if it is not possible to obtain verification of units.

* As a replacement value for any non-detect prior to standard statistical analyses, the data user may choose to do the following:

  > Use ½ the reported detection limit, for replacement of non-detects.

  > Maximum-likelihood methods (see Helsel, 1990), in which non-detects are fitted to a distribution and assigned a range of values, may also be used as a method of replacing non-detects. (NOTE: This method does require the analyst to choose a distribution — either lognormal or normal — to assign values to non-detects. The analyst should also be aware of back-transformation bias in the case of log-transformed data.)

Based on the study of Sanford *et al.* (1993) and EPA CERCLA guidance, the

recommendation of EG&G is to use ½ the reported detection limit as a replacement value for analytes with as much as 80-percent non-detects. For analytes with a non-detect rate of greater than 80 percent, the use of inferential statistical analysis is not recommended. EG&G will provide additional guidance for treatment of these high-rate non-detects.

* All data for radionuclides should be used as detects, except for rejected data (validation code = R). For liquid samples, radionuclide data are generally given in units of PCI/L; for solids, radionuclide data are in PCI/G, except for TRITIUM data, which are always in units of PCI/L.

* For organics, the result qualifier should be used to determine the percentage of non-detects. Non-detects for organic analytes are generally qualified "U", but other designations may also appear in the result-qualifier field (for additional information about result qualifiers (see attached Appendix C).

  "Hits" of some common lab contaminants such as acetone, methylene chloride, and certain phthlates may indicate contamination if detected in the associated lab blank; such sample results are designated by a "B" in the result-qualifier field. EPA guidance for risk assessment (1989 EPA/540/1-89/002) indicates that if the concentration of a common lab contaminant in a sample is more than 10 times the concentration of the same analyte in the blank, then the sample result is taken to be a real "hit", not just lab contamination. For other analytes that are not typically found as lab contaminants, EPA guidance (EPA, 1989) states that if the concentration in the sample exceeds 5 times the concentration in the blank, then the sample result is taken to be a real "hit", not just lab contamination.

* For metals and water-quality parameters, it may be ineffective to rely on the result qualifier alone. The following criteria have been employed to differentiate detects from non-detects, and are suggested as guidelines for the data:

  > If the result-qualifier field contains a "U", the result is taken as a non-detect (i.e., censored data point).

  > If the result-qualifier field is blank, the result is used as a detected value, barring evidence to the contrary.

  > If the result qualifier (for inorganics) is "B" (indicating that the result was above the IDL but below the CRDL), the result is taken to be a detected value (see Appendix C).

  > Other characters also are found in the qualifier field, and, barring any other evidence to the contrary, these are generally accepted as detects.

* All data should be reviewed graphically (non-detects and detects together) prior to the application of any statistical tests. This will help to illustrate any potential problems, such as high-value non-detects (e.g., non-detect values reported as the value of the CRDL). If questions arise, EG&G will give guidance to the subcontractor after jointly reviewing the graphical presentations of the data.

3.0 ISSUES REGARDING DATA CLEANUP

The so-called "data cleanup" of RFEDS output is mostly a task to make the data consistent. This consists of a time-consuming series of steps (which should be documented by the data user) including the standardization of units, standardization of geologic codes, standardization of locations if the location designation has changed over time, standardization of analyte names (usage has changed over the years), deletion of blank "form-generated" records for which no results are given, exclusion of QC data (rinsates, etc.) from the working data set, removal of any rejected (val = 'R') data, replacement of non-validated records with corresponding validated records (if available), correction of incorrect units (e.g., pH should have 'PH' as the unit, *not* 'MG/L' as the unit), treatment of qc DUP/REAL pairs, appropriate use of DIL data, outlier analysis, etc.

Upon receipt of RFEDS data, the user should verify the field positions of all variables in the RFEDS ASCII output file. After verification, the ASCII file may be transformed into data files for a specific software (e.g., SAS, Lotus, Excel, SPSS, etc.) to be used in the data manipulation. It is recommended that the user create successive generations of the data files rather than just continually updating the original data file; this simplifies data analysis if back-tracking is required for any reason.

Successive generations of data files may proceed as follows (this is just a suggestion):

(1) Original data files created from RFEDS ASCII files; these files contain the entire RFEDS data pull, including QC samples, rejected data, etc.

(2) Second generation of data files, drop QC samples (except qc DUPs of DUP/REAL pairs), rejected data, blank form-generated records, tentatively identified compounds (TICs), etc. Create new variables, using validated data (where available) to supersede non-validated results, units, qualifiers, and detection limits. Standardize units within each analyte suite. Note that in the old RFEDS output format (Appendix A) there were variable fields entitled "Qualifier" (lab qualifier), "Validation" (the validation code), and "VQual" (the validation qualifier). The validation qualifier ("VQual") should supersede the lab qualifier ("Qualifier"). **The validation code ("Validation") is a code, not a qualifier.**

In the new RFEDS output format (i.e., data extracted after February 21, 1994), the validation qualifier ("VQual") field is not present; rather, the validated qualifier will automatically replace the lab qualifier ("Qualifier"). The validation code field ("Validation") will still indicate whether the datum is acceptable (Validation = A, V, or JA), or rejected (Validation = R), or other.

Standardize location names if designations have changed over time (check cross-reference listings of well location names, etc.). Standardize geologic codes. Standardize analyte names (e.g. "PLUTONIUM-239,240" = "PLUTONIUM-239/240", etc.). (NOTE: standardization of analyte names and units should now be automatic in the new RFEDS data output).

(3) From (1), create a separate file with QC data for analysis of data quality. Check the PARCC parameters (precision, accuracy, representativeness, completeness, and comparability).

(4) **NOTE: The averaging of qc DUP/REAL pairs may be too time-consuming to perform, and will most likely result in insignificant changes to numerical values. The following suggested averaging of qc DUP/REAL pairs should be done at the analyst's discretion.**

From (2), create a third generation of data files with averaged DUP/REAL pairs (change REAL value to the mean value of the averaged DUP/REAL pair, then delete the DUP record). In the case of DUPs with no corresponding REAL record, change "DUP" to "REAL". (NOTE: Prior to averaging of DUP/REAL pairs, sort the data by LOCATION, SAMPLE NUMBER, SAMPLE DATE, and ANALYTE. This should bring together all existing DUP/REAL pairs).

Treatment of DIL data requires the data analyst to find the analyte(s) that necessitated the dilution; these should have a qualifier of "E" (for exceedance). The DIL result(s) for the E-qualified analyte(s) should be used in the data analysis; other analytes may have results reported for the DIL sample analysis, but these results should be deleted if these analytes in the original undiluted sample were NOT qualified as "E".

Outlier analysis, and exclusion of identified outliers from data analysis, may not be allowable by the regulatory agencies. That is, it is easy to argue that an extremely high value in background is probably an outlier that can be excluded from data analysis, but it is difficult to argue that an extremely high value in an OU is an outlier rather than contamination.

The RFEDS has shown continuous improvement in the quality of data contained in the system. Newer data (1992-93) are generally "cleaner" than historic (pre-1992) data. However, all data users need to be made aware of potential pitfalls before applying statistical tests to the data. The steps listed in the previous paragraph give a general overview for the process of data cleanup.

3.1 Summary and Recommendations

* All data users should carefully document the steps used in the process of data cleanup. If questions arise, review of this documentation should be able to provide the necessary information; otherwise contact your EG&G project manager for additional information.

* RFEDS and the Sample Management Group are committed to Continuous Improvement; recent data (1992 to present) have fewer problems than historic data (pre-1992). Issues of duplicate records, incorrect units, etc., are currently being addressed.

The new RFEDS program for uploading data now runs automatic checks to ensure

standardization of units and analyte names, checks to ensure that appropriate QC samples are included, and checks for completeness of analyte suites.

4.0 REFERENCES

Helsel, D.R. (1990). Less than obvious: statistical treatment of data below the detection limit. *Environmental Science & Technology*, v. 24, n. 12, p. 1766- 1774.

Sanford, R.F., Pierson, C.T., and Crovelli, R.A. (1993). An objective replacement method for censored geochemical data. *Mathematical Geology*, v. 25, n. 1, p. 59-80.

U.S. Environmental Protection Agency (February, 1989). *Statistical Analysis of Ground-water Monitoring Data at RCRA Facilities, Interim Final Guidance.* EPA/530-SW-89-026.

U.S. Environmental Protection Agency (July, 1992). *Statistical Analysis of Ground-water Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance.*

APPENDIX A (Old RFEDS output format, pre 2-21-94)

BASIC ANALYTICAL DATA EXTRACTION FORMAT DESCRIPTION

The output file from a standard data extraction is ASCII format, column delimited with spaces used to fill out column width. An additional space has been added between columns for legibility.

The requested data extraction has the following column format:

FIELD	STARTING POSITION	FIELD LENGTH
Location	1	15
Sample Number	17	20
Project Name	38	15
Sample Type	54	2
Sample QC Code	57	4
Sample QC Partner	62	20
Sample Date	83	9
Laboratory	93	5
Lab Batch Id	99	15
Analysis Date	115	9
Test Group Code	125	10
Result Type	136	3
Chemical	140	40
Parameter Code	181	11
Run Number	193	3
Count Number	197	3
Lab QA Code	201	4
Lab Sample Number	206	10
Result Qualifier	217	1
Result	219	10
Unit Measure	230	10
Error	241	10
Qualifier	252	5
Detect Limit	258	10
Validation	269	2
Reason1	272	3
Reason2	276	3
Reason3	280	3
Reason4	284	3
VResult	288	10
VUnit	299	10
VQual	310	5
VDetect	316	10
Validation Date	327	9
Sequence Id (RFEDS ID)	337	10

APPENDIX B (New RFEDS output format, post 2-21-94)

RFEDS BASIC ANALYTICAL DATA EXTRACTION FORMAT DESCRIPTION

2/14/94

The output file from a standard data extraction is ASCII format, column delimited with spaces used to fill out column width. An additional space has been added between columns for legibility.

The requested data extraction has the following column format:
ADDITIONAL SPACE = 1

FIELD	STARTING POSITION	FIELD LENGTH
Location	1	15
Sample Number	17	20
Project Name	38	15
Sample Type (type)	54	2
Sample QC Code (qc)	57	4
Sample QC Partner	62	20
Sample Date (sdate)	83	9
Laboratory	93	5
Lab Batch Id	99	15
Analysis Date	115	9
Test Group Code (group)	125	10
Result Type (id)	136	3
Chemical	140	40
Parameter Code	181	11
Run Number	193	3
Count Number	197	3
Lab QA Code	201	4
Lab Sample Number	206	10
Result Qualifier	217	1
Result	219	10
Unit Measure (units)	230	10
Error	241	10
Qualifier (qual)	252	5
Detect Limit (detect)	258	10
Validation (val)	269	2
Reason1 r1	272	3
Reason2 r2	276	3
Reason3 r3	280	3
Reason4 r4	284	3
Validation Date	288	9
Sequence Id (RFEDS ID)	298	10
Secondary Result Type	309	3
Matrix	313	8
Lab Disposition	322	15

J	organics: MS data indicate presence of compound but below detection limit (estimated value)	yes	yes
?delete?	inorganics: value greater than IDL but control sample analysis not within control limits (estimated value)	yes	yes
L	undefined	no	no
N	organics: compound presumed present (TIC)	yes, but remove to TIC table	no
N	inorganics: spiked sample recovery not within control limits (estimated value)	yes	yes
N*	inorganics: spiked sample recovery and duplicate analysis not within control limits (estimated value)	yes	yes
R	validation code for rejected data accidentally entered in lab qualifier field (unusable data)	no	no
S	inorganics: the reported value determined by the method of standard additions	yes	yes
U	organics and inorganics: analyte analyzed below detection limit	yes	no
JC	organics: pesticide result confirmed but below detection limit	yes	no
UJ	organics: analyte analyzed but below detection limit	yes	no
UN	organics: compound presumed present but below detection limit	yes	no
UN	inorganics: spiked sample recovery not within control limits and sample result below detection limit	yes	no
UW	inorganics: post-digestion spike for GFAA analysis is out of control limits and sample result is below detection limit	yes	no
UX		yes	no
V	validation code for valid data accidentally entered into lab-qualifier field	yes	yes
W	inorganics: post-digestion spike for GFAA analysis is out of control limits while sample absorbance < 50% of spike absorbance	yes	yes
X	organics (pre-1992): lab software flag (combines more than one qualifier, not defined). ** COMMENT: Do not include in analysis unless accompanied by a validated result. **	**	**

X	inorganics (pre-1992): detection limit greater than normal, spike matrix interference	yes	yes
X	other (OU7 RFI/RI samples): result by calculation defined in GRRASP	yes	yes
Y	rads: chemical yield exceeded acceptable limits (estimated value)	yes	yes

Note on the use of X qualifiers: X is defined in the GRRASP as a result determined by calculation, not by direct laboratory analysis. Therefore, for samples analyzed during the period that the GRRASP has been in effect (since January 1992), the results qualified by an X will be treated as estimated values (similar to J). For historic data, when the GRRASP was not used by laboratories, an X qualifier has two definitions. For organics, the X is a flag entered manually by the laboratory, but is not defined in RFEDS. Therefore, organic results qualified by X are not considered usable data, unless a validated result is given. For inorganics, an X qualifier indicates that the detection limit for the analyte is higher than normal due to matrix interference. Inorganics qualified with an X will be treated like a J result. The X qualifier is sometimes also used with other qualifiers (i.e., UX, XJ); in these cases, the meaning of X depends on the analyte and the date of the analysis.

APPENDIX D

VALIDATION CODES

Code	Definition	Include in Data Analysis?
J	estimated result	yes
A	acceptable result	yes
JA	acceptable result for estimated value	yes
	NOTE: (those data qualified with a "U" but having validation code of "JA" are still non-detects)	
R	rejected result	no
V	valid result	yes
Y	not yet validated; validation in progress	yes
Z	validation not required	yes

Attachment 5
Statistical Comparison of OU 3 CDPHE and RFETS Soil Samples

MEMORANDUM

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FROM: Susan Blake/CH2M Hill

DATE: February 11, 1994

SUBJECT: Statistical Comparison of RFP OU 3 CDH and RFP Soil Samples

PROJECT: RME30181.X1.62

INTRODUCTION/PURPOSE

This memorandum documents the statistical analysis that was performed to determine if the RFP OU 3 Colorado Department of Health (CDH) soil sample data are significantly different from the Rocky Flats Plant (RFP) soil sample data. The results indicated the two methods are not significantly different and provide the basis for combining the data for further analysis. CDH and RFP data were analyzed and compared for the following radionuclides: Americium-241, plutonium-239/240, uranium 233/234, uranium-235, and uranium-238.

APPROACH

The statistical hypothesis tested is that the CDH radionuclides activity levels are equal to the RFP radionuclides activity levels. The CDH and RFP soil data are matched by sample location and therefore are treated as paired data. The null hypothesis is that the median of the population of paired differences is equal to zero. The alternative hypothesis is the median difference is not equal to zero.

If the null hypothesis is not rejected (i.e. the median of the differences is not significantly different from zero), then it is concluded that the median of the CDH data is not significantly different from the median of the RFP data and the data are combined for further analysis. If the null hypothesis is rejected, then it is concluded that the CDH and RFP sampling result medians are statistically significantly different.

Two types of statistical comparisons for paired data were performed. The paired t-test is a parametric test that assumes the population of the differences in the pairs are normally distributed and compares the mean of the population of paired differences to zero. (In a normal distribution the mean is the same as the median.)

The Wilcoxon signed rank test is a nonparametric test that makes no probability distribution assumptions about the data. This test determines whether the median of the population of paired differences is equal to zero. The test is more efficient than the t-test for detecting differences in the two groups of data when the data are not normally distributed. The Wilcoxon signed rank test is also appropriate for when the population of the paired differences in the data have heavy-tailed distributions and contain outliers (Snedecor and Cochran, 1989).

SAS statistical software PROCEDURE UNIVARIATE was executed on the differences of the CDH and RFP data paired by location. This SAS output (shown in the Appendix) gives results for the paired t-test and the Wilcoxon signed-rank test.

The SAS output includes the mean and standard deviation of the differences for each comparison. These statistics are used to calculate a T-statistic that is used with the degrees of freedom (equal to the number of paired differences minus one) to determine the probability (known as the p-value) of observing the sample results of the two data sets given the null hypothesis that the mean of the differences is zero. The T-statistic, sample size, and p-values (Pr>|T|) are also shown in the SAS PROC UNI output.

In the Wilcoxon signed rank test the absolute values of the differences are ranked, the smallest differences being assigned rank 1. The ranks with the negative signs are totalled and the ranks with the positive signs are totalled. The smaller of these totals is the Sgn Rank (S-statistic) shown in the SAS output. The corresponding p-value (Pr>|S|) is also shown.

The comparison approach is the same whether using a paired t-test or the Wilcoxon signed rank test. If the p-value is high (i.e., greater than or equal to 0.05 for 95% confidence), we do not reject the null hypothesis and conclude there is no statistically significant difference in the median of the two data sets. If the probability is low (i.e, less than 0.05), we reject the null hypothesis and conclude there is a statistically significant difference in the medians of the two data sets. Statistically significant differences in the medians of the CDH and RFP soil radionuclide activity level data are qualitatively evaluated to determine if the magnitude of the difference is physically or scientifically significant.

ANALYSIS/RESULTS

The SAS PROC UNI results for each radionuclide analyzed are shown in the Appendix to this memorandum. The results are for CDH minus RFP values for each sample location. N is the number of paired differences or sample locations. The results of the paired t-tests and Wilcoxon signed rank test are shown in Table 1. The mean, standard deviation, N, and p-values are shown for each comparison.

TABLE 1. SAS RESULTS OF CDH AND RFO PAIRED TESTS

CDH-RFP	Diff Mean	Diff Std Dev	N	t-test P-value	WSR P-value	Diff?
Am-241	0.00033	0.0428	57	0.9536	0.6533	NO
Pu-239 /240	0.03985	0.1852	61	0.0981	0.9781	NO
Ur-233 /234	0.07456	0.2267	60	0.0135	0.0134	YES
Ur-235	0.00342	0.03984	60	0.5087	0.5137	NO
Ur-238	0.07677	0.2447	60	0.0182	0.0151	YES

The t-test and Wilcoxon signed rank test results are consistent. The mean difference is positive for all the radionuclides indicating the CDH values are on the average higher than the RFP values. However, the uranium-233/234 and uranium-238 CDH and RFP comparisons show the only statistically significantly differences with 95% confidence (i.e., the p-values are less than 0.05). These two statistically significant differences were evaluated further.

Summary statistics of uranium-233/234 and uranium-238 CDH and RFP methods are shown in Table 2. The difference in the means of the CDH and RFP method for uranium-233/234 is 0.075 pCi/g. The difference in the means of the means of the CDH and RFP methods for uranium-238 methods is 0.077 pCi/g. These differences were determined to not be physically significant. The other descriptive statistics for the CDH and RFP groups for uranium-233/234 and uranium-238 were qualitatively considered to be similar.

Based on the results of the paired statistical tests and a review of the descriptive statistics, it was determined to be appropriate to combine the CDH and RFP radionuclide soil sample data for further analysis. The data are combined by averaging the CDH and RFP values at each soil sample location.

TABLE 2. DESCRIPTIVE STATISTICS FOR CDH AND RFP UR-233/234 AND UR-238 SOIL SAMPLE DATA

STATISTIC	UR-233/234 CDH	UR-233/234 RFP	UR-238 CDH	UR-238 RFP
Sample size	60	60	60	60
Mean (pCi/g)	1.051	0.976	1.077	1.000
SD (pCi/g)	0.271	0.289	0.292	0.263
Min (pCi/g)	0.633	0.32	0.39	0.59
Med (pCi/g)	0.997	0.94	1.011	0.948
Max (pCi/g)	1.889	2.39	2.081	2.182

APPENDIX G

SUMMARY OF QUALITY CONTROL AND QUALITY ASSURANCE

INTRODUCTION

In Section 5 of the Work Plan, data quality objectives (DQOs) were identified for the OU 3 RFI/RI project. This appendix discusses the results of the OU 3 data quality and usability evaluation with respect to the established DQOs. The precision, accuracy, representativeness, completeness, and comparability (PARCC) of the data set were evaluated separately to determine overall data quality and their usability toward intended purposes. The results of the PARCC analysis indicate that the DQOs were satisfied by the sampling and analysis effort conducted for OU 3. Therefore, the data are deemed usable, as qualified, for the intended purposes. In addition, a review of field sampling activities was conducted by International Technology Corporation (IT) on July 15, 1992. Results of this review stated that Standard Operating Procedures (SOPs) were being implemented during the sampling effort.

Data Source and Data Qualifiers

The Rocky Flats Environmental Data System (RFEDS) database for OU 3 was used in the PARCC analysis. The database contained independently validated data with qualifiers applied by the laboratory as well as independent data validators. Prior to performing the PARCC analysis, quality checks were performed on the database in terms of completeness, replicate records, consistency in chemical names, units and reported values, extent of independent validation, and consistency in validation qualifiers. After necessary modifications and corrections, the database was found to be acceptable for performing the PARCC analysis.

For the benefit of the reader, the definitions of the laboratory and independent validation qualifiers found in RFEDS database are presented below. Before submitting the data, the laboratory determines the data quality and applies qualifiers as required by the method. After receipt, the data quality is independently checked by data validators. The laboratory data qualification often focuses on contractual or method compliance requirements, while the independent data validation focuses more on data usability. For this primary reason, the criteria for data qualification are often different for the laboratory and the data validators. In any event, the independent data validation qualifiers supersede the laboratory qualifiers.

Laboratory Data Qualifiers

The laboratory data qualifiers are primarily those specified in the Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) organic and inorganic method protocols, or adapted from the CLP protocols. Some differences exist between the laboratory qualifiers used for organic and inorganic data; therefore, the laboratory qualifiers for the two types of analyses are presented separately.

Table G-1
Validation Counts for Real Samples by Medium and Sample Analysis

Medium	QC Code	Sample Analysis	Total Records	Total Non-Val Records	Total Val Records	Number Rejected Records	Number Valid Records	Usable Data Points
BI	Real	Metals	748	0	748	17	731	97.73%
BI	Real	Radionclides	1511	22	1489	114	1375	92.46%
GW	Real	Metals	928	232	696	9	687	99.03%
GW	Real	Radionuclides	83	18	65	0	65	100.00%
GW	Real	Water-Quality	128	48	80	0	80	100.00%
PT	Real	Radionuclides	552	3	549	204	345	63.04%
SD	Real	Metals	6405	197	6208	302	5906	95.28%
SD	Real	Radionuclides	1937	82	1855	121	1734	93.75%
SD	Real	VOAs	616	38	578	227	351	63.15%
SD	Real	Water-Quality	241	79	162	18	144	92.53%
SS	Real	Radionuclides	658	90	568	31	537	95.29%
SW	Real	Metals	2884	219	2665	23	2642	99.20%
SW	Real	Radionuclides	718	1	717	100	617	86.07%
SW	Real	Tripesticides	126	22	104	0	104	100.00%
SW	Real	VOAs	340	0	340	10	330	97.06%
SW	Real	Water-Quality	708	56	652	3	649	99.58%
UN	Real	Radionuclides	15	0	15	0	15	100.00
			18,598	1,107	17,491	1,179	16,312	93.2%

Table G-2
Validation Counts for QC Samples by Medium and Sample Analysis

Medium	QC Code	Sample Analysis	Total Records	Total Non-Val Records	Total Val Records	Number Rejected Records	Number Valid Records	Usable Data Points
GW	Dup	Metals	58	0	58	1	57	98.28%
GW	FB	Metals	58	0	58	1	57	98.28%
GW	RNS	Metals	58	0	58	0	57	98.28%
GW	Dup	Radionuclides	5	0	5	0	5	100.00%
GW	FB	Radionuclides	5	0	5	0	5	100.00%
GW	RNS	Radionuclides	5	0	5	0	5	100.00%
GW	Dup	Water-Quality	8	0	8	0	8	100.00%
GW	FB	Water-Qiality	8	0	8	0	8	100.00%
GW	RNS	Water-Quality	8	0	8	0	8	100.00%
PT	Dup	Radionuclides	53	1	52	23	29	56.60%
PT	RNS	Radionuclides	57	0	57	28	29	50.88%
SD	Dup	Metals	421	1	420	29	391	93.11%
SD	RNS	Metals	261	0	261	4	257	98.47%
SD	Dup	Radionuclides	114	0	114	10	104	91.23%
SD	RNS	Radionuclides	63	0	63	2	61	96.83%
SD	Dup	VOAs	69	1	68	32	36	53.62%
SD	RNS	VOAs	34	0	34	1	33	97.06%
SD	Dup	Water-Quality	15	1	14	1	13	93.33%
SD	RNS	Water-Quality	9	0	9	0	9	100.00%
SS	Dup	Radionculides	79	25	54	7	47	91.14%
SS	RNS	Radionculides	40	1	39	0	39	100.00%
SW	Dup	Metals	754	54	700	6	694	99.20%
SW	FB	Metals	88	1	87	1	86	98.86%
SW	MS	Metals	58	0	58	0	58	100.00%
SW	RNS	Metals	726	34	692	16	676	97.80%
SW	RNS	Pesticides	216	27	189	0	189	100.00%
SW	BB	Radionuclides	1	0	1	0	1	100.00%
SW	Dup	Radionuclides	207	0	207	14	193	93.24%
SW	FB	Radionuclides	22	0	22	5	17	77.27%
SW	LR	Radionuclides	16	0	16	10	6	37.50%
SW	MS	Radionuclides	28	0	28	0	28	100.00%
SW	RNS	Radionuclides	203	0	203	21	182	89.66%
SW	RNS	SVOAs	524	69	455	3	452	99.43%
SW	Dup	Tripesticides	32	4	28	0	28	100.00%
SW	FB	Tripesticides	2	2	0	0	0	100.00%
SW	MS	Tripesticides	2	0	2	0	0	100.00%
SW	RNS	Tripesticides	25	4	21	0	21	100.00%
SW	Dup	VOAs	137	1	136	2	134	98.54%
SW	RNS	VOAs	408	34	374	2	372	99.51%
SW	TB	VOAs	68	0	68	2	66	97.06%
SW	Dup	Water-Quality	118	10	108	1	107	99.15%
SW	FB	Water-Quality	13	0	13	0	13	100.00%
SW	MS	Water-Quality	12	0	12	0	12	100.00%
SW	RNS	Water-Quality	120	0	120	3	117	97.50
			5,208					

Table G-3
Rejected Data Reason Code Summary

No. of Occurrences	Reason Code
392	57
361	52
326	78
213	10
168	59
165	13
161	4
160	62
146	32
118	27
95	70
92	8
90	18
76	99
44	85
41	60
38	61
34	58
31	30
31	51
29	41
25	21
21	36
12	9
7	2
6	1
6	77
3	88
1	53

Table G-4
Validation Reason Code Descriptions - December 17, 1993

Val	Description
1	Holding times were exceeded
2	Holding times were grossly exceeded
3	Initial calibration correlation coefficient <0.995
4	Calibration verification criteria were not met
5	CRDL check sample recovery criteria were not met
6	Incorrect calibration of instrument
7	Analyte values > IDL were found in the blanks
8	Negative bias was indicted in the blanks
9	Interference indicate in the ICP Interf Chk Sample
10	Lab Control Sample recovery criteria were not met
11	Duplicate sample precision criteria were not met
12	Predigestion matrix spk criteria were not met (+/-25%)
13	Predigestion matrix spk criteria were not met (<30%)
14	Postdigestion matrix spk recov criteria were not met
15	MSA was required but not performed
16	MSA calibration correlation coefficient <0.995
17	Serial dilution criteria not met
18	Documentation was not provided
19	Calibration verification criteria was not met
20	AA dup injection precision critria were not met
21	Reagent blanks exceeded MDA
22	Tracer contamination
23	Inproper aliquot size
24	Sample aliquot not taken quantitatively
25	Primary standard has exceeded exp date
26	No raw data submitted by the laboratory
27	Recovery criteria were not met
28	Duplicate analysis was not performed
29	Verification criteria were not met
30	Replicate precision criteria were not met
31	Replicate analysis was not performed
32	Lab control samples > +/-3 sigma
33	Lab control samples > +/-2 sigma and > +/-3 sigma
34	Efficiency spectra shows drop
35	tSIE criteria were not met
36	MDA exceeded the RDL
37	Sample exceeded efficiency curve weight limit
38	Excessive solids on planchet
39	Tune criteria not met
40	Organics initial calibration criteria were not met
41	organics cont. calibration criteria were not met
42	Surrogates were outside criteria
43	Internal standards outside criteria
44	No mass spectra were provided
45	Results were not confirmed
46	GC/MS confirmation was not performed
47	Percent breakdown exceeded 20 percent
48	Linear range of instrument was exceeded
49	Mehtod blank contamination
50	Unknown carrier volume
51	Nonverifiable lab results and/or unsubmitted data
52	Transcription error
53	Calculation error

Table G-4 (ontinued)

Val	Description
54	Incorrect reported activity or MDA
55	Result exceeds linear range, serial dilute val reported
56	IDL changed due to significant figure discrepancy
57	Percent solids < 30 percent
58	Percent solids <10 percent
59	Blank activity exceeded RDL
60	Blank recovery criteria were no met
61	Replicate recovery criteria were not met
62	LCS relative percent error criteria not met
63	LCS expected value not submitted/verifiable
64	Non-traceable/non-certified standard was used
65	Tracer/spike aliquot non-verifiable
66	Carrier aliquot non-verifiable
67	Sample results not submitted/verifiable
68	Frequency of quality controls amples not met
69	Samples not distilled
70	Resolution criteria no met
71	Unit conversion of reusits
72	Calibration counting statistics not met
73	IPA not performed
74	LCS data not submitted
75	Blank data not submitted
76	Instrument gain and/or efficiency not submitted
77	Detector efficiency criteria not met
78	MDAs were calculated by reviewer
79	Result obtained through dilution
80	Spurious counts of unknown origin
81	Repeat count outside of 3 sigma counting error
82	Samples results were not corrected for decay
83	Samples results were not included on Data Summary Table
84	Key fields wrong
85	Record added by QLI
86	Results consid. qualitative not quantitative
87	Lab did no analysis for this record
88	Blank corrected results
89	Sample analysis was not requested
90	Sample result was validated due to analysis
91	See hardcopy for further analysis

Laboratory-Assigned Qualifiers-Organics

- U - Indicates that the compound was analyzed for but not detected. The minimum detection limit for the sample is reported with a U, after correcting for such parameters as concentration and dilution actions, and moisture content (as applicable).

- J - Indicates an estimated value. This qualifier is used either when estimating a concentration for tentatively identified compounds or when the data indicate the presence of a compound that meets identification criteria but the result is less than the specified detection limit.

- B - This qualifier is used when the analyte is found in the laboratory blank as well as in the sample. It indicates possible or probable laboratory blank contamination.

  C - This qualifier applies to pesticide results only. The "C" qualifier indicates the presence of a particular compound has been confirmed by GC/MS analysis.

- E - This qualifier applies to GC/MS only. The "E" qualifier indicates that the concentration of the associated compound is above the upper calibration range of the instrument.

- D - This qualifier indicates that the reported value was obtained from a sample diluted to bring the concentration of compounds, exceeding the upper calibration range (see "E" qualifier above), within the calibration range of the instrument.

Laboratory-Assigned Qualifiers-Inorganics

- U - This qualifier indicates that the element was analyzed for but was not detected. The minimum detection limit for the sample is reported with the U, after correcting for such things as concentration and dilution action, and moisture content (as applicable).

- E - This qualifier indicates that a value was estimated because of interference.

- N - This qualifier indicates that the spike sample recovery is not within control limits.

- B - This qualifier indicates a value less than the specified detection limit.

- W - Post-digestion spike for Furnace AA analysis is out of control limits.

- + - Correlation coefficient for the MSA is less than 0.995.

- * - Indicates that the duplicate precision criteria were not met.

The laboratory qualifiers are sometimes used in various combinations, as appropriate, to indicate more than one type of quality control problem.

Independent Data Validation Qualifiers

Because independent data validation is concerned with data usability, the same set of qualifiers is applied to organic as well as inorganic data. The various reasons for laboratory quality control problems are reduced down to a single or a set of qualifiers indicating overall data validity and acceptability. The independent data validator-assigned qualifiers are described below.

Independent Validator-assigned Qualifiers-Inorganics and Organics

- U - The material was analyzed for, but not detected. The associated numerical value is the estimated limit of quantitation for the sample.
- J - The associated numerical value is an estimated quantity because control criteria were not met or the reported value is below the specified detection limit.
- JA - Estimated, acceptable.
- R - Quality control indicates that the data are unusable (compound may or may not be present). Resampling and/or re-analysis is necessary for verification.
- Z - No analytical result (inorganic data only).
- Q - No analytical result (organic data only).
- N - Presumptive evidence of presence of material (tentative identification).
- A - Data are acceptable, with qualifications.
- V - Data are valid.
- VA - Data are valid and acceptable with qualifications. Indicates the sample was not validated.

QA/QC Samples and Analyses

Field as well as laboratory QA/QC samples were included in the sampling program to allow for determining the success of the field sampling as well as the laboratory analytical effort. Field QA/QC samples were collected as specified in the Field Sampling Plan (FSP). Primarily, field duplicates, field blanks and equipment rinseates were collected for various sampling media at the frequency specified in the FSP. Table G-5 lists the types and number of field QA/QC samples collected per sampling media and analytical suites.

Laboratory QA/QC consisted of instrument performance checks, and sample- and compound specific analyses, as required in the analytical methods. The types of laboratory QA/QC analyses are too numerous to list here, but generally consist of instrument tuning and performance checks, initial and continuing calibrations, independent standards, method and instrument blanks, matrix spikes, and duplicates.

Table G-5
Types and Number of Field QA/QC Samples and Analytical Suites

Field Replicates

	Groundwater			Surface Water		Surface Soils	
Analysis	Total	Dissolved	Sediment	Total	Dissolved	Trench	Plots
Metals	1	1	27	6	8	-	-
Radionuclides	-	-	27	4	8	11	14
Triazine Pesticides	-	-	-	7	-	-	-
Volatile Organics	-	-	4	2	-	-	-
Water Quality Parameters	1	-	23	8	-	-	-

Field Blanks

Analysis	Groundwater	Surface Water
Metals	1	2
Radionuclides	1	2
Water Quality Parameters	1	2

Equipment Rinseates

Analysis	Sediment	Surface Soil	Surface Water	Trench
Metals	6	7	20	-
Radionuclides	6	7	20	10
Volatile Organics	6	7	20	-
Water Quality Parameters	6	7	20	-

PARCC Evaluation-Assessment of Data Usability

To evaluate the usability and validity of the analytical data, the precision, accuracy, representativeness, completeness, and comparability (PARCC) were evaluated. To ensure compliance with DQOs, protocols from *Evaluation of ERM Data for Usability in Final Reports* (1994) were followed. These procedures are based on requirements set forth in the Quality Assurance Project Plan Manual (EG&G, 1989), DOE Data Management Requirements (DOE, 1993c), and EPA Guidelines (EPA, 1987a). To comply with EG&G's request, certain parameters were modified to reflect general acceptance guidelines.

Precision

Precision measures the reproducibility of measurements or degree of agreement among replicate or duplicate measurements of a parameter. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. The objective of calculating sampling and analytical precision is to demonstrate that reproducibility of measurements between similar samples is acceptable. Precision is usually stated in terms of standard deviation (SD) or relative standard deviation (RSD), if a statistically sufficient number (minimally 5) of replicate measurements are available. However, other estimates, such as relative percent difference (RPD), range, and relative range, are more appropriate if only a limited number of replicate measurements are available.

RPDs were used to assess the precision of the analytical data. The formula for RPD is

$$RPD\ (\%) = 100 * |C_1 - C_2| / C_{ave} \qquad \text{(G-1)}$$

where

RPD = Relative percent difference
C_{ave} = Average of the replicate concentration measurements
C_1 = Concentration of analyte in the sample (REAL)
C_2 = Concentration of analyte in the duplicate (DUP)

A replicate sample could be either a laboratory or a field replicate. A laboratory replicate generally indicates the analytical precision, while the field replicate encompasses the sampling as well as analytical precision. The data from the field original and duplicate samples provide a measure of the sampling precision and sample homogeneity (i.e., the amount of error in the data attributed to sampling technique, or to variability in the analyte concentration in the medium being sampled). The precision analysis presented below is based on field replicates, because they include field variability in addition to the analytical variability. To assess laboratory data quality, laboratory precision was evaluated during the data validation.

The procedure for collection of field replicates is dependent on the medium being sampled. In groundwater and surface water sampling events, field replicates are collected following the real sample collection, and are collected using identical sampling techniques. Due to homogeneity of the aqueous sampling media, the aqueous replicate samples are true "duplicates." For soil/sediment and other solid sampling media, it is necessary to obtain splits of the interval being sampled; with the sample and replicate being collected using the same technique. Due to heterogeneity of the solid media, the soil replicates are not considered "duplicates" in the true sense, rather, they are collocated samples.

Because the solid media samples tend to be less homogeneous than water samples, the target RPDs for solid samples are generally set higher than those for water samples. The acceptable laboratory precision is a maximum of 20 RPD for water samples, and 35 RPD for soil samples. When accounting for sampling precision, the overall precision goals for OU 3 samples were set at 30 RPD for water and 40 RPD for relatively homogenous soil/sediment samples (see Section 10 of the Work Plan). The RPD criterion is not applicable to biological matrices and heterogeneous soil/sediment samples.

Because of a limited number of field replicate samples from a given location, the precision of the OU 3 data set was evaluated in terms of RPD by comparing results from the real and duplicate samples. The following discussions will concentrate on RPDs as specified in *Evaluation of ERM Data for Usability in Final Reports* (EG&G, 1994) and the Work Plan.

The RPD evaluation is valid only if the original and the replicate sample values are positive (detects). It is not uncommon for environmental samples to produce a positive result and a nondetect for the replicate pair. In order to perform a meaningful precision analysis, the RPDs were calculated considering only those results where both replicate values are positive. Table G-6 presents a summary of the minimum, maximum, and average RPDs by medium and analytical suites. The aggregate RPDs presented in Table G-6 were calculated from respective individual chemical RPDs presented in Table G-7. This method of aggregation is acceptable, because the RPD goals presented in the Work Plan are not chemical-specific (i.e., all chemicals in a sampling media have the same RPD goal [30 percent for water samples or 40 percent for soil/sediment samples]). With respect to the historic RPDs from the CLP laboratories, the

aggregation of the individual chemical RPDs is inappropriate, because the historic RPDs are chemical-specific. The historic RPDs are not used in a direct fashion to determine data quality, rather they are used to supplement the conclusions derived from comparison to the goals presented in the Work Plan.

A close examination of Table G-6 indicates that the overall, average RPDs for total and dissolved metals, water quality parameters, tripesticides and volatile organic analytes are acceptable for all sampling media (less than 30 or 40 RPD depending on the sample matrix). The maximum RPDs listed in Table G-2 represent the highest observed RPD for any analyte in the sampling media. For example, the maximum RPD of 55 for total metals in groundwater corresponds to copper replicate analysis for location 49292. Values of 4.4 and 2.5 µg/L were observed for the duplicate pair. Both of these values are significantly below the lower reporting limit of 25 µg/L for copper; therefore, high RPD would have been expected. This does not indicate any discrepancies with sampling. Similarly, a maximum RPD of 142 for volatile organic analytes (VOAs) in sediments at location SED15392 is attributed to acetone. Acetone is a common laboratory contaminant that can be introduced into the analysis at variable levels from the laboratory environment. A meaningful RPD evaluation is not possible in such cases. While a measurement-by-measurement evaluation of the replicate data points is not practical, the examples indicated above indicate that many apparent RPD exceedances may be reasonably discounted. A general trend analysis is more appropriate than sample- or chemical-specific evaluations.

Table G-6
RPDs by Medium and Analytical Suite

Medium	T/D	Analytical Suite	Required RPD Value	Number of Comparisons	Number Within Required RPD	Minimum RPD	Average RPD	Maximum RPD
GW	D	Metals	30	11	11	.44	3.16	9.40
GW	T	Metals	30	13	11	0.00	12.08	55.07
GW	D	Radionculides	30	3	1	8.13	49.05	96.39
GW	T	Radionuclides	30	2	0	62.90	322.74	582.58
GW	T	Water-Quality	30	7	5	0.00	30.74	133.33
PT	T	Radionuclides	40	27	14	3.97	45.82	122.56
SD	T	Metals	40	568	514	0.00	16.00	135.26
SD	T	Radionuclides	40	163	117	0.00	35.79	159.79
SD	T	VOAs	40	2	1	0.00	70.94	141.88
SD	T	Water-Quality	40	10	10	.13	1.23	3.83
SS	T	Radionuclides	40	59	40	0.00	35.15	167.35
SW	D	Metals	30	83	59	0.00	27.38	166.20
SW	T	Metals	30	114	98	0.00	12.67	85.42
SW	D	Radionuclides	30	12	7	2.67	40.92	142.86
SW	T	Radionuclides	30	25	9	5.92	97.76	878.07
SW	T	Water-Quality	30	53	48	0.00	9.70	88.46

In contrast to the analytical suite, the average RPDs for radionuclides exceed the RPD goal for practically all sampling media. For radionuclides, precision is better when only detected replicates pairs are evaluated. This is not surprising, because a majority of radionuclide concentrations are near the lower limit of detection (where the errors in measurement are relatively large and detect-nondetect observations or even negative observations are probable). The activities observed in most instances are at levels indistinguishable from the minimum detectable activity. In practicality, no real difference exists between the real result and the replicate result, although the calculated RPD is high.

The RPD evaluation is most meaningful when both replicate values are detects, at concentrations significantly above the limit of detection. An examination of Table G-7 reveals that generally where high RPDs are calculated, the reported values are very low. This apparent disagreement between the replicate pairs does not imply that the sampling or analysis methods are faulty or inappropriate. It simply points to the limitation of applying the RPD-based evaluation to low-level concentrations.

The average variation in results for soil/sediment replicate samples is larger than that for aqueous samples, due primarily to the heterogeneity of the sampling media, but when there are substantial detections (significantly above the limit of detection), the replicate values agree well with the original sample results for all sampling media.

Because the overall precision based on most of the analytical suites is acceptable, the sampling methods are deemed to be appropriate and properly implemented. The same sampling methods are used regardless of whether the samples are analyzed for water quality parameters or radionuclides. The apparent imprecision of the radionuclide data is not related to sampling, but to the inherent error of the measurement process.

Accuracy

Accuracy is a quantitative measure of data quality that refers to the degree of difference between measured or calculated values and the true value of a parameter. When referencing data quality, accuracy is a measure of how closely an analytical result corresponds to the "true" concentration in a sample. The accuracy of data obtained in an investigation is a function of the sampling technique, potential for sample contamination, and analytical capabilities of the laboratory. Sources of error include the sampling process, field contamination, preservation, handling, sample matrix, sample preparation, and analysis techniques. Sampling accuracy may be assessed by evaluating the results of field/trip blanks, where as analytical accuracy may be assessed through the use of known and unknown QC samples and matrix spikes. Accuracy is evaluated by analysis of reference samples of known concentration, percent recoveries for spiked samples, and by review of blank data (i.e., field blanks, trip blanks), all of which may have an effect on measurement accuracy. These data were incorporated into the OU 3 database.

Measurement accuracy was evaluated quantitatively through percent recovery (%R) measurements obtained from the laboratory spiked samples. Field spikes were not performed for the OU 3 sampling events.

The percent recoveries for spiked samples (MS/MSD) were reviewed by the independent data validators (Quantalex) during the data validation process. Based on a preliminary review, the data were qualified appropriately. Along with the data validation qualifiers (V,A,R, etc.) the reason for assigning that qualifier was coded into the database.

The accuracy (%R) of the laboratory spike samples was determined using

$$\%R = 100 * (SSR-SR)/SA \qquad \text{(G-2)}$$

where

SA = spike added
SSR = spiked sample result
SR = sample result

Summary statistics are reported in terms of the absolute value of percent bias to better express variations around percent recovery (% bias = 100-%R).

Table G-8 presents the laboratory matrix spike recovery data from the RFEDS database. Note that the recovery data exist only for the surface water samples. Additionally, not all analytical suites were represented in the database. The metals, tripesticides, and water quality parameter spike recovery data for surface water were found in the database, but volatile organic analyte and radionuclide data were absent. The recovery data set is incomplete with respect to spike results because these results were unavailable from the laboratory.

The spike recovery acceptance criterion for metals and water quality parameters is 75 to 125 percent of the true value (see Section 10 of the Work Plan). For organic analytical suites, the acceptance criteria are compound-specific, and generally range from 40 to 140 percent of the true value. Acceptance criteria for tripesticides were not explicitly defined in the Section 10 of the Work Plan, but for the purpose of PARCC evaluation, an acceptance range of 75 to 125 percent recovery was adopted.

The percent recovery (%R) for all test groups in surface water ranged from 85.0 to 94.3. Based on the observed matrix spike recoveries, the OU 3 data for respective test groups are deemed acceptable in terms of accuracy.

Because of very low or background level concentrations of the radionuclides in the test matrices, accuracy was difficult to evaluate for radionuclide analysis. At low concentration levels, the background activities and counting errors become magnified with respect to the sample values. This is evident from Table G-9, which summarizes the number of data records in which the error was greater than one-half the result. Up to 87 percent of the total records had errors greater than sample results (surface water for dissolved radionuclides). When low level, but truly positive, results were expected, such as in soil/sediments, there appears to be greater differentiation between the sample results and errors, because only 18 percent of the records had comparatively high errors in surface soils and 33 percent in sediments.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. The discussion of representativeness in this section is limited to an evaluation of whether analytical results for field samples are truly representative of environmental concentrations, or whether they may have been influenced by the introduction of contamination during collection and handling.

Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. The representativeness criterion is best satisfied by making certain that sampling locations are selected properly and a sufficient number of samples are collected. QC blanks are examined for external contamination, and nonconformance with approved sampling and analytical methodology is evaluated for its effects on representativeness.

The field QC samples were validated with the same procedures as real field samples. Analytes identified as laboratory contaminants were qualified as such. A comparison was then made between the equipment rinseate data and field blank data. Table G-10 summarizes the detected values remaining after discounting laboratory contamination for the equipment rinseates, field blanks, and trip blanks.

Table G-11 includes results greater than detection limits for field blanks, equipment rinseates, and trip blanks where the results are greater than the detection limit. Note that several common metals (aluminum, silicon, calcium, iron, magnesium, sodium, potassium) and water quality parameters are unavoidable in the water used as blanks or for rinsing equipment. These analytes may be detected at concentrations significantly above the detection limit, but this does not indicate a problem. For less common analytes, the concentrations are only marginally above the detection limits.

An exception is noted for cadmium in a small number of rinseate blanks, where results significantly higher than the detection limits are observed (44 to 77 µg/L, compared to a detection limit of 5 µg/L). Cadmium is not a commonly occurring metal. The reasons for cadmium's presence in the rinseate blank are not known, but the observations appear to be anomalous. The detections of lead and tin are generally attributed to laboratory analytical limitations. In the past 5 years, tin has been excluded from the CLP metals list due to historic problems with its analysis. Several radionuclides were also detected above the lower limit of detection.

Practically all of the observations are at low concentrations and explainable by the reasons discussed earlier. No organic analytes were detected in the field QC samples. Table G-12 shows the overall detection frequency (all positive results above or below the detection limits) for all parameters analyzed in the field QC samples. Analytes appearing on Table G-12 but not on Table G-11 are those detected below the detection limits.

It is concluded from Tables G-10, G-11, and G-12 that introduction of contamination during sampling, if any, is insignificant. In such an event, the sample data are considered unaffected by field conditions and sample handling procedures.

Furthermore, a statistically-derived sampling program was designed by evaluating a large amount of historic data and current project objectives. The sampling and analytical needs were individually evaluated for each sampling media and area of concern. Sampling locations and number of samples were determined from the historic contamination patterns or information. The sampling program was documented in the Field Sampling Plan (FSP) and Work Plan, and implemented as planned. Laboratory analyses were conducted using the prescribed analytical methods. In combination with the results of the field QC samples, the design and implementation of the sampling program leads to a conclusion that the OU 3 sample data are representative of the field conditions.

Completeness

Completeness is a measure of how much useable data were derived from the sampling program. For analytical data, completeness is expressed by the percent of data that was accepted during data validation. The completeness goal is essentially the same for all data use—to generate a sufficient amount of valid data. This objective is evaluated by computing the fraction of measurement data that remained valid after discarding any invalid data to physical, accuracy, or precision reasons.

The target objective for completeness for OU 3 analytical data is 90 percent as stated in the Work Plan. Most data sets for OU 3 meet this objective, with the exception of total radiochemistry in groundwater and sediment, water quality parameters in groundwater and surface water, filtered radiochemistry in surface water, and pesticides in surface water. The percentage completed for these data is greater than 78 percent. Although these data do not meet the target objective, they are expected to meet the goal of 90 percent when the database is complete. Presently, the OU 3 data set consists of both validated and unvalidated data. The database was frozen as of __/__/__ to proceed with data analysis.

The completeness of the database in terms of records present and validated compared to those expected or planned is summarized in Table G-1, by sampling media. For example, for the surface soil plots (SS), practically all records were validated, and validation resulted in rejection of approximately 5 percent of the data. Table G-2 contains validation counts for quality control samples (field blanks, duplicates, etc.) and analysis types (metals, radionuclides, etc.) Table G-3 provides a summary of rejected records and reasons for data rejection. The numerical codes for data rejection are defined in Table G-4. For example, 392 records were rejected for reason "57," which is indicated as "Percent solids < 30 percent" in Table G-4. The completeness of database, as defined under PARCC, is discussed later.

Comparability

Comparability expresses the extent to which data collected over a period of time and analyzed with different methods can be equivalent. It is a qualitative parameter expressing the confidence with which one data set can be compared with another. Sample data should be comparable with other measurement data for similar samples and sample conditions.

As specified in the work plan, work performed at OU 3 followed approved sampling and analysis plans and Standard Operating Procedures (SOPs), used standardized analytical protocols, and reported data in consistent units of measurement. Comparability was achieved by following these protocols for inputting data into the OU 3 database.

Tentatively Identified Compounds

Three volatile organic chemicals in lake sediments in IHSS 202 were flagged as unknown tentatively identified compounds (TICs). A fourth volatile organic, trichlorotrifluoroethane, was detected in creek sediments in IHSS 202. This latter compound is a refrigerant and is ubiquitous in atmosphere and laboratory environment (due to leakage from refrigeration equipment). Details for these analytes are shown in Table G-13. No TICs were identified for surface water samples.

Conclusions

The PARCC analysis presented in this appendix indicates that the overall data quality objectives were satisfied for the OU 3 samples. Although, occasional sample- and analyte-specific exceedances of the

objectives were noted, these exceedances were judged to be either random or related to analytical limitations (radionuclides) and not related to sampling. No project-wide systematic trends were noted that would affect the overall quality or usability of the data, or conclusions drawn from the data. Other than the data that were rejected and excluded from the database for independent data validation reasons, no additional data are proposed to be excluded from further consideration based on the PARCC analysis. The statistical impact of using or not using the questionable data is judged to be insignificant.

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
PT	RADIONUCLIDES	TR02792	T	AMERICIUM-241	TR02006CH	TR02008CH	PCI/G	.272	.129	71.76%
PT	RADIONUCLIDES	TR02792	T	PLUTONIUM-239/240	TR02006CH	TR02008CH	PCI/G	1.412	.790	56.53%
PT	RADIONUCLIDES	TR02792	T	URANIUM-233/234	TR02006CH	TR02008CH	PCI/G	1.283	1.233	3.97%
PT	RADIONUCLIDES	TR02792	T	URANIUM-235	TR02006CH	TR02008CH	PCI/G	.093	.037	85.81%
PT	RADIONUCLIDES	TR02792	T	URANIUM-238	TR02006CH	TR02008CH	PCI/G	1.476	1.292	13.29%
PT	RADIONUCLIDES	TR02892	T	PLUTONIUM-239/240	TR02025CH	TR02027CH	PCI/G	.279	.547	64.89%
PT	RADIONUCLIDES	TR02892	T	URANIUM-233/234	TR02025CH	TR02027CH	PCI/G	.735	.494	39.22%
PT	RADIONUCLIDES	TR02892	T	URANIUM-235	TR02025CH	TR02027CH	PCI/G	.031	.018	53.06%
PT	RADIONUCLIDES	TR02892	T	URANIUM-238	TR02025CH	TR02027CH	PCI/G	.658	.475	32.30%
PT	RADIONUCLIDES	TR02992	T	PLUTONIUM-239/240	TR02044CH	TR02046CH	PCI/G	.521	2.170	122.56%
PT	RADIONUCLIDES	TR03092	T	AMERICIUM-241	TR02063CH	TR02065CH	PCI/G	.079	.102	24.45%
PT	RADIONUCLIDES	TR03092	T	PLUTONIUM-239/240	TR02063CH	TR02065CH	PCI/G	.439	.600	31.03%
PT	RADIONUCLIDES	TR03092	T	URANIUM-233/234	TR02063CH	TR02065CH	PCI/G	.909	.770	16.64%
PT	RADIONUCLIDES	TR03092	T	URANIUM-235	TR02063CH	TR02065CH	PCI/G	.075	.243	105.60%
PT	RADIONUCLIDES	TR03092	T	URANIUM-238	TR02063CH	TR02065CH	PCI/G	.801	.318	86.43%
PT	RADIONUCLIDES	TR03492	T	AMERICIUM-241	TR02139CH	TR02141CH	PCI/G	.144	.119	18.91%
PT	RADIONUCLIDES	TR03492	T	PLUTONIUM-239/240	TR02139CH	TR02141CH	PCI/G	1.593	.413	117.63%
PT	RADIONUCLIDES	TR03592	T	PLUTONIUM-239/240	TR02158CH	TR02160CH	PCI/G	.280	.447	45.94%
PT	RADIONUCLIDES	TR03592	T	URANIUM-233/234	TR02158CH	TR02160CH	PCI/G	1.280	1.230	3.98%
PT	RADIONUCLIDES	TR03592	T	URANIUM-235	TR02158CH	TR02160CH	PCI/G	.022	.039	57.10%
PT	RADIONUCLIDES	TR03592	T	URANIUM-238	TR02158CH	TR02160CH	PCI/G	1.190	1.010	16.36%
PT	RADIONUCLIDES	TR03692	T	AMERICIUM-241	TR02177CH	TR02179CH	PCI/G	.128	.166	25.92%
PT	RADIONUCLIDES	TR03692	T	PLUTONIUM-239/240	TR02177CH	TR02179CH	PCI/G	.596	.951	45.94%
PT	RADIONUCLIDES	TR03692	T	URANIUM-233/234	TR02177CH	TR02179CH	PCI/G	1.528	1.642	7.19%
PT	RADIONUCLIDES	TR03692	T	URANIUM-235	TR02177CH	TR02179CH	PCI/G	.085	.105	21.29%
PT	RADIONUCLIDES	TR03692	T	URANIUM-238	TR02177CH	TR02179CH	PCI/G	1.654	1.455	12.80%
PT	RADIONUCLIDES	TR03792	T	PLUTONIUM-239/240	TR02196CH	TR02198CH	PCI/G	.163	.091	56.49%
SD	METALS	SED00292	T	ALUMINUM	SW80206WCU3	SD00383WCU3	MG/KG	7520.000	7590.000	.93%
SD	METALS	SED00292	T	ARSENIC	SW80206WCU3	SD00383WCU3	MG/KG	3.700	3.000	20.90%
SD	METALS	SED00292	T	BARIUM	SW80206WCU3	SD00383WCU3	MG/KG	97.100	88.100	9.72%
SD	METALS	SED00292	T	BERYLLIUM	SW80206WCU3	SD00383WCU3	MG/KG	.990	.630	44.44%
SD	METALS	SED00292	T	CALCIUM	SW80206WCU3	SD00383WCU3	MG/KG	5310.000	4840.000	9.26%
SD	METALS	SED00292	T	COBALT	SW80206WCU3	SD00383WCU3	MG/KG	15.700	6.600	81.61%
SD	METALS	SED00292	T	COPPER	SW80206WCU3	SD00383WCU3	MG/KG	17.800	15.700	12.54%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED00292	T	IRON	SW80206WCU3	SD00383WCU3	MG/KG	38600.000	11100.000	110.66%
SD	METALS	SED00292	T	LEAD	SW80206WCU3	SD00383WCU3	MG/KG	12.000	14.800	20.90%
SD	METALS	SED00292	T	LITHIUM	SW80206WCU3	SD00383WCU3	MG/KG	5.700	6.000	5.13%
SD	METALS	SED00292	T	MAGNESIUM	SW80206WCU3	SD00383WCU3	MG/KG	2260.000	2020.000	11.21%
SD	METALS	SED00292	T	MANGANESE	SW80206WCU3	SD00383WCU3	MG/KG	452.000	184.000	84.28%
SD	METALS	SED00292	T	MOLYBDENUM	SW80206WCU3	SD00383WCU3	MG/KG	13.200	3.600	114.29%
SD	METALS	SED00292	T	NICKEL	SW80206WCU3	SD00383WCU3	MG/KG	28.700	11.300	87.00%
SD	METALS	SED00292	T	POTASSIUM	SW80206WCU3	SD00383WCU3	MG/KG	1090.000	1160.000	6.22%
SD	METALS	SED00292	T	SELENIUM	SW80206WCU3	SD00383WCU3	MG/KG	.580	.720	21.54%
SD	METALS	SED00292	T	SILICON	SW80206WCU3	SD00383WCU3	MG/KG	412.000	159.000	88.62%
SD	METALS	SED00292	T	SILVER	SW80206WCU3	SD00383WCU3	MG/KG	3.500	1.700	69.23%
SD	METALS	SED00292	T	SODIUM	SW80206WCU3	SD00383WCU3	MG/KG	634.000	619.000	2.39%
SD	METALS	SED00292	T	STRONTIUM	SW80206WCU3	SD00383WCU3	MG/KG	47.900	43.400	9.86%
SD	METALS	SED00292	T	VANADIUM	SW80206WCU3	SD00383WCU3	MG/KG	25.200	18.000	33.33%
SD	METALS	SED00292	T	ZINC	SW80206WCU3	SD00383WCU3	MG/KG	78.400	62.500	22.57%
SD	METALS	SED00892	T	ALUMINUM	SW80204WCU3	SD00381WCU3	MG/KG	8410.000	11800.000	33.55%
SD	METALS	SED00892	T	ANTIMONY	SW80204WCU3	SD00381WCU3	MG/KG	9.400	8.400	11.24%
SD	METALS	SED00892	T	ARSENIC	SW80204WCU3	SD00381WCU3	MG/KG	6.200	6.200	0.00%
SD	METALS	SED00892	T	BARIUM	SW80204WCU3	SD00381WCU3	MG/KG	119.000	128.000	7.29%
SD	METALS	SED00892	T	BERYLLIUM	SW80204WCU3	SD00381WCU3	MG/KG	.940	1.000	6.19%
SD	METALS	SED00892	T	CALCIUM	SW80204WCU3	SD00381WCU3	MG/KG	18300.000	18900.000	3.23%
SD	METALS	SED00892	T	CHROMIUM	SW80204WCU3	SD00381WCU3	MG/KG	2.700	8.500	103.57%
SD	METALS	SED00892	T	COBALT	SW80204WCU3	SD00381WCU3	MG/KG	11.300	12.800	12.45%
SD	METALS	SED00892	T	COPPER	SW80204WCU3	SD00381WCU3	MG/KG	18.500	15.500	17.65%
SD	METALS	SED00892	T	IRON	SW80204WCU3	SD00381WCU3	MG/KG	29500.000	19100.000	42.80%
SD	METALS	SED00892	T	LEAD	SW80204WCU3	SD00381WCU3	MG/KG	15.000	17.700	16.51%
SD	METALS	SED00892	T	LITHIUM	SW80204WCU3	SD00381WCU3	MG/KG	6.000	8.000	28.57%
SD	METALS	SED00892	T	MAGNESIUM	SW80204WCU3	SD00381WCU3	MG/KG	2340.000	2590.000	10.14%
SD	METALS	SED00892	T	MANGANESE	SW80204WCU3	SD00381WCU3	MG/KG	453.000	336.000	29.66%
SD	METALS	SED00892	T	MOLYBDENUM	SW80204WCU3	SD00381WCU3	MG/KG	10.600	7.000	40.91%
SD	METALS	SED00892	T	NICKEL	SW80204WCU3	SD00381WCU3	MG/KG	27.600	19.000	36.91%
SD	METALS	SED00892	T	POTASSIUM	SW80204WCU3	SD00381WCU3	MG/KG	665.000	814.000	20.15%
SD	METALS	SED00892	T	SELENIUM	SW80204WCU3	SD00381WCU3	MG/KG	.750	.550	30.77%
SD	METALS	SED00892	T	SILICON	SW80204WCU3	SD00381WCU3	MG/KG	157.000	228.000	36.88%
SD	METALS	SED00892	T	SILVER	SW80204WCU3	SD00381WCU3	MG/KG	1.800	1.500	1[illegible].18%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED00892	T	SODIUM	SW80204WCU3	SD00381WCU3	MG/KG	395.000	420.000	6.13%
SD	METALS	SED00892	T	STRONTIUM	SW80204WCU3	SD00381WCU3	MG/KG	91.300	97.600	6.67%
SD	METALS	SED00892	T	VANADIUM	SW80204WCU3	SD00381WCU3	MG/KG	35.700	34.500	3.42%
SD	METALS	SED00892	T	ZINC	SW80204WCU3	SD00381WCU3	MG/KG	104.000	65.600	45.28%
SD	METALS	SED01392	T	ALUMINUM	SW80226WCU3	SD00391WCU3	MG/KG	10600.000	7630.000	32.58%
SD	METALS	SED01392	T	ARSENIC	SW80226WCU3	SD00391WCU3	MG/KG	5.100	6.300	21.05%
SD	METALS	SED01392	T	BARIUM	SW80226WCU3	SD00391WCU3	MG/KG	84.300	77.500	8.41%
SD	METALS	SED01392	T	BERYLLIUM	SW80226WCU3	SD00391WCU3	MG/KG	.410	.550	29.17%
SD	METALS	SED01392	T	CALCIUM	SW80226WCU3	SD00391WCU3	MG/KG	6480.000	5410.000	18.00%
SD	METALS	SED01392	T	CESIUM	SW80226WCU3	SD00391WCU3	MG/KG	2.000	3.100	43.14%
SD	METALS	SED01392	T	COBALT	SW80226WCU3	SD00391WCU3	MG/KG	7.500	11.400	41.27%
SD	METALS	SED01392	T	COPPER	SW80226WCU3	SD00391WCU3	MG/KG	9.700	12.400	24.43%
SD	METALS	SED01392	T	IRON	SW80226WCU3	SD00391WCU3	MG/KG	15200.000	41100.000	92.01%
SD	METALS	SED01392	T	LEAD	SW80226WCU3	SD00391WCU3	MG/KG	16.300	26.900	49.07%
SD	METALS	SED01392	T	LITHIUM	SW80226WCU3	SD00391WCU3	MG/KG	7.200	5.700	23.26%
SD	METALS	SED01392	T	MAGNESIUM	SW80226WCU3	SD00391WCU3	MG/KG	2510.000	2060.000	19.69%
SD	METALS	SED01392	T	MANGANESE	SW80226WCU3	SD00391WCU3	MG/KG	334.000	492.000	38.26%
SD	METALS	SED01392	T	NICKEL	SW80226WCU3	SD00391WCU3	MG/KG	15.000	12.800	15.83%
SD	METALS	SED01392	T	POTASSIUM	SW80226WCU3	SD00391WCU3	MG/KG	1210.000	1110.000	8.62%
SD	METALS	SED01392	T	SODIUM	SW80226WCU3	SD00391WCU3	MG/KG	193.000	182.000	5.87%
SD	METALS	SED01392	T	STRONTIUM	SW80226WCU3	SD00391WCU3	MG/KG	35.800	32.100	10.90%
SD	METALS	SED01392	T	THALLIUM	SW80226WCU3	SD00391WCU3	MG/KG	.250	.280	11.32%
SD	METALS	SED01392	T	VANADIUM	SW80226WCU3	SD00391WCU3	MG/KG	33.100	68.500	69.69%
SD	METALS	SED01392	T	ZINC	SW80226WCU3	SD00391WCU3	MG/KG	50.300	96.300	62.76%
SD	METALS	SED01792	T	ALUMINUM	SW80241WCU3	SD00393WCU3	MG/KG	8990.000	9840.000	9.03%
SD	METALS	SED01792	T	ARSENIC	SW80241WCU3	SD00393WCU3	MG/KG	2.200	3.200	37.04%
SD	METALS	SED01792	T	BARIUM	SW80241WCU3	SD00393WCU3	MG/KG	112.000	111.000	.90%
SD	METALS	SED01792	T	BERYLLIUM	SW80241WCU3	SD00393WCU3	MG/KG	.630	1.300	69.43%
SD	METALS	SED01792	T	CALCIUM	SW80241WCU3	SD00393WCU3	MG/KG	17200.000	17700.000	2.87%
SD	METALS	SED01792	T	CHROMIUM	SW80241WCU3	SD00393WCU3	MG/KG	11.100	12.200	9.44%
SD	METALS	SED01792	T	COBALT	SW80241WCU3	SD00393WCU3	MG/KG	4.600	7.000	41.38%
SD	METALS	SED01792	T	COPPER	SW80241WCU3	SD00393WCU3	MG/KG	17.400	21.700	21.99%
SD	METALS	SED01792	T	IRON	SW80241WCU3	SD00393WCU3	MG/KG	15100.000	34400.000	77.98%
SD	METALS	SED01792	T	LEAD	SW80241WCU3	SD00393WCU3	MG/KG	19.900	19.700	1.01%
SD	METALS	SED01792	T	LITHIUM	SW80241WCU3	SD00393WCU3	MG/KG	10.000	9.700	3.05%

6/02/95

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED01792	T	MAGNESIUM	SW80241WCU3	SD00393WCU3	MG/KG	3120.000	3360.000	7.41%
SD	METALS	SED01792	T	MANGANESE	SW80241WCU3	SD00393WCU3	MG/KG	195.000	821.000	123.23%
SD	METALS	SED01792	T	NICKEL	SW80241WCU3	SD00393WCU3	MG/KG	8.600	15.400	56.67%
SD	METALS	SED01792	T	POTASSIUM	SW80241WCU3	SD00393WCU3	MG/KG	2140.000	2320.000	8.07%
SD	METALS	SED01792	T	SELENIUM	SW80241WCU3	SD00393WCU3	MG/KG	2.000	2.000	0.00%
SD	METALS	SED01792	T	SILICON	SW80241WCU3	SD00393WCU3	MG/KG	3290.000	2790.000	16.45%
SD	METALS	SED01792	T	SILVER	SW80241WCU3	SD00393WCU3	MG/KG	1.100	1.500	30.77%
SD	METALS	SED01792	T	SODIUM	SW80241WCU3	SD00393WCU3	MG/KG	1610.000	1590.000	1.25%
SD	METALS	SED01792	T	STRONTIUM	SW80241WCU3	SD00393WCU3	MG/KG	93.800	101.000	7.39%
SD	METALS	SED01792	T	VANADIUM	SW80241WCU3	SD00393WCU3	MG/KG	26.900	39.000	36.72%
SD	METALS	SED01792	T	ZINC	SW80241WCU3	SD00393WCU3	MG/KG	71.200	78.600	9.88%
SD	METALS	SED02092	T	ALUMINUM	SD06003CH	SD06002CH	MG/KG	5000.000	4840.000	3.25%
SD	METALS	SED02092	T	ARSENIC	SW80243WCU3	SD00454WCU3	MG/KG	4.600	6.200	29.63%
SD	METALS	SED02092	T	ARSENIC	SD06003CH	SD06002CH	MG/KG	6.300	7.800	21.28%
SD	METALS	SED02092	T	BARIUM	SW80243WCU3	SD00454WCU3	MG/KG	135.000	122.000	10.12%
SD	METALS	SED02092	T	BARIUM	SD06003CH	SD06002CH	MG/KG	134.000	122.000	9.38%
SD	METALS	SED02092	T	BERYLLIUM	SW80243WCU3	SD00454WCU3	MG/KG	.220	.520	81.08%
SD	METALS	SED02092	T	BERYLLIUM	SD06003CH	SD06002CH	MG/KG	.390	.400	2.53%
SD	METALS	SED02092	T	CADMIUM	SW80243WCU3	SD00454WCU3	MG/KG	3.500	2.600	29.51%
SD	METALS	SED02092	T	CADMIUM	SD06003CH	SD06002CH	MG/KG	2.100	2.000	4.88%
SD	METALS	SED02092	T	CALCIUM	SD06003CH	SD06002CH	MG/KG	2220.000	2240.000	.90%
SD	METALS	SED02092	T	CHROMIUM	SW80243WCU3	SD00454WCU3	MG/KG	4.400	4.300	2.30%
SD	METALS	SED02092	T	CHROMIUM	SD06003CH	SD06002CH	MG/KG	6.900	9.000	26.42%
SD	METALS	SED02092	T	COBALT	SW80243WCU3	SD00454WCU3	MG/KG	8.800	8.000	9.52%
SD	METALS	SED02092	T	COBALT	SD06003CH	SD06002CH	MG/KG	8.600	8.600	0.00%
SD	METALS	SED02092	T	COPPER	SW80243WCU3	SD00454WCU3	MG/KG	37.300	31.600	16.55%
SD	METALS	SED02092	T	COPPER	SD06003CH	SD06002CH	MG/KG	52.300	46.800	11.10%
SD	METALS	SED02092	T	IRON	SW80243WCU3	SD00454WCU3	MG/KG	16800.000	12700.000	27.80%
SD	METALS	SED02092	T	IRON	SD06003CH	SD06002CH	MG/KG	12000.000	11900.000	.84%
SD	METALS	SED02092	T	LEAD	SD06003CH	SD06002CH	MG/KG	66.800	89.500	29.05%
SD	METALS	SED02092	T	LITHIUM	SW80243WCU3	SD00454WCU3	MG/KG	2.700	3.500	25.81%
SD	METALS	SED02092	T	LITHIUM	SD06003CH	SD06002CH	MG/KG	5.800	5.800	0.00%
SD	METALS	SED02092	T	MAGNESIUM	SW80243WCU3	SD00454WCU3	MG/KG	1070.000	941.000	12.83%
SD	METALS	SED02092	T	MAGNESIUM	SD06003CH	SD06002CH	MG/KG	2090.000	1990.000	4.90%
SD	METALS	SED02092	T	MANGANESE	SW80243WCU3	SD00454WCU3	MG/KG	2710.000	2500.000	[illegible]06%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED02092	T	MANGANESE	SD06003CH	SD06002CH	MG/KG	2340.000	2250.000	3.92%
SD	METALS	SED02092	T	MERCURY	SD06003CH	SD06002CH	MG/KG	.100	.080	22.22%
SD	METALS	SED02092	T	MOLYBDENUM	SW80243WCU3	SD00454WCU3	MG/KG	6.700	5.000	29.06%
SD	METALS	SED02092	T	MOLYBDENUM	SD06003CH	SD06002CH	MG/KG	3.600	2.800	25.00%
SD	METALS	SED02092	T	NICKEL	SD06003CH	SD06002CH	MG/KG	15.500	14.300	8.05%
SD	METALS	SED02092	T	POTASSIUM	SD06003CH	SD06002CH	MG/KG	1330.000	1260.000	5.41%
SD	METALS	SED02092	T	SILVER	SW80243WCU3	SD00454WCU3	MG/KG	1.100	.710	43.09%
SD	METALS	SED02092	T	SILVER	SD06003CH	SD06002CH	MG/KG	2.100	1.700	21.05%
SD	METALS	SED02092	T	SODIUM	SD06003CH	SD06002CH	MG/KG	102.000	112.000	9.35%
SD	METALS	SED02092	T	STRONTIUM	SW80243WCU3	SD00454WCU3	MG/KG	35.200	31.200	12.05%
SD	METALS	SED02092	T	STRONTIUM	SD06003CH	SD06002CH	MG/KG	35.400	30.700	14.22%
SD	METALS	SED02092	T	VANADIUM	SW80243WCU3	SD00454WCU3	MG/KG	25.100	19.400	25.62%
SD	METALS	SED02092	T	VANADIUM	SD06003CH	SD06002CH	MG/KG	16.200	16.400	1.23%
SD	METALS	SED02092	T	ZINC	SW80243WCU3	SD00454WCU3	MG/KG	685.000	640.000	6.79%
SD	METALS	SED02092	T	ZINC	SD06003CH	SD06002CH	MG/KG	739.000	723.000	2.19%
SD	METALS	SED03692	T	ALUMINUM	SW80212WCU3	SD00360WCU3	MG/KG	4380.000	3750.000	15.50%
SD	METALS	SED03692	T	ARSENIC	SW80212WCU3	SD00360WCU3	MG/KG	2.600	2.400	8.00%
SD	METALS	SED03692	T	BARIUM	SW80212WCU3	SD00360WCU3	MG/KG	72.200	67.500	6.73%
SD	METALS	SED03692	T	BERYLLIUM	SW80212WCU3	SD00360WCU3	MG/KG	.320	.210	41.51%
SD	METALS	SED03692	T	CALCIUM	SW80212WCU3	SD00360WCU3	MG/KG	9320.000	8790.000	5.85%
SD	METALS	SED03692	T	CHROMIUM	SW80212WCU3	SD00360WCU3	MG/KG	3.300	2.900	12.90%
SD	METALS	SED03692	T	COBALT	SW80212WCU3	SD00360WCU3	MG/KG	4.700	4.400	6.59%
SD	METALS	SED03692	T	COPPER	SW80212WCU3	SD00360WCU3	MG/KG	8.800	17.900	68.16%
SD	METALS	SED03692	T	IRON	SW80212WCU3	SD00360WCU3	MG/KG	7770.000	7430.000	4.47%
SD	METALS	SED03692	T	LEAD	SW80212WCU3	SD00360WCU3	MG/KG	10.300	10.000	2.96%
SD	METALS	SED03692	T	LITHIUM	SW80212WCU3	SD00360WCU3	MG/KG	4.200	3.700	12.66%
SD	METALS	SED03692	T	MAGNESIUM	SW80212WCU3	SD00360WCU3	MG/KG	1480.000	1360.000	8.45%
SD	METALS	SED03692	T	MANGANESE	SW80212WCU3	SD00360WCU3	MG/KG	168.000	160.000	4.88%
SD	METALS	SED03692	T	MOLYBDENUM	SW80212WCU3	SD00360WCU3	MG/KG	3.700	3.900	5.26%
SD	METALS	SED03692	T	NICKEL	SW80212WCU3	SD00360WCU3	MG/KG	7.300	6.500	11.59%
SD	METALS	SED03692	T	POTASSIUM	SW80212WCU3	SD00360WCU3	MG/KG	794.000	732.000	8.13%
SD	METALS	SED03692	T	SILICON	SW80212WCU3	SD00360WCU3	MG/KG	178.000	200.000	11.64%
SD	METALS	SED03692	T	SODIUM	SW80212WCU3	SD00360WCU3	MG/KG	509.000	505.000	.79%
SD	METALS	SED03692	T	STRONTIUM	SW80212WCU3	SD00360WCU3	MG/KG	39.600	36.800	7.33%
SD	METALS	SED03692	T	VANADIUM	SW80212WCU3	SD00360WCU3	MG/KG	11.200	10.600	5.50%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED03692	T	ZINC	SW80212WCU3	SD00360WCU3	MG/KG	39.100	41.100	4.99%
SD	METALS	SED03992	T	ALUMINUM	SW80214WCU3	SD00363WCU3	MG/KG	865.000	1140.000	27.43%
SD	METALS	SED03992	T	ARSENIC	SW80214WCU3	SD00363WCU3	MG/KG	1.400	1.200	15.38%
SD	METALS	SED03992	T	BARIUM	SW80214WCU3	SD00363WCU3	MG/KG	14.300	13.000	9.52%
SD	METALS	SED03992	T	CALCIUM	SW80214WCU3	SD00363WCU3	MG/KG	427.000	451.000	5.47%
SD	METALS	SED03992	T	COBALT	SW80214WCU3	SD00363WCU3	MG/KG	1.300	1.400	7.41%
SD	METALS	SED03992	T	COPPER	SW80214WCU3	SD00363WCU3	MG/KG	1.200	1.300	8.00%
SD	METALS	SED03992	T	IRON	SW80214WCU3	SD00363WCU3	MG/KG	3100.000	2910.000	6.32%
SD	METALS	SED03992	T	LEAD	SW80214WCU3	SD00363WCU3	MG/KG	4.300	2.400	56.72%
SD	METALS	SED03992	T	MAGNESIUM	SW80214WCU3	SD00363WCU3	MG/KG	197.000	228.000	14.59%
SD	METALS	SED03992	T	MANGANESE	SW80214WCU3	SD00363WCU3	MG/KG	89.600	46.500	63.34%
SD	METALS	SED03992	T	MOLYBDENUM	SW80214WCU3	SD00363WCU3	MG/KG	.910	.880	3.35%
SD	METALS	SED03992	T	POTASSIUM	SW80214WCU3	SD00363WCU3	MG/KG	258.000	307.000	17.35%
SD	METALS	SED03992	T	SILICON	SW80214WCU3	SD00363WCU3	MG/KG	204.000	219.000	7.09%
SD	METALS	SED03992	T	SODIUM	SW80214WCU3	SD00363WCU3	MG/KG	29.800	31.300	4.91%
SD	METALS	SED03992	T	STRONTIUM	SW80214WCU3	SD00363WCU3	MG/KG	2.800	4.100	37.68%
SD	METALS	SED03992	T	VANADIUM	SW80214WCU3	SD00363WCU3	MG/KG	4.900	4.400	10.75%
SD	METALS	SED03992	T	ZINC	SW80214WCU3	SD00363WCU3	MG/KG	9.000	9.100	1.10%
SD	METALS	SED04492	T	ALUMINUM	SW80216WCU3	SD00368WCU3	MG/KG	7070.000	9130.000	25.43%
SD	METALS	SED04492	T	ARSENIC	SW80216WCU3	SD00368WCU3	MG/KG	8.700	10.000	13.90%
SD	METALS	SED04492	T	BARIUM	SW80216WCU3	SD00368WCU3	MG/KG	86.800	90.900	4.61%
SD	METALS	SED04492	T	BERYLLIUM	SW80216WCU3	SD00368WCU3	MG/KG	.450	.490	8.51%
SD	METALS	SED04492	T	CALCIUM	SW80216WCU3	SD00368WCU3	MG/KG	2900.000	2920.000	.69%
SD	METALS	SED04492	T	CHROMIUM	SW80216WCU3	SD00368WCU3	MG/KG	8.200	9.300	12.57%
SD	METALS	SED04492	T	COBALT	SW80216WCU3	SD00368WCU3	MG/KG	6.500	6.600	1.53%
SD	METALS	SED04492	T	COPPER	SW80216WCU3	SD00368WCU3	MG/KG	42.300	43.300	2.34%
SD	METALS	SED04492	T	IRON	SW80216WCU3	SD00368WCU3	MG/KG	14400.000	16100.000	11.15%
SD	METALS	SED04492	T	LEAD	SW80216WCU3	SD00368WCU3	MG/KG	93.800	103.000	9.35%
SD	METALS	SED04492	T	LITHIUM	SW80216WCU3	SD00368WCU3	MG/KG	6.000	7.900	27.34%
SD	METALS	SED04492	T	MAGNESIUM	SW80216WCU3	SD00368WCU3	MG/KG	2220.000	2460.000	10.26%
SD	METALS	SED04492	T	MANGANESE	SW80216WCU3	SD00368WCU3	MG/KG	316.000	330.000	4.33%
SD	METALS	SED04492	T	MERCURY	SW80216WCU3	SD00368WCU3	MG/KG	.150	.180	18.18%
SD	METALS	SED04492	T	MOLYBDENUM	SW80216WCU3	SD00368WCU3	MG/KG	7.700	7.500	2.63%
SD	METALS	SED04492	T	NICKEL	SW80216WCU3	SD00368WCU3	MG/KG	11.300	10.600	6.39%
SD	METALS	SED04492	T	POTASSIUM	SW8[illegible]6WCU3	SD00368WCU3	MG/KG	2030.000	2210.000	[illegible]9%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED04492	T	SILICON	SW80216WCU3	SD00368WCU3	MG/KG	295.000	169.000	54.31%
SD	METALS	SED04492	T	SILVER	SW80216WCU3	SD00368WCU3	MG/KG	2.100	2.200	4.65%
SD	METALS	SED04492	T	SODIUM	SW80216WCU3	SD00368WCU3	MG/KG	154.000	162.000	5.06%
SD	METALS	SED04492	T	STRONTIUM	SW80216WCU3	SD00368WCU3	MG/KG	33.200	34.400	3.55%
SD	METALS	SED04492	T	VANADIUM	SW80216WCU3	SD00368WCU3	MG/KG	23.000	25.800	11.48%
SD	METALS	SED04492	T	ZINC	SW80216WCU3	SD00368WCU3	MG/KG	208.000	219.000	5.15%
SD	METALS	SED04992	T	ALUMINUM	SW80208WCU3	SD00384WCU3	MG/KG	1140.000	2230.000	64.69%
SD	METALS	SED04992	T	ARSENIC	SW80208WCU3	SD00384WCU3	MG/KG	1.400	2.000	35.29%
SD	METALS	SED04992	T	BARIUM	SW80208WCU3	SD00384WCU3	MG/KG	46.900	40.600	14.40%
SD	METALS	SED04992	T	CALCIUM	SW80208WCU3	SD00384WCU3	MG/KG	3100.000	3970.000	24.61%
SD	METALS	SED04992	T	CHROMIUM	SW80208WCU3	SD00384WCU3	MG/KG	.890	.680	26.75%
SD	METALS	SED04992	T	COBALT	SW80208WCU3	SD00384WCU3	MG/KG	1.400	1.700	19.35%
SD	METALS	SED04992	T	COPPER	SW80208WCU3	SD00384WCU3	MG/KG	2.700	3.600	28.57%
SD	METALS	SED04992	T	IRON	SW80208WCU3	SD00384WCU3	MG/KG	4320.000	5430.000	22.77%
SD	METALS	SED04992	T	LEAD	SW80208WCU3	SD00384WCU3	MG/KG	2.900	3.800	26.87%
SD	METALS	SED04992	T	LITHIUM	SW80208WCU3	SD00384WCU3	MG/KG	.530	1.600	100.47%
SD	METALS	SED04992	T	MAGNESIUM	SW80208WCU3	SD00384WCU3	MG/KG	471.000	714.000	41.01%
SD	METALS	SED04992	T	MANGANESE	SW80208WCU3	SD00384WCU3	MG/KG	119.000	121.000	1.67%
SD	METALS	SED04992	T	POTASSIUM	SW80208WCU3	SD00384WCU3	MG/KG	183.000	271.000	38.77%
SD	METALS	SED04992	T	SILICON	SW80208WCU3	SD00384WCU3	MG/KG	109.000	250.000	78.55%
SD	METALS	SED04992	T	SODIUM	SW80208WCU3	SD00384WCU3	MG/KG	61.400	62.600	1.94%
SD	METALS	SED04992	T	STRONTIUM	SW80208WCU3	SD00384WCU3	MG/KG	11.200	17.800	45.52%
SD	METALS	SED04992	T	VANADIUM	SW80208WCU3	SD00384WCU3	MG/KG	5.600	7.100	23.62%
SD	METALS	SED04992	T	ZINC	SW80208WCU3	SD00384WCU3	MG/KG	20.600	29.900	36.83%
SD	METALS	SED05892	T	ALUMINUM	SW80201WCU3	SD00345WCU3	MG/KG	14900.000	12300.000	19.12%
SD	METALS	SED05892	T	ANTIMONY	SW80201WCU3	SD00345WCU3	MG/KG	6.600	7.100	7.30%
SD	METALS	SED05892	T	ARSENIC	SW80201WCU3	SD00345WCU3	MG/KG	5.500	4.600	17.82%
SD	METALS	SED05892	T	BARIUM	SW80201WCU3	SD00345WCU3	MG/KG	133.000	130.000	2.28%
SD	METALS	SED05892	T	BERYLLIUM	SW80201WCU3	SD00345WCU3	MG/KG	.580	.570	1.74%
SD	METALS	SED05892	T	CADMIUM	SW80201WCU3	SD00345WCU3	MG/KG	.700	.660	5.88%
SD	METALS	SED05892	T	CALCIUM	SW80201WCU3	SD00345WCU3	MG/KG	8140.000	8590.000	5.38%
SD	METALS	SED05892	T	CHROMIUM	SW80201WCU3	SD00345WCU3	MG/KG	14.700	12.000	20.22%
SD	METALS	SED05892	T	COBALT	SW80201WCU3	SD00345WCU3	MG/KG	10.200	8.800	14.74%
SD	METALS	SED05892	T	COPPER	SW80201WCU3	SD00345WCU3	MG/KG	22.500	23.500	4.35%
SD	METALS	SED05892	T	IRON	SW80201WCU3	SD00345WCU3	MG/KG	18200.000	18800.000	3.24%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED05892	T	LITHIUM	SW80201WCU3	SD00345WCU3	MG/KG	12.200	10.500	14.98%
SD	METALS	SED05892	T	MAGNESIUM	SW80201WCU3	SD00345WCU3	MG/KG	3650.000	3400.000	7.09%
SD	METALS	SED05892	T	MANGANESE	SW80201WCU3	SD00345WCU3	MG/KG	295.000	311.000	5.28%
SD	METALS	SED05892	T	MOLYBDENUM	SW80201WCU3	SD00345WCU3	MG/KG	8.400	8.200	2.41%
SD	METALS	SED05892	T	NICKEL	SW80201WCU3	SD00345WCU3	MG/KG	20.700	18.900	9.09%
SD	METALS	SED05892	T	POTASSIUM	SW80201WCU3	SD00345WCU3	MG/KG	2260.000	1890.000	17.83%
SD	METALS	SED05892	T	SELENIUM	SW80201WCU3	SD00345WCU3	MG/KG	.240	.650	92.13%
SD	METALS	SED05892	T	SILICON	SW80201WCU3	SD00345WCU3	MG/KG	237.000	253.000	6.53%
SD	METALS	SED05892	T	SILVER	SW80201WCU3	SD00345WCU3	MG/KG	1.600	2.100	27.03%
SD	METALS	SED05892	T	SODIUM	SW80201WCU3	SD00345WCU3	MG/KG	197.000	193.000	2.05%
SD	METALS	SED05892	T	STRONTIUM	SW80201WCU3	SD00345WCU3	MG/KG	54.800	54.200	1.10%
SD	METALS	SED05892	T	VANADIUM	SW80201WCU3	SD00345WCU3	MG/KG	35.600	34.300	3.72%
SD	METALS	SED05892	T	ZINC	SW80201WCU3	SD00345WCU3	MG/KG	80.100	76.400	4.73%
SD	METALS	SED06992	T	ALUMINUM	SW80202WCU3	SD00351WCU3	MG/KG	6720.000	5900.000	13.00%
SD	METALS	SED06992	T	ARSENIC	SW80202WCU3	SD00351WCU3	MG/KG	4.200	4.800	13.33%
SD	METALS	SED06992	T	BARIUM	SW80202WCU3	SD00351WCU3	MG/KG	113.000	120.000	6.01%
SD	METALS	SED06992	T	BERYLLIUM	SW80202WCU3	SD00351WCU3	MG/KG	.450	.450	0.00%
SD	METALS	SED06992	T	CALCIUM	SW80202WCU3	SD00351WCU3	MG/KG	18000.000	21700.000	18.64%
SD	METALS	SED06992	T	CHROMIUM	SW80202WCU3	SD00351WCU3	MG/KG	4.800	4.600	4.26%
SD	METALS	SED06992	T	COBALT	SW80202WCU3	SD00351WCU3	MG/KG	7.000	7.100	1.42%
SD	METALS	SED06992	T	COPPER	SW80202WCU3	SD00351WCU3	MG/KG	16.100	17.700	9.47%
SD	METALS	SED06992	T	IRON	SW80202WCU3	SD00351WCU3	MG/KG	11500.000	10400.000	10.05%
SD	METALS	SED06992	T	LITHIUM	SW80202WCU3	SD00351WCU3	MG/KG	6.500	5.900	9.68%
SD	METALS	SED06992	T	MAGNESIUM	SW80202WCU3	SD00351WCU3	MG/KG	2430.000	2500.000	2.84%
SD	METALS	SED06992	T	MANGANESE	SW80202WCU3	SD00351WCU3	MG/KG	383.000	516.000	29.59%
SD	METALS	SED06992	T	MOLYBDENUM	SW80202WCU3	SD00351WCU3	MG/KG	5.300	4.700	12.00%
SD	METALS	SED06992	T	NICKEL	SW80202WCU3	SD00351WCU3	MG/KG	11.900	11.800	.84%
SD	METALS	SED06992	T	POTASSIUM	SW80202WCU3	SD00351WCU3	MG/KG	676.000	678.000	.30%
SD	METALS	SED06992	T	SILICON	SW80202WCU3	SD00351WCU3	MG/KG	161.000	131.000	20.55%
SD	METALS	SED06992	T	SILVER	SW80202WCU3	SD00351WCU3	MG/KG	1.300	.970	29.07%
SD	METALS	SED06992	T	SODIUM	SW80202WCU3	SD00351WCU3	MG/KG	477.000	570.000	17.77%
SD	METALS	SED06992	T	STRONTIUM	SW80202WCU3	SD00351WCU3	MG/KG	79.300	88.100	10.51%
SD	METALS	SED06992	T	VANADIUM	SW80202WCU3	SD00351WCU3	MG/KG	15.700	13.400	15.81%
SD	METALS	SED06992	T	ZINC	SW80202WCU3	SD00351WCU3	MG/KG	70.800	82.300	15.02%
SD	METALS	SED07592	T	ALUMINUM	SW80229WCU3	SD00374WCU3	MG/KG	16500.000	13000.000	2[illegible]73%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED07592	T	ARSENIC	SW80229WCU3	SD00374WCU3	MG/KG	3.700	3.400	8.45%
SD	METALS	SED07592	T	BARIUM	SW80229WCU3	SD00374WCU3	MG/KG	107.000	101.000	5.77%
SD	METALS	SED07592	T	BERYLLIUM	SW80229WCU3	SD00374WCU3	MG/KG	.540	.360	40.00%
SD	METALS	SED07592	T	CALCIUM	SW80229WCU3	SD00374WCU3	MG/KG	17500.000	16200.000	7.72%
SD	METALS	SED07592	T	CHROMIUM	SW80229WCU3	SD00374WCU3	MG/KG	14.000	9.600	37.29%
SD	METALS	SED07592	T	COBALT	SW80229WCU3	SD00374WCU3	MG/KG	6.500	6.700	3.03%
SD	METALS	SED07592	T	COPPER	SW80229WCU3	SD00374WCU3	MG/KG	11.600	12.100	4.22%
SD	METALS	SED07592	T	IRON	SW80229WCU3	SD00374WCU3	MG/KG	13900.000	13200.000	5.17%
SD	METALS	SED07592	T	LEAD	SW80229WCU3	SD00374WCU3	MG/KG	14.500	2.800	135.26%
SD	METALS	SED07592	T	LITHIUM	SW80229WCU3	SD00374WCU3	MG/KG	9.800	6.800	36.14%
SD	METALS	SED07592	T	MAGNESIUM	SW80229WCU3	SD00374WCU3	MG/KG	4060.000	3670.000	10.09%
SD	METALS	SED07592	T	MANGANESE	SW80229WCU3	SD00374WCU3	MG/KG	148.000	165.000	10.86%
SD	METALS	SED07592	T	POTASSIUM	SW80229WCU3	SD00374WCU3	MG/KG	1960.000	1050.000	60.47%
SD	METALS	SED07592	T	SODIUM	SW80229WCU3	SD00374WCU3	MG/KG	246.000	211.000	15.32%
SD	METALS	SED07592	T	STRONTIUM	SW80229WCU3	SD00374WCU3	MG/KG	85.800	80.300	6.62%
SD	METALS	SED07592	T	VANADIUM	SW80229WCU3	SD00374WCU3	MG/KG	34.200	29.800	13.75%
SD	METALS	SED07592	T	ZINC	SW80229WCU3	SD00374WCU3	MG/KG	40.500	37.500	7.69%
SD	METALS	SED08192	T	ALUMINUM	SD06410CH	SD06409CH	MG/KG	15700.000	17000.000	7.95%
SD	METALS	SED08192	T	ARSENIC	SD06410CH	SD06409CH	MG/KG	9.900	10.000	1.01%
SD	METALS	SED08192	T	BARIUM	SD06410CH	SD06409CH	MG/KG	199.000	202.000	1.50%
SD	METALS	SED08192	T	BERYLLIUM	SD06410CH	SD06409CH	MG/KG	1.400	1.400	0.00%
SD	METALS	SED08192	T	CADMIUM	SD06410CH	SD06409CH	MG/KG	4.200	3.300	24.00%
SD	METALS	SED08192	T	CALCIUM	SD06410CH	SD06409CH	MG/KG	10100.000	7750.000	26.33%
SD	METALS	SED08192	T	CESIUM	SD06410CH	SD06409CH	MG/KG	29.000	31.300	7.63%
SD	METALS	SED08192	T	CHROMIUM	SD06410CH	SD06409CH	MG/KG	19.700	20.000	1.51%
SD	METALS	SED08192	T	COBALT	SD06410CH	SD06409CH	MG/KG	12.200	11.300	7.66%
SD	METALS	SED08192	T	COPPER	SD06410CH	SD06409CH	MG/KG	148.000	142.000	4.14%
SD	METALS	SED08192	T	IRON	SD06410CH	SD06409CH	MG/KG	20500.000	22900.000	11.06%
SD	METALS	SED08192	T	LEAD	SD06410CH	SD06409CH	MG/KG	120.000	120.000	0.00%
SD	METALS	SED08192	T	LITHIUM	SD06410CH	SD06409CH	MG/KG	13.100	14.000	6.64%
SD	METALS	SED08192	T	MAGNESIUM	SD06410CH	SD06409CH	MG/KG	4370.000	4340.000	.69%
SD	METALS	SED08192	T	MANGANESE	SD06410CH	SD06409CH	MG/KG	642.000	1180.000	59.06%
SD	METALS	SED08192	T	MERCURY	SD06410CH	SD06409CH	MG/KG	.260	.230	12.24%
SD	METALS	SED08192	T	MOLYBDENUM	SD06410CH	SD06409CH	MG/KG	12.100	9.900	20.00%
SD	METALS	SED08192	T	NICKEL	SD06410CH	SD06409CH	MG/KG	24.000	19.000	23.26%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED08192	T	POTASSIUM	SD06410CH	SD06409CH	MG/KG	3280.000	3130.000	4.68%
SD	METALS	SED08192	T	SILVER	SD06410CH	SD06409CH	MG/KG	2.900	1.900	41.67%
SD	METALS	SED08192	T	SODIUM	SD06410CH	SD06409CH	MG/KG	160.000	152.000	5.13%
SD	METALS	SED08192	T	STRONTIUM	SD06410CH	SD06409CH	MG/KG	71.100	68.100	4.31%
SD	METALS	SED08192	T	VANADIUM	SD06410CH	SD06409CH	MG/KG	37.900	37.700	.53%
SD	METALS	SED08192	T	ZINC	SD06410CH	SD06409CH	MG/KG	915.000	730.000	22.49%
SD	METALS	SED08392	T	ALUMINUM	SD06468CH	SD06467CH	MG/KG	18900.000	16700.000	12.36%
SD	METALS	SED08392	T	ARSENIC	SD06468CH	SD06467CH	MG/KG	33.800	31.500	7.04%
SD	METALS	SED08392	T	BARIUM	SD06468CH	SD06467CH	MG/KG	214.000	225.000	5.01%
SD	METALS	SED08392	T	BERYLLIUM	SD06468CH	SD06467CH	MG/KG	1.300	1.400	7.41%
SD	METALS	SED08392	T	CADMIUM	SD06468CH	SD06467CH	MG/KG	7.000	11.900	51.85%
SD	METALS	SED08392	T	CALCIUM	SD06468CH	SD06467CH	MG/KG	6660.000	7010.000	5.12%
SD	METALS	SED08392	T	CHROMIUM	SD06468CH	SD06467CH	MG/KG	31.400	30.100	4.23%
SD	METALS	SED08392	T	COBALT	SD06468CH	SD06467CH	MG/KG	16.700	16.400	1.81%
SD	METALS	SED08392	T	COPPER	SD06468CH	SD06467CH	MG/KG	225.000	254.000	12.11%
SD	METALS	SED08392	T	IRON	SD06468CH	SD06467CH	MG/KG	27600.000	27500.000	.36%
SD	METALS	SED08392	T	LEAD	SD06468CH	SD06467CH	MG/KG	246.000	215.000	13.45%
SD	METALS	SED08392	T	LITHIUM	SD06468CH	SD06467CH	MG/KG	16.000	13.800	14.77%
SD	METALS	SED08392	T	MAGNESIUM	SD06468CH	SD06467CH	MG/KG	4700.000	4580.000	2.59%
SD	METALS	SED08392	T	MANGANESE	SD06468CH	SD06467CH	MG/KG	877.000	772.000	12.73%
SD	METALS	SED08392	T	MERCURY	SD06468CH	SD06467CH	MG/KG	.410	.180	77.97%
SD	METALS	SED08392	T	MOLYBDENUM	SD06468CH	SD06467CH	MG/KG	2.600	4.000	42.42%
SD	METALS	SED08392	T	NICKEL	SD06468CH	SD06467CH	MG/KG	28.700	30.800	7.06%
SD	METALS	SED08392	T	POTASSIUM	SD06468CH	SD06467CH	MG/KG	3700.000	3410.000	8.16%
SD	METALS	SED08392	T	SILVER	SD06468CH	SD06467CH	MG/KG	5.000	6.200	21.43%
SD	METALS	SED08392	T	SODIUM	SD06468CH	SD06467CH	MG/KG	416.000	460.000	10.05%
SD	METALS	SED08392	T	STRONTIUM	SD06468CH	SD06467CH	MG/KG	63.600	64.500	1.41%
SD	METALS	SED08392	T	TIN	SD06468CH	SD06467CH	MG/KG	10.900	9.000	19.10%
SD	METALS	SED08392	T	VANADIUM	SD06468CH	SD06467CH	MG/KG	45.800	44.200	3.56%
SD	METALS	SED08392	T	ZINC	SD06468CH	SD06467CH	MG/KG	1660.000	1980.000	17.58%
SD	METALS	SED08592	T	ALUMINUM	SD06521CH	SD06520CH	MG/KG	9780.000	10100.000	3.22%
SD	METALS	SED08592	T	ARSENIC	SD06521CH	SD06520CH	MG/KG	4.400	4.100	7.06%
SD	METALS	SED08592	T	BARIUM	SD06521CH	SD06520CH	MG/KG	179.000	163.000	9.36%
SD	METALS	SED08592	T	BERYLLIUM	SD06521CH	SD06520CH	MG/KG	.830	.860	3.55%
SD	METALS	SED08592	T	CALCIUM	SD06521CH	SD06520CH	MG/KG	7820.000	8030.000	[illegible]65%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED08592	T	CESIUM	SD06521CH	SD06520CH	MG/KG	15.600	34.400	75.20%
SD	METALS	SED08592	T	CHROMIUM	SD06521CH	SD06520CH	MG/KG	10.200	10.200	0.00%
SD	METALS	SED08592	T	COBALT	SD06521CH	SD06520CH	MG/KG	9.500	9.700	2.08%
SD	METALS	SED08592	T	COPPER	SD06521CH	SD06520CH	MG/KG	21.800	21.900	.46%
SD	METALS	SED08592	T	IRON	SD06521CH	SD06520CH	MG/KG	13000.000	13000.000	0.00%
SD	METALS	SED08592	T	LEAD	SD06521CH	SD06520CH	MG/KG	19.900	20.600	3.46%
SD	METALS	SED08592	T	LITHIUM	SD06521CH	SD06520CH	MG/KG	8.000	7.700	3.82%
SD	METALS	SED08592	T	MAGNESIUM	SD06521CH	SD06520CH	MG/KG	2850.000	2950.000	3.45%
SD	METALS	SED08592	T	MANGANESE	SD06521CH	SD06520CH	MG/KG	205.000	198.000	3.47%
SD	METALS	SED08592	T	MOLYBDENUM	SD06521CH	SD06520CH	MG/KG	1.100	1.100	0.00%
SD	METALS	SED08592	T	NICKEL	SD06521CH	SD06520CH	MG/KG	15.500	16.000	3.17%
SD	METALS	SED08592	T	POTASSIUM	SD06521CH	SD06520CH	MG/KG	1350.000	1320.000	2.25%
SD	METALS	SED08592	T	SILVER	SD06521CH	SD06520CH	MG/KG	2.300	1.900	19.05%
SD	METALS	SED08592	T	SODIUM	SD06521CH	SD06520CH	MG/KG	170.000	185.000	8.45%
SD	METALS	SED08592	T	STRONTIUM	SD06521CH	SD06520CH	MG/KG	58.500	61.500	5.00%
SD	METALS	SED08592	T	VANADIUM	SD06521CH	SD06520CH	MG/KG	25.300	26.500	4.63%
SD	METALS	SED08592	T	ZINC	SD06521CH	SD06520CH	MG/KG	66.000	68.300	3.43%
SD	METALS	SED08692	T	ALUMINUM	SD06548CH	SD06547CH	MG/KG	12200.000	11200.000	8.55%
SD	METALS	SED08692	T	ARSENIC	SD06548CH	SD06547CH	MG/KG	9.900	6.400	42.94%
SD	METALS	SED08692	T	BARIUM	SD06548CH	SD06547CH	MG/KG	153.000	144.000	6.06%
SD	METALS	SED08692	T	BERYLLIUM	SD06548CH	SD06547CH	MG/KG	1.300	1.100	16.67%
SD	METALS	SED08692	T	CADMIUM	SD06548CH	SD06547CH	MG/KG	.790	1.300	48.80%
SD	METALS	SED08692	T	CALCIUM	SD06548CH	SD06547CH	MG/KG	6430.000	6170.000	4.13%
SD	METALS	SED08692	T	CESIUM	SD06548CH	SD06547CH	MG/KG	21.700	26.600	20.29%
SD	METALS	SED08692	T	CHROMIUM	SD06548CH	SD06547CH	MG/KG	13.100	11.800	10.44%
SD	METALS	SED08692	T	COBALT	SD06548CH	SD06547CH	MG/KG	10.000	8.700	13.90%
SD	METALS	SED08692	T	COPPER	SD06548CH	SD06547CH	MG/KG	57.400	53.300	7.41%
SD	METALS	SED08692	T	IRON	SD06548CH	SD06547CH	MG/KG	15500.000	14500.000	6.67%
SD	METALS	SED08692	T	LEAD	SD06548CH	SD06547CH	MG/KG	47.100	41.600	12.40%
SD	METALS	SED08692	T	LITHIUM	SD06548CH	SD06547CH	MG/KG	11.400	9.800	15.09%
SD	METALS	SED08692	T	MAGNESIUM	SD06548CH	SD06547CH	MG/KG	3310.000	3070.000	7.52%
SD	METALS	SED08692	T	MANGANESE	SD06548CH	SD06547CH	MG/KG	342.000	257.000	28.38%
SD	METALS	SED08692	T	MERCURY	SD06548CH	SD06547CH	MG/KG	.260	.180	36.36%
SD	METALS	SED08692	T	NICKEL	SD06548CH	SD06547CH	MG/KG	18.300	17.200	6.20%
SD	METALS	SED08692	T	POTASSIUM	SD06548CH	SD06547CH	MG/KG	2000.000	1840.000	8.33%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED08692	T	SODIUM	SD06548CH	SD06547CH	MG/KG	127.000	109.000	15.25%
SD	METALS	SED08692	T	STRONTIUM	SD06548CH	SD06547CH	MG/KG	57.400	53.500	7.03%
SD	METALS	SED08692	T	VANADIUM	SD06548CH	SD06547CH	MG/KG	35.100	32.400	8.00%
SD	METALS	SED08692	T	ZINC	SD06548CH	SD06547CH	MG/KG	258.000	233.000	10.18%
SD	METALS	SED08892	T	ALUMINUM	SD06671CH	SD06670CH	MG/KG	14100.000	13800.000	2.15%
SD	METALS	SED08892	T	ARSENIC	SD06671CH	SD06670CH	MG/KG	4.800	4.200	13.33%
SD	METALS	SED08892	T	BARIUM	SD06671CH	SD06670CH	MG/KG	198.000	190.000	4.12%
SD	METALS	SED08892	T	BERYLLIUM	SD06671CH	SD06670CH	MG/KG	1.200	1.200	0.00%
SD	METALS	SED08892	T	CALCIUM	SD06671CH	SD06670CH	MG/KG	5230.000	5070.000	3.11%
SD	METALS	SED08892	T	CHROMIUM	SD06671CH	SD06670CH	MG/KG	16.100	16.400	1.85%
SD	METALS	SED08892	T	COBALT	SD06671CH	SD06670CH	MG/KG	8.300	7.800	6.21%
SD	METALS	SED08892	T	COPPER	SD06671CH	SD06670CH	MG/KG	21.600	21.700	.46%
SD	METALS	SED08892	T	IRON	SD06671CH	SD06670CH	MG/KG	16300.000	16000.000	1.86%
SD	METALS	SED08892	T	LEAD	SD06671CH	SD06670CH	MG/KG	30.500	28.000	8.55%
SD	METALS	SED08892	T	LITHIUM	SD06671CH	SD06670CH	MG/KG	11.900	12.100	1.67%
SD	METALS	SED08892	T	MAGNESIUM	SD06671CH	SD06670CH	MG/KG	3670.000	3560.000	3.04%
SD	METALS	SED08892	T	MANGANESE	SD06671CH	SD06670CH	MG/KG	234.000	213.000	9.40%
SD	METALS	SED08892	T	NICKEL	SD06671CH	SD06670CH	MG/KG	17.000	16.200	4.82%
SD	METALS	SED08892	T	POTASSIUM	SD06671CH	SD06670CH	MG/KG	2950.000	2910.000	1.37%
SD	METALS	SED08892	T	SODIUM	SD06671CH	SD06670CH	MG/KG	165.000	161.000	2.45%
SD	METALS	SED08892	T	STRONTIUM	SD06671CH	SD06670CH	MG/KG	45.800	44.400	3.10%
SD	METALS	SED08892	T	TIN	SD06671CH	SD06670CH	MG/KG	14.600	14.600	0.00%
SD	METALS	SED08892	T	VANADIUM	SD06671CH	SD06670CH	MG/KG	34.600	33.600	2.93%
SD	METALS	SED08892	T	ZINC	SD06671CH	SD06670CH	MG/KG	65.700	63.200	3.88%
SD	METALS	SED08992	T	ALUMINUM	SD06694CH	SD06693CH	MG/KG	19500.000	18400.000	5.80%
SD	METALS	SED08992	T	ARSENIC	SD06694CH	SD06693CH	MG/KG	6.600	6.800	2.99%
SD	METALS	SED08992	T	BARIUM	SD06694CH	SD06693CH	MG/KG	217.000	214.000	1.39%
SD	METALS	SED08992	T	BERYLLIUM	SD06694CH	SD06693CH	MG/KG	1.300	1.300	0.00%
SD	METALS	SED08992	T	CALCIUM	SD06694CH	SD06693CH	MG/KG	15300.000	15300.000	0.00%
SD	METALS	SED08992	T	CHROMIUM	SD06694CH	SD06693CH	MG/KG	20.600	19.800	3.96%
SD	METALS	SED08992	T	COBALT	SD06694CH	SD06693CH	MG/KG	9.200	9.000	2.20%
SD	METALS	SED08992	T	COPPER	SD06694CH	SD06693CH	MG/KG	29.100	29.800	2.38%
SD	METALS	SED08992	T	IRON	SD06694CH	SD06693CH	MG/KG	19800.000	18800.000	5.18%
SD	METALS	SED08992	T	LEAD	SD06694CH	SD06693CH	MG/KG	36.100	32.100	11.73%
SD	METALS	SED08992	T	LITHIUM	SD06694CH	SD06693CH	MG/KG	18.500	17.900	[illegible]30%

Table 6-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED08992	T	MAGNESIUM	SD06694CH	SD06693CH	MG/KG	4560.000	4450.000	2.44%
SD	METALS	SED08992	T	MANGANESE	SD06694CH	SD06693CH	MG/KG	195.000	186.000	4.72%
SD	METALS	SED08992	T	NICKEL	SD06694CH	SD06693CH	MG/KG	20.400	19.900	2.48%
SD	METALS	SED08992	T	POTASSIUM	SD06694CH	SD06693CH	MG/KG	3950.000	3810.000	3.61%
SD	METALS	SED08992	T	SODIUM	SD06694CH	SD06693CH	MG/KG	260.000	259.000	.39%
SD	METALS	SED08992	T	STRONTIUM	SD06694CH	SD06693CH	MG/KG	80.400	79.000	1.76%
SD	METALS	SED08992	T	TIN	SD06694CH	SD06693CH	MG/KG	8.400	6.700	22.52%
SD	METALS	SED08992	T	VANADIUM	SD06694CH	SD06693CH	MG/KG	47.200	45.400	3.89%
SD	METALS	SED08992	T	ZINC	SD06694CH	SD06693CH	MG/KG	84.500	84.100	.47%
SD	METALS	SED09192	T	ALUMINUM	SD06613CH	SD06612CH	MG/KG	25300.000	16300.000	43.27%
SD	METALS	SED09192	T	ARSENIC	SD06613CH	SD06612CH	MG/KG	5.500	7.200	26.77%
SD	METALS	SED09192	T	BARIUM	SD06613CH	SD06612CH	MG/KG	196.000	191.000	2.58%
SD	METALS	SED09192	T	BERYLLIUM	SD06613CH	SD06612CH	MG/KG	1.500	1.300	14.29%
SD	METALS	SED09192	T	CALCIUM	SD06613CH	SD06612CH	MG/KG	15300.000	12800.000	17.79%
SD	METALS	SED09192	T	CHROMIUM	SD06613CH	SD06612CH	MG/KG	26.000	17.400	39.63%
SD	METALS	SED09192	T	COBALT	SD06613CH	SD06612CH	MG/KG	10.900	9.400	14.78%
SD	METALS	SED09192	T	COPPER	SD06613CH	SD06612CH	MG/KG	161.000	146.000	9.77%
SD	METALS	SED09192	T	IRON	SD06613CH	SD06612CH	MG/KG	21300.000	18900.000	11.94%
SD	METALS	SED09192	T	LEAD	SD06613CH	SD06612CH	MG/KG	55.300	59.400	7.15%
SD	METALS	SED09192	T	LITHIUM	SD06613CH	SD06612CH	MG/KG	19.400	14.300	30.27%
SD	METALS	SED09192	T	MAGNESIUM	SD06613CH	SD06612CH	MG/KG	4750.000	3680.000	25.39%
SD	METALS	SED09192	T	MANGANESE	SD06613CH	SD06612CH	MG/KG	329.000	569.000	53.45%
SD	METALS	SED09192	T	MERCURY	SD06613CH	SD06612CH	MG/KG	.190	.160	17.14%
SD	METALS	SED09192	T	MOLYBDENUM	SD06613CH	SD06612CH	MG/KG	1.100	.990	10.53%
SD	METALS	SED09192	T	NICKEL	SD06613CH	SD06612CH	MG/KG	21.200	17.900	16.88%
SD	METALS	SED09192	T	POTASSIUM	SD06613CH	SD06612CH	MG/KG	3720.000	2520.000	38.46%
SD	METALS	SED09192	T	SILVER	SD06613CH	SD06612CH	MG/KG	4.900	4.300	13.04%
SD	METALS	SED09192	T	SODIUM	SD06613CH	SD06612CH	MG/KG	154.000	136.000	12.41%
SD	METALS	SED09192	T	STRONTIUM	SD06613CH	SD06612CH	MG/KG	88.400	76.800	14.04%
SD	METALS	SED09192	T	TIN	SD06613CH	SD06612CH	MG/KG	3.500	3.900	10.81%
SD	METALS	SED09192	T	VANADIUM	SD06613CH	SD06612CH	MG/KG	58.000	38.300	40.91%
SD	METALS	SED09192	T	ZINC	SD06613CH	SD06612CH	MG/KG	201.000	175.000	13.83%
SD	METALS	SED10392	T	ALUMINUM	SD06110CH	SD06109CH	MG/KG	14500.000	15200.000	4.71%
SD	METALS	SED10392	T	ARSENIC	SD06110CH	SD06109CH	MG/KG	7.300	9.300	24.10%
SD	METALS	SED10392	T	BARIUM	SD06110CH	SD06109CH	MG/KG	123.000	124.000	.81%

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Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED10392	T	BERYLLIUM	SD06110CH	SD06109CH	MG/KG	1.100	1.100	0.00%
SD	METALS	SED10392	T	CADMIUM	SD06110CH	SD06109CH	MG/KG	4.200	3.900	7.41%
SD	METALS	SED10392	T	CALCIUM	SD06110CH	SD06109CH	MG/KG	4370.000	4300.000	1.61%
SD	METALS	SED10392	T	CHROMIUM	SD06110CH	SD06109CH	MG/KG	16.200	16.200	0.00%
SD	METALS	SED10392	T	COBALT	SD06110CH	SD06109CH	MG/KG	10.300	9.800	4.98%
SD	METALS	SED10392	T	COPPER	SD06110CH	SD06109CH	MG/KG	105.000	102.000	2.90%
SD	METALS	SED10392	T	IRON	SD06110CH	SD06109CH	MG/KG	19600.000	19800.000	1.02%
SD	METALS	SED10392	T	LEAD	SD06110CH	SD06109CH	MG/KG	76.900	68.500	11.55%
SD	METALS	SED10392	T	LITHIUM	SD06110CH	SD06109CH	MG/KG	11.000	11.900	7.86%
SD	METALS	SED10392	T	MAGNESIUM	SD06110CH	SD06109CH	MG/KG	3620.000	3660.000	1.10%
SD	METALS	SED10392	T	MANGANESE	SD06110CH	SD06109CH	MG/KG	853.000	832.000	2.49%
SD	METALS	SED10392	T	MERCURY	SD06110CH	SD06109CH	MG/KG	.290	.200	36.73%
SD	METALS	SED10392	T	NICKEL	SD06110CH	SD06109CH	MG/KG	18.300	17.500	4.47%
SD	METALS	SED10392	T	POTASSIUM	SD06110CH	SD06109CH	MG/KG	2720.000	2770.000	1.82%
SD	METALS	SED10392	T	SILVER	SD06110CH	SD06109CH	MG/KG	2.400	2.100	13.33%
SD	METALS	SED10392	T	SODIUM	SD06110CH	SD06109CH	MG/KG	148.000	157.000	5.90%
SD	METALS	SED10392	T	STRONTIUM	SD06110CH	SD06109CH	MG/KG	44.500	44.400	.22%
SD	METALS	SED10392	T	VANADIUM	SD06110CH	SD06109CH	MG/KG	31.100	30.000	3.60%
SD	METALS	SED10392	T	ZINC	SD06110CH	SD06109CH	MG/KG	973.000	929.000	4.63%
SD	METALS	SED11392	T	ALUMINUM	SD06121CH	SD06120CH	MG/KG	10500.000	14000.000	28.57%
SD	METALS	SED11392	T	ARSENIC	SD06121CH	SD06120CH	MG/KG	16.800	8.800	62.50%
SD	METALS	SED11392	T	BARIUM	SD06121CH	SD06120CH	MG/KG	156.000	171.000	9.17%
SD	METALS	SED11392	T	BERYLLIUM	SD06121CH	SD06120CH	MG/KG	.840	.960	13.33%
SD	METALS	SED11392	T	CADMIUM	SD06121CH	SD06120CH	MG/KG	5.000	3.200	43.90%
SD	METALS	SED11392	T	CALCIUM	SD06121CH	SD06120CH	MG/KG	3710.000	4130.000	10.71%
SD	METALS	SED11392	T	CHROMIUM	SD06121CH	SD06120CH	MG/KG	16.200	19.800	20.00%
SD	METALS	SED11392	T	COBALT	SD06121CH	SD06120CH	MG/KG	8.700	9.100	4.49%
SD	METALS	SED11392	T	COPPER	SD06121CH	SD06120CH	MG/KG	167.000	176.000	5.25%
SD	METALS	SED11392	T	IRON	SD06121CH	SD06120CH	MG/KG	20200.000	26800.000	28.09%
SD	METALS	SED11392	T	LEAD	SD06121CH	SD06120CH	MG/KG	190.000	137.000	32.42%
SD	METALS	SED11392	T	LITHIUM	SD06121CH	SD06120CH	MG/KG	10.100	12.300	19.64%
SD	METALS	SED11392	T	MAGNESIUM	SD06121CH	SD06120CH	MG/KG	3580.000	4380.000	20.10%
SD	METALS	SED11392	T	MANGANESE	SD06121CH	SD06120CH	MG/KG	385.000	357.000	7.55%
SD	METALS	SED11392	T	NICKEL	SD06121CH	SD06120CH	MG/KG	17.300	17.300	0.00%
SD	METALS	SED11392	T	POTASSIUM	SD06121CH	SD06120CH	MG/KG	2970.000	3450.000	14.95%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED11392	T	SILVER	SD06121CH	SD06120CH	MG/KG	4.900	3.900	22.73%
SD	METALS	SED11392	T	SODIUM	SD06121CH	SD06120CH	MG/KG	131.000	158.000	18.69%
SD	METALS	SED11392	T	STRONTIUM	SD06121CH	SD06120CH	MG/KG	38.800	47.700	20.58%
SD	METALS	SED11392	T	TIN	SD06121CH	SD06120CH	MG/KG	5.900	7.400	22.56%
SD	METALS	SED11392	T	VANADIUM	SD06121CH	SD06120CH	MG/KG	31.000	35.800	14.37%
SD	METALS	SED11392	T	ZINC	SD06121CH	SD06120CH	MG/KG	738.000	612.000	18.67%
SD	METALS	SED13492	T	ALUMINUM	SD06139CH	SD06138CH	MG/KG	13400.000	11900.000	11.86%
SD	METALS	SED13492	T	ARSENIC	SD06139CH	SD06138CH	MG/KG	7.100	7.000	1.42%
SD	METALS	SED13492	T	BARIUM	SD06139CH	SD06138CH	MG/KG	156.000	149.000	4.59%
SD	METALS	SED13492	T	BERYLLIUM	SD06139CH	SD06138CH	MG/KG	1.200	1.200	0.00%
SD	METALS	SED13492	T	CADMIUM	SD06139CH	SD06138CH	MG/KG	1.200	1.200	0.00%
SD	METALS	SED13492	T	CALCIUM	SD06139CH	SD06138CH	MG/KG	5690.000	5610.000	1.42%
SD	METALS	SED13492	T	CHROMIUM	SD06139CH	SD06138CH	MG/KG	13.600	13.600	0.00%
SD	METALS	SED13492	T	COBALT	SD06139CH	SD06138CH	MG/KG	9.600	9.700	1.04%
SD	METALS	SED13492	T	COPPER	SD06139CH	SD06138CH	MG/KG	109.000	105.000	3.74%
SD	METALS	SED13492	T	IRON	SD06139CH	SD06138CH	MG/KG	17900.000	16800.000	6.34%
SD	METALS	SED13492	T	LEAD	SD06139CH	SD06138CH	MG/KG	54.300	58.600	7.62%
SD	METALS	SED13492	T	LITHIUM	SD06139CH	SD06138CH	MG/KG	9.600	9.500	1.05%
SD	METALS	SED13492	T	MAGNESIUM	SD06139CH	SD06138CH	MG/KG	3550.000	3340.000	6.10%
SD	METALS	SED13492	T	MANGANESE	SD06139CH	SD06138CH	MG/KG	648.000	620.000	4.42%
SD	METALS	SED13492	T	MOLYBDENUM	SD06139CH	SD06138CH	MG/KG	2.500	1.900	27.27%
SD	METALS	SED13492	T	NICKEL	SD06139CH	SD06138CH	MG/KG	17.700	17.200	2.87%
SD	METALS	SED13492	T	POTASSIUM	SD06139CH	SD06138CH	MG/KG	2220.000	2010.000	9.93%
SD	METALS	SED13492	T	SILVER	SD06139CH	SD06138CH	MG/KG	2.200	2.600	16.67%
SD	METALS	SED13492	T	SODIUM	SD06139CH	SD06138CH	MG/KG	172.000	138.000	21.94%
SD	METALS	SED13492	T	STRONTIUM	SD06139CH	SD06138CH	MG/KG	54.600	51.300	6.23%
SD	METALS	SED13492	T	VANADIUM	SD06139CH	SD06138CH	MG/KG	36.800	31.900	14.26%
SD	METALS	SED13492	T	ZINC	SD06139CH	SD06138CH	MG/KG	434.000	427.000	1.63%
SD	METALS	SED14492	T	ALUMINUM	SD06150CH	SD06149CH	MG/KG	11900.000	13400.000	11.86%
SD	METALS	SED14492	T	ARSENIC	SD06150CH	SD06149CH	MG/KG	4.400	5.300	18.56%
SD	METALS	SED14492	T	BARIUM	SD06150CH	SD06149CH	MG/KG	119.000	130.000	8.84%
SD	METALS	SED14492	T	BERYLLIUM	SD06150CH	SD06149CH	MG/KG	.910	.970	6.38%
SD	METALS	SED14492	T	CALCIUM	SD06150CH	SD06149CH	MG/KG	4230.000	4540.000	7.07%
SD	METALS	SED14492	T	CHROMIUM	SD06150CH	SD06149CH	MG/KG	12.300	14.400	15.73%
SD	METALS	SED14492	T	COBALT	SD06150CH	SD06149CH	MG/KG	7.600	8.800	14.63%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED14492	T	COPPER	SD06150CH	SD06149CH	MG/KG	39.700	37.200	6.50%
SD	METALS	SED14492	T	IRON	SD06150CH	SD06149CH	MG/KG	15800.000	19500.000	20.96%
SD	METALS	SED14492	T	LEAD	SD06150CH	SD06149CH	MG/KG	28.000	27.000	3.64%
SD	METALS	SED14492	T	LITHIUM	SD06150CH	SD06149CH	MG/KG	9.600	10.100	5.08%
SD	METALS	SED14492	T	MAGNESIUM	SD06150CH	SD06149CH	MG/KG	2720.000	2980.000	9.12%
SD	METALS	SED14492	T	MANGANESE	SD06150CH	SD06149CH	MG/KG	495.000	492.000	.61%
SD	METALS	SED14492	T	NICKEL	SD06150CH	SD06149CH	MG/KG	15.000	16.400	8.92%
SD	METALS	SED14492	T	POTASSIUM	SD06150CH	SD06149CH	MG/KG	1750.000	1890.000	7.69%
SD	METALS	SED14492	T	SODIUM	SD06150CH	SD06149CH	MG/KG	130.000	159.000	20.07%
SD	METALS	SED14492	T	STRONTIUM	SD06150CH	SD06149CH	MG/KG	41.800	45.900	9.35%
SD	METALS	SED14492	T	VANADIUM	SD06150CH	SD06149CH	MG/KG	32.700	38.700	16.81%
SD	METALS	SED14492	T	ZINC	SD06150CH	SD06149CH	MG/KG	143.000	155.000	8.05%
SD	METALS	SED15192	T	ALUMINUM	SD06217CH	SD06208CH	MG/KG	15200.000	15200.000	0.00%
SD	METALS	SED15192	T	ARSENIC	SD06217CH	SD06208CH	MG/KG	5.600	5.200	7.41%
SD	METALS	SED15192	T	BARIUM	SD06217CH	SD06208CH	MG/KG	197.000	221.000	11.48%
SD	METALS	SED15192	T	BERYLLIUM	SD06217CH	SD06208CH	MG/KG	1.100	1.200	8.70%
SD	METALS	SED15192	T	CALCIUM	SD06217CH	SD06208CH	MG/KG	7310.000	10100.000	32.05%
SD	METALS	SED15192	T	CHROMIUM	SD06217CH	SD06208CH	MG/KG	18.900	17.200	9.42%
SD	METALS	SED15192	T	COBALT	SD06217CH	SD06208CH	MG/KG	8.600	8.600	0.00%
SD	METALS	SED15192	T	COPPER	SD06217CH	SD06208CH	MG/KG	46.000	40.000	13.95%
SD	METALS	SED15192	T	IRON	SD06217CH	SD06208CH	MG/KG	17300.000	19500.000	11.96%
SD	METALS	SED15192	T	LEAD	SD06217CH	SD06208CH	MG/KG	35.100	34.600	1.43%
SD	METALS	SED15192	T	LITHIUM	SD06217CH	SD06208CH	MG/KG	13.400	13.600	1.48%
SD	METALS	SED15192	T	MAGNESIUM	SD06217CH	SD06208CH	MG/KG	4380.000	4760.000	8.32%
SD	METALS	SED15192	T	MANGANESE	SD06217CH	SD06208CH	MG/KG	194.000	246.000	23.64%
SD	METALS	SED15192	T	NICKEL	SD06217CH	SD06208CH	MG/KG	18.400	18.800	2.15%
SD	METALS	SED15192	T	POTASSIUM	SD06217CH	SD06208CH	MG/KG	3200.000	3170.000	.94%
SD	METALS	SED15192	T	SODIUM	SD06217CH	SD06208CH	MG/KG	390.000	401.000	2.78%
SD	METALS	SED15192	T	STRONTIUM	SD06217CH	SD06208CH	MG/KG	60.200	75.500	22.55%
SD	METALS	SED15192	T	VANADIUM	SD06217CH	SD06208CH	MG/KG	43.400	44.200	1.83%
SD	METALS	SED15192	T	ZINC	SD06217CH	SD06208CH	MG/KG	76.900	82.300	6.78%
SD	METALS	SED15392	T	ALUMINUM	SD06013CH	SD06011CH	MG/KG	15000.000	13800.000	8.33%
SD	METALS	SED15392	T	ARSENIC	SD06013CH	SD06011CH	MG/KG	5.000	4.500	10.53%
SD	METALS	SED15392	T	BARIUM	SD06013CH	SD06011CH	MG/KG	192.000	176.000	8.70%
SD	METALS	SED15392	T	BERYLLIUM	SD06013CH	SD06011CH	MG/KG	1.200	.800	4[illegible].00%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED15392	T	CALCIUM	SD06013CH	SD06011CH	MG/KG	10800.000	8900.000	19.29%
SD	METALS	SED15392	T	CHROMIUM	SD06013CH	SD06011CH	MG/KG	15.900	14.400	9.90%
SD	METALS	SED15392	T	COBALT	SD06013CH	SD06011CH	MG/KG	10.100	9.500	6.12%
SD	METALS	SED15392	T	COPPER	SD06013CH	SD06011CH	MG/KG	28.400	25.900	9.21%
SD	METALS	SED15392	T	IRON	SD06013CH	SD06011CH	MG/KG	21700.000	17500.000	21.43%
SD	METALS	SED15392	T	LEAD	SD06013CH	SD06011CH	MG/KG	31.100	36.900	17.06%
SD	METALS	SED15392	T	LITHIUM	SD06013CH	SD06011CH	MG/KG	13.500	11.900	12.60%
SD	METALS	SED15392	T	MAGNESIUM	SD06013CH	SD06011CH	MG/KG	4170.000	3990.000	4.41%
SD	METALS	SED15392	T	MANGANESE	SD06013CH	SD06011CH	MG/KG	359.000	240.000	39.73%
SD	METALS	SED15392	T	NICKEL	SD06013CH	SD06011CH	MG/KG	18.800	15.400	19.88%
SD	METALS	SED15392	T	POTASSIUM	SD06013CH	SD06011CH	MG/KG	3120.000	2950.000	5.60%
SD	METALS	SED15392	T	SILVER	SD06013CH	SD06011CH	MG/KG	1.900	2.000	5.13%
SD	METALS	SED15392	T	SODIUM	SD06013CH	SD06011CH	MG/KG	256.000	234.000	8.98%
SD	METALS	SED15392	T	STRONTIUM	SD06013CH	SD06011CH	MG/KG	71.600	60.600	16.64%
SD	METALS	SED15392	T	VANADIUM	SD06013CH	SD06011CH	MG/KG	45.200	39.800	12.71%
SD	METALS	SED15392	T	ZINC	SD06013CH	SD06011CH	MG/KG	77.700	71.200	8.73%
SD	METALS	SED16092	T	ALUMINUM	SD06163CH	SD06162CH	MG/KG	18300.000	17900.000	2.21%
SD	METALS	SED16092	T	ARSENIC	SD06163CH	SD06162CH	MG/KG	10.400	4.400	81.08%
SD	METALS	SED16092	T	BARIUM	SD06163CH	SD06162CH	MG/KG	250.000	254.000	1.59%
SD	METALS	SED16092	T	BERYLLIUM	SD06163CH	SD06162CH	MG/KG	1.000	1.400	33.33%
SD	METALS	SED16092	T	CALCIUM	SD06163CH	SD06162CH	MG/KG	42000.000	40500.000	3.64%
SD	METALS	SED16092	T	CHROMIUM	SD06163CH	SD06162CH	MG/KG	22.100	20.900	5.58%
SD	METALS	SED16092	T	COBALT	SD06163CH	SD06162CH	MG/KG	8.100	8.900	9.41%
SD	METALS	SED16092	T	COPPER	SD06163CH	SD06162CH	MG/KG	22.100	22.800	3.12%
SD	METALS	SED16092	T	IRON	SD06163CH	SD06162CH	MG/KG	22300.000	22100.000	.90%
SD	METALS	SED16092	T	LEAD	SD06163CH	SD06162CH	MG/KG	37.000	30.100	20.57%
SD	METALS	SED16092	T	LITHIUM	SD06163CH	SD06162CH	MG/KG	10.200	13.400	27.12%
SD	METALS	SED16092	T	MAGNESIUM	SD06163CH	SD06162CH	MG/KG	4690.000	4730.000	.85%
SD	METALS	SED16092	T	MANGANESE	SD06163CH	SD06162CH	MG/KG	485.000	498.000	2.64%
SD	METALS	SED16092	T	NICKEL	SD06163CH	SD06162CH	MG/KG	15.300	17.000	10.53%
SD	METALS	SED16092	T	POTASSIUM	SD06163CH	SD06162CH	MG/KG	3450.000	3360.000	2.64%
SD	METALS	SED16092	T	SODIUM	SD06163CH	SD06162CH	MG/KG	430.000	690.000	46.43%
SD	METALS	SED16092	T	STRONTIUM	SD06163CH	SD06162CH	MG/KG	190.000	188.000	1.06%
SD	METALS	SED16092	T	TIN	SD06163CH	SD06162CH	MG/KG	51.400	43.800	15.97%
SD	METALS	SED16092	T	VANADIUM	SD06163CH	SD06162CH	MG/KG	42.300	44.200	4.39%

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Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	METALS	SED16092	T	ZINC	SD06163CH	SD06162CH	MG/KG	99.700	97.100	2.64%
SD	RADIONUCLIDES	SED00292	T	GROSS ALPHA	SW80206WCU3	SD00383WCU3	PCI/G	28.000	40.000	35.29%
SD	RADIONUCLIDES	SED00292	T	GROSS BETA	SW80206WCU3	SD00383WCU3	PCI/G	23.000	23.000	0.00%
SD	RADIONUCLIDES	SED00292	T	PLUTONIUM-239/240	SW80206WCU3	SD00383WCU3	PCI/G	.300	.140	72.73%
SD	RADIONUCLIDES	SED00292	T	RADIUM-226	SW80206WCU3	SD00383WCU3	PCI/G	.850	.810	4.82%
SD	RADIONUCLIDES	SED00292	T	RADIUM-228	SW80206WCU3	SD00383WCU3	PCI/G	1.300	1.200	8.00%
SD	RADIONUCLIDES	SED00892	T	GROSS ALPHA	SW80204WCU3	SD00381WCU3	PCI/G	15.000	14.000	6.90%
SD	RADIONUCLIDES	SED00892	T	GROSS BETA	SW80204WCU3	SD00381WCU3	PCI/G	20.000	13.000	42.42%
SD	RADIONUCLIDES	SED00892	T	RADIUM-226	SW80204WCU3	SD00381WCU3	PCI/G	1.200	1.200	0.00%
SD	RADIONUCLIDES	SED00892	T	RADIUM-228	SW80204WCU3	SD00381WCU3	PCI/G	.970	1.300	29.07%
SD	RADIONUCLIDES	SED00892	T	URANIUM-233/234	SW80204WCU3	SD00381WCU3	PCI/G	1.200	1.900	45.16%
SD	RADIONUCLIDES	SED00892	T	URANIUM-235	SW80204WCU3	SD00381WCU3	PCI/G	.040	.045	11.76%
SD	RADIONUCLIDES	SED00892	T	URANIUM-238	SW80204WCU3	SD00381WCU3	PCI/G	1.400	1.800	25.00%
SD	RADIONUCLIDES	SED01392	T	AMERICIUM-241	SW80226WCU3	SD00391WCU3	PCI/G	.046	.042	9.09%
SD	RADIONUCLIDES	SED01392	T	GROSS ALPHA	SW80226WCU3	SD00391WCU3	PCI/G	17.000	50.000	98.51%
SD	RADIONUCLIDES	SED01392	T	GROSS BETA	SW80226WCU3	SD00391WCU3	PCI/G	20.000	37.000	59.65%
SD	RADIONUCLIDES	SED01392	T	PLUTONIUM-239/240	SW80226WCU3	SD00391WCU3	PCI/G	.069	.076	9.66%
SD	RADIONUCLIDES	SED01392	T	URANIUM-233/234	SW80226WCU3	SD00391WCU3	PCI/G	1.000	1.300	26.09%
SD	RADIONUCLIDES	SED01392	T	URANIUM-235	SW80226WCU3	SD00391WCU3	PCI/G	.057	.110	63.47%
SD	RADIONUCLIDES	SED01392	T	URANIUM-238	SW80226WCU3	SD00391WCU3	PCI/G	.790	1.400	55.71%
SD	RADIONUCLIDES	SED01792	T	AMERICIUM-241	SW80241WCU3	SD00393WCU3	PCI/G	.033	.028	16.26%
SD	RADIONUCLIDES	SED01792	T	GROSS ALPHA	SW80241WCU3	SD00393WCU3	PCI/G	17.610	19.350	9.42%
SD	RADIONUCLIDES	SED01792	T	GROSS BETA	SW80241WCU3	SD00393WCU3	PCI/G	31.060	27.850	10.90%
SD	RADIONUCLIDES	SED01792	T	PLUTONIUM-239/240	SW80241WCU3	SD00393WCU3	PCI/G	.179	.195	8.40%
SD	RADIONUCLIDES	SED01792	T	TRITIUM	SW80241WCU3	SD00393WCU3	PCI/L	77.000	192.000	85.50%
SD	RADIONUCLIDES	SED01792	T	URANIUM-233/234	SW80241WCU3	SD00393WCU3	PCI/G	1.455	1.477	1.50%
SD	RADIONUCLIDES	SED01792	T	URANIUM-235	SW80241WCU3	SD00393WCU3	PCI/G	.101	.014	149.84%
SD	RADIONUCLIDES	SED01792	T	URANIUM-238	SW80241WCU3	SD00393WCU3	PCI/G	1.607	1.376	15.49%
SD	RADIONUCLIDES	SED02092	T	AMERICIUM-241	SW80243WCU3	SD00454WCU3	PCI/G	.010	.008	24.97%
SD	RADIONUCLIDES	SED02092	T	GROSS ALPHA	SW80243WCU3	SD00454WCU3	PCI/G	14.300	9.280	42.58%
SD	RADIONUCLIDES	SED02092	T	GROSS ALPHA	SD06003CH	SD06002CH	PCI/G	33.000	37.000	11.43%
SD	RADIONUCLIDES	SED02092	T	GROSS BETA	SW80243WCU3	SD00454WCU3	PCI/G	22.000	24.000	8.70%
SD	RADIONUCLIDES	SED02092	T	GROSS BETA	SD06003CH	SD06002CH	PCI/G	36.000	28.000	25.00%
SD	RADIONUCLIDES	SED02092	T	PLUTONIUM-239/240	SW80243WCU3	SD00454WCU3	PCI/G	.002	.009	[illegible].39%

Table [illegible]-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	RADIONUCLIDES	SED02092	T	URANIUM-233/234	SW80243WCU3	SD00454WCU3	PCI/G	.819	.844	3.01%
SD	RADIONUCLIDES	SED02092	T	URANIUM-233/234	SD06003CH	SD06002CH	PCI/G	.670	.800	17.69%
SD	RADIONUCLIDES	SED02092	T	URANIUM-235	SW80243WCU3	SD00454WCU3	PCI/G	.047	.026	59.15%
SD	RADIONUCLIDES	SED02092	T	URANIUM-235	SD06003CH	SD06002CH	PCI/G	.065	.032	68.04%
SD	RADIONUCLIDES	SED02092	T	URANIUM-238	SW80243WCU3	SD00454WCU3	PCI/G	.668	.733	9.28%
SD	RADIONUCLIDES	SED02092	T	URANIUM-238	SD06003CH	SD06002CH	PCI/G	.620	.520	17.54%
SD	RADIONUCLIDES	SED03692	T	GROSS ALPHA	SW80212WCU3	SD00360WCU3	PCI/G	21.000	20.000	4.88%
SD	RADIONUCLIDES	SED03692	T	GROSS BETA	SW80212WCU3	SD00360WCU3	PCI/G	13.000	14.000	7.41%
SD	RADIONUCLIDES	SED03692	T	RADIUM-226	SW80212WCU3	SD00360WCU3	PCI/G	.820	.790	3.73%
SD	RADIONUCLIDES	SED03692	T	RADIUM-228	SW80212WCU3	SD00360WCU3	PCI/G	1.000	1.200	18.18%
SD	RADIONUCLIDES	SED03692	T	STRONTIUM-89/90	SW80212WCU3	SD00360WCU3	PCI/G	.350	.260	29.51%
SD	RADIONUCLIDES	SED03692	T	URANIUM-233/234	SW80212WCU3	SD00360WCU3	PCI/G	.580	.650	11.38%
SD	RADIONUCLIDES	SED03692	T	URANIUM-238	SW80212WCU3	SD00360WCU3	PCI/G	.880	.860	2.30%
SD	RADIONUCLIDES	SED03992	T	GROSS BETA	SW80214WCU3	SD00363WCU3	PCI/G	13.000	30.000	79.07%
SD	RADIONUCLIDES	SED03992	T	PLUTONIUM-239/240	SW80214WCU3	SD00363WCU3	PCI/G	.087	.016	137.86%
SD	RADIONUCLIDES	SED03992	T	URANIUM-233/234	SW80214WCU3	SD00363WCU3	PCI/G	.320	1.600	133.33%
SD	RADIONUCLIDES	SED03992	T	URANIUM-235	SW80214WCU3	SD00363WCU3	PCI/G	.034	.096	95.38%
SD	RADIONUCLIDES	SED03992	T	URANIUM-238	SW80214WCU3	SD00363WCU3	PCI/G	.360	1.600	126.53%
SD	RADIONUCLIDES	SED04492	T	GROSS ALPHA	SW80216WCU3	SD00368WCU3	PCI/G	31.000	5.100	143.49%
SD	RADIONUCLIDES	SED04492	T	GROSS BETA	SW80216WCU3	SD00368WCU3	PCI/G	32.000	6.600	131.61%
SD	RADIONUCLIDES	SED04492	T	URANIUM-233/234	SW80216WCU3	SD00368WCU3	PCI/G	1.700	.190	159.79%
SD	RADIONUCLIDES	SED04492	T	URANIUM-235	SW80216WCU3	SD00368WCU3	PCI/G	.073	.026	94.95%
SD	RADIONUCLIDES	SED04492	T	URANIUM-238	SW80216WCU3	SD00368WCU3	PCI/G	1.600	.220	151.65%
SD	RADIONUCLIDES	SED04992	T	GROSS BETA	SW80208WCU3	SD00384WCU3	PCI/G	15.000	10.000	40.00%
SD	RADIONUCLIDES	SED05892	T	AMERICIUM-241	SW80201WCU3	SD00345WCU3	PCI/G	.018	.009	66.67%
SD	RADIONUCLIDES	SED05892	T	CESIUM-137	SW80201WCU3	SD00345WCU3	PCI/G	.190	.230	19.05%
SD	RADIONUCLIDES	SED05892	T	GROSS ALPHA	SW80201WCU3	SD00345WCU3	PCI/G	18.000	23.000	24.39%
SD	RADIONUCLIDES	SED05892	T	GROSS BETA	SW80201WCU3	SD00345WCU3	PCI/G	21.000	24.000	13.33%
SD	RADIONUCLIDES	SED05892	T	RADIUM-226	SW80201WCU3	SD00345WCU3	PCI/G	1.000	1.000	0.00%
SD	RADIONUCLIDES	SED05892	T	RADIUM-228	SW80201WCU3	SD00345WCU3	PCI/G	1.700	1.400	19.35%
SD	RADIONUCLIDES	SED05892	T	STRONTIUM-89/90	SW80201WCU3	SD00345WCU3	PCI/G	.230	.270	16.00%
SD	RADIONUCLIDES	SED05892	T	URANIUM-233/234	SW80201WCU3	SD00345WCU3	PCI/G	.740	.980	27.91%
SD	RADIONUCLIDES	SED05892	T	URANIUM-235	SW80201WCU3	SD00345WCU3	PCI/G	.031	.099	104.62%
SD	RADIONUCLIDES	SED05892	T	URANIUM-238	SW80201WCU3	SD00345WCU3	PCI/G	.980	1.100	11.54%
SD	RADIONUCLIDES	SED06992	T	AMERICIUM-241	SW80202WCU3	SD00351WCU3	PCI/G	.009	.006	40.00%

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Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	RADIONUCLIDES	SED06992	T	GROSS ALPHA	SW80202WCU3	SD00351WCU3	PCI/G	26.000	28.000	7.41%
SD	RADIONUCLIDES	SED06992	T	GROSS BETA	SW80202WCU3	SD00351WCU3	PCI/G	21.000	20.000	4.88%
SD	RADIONUCLIDES	SED06992	T	RADIUM-226	SW80202WCU3	SD00351WCU3	PCI/G	1.000	.940	6.19%
SD	RADIONUCLIDES	SED06992	T	RADIUM-228	SW80202WCU3	SD00351WCU3	PCI/G	1.200	1.000	18.18%
SD	RADIONUCLIDES	SED06992	T	URANIUM-233/234	SW80202WCU3	SD00351WCU3	PCI/G	.920	1.000	8.33%
SD	RADIONUCLIDES	SED06992	T	URANIUM-235	SW80202WCU3	SD00351WCU3	PCI/G	.056	.046	19.61%
SD	RADIONUCLIDES	SED06992	T	URANIUM-238	SW80202WCU3	SD00351WCU3	PCI/G	.990	1.100	10.53%
SD	RADIONUCLIDES	SED07592	T	AMERICIUM-241	SW80229WCU3	SD00374WCU3	PCI/G	.008	.005	46.15%
SD	RADIONUCLIDES	SED07592	T	GROSS ALPHA	SW80229WCU3	SD00374WCU3	PCI/G	29.000	25.000	14.81%
SD	RADIONUCLIDES	SED07592	T	GROSS BETA	SW80229WCU3	SD00374WCU3	PCI/G	27.000	25.000	7.69%
SD	RADIONUCLIDES	SED07592	T	PLUTONIUM-239/240	SW80229WCU3	SD00374WCU3	PCI/G	.039	.005	154.55%
SD	RADIONUCLIDES	SED07592	T	URANIUM-233/234	SW80229WCU3	SD00374WCU3	PCI/G	.660	.860	26.32%
SD	RADIONUCLIDES	SED07592	T	URANIUM-235	SW80229WCU3	SD00374WCU3	PCI/G	.013	.012	8.00%
SD	RADIONUCLIDES	SED07592	T	URANIUM-238	SW80229WCU3	SD00374WCU3	PCI/G	1.000	.780	24.72%
SD	RADIONUCLIDES	SED08192	T	AMERICIUM-241	SD06410CH	SD06409CH	PCI/G	.021	.007	104.05%
SD	RADIONUCLIDES	SED08192	T	PLUTONIUM-239/240	SD06410CH	SD06409CH	PCI/G	.043	.056	26.30%
SD	RADIONUCLIDES	SED08192	T	POLONIUM-210	SD06410CH	SD06409CH	PCI/G	.339	.270	22.66%
SD	RADIONUCLIDES	SED08192	T	URANIUM-233/234	SD06410CH	SD06409CH	PCI/G	1.700	2.120	21.99%
SD	RADIONUCLIDES	SED08192	T	URANIUM-235	SD06410CH	SD06409CH	PCI/G	.067	.093	31.75%
SD	RADIONUCLIDES	SED08192	T	URANIUM-238	SD06410CH	SD06409CH	PCI/G	1.740	1.920	9.84%
SD	RADIONUCLIDES	SED08392	T	AMERICIUM-241	SD06468CH	SD06467CH	PCI/G	.016	.049	99.85%
SD	RADIONUCLIDES	SED08392	T	PLUTONIUM-239/240	SD06468CH	SD06467CH	PCI/G	.101	.240	81.52%
SD	RADIONUCLIDES	SED08392	T	POLONIUM-210	SD06468CH	SD06467CH	PCI/G	1.330	1.740	26.71%
SD	RADIONUCLIDES	SED08392	T	URANIUM-233/234	SD06468CH	SD06467CH	PCI/G	2.220	2.310	3.97%
SD	RADIONUCLIDES	SED08392	T	URANIUM-235	SD06468CH	SD06467CH	PCI/G	.110	.130	16.67%
SD	RADIONUCLIDES	SED08392	T	URANIUM-238	SD06468CH	SD06467CH	PCI/G	2.470	2.120	15.25%
SD	RADIONUCLIDES	SED08592	T	PLUTONIUM-239/240	SD06521CH	SD06520CH	PCI/G	.078	.076	1.93%
SD	RADIONUCLIDES	SED08592	T	POLONIUM-210	SD06521CH	SD06520CH	PCI/G	1.153	1.319	13.43%
SD	RADIONUCLIDES	SED08592	T	URANIUM-233/234	SD06521CH	SD06520CH	PCI/G	1.065	.910	15.72%
SD	RADIONUCLIDES	SED08592	T	URANIUM-235	SD06521CH	SD06520CH	PCI/G	.042	.077	58.12%
SD	RADIONUCLIDES	SED08592	T	URANIUM-238	SD06521CH	SD06520CH	PCI/G	1.044	1.159	10.44%
SD	RADIONUCLIDES	SED08692	T	PLUTONIUM-239/240	SD06548CH	SD06547CH	PCI/G	.136	.164	18.49%
SD	RADIONUCLIDES	SED08692	T	POLONIUM-210	SD06548CH	SD06547CH	PCI/G	2.411	2.286	5.32%
SD	RADIONUCLIDES	SED08692	T	URANIUM-233/234	SD06548CH	SD06547CH	PCI/G	1.506	1.534	1.84%
SD	RADIONUCLIDES	SED08692	T	URANIUM-235	SD06548CH	SD06547CH	PCI/G	.143	.038	5.72%

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By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	RADIONUCLIDES	SED08692	T	URANIUM-238	SD06548CH	SD06547CH	PCI/G	1.561	1.530	2.01%
SD	RADIONUCLIDES	SED08892	T	AMERICIUM-241	SD06671CH	SD06670CH	PCI/G	.006	.004	54.69%
SD	RADIONUCLIDES	SED08892	T	PLUTONIUM-239/240	SD06671CH	SD06670CH	PCI/G	.001	.005	122.88%
SD	RADIONUCLIDES	SED08892	T	URANIUM-233/234	SD06671CH	SD06670CH	PCI/G	1.030	1.120	8.37%
SD	RADIONUCLIDES	SED08892	T	URANIUM-235	SD06671CH	SD06670CH	PCI/G	.051	.013	118.75%
SD	RADIONUCLIDES	SED08892	T	URANIUM-238	SD06671CH	SD06670CH	PCI/G	1.030	1.180	13.57%
SD	RADIONUCLIDES	SED08992	T	PLUTONIUM-239/240	SD06694CH	SD06693CH	PCI/G	.600	.556	7.59%
SD	RADIONUCLIDES	SED08992	T	POLONIUM-210	SD06694CH	SD06693CH	PCI/G	2.634	2.819	6.79%
SD	RADIONUCLIDES	SED08992	T	URANIUM-233/234	SD06694CH	SD06693CH	PCI/G	1.300	1.430	9.52%
SD	RADIONUCLIDES	SED08992	T	URANIUM-235	SD06694CH	SD06693CH	PCI/G	.036	.059	47.90%
SD	RADIONUCLIDES	SED08992	T	URANIUM-238	SD06694CH	SD06693CH	PCI/G	1.236	1.103	11.37%
SD	RADIONUCLIDES	SED09192	T	PLUTONIUM-239/240	SD06613CH	SD06612CH	PCI/G	4.030	4.870	18.88%
SD	RADIONUCLIDES	SED09192	T	POLONIUM-210	SD06613CH	SD06612CH	PCI/G	2.350	2.350	0.00%
SD	RADIONUCLIDES	SED09192	T	URANIUM-233/234	SD06613CH	SD06612CH	PCI/G	1.210	.962	22.84%
SD	RADIONUCLIDES	SED09192	T	URANIUM-235	SD06613CH	SD06612CH	PCI/G	.058	.036	46.19%
SD	RADIONUCLIDES	SED09192	T	URANIUM-238	SD06613CH	SD06612CH	PCI/G	1.160	1.210	4.22%
SD	RADIONUCLIDES	SED10392	T	AMERICIUM-241	SD06110CH	SD06109CH	PCI/G	.009	.020	74.20%
SD	RADIONUCLIDES	SED10392	T	GROSS ALPHA	SD06110CH	SD06109CH	PCI/G	23.770	25.620	7.49%
SD	RADIONUCLIDES	SED10392	T	GROSS BETA	SD06110CH	SD06109CH	PCI/G	27.970	29.400	4.99%
SD	RADIONUCLIDES	SED10392	T	PLUTONIUM-239/240	SD06110CH	SD06109CH	PCI/G	.038	.016	82.48%
SD	RADIONUCLIDES	SED10392	T	URANIUM-233/234	SD06110CH	SD06109CH	PCI/G	2.135	2.206	3.27%
SD	RADIONUCLIDES	SED10392	T	URANIUM-235	SD06110CH	SD06109CH	PCI/G	.098	.163	49.66%
SD	RADIONUCLIDES	SED10392	T	URANIUM-238	SD06110CH	SD06109CH	PCI/G	2.116	2.089	1.28%
SD	RADIONUCLIDES	SED11392	T	GROSS ALPHA	SD06121CH	SD06120CH	PCI/G	19.100	16.200	16.43%
SD	RADIONUCLIDES	SED11392	T	GROSS BETA	SD06121CH	SD06120CH	PCI/G	20.000	20.400	1.98%
SD	RADIONUCLIDES	SED11392	T	PLUTONIUM-239/240	SD06121CH	SD06120CH	PCI/G	.012	.030	86.41%
SD	RADIONUCLIDES	SED11392	T	URANIUM-233/234	SD06121CH	SD06120CH	PCI/G	.467	.429	8.48%
SD	RADIONUCLIDES	SED11392	T	URANIUM-235	SD06121CH	SD06120CH	PCI/G	.008	.010	18.58%
SD	RADIONUCLIDES	SED11392	T	URANIUM-238	SD06121CH	SD06120CH	PCI/G	.617	.439	33.71%
SD	RADIONUCLIDES	SED13492	T	AMERICIUM-241	SD06139CH	SD06138CH	PCI/G	.206	.094	74.76%
SD	RADIONUCLIDES	SED13492	T	GROSS ALPHA	SD06139CH	SD06138CH	PCI/G	21.400	20.600	3.81%
SD	RADIONUCLIDES	SED13492	T	GROSS BETA	SD06139CH	SD06138CH	PCI/G	23.500	28.700	19.92%
SD	RADIONUCLIDES	SED13492	T	PLUTONIUM-239/240	SD06139CH	SD06138CH	PCI/G	.103	.145	33.87%
SD	RADIONUCLIDES	SED13492	T	URANIUM-233/234	SD06139CH	SD06138CH	PCI/G	1.580	1.500	5.19%
SD	RADIONUCLIDES	SED13492	T	URANIUM-235	SD06139CH	SD06138CH	PCI/G	.094	.121	25.12%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	RADIONUCLIDES	SED13492	T	URANIUM-238	SD06139CH	SD06138CH	PCI/G	1.550	1.400	10.17%
SD	RADIONUCLIDES	SED14492	T	AMERICIUM-241	SD06150CH	SD06149CH	PCI/G	.013	.018	34.21%
SD	RADIONUCLIDES	SED14492	T	GROSS ALPHA	SD06150CH	SD06149CH	PCI/G	12.500	13.400	6.95%
SD	RADIONUCLIDES	SED14492	T	GROSS BETA	SD06150CH	SD06149CH	PCI/G	15.900	14.900	6.49%
SD	RADIONUCLIDES	SED14492	T	PLUTONIUM-239/240	SD06150CH	SD06149CH	PCI/G	.014	.066	128.86%
SD	RADIONUCLIDES	SED14492	T	URANIUM-233/234	SD06150CH	SD06149CH	PCI/G	.923	.921	.22%
SD	RADIONUCLIDES	SED14492	T	URANIUM-235	SD06150CH	SD06149CH	PCI/G	.008	.042	137.72%
SD	RADIONUCLIDES	SED14492	T	URANIUM-238	SD06150CH	SD06149CH	PCI/G	.775	1.070	31.98%
SD	RADIONUCLIDES	SED15192	T	AMERICIUM-241	SD06217CH	SD06208CH	PCI/G	.091	.076	17.44%
SD	RADIONUCLIDES	SED15192	T	GROSS ALPHA	SD06217CH	SD06208CH	PCI/G	24.280	21.900	10.31%
SD	RADIONUCLIDES	SED15192	T	GROSS BETA	SD06217CH	SD06208CH	PCI/G	29.440	27.330	7.43%
SD	RADIONUCLIDES	SED15192	T	PLUTONIUM-239/240	SD06217CH	SD06208CH	PCI/G	.488	.395	21.07%
SD	RADIONUCLIDES	SED15192	T	URANIUM-233/234	SD06217CH	SD06208CH	PCI/G	1.279	1.640	24.73%
SD	RADIONUCLIDES	SED15192	T	URANIUM-235	SD06217CH	SD06208CH	PCI/G	.012	.016	29.03%
SD	RADIONUCLIDES	SED15192	T	URANIUM-238	SD06217CH	SD06208CH	PCI/G	1.634	1.960	18.14%
SD	RADIONUCLIDES	SED15392	T	GROSS ALPHA	SD06013CH	SD06011CH	PCI/G	41.000	42.000	2.41%
SD	RADIONUCLIDES	SED15392	T	GROSS BETA	SD06013CH	SD06011CH	PCI/G	40.000	37.000	7.79%
SD	RADIONUCLIDES	SED15392	T	PLUTONIUM-239/240	SD06013CH	SD06011CH	PCI/G	.400	.210	62.30%
SD	RADIONUCLIDES	SED16092	T	AMERICIUM-241	SD06163CH	SD06162CH	PCI/G	.075	.071	5.06%
SD	RADIONUCLIDES	SED16092	T	GROSS ALPHA	SD06163CH	SD06162CH	PCI/G	22.210	18.070	20.56%
SD	RADIONUCLIDES	SED16092	T	GROSS BETA	SD06163CH	SD06162CH	PCI/G	28.880	27.040	6.58%
SD	RADIONUCLIDES	SED16092	T	PLUTONIUM-239/240	SD06163CH	SD06162CH	PCI/G	.439	.331	27.88%
SD	RADIONUCLIDES	SED16092	T	URANIUM-233/234	SD06163CH	SD06162CH	PCI/G	1.574	1.680	6.52%
SD	RADIONUCLIDES	SED16092	T	URANIUM-235	SD06163CH	SD06162CH	PCI/G	.071	.035	68.38%
SD	RADIONUCLIDES	SED16092	T	URANIUM-238	SD06163CH	SD06162CH	PCI/G	1.297	1.414	8.63%
SD	VOAS	SED07592	T	METHYLENE CHLORIDE	SW80229WCU3	SD00374WCU3	UG/KG	2.000	2.000	0.00%
SD	VOAS	SED15392	T	ACETONE	SD06013CH	SD06011CH	UG/KG	17.000	100.000	141.88%
SD	WATER-QUALITY	SED00292	T	% SOLIDS	SW80206WCU3	SD00383WCU3	%	71.800	72.700	1.25%
SD	WATER-QUALITY	SED00892	T	% SOLIDS	SW80204WCU3	SD00381WCU3	%	71.500	70.400	1.55%
SD	WATER-QUALITY	SED01792	T	% SOLIDS	SW80241WCU3	SD00393WCU3	%	46.900	48.100	2.53%
SD	WATER-QUALITY	SED02092	T	% SOLIDS	SW80243WCU3	SD00454WCU3	%	92.800	93.200	.43%
SD	WATER-QUALITY	SED03692	T	% SOLIDS	SW80212WCU3	SD00360WCU3	%	75.200	75.400	.27%
SD	WATER-QUALITY	SED03992	T	% SOLIDS	SW80214WCU3	SD00363WCU3	%	78.300	77.900	.51%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SD	WATER-QUALITY	SED04492	T	% SOLIDS	SW80216WCU3	SD00368WCU3	%	78.300	78.200	.13%
SD	WATER-QUALITY	SED04992	T	% SOLIDS	SW80208WCU3	SD00384WCU3	%	78.700	77.800	1.15%
SD	WATER-QUALITY	SED05892	T	% SOLIDS	SW80201WCU3	SD00345WCU3	%	64.000	66.500	3.83%
SD	WATER-QUALITY	SED06992	T	% SOLIDS	SW80202WCU3	SD00351WCU3	%	72.600	73.100	.69%
SS	RADIONUCLIDES	PT14092	T	AMERICIUM-241	SS04531CH	SS04031CH	PCI/G	.017	.010	51.85%
SS	RADIONUCLIDES	PT14092	T	PLUTONIUM-239/240	SS04530CH	SS04030CH	PCI/G	.024	.044	58.82%
SS	RADIONUCLIDES	PT14092	T	PLUTONIUM-239/240	SS04531CH	SS04031CH	PCI/G	.017	.054	104.23%
SS	RADIONUCLIDES	PT14092	T	URANIUM-233/234	SS04530CH	SS04030CH	PCI/G	1.200	.920	26.42%
SS	RADIONUCLIDES	PT14092	T	URANIUM-233/234	SS04531CH	SS04031CH	PCI/G	.940	.970	3.14%
SS	RADIONUCLIDES	PT14092	T	URANIUM-235	SS04530CH	SS04030CH	PCI/G	.057	.140	84.26%
SS	RADIONUCLIDES	PT14092	T	URANIUM-235	SS04531CH	SS04031CH	PCI/G	.110	.051	73.29%
SS	RADIONUCLIDES	PT14092	T	URANIUM-238	SS04530CH	SS04030CH	PCI/G	1.200	1.100	8.70%
SS	RADIONUCLIDES	PT14092	T	URANIUM-238	SS04531CH	SS04031CH	PCI/G	.740	.900	19.51%
SS	RADIONUCLIDES	PT14892	T	PLUTONIUM-239/240	SS04547CH	SS04047CH	PCI/G	.007	.010	35.29%
SS	RADIONUCLIDES	PT14892	T	URANIUM-233/234	SS04546CH	SS04046CH	PCI/G	.850	.940	10.06%
SS	RADIONUCLIDES	PT14892	T	URANIUM-233/234	SS04547CH	SS04047CH	PCI/G	1.100	.900	20.00%
SS	RADIONUCLIDES	PT14892	T	URANIUM-235	SS04546CH	SS04046CH	PCI/G	.066	.034	64.00%
SS	RADIONUCLIDES	PT14892	T	URANIUM-235	SS04547CH	SS04047CH	PCI/G	.052	.069	28.10%
SS	RADIONUCLIDES	PT14892	T	URANIUM-238	SS04546CH	SS04046CH	PCI/G	1.100	.960	13.59%
SS	RADIONUCLIDES	PT14892	T	URANIUM-238	SS04547CH	SS04047CH	PCI/G	.870	.780	10.91%
SS	RADIONUCLIDES	PT16092	T	AMERICIUM-241	SS04570CH	SS04070CH	PCI/G	.006	.016	90.91%
SS	RADIONUCLIDES	PT16092	T	PLUTONIUM-239/240	SS04570CH	SS04070CH	PCI/G	.046	.061	28.04%
SS	RADIONUCLIDES	PT16092	T	PLUTONIUM-239/240	SS04571CH	SS04071CH	PCI/G	.036	.036	0.00%
SS	RADIONUCLIDES	PT16092	T	URANIUM-233/234	SS04570CH	SS04070CH	PCI/G	.810	.910	11.63%
SS	RADIONUCLIDES	PT16092	T	URANIUM-233/234	SS04571CH	SS04071CH	PCI/G	1.000	1.000	0.00%
SS	RADIONUCLIDES	PT16092	T	URANIUM-235	SS04570CH	SS04070CH	PCI/G	.030	.038	23.53%
SS	RADIONUCLIDES	PT16092	T	URANIUM-235	SS04571CH	SS04071CH	PCI/G	.013	.033	86.96%
SS	RADIONUCLIDES	PT16092	T	URANIUM-238	SS04570CH	SS04070CH	PCI/G	1.000	.940	6.19%
SS	RADIONUCLIDES	PT16092	T	URANIUM-238	SS04571CH	SS04071CH	PCI/G	.850	1.100	25.64%
SS	RADIONUCLIDES	PT16192	T	AMERICIUM-241	SS04572CH	SS04072CH	PCI/G	.019	.010	57.54%
SS	RADIONUCLIDES	PT16192	T	AMERICIUM-241	SS04573CH	SS04073CH	PCI/G	.013	.007	53.76%
SS	RADIONUCLIDES	PT16192	T	PLUTONIUM-239/240	SS04573CH	SS04073CH	PCI/G	.052	.032	47.34%
SS	RADIONUCLIDES	PT16192	T	URANIUM-233/234	SS04572CH	SS04072CH	PCI/G	1.265	1.283	1.41%
SS	RADIONUCLIDES	PT16192	T	URANIUM-233/234	SS04573CH	SS04073CH	PCI/G	1.240	1.310	5.49%

6/02/95

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
GW	METALS	49292	D	ARSENIC	GW30055CH	GW30025CH	UG/L	3.800	3.500	8.22%
GW	METALS	49292	D	BARIUM	GW30055CH	GW30025CH	UG/L	35.000	35.500	1.42%
GW	METALS	49292	D	CALCIUM	GW30055CH	GW30025CH	UG/L	89900.000	91200.000	1.44%
GW	METALS	49292	D	IRON	GW30055CH	GW30025CH	UG/L	599.000	594.000	.84%
GW	METALS	49292	D	LITHIUM	GW30055CH	GW30025CH	UG/L	81.400	82.100	.86%
GW	METALS	49292	D	MAGNESIUM	GW30055CH	GW30025CH	UG/L	22700.000	22800.000	.44%
GW	METALS	49292	D	MANGANESE	GW30055CH	GW30025CH	UG/L	64.900	71.300	9.40%
GW	METALS	49292	D	POTASSIUM	GW30055CH	GW30025CH	UG/L	3650.000	3980.000	8.65%
GW	METALS	49292	D	SILICON	GW30055CH	GW30025CH	UG/L	5500.000	5420.000	1.47%
GW	METALS	49292	D	SODIUM	GW30055CH	GW30025CH	UG/L	271000.000	268000.000	1.11%
GW	METALS	49292	D	STRONTIUM	GW30055CH	GW30025CH	UG/L	1140.000	1130.000	.88%
GW	METALS	49292	T	ALUMINUM	GW30055CH	GW30025CH	UG/L	338.000	198.000	52.24%
GW	METALS	49292	T	ARSENIC	GW30055CH	GW30025CH	UG/L	3.200	3.000	6.45%
GW	METALS	49292	T	BARIUM	GW30055CH	GW30025CH	UG/L	38.500	37.200	3.43%
GW	METALS	49292	T	CALCIUM	GW30055CH	GW30025CH	UG/L	87300.000	87300.000	0.00%
GW	METALS	49292	T	COPPER	GW30055CH	GW30025CH	UG/L	4.400	2.500	55.07%
GW	METALS	49292	T	IRON	GW30055CH	GW30025CH	UG/L	1300.000	1080.000	18.49%
GW	METALS	49292	T	LITHIUM	GW30055CH	GW30025CH	UG/L	74.400	74.600	.27%
GW	METALS	49292	T	MAGNESIUM	GW30055CH	GW30025CH	UG/L	21400.000	21500.000	.47%
GW	METALS	49292	T	MANGANESE	GW30055CH	GW30025CH	UG/L	70.200	73.100	4.05%
GW	METALS	49292	T	POTASSIUM	GW30055CH	GW30025CH	UG/L	3770.000	3440.000	9.15%
GW	METALS	49292	T	SILICON	GW30055CH	GW30025CH	UG/L	5930.000	5600.000	5.72%
GW	METALS	49292	T	SODIUM	GW30055CH	GW30025CH	UG/L	258000.000	256000.000	.78%
GW	METALS	49292	T	STRONTIUM	GW30055CH	GW30025CH	UG/L	1090.000	1080.000	.92%
GW	RADIONUCLIDES	49292	D	URANIUM-233/234	GW30055CH	GW30025CH	PCI/L	.312	.338	8.13%
GW	RADIONUCLIDES	49292	D	URANIUM-235	GW30055CH	GW30025CH	PCI/L	-.011	-.004	96.39%
GW	RADIONUCLIDES	49292	D	URANIUM-238	GW30055CH	GW30025CH	PCI/L	.134	.087	42.62%
GW	RADIONUCLIDES	49292	T	AMERICIUM-241	GW30055CH	GW30025CH	PCI/L	.001	.002	62.90%
GW	RADIONUCLIDES	49292	T	PLUTONIUM-239/240	GW30055CH	GW30025CH	PCI/L	-.001	.002	582.58%
GW	WATER-QUALITY	49292	T	BICARBONATE AS CACO3	GW30055CH	GW30025CH	MG/L	420.000	420.000	0.00%
GW	WATER-QUALITY	49292	T	CHLORIDE	GW30055CH	GW30025CH	MG/L	32.790	34.100	3.92%
GW	WATER-QUALITY	49292	T	FLUORIDE	GW30055CH	GW30025CH	MG/L	.900	.900	0.00%
GW	WATER-QUALITY	49292	T	NITRATE/NITRITE	GW30055CH	GW30025CH	MG/L	.060	.300	133.33%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SS	RADIONUCLIDES	PT16192	T	URANIUM-235	SS04572CH	SS04072CH	PCI/G	.060	.065	9.16%
SS	RADIONUCLIDES	PT16192	T	URANIUM-235	SS04573CH	SS04073CH	PCI/G	.048	.049	1.64%
SS	RADIONUCLIDES	PT16192	T	URANIUM-238	SS04572CH	SS04072CH	PCI/G	1.361	1.301	4.51%
SS	RADIONUCLIDES	PT16192	T	URANIUM-238	SS04573CH	SS04073CH	PCI/G	1.345	1.244	7.80%
SS	RADIONUCLIDES	PT17092	T	AMERICIUM-241	SS04591CH	SS04091CH	PCI/G	.020	.020	0.00%
SS	RADIONUCLIDES	PT17092	T	PLUTONIUM-239/240	SS04590CH	SS04090CH	PCI/G	.029	.021	32.00%
SS	RADIONUCLIDES	PT17092	T	PLUTONIUM-239/240	SS04591CH	SS04091CH	PCI/G	.032	.030	6.45%
SS	RADIONUCLIDES	PT17092	T	URANIUM-233/234	SS04591CH	SS04091CH	PCI/G	.790	.850	7.32%
SS	RADIONUCLIDES	PT17092	T	URANIUM-238	SS04591CH	SS04091CH	PCI/G	1.200	1.100	8.70%
SS	RADIONUCLIDES	PT19492	T	AMERICIUM-241	SS04540CH	SS04140CH	PCI/G	.013	.012	8.00%
SS	RADIONUCLIDES	PT19492	T	AMERICIUM-241	SS04541CH	SS04141CH	PCI/G	.140	.031	127.49%
SS	RADIONUCLIDES	PT19492	T	PLUTONIUM-239/240	SS04540CH	SS04140CH	PCI/G	.013	.019	37.50%
SS	RADIONUCLIDES	PT19492	T	PLUTONIUM-239/240	SS04541CH	SS04141CH	PCI/G	.160	.230	35.90%
SS	RADIONUCLIDES	PT19492	T	URANIUM-233/234	SS04540CH	SS04140CH	PCI/G	1.300	1.100	16.67%
SS	RADIONUCLIDES	PT19492	T	URANIUM-233/234	SS04541CH	SS04141CH	PCI/G	.960	.950	1.05%
SS	RADIONUCLIDES	PT19492	T	URANIUM-235	SS04540CH	SS04140CH	PCI/G	.065	.140	73.17%
SS	RADIONUCLIDES	PT19492	T	URANIUM-235	SS04541CH	SS04141CH	PCI/G	.036	.022	48.28%
SS	RADIONUCLIDES	PT19492	T	URANIUM-238	SS04540CH	SS04140CH	PCI/G	1.200	1.300	8.00%
SS	RADIONUCLIDES	PT19492	T	URANIUM-238	SS04541CH	SS04141CH	PCI/G	.980	.990	1.02%
SS	RADIONUCLIDES	PT19592	T	AMERICIUM-241	SS04542CH	SS04142CH	PCI/G	.041	.011	115.38%
SS	RADIONUCLIDES	PT19592	T	AMERICIUM-241	SS04543CH	SS04143CH	PCI/G	.062	.032	63.83%
SS	RADIONUCLIDES	PT19592	T	PLUTONIUM-239/240	SS04542CH	SS04142CH	PCI/G	.360	.032	167.35%
SS	RADIONUCLIDES	PT19592	T	PLUTONIUM-239/240	SS04543CH	SS04143CH	PCI/G	.140	.110	24.00%
SS	RADIONUCLIDES	PT19592	T	URANIUM-233/234	SS04542CH	SS04142CH	PCI/G	1.300	1.300	0.00%
SS	RADIONUCLIDES	PT19592	T	URANIUM-233/234	SS04543CH	SS04143CH	PCI/G	1.100	1.200	8.70%
SS	RADIONUCLIDES	PT19592	T	URANIUM-235	SS04542CH	SS04142CH	PCI/G	.040	.110	93.33%
SS	RADIONUCLIDES	PT19592	T	URANIUM-235	SS04543CH	SS04143CH	PCI/G	.069	.033	70.59%
SS	RADIONUCLIDES	PT19592	T	URANIUM-238	SS04542CH	SS04142CH	PCI/G	1.400	1.300	7.41%
SS	RADIONUCLIDES	PT19592	T	URANIUM-238	SS04543CH	SS04143CH	PCI/G	.750	1.100	37.84%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
GW	WATER-QUALITY	49292	T	SULFATE	GW30055CH	GW30025CH	MG/L	400.000	530.000	27.96%
GW	WATER-QUALITY	49292	T	TOTAL DISSOLVED SOLIDS	GW30055CH	GW30025CH	MG/L	1100.000	1100.000	0.00%
GW	WATER-QUALITY	49292	T	TOTAL SUSPENDED SOLIDS	GW30055CH	GW30025CH	MG/L	9.000	15.000	50.00%
SW	METALS	SW00392	D	ALUMINUM	SW07003CH	SW07001CH	UG/L	455.000	42.000	166.20%
SW	METALS	SW00392	D	BARIUM	SW07003CH	SW07001CH	UG/L	21.400	17.900	17.81%
SW	METALS	SW00392	D	CALCIUM	SW07003CH	SW07001CH	UG/L	14600.000	13900.000	4.91%
SW	METALS	SW00392	D	COPPER	SW07003CH	SW07001CH	UG/L	8.100	4.300	61.29%
SW	METALS	SW00392	D	IRON	SW07003CH	SW07001CH	UG/L	228.000	50.500	127.47%
SW	METALS	SW00392	D	LEAD	SW07003CH	SW07001CH	UG/L	10.200	7.800	26.67%
SW	METALS	SW00392	D	LITHIUM	SW07003CH	SW07001CH	UG/L	5.900	5.300	10.71%
SW	METALS	SW00392	D	MAGNESIUM	SW07003CH	SW07001CH	UG/L	3520.000	3430.000	2.59%
SW	METALS	SW00392	D	MANGANESE	SW07003CH	SW07001CH	UG/L	58.100	17.900	105.79%
SW	METALS	SW00392	D	MOLYBDENUM	SW07003CH	SW07001CH	UG/L	4.300	3.000	35.62%
SW	METALS	SW00392	D	POTASSIUM	SW07003CH	SW07001CH	UG/L	1580.000	1100.000	35.82%
SW	METALS	SW00392	D	SILICON	SW07003CH	SW07001CH	UG/L	3390.000	3330.000	1.79%
SW	METALS	SW00392	D	SODIUM	SW07003CH	SW07001CH	UG/L	7270.000	7160.000	1.52%
SW	METALS	SW00392	D	STRONTIUM	SW07003CH	SW07001CH	UG/L	102.000	102.000	0.00%
SW	METALS	SW00392	D	ZINC	SW07003CH	SW07001CH	UG/L	44.900	18.900	81.50%
SW	METALS	SW02092	D	ALUMINUM	SW07112CH	SW07111CH	UG/L	18.500	15.900	15.12%
SW	METALS	SW02092	D	ARSENIC	SW07112CH	SW07111CH	UG/L	4.000	3.900	2.53%
SW	METALS	SW02092	D	BARIUM	SW07112CH	SW07111CH	UG/L	31.400	31.400	0.00%
SW	METALS	SW02092	D	CALCIUM	SW07112CH	SW07111CH	UG/L	14200.000	14300.000	.70%
SW	METALS	SW02092	D	COBALT	SW07112CH	SW07111CH	UG/L	1.800	1.700	5.71%
SW	METALS	SW02092	D	IRON	SW07112CH	SW07111CH	UG/L	9.300	14.800	45.64%
SW	METALS	SW02092	D	LEAD	SW07112CH	SW07111CH	UG/L	3.800	2.200	53.33%
SW	METALS	SW02092	D	LITHIUM	SW07112CH	SW07111CH	UG/L	7.400	10.700	36.46%
SW	METALS	SW02092	D	MAGNESIUM	SW07112CH	SW07111CH	UG/L	6780.000	6820.000	.59%
SW	METALS	SW02092	D	MANGANESE	SW07112CH	SW07111CH	UG/L	3.000	3.200	6.45%
SW	METALS	SW02092	D	POTASSIUM	SW07112CH	SW07111CH	UG/L	626.000	628.000	.32%
SW	METALS	SW02092	D	SILICON	SW07112CH	SW07111CH	UG/L	669.000	809.000	18.94%
SW	METALS	SW02092	D	SODIUM	SW07112CH	SW07111CH	UG/L	30600.000	30900.000	.98%
SW	METALS	SW02092	D	STRONTIUM	SW07112CH	SW07111CH	UG/L	137.000	138.000	.73%
SW	METALS	SW02092	D	VANADIUM	SW07112CH	SW07111CH	UG/L	6.100	5.100	17.86%
SW	METALS	SW02792	D	ARSENIC	SW07215CH	SW07214CH	UG/L	4.300	2.800	2.25%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SW	METALS	SW02792	D	BARIUM	SW07215CH	SW07214CH	UG/L	23.700	24.100	1.67%
SW	METALS	SW02792	D	CALCIUM	SW07215CH	SW07214CH	UG/L	12700.000	13200.000	3.86%
SW	METALS	SW02792	D	IRON	SW07215CH	SW07214CH	UG/L	7.000	54.000	154.10%
SW	METALS	SW02792	D	LEAD	SW07215CH	SW07214CH	UG/L	5.600	1.900	98.67%
SW	METALS	SW02792	D	LITHIUM	SW07215CH	SW07214CH	UG/L	8.700	10.700	20.62%
SW	METALS	SW02792	D	MAGNESIUM	SW07215CH	SW07214CH	UG/L	6090.000	6320.000	3.71%
SW	METALS	SW02792	D	MANGANESE	SW07215CH	SW07214CH	UG/L	2.700	3.700	31.25%
SW	METALS	SW02792	D	POTASSIUM	SW07215CH	SW07214CH	UG/L	507.000	497.000	1.99%
SW	METALS	SW02792	D	SILICON	SW07215CH	SW07214CH	UG/L	515.000	422.000	19.85%
SW	METALS	SW02792	D	SODIUM	SW07215CH	SW07214CH	UG/L	31200.000	32600.000	4.39%
SW	METALS	SW02792	D	STRONTIUM	SW07215CH	SW07214CH	UG/L	123.000	128.000	3.98%
SW	METALS	SW02792	D	VANADIUM	SW07215CH	SW07214CH	UG/L	5.200	4.500	14.43%
SW	METALS	SW03092	D	ARSENIC	SW07017CH	SW07016CH	UG/L	4.300	3.100	32.43%
SW	METALS	SW03092	D	BARIUM	SW07017CH	SW07016CH	UG/L	21.600	22.600	4.52%
SW	METALS	SW03092	D	CALCIUM	SW07017CH	SW07016CH	UG/L	11400.000	11800.000	3.45%
SW	METALS	SW03092	D	IRON	SW07017CH	SW07016CH	UG/L	71.100	21.800	106.14%
SW	METALS	SW03092	D	LEAD	SW07017CH	SW07016CH	UG/L	11.400	4.900	79.75%
SW	METALS	SW03092	D	LITHIUM	SW07017CH	SW07016CH	UG/L	6.600	8.100	20.41%
SW	METALS	SW03092	D	MAGNESIUM	SW07017CH	SW07016CH	UG/L	7100.000	7040.000	.85%
SW	METALS	SW03092	D	MANGANESE	SW07017CH	SW07016CH	UG/L	4.400	8.000	58.06%
SW	METALS	SW03092	D	POTASSIUM	SW07017CH	SW07016CH	UG/L	184.000	238.000	25.59%
SW	METALS	SW03092	D	SILICON	SW07017CH	SW07016CH	UG/L	2710.000	3070.000	12.46%
SW	METALS	SW03092	D	SODIUM	SW07017CH	SW07016CH	UG/L	27700.000	28000.000	1.08%
SW	METALS	SW03092	D	STRONTIUM	SW07017CH	SW07016CH	UG/L	114.000	121.000	5.96%
SW	METALS	SW03192	D	BARIUM	SW07220CH	SW07219CH	UG/L	36.800	36.200	1.64%
SW	METALS	SW03192	D	CALCIUM	SW07220CH	SW07219CH	UG/L	23000.000	23100.000	.43%
SW	METALS	SW03192	D	IRON	SW07220CH	SW07219CH	UG/L	39.500	16.200	83.66%
SW	METALS	SW03192	D	LEAD	SW07220CH	SW07219CH	UG/L	2.300	2.300	0.00%
SW	METALS	SW03192	D	LITHIUM	SW07220CH	SW07219CH	UG/L	8.200	8.600	4.76%
SW	METALS	SW03192	D	MAGNESIUM	SW07220CH	SW07219CH	UG/L	5360.000	5380.000	.37%
SW	METALS	SW03192	D	MOLYBDENUM	SW07220CH	SW07219CH	UG/L	8.800	5.000	55.07%
SW	METALS	SW03192	D	POTASSIUM	SW07220CH	SW07219CH	UG/L	1890.000	1910.000	1.05%
SW	METALS	SW03192	D	SELENIUM	SW07220CH	SW07219CH	UG/L	3.000	3.000	0.00%
SW	METALS	SW03192	D	SILICON	SW07220CH	SW07219CH	UG/L	920.000	915.000	.54%
SW	METALS	SW03192	D	SODIUM	SW07220CH	SW07219CH	UG/L	11900.000	12000.000	.84%

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Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
GW	METALS	49292	D	ARSENIC	GW30055CH	GW30025CH	UG/L	3.800	3.500	8.22%
GW	METALS	49292	D	BARIUM	GW30055CH	GW30025CH	UG/L	35.000	35.500	1.42%
GW	METALS	49292	D	CALCIUM	GW30055CH	GW30025CH	UG/L	89900.000	91200.000	1.44%
GW	METALS	49292	D	IRON	GW30055CH	GW30025CH	UG/L	599.000	594.000	.84%
GW	METALS	49292	D	LITHIUM	GW30055CH	GW30025CH	UG/L	81.400	82.100	.86%
GW	METALS	49292	D	MAGNESIUM	GW30055CH	GW30025CH	UG/L	22700.000	22800.000	.44%
GW	METALS	49292	D	MANGANESE	GW30055CH	GW30025CH	UG/L	64.900	71.300	9.40%
GW	METALS	49292	D	POTASSIUM	GW30055CH	GW30025CH	UG/L	3650.000	3980.000	8.65%
GW	METALS	49292	D	SILICON	GW30055CH	GW30025CH	UG/L	5500.000	5420.000	1.47%
GW	METALS	49292	D	SODIUM	GW30055CH	GW30025CH	UG/L	271000.000	268000.000	1.11%
GW	METALS	49292	D	STRONTIUM	GW30055CH	GW30025CH	UG/L	1140.000	1130.000	.88%
GW	METALS	49292	T	ALUMINUM	GW30055CH	GW30025CH	UG/L	338.000	198.000	52.24%
GW	METALS	49292	T	ARSENIC	GW30055CH	GW30025CH	UG/L	3.200	3.000	6.45%
GW	METALS	49292	T	BARIUM	GW30055CH	GW30025CH	UG/L	38.500	37.200	3.43%
GW	METALS	49292	T	CALCIUM	GW30055CH	GW30025CH	UG/L	87300.000	87300.000	0.00%
GW	METALS	49292	T	COPPER	GW30055CH	GW30025CH	UG/L	4.400	2.500	55.07%
GW	METALS	49292	T	IRON	GW30055CH	GW30025CH	UG/L	1300.000	1080.000	18.49%
GW	METALS	49292	T	LITHIUM	GW30055CH	GW30025CH	UG/L	74.400	74.600	.27%
GW	METALS	49292	T	MAGNESIUM	GW30055CH	GW30025CH	UG/L	21400.000	21500.000	.47%
GW	METALS	49292	T	MANGANESE	GW30055CH	GW30025CH	UG/L	70.200	73.100	4.05%
GW	METALS	49292	T	POTASSIUM	GW30055CH	GW30025CH	UG/L	3770.000	3440.000	9.15%
GW	METALS	49292	T	SILICON	GW30055CH	GW30025CH	UG/L	5930.000	5600.000	5.72%
GW	METALS	49292	T	SODIUM	GW30055CH	GW30025CH	UG/L	258000.000	256000.000	.78%
GW	METALS	49292	T	STRONTIUM	GW30055CH	GW30025CH	UG/L	1090.000	1080.000	.92%
GW	RADIONUCLIDES	49292	D	URANIUM-233/234	GW30055CH	GW30025CH	PCI/L	.312	.338	8.13%
GW	RADIONUCLIDES	49292	D	URANIUM-235	GW30055CH	GW30025CH	PCI/L	-.011	-.004	96.39%
GW	RADIONUCLIDES	49292	D	URANIUM-238	GW30055CH	GW30025CH	PCI/L	.134	.087	42.62%
GW	RADIONUCLIDES	49292	T	AMERICIUM-241	GW30055CH	GW30025CH	PCI/L	.001	.002	62.90%
GW	RADIONUCLIDES	49292	T	PLUTONIUM-239/240	GW30055CH	GW30025CH	PCI/L	-.001	.002	582.58%
GW	WATER-QUALITY	49292	T	BICARBONATE AS CACO3	GW30055CH	GW30025CH	MG/L	420.000	420.000	0.00%
GW	WATER-QUALITY	49292	T	CHLORIDE	GW30055CH	GW30025CH	MG/L	32.790	34.100	3.92%
GW	WATER-QUALITY	49292	T	FLUORIDE	GW30055CH	GW30025CH	MG/L	.900	.900	0.00%
GW	WATER-QUALITY	49292	T	NITRATE/NITRITE	GW30055CH	GW30025CH	MG/L	.060	.300	133.33%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SW	METALS	SW03192	D	STRONTIUM	SW07220CH	SW07219CH	UG/L	162.000	163.000	.62%
SW	METALS	SW03192	D	TIN	SW07220CH	SW07219CH	UG/L	12.200	9.200	28.04%
SW	METALS	SW03192	D	ZINC	SW07220CH	SW07219CH	UG/L	12.200	12.600	3.23%
SW	METALS	SW03292	D	ALUMINUM	SW07027CH	SW07023CH	UG/L	431.000	117.000	114.60%
SW	METALS	SW03292	D	BARIUM	SW07027CH	SW07023CH	UG/L	37.200	33.000	11.97%
SW	METALS	SW03292	D	CALCIUM	SW07027CH	SW07023CH	UG/L	23200.000	21700.000	6.68%
SW	METALS	SW03292	D	IRON	SW07027CH	SW07023CH	UG/L	28.600	92.400	105.45%
SW	METALS	SW03292	D	LEAD	SW07027CH	SW07023CH	UG/L	2.100	3.500	50.00%
SW	METALS	SW03292	D	LITHIUM	SW07027CH	SW07023CH	UG/L	6.400	8.600	29.33%
SW	METALS	SW03292	D	MAGNESIUM	SW07027CH	SW07023CH	UG/L	5270.000	5090.000	3.47%
SW	METALS	SW03292	D	MANGANESE	SW07027CH	SW07023CH	UG/L	26.500	9.400	95.26%
SW	METALS	SW03292	D	MOLYBDENUM	SW07027CH	SW07023CH	UG/L	2.700	2.900	7.14%
SW	METALS	SW03292	D	POTASSIUM	SW07027CH	SW07023CH	UG/L	1870.000	1790.000	4.37%
SW	METALS	SW03292	D	SILICON	SW07027CH	SW07023CH	UG/L	1270.000	1230.000	3.20%
SW	METALS	SW03292	D	SODIUM	SW07027CH	SW07023CH	UG/L	11800.000	11400.000	3.45%
SW	METALS	SW03292	D	STRONTIUM	SW07027CH	SW07023CH	UG/L	157.000	150.000	4.56%
SW	METALS	SW03292	D	ZINC	SW07027CH	SW07023CH	UG/L	12.800	15.100	16.49%
SW	METALS	SW00192	T	ALUMINUM	SW80218WCU3	SW01938WCU3	UG/L	433.000	536.000	21.26%
SW	METALS	SW00192	T	ARSENIC	SW80218WCU3	SW01938WCU3	UG/L	.700	1.200	52.63%
SW	METALS	SW00192	T	BARIUM	SW80218WCU3	SW01938WCU3	UG/L	80.100	84.500	5.35%
SW	METALS	SW00192	T	CALCIUM	SW80218WCU3	SW01938WCU3	UG/L	47200.000	49900.000	5.56%
SW	METALS	SW00192	T	IRON	SW80218WCU3	SW01938WCU3	UG/L	453.000	449.000	.89%
SW	METALS	SW00192	T	LEAD	SW80218WCU3	SW01938WCU3	UG/L	.900	1.300	36.36%
SW	METALS	SW00192	T	LITHIUM	SW80218WCU3	SW01938WCU3	UG/L	7.500	10.400	32.40%
SW	METALS	SW00192	T	MAGNESIUM	SW80218WCU3	SW01938WCU3	UG/L	11100.000	11800.000	6.11%
SW	METALS	SW00192	T	MANGANESE	SW80218WCU3	SW01938WCU3	UG/L	97.000	105.000	7.92%
SW	METALS	SW00192	T	POTASSIUM	SW80218WCU3	SW01938WCU3	UG/L	6390.000	6820.000	6.51%
SW	METALS	SW00192	T	SILICON	SW80218WCU3	SW01938WCU3	UG/L	3460.000	3980.000	13.98%
SW	METALS	SW00192	T	SODIUM	SW80218WCU3	SW01938WCU3	UG/L	40000.000	40600.000	1.49%
SW	METALS	SW00192	T	STRONTIUM	SW80218WCU3	SW01938WCU3	UG/L	306.000	327.000	6.64%
SW	METALS	SW00192	T	ZINC	SW80218WCU3	SW01938WCU3	UG/L	15.000	9.400	45.90%
SW	METALS	SW00392	T	ALUMINUM	SW07003CH	SW07001CH	UG/L	718.000	575.000	22.12%
SW	METALS	SW00392	T	BARIUM	SW07003CH	SW07001CH	UG/L	25.400	24.400	4.02%
SW	METALS	SW00392	T	CALCIUM	SW07003CH	SW07001CH	UG/L	13400.000	14000.000	4.38%
SW	METALS	SW00392	T	COPPER	SW07003CH	SW07001CH	UG/L	16.500	14.000	16.39%

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Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SW	METALS	SW00392	T	IRON	SW07003CH	SW07001CH	UG/L	1100.000	919.000	17.93%
SW	METALS	SW00392	T	LEAD	SW07003CH	SW07001CH	UG/L	10.700	9.000	17.26%
SW	METALS	SW00392	T	LITHIUM	SW07003CH	SW07001CH	UG/L	5.500	5.800	5.31%
SW	METALS	SW00392	T	MAGNESIUM	SW07003CH	SW07001CH	UG/L	3450.000	3560.000	3.14%
SW	METALS	SW00392	T	MANGANESE	SW07003CH	SW07001CH	UG/L	137.000	112.000	20.08%
SW	METALS	SW00392	T	MOLYBDENUM	SW07003CH	SW07001CH	UG/L	3.500	3.500	0.00%
SW	METALS	SW00392	T	POTASSIUM	SW07003CH	SW07001CH	UG/L	1260.000	1180.000	6.56%
SW	METALS	SW00392	T	SILICON	SW07003CH	SW07001CH	UG/L	3650.000	3600.000	1.38%
SW	METALS	SW00392	T	SODIUM	SW07003CH	SW07001CH	UG/L	6940.000	7130.000	2.70%
SW	METALS	SW00392	T	STRONTIUM	SW07003CH	SW07001CH	UG/L	98.400	102.000	3.59%
SW	METALS	SW00392	T	ZINC	SW07003CH	SW07001CH	UG/L	92.900	76.700	19.10%
SW	METALS	SW00692	T	ALUMINUM	SW80220WCU3	SW01940WCU3	UG/L	1990.000	1260.000	44.92%
SW	METALS	SW00692	T	ARSENIC	SW80220WCU3	SW01940WCU3	UG/L	1.300	1.200	8.00%
SW	METALS	SW00692	T	BARIUM	SW80220WCU3	SW01940WCU3	UG/L	27.000	24.600	9.30%
SW	METALS	SW00692	T	CALCIUM	SW80220WCU3	SW01940WCU3	UG/L	11000.000	11500.000	4.44%
SW	METALS	SW00692	T	COPPER	SW80220WCU3	SW01940WCU3	UG/L	19.800	19.300	2.56%
SW	METALS	SW00692	T	IRON	SW80220WCU3	SW01940WCU3	UG/L	2340.000	1830.000	24.46%
SW	METALS	SW00692	T	LEAD	SW80220WCU3	SW01940WCU3	UG/L	11.000	9.700	12.56%
SW	METALS	SW00692	T	MAGNESIUM	SW80220WCU3	SW01940WCU3	UG/L	2940.000	3000.000	2.02%
SW	METALS	SW00692	T	MANGANESE	SW80220WCU3	SW01940WCU3	UG/L	210.000	223.000	6.00%
SW	METALS	SW00692	T	POTASSIUM	SW80220WCU3	SW01940WCU3	UG/L	2300.000	2280.000	.87%
SW	METALS	SW00692	T	SILICON	SW80220WCU3	SW01940WCU3	UG/L	7660.000	5650.000	30.20%
SW	METALS	SW00692	T	SODIUM	SW80220WCU3	SW01940WCU3	UG/L	4610.000	4750.000	2.99%
SW	METALS	SW00692	T	STRONTIUM	SW80220WCU3	SW01940WCU3	UG/L	77.900	76.300	2.08%
SW	METALS	SW00692	T	ZINC	SW80220WCU3	SW01940WCU3	UG/L	158.000	163.000	3.12%
SW	METALS	SW02092	T	ALUMINUM	SW07112CH	SW07111CH	UG/L	196.000	314.000	46.27%
SW	METALS	SW02092	T	ARSENIC	SW07112CH	SW07111CH	UG/L	4.300	4.700	8.89%
SW	METALS	SW02092	T	BARIUM	SW07112CH	SW07111CH	UG/L	34.700	36.500	5.06%
SW	METALS	SW02092	T	CALCIUM	SW07112CH	SW07111CH	UG/L	13900.000	14400.000	3.53%
SW	METALS	SW02092	T	IRON	SW07112CH	SW07111CH	UG/L	246.000	313.000	23.97%
SW	METALS	SW02092	T	LEAD	SW07112CH	SW07111CH	UG/L	3.100	2.100	38.46%
SW	METALS	SW02092	T	LITHIUM	SW07112CH	SW07111CH	UG/L	8.900	11.100	22.00%
SW	METALS	SW02092	T	MAGNESIUM	SW07112CH	SW07111CH	UG/L	6550.000	6810.000	3.89%
SW	METALS	SW02092	T	MANGANESE	SW07112CH	SW07111CH	UG/L	27.800	28.800	3.53%
SW	METALS	SW02092	T	POTASSIUM	SW07112CH	SW07111CH	UG/L	640.000	679.000	5.91%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SW	METALS	SW02092	T	SILICON	SW07112CH	SW07111CH	UG/L	560.000	604.000	7.56%
SW	METALS	SW02092	T	SODIUM	SW07112CH	SW07111CH	UG/L	29200.000	30500.000	4.36%
SW	METALS	SW02092	T	STRONTIUM	SW07112CH	SW07111CH	UG/L	131.000	137.000	4.48%
SW	METALS	SW02092	T	VANADIUM	SW07112CH	SW07111CH	UG/L	6.400	6.400	0.00%
SW	METALS	SW02092	T	ZINC	SW07112CH	SW07111CH	UG/L	9.400	11.300	18.36%
SW	METALS	SW02792	T	ALUMINUM	SW07215CH	SW07214CH	UG/L	166.000	126.000	27.40%
SW	METALS	SW02792	T	ARSENIC	SW07215CH	SW07214CH	UG/L	6.000	5.600	6.90%
SW	METALS	SW02792	T	BARIUM	SW07215CH	SW07214CH	UG/L	26.000	26.300	1.15%
SW	METALS	SW02792	T	CALCIUM	SW07215CH	SW07214CH	UG/L	12600.000	12800.000	1.57%
SW	METALS	SW02792	T	IRON	SW07215CH	SW07214CH	UG/L	133.000	154.000	14.63%
SW	METALS	SW02792	T	LEAD	SW07215CH	SW07214CH	UG/L	37.200	29.500	23.09%
SW	METALS	SW02792	T	LITHIUM	SW07215CH	SW07214CH	UG/L	6.900	6.400	7.52%
SW	METALS	SW02792	T	MAGNESIUM	SW07215CH	SW07214CH	UG/L	5870.000	6000.000	2.19%
SW	METALS	SW02792	T	MANGANESE	SW07215CH	SW07214CH	UG/L	15.000	13.900	7.61%
SW	METALS	SW02792	T	POTASSIUM	SW07215CH	SW07214CH	UG/L	740.000	494.000	39.87%
SW	METALS	SW02792	T	SILICON	SW07215CH	SW07214CH	UG/L	372.000	360.000	3.28%
SW	METALS	SW02792	T	SODIUM	SW07215CH	SW07214CH	UG/L	29800.000	30700.000	2.98%
SW	METALS	SW02792	T	STRONTIUM	SW07215CH	SW07214CH	UG/L	120.000	123.000	2.47%
SW	METALS	SW02792	T	VANADIUM	SW07215CH	SW07214CH	UG/L	4.800	3.900	20.69%
SW	METALS	SW03092	T	ALUMINUM	SW07017CH	SW07016CH	UG/L	78.900	82.300	4.22%
SW	METALS	SW03092	T	ARSENIC	SW07017CH	SW07016CH	UG/L	4.000	4.000	0.00%
SW	METALS	SW03092	T	BARIUM	SW07017CH	SW07016CH	UG/L	23.000	22.900	.44%
SW	METALS	SW03092	T	CALCIUM	SW07017CH	SW07016CH	UG/L	12100.000	11800.000	2.51%
SW	METALS	SW03092	T	IRON	SW07017CH	SW07016CH	UG/L	126.000	139.000	9.81%
SW	METALS	SW03092	T	LEAD	SW07017CH	SW07016CH	UG/L	5.300	9.800	59.60%
SW	METALS	SW03092	T	LITHIUM	SW07017CH	SW07016CH	UG/L	8.600	8.600	0.00%
SW	METALS	SW03092	T	MAGNESIUM	SW07017CH	SW07016CH	UG/L	7230.000	7170.000	.83%
SW	METALS	SW03092	T	MANGANESE	SW07017CH	SW07016CH	UG/L	26.500	37.000	33.07%
SW	METALS	SW03092	T	POTASSIUM	SW07017CH	SW07016CH	UG/L	204.000	168.000	19.35%
SW	METALS	SW03092	T	SILICON	SW07017CH	SW07016CH	UG/L	2660.000	2740.000	2.96%
SW	METALS	SW03092	T	SODIUM	SW07017CH	SW07016CH	UG/L	27700.000	27500.000	.72%
SW	METALS	SW03092	T	STRONTIUM	SW07017CH	SW07016CH	UG/L	114.000	121.000	5.96%
SW	METALS	SW03092	T	ZINC	SW07017CH	SW07016CH	UG/L	11.900	11.400	4.29%
SW	METALS	SW03192	T	ALUMINUM	SW07220CH	SW07219CH	UG/L	238.000	226.000	5.17%
SW	METALS	SW03192	T	BARIUM	SW07220CH	SW07219CH	UG/L	35.700	36.400	1.94%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SW	METALS	SW03192	T	CALCIUM	SW07220CH	SW07219CH	UG/L	22200.000	22600.000	1.79%
SW	METALS	SW03192	T	IRON	SW07220CH	SW07219CH	UG/L	204.000	208.000	1.94%
SW	METALS	SW03192	T	LEAD	SW07220CH	SW07219CH	UG/L	2.700	4.300	45.71%
SW	METALS	SW03192	T	LITHIUM	SW07220CH	SW07219CH	UG/L	8.900	8.500	4.60%
SW	METALS	SW03192	T	MAGNESIUM	SW07220CH	SW07219CH	UG/L	5160.000	5250.000	1.73%
SW	METALS	SW03192	T	MANGANESE	SW07220CH	SW07219CH	UG/L	12.700	13.400	5.36%
SW	METALS	SW03192	T	MOLYBDENUM	SW07220CH	SW07219CH	UG/L	6.600	4.200	44.44%
SW	METALS	SW03192	T	POTASSIUM	SW07220CH	SW07219CH	UG/L	1900.000	1920.000	1.05%
SW	METALS	SW03192	T	SILICON	SW07220CH	SW07219CH	UG/L	1010.000	1010.000	0.00%
SW	METALS	SW03192	T	SODIUM	SW07220CH	SW07219CH	UG/L	11400.000	11600.000	1.74%
SW	METALS	SW03192	T	STRONTIUM	SW07220CH	SW07219CH	UG/L	158.000	161.000	1.88%
SW	METALS	SW03192	T	ZINC	SW07220CH	SW07219CH	UG/L	16.800	15.200	10.00%
SW	METALS	SW03292	T	ALUMINUM	SW07027CH	SW07023CH	UG/L	165.000	411.000	85.42%
SW	METALS	SW03292	T	BARIUM	SW07027CH	SW07023CH	UG/L	34.500	35.700	3.42%
SW	METALS	SW03292	T	CALCIUM	SW07027CH	SW07023CH	UG/L	22000.000	22100.000	.45%
SW	METALS	SW03292	T	COPPER	SW07027CH	SW07023CH	UG/L	2.800	3.900	32.84%
SW	METALS	SW03292	T	IRON	SW07027CH	SW07023CH	UG/L	128.000	134.000	4.58%
SW	METALS	SW03292	T	LEAD	SW07027CH	SW07023CH	UG/L	3.300	2.900	12.90%
SW	METALS	SW03292	T	LITHIUM	SW07027CH	SW07023CH	UG/L	9.000	7.300	20.86%
SW	METALS	SW03292	T	MAGNESIUM	SW07027CH	SW07023CH	UG/L	5160.000	5080.000	1.56%
SW	METALS	SW03292	T	MANGANESE	SW07027CH	SW07023CH	UG/L	11.200	26.000	79.57%
SW	METALS	SW03292	T	POTASSIUM	SW07027CH	SW07023CH	UG/L	1800.000	1830.000	1.65%
SW	METALS	SW03292	T	SILICON	SW07027CH	SW07023CH	UG/L	1280.000	1230.000	3.98%
SW	METALS	SW03292	T	SODIUM	SW07027CH	SW07023CH	UG/L	11600.000	11300.000	2.62%
SW	METALS	SW03292	T	STRONTIUM	SW07027CH	SW07023CH	UG/L	152.000	150.000	1.32%
SW	METALS	SW03292	T	ZINC	SW07027CH	SW07023CH	UG/L	16.200	20.600	23.91%
SW	RADIONUCLIDES	SW00392	D	GROSS ALPHA	SW07003CH	SW07001CH	PCI/L	.880	1.400	45.61%
SW	RADIONUCLIDES	SW00392	D	PLUTONIUM-239/240	SW07003CH	SW07001CH	PCI/L	.006	.001	142.86%
SW	RADIONUCLIDES	SW00392	D	URANIUM-233/234	SW07003CH	SW07001CH	PCI/L	.480	.370	25.88%
SW	RADIONUCLIDES	SW00392	D	URANIUM-238	SW07003CH	SW07001CH	PCI/L	.380	.370	2.67%
SW	RADIONUCLIDES	SW02792	D	URANIUM-233/234	SW07215CH	SW07214CH	PCI/L	.580	.840	36.62%
SW	RADIONUCLIDES	SW03192	D	AMERICIUM-241	SW07220CH	SW07219CH	PCI/L	.005	.006	20.79%
SW	RADIONUCLIDES	SW03192	D	GROSS ALPHA	SW07220CH	SW07219CH	PCI/L	1.080	.958	12.01%
SW	RADIONUCLIDES	SW03192	D	GROSS BETA	SW07220CH	SW07219CH	PCI/L	2.817	2.998	6.23%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SW	RADIONUCLIDES	SW03192	D	PLUTONIUM-239/240	SW07220CH	SW07219CH	PCI/L	.001	.001	73.85%
SW	RADIONUCLIDES	SW03192	D	URANIUM-233/234	SW07220CH	SW07219CH	PCI/L	.675	.546	21.11%
SW	RADIONUCLIDES	SW03192	D	URANIUM-235	SW07220CH	SW07219CH	PCI/L	-.004	-.012	93.37%
SW	RADIONUCLIDES	SW03192	D	URANIUM-238	SW07220CH	SW07219CH	PCI/L	.341	.377	10.09%
SW	RADIONUCLIDES	SW00392	T	PLUTONIUM-239/240	SW07003CH	SW07001CH	PCI/L	.001	.004	120.00%
SW	RADIONUCLIDES	SW00392	T	URANIUM-235	SW07003CH	SW07001CH	PCI/L	.170	.160	6.06%
SW	RADIONUCLIDES	SW00692	T	AMERICIUM-241	SW80220WCU3	SW01940WCU3	PCI/L	.006	.005	18.18%
SW	RADIONUCLIDES	SW00692	T	GROSS ALPHA	SW80220WCU3	SW01940WCU3	PCI/L	1.900	.910	70.46%
SW	RADIONUCLIDES	SW00692	T	GROSS BETA	SW80220WCU3	SW01940WCU3	PCI/L	4.600	2.900	45.33%
SW	RADIONUCLIDES	SW00692	T	URANIUM-233/234	SW80220WCU3	SW01940WCU3	PCI/L	1.200	1.100	8.70%
SW	RADIONUCLIDES	SW00692	T	URANIUM-238	SW80220WCU3	SW01940WCU3	PCI/L	.870	.820	5.92%
SW	RADIONUCLIDES	SW02792	T	GROSS BETA	SW07215CH	SW07214CH	PCI/L	3.000	4.800	46.15%
SW	RADIONUCLIDES	SW02792	T	PLUTONIUM-239/240	SW07215CH	SW07214CH	PCI/L	.006	.004	50.00%
SW	RADIONUCLIDES	SW02792	T	URANIUM-238	SW07215CH	SW07214CH	PCI/L	.500	.360	32.56%
SW	RADIONUCLIDES	SW03092	T	AMERICIUM-241	SW07017CH	SW07016CH	PCI/L	.005	.019	116.67%
SW	RADIONUCLIDES	SW03092	T	GROSS ALPHA	SW07017CH	SW07016CH	PCI/L	1.200	1.500	22.22%
SW	RADIONUCLIDES	SW03092	T	URANIUM-233/234	SW07017CH	SW07016CH	PCI/L	.490	.730	39.34%
SW	RADIONUCLIDES	SW03192	T	AMERICIUM-241	SW07220CH	SW07219CH	PCI/L	.013	0.000	200.00%
SW	RADIONUCLIDES	SW03192	T	GROSS ALPHA	SW07220CH	SW07219CH	PCI/L	.622	1.092	54.89%
SW	RADIONUCLIDES	SW03192	T	GROSS BETA	SW07220CH	SW07219CH	PCI/L	2.487	2.147	14.67%
SW	RADIONUCLIDES	SW03192	T	PLUTONIUM-239/240	SW07220CH	SW07219CH	PCI/L	.002	-.001	448.37%
SW	RADIONUCLIDES	SW03192	T	URANIUM-233/234	SW07220CH	SW07219CH	PCI/L	.549	.675	20.68%
SW	RADIONUCLIDES	SW03192	T	URANIUM-235	SW07220CH	SW07219CH	PCI/L	.035	-.022	878.07%
SW	RADIONUCLIDES	SW03192	T	URANIUM-238	SW07220CH	SW07219CH	PCI/L	.438	.830	61.76%
SW	RADIONUCLIDES	SW03292	T	AMERICIUM-241	SW07027CH	SW07023CH	PCI/L	.011	.006	58.82%
SW	RADIONUCLIDES	SW03292	T	GROSS ALPHA	SW07027CH	SW07023CH	PCI/L	1.900	1.300	37.50%
SW	RADIONUCLIDES	SW03292	T	PLUTONIUM-239/240	SW07027CH	SW07023CH	PCI/L	.004	.003	28.57%
SW	RADIONUCLIDES	SW03292	T	URANIUM-233/234	SW07027CH	SW07023CH	PCI/L	.700	.780	10.81%
SW	RADIONUCLIDES	SW03292	T	URANIUM-238	SW07027CH	SW07023CH	PCI/L	.850	.520	48.18%
SW	WATER-QUALITY	SW00192	T	AMMONIA	SW80218WCU3	SW01938WCU3	MG/L	1.100	1.100	0.00%
SW	WATER-QUALITY	SW00192	T	BICARBONATE AS CACO3	SW80218WCU3	SW01938WCU3	MG/L	132.000	133.000	.75%
SW	WATER-QUALITY	SW00192	T	CHLORIDE	SW80218WCU3	SW01938WCU3	MG/L	61.600	49.500	21.78%
SW	WATER-QUALITY	SW00192	T	FLUORIDE	SW80218WCU3	SW01938WCU3	MG/L	.610	.610	0.00%
SW	WATER-QUALITY	SW00192	T	NITRATE/NITRITE	SW80218WCU3	SW01938WCU3	MG/L	1.800	1.700	5.71%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SW	WATER-QUALITY	SW00192	T	PHOSPHORUS	SW80218WCU3	SW01938WCU3	MG/L	.094	.130	32.14%
SW	WATER-QUALITY	SW00192	T	SULFATE	SW80218WCU3	SW01938WCU3	MG/L	57.300	58.300	1.73%
SW	WATER-QUALITY	SW00192	T	TOTAL DISSOLVED SOLIDS	SW80218WCU3	SW01938WCU3	MG/L	332.000	340.000	2.38%
SW	WATER-QUALITY	SW00192	T	TOTAL SUSPENDED SOLIDS	SW80218WCU3	SW01938WCU3	MG/L	21.000	20.000	4.88%
SW	WATER-QUALITY	SW00392	T	BICARBONATE AS CACO3	SW07003CH	SW07001CH	MG/L	36.700	35.000	4.74%
SW	WATER-QUALITY	SW00392	T	FLUORIDE	SW07003CH	SW07001CH	MG/L	.326	.336	3.02%
SW	WATER-QUALITY	SW00392	T	ORTHOPHOSPHATE	SW07003CH	SW07001CH	MG/L	.060	.058	3.39%
SW	WATER-QUALITY	SW00392	T	PHOSPHORUS	SW07003CH	SW07001CH	MG/L	.072	.076	5.41%
SW	WATER-QUALITY	SW00392	T	SULFATE	SW07003CH	SW07001CH	MG/L	17.000	17.100	.59%
SW	WATER-QUALITY	SW00392	T	TOTAL DISSOLVED SOLIDS	SW07003CH	SW07001CH	MG/L	77.000	82.000	6.29%
SW	WATER-QUALITY	SW00392	T	TOTAL SUSPENDED SOLIDS	SW07003CH	SW07001CH	MG/L	22.000	17.000	25.64%
SW	WATER-QUALITY	SW00692	T	AMMONIA	SW80220WCU3	SW01940WCU3	MG/L	.860	.720	17.72%
SW	WATER-QUALITY	SW00692	T	BICARBONATE AS CACO3	SW80220WCU3	SW01940WCU3	MG/L	24.100	20.100	18.10%
SW	WATER-QUALITY	SW00692	T	CHLORIDE	SW80220WCU3	SW01940WCU3	MG/L	5.000	11.100	75.78%
SW	WATER-QUALITY	SW00692	T	FLUORIDE	SW80220WCU3	SW01940WCU3	MG/L	.410	.400	2.47%
SW	WATER-QUALITY	SW00692	T	PHOSPHORUS	SW80220WCU3	SW01940WCU3	MG/L	.100	.089	11.64%
SW	WATER-QUALITY	SW00692	T	SULFATE	SW80220WCU3	SW01940WCU3	MG/L	20.900	20.800	.48%
SW	WATER-QUALITY	SW00692	T	TOTAL DISSOLVED SOLIDS	SW80220WCU3	SW01940WCU3	MG/L	74.000	82.000	10.26%
SW	WATER-QUALITY	SW02092	T	AMMONIA	SW07112CH	SW07111CH	MG/L	.050	.055	9.52%
SW	WATER-QUALITY	SW02092	T	BICARBONATE AS CACO3	SW07112CH	SW07111CH	MG/L	39.100	39.300	.51%
SW	WATER-QUALITY	SW02092	T	CARBONATE AS CACO3	SW07112CH	SW07111CH	MG/L	42.800	42.000	1.89%
SW	WATER-QUALITY	SW02092	T	CHLORIDE	SW07112CH	SW07111CH	MG/L	22.100	21.900	.91%
SW	WATER-QUALITY	SW02092	T	FLUORIDE	SW07112CH	SW07111CH	MG/L	.593	.576	2.91%
SW	WATER-QUALITY	SW02092	T	SULFATE	SW07112CH	SW07111CH	MG/L	16.100	16.300	1.23%
SW	WATER-QUALITY	SW02092	T	TOTAL DISSOLVED SOLIDS	SW07112CH	SW07111CH	MG/L	152.000	152.000	0.00%
SW	WATER-QUALITY	SW02092	T	TOTAL SUSPENDED SOLIDS	SW07112CH	SW07111CH	MG/L	10.000	8.000	22.22%
SW	WATER-QUALITY	SW02792	T	BICARBONATE AS CACO3	SW07215CH	SW07214CH	MG/L	33.900	33.100	2.39%
SW	WATER-QUALITY	SW02792	T	CARBONATE AS CACO3	SW07215CH	SW07214CH	MG/L	43.200	43.800	1.38%
SW	WATER-QUALITY	SW02792	T	CHLORIDE	SW07215CH	SW07214CH	MG/L	23.900	24.600	2.89%
SW	WATER-QUALITY	SW02792	T	FLUORIDE	SW07215CH	SW07214CH	MG/L	.684	.684	0.00%
SW	WATER-QUALITY	SW02792	T	SULFATE	SW07215CH	SW07214CH	MG/L	15.600	15.600	0.00%
SW	WATER-QUALITY	SW02792	T	TOTAL DISSOLVED SOLIDS	SW07215CH	SW07214CH	MG/L	174.000	181.000	3.94%
SW	WATER-QUALITY	SW03092	T	BICARBONATE AS CACO3	SW07017CH	SW07016CH	MG/L	18.500	25.300	31.05%
SW	WATER-QUALITY	SW03092	T	CARBONATE AS CACO3	SW07017CH	SW07016CH	MG/L	52.200	46.600	11.34%
SW	WATER-QUALITY	SW03092	T	FLUORIDE	SW07017CH	SW07016CH	MG/L	.609	.609	0.00%

Table G-7
Validation Counts for Real Samples
By Medium and Sample Analysis

Medium	Sample Analysis	Location Code	T/D	Chemical Name	Duplicate Sample Num	Real Sample Num	Units	Real Result	Dup Result	RPD
SW	WATER-QUALITY	SW03092	T	OIL AND GREASE	SW07017CH	SW07016CH	MG/L	19.500	7.540	88.46%
SW	WATER-QUALITY	SW03092	T	ORTHOPHOSPHATE	SW07017CH	SW07016CH	MG/L	.185	.286	42.89%
SW	WATER-QUALITY	SW03092	T	PHOSPHORUS	SW07017CH	SW07016CH	MG/L	.072	.078	8.00%
SW	WATER-QUALITY	SW03092	T	SULFATE	SW07017CH	SW07016CH	MG/L	18.600	18.400	1.08%
SW	WATER-QUALITY	SW03092	T	TOTAL DISSOLVED SOLIDS	SW07017CH	SW07016CH	MG/L	175.000	180.000	2.82%
SW	WATER-QUALITY	SW03192	T	BICARBONATE AS CACO3	SW07220CH	SW07219CH	MG/L	52.800	52.400	.76%
SW	WATER-QUALITY	SW03192	T	CHLORIDE	SW07220CH	SW07219CH	MG/L	7.820	8.080	3.27%
SW	WATER-QUALITY	SW03192	T	FLUORIDE	SW07220CH	SW07219CH	MG/L	.564	.572	1.41%
SW	WATER-QUALITY	SW03192	T	SULFATE	SW07220CH	SW07219CH	MG/L	41.000	41.000	0.00%
SW	WATER-QUALITY	SW03192	T	TOTAL DISSOLVED SOLIDS	SW07220CH	SW07219CH	MG/L	109.000	101.000	7.62%
SW	WATER-QUALITY	SW03292	T	BICARBONATE AS CACO3	SW07027CH	SW07023CH	MG/L	50.100	50.300	.40%
SW	WATER-QUALITY	SW03292	T	FLUORIDE	SW07027CH	SW07023CH	MG/L	.571	.554	3.02%
SW	WATER-QUALITY	SW03292	T	TOTAL DISSOLVED SOLIDS	SW07027CH	SW07023CH	MG/L	140.000	130.000	7.41%

Table G-8
Matrix Spike Recovery Data

Location	Sample Number	Sample Type	QC Code	Sample Date	Lab Code	Lab Batch ID	Analysis Date	Test Group	Result Type	Chemical	Result (%Rec)	Qual
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DMETADD	MS	LITHIUM	98.3	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DMETADD	MS	LITHIUM	96.9	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DMETADD	MS	MOLYBDENUM	97.9	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DMETADD	MS	MOLYBDENUM	95.3	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	11/16/92	DMETADD	MS	SILICON	86.8	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/10/92	DMETADD	MS	SILICON	92.9	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DMETADD	MS	STRONTIUM	98.2	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DMETADD	MS	STRONTIUM	95.8	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DMETADD	MS	TIN	95.3	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DMETADD	MS	TIN	95.2	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/21/92	DMETADD	MS	TOTAL RADIOCESIUM	91.5	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/28/92	DMETADD	MS	TOTAL RADIOCESIUM	88.0	
Average Percent Recovered for Test Group:											94.3	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	ALUMINUM	95.6	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	ALUMINUM	97.9	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	ANTIMONY	96.2	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	ANTIMONY	95.8	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/19/92	DSMETCLP	MS	ARSENIC	95.9	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	ARSENIC	103.0	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	BARIUM	97.4	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	BARIUM	95.2	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	BERYLLIUM	100.0	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	BERYLLIUM	99.2	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	CADMIUM	101.0	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	CADMIUM	98.1	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	CHROMIUM	95.0	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	CHROMIUM	96.5	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	COBALT	98.2	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	COBALT	96.8	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	COPPER	96.0	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	COPPER	96.2	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	IRON	94.4	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	IRON	106.0	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/18/92	DSMETCLP	MS	LEAD	88.1	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	LEAD	81.5	

Table G-8
Matrix Spike Recovery Data

Location	Sample Number	Sample Type	QC Code	Sample Date	Lab Code	Lab Batch ID	Analysis Date	Test Group	Result Type	Chemical	Result (%Rec)	Qual
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	MANGANESE	97.4	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	MANGANESE	96.9	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	10/23/92	DSMETCLP	MS	MERCURY	98.4	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	11/10/92	DSMETCLP	MS	MERCURY	77.0	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	NICKEL	97.2	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	NICKEL	97.3	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/19/92	DSMETCLP	MS	SELENIUM	43.4	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	SELENIUM	99.8	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	SILVER	85.2	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	SILVER	92.9	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/18/92	DSMETCLP	MS	THALLIUM	82.8	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	THALLIUM	80.5	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	VANADIUM	96.9	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	VANADIUM	96.0	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210119	12/04/92	DSMETCLP	MS	ZINC	98.3	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210321	12/23/92	DSMETCLP	MS	ZINC	98.1	
Average Percent Recovered for Test Group:											93.7	
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	METADD	MS	LITHIUM	93.9	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	METADD	MS	LITHIUM	101.0	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	METADD	MS	LITHIUM	86.2	
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	METADD	MS	MOLYBDENUM	89.9	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	METADD	MS	MOLYBDENUM	93.5	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	METADD	MS	MOLYBDENUM	85.1	
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	10/16/92	METADD	MS	SILICON	87.6	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	11/16/92	METADD	MS	SILICON	86.6	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/10/92	METADD	MS	SILICON	87.3	
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	METADD	MS	STRONTIUM	92.6	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	METADD	MS	STRONTIUM	96.6	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	METADD	MS	STRONTIUM	84.7	
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	METADD	MS	TIN	90.6	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	METADD	MS	TIN	94.3	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	METADD	MS	TIN	82.1	U
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	12/08/92	METADD	MS	TOTAL RADIOCESIUM	85.0	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/21/92	METADD	MS	TOTAL RADIOCESIUM	85.0	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/28/92	METADD	MS	TOTAL RADIOCESIUM	82.5	U

Table G-8
Matrix Spike Recovery Data

Location	Sample Number	Sample Type	QC Code	Sample Date	Lab Code	Lab Batch ID	Analysis Date	Test Group	Result Type	Chemical	Result (%Rec)	Qual
Average Percent Recovered for Test Group:											89.1	
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	ALUMINUM	97.7	
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	ANTIMONY	94.1	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	9/13/92	METCLP	MS	ARSENIC	96.5	
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	BARIUM	96.7	
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	BERYLLIUM	97.1	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	CADMIUM	94.6	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	CHROMIUM	95.4	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	COBALT	95.6	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	COPPER	95.9	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	IRON	97.0	
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	9/14/92	METCLP	MS	LEAD	75.1	
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	LITHIUM	93.9	
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	MANGANESE	96.1	
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/14/92	METCLP	MS	MERCURY	81.9	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	MOLYBDENUM	94.7	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	NICKEL	94.2	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	9/13/92	METCLP	MS	SELENIUM	52.4	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/13/92	METCLP	MS	SILICON	95.1	
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	SILVER	97.7	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	STRONTIUM	96.1	
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	9/14/92	METCLP	MS	THALLIUM	41.6	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	TIN	89.2	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	9/10/92	METCLP	MS	TOTAL RADIOCESIUM	93.0	
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	VANADIUM	96.6	U
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/18/92	METCLP	MS	ZINC	94.5	
Average Percent Recovered for Test Group:											90.1	
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	ALUMINUM	93.0	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	ALUMINUM	106.0	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	ALUMINUM	92.6	
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	ANTIMONY	96.0	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	ANTIMONY	94.7	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	ANTIMONY	82.4	U

Table G-8
Matrix Spike Recovery Data

Location	Sample Number	Sample Type	QC Code	Sample Date	Lab Code	Lab Batch ID	Analysis Date	Test Group	Result Type	Chemical	Result (%Rec)	Qual
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	12/05/92	SMETCLP	MS	ARSENIC	89.4	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/19/92	SMETCLP	MS	ARSENIC	95.6	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/23/92	SMETCLP	MS	ARSENIC	75.4	U
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	BARIUM	92.4	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	BARIUM	95.1	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	BARIUM	83.4	
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	BERYLLIUM	97.2	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	BERYLLIUM	94.9	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	BERYLLIUM	85.9	U
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	CADMIUM	90.9	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	CADMIUM	99.4	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	CADMIUM	88.4	U
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	CHROMIUM	93.1	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	CHROMIUM	94.1	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	CHROMIUM	84.9	U
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	COBALT	91.7	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	COBALT	97.5	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	COBALT	83.7	U
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	COPPER	92.7	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	COPPER	93.7	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	COPPER	85.8	U
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	IRON	93.3	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	IRON	99.8	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	IRON	109.0	
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	12/05/92	SMETCLP	MS	LEAD	78.5	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/18/92	SMETCLP	MS	LEAD	85.5	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/23/92	SMETCLP	MS	LEAD	95.8	
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	MANGANESE	91.8	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	MANGANESE	93.9	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	MANGANESE	83.7	
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	10/09/92	SMETCLP	MS	MERCURY	60.3	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	10/22/92	SMETCLP	MS	MERCURY	94.1	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	11/10/92	SMETCLP	MS	MERCURY	88.6	
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	NICKEL	91.9	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	NICKEL	94.3	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	NICKEL	87.6	
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	12/05/92	SMETCLP	MS	SELENIUM	63.3	U

Table G-8
Matrix Spike Recovery Data

Location	Sample Number	Sample Type	QC Code	Sample Date	Lab Code	Lab Batch ID	Analysis Date	Test Group	Result Type	Chemical	Result (%Rec)	Qual
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/19/92	SMETCLP	MS	SELENIUM	79.7	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/23/92	SMETCLP	MS	SELENIUM	54.0	U
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	SILVER	87.2	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	SILVER	90.2	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	SILVER	77.3	U
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	12/05/92	SMETCLP	MS	THALLIUM	71.3	U
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/18/92	SMETCLP	MS	THALLIUM	77.1	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/23/92	SMETCLP	MS	THALLIUM	56.0	U
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	VANADIUM	94.8	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	VANADIUM	94.3	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	VANADIUM	84.2	U
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	11/11/92	SMETCLP	MS	ZINC	91.7	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	12/03/92	SMETCLP	MS	ZINC	94.0	
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	12/20/92	SMETCLP	MS	ZINC	97.1	
Average Percent Recovered for Test Group:											88.2	
SW02192	SW07205CH	SW	REAL	10/02/92	ITAUS	xgsw 100992	10/22/92	TRIPES619	MS	ATRAZINE	99.0	
SW02192	SW07205CH	SW	REAL	10/02/92	ITAUS	xgsw 100992	10/22/92	TRIPES619	MSD	ATRAZINE	101.0	
SW03392	SW07222CH	SW	REAL	10/13/92	ITAUS	xgsw 101592	11/05/92	TRIPES619	MS	ATRAZINE	96.0	
SW03392	SW07222CH	SW	REAL	10/13/92	ITAUS	xgsw 101592	11/05/92	TRIPES619	MSD	ATRAZINE	85.0	
SW02192	SW07205CH	SW	REAL	10/02/92	ITAUS	xgsw 100992	10/22/92	TRIPES619	MS	SIMAZINE	96.0	
SW02192	SW07205CH	SW	REAL	10/02/92	ITAUS	xgsw 100992	10/22/92	TRIPES619	MSD	SIMAZINE	98.0	
SW03392	SW07222CH	SW	REAL	10/13/92	ITAUS	xgsw 101592	11/05/92	TRIPES619	MS	SIMAZINE	92.0	
SW03392	SW07222CH	SW	REAL	10/13/92	ITAUS	xgsw 101592	11/05/92	TRIPES619	MSD	SIMAZINE	85.0	
Average Percent Recovered for Test Group:											94.0	
SW02692	SW07012CH	SW	REAL	7/20/92	ITLSL	S170	7/23/92	WQPL	MS	AMMONIA	94.0	
SW01792	SW07108CH	SW	REAL	9/15/92	ITLSL	S190	10/08/92	WQPL	MS	AMMONIA	101.0	
SW02192	SW07205CH	SW	REAL	10/02/92	ITLSL	S195	10/08/92	WQPL	MS	AMMONIA	107.0	
SW03392	SW07222CH	SW	REAL	10/13/92	ITLSL	S207	10/23/92	WQPL	MS	AMMONIA	101.0	
SW02692	SW07012CH	SW	REAL	7/20/92	ITLSL	S170	7/23/92	WQPL	MS	CHLORIDE	30.0	
SW01792	SW07108CH	SW	REAL	9/15/92	ITLSL	S190	9/18/92	WQPL	MS	CHLORIDE	114.0	
SW02192	SW07205CH	SW	REAL	10/02/92	ITLSL	S195	10/08/92	WQPL	MS	CHLORIDE	106.0	
SW03392	SW07222CH	SW	REAL	10/13/92	ITLSL	S207	10/27/92	WQPL	MS	CHLORIDE	140.0	
SW03092	SW07016CH	SW	REAL	7/21/92	TMAS	S207178	8/05/92	WQPL	MS	CYANIDE	188.0	U

Table G-8
Matrix Spike Recovery Data

Location	Sample Number	Sample Type	QC Code	Sample Date	Lab Code	Lab Batch ID	Analysis Date	Test Group	Result Type	Chemical	Result (%Rec)	Qual
SW02092	SW07114CH	SW	MS	9/14/92	TMAS	S209401	9/28/92	WQPL	MS	CYANIDE	93.3	
SW02192	SW07205CH	SW	REAL	10/02/92	TMAS	S210118	10/16/92	WQPL	MS	CYANIDE	105.0	U
SW03592	SW07225CH	SW	REAL	10/14/92	TMAS	S210319	10/26/92	WQPL	MS	CYANIDE	90.4	
SW02692	SW07012CH	SW	REAL	7/20/92	ITLSL	S170	7/23/92	WQPL	MS	FLUORIDE	106.0	
SW01792	SW07108CH	SW	REAL	9/15/92	ITLSL	S190	9/18/92	WQPL	MS	FLUORIDE	102.0	
SW02192	SW07205CH	SW	REAL	10/02/92	ITLSL	S195	10/08/92	WQPL	MS	FLUORIDE	106.0	
SW03392	SW07222CH	SW	REAL	10/13/92	ITLSL	S207	10/23/92	WQPL	MS	FLUORIDE	100.0	
SW02692	SW07012CH	SW	REAL	7/20/92	ITLSL	S170	1/01/00	WQPL	MS	NITRATE/NITRITE	99.0	
SW01792	SW07108CH	SW	REAL	9/15/92	ITLSL	S190	9/29/92	WQPL	MS	NITRATE/NITRITE	108.0	
SW02192	SW07205CH	SW	REAL	10/02/92	ITLSL	S195	10/12/92	WQPL	MS	NITRATE/NITRITE	130.0	
SW03392	SW07222CH	SW	REAL	10/13/92	ITLSL	S207	10/27/92	WQPL	MS	NITRATE/NITRITE	97.0	
SW01792	SW07108CH	SW	REAL	9/15/92	ITLSL	S190	9/17/92	WQPL	MS	NITRITE	101.0	
SW03092	SW07016CH	SW	REAL	7/21/92	ITLSL	S170	1/01/00	WQPL	MS	OIL AND GREASE	90.0	
SW02192	SW07205CH	SW	REAL	10/02/92	ITLSL	S195	10/13/92	WQPL	MS	OIL AND GREASE	104.0	
SW03392	SW07222CH	SW	REAL	10/13/92	ITLSL	S207	10/20/92	WQPL	MS	OIL AND GREASE	97.0	
SW02692	SW07012CH	SW	REAL	7/20/92	ITLSL	S170	7/22/92	WQPL	MS	ORTHOPHOSPHATE	105.0	
SW01892	SW07109CH	SW	REAL	9/14/92	ITLSL	S190	9/16/92	WQPL	MS	ORTHOPHOSPHATE	83.0	
SW02192	SW07205CH	SW	REAL	10/02/92	ITLSL	S195	10/04/92	WQPL	MS	ORTHOPHOSPHATE	86.0	
SW03392	SW07222CH	SW	REAL	10/13/92	ITLSL	S207	10/15/92	WQPL	MS	ORTHOPHOSPHATE	90.0	
SW02692	SW07012CH	SW	REAL	7/20/92	ITLSL	S170	8/07/92	WQPL	MS	PHOSPHORUS	100.0	
SW01792	SW07108CH	SW	REAL	9/15/92	ITLSL	S190	9/23/92	WQPL	MS	PHOSPHORUS	88.0	
SW02192	SW07205CH	SW	REAL	10/02/92	ITLSL	S195	10/21/92	WQPL	MS	PHOSPHORUS	93.0	
SW03392	SW07222CH	SW	REAL	10/13/92	ITLSL	S207	10/21/92	WQPL	MS	PHOSPHORUS	84.0	
SW02692	SW07012CH	SW	REAL	7/20/92	ITLSL	S170	7/23/92	WQPL	MS	SULFATE	115.0	
SW01792	SW07108CH	SW	REAL	9/15/92	ITLSL	S190	9/18/92	WQPL	MS	SULFATE	140.0	
SW02192	SW07205CH	SW	REAL	10/02/92	ITLSL	S195	10/08/92	WQPL	MS	SULFATE	90.0	
SW03392	SW07222CH	SW	REAL	10/13/92	ITLSL	S207	10/27/92	WQPL	MS	SULFATE	180.0	
SW03092	SW07016CH	SW	REAL	7/21/92	ITLSL	S170	7/24/92	WQPL	MS	SULFIDE	78.0	
SW02192	SW07205CH	SW	REAL	10/02/92	ITLSL	S195	10/06/92	WQPL	MS	SULFIDE	85.0	
SW03392	SW07222CH	SW	REAL	10/13/92	ITLSL	S207	10/15/92	WQPL	MS	SULFIDE	85.0	

Average Percent Recovered for Test Group: 102.9

Average Percent Recovered for Sample Type: 93.1

Table G-9
High Error Value Summary

Medium	Type of Analysis	*Total Records	Records in which Error > Result / 2
BI	Total Rads	1261	914 (72.48%)
GW	Dissolved Rads	41	25 (60.98%)
GW	Total Rads	40	30 (75.00%)
PT	Total Rads	347	160 (46.11%)
SD	Total Rads	1836	605 (32.95%)
SS	Total Rads	147	26 (17.69%)
SW	Dissolved Rads	260	225 (86.54%)
SW	Total Rads	320	267 (83.44%)

* Represents total number of records for which error values were provided.

Table G-10
Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
49292	GW	FB	GW30057CH	1/28/93		METALS	SODIUM	77.400	UG/L		B	V		201
49292	GW	FB	GW30057CH	1/28/93	D	METALS	CALCIUM	85.300	UG/L		B	JA		201
49292	GW	FB	GW30057CH	1/28/93	D	METALS	MAGNESIUM	18.600	UG/L		B	V		201
49292	GW	FB	GW30057CH	1/28/93	D	RADIONUCLIDES	URANIUM-233/234	.071	PCI/L	.133	J	A		201
49292	GW	FB	GW30057CH	1/28/93	D	RADIONUCLIDES	URANIUM-235	.171	PCI/L	.187	J	A		201
49292	GW	FB	GW30057CH	1/28/93	D	RADIONUCLIDES	URANIUM-238	.039	PCI/L	.094	J	A		201
49292	GW	FB	GW30057CH	1/28/93	T	RADIONUCLIDES	AMERICIUM-241	.007	PCI/L	.006	J	A		201
49292	GW	FB	GW30057CH	1/28/93	T	RADIONUCLIDES	PLUTONIUM-239/240	.002	PCI/L	.004	J	A		201
49292	GW	FB	GW30057CH	1/28/93		WATER-QUALITY	BICARBONATE AS CACO3	3.000	MG/L			V		201
49292	GW	FB	GW30057CH	1/28/93		WATER-QUALITY	NITRATE/NITRITE	.080	MG/L			V		201
49292	GW	RNS	GW30056CH	1/28/93		METALS	ALUMINUM	39.900	UG/L		BN	JA		201
49292	GW	RNS	GW30056CH	1/28/93		METALS	CALCIUM	329.000	UG/L		B	V		201
49292	GW	RNS	GW30056CH	1/28/93		METALS	COPPER	5.400	UG/L		B	V		201
49292	GW	RNS	GW30056CH	1/28/93		METALS	IRON	108.000	UG/L		*	JA		201
49292	GW	RNS	GW30056CH	1/28/93		METALS	MAGNESIUM	34.600	UG/L		B	JA		201
49292	GW	RNS	GW30056CH	1/28/93		METALS	MANGANESE	1.900	UG/L		B	V		201
49292	GW	RNS	GW30056CH	1/28/93		METALS	SILICON	125.000	UG/L			JA		201
49292	GW	RNS	GW30056CH	1/28/93		METALS	SODIUM	591.000	UG/L		B	V		201
49292	GW	RNS	GW30056CH	1/28/93		METALS	ZINC	45.200	UG/L			V		201
49292	GW	RNS	GW30056CH	1/28/93	D	METALS	CALCIUM	68.400	UG/L		B	JA		201
49292	GW	RNS	GW30056CH	1/28/93	D	METALS	MAGNESIUM	19.300	UG/L		B	V		201
49292	GW	RNS	GW30056CH	1/28/93	D	METALS	MANGANESE	1.900	UG/L		B	V		201
49292	GW	RNS	GW30056CH	1/28/93	D	METALS	POTASSIUM	390.000	UG/L		B	JA		201
49292	GW	RNS	GW30056CH	1/28/93	D	RADIONUCLIDES	URANIUM-233/234	.101	PCI/L	.163	J	A		201
49292	GW	RNS	GW30056CH	1/28/93	D	RADIONUCLIDES	URANIUM-235	.030	PCI/L	.116	J	A		201
49292	GW	RNS	GW30056CH	1/28/93	D	RADIONUCLIDES	URANIUM-238	.021	PCI/L	.117	J	A		201
49292	GW	RNS	GW30056CH	1/28/93	T	RADIONUCLIDES	AMERICIUM-241	.001	PCI/L	.002	J	A		201
49292	GW	RNS	GW30056CH	1/28/93		WATER-QUALITY	BICARBONATE AS CACO3	1.000	MG/L			JA		201
49292	GW	RNS	GW30056CH	1/28/93		WATER-QUALITY	NITRATE/NITRITE	.060	MG/L			V		201

Table G-10
Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
TR02792	PT	RNS	TR02013CH	10/26/92	T	RADIONUCLIDES	AMERICIUM-241	.005	PCI/L	.005	J	A		199
TR02892	PT	RNS	TR02032CH	10/23/92	T	RADIONUCLIDES	AMERICIUM-241	.003	PCI/L	.004	J	A		199
TR02992	PT	RNS	TR02051CH	10/27/92	T	RADIONUCLIDES	AMERICIUM-241	.005	PCI/L	.006	J	A		199
TR03092	PT	RNS	TR02070CH	10/23/92	T	RADIONUCLIDES	AMERICIUM-241	.004	PCI/L	.005	J	A		199
TR03292	PT	RNS	TR02108CH	10/27/92	T	RADIONUCLIDES	AMERICIUM-241	.006	PCI/L	.006	J	A		199
TR03492	PT	RNS	TR02146CH	10/21/92	T	RADIONUCLIDES	AMERICIUM-241	.006	PCI/L	.005	J	A		199
TR03592	PT	RNS	TR02165CH	10/19/92	T	RADIONUCLIDES	AMERICIUM-241	.004	PCI/L	.005	J	A		199
TR03692	PT	RNS	TR02184CH	10/26/92	T	RADIONUCLIDES	AMERICIUM-241	.005	PCI/L	.005	J	A		199
TR03792	PT	RNS	TR02203CH	10/20/92	T	RADIONUCLIDES	AMERICIUM-241	.003	PCI/L	.004	J	A		199
TR02792	PT	RNS	TR02013CH	10/26/92	T	RADIONUCLIDES	PLUTONIUM-239/240	.005	PCI/L	.005	J	A		199
TR03392	PT	RNS	TR02127CH	10/22/92	T	RADIONUCLIDES	PLUTONIUM-239/240	.006	PCI/L	.006		A		199
TR03692	PT	RNS	TR02184CH	10/26/92	T	RADIONUCLIDES	PLUTONIUM-239/240	.002	PCI/L	.004	J	A		199
TR02792	PT	RNS	TR02013CH	10/26/92	T	RADIONUCLIDES	URANIUM-238	.046	PCI/L	.092	J	A		199
TR03692	PT	RNS	TR02184CH	10/26/92	T	RADIONUCLIDES	URANIUM-238	.040	PCI/L	.095	J	A		199
SED08392	SD	RNS	SD06480CH	9/08/92		METALS	ALUMINUM	247.000	UG/L			V		201
SED09292	SD	RNS	SD06654CH	9/15/92		METALS	ALUMINUM	18.700	UG/L			JA		200
SED11392	SD	RNS	SD06122CH	9/03/92		METALS	ALUMINUM	23.300	UG/L			JA		201
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	ALUMINUM	1430.000	UG/L			V		
SED15292	SD	RNS	SD06211CH	10/06/92		METALS	ALUMINUM	37.400	UG/L			V		202
SED00392	SD	RNS	SD06012CH	7/10/92		METALS	BARIUM	1.000	UG/L			V		201
SED08392	SD	RNS	SD06480CH	9/08/92		METALS	BARIUM	3.000	UG/L			V		201
SED08692	SD	RNS	SD06567CH	9/01/92		METALS	BARIUM	1.200	UG/L			V		200
SED09292	SD	RNS	SD06654CH	9/15/92		METALS	BARIUM	2.300	UG/L			V		200
SED11392	SD	RNS	SD06122CH	9/03/92		METALS	BARIUM	1.200	UG/L			V		201
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	BARIUM	12.400	UG/L			V		
SED15292	SD	RNS	SD06211CH	10/06/92		METALS	BARIUM	.970	UG/L			JA		202
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	BARIUM	10.700	UG/L			V		202
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	BERYLLIUM	2.400	UG/L			V		202
SED00392	SD	RNS	SD06012CH	7/10/92		METALS	CADMIUM	53.900	UG/L			V		201
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	CADMIUM	3.000	UG/L			V		202
SED00392	SD	RNS	SD06012CH	7/10/92		METALS	CALCIUM	99.500	UG/L			V		201
SED08392	SD	RNS	SD06480CH	9/08/92		METALS	CALCIUM	817.000	UG/L			V		201
SED08692	SD	RNS	SD06567CH	9/01/92		METALS	CALCIUM	68.500	UG/L			V		200
SED09192	SD	RNS	SD06625CH	9/02/92		METALS	CALCIUM	136.000	UG/L			V		200
SED09292	SD	RNS	SD06654CH	9/15/92		METALS	CALCIUM	103.000	UG/L			JA		200
SED11392	SD	RNS	SD06122CH	9/03/92		METALS	CALCIUM	251.000	UG/L			V		201

Table G-1

Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	CALCIUM	1060.000	UG/L			V		
SED15292	SD	RNS	SD06211CH	10/06/92		METALS	CALCIUM	376.000	UG/L			V		202
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	CALCIUM	422.000	UG/L			V		202
SED09192	SD	RNS	SD06625CH	9/02/92		METALS	CESIUM	60.000	UG/L			V		200
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	CESIUM	90.000	UG/L			V		
SED09292	SD	RNS	SD06654CH	9/15/92		METALS	COBALT	2.200	UG/L			V		200
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	COBALT	2.600	UG/L			V		202
SED08392	SD	RNS	SD06480CH	9/08/92		METALS	COPPER	3.500	UG/L			JA		201
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	COPPER	7.200	UG/L			JA		
SED15292	SD	RNS	SD06211CH	10/06/92		METALS	COPPER	2.300	UG/L			JA		202
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	COPPER	5.300	UG/L			JA		202
SED00392	SD	RNS	SD06012CH	7/10/92		METALS	IRON	20.900	UG/L			V		201
SED08392	SD	RNS	SD06480CH	9/08/92		METALS	IRON	37.800	UG/L			JA		201
SED09292	SD	RNS	SD06654CH	9/15/92		METALS	IRON	18.300	UG/L			JA		200
SED11392	SD	RNS	SD06122CH	9/03/92		METALS	IRON	432.000	UG/L			V		201
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	IRON	1210.000	UG/L			V		
SED15292	SD	RNS	SD06211CH	10/06/92		METALS	IRON	13.800	UG/L			JA		202
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	IRON	27.800	UG/L			V		202
SED00392	SD	RNS	SD06012CH	7/10/92		METALS	LEAD	3.900	UG/L			V		201
SED08692	SD	RNS	SD06567CH	9/01/92		METALS	LEAD	1.300	UG/L			JA		200
SED09192	SD	RNS	SD06625CH	9/02/92		METALS	LEAD	2.100	UG/L			JA		200
SED09292	SD	RNS	SD06654CH	9/15/92		METALS	LEAD	2.300	UG/L			V		200
SED11392	SD	RNS	SD06122CH	9/03/92		METALS	LEAD	3.200	UG/L			JA		201
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	LEAD	3.900	UG/L			V		
SED15292	SD	RNS	SD06211CH	10/06/92		METALS	LEAD	2.200	UG/L			V		202
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	LEAD	5.400	UG/L			V		202
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	LITHIUM	5.700	UG/L			V		202
SED00392	SD	RNS	SD06012CH	7/10/92		METALS	MAGNESIUM	33.000	UG/L			JA		201
SED08392	SD	RNS	SD06480CH	9/08/92		METALS	MAGNESIUM	76.400	UG/L			JA		201
SED08692	SD	RNS	SD06567CH	9/01/92		METALS	MAGNESIUM	31.300	UG/L			JA		200
SED09292	SD	RNS	SD06654CH	9/15/92		METALS	MAGNESIUM	19.500	UG/L			V		200
SED11392	SD	RNS	SD06122CH	9/03/92		METALS	MAGNESIUM	41.800	UG/L			JA		201
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	MAGNESIUM	304.000	UG/L			V		
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	MAGNESIUM	143.000	UG/L			V		202
SED00392	SD	RNS	SD06012CH	7/10/92		METALS	MANGANESE	1.800	UG/L			V		201
SED08392	SD	RNS	SD06480CH	9/08/92		METALS	MANGANESE	18.000	UG/L			V		201
SED08692	SD	RNS	SD06567CH	9/01/92		METALS	MANGANESE	1.900	UG/L			V		200
SED09192	SD	RNS	SD06625CH	9/02/92		METALS	MANGANESE	1.800	UG/L			V		200

Table G-10
Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
SED09292	SD	RNS	SD06654CH	9/15/92		METALS	MANGANESE	5.500	UG/L			V		200
SED11392	SD	RNS	SD06122CH	9/03/92		METALS	MANGANESE	6.100	UG/L			V		201
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	MANGANESE	18.100	UG/L			V		
SED15292	SD	RNS	SD06211CH	10/06/92		METALS	MANGANESE	2.200	UG/L			V		202
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	MANGANESE	3.200	UG/L			JA		202
SED15292	SD	RNS	SD06211CH	10/06/92		METALS	MERCURY	.120	UG/L			JA		202
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	MOLYBDENUM	5.400	UG/L			JA		202
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	POTASSIUM	261.000	UG/L			V		
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	POTASSIUM	246.000	UG/L			V		202
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	SELENIUM	3.000	UG/L			JA		202
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	SILICON	329.000	UG/L			JA		
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	SILVER	2.300	UG/L			JA		202
SED00392	SD	RNS	SD06012CH	7/10/92		METALS	SODIUM	171.000	UG/L			JA		201
SED08392	SD	RNS	SD06480CH	9/08/92		METALS	SODIUM	383.000	UG/L			JA		201
SED08692	SD	RNS	SD06567CH	9/01/92		METALS	SODIUM	83.500	UG/L			V		200
SED09192	SD	RNS	SD06625CH	9/02/92		METALS	SODIUM	83.500	UG/L			V		200
SED09292	SD	RNS	SD06654CH	9/15/92		METALS	SODIUM	78.400	UG/L			JA		200
SED11392	SD	RNS	SD06122CH	9/03/92		METALS	SODIUM	277.000	UG/L			V		201
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	SODIUM	698.000	UG/L			V		
SED15292	SD	RNS	SD06211CH	10/06/92		METALS	SODIUM	109.000	UG/L			V		202
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	SODIUM	344.000	UG/L			JA		202
SED08392	SD	RNS	SD06480CH	9/08/92		METALS	STRONTIUM	2.800	UG/L			V		201
SED08692	SD	RNS	SD06567CH	9/01/92		METALS	STRONTIUM	1.100	UG/L			V		200
SED09292	SD	RNS	SD06654CH	9/15/92		METALS	STRONTIUM	2.000	UG/L			V		200
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	STRONTIUM	5.600	UG/L			V		
SED15292	SD	RNS	SD06211CH	10/06/92		METALS	STRONTIUM	1.400	UG/L			JA		202
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	STRONTIUM	2.800	UG/L			V		202
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	TIN	242.000	UG/L			JA		
SED00392	SD	RNS	SD06012CH	7/10/92		METALS	ZINC	10.200	UG/L			V		201
SED08392	SD	RNS	SD06480CH	9/08/92		METALS	ZINC	26.800	UG/L			V		201
SED08692	SD	RNS	SD06567CH	9/01/92		METALS	ZINC	16.700	UG/L			V		200
SED09192	SD	RNS	SD06625CH	9/02/92		METALS	ZINC	12.600	UG/L			V		200
SED09292	SD	RNS	SD06654CH	9/15/92		METALS	ZINC	10.500	UG/L			JA		200
SED11392	SD	RNS	SD06122CH	9/03/92		METALS	ZINC	322.000	UG/L			V		201
SED14292	SD	RNS	SD06151CH	8/28/92		METALS	ZINC	12.400	UG/L			JA		
SED15292	SD	RNS	SD06211CH	10/06/92		METALS	ZINC	46.600	UG/L			JA		202
SED15392	SD	RNS	SD06014CH	7/22/92		METALS	ZINC	26.800	UG/L			V		202

Table G-1

Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
SED15292	SD	RNS	SD06211CH	10/06/92	T	RADIONUCLIDES	GROSS ALPHA	.049	PCI/L	.118	J	A		202
SED15392	SD	RNS	SD06014CH	7/22/92	T	RADIONUCLIDES	PLUTONIUM-239/240	.005	PCI/L	.004	J	A		202
SED15292	SD	RNS	SD06211CH	10/06/92	T	RADIONUCLIDES	URANIUM-233/234	.098	PCI/L	.133	J	A		202
SED15392	SD	RNS	SD06014CH	7/22/92	T	RADIONUCLIDES	URANIUM-233/234	.200	PCI/L	.250	J	A		202
SED00392	SD	RNS	SD06012CH	7/10/92	T	RADIONUCLIDES	URANIUM-238	.120	PCI/L	.160	J	A		201
SED15392	SD	RNS	SD06014CH	7/22/92	T	RADIONUCLIDES	URANIUM-238	.260	PCI/L	.290	J	A		202
PT13392	SS	RNS	SS04616CH	2/05/93	T	RADIONUCLIDES	AMERICIUM-241	.005	PCI/G	.003			CDH	199
PT13492	SS	RNS	SS04618CH	2/24/93	T	RADIONUCLIDES	AMERICIUM-241	.150	PCI/L	.019		A	CDH	199
PT19592	SS	RNS	SS04642CH	5/26/93	T	RADIONUCLIDES	AMERICIUM-241	.002	PCI/L	.002	BJ	V	CDH	199
PT13492	SS	RNS	SS04619CH	2/24/93	T	RADIONUCLIDES	PLUTONIUM-239/240	.002	PCI/L	.002		A	MHM	199
PT19592	SS	RNS	SS04643CH	5/26/93	T	RADIONUCLIDES	PLUTONIUM-239/240	.002	PCI/L	.002	J	V	MHM	199
PT13392	SS	RNS	SS04617CH	2/05/93	T	RADIONUCLIDES	URANIUM-233/234	.230	PCI/L	.240		A	MHM	199
PT13492	SS	RNS	SS04619CH	2/24/93	T	RADIONUCLIDES	URANIUM-233/234	.250	PCI/L	.199		A	MHM	199
PT13592	SS	RNS	SS04621CH	2/09/93	T	RADIONUCLIDES	URANIUM-233/234	.410	PCI/L	.275		A	MHM	199
PT19592	SS	RNS	SS04642CH	5/26/93	T	RADIONUCLIDES	URANIUM-233/234	.520	PCI/L	.310	BJ	A	CDH	199
PT19592	SS	RNS	SS04643CH	5/26/93	T	RADIONUCLIDES	URANIUM-233/234	.600	PCI/L	.330	B	A	MHM	199
PT13392	SS	RNS	SS04616CH	2/05/93	T	RADIONUCLIDES	URANIUM-238	.340	PCI/L	.268		JA	CDH	199
PT19592	SS	RNS	SS04642CH	5/26/93	T	RADIONUCLIDES	URANIUM-238	.880	PCI/L	.410	B	A	CDH	199
PT19592	SS	RNS	SS04643CH	5/26/93	T	RADIONUCLIDES	URANIUM-238	.300	PCI/L	.230	BJ	A	MHM	199
SW02592	SW	BB	SW07234CH	10/02/92	T	RADIONUCLIDES	TRITIUM	49.320	PCI/L	237.000	J	V		200
SW02692	SW	FB	SW07211CH	10/08/92		METALS	ALUMINUM	46.400	UG/L			V		202
SW03092	SW	FB	SW07018CH	7/21/92		METALS	ALUMINUM	22.300	UG/L			V		202
SW02092	SW	FB	SW07115CH	9/14/92		METALS	BARIUM	2.100	UG/L			V		202
SW03092	SW	FB	SW07018CH	7/21/92		METALS	BARIUM	4.900	UG/L			V		202
SW02692	SW	FB	SW07211CH	10/08/92		METALS	CADMIUM	1.500	UG/L			JA		202
SW02092	SW	FB	SW07115CH	9/14/92		METALS	CALCIUM	93.500	UG/L			V		202
SW02692	SW	FB	SW07211CH	10/08/92		METALS	CALCIUM	105.000	UG/L			V		202
SW03092	SW	FB	SW07018CH	7/21/92		METALS	CALCIUM	133.000	UG/L			V		202
SW02092	SW	FB	SW07115CH	9/14/92		METALS	IRON	33.200	UG/L			V		202
SW02692	SW	FB	SW07211CH	10/08/92		METALS	IRON	24.600	UG/L			JA		202
SW03092	SW	FB	SW07018CH	7/21/92		METALS	IRON	77.800	UG/L			V		202
SW02692	SW	FB	SW07211CH	10/08/92		METALS	LEAD	10.400	UG/L			V		202
SW03092	SW	FB	SW07018CH	7/21/92		METALS	LEAD	3.900	UG/L			JA		202
SW02092	SW	FB	SW07115CH	9/14/92		METALS	MAGNESIUM	18.600	UG/L			V		202
SW03092	SW	FB	SW07018CH	7/21/92		METALS	MAGNESIUM	32.200	UG/L			JA		202

Table G-10
Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
SW02092	SW	FB	SW07115CH	9/14/92		METALS	MANGANESE	1.800	UG/L			V		202
SW03092	SW	FB	SW07018CH	7/21/92		METALS	MANGANESE	20.000	UG/L			V		202
SW02092	SW	FB	SW07115CH	9/14/92		METALS	SELENIUM	3.000	UG/L		I	JA		202
SW03092	SW	FB	SW07018CH	7/21/92		METALS	SILICON	167.000	UG/L			V		202
SW02092	SW	FB	SW07115CH	9/14/92		METALS	SODIUM	132.000	UG/L			V		202
SW02692	SW	FB	SW07211CH	10/08/92		METALS	SODIUM	96.200	UG/L			V		202
SW03092	SW	FB	SW07018CH	7/21/92		METALS	SODIUM	867.000	UG/L			V		202
SW03092	SW	FB	SW07018CH	7/21/92		METALS	STRONTIUM	2.600	UG/L			V		202
SW03092	SW	FB	SW07018CH	7/21/92		METALS	THALLIUM	1.200	UG/L			JA		202
SW02692	SW	FB	SW07211CH	10/08/92		METALS	TIN	7.400	UG/L			V		202
SW02092	SW	FB	SW07115CH	9/14/92		METALS	ZINC	13.900	UG/L			V		202
SW02692	SW	FB	SW07211CH	10/08/92		METALS	ZINC	6.800	UG/L			V		202
SW02692	SW	FB	SW07211CH	10/08/92	T	RADIONUCLIDES	AMERICIUM-241	.006	PCI/L	.006	J	A		202
SW02692	SW	FB	SW07211CH	10/08/92	T	RADIONUCLIDES	GROSS BETA	.197	PCI/L	.660	J	A		202
SW03092	SW	FB	SW07018CH	7/21/92	T	RADIONUCLIDES	PLUTONIUM-239/240	.001	PCI/L	.002	J	A		202
SW02692	SW	FB	SW07211CH	10/08/92	T	RADIONUCLIDES	TRITIUM	24.190	PCI/L	241.000	J	V		202
SW02692	SW	FB	SW07211CH	10/08/92		WATER-QUALITY	AMMONIA	.093	MG/L			V		202
SW02692	SW	FB	SW07211CH	10/08/92		WATER-QUALITY	ORTHOPHOSPHATE	.065	MG/L			V		202
SW02692	SW	FB	SW07211CH	10/08/92		WATER-QUALITY	TOTAL DISSOLVED SOLIDS	23.000	MG/L			V		202
SD01792	SW	RNS	SW80240WCU3	10/23/92		METALS	ALUMINUM	20.300	UG/L			JA		
SD06992	SW	RNS	SW80203WCU3	5/13/92		METALS	ALUMINUM	84.900	UG/L			JA		
SED02092	SW	RNS	SW80242WCU3	10/30/92		METALS	ALUMINUM	134.000	UG/L			JA		201
SW00292	SW	RNS	SW07006CH	7/10/92		METALS	ALUMINUM	21.400	UG/L			JA		200
SW02092	SW	RNS	SW07113CH	9/14/92		METALS	ALUMINUM	23.300	UG/L			JA		202
SD05892	SW	RNS	SW80200WCU3	5/12/92		METALS	ANTIMONY	20.800	UG/L			JA		
SW02092	SW	RNS	SW07113CH	9/14/92		METALS	ANTIMONY	16.600	UG/L			JA		202
SD01792	SW	RNS	SW80240WCU3	10/23/92		METALS	BARIUM	2.500	UG/L			JA		
SD05892	SW	RNS	SW80200WCU3	5/12/92		METALS	BARIUM	6.200	UG/L			JA		
SW02092	SW	RNS	SW07113CH	9/14/92		METALS	BARIUM	2.600	UG/L			V		202
SW03092	SW	RNS	SW07021CH	7/21/92		METALS	BARIUM	2.400	UG/L			V		202
SW00792	SW	RNS	SW07004CH	7/09/92		METALS	CADMIUM	43.600	UG/L			V		201
SD00292	SW	RNS	SW80207WCU3	5/20/92		METALS	CALCIUM	54.400	UG/L			JA		
SD00892	SW	RNS	SW80205WCU3	5/19/92		METALS	CALCIUM	115.000	UG/L			JA		
SD01792	SW	RNS	SW80240WCU3	10/23/92		METALS	CALCIUM	82.400	UG/L			JA		
SD03692	SW	RNS	SW80213WCU3	6/04/92		METALS	CALCIUM	44.300	UG/L			JA		

Table G-10
Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
SD03992	SW	RNS	SW80215WCU3	6/05/92		METALS	CALCIUM	61.300	UG/L			JA		
SD04492	SW	RNS	SW80217WCU3	6/05/92		METALS	CALCIUM	110.000	UG/L			JA		
SD04992	SW	RNS	SW80209WCU3	6/02/92		METALS	CALCIUM	79.300	UG/L			JA		
SD05892	SW	RNS	SW80200WCU3	5/12/92		METALS	CALCIUM	133.000	UG/L			JA		
SD06992	SW	RNS	SW80203WCU3	5/13/92		METALS	CALCIUM	93.300	UG/L			JA		
SED02092	SW	RNS	SW80242WCU3	10/30/92		METALS	CALCIUM	140.000	UG/L			JA		201
SW00192	SW	RNS	SW80219WCU3	6/05/92		METALS	CALCIUM	124.000	UG/L			JA		200
SW00292	SW	RNS	SW07006CH	7/10/92		METALS	CALCIUM	60.100	UG/L			V		200
SW00692	SW	RNS	SW80221WCU3	6/09/92		METALS	CALCIUM	44.800	UG/L			JA		200
SW00792	SW	RNS	SW07004CH	7/09/92		METALS	CALCIUM	67.000	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92		METALS	CALCIUM	118.000	UG/L			V		202
SW02692	SW	RNS	SW07213CH	10/08/92		METALS	CALCIUM	169.000	UG/L			V		202
SW03092	SW	RNS	SW07021CH	7/21/92		METALS	CALCIUM	68.300	UG/L			V		202
SD00892	SW	RNS	SW80205WCU3	5/19/92		METALS	CHROMIUM	2.500	UG/L			JA		
SD01392	SW	RNS	SW80227WCU3	7/08/92		METALS	CHROMIUM	6.600	UG/L		B	JA		
SD05892	SW	RNS	SW80200WCU3	5/12/92		METALS	CHROMIUM	2.300	UG/L			JA		
SD06992	SW	RNS	SW80203WCU3	5/13/92		METALS	CHROMIUM	2.700	UG/L			JA		
SED02092	SW	RNS	SW80242WCU3	10/30/92		METALS	CHROMIUM	4.100	UG/L			JA		201
SD05892	SW	RNS	SW80200WCU3	5/12/92		METALS	COPPER	3.000	UG/L			JA		
SED02092	SW	RNS	SW80242WCU3	10/30/92		METALS	COPPER	4.600	UG/L			JA		201
SW00792	SW	RNS	SW07004CH	7/09/92		METALS	COPPER	4.100	UG/L			V		201
SD00292	SW	RNS	SW80207WCU3	5/20/92		METALS	IRON	45.200	UG/L			JA		
SD00892	SW	RNS	SW80205WCU3	5/19/92		METALS	IRON	26.900	UG/L			JA		
SD01792	SW	RNS	SW80240WCU3	10/23/92		METALS	IRON	32.900	UG/L			JA		
SD04992	SW	RNS	SW80209WCU3	6/02/92		METALS	IRON	37.000	UG/L			V		
SD06992	SW	RNS	SW80203WCU3	5/13/92		METALS	IRON	30.900	UG/L			JA		
SED02092	SW	RNS	SW80242WCU3	10/30/92		METALS	IRON	120.000	UG/L			JA		201
SW00792	SW	RNS	SW07004CH	7/09/92		METALS	IRON	29.300	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92		METALS	IRON	12.100	UG/L			JA		202
SW02692	SW	RNS	SW07213CH	10/08/92		METALS	IRON	14.900	UG/L			JA		202
SD01792	SW	RNS	SW80240WCU3	10/23/92		METALS	LEAD	5.800	UG/L			V		
SD03692	SW	RNS	SW80213WCU3	6/04/92		METALS	LEAD	67.500	UG/L			V		
SED02092	SW	RNS	SW80242WCU3	10/30/92		METALS	LEAD	1.800	UG/L					201
SW00292	SW	RNS	SW07006CH	7/10/92		METALS	LEAD	1.600	UG/L			V		200
SW00792	SW	RNS	SW07004CH	7/09/92		METALS	LEAD	4.000	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92		METALS	LEAD	4.100	UG/L			V		202
SW02692	SW	RNS	SW07213CH	10/08/92		METALS	LEAD	24.300	UG/L			V		202
SW03092	SW	RNS	SW07021CH	7/21/92		METALS	LEAD	3.300	UG/L			JA		202

Table G-10
Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
SD01792	SW	RNS	SW80240WCU3	10/23/92		METALS	LITHIUM	4.800	UG/L			JA		
SED02092	SW	RNS	SW80242WCU3	10/30/92		METALS	MAGNESIUM	63.900	UG/L			JA		201
SW02092	SW	RNS	SW07113CH	9/14/92		METALS	MAGNESIUM	29.200	UG/L			V		202
SD00292	SW	RNS	SW80207WCU3	5/20/92		METALS	MANGANESE	2.700	UG/L			JA		
SD00892	SW	RNS	SW80205WCU3	5/19/92		METALS	MANGANESE	2.600	UG/L			JA		
SD01392	SW	RNS	SW80227WCU3	7/08/92		METALS	MANGANESE	13.600	UG/L		B	V		
SD01792	SW	RNS	SW80240WCU3	10/23/92		METALS	MANGANESE	6.500	UG/L			JA		
SD03692	SW	RNS	SW80213WCU3	6/04/92		METALS	MANGANESE	8.300	UG/L			JA		
SD04492	SW	RNS	SW80217WCU3	6/05/92		METALS	MANGANESE	9.900	UG/L			JA		
SD05892	SW	RNS	SW80200WCU3	5/12/92		METALS	MANGANESE	12.800	UG/L			JA		
SD06992	SW	RNS	SW80203WCU3	5/13/92		METALS	MANGANESE	2.700	UG/L			JA		
SD07592	SW	RNS	SW80228WCU3	7/13/92		METALS	MANGANESE	5.500	UG/L		B	V		
SED02092	SW	RNS	SW80242WCU3	10/30/92		METALS	MANGANESE	8.600	UG/L			JA		201
SW00292	SW	RNS	SW07006CH	7/10/92		METALS	MANGANESE	1.700	UG/L			V		200
SW00692	SW	RNS	SW80221WCU3	6/09/92		METALS	MANGANESE	2.600	UG/L			JA		200
SW00792	SW	RNS	SW07004CH	7/09/92		METALS	MANGANESE	3.200	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92		METALS	MANGANESE	5.700	UG/L			V		202
SW03092	SW	RNS	SW07021CH	7/21/92		METALS	MANGANESE	3.400	UG/L			V		202
SD05892	SW	RNS	SW80200WCU3	5/12/92		METALS	MOLYBDENUM	4.100	UG/L			JA		
SW02092	SW	RNS	SW07113CH	9/14/92		METALS	NICKEL	7.200	UG/L			V		202
SD00892	SW	RNS	SW80205WCU3	5/19/92		METALS	POTASSIUM	711.000	UG/L			JA		
SD04492	SW	RNS	SW80217WCU3	6/05/92		METALS	POTASSIUM	1890.000	UG/L			JA		
SED02092	SW	RNS	SW80242WCU3	10/30/92		METALS	POTASSIUM	1390.000	UG/L			JA		201
SW00692	SW	RNS	SW80221WCU3	6/09/92		METALS	POTASSIUM	1830.000	UG/L			JA		200
SD00892	SW	RNS	SW80205WCU3	5/19/92		METALS	SELENIUM	1.300	UG/L			JA		
SD01392	SW	RNS	SW80227WCU3	7/08/92		METALS	SELENIUM	1.200	UG/L		B	V		
SD04492	SW	RNS	SW80217WCU3	6/05/92		METALS	SELENIUM	.800	UG/L			JA		
SD05892	SW	RNS	SW80200WCU3	5/12/92		METALS	SELENIUM	1.100	UG/L			JA		
SW00692	SW	RNS	SW80221WCU3	6/09/92		METALS	SELENIUM	.800	UG/L			JA		200
SW00792	SW	RNS	SW07004CH	7/09/92		METALS	SELENIUM	4.100	UG/L		W	JA		201
SD00292	SW	RNS	SW80207WCU3	5/20/92		METALS	SILICON	119.000	UG/L			JA		
SD00892	SW	RNS	SW80205WCU3	5/19/92		METALS	SILICON	169.000	UG/L			JA		
SD01392	SW	RNS	SW80227WCU3	7/08/92		METALS	SILICON	211.000	UG/L			V		
SD01792	SW	RNS	SW80240WCU3	10/23/92		METALS	SILICON	89.300	UG/L			JA		
SD03692	SW	RNS	SW80213WCU3	6/04/92		METALS	SILICON	94.200	UG/L			JA		
SD03992	SW	RNS	SW80215WCU3	6/05/92		METALS	SILICON	74.300	UG/L			JA		
SD04492	SW	RNS	SW80217WCU3	6/05/92		METALS	SILICON	93.800	UG/L			JA		
SD04992	SW	RNS	SW80209WCU3	6/02/92		METALS	SILICON	124.000	UG/L			JA		

Table G-10
Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
SD05892	SW	RNS	SW80200WCU3	5/12/92		METALS	SILICON	128.000	UG/L			JA		
SD06992	SW	RNS	SW80203WCU3	5/13/92		METALS	SILICON	114.000	UG/L			JA		
SD07592	SW	RNS	SW80228WCU3	7/13/92		METALS	SILICON	137.000	UG/L			JA		
SED02092	SW	RNS	SW80242WCU3	10/30/92		METALS	SILICON	582.000	UG/L					201
SW00192	SW	RNS	SW80219WCU3	6/05/92		METALS	SILICON	83.000	UG/L			JA		200
SW00692	SW	RNS	SW80221WCU3	6/09/92		METALS	SILICON	55.000	UG/L			JA		200
SD00292	SW	RNS	SW80207WCU3	5/20/92		METALS	SODIUM	208.000	UG/L			JA		
SD00892	SW	RNS	SW80205WCU3	5/19/92		METALS	SODIUM	105.000	UG/L			JA		
SD01392	SW	RNS	SW80227WCU3	7/08/92		METALS	SODIUM	975.000	UG/L		B	V		
SD01792	SW	RNS	SW80240WCU3	10/23/92		METALS	SODIUM	155.000	UG/L			JA		
SD03692	SW	RNS	SW80213WCU3	6/04/92		METALS	SODIUM	308.000	UG/L			V		
SD03992	SW	RNS	SW80215WCU3	6/05/92		METALS	SODIUM	178.000	UG/L			JA		
SD04492	SW	RNS	SW80217WCU3	6/05/92		METALS	SODIUM	112.000	UG/L			JA		
SD04992	SW	RNS	SW80209WCU3	6/02/92		METALS	SODIUM	214.000	UG/L			JA		
SD05892	SW	RNS	SW80200WCU3	5/12/92		METALS	SODIUM	138.000	UG/L			JA		
SD06992	SW	RNS	SW80203WCU3	5/13/92		METALS	SODIUM	244.000	UG/L			JA		
SED02092	SW	RNS	SW80242WCU3	10/30/92		METALS	SODIUM	841.000	UG/L					201
SW00192	SW	RNS	SW80219WCU3	6/05/92		METALS	SODIUM	244.000	UG/L			JA		200
SW00292	SW	RNS	SW07006CH	7/10/92		METALS	SODIUM	130.000	UG/L			JA		200
SW00692	SW	RNS	SW80221WCU3	6/09/92		METALS	SODIUM	71.500	UG/L			JA		200
SW00792	SW	RNS	SW07004CH	7/09/92		METALS	SODIUM	238.000	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92		METALS	SODIUM	85.000	UG/L			JA		202
SW02692	SW	RNS	SW07213CH	10/08/92		METALS	SODIUM	113.000	UG/L			V		202
SW03092	SW	RNS	SW07021CH	7/21/92		METALS	SODIUM	98.400	UG/L			V		202
SD01392	SW	RNS	SW80227WCU3	7/08/92		METALS	STRONTIUM	2.700	UG/L		B	V		
SW02092	SW	RNS	SW07113CH	9/14/92		METALS	STRONTIUM	2.100	UG/L			V		202
SW03092	SW	RNS	SW07021CH	7/21/92		METALS	STRONTIUM	1.000	UG/L			V		202
SD03692	SW	RNS	SW80213WCU3	6/04/92		METALS	TIN	16.900	UG/L			JA		
SD04992	SW	RNS	SW80209WCU3	6/02/92		METALS	TIN	11.000	UG/L			JA		
SW02092	SW	RNS	SW07113CH	9/14/92		METALS	TIN	11.500	UG/L			JA		202
SD00892	SW	RNS	SW80205WCU3	5/19/92		METALS	ZINC	1.900	UG/L			JA		
SD01792	SW	RNS	SW80240WCU3	10/23/92		METALS	ZINC	14.200	UG/L			JA		
SD03692	SW	RNS	SW80213WCU3	6/04/92		METALS	ZINC	9.400	UG/L			JA		
SD04492	SW	RNS	SW80217WCU3	6/05/92		METALS	ZINC	1.700	UG/L			JA		
SD04992	SW	RNS	SW80209WCU3	6/02/92		METALS	ZINC	5.100	UG/L			JA		
SD06992	SW	RNS	SW80203WCU3	5/13/92		METALS	ZINC	798.000	UG/L			JA		
SED02092	SW	RNS	SW80242WCU3	10/30/92		METALS	ZINC	6.200	UG/L			JA		201
SW00292	SW	RNS	SW07006CH	7/10/92		METALS	ZINC	11.800	UG/L			V		200

Table G-10
Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
SW00692	SW	RNS	SW80221WCU3	6/09/92		METALS	ZINC	2.700	UG/L			JA		200
SW00792	SW	RNS	SW07004CH	7/09/92		METALS	ZINC	18.300	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92		METALS	ZINC	9.800	UG/L			JA		202
SW02692	SW	RNS	SW07213CH	10/08/92		METALS	ZINC	9.400	UG/L			V		202
SW03092	SW	RNS	SW07021CH	7/21/92		METALS	ZINC	12.400	UG/L			JA		202
SW00292	SW	RNS	SW07006CH	7/10/92	D	METALS	ALUMINUM	33.100	UG/L			JA		200
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	ALUMINUM	1830.000	UG/L			V		202
SW02692	SW	RNS	SW07213CH	10/08/92	D	METALS	ALUMINUM	45.000	UG/L			JA		202
SW00292	SW	RNS	SW07006CH	7/10/92	D	METALS	BARIUM	1.600	UG/L			V		200
SW00792	SW	RNS	SW07004CH	7/09/92	D	METALS	BARIUM	1.100	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	BARIUM	13.100	UG/L			V		202
SW02692	SW	RNS	SW07213CH	10/08/92	D	METALS	BARIUM	1.000	UG/L			JA		202
SW00792	SW	RNS	SW07004CH	7/09/92	D	METALS	CADMIUM	77.000	UG/L			V		201
SW00292	SW	RNS	SW07006CH	7/10/92	D	METALS	CALCIUM	97.800	UG/L			V		200
SW00792	SW	RNS	SW07004CH	7/09/92	D	METALS	CALCIUM	117.000	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	CALCIUM	3750.000	UG/L			V		202
SW02692	SW	RNS	SW07213CH	10/08/92	D	METALS	CALCIUM	368.000	UG/L					202
SD01392	SW	RNS	SW80227WCU3	7/08/92	D	METALS	CHROMIUM	5.100	UG/L		B	JA		
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	COBALT	1.300	UG/L			V		202
SW00792	SW	RNS	SW07004CH	7/09/92	D	METALS	COPPER	5.800	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	COPPER	5.300	UG/L			JA		202
SD07592	SW	RNS	SW80228WCU3	7/13/92	D	METALS	IRON	33.100	UG/L		B	V		
SW00292	SW	RNS	SW07006CH	7/10/92	D	METALS	IRON	38.000	UG/L			V		200
SW00792	SW	RNS	SW07004CH	7/09/92	D	METALS	IRON	20.700	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	IRON	126.000	UG/L			V		202
SD01392	SW	RNS	SW80227WCU3	7/08/92	D	METALS	LEAD	4.400	UG/L			JA		
SW00292	SW	RNS	SW07006CH	7/10/92	D	METALS	LEAD	5.200	UG/L			V		200
SW00792	SW	RNS	SW07004CH	7/09/92	D	METALS	LEAD	11.800	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	LEAD	2.600	UG/L			V		202
SW02692	SW	RNS	SW07213CH	10/08/92	D	METALS	LEAD	14.500	UG/L					202
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	LITHIUM	3.300	UG/L			JA		202
SW02692	SW	RNS	SW07213CH	10/08/92	D	METALS	LITHIUM	3.200	UG/L			JA		202
SW00292	SW	RNS	SW07006CH	7/10/92	D	METALS	MAGNESIUM	30.700	UG/L			JA		200
SW00792	SW	RNS	SW07004CH	7/09/92	D	METALS	MAGNESIUM	22.800	UG/L			JA		201
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	MAGNESIUM	348.000	UG/L			V		202
SD01392	SW	RNS	SW80227WCU3	7/08/92	D	METALS	MANGANESE	3.000	UG/L		B	V		
SD07592	SW	RNS	SW80228WCU3	7/13/92	D	METALS	MANGANESE	3.500	UG/L		B	V		

Table G-10

Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
SW00292	SW	RNS	SW07006CH	7/10/92	D	METALS	MANGANESE	3.400	UG/L			V		200
SW00792	SW	RNS	SW07004CH	7/09/92	D	METALS	MANGANESE	3.400	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	MANGANESE	111.000	UG/L			V		202
SW02692	SW	RNS	SW07213CH	10/08/92	D	METALS	MANGANESE	2.500	UG/L			JA		202
SW02692	SW	RNS	SW07213CH	10/08/92	D	METALS	MOLYBDENUM	2.000	UG/L			JA		202
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	NICKEL	4.500	UG/L			V		202
SD01392	SW	RNS	SW80227WCU3	7/08/92	D	METALS	SELENIUM	1.400	UG/L		B	V		
SD01392	SW	RNS	SW80227WCU3	7/08/92	D	METALS	SILICON	258.000	UG/L			JA		
SD07592	SW	RNS	SW80228WCU3	7/13/92	D	METALS	SILICON	102.000	UG/L			JA		
SD01392	SW	RNS	SW80227WCU3	7/08/92	D	METALS	SODIUM	1010.000	UG/L		B	V		
SW00292	SW	RNS	SW07006CH	7/10/92	D	METALS	SODIUM	156.000	UG/L			JA		200
SW00792	SW	RNS	SW07004CH	7/09/92	D	METALS	SODIUM	299.000	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	SODIUM	798.000	UG/L			V		202
SW02692	SW	RNS	SW07213CH	10/08/92	D	METALS	SODIUM	200.000	UG/L			JA		202
SD01392	SW	RNS	SW80227WCU3	7/08/92	D	METALS	STRONTIUM	1.000	UG/L		B	V		
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	STRONTIUM	14.800	UG/L			V		202
SW02692	SW	RNS	SW07213CH	10/08/92	D	METALS	STRONTIUM	1.200	UG/L			JA		202
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	VANADIUM	2.600	UG/L			V		202
SW00292	SW	RNS	SW07006CH	7/10/92	D	METALS	ZINC	18.400	UG/L			V		200
SW00792	SW	RNS	SW07004CH	7/09/92	D	METALS	ZINC	24.200	UG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92	D	METALS	ZINC	29.200	UG/L			JA		202
SW02692	SW	RNS	SW07213CH	10/08/92	D	METALS	ZINC	12.400	UG/L					202
SD06992	SW	RNS	SW80203WCU3	5/13/92		PESTICIDES	4,4'-DDE	.010	UG/L		J	A		
SD04992	SW	RNS	SW80209WCU3	6/02/92		PESTICIDES	4,4'-DDT	.010	UG/L		J	A		
SD05892	SW	RNS	SW80200WCU3	5/12/92		PESTICIDES	4,4'-DDT	.051	UG/L			JA		
SD06992	SW	RNS	SW80203WCU3	5/13/92		PESTICIDES	4,4'-DDT	.051	UG/L			JA		
SW00292	SW	RNS	SW07006CH	7/10/92	D	RADIONUCLIDES	AMERICIUM-241	.005	PCI/L	.004	BJ	A		200
SW02692	SW	RNS	SW07213CH	10/08/92	D	RADIONUCLIDES	AMERICIUM-241	.004	PCI/L	.005		A		202
SW00292	SW	RNS	SW07006CH	7/10/92	D	RADIONUCLIDES	URANIUM-233/234	.130	PCI/L	.150	J	A		200
SW00792	SW	RNS	SW07004CH	7/09/92	D	RADIONUCLIDES	URANIUM-233/234	.450	PCI/L	.370	BJ	V		201
SW00292	SW	RNS	SW07006CH	7/10/92	D	RADIONUCLIDES	URANIUM-238	.120	PCI/L	.150	BJ	A		200
SW00792	SW	RNS	SW07004CH	7/09/92	D	RADIONUCLIDES	URANIUM-238	.300	PCI/L	.300	BJ	V		201
SW02692	SW	RNS	SW07213CH	10/08/92	D	RADIONUCLIDES	URANIUM-238	.380	PCI/L	.372		JA		202
SD01392	SW	RNS	SW80227WCU3	7/08/92	T	RADIONUCLIDES	AMERICIUM-241	.004	PCI/L	.004	BJ	A		
SD01792	SW	RNS	SW80240WCU3	10/23/92	T	RADIONUCLIDES	AMERICIUM-241	.004	PCI/L	.006	J	A		

Table G-10
Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
SD03692	SW	RNS	SW80213WCU3	6/04/92	T	RADIONUCLIDES	AMERICIUM-241	.006	PCI/L	.004	J	V		
SD06992	SW	RNS	SW80203WCU3	5/13/92	T	RADIONUCLIDES	AMERICIUM-241	.008	PCI/L	.006	J	A		
SW00292	SW	RNS	SW07006CH	7/10/92	T	RADIONUCLIDES	AMERICIUM-241	.008	PCI/L	.008	J	A		200
SW02692	SW	RNS	SW07213CH	10/08/92	T	RADIONUCLIDES	AMERICIUM-241	.005	PCI/L	.005		A		202
SD04992	SW	RNS	SW80209WCU3	6/02/92	T	RADIONUCLIDES	CESIUM-137	1.200	PCI/L	.440		V		
SW00692	SW	RNS	SW80221WCU3	6/09/92	T	RADIONUCLIDES	GROSS ALPHA	.410	PCI/L	.270	J	V		200
SD01792	SW	RNS	SW80240WCU3	10/23/92	T	RADIONUCLIDES	GROSS BETA	.404	PCI/L	.674	J	A		
SD06992	SW	RNS	SW80203WCU3	5/13/92	T	RADIONUCLIDES	GROSS BETA	2.900	PCI/L	1.700	J	A		
SD00292	SW	RNS	SW80207WCU3	5/20/92	T	RADIONUCLIDES	PLUTONIUM-239/240	.002	PCI/L	.004	J	A		
SD01792	SW	RNS	SW80240WCU3	10/23/92	T	RADIONUCLIDES	PLUTONIUM-239/240	.003	PCI/L	.004	J	A		
SD03692	SW	RNS	SW80213WCU3	6/04/92	T	RADIONUCLIDES	PLUTONIUM-239/240	.002	PCI/L	.004	J	A		
SD04492	SW	RNS	SW80217WCU3	6/05/92	T	RADIONUCLIDES	PLUTONIUM-239/240	.001	PCI/L	.001	J	V		
SD06992	SW	RNS	SW80203WCU3	5/13/92	T	RADIONUCLIDES	PLUTONIUM-239/240	.098	PCI/L	.032		A		
SW00792	SW	RNS	SW07004CH	7/09/92	T	RADIONUCLIDES	PLUTONIUM-239/240	.001	PCI/L	.002	J	A		201
SD04992	SW	RNS	SW80209WCU3	6/02/92	T	RADIONUCLIDES	STRONTIUM-89/90	.290	PCI/L	.200	J	V		
SD00292	SW	RNS	SW80207WCU3	5/20/92	T	RADIONUCLIDES	URANIUM-233/234	.420	PCI/L	.100	BJ	A		
SD00892	SW	RNS	SW80205WCU3	5/19/92	T	RADIONUCLIDES	URANIUM-233/234	2.200	PCI/L	.770	B	A		
SD01392	SW	RNS	SW80227WCU3	7/08/92	T	RADIONUCLIDES	URANIUM-233/234	.300	PCI/L	.350	BJ	A		
SD03692	SW	RNS	SW80213WCU3	6/04/92	T	RADIONUCLIDES	URANIUM-233/234	.500	PCI/L	.120	BJ	A		
SD03992	SW	RNS	SW80215WCU3	6/05/92	T	RADIONUCLIDES	URANIUM-233/234	.580	PCI/L	.600	BJ	A		
SD04492	SW	RNS	SW80217WCU3	6/05/92	T	RADIONUCLIDES	URANIUM-233/234	.170	PCI/L	.240	BJ	A		
SD04992	SW	RNS	SW80209WCU3	6/02/92	T	RADIONUCLIDES	URANIUM-233/234	.500	PCI/L	.130	BJ	A		
SD05892	SW	RNS	SW80200WCU3	5/12/92	T	RADIONUCLIDES	URANIUM-233/234	.540	PCI/L	.120	BJ	A		
SD06992	SW	RNS	SW80203WCU3	5/13/92	T	RADIONUCLIDES	URANIUM-233/234	.520	PCI/L	.120	BJ	A		
SD07592	SW	RNS	SW80228WCU3	7/13/92	T	RADIONUCLIDES	URANIUM-233/234	.180	PCI/L	.280	BJ	A		
SED02092	SW	RNS	SW80242WCU3	10/30/92	T	RADIONUCLIDES	URANIUM-233/234	.310	PCI/L	.223		A		201
SW00292	SW	RNS	SW07006CH	7/10/92	T	RADIONUCLIDES	URANIUM-233/234	.090	PCI/L	.130	BJ	A		200
SW03092	SW	RNS	SW07021CH	7/21/92	T	RADIONUCLIDES	URANIUM-233/234	.140	PCI/L	.200	J	A		202
SD00292	SW	RNS	SW80207WCU3	5/20/92	T	RADIONUCLIDES	URANIUM-235	.024	PCI/L	.024	BJ	A		
SD00892	SW	RNS	SW80205WCU3	5/19/92	T	RADIONUCLIDES	URANIUM-235	.340	PCI/L	.300	J	A		
SD03692	SW	RNS	SW80213WCU3	6/04/92	T	RADIONUCLIDES	URANIUM-235	.079	PCI/L	.050	J	A		
SD04992	SW	RNS	SW80209WCU3	6/02/92	T	RADIONUCLIDES	URANIUM-235	.014	PCI/L	.020	BJ	A		
SD05892	SW	RNS	SW80200WCU3	5/12/92	T	RADIONUCLIDES	URANIUM-235	.034	PCI/L	.036	J	A		
SD06992	SW	RNS	SW80203WCU3	5/13/92	T	RADIONUCLIDES	URANIUM-235	.033	PCI/L	.036	J	A		
SD07592	SW	RNS	SW80228WCU3	7/13/92	T	RADIONUCLIDES	URANIUM-235	.097	PCI/L	.200	J	A		
SW00292	SW	RNS	SW07006CH	7/10/92	T	RADIONUCLIDES	URANIUM-235	.045	PCI/L	.090	J	A		200
SD00292	SW	RNS	SW80207WCU3	5/20/92	T	RADIONUCLIDES	URANIUM-238	.410	PCI/L	.100	BJ	A		
SD00892	SW	RNS	SW80205WCU3	5/19/92	T	RADIONUCLIDES	URANIUM-238	.480	PCI/L	.350	BJ	A		

Table G-10
Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
SD01392	SW	RNS	SW80227WCU3	7/08/92	T	RADIONUCLIDES	URANIUM-238	.100	PCI/L	.200	BJ	A		
SD03692	SW	RNS	SW80213WCU3	6/04/92	T	RADIONUCLIDES	URANIUM-238	.480	PCI/L	.110	BJ	A		
SD03992	SW	RNS	SW80215WCU3	6/05/92	T	RADIONUCLIDES	URANIUM-238	.580	PCI/L	.600	J	A		
SD04492	SW	RNS	SW80217WCU3	6/05/92	T	RADIONUCLIDES	URANIUM-238	.170	PCI/L	.240	BJ	A		
SD04992	SW	RNS	SW80209WCU3	6/02/92	T	RADIONUCLIDES	URANIUM-238	.540	PCI/L	.130	BJ	A		
SD05892	SW	RNS	SW80200WCU3	5/12/92	T	RADIONUCLIDES	URANIUM-238	.480	PCI/L	.120	BJ	A		
SD06992	SW	RNS	SW80203WCU3	5/13/92	T	RADIONUCLIDES	URANIUM-238	.380	PCI/L	.100	BJ	A		
SD07592	SW	RNS	SW80228WCU3	7/13/92	T	RADIONUCLIDES	URANIUM-238	.290	PCI/L	.340	BJ	A		
SW00292	SW	RNS	SW07006CH	7/10/92	T	RADIONUCLIDES	URANIUM-238	.230	PCI/L	.200	J	A		200
SD05892	SW	RNS	SW80200WCU3	5/12/92		SVOAS	TIC	7.000	UG/L		J			
SD06992	SW	RNS	SW80203WCU3	5/13/92		SVOAS	TIC	7.000	UG/L		J			
SD05892	SW	RNS	SW80200WCU3	5/12/92		SVOAS	UNKNOWN HYDROCARBON	7.000	UG/L		J			
SD06992	SW	RNS	SW80203WCU3	5/13/92		SVOAS	UNKNOWN HYDROCARBON	7.000	UG/L		J			
SD03692	SW	RNS	SW80213WCU3	6/04/92		SVOAS	bis(2-ETHYLHEXYL)PHTHALATE	2.000	UG/L		J			
SD00292	SW	RNS	SW80207WCU3	5/20/92		VOAS	ACETONE	49.000	UG/L			JA		
SD07592	SW	RNS	SW80228WCU3	7/13/92		VOAS	ACETONE	18.000	UG/L			JA		
SD03992	SW	RNS	SW80215WCU3	6/05/92		VOAS	CHLOROMETHANE	2.000	UG/L		J	A		
SD04492	SW	RNS	SW80217WCU3	6/05/92		VOAS	CHLOROMETHANE	3.000	UG/L		J	A		
SW03092	SW	RNS	SW07021CH	7/21/92		VOAS	TOLUENE	1.000	UG/L		J	A		202
SD04992	SW	RNS	SW80209WCU3	6/02/92		WATER-QUALITY	AMMONIA	.140	MG/L			V		
SW00192	SW	RNS	SW80219WCU3	6/05/92		WATER-QUALITY	AMMONIA	.720	MG/L			V		200
SW00692	SW	RNS	SW80221WCU3	6/09/92		WATER-QUALITY	AMMONIA	.170	MG/L			JA		200
SW00792	SW	RNS	SW07004CH	7/09/92		WATER-QUALITY	AMMONIA	.084	MG/L			V		201
SW02092	SW	RNS	SW07113CH	9/14/92		WATER-QUALITY	AMMONIA	.094	MG/L			V		202
SW02692	SW	RNS	SW07213CH	10/08/92		WATER-QUALITY	AMMONIA	.093	MG/L			V		202
SW03092	SW	RNS	SW07021CH	7/21/92		WATER-QUALITY	AMMONIA	.094	MG/L			V		202
SW00192	SW	RNS	SW80219WCU3	6/05/92		WATER-QUALITY	CHLORIDE	10.100	MG/L			V		200
SW00692	SW	RNS	SW80221WCU3	6/09/92		WATER-QUALITY	CHLORIDE	9.100	MG/L			V		200
SW00292	SW	RNS	SW07006CH	7/10/92		WATER-QUALITY	OIL AND GREASE	8.850	MG/L			V		200
SW00792	SW	RNS	SW07004CH	7/09/92		WATER-QUALITY	OIL AND GREASE	10.600	MG/L			V		201
SW03092	SW	RNS	SW07021CH	7/21/92		WATER-QUALITY	OIL AND GREASE	8.400	MG/L			V		202
SW03092	SW	RNS	SW07021CH	7/21/92		WATER-QUALITY	ORTHOPHOSPHATE	.113	MG/L			V		202
SW00192	SW	RNS	SW80219WCU3	6/05/92		WATER-QUALITY	TOTAL DISSOLVED SOLIDS	10.000	MG/L			V		200
SW00692	SW	RNS	SW80221WCU3	6/09/92		WATER-QUALITY	TOTAL DISSOLVED SOLIDS	20.000	MG/L			V		200
SW00792	SW	RNS	SW07004CH	7/09/92		WATER-QUALITY	TOTAL DISSOLVED SOLIDS	23.000	MG/L			V		201

Table G-10
Chemicals Detected in QC Samples

Location	Medium	Sample QC Code	Sample Number	Sample Date	T/D	Analysis Suite	Chemical	Result	Units	Error	Qualifiers	Validation	Method	IHSS
SW03092	SW	RNS	SW07021CH	7/21/92		WATER-QUALITY	TOTAL DISSOLVED SOLIDS	52.000	MG/L			V		202
SW02692	SW	RNS	SW07213CH	10/08/92		WATER-QUALITY	TOTAL SUSPENDED SOLIDS	7.000	MG/L			V		202
SD00292	SW	RNS	SW80207WCU3	5/20/92		WATER-QUALITY	pH	9.300	PH			V		
SD00892	SW	RNS	SW80205WCU3	5/19/92		WATER-QUALITY	pH	7.000	PH			V		
SD03692	SW	RNS	SW80213WCU3	6/04/92		WATER-QUALITY	pH	7.000	PH			V		
SD03992	SW	RNS	SW80215WCU3	6/05/92		WATER-QUALITY	pH	8.400	PH			V		
SD04492	SW	RNS	SW80217WCU3	6/05/92		WATER-QUALITY	pH	6.600	PH			V		
SD04992	SW	RNS	SW80209WCU3	6/02/92		WATER-QUALITY	pH	7.300	PH			V		
SD05892	SW	RNS	SW80200WCU3	5/12/92		WATER-QUALITY	pH	7.700	PH			V		
SD06992	SW	RNS	SW80203WCU3	5/13/92		WATER-QUALITY	pH	7.200	PH			V		
SW03092	SW	TB	SW07019CH	7/21/92		VOAS	TOLUENE	1.000	UG/L		J	A		202

Table G-11
Results Greater than Detection Limits for QC Samples

Sample QC Code	Sample Number	Chemical	Result	Detection Limit
FB	GW30057CH	AMERICIUM-241	.007	0.000
FB	GW30057CH	BICARBONATE AS CACO3	3.000	1.000
FB	GW30057CH	NITRATE/NITRITE	.080	.020
FB	GW30057CH	PLUTONIUM-239/240	.002	0.000
FB	GW30057CH	URANIUM-235	.171	.137
FB	SW07018CH	GROSS ALPHA	.480	.340
FB	SW07018CH	LEAD	3.900	3.000
FB	SW07018CH	MANGANESE	20.000	15.000
FB	SW07018CH	SILICON	167.000	100.000
FB	SW07211CH	AMERICIUM-241	.006	0.000
FB	SW07211CH	AMMONIA	.093	.050
FB	SW07211CH	LEAD	10.400	3.000
FB	SW07211CH	ORTHOPHOSPHATE	.065	.050
FB	SW07211CH	TOTAL DISSOLVED SOLIDS	23.000	10.000
FB	SW07211CH	URANIUM-233/234	.051	0.000
RNS	GW30056CH	AMERICIUM-241	.001	0.000
RNS	GW30056CH	IRON	108.000	100.000
RNS	GW30056CH	NITRATE/NITRITE	.060	.020
RNS	GW30056CH	SILICON	125.000	100.000
RNS	GW30056CH	ZINC	45.200	20.000
RNS	SD06012CH	CADMIUM	53.900	5.000
RNS	SD06012CH	LEAD	3.900	3.000
RNS	SD06014CH	LEAD	5.400	3.000
RNS	SD06014CH	PLUTONIUM-239/240	.005	.002
RNS	SD06014CH	URANIUM-233/234	.200	.160
RNS	SD06014CH	URANIUM-238	.260	.180
RNS	SD06014CH	ZINC	26.800	20.000
RNS	SD06122CH	IRON	432.000	100.000
RNS	SD06122CH	LEAD	3.200	3.000
RNS	SD06122CH	ZINC	322.000	20.000
RNS	SD06151CH	ALUMINUM	1430.000	200.000
RNS	SD06151CH	IRON	1210.000	100.000
RNS	SD06151CH	LEAD	3.900	3.000
RNS	SD06151CH	MANGANESE	18.100	15.000
RNS	SD06151CH	SILICON	329.000	100.000
RNS	SD06151CH	TIN	242.000	200.000
RNS	SD06211CH	ZINC	46.600	20.000
RNS	SD06480CH	ALUMINUM	247.000	200.000
RNS	SD06480CH	MANGANESE	18.000	15.000
RNS	SD06480CH	ZINC	26.800	20.000
RNS	SS04616CH	AMERICIUM-241	.005	.002
RNS	SS04616CH	URANIUM-238	.340	.194

6/06/95

Table G-11
Results Greater than Detection Limits for QC Samples

Sample QC Code	Sample Number	Chemical	Result	Detection Limit
RNS	SS04617CH	URANIUM-233/234	.230	.229
RNS	SS04618CH	AMERICIUM-241	.150	.001
RNS	SS04619CH	PLUTONIUM-239/240	.002	.002
RNS	SS04619CH	URANIUM-233/234	.250	.157
RNS	SS04621CH	URANIUM-233/234	.410	.186
RNS	SS04642CH	AMERICIUM-241	.002	.001
RNS	SS04642CH	URANIUM-233/234	.520	.062
RNS	SS04642CH	URANIUM-238	.880	.037
RNS	SS04643CH	URANIUM-233/234	.600	.035
RNS	SS04643CH	URANIUM-238	.300	.035
RNS	SW07004CH	AMMONIA	.084	.050
RNS	SW07004CH	CADMIUM	43.600	5.000
RNS	SW07004CH	CADMIUM	77.000	5.000
RNS	SW07004CH	LEAD	4.000	3.000
RNS	SW07004CH	LEAD	11.800	3.000
RNS	SW07004CH	OIL AND GREASE	10.600	5.000
RNS	SW07004CH	TOTAL DISSOLVED SOLIDS	23.000	10.000
RNS	SW07004CH	URANIUM-233/234	.450	.062
RNS	SW07004CH	URANIUM-238	.300	.062
RNS	SW07004CH	ZINC	24.200	20.000
RNS	SW07006CH	AMERICIUM-241	.005	.002
RNS	SW07006CH	AMERICIUM-241	.008	.006
RNS	SW07006CH	LEAD	5.200	3.000
RNS	SW07006CH	OIL AND GREASE	8.850	5.000
RNS	SW07006CH	URANIUM-233/234	.090	.038
RNS	SW07006CH	URANIUM-233/234	.130	.035
RNS	SW07006CH	URANIUM-235	.045	.038
RNS	SW07006CH	URANIUM-238	.120	.059
RNS	SW07006CH	URANIUM-238	.230	.038
RNS	SW07021CH	AMMONIA	.094	.050
RNS	SW07021CH	LEAD	3.300	3.000
RNS	SW07021CH	OIL AND GREASE	8.400	5.000
RNS	SW07021CH	ORTHOPHOSPHATE	.113	.050
RNS	SW07021CH	TOTAL DISSOLVED SOLIDS	52.000	10.000
RNS	SW07021CH	URANIUM-233/234	.140	.058
RNS	SW07113CH	ALUMINUM	1830.000	200.000
RNS	SW07113CH	AMMONIA	.094	.050
RNS	SW07113CH	IRON	126.000	100.000
RNS	SW07113CH	LEAD	4.100	3.000
RNS	SW07113CH	MANGANESE	111.000	15.000
RNS	SW07113CH	ZINC	29.200	20.000

Table G-11
Results Greater than Detection Limits for QC Samples

Sample QC Code	Sample Number	Chemical	Result	Detection Limit
RNS	SW07213CH	AMERICIUM-241	.004	.004
RNS	SW07213CH	AMERICIUM-241	.005	.003
RNS	SW07213CH	AMMONIA	.093	.050
RNS	SW07213CH	LEAD	14.500	3.000
RNS	SW07213CH	LEAD	24.300	3.000
RNS	SW07213CH	TOTAL SUSPENDED SOLIDS	7.000	5.000
RNS	SW07213CH	URANIUM-238	.380	.254
RNS	SW80200WCU3	ACETONE	15.000	10.000
RNS	SW80200WCU3	ANTIMONY	20.800	19.800
RNS	SW80200WCU3	BARIUM	6.200	3.800
RNS	SW80200WCU3	CALCIUM	133.000	24.100
RNS	SW80200WCU3	CHROMIUM	2.300	2.000
RNS	SW80200WCU3	COPPER	3.000	2.300
RNS	SW80200WCU3	MANGANESE	12.800	1.500
RNS	SW80200WCU3	MOLYBDENUM	4.100	3.500
RNS	SW80200WCU3	SELENIUM	1.100	.800
RNS	SW80200WCU3	SILICON	128.000	27.700
RNS	SW80200WCU3	SODIUM	138.000	34.400
RNS	SW80200WCU3	TIC	7.000	
RNS	SW80200WCU3	UNKNOWN HYDROCARBON	7.000	
RNS	SW80200WCU3	URANIUM-233/234	.540	.032
RNS	SW80200WCU3	URANIUM-235	.034	.032
RNS	SW80200WCU3	URANIUM-238	.480	.032
RNS	SW80200WCU3	pH	7.700	.200
RNS	SW80203WCU3	ACETONE	19.000	10.000
RNS	SW80203WCU3	ALUMINUM	84.900	29.200
RNS	SW80203WCU3	AMERICIUM-241	.008	.001
RNS	SW80203WCU3	CALCIUM	93.300	24.100
RNS	SW80203WCU3	CHROMIUM	2.700	2.000
RNS	SW80203WCU3	GROSS BETA	2.900	2.400
RNS	SW80203WCU3	IRON	30.900	18.400
RNS	SW80203WCU3	MANGANESE	2.700	1.500
RNS	SW80203WCU3	PLUTONIUM-239/240	.098	.010
RNS	SW80203WCU3	SILICON	114.000	27.700
RNS	SW80203WCU3	SODIUM	244.000	34.400
RNS	SW80203WCU3	TIC	7.000	
RNS	SW80203WCU3	UNKNOWN HYDROCARBON	7.000	
RNS	SW80203WCU3	URANIUM-233/234	.520	.054
RNS	SW80203WCU3	URANIUM-233/234	.530	.036
RNS	SW80203WCU3	URANIUM-235	.033	.031
RNS	SW80203WCU3	URANIUM-235	.054	.036
RNS	SW80203WCU3	URANIUM-238	.380	.031
RNS	SW80203WCU3	URANIUM-238	.450	.012
RNS	SW80203WCU3	ZINC	798.000	1.700
RNS	SW80203WCU3	bis(2-ETHYLHEXYL)PHTHALATE	11.000	10.000
RNS	SW80203WCU3	pH	7.200	.200
RNS	SW80205WCU3	CALCIUM	115.000	24.100
RNS	SW80205WCU3	CHROMIUM	2.500	2.000
RNS	SW80205WCU3	IRON	26.900	18.400

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Table G-11
Results Greater than Detection Limits for QC Samples

Sample QC Code	Sample Number	Chemical	Result	Detection Limit
RNS	SW80205WCU3	MANGANESE	2.600	1.500
RNS	SW80205WCU3	POTASSIUM	711.000	674.000
RNS	SW80205WCU3	SELENIUM	1.300	.800
RNS	SW80205WCU3	SILICON	169.000	27.700
RNS	SW80205WCU3	SODIUM	105.000	34.400
RNS	SW80205WCU3	URANIUM-233/234	2.200	.050
RNS	SW80205WCU3	URANIUM-235	.340	.160
RNS	SW80205WCU3	URANIUM-238	.480	.085
RNS	SW80205WCU3	ZINC	1.900	1.700
RNS	SW80205WCU3	pH	7.000	.200
RNS	SW80207WCU3	ACETONE	49.000	10.000
RNS	SW80207WCU3	CALCIUM	54.400	24.100
RNS	SW80207WCU3	IRON	45.200	18.400
RNS	SW80207WCU3	MANGANESE	2.700	1.500
RNS	SW80207WCU3	SILICON	119.000	27.700
RNS	SW80207WCU3	SODIUM	208.000	34.400
RNS	SW80207WCU3	URANIUM-233/234	.420	.028
RNS	SW80207WCU3	URANIUM-235	.024	.009
RNS	SW80207WCU3	URANIUM-238	.410	.040
RNS	SW80207WCU3	pH	9.300	.200
RNS	SW80209WCU3	AMMONIA	.140	.100
RNS	SW80209WCU3	CALCIUM	79.300	24.100
RNS	SW80209WCU3	CESIUM-137	1.200	.550
RNS	SW80209WCU3	IRON	37.000	18.400
RNS	SW80209WCU3	SILICON	124.000	27.700
RNS	SW80209WCU3	SODIUM	214.000	34.400
RNS	SW80209WCU3	TIN	11.000	9.400
RNS	SW80209WCU3	URANIUM-233/234	.500	.064
RNS	SW80209WCU3	URANIUM-235	.014	.010
RNS	SW80209WCU3	URANIUM-238	.540	.055
RNS	SW80209WCU3	ZINC	5.100	1.700
RNS	SW80209WCU3	pH	7.300	.200
RNS	SW80213WCU3	AMERICIUM-241	.006	.001
RNS	SW80213WCU3	CALCIUM	44.300	24.100
RNS	SW80213WCU3	LEAD	67.500	4.000
RNS	SW80213WCU3	MANGANESE	8.300	1.500
RNS	SW80213WCU3	SILICON	94.200	27.700
RNS	SW80213WCU3	SODIUM	308.000	34.400
RNS	SW80213WCU3	TIN	16.900	9.400
RNS	SW80213WCU3	URANIUM-233/234	.500	.010
RNS	SW80213WCU3	URANIUM-235	.079	.030
RNS	SW80213WCU3	URANIUM-238	.480	.010
RNS	SW80213WCU3	ZINC	9.400	1.700
RNS	SW80213WCU3	pH	7.000	.200
RNS	SW80215WCU3	CALCIUM	61.300	24.100
RNS	SW80215WCU3	SILICON	74.300	27.700
RNS	SW80215WCU3	SODIUM	178.000	34.400
RNS	SW80215WCU3	URANIUM-233/234	.580	.210

Table G-11
Results Greater than Detection Limits for QC Samples

Sample QC Code	Sample Number	Chemical	Result	Detection Limit
RNS	SW80215WCU3	URANIUM-238	.580	.210
RNS	SW80215WCU3	pH	8.400	.200
RNS	SW80217WCU3	2,4,5-TRICHLOROPHENOL	52.000	50.000
RNS	SW80217WCU3	2,4-DINITROPHENOL	52.000	50.000
RNS	SW80217WCU3	2-NITROANILINE	52.000	50.000
RNS	SW80217WCU3	3,3'-DICHLOROBENZIDINE	21.000	20.000
RNS	SW80217WCU3	3-NITROANILINE	52.000	50.000
RNS	SW80217WCU3	4,6-DINITRO-2-METHYLPHENOL	52.000	50.000
RNS	SW80217WCU3	4-NITROANILINE	52.000	50.000
RNS	SW80217WCU3	4-NITROPHENOL	52.000	50.000
RNS	SW80217WCU3	BENZOIC ACID	52.000	50.000
RNS	SW80217WCU3	CALCIUM	110.000	24.100
RNS	SW80217WCU3	MANGANESE	9.900	1.500
RNS	SW80217WCU3	PENTACHLOROPHENOL	52.000	50.000
RNS	SW80217WCU3	POTASSIUM	1890.000	674.000
RNS	SW80217WCU3	SILICON	93.800	27.700
RNS	SW80217WCU3	SODIUM	112.000	34.400
RNS	SW80217WCU3	URANIUM-233/234	.170	.071
RNS	SW80217WCU3	URANIUM-238	.170	.071
RNS	SW80217WCU3	pH	6.600	.200
RNS	SW80219WCU3	AMETRYN	.610	.060
RNS	SW80219WCU3	AMMONIA	.720	.100
RNS	SW80219WCU3	ATRATON	.510	.060
RNS	SW80219WCU3	ATRAZINE	.510	.050
RNS	SW80219WCU3	CALCIUM	124.000	24.100
RNS	SW80219WCU3	CHLORIDE	10.100	1.000
RNS	SW80219WCU3	GROSS ALPHA	4.990	2.000
RNS	SW80219WCU3	GROSS BETA	14.020	4.000
RNS	SW80219WCU3	PLUTONIUM-239/240	.114	.010
RNS	SW80219WCU3	PROMETON	.310	.030
RNS	SW80219WCU3	PROMETRYN	.610	.060
RNS	SW80219WCU3	PROPAZINE	.310	.030
RNS	SW80219WCU3	SILICON	83.000	27.700
RNS	SW80219WCU3	SIMAZINE	.610	.060
RNS	SW80219WCU3	SIMETRYN	.710	.070
RNS	SW80219WCU3	SODIUM	244.000	34.400
RNS	SW80219WCU3	TERBUTHYLAZINE	.310	.030
RNS	SW80219WCU3	TERBUTRYN	.510	.050
RNS	SW80221WCU3	AMETRYN	.640	.060
RNS	SW80221WCU3	AMMONIA	.170	.100
RNS	SW80221WCU3	ATRATON	.640	.060
RNS	SW80221WCU3	ATRAZINE	.530	.050
RNS	SW80221WCU3	CALCIUM	44.800	24.100
RNS	SW80221WCU3	CHLORIDE	9.100	1.000
RNS	SW80221WCU3	GROSS ALPHA	.410	.350
RNS	SW80221WCU3	MANGANESE	2.600	1.500
RNS	SW80221WCU3	POTASSIUM	1830.000	674.000
RNS	SW80221WCU3	PROMETON	.320	.030
RNS	SW80221WCU3	PROMETRYN	.640	.060

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Table G-11
Results Greater than Detection Limits for QC Samples

Sample QC Code	Sample Number	Chemical	Result	Detection Limit
RNS	SW80221WCU3	PROPAZINE	.320	.030
RNS	SW80221WCU3	SILICON	55.000	27.700
RNS	SW80221WCU3	SIMAZINE	.640	.060
RNS	SW80221WCU3	SIMETRYN	.740	.070
RNS	SW80221WCU3	SODIUM	71.500	34.400
RNS	SW80221WCU3	TERBUTHYLAZINE	.320	.030
RNS	SW80221WCU3	TOTAL DISSOLVED SOLIDS	20.000	10.000
RNS	SW80221WCU3	URANIUM-233/234	1.100	.310
RNS	SW80221WCU3	URANIUM-235	.220	.180
RNS	SW80221WCU3	URANIUM-238	.220	.180
RNS	SW80221WCU3	ZINC	2.700	1.700
RNS	SW80227WCU3	AMERICIUM-241	.004	.002
RNS	SW80227WCU3	SILICON	211.000	100.000
RNS	SW80227WCU3	SILICON	258.000	100.000
RNS	SW80227WCU3	URANIUM-233/234	.300	.083
RNS	SW80227WCU3	URANIUM-238	.100	.083
RNS	SW80228WCU3	ACETONE	18.000	10.000
RNS	SW80228WCU3	SILICON	102.000	100.000
RNS	SW80228WCU3	SILICON	137.000	100.000
RNS	SW80228WCU3	URANIUM-233/234	.180	.140
RNS	SW80228WCU3	URANIUM-235	.097	.081
RNS	SW80228WCU3	URANIUM-238	.290	.081
RNS	SW80240WCU3	ALUMINUM	20.300	18.700
RNS	SW80240WCU3	AMERICIUM-241	.004	0.000
RNS	SW80240WCU3	BARIUM	2.500	2.100
RNS	SW80240WCU3	CALCIUM	82.400	17.400
RNS	SW80240WCU3	IRON	32.900	4.700
RNS	SW80240WCU3	LEAD	5.800	1.300
RNS	SW80240WCU3	LITHIUM	4.800	4.700
RNS	SW80240WCU3	MANGANESE	6.500	2.100
RNS	SW80240WCU3	PLUTONIUM-239/240	.003	0.000
RNS	SW80240WCU3	SILICON	89.300	15.200
RNS	SW80240WCU3	SODIUM	155.000	28.300
RNS	SW80240WCU3	ZINC	14.200	2.100
RNS	SW80242WCU3	ALUMINUM	134.000	18.700
RNS	SW80242WCU3	CALCIUM	140.000	17.400
RNS	SW80242WCU3	CHROMIUM	4.100	2.400
RNS	SW80242WCU3	COPPER	4.600	2.400
RNS	SW80242WCU3	IRON	120.000	4.700
RNS	SW80242WCU3	LEAD	1.800	1.300
RNS	SW80242WCU3	MAGNESIUM	63.900	29.600
RNS	SW80242WCU3	MANGANESE	8.600	2.100
RNS	SW80242WCU3	POTASSIUM	1390.000	779.000
RNS	SW80242WCU3	SILICON	582.000	15.200
RNS	SW80242WCU3	SODIUM	841.000	28.300
RNS	SW80242WCU3	URANIUM-233/234	.310	.167
RNS	SW80242WCU3	ZINC	6.200	2.100

Table G-11
Results Greater than Detection Limits for QC Samples

Sample QC Code	Sample Number	Chemical	Result	Detection Limit
RNS	TR02013CH	AMERICIUM-241	.005	0.000
RNS	TR02013CH	PLUTONIUM-239/240	.005	0.000
RNS	TR02013CH	URANIUM-238	.046	0.000
RNS	TR02032CH	AMERICIUM-241	.003	0.000
RNS	TR02032CH	PLUTONIUM-239/240	.001	0.000
RNS	TR02051CH	AMERICIUM-241	.005	0.000
RNS	TR02070CH	AMERICIUM-241	.004	0.000
RNS	TR02108CH	AMERICIUM-241	.006	0.000
RNS	TR02108CH	PLUTONIUM-239/240	.008	0.000
RNS	TR02127CH	PLUTONIUM-239/240	.006	.005
RNS	TR02146CH	AMERICIUM-241	.006	0.000
RNS	TR02165CH	AMERICIUM-241	.004	0.000
RNS	TR02165CH	PLUTONIUM-239/240	.011	0.000
RNS	TR02165CH	URANIUM-235	.046	0.000
RNS	TR02184CH	AMERICIUM-241	.005	0.000
RNS	TR02184CH	PLUTONIUM-239/240	.002	0.000
RNS	TR02203CH	AMERICIUM-241	.003	0.000
RNS	TR02203CH	PLUTONIUM-239/240	.003	0.000

Table G-12
Detection Frequency for QC Samples

QC Code	Chemical	Detection Frequency	No. of Detects	No. of Non-Det.
FB	ALUMINUM	.400	2	3
FB	AMERICIUM-241	.500	2	2
FB	AMMONIA	1.000	1	0
FB	ANTIMONY	0.000	0	5
FB	ARSENIC	0.000	0	5
FB	ATRAZINE	0.000	0	1
FB	BARIUM	.400	2	3
FB	BERYLLIUM	0.000	0	5
FB	BICARBONATE AS CACO3	.500	1	1
FB	CADMIUM	.200	1	4
FB	CALCIUM	.800	4	1
FB	CARBONATE AS CACO3	0.000	0	2
FB	CESIUM	0.000	0	5
FB	CHLORIDE	0.000	0	2
FB	CHROMIUM	0.000	0	5
FB	COBALT	0.000	0	5
FB	COPPER	0.000	0	5
FB	CYANIDE	0.000	0	1
FB	FLUORIDE	0.000	0	2
FB	GROSS ALPHA	.667	2	1
FB	GROSS BETA	.333	1	2
FB	IRON	.600	3	2
FB	LEAD	.400	2	3
FB	LITHIUM	0.000	0	5
FB	MAGNESIUM	.600	3	2
FB	MANGANESE	.400	2	3
FB	MERCURY	0.000	0	5
FB	MOLYBDENUM	0.000	0	5
FB	NICKEL	0.000	0	5
FB	NITRATE/NITRITE	.500	1	1
FB	OIL AND GREASE	0.000	0	1
FB	ORTHOPHOSPHATE	1.000	1	0
FB	PHOSPHORUS	0.000	0	1
FB	PLUTONIUM-239/240	.750	3	1
FB	POTASSIUM	0.000	0	5
FB	SELENIUM	.200	1	4
FB	SILICON	.200	1	4
FB	SILVER	0.000	0	5
FB	SIMAZINE	0.000	0	1
FB	SODIUM	.800	4	1
FB	STRONTIUM	.200	1	4
FB	SULFATE	0.000	0	2
FB	SULFIDE	0.000	0	1
FB	THALLIUM	.200	1	4
FB	TIN	.200	1	4
FB	TOTAL DISSOLVED SOLIDS	.500	1	1
FB	TOTAL SUSPENDED SOLIDS	0.000	0	2
FB	TRITIUM	1.000	1	0
FB	URANIUM-233/234	.500	2	2
FB	URANIUM-235	.500	2	2
FB	URANIUM-238	.500	2	2
FB	VANADIUM	0.000	0	5
FB	ZINC	.400	2	3

Table G-12
Detection Frequency for QC Samples

QC Code	Chemical	Detection Frequency	No. of Detects	No. of Non-Det.
RNS	1,1,1-TRICHLOROETHANE	0.000	0	13
RNS	1,1,2,2-TETRACHLOROETHANE	0.000	0	13
RNS	1,1,2-TRICHLOROETHANE	0.000	0	13
RNS	1,1-DICHLOROETHANE	0.000	0	13
RNS	1,1-DICHLOROETHENE	0.000	0	13
RNS	1,2,4-TRICHLOROBENZENE	0.000	0	8
RNS	1,2-DICHLOROBENZENE	0.000	0	8
RNS	1,2-DICHLOROETHANE	0.000	0	13
RNS	1,2-DICHLOROETHENE	0.000	0	13
RNS	1,2-DICHLOROPROPANE	0.000	0	13
RNS	1,3-DICHLOROBENZENE	0.000	0	8
RNS	1,4-DICHLOROBENZENE	0.000	0	8
RNS	2,4,5-TRICHLOROPHENOL	0.000	0	8
RNS	2,4,6-TRICHLOROPHENOL	0.000	0	8
RNS	2,4-DICHLOROPHENOL	0.000	0	8
RNS	2,4-DIMETHYLPHENOL	0.000	0	8
RNS	2,4-DINITROPHENOL	0.000	0	8
RNS	2,4-DINITROTOLUENE	0.000	0	8
RNS	2,6-DINITROTOLUENE	0.000	0	8
RNS	2-BUTANONE	0.000	0	13
RNS	2-CHLORONAPHTHALENE	0.000	0	8
RNS	2-CHLOROPHENOL	0.000	0	8
RNS	2-HEXANONE	0.000	0	13
RNS	2-METHYLNAPHTHALENE	0.000	0	8
RNS	2-METHYLPHENOL	0.000	0	8
RNS	2-NITROANILINE	0.000	0	8
RNS	2-NITROPHENOL	0.000	0	8
RNS	3,3'-DICHLOROBENZIDINE	0.000	0	8
RNS	3-NITROANILINE	0.000	0	8
RNS	4,4'-DDD	0.000	0	8
RNS	4,4'-DDE	.125	1	7
RNS	4,4'-DDT	.375	3	5
RNS	4,6-DINITRO-2-METHYLPHENOL	0.000	0	8
RNS	4-BROMOPHENYL PHENYL ETHER	0.000	0	8
RNS	4-CHLORO-3-METHYLPHENOL	0.000	0	8
RNS	4-CHLOROANILINE	0.000	0	8
RNS	4-CHLOROPHENYL PHENYL ETHER	0.000	0	8
RNS	4-METHYL-2-PENTANONE	0.000	0	13
RNS	4-METHYLPHENOL	0.000	0	8
RNS	4-NITROANILINE	0.000	0	8
RNS	4-NITROPHENOL	0.000	0	8
RNS	ACENAPHTHENE	0.000	0	8
RNS	ACENAPHTHYLENE	0.000	0	8
RNS	ACETONE	.154	2	11
RNS	ALDRIN	0.000	0	8
RNS	ALKALINITY AS CACO3	0.000	0	8
RNS	ALUMINUM	.389	14	22
RNS	AMERICIUM-241	.379	22	36
RNS	AMETRYN	0.000	0	2
RNS	AMMONIA	.875	7	1
RNS	ANTHRACENE	0.000	0	8
RNS	ANTIMONY	.056	2	34

Table G-12
Detection Frequency for QC Samples

QC Code	Chemical	Detection Frequency	No. of Detects	No. of Non-Det.
RNS	AROCLOR-1016	0.000	0	8
RNS	AROCLOR-1221	0.000	0	8
RNS	AROCLOR-1232	0.000	0	8
RNS	AROCLOR-1242	0.000	0	8
RNS	AROCLOR-1248	0.000	0	8
RNS	AROCLOR-1254	0.000	0	8
RNS	AROCLOR-1260	0.000	0	8
RNS	ARSENIC	0.000	0	36
RNS	ATRATON	0.000	0	2
RNS	ATRAZINE	0.000	0	5
RNS	BARIUM	.444	16	20
RNS	BENZENE	0.000	0	13
RNS	BENZO(a)ANTHRACENE	0.000	0	8
RNS	BENZO(a)PYRENE	0.000	0	8
RNS	BENZO(b)FLUORANTHENE	0.000	0	8
RNS	BENZO(ghi)PERYLENE	0.000	0	8
RNS	BENZO(k)FLUORANTHENE	0.000	0	8
RNS	BENZOIC ACID	0.000	0	8
RNS	BENZYL ALCOHOL	0.000	0	8
RNS	BERYLLIUM	.028	1	35
RNS	BICARBONATE AS CACO3	.125	1	7
RNS	BROMODICHLOROMETHANE	0.000	0	13
RNS	BROMOFORM	0.000	0	13
RNS	BROMOMETHANE	0.000	0	13
RNS	BUTYL BENZYL PHTHALATE	0.000	0	8
RNS	CADMIUM	.111	4	32
RNS	CALCIUM	.889	32	4
RNS	CARBON DISULFIDE	0.000	0	13
RNS	CARBON TETRACHLORIDE	0.000	0	13
RNS	CARBONATE AS CACO3	0.000	0	8
RNS	CESIUM	.056	2	34
RNS	CESIUM-137	.143	1	6
RNS	CHLORIDE	.250	2	6
RNS	CHLOROBENZENE	0.000	0	13
RNS	CHLOROETHANE	0.000	0	13
RNS	CHLOROFORM	0.000	0	13
RNS	CHLOROMETHANE	.154	2	11
RNS	CHROMIUM	.167	6	30
RNS	CHRYSENE	0.000	0	8
RNS	COBALT	.083	3	33
RNS	COPPER	.278	10	26
RNS	CYANIDE	0.000	0	16
RNS	DI-n-BUTYL PHTHALATE	0.000	0	8
RNS	DI-n-OCTYL PHTHALATE	0.000	0	8
RNS	DIBENZO(a,h)ANTHRACENE	0.000	0	8
RNS	DIBENZOFURAN	0.000	0	8
RNS	DIBROMOCHLOROMETHANE	0.000	0	13
RNS	DIELDRIN	0.000	0	8
RNS	DIETHYL PHTHALATE	0.000	0	8
RNS	DIMETHYL PHTHALATE	0.000	0	8
RNS	ENDOSULFAN I	0.000	0	8
RNS	ENDOSULFAN II	0.000	0	8
RNS	ENDOSULFAN SULFATE	0.000	0	8

Table G-12
Detection Frequency for QC Samples

QC Code	Chemical	Detection Frequency	No. of Detects	No. of Non-Det.
RNS	ENDRIN	0.000	0	8
RNS	ENDRIN KETONE	0.000	0	8
RNS	ETHYLBENZENE	0.000	0	13
RNS	FLUORANTHENE	0.000	0	8
RNS	FLUORENE	0.000	0	8
RNS	FLUORIDE	0.000	0	8
RNS	GROSS ALPHA	.118	4	30
RNS	GROSS BETA	.118	4	30
RNS	HEPTACHLOR	0.000	0	8
RNS	HEPTACHLOR EPOXIDE	0.000	0	8
RNS	HEXACHLOROBENZENE	0.000	0	8
RNS	HEXACHLOROBUTADIENE	0.000	0	8
RNS	HEXACHLOROCYCLOPENTADIENE	0.000	0	8
RNS	HEXACHLOROETHANE	0.000	0	8
RNS	INDENO(1,2,3-cd)PYRENE	0.000	0	8
RNS	IRON	.583	21	15
RNS	ISOPHORONE	0.000	0	8
RNS	LEAD	.583	21	15
RNS	LITHIUM	.111	4	32
RNS	MAGNESIUM	.389	14	22
RNS	MANGANESE	.889	32	4
RNS	MERCURY	.028	1	35
RNS	METHOXYCHLOR	0.000	0	8
RNS	METHYLENE CHLORIDE	0.000	0	13
RNS	MOLYBDENUM	.083	3	33
RNS	N-NITROSO-DI-n-PROPYLAMINE	0.000	0	8
RNS	N-NITROSODIPHENYLAMINE	0.000	0	8
RNS	NAPHTHALENE	0.000	0	8
RNS	NICKEL	.056	2	34
RNS	NITRATE/NITRITE	.063	1	15
RNS	NITROBENZENE	0.000	0	8
RNS	OIL AND GREASE	.500	3	3
RNS	ORTHOPHOSPHATE	.143	1	6
RNS	PENTACHLOROPHENOL	0.000	0	8
RNS	PHENANTHRENE	0.000	0	8
RNS	PHENOL	0.000	0	8
RNS	PHOSPHORUS	0.000	0	7
RNS	PLUTONIUM-236	1.000	1	0
RNS	PLUTONIUM-238	0.000	0	1
RNS	PLUTONIUM-239/240	.407	22	32
RNS	POTASSIUM	.194	7	29
RNS	PROMETON	0.000	0	2
RNS	PROMETRYN	0.000	0	2
RNS	PROPAZINE	0.000	0	2
RNS	PYRENE	0.000	0	8
RNS	SELENIUM	.222	8	28
RNS	SILICON	.500	18	18
RNS	SILVER	.028	1	35
RNS	SIMAZINE	0.000	0	5
RNS	SIMETRYN	0.000	0	2
RNS	SODIUM	.917	33	3
RNS	STRONTIUM	.333	12	24
RNS	STRONTIUM-89/90	.143	1	6

Table G-12
Detection Frequency for QC Samples

QC Code	Chemical	Detection Frequency	No. of Detects	No. of Non-Det.
RNS	STYRENE	0.000	0	13
RNS	SULFATE	0.000	0	8
RNS	SULFIDE	0.000	0	6
RNS	TERBUTHYLAZINE	0.000	0	2
RNS	TERBUTRYN	0.000	0	1
RNS	TETRACHLOROETHENE	0.000	0	13
RNS	THALLIUM	0.000	0	36
RNS	TIC	1.000	2	0
RNS	TIN	.111	4	32
RNS	TOLUENE	.077	1	12
RNS	TOTAL DISSOLVED SOLIDS	.500	4	4
RNS	TOTAL SUSPENDED SOLIDS	.125	1	7
RNS	TOTAL XYLENES	0.000	0	13
RNS	TOXAPHENE	0.000	0	8
RNS	TRICHLOROETHENE	0.000	0	13
RNS	TRITIUM	0.000	0	10
RNS	UNKNOWN HYDROCARBON	1.000	2	0
RNS	URANIUM-233/234	.667	36	18
RNS	URANIUM-235	.426	23	31
RNS	URANIUM-238	.630	34	20
RNS	VANADIUM	.028	1	35
RNS	VINYL ACETATE	0.000	0	13
RNS	VINYL CHLORIDE	0.000	0	13
RNS	ZINC	.750	27	9
RNS	alpha-BHC	0.000	0	8
RNS	alpha-CHLORDANE	0.000	0	8
RNS	beta-BHC	0.000	0	8
RNS	bis(2-CHLOROETHOXY)METHANE	0.000	0	8
RNS	bis(2-CHLOROETHYL)ETHER	0.000	0	8
RNS	bis(2-CHLOROISOPROPYL)ETHER	0.000	0	8
RNS	bis(2-ETHYLHEXYL)PHTHALATE	.125	1	7
RNS	cis-1,3-DICHLOROPROPENE	0.000	0	13
RNS	delta-BHC	0.000	0	8
RNS	gamma-BHC (LINDANE)	0.000	0	8
RNS	gamma-CHLORDANE	0.000	0	8
RNS	pH	1.000	8	0
RNS	trans-1,3-DICHLOROPROPENE	0.000	0	13
TB	1,1,1-TRICHLOROETHANE	0.000	0	2
TB	1,1,2,2-TETRACHLOROETHANE	0.000	0	2
TB	1,1,2-TRICHLOROETHANE	0.000	0	2
TB	1,1-DICHLOROETHANE	0.000	0	2
TB	1,1-DICHLOROETHENE	0.000	0	2
TB	1,2-DICHLOROETHANE	0.000	0	2
TB	1,2-DICHLOROETHENE	0.000	0	2
TB	1,2-DICHLOROPROPANE	0.000	0	2
TB	2-BUTANONE	0.000	0	2
TB	2-HEXANONE	0.000	0	2
TB	4-METHYL-2-PENTANONE	0.000	0	2
TB	ACETONE	0.000	0	2
TB	BENZENE	0.000	0	2
TB	BROMODICHLOROMETHANE	0.000	0	2
TB	BROMOFORM	0.000	0	2

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Table G-12
Detection Frequency for QC Samples

QC Code	Chemical	Detection Frequency	No. of Detects	No. of Non-Det.
TB	BROMOMETHANE	0.000	0	2
TB	CARBON DISULFIDE	0.000	0	2
TB	CARBON TETRACHLORIDE	0.000	0	2
TB	CHLOROBENZENE	0.000	0	2
TB	CHLOROETHANE	0.000	0	2
TB	CHLOROFORM	0.000	0	2
TB	CHLOROMETHANE	0.000	0	2
TB	DIBROMOCHLOROMETHANE	0.000	0	2
TB	ETHYLBENZENE	0.000	0	2
TB	METHYLENE CHLORIDE	0.000	0	2
TB	STYRENE	0.000	0	2
TB	TETRACHLOROETHENE	0.000	0	2
TB	TOLUENE	.500	1	1
TB	TOTAL XYLENES	0.000	0	2
TB	TRICHLOROETHENE	0.000	0	2
TB	VINYL ACETATE	0.000	0	2
TB	VINYL CHLORIDE	0.000	0	2
TB	cis-1,3-DICHLOROPROPENE	0.000	0	2
TB	trans-1,3-DICHLOROPROPENE	0.000	0	2

Table G-13
Data Records Flagged as TICs

Location Code	Sample Type	QC Code	Sample Number	Sample Date	Dry	RFEDS Test Group Code	Main Test Group Code	General Test Group Code	Chemical	Analysis Date	New Result	New Unit	New Qual	Val	IHSS	DGTYPE	GRAB/CORE	AREA
SED01492	SD	REAL	SD00455WCU3	10/30/92		VOACLP	VOA-ORG-CLP	VOAS	TRICHLOROTRIFLUOROETHANE	11/13/92	50.000	UG/KG	JB		202	CREEK	GRAB	S
SED07592	SD	REAL	SD00374WCU3	7/13/92	N	VOACLP	VOA-ORG-CLP	VOAS	UNKNOWN	7/16/92	9.000	UG/KG	J		202	LAKE	GRAB	S
SED07692	SD	REAL	SD00375WCU3	7/13/92	N	VOACLP	VOA-ORG-CLP	VOAS	UNKNOWN-1	7/16/92	9.000	UG/KG	J		202	LAKE	GRAB	S
SED07692	SD	REAL	SD00375WCU3	7/13/92	N	VOACLP	VOA-ORG-CLP	VOAS	UNKNOWN-2	7/16/92	24.000	UG/KG	J		202	LAKE	GRAB	S

APPENDIX H

SOIL-TRENCH PROFILES

Appendix H contains tables and figures showing activities of radionuclides (americium-241, plutonium-239, -240, uranium-233, -234, uranium-235, and uranium-238) with depth for each soil trench. In the table content, "A" indicates data accepted and "R" indicates data rejected by the independent data validation process.

Appendix H also includes tables that summarize the classification and mineralogy of soils collected from the trenches. The particle size, pH, bulk density, specific surface area, and cation exchange capacity are also summarized for each trench.

Rocky Flats
Trench 02792 Data

Depth (cm)	Val	$^{239/240}Pu$ (pCi/g)	A	R
0	A	1.41E+00	1.4E+0	
3	A	2.66E-01	2.7E-1	
6	A	7.47E-02	7.5E-2	
9	A	1.61E-02	1.6E-2	
18	A	1.74E-02	1.7E-2	
24	A	1.47E-02	1.5E-2	
36	A	3.10E-03	3.1E-3	
48	A	3.76E-03	3.8E-3	
72	A	3.66E-03	3.7E-3	
96	A	1.72E-02	1.7E-2	

Val	^{241}Am (pCi/g)	A	R
A	2.72E-01	2.7E-1	
A	7.39E-02	7.4E-2	
A	1.47E-02	1.5E-2	
A	5.21E-03	5.2E-3	
A	9.80E-03	9.8E-3	
A	4.19E-03	4.2E-3	
A	7.32E-03	7.3E-3	
A	2.55E-03	2.5E-3	
A	2.36E-03	2.4E-3	
A	1.64E-02	1.6E-2	

Val	$^{241}Am/^{239/240}Pu$	A	R
A	1.93E-01	1.9E-1	
A	2.78E-01	2.8E-1	
A	1.97E-01	2.0E-1	
A	3.23E-01	3.2E-1	
A	5.63E-01	5.6E-1	
A	2.86E-01	2.9E-1	
A	2.36E+00	2.4E+0	
A	6.78E-01	6.8E-1	
A	6.44E-01	6.4E-1	
A	9.53E-01	9.5E-1	

Depth (cm)	Val	$^{233/234}U$ (pCi/g)	A	R
0	A	1.28E+00	1.3E+0	
3	A	1.60E+00	1.6E+0	
6	A	1.35E+00	1.3E+0	
9	A	1.53E+00	1.5E+0	
18	A	1.37E+00	1.4E+0	
24	A	9.06E-01	9.1E-1	
36	A	8.66E-01	8.7E-1	
48	A	6.24E-01	6.2E-1	
72	A	5.06E-01	5.1E-1	
96	A	1.47E+00	1.5E+0	

Val	^{235}U (pCi/g)	A	R
A	9.26E-02	9.3E-2	
A	1.85E-02	1.8E-2	
A	1.01E-01	1.0E-1	
A	5.82E-02	5.8E-2	
A	8.93E-03	8.9E-3	
A	7.06E-02	7.1E-2	
A	5.48E-02	5.5E-2	
A	3.29E-02	3.3E-2	
A	2.54E-02	2.5E-2	
A	5.71E-02	5.7E-2	

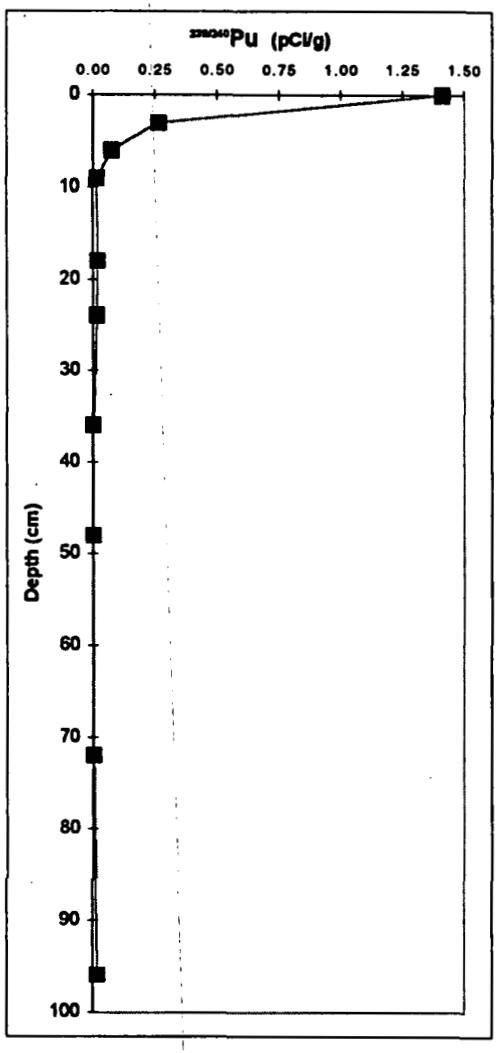
Val	^{238}U (pCi/g)	A	R
A	1.48E+00	1.5E+0	
A	1.38E+00	1.4E+0	
A	1.26E+00	1.3E+0	
A	1.57E+00	1.6E+0	
A	1.35E+00	1.4E+0	
A	7.52E-01	7.5E-1	
A	1.02E+00	1.0E+0	
A	7.32E-01	7.3E-1	
A	4.04E-01	4.0E-1	
A	1.67E+00	1.7E+0	

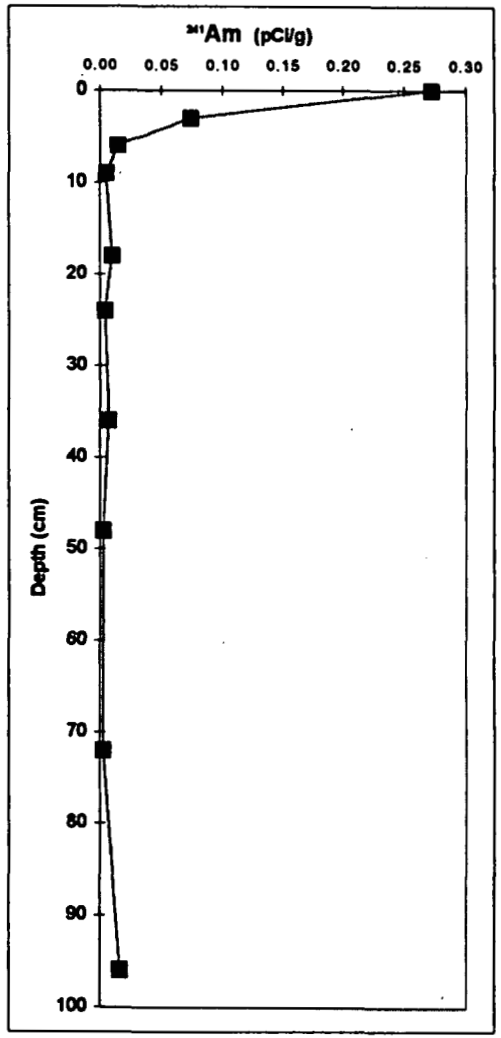
Depth (cm)	Val	$^{233/234}U/^{238}U$	A	R
0	A	8.69E-01	8.7E-1	
3	A	1.16E+00	1.2E+0	
6	A	1.07E+00	1.1E+0	
9	A	9.78E-01	9.8E-1	
18	A	1.01E+00	1.0E+0	
24	A	1.21E+00	1.2E+0	
36	A	8.46E-01	8.5E-1	
48	A	8.53E-01	8.5E-1	
72	A	1.25E+00	1.3E+0	
96	A	8.81E-01	8.8E-1	

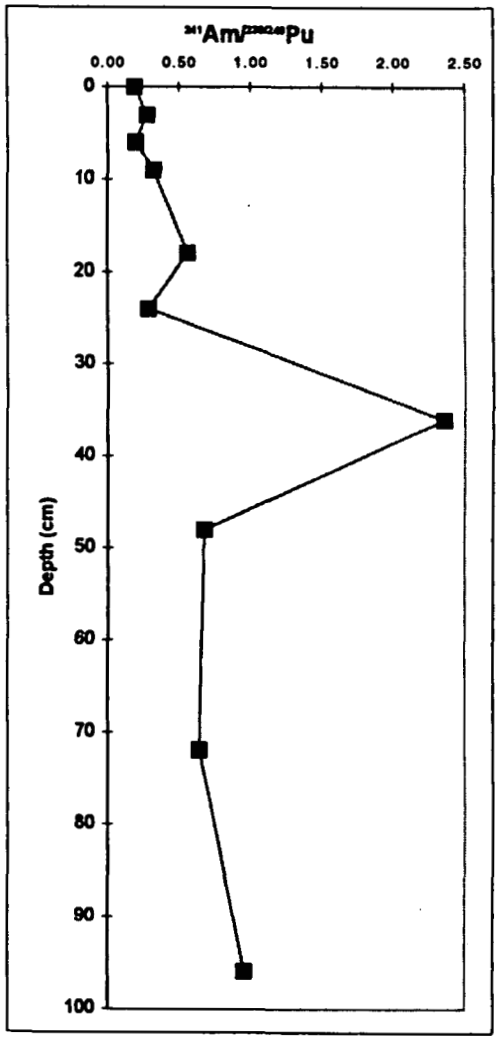
Val	$^{235}U/^{238}U$	A	R
A	6.27E-02	6.3E-2	
A	1.34E-02	1.3E-2	
A	8.06E-02	8.1E-2	
A	3.72E-02	3.7E-2	
A	6.60E-03	6.6E-3	
A	9.40E-02	9.4E-2	
A	5.35E-02	5.4E-2	
A	4.49E-02	4.5E-2	
A	6.28E-02	6.3E-2	
A	3.42E-02	3.4E-2	

Val	$^{233/234}U/^{235}U$	A	R
A	1.39E+01	1.4E+1	
A	8.65E+01	8.7E+1	
A	1.33E+01	1.3E+1	
A	2.63E+01	2.6E+1	
A	1.54E+02	1.5E+2	
A	1.28E+01	1.3E+1	
A	1.58E+01	1.6E+1	
A	1.90E+01	1.9E+1	
A	2.00E+01	2.0E+1	
A	2.58E+01	2.6E+1	

Trench 02792

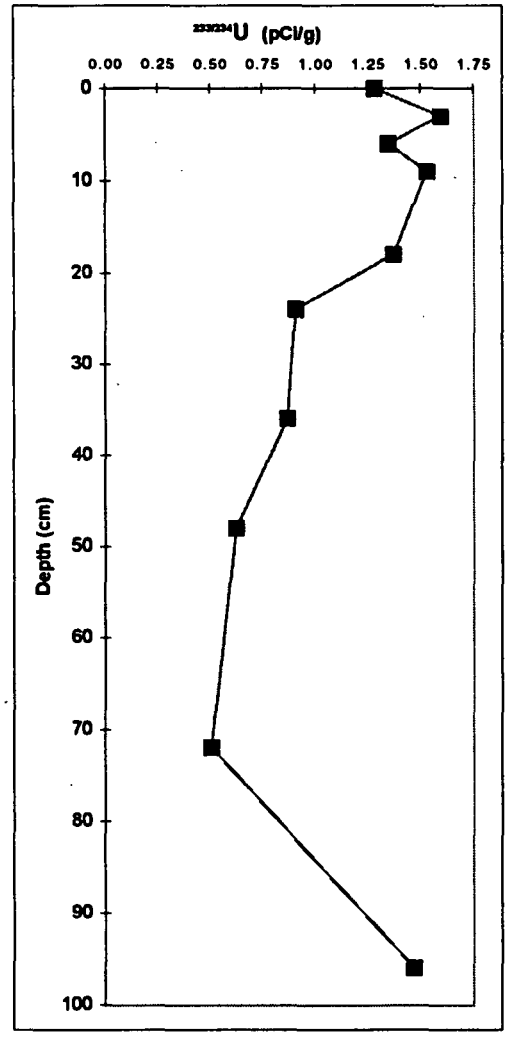


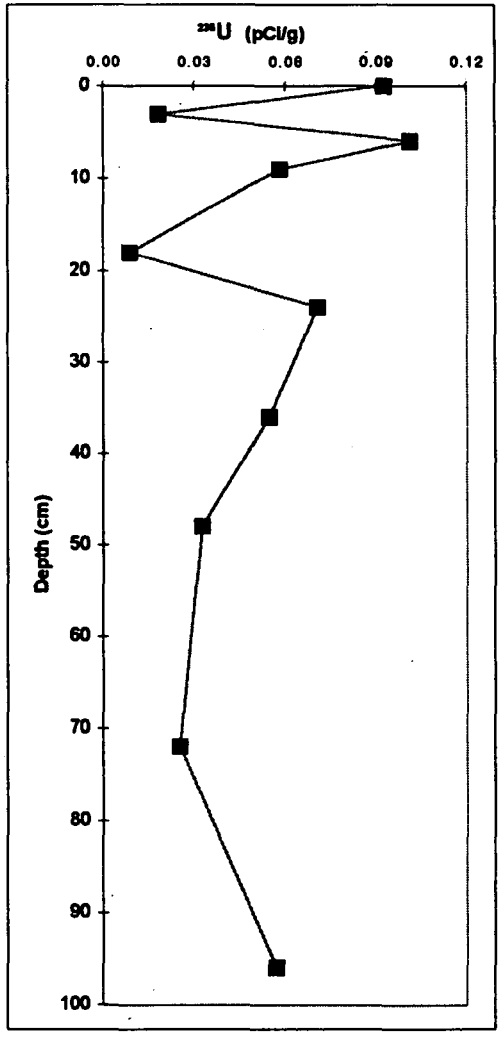


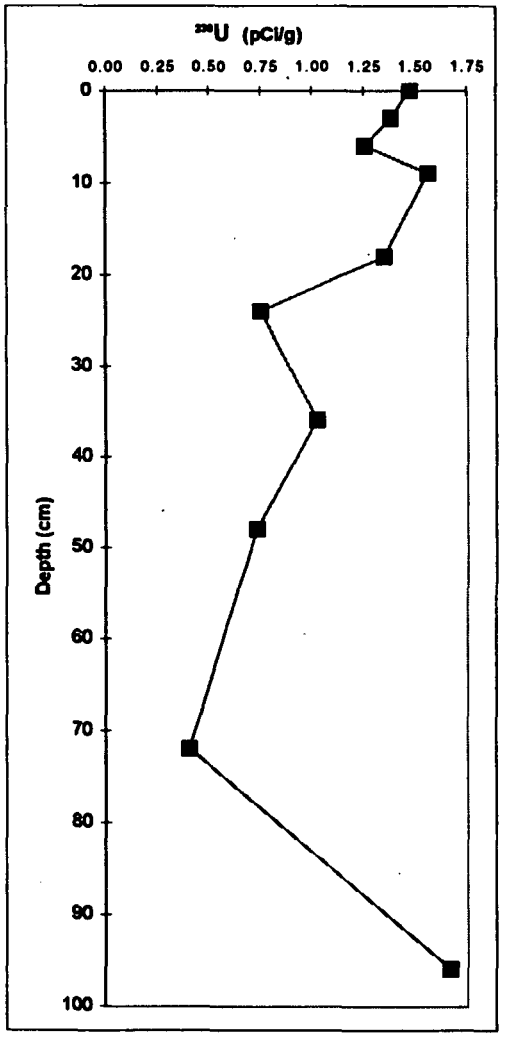


Rejected values indicated by

Trench 02792







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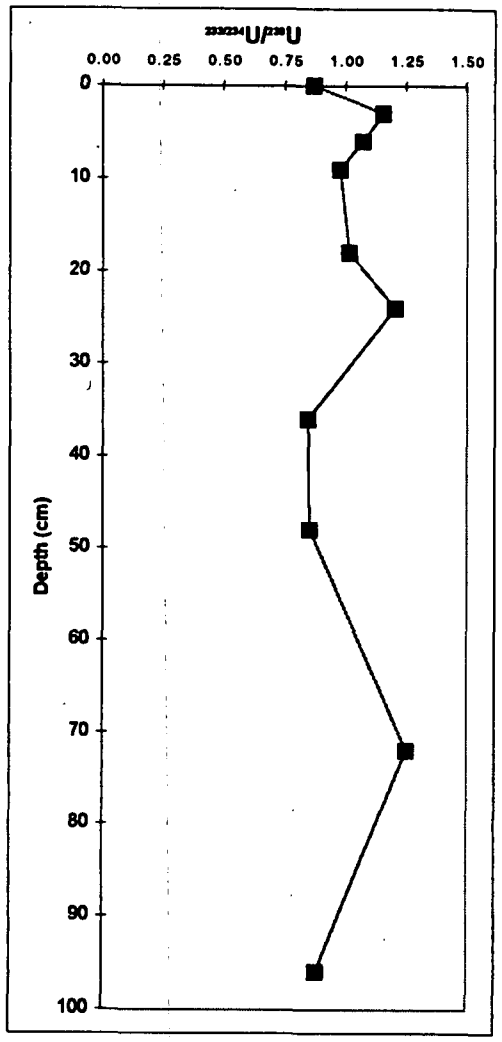
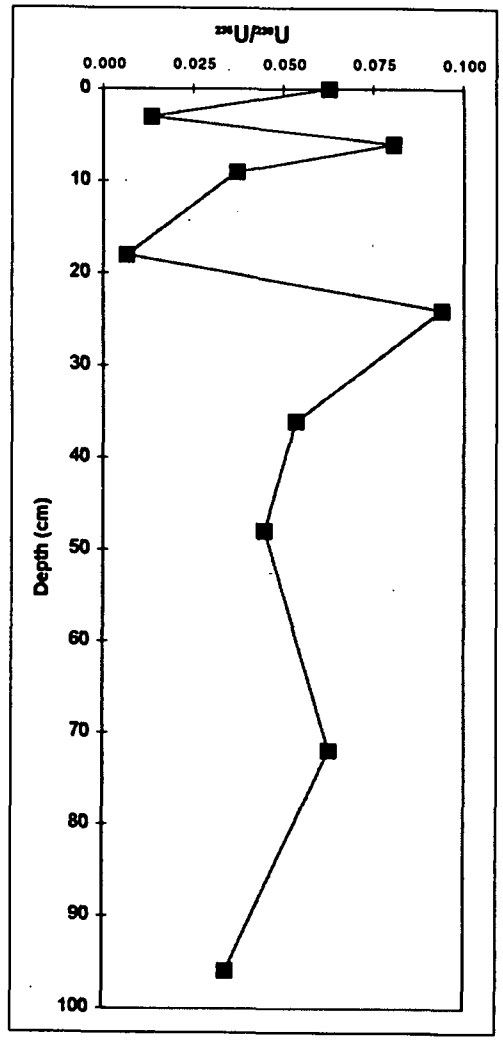
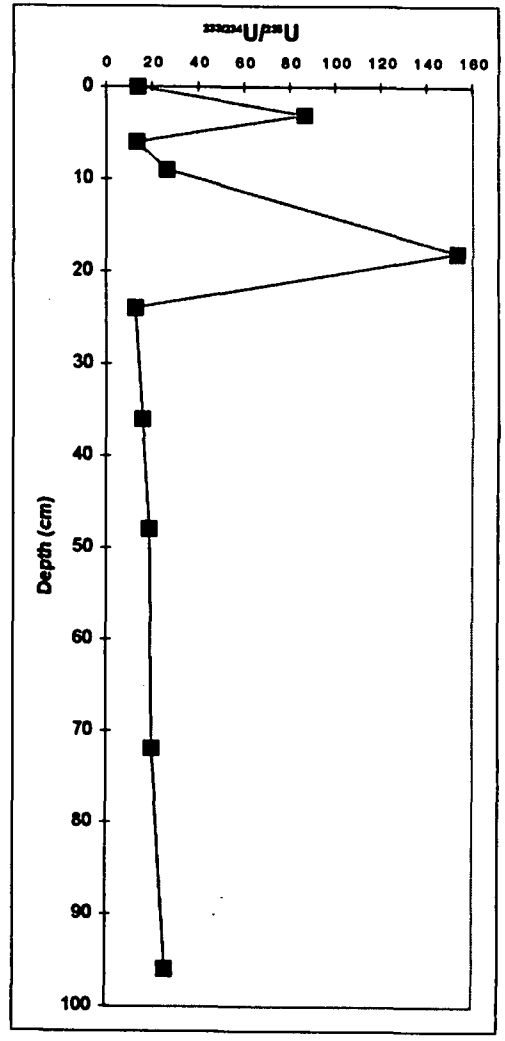






Rejected values indicated by

Rocky Flats
Trench 02892 Data

Depth (cm)	Val	$^{239/240}Pu$ (pCi/g)	A	R
0	A	2.79E-01	2.8E-1	
3	A	8.40E-02	8.4E-2	
6	A	1.70E-02	1.7E-2	
9	A	1.30E-02	1.3E-2	
18	A	7.00E-03	7.0E-3	
24	A	8.00E-03	8.0E-3	
36	A	3.00E-03	3.0E-3	
48	A	1.00E-03	1.0E-3	
72	A	2.00E-03	2.0E-3	
96	A	5.00E-03	5.0E-3	

Val	^{241}Am (pCi/g)	A	R
R	6.60E-02		6.6E-2
R	2.80E-02		2.8E-2
R	6.00E-03		6.0E-3
R	2.00E-02		2.0E-2
R	-1.00E-03		-1.0E-3
R	3.00E-03		3.0E-3
R	4.00E-03		4.0E-3
R	3.00E-03		3.0E-3
R	8.00E-03		8.0E-3
R	3.00E-03		3.0E-3

Val	$^{241}Am/^{239/240}Pu$	A	R
R	2.37E-01		2.4E-1
R	3.33E-01		3.3E-1
R	3.53E-01		3.5E-1
R	1.54E+00		1.5E+0
R	-1.43E-01		-1.4E-1
R	3.75E-01		3.8E-1
R	1.33E+00		1.3E+0
R	3.00E+00		3.0E+0
R	4.00E+00		4.0E+0
R	6.00E-01		6.0E-1

Depth (cm)	Val	$^{233/234}U$ (pCi/g)	A	R
0	A	7.35E-01	7.4E-1	
3	A	1.24E+00	1.2E+0	
6	A	1.42E+00	1.4E+0	
9	A	8.82E-01	8.8E-1	
18	A	7.79E-01	7.8E-1	
24	A	1.15E+00	1.1E+0	
36	A	8.27E-01	8.3E-1	
48	A	1.14E+00	1.1E+0	
72	A	8.75E-01	8.8E-1	
96	A	8.58E-01	8.6E-1	

Val	^{235}U (pCi/g)	A	R
A	3.10E-02	3.1E-2	
A	4.70E-02	4.7E-2	
A	4.00E-02	4.0E-2	
A	4.10E-02	4.1E-2	
A	3.30E-02	3.3E-2	
A	2.30E-02	2.3E-2	
A	6.00E-03	6.0E-3	
A	4.00E-02	4.0E-2	
A	1.03E-01	1.0E-1	
A	5.80E-02	5.8E-2	

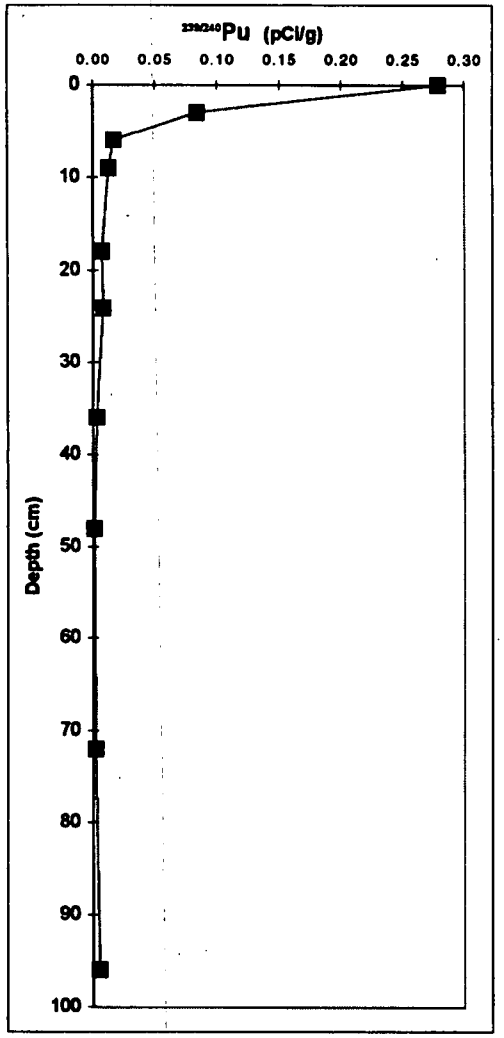
Val	^{238}U (pCi/g)	A	R
A	6.58E-01	6.6E-1	
A	1.10E+00	1.1E+0	
A	1.17E+00	1.2E+0	
A	1.03E+00	1.0E+0	
A	8.82E-01	8.8E-1	
A	7.91E-01	7.9E-1	
A	7.34E-01	7.3E-1	
A	1.10E+00	1.1E+0	
A	1.00E+00	1.0E+0	
A	9.47E-01	9.5E-1	

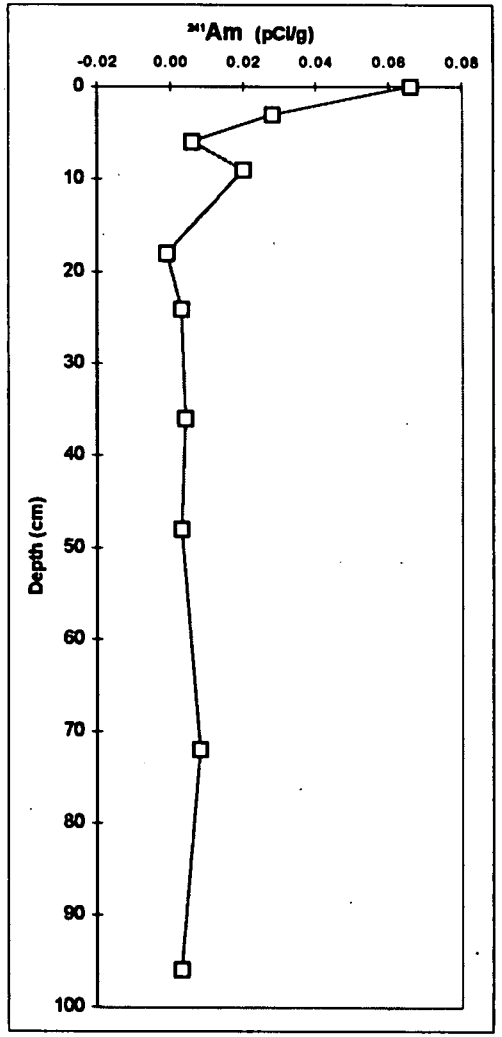
Depth (cm)	Val	$^{233/234}U/^{238}U$	A	R
0	A	1.12E+00	1.1E+0	
3	A	1.13E+00	1.1E+0	
6	A	1.21E+00	1.2E+0	
9	A	8.59E-01	8.6E-1	
18	A	8.83E-01	8.8E-1	
24	A	1.45E+00	1.5E+0	
36	A	1.13E+00	1.1E+0	
48	A	1.04E+00	1.0E+0	
72	A	8.74E-01	8.7E-1	
96	A	9.06E-01	9.1E-1	

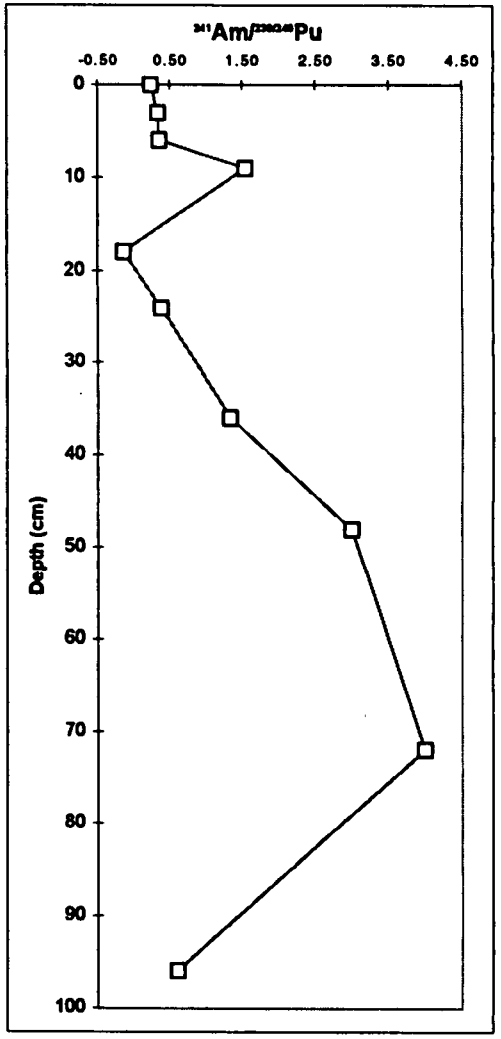
Val	$^{235}U/^{238}U$	A	R
A	4.71E-02	4.7E-2	
A	4.29E-02	4.3E-2	
A	3.41E-02	3.4E-2	
A	3.99E-02	4.0E-2	
A	3.74E-02	3.7E-2	
A	2.91E-02	2.9E-2	
A	8.17E-03	8.2E-3	
A	3.65E-02	3.7E-2	
A	1.03E-01	1.0E-1	
A	6.12E-02	6.1E-2	

Val	$^{233/234}U/^{235}U$	A	R
A	2.37E+01	2.4E+1	
A	2.64E+01	2.6E+1	
A	3.54E+01	3.5E+1	
A	2.15E+01	2.2E+1	
A	2.36E+01	2.4E+1	
A	4.99E+01	5.0E+1	
A	1.38E+02	1.4E+2	
A	2.86E+01	2.9E+1	
A	8.50E+00	8.5E+0	
A	1.48E+01	1.5E+1	

Trench 02892

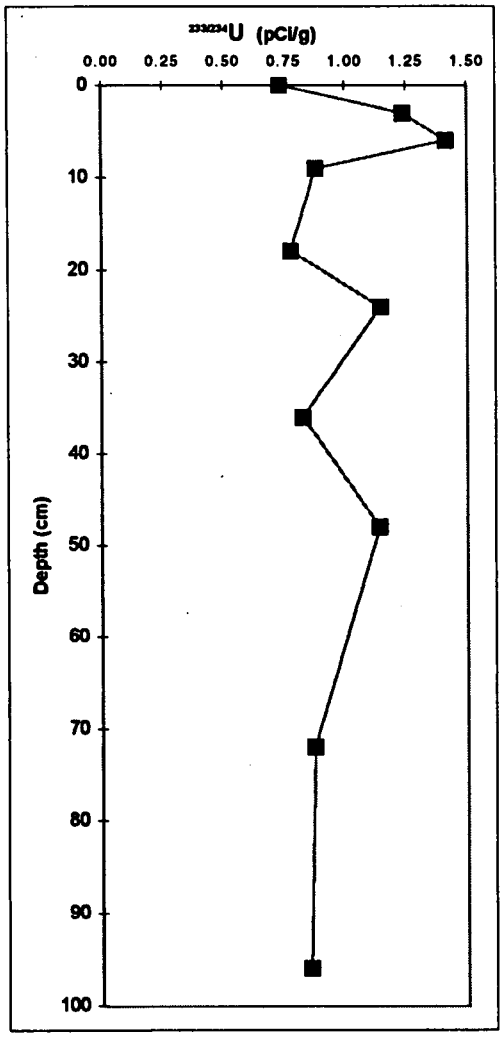


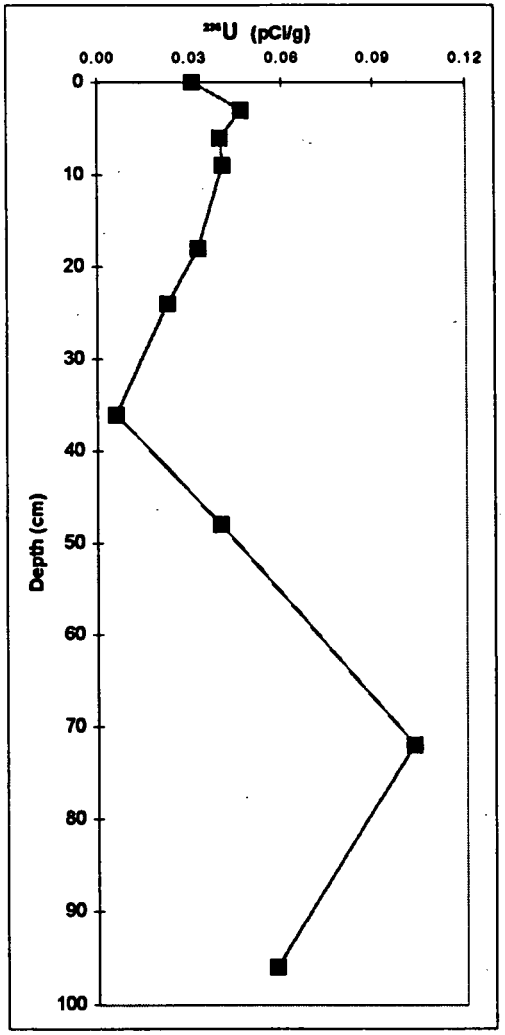


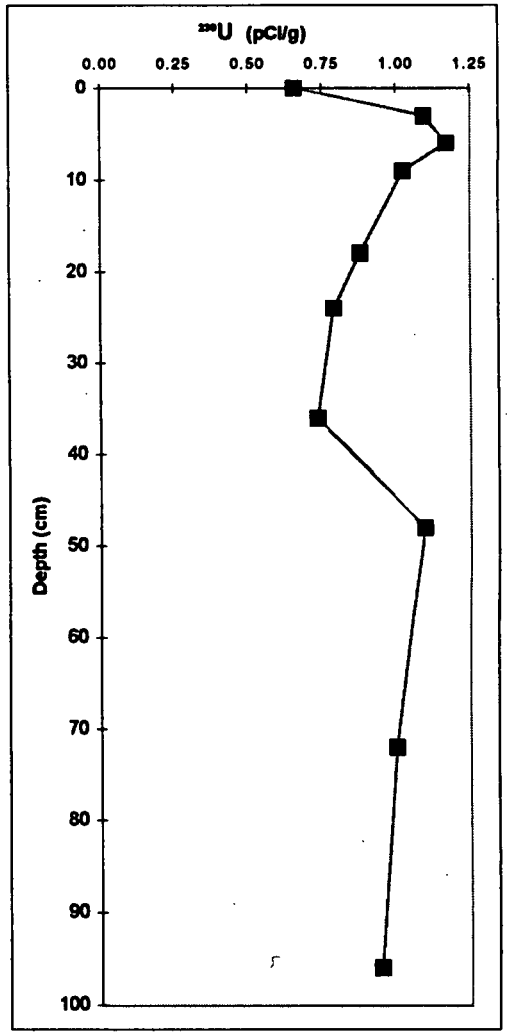


Rejected values indicated by

Trench 02892

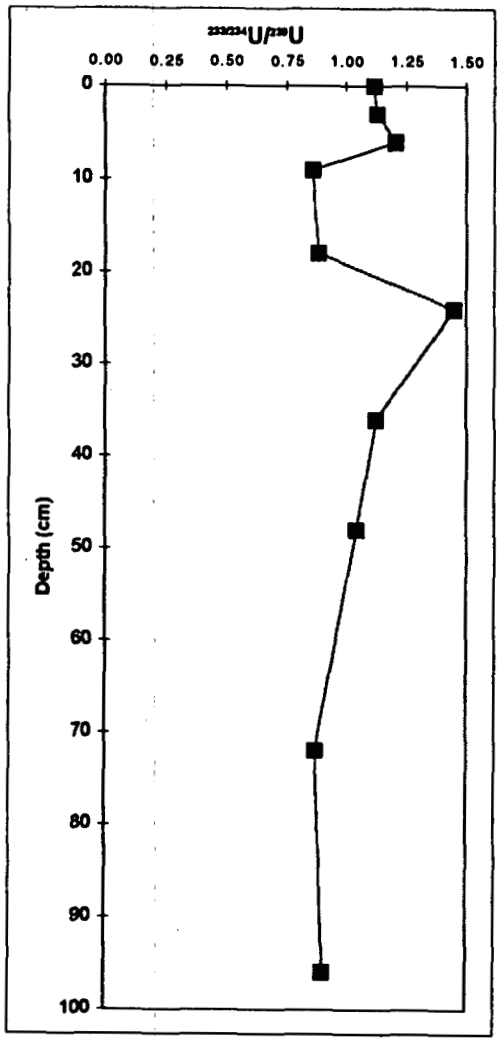


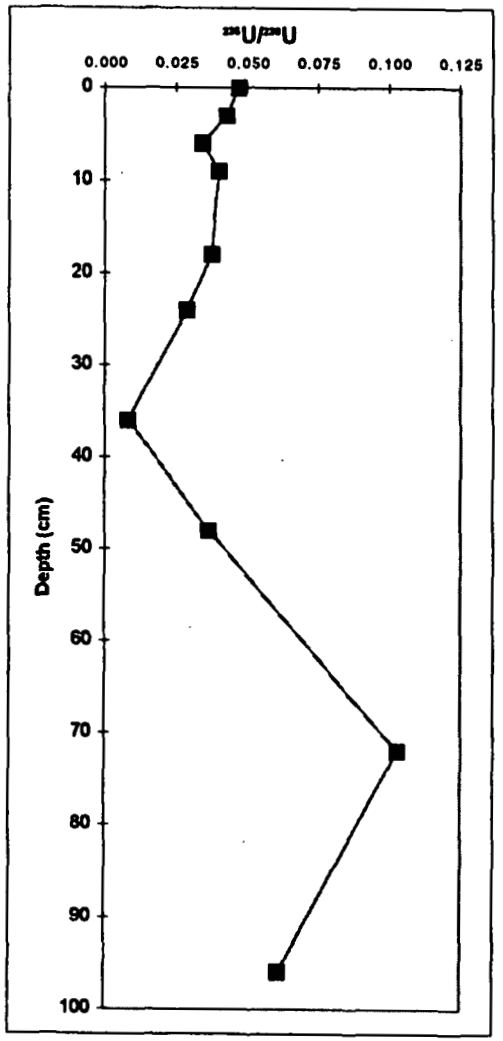


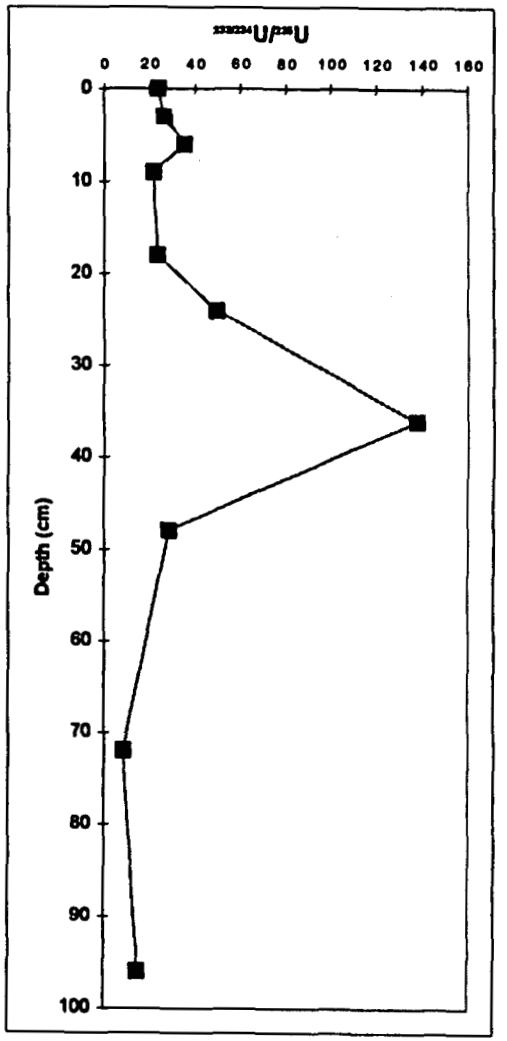


Rejected values indicated by

Trench 02892







Rejected values indicated by

Rocky Flats
Trench 02992 Data

Depth (cm)	Val	$^{239/240}Pu$ (pCi/g)	A	R
0	A	5.21E-01	5.2E-1	
3	A	2.04E-01	2.0E-1	
6	A	3.57E-02	3.6E-2	
9	A	1.71E-02	1.7E-2	
18	R	3.09E-03		3.09E-03
24	A	9.97E-03	1.0E-2	
36	A	1.15E-02	1.2E-2	
48	A	1.60E-02	1.6E-2	
72	A	4.41E-03	4.4E-3	
96	A	1.49E-02	1.5E-2	

Val	^{241}Am (pCi/g)	A	R
R	5.61E-01		5.6E-1
R	5.61E-01		5.6E-1
R	1.34E-02		1.3E-2
R	6.94E-03		6.9E-3
R	2.89E-03		2.9E-3
R	4.79E-03		4.8E-3
R	3.19E-02		3.2E-2
R	7.53E-03		7.5E-3
R	5.17E-02		5.2E-2
R	3.22E-03		3.2E-3

Val	$^{241}Am/^{239/240}Pu$	A	R
R	1.08E+00		1.1E+0
R	2.75E+00		2.8E+0
R	3.75E-01		3.8E-1
R	4.06E-01		4.1E-1
R	9.35E-01		9.4E-1
R	4.80E-01		4.8E-1
R	2.77E+00		2.8E+0
R	4.71E-01		4.7E-1
R	1.17E+01		1.2E+1
R	2.16E-01		2.2E-1

Depth (cm)	Val	$^{233/234}U$ (pCi/g)	A	R
0	A	8.00E-01	8.0E-1	
3	A	1.23E+00	1.2E+0	
6	A	7.62E-01	7.6E-1	
9	A	4.97E-01	5.0E-1	
18	A	6.63E-01	6.6E-1	
24	A	5.83E-01	5.8E-1	
36	A	4.64E-01	4.6E-1	
48	A	4.06E-01	4.1E-1	
72	A	6.53E-01	6.5E-1	
96	A	7.56E-01	7.6E-1	

Val	^{235}U (pCi/g)	A	R
A	3.05E-02	3.1E-2	
A	7.52E-02	7.5E-2	
A	3.11E-02	3.1E-2	
A	2.48E-02	2.5E-2	
A	2.01E-02	2.0E-2	
A	5.92E-02	5.9E-2	
A	2.11E-02	2.1E-2	
A	2.00E-02	2.0E-2	
A	1.61E-02	1.6E-2	
A	1.59E-02	1.6E-2	

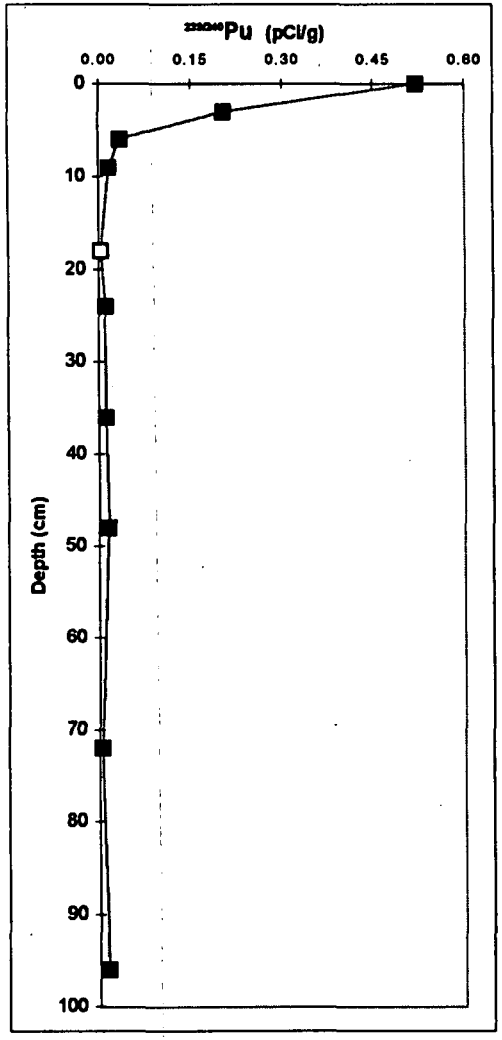
Val	^{238}U (pCi/g)	A	R
A	8.00E-01	8.0E-1	
A	1.45E+00	1.5E+0	
A	7.23E-01	7.2E-1	
A	6.70E-01	6.7E-1	
A	5.43E-01	5.4E-1	
A	7.10E-01	7.1E-1	
A	4.78E-01	4.8E-1	
A	5.00E-01	5.0E-1	
A	5.57E-01	5.6E-1	
A	6.92E-01	6.9E-1	

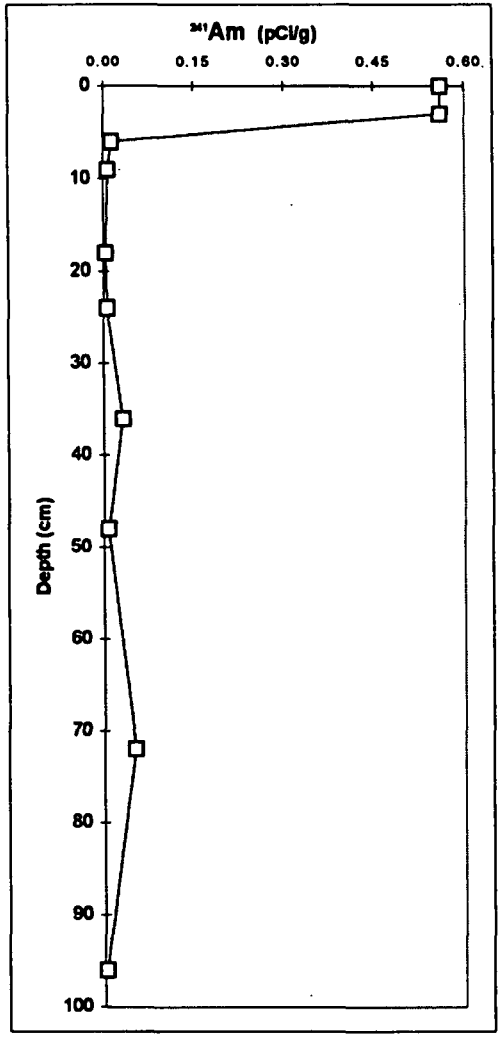
Depth (cm)	Val	$^{233/234}U/^{238}U$	A	R
0	A	1.00E+00	1.0E+0	
3	A	8.48E-01	8.5E-1	
6	A	1.05E+00	1.1E+0	
9	A	7.42E-01	7.4E-1	
18	A	1.22E+00	1.2E+0	
24	A	8.21E-01	8.2E-1	
36	A	9.71E-01	9.7E-1	
48	A	8.12E-01	8.1E-1	
72	A	1.17E+00	1.2E+0	
96	A	1.09E+00	1.1E+0	

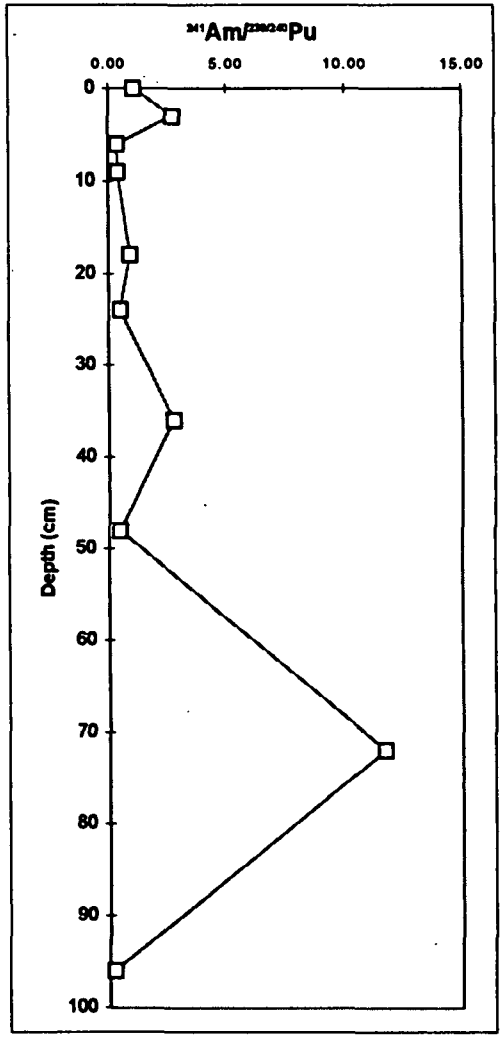
Val	$^{235}U/^{238}U$	A	R
A	3.81E-02	3.8E-2	
A	5.19E-02	5.2E-2	
A	4.30E-02	4.3E-2	
A	3.70E-02	3.7E-2	
A	3.70E-02	3.7E-2	
A	8.34E-02	8.3E-2	
A	4.41E-02	4.4E-2	
A	4.00E-02	4.0E-2	
A	2.89E-02	2.9E-2	
A	2.30E-02	2.3E-2	

Val	$^{233/234}U/^{235}U$	A	R
A	2.62E+01	2.6E+1	
A	1.64E+01	1.6E+1	
A	2.45E+01	2.5E+1	
A	2.00E+01	2.0E+1	
A	3.30E+01	3.3E+1	
A	9.85E+00	9.8E+0	
A	2.20E+01	2.2E+1	
A	2.03E+01	2.0E+1	
A	4.06E+01	4.1E+1	
A	4.75E+01	4.8E+1	

Trench 02992

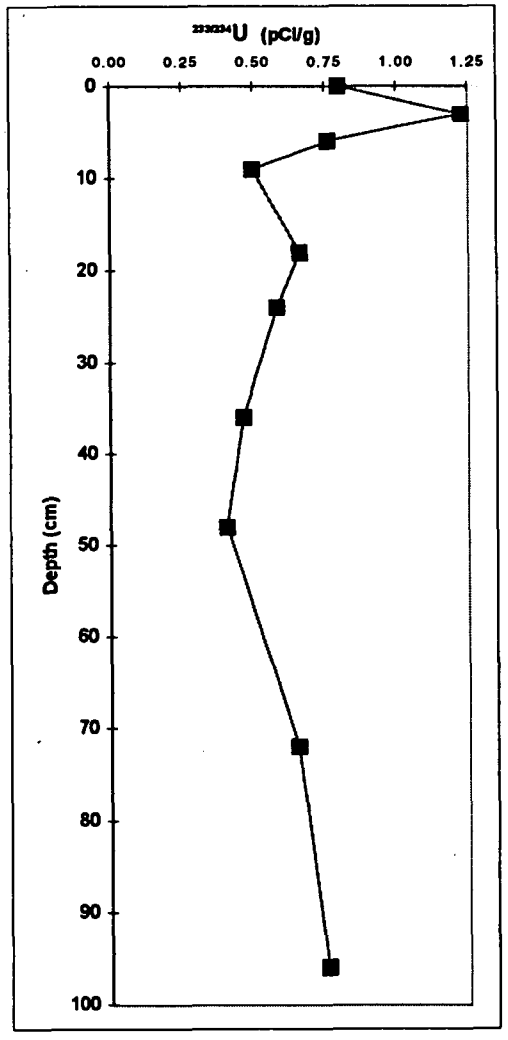


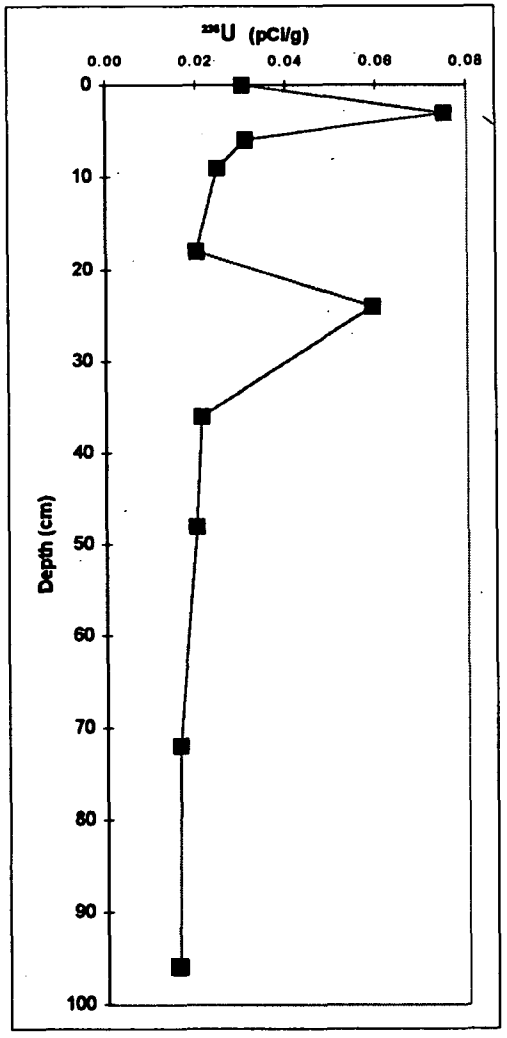


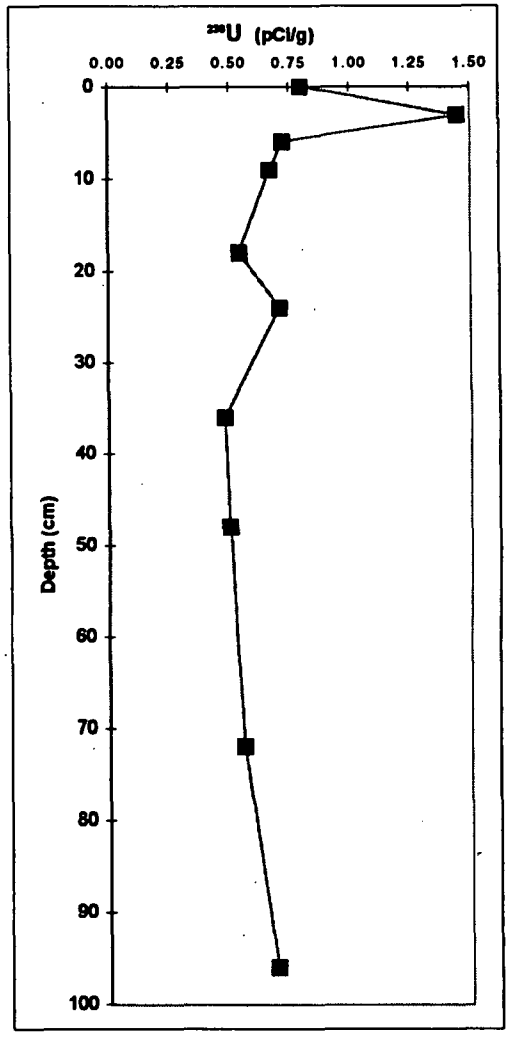


Rejected values indicated by

Trench 02992

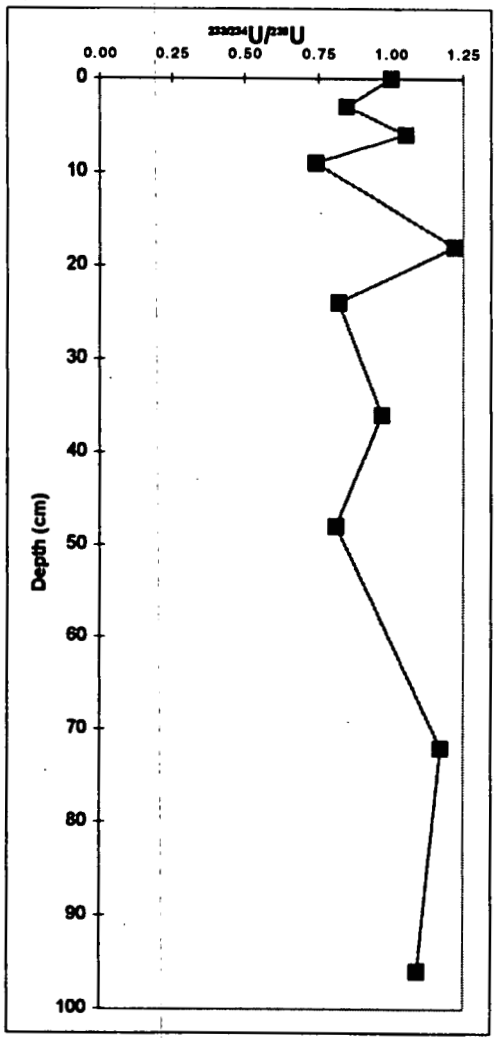


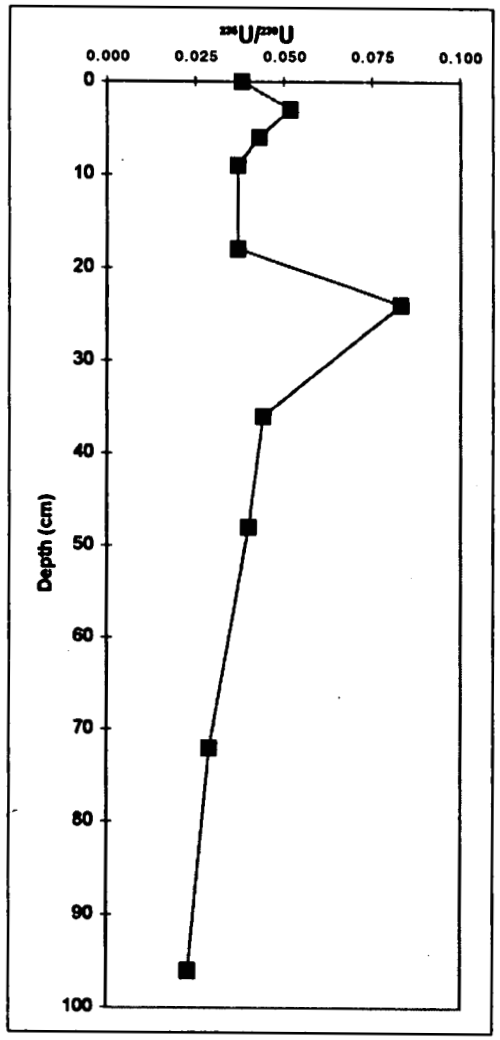


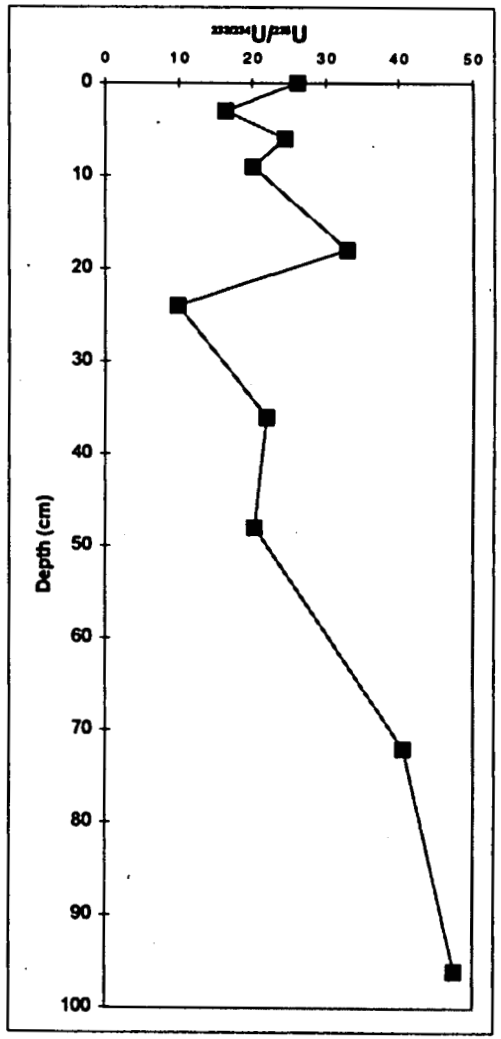


Rejected values indicated by

Trench 02992







Rejected values indicated by

Rocky Flats
Trench 03092 Data

Depth (cm)	Val	$^{239/240}Pu$ (pCi/g)	A	R
0	A	4.39E-01	4.4E-1	
3	A	3.81E-01	3.8E-1	
6	A	1.36E-01	1.4E-1	
9	A	3.08E-02	3.1E-2	
18	A	1.74E-02	1.7E-2	
24	A	1.08E-02	1.1E-2	
36	A	-5.74E-03	-5.7E-3	
48	A	0.00E+00	0.0E+0	
72	A	1.54E-02	1.5E-2	
96	A	4.41E-03	4.4E-3	

Val	^{241}Am (pCi/g)	A	R
A	7.94E-02	7.9E-2	
A	9.29E-02	9.3E-2	
A	3.71E-02	3.7E-2	
A	1.03E-02	1.0E-2	
A	3.88E-03	3.9E-3	
A	3.84E-03	3.8E-3	
A	4.00E-03	4.0E-3	
A	1.94E-03	1.9E-3	
A	4.34E-03	4.3E-3	
A	3.94E-03	3.9E-3	

Val	$^{241}Am/^{239/240}Pu$	A	R
A	1.81E-01	1.8E-1	
A	2.44E-01	2.4E-1	
A	2.72E-01	2.7E-1	
A	3.35E-01	3.3E-1	
A	2.23E-01	2.2E-1	
A	3.56E-01	3.6E-1	
A	-6.96E-01	-7.0E-1	
A			
A	2.82E-01	2.8E-1	
A	8.94E-01	8.9E-1	

Depth (cm)	Val	$^{233/234}U$ (pCi/g)	A	R
0	A	9.09E-01	9.1E-1	
3	A	7.39E-01	7.4E-1	
6	A	6.96E-01	7.0E-1	
9	A	9.97E-01	1.0E+0	
18	A	1.02E+00	1.0E+0	
24	A	7.72E-01	7.7E-1	
36	A	1.74E+00	1.7E+0	
48	A	8.93E-01	8.9E-1	
72	A	1.05E+00	1.1E+0	
96	A	1.11E+00	1.1E+0	

Val	^{235}U (pCi/g)	A	R
A	7.51E-02	7.5E-2	
A	3.79E-02	3.8E-2	
A	2.50E-02	2.5E-2	
A	4.40E-02	4.4E-2	
A	-7.61E-03	-7.6E-3	
A	7.38E-02	7.4E-2	
A	1.23E-01	1.2E-1	
A	2.03E-02	2.0E-2	
A	7.01E-02	7.0E-2	
A	1.83E-02	1.8E-2	

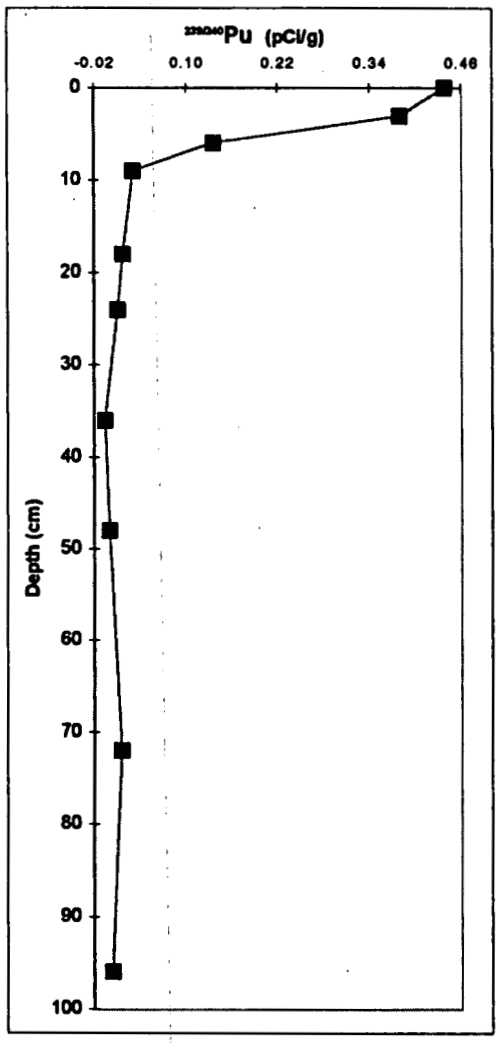
Val	^{238}U (pCi/g)	A	R
A	8.01E-01	8.0E-1	
A	9.24E-01	9.2E-1	
A	1.20E+00	1.2E+0	
A	1.07E+00	1.1E+0	
A	9.18E-01	9.2E-1	
A	1.22E+00	1.2E+0	
A	1.03E+00	1.0E+0	
A	7.47E-01	7.5E-1	
A	7.44E-01	7.4E-1	
A	9.57E-01	9.6E-1	

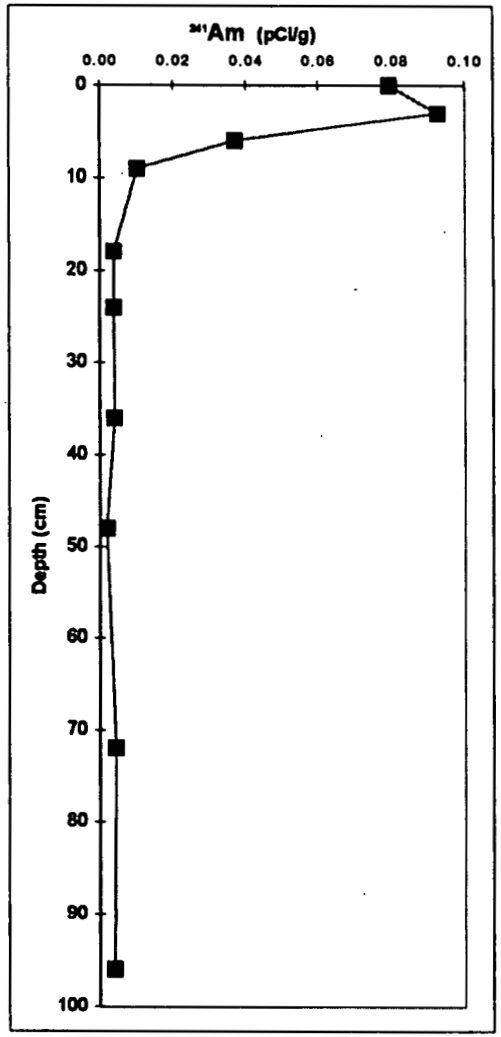
Depth (cm)	Val	$^{233/234}U/^{238}U$	A	R
0	A	1.14E+00	1.1E+0	
3	A	8.00E-01	8.0E-1	
6	A	5.82E-01	5.8E-1	
9	A	9.29E-01	9.3E-1	
18	A	1.11E+00	1.1E+0	
24	A	6.34E-01	6.3E-1	
36	A	1.68E+00	1.7E+0	
48	A	1.20E+00	1.2E+0	
72	A	1.42E+00	1.4E+0	
96	A	1.15E+00	1.2E+0	

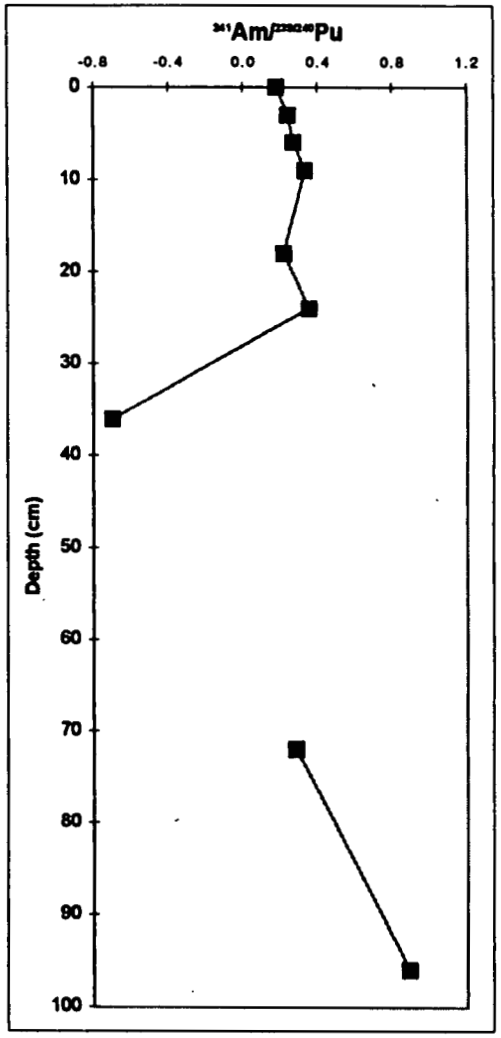
Val	$^{235}U/^{238}U$	A	R
A	9.37E-02	9.4E-2	
A	4.10E-02	4.1E-2	
A	2.09E-02	2.1E-2	
A	4.10E-02	4.1E-2	
A	-8.29E-03	-8.3E-3	
A	6.06E-02	6.1E-2	
A	1.19E-01	1.2E-1	
A	2.72E-02	2.7E-2	
A	9.42E-02	9.4E-2	
A	1.92E-02	1.9E-2	

Val	$^{233/234}U/^{235}U$	A	R
A	1.21E+01	1.2E+1	
A	1.95E+01	1.9E+1	
A	2.78E+01	2.8E+1	
A	2.27E+01	2.3E+1	
A	-1.33E+02	-1.3E+2	
A	1.05E+01	1.0E+1	
A	1.41E+01	1.4E+1	
A	4.40E+01	4.4E+1	
A	1.50E+01	1.5E+1	
A	6.03E+01	6.0E+1	

Trench 03092

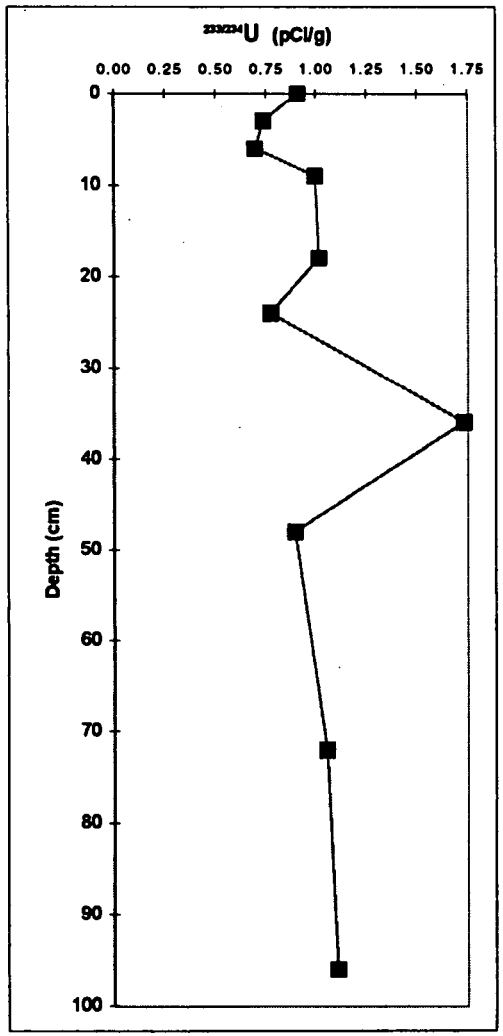


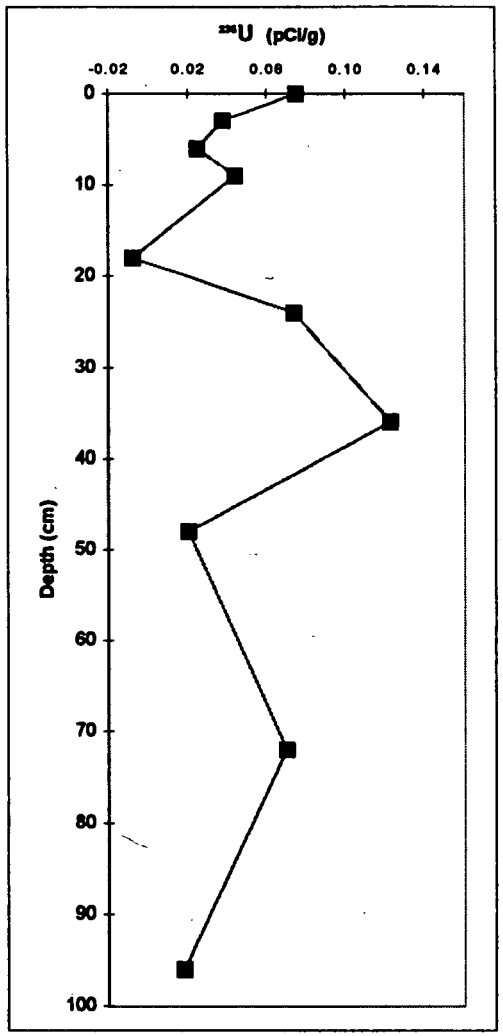


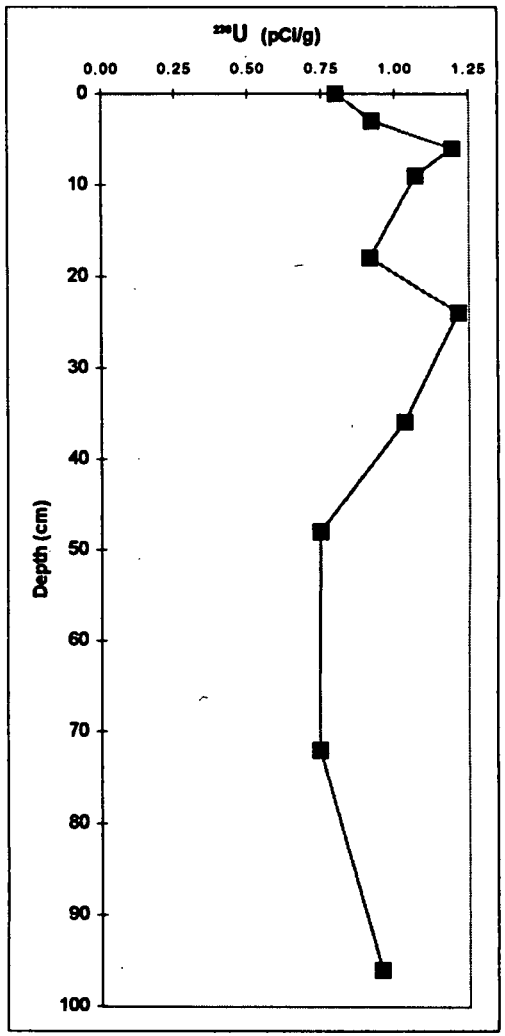


Rejected values indicated by

Trench 03092

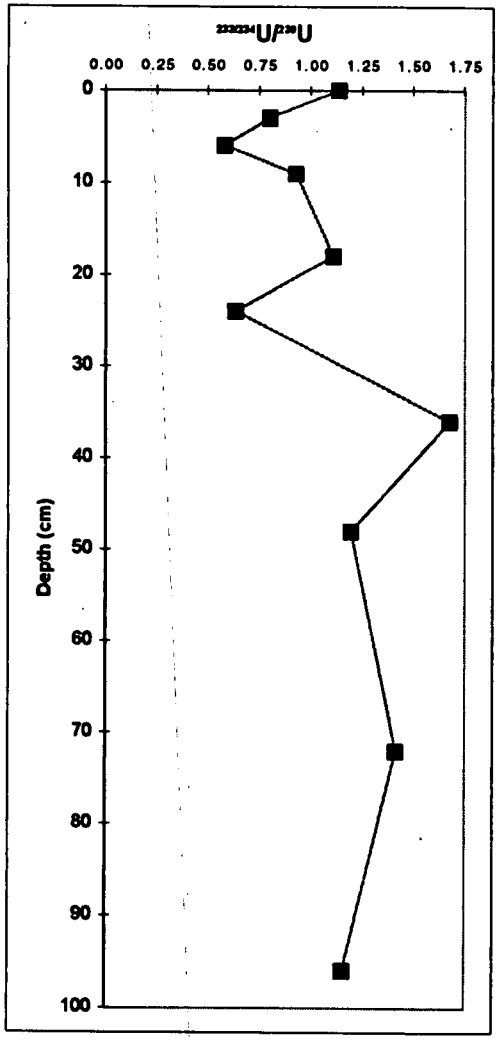


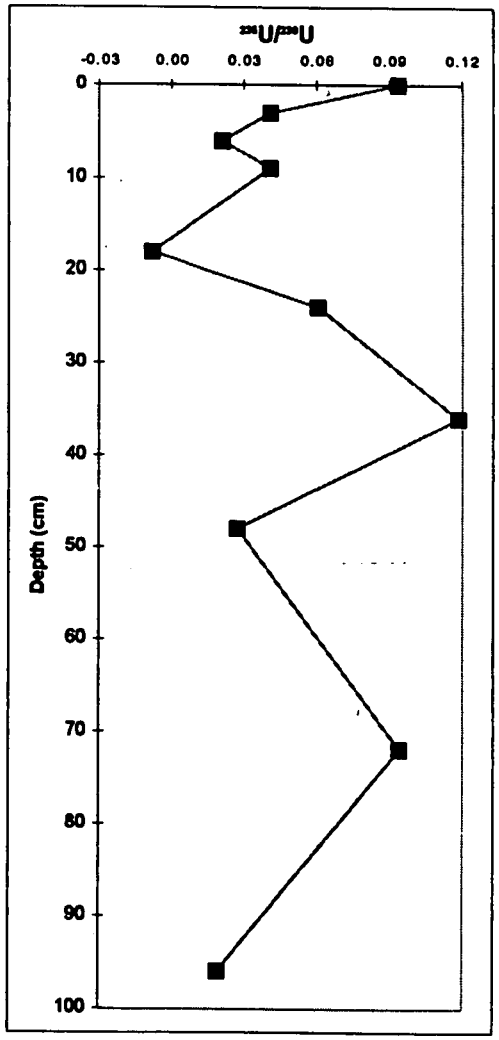


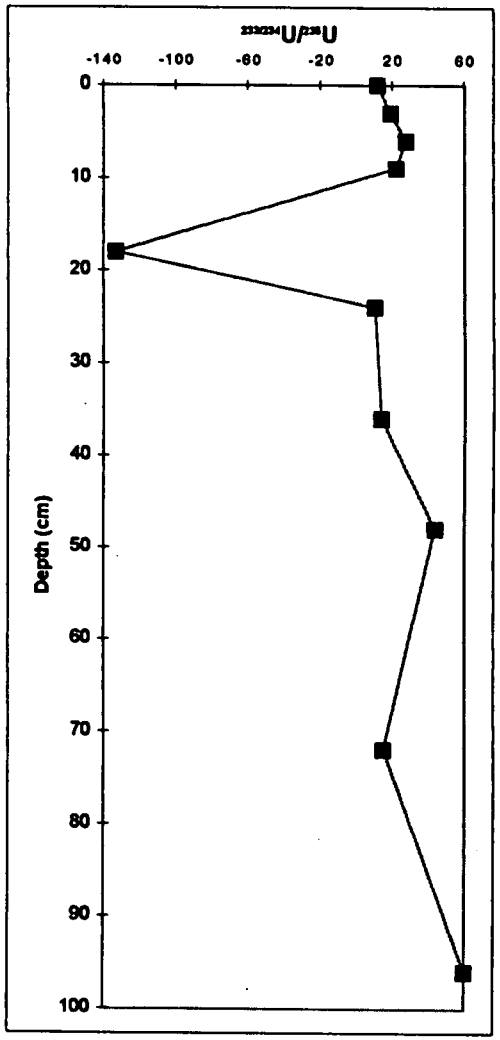


Rejected values indicated by

Trench 03092







Rejected values indicated by

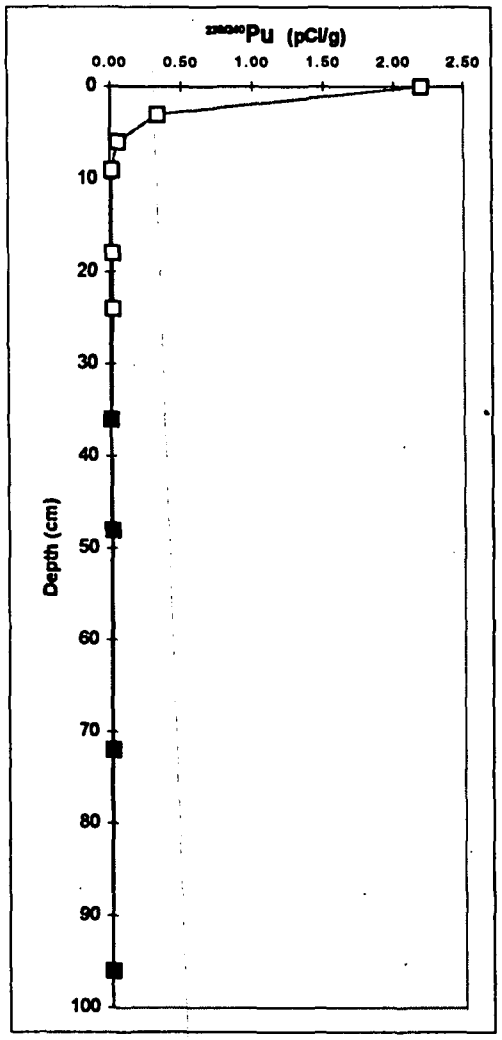
Rocky Flats
Trench 03192 Data

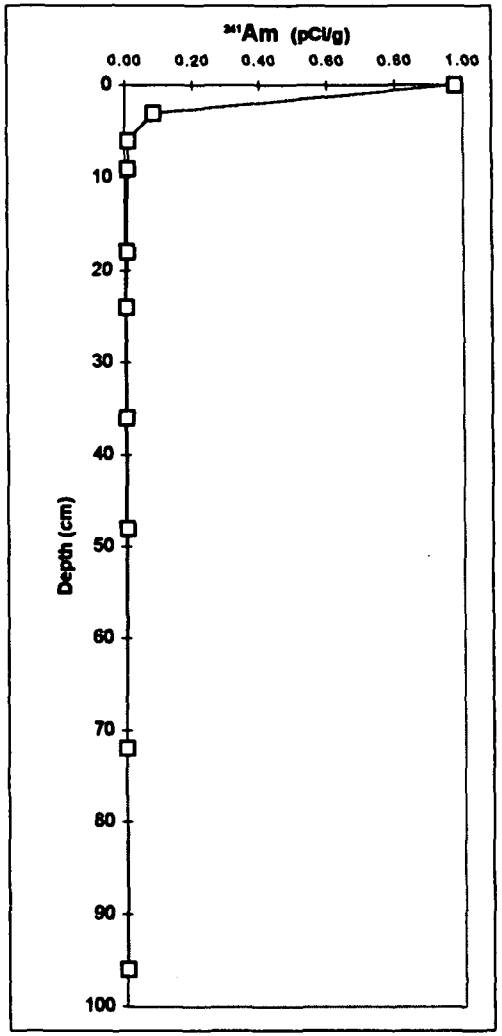
Depth (cm)	Val	$^{239/240}Pu$ (pCi/g)	A	R	Val	^{241}Am (pCi/g)	A	R	Val	$^{241}Am/^{239/240}Pu$	A	R
0	R	2.20E+00		2.20E+00	R	9.77E-01		9.8E-1	R	4.44E-01		4.4E-1
3	R	3.31E-01		3.31E-01	R	8.50E-02		8.5E-2	R	2.57E-01		2.6E-1
6	R	5.72E-02		5.72E-02	R	1.12E-02		1.1E-2	R	1.96E-01		2.0E-1
9	R	1.02E-02		1.02E-02	R	8.24E-03		8.2E-3	R	8.08E-01		8.1E-1
18	R	1.13E-02		1.13E-02	R	6.13E-03		6.1E-3	R	5.42E-01		5.4E-1
24	R	1.82E-02		1.82E-02	R	3.98E-03		4.0E-3	R	2.19E-01		2.2E-1
36	A	5.99E-03	6.0E-3		R	3.48E-03		3.5E-3	R	5.81E-01		5.8E-1
48	A	7.99E-03	8.0E-3		R	4.18E-03		4.2E-3	R	5.23E-01		5.2E-1
72	A	8.52E-03	8.5E-3		R	9.30E-04		9.3E-4	R	1.09E-01		1.1E-1
96	A	4.36E-03	4.4E-3		R	2.54E-03		2.5E-3	R	5.83E-01		5.8E-1

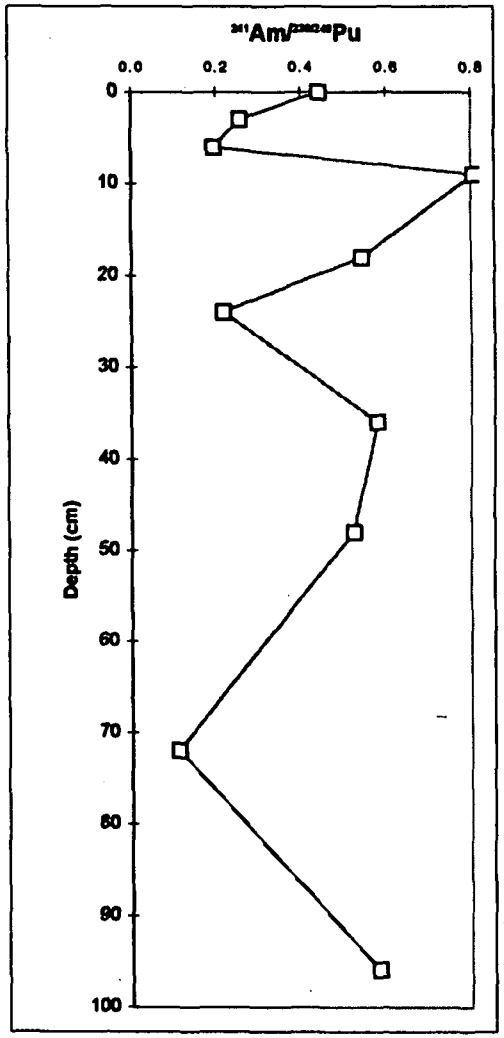
Depth (cm)	Val	$^{233/234}U$ (pCi/g)	A	R	Val	^{235}U (pCi/g)	A	R	Val	^{238}U (pCi/g)	A	R
0	R	7.46E-01		7.46E-01	R	5.69E-02		5.7E-2	R	6.54E-01		6.5E-1
3	R	5.82E-01		5.82E-01	R	4.76E-02		4.8E-2	R	5.92E-01		5.9E-1
6	R	5.50E-01		5.50E-01	R	3.77E-02		3.8E-2	R	5.88E-01		5.9E-1
9	R	8.13E-01		8.13E-01	R	2.22E-02		2.2E-2	R	6.29E-01		6.3E-1
18	R	8.70E-01		8.70E-01	R	1.41E-02		1.4E-2	R	7.28E-01		7.3E-1
24	R	1.30E+00		1.30E+00	R	3.28E-02		3.3E-2	R	1.20E+00		1.2E+0
36	A	5.08E-01	5.1E-1		A	5.65E-02	5.7E-2		A	7.62E-01	7.6E-1	
48	A	4.25E-01	4.3E-1		A	1.06E-02	1.1E-2		A	4.78E-01	4.8E-1	
72	A	3.31E-01	3.3E-1		A	1.18E-02	1.2E-2		A	3.78E-01	3.8E-1	
96	A	2.64E-01	2.6E-1		A	0.00E+00	0.0E+0		A	3.05E-01	3.1E-1	

Depth (cm)	Val	$^{233/234}U/^{238}U$	A	R	Val	$^{235}U/^{238}U$	A	R	Val	$^{233/234}U/^{235}U$	A	R
0	R	1.14E+00		1.14E+00	R	8.70E-02		8.7E-2	R	1.31E+01		1.3E+1
3	R	9.83E-01		9.83E-01	A	8.04E-02	8.0E-2		R	1.22E+01		1.2E+1
6	A	9.35E-01	9.4E-1		A	6.41E-02	6.4E-2		R	1.46E+01		1.5E+1
9	A	1.29E+00	1.3E+0		A	3.53E-02	3.5E-2		R	3.66E+01		3.7E+1
18	A	1.20E+00	1.2E+0		A	1.94E-02	1.9E-2		R	6.17E+01		6.2E+1
24	A	1.08E+00	1.1E+0		A	2.73E-02	2.7E-2		R	3.96E+01		4.0E+1
36	A	6.67E-01	6.7E-1		A	7.41E-02	7.4E-2		A	8.99E+00	9.0E+0	
48	A	8.89E-01	8.9E-1		A	2.22E-02	2.2E-2		A	4.01E+01	4.0E+1	
72	A	8.76E-01	8.8E-1		A	3.12E-02	3.1E-2		A	2.81E+01	2.8E+1	
96	A	8.66E-01	8.7E-1		A	0.00E+00	0.0E+0		A			

Trench 03192

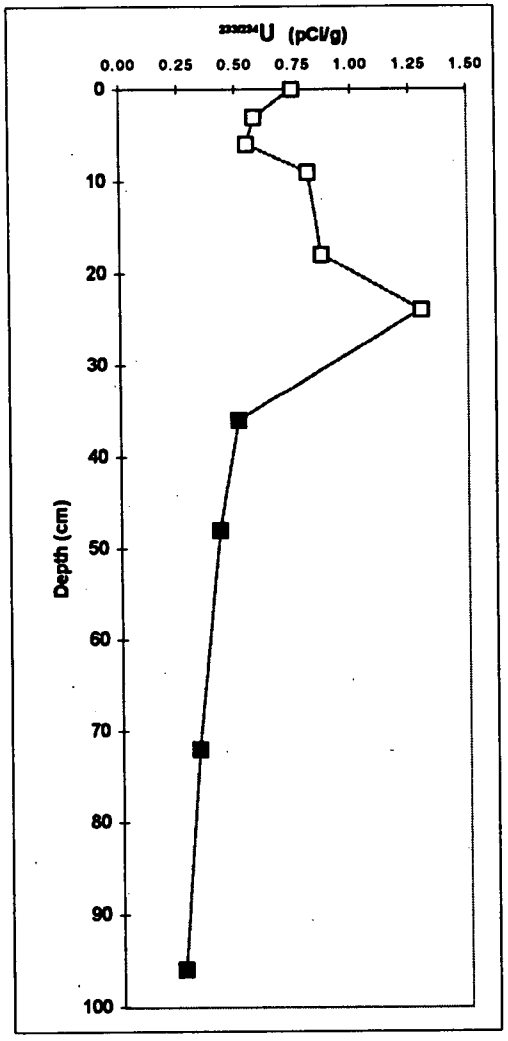


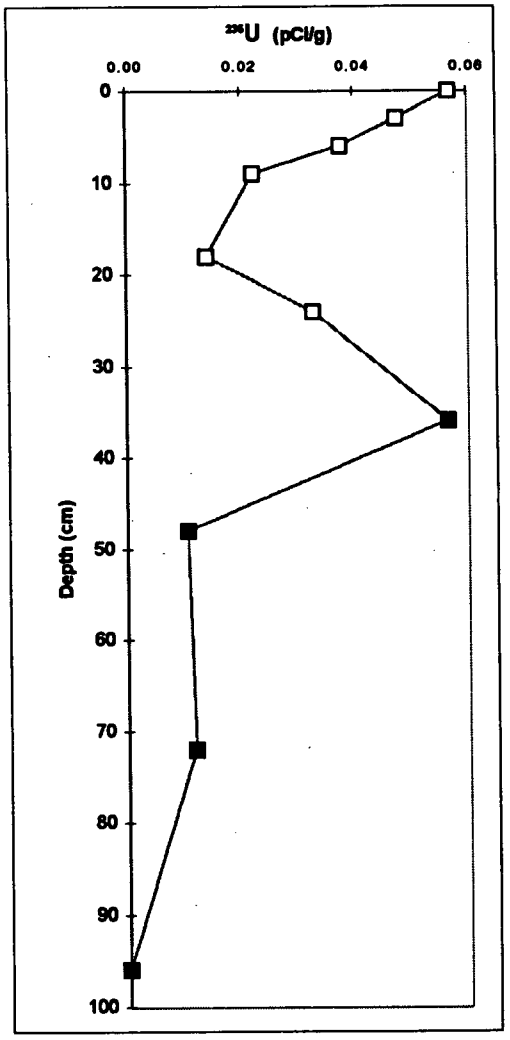


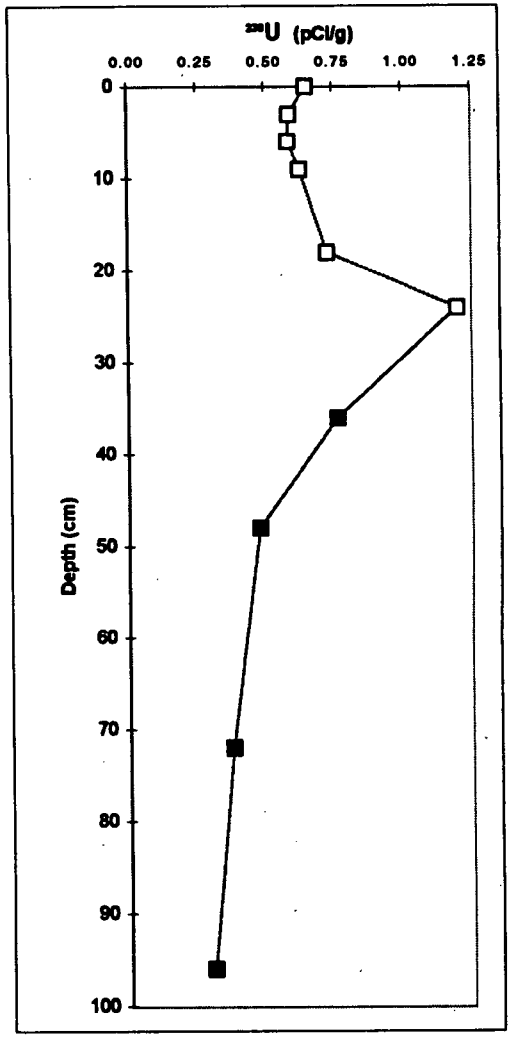


Rejected values indicated by

Trench 03192







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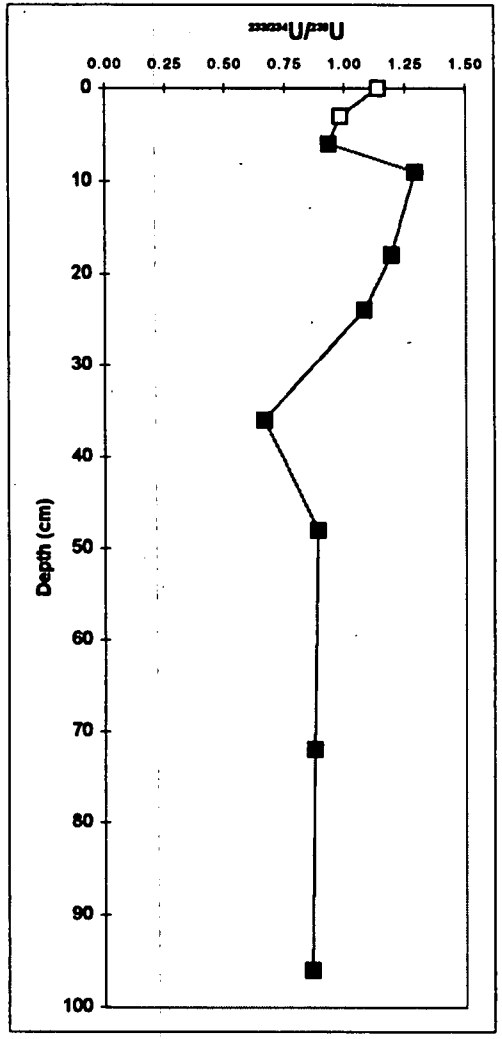
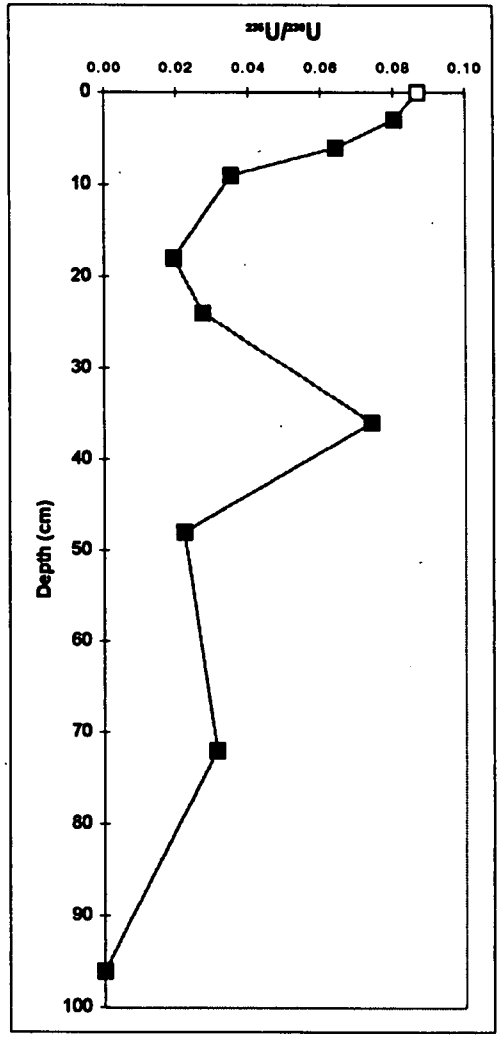
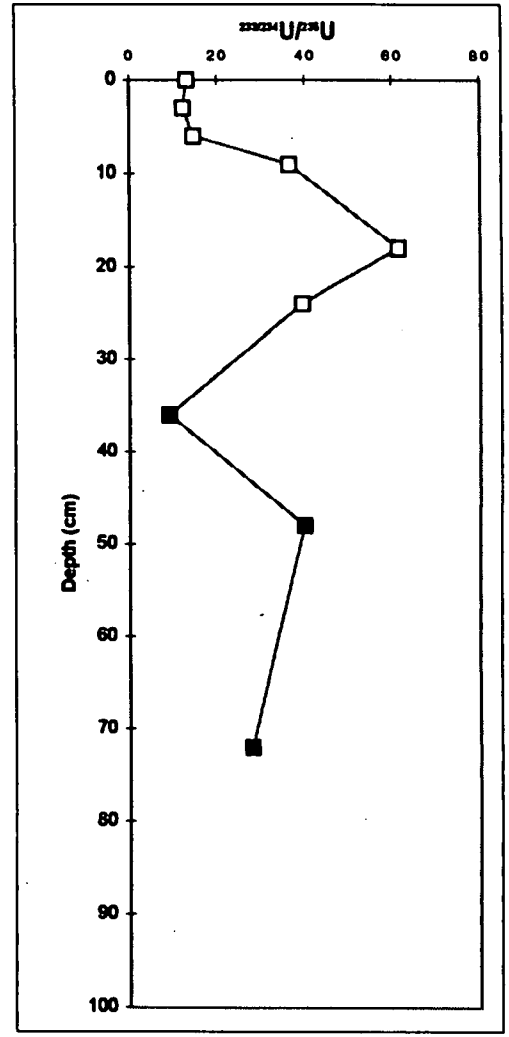






Rejected values indicated by

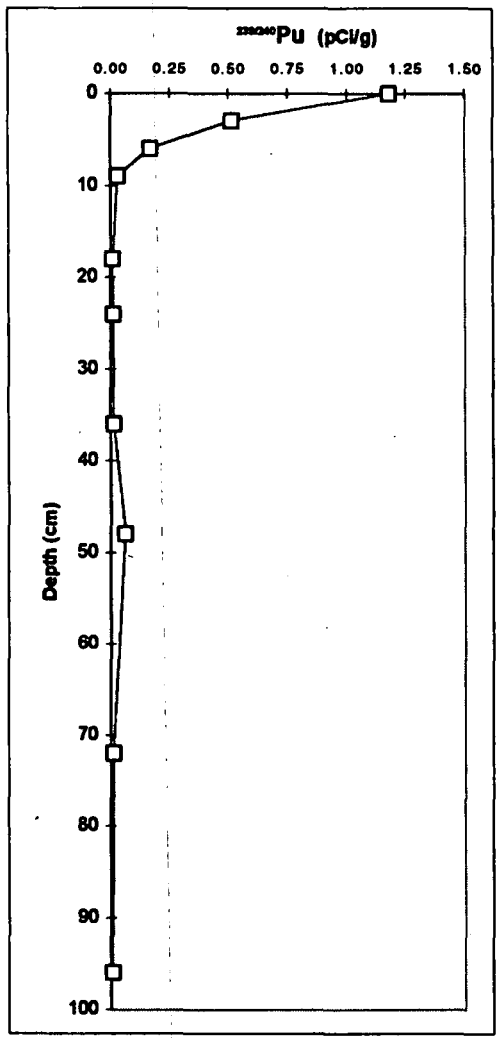
Rocky Flats
Trench 03292 Data

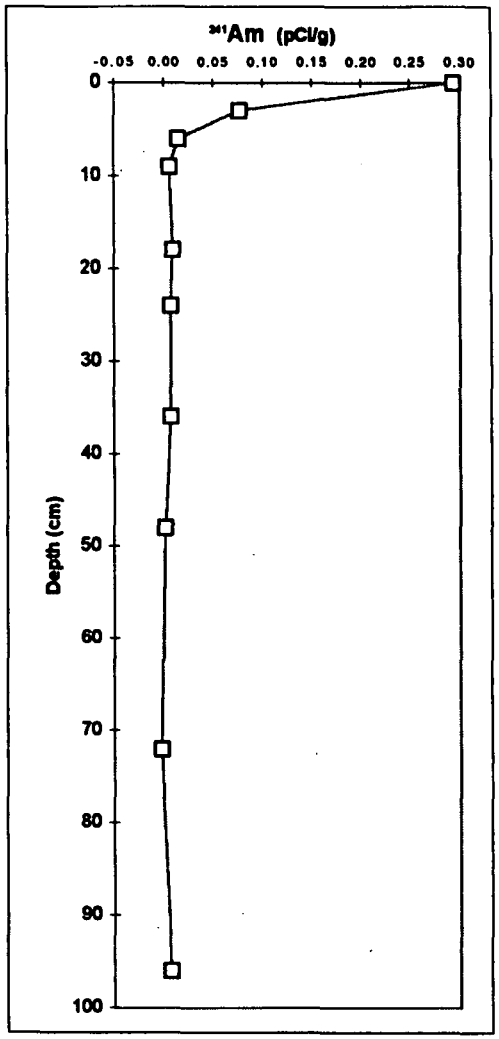
Depth (cm)	Val	$^{239/240}Pu$ (pCi/g)	A	R	Val	^{241}Am (pCi/g)	A	R	Val	$^{241}Am/^{239/240}Pu$	A	R
0	R	1.18E+00		1.18E+00	R	2.94E-01		2.9E-1	R	2.49E-01		2.5E-1
3	R	5.16E-01		5.16E-01	R	7.69E-02		7.7E-2	R	1.49E-01		1.5E-1
6	R	1.69E-01		1.69E-01	R	1.49E-02		1.5E-2	R	8.82E-02		8.8E-2
9	R	2.91E-02		2.91E-02	R	5.95E-03		6.0E-3	R	2.04E-01		2.0E-1
18	R	6.85E-03		6.85E-03	R	9.25E-03		9.3E-3	R	1.35E+00		1.4E+0
24	R	1.02E-02		1.02E-02	R	7.11E-03		7.1E-3	R	6.97E-01		7.0E-1
36	R	1.28E-02		1.28E-02	R	7.20E-03		7.2E-3	R	5.63E-01		5.6E-1
48	R	6.20E-02		6.20E-02	R	1.24E-03		1.2E-3	R	2.00E-02		2.0E-2
72	R	9.80E-03		9.80E-03	R	-2.71E-03		-2.7E-3	R	-2.77E-01		-2.8E-1
96	R	8.08E-03		8.08E-03	R	7.51E-03		7.5E-3	R	9.29E-01		9.3E-1

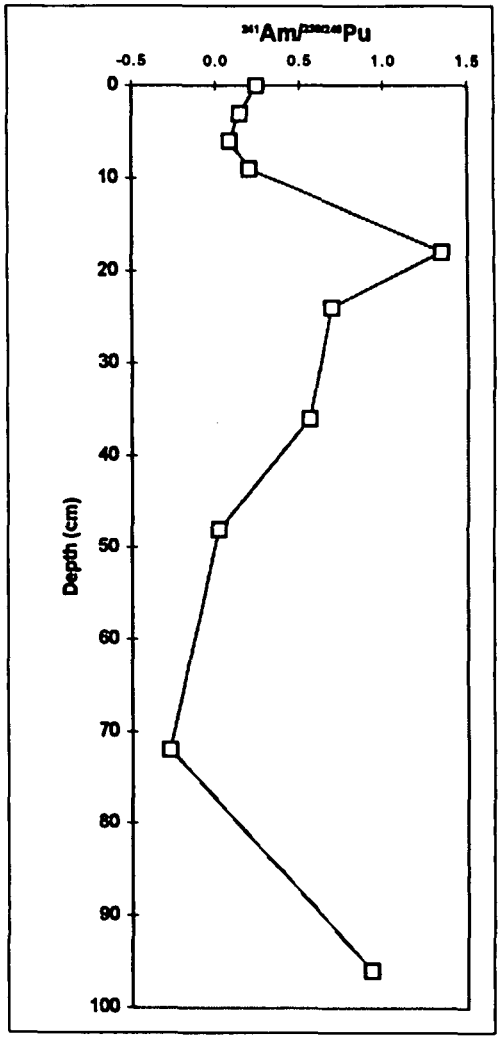
Depth (cm)	Val	$^{233/234}U$ (pCi/g)	A	R	Val	^{235}U (pCi/g)	A	R	Val	^{238}U (pCi/g)	A	R
0	R	8.19E-01		8.19E-01	R	4.10E-02		4.1E-2	R	7.24E-01		7.2E-1
3	R	6.51E-01		6.51E-01	R	5.80E-02		5.8E-2	R	5.09E-01		5.1E-1
6	R	9.39E-01		9.39E-01	R	4.69E-02		4.7E-2	R	1.13E+00		1.1E+0
9	R	6.01E-01		6.01E-01	R	2.04E-02		2.0E-2	R	4.78E-01		4.8E-1
18	R	1.09E+00		1.09E+00	R	7.66E-02		7.7E-2	R	1.15E+00		1.2E+0
24	R	5.42E-01		5.42E-01	R	1.67E-02		1.7E-2	R	4.67E-01		4.7E-1
36	R	5.68E-01		5.68E-01	R	1.46E-02		1.5E-2	R	5.90E-01		5.9E-1
48	R	5.54E-01		5.54E-01	R	1.61E-02		1.6E-2	R	6.59E-01		6.6E-1
72	R	5.06E-01		5.06E-01	R	4.60E-02		4.6E-2	R	4.69E-01		4.7E-1
96	R	4.49E-01		4.49E-01	R	3.15E-02		3.2E-2	R	5.12E-01		5.1E-1

Depth (cm)	Val	$^{233/234}U/^{238}U$	A	R	Val	$^{235}U/^{238}U$	A	R	Val	$^{233/234}U/^{235}U$	A	R
0	R	1.13E+00		1.13E+00	R	5.66E-02		5.7E-2	R	2.00E+01		2.0E+1
3	R	1.28E+00		1.28E+00	R	1.14E-01		1.1E-1	R	1.12E+01		1.1E+1
6	R	8.31E-01		8.31E-01	R	4.15E-02		4.2E-2	R	2.00E+01		2.0E+1
9	R	1.26E+00		1.26E+00	R	4.27E-02		4.3E-2	R	2.95E+01		2.9E+1
18	R	9.48E-01		9.48E-01	R	6.66E-02		6.7E-2	R	1.42E+01		1.4E+1
24	R	1.16E+00		1.16E+00	R	3.58E-02		3.6E-2	R	3.25E+01		3.2E+1
36	R	9.63E-01		9.63E-01	R	2.47E-02		2.5E-2	R	3.89E+01		3.9E+1
48	R	8.41E-01		8.41E-01	R	2.44E-02		2.4E-2	R	3.44E+01		3.4E+1
72	R	1.08E+00		1.08E+00	R	9.81E-02		9.8E-2	R	1.10E+01		1.1E+1
96	R	8.77E-01		8.77E-01	R	6.15E-02		6.2E-2	R	1.43E+01		1.4E+1

Trench 03292

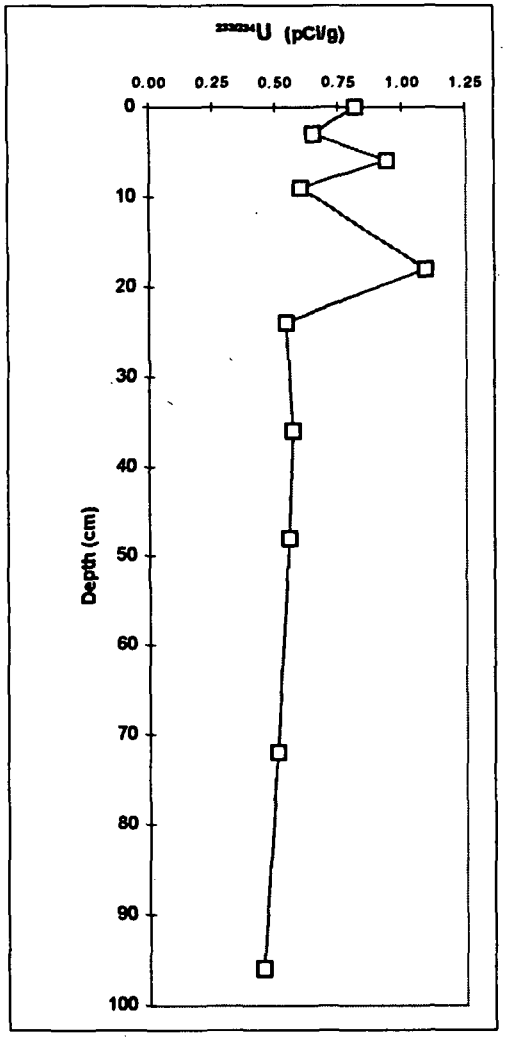


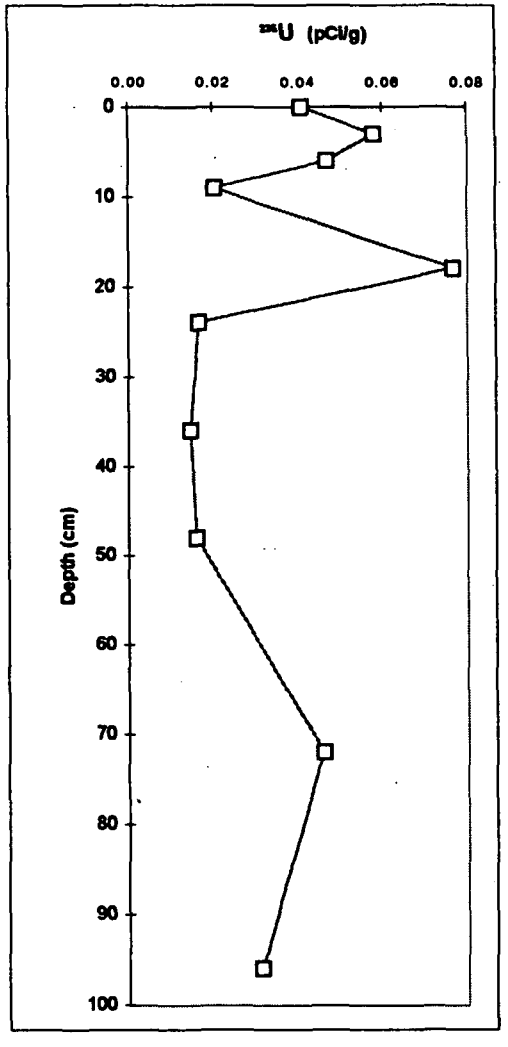


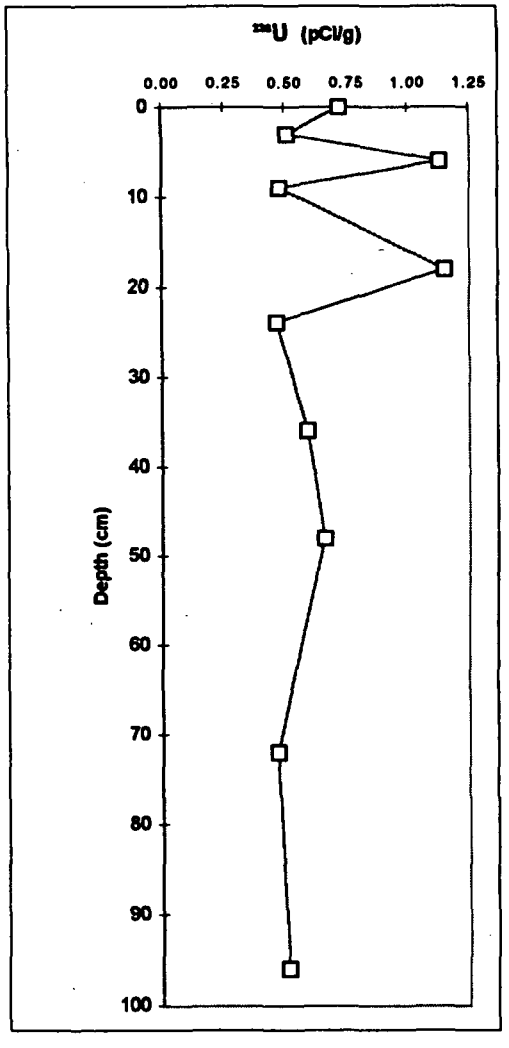


Rejected values indicated by

Trench 03292







Rejected values indicated by

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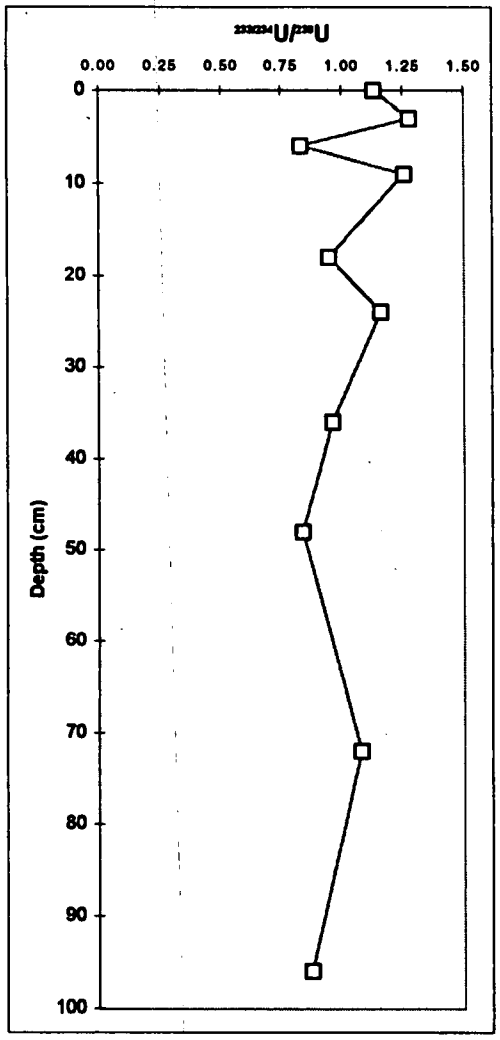
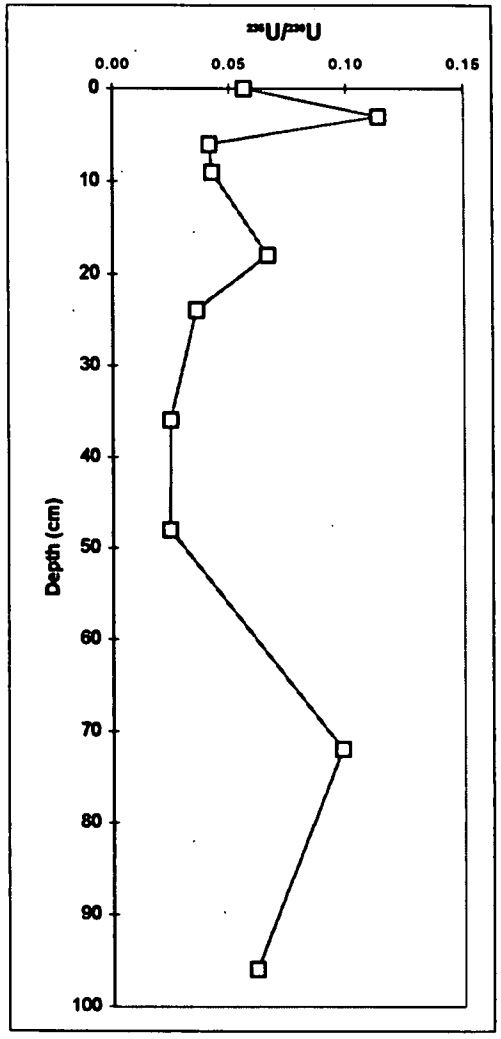
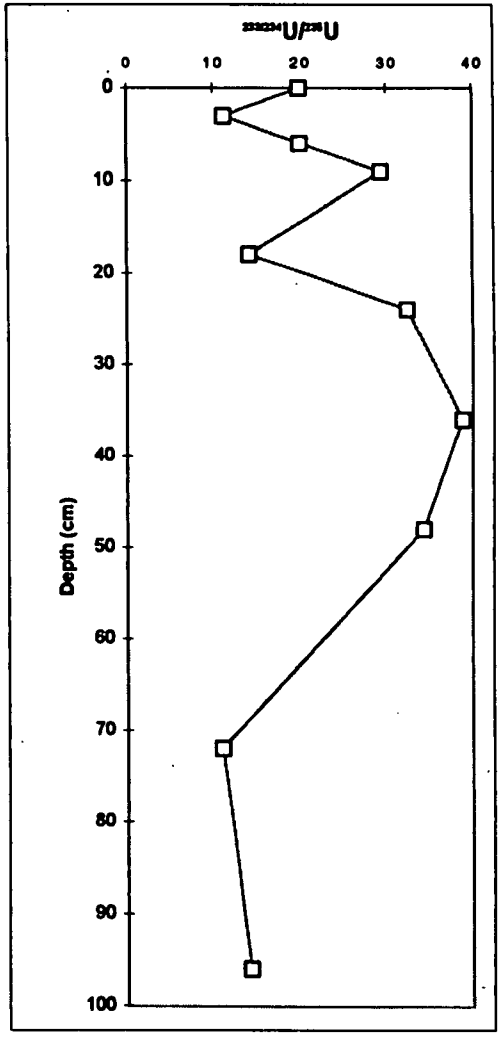






Rejected values indicated by

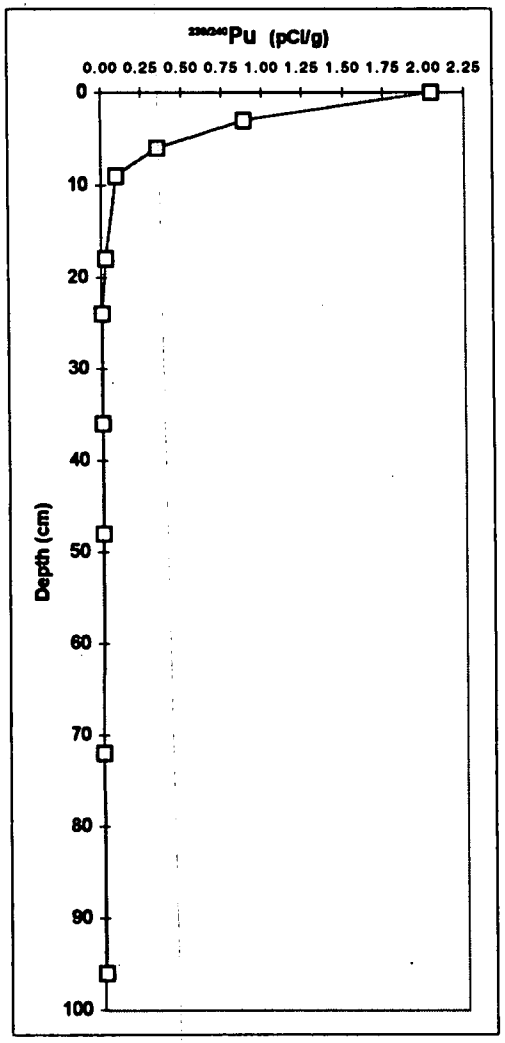
Rocky Flats
Trench 03392 Data

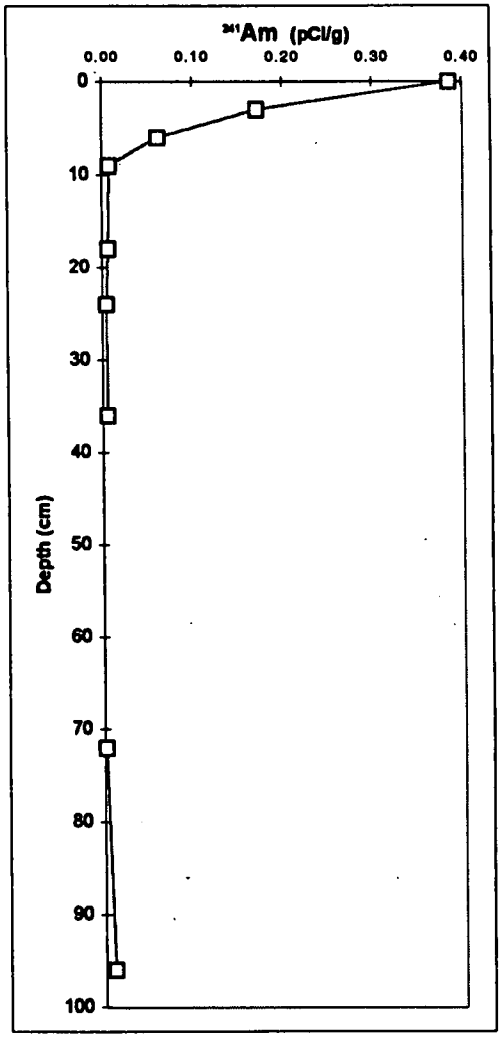
Depth (cm)	Val	$^{239/240}Pu$ (pCi/g)	A	R	Val	^{241}Am (pCi/g)	A	R	Val	$^{241}Am/^{239/240}Pu$	A	R
0	R	2.05E+00		2.05E+00	R	3.86E-01		3.9E-1	R	1.88E-01		1.9E-1
3	R	8.90E-01		8.90E-01	R	1.72E-01		1.7E-1	R	1.93E-01		1.9E-1
6	R	3.49E-01		3.49E-01	R	6.19E-02		6.2E-2	R	1.77E-01		1.8E-1
9	R	9.49E-02		9.49E-02	R	7.65E-03		7.7E-3	R	8.06E-02		8.1E-2
18	R	2.74E-02		2.74E-02	R	6.44E-03		6.4E-3	R	2.35E-01		2.4E-1
24	R	4.64E-03		4.64E-03	R	4.40E-03		4.4E-3	R	9.48E-01		9.5E-1
36	R	3.10E-03		3.10E-03	R	4.75E-03		4.8E-3	R	1.53E+00		1.5E+0
48	R	4.00E-03		4.00E-03					R			
72	R	0.00E+00		0.00E+00	R	1.16E-03		1.2E-3	R			
96	R	7.94E-03		7.94E-03	R	1.05E-02		1.1E-2	R	1.32E+00		1.3E+0

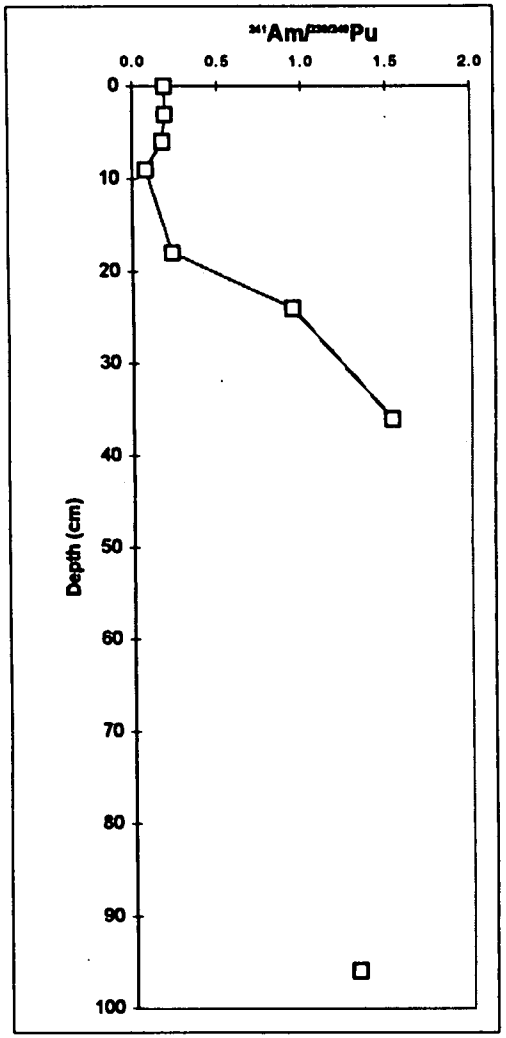
Depth (cm)	Val	$^{233/234}U$ (pCi/g)	A	R	Val	^{235}U (pCi/g)	A	R	Val	^{238}U (pCi/g)	A	R
0	R	8.73E-01		8.73E-01	R	1.21E-02		1.2E-2	R	7.88E-01		7.9E-1
3	R	8.45E-01		8.45E-01	R	1.54E-02		1.5E-2	R	6.91E-01		6.9E-1
6	R	6.62E-01		6.62E-01	R	1.00E-02		1.0E-2	R	6.27E-01		6.3E-1
9	R	6.03E-01		6.03E-01	R	1.55E-02		1.6E-2	R	5.18E-01		5.2E-1
18	R	1.43E+00		1.43E+00	R	2.05E-02		2.1E-2	R	1.02E+00		1.0E+0
24	R	7.22E-01		7.22E-01	R	4.09E-02		4.1E-2	R	5.86E-01		5.9E-1
36	R	5.71E-01		5.71E-01	R	2.79E-02		2.8E-2	R	6.55E-01		6.6E-1
48	R	8.53E-01		8.53E-01	R	5.02E-02		5.0E-2	R	9.79E-01		9.8E-1
72	R	7.41E-01		7.41E-01	R	5.22E-02		5.2E-2	R	9.18E-01		9.2E-1
96	R	8.14E-01		8.14E-01	R	2.67E-02		2.7E-2	R	6.54E-01		6.5E-1

Depth (cm)	Val	$^{233/234}U/^{238}U$	A	R	Val	$^{235}U/^{238}U$	A	R	Val	$^{233/234}U/^{235}U$	A	R
0	R	1.11E+00		1.11E+00	R	1.54E-02		1.5E-2	R	7.21E+01		7.2E+1
3	R	1.22E+00		1.22E+00	R	2.23E-02		2.2E-2	R	5.49E+01		5.5E+1
6	R	1.06E+00		1.06E+00	R	1.59E-02		1.6E-2	R	6.62E+01		6.6E+1
9	R	1.16E+00		1.16E+00	R	2.99E-02		3.0E-2	R	3.89E+01		3.9E+1
18	R	1.40E+00		1.40E+00	R	2.01E-02		2.0E-2	R	6.98E+01		7.0E+1
24	R	1.23E+00		1.23E+00	R	6.98E-02		7.0E-2	R	1.77E+01		1.8E+1
36	R	8.72E-01		8.72E-01	R	4.26E-02		4.3E-2	R	2.05E+01		2.0E+1
48	R	8.71E-01		8.71E-01	R	5.13E-02		5.1E-2	R	1.70E+01		1.7E+1
72	R	8.07E-01		8.07E-01	R	5.69E-02		5.7E-2	R	1.42E+01		1.4E+1
96	R	1.24E+00		1.24E+00	R	4.08E-02		4.1E-2	R	3.05E+01		3.0E+1

Trench 03392

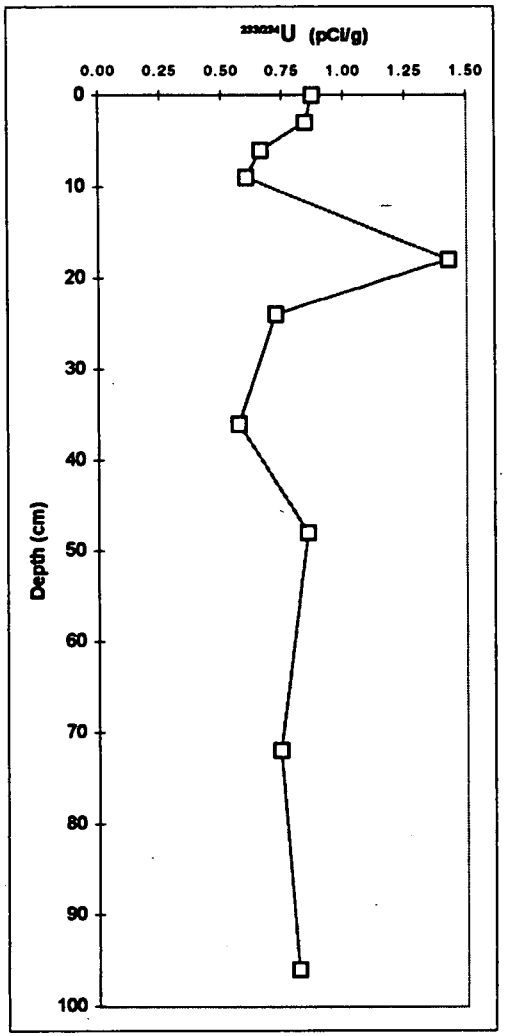


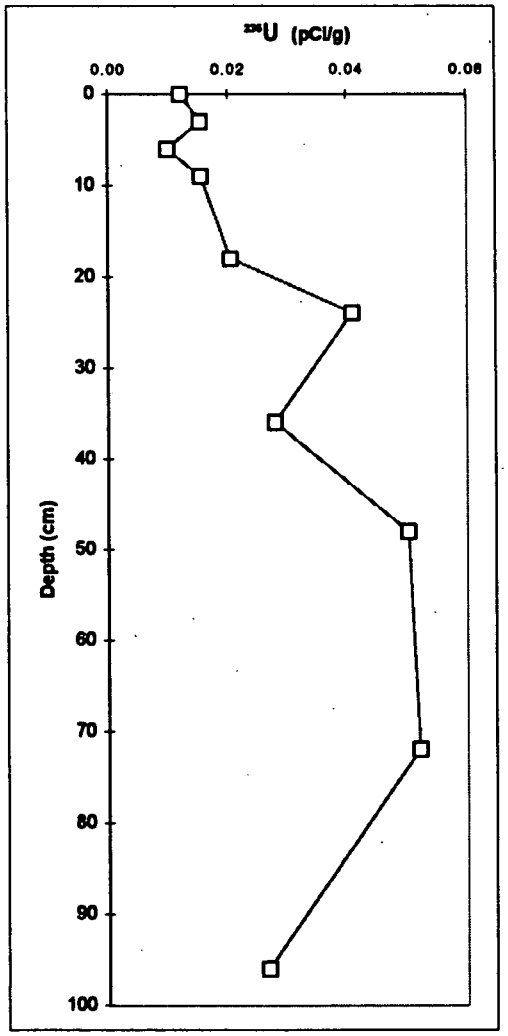


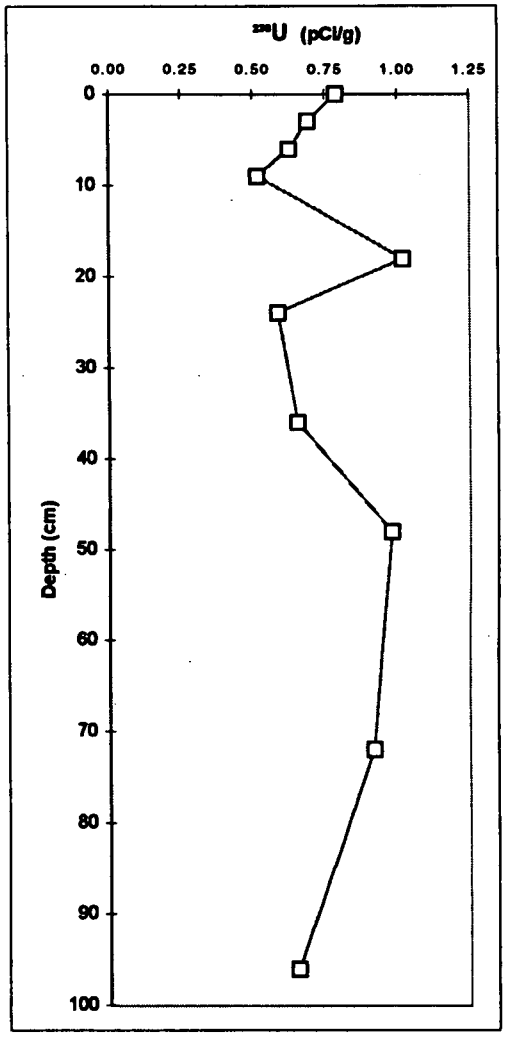


Rejected values indicated by

Trench 03392

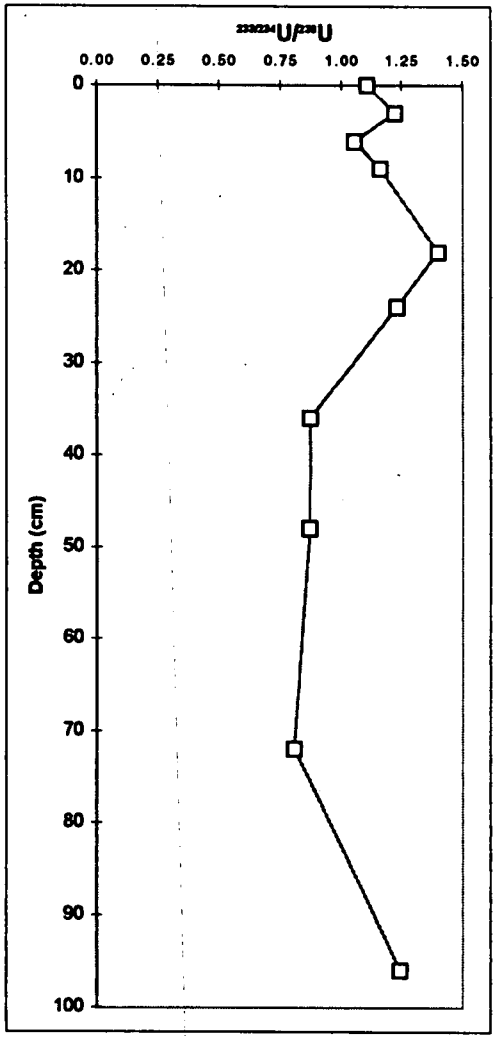


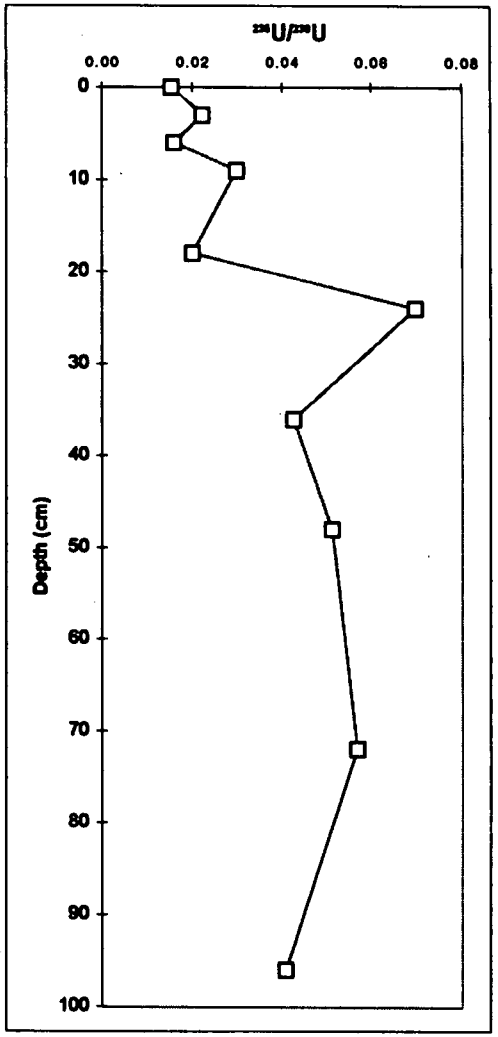


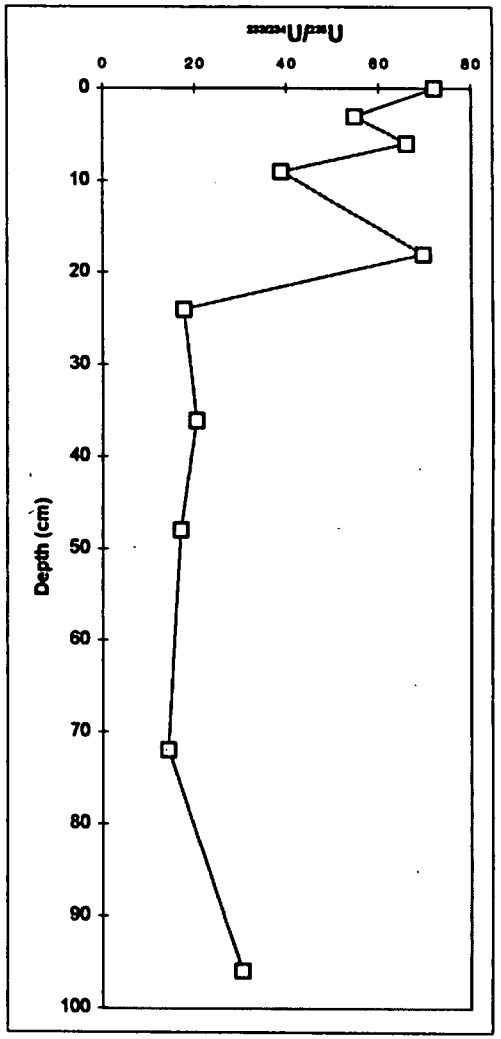


Rejected values indicated by

Trench 03392







Rejected values indicated by

Rocky Flats
Trench 03492 Data

Depth (cm)	Val	$^{239/240}Pu$ (pCi/g)	A	R
0	A	1.59E+00	1.6E+0	
3	A	3.28E-01	3.3E-1	
6	A	1.74E-01	1.7E-1	
9	A	8.36E-02	8.4E-2	
18	A	3.95E-02	4.0E-2	
24	A	1.00E-02	1.0E-2	
36	A	1.15E-02	1.2E-2	
48	A	8.55E-03	8.5E-3	
72	A	1.83E-03	1.8E-3	
96	A	0.00E+00	0.0E+0	

Val	^{241}Am (pCi/g)	A	R
A	1.44E-01	1.4E-1	
A	5.86E-02	5.9E-2	
A	4.20E-02	4.2E-2	
A	1.85E-02	1.8E-2	
A	3.05E-03	3.0E-3	
A	7.74E-03	7.7E-3	
A	-1.77E-03	-1.8E-3	
A	1.10E-02	1.1E-2	
A	2.02E-03	2.0E-3	
A	6.09E-03	6.1E-3	

Val	$^{241}Am/^{239/240}Pu$	A	R
A	9.05E-02	9.0E-2	
A	1.79E-01	1.8E-1	
A	2.42E-01	2.4E-1	
A	2.21E-01	2.2E-1	
A	7.71E-02	7.7E-2	
A	7.73E-01	7.7E-1	
A	-1.53E-01	-1.5E-1	
A	1.28E+00	1.3E+0	
A	1.11E+00	1.1E+0	
A			

Depth (cm)	Val	$^{233/234}U$ (pCi/g)	A	R
0	R	1.09E+00		1.1E+0
3	R	1.17E+00		1.2E+0
6	A	1.45E+00	1.4E+0	
9	A	9.48E-01	9.5E-1	
18	R	1.39E+00		1.4E+0
24	R	1.13E+00		1.1E+0
36	R	8.29E-01		8.3E-1
48	R	5.98E-01		6.0E-1
72	R	1.07E+00		1.1E+0
96	R	1.67E+00		1.7E+0

Val	^{235}U (pCi/g)	A	R
R	3.55E-02		3.5E-2
R	9.25E-02		9.3E-2
A	2.61E-01	2.6E-1	
A	2.60E-02	2.6E-2	
R	1.58E-01		1.6E-1
R	5.54E-02		5.5E-2
R	4.85E-02		4.9E-2
R	1.65E-02		1.7E-2
R	7.93E-02		7.9E-2
R	1.35E-01		1.4E-1

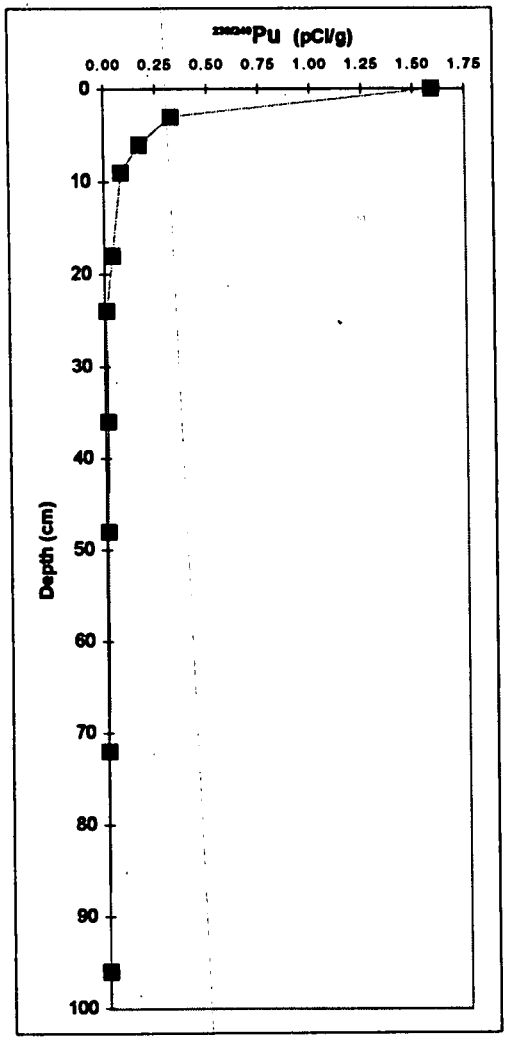
Val	^{238}U (pCi/g)	A	R
R	1.04E+00		1.0E+0
R	1.05E+00		1.1E+0
A	1.11E+00	1.1E+0	
A	1.24E+00	1.2E+0	
R	1.13E+00		1.1E+0
R	1.01E+00		1.0E+0
R	9.88E-01		9.9E-1
R	7.32E-01		7.3E-1
R	9.88E-01		9.9E-1
R	9.85E-01		9.9E-1

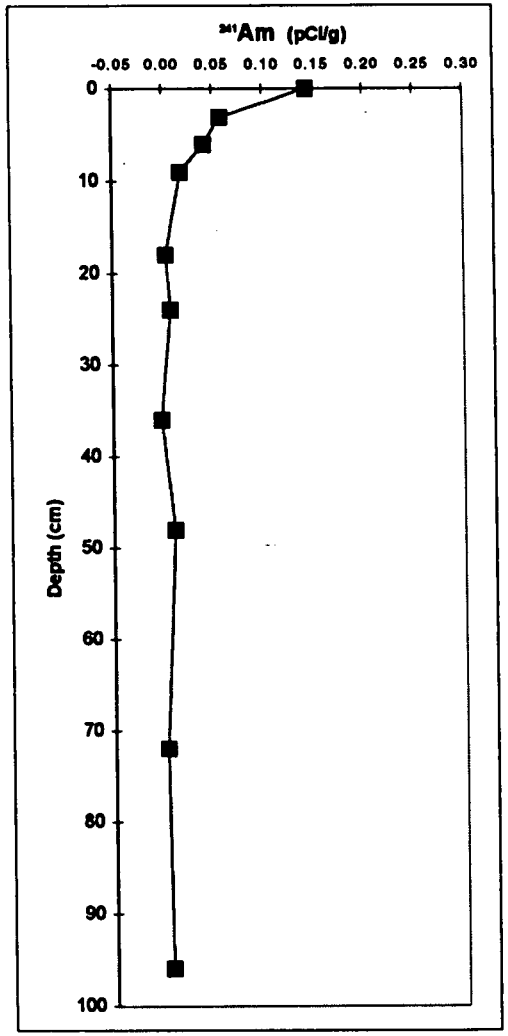
Depth (cm)	Val	$^{233/234}U/^{238}U$	A	R
0	R	1.05E+00		1.0E+0
3	R	1.12E+00		1.1E+0
6	A	1.30E+00	1.3E+0	
9	A	7.63E-01	7.6E-1	
18	R	1.23E+00		1.2E+0
24	R	1.12E+00		1.1E+0
36	R	8.39E-01		8.4E-1
48	R	8.17E-01		8.2E-1
72	R	1.08E+00		1.1E+0
96	R	1.70E+00		1.7E+0

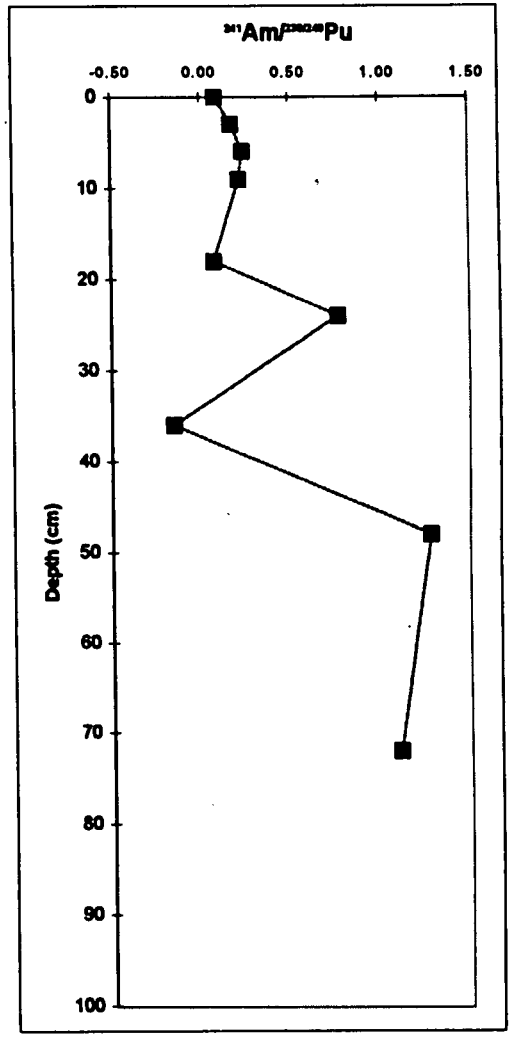
Val	$^{235}U/^{238}U$	A	R
R	3.41E-02		3.4E-2
R	8.80E-02		8.8E-2
A	2.35E-01	2.3E-1	
A	2.10E-02	2.1E-2	
R	1.40E-01		1.4E-1
R	5.49E-02		5.5E-2
R	4.91E-02		4.9E-2
R	2.26E-02		2.3E-2
R	8.03E-02		8.0E-2
R	1.37E-01		1.4E-1

Val	$^{233/234}U/^{235}U$	A	R
R	3.08E+01		3.1E+1
R	1.27E+01		1.3E+1
A	5.55E+00	5.5E+0	
A	3.64E+01	3.6E+1	
R	8.81E+00		8.8E+0
R	2.03E+01		2.0E+1
R	1.71E+01		1.7E+1
R	3.62E+01		3.6E+1
R	1.34E+01		1.3E+1
R	1.24E+01		1.2E+1

Trench 03492

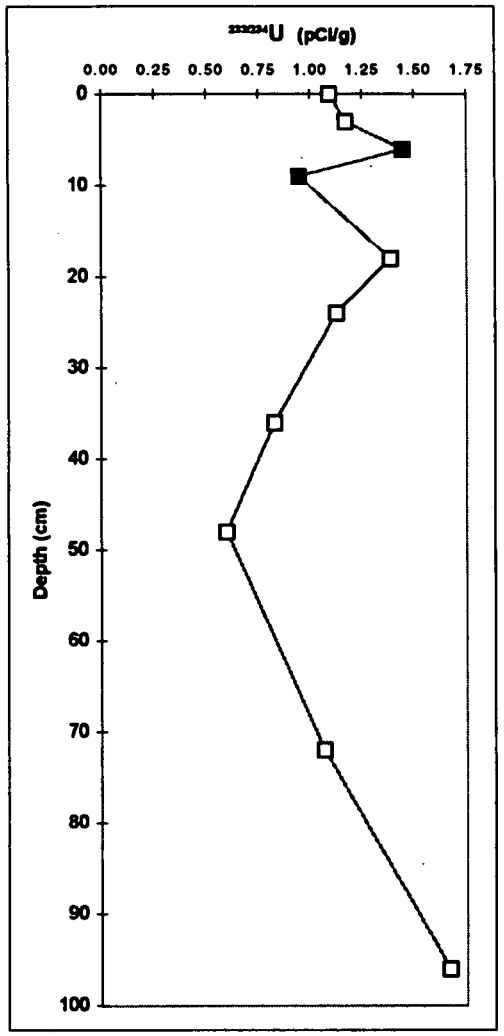


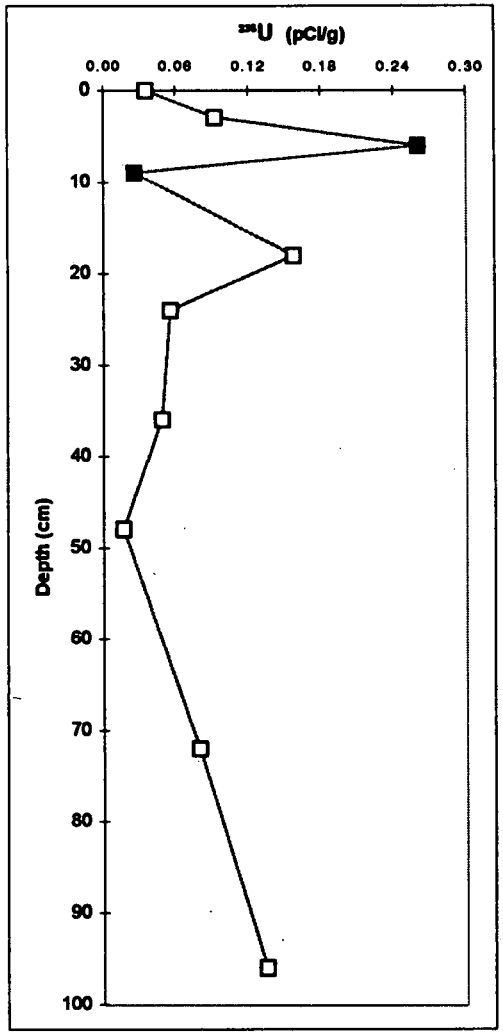


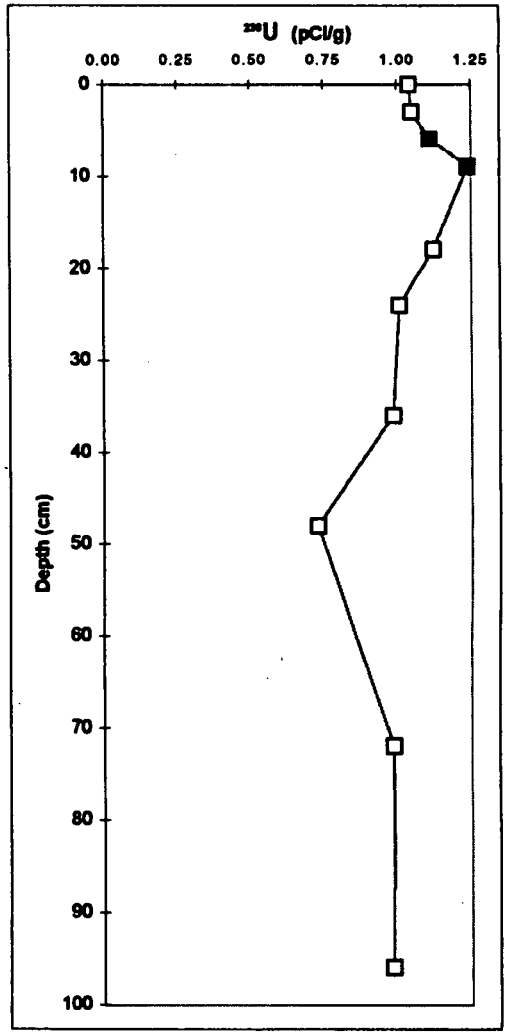


Rejected values indicated by

Trench 03492

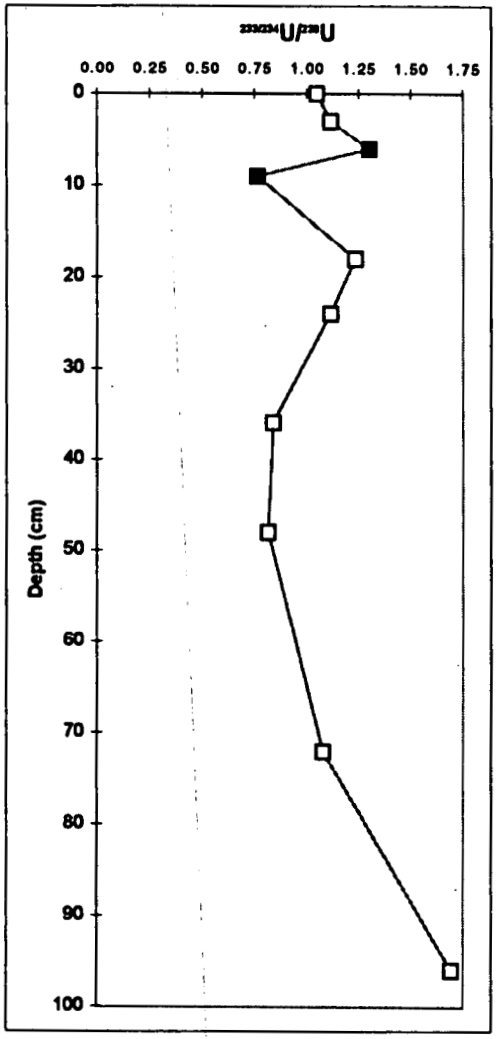


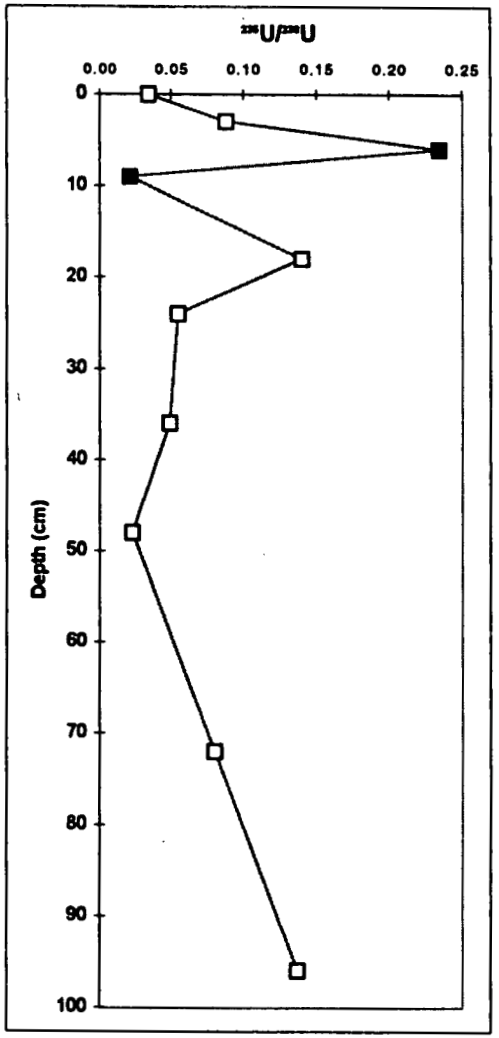


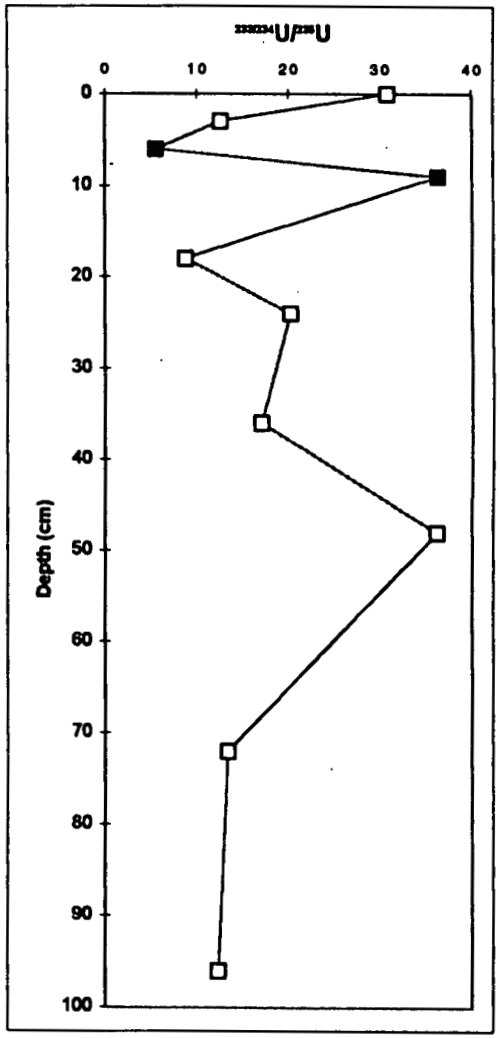


Rejected values indicated by

Trench 03492







Rejected values indicated by

Rocky Flats
Trench 03592 Data

Depth (cm)	Val	$^{239/240}Pu$ (pCi/g)	A	R
0	A	2.80E-01	2.8E-1	
3	A	6.53E-01	6.5E-1	
6	A	6.60E-02	6.6E-2	
9	A	3.08E-01	3.1E-1	
18	A	1.39E-02	1.4E-2	
24	A	7.00E-03	7.0E-3	
36	A	5.37E-03	5.4E-3	
48	A	1.47E-03	1.5E-3	
72	A	3.06E-03	3.1E-3	
96	A	0.00E+00	0.0E+0	

Val	^{241}Am (pCi/g)	A	R
R	5.64E-02		5.6E-2
R	7.71E-02		7.7E-2
A	1.49E-02	1.5E-2	
R	3.35E-02		3.4E-2
R	7.26E-03		7.3E-3
R	1.20E-02		1.2E-2
R	4.67E-03		4.7E-3
R	2.58E-03		2.6E-3
R	1.87E-03		1.9E-3
R	2.06E-03		2.1E-3

Val	$^{241}Am/^{239/240}Pu$	A	R
R	2.01E-01		2.0E-1
R	1.18E-01		1.2E-1
A	2.26E-01	2.3E-1	
R	1.09E-01		1.1E-1
R	5.22E-01		5.2E-1
R	1.71E+00		1.7E+0
R	8.70E-01		8.7E-1
R	1.76E+00		1.8E+0
R	6.11E-01		6.1E-1
R			

Depth (cm)	Val	$^{233/234}U$ (pCi/g)	A	R
0	A	1.28E+00	1.3E+0	
3	A	1.69E+00	1.7E+0	
6	A	1.38E+00	1.4E+0	
9	A	1.17E+00	1.2E+0	
18	A	9.20E-01	9.2E-1	
24	A	6.98E-01	7.0E-1	
36	A	9.04E-01	9.0E-1	
48	A	8.14E-01	8.1E-1	
72	A	8.27E-01	8.3E-1	
96	A	7.16E-01	7.2E-1	

Val	^{235}U (pCi/g)	A	R
A	2.19E-02	2.2E-2	
A	1.39E-01	1.4E-1	
A	7.52E-02	7.5E-2	
A	6.29E-02	6.3E-2	
A	2.75E-02	2.8E-2	
A	3.49E-02	3.5E-2	
A	2.85E-02	2.9E-2	
A	3.45E-02	3.5E-2	
A	1.14E-02	1.1E-2	
A	8.40E-03	8.4E-3	

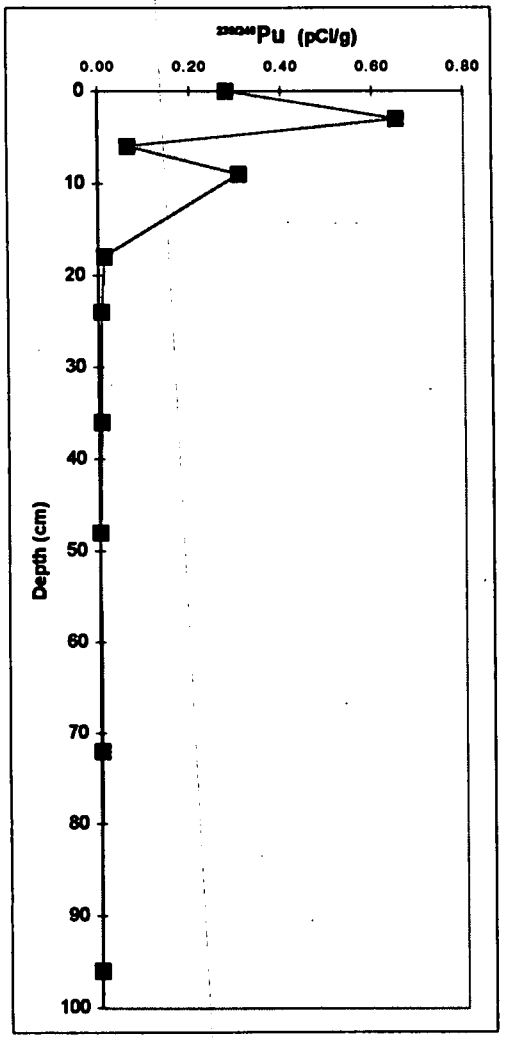
Val	^{238}U (pCi/g)	A	R
A	1.19E+00	1.2E+0	
A	1.55E+00	1.6E+0	
A	1.24E+00	1.2E+0	
A	1.16E+00	1.2E+0	
A	8.17E-01	8.2E-1	
A	5.65E-01	5.7E-1	
A	7.26E-01	7.3E-1	
A	7.52E-01	7.5E-1	
A	5.76E-01	5.8E-1	
A	8.34E-01	8.3E-1	

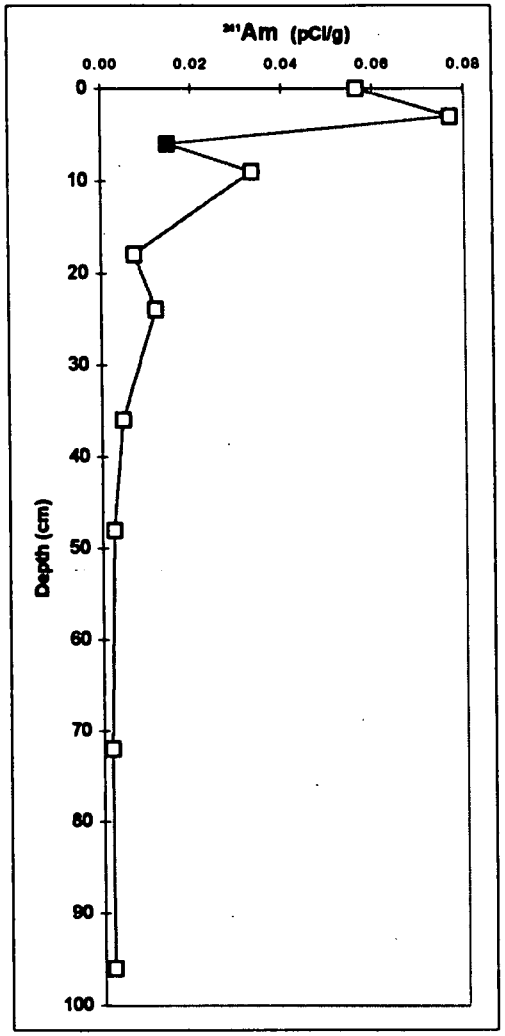
Depth (cm)	Val	$^{233/234}U/^{238}U$	A	R
0	A	1.08E+00	1.1E+0	
3	A	1.09E+00	1.1E+0	
6	A	1.11E+00	1.1E+0	
9	A	1.01E+00	1.0E+0	
18	A	1.13E+00	1.1E+0	
24	A	1.24E+00	1.2E+0	
36	A	1.25E+00	1.2E+0	
48	A	1.08E+00	1.1E+0	
72	A	1.44E+00	1.4E+0	
96	A	8.59E-01	8.6E-1	

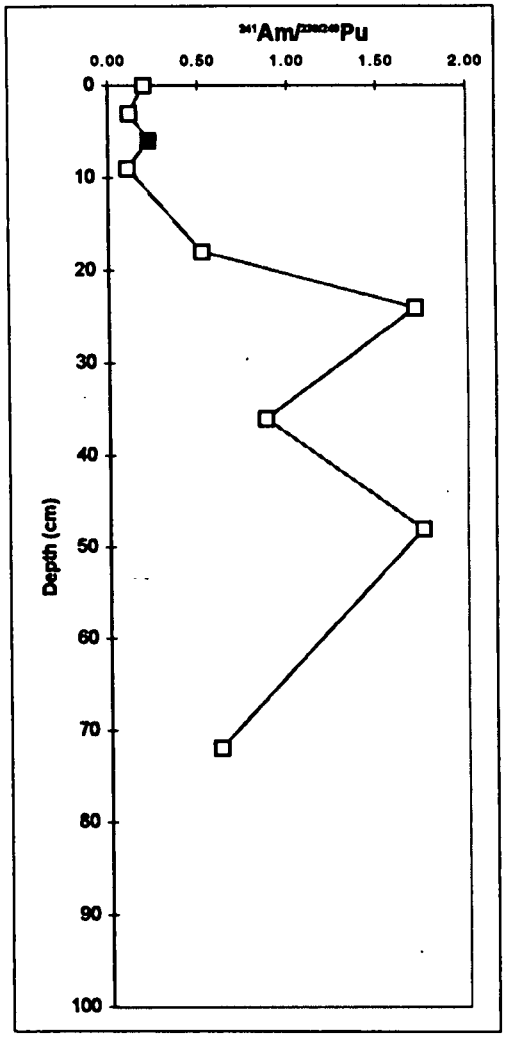
Val	$^{235}U/^{238}U$	A	R
A	1.84E-02	1.8E-2	
A	8.97E-02	9.0E-2	
A	6.06E-02	6.1E-2	
A	5.42E-02	5.4E-2	
A	3.37E-02	3.4E-2	
A	6.18E-02	6.2E-2	
A	3.93E-02	3.9E-2	
A	4.59E-02	4.6E-2	
A	1.98E-02	2.0E-2	
A	1.01E-02	1.0E-2	

Val	$^{233/234}U/^{235}U$	A	R
A	5.84E+01	5.8E+1	
A	1.22E+01	1.2E+1	
A	1.84E+01	1.8E+1	
A	1.86E+01	1.9E+1	
A	3.35E+01	3.3E+1	
A	2.00E+01	2.0E+1	
A	3.17E+01	3.2E+1	
A	2.36E+01	2.4E+1	
A	7.25E+01	7.3E+1	
A	8.52E+01	8.5E+1	

Trench 03592

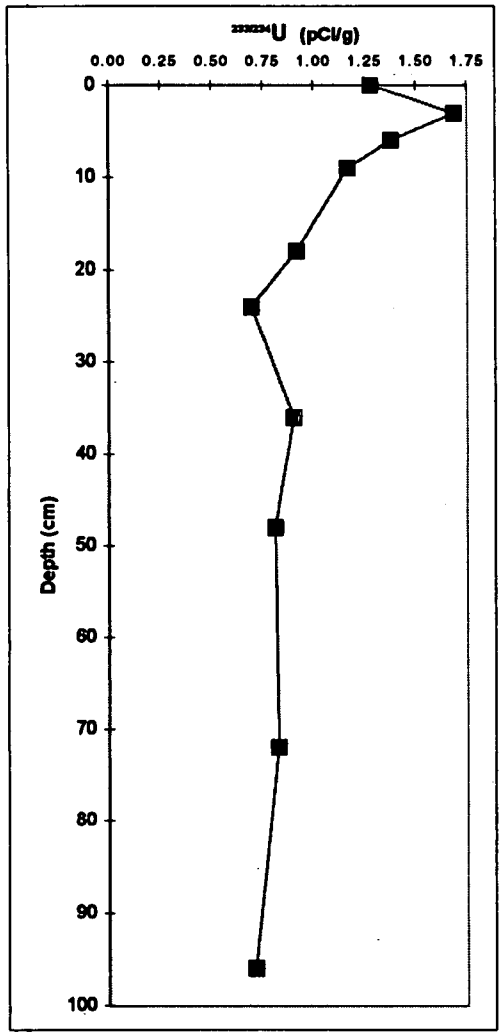


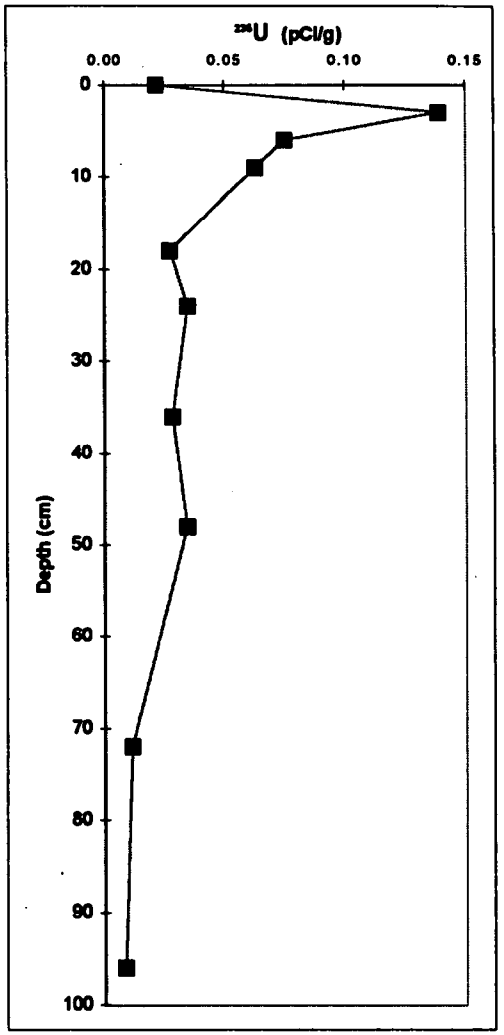


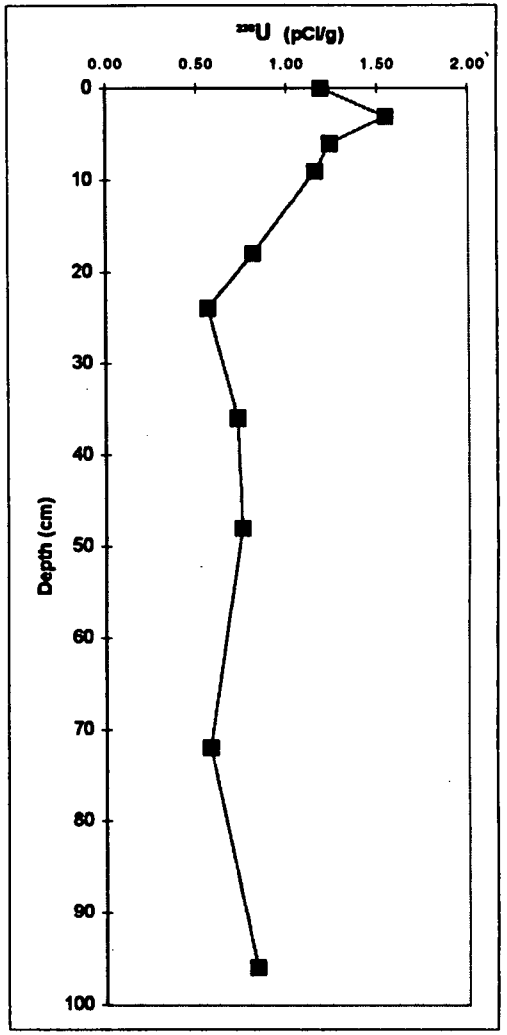


Rejected values indicated by

Trench 03592

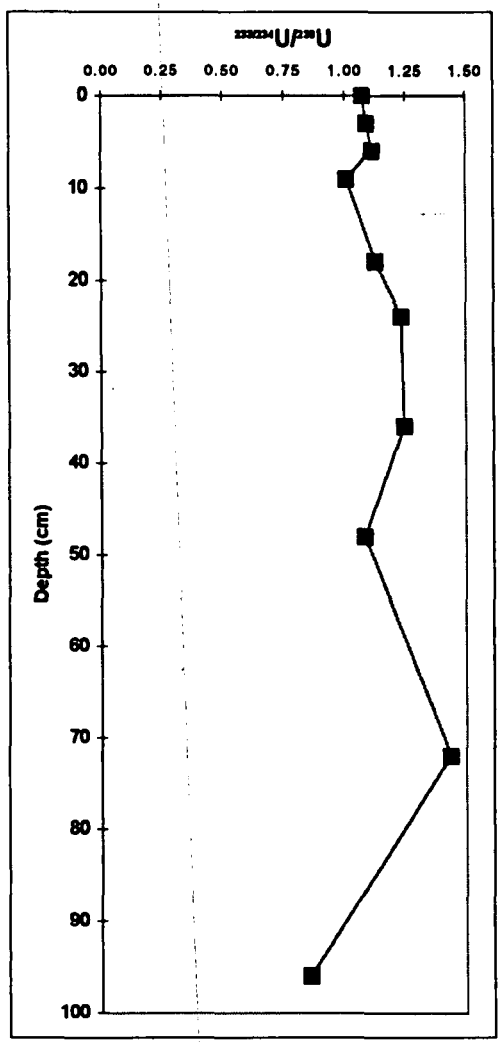


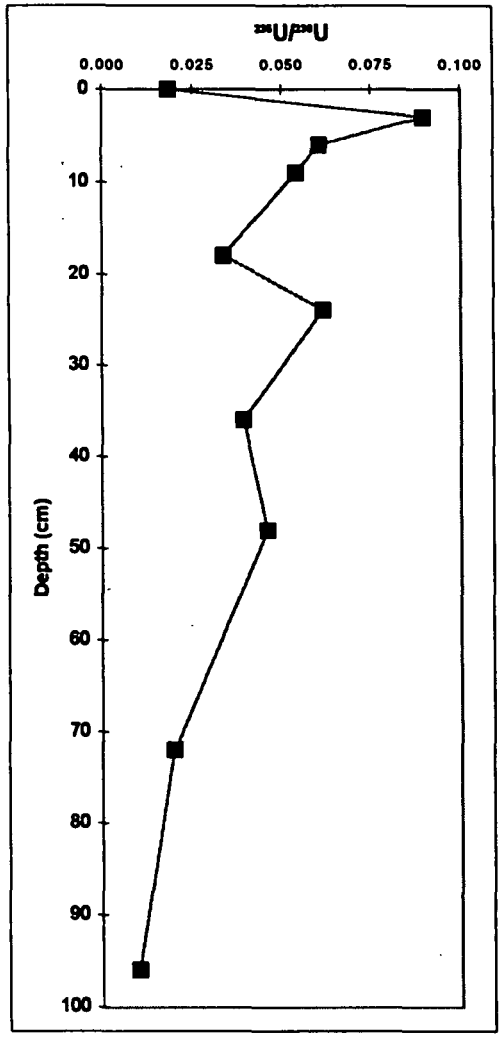


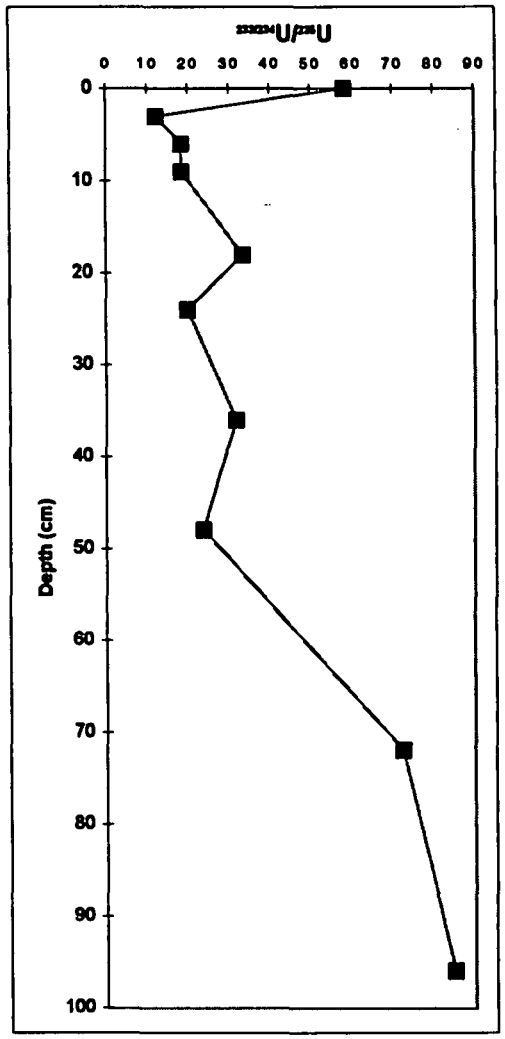


Rejected values indicated by

Trench 03592







Rejected values indicated by

Rocky Flats
Trench 03692 Data

Depth (cm)	Val	$^{239/240}Pu$ (pCi/g)	A	R
0	A	5.96E-01	6.0E-1	
3	A	4.84E-01	4.8E-1	
6	A	3.14E-01	3.1E-1	
9	R	9.18E-02		9.2E-2
18	A	1.09E-01	1.1E-1	
24	A	2.44E-03	2.4E-3	
36	A	1.64E-02	1.6E-2	
48	A	0.00E+00	0.0E+0	
72	A	3.95E-03	4.0E-3	
96	R	9.84E-03		9.8E-3

Depth (cm)	Val	^{241}Am (pCi/g)	A	R
0	A	1.28E-01	1.3E-1	
3	A	1.12E-01	1.1E-1	
6	A	3.03E-02	3.0E-2	
9	A	1.75E-02	1.7E-2	
18	A	1.08E-02	1.1E-2	
24	A	1.70E-03	1.7E-3	
36	A	7.08E-03	7.1E-3	
48	A	1.02E-03	1.0E-3	
72	A	6.61E-04	6.6E-4	
96	A	2.62E-03	2.6E-3	

Depth (cm)	Val	$^{241}Am/^{239/240}Pu$	A	R
0	A	2.14E-01	2.1E-1	
3	A	2.31E-01	2.3E-1	
6	A	9.67E-02	9.7E-2	
9	R	1.90E-01		1.9E-1
18	A	9.92E-02	9.9E-2	
24	A	6.95E-01	6.9E-1	
36	A	4.33E-01	4.3E-1	
48	A			
72	A	1.67E-01	1.7E-1	
96	R	2.66E-01		2.7E-1

Depth (cm)	Val	$^{233/234}U$ (pCi/g)	A	R
0	A	1.53E+00	1.5E+0	
3	A	2.02E+00	2.0E+0	
6	A	1.61E+00	1.6E+0	
9	A	1.53E+00	1.5E+0	
18	A	1.12E+00	1.1E+0	
24	A	1.15E+00	1.1E+0	
36	A	1.21E+00	1.2E+0	
48	A	1.07E+00	1.1E+0	
72	A	1.56E+00	1.6E+0	
96	A	1.16E+00	1.2E+0	

Depth (cm)	Val	^{235}U (pCi/g)	A	R
0	A	8.46E-02	8.5E-2	
3	A	7.09E-02	7.1E-2	
6	A	5.70E-02	5.7E-2	
9	A	2.70E-02	2.7E-2	
18	A	1.65E-02	1.7E-2	
24	A	4.90E-02	4.9E-2	
36	A	7.71E-02	7.7E-2	
48	A	8.16E-02	8.2E-2	
72	A	6.54E-02	6.5E-2	
96	A	3.55E-01	3.6E-1	

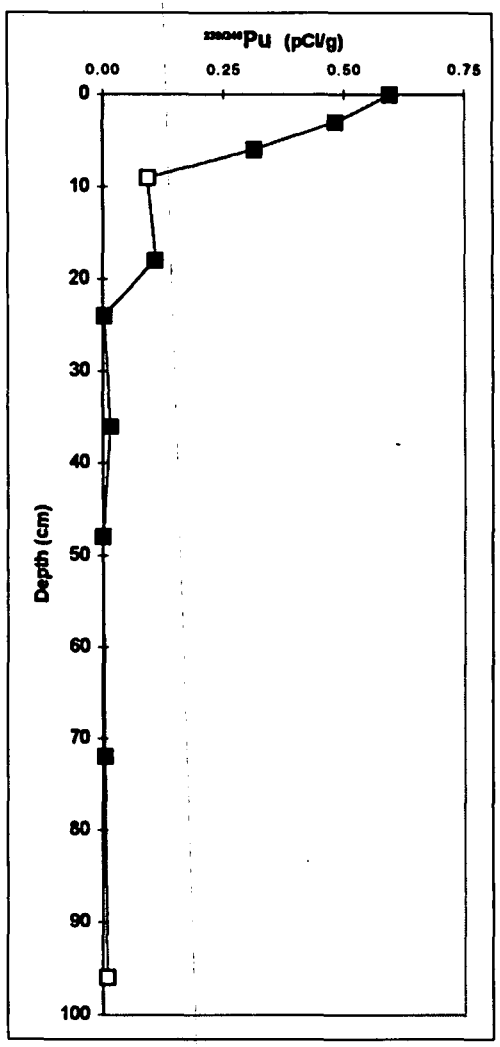
Depth (cm)	Val	^{238}U (pCi/g)	A	R
0	A	1.65E+00	1.7E+0	
3	A	2.15E+00	2.1E+0	
6	A	1.70E+00	1.7E+0	
9	A	1.45E+00	1.5E+0	
18	A	1.17E+00	1.2E+0	
24	A	1.31E+00	1.3E+0	
36	A	1.09E+00	1.1E+0	
48	A	9.95E-01	9.9E-1	
72	A	1.42E+00	1.4E+0	
96	A	1.25E+00	1.2E+0	

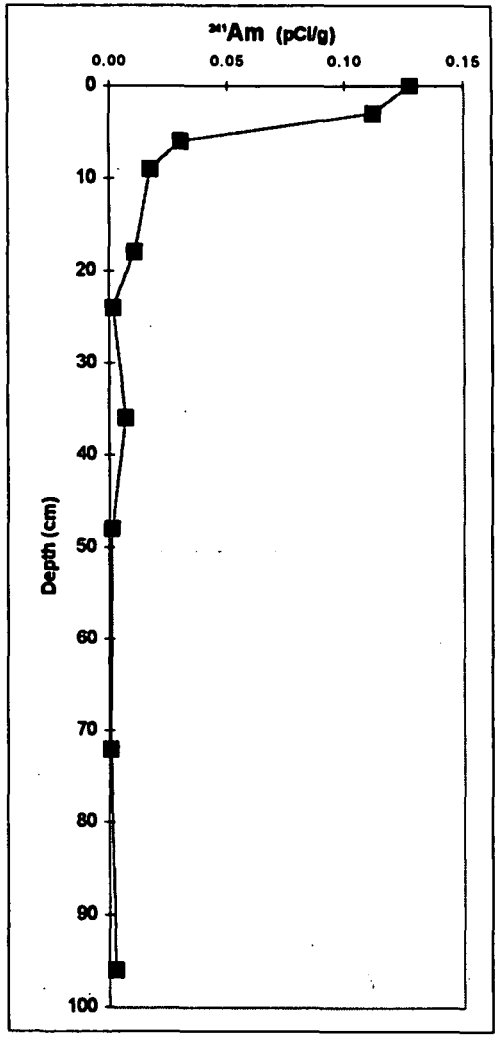
Depth (cm)	Val	$^{233/234}U/^{238}U$	A	R
0	A	9.24E-01	9.2E-1	
3	A	9.39E-01	9.4E-1	
6	A	9.47E-01	9.5E-1	
9	A	1.06E+00	1.1E+0	
18	A	9.51E-01	9.5E-1	
24	A	8.73E-01	8.7E-1	
36	A	1.12E+00	1.1E+0	
48	A	1.07E+00	1.1E+0	
72	A	1.10E+00	1.1E+0	
96	A	9.32E-01	9.3E-1	

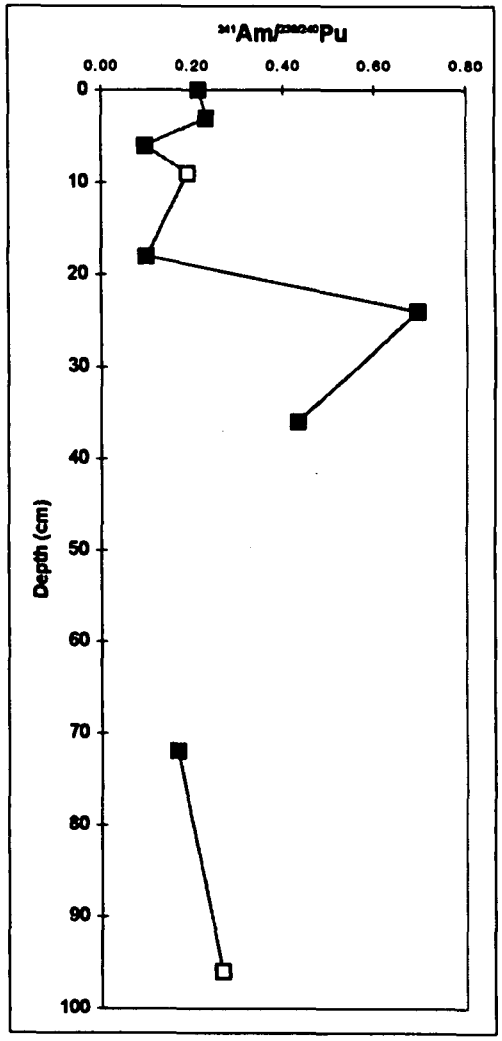
Depth (cm)	Val	$^{235}U/^{238}U$	A	R
0	A	5.11E-02	5.1E-2	
3	A	3.30E-02	3.3E-2	
6	A	3.36E-02	3.4E-2	
9	A	1.86E-02	1.9E-2	
18	A	1.41E-02	1.4E-2	
24	A	3.73E-02	3.7E-2	
36	A	7.09E-02	7.1E-2	
48	A	8.20E-02	8.2E-2	
72	A	4.60E-02	4.6E-2	
96	A	2.85E-01	2.8E-1	

Depth (cm)	Val	$^{233/234}U/^{235}U$	A	R
0	A	1.81E+01	1.8E+1	
3	A	2.84E+01	2.8E+1	
6	A	2.82E+01	2.8E+1	
9	A	5.68E+01	5.7E+1	
18	A	6.76E+01	6.8E+1	
24	A	2.34E+01	2.3E+1	
36	A	1.57E+01	1.6E+1	
48	A	1.31E+01	1.3E+1	
72	A	2.38E+01	2.4E+1	
96	A	3.27E+00	3.3E+0	

Trench 03692

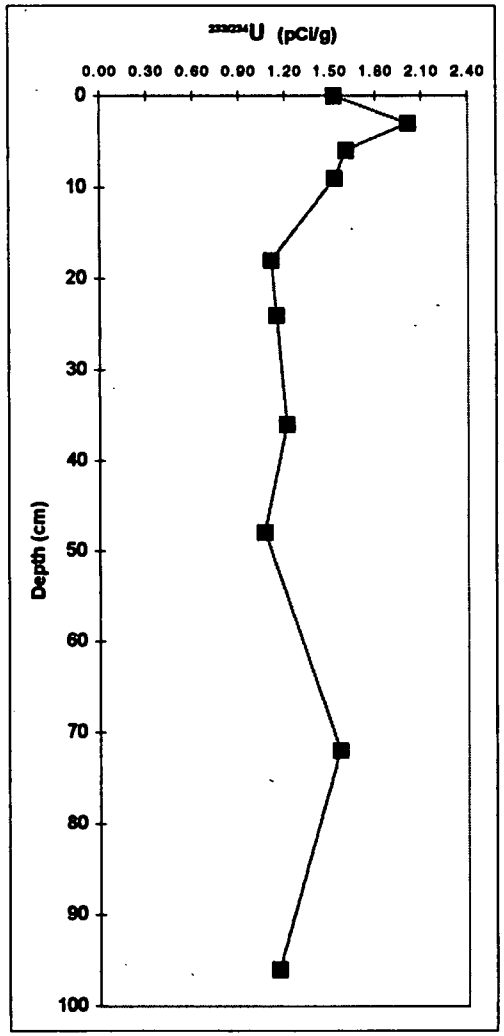


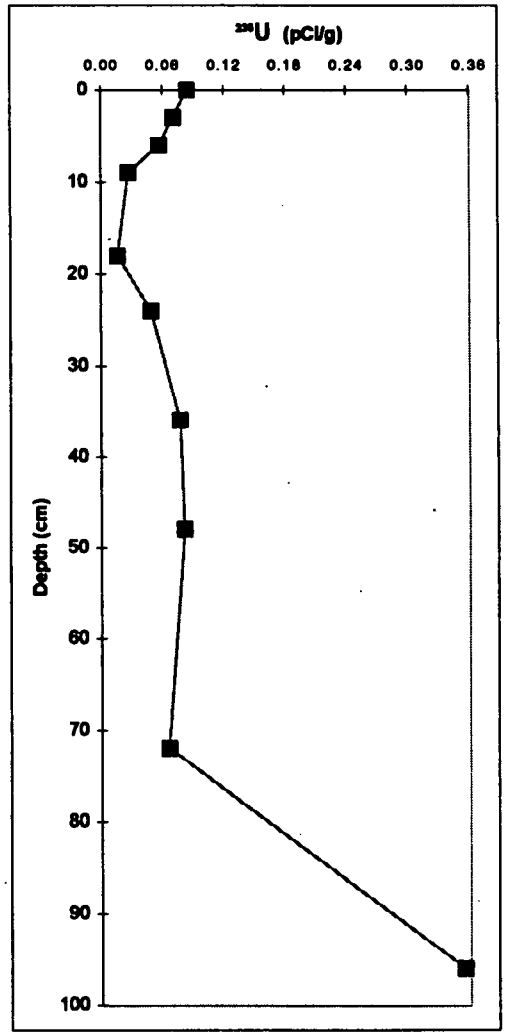


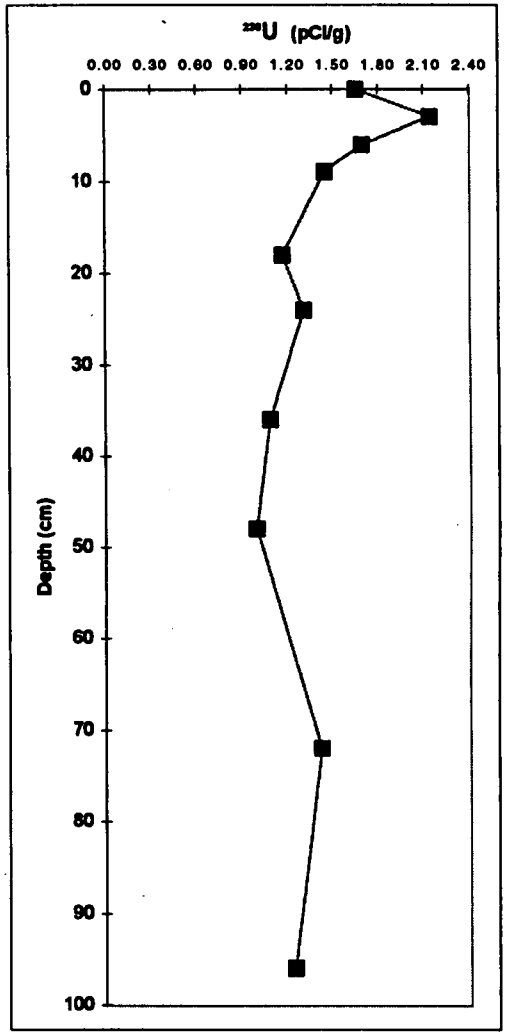


Rejected values indicated by

Trench 03692







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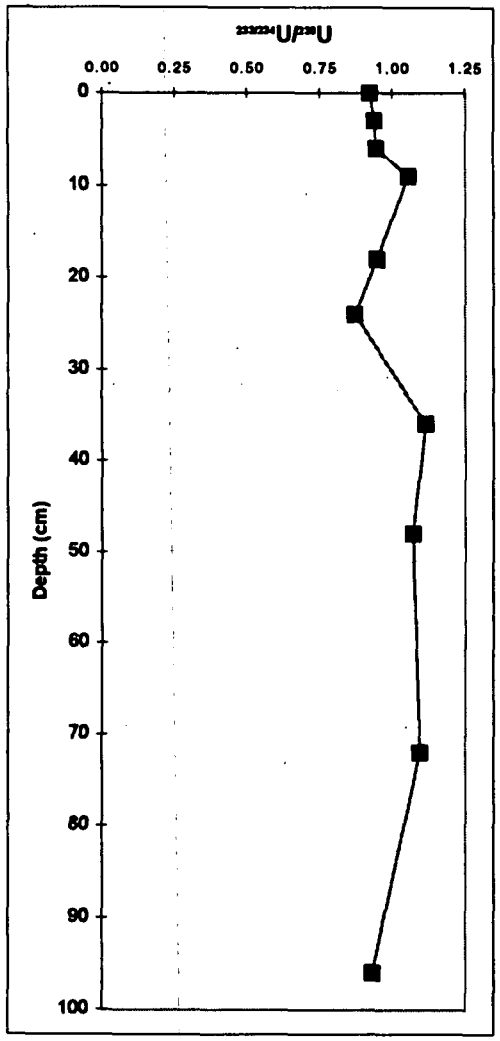
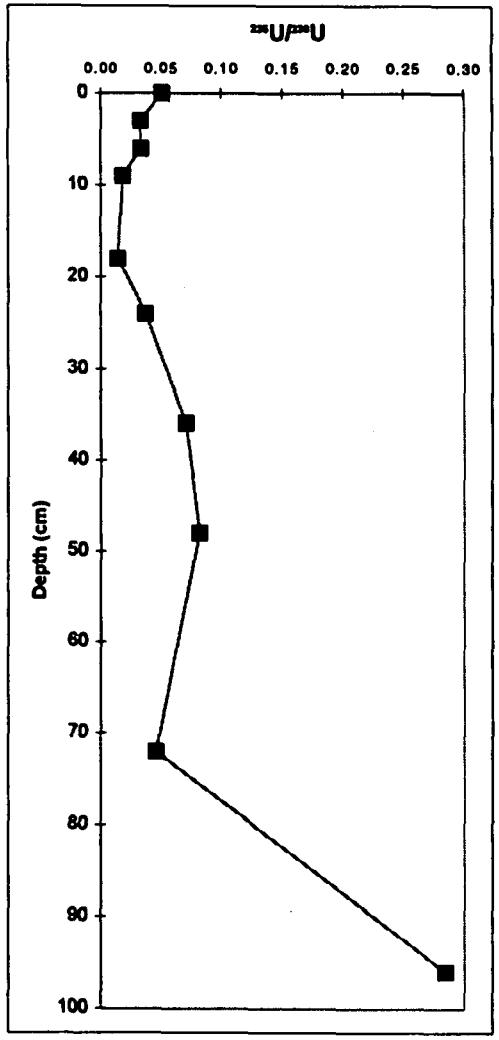
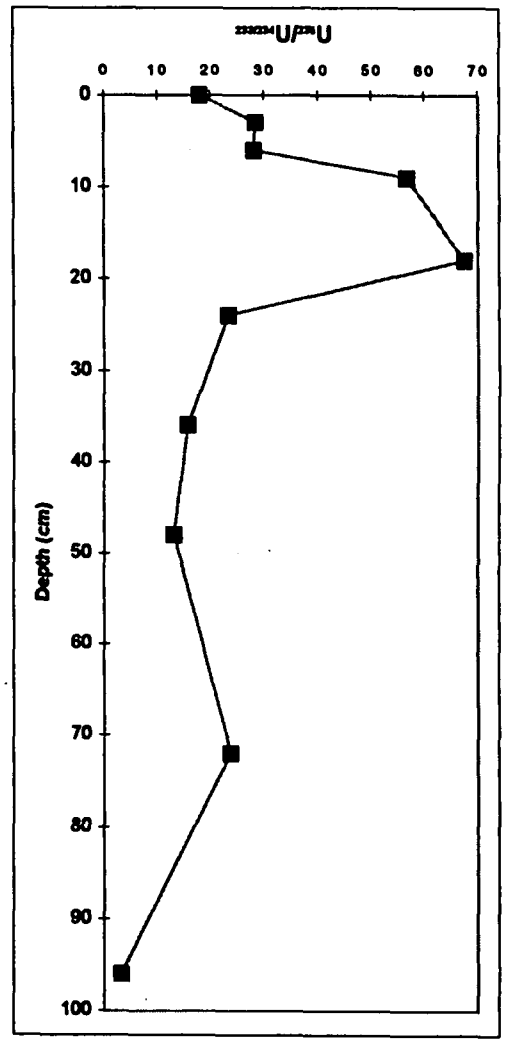






Rejected values indicated by

Classification and Mineralogy of Soils

PIT	MAP UNIT	LANDSCAPE POSITION	EPIPEDON	SUBSURFACE HORIZON	DISCONTINUITIES	CLAY MINERALOGY	PARTICLE SIZE CLASS	PEDON CLASSIFICATION	CLOSEST SERIES AND CLASSIFICATION	REMARKS
27	Standley-Nunn	Summit	Mollic	Argillic Calcic	38 and 80 cm	smectitic (montmorillonitic)	Clayey-skeletal over sandy-skeletal	Clayey-skeletal over sandy skeletal, mixed, mesic Aridic Argiustoll	Valmont (clayey over loamy-skeletal, montmorillonitic, mesic Aridic Argiustolls)	
28	Denver-Kutch	Backslope	Mollic	Argillic	10 cm	smectitic (montmorillonitic)	Fine	Fine, montmorillonitic, mesic Typic Argiaquoll	Nunn Variant (fine, montmorillonitic, mesic Aquic Argiustolls)	The color of Ap horizon is 10YR 5/2 (dry) rather than 10YR 6/2, as described The Ap horizon has 1.98% O.C.
29	Layden Primn Standley	Backslope	Mollic	Cambic	15 and 100 cm	mixed	Fine-loamy	Fine-loamy, mixed, mesic Aridic Haplustoll	Manzano (fine-loamy, mixed, mesic Cumulic Haplustolls)	
30	Englewood	Toeslope	Mollic	Cambic	38 and 75 cm	mixed	Fine-loamy	Fine-loamy, mixed (calcareous), mesic Fluvaquentic Endoaquoll	Loveland (fine-loamy over sandy or sandy-skeletal, mixed (calcareous), mesic Fluvaquentic Haplaquolls)	
31	Standley-Nunn	Summit	Mollic	Argillic	47 and 107 cm	smectitic (montmorillonitic)	Clayey-skeletal	Clayey-skeletal , montmorillonitic, mesic Aridic Argiustoll	Standley (fine, montmorillonitic, mesic Aridic Argiustolls)	
32	Standley-Nunn	Summit	Mollic	Argillic Calcic	7 cm	smectitic (montmorillonitic)	Clayey-skeletal	Clayey-skeletal , montmorillonitic, mesic Pachic Argiustoll	Standley (fine, montmorillonitic, mesic Aridic Argiustolls)	
33	Nunn	Summit	Mollic	Argillic	29 cm	smectitic (montmorillonitic)	Fine	Fine , montmorillonitic, mesic Pachic Argiustoll	Standley (fine, montmorillonitic, mesic Aridic Argiustolls)	
34	Haverson	Toeslope	Mollic	Argillic	None	smectitic (montmorillonitic)	Fine	Fine, montmorillonitic, mesic Torrertic Argiustoll	Englewood (fine, montmorillonitic, mesic Torrertic Argiustolls)	
35	McClave	Toeslope	Mollic	Cambic	19, 43, 60, 74 cm	mixed	Loamy-skeletal	Loamy-skeletal, mixed, mesic Torrifluventic Haplustoll	Haverson (fine-loamy, mixed (calcareous), mesic Ustic Torrifluvents)	

Classification and Mineralogy of Soils

PIT	MAP UNIT	LANDSCAPE POSITION	EPIPEDON	SUBSURFACE HORIZON	DISCONTINUITIES	CLAY MINERALOGY	PARTICLE SIZE CLASS	PEDON CLASSIFICATION	CLOSEST SERIES AND CLASSIFICATION	REMARKS
36	Denver-Kutch	Footslope	Mollic	Cambic Calcic	7, 52, 92 cm	smectitic (montmorillonitic)	Clayey-skeletal	Clayey-skeletal, mixed, mesic Pachic Calciustoll	Lebsack (fine, montmorillonitic, mesic Pachic Haplustolls)	No argillic identified because this pedon did not have a significant fine-clay increase with depth. Assumes that 10 YR 5/4 colors are dry colors.
					7, 24, 92 cm		Fine	Fine, montmorillonitic, mesic Typic Calciustoll		Alternative Pedon (36) Classification for Part 2
37	Nunn	Footslope	Mollic	Argillic	51 cm	smectitic (montmorillonitic)	Fine	Fine, montmorillonitic, mesic Pachic Argiustoll	Nunn (fine, montmorillonitic, mesic Aridic Argiustolls)	
38		Summit	Ochric	Argillic Calcic	43, 66, 93 cm	mixed	Fine-loamy over clayey (skeletal)	Fine-loamy over clayey, mixed, mesic Aridic Haplustalf	Ascalon (fine-loamy, mixed, mesic Aridic Argiustolls)	There is no fine-loamy over clayey-skeletal particle size class officially recognized, so we used the closest particle size class
39		Summit	Mollic	Argillic Calcic	101 cm	smectitic (montmorillonitic)	Fine	Fine, montmorillonitic, mesic Torrertic Argiustoll	Kutch (fine, montmorillonitic, mesic Torrertic Argiustolls)	
40		Summit	Mollic	Argillic Calcic	None	mixed	Fine-loamy	Fine-loamy, mixed, mesic Aridic Argiustoll	Ascalon (fine-loamy, mixed, mesic Aridic Argiustolls)	

Pit 27

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-8	A	51.3	12.0	8.9	8.9	11.8	6.7	48.2	18.9	14.7	33.6	9.9	8.4	18.3
7-38	Bt	39.7	5.3	5.5	7.6	8.9	4.9	32.2	12.1	6.8	18.9	21.3	27.6	48.9
38-80	2Bk	65.2	17.2	15.3	21.5	12.1	2.4	68.5	4.6	4.4	9.0	15.8	6.7	22.5
80-110	3BC	58.5	25.7	30.9	20.5	6.2	0.9	84.2	1.9	1.5	3.4	6.6	5.8	12.4

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-8	A	0.0	4.9	4.8	*	62	2.72	29.8	9.20	1.63	0.93	0.08
7-38	Bt	0.0	7.0	6.7	*	296	1.70	18.2	27.73	2.88	1.38	0.10
38-80	2Bk	17.7	8.0	7.6	*	128	0.50	12.4	**	**	**	**
80-110	3BC	5.2	8.1	7.6	*	71	0.26	23.5	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy						
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-Interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-8	A	7128	297	1104	790	58		24	9		6	3
7-38	Bt	9164	185	1454	753	47		24	14		3	12
38-80	2Bk	4343	83	488	467	62		19	12		3	4
80-110	3BC	3873	81	423	413	63		18	13		4	2

Pit 28

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-10	A	6.1	6.2	4.9	6.2	11.7	10.4	39.4	22.3	16.5	38.8	10.2	11.6	21.8
10-42	2Bt1	0.8	0.7	0.7	2.6	8.4	8.6	21.0	18.2	19.4	37.6	16.8	24.6	41.4
42-104	2Bt2	0.4	0.7	0.7	1.0	4.0	5.6	12.0	15.6	23.9	39.5	29.6	18.9	48.5
104-111	2Bt3	0.6	0.9	0.8	1.1	5.0	5.0	12.8	13.6	25.5	39.1	30.4	17.7	48.1

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-10	A	0.0	6.7	6.1	1.47	89	2.0	17.0	10.76	2.63	1.14	0.18
10-42	2Bt1	0.0	6.8	6.3	1.73	213	1.3	28.7	19.89	4.93	1.12	0.42
42-104	2Bt2	3.5	8.1	7.7	1.90	250	1.0	33.3	**	**	**	**
104-111	2Bt3	6.1	7.9	7.7	1.89	230	0.8	31.4	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy						
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-10	A	6986	284	600	1081	58		22	14		5	1
10-42	2Bt1	7436	255	748	957	66		18	11		3	2
42-104	2Bt2	6798	267	667	1101	66	Trace	20	9		2	4
104-111	2Bt3	7921	246	551	1002	63		19	13		2	3

Pit 29

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-7.5	A	0.8	1.0	1.1	2.4	7.6	6.1	18.2	20.7	22.4	43.1	20.1	18.6	38.7
7.5-15	Bw1	0.6	0.7	1.8	3.2	8.3	6.0	20.0	14.2	20.7	34.9	28.6	16.5	45.1
15-26	2Bw2	3.5	1.3	1.3	2.7	17.5	15.4	38.2	22.2	16.0	38.2	11.0	12.6	23.6
26-41	2Bw3	0.2	0.2	0.2	0.7	16.2	21.8	39.1	19.9	10.4	30.3	12.0	18.6	30.6
41-100	3Bw4	0.0	0.2	0.1	0.5	13.2	18.6	32.6	23.2	16.3	39.5	17.7	10.3	28.0
100-119	3Bw5	0.0	0.1	0.2	0.4	2.1	8.6	11.4	21.7	25.8	47.5	29.4	11.7	41.1

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-7.5	A	0.0	6.6	6.5	*	194	2.5	29.6	21.08	4.71	1.07	0.07
7.5-15	Bw1	3.4	7.8	7.4	1.70	218	1.3	30.9	**	**	**	**
15-26	2Bw2	4.0	7.6	7.2	1.37	94	1.4	17.7	**	**	**	**
26-41	2Bw3	2.5	7.8	7.5	1.70	148	0.9	22.1	**	**	**	**
41-100	3Bw4	7.9	8.2	7.8	1.59	121	0.5	18.9	**	**	**	**
100-119	3Bw5	6.2	8.1	7.7	1.90	187	0.3	26.9	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy						
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-7.5	A	7702	208	608	1183	65		18	12		3	2
7.5-15	Bw1	8129	243	722	1013	59		20	16		3	3
15-26	2Bw2	7286	244	555	877	57		21	16		4	2
26-41	2Bw3	8360	134	710	821	57		17	19		4	3
41-100	3Bw4	10053	178	611	679	53	Trace	17	20	Trace	5	5
100-119	3Bw5	13510	213	548	954	58	Trace	19	14		5	4

Pit 30

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-10	A	0.1	0.7	0.4	0.8	4.4	7.7	14.0	22.2	24.8	47.0	19.3	19.7	39.0
10-38	Bw1	0.0	0.7	0.4	1.0	5.3	6.7	14.1	23.6	24.0	47.6	17.2	21.1	38.3
38-48	2Bw2	27.3	10.7	9.1	7.9	11.2	6.1	45.0	13.9	14.7	28.6	12.4	14.0	26.4
48-75	2Bw3	10.3	4.8	4.5	7.8	17.6	10.5	45.2	15.6	13.8	29.4	11.2	14.2	25.4
75-110	3Bw4	4.2	2.5	2.9	2.9	7.4	7.0	22.7	16.6	17.6	34.2	21.8	21.2	43.0

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil	Ca	Mg	K	Na
0-10	A	1.6	7.6	7.3	1.54	194	2.5	31.7	**	**	**	**
10-38	Bw1	2.2	7.7	7.4	1.73	189	1.2	27.1	**	**	**	**
38-48	2Bw2	2.7	8.0	7.5	1.70	124	0.7	19.3	**	**	**	**
48-75	2Bw3	3.7	8.1	7.6	1.72	125	0.5	17.2	**	**	**	**
75-110	3Bw4	2.9	8.0	7.6	1.89	238	0.9	27.9	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy					
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-10	A	4967	193	491	1383	60		20	14		2	4
10-38	Bw1	6203	209	552	1357	61		19	13		2	4
38-48	2Bw2	7328	197	436	1034	55		19	16		4	6
48-75	2Bw3	8364	195	540	811	60		18	15		5	3
75-110	3Bw4	7275	219	830	877	64		21	10		2	2

Pit 31

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-12	A	54.4	13.4	9.2	7.7	10.2	6.9	47.4	17.0	17.9	34.9	9.6	8.1	17.7
12-47	Bt1	37.6	4.4	3.5	3.8	6.7	4.7	23.1	13.3	17.0	30.2	14.8	32.0	46.8
47-107	2Bt2	62.5	14.8	13.6	11.7	8.3	2.6	51.0	5.0	5.2	10.2	7.9	30.9	38.8
107-120	2BC	47.5	30.2	25.9	14.6	6.9	1.3	78.9	2.6	5.6	8.2	7.8	5.1	12.9

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-12	A	0.0	5.9	5.4	1.23	67	2.5	15.2	8.66	1.56	0.85	0.06
12-47	Bt1	0.0	6.6	6.1	*	254	1.2	29.4	21.00	3.90	1.29	0.11
47-107	2Bt2	0.0	6.7	6.1	*	275	0.9	27.5	17.10	4.66	1.38	0.09
107-120	2BC	13.4	8.1	7.5	*	64	0.3	13.2	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy					
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-12	A	7379	336	966	550	50		27	10		6	7
12-47	Bt1	10509	292	1339	706	63		24	7		3	3
47-107	2Bt2	9704	123	1548	612	65		21	8		4	2
107-120	2BC	3858	71	427	417	63		19	11		4	3

Pit 32

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-7	A	29.7	14.2	13.0	8.9	9.0	4.4	49.5	14.7	18.8	33.5	9.4	7.6	17.0
7-64	2Bt	43.8	10.8	11.4	7.6	5.2	2.1	37.1	3.4	5.2	8.6	14.0	40.3	54.3
64-110	2Btk	49.9	18.4	17.8	13.8	8.1	2.1	60.2	4.1	8.6	12.7	19.0	8.1	27.1

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-7	A	0.0	4.9	4.7	*	63	2.9	15.1	7.57	1.37	1.28	0.05
7-64	2Bt	0.0	6.1	5.7	*	338	1.2	33.4	21.11	3.97	1.47	0.08
64-110	2Btk	21.6	7.9	7.5	1.85	132	0.6	19.9	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy					
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-7	A	7520	289	1289	637	55		23	11		6	5
7-64	2Bt	11202	179	1956	708	62		25	8		3	2
64-110	2Btk	5212	90	813	469	59		22	13		3	3

Pit 33

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-12	A	19.4	15.7	16.0	7.9	8.7	3.6	51.9	11.8	15.6	27.4	10.3	10.4	20.7
12-29	Bt1	50.5	30.4	10.5	5.4	4.5	1.9	52.7	3.5	10.5	14.0	8.7	24.6	33.3
29-82	2Bt2	6.7	4.4	5.4	5.0	7.3	3.4	25.4	10.0	19.3	29.3	18.2	27.2	45.4
82-110	2Bt3	18.4	5.3	5.6	4.7	5.7	3.3	24.6	11.5	19.6	31.1	38.6	5.7	44.3

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-12	A	4.3	7.2	6.9	*	79	3.9	18.8	15.69	3.12	1.92	0.17
12-29	Bt1	0.0	7.0	6.6	*	189	1.5	25.3	15.94	4.40	1.57	0.60
29-82	2Bt2	0.0	6.8	6.6	1.79	268	0.9	31.3	22.84	5.30	1.10	0.85
82-110	2Bt3	5.5	7.8	7.7	1.62	275	0.8	36.1	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy					
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg/g soil				%						
0-12	A	5858	255	760	773	61		18	11		4	6
12-29	Bt1	6888	200	915	681	60		27	7		3	3
29-82	2Bt2	7914	291	1272	625	65		25	7		2	2
82-110	2Bt3	4058	72	895	618	64		26	7		1	1

Pit 34

Depth	Horizon	Particle Size: >2mm Rock Fragments	<2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-14	A	21.1	5.5	4.3	7.7	14.5	9.9	41.9	18.8	15.5	34.3	11.0	12.8	23.8
14-56	Bt	2.2	3.2	3.8	4.5	8.1	5.2	24.8	15.0	13.9	28.9	12.4	33.9	46.3
56-96 part 2	Bt	9.1	3.6	3.9	6.3	12.7	7.7	34.2	15.0	16.5	31.5	13.1	21.2	34.3
56-96 part 1	Btk	21.8	8.5	6.6	6.5	10.4	6.6	38.6	14.2	17.0	31.2	15.9	14.3	30.2
96-110	B	13.4	4.1	4.9	7.6	15.3	8.9	40.8	16.1	14.4	30.5	17.9	10.8	28.7

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases: Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-14	A	0.0	6.0	5.7	1.48	95	2.2	18.4	11.16	3.03	1.21	0.06
14-56	Bt	0.0	6.8	6.4	1.84	282	1.1	29.2	20.07	7.80	1.14	0.14
56-96 part 2	Bt	1.6	7.9	7.5	1.79	201	0.7	26.8	**	**	**	**
56-96 part 1	Btk	3.0	8.0	7.7	1.79	171	0.6	22.6	**	**	**	**
96-110	B	3.2	8.0	7.7	1.81	156	0.4	21.3	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable): Fe	Mn	Al	Si	Clay Mineralogy: Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		μg /g soil				%						
0-14	A	8602	353	813	686	54		26	10		5	4
14-56	Bt	10501	294	1053	657	63		23	8		3	3
56-96 part 2	Bt	8788	334	770	651	65		20	8		4	3
56-96 part 1	Btk	8487	254	712	517	65		18	10		4	3
96-110	B	8483	302	603	517	67		16	10		4	4

Pit 35

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-6	A	0.1	1.8	1.9	3.0	6.0	5.1	17.8	23.3	27.3	50.6	20.0	11.6	31.6
6-19	Bw1	0.4	2.2	2.4	4.2	9.5	6.5	24.8	21.5	23.2	44.7	17.5	13.0	30.5
19-43	2Bw2	37.3	16.6	11.8	8.3	10.1	4.6	51.4	10.8	12.4	23.2	10.8	14.6	25.4
43-60	3Bw3	43.7	18.8	19.4	16.0	12.8	3.2	70.2	7.5	6.7	14.2	6.4	9.2	15.6
60-74	4Bw4	14.8	2.7	7.4	12.3	20.5	6.4	49.3	12.9	12.4	25.3	10.6	14.8	25.4
74-110	5Bw5	52.5	18.3	22.4	16.5	10.9	3.7	71.7	6.5	5.5	11.9	6.4	10.1	16.5

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-6	A	0.0	6.9	6.6	*	144	5.0	26.9	21.12	5.99	2.33	0.31
6-19	Bw1	1.6	7.1	6.8	1.57	148	2.5	23.7	18.34	5.02	1.70	0.49
19-43	2Bw2	3.0	8.0	7.5	*	147	1.2	20.8	**	**	**	**
43-60	3Bw3	2.2	8.3	7.6	1.69	89	0.5	15.6	**	**	**	**
60-74	4Bw4	2.8	8.3	7.7	1.77	145	1.0	21.2	**	**	**	**
74-110	5Bw5	2.7	8.3	7.8	1.72	103	0.4	13.8	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy					
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-6	A	6778	385	551	1135	58		22	13		3	4
6-19	Bw1	6872	306	494	1173	60		23	11		3	3
19-43	2Bw2	6748	181	652	903	61		23	10		4	3
43-60	3Bw3	6751	114	485	594	56		25	10		6	3
60-74	4Bw4	7709	223	706	686	65		21	8		4	3
74-110	5Bw5	7950	123	512	679	63		20	8		7	2

Pit 36

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-6	A	16.1	7.1	8.7	10.5	15.0	7.3	48.6	16.1	10.4	26.5	12.0	12.9	24.9
7-24	2Bw1	25.7	8.2	6.0	7.2	11.0	4.5	36.9	9.3	10.1	19.4	36.5	7.2	43.7
24-52 split part 1	2Bk	10.6	3.9	4.0	7.0	10.5	4.3	29.7	9.0	13.0	22.0	40.5	7.8	48.3
24-52 split part 2	2Bw2	70.6	23.9	14.1	9.3	7.1	2.4	56.8	5.6	7.2	12.8	24.8	5.6	30.4
52-92	3Bk2	0.2	0.4	1.4	4.9	13.6	5.7	26.0	10.1	18.2	28.3	38.6	7.1	45.7
92-112	4Bw4	41.5	11.1	9.5	11.9	15.2	5.0	52.7	8.9	10.4	19.3	19.6	8.4	28.0

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-6	A	0.0	6.7	6.6	*	124	2.9	21.6	16.46	2.50	0.97	0.06
7-24	2Bw1	5.1	7.4	7.1	1.44	266	1.9	31.2	**	**	**	**
24-52 split part 1	2Bk	38.4	8.0	7.6	*	147	0.9	19.0	**	**	**	**
24-52 split part 2	2Bw2	4.6	7.8	7.4	*	225	1.4	27.2	**	**	**	**
52-92	3Bk2	43.3	8.1	7.7	*	117	0.5	15.3	**	**	**	**
92-112	4Bw4	16.0	8.1	7.7	1.88	126	0.4	15.4	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy						
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-6	A	7859	233	816	731	58		23	11		5	4
7-24	2Bw1	9589	154	1164	568	64		20	10		3	2
24-52 split part 1	2Bk	4964	67	653	252	59		18	19	Trace	1	2
24-52 split part 2	2Bw2	8814	148	985	473	65		20	9		4	3
52-92	3Bk2	4172	62	380	251	55		16	24	Trace	1	3
92-112	4Bw4	7119	122	489	381	64		16	13	Trace	4	3

Pit 37

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-8	A	0.6	1.5	2.4	6.1	16.0	10.1	36.1	19.3	13.0	32.3	16.0	15.6	31.6
8-25	Bt1	6.8	1.9	3.0	6.6	15.7	8.6	35.8	14.2	11.7	25.9	27.7	10.6	38.3
25-51	Bt2	2.9	2.3	2.3	5.1	13.2	7.7	30.6	14.8	14.3	29.1	28.0	12.3	40.3
51-82	2Bt3	0.5	0.9	1.0	2.4	5.4	8.9	18.6	18.5	21.1	39.6	30.4	11.4	41.8
82-120	2Bt4	0.5	0.5	1.0	2.6	8.8	5.0	17.9	18.1	20.2	38.3	32.2	11.6	43.8

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-8	A	2.5	7.7	7.4	*	174	3.0	23.1	**	**	**	**
8-25	Bt1	3.4	8.0	7.5	1.80	254	0.9	25.2	**	**	**	**
25-51	Bt2	11.3	8.3	7.8	1.73	210	0.6	23.4	**	**	**	**
51-82	2Bt3	9.6	8.4	7.9	1.74	240	0.2	26.6	**	**	**	**
82-120	2Bt4	5.7	8.2	7.9	1.57	191	0.7	22.3	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy					
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-8	A	5887	272	492	777	60		25	9		3	3
8-25	Bt1	6302	195	610	523	67		21	7		2	2
25-51	Bt2	6020	195	553	565	69		18	9		2	1
51-82	2Bt3	6439	227	500	568	66		22	7		2	2
82-120	2Bt4	6561	251	440	649	63		25	8		2	2

APPENDIX I

SEDIMENT AND SURFACE WATER MAPS

Appendix I contains maps showing the concentrations and activities of selected metals and radionuclides at each sampling location for sediments (grab samples only) and surface water. These maps were used for spatial analysis of concentration and activity patterns to determine if patterns indicated deposition of contamination or natural variability. The following figures illustrate the spatial distribution of selected metals, as well as plutonium, americium, and uranium in sediments and surface water:

Figure I-1 IHSS 200-Stream and Reservoir Sediments (arsenic, beryllium, calcium, chromium, iron, manganese, potassium, and zinc)

Figure I-2 IHSS 201-Stream and Reservoir Sediments (arsenic, beryllium, calcium, chromium, iron, manganese, potassium, and zinc)

Figure I-3 IHSS 202-Stream and Reservoir Sediments (arsenic, beryllium, calcium, chromium, iron, manganese, potassium, and zinc)

Figure I-4 IHSS 200-Stream and Reservoir Sediments (americium-241, plutonium-239, -240, uranium-233, -234, uranium-235, and uranium-238)

Figure I-5 IHSS 201-Stream and Reservoir Sediments (americium-241, plutonium-239, -240, uranium-233, -234, uranium-235, and uranium-238)

Figure I-6 IHSS 202-Stream and Reservoir Sediments (americium-241, plutonium-239, -240, uranium-233, -234, uranium-235, and uranium-238)

Figure I-7 IHSS 200-Stream and Reservoir Surface Water (arsenic, beryllium, calcium, chromium, iron, manganese, potassium, and zinc)

Figure I-8 IHSS 201-Stream and Reservoir Surface Water (arsenic, beryllium, calcium, chromium, iron, manganese, potassium, and zinc)

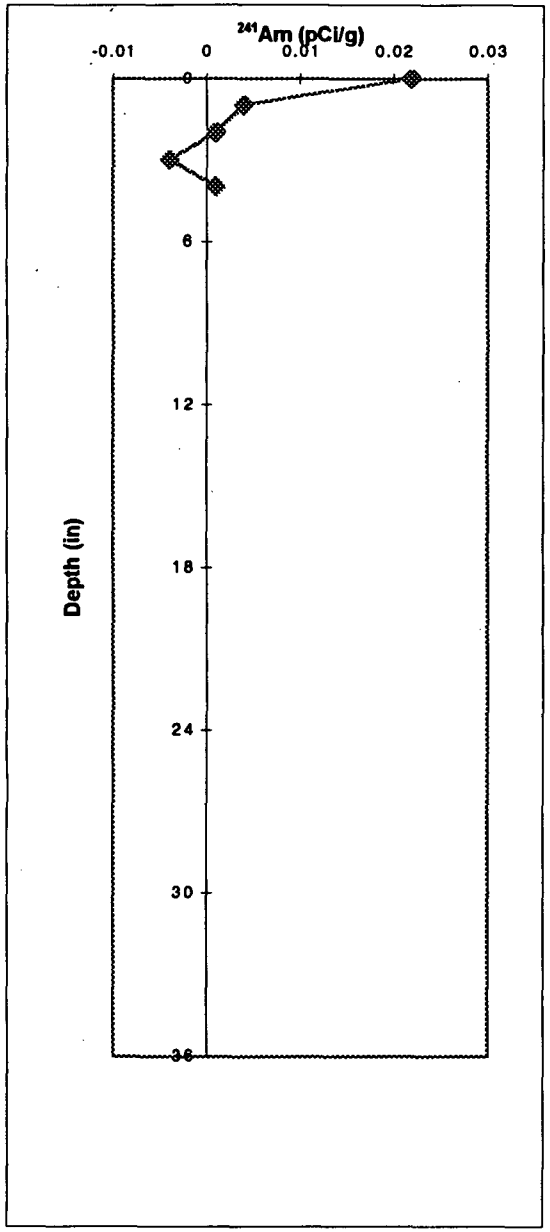
Figure I-9 IHSS 202-Stream and Reservoir Surface Water (arsenic, beryllium, calcium, chromium, iron, manganese, potassium, and zinc)

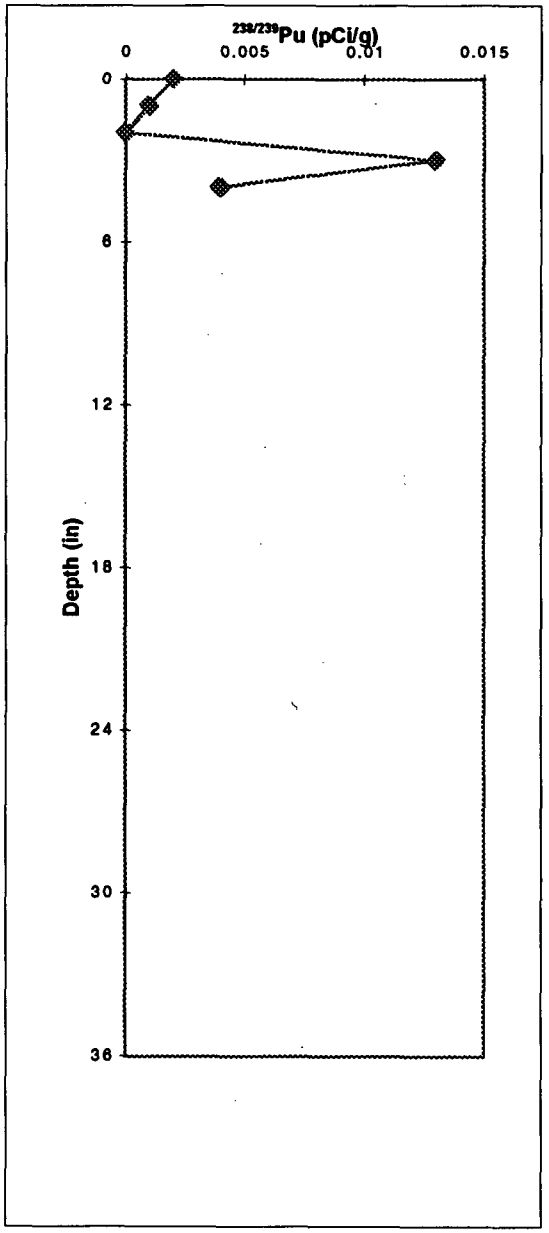
With the exception of plutonium-239, -240 in Great Western Reservoir, all metals were eliminated by the COC selection process. Part of that process was a weight-of-evidence evaluation, that included the spatial analysis presented in the maps in Appendix I.

Appendix J contains figures showing activities of radionuclides (americium-241, plutonium-239, -240, uranium-233, -234, uranium-235, and uranium-238) and concentrations of selected metals (arsenic, beryllium, cadmium, chromium, lead, mercury, and nickel) with depth in the sediment cores collected from the three reservoir IHSSs:

- Great Western Reservoir (IHSS 200)
- Standley Lake (IHSS 201)
- Mower Reservoir (IHSS 202)

Figure J-1
Location SED05792





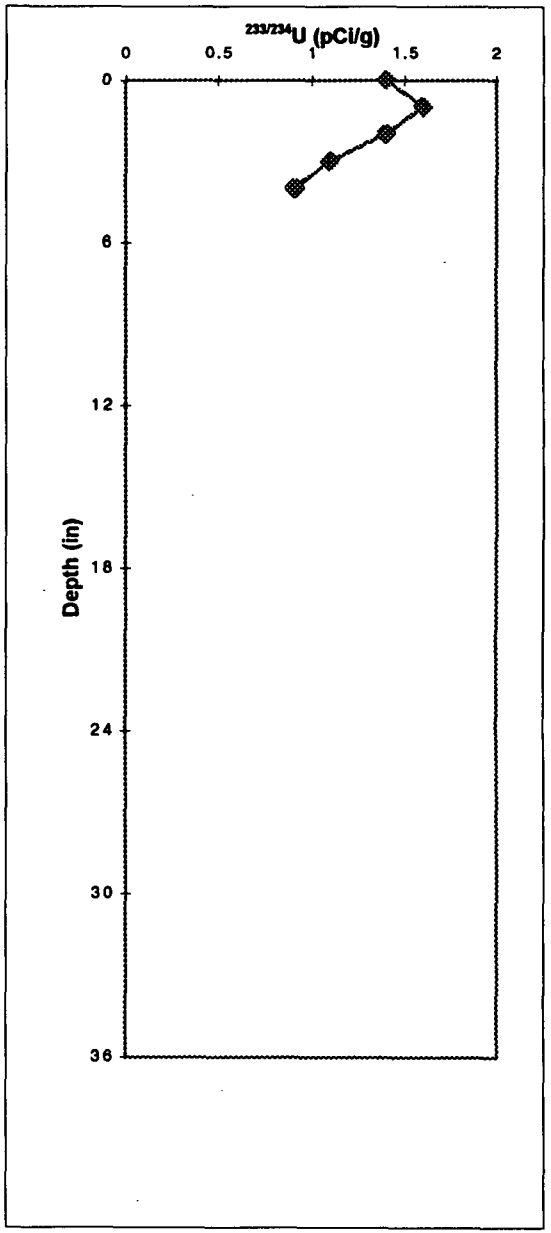
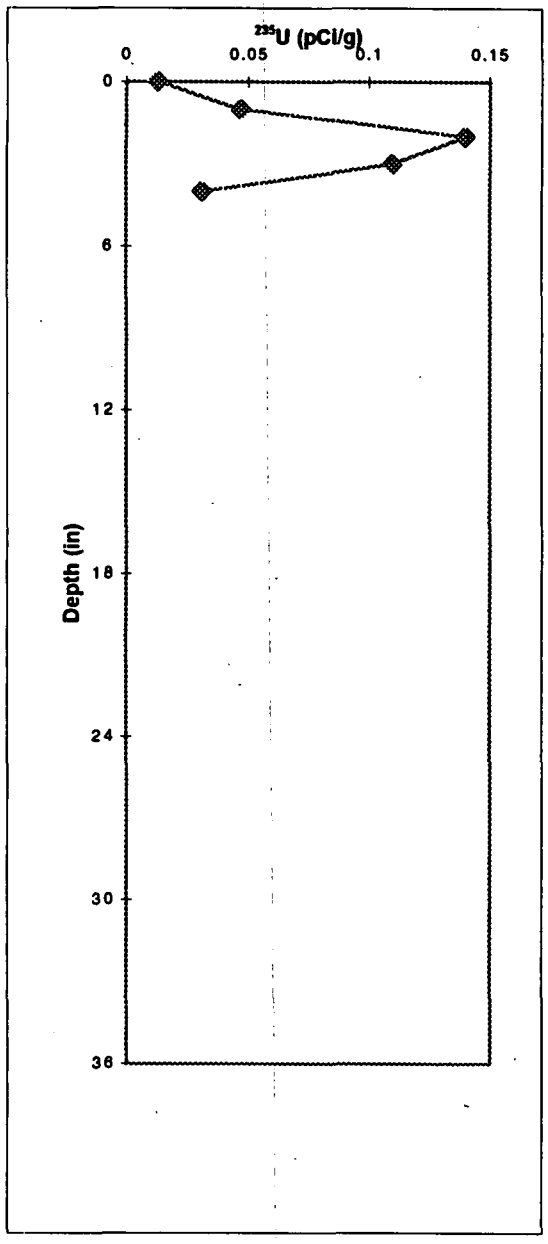
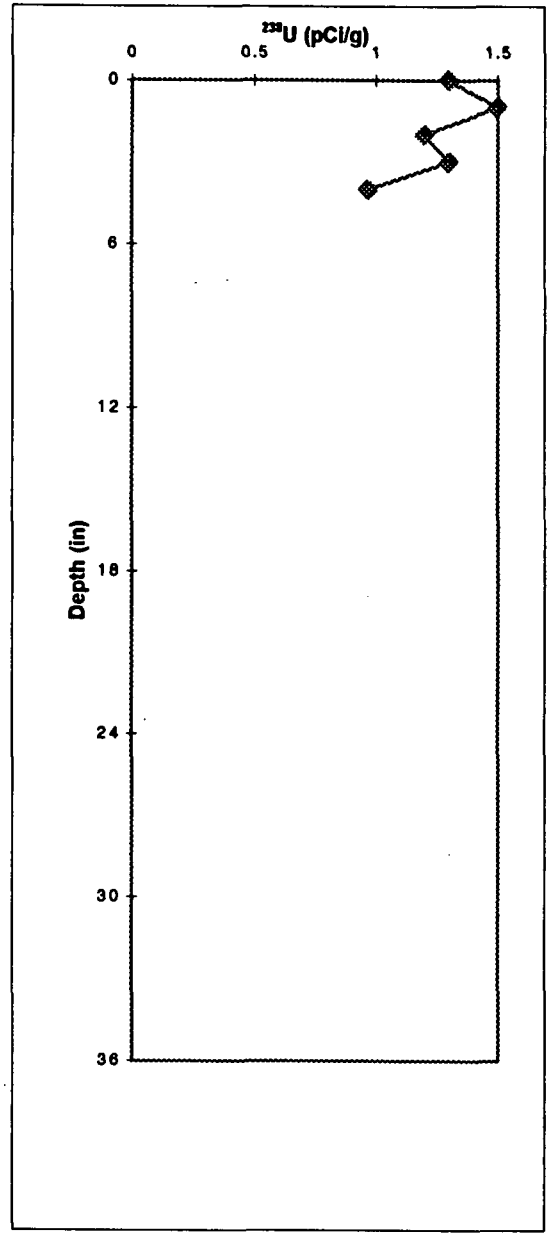
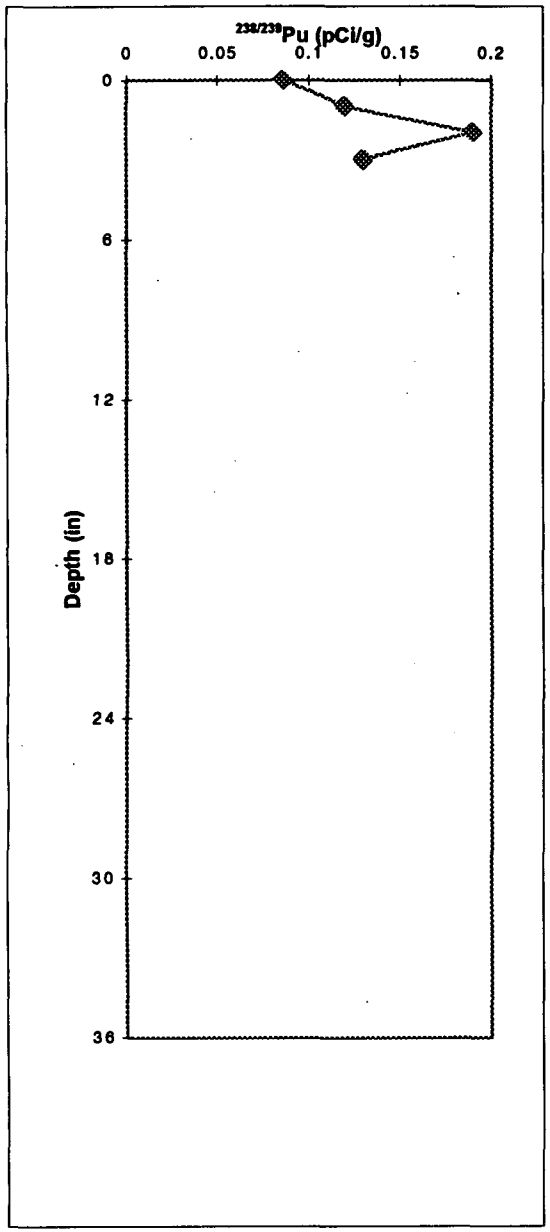


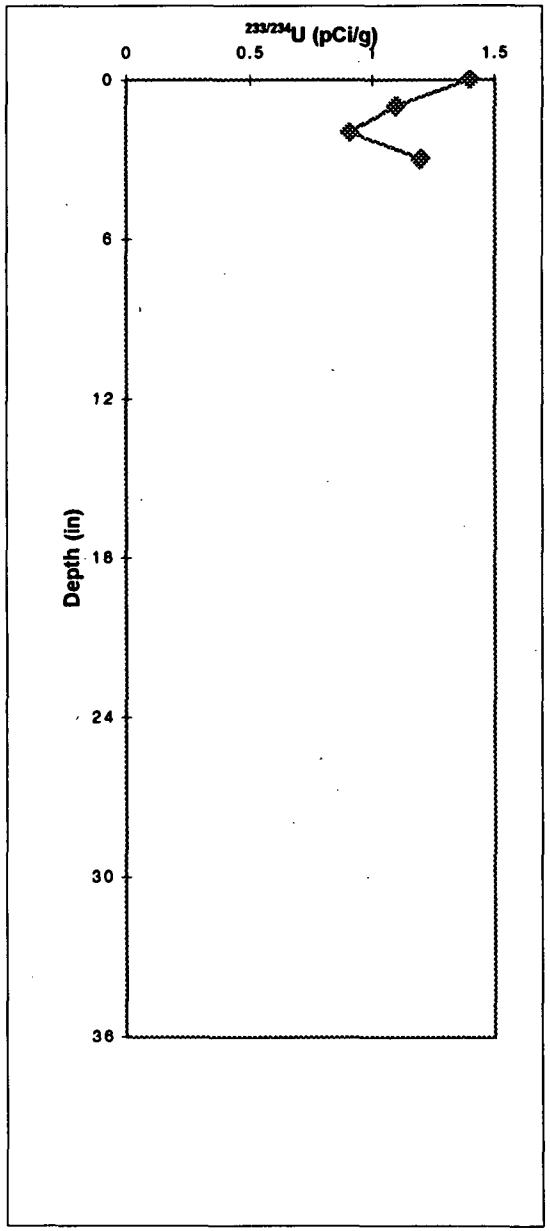
Figure J-1
Location SED05792





Figu[illegible] J-2
Location SED06192





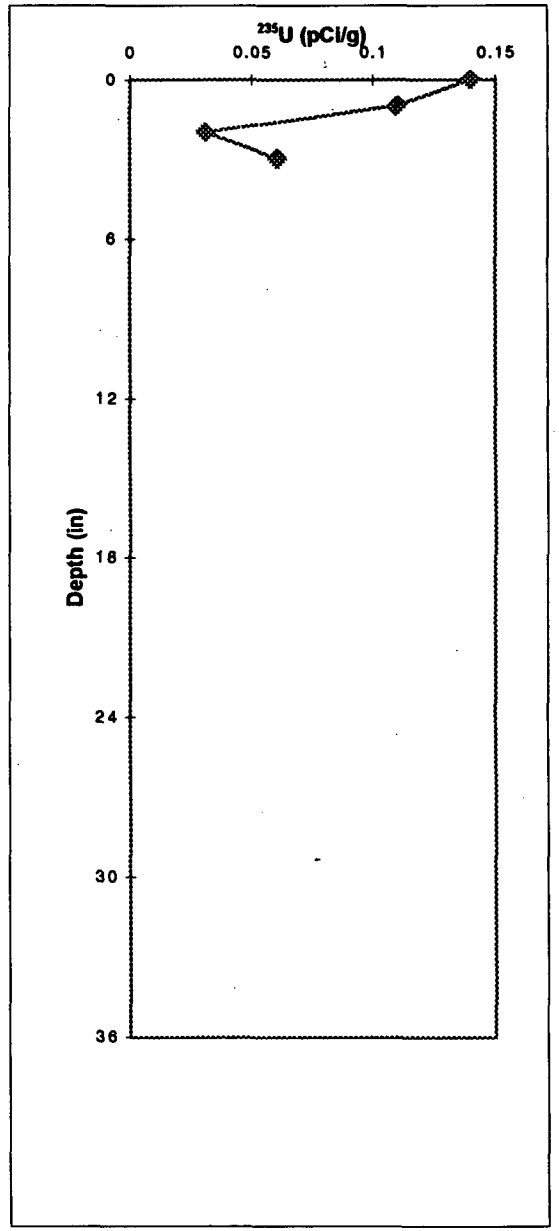


Figure J-2
Location SED06192

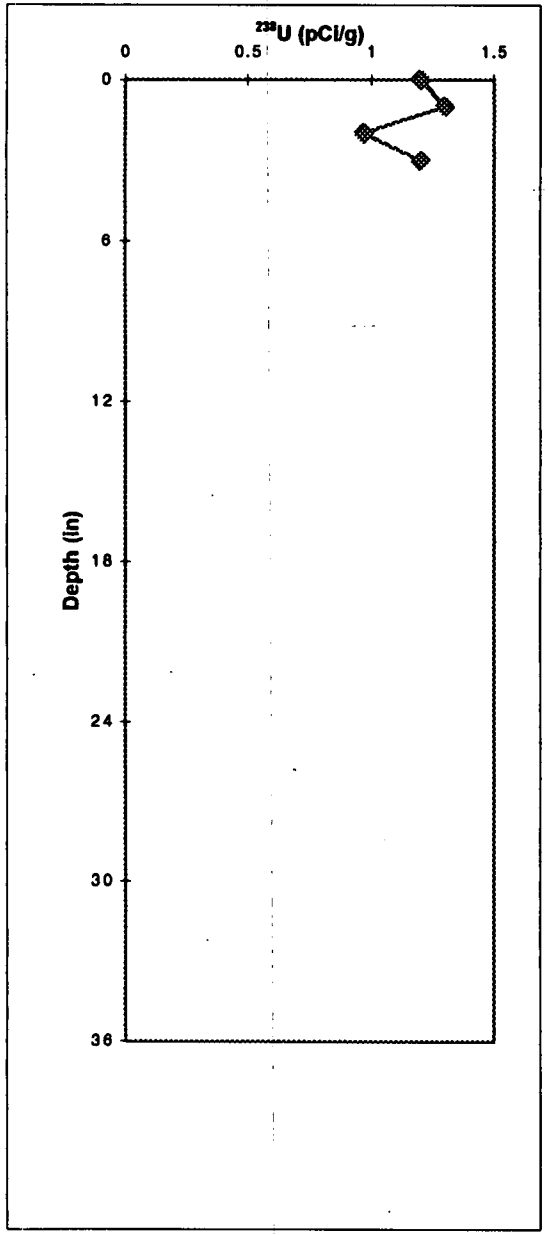
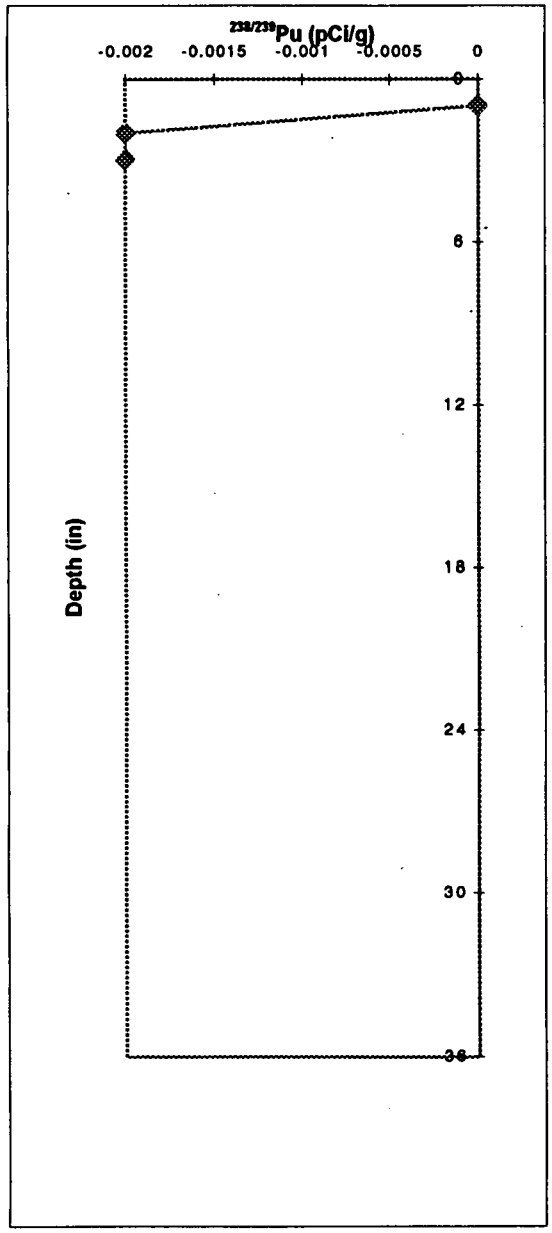
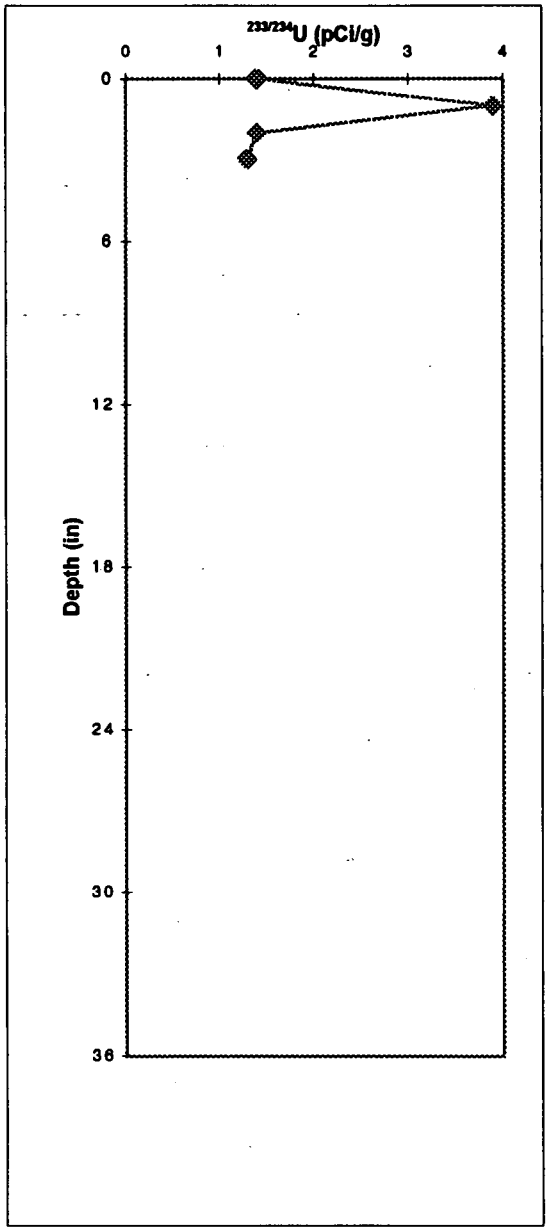


Figure J-3
Location SED06692





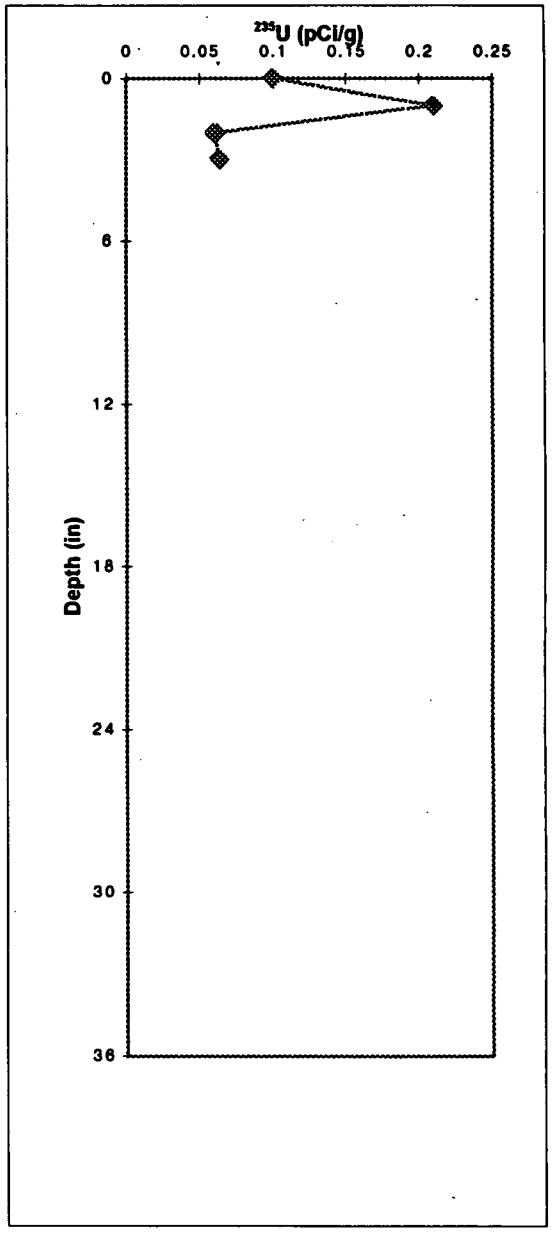
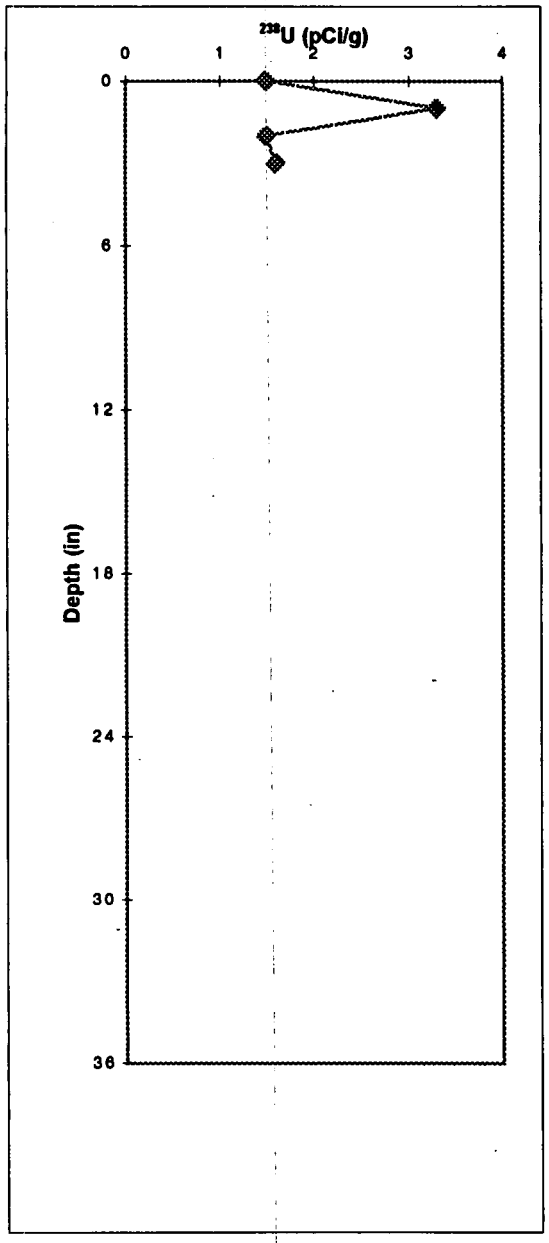


Figure J-3
Location SED06692



Figu J-4
Location SED08492

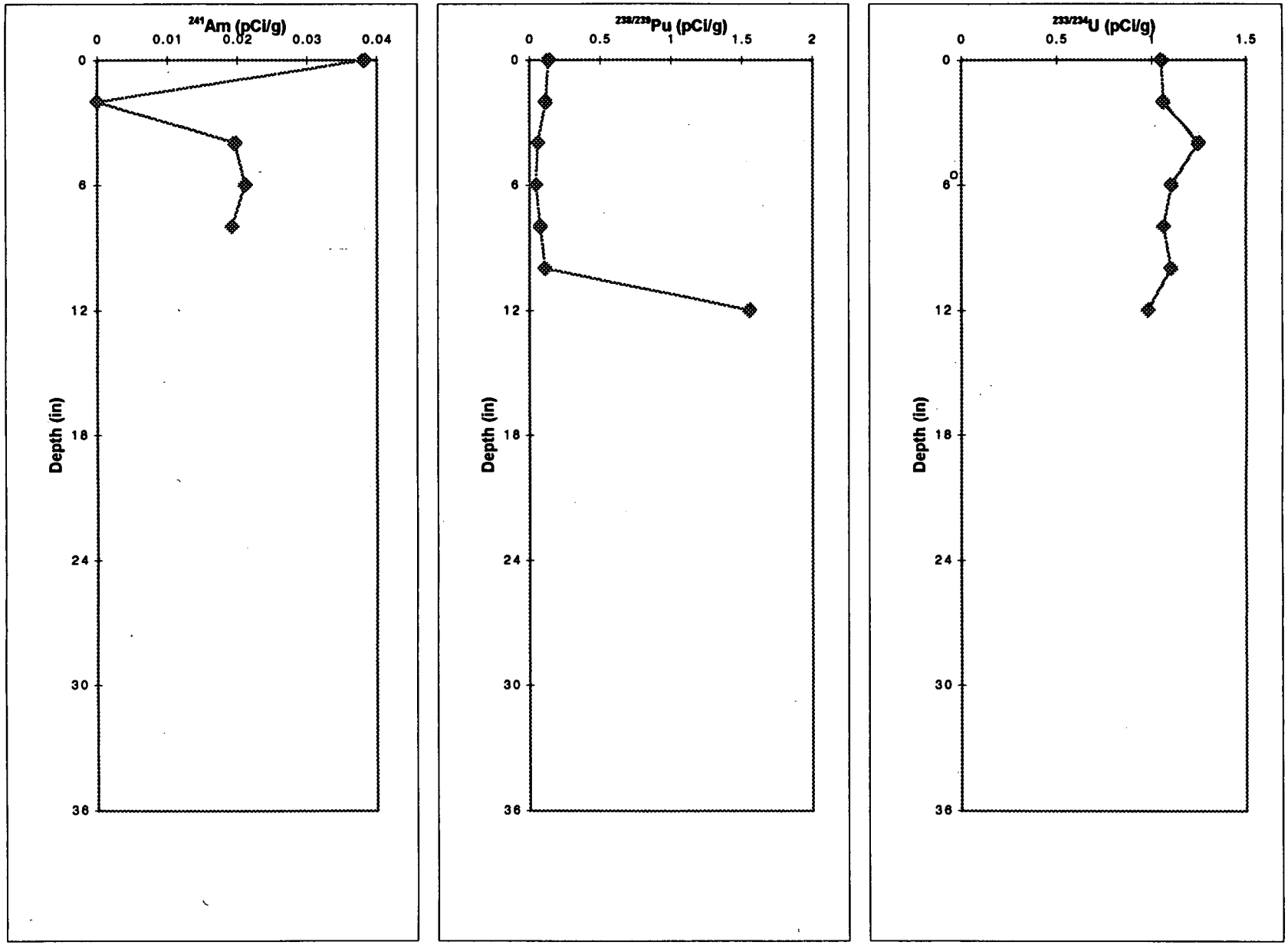
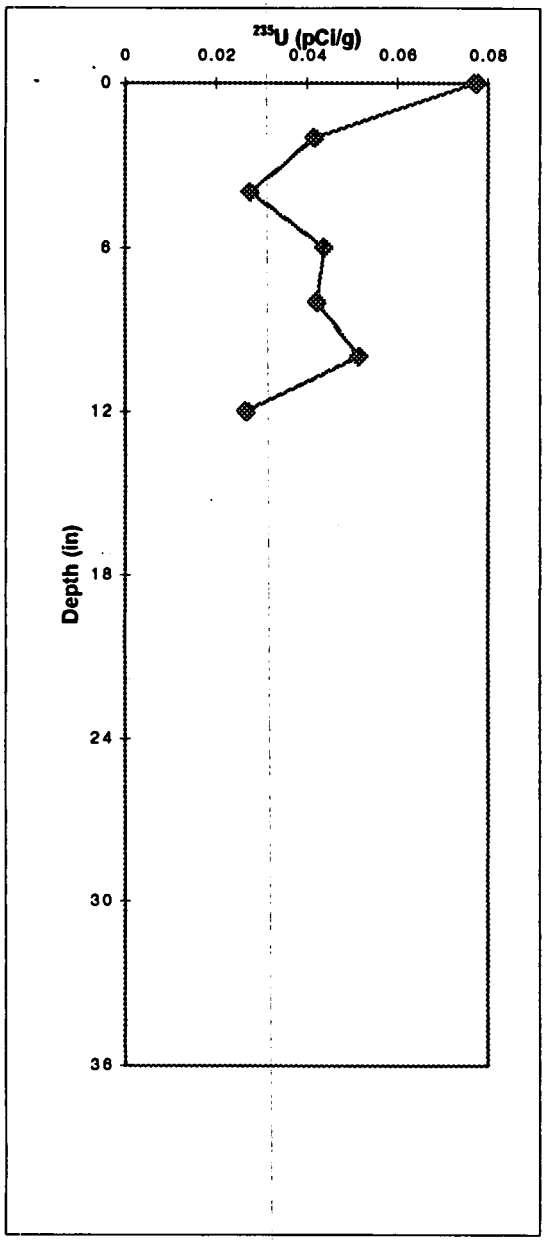
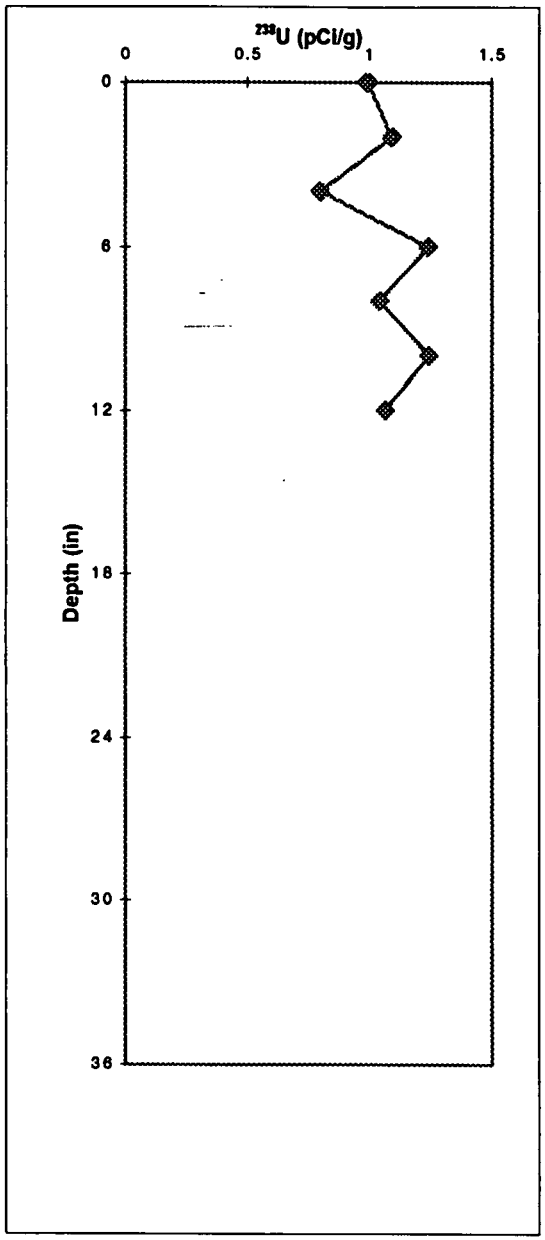


Figure J-4
Location SED08492





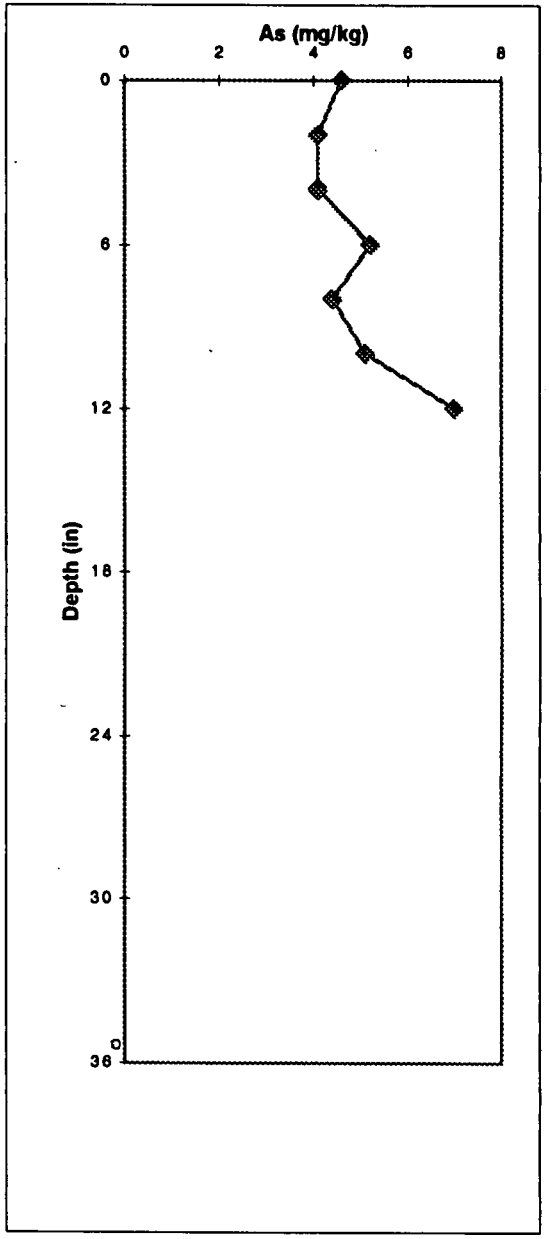
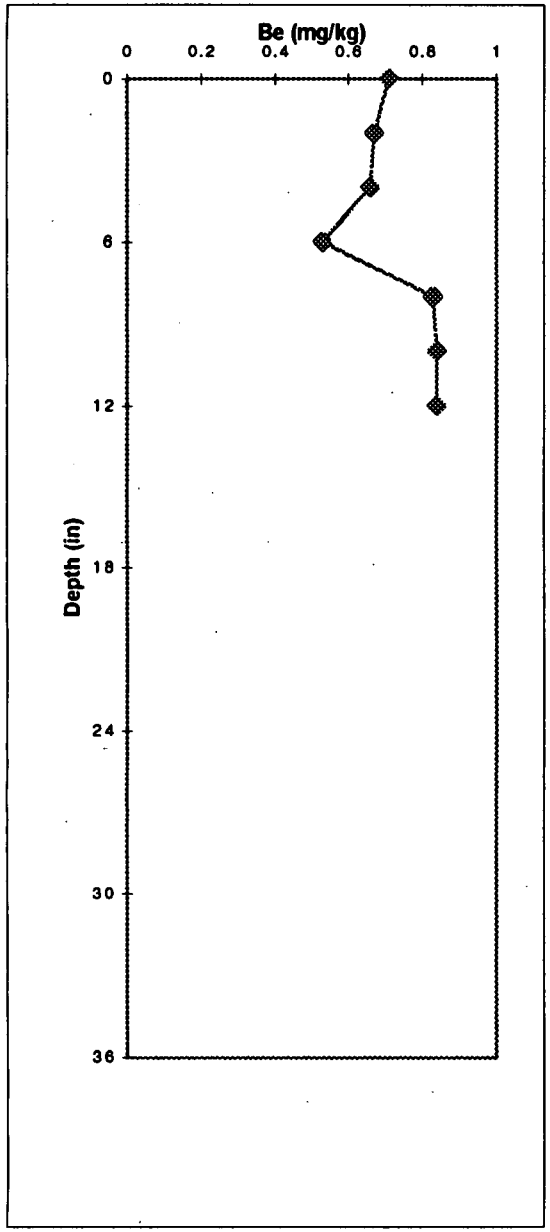
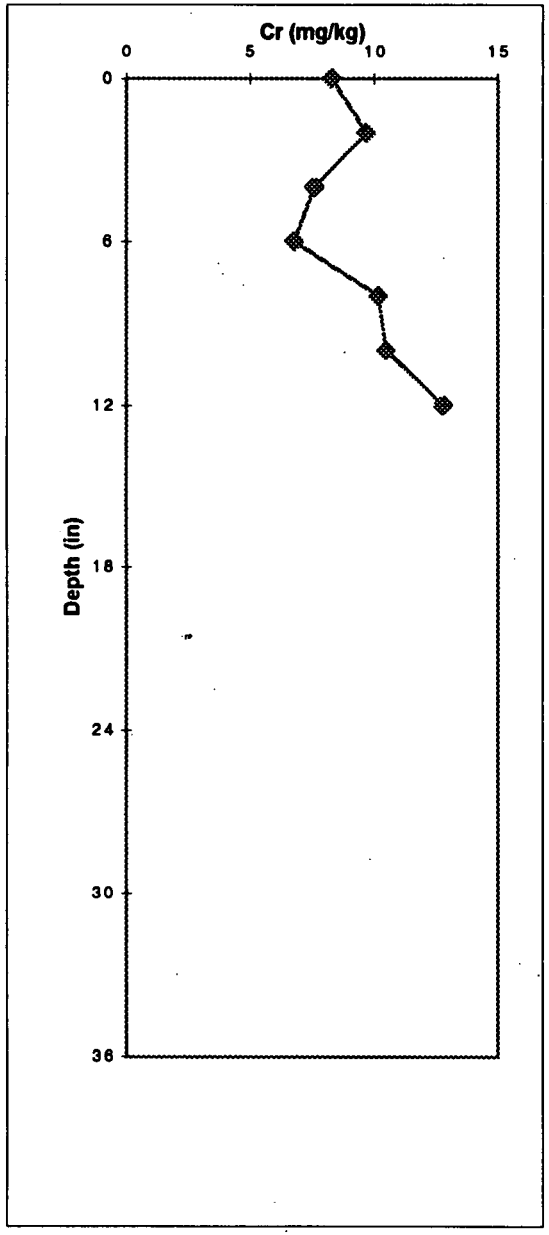


Figure J-4
Location SED08492





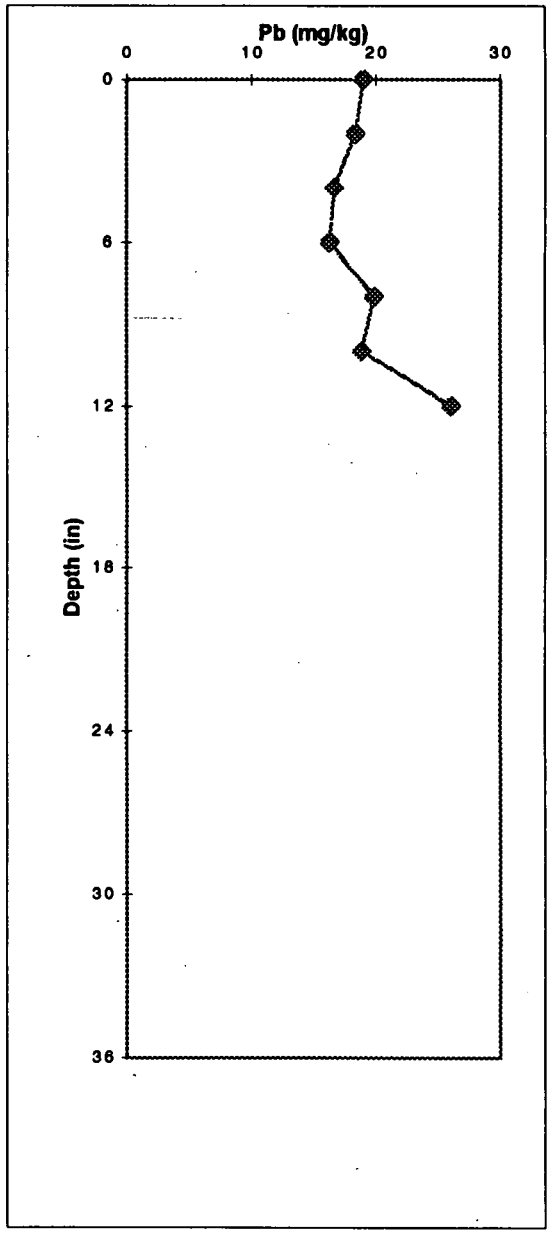


Figure J-4
Location SED08492

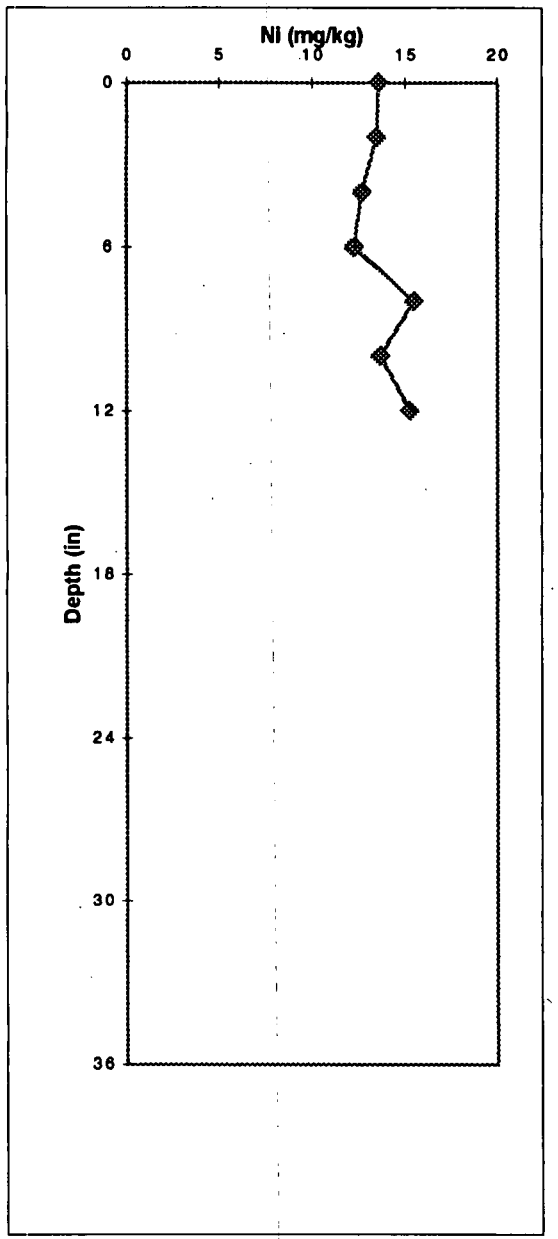
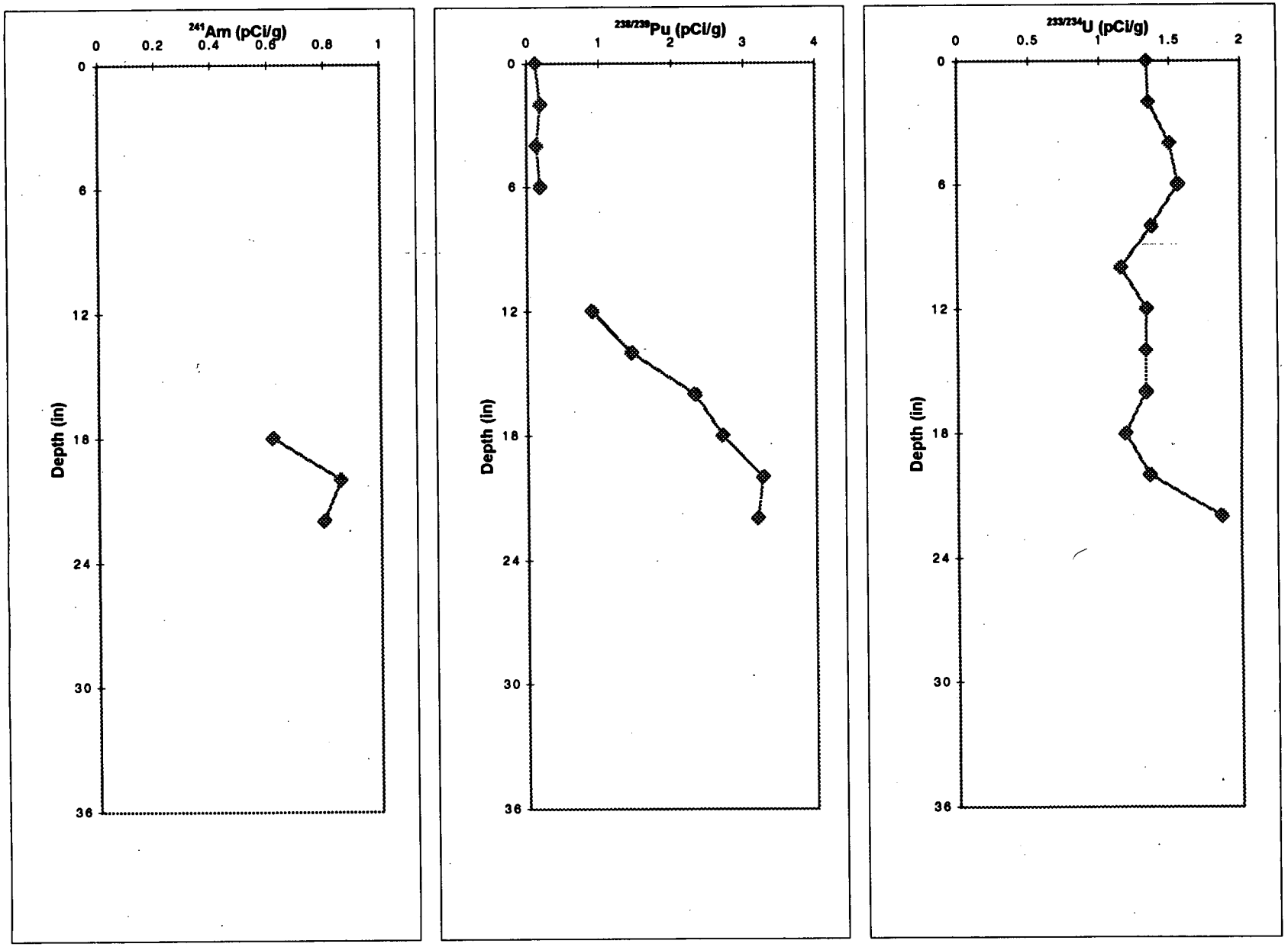


Figure J-5
Location SED08692



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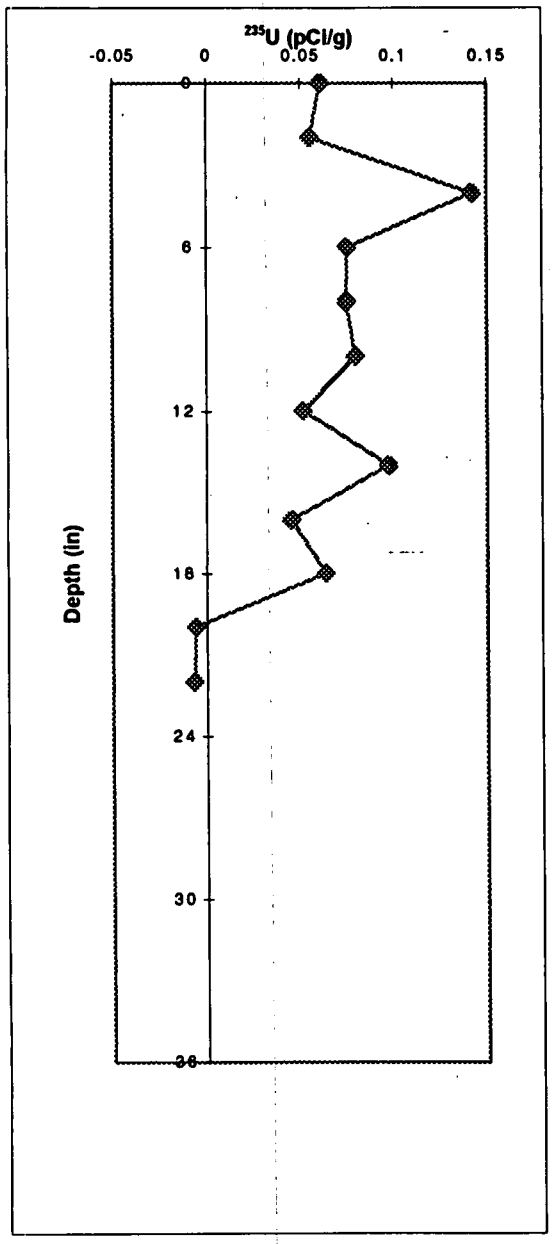
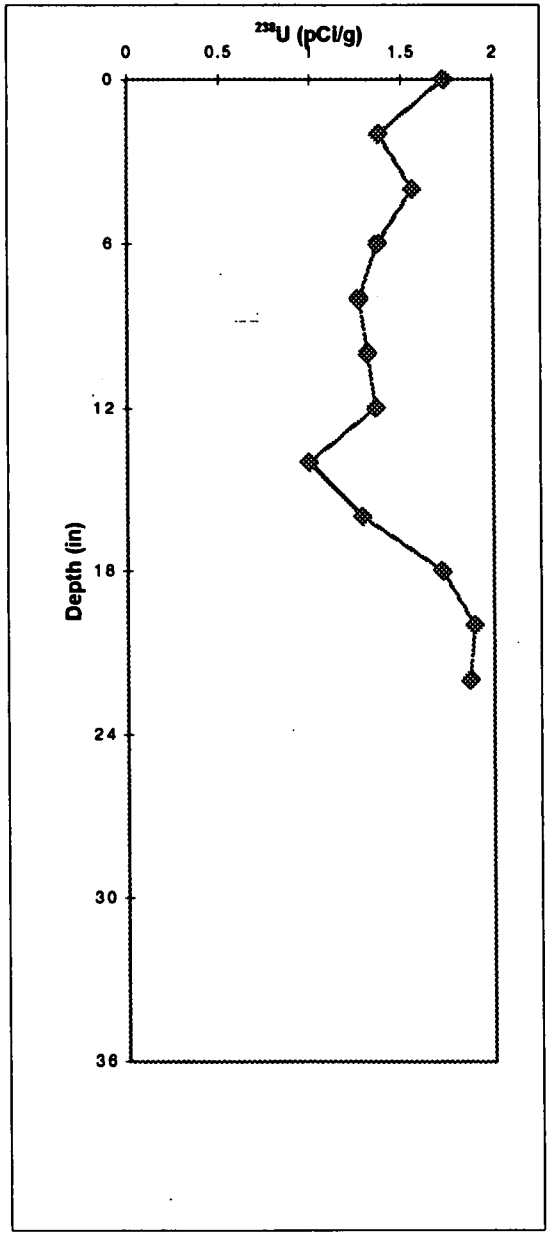
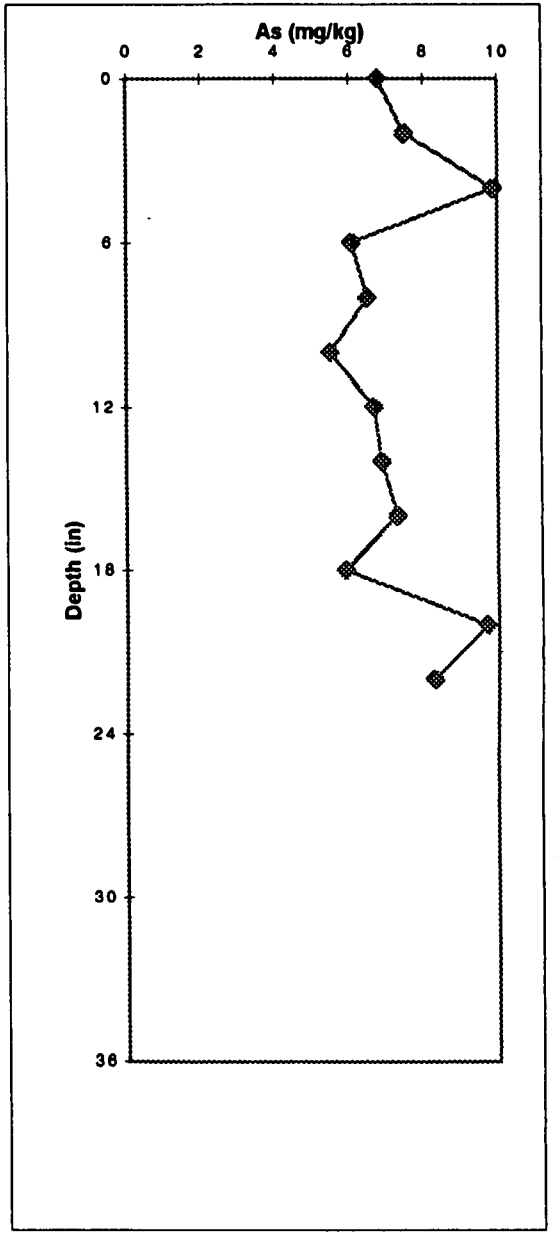
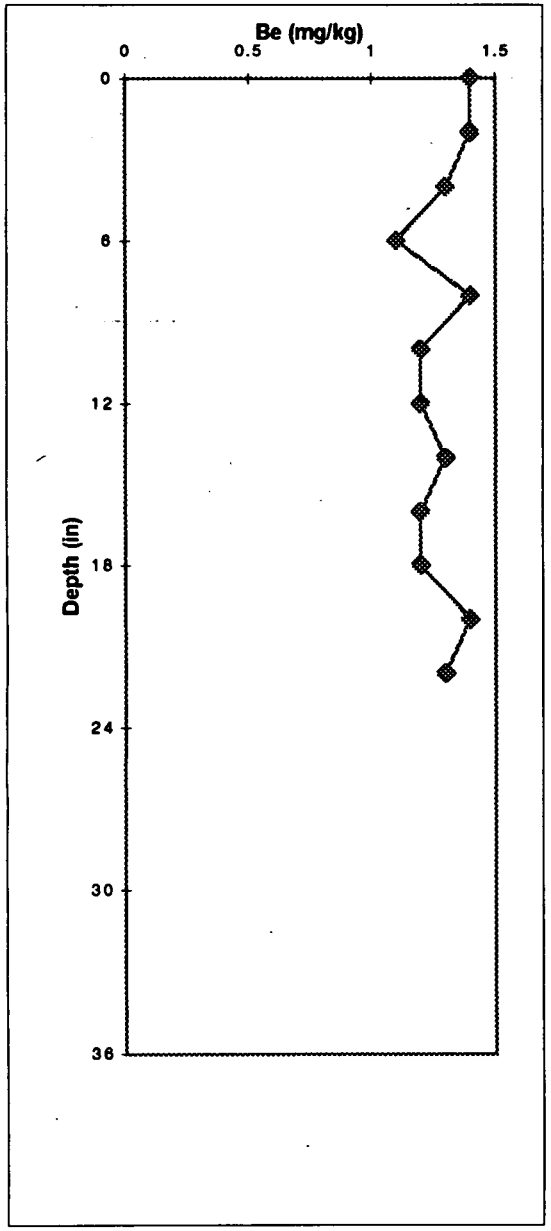
Location SED08692

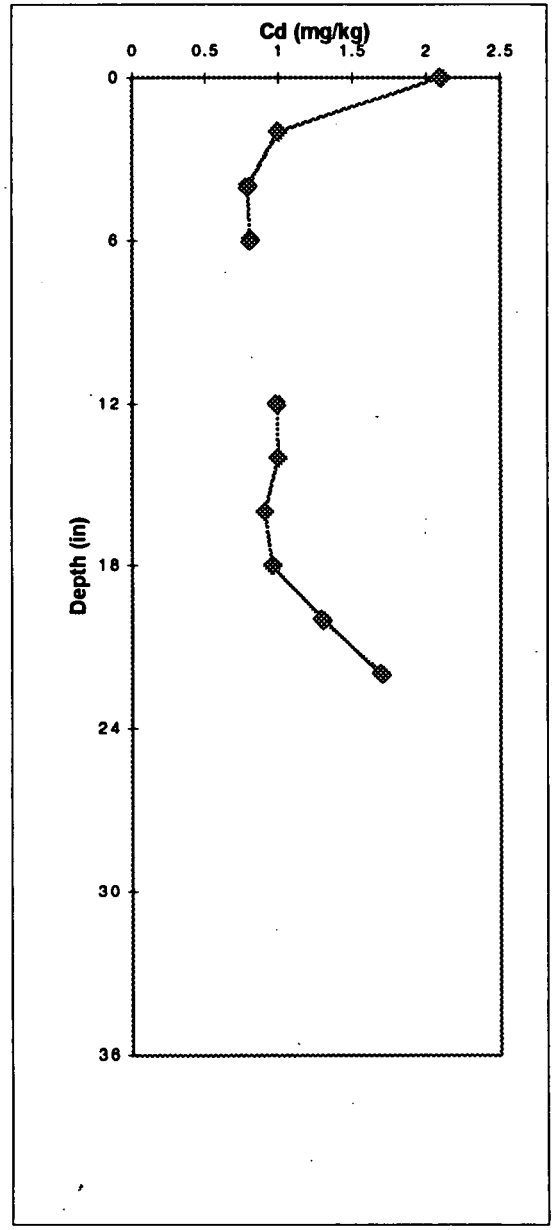






Figu[illegible] J-5
Location SED08692





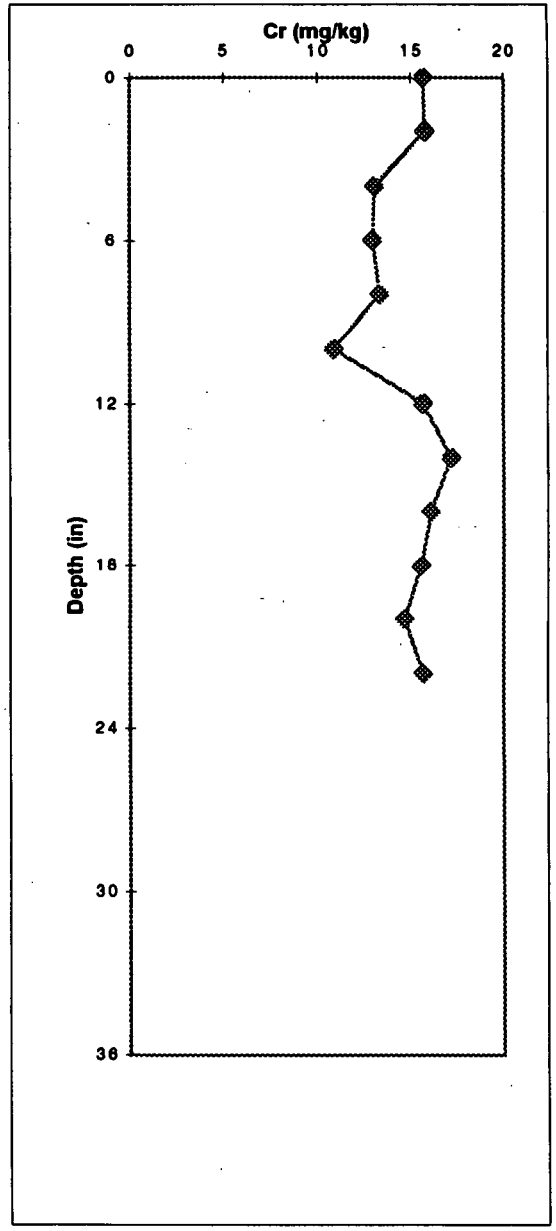
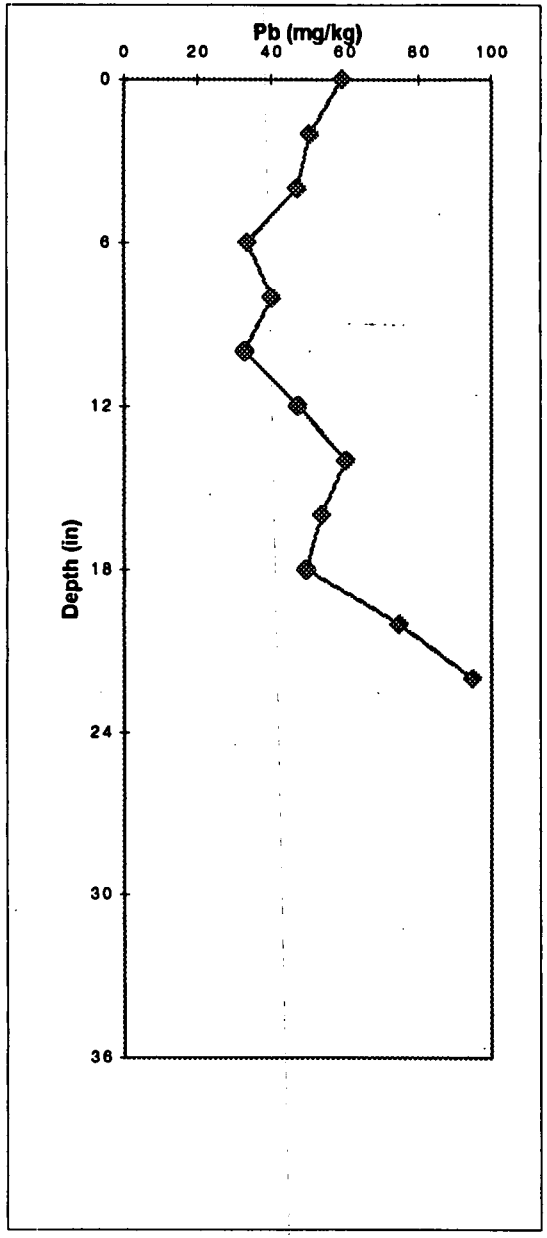
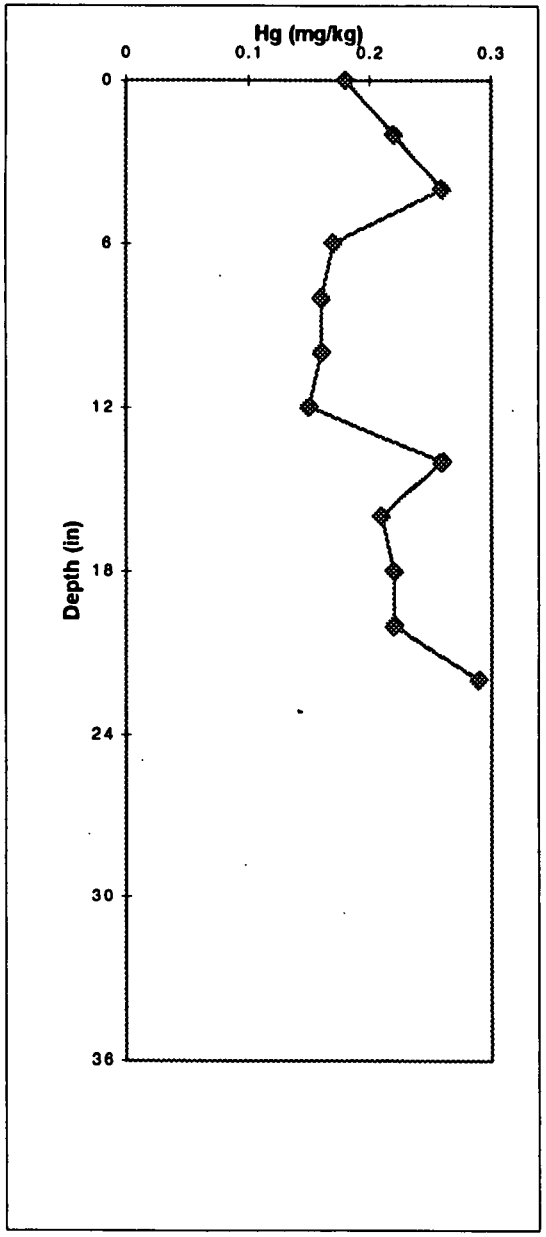
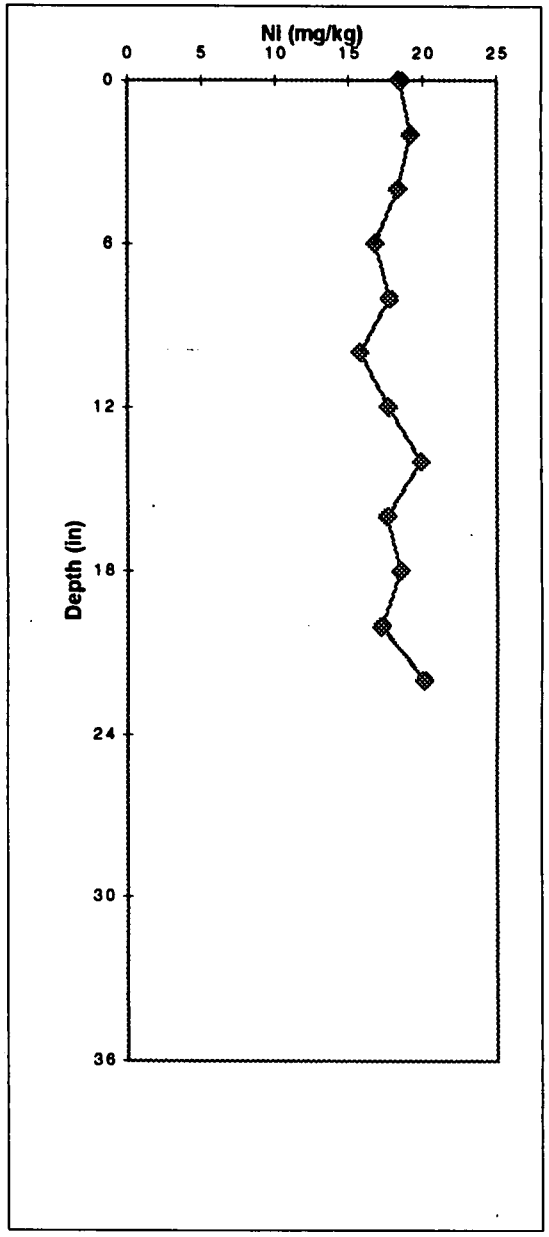


Figure J-5
Location SED08692







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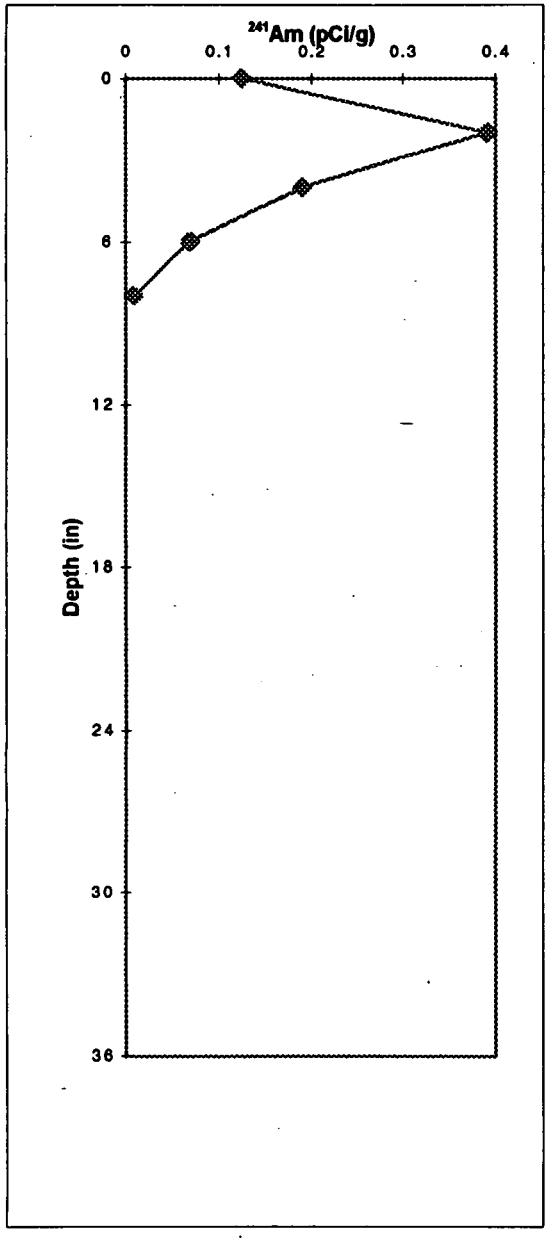
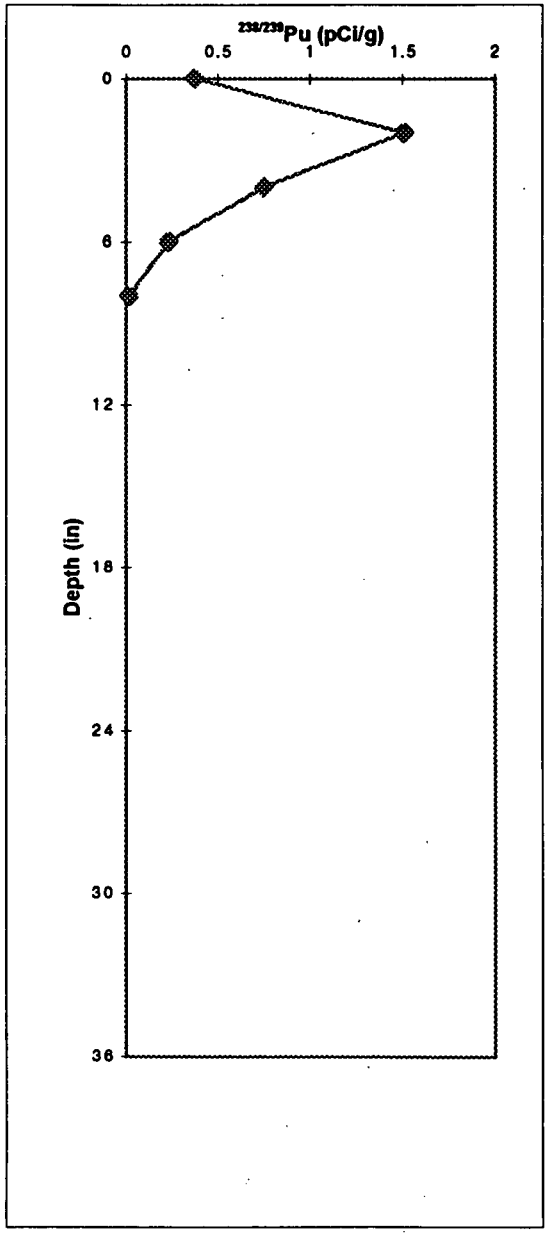
Location SED08792





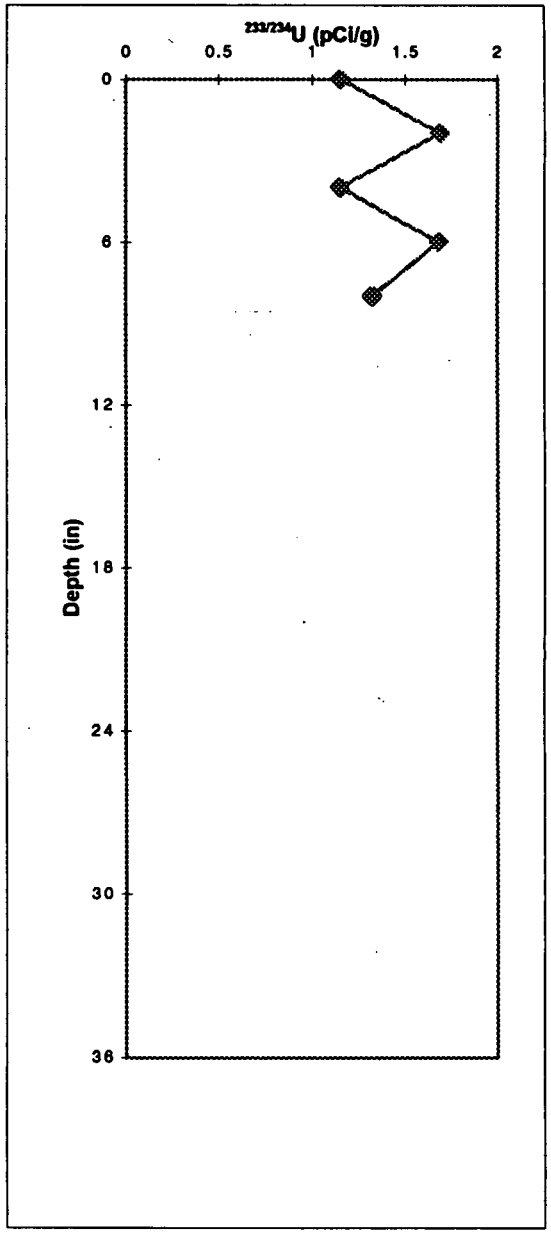
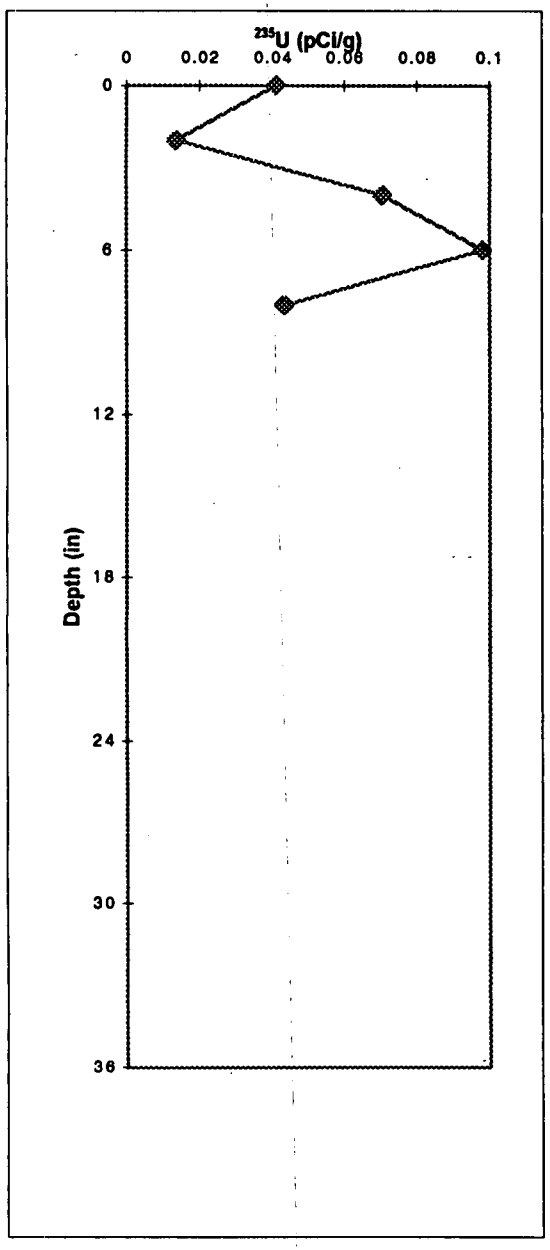
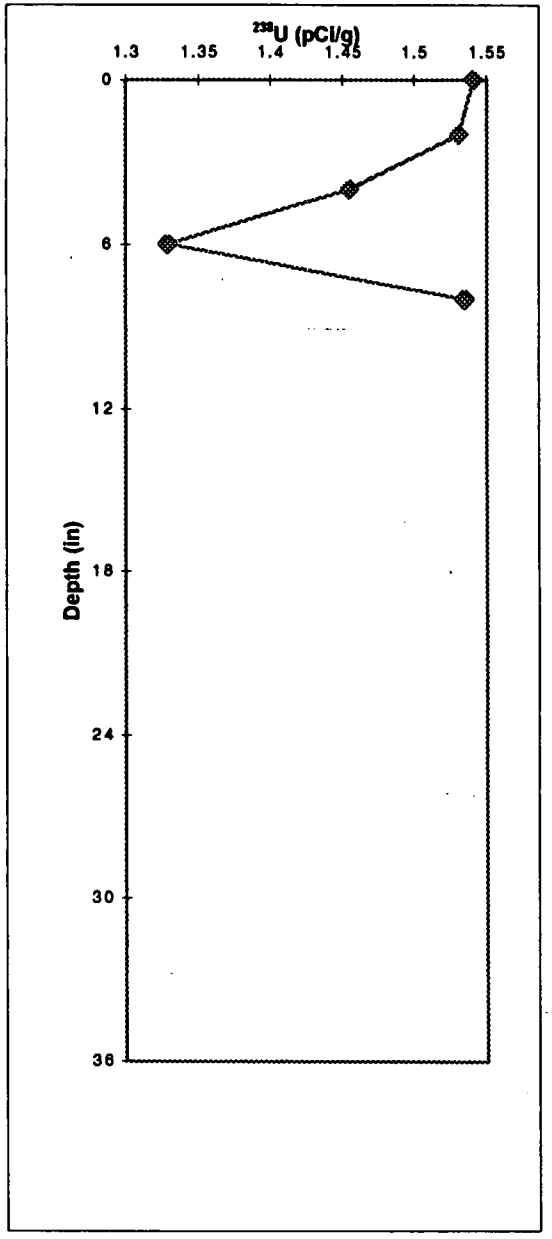
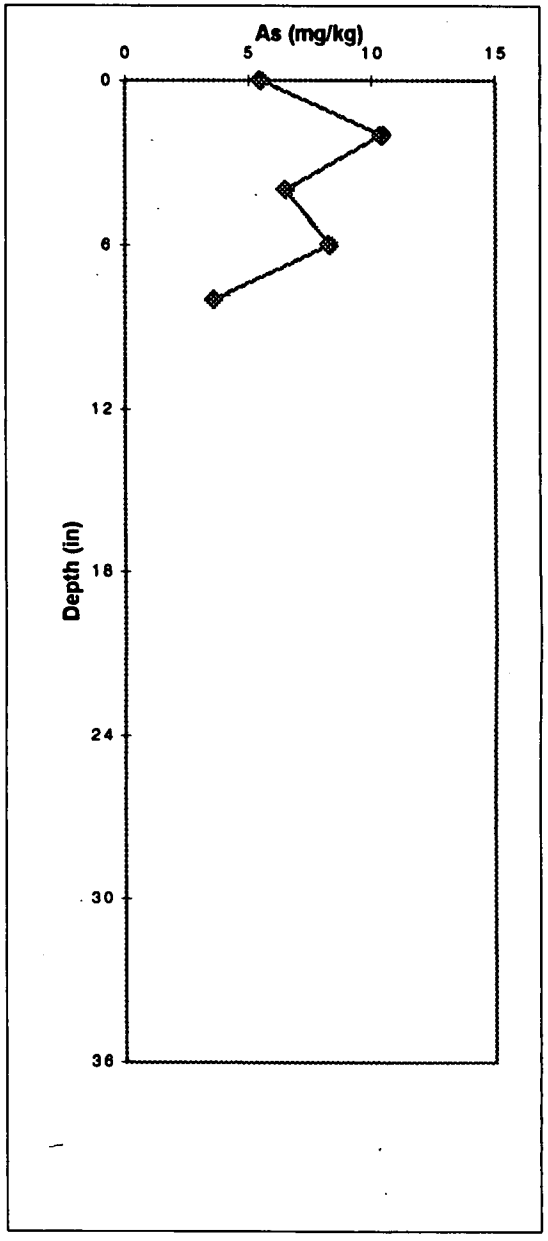


Figure J-6
Location SED08792







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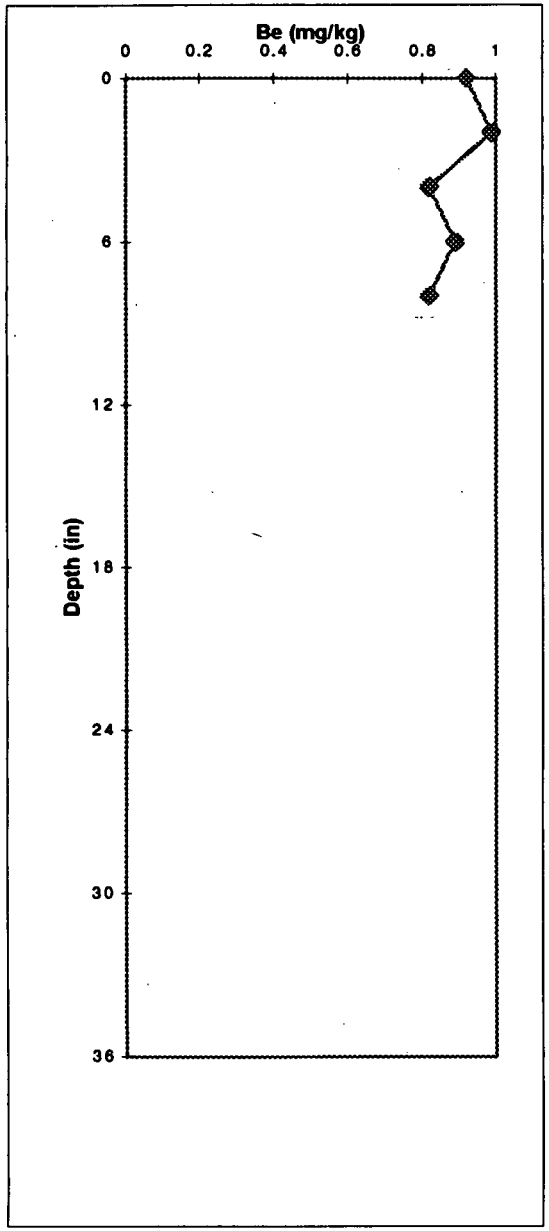

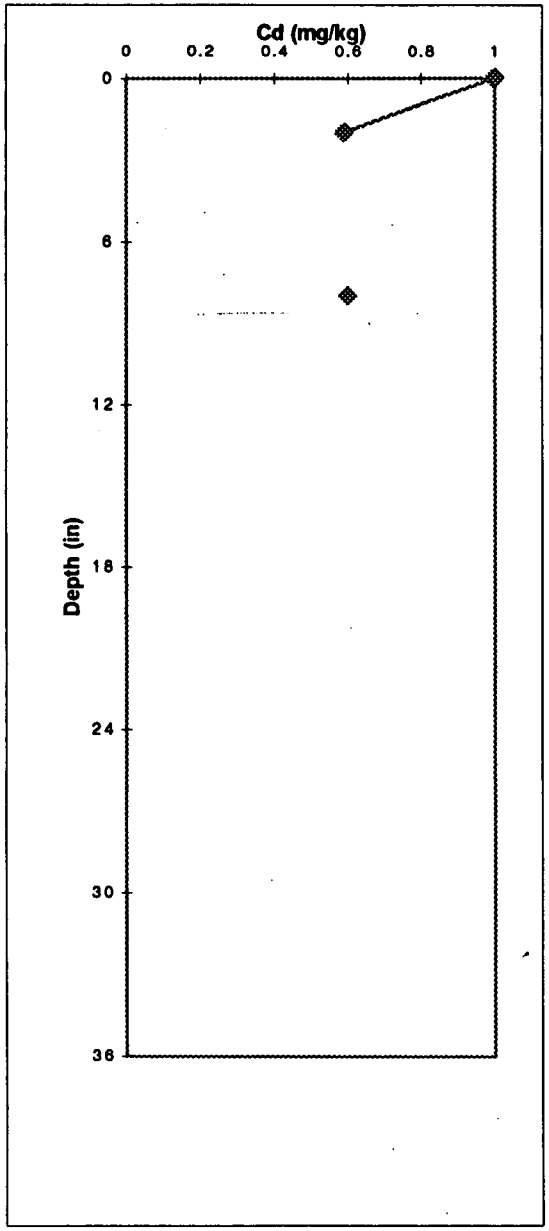

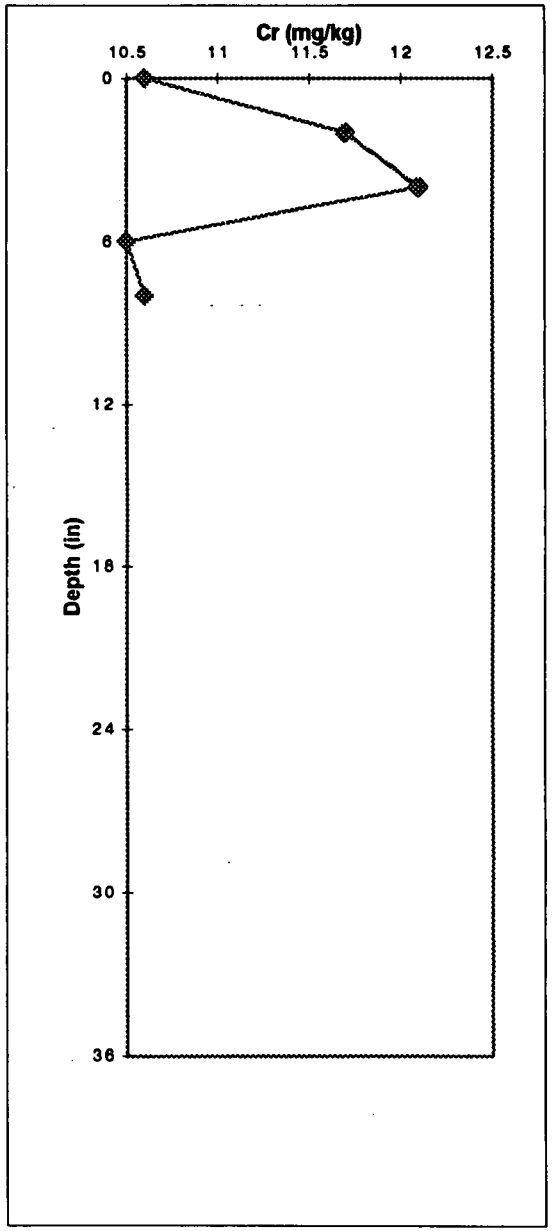

Figure J-6
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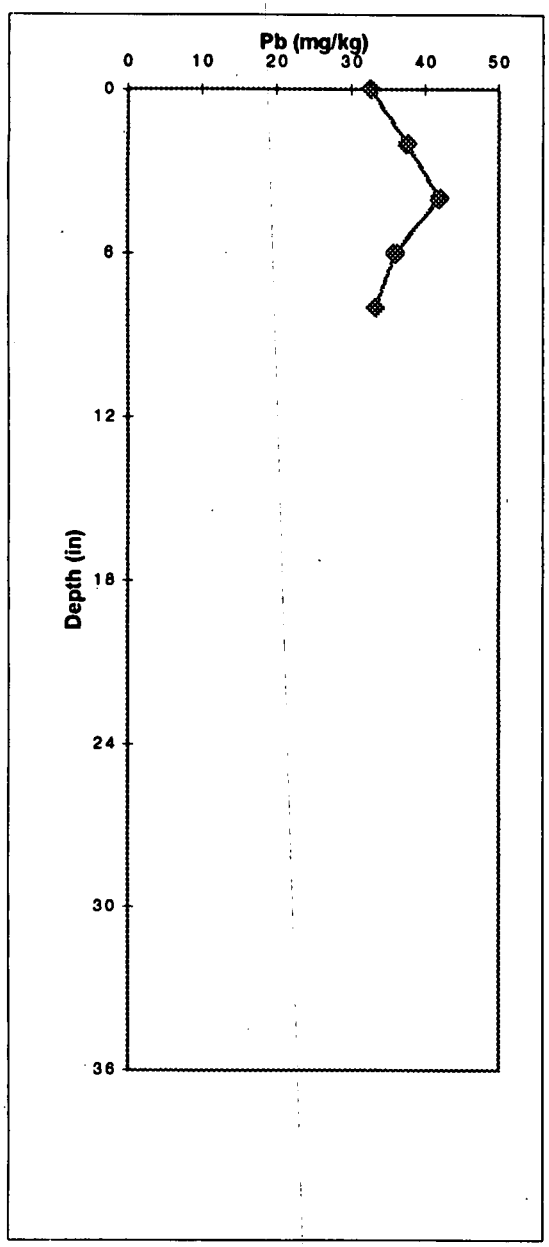

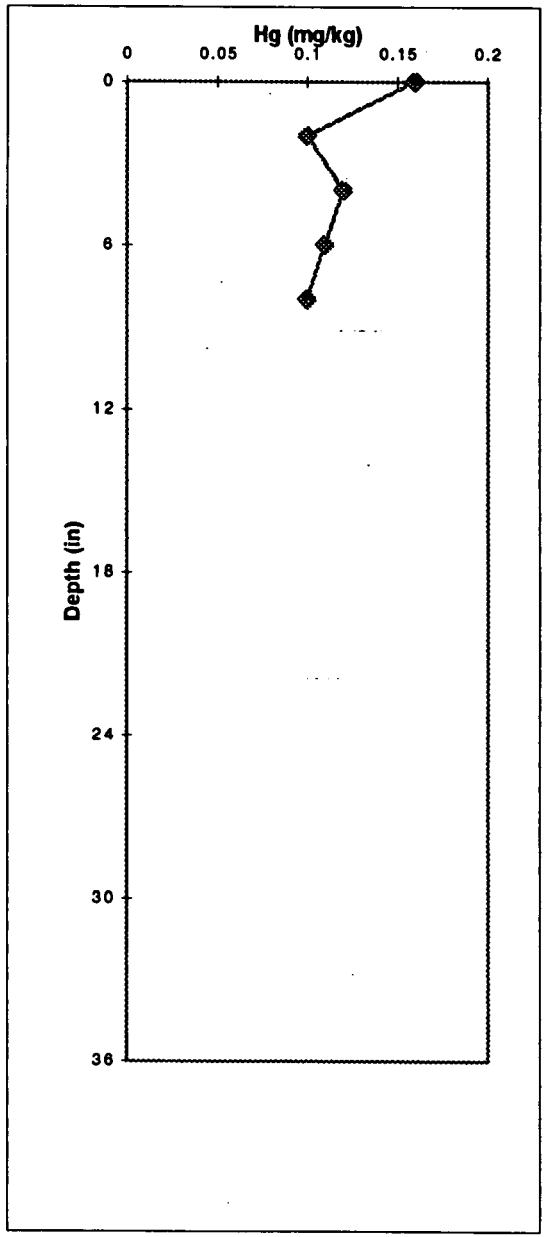

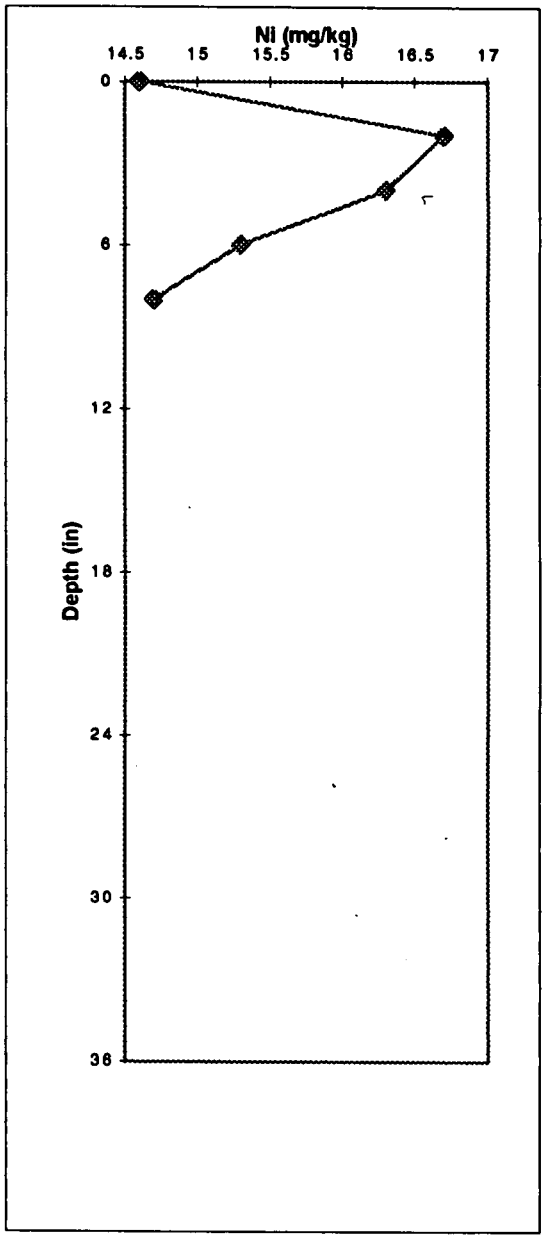

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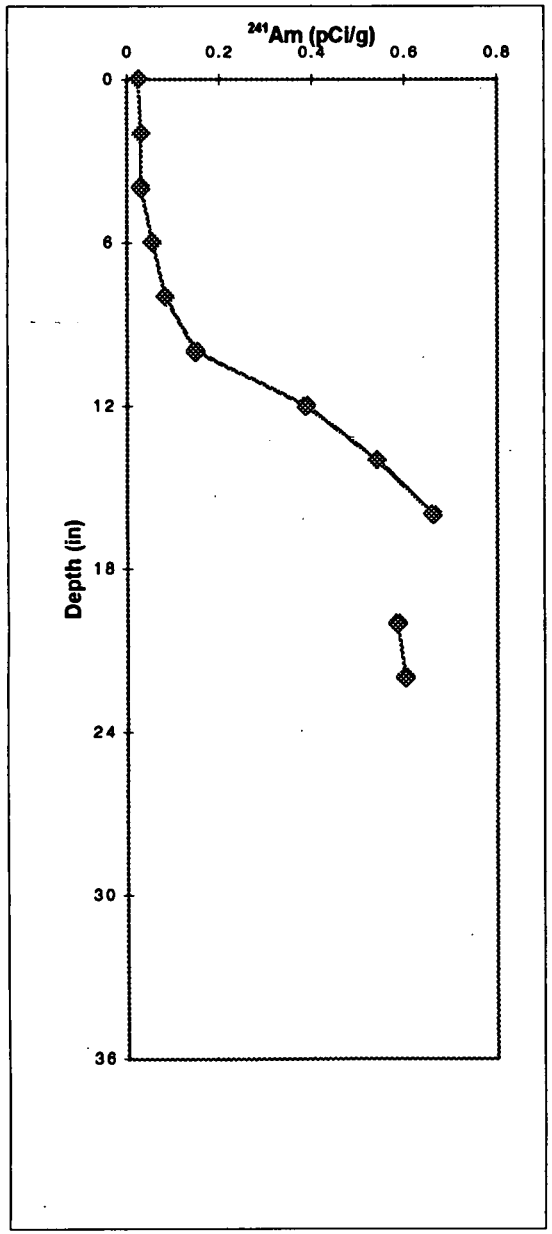
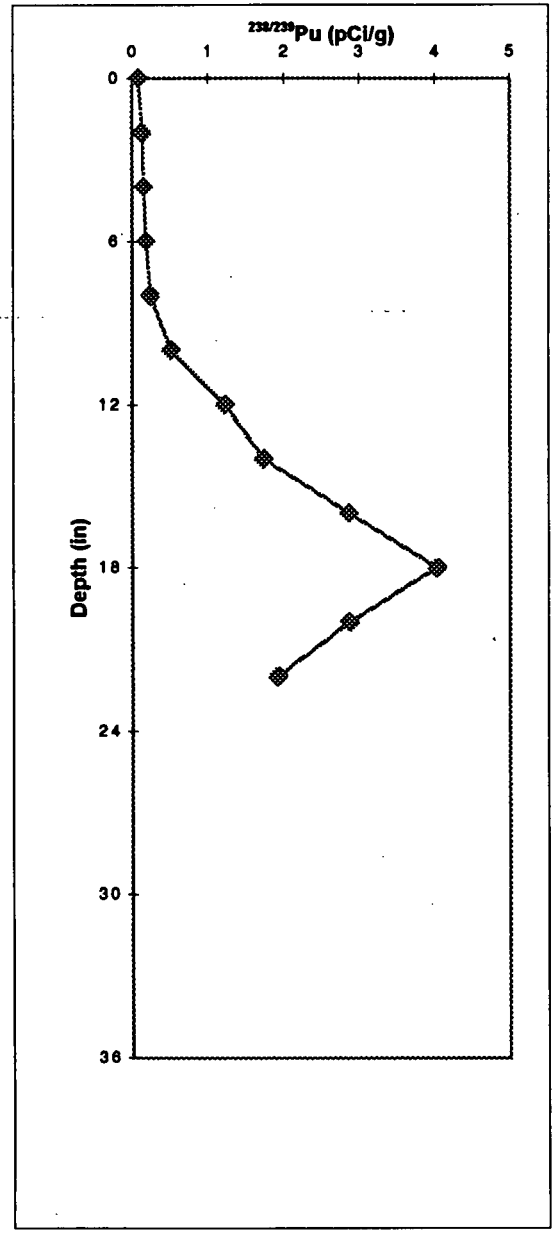
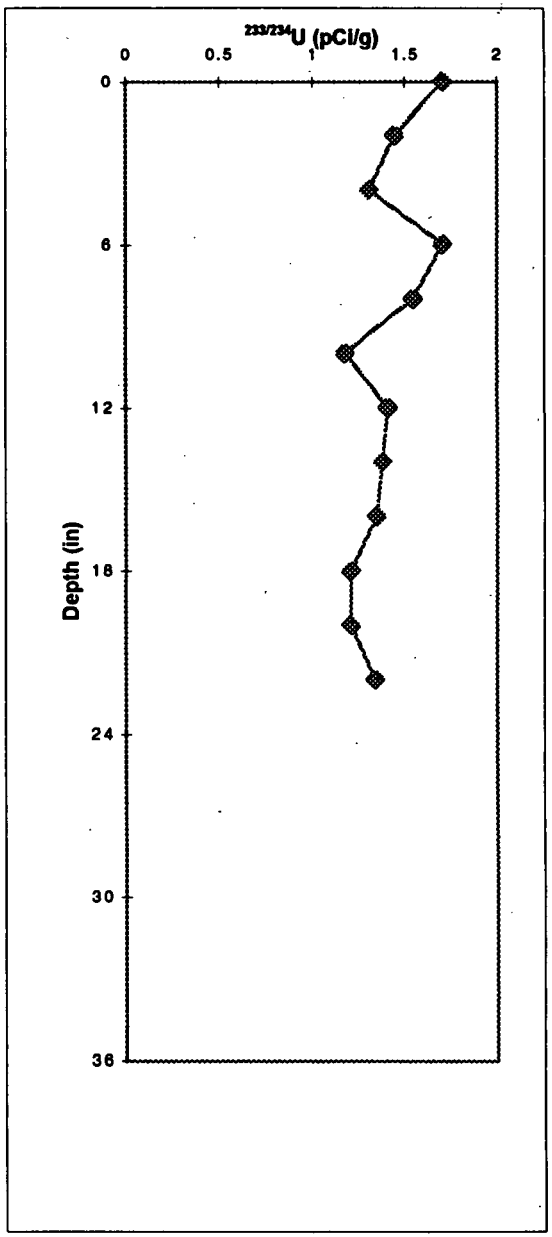
Location SED09192







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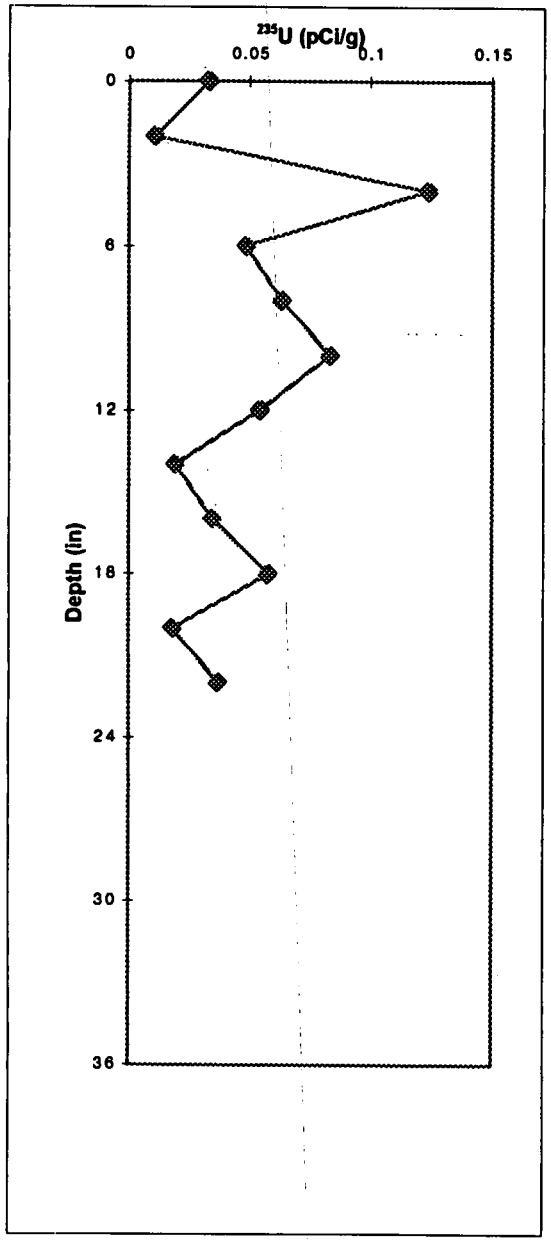

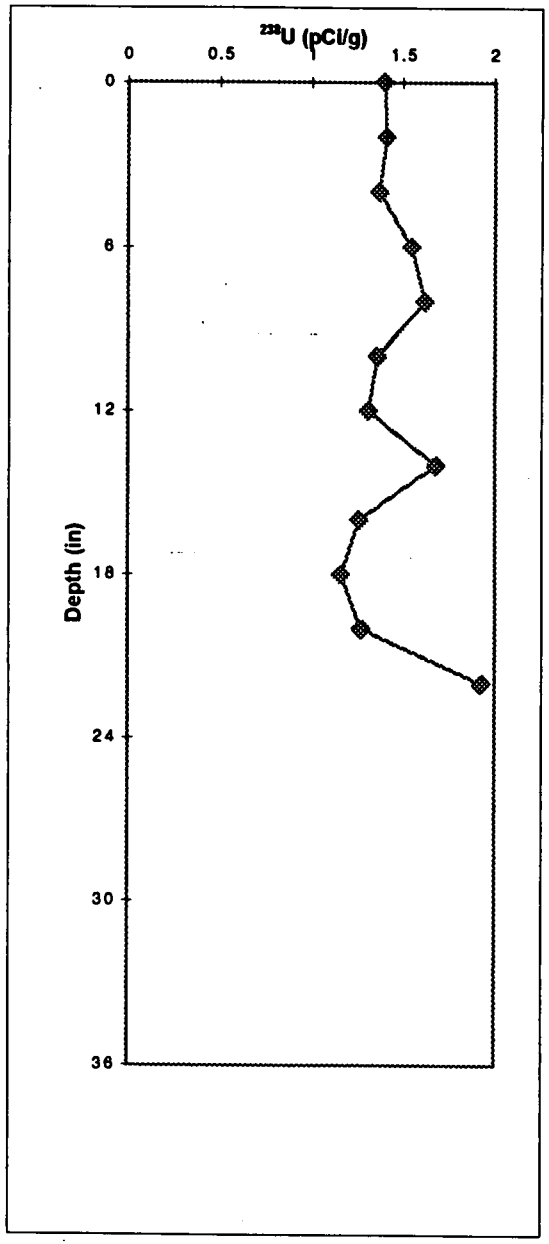

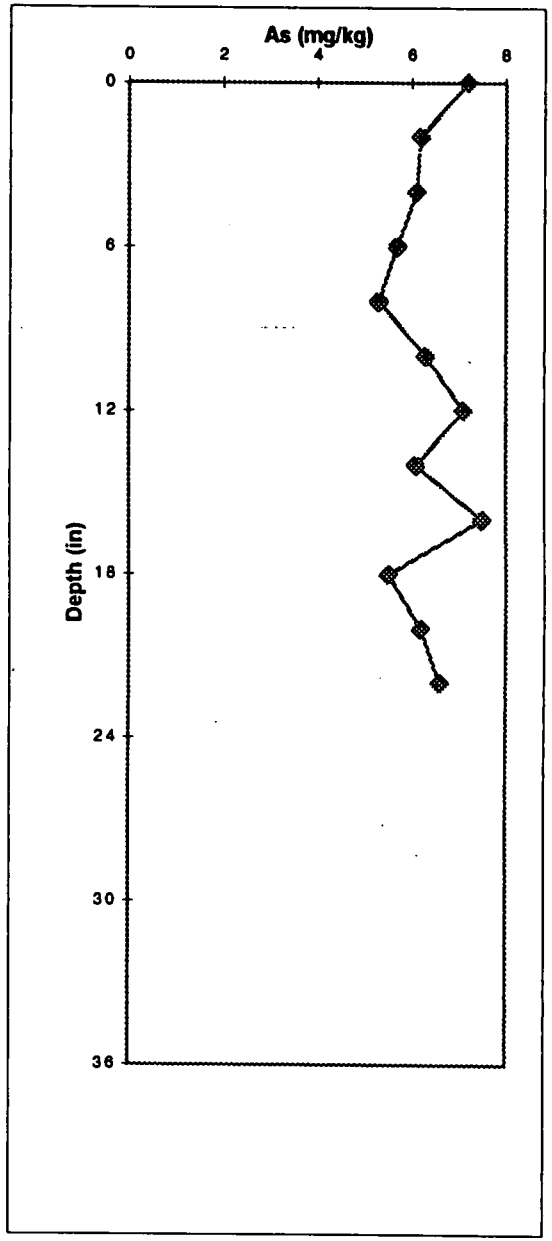

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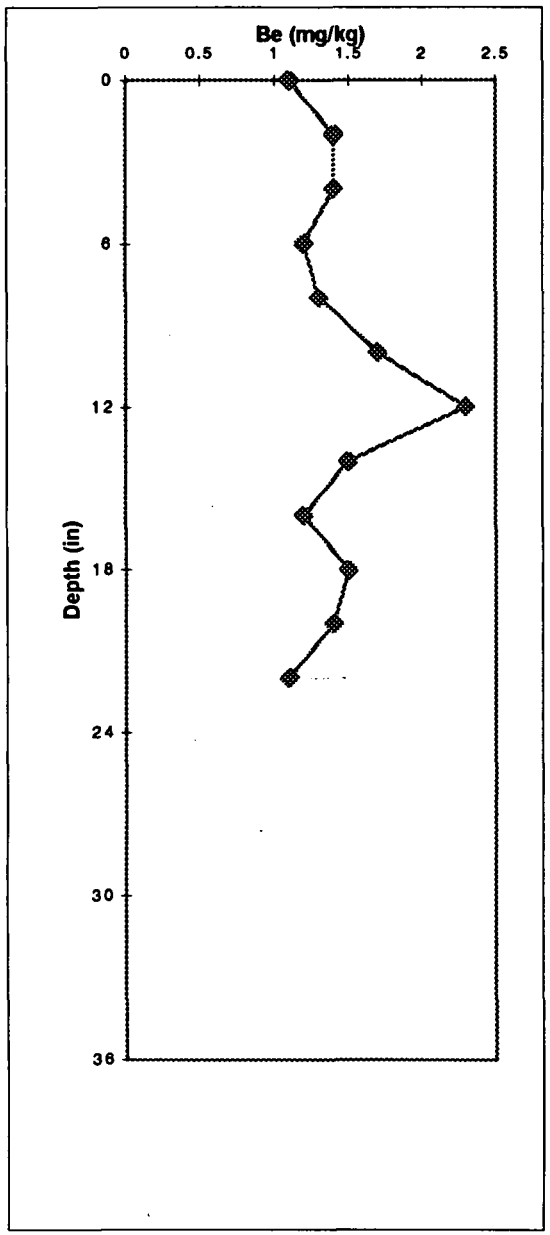

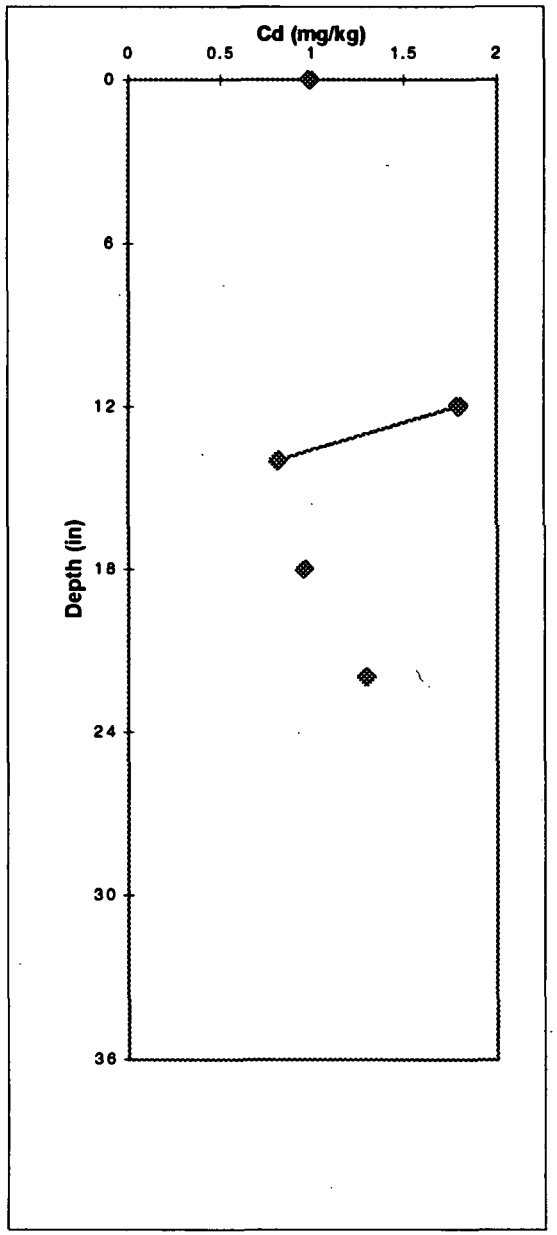

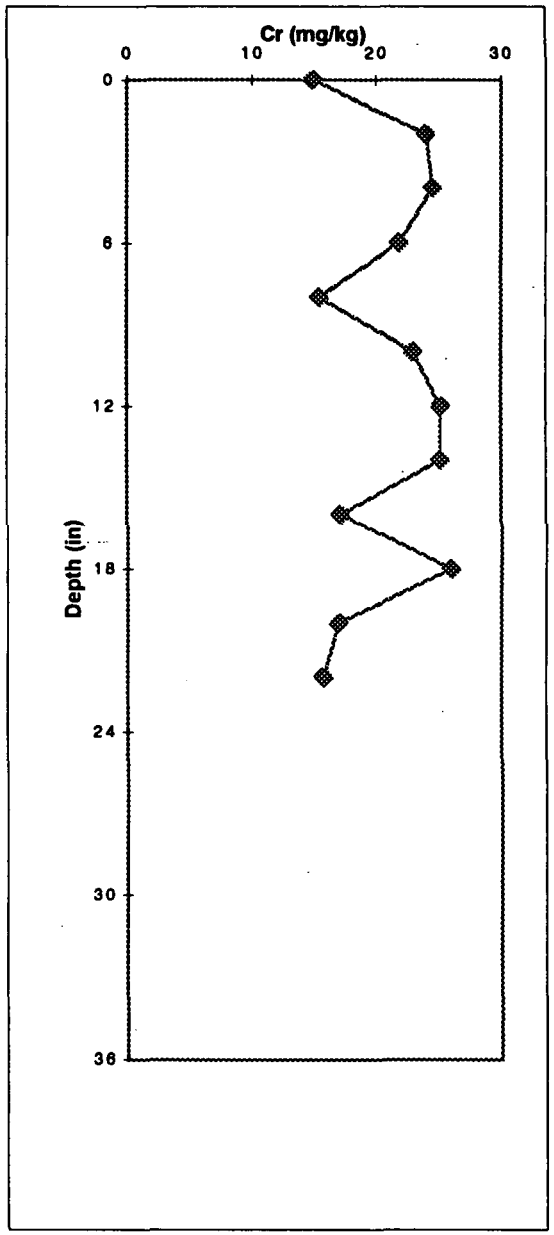

Figure J-7
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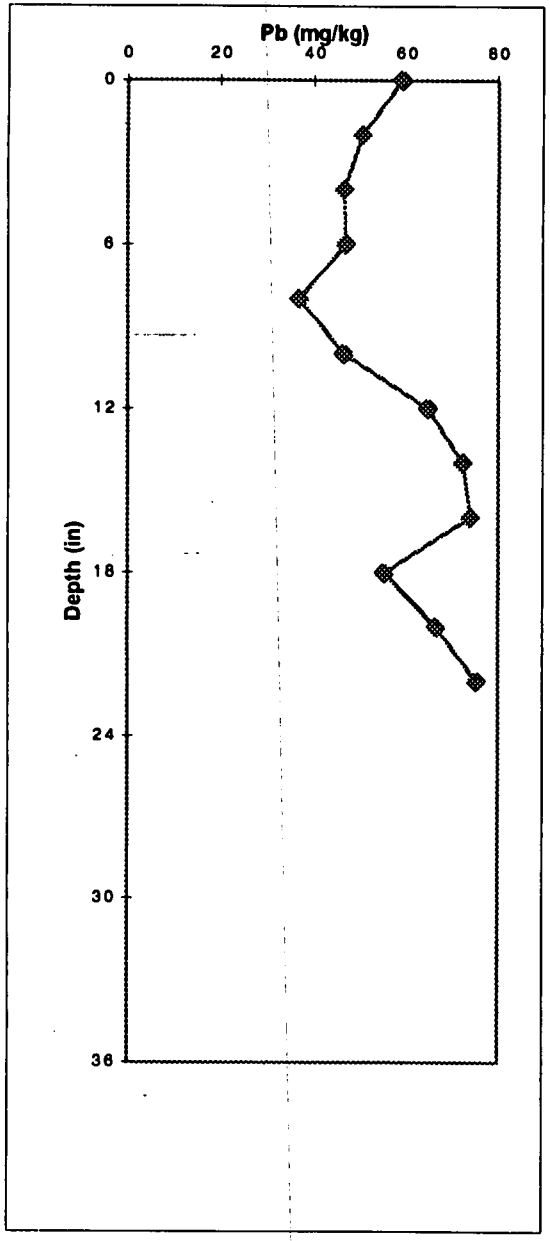

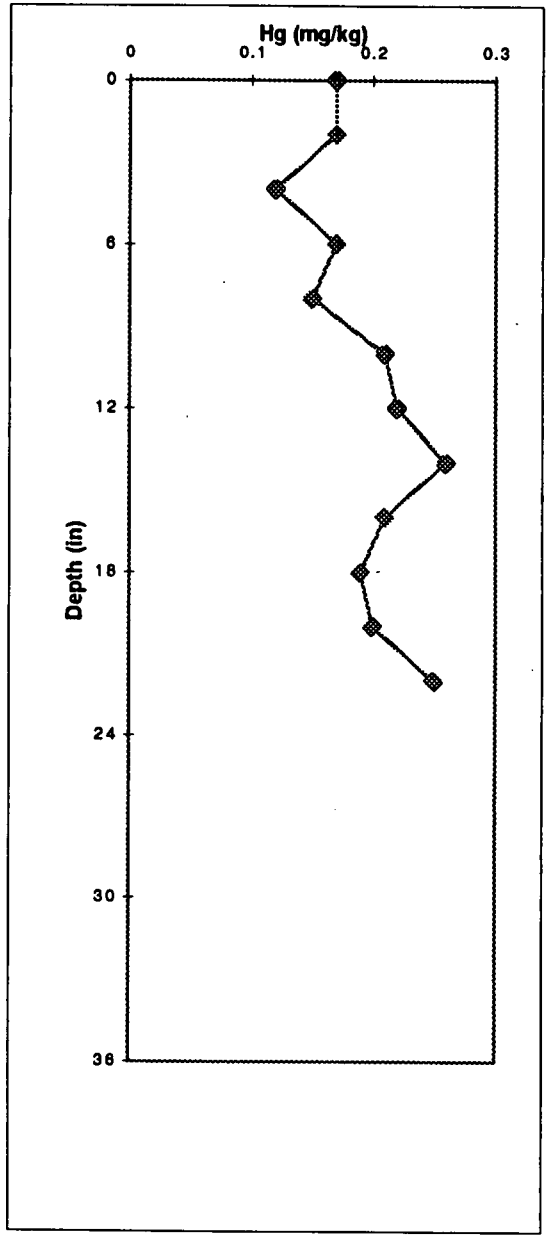

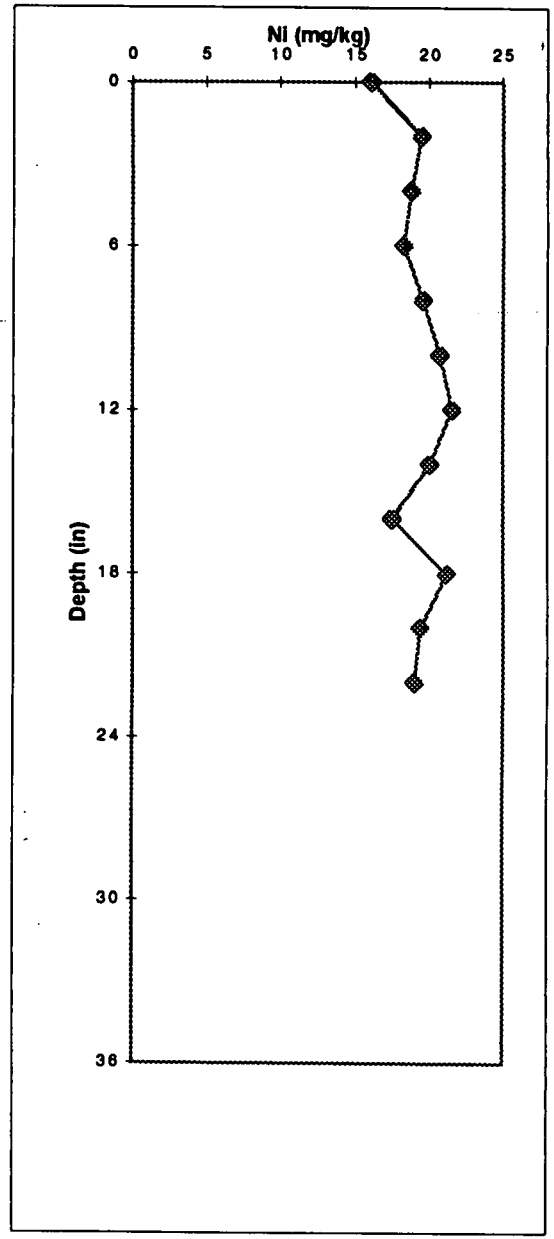

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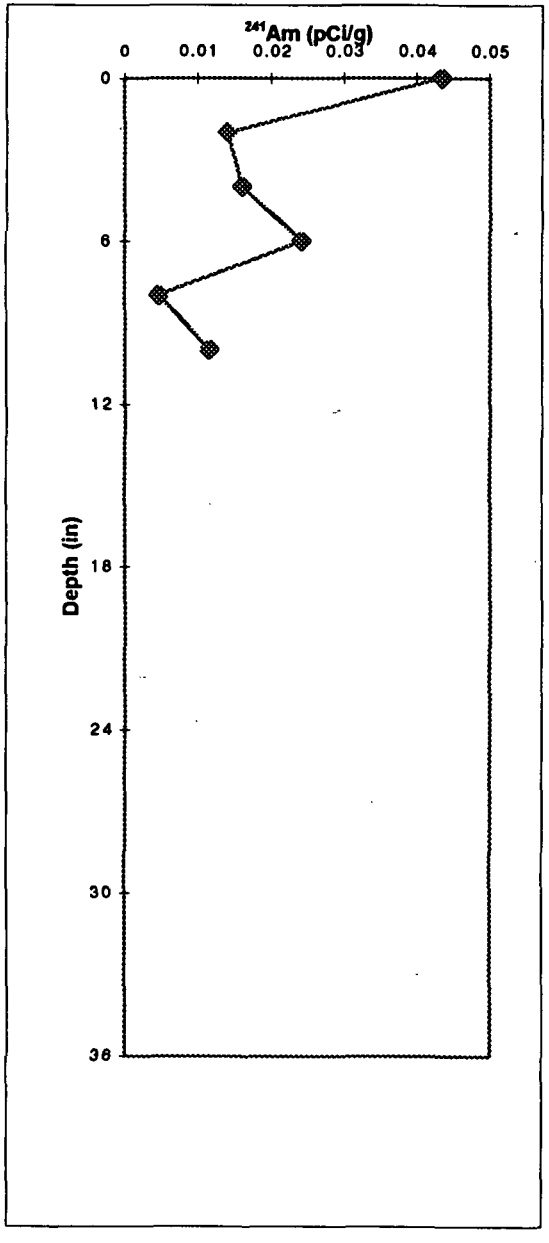

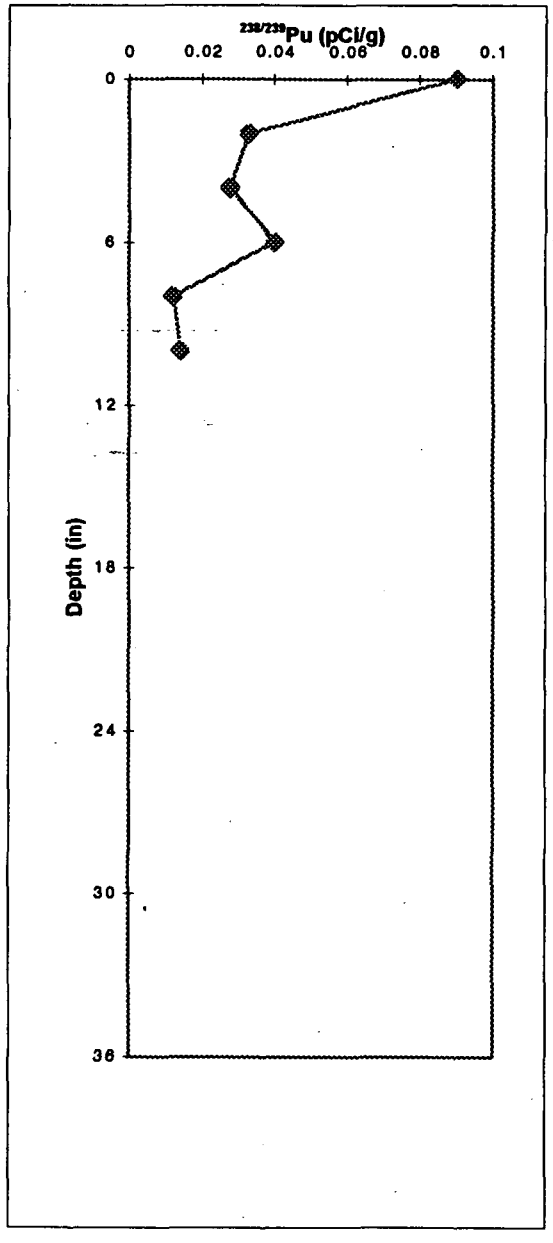

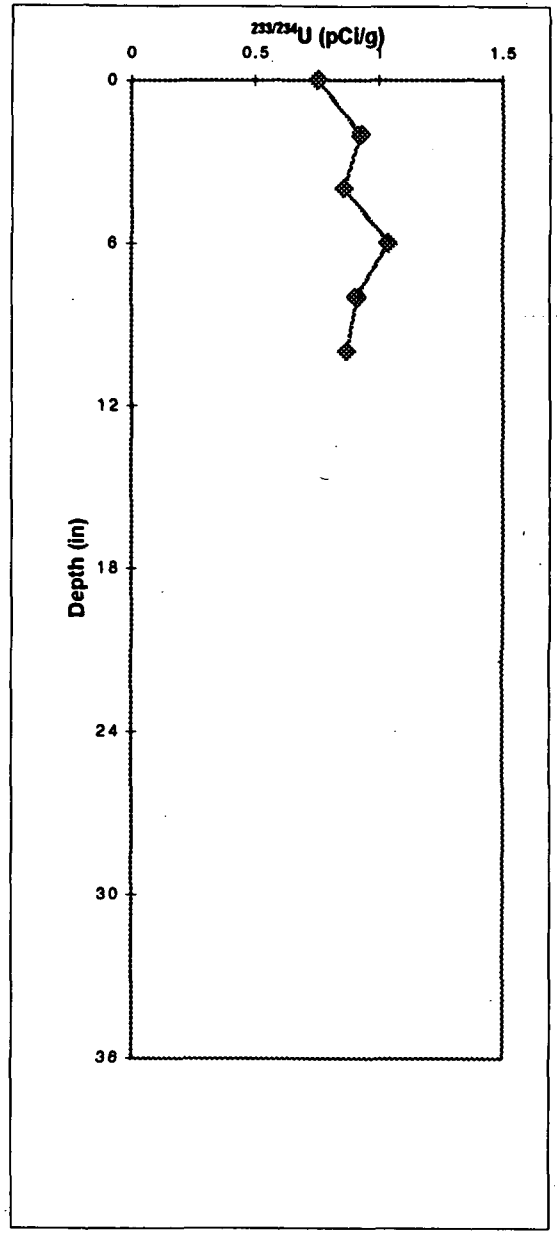

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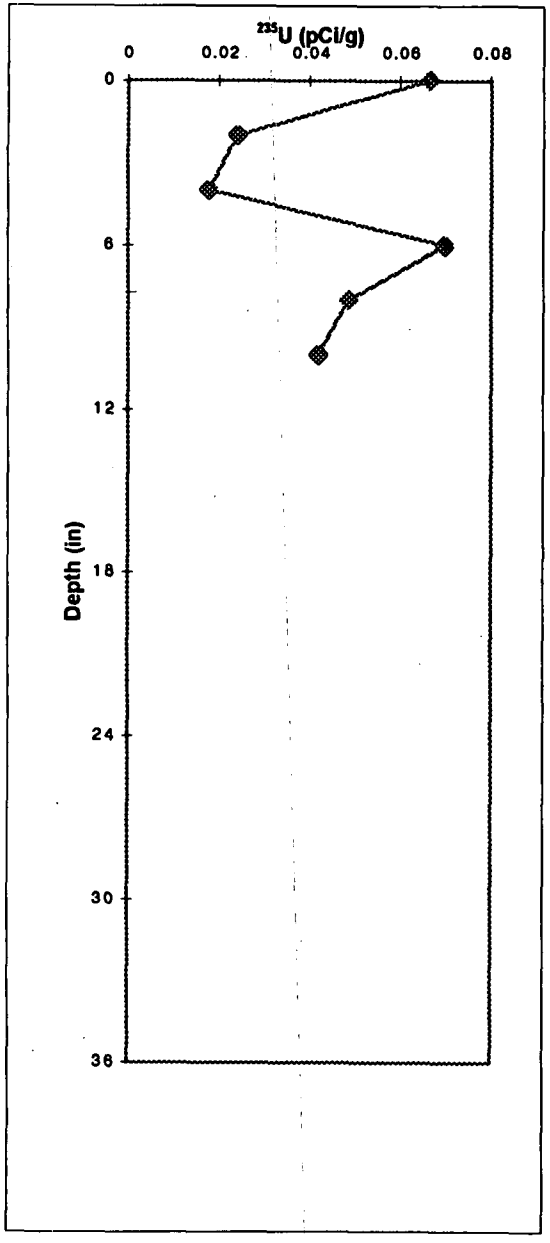
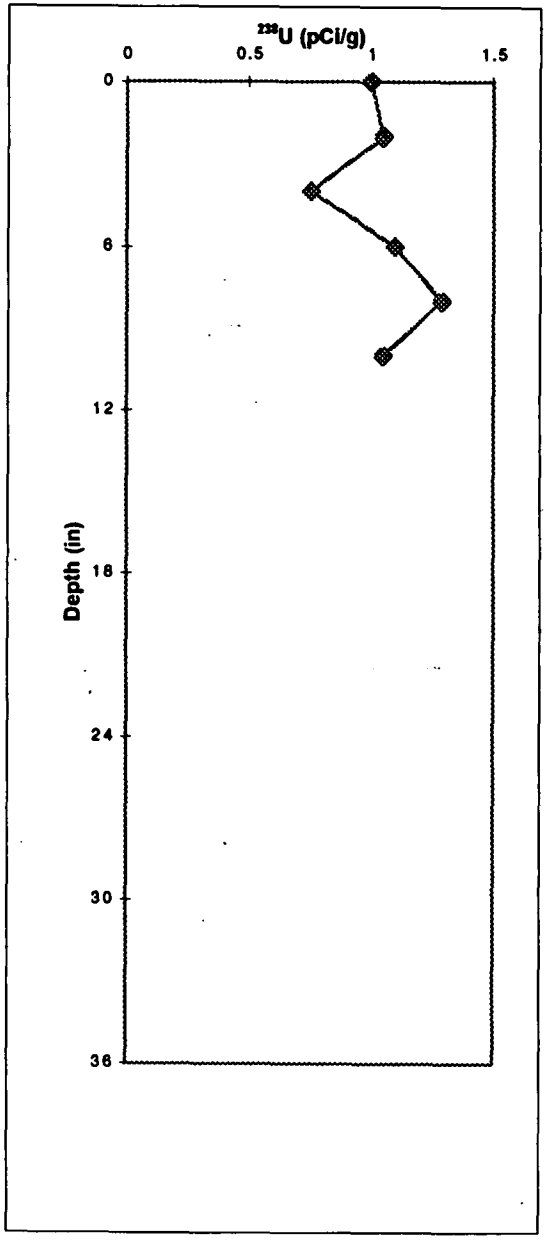
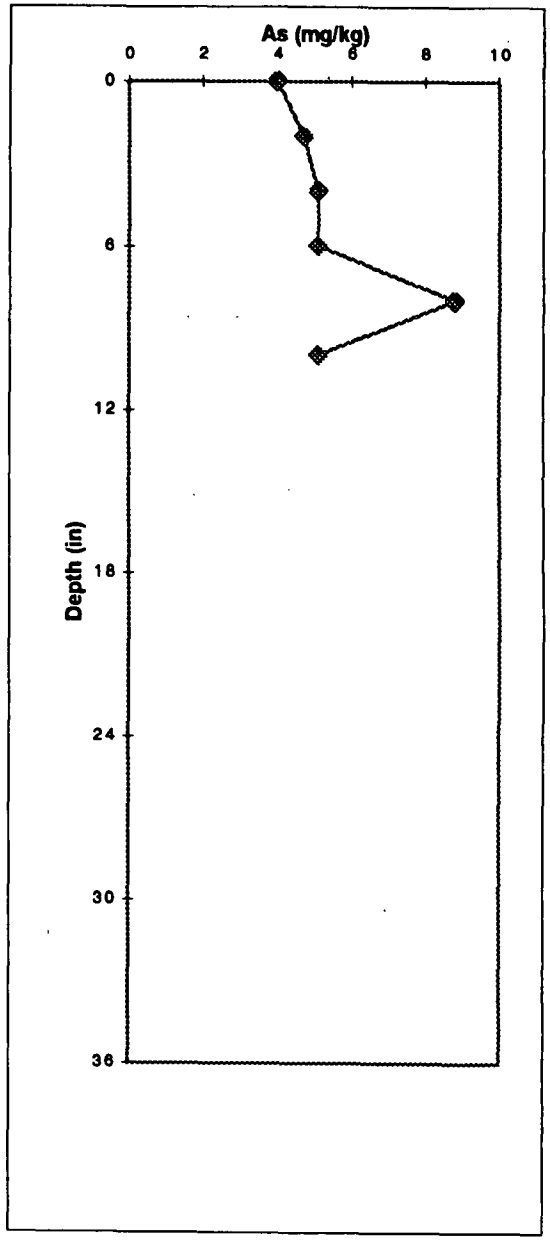
Location SED09292







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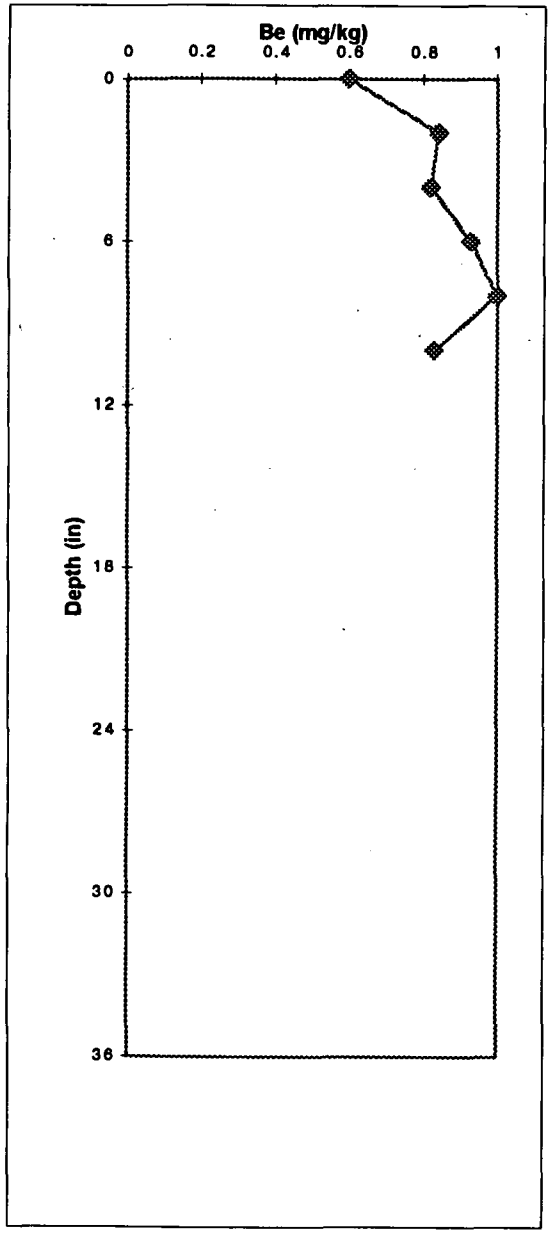

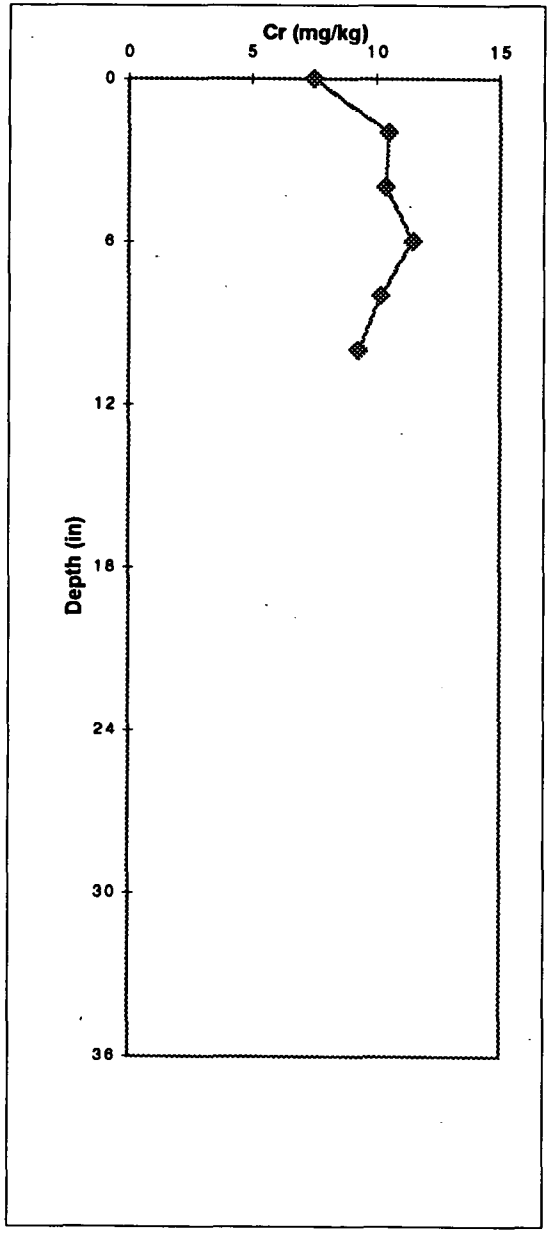

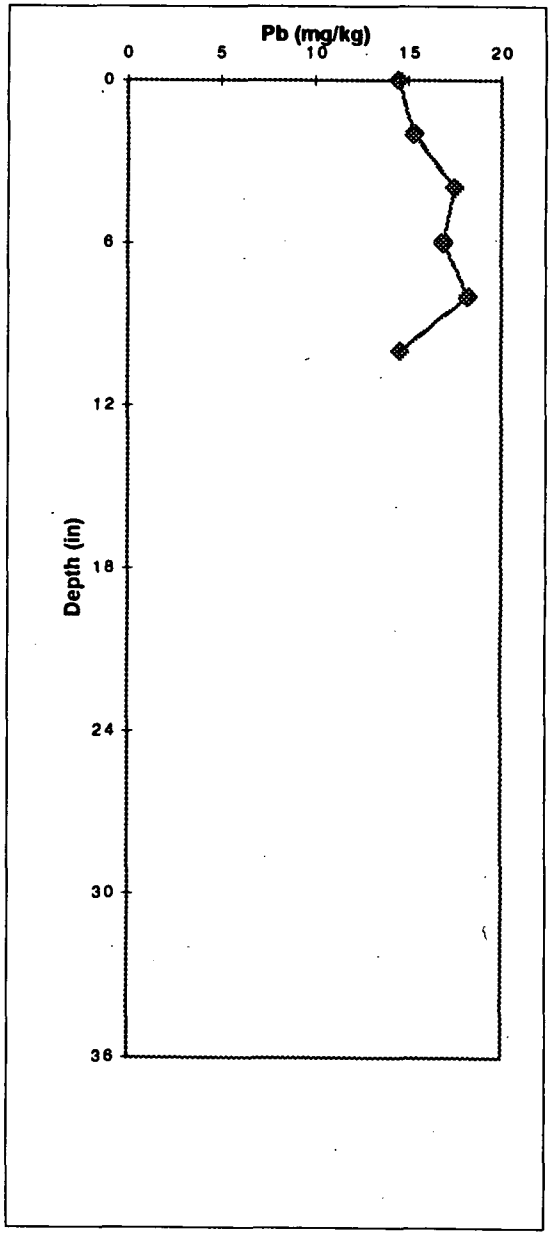

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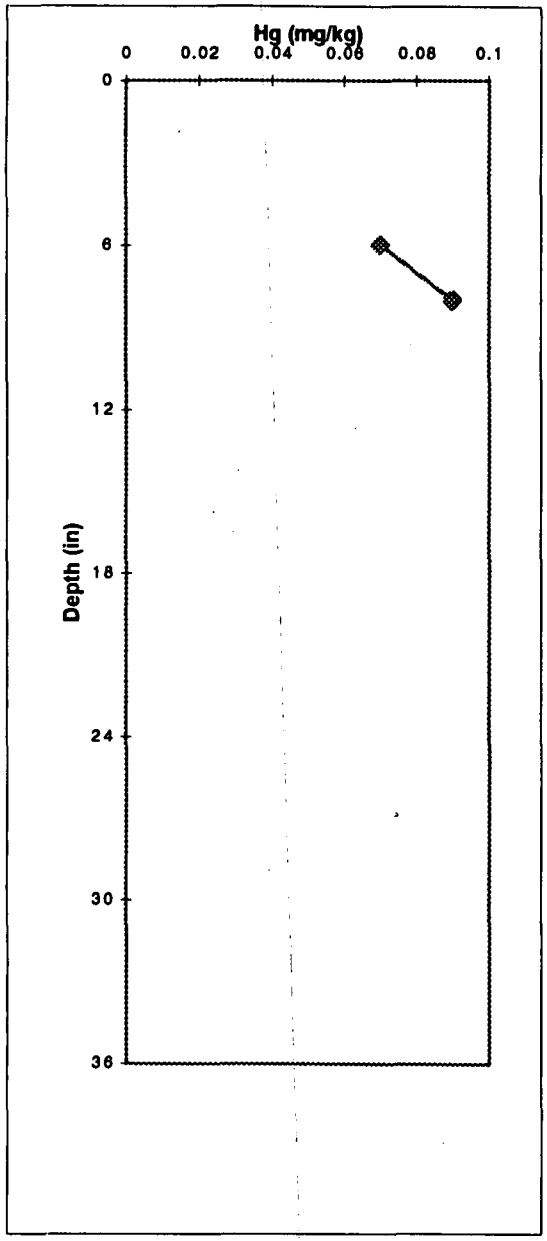


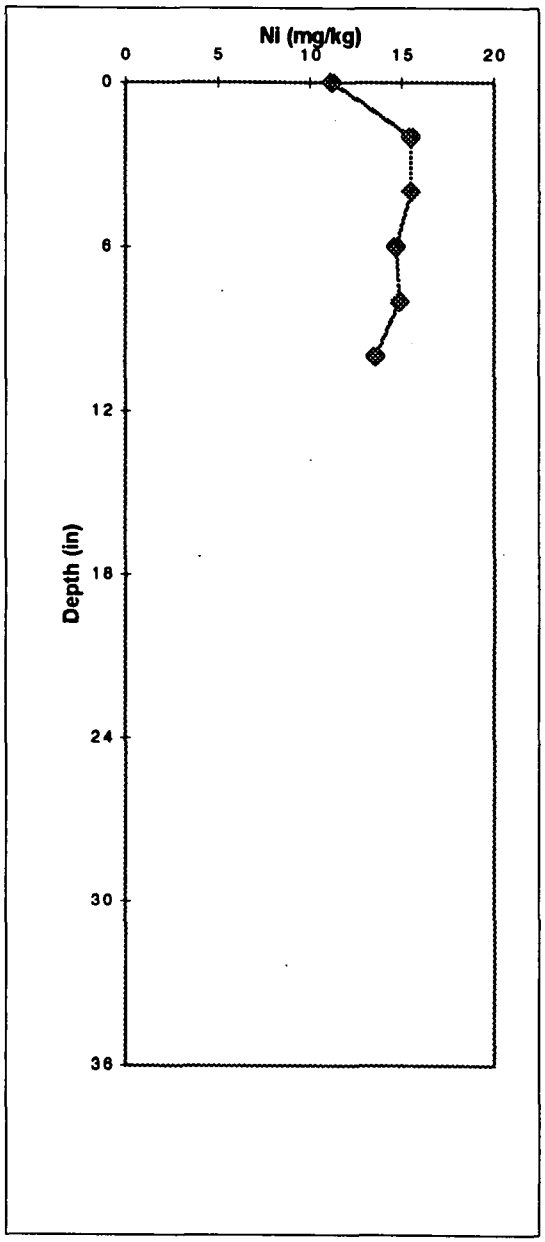
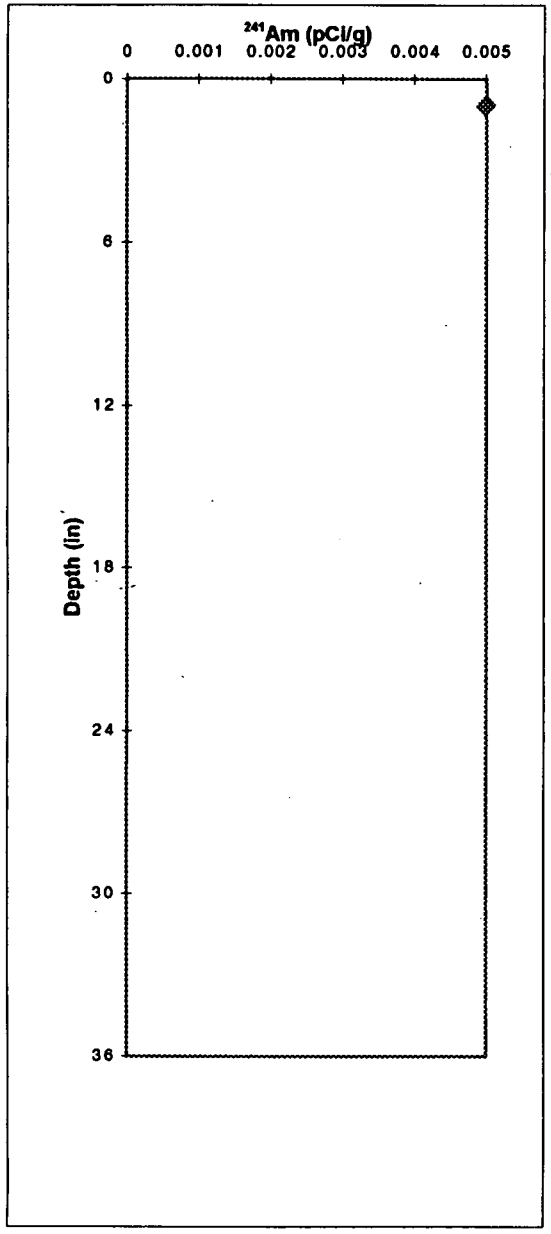
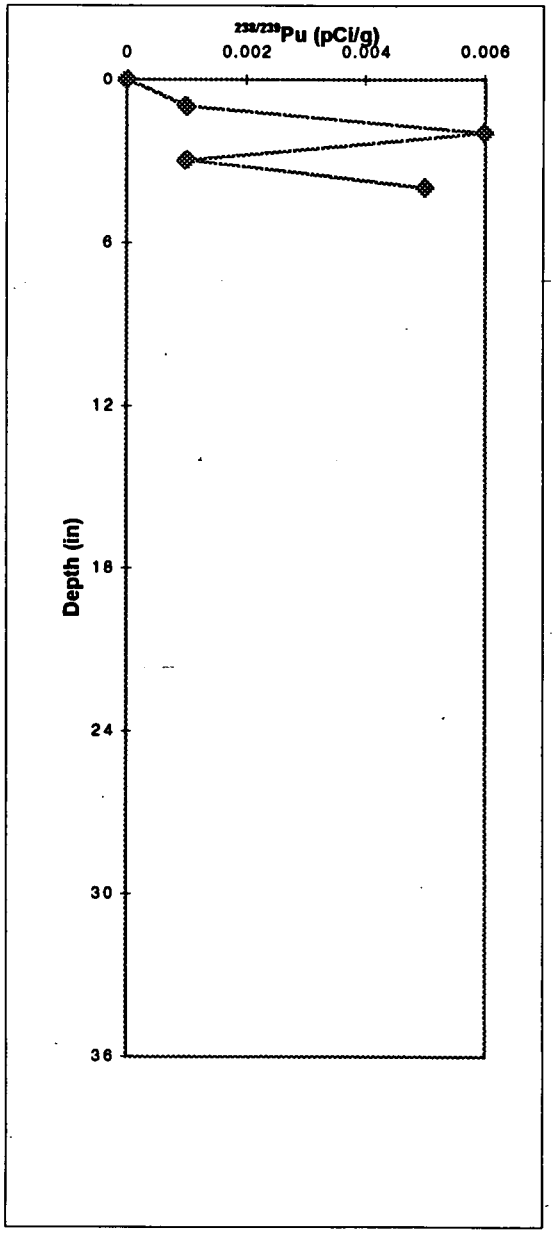
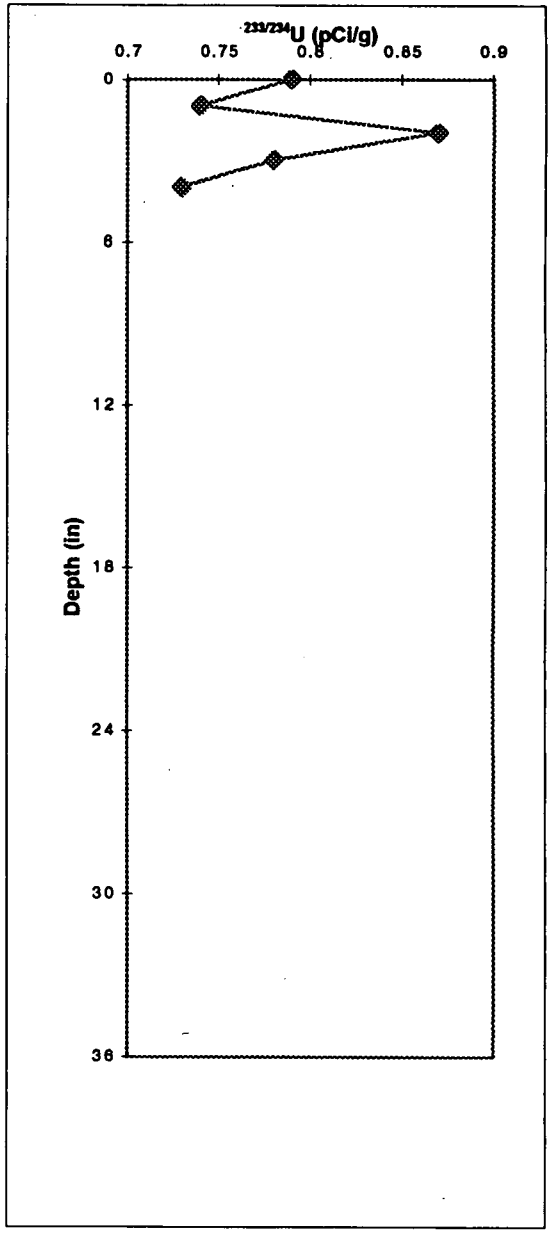


Fig J-9
Location SED03692







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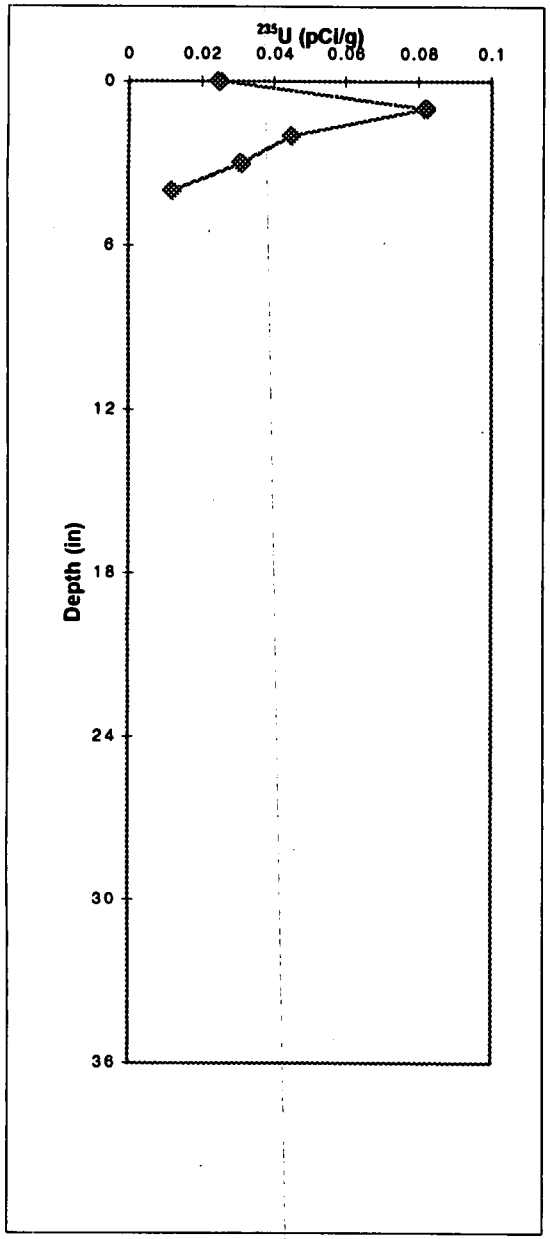


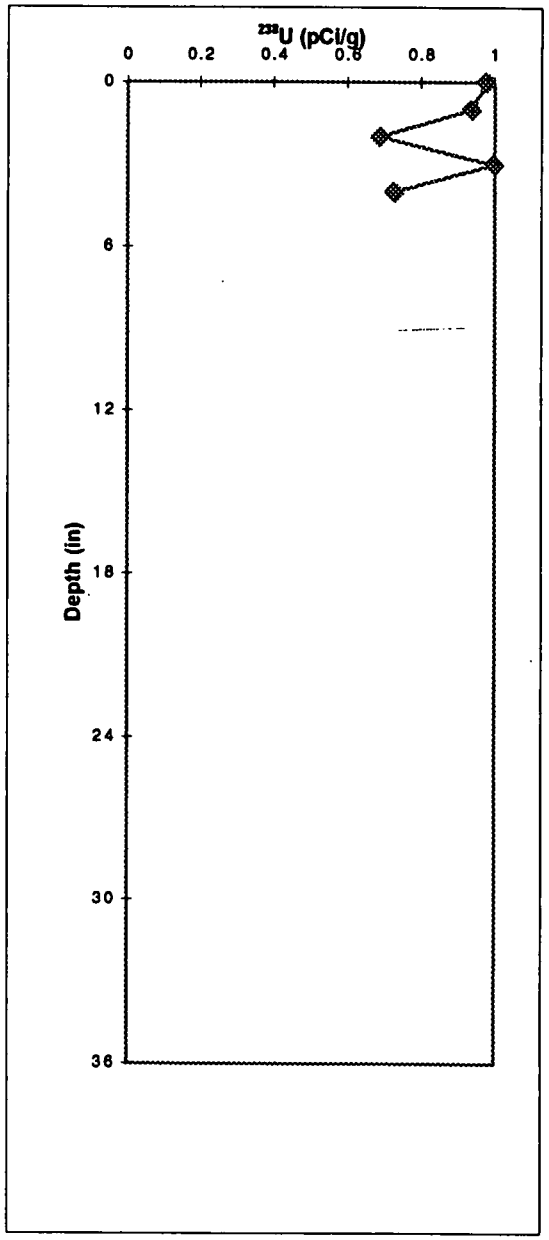
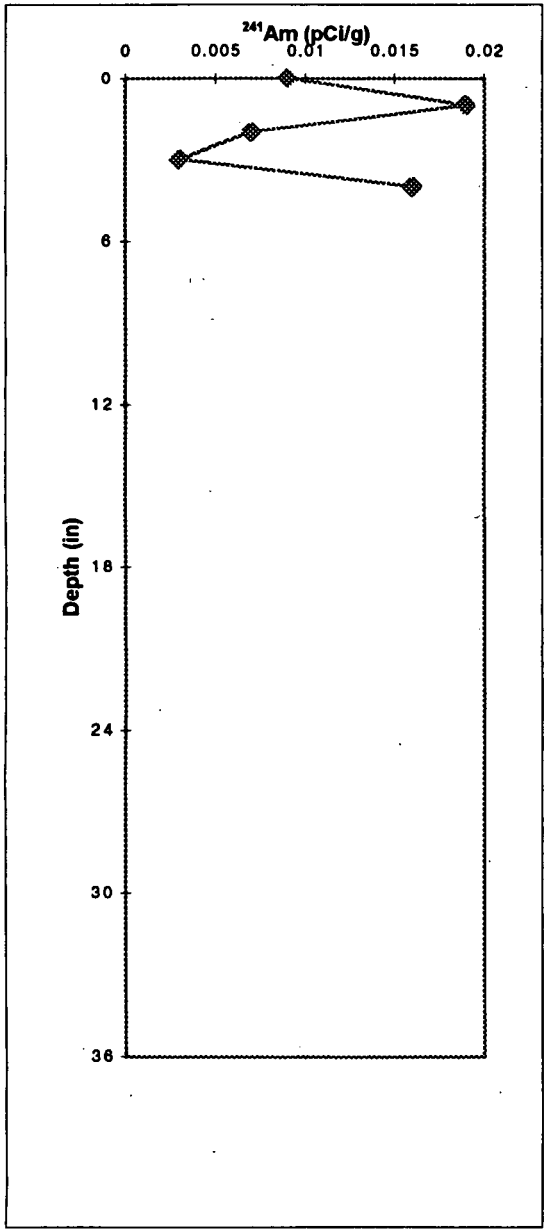
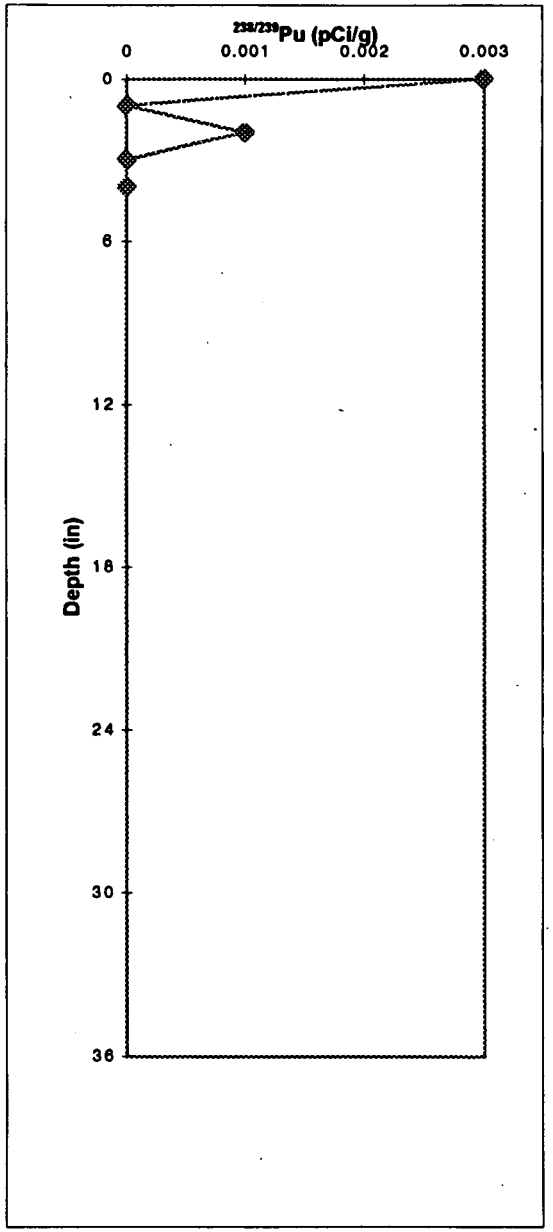


Figure J-10
Location SED03992





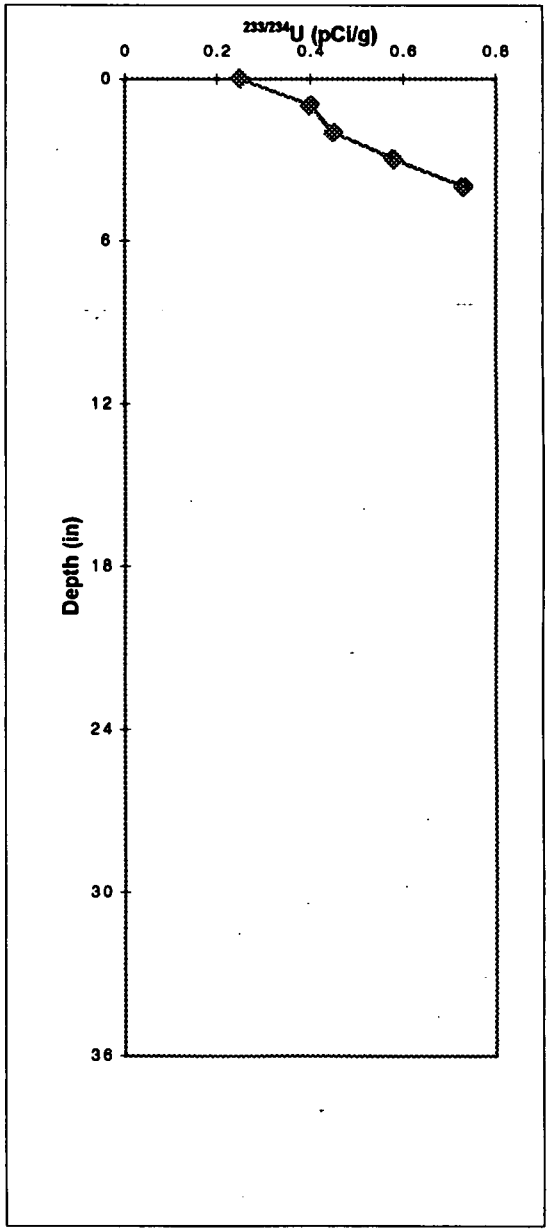


Figure J-10
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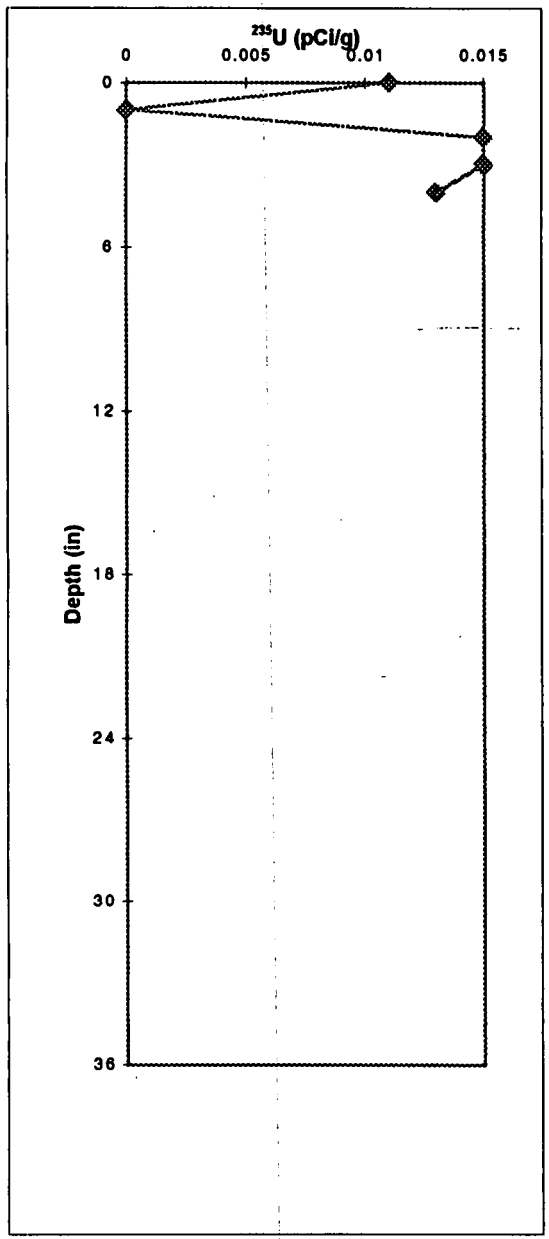


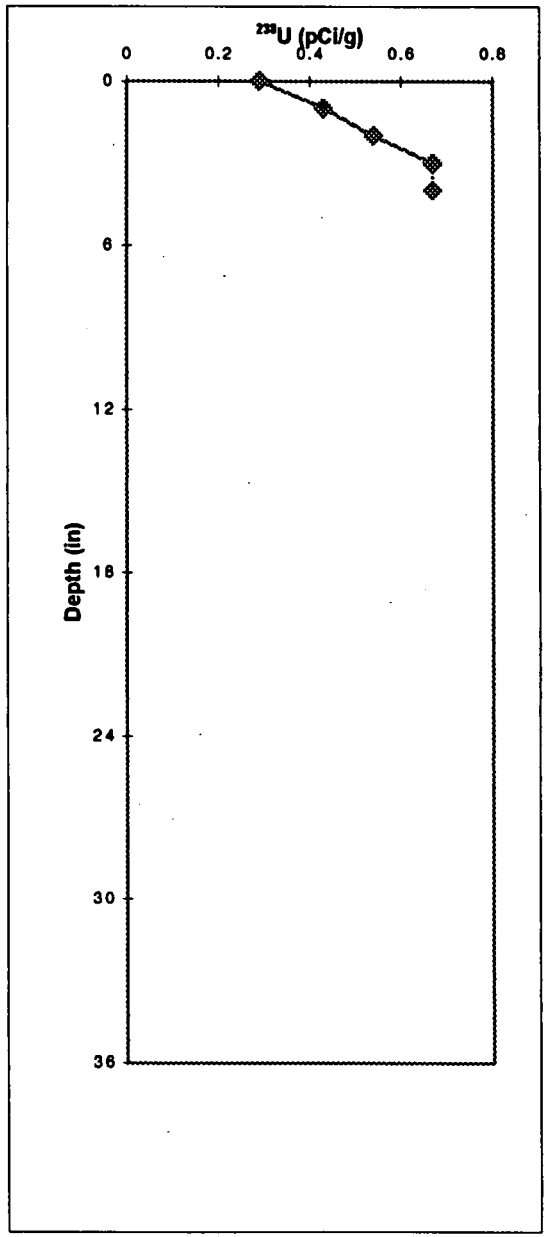
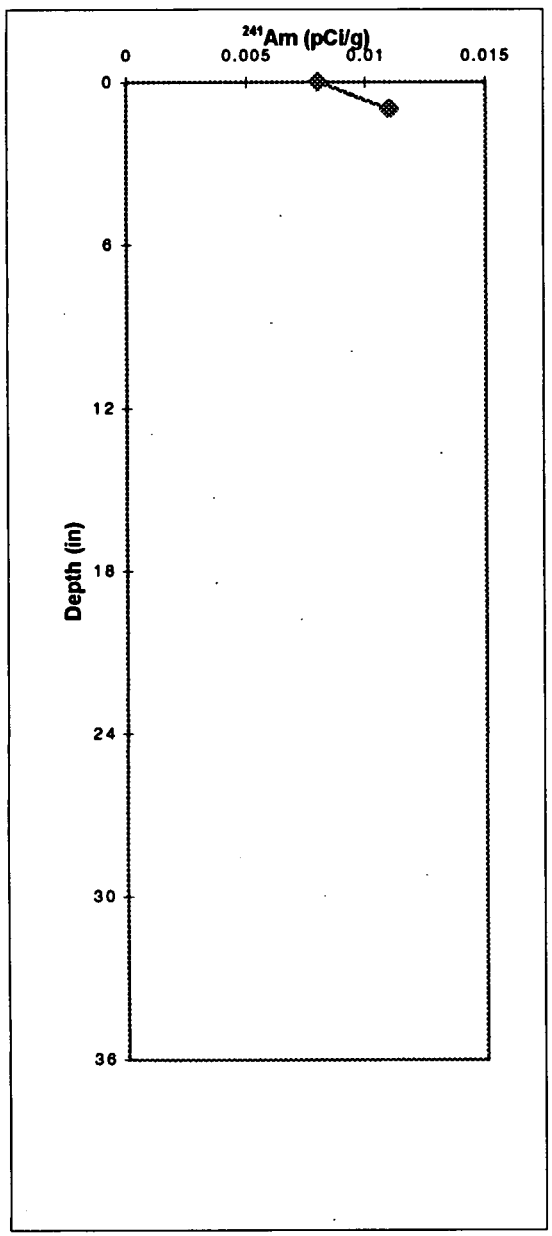
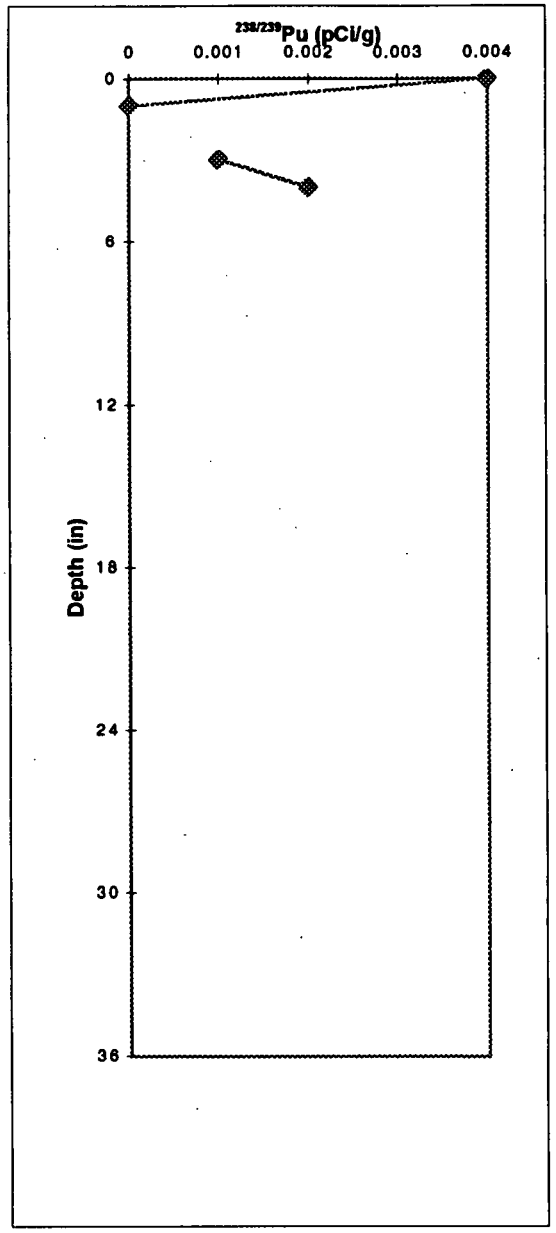


Figure J-12
Location SED04992





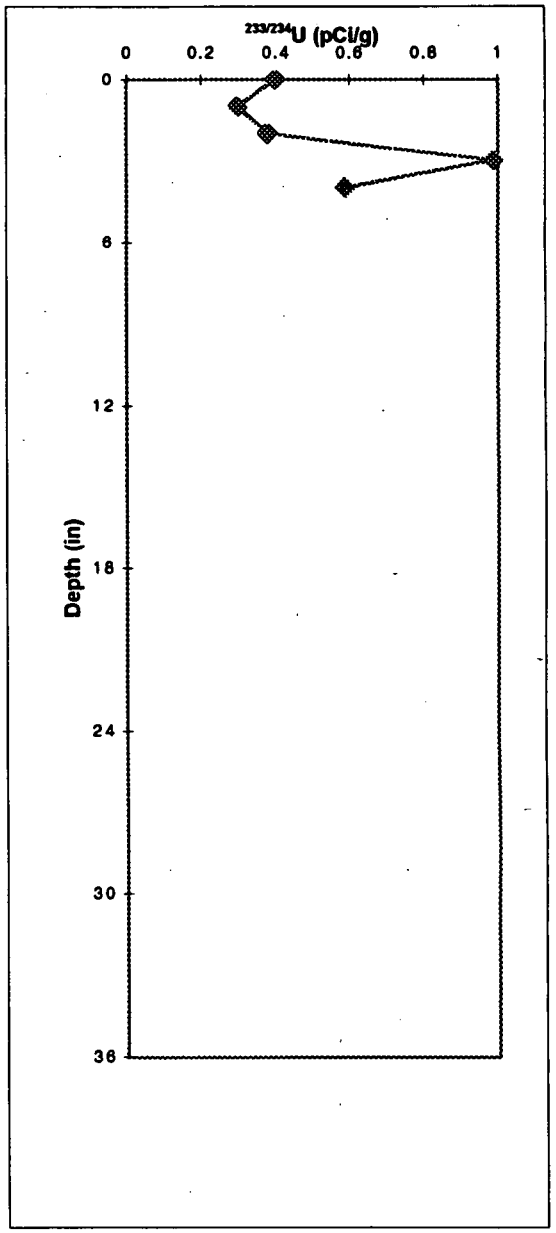
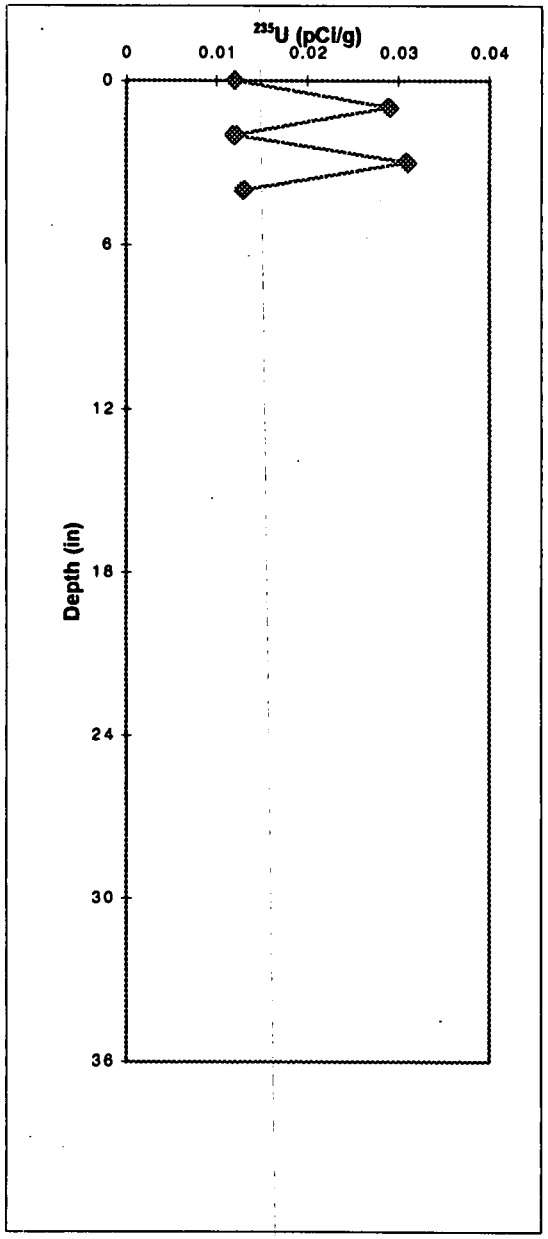


Figure J-12
Location SED04992



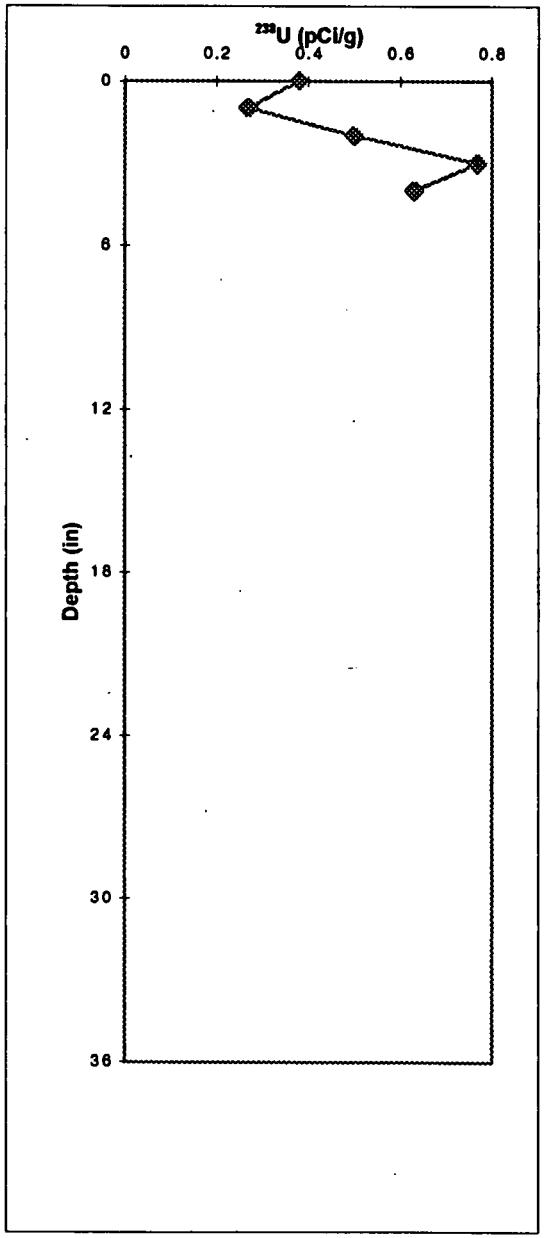
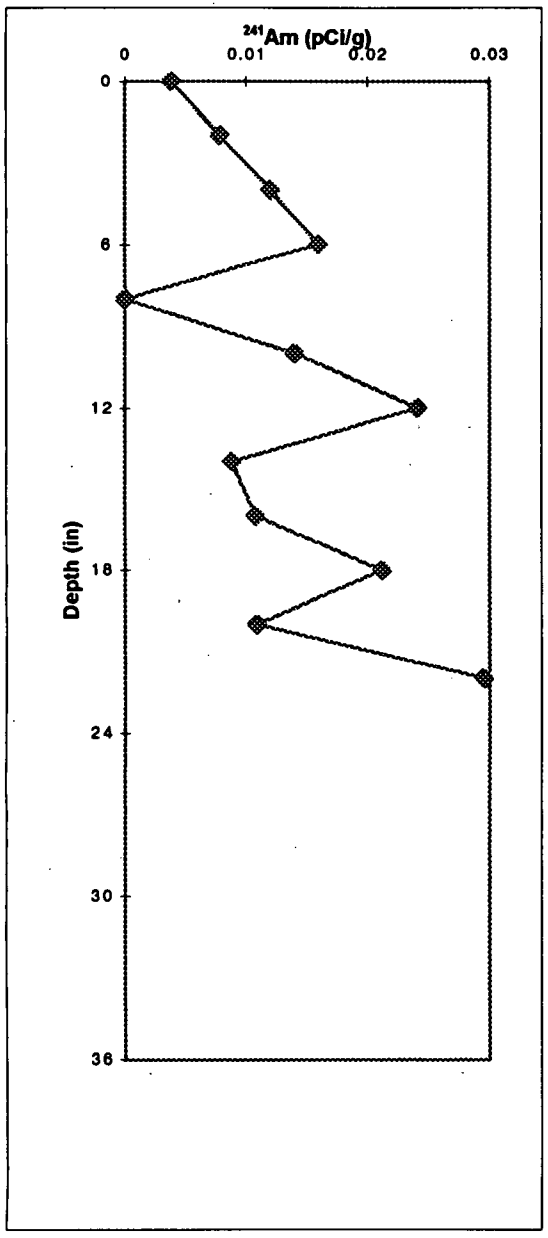
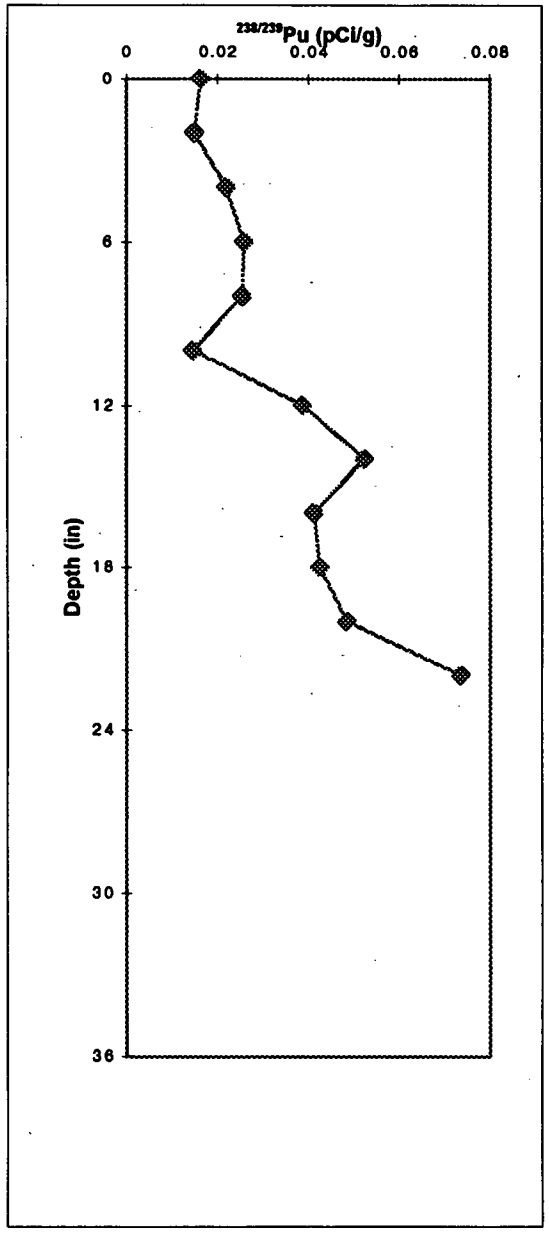


Figure J-13
Location SED08192





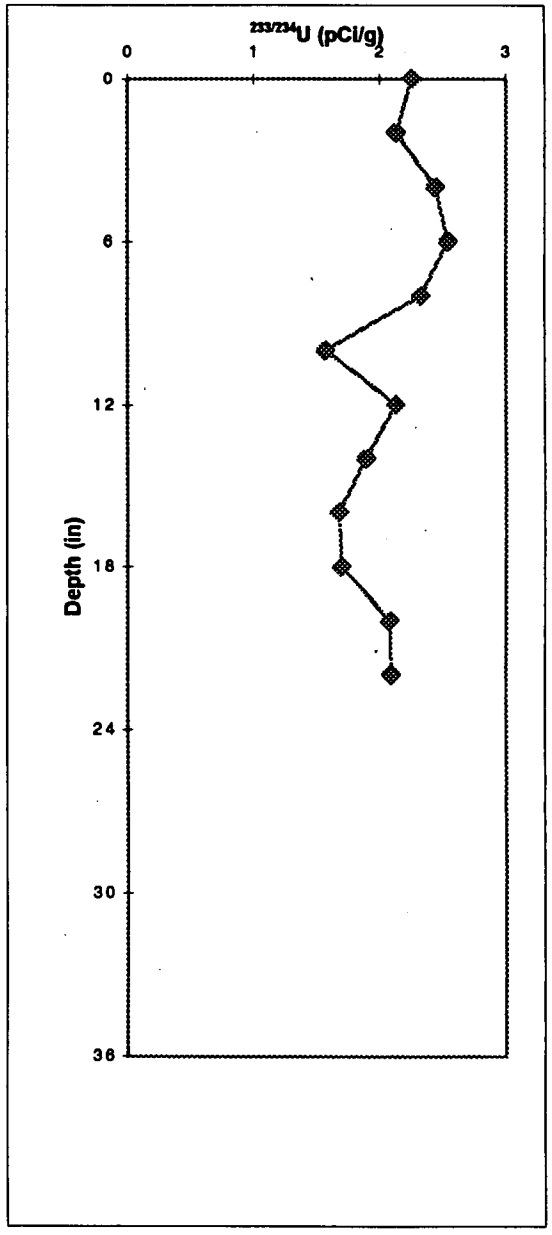


Figure J-13
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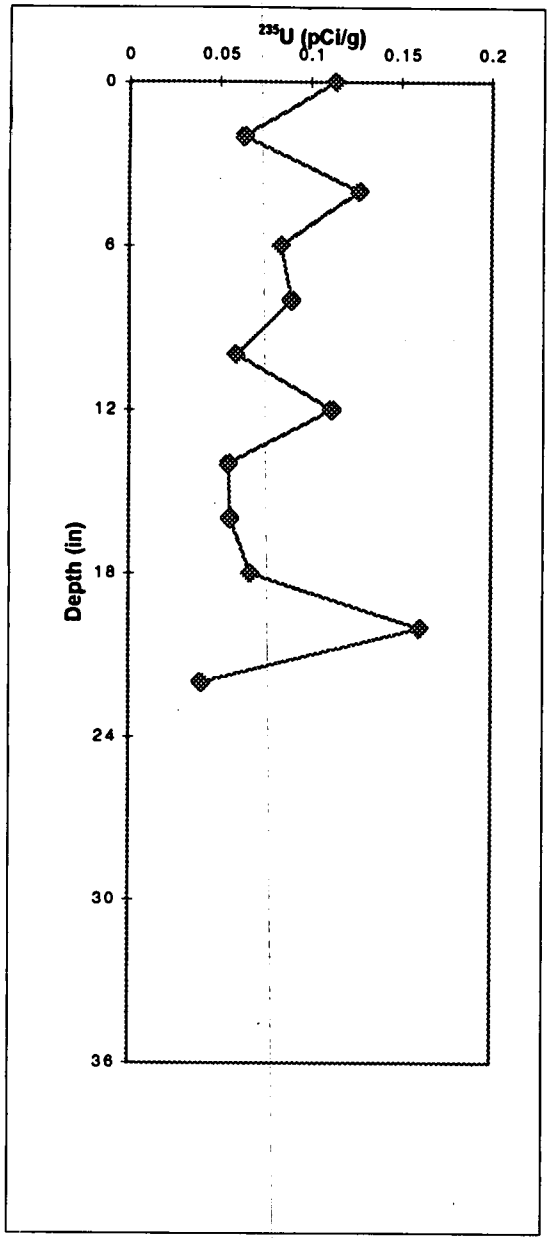
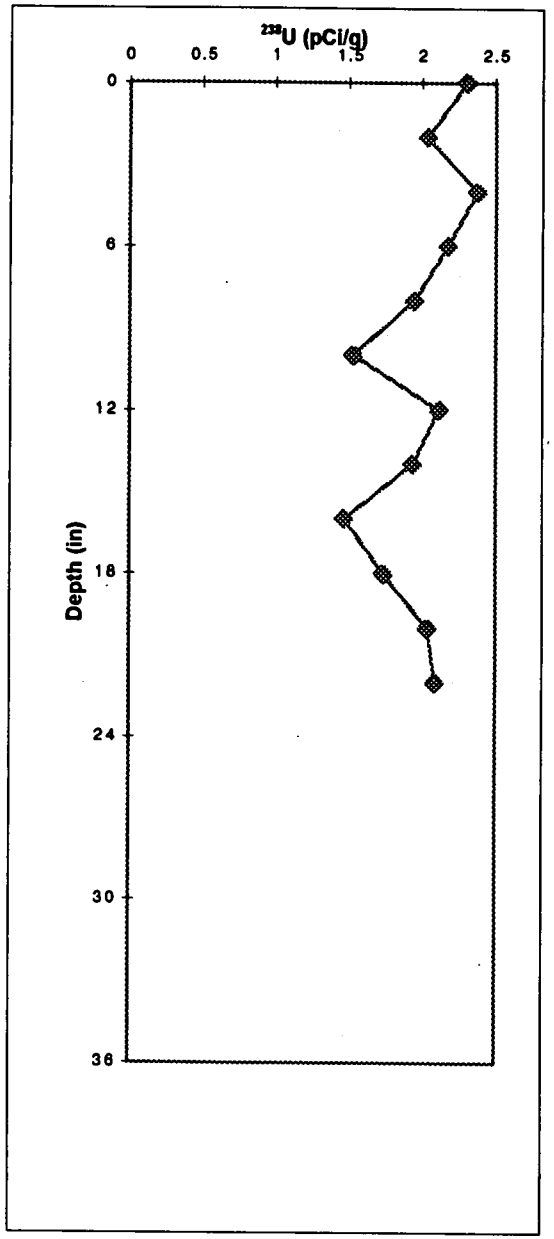
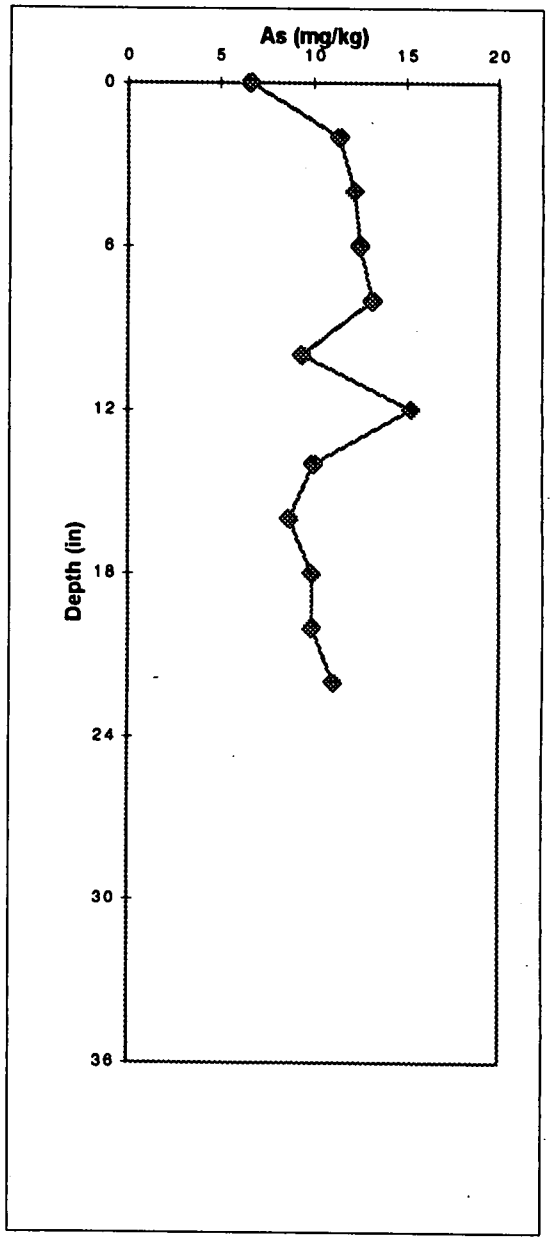
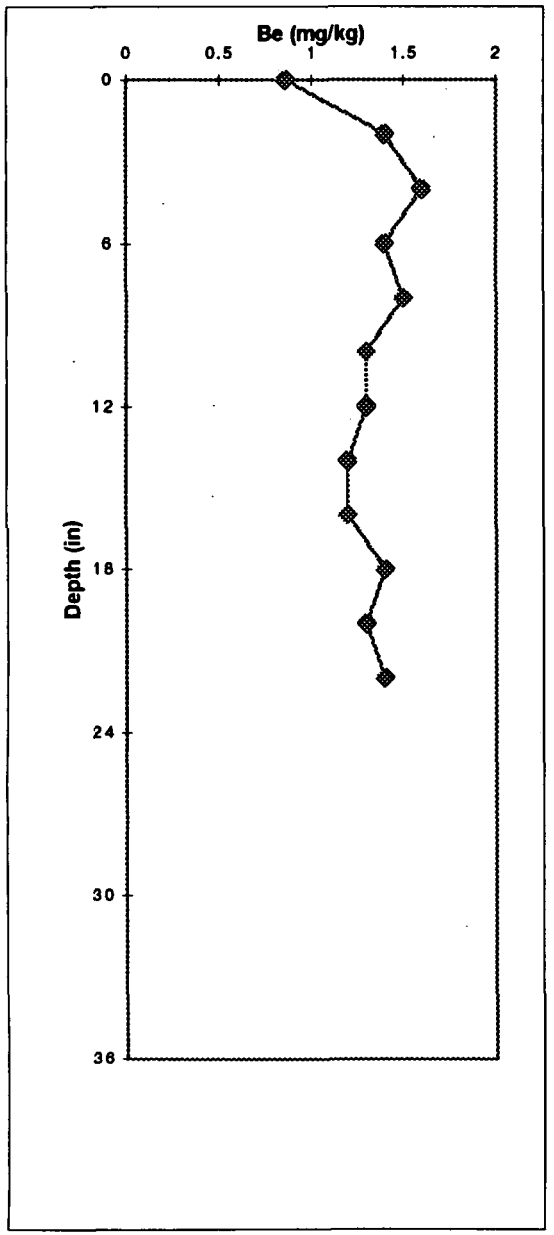
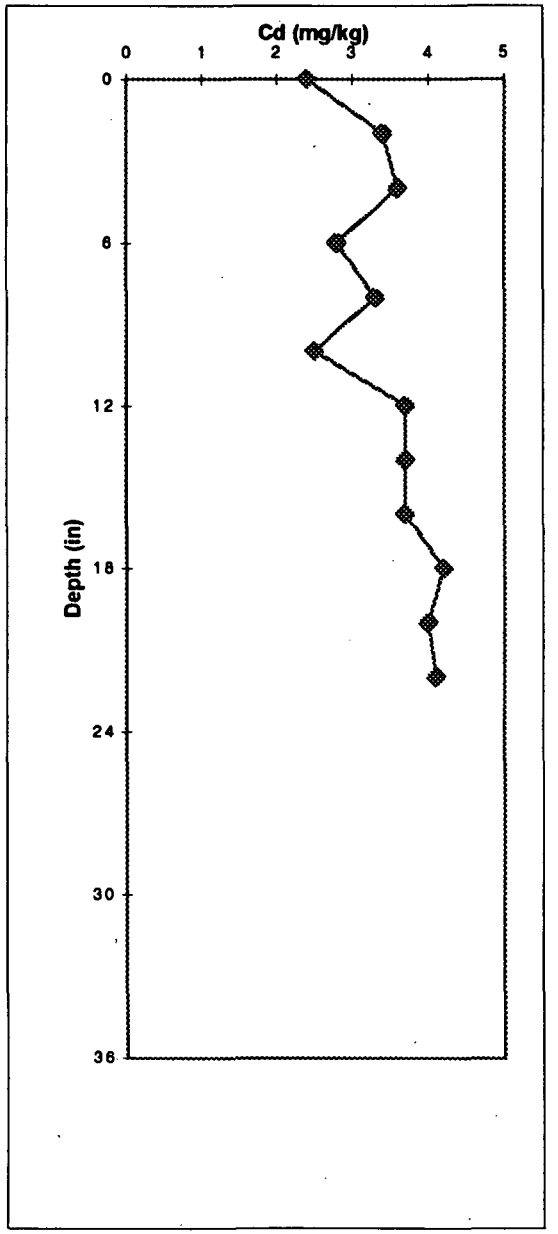






Figu[illegible]J-13
Location SED08192





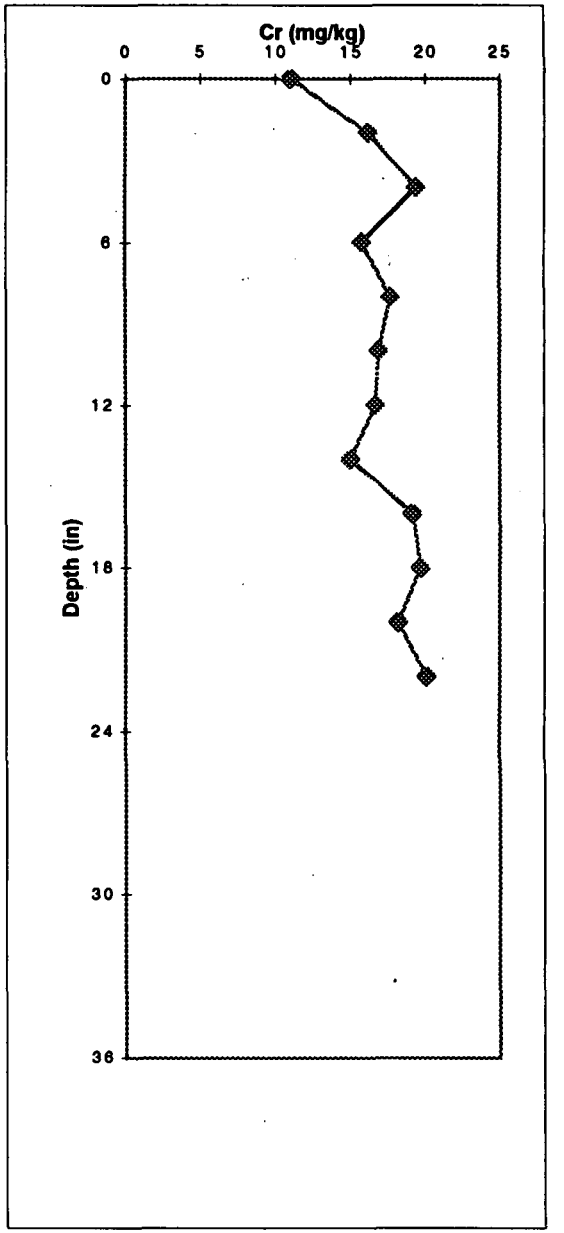
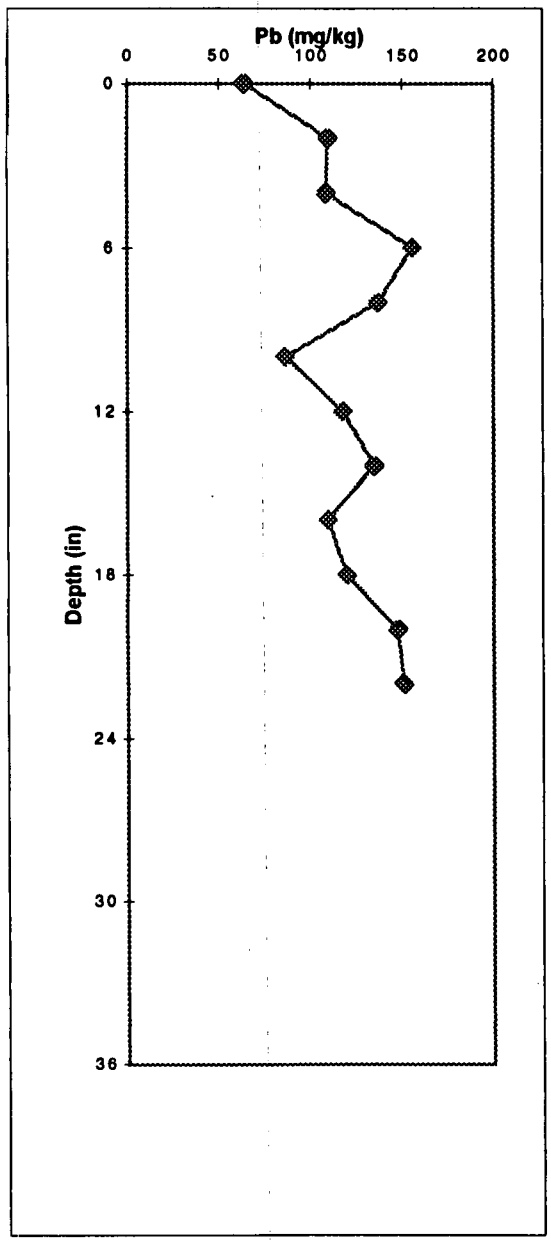
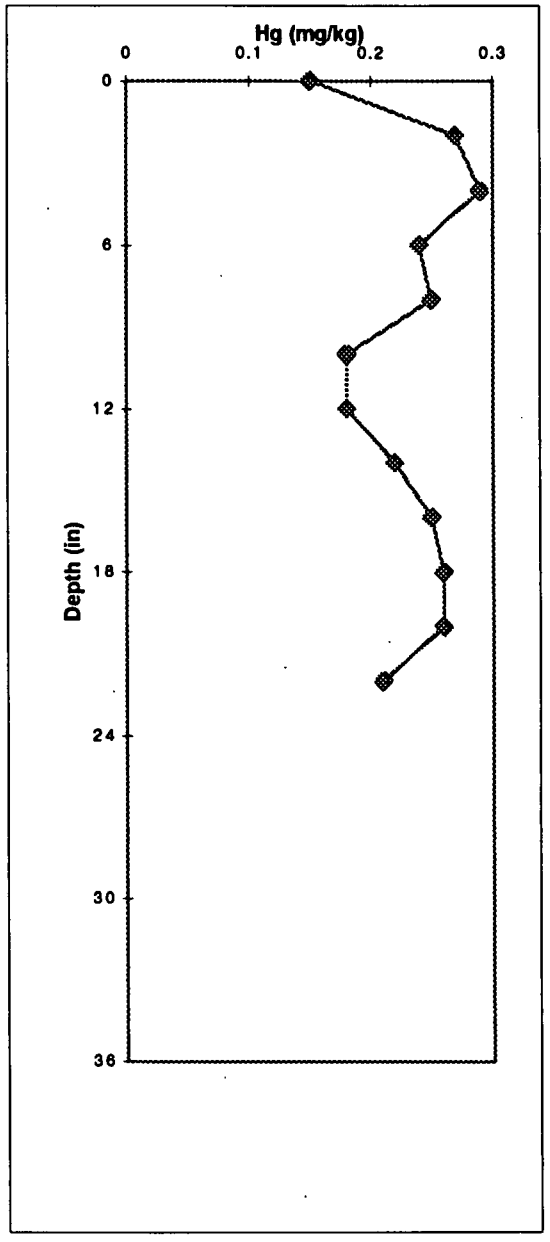
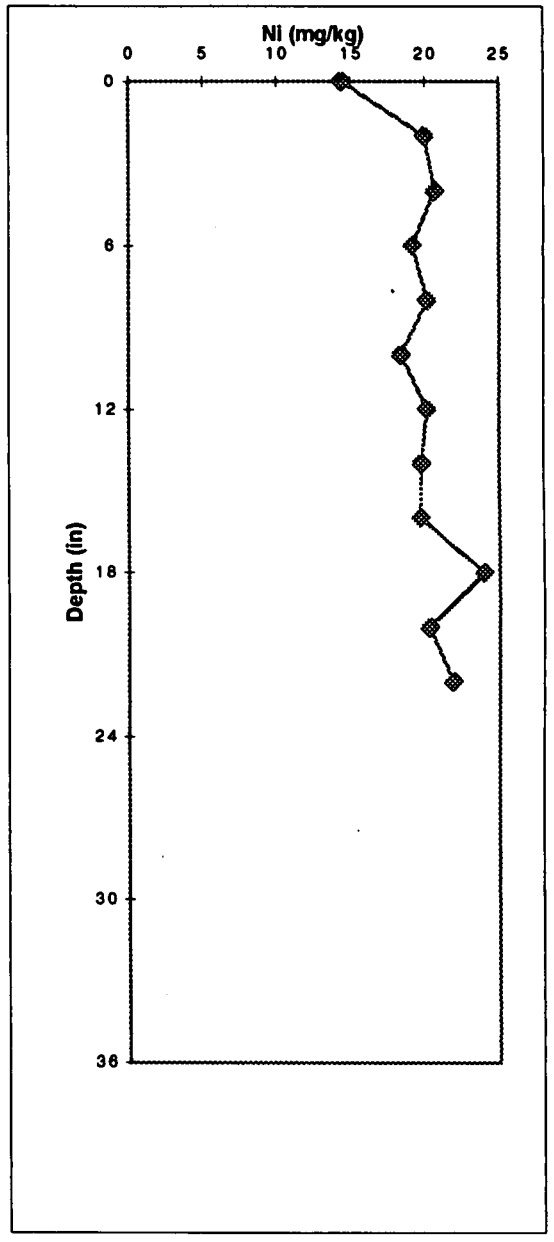


Figure J-13
Location SED08192







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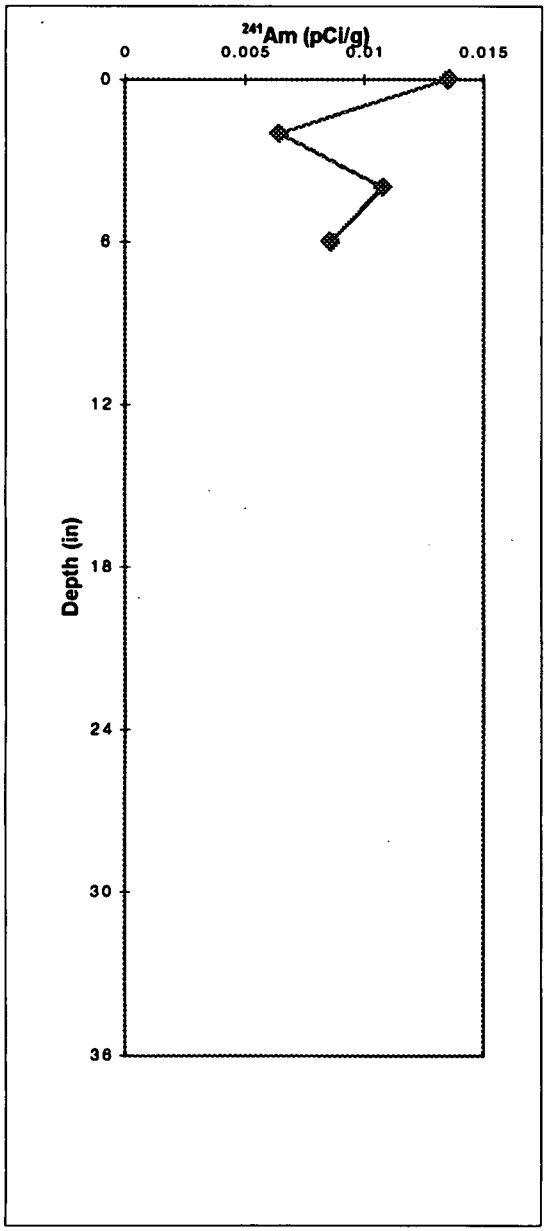
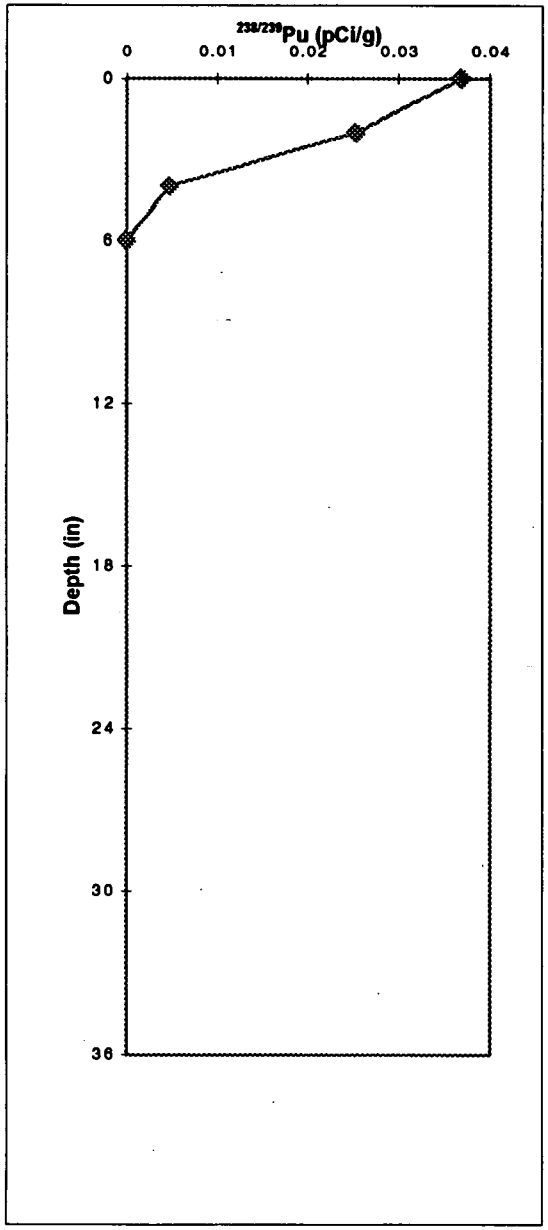
Location SED08292





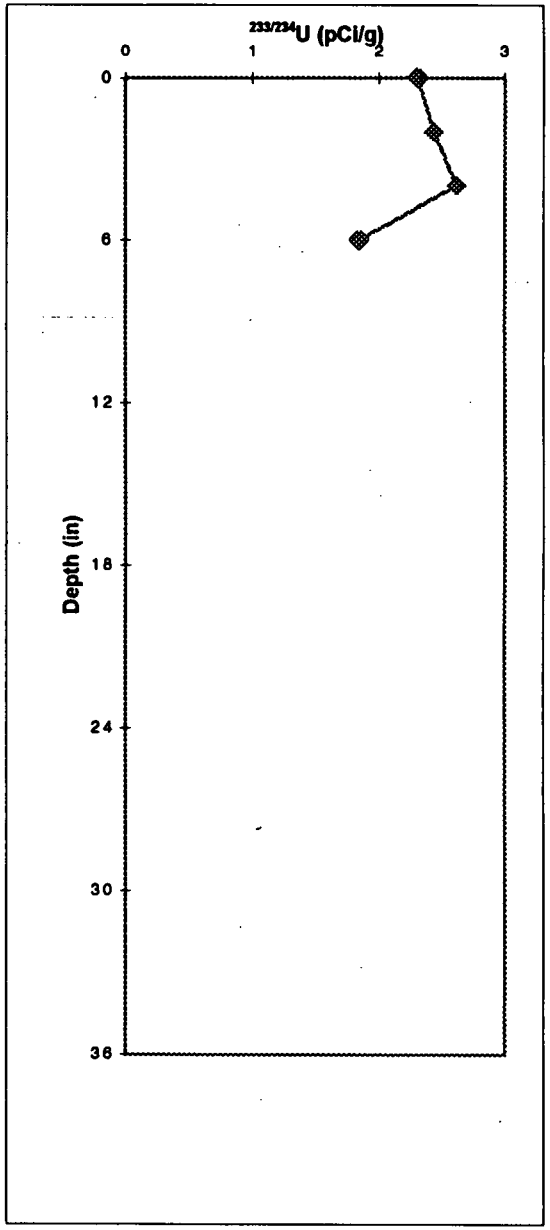
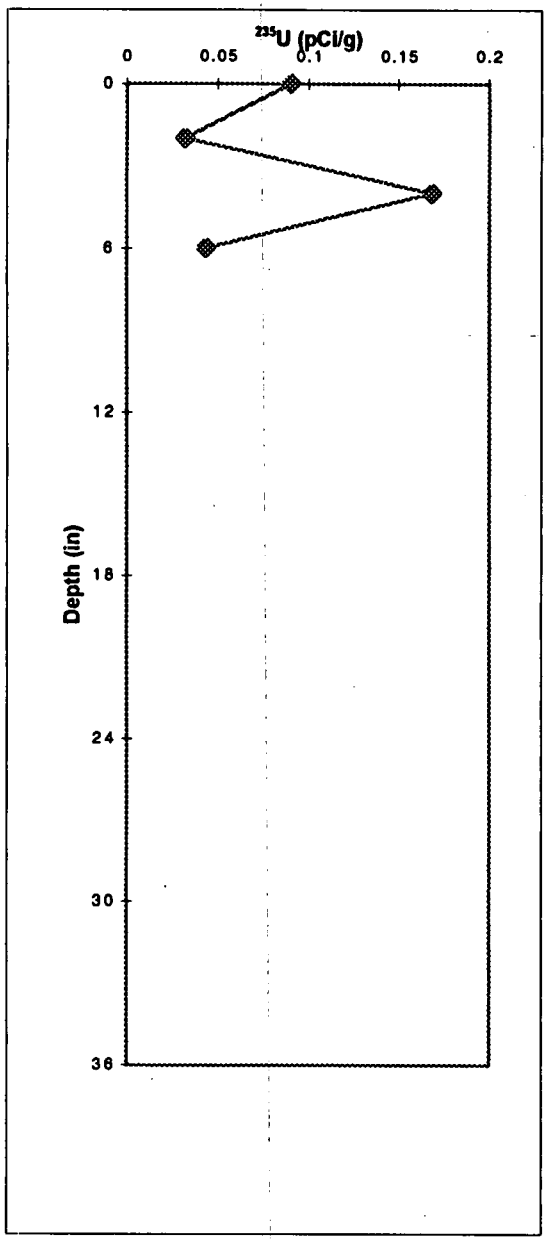
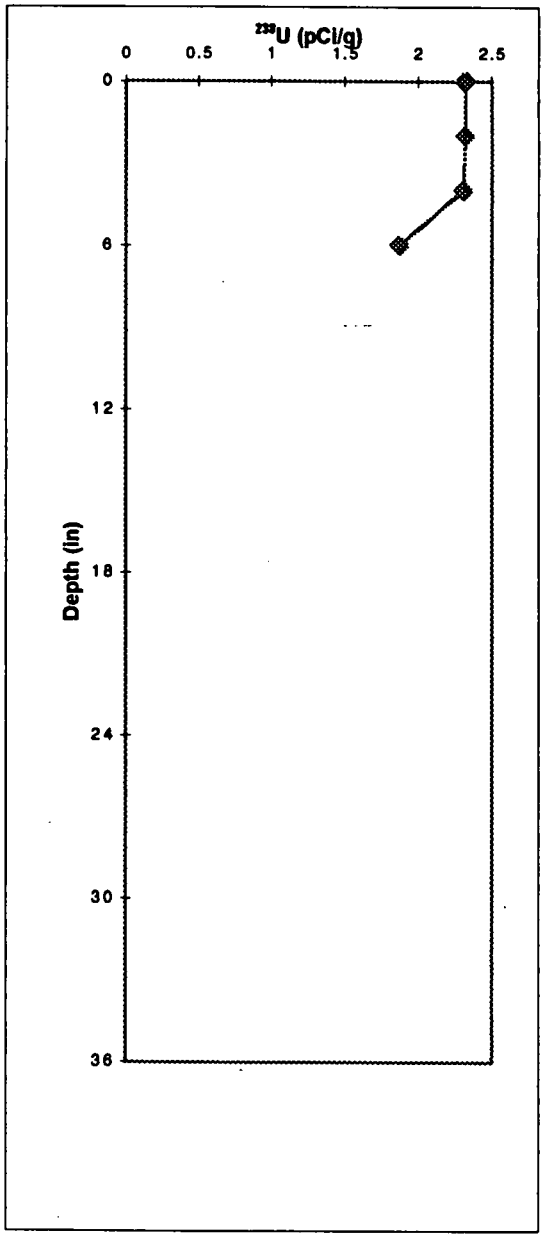


Figure J-14
Location SED08292





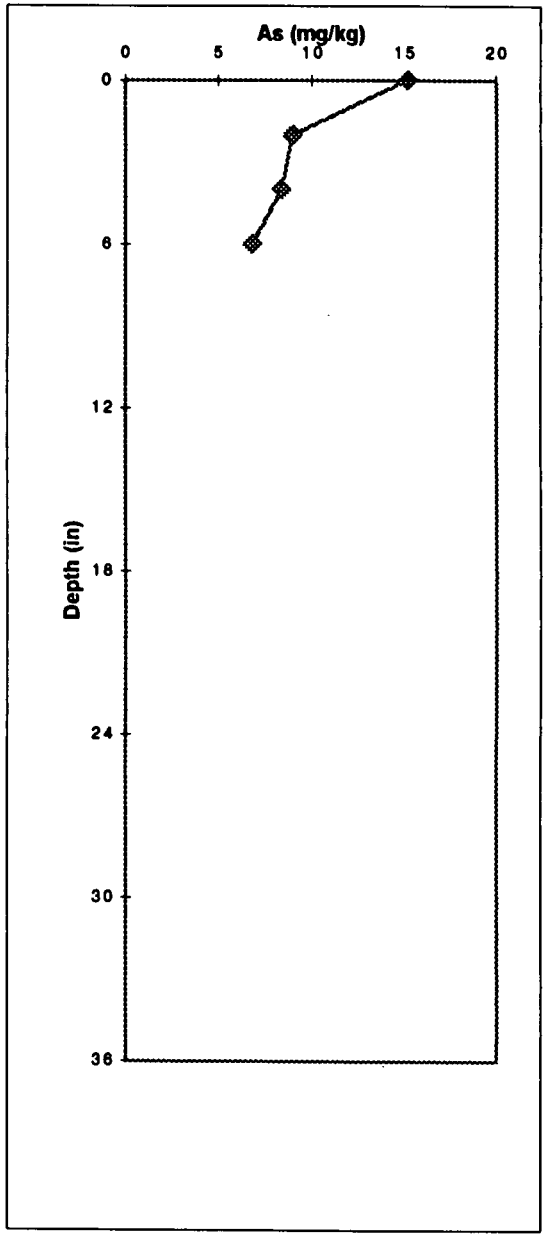
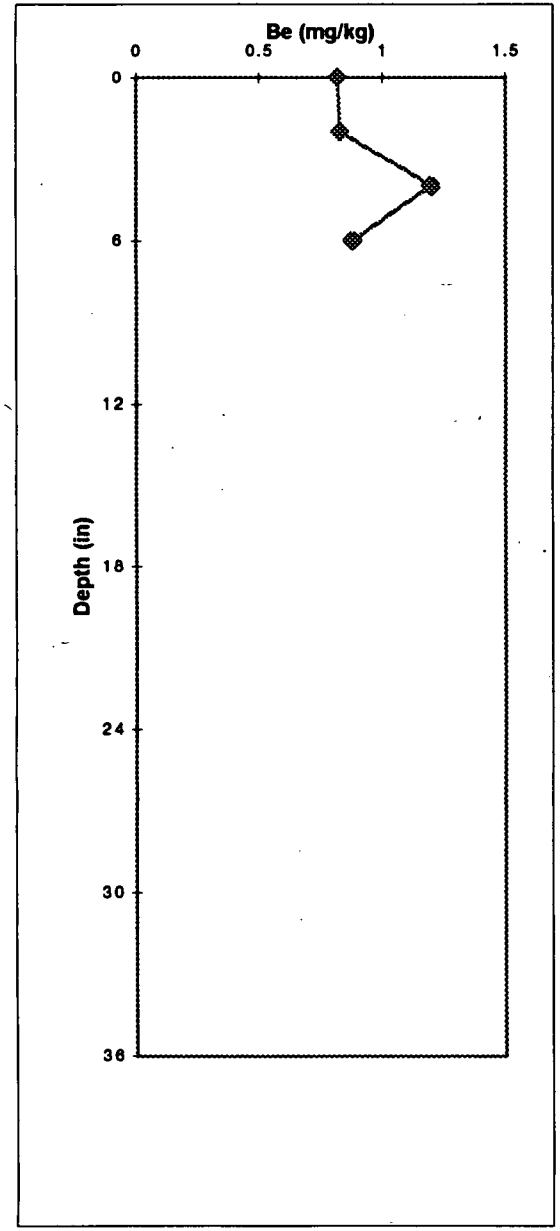
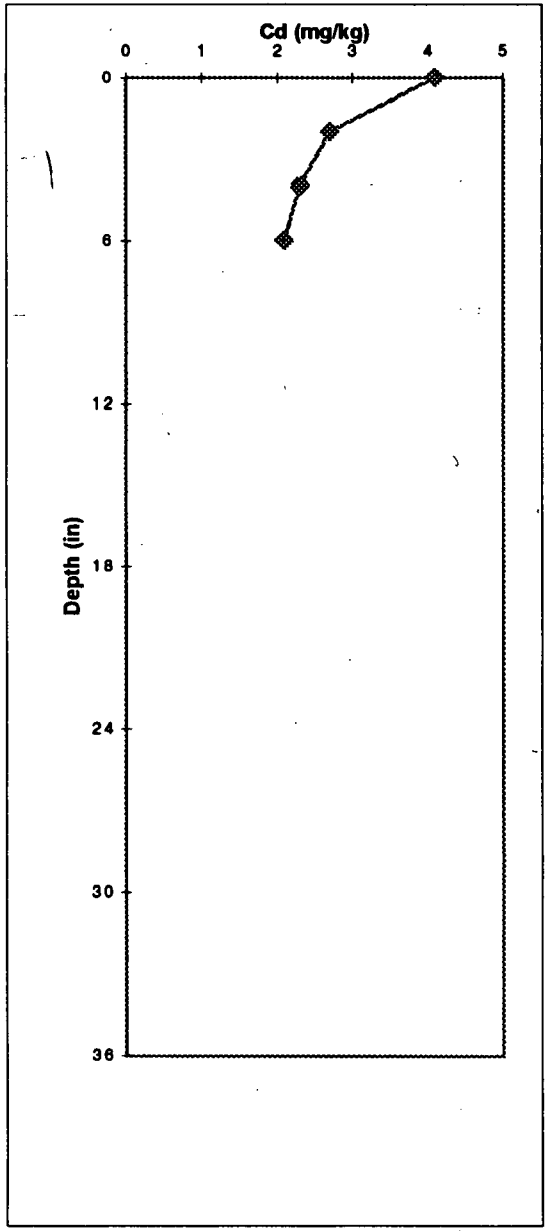


Figure J-14
Location SED08292





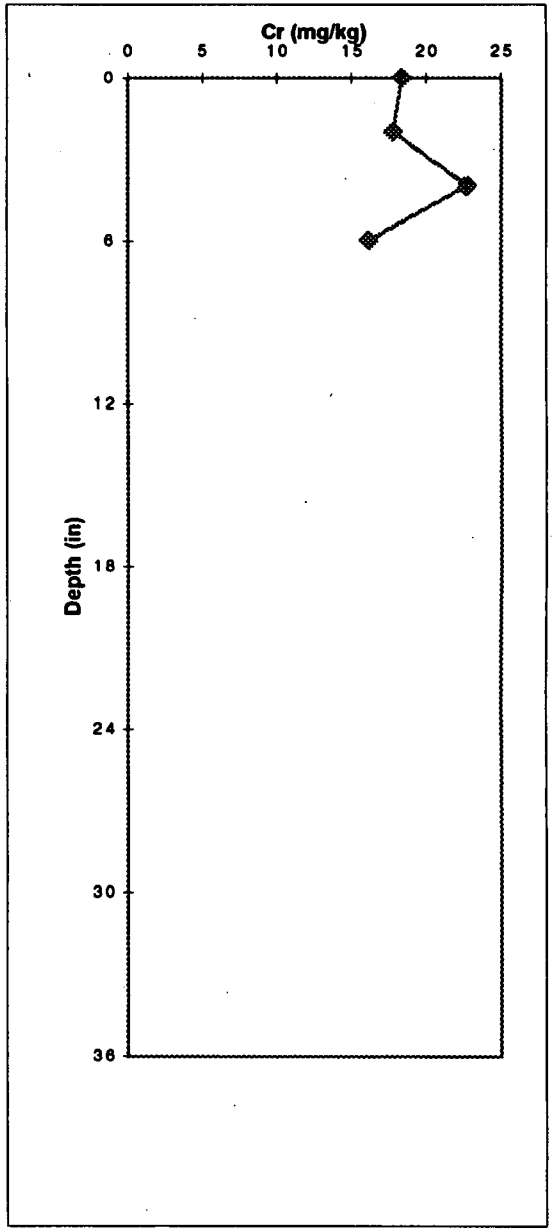


Figure J-14
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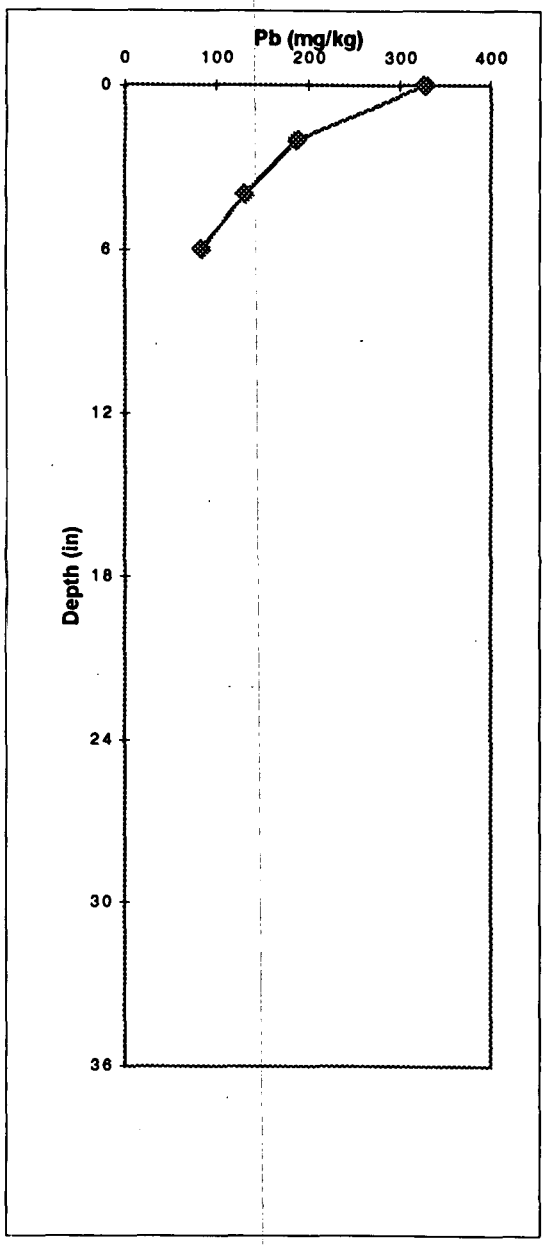
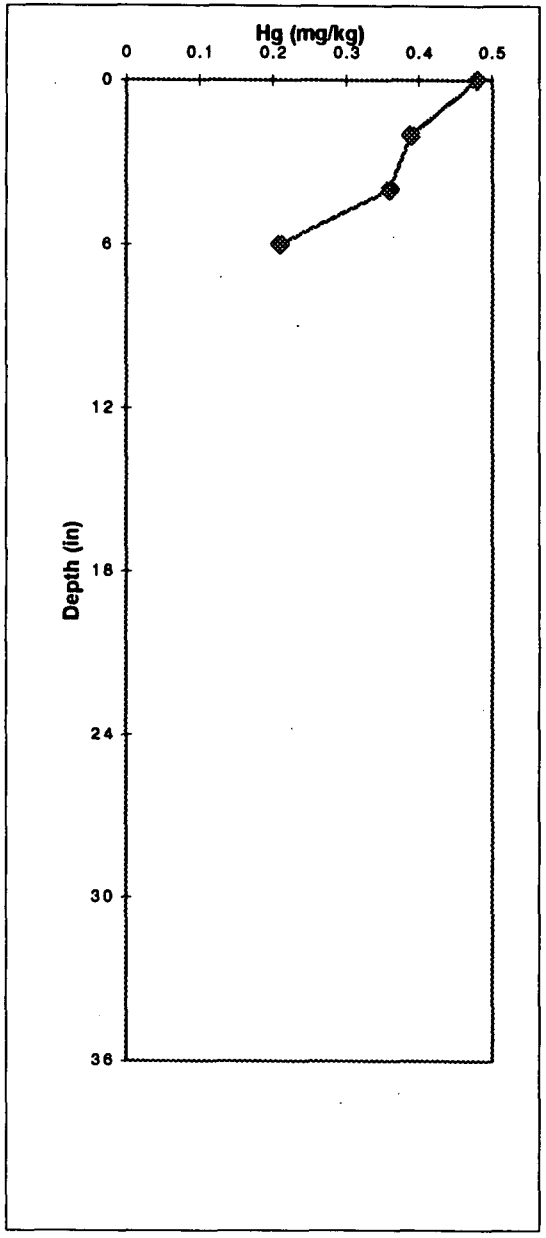




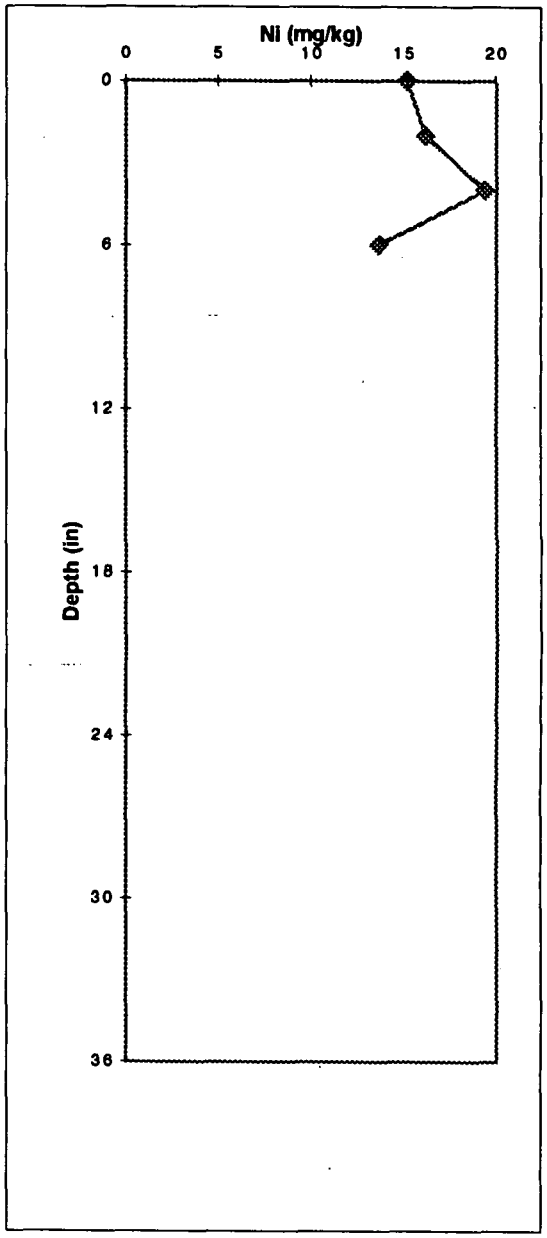
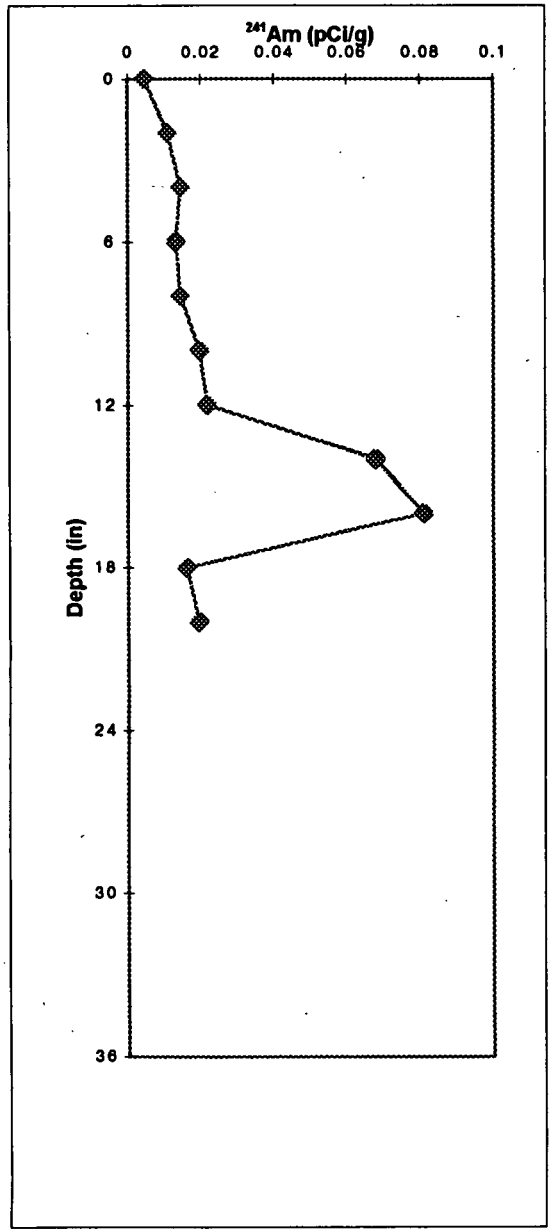
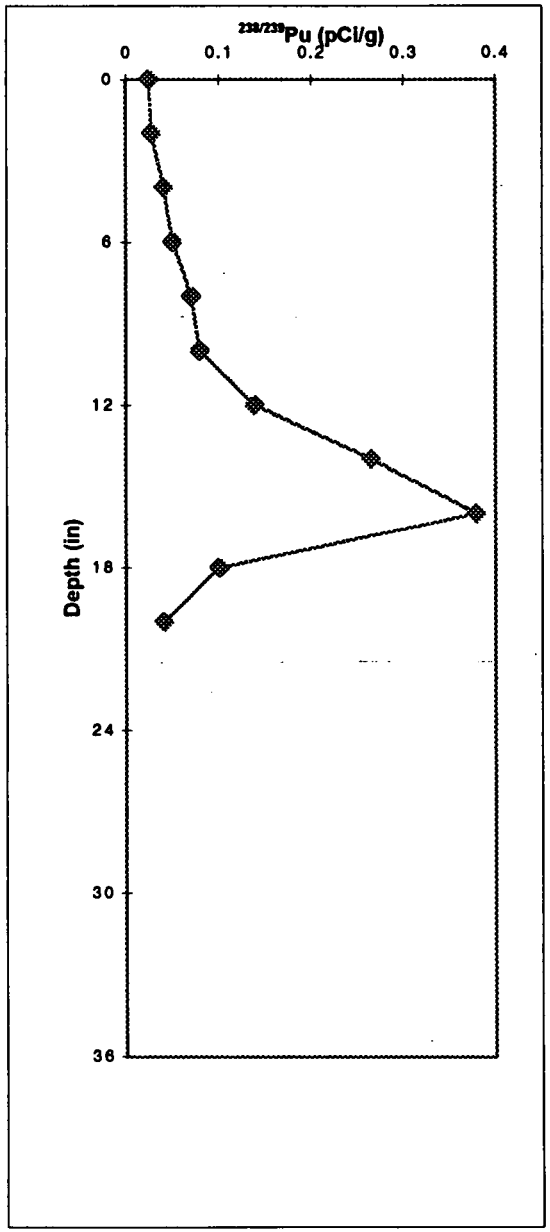


Figure J-15
Location SED08392





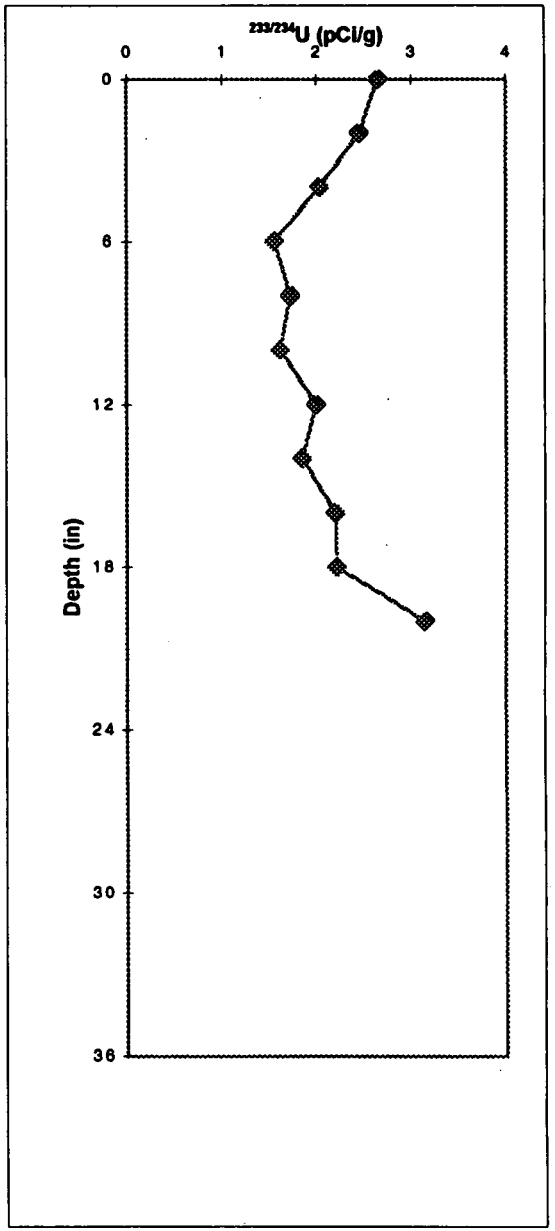


Figure J-15
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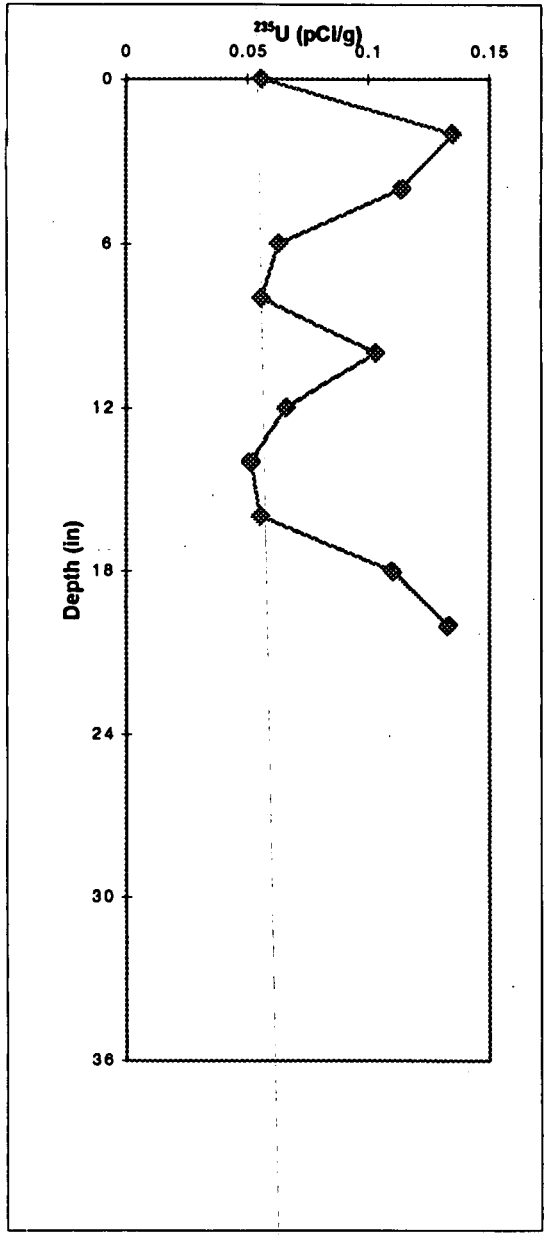
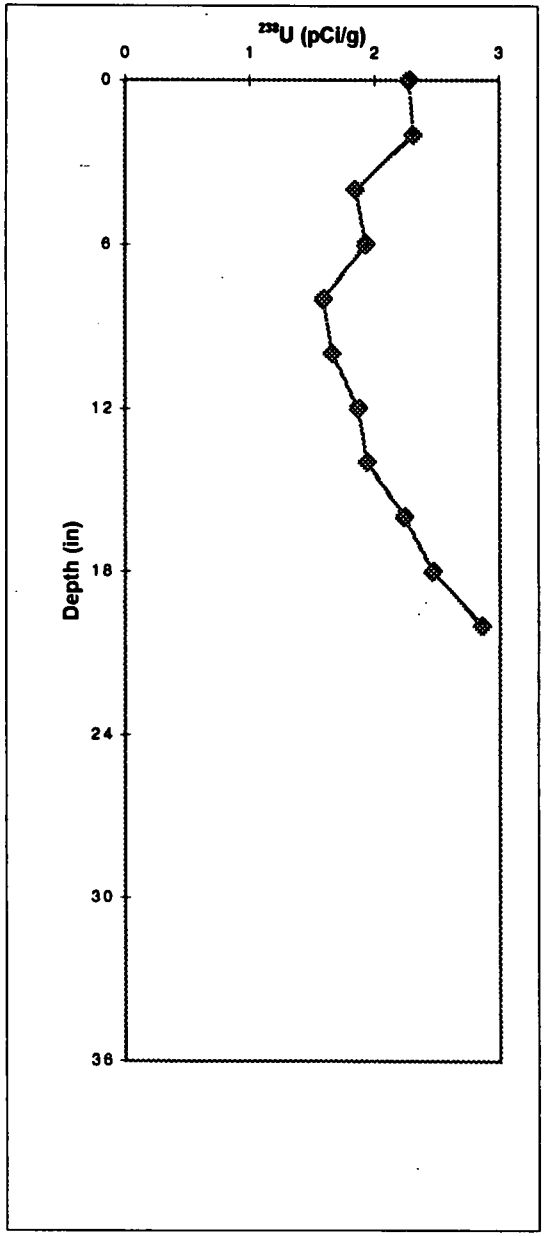
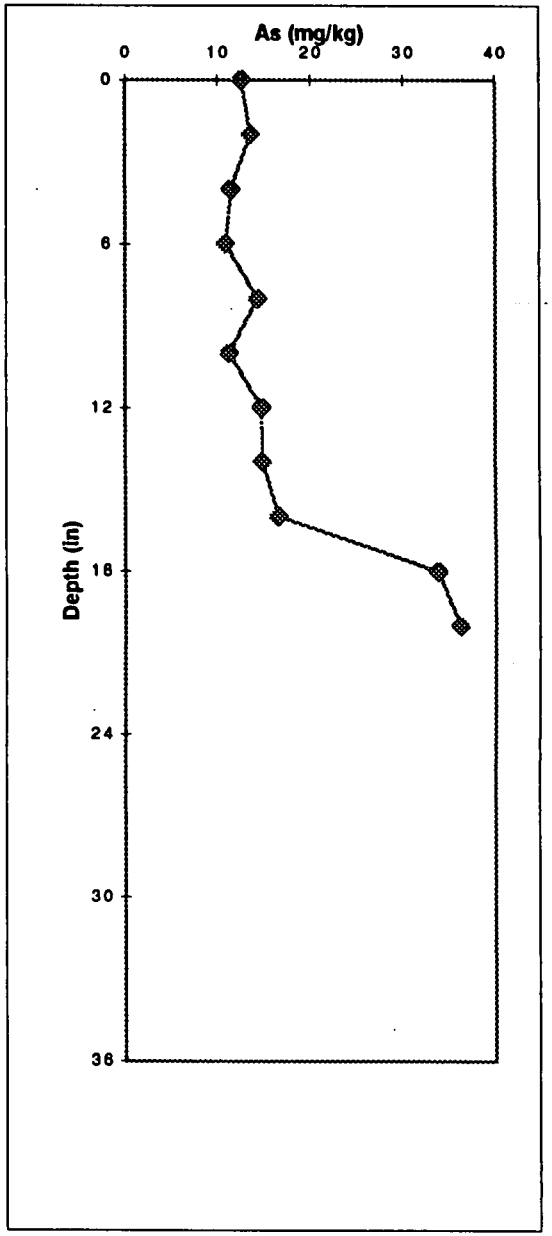
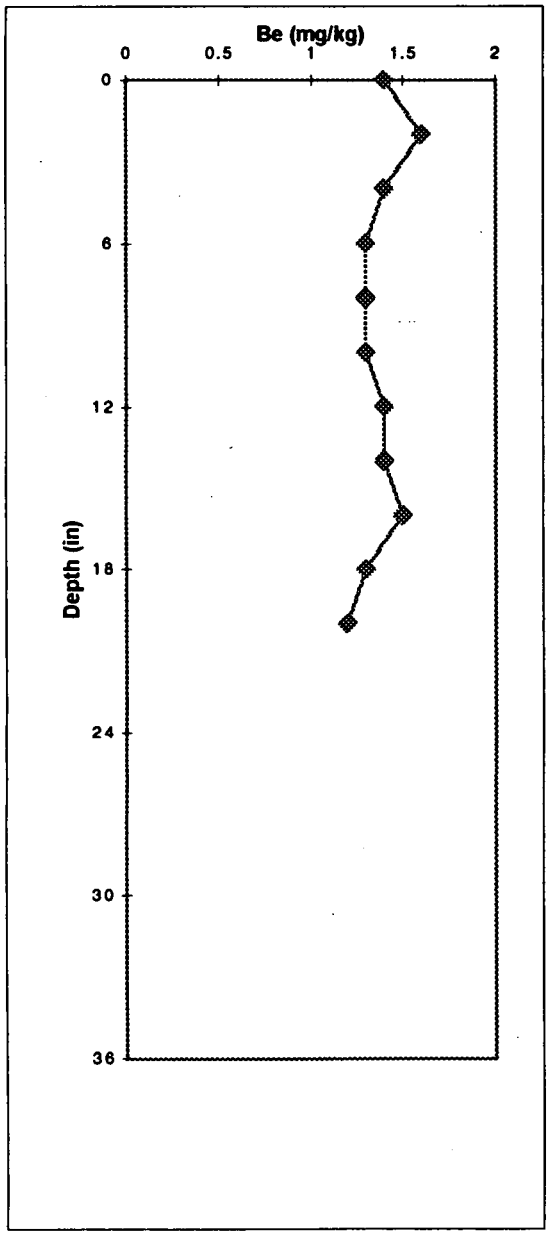
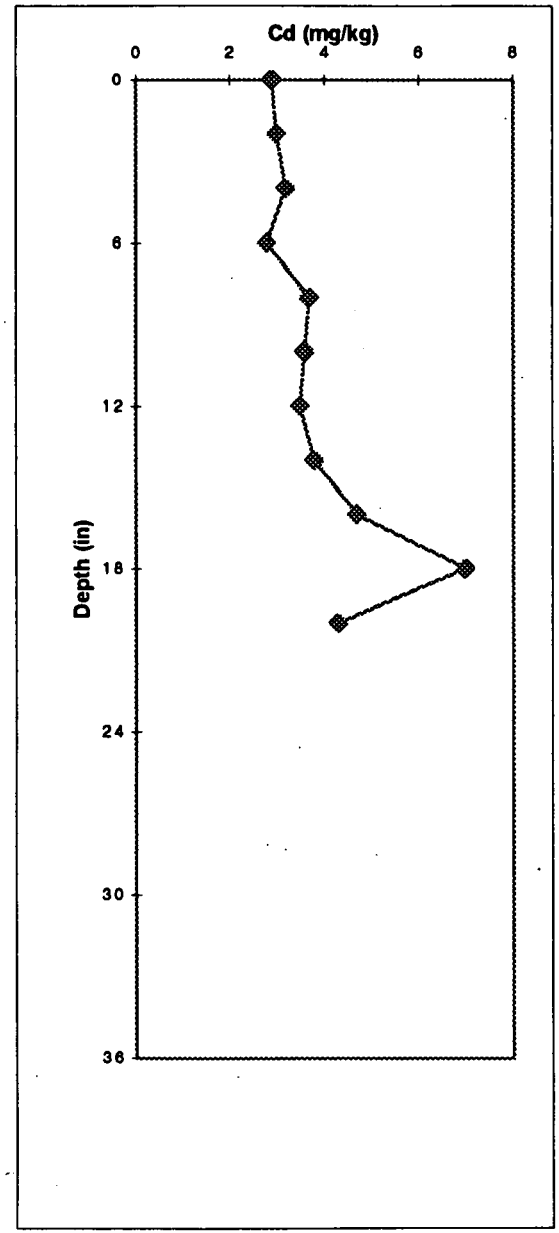






Figu J-15
Location SED08392





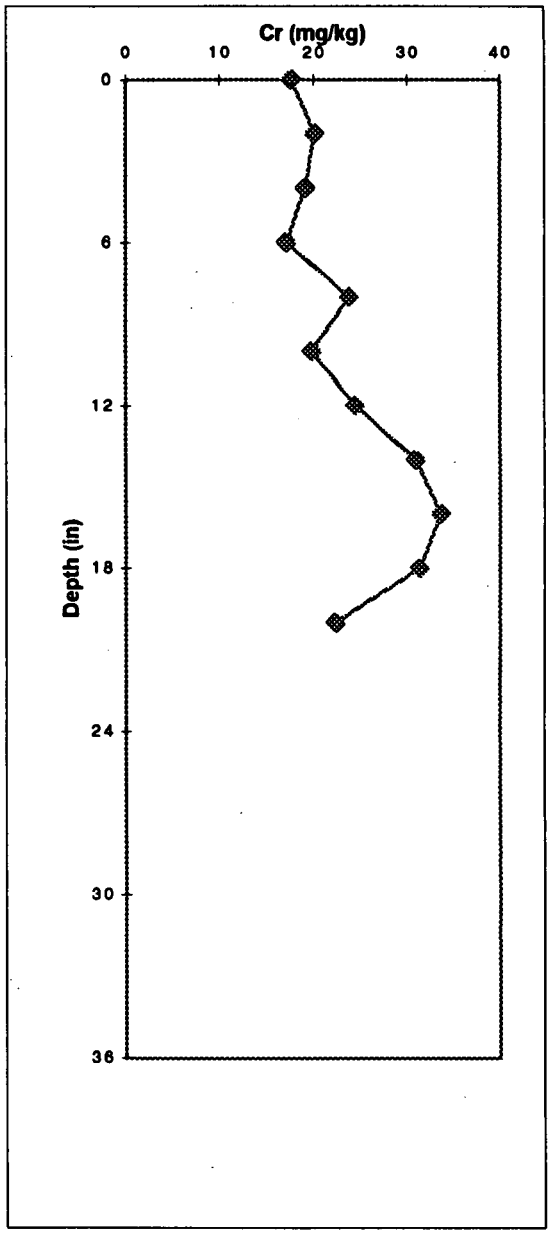
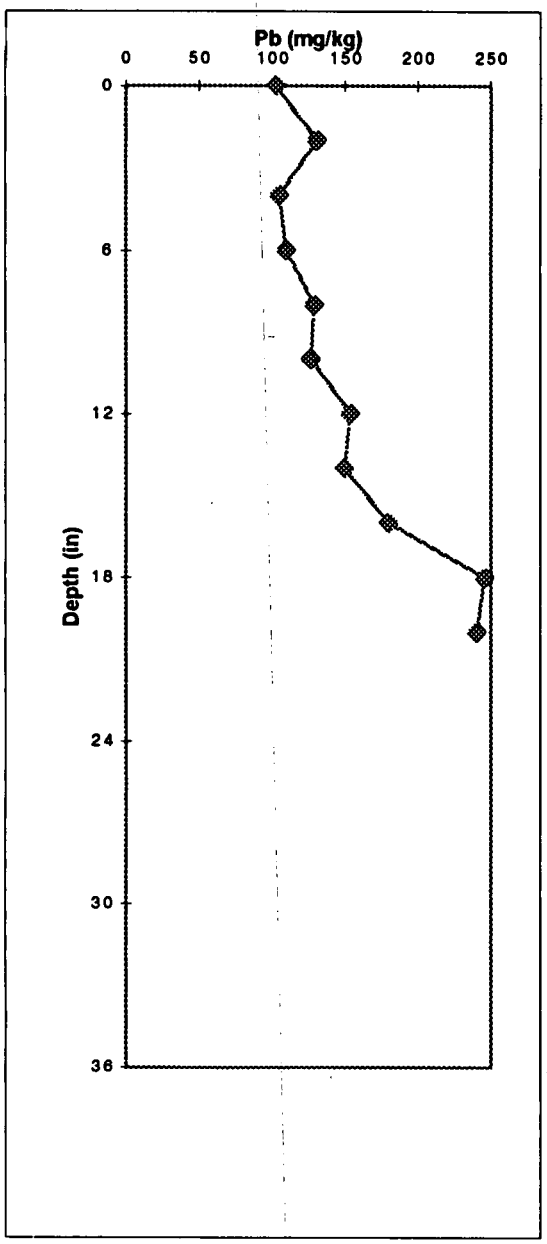
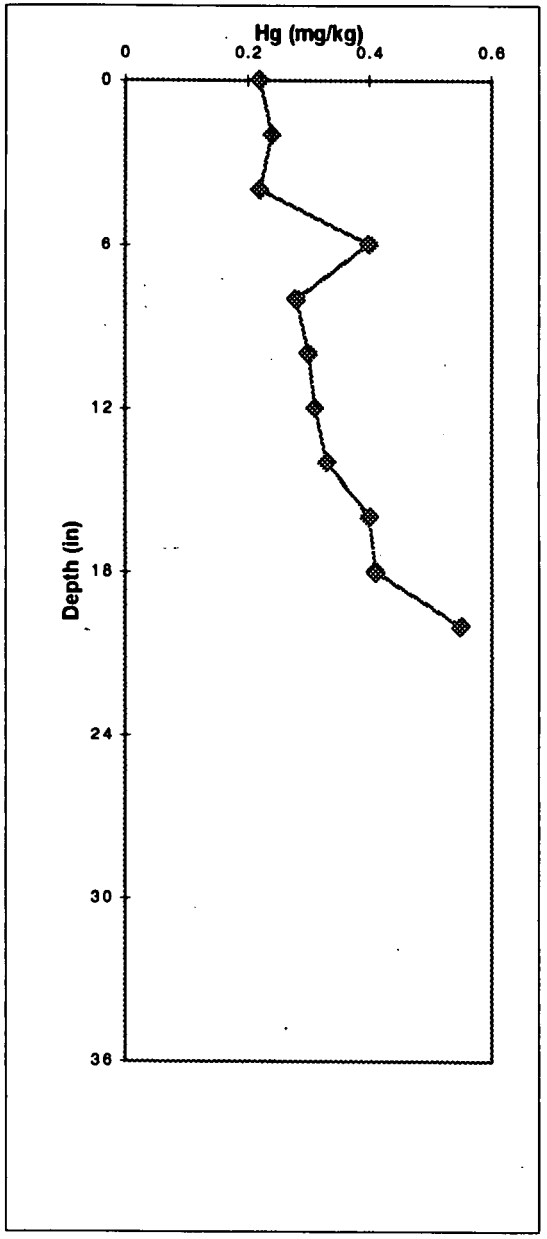


Figure J-15
Location SED08392





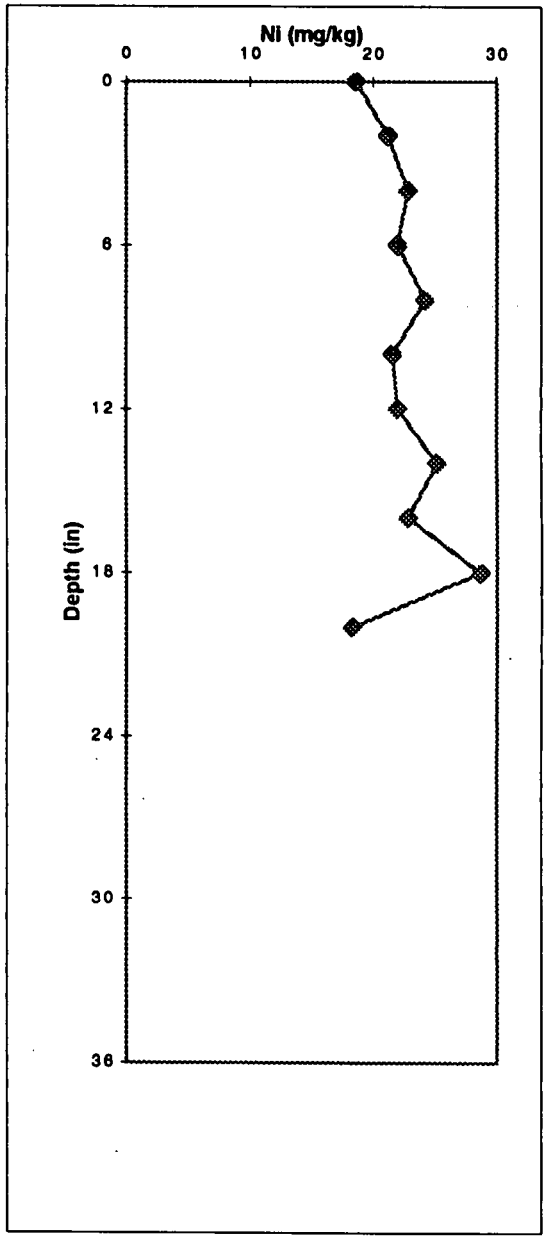
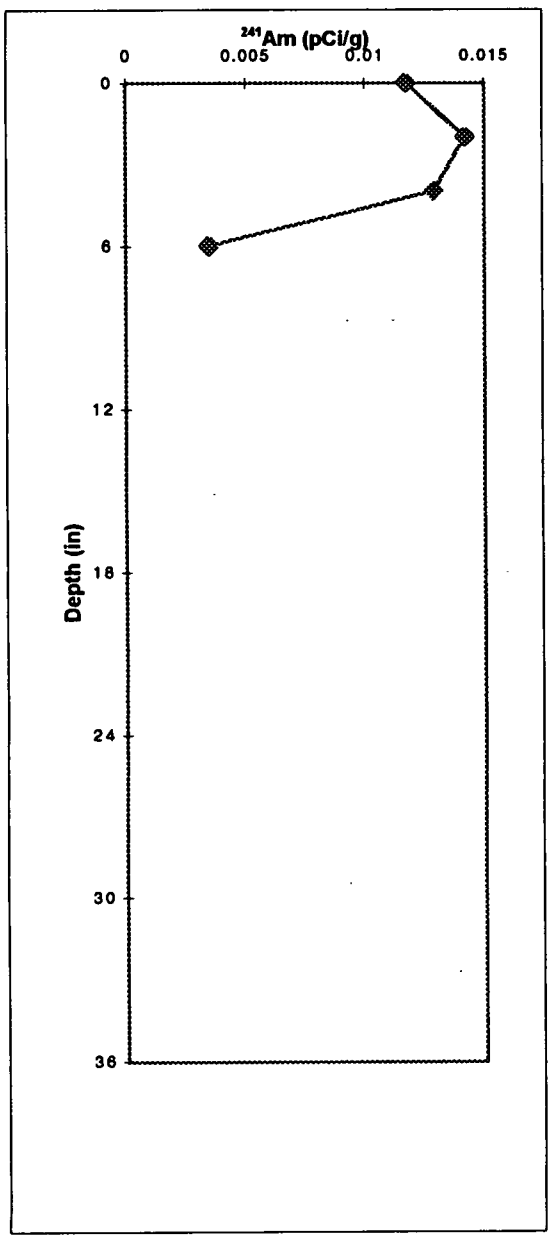
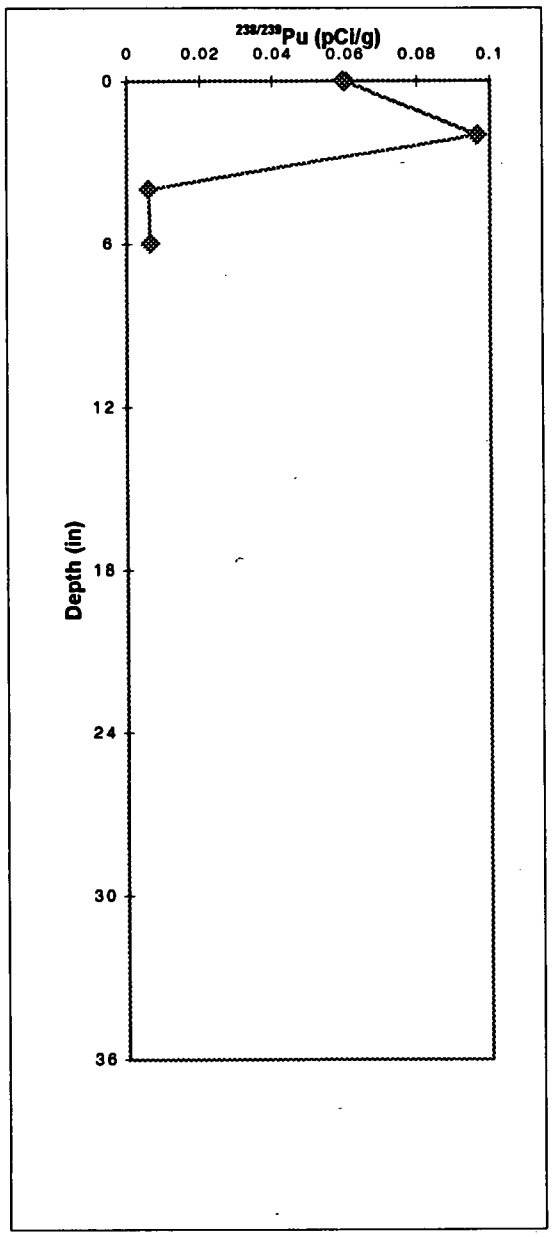


Figure J-16
Location SED08492





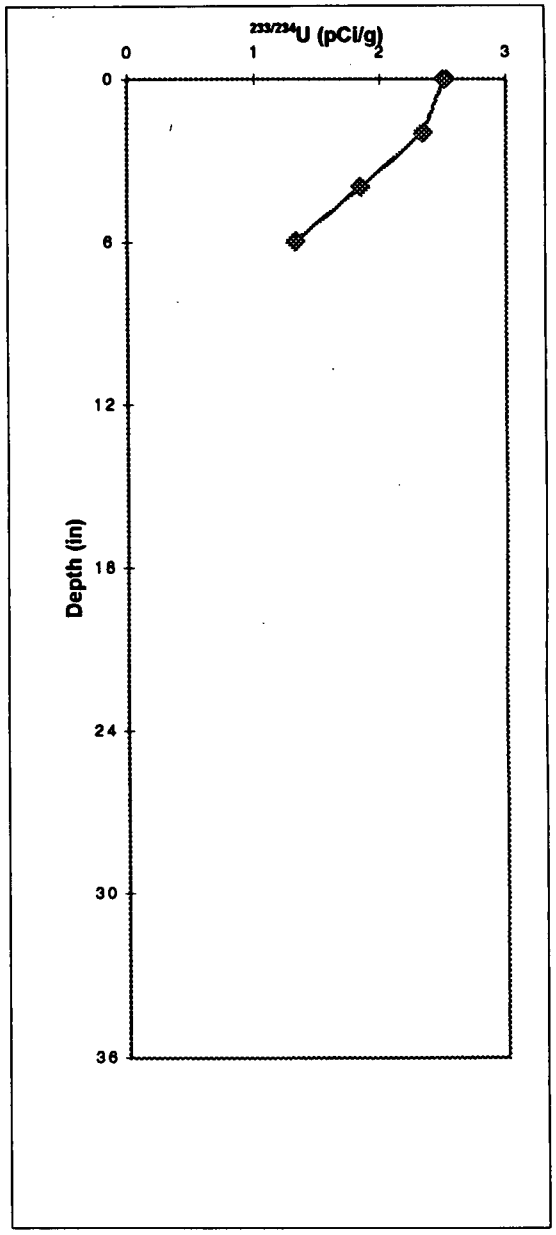
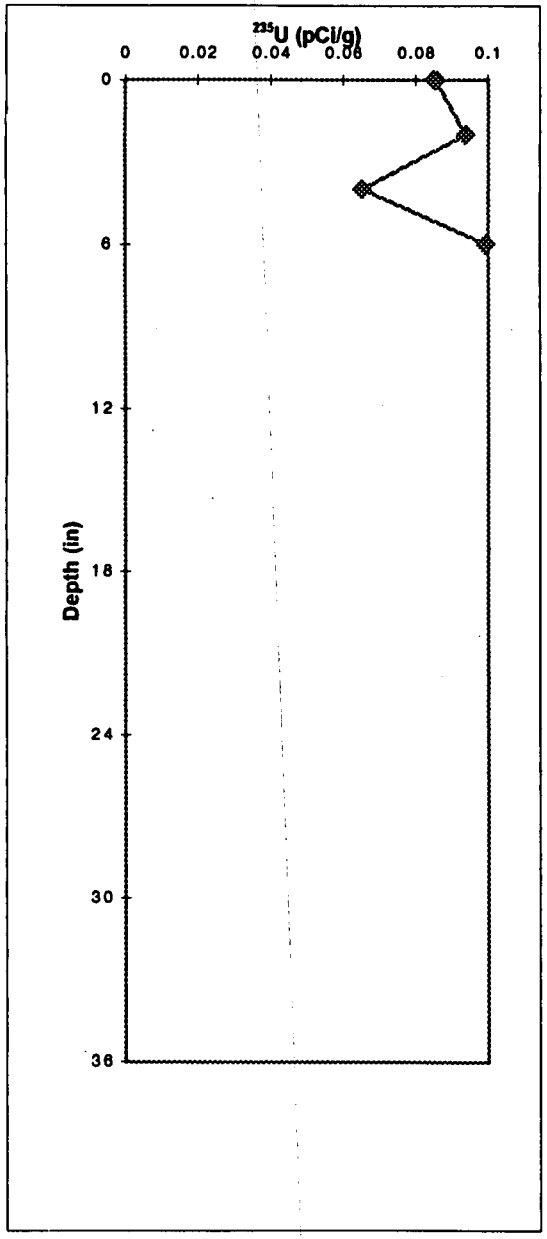
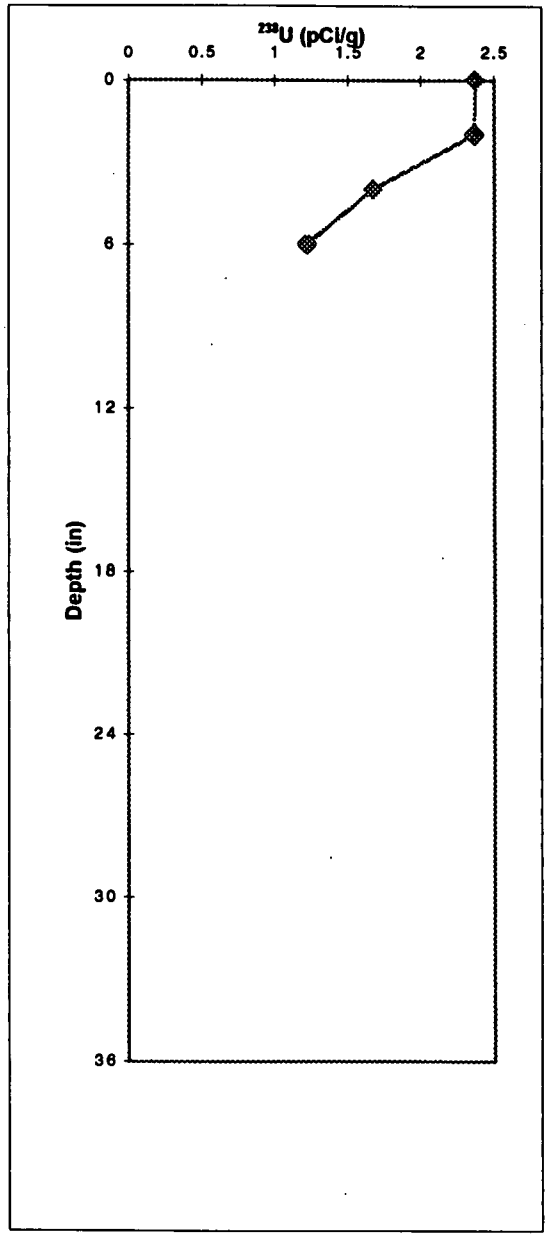


Figure J-16
Location SED08492





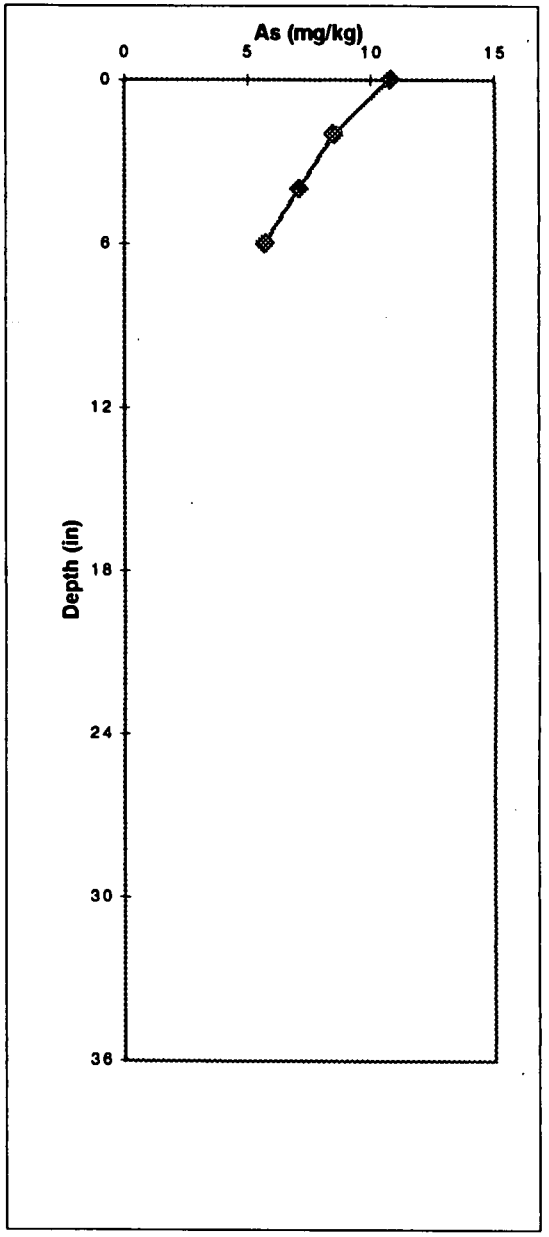
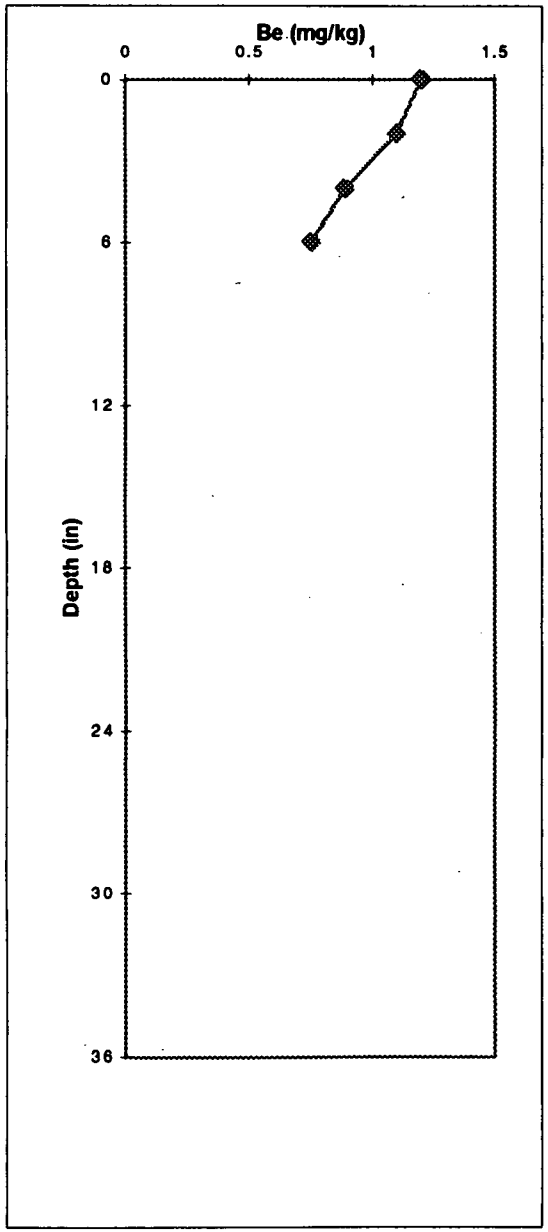
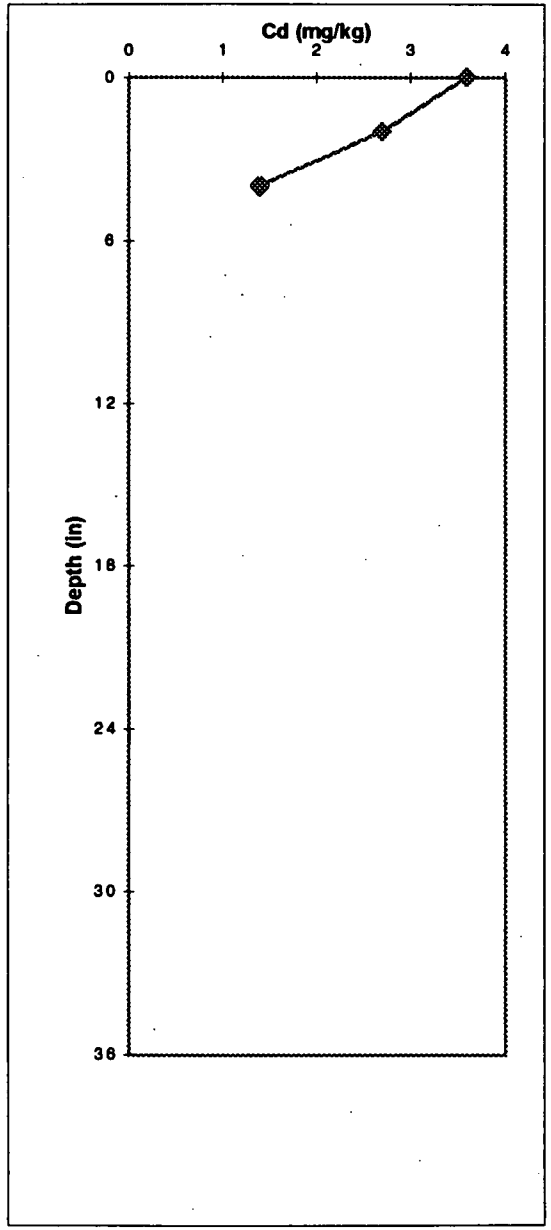


Figure J-16
Location SED08492





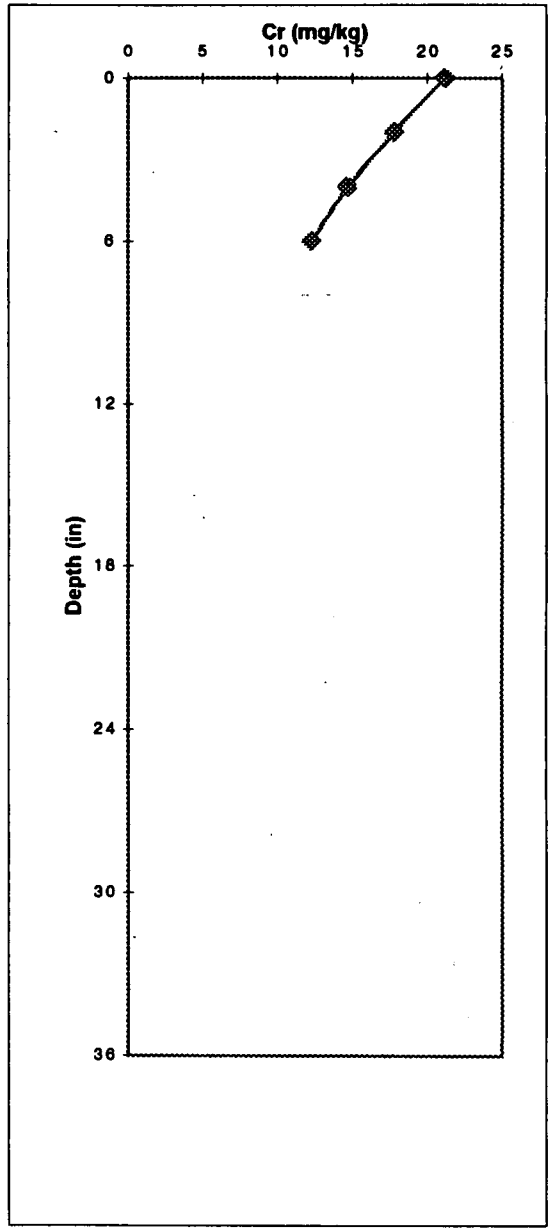


Figure J-16
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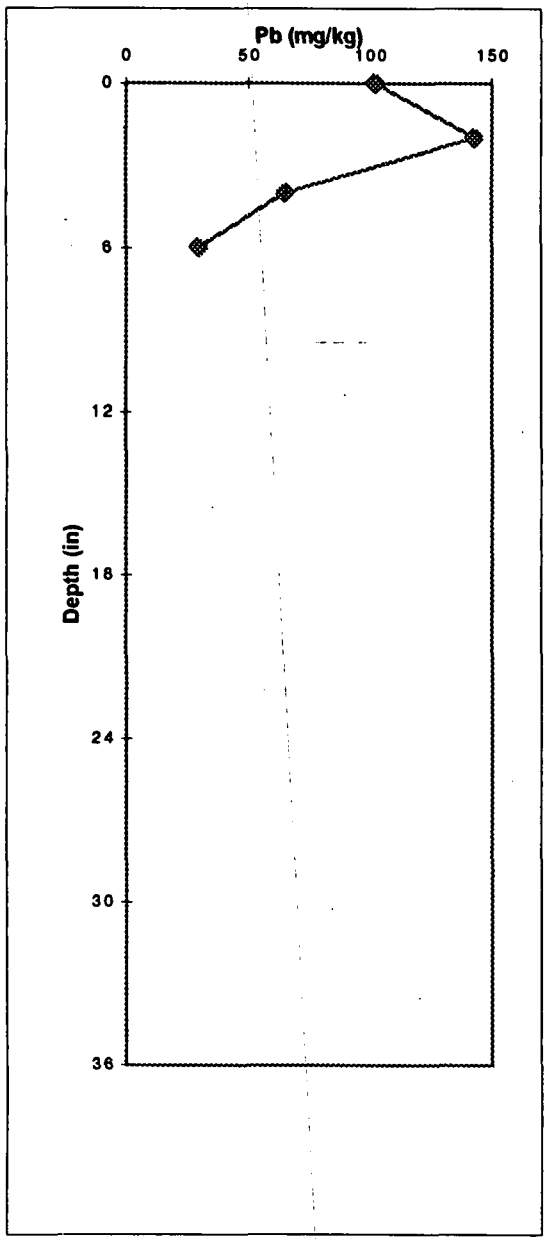
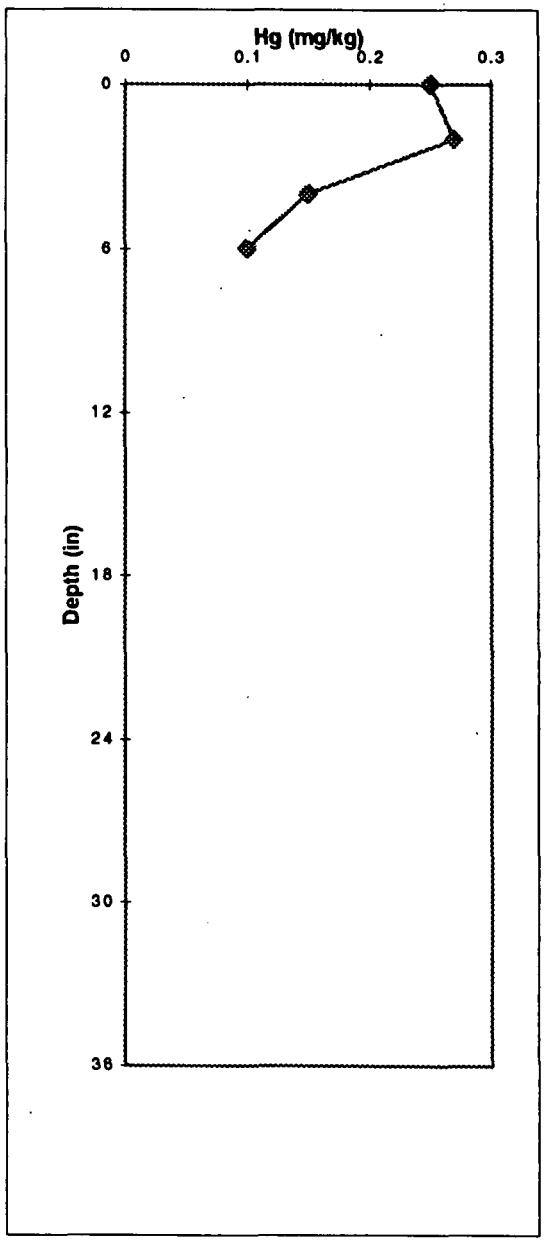




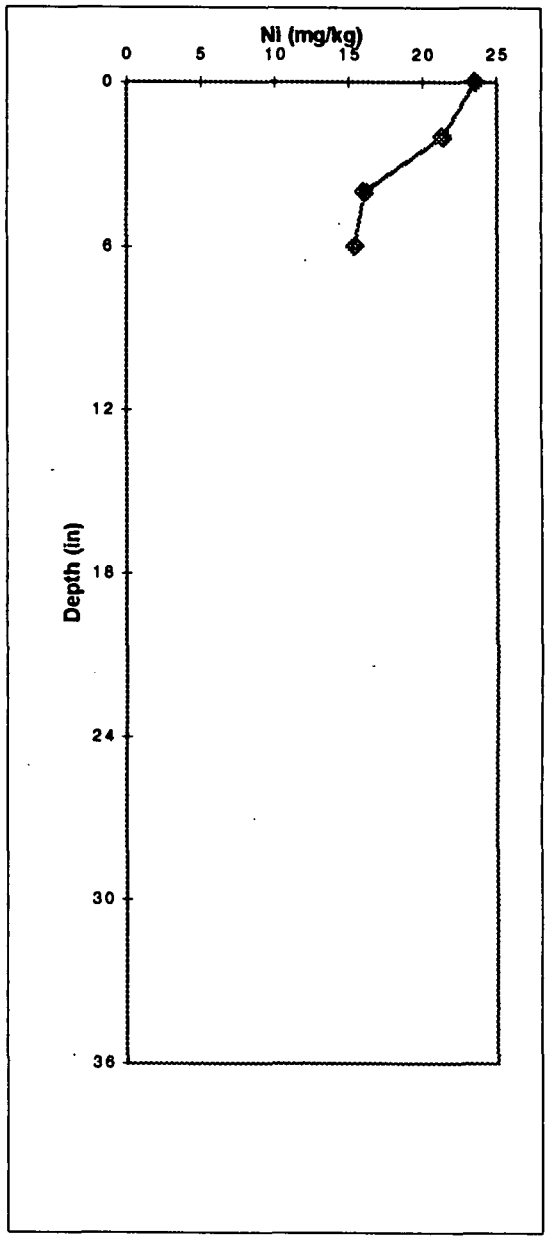
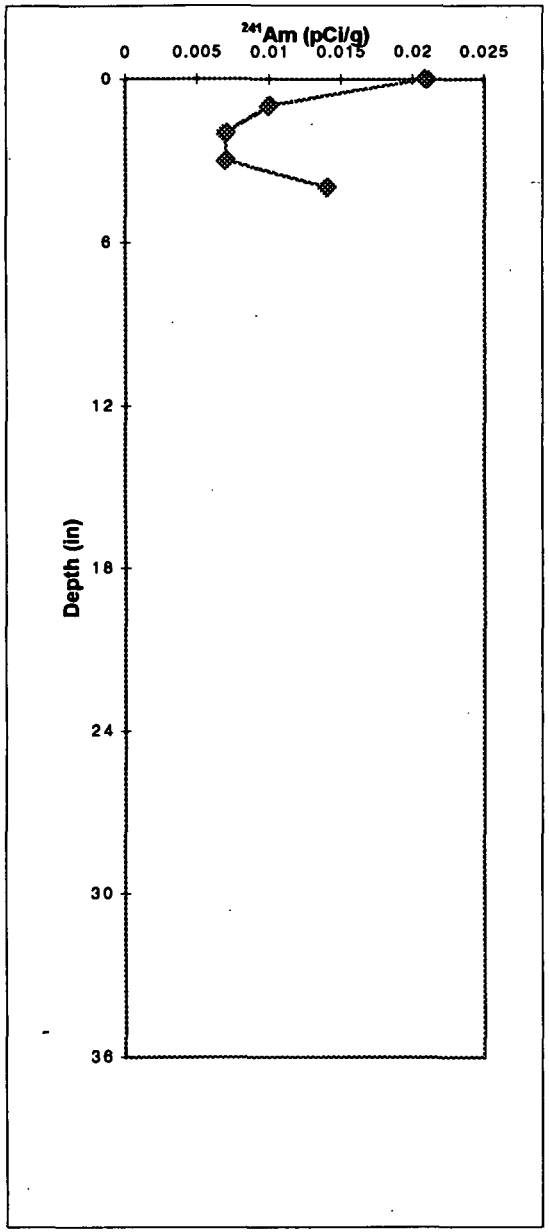
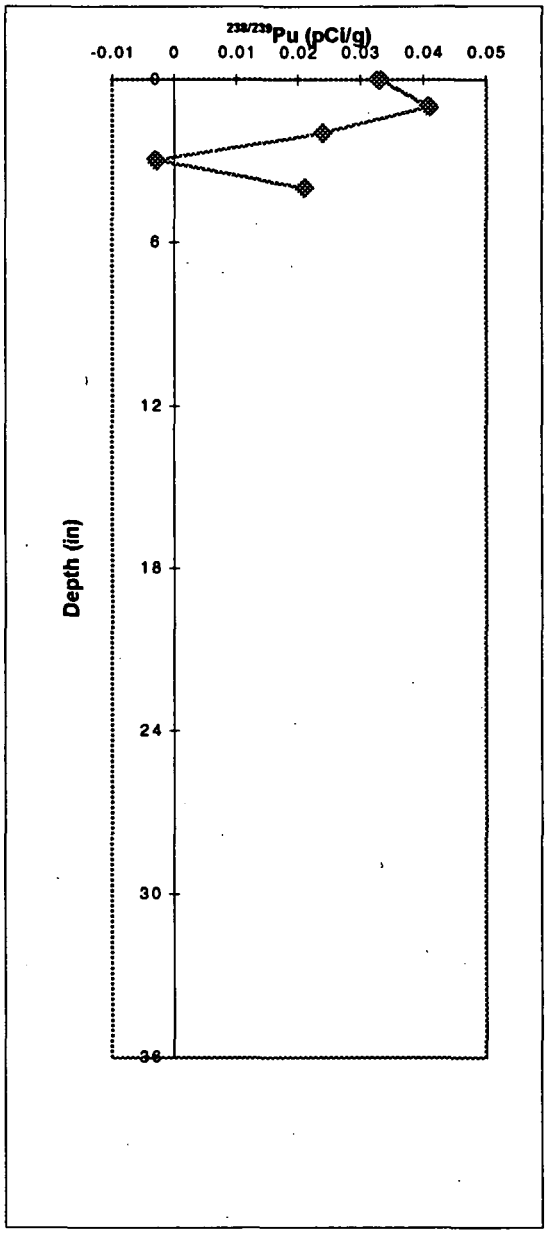


Figure J-17
Location SED07592





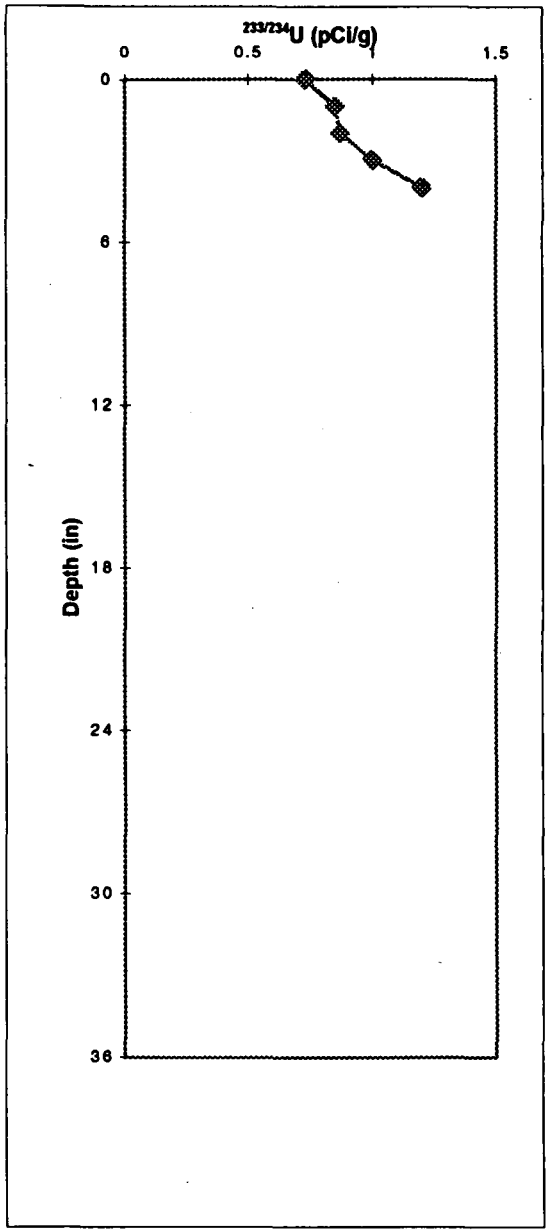
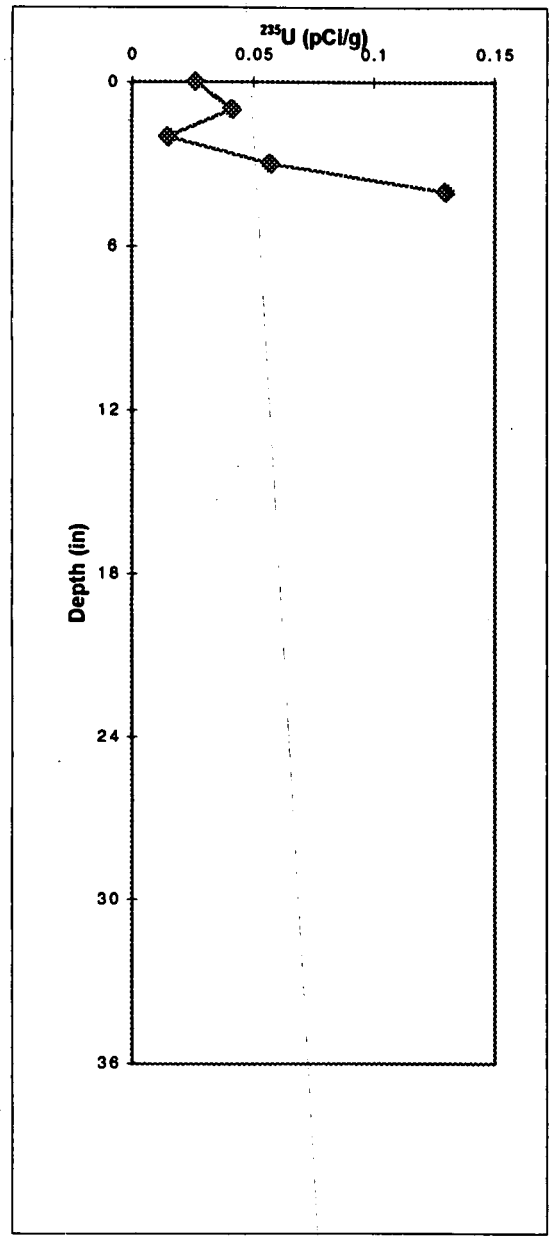
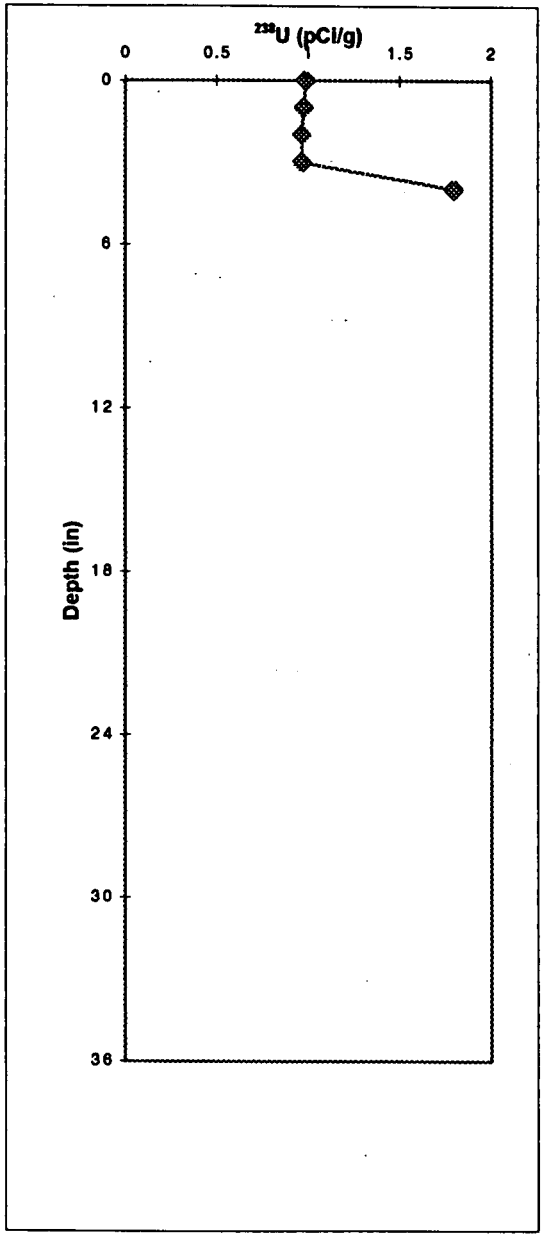
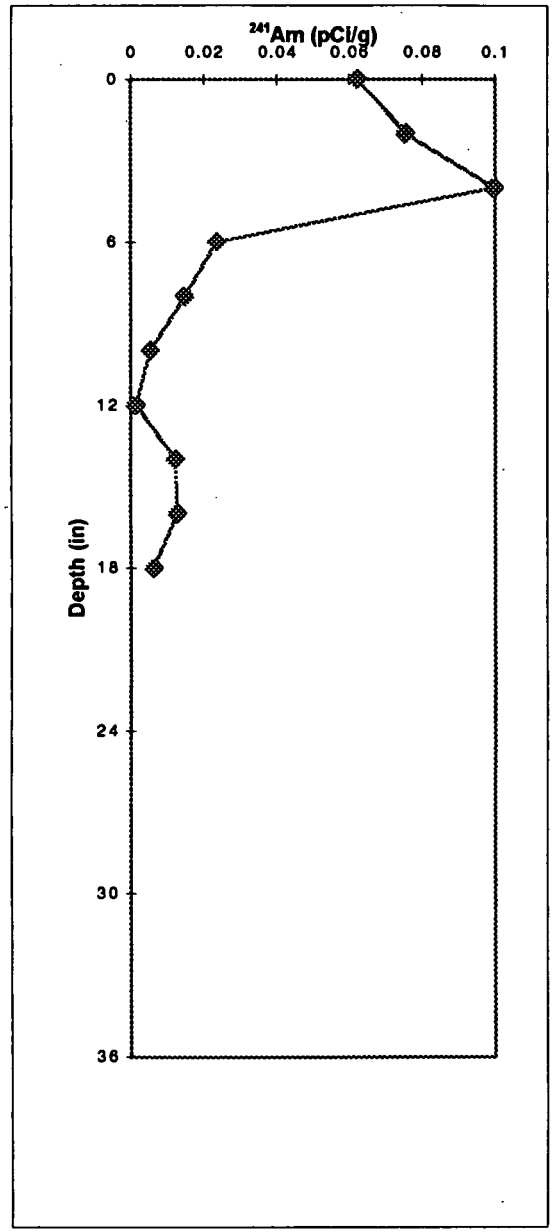


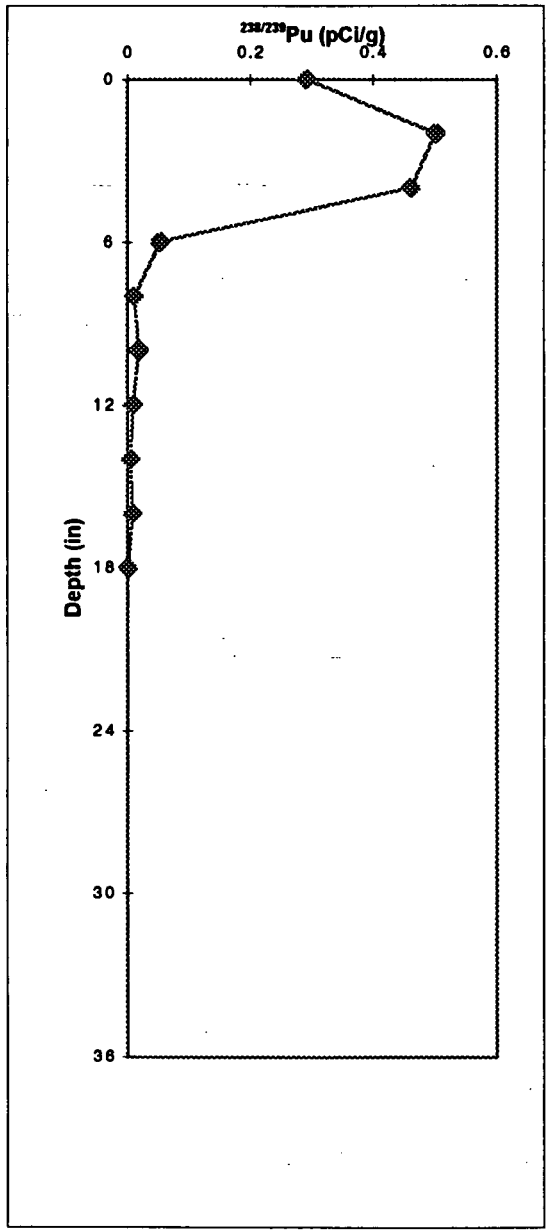
Figure J-17
Location SED07592





Figu J-18
Location SED08892





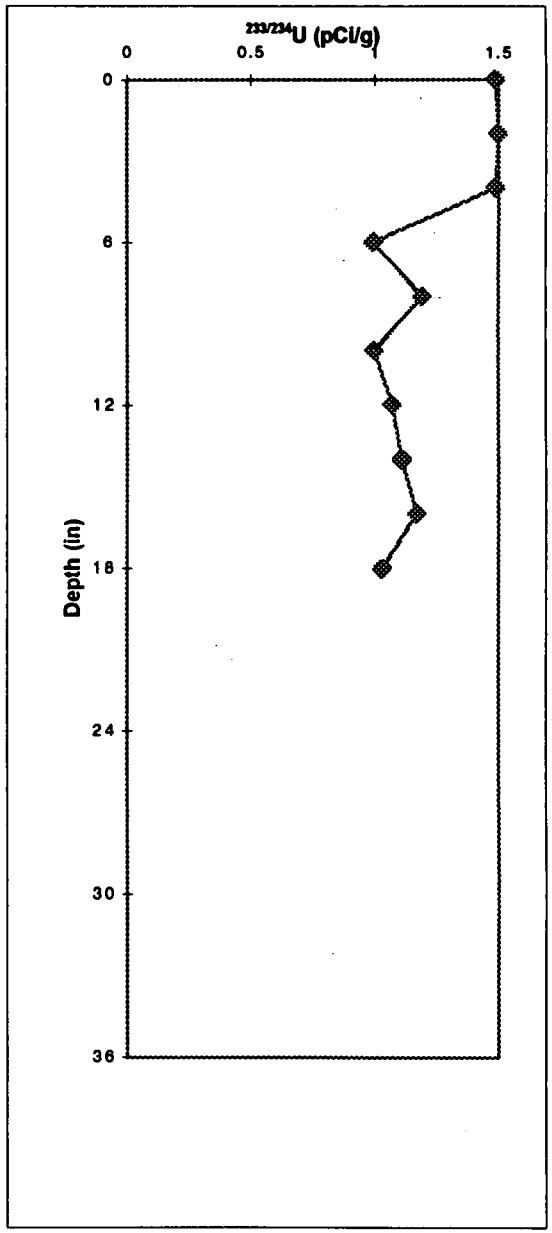
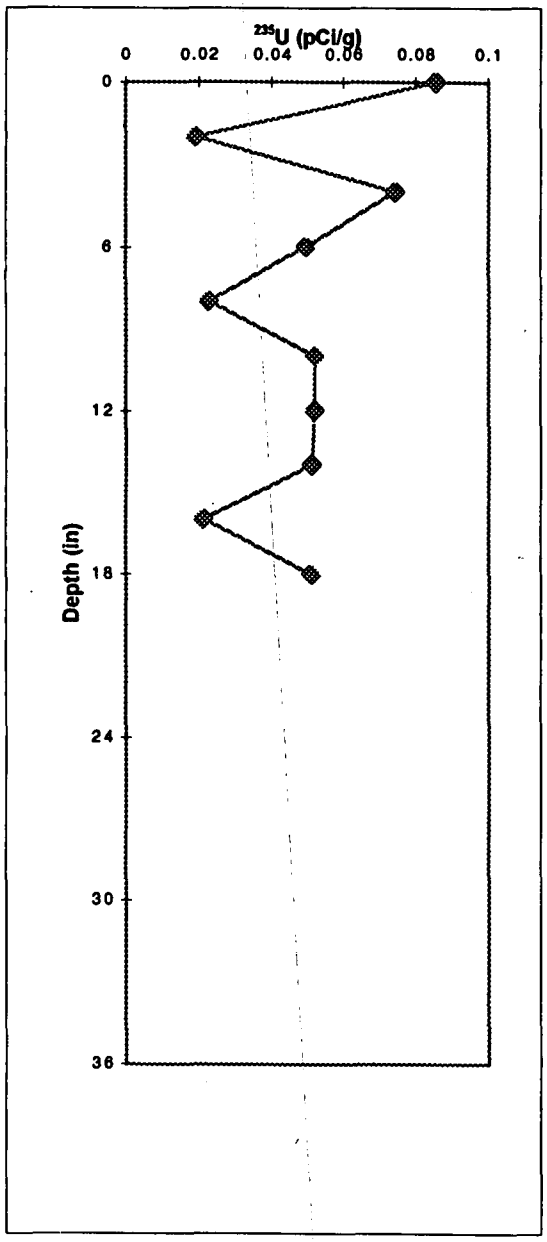
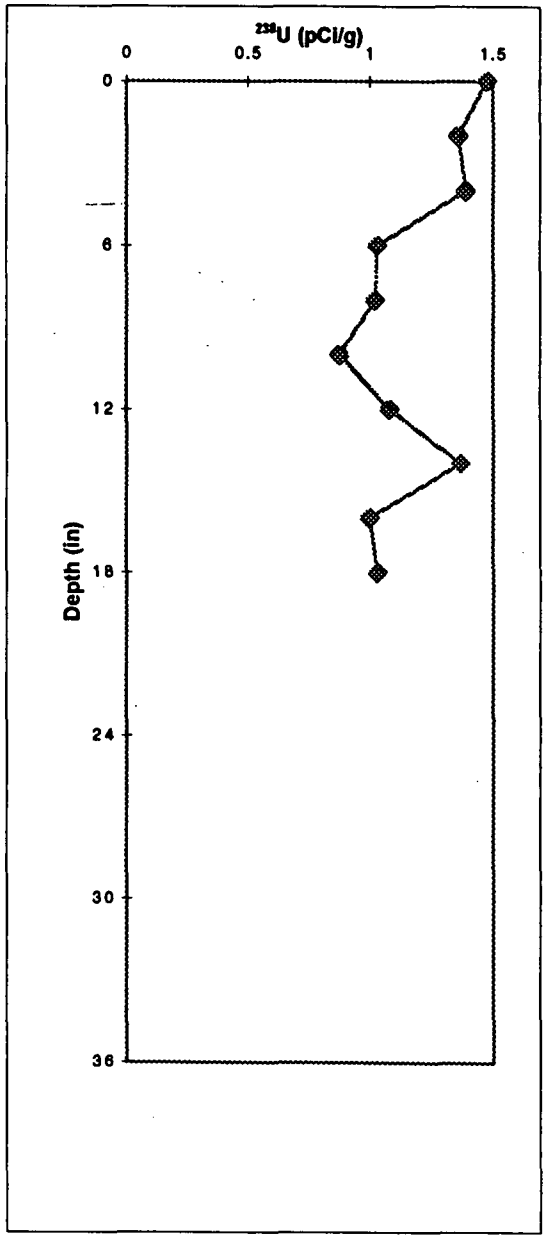
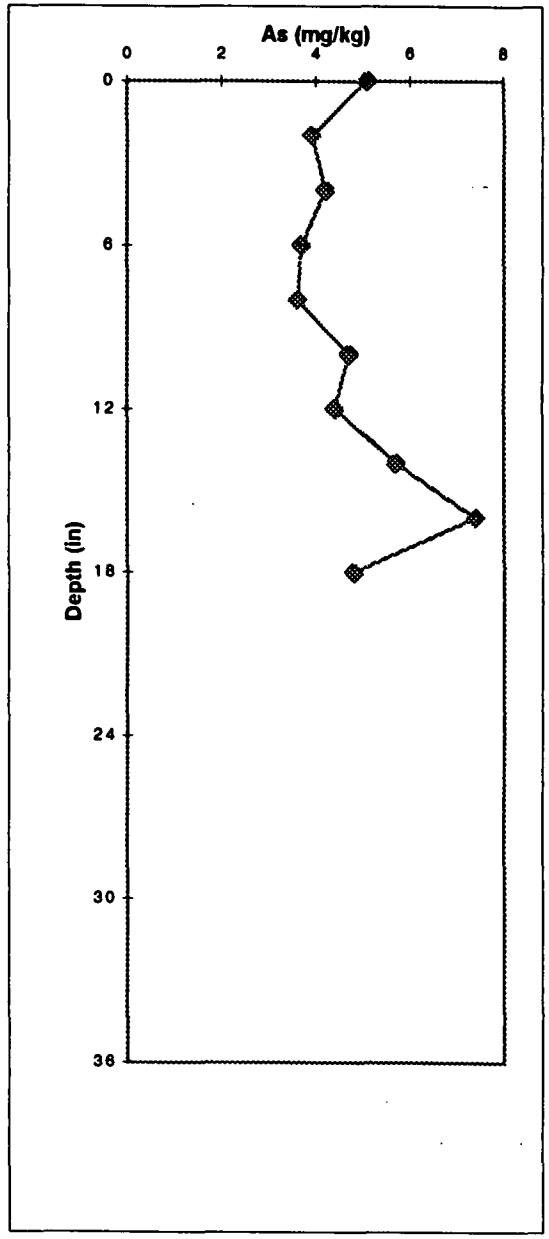


Figure J-18
Location SED08892







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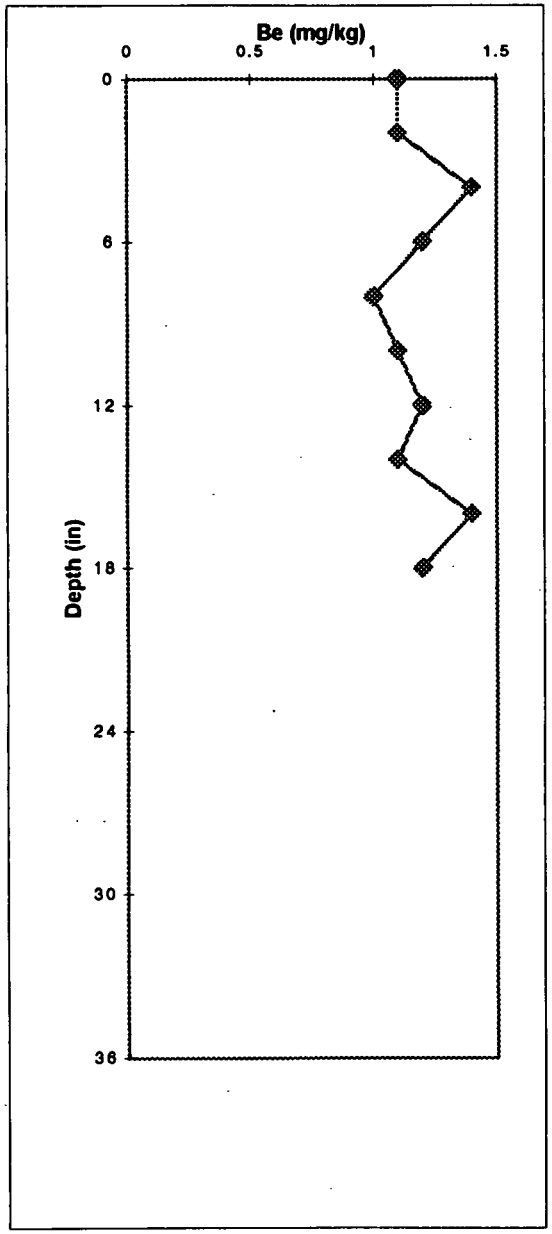

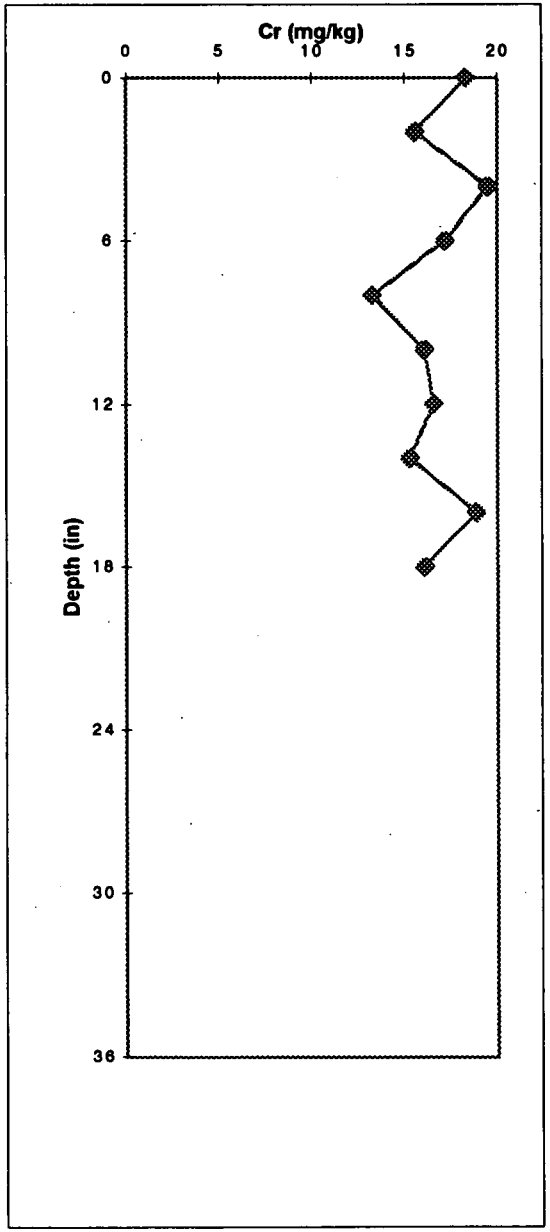

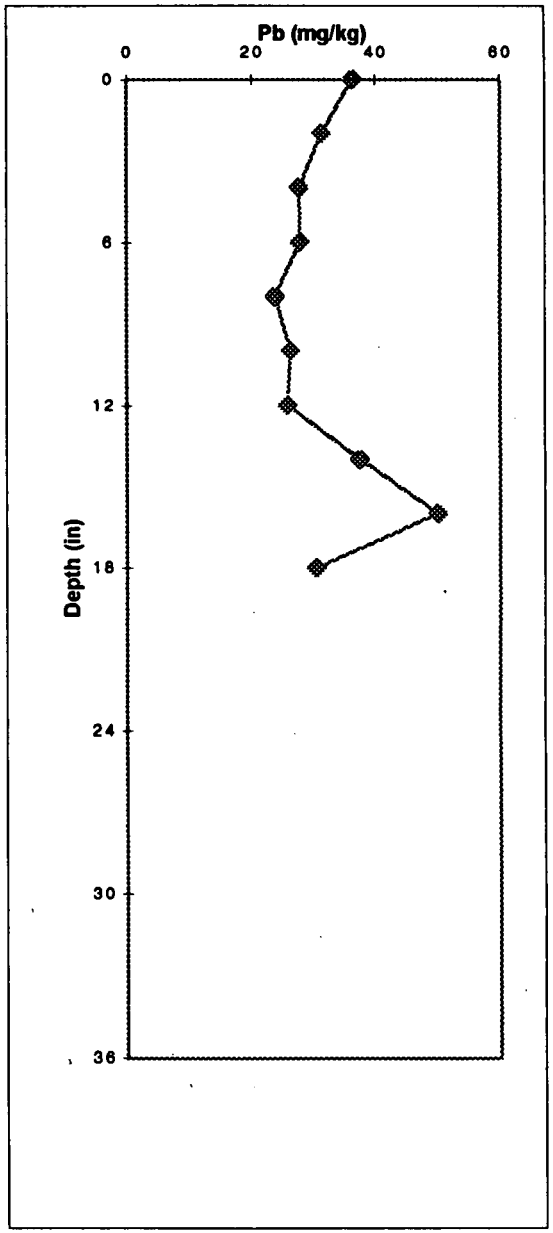

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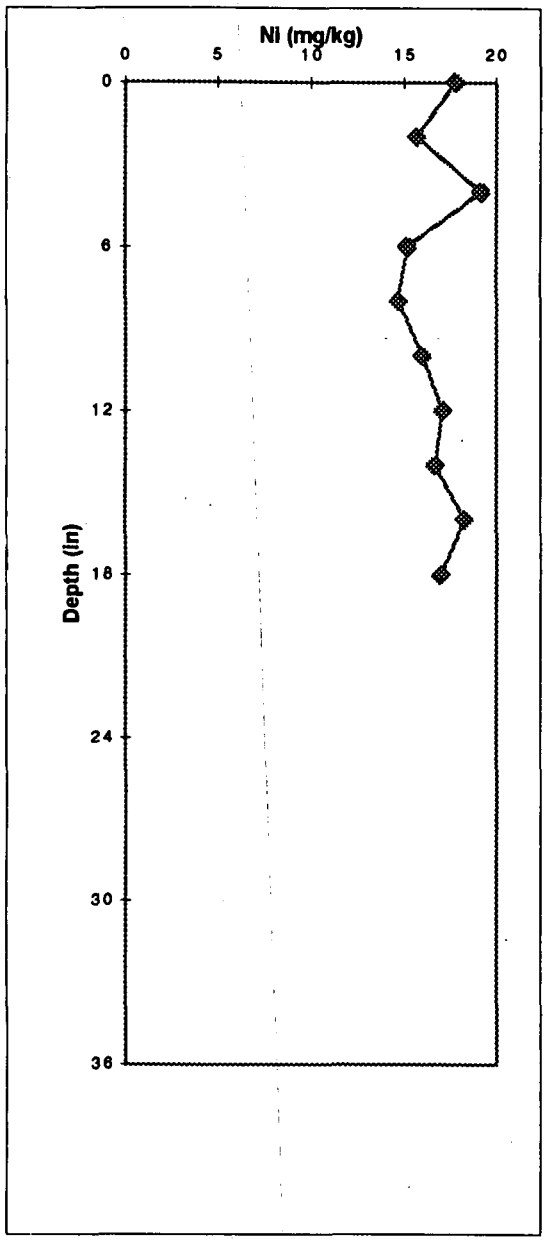

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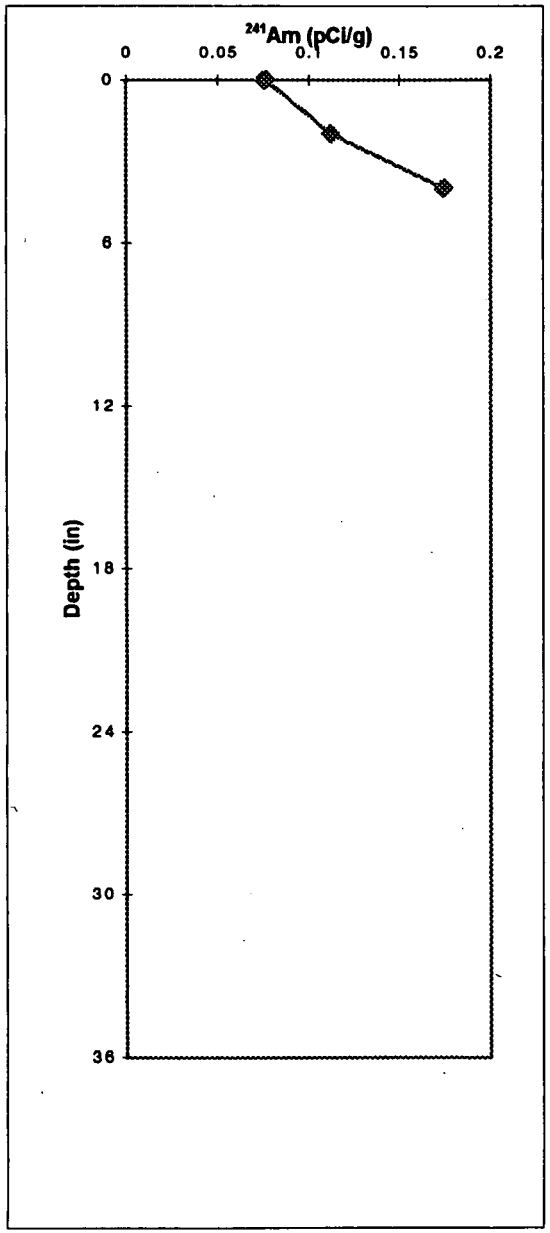

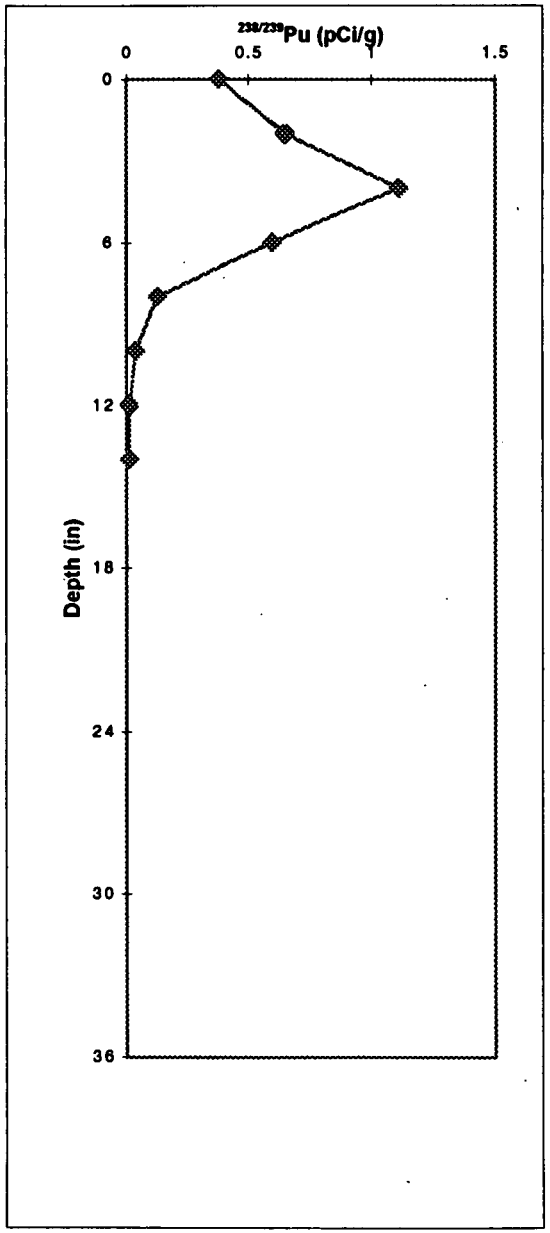

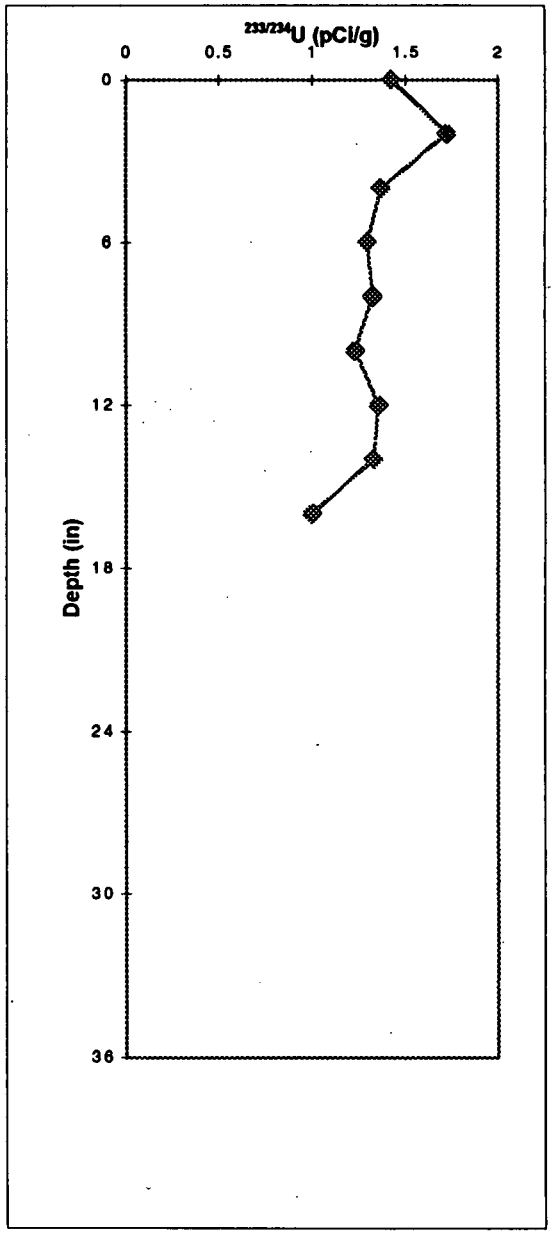

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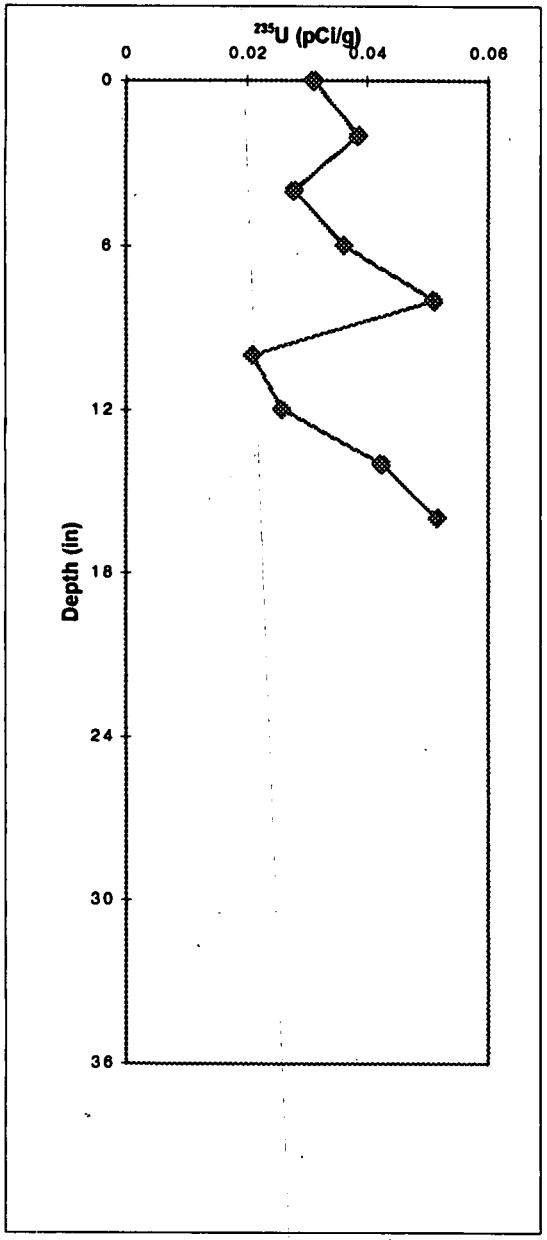

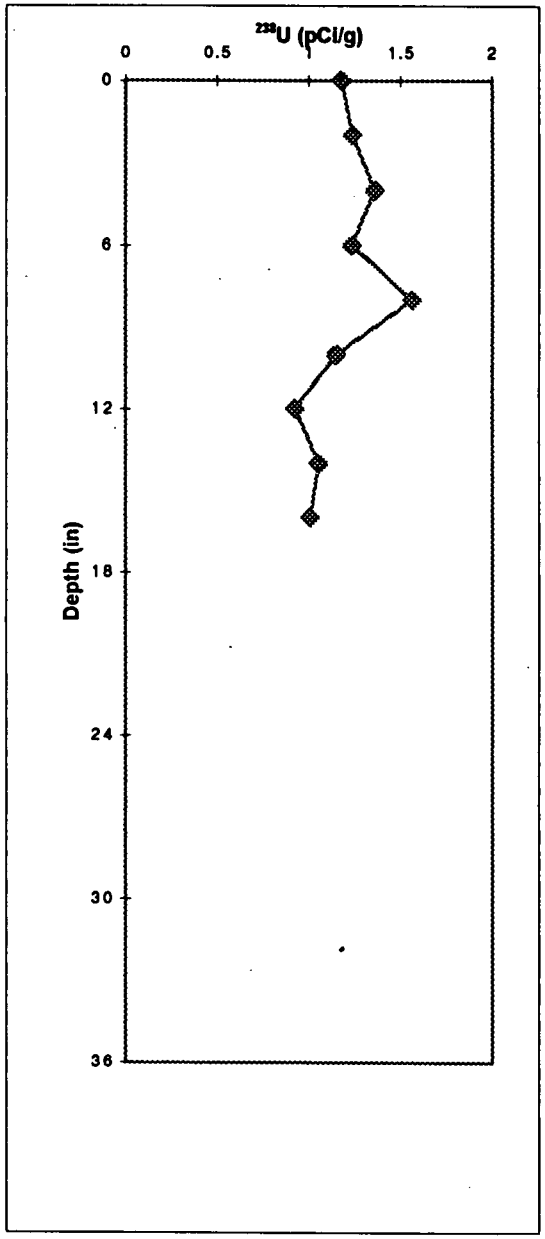

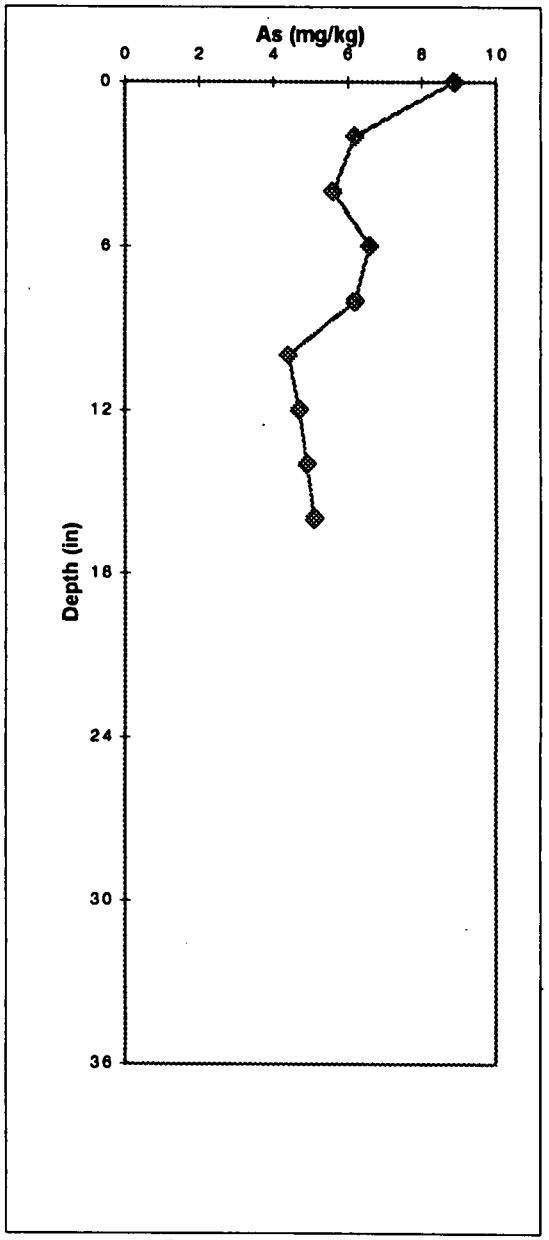

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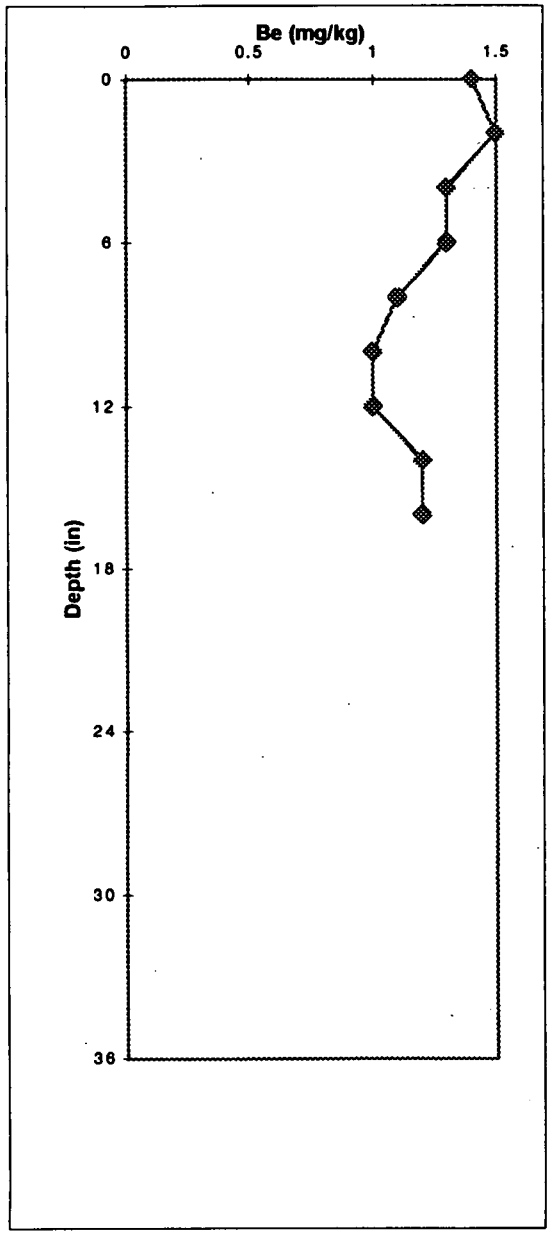

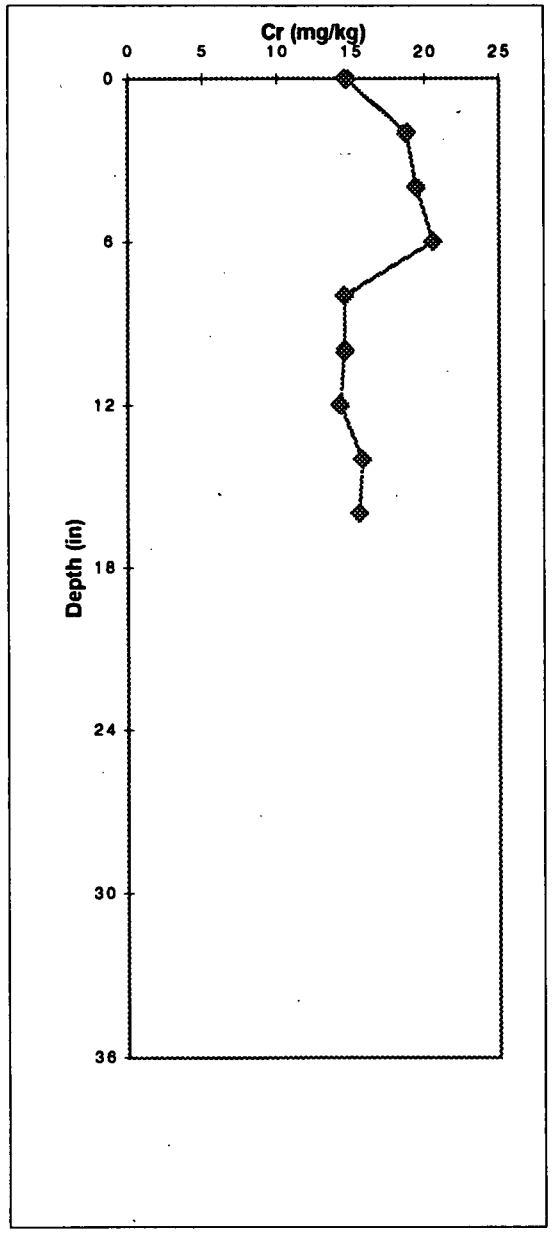

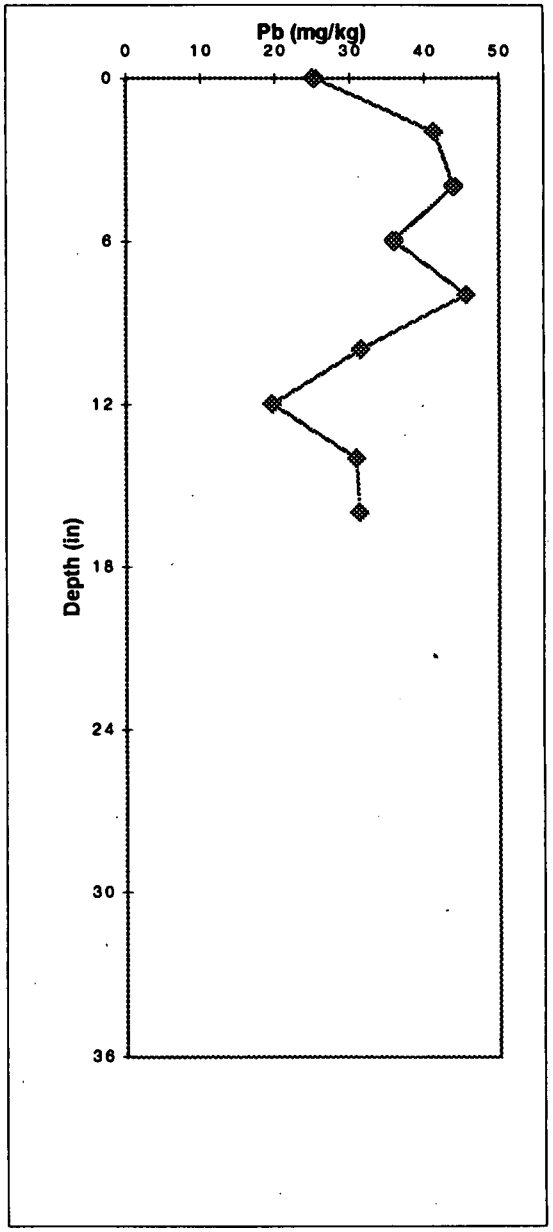

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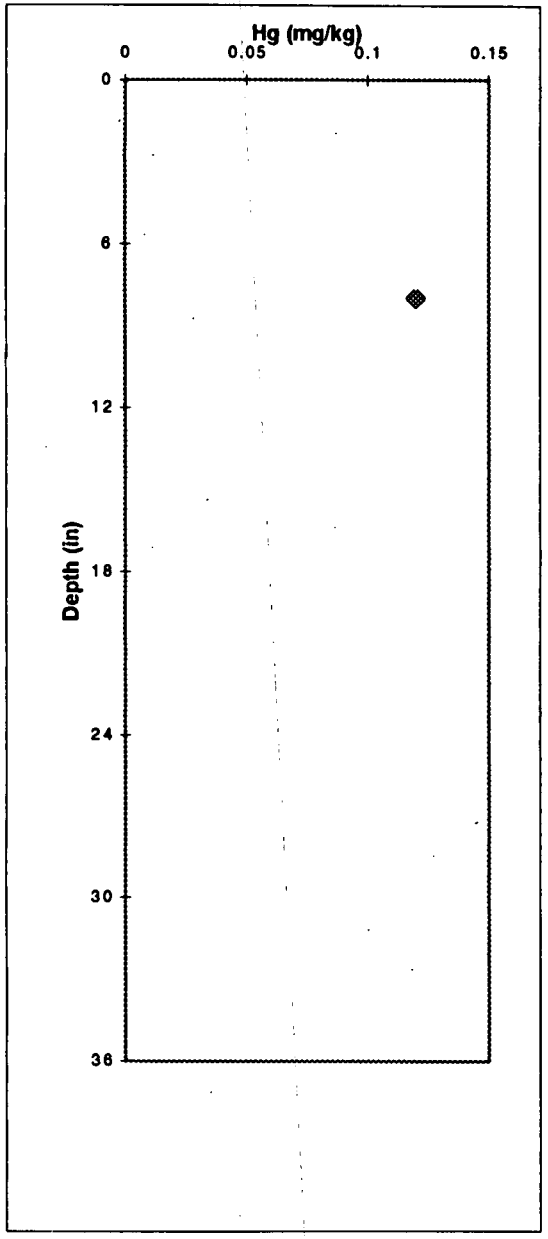

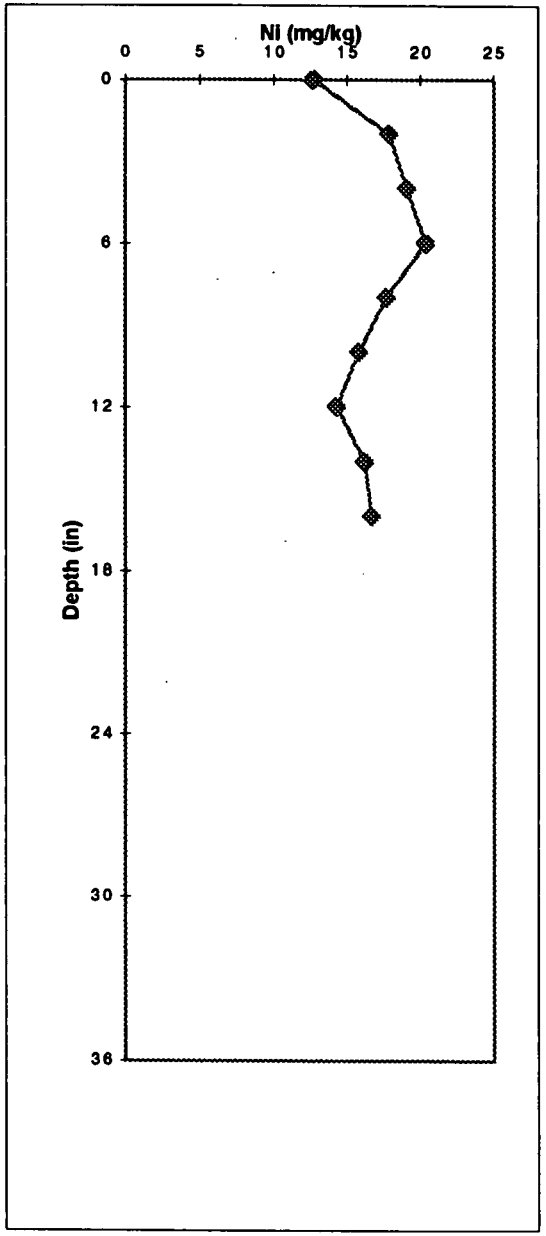

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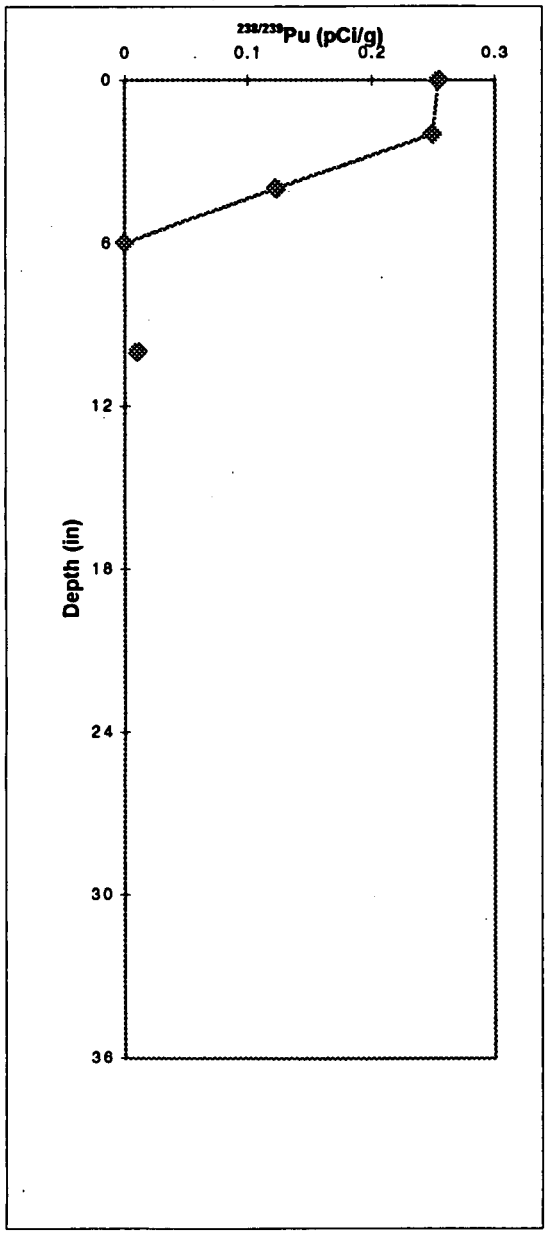

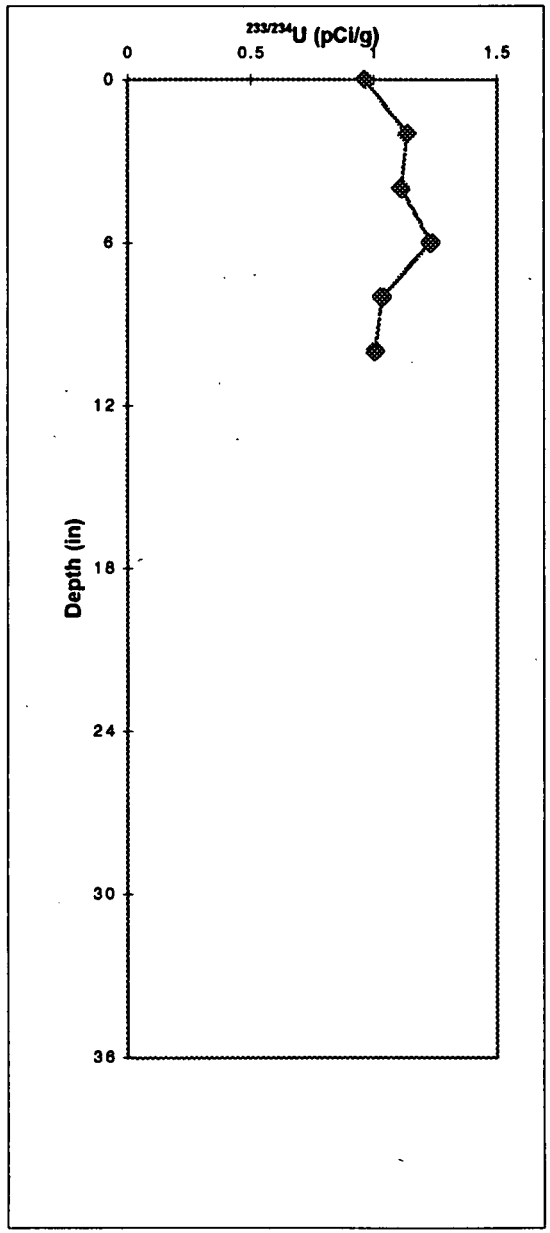

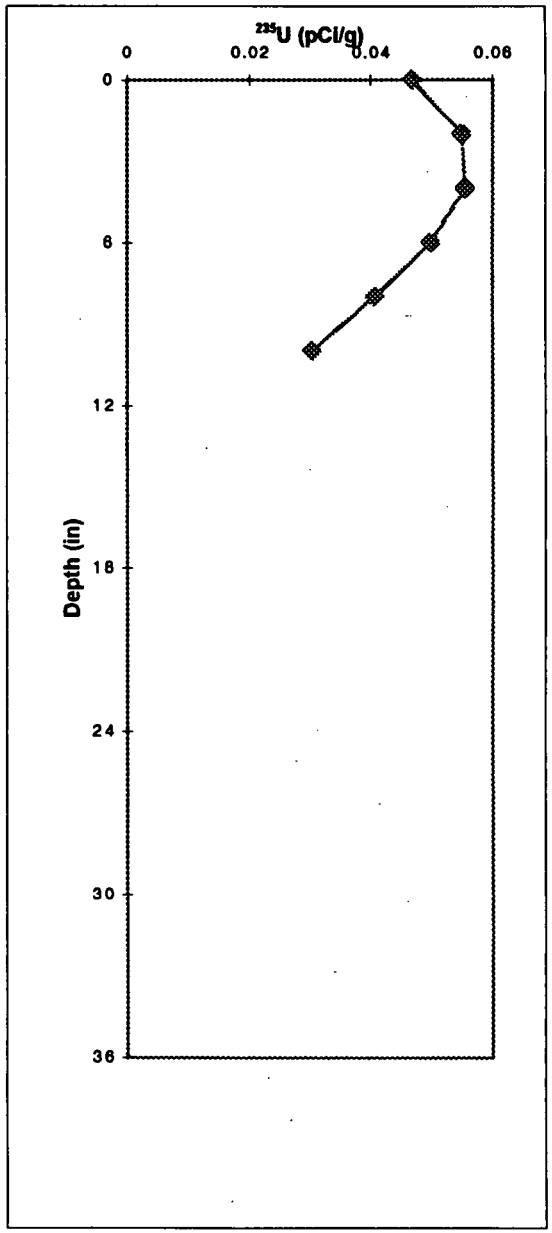

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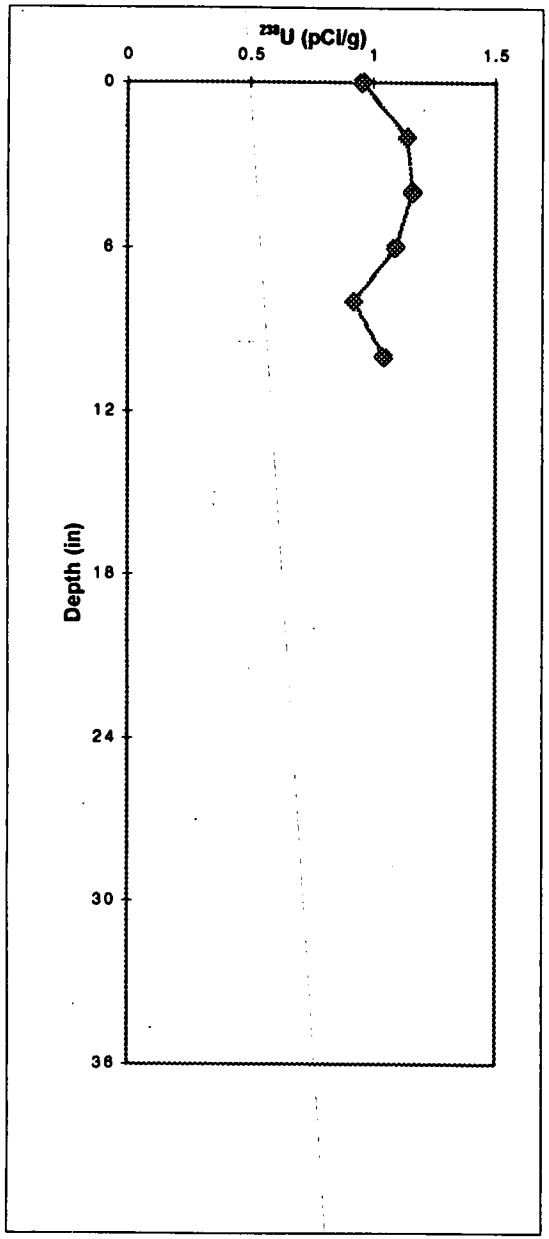

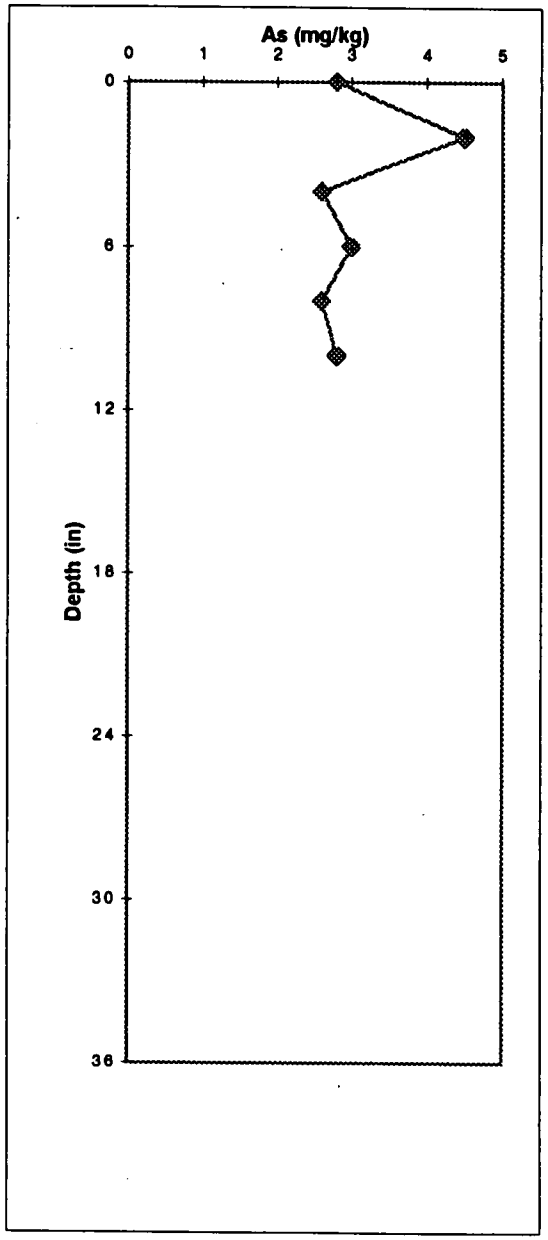

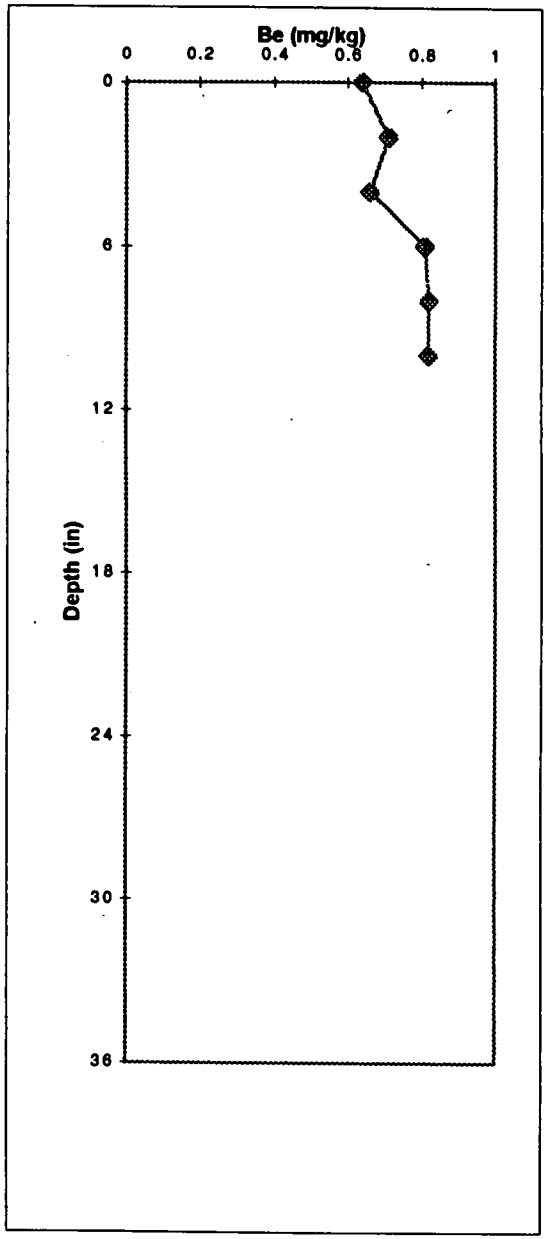

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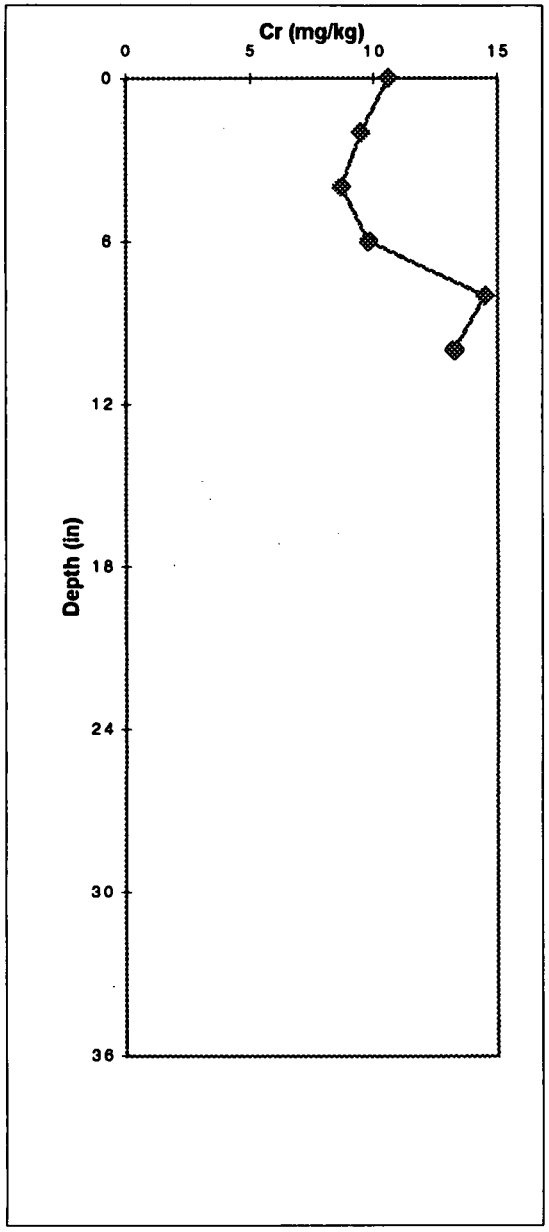

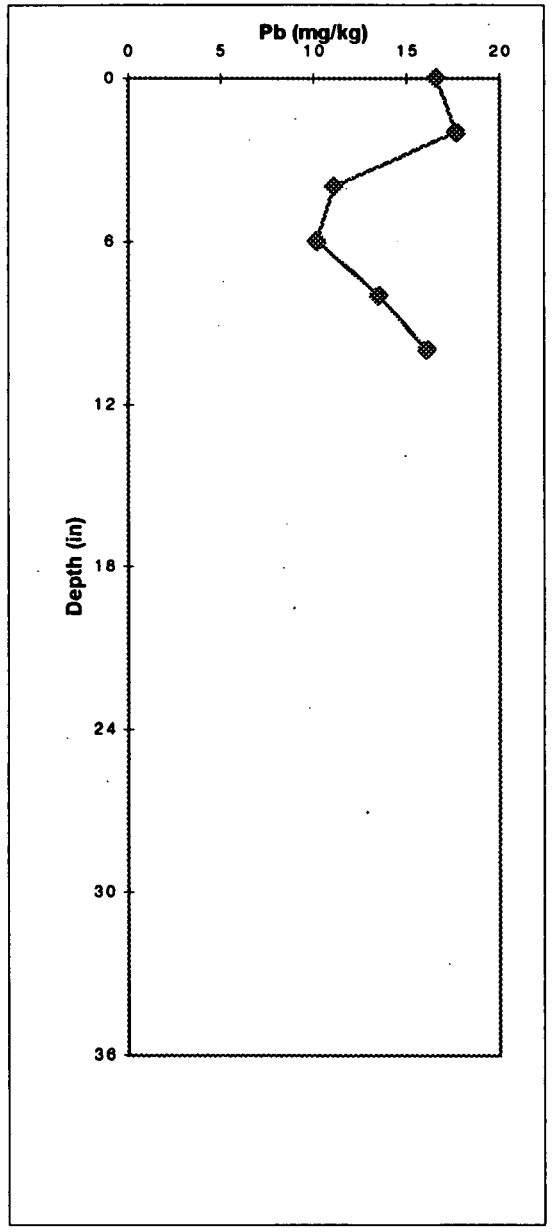

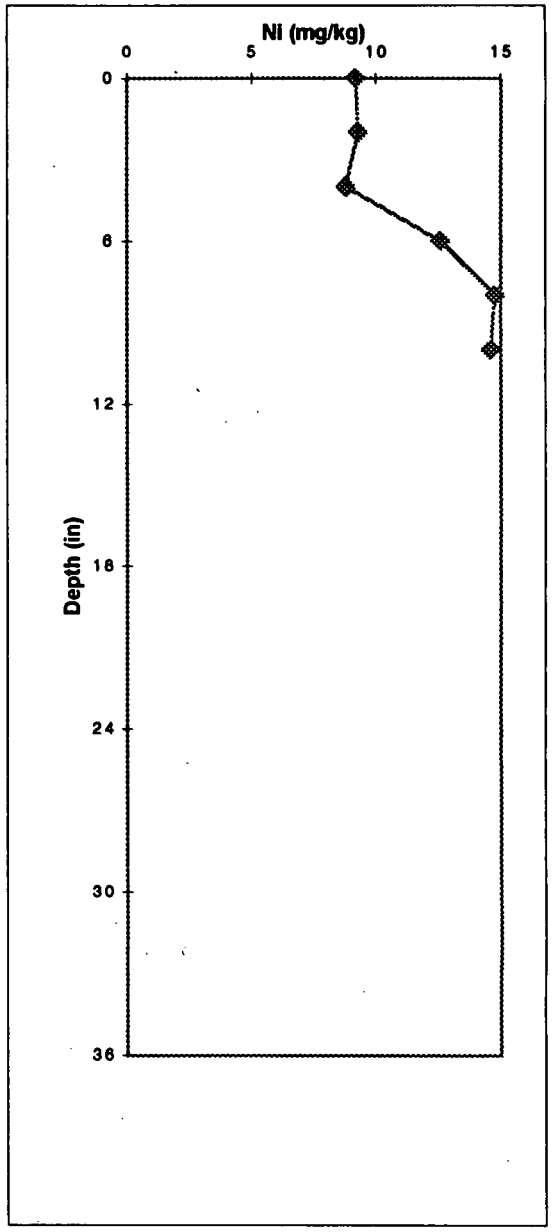

APPENDIX K

SEDIMENT DATING AND SEDIMENTATION RATES FOR GREAT WESTERN RESERVOIR, STANDLEY LAKE, AND MOWER RESERVOIR

RF/ER-94-0023.UN

FISCAL YEAR 1994 OU3 Sediment Dating and Sedimentation Rates

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October 1994

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ABSTRACT

Rocky Flats Environmental Technology Site (RFETS) investigated the sediment history of Standley Lake, Great Western Reservoir, and Mower Reservoir using ^{137}Cs and $^{239,240}Pu$ global fall-out and $^{239,240}Pu$ RFETS influences. Peak activities of ^{137}Cs and $^{239,240}Pu$ provided a means to date core horizons for these reservoirs near the RFETS. Sedimentation rates for Standley Lake, Great Western Reservoir, and Mower Reservoir are 0.75, 0.9, and 0.3 in/yr respectively. RFETS also compared historic sediment data to provide a comparison of sedimentation rates and core increments. Mower Reservoir historic sediment data did not exist, but Great Western Reservoir and Standley Lake sediment dating was compared with studies performed by EPA (1973), Hardy et al. (1980), and Thomas and Robertson (1981), and Rockwell International (1985). Comparing historic sediment data for SL with the OU3 study proved to be successful with the Hardy et al. study, but summarizing and comparing historic sediment information revealed inconsistencies that arise between designated horizons for different studies.

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LIST OF ACRONYMS

RFETS	Rocky Flats Environmental Technology Site
OU3	Operable Unit 3
RCRA	Resource Conservation and Recovery Act
RFI/RI	RCRA Facility Investigation/Remedial Investigation
SL	Standley Lake
GWR	Great Western Reservoir
MR	Mower Reservoir
Cs	Cesium
Pu	Plutonium
Pb	Lead
EPA	Environmental Protection Agency

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1.0 INTRODUCTION

Environmental Technologies at Rocky Flats Environmental Technology Site (RFETS) investigated the sediment history of Standley Lake, Great Western Reservoir, and Mower Reservoir using ^{137}Cs and $^{239,240}Pu$ global fall-out as dating indicators. These Colorado front range reservoirs have been the subject of study by various city, state and national agencies because of suspected Department of Energy Rocky Flats Plant impacts (Figure 1). We performed sediment dating as part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation Report for Operable Unit 3 (RFI/RI Report OU3) (EG&G 1994). A sediment chronology profile assists scientist in determining the year of sedimentation for a particular peak concentration of contaminants.

Radioisotope sediment dating for the three reservoirs indicated sedimentation rates of 0.7 to 0.8 in./yr. for Standley Lake (SL), 0.9 in./yr. for Great Western Reservoir (GWR), and 0.3 in./yr. in Mower Reservoir (MR). RFETS sediment dating for Operable Unit 3 compared favorably with the Hardy, Livingston, Burke, and Volchok Standley Lake study (Hardy et al. 1978).

This report describes the cesium/plutonium sediment dating method, estimates sedimentation rates for Operable Unit 3 (OU3) reservoirs, and compares these results to previous investigations.

2.0 THEORY OF CESIUM AND PLUTONIUM DATING

Isotopes introduced into the atmosphere by natural and manmade methods descend to the earth's surface by precipitation and dry fallout. The fission products, ^{137}Cs and $^{239,240}Pu$, of nuclear weapons testing and nuclear power facilities are frequently used to determine sedimentation rates and depositional history (Matsumoto and Wong 1977; Krishnaswami and Lal 1978).

Peak weapons testing during 1962-63 maximized cesium and plutonium in the atmosphere and subsequent fallout and are often used as a stratigraphic marker (Robbins and Edgington 1975). One of the primary assumptions in sediment dating is that maximum cesium and plutonium in a sediment core represent peak weapons testing during 1962-1963. Another is constant sedimentation rates prevail throughout the core. A third is no migration of cesium and plutonium occurs through the sediment column.

Nuclear reactors also contribute to cesium deposits, but the aerial fallout is usually localized (Krishnaswami and Lal 1978). Cesium is an abundant component of discharges during accidents at nuclear power facilities such as Chernobyl in 1986 and Three Mile Island in 1979 (Gilbert 1989). Increased cesium content may be apparent in more recently deposited sediment layers coinciding with these incidents.

Contaminants were released to the environment during several periodic events at RFETS. During the history of activities, releases of contaminants into the environment occurred due to early operational practices during the 1950's and 1960's, holding pond reconstruction between 1970-1973, and an airborne radionuclide release during a building fire in 1969. Recent studies illustrated plutonium concentrations over normal global fallout in the 1969 sedimentation year for GWR and SL creating an independent dating marker (Thomas and Robertson 1981 and Hardy et al. 1978). The 1969 fire and 903 area clean-up were used as the plutonium peak for this study. Cesium was not a product of any RFETS influenced activities, so OU3 reservoir sediments contain only global cesium fallout peaking in 1963 (Thomas and Robertson 1981).

In most ponds, reservoirs, and lakes, cesium and plutonium are removed to the sediments via adsorption almost immediately. Removal to the sediments is driven by processes such as 1) adsorption to particulate matter present in the water column (clay minerals and organic matter); 2) direct adsorption to epilimnion sediments; and 3) scavenging by organisms (Anderson et al. 1987; Nittrouer et al. 1979; Hakonson and Whicker 1974).

Once cesium and plutonium are incorporated within the solid phase of the sediment, they are usually resistant to redistribution. Mechanisms that may cause redistribution include bioturbation, erosion, slumping, unreported human activity on the sediment bed, and irregular processes of deposition (Robbins et al. 1977).

The sampling process can cause further disturbances that affect the distribution of radionuclides and other chemical components (Anderson et al. 1987; Gilbert 1989). Some examples of sampling disturbances include:

1. Disturbance of the sediment/water interface by turbulence created by the gravity coring apparatus;

2. Compaction of the sediment caused by the impact of the gravity coring device;

3. Inadequate suction within the free-fall gravity coring device leading to segmentation of the sample core;

4. Small sample volume from the free-fall gravity coring device.

Disturbances 1 and 2 can create unpredictable and erratic activities of cesium and plutonium through the top layers of a sediment core. Therefore, other methods of dating are used. A third isotopic dating method, such as measuring the decay of naturally occurring ^{210}Pb, can verify cesium and plutonium dating. A fourth method of verification includes comparing historic sediment studies when available.

^{210}Pb dating is an applicable dating method for OU3 reservoirs, but for the OU3 study, small sample sizes for each core increment limited the number of parameters analyzed. Lack of adequate sample size prevented ^{210}Pb dating measurement. To verify cesium/plutonium dating results, RFETS used historic sediment dating information from studies performed by Hardy et al. (1978), EPA (1973), Thomas and Robertson (1981), and Rockwell (1985).

Hardy et al. (1980) applied a fifth method of dating verification by performing an analysis of isotopic ratio data which can support peak cesium fallout identification. Hardy et al. verified the influence of RFETS debris vs. global fallout by determining ^{241}Am and $^{239,240}Pu$ ratios. Additionally, $^{239,240}Pu$ to ^{137}Cs ratio values can correspond to RFETS influences and lack thereof. Radionuclide ratio analysis is beyond the scope of this report but can be found in the OU3 RFI/RI report (EG&G 1995).

3.0 METHODOLOGY

This report describes sediment dating, core selection, coring equipment limitations, dating methodology, and statistical analysis. Sampling locations, strategies and field methods for OU3 reservoir sediment samples are discussed in detail in the OU3 RFI/RI report (1995).

The United States Geological Survey (USGS) extracted 12 cores from the three reservoirs, and RFETS dedicated 4 SL cores, 5 GWR cores, and 3 MR cores to chemical analysis and sediment dating (Figure 2 through 4). Two cores from GWR and MR met the required criteria of optimum sampling location within the reservoir, sufficient core thickness, and adequate sample size. One SL core met the required criteria.

Sampling from the deepest areas of the reservoir optimizes sediment dating accuracy, due to minimized sediment disturbances. If deeper portions of a lake are anoxic, which can occur in the hypolimnion of some lakes during stratification, there will be a reduction in the number of large benthic fauna communities which would normally mix the sediments (Anderson et al. 1987). Sediment mixing due to human or biological disturbances is minimal in the deepest areas and radionuclides concentrate in this area.

Due to a loss of suction in the free-fall gravity coring apparatus, some of the 12 cores failed to retain sufficient thickness to reach the 1962 peak cesium/plutonium activities. For dating purposes, RFETS rejected cores with insufficient sediment thickness.

After rejecting cores based on the above criteria, RFETS used 2 cores from GWR and MR and one core from SL to determine sediment history. The second SL core had minimal sample size for chemical analysis, and cesium analysis could not be performed.

The field crew sectioned each core into 2 in. increments with separate laboratory analysis performed on each increment. This step provides cesium and plutonium activities for 2 in. sediment layers.

The widely established cesium/plutonium dating method is based on selecting the peak cesium and plutonium activities within a core increment. With the following assumptions, the sediment horizon corresponds to peak atmospheric testing in 1962 and the 1969 RFETS fire and 903 area clean-up (Gilbert 1989):

1. By allowing time for aerial deposition, peak cesium activity within the sediment corresponds to the year 1963, while peak plutonium in GWR and SL corresponds to 1969;

2. Cesium and plutonium are absorbed to the sediments almost immediately and do not remain in the water column;

3. Migration of cesium and plutonium within the sediments after deposition is insignificant;

4. Annual sedimentation rate is constant.

The horizon of maximum cesium activity establishes the location of 1963 sedimentation. The year of sedimentation for each core increment is established by determining the length of sediment between the top of the core and the top of the layer of peak cesium activity. To determine sedimentation rates, the length is divided by the number of years elapsed between 1963 and the date of core recovery (Gilbert 1989).

Plutonium dating is performed in the same manner, but for this study, the layer of maximum activity corresponds to the 1969 fire and 903 area clean-up. Again, the length from peak plutonium to the top is divided by the number of years elapsed between 1969 and the date of core recovery.

Historic reservoir sediment studies supplemented cesium and plutonium dating methods by comparing incremental results. RFETS compiled information from studies by EPA (1973), Hardy et al. (1978 and 1980), Thomas and Robertson (1981), and Rockwell International (1985).

Sampling strategies for each study included extracting cores at various locations within GWR and SL (Figures 2 through 4). For dating comparisons, RFETS selected data from cores retrieved from the deepest areas of the reservoirs, near the center of the dam. In none of the studies did the core sampling locations exactly match the OU3 sampling locations. These front range reservoirs are located in flat drainage valleys and are relatively flat near the dam, and since these radionuclides are resistant to redistribution, sedimentation rates and radionuclide distributions are similar (Wolaver 1989).

Thomas and Robertson dated GWR sediments using the cesium method, while Hardy et al. dated SL sediments using both the cesium and plutonium methods. RFETS used both cesium and plutonium for OU3 sediment dating and a comparison with historic studies.

EPA (1973) and Rockwell International (1985) reported incremental radionuclide activities without sediment dating, because the objective of these studies was to report where higher radionuclide concentrations existed. For these studies, we identified cesium or plutonium peaks within cores in the deepest reservoir areas and dated the core increments in the same manner as the OU3 cores. Cesium data was not always available.

Core retrieving methods for these historic studies were similar to OU3 coring methods. In each study, a gravity-type corer retrieved cores of varying diameter. Varying diameters allow for various sample sizes for analysis without changing the sampling quality, but may minimize core

depth. Each sampling event is susceptible to equipment limitations such as surficial disturbances and sediment compaction.

4.0 RESULTS

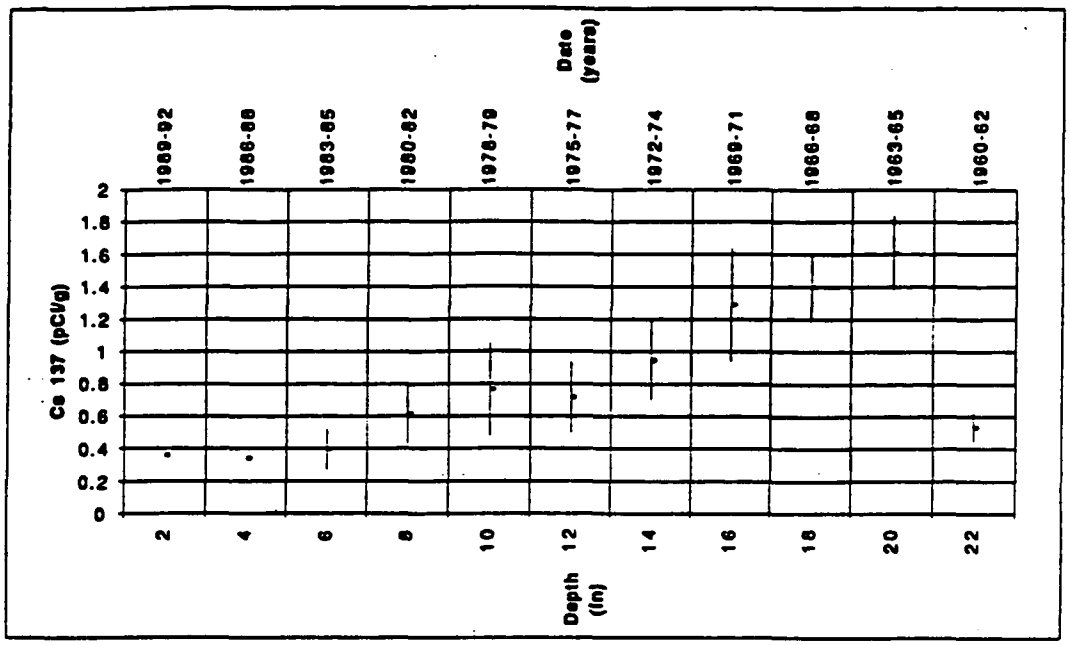
Figures 5 through 9 illustrate the variation of cesium and plutonium with depth, and peak activities. Tables 1 through 6 summarize activities and dating results for cores within each of the reservoirs. Instrument counting error is illustrated with error bars in the figures and enumerated in the tables.

The SL cesium activities peaked at the 18 to 20 in. increment. Cesium in both of the GWR cores peaked at the 24 to 26 in. increment. MR cesium activities peaked in both cores at the 6 to 8 in. increment. Plutonium peaked at different intervals than the cesium in each core indicating another source other than fall-out. SL, GWR, and MR deposited sediments at 0.7 to 0.8 (0.75 average), 0.9, and 0.3 in./yr. respectively.

All values reported for cesium and plutonium have an associated error value comprised of counting error and analytical error. The random nature of radioactive disintegrations and laboratory error are estimated with the error value, as seen in Figures 5 through 9 and Tables 1 through 6.

RFETS statistically compared the similarity between cesium activities of core pairs in GWR and in MR. The difference between the measured cesium values was derived, and a paired t-test was used to determine whether there was a difference between the core pairs.

The paired t-test hypothesized that the mean difference between the duplicate pairs was zero (H_0: $U_d=0$). The mean difference was not significantly different from zero and there was no significant difference between core pairs (Table 7). There is significant confidence that the core pairs are approximately the same when compared layer by layer.



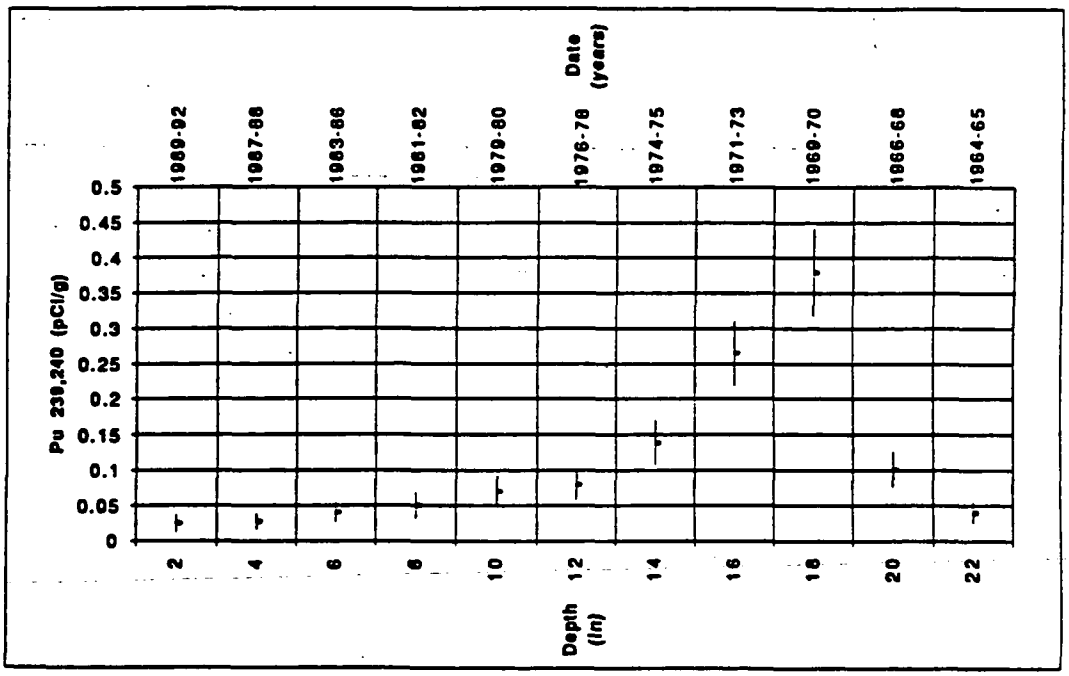
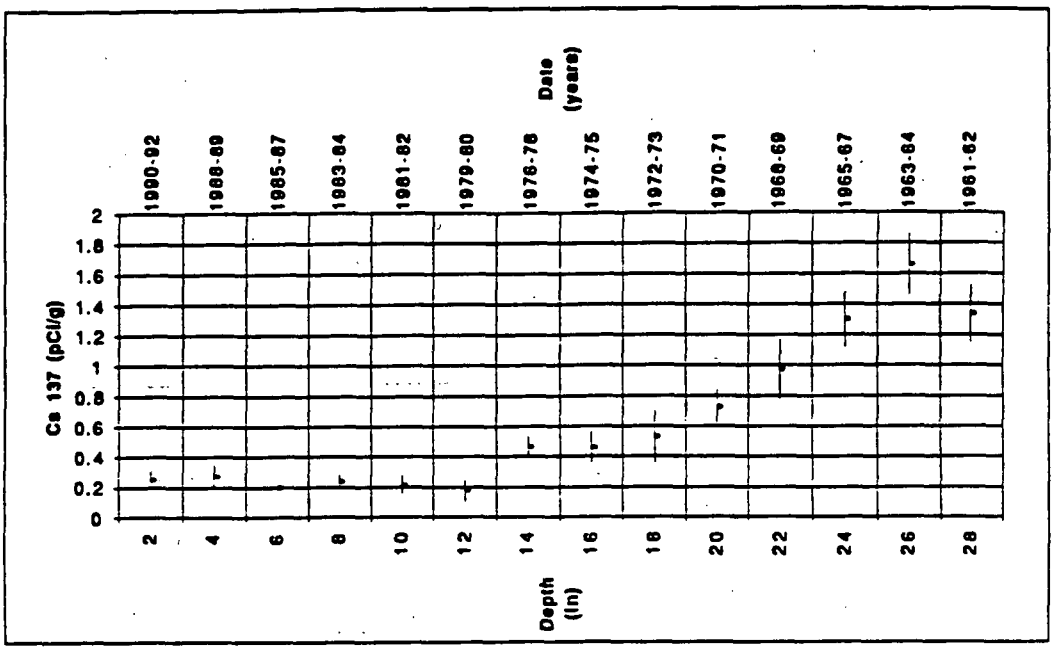


Figure 5. Depth distribution of Cs-137 and Pu 239,240 in Standley Lake sediment based on Core # SED08392. Sediment layer dates are illustrated for cesium or plutonium dating. For data points where there are no confidence intervals, the value was below the detection limit.



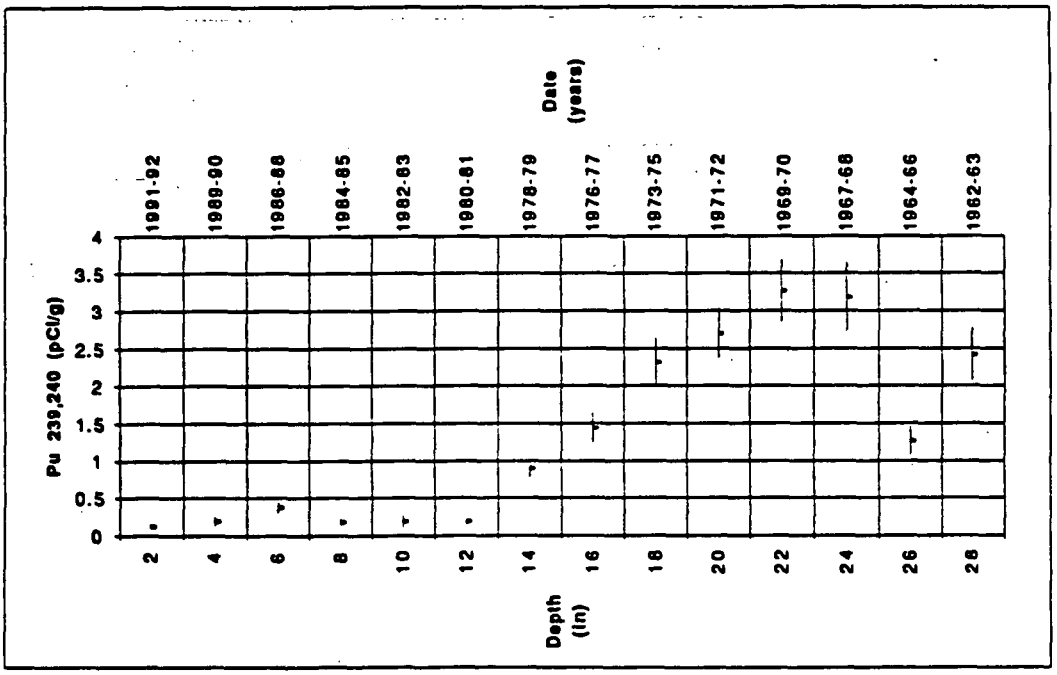
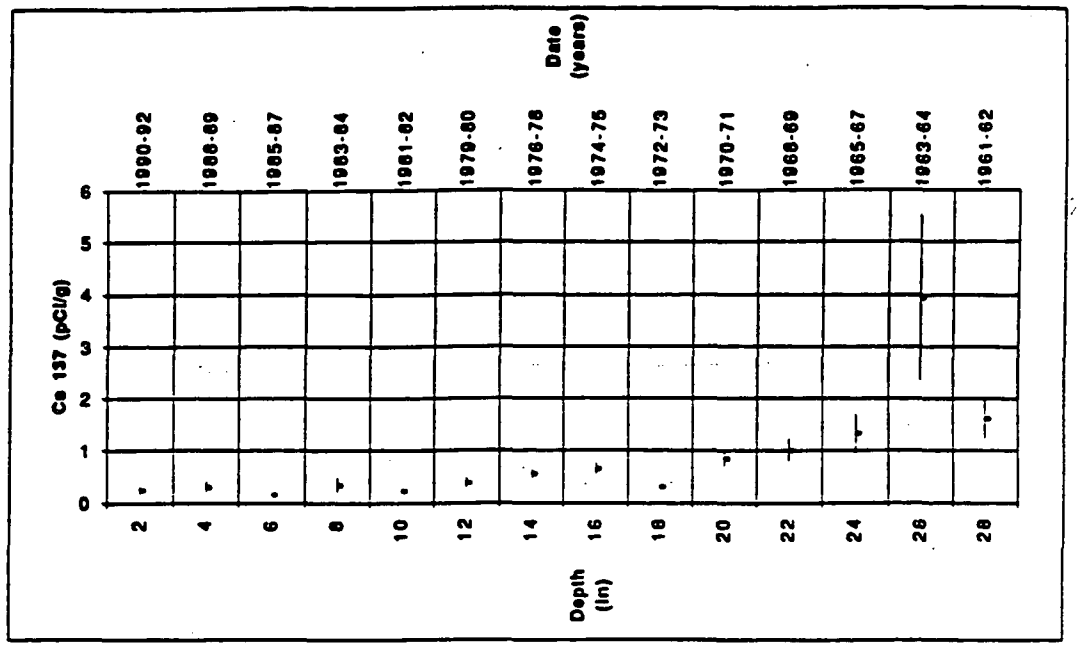


Figure 6. Depth distribution of Cs-137 and Pu-239,240 in Great Western Reservoir sediment based on Core # SED 08692. Corresponding sediment layer dates are illustrated for cesium or plutonium dating. For data points where there are no confidence intervals, the value was below the detection limit.



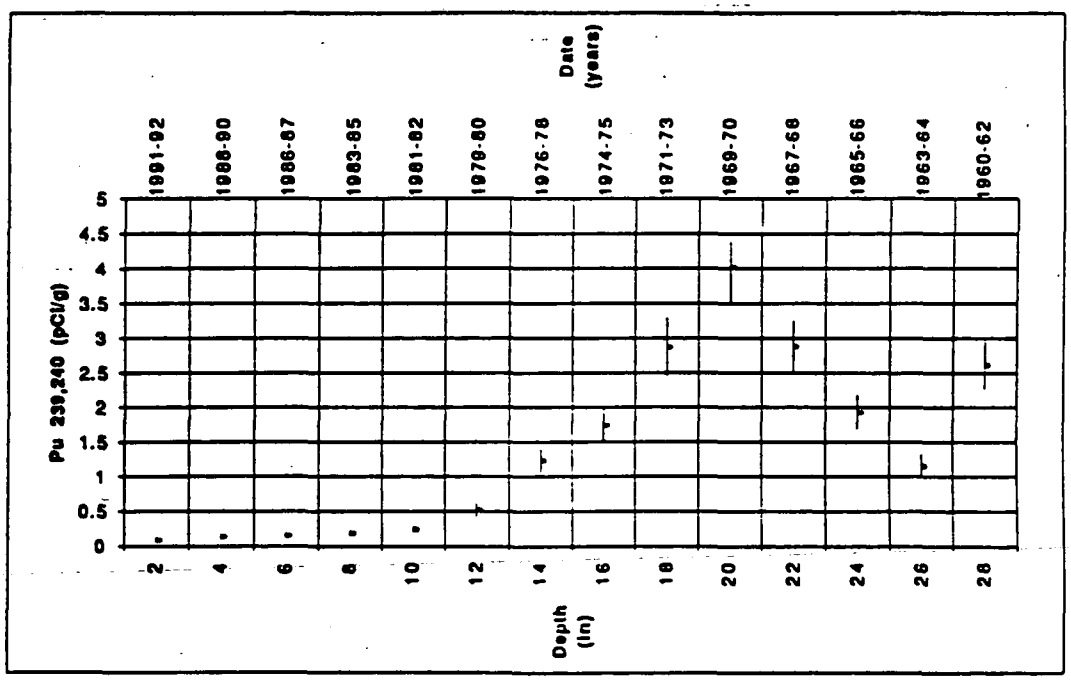
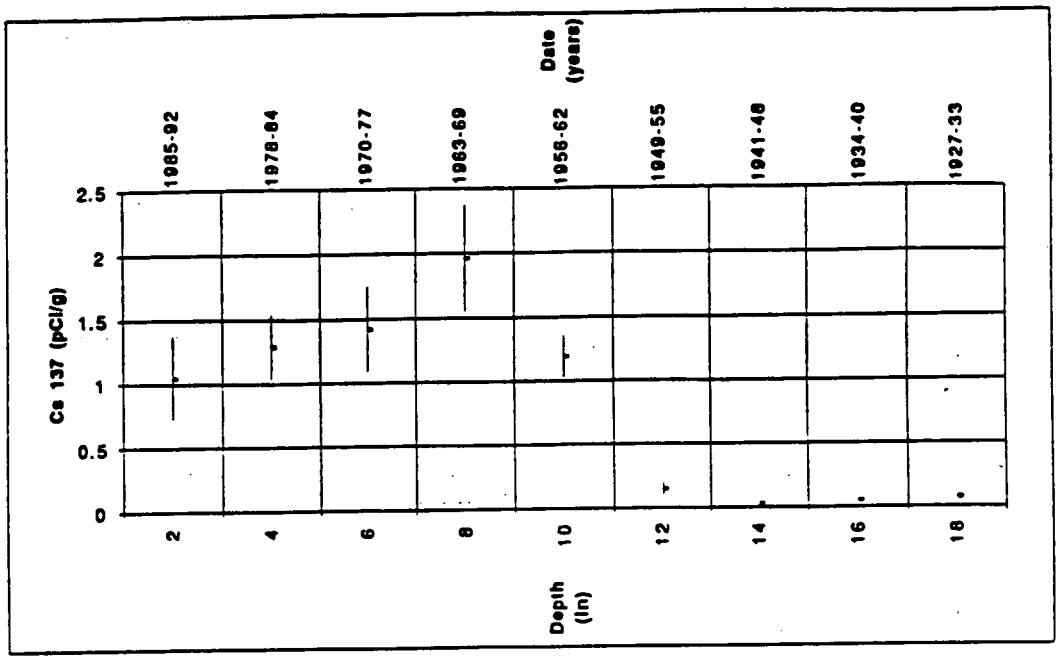


Figure 7. Depth distribution of Cs-137 and Pu-239,240 in Great Western Reservoir sediment based on Core # SED 09192. Corresponding sediment layer dates are illustrated for cesium or plutonium dating. For data points where there are no confidence intervals, the value was below the detection limit.



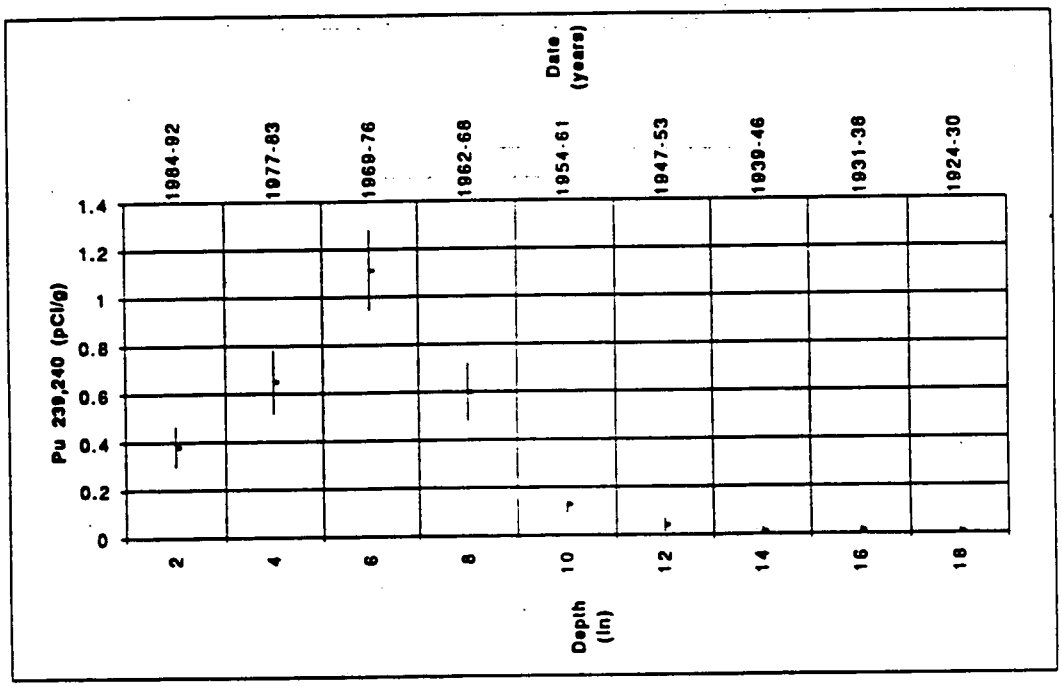
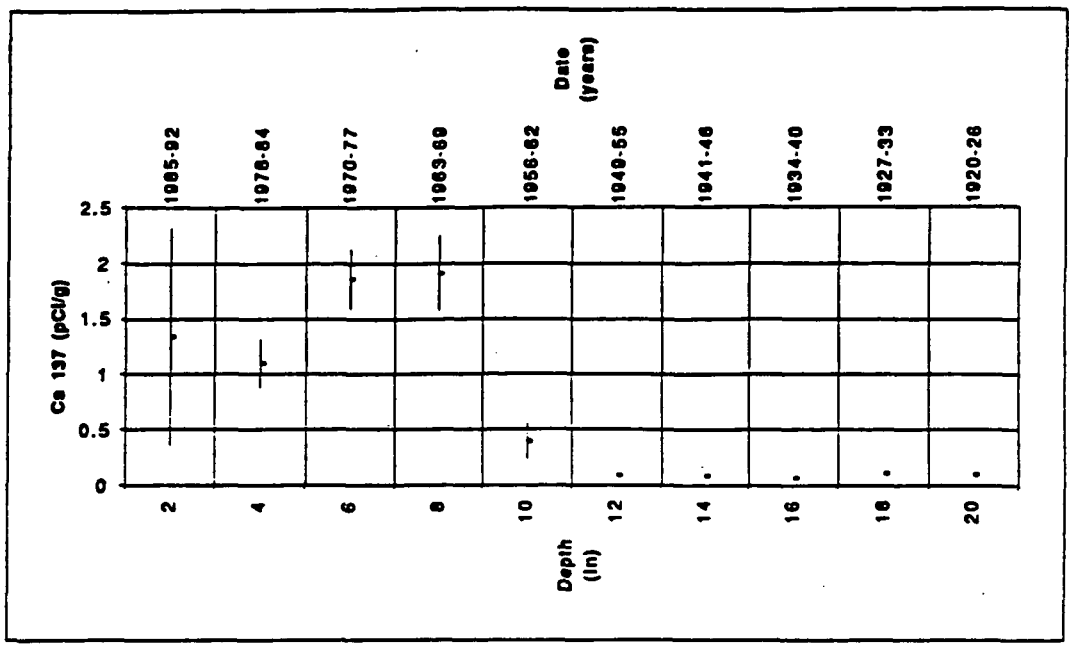


Figure 8. Depth distribution of Cs-137 and Pu-239,240 in Mower Reservoir sediment based on Core # SED 08992. Corresponding sediment layer dates are illustrated for cesium or plutonium dating. For data points where there are no confidence interval, the value was below the detection limit.



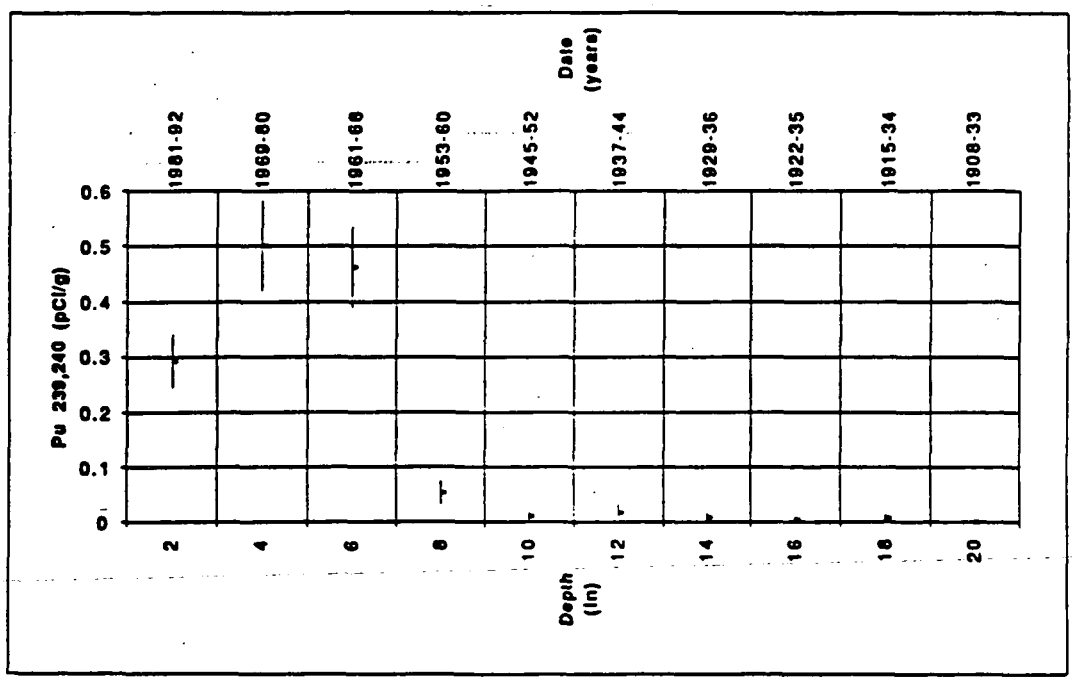


Figure 9. Depth distribution of Cs-137 and Pu-239,240 in Mower Reservoir sediment based on Core # SED 08892. Corresponding sediment layer dates are illustrated for cesium or plutonium dating. For data points where there are no confidence intervals, the value was below the detection limit.

Table 1. Standley Lake Cs-137 and Pu-239,240 sediment activity and errors based on 1992 OU3 sediment core samples.

LOCATION NUMBER	Depth (inches)	Cs-137 (pCi/g)	Error (pCi/g)	Pu-239,240 (pCi/g)	Error (pCi/g)
SED08392	2	0.36	u (3)	0.0249	0.0128
	4	0.34	u (3)	0.028	0.0114
	6	0.397	0.124	0.0412	0.0145
	8	0.614	0.182	0.0505	0.0187
	10	0.765	0.287	0.0705	0.0218
	12	0.716	0.221	0.0796	0.022
	14	0.946	0.242	0.139	0.032
	16	1.29	0.35	0.265	0.046
	18	1.4	0.21	0.38(2)	0.063
	20	1.61(1)	0.23	0.101	0.025
	22	0.534	0.088	0.0408	0.0158

Note:
1. Core's peak cesium activity.
2. Core's peak plutonium activity.
3. u = below instrument detection limit.

Table 2. Standley Lake Cs-137 and Pu-239,240 sediment dating based on 1992 OU3 sediment core samples.

LOCATION NUMBER	Depth (inches)	Cs Dated Sediment Age (years)	Pu Dated Sediment Age (years)
SED08392	2	1989-92	1989-92
	4	1986-88	1987-88
	6	1983-85	1983-86
	8	1980-82	1981-82
	10	1978-79	1979-80
	12	1975-77	1976-78
	14	1972-74	1974-75
	16	1969-71	1971-73
	18(3)	1966-68	1969-70
	20(2)	1963-65	1966-68
	22	1960-62	1964-65

Note:
1. The cesium and plutonium based sedimentation rates for Standley Lake based on core #SED08392 are 0.7 and 0.8 in/yr respectively.
2. Core's peak cesium activity interval.
3. Core's peak plutonium activity interval.

Table 3. Great Western Reservoir Cs-137 and Pu-239,240 sediment activity and errors based on 1992 OU3 sediment core samples.

LOCATION NUMBER	Depth (inches)	Cs-137 (pCi/g)	Error (pCi/g)	Pu-239,240 (pCi/g)	Error (pCi/g)
SED08692	2	0.252	0.056	0.1246	0.033
	4	0.272	0.075	0.1915	0.0623
	6	0.2	0 (3)	0.3745	0.0694
	8	0.238	0.043	0.1809	0.046
	10	0.214	0.062	0.1875	0.0775
	12	0.176	0.072	0.1887	0.0403
	14	0.462	0.076	0.8958	0.125
	16	0.461	0.104	1.437	0.2
	18	0.528	0.173	2.313	0.325
	20	0.725	0.109	2.698	0.335
	22	0.975	0.2	**3.263(2)**	**0.421**
	24	1.3	0.18	3.183	0.459
	26	**1.66(1)**	**0.2**	1.266	0.192
	28	1.34	0.19	2.413	0.36
SED09192	2	0.248	0.077	0.0891	0.034
	4	0.299	0.11	0.134	0.034
	6	0.16	u	0.154	0.038
	8	0.34	0.136	0.191	0.043
	10	0.23	u	0.243	0.051
	12	0.379	0.099	0.519	0.091
	14	0.55	0.09	1.23	0.18
	16	0.651	0.109	1.74	0.24
	18	0.31	u	2.87	0.43
	20	0.848	0.142	**4.03(2)**	**0.5**
	22	1.01	0.21	2.88	0.37
	24	1.33	0.38	1.93	0.25
	26	**3.93(1)**	**1.58**	1.16	0.16
	28	1.61	0.38	2.61	0.35

Note:
1. Core's peak cesium activity.
2. Core's peak plutonium activity.
3. u = below instrument detection limit.

Table 4. Great Western Reservoir Cs-137 and Pu-239,240 sediment dating based on 1992 OU3 sediment core samples.

LOCATION NUMBER	Depth (inches)	Cs dated Sediment Age (years)	Pu dated Sediment Age (years)
SED08692	2	1990-92	1991-92
	4	1988-89	1989-90
	6	1985-87	1986-88
	8	1983-84	1984-85
	10	1981-82	1982-83
	12	1979-80	1980-81
	14	1976-78	1978-79
	16	1974-75	1976-77
	18	1972-73	1973-75
	20	1970-71	1971-72
	22	1968-69	1969-70(3)
	24	1965-67	1967-68
	26	1963-64(2)	1964-66
	28	1961-62	1962-63
SED09192	2	1990-92	1991-92
	4	1988-89	1988-90
	6	1985-87	1986-87
	8	1983-84	1983-85
	10	1981-82	1981-82
	12	1979-80	1979-80
	14	1976-78	1976-78
	16	1974-75	1974-75
	18	1972-73	1971-73
	20	1970-71	1969-70(3)
	22	1968-69	1967-68
	24	1965-67	1965-66
	26	1963-64(2)	1963-64
	28	1961-62	1960-62

Note:
1. The cesium and plutonium based sedimentation rate for GWR based on cores #SED08692 and #SED09192 is 0.9 in./yr.
2. Core's peak cesium activity interval.
3. Core's peak plutonium activity interval.

Table 5. Mower Reservoir Cs-137 and Pu-239,240 sediment activity and errors based on 1992 OU3 sediment core samples.

LOCATION NUMBER	Depth (inches)	Cs-137 (pCi/g)	Error (pCi/g)	Pu-239,240 (pCi/g)	Error (pCi/g)
SED08892	2	1.34	0.98	0.292	0.048
	4	1.1	0.22	**0.502(2)**	0.082
	6	1.86	0.27	0.462	0.073
	8	**1.91(1)**	0.34	0.0214	0.0214
	10	0.396	0.161	0.0122	0.0122
	12	0.093	u (3)	0.0147	0.0147
	14	0.088	u	0.00871	0.00871
	16	0.068	u	0.00642	0.00642
	18	0.11	u	0.00761	0.00761
	20	0.099	u	0.00427	0.00427
SED08992	2	1.05	0.32	0.3811	0.0836
	4	1.29	0.25	0.6509	0.132
	6	1.42	0.33	**1.112(2)**	0.17
	8	**1.96(1)**	0.41	0.6001	0.121
	10	1.19	0.16	0.1281	0.038
	12	0.143	0.043	0.04021	0.029
	14	0.026	u	0.01186	u
	16	0.051	u	0.01393	u
	18	0.073	u	0.00779	u

Note:
1. Core's peak cesium activity.
2. Core's peak plutonium activity.
3. u = below instrument detection limit.

Table 6. Mower Reservoir Cs-137 and Pu-239,240 sediment dating based on 1992 OU3 sediment core samples.

LOCATION NUMBER	Depth (inches)	Cs dated Sediment Age (years)	Pu dated Sediment Age (years)
SED08892	2	1985-92	1981-92
	4	1978-84	1969-80(3)
	6	1970-77	1961-68
	8	1963-69(2)	1953-60
	10	1956-62	1945-52
	12	1949-55	1937-44
	14	1941-48	1929-36
	16	1934-40	1922-35
	18	1927-33	1915-34
	20	1920-26	1908-33
SED08992	2	1985-92	1984-92
	4	1978-84	1977-83
	6	1970-77	1969-76(3)
	8	1963-69(2)	1962-68
	10	1956-62	1954-61
	12	1949-55	1947-53
	14	1941-48	1939-46
	16	1934-40	1931-38
	18	1927-33	1924-30

Note:
1. The cesium and plutonium based sedimentation rate for Mower Reservoir based on cores #SED08892 and SED08992 is 0.3 in./yr.
2. Core's peak cesium activity interval.
3. Core's peak plutonium activity interval.

Table 7. Paired t-test on core pairs within Great Western Reservoir and Mower Reservoir.

Location	LOCATION NUMBER	Mean Difference	DF	t-Value	P-Value
Great Western Reservoir	SED08692 SED09192	-0.221	13	-1.374	0.1928
Mower Reservoir	SED08892 SED08992	0.026	8	0.23	0.8236

RFETS compared sediment dating results for the 1992 OU3 sampling with EPA (1973), Hardy et al. (1978), Thomas and Robertson (1981), and Rockwell International (1985). Some studies characterized GWR sediments, others SL sediments, but previous MR core samples did not exist before the OU3 sampling (Table 8 and Appendices A-1 through A-5). EPA data includes plutonium for SL and GWR; Hardy et al, includes cesium/plutonium for SL; Thomas and Robertson data include cesium for SL and GWR; Rockwell data include plutonium for GWR.

EPA retrieved 12 cores from GWR and two cores from SL. From these, RFETS selected data from those cores near the middle of the dam for comparison (GWR core #11c and SL core #14c). Hardy et al. retrieved one core from the center of SL. Thomas and Robertson retrieved 10 cores from GWR and one core from SL, and of these, RFETS selected core #A-3 in GWR and core #5 in SL. RFETS selected core KB#4 from four Rockwell International gravity cores from GWR.

Appendices A-1, A-2, and A-3 illustrate a comparison of the OU3 SL sediment core with EPA, Hardy et al., and Thomas and Robertson. EPA and Thomas and Robertson recorded plutonium activities, therefore, we dated these cores using the 1969 RFETS fire and 903 area clean-up plutonium peak. Both cesium and plutonium activities were available for dating the Hardy et al. cores.

The intermittent nature of EPA core horizons for SL interfered with identifying the EPA recorded plutonium activities. The available data placed peak plutonium at the 12 inch depth, which is appropriately labeled as the RFETS fire and 903 area clean-up in 1969, but this sedimentation rate is suspect because 6 in./yr. is abnormally high.

The OU-3 and EPA cores did not correspond unilaterally for SL cores (Table 8 and Appendix A-1). EPA reported a sedimentation rate of 1.1 to 1.5 in./yr. based on all their cores, which more favorably compare to the OU3 average sedimentation rate of 0.75 in./yr.

Peak plutonium reported by Hardy et al. allowed for a fair comparison with OU3 SL dating (Table 8 and Appendix A-2). OU3 derived sedimentation rates of 0.75 in./yr. were slightly

Table 8. Summary of OU3 and historic sediment dating (refer to Appendix 1-5).

STUDY	Standley Lake			Great Western Reservoir		
	SAMPLED	SEDIMENTATION RATE COMPARISON WITH OU3 (OU3 : Study) (in./yr.)	OU3 SEDIMENT DATING COMPARISON	SAMPLED	SEDIMENTATION RATE COMPARISON WITH OU3 (OU3 : Study) (in./yr.)	OU3 SEDIMENT DATING COMPARISON
EPA 1970	YES	0.7-0.8 : 6.1	POOR + 3 yr	YES	-	Core Thickness Inadaquate
Hardy et al. 1978	YES	0.7-0.8 : 1.24-1.28	GOOD + 0 to 1 yr	NO	-	-
Thomas and Robertson 1981	YES	0.7-0.8 : 0.98	FAIR +0 to 2 yrs	YES	0.9 : 1.48	FAIR +1 to 2 yrs
Rockwell International 1985	NO	-	-	YES	0.9 : 1.20	FAIR + 2 yrs
Rockwell International (Broomfield analysis)1985	NO	-	-	YES	-	Core Thickness Inadaquate

Note: When possible, sedimentation rates were based on cores taken from the deepest reservoir area.

lower than the 1.2 in./yr. Hardy rate. The Thomas and Robertson cesium-derived sedimentation rate of 1 in./yr. is a reasonable comparison to the 0.75 OU3 rate (Table 8 and Appendix A-3).

Appendix A-4 and A-5 illustrate the comparison of Thomas and Robertson (1981) and Rockwell International (1985) investigations of Great Western Reservoir. The Rockwell core dating matched the OU3 1992 core dating remarkably well, with sedimentation rates of 1.2 and 0.9 in./yr. respectively (Appendix A-5). Data from the Thomas and Robertson study did not compare to the OU3 study (Appendix A-4).

5.0 DISCUSSION

Within each core, peak cesium and peak plutonium occurred at different depths (Tables 1 through 6). Based on former front range reservoir sediment study results, we can identify the cesium peak as 1963 peak global fallout, and the plutonium peak as the RFETS 1969 fire and 903 area clean-up. Different plutonium and cesium peak intervals in the OU3 cores confirm that different events affected plutonium activities other than atmospheric testing.

OU3 cesium and plutonium dating schemes compared well (Tables 1 through 6). Intervals of plutonium peaks corresponded primarily to deposition periods from 1968 to 1969 as a result of recorded air borne releases from the plant. Sediment dating for these cores is confirmed based on the fact that peak plutonium usually occurred in the 1969 interval as determined from cesium dating.

The agreement between core pairs in GWR and MR is quite favorable. Peak cesium horizons and dating results matched in the GWR and MR core pairs (Table 7). The paired t-test verified that cesium activities at each incremental depth were consistent between cores in each pair. Consistency between cores indicates minimal sediment mixing from bioturbation, erosion, slumping, or irregular processes of deposition. Minimal sediment mixing prevents excessive radionuclide movement, and more reliable sediment dating.

MR is a relatively flat and shallow reservoir. At shallow depths, we expected to find bioturbation due to crayfish, midge larvae, or earthworms, but the similarity between cores does not suggest a bioturbation problem. Core #SED08992 was taken at a water depth of only 5 ft, while #SED08892 was 400 ft away at a water depth of 6 ft.

The MR sedimentation rate was low relative to SL and GWR (0.3 vs. 0.9 and 0.75 in./yr. respectively). Other Colorado front range reservoirs deposit sediments at rates of 0.49 to 2.5 in./yr. (Wolaver 1989, EPA 1973, Hardy et al. 1980, Thomas and Robertson 1981, and Rockwell International 1985). Rates vary from reservoir to reservoir based on the size of the drainage basin, methods of water transport into the reservoir (conduit, manmade ditch, or natural waterway), reservoir residence time, and surrounding vegetative cover.

One reason for low sedimentation in MR is that it is smaller than GWR and SL, with more vegetation surrounding the lake. Vegetative cover protects the reservoir banks from erosion and contributes to low sedimentation rates. Another reason is MR receives water periodically from Rocky Flats Lake (near Colorado Hwy. 93) and Pond C-1 on the RFETS property, both of which serve as settling ponds upstream from MR. A third is that GWR and SL receive water from a much larger drainage basin (Clear Creek) that includes significant spring runoff which allows for high suspended solids. The MR drainage basin originates within RFETS boundaries and has very little spring runoff.

Another explanation for low sedimentation rates relates to the location of the cesium and plutonium peaks within the two cores. Sediment winnowing in the shallow MR water can cause redistribution of these radionuclides, so the peak activities of cesium/plutonium may not be in the layer of original deposition (Anderson et al. 1987). However, there was high correlation between the two MR cores, which suggests minimal sampling or winnowing disturbance.

As previously mentioned, all values reported for cesium and plutonium have an associated error value. Scientists performing sediment dating usually accept the midpoint as the true value (Robbins and Edgington 1975 and Krishnaswami and Lal 1978). It is possible in our sediment cores that the "real" peak activity falls within the error interval of a sediment layer other than

the layer with the peak midpoint activity. We analyzed these differences for cesium in each reservoir core.

In SL, it is possible that the "real" peak cesium occurred in the 16 or 18 in. layer. The result of this scenario is that sedimentation rates would be decreased to 0.5 - 0.6 in./yr. In turn, dating using the 16 or 18 in. layer for peak activity creates a sediment layer dating difference of 3 to 6 yrs. The sedimentation rates based on the 16 and 18 in. layer are significantly lower than the midpoint peak derived rate (0.7 in./yr.) and previous reports (1.1 - 2.5 in./yr.) (EPA 1973 and Hardy et al. 1980).

Error intervals for the GWR cores indicate that the "real" peak may be in a sediment increment above or below the layer of peak midpoint activity. This translates into a faster or slower sedimentation rate than the recorded peak midpoint activity derived sedimentation rate (0.8 - 1.0 in./yr.) and sediment layer dating could be as much as 1 year different.

The overlap of MR error intervals reveals a slower sedimentation rate than the peak midpoint interval (only 0.07 - 0.20 in./yr.) with a sediment layer dating difference of 23 yrs. Sedimentation rates based on the peak midpoint value are already low, and based on sedimentation rates for other front range reservoirs, it is difficult to justify lower rates.

EPA, Hardy et al., and Thomas and Robertson core-sampled SL with various results. The location of peak plutonium in the EPA study was abnormal. Cores were extracted in 1970, possibly too early for a 1969 RFETS fire and 903 area clean-up plutonium peak and the depth of the sediment core was also inadequate. Another cause of this unusual distribution may be the coring device. A gravity core can disturb surficial sediments and prevent a realistic representation of plutonium deposition. The plutonium peak may not be a result of the 1969 fire and 903 area clean-up, but a sub-peak.

OU3, Hardy et al., and Thomas and Robertson sedimentation rates for SL are fairly comparable. Where they are different, it is our opinion that the OU3 cores are the most representative because of the length of the OU3 cores as compared to the historic study cores. Sometimes

not possible to extract a long sediment core, and we found that the OU3 cores were longer than cores from the previously mentioned historic studies. Logically, the longer cores represent the best average sedimentation rate since more years of sedimentation are represented.

Another reason for variation between studies may reflect variable annual sedimentation rates. With cesium/plutonium dating, we assume that annual sedimentation rates are the same. This assumption may label a sediment increment as a given year, but be off by a couple of years due to varying sedimentation rates.

The GWR study comparisons with OU3 results include Thomas and Robertson (1981) and Rockwell International (1985) (Table 8 and Appendices A-4 and A-5). OU3 compares with these two historic studies, but poorly at best.

Summarizing and comparing historic sediment information revealed inconsistencies that arise between designated horizons for different studies. One study out of five allowed a year for year match of sediment horizons with the OU3 plutonium sediment dating (i.e.. Hardy et al.). The other four were offset on horizon dating, sometimes from as little as 2 to as many as 6 years (Appendix A).

Factors that cause horizon date variability include: 1) laboratory analysis technique and error; 2) replicating the sampling location within the reservoir; 3) the possibility that radionuclides migrate to some degree; 4) sedimentation is assumed to be constant from year to year (but in nearly all watersheds, this is a gross assumption), and 5) cores taken at different years with different thicknesses represent a snapshot of different sedimentation years.

6.0 CONCLUSIONS

Aerial fallout from peak weapons testing during 1963 and the 1969 RFETS fire and 903 area clean-up provided sediment markers within cores extracted from GWR, SL, and MR. Peak

activities of ^{137}Cs and $^{239,240}Pu$ provided a means to date core horizons for one SL core, two GWR cores, and two MR cores.

SL, GWR, and MR sedimentation rates based on the OU3 study are 0.75, 0.9, and 0.3 in./yr., respectively. Core pairs from GWR and MR were compared using a paired t-test and it was confirmed there was no difference between the core pairs. Therefore, sediment dating between the core pairs from each reservoir was identical. This analysis indicates that the sampling process and migration minimally affected the distribution of cesium and plutonium.

Historic sediment information from GWR and SL provided a second comparison. Historic information on MR is very limited, and previous sediment core data are non-existent. RFETS compared GWR and SL sediment dating results for the 1992 OU3 sampling with previous studies performed by EPA (1973), Hardy et al. (1980), Thomas and Robertson (1981), and Rockwell International (1985). Comparing historic sediment data for SL with the OU3 study proved t[illegible] successful with the Hardy et al. study. Plutonium dating for the OU3 and Hardy et al. sediment intervals was nearly identical. Only one study out of five allowed a year for year match of sediment horizons. The other four were offset on horizon dating, sometimes two years and as much as six years (Appendix A).

Summarizing and comparing historic sediment information revealed inconsistencies that arise between designated horizons for different studies. Factors that cause horizon date variability include: 1) laboratory analysis technique and error; 2) replicating the sampling location within the reservoir; 3) the possibility that radionuclides migrate to some degree; 4) sedimentation is assumed to be constant from year to year, and 5) cores taken at different years with different thicknesses represent a snapshot of different sedimentation years.

We believe the OU3 cores are representative of sedimentation rates for the assigned time period. The SL cores were 2 to 4 in. longer and GWR cores 8 in. longer than any of the historic studies, providing a better average annual sedimentation rate. There was strong correlation between GWR and MR core pairs, and the one SL OU3 core compared favorably with the Hardy et al. study.

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Appendix A-1. Comparison of Standley Lake Pu dating by OU3 (1992) and EPA (1970).

	OU3 (1992)			EPA core #14c	
LOCATION NUMBER	Depth (inches)	Cs Dated Sediment Age (years)	Pu Dated Sediment Age (years)	Depth (inches)	Pu Dated Sediment Age (years)
SED08392	0-2.0	1989-92	1989-92		
	2.0-4.0	1986-88	1987-88		
	4.0-6.0	1983-85	1983-86		
	6.0-8.0	1980-82	1981-82	0-2.25	1970
	8.0-10.0	1978-79	1979-80	2.25-4.25	1970
	10.0-12.0	1975-77	1976-78		1970
	12.0-14.0	1972-74	1974-75	7.25-8.25	1969
	14.0-16.0	1969-71	1971-73		1969
	16.0-18.0	1966-68	1969-70(2)	11.25-12.25(1)	1969(2)
	18.0-20.0	1963-65(1)	1966-68	12.25-14.75	1968
	20.0-22.0	1960-62	1964-65		

Note: 1. Core's peak cesium activity interval.
2. Core's peak plutonium activity interval.
3. OU3 (1992) sedimentation rate is 0.7-0.8 in./yr.
4. EPA (1970) sedimentation rate based on core 14C is 6.13 in./yr. They recorded sedimentation rates of 1.1-1.61 in./yr. based on all their cores.

Appendix A-2. Comparison of Standley Lake Cs and Pu dating by OU3 (1992) and Hardy (1980).

	OU3 (1992)			Hardy et al. core #1		
LOCATION NUMBER	Depth (inches)	Cs Dated Sediment Age (years)	Pu Dated Sediment Age (years)	Depth (inches)	Cs Dated Sediment Age (years)	Pu Dated Sediment Age (years)
SED08392	0-2.0	1989-92	1989-92			
	2.0-4.0	1986-88	1987-88			
	4.0-6.0	1983-85	1983-86			
	6.0-8.0	1980-82	1981-82			
	8.0-10.0	1978-79	1979-80			
	10.0-12.0	1975-77	1976-78	0-2.36	1975-76	1975-76
	12.0-14.0	1972-74	1974-75	2.36-4.72	1973-75	1973-75
	14.0-16.0	1969-71	1971-73	4.72-7.87	1971-73	1971-73
	16.0-18.0	1966-68	1969-70(2)	7.87-10.24	1969-70	1969-70(2)
	18.0-20.0	1963-65(1)	1966-68	10.24-12.6	1967-1968	1967-68
	20.0-22.0	1960-62	1964-65	12.6-14.96	1965-1966	1965-67
				14.96-18.11	1962-64(1)	1963-65
				18.11-19.69	1961-62	1962

Note:
1. Core's peak cesium activity interval.
2. Core's peak plutonium activity interval.
3. OU3 (1992) sedimentation rate is 0.7-0.8 in./yr.
4. Hardy (1980) recorded a sedimentation rate of 1.3 in./yr.

Appendix A-3. Comparison of Standley Lake Cs and Pu dating by OU3 (1992) and Thomas and Robertson (1981).

	OU3			Thomas and Robertson core #5	
LOCATION NUMBER	Depth (inches)	Cs Dated Sediment Age (years)	Pu Dated Sediment Age (years)	Depth (inches)	Cs Dated Sediment Age (years)
SED08392	0-2.0	1989-92	1989-92		
	2.0-4.0	1986-88	1987-88	0-1.97	1974
	4.0-6.0	1983-85	1983-86	1.97-3.94	1973
	6.0-8.0	1980-82	1981-82	3.94-5.91	1972
	8.0-10.0	1978-79	1979-80	5.91-7.87	1971
	10.0-12.0	1975-77	1976-78	7.87-9.84	1969
	12.0-14.0	1972-74	1974-75	9.84-11.81	1967
	14.0-16.0	1969-71	1971-73	11.81-13.78	1966
	16.0-18.0	1966-68	1969-70(2)	13.78-15.75	1964
	18.0-20.0	1963-65(1)	1966-68	15.75-17.72	1963(1)
	20.0-22.0	1960-62	1964-65	17.72-19.69	1962

Note:
1. Core's peak cesium activity interval.
2. Core's peak plutonium activity interval.
3. OU3 (1992) sedimentation rate is 0.7-0.8 in./yr.
4. Thomas and Robertson (1981) sedimentation rate based on core #5 is 0.98 in./yr.

Appendix A-4. Comparison of Great Western Reservoir Cs and Pu dating by OU3 (1992) and Thomas and Robertson (1981).

	OU-3			Thomas and Robertson core #A-3	
LOCATION NUMBER	Depth (inches)	Cs Dated Sediment Age (years)	Pu Dated Sediment Age (years)	Depth (inches)	Cs Dated Sediment Age (years)
SED08692	2	1990-92	1991-92		
	4	1988-89	1989-90		
	6	1985-87	1986-88		
	8	1983-84	1984-85		
	10	1981-82	1982-83	0-1.97	1974
	12	1979-80	1980-81	1.97-3.94	1973
	14	1976-78	1978-79	3.94-5.91	1972
	16	1974-75	1976-77	5.91-7.87	1971
	18	1972-73	1973-75	7.87-9.84	1969
	20	1970-71	1971-72	9.84-11.81	1967
	22	1967-69	1969-70(2)	11.81-13.78	1966
	24	1965-66	1967-68	13.78-15.75	1964
	26	1963-64(1)	1964-66	15.75-17.72	1963(1)
	28	1961-62	1962-63	17.72-19.69	1962
SED09192	2	1990-92	1991-92		
	4	1988-89	1988-90		
	6	1985-87	1986-87		
	8	1983-84	1983-85		
	10	1981-82	1981-82	0-1.97	1974
	12	1979-80	1979-80	1.97-3.94	1973
	14	1976-78	1976-78	3.94-5.91	1972
	16	1974-75	1974-75	5.91-7.87	1971
	18	1972-73	1971-73	7.87-9.84	1969
	20	1970-71	1969-70(2)	9.84-11.81	1967
	22	1967-69	1967-68	11.81-13.78	1966
	24	1965-66	1965-66	13.78-15.75	1964
	26	1963-64(1)	1963-64	15.75-17.72	1963(1)
	28	1961-62	1960-62	17.72-19.69	1962

Note: 1. Core's peak cesium concentration interval.
2. Core's peak plutonium concentration interval.
3. OU3 (1992) sedimentation rate based on core #SED09192 is 0.9 in./yr.
4. Thomas and Robertson (1981) sedimentation rate based on core A-3 is 1.48 in./yr.

Appendix A-5. Great Western Reservoir OU3 (1992) Cs/Pu dating compared to Pu dating from Rockwell International (1985).

	OU3			RI core KB#4	
LOCATION NUMBER	Depth (inches)	Cs dated Sediment Age (years)	Pu dated Sediment Age (years)	Depth (inches)	Pu dated Sediment Age (years)
SED08692	2	1990-92	1991-92		
	4	1988-89	1989-90		
	6	1985-87	1986-88	0-2	1983
	8	1983-84	1984-85	2-4	1982
	10	1981-82	1982-83	4-6	1980-81
	12	1979-80	1980-81	6-8	1978-79
	14	1976-78	1978-79	8-10	1976-77
	16	1974-75	1976-77	10-12	1974-75
	18	1972-73	1973-75	12-14	1972-73
	20	1970-71	1971-72	14-16	1970-71
	22	1967-69	1969-70(2)	16-18	1969 (2)
	24	1965-66	1967-68	18-20	1967-68
	26	1963-64(1)	1964-66		
	28	1961-62	1962-63		
SED09192	2	1990-92	1991-92		
	4	1988-89	1988-90	0-2	1983
	6	1985-87	1986-87	2-4	1982
	8	1983-84	1983-85	4-6	1980-81
	10	1981-82	1981-82	6-8	1978-79
	12	1979-80	1979-80	8-10	1976-77
	14	1976-78	1976-78	10-12	1974-75
	16	1974-75	1974-75	12-14	1972-73
	18	1972-73	1971-73	14-16	1970-71
	20	1970-71	1969-70(2)	16-18	1969 (2)
	22	1967-69	1967-68	18-20	1967-68
	24	1965-66	1965-66		
	26	1963-64(1)	1963-64		
	28	1961-62	1960-62		

Note: 1. Core's peak cesium concentration interval.
2. Core's peak plutonium concentration interval.
3. OU3 SED09192 (1992) Sedimentaion rate is 0.9 in./yr.
Rockwell International (1985) sedimentaion rate is 1.2 in./yr. based on core KB #4.

APPENDIX L

PCB STUDY

GOING LTR NO.

ROER# 5400.1

-RF 10997

DIST.	LTR	ENC
L, M.E.		
SAME, A.R.		
N.S.		
H, D.B.		
VAL, G.J.		
J.G.		
ERA, D.W.		
R.E.		
J.A.		
ER, W.S.		
N, P.M.		
I, S.J.		
AN, L.K.		
Y, T.J.		
HL, T.		
S, J.G.		
HINS, N.M.		
SON, O.T.		
R.E.		
TER, A.W.		
G.E.		
NALD, M.M.		
NNA, F.G.		
ROSE, J.K.		
SAN, R.Y.		
ER, G.L.		
TO, V.M.		
G, T.L.		
LIN, N.B.		
WARTZ, J.K.		
CK, S.H.		
ART, D.L.		
R, S.G.	✓	
I, P.M.		
EIS, G.M.		
N, J.M.		
HOLSTEIN	✓	✓
MAST	✓	✓
RAUDALL	✓	✓
VECCHIO	✓	✓
BIGNER	✓	✓
DUGGU	✓	✓
ES, CONTROL	X	X
N RECORDS/CRD	✓	✓
ERC		
ECOG		

SSIFICATION:

CLASSIFIED		✓
FIDENTIAL		
ET		

THORIZED CLASSIFIER
CUMENT CLASSIFICATION
ISH WAIVER PER
ECIFICATION OFFICE

EPLY TO RFP CC NO:
N/A

TION ITEM STATUS
RTIAL/OPEN
C/CLOSED

APPROVALS:

S & TYPIST INITIALS
PAR /CA

EG&G ROCKY FLATS

EG&G ROCKY FLATS, INC.
ROCKY FLATS PLANT, P.O. BOX 464, GOLDEN, COLORADO 80402-0464 • (303) 966-7000

October 31, 1994 94-RF-10997

Jessie M. Roberson
Acting Assistant Manager for
Environmental Restoration
DOE, RFFO

Attn: Kurt Muenchow

RESULTS OF PCB SEDIMENT AND TISSUE SAMPLING FOR WALNUT AND WOMAN CREEK DRAINAGES AND OFFSITE RESERVOIRS - SGS-576-94

Action: None required

As discussed in my letter to you dated September 8, 1994 (09292), preliminary results of sediment and tissue samples collected during the Operable Unit 6 (OU6) Remedial Investigation (RI) (August 1992-June 1993) indicated elevated polychlorinated biphenyls (PCBs) concentrations from some of the A- and B-Series Ponds. The A- and B-Series Ponds are located in the drainages of the North and South Walnut creeks. Prior to 1989, Walnut Creek discharged into Great Western Reservoir (OU3, IHSS 200). A diversion canal was constructed in 1989 that routed the flow coming from Walnut Creek around Great Western Reservoir and back into Walnut Creek below the dam (see map). The potential exists for sediments and/or specific biota in Great Western Reservoir and Stanley Lake Reservoir to have been impacted by PCB contaminants from the Rocky Flats Environmental Technologies Site (RFETS) prior to 1989. Because of this possibility, a sediment and tissue PCBs sampling project was undertaken as part of the Environmental Evaluation (EE) portion of the OU6 RI.

As shown in the attached paper, results from the recent sediment sampling (June-July 1994) reveal no detectable levels of PCBs in terminal ponds A-4, B-5 or C-2, indicating that it is not likely that sediments derived from RFETS are contributing PCBs to any of the offsite reservoirs or downstream ecosystems. Furthermore, the decreasing trend in PCB concentrations in fish tissue samples from the PCB source in sediments to downstream ecosystems supports this finding. Elevated PCB concentrations detected in fish tissue samples collected from Standley Lake are not likely due to RFETS sources since historically RFETS has contributed less than 5% of the surface water inputs to this reservoir and upstream sites closer to RFETS sources have lower or non-detectable PCB concentrations. In addition, since no PCBs were detected in any of the small mammal tissue samples collected from around Ponds A-1, A-3, B-1 and B-4, it is evident that PCBs have not

bioaccumulated in terrestrial food chains. The Prebles Meadow Jumping Mouse and predatory birds feeding onsite are not threatened with PCB contamination from these terrestrial sources at RFETS. PCB levels in fish tissue from RFETS sources are also below effects thresholds for fish-eating birds.

Should you or your staff have any further questions or concerns regarding this issue, please call Ed Mast of my staff at 966-8589.

EMast FOR
S. G. Stiger
Director
Environmental Restoration Program Division
EG&G Rocky Flats Environmental Technology Site

RAR:cb

Orig. and 1 cc - J. M. Roberson

Attachment:
As Stated

cc:
F. R. Lockhart - DOE, RFFO
M. N. Silverman - DOE, RFFO

RESULTS OF PCB SEDIMENT AND TISSUE SAMPLING FOR WALNUT AND WOMAN CREEK DRAINAGES AND OFFSITE RESERVOIRS

Executive Summary

Results from the recent surface sediment sampling (June-July 1994) reveal no detectable levels of polychlorinated biphenyls (PCBs) in terminal ponds A-4, B-5 or C-2, indicating that it is not likely that sediments derived from Rocky Flats Environmental Technologies Site (RFETS) are contributing PCBs to any of the offsite reservoirs or downstream ecosystems. Furthermore, the decreasing trend in PCB concentrations in fish tissue samples from the PCB source in sediments to downstream ecosystems supports this finding. Elevated PCB concentrations detected in fish tissue samples collected from Standley Lake are not likely due to RFETS sources since historically RFETS has contributed less than 5% of the surface water inputs to this reservoir and upstream sites closer to RFETS sources have lower or non-detectable PCB concentrations. In addition, since no PCBs were detected in any of the small mammal tissue samples collected from around Ponds A-1, A-3, B-1 and B-4, it is evident that PCBs have not bioaccumulated in terrestrial food chains. The Prebles Meadow Jumping Mouse (PMJM) and predatory birds feeding onsite are not threatened with PCB contamination from these terrestrial sources at RFETS. PCB levels in fish tissue from RFETS sources are also below effects thresholds for fish-eating birds (DOE 1994a).

Introduction

Preliminary results of sediment and tissue samples collected during the Operable Unit 6 (OU6) Remedial Investigation (RI) (August 1992-June 1993) indicated elevated PCBs concentrations from some of the A- and B-Series Ponds. The A- and B-Series Ponds are located in the drainages of the North and South Walnut creeks. Prior to 1989, Walnut Creek discharged into Great Western Reservoir (OU3, IHSS 200). A diversion canal was constructed in 1989 that routed the flow coming from Walnut Creek around Great Western Reservoir and back into Walnut Creek below the dam (see map). The potential exists for sediments and/or specific biota in Great Western Reservoir and Standley Lake Reservoir to have been impacted by PCB contaminants from the RFETS prior to 1989. Because of this possibility, a sediment and tissue PCBs sampling project was undertaken as part of the Environmental Evaluation (EE) portion of the OU6 RI.

This sampling effort has entailed the collection of additional sediment and tissue samples from the A- and B-Series Ponds and the collection of fish samples from the Walnut Creek terminal pond at Indiana Street (OU6) and Great Western Reservoir to determine if any PCBs have migrated downstream of the terminal ponds. The study area was further expanded at the request of DOE (DOE 1994b) to include fish tissue samples from Mower Reservoir, Standley Lake Reservoir, the C-Series Ponds (OU5), and the D-Series Ponds (in the buffer zone southeast of OU5). All of the sampling results have been received and analyzed and are discussed below. The relevant field sampling plans will be appended as appropriate.

Attachment 1 presents the unvalidated PCB results in sediment samples collected from the A- and B-Series ponds in OU6, while Attachment 2 presents the recent PCB tissue results (unvalidated) for OUs 3, 5, and 6.

It should be noted that during the OU6 RFI/RI in the fall of 1992 no PCBs were detected in the surface water samples collected from the A- and B-Series Ponds. PCBs are hydrophobic and are therefore difficult to detect dissolved in water. However, the lack of PCB detections in water samples does not ensure that PCBs are not being transported through aquatic ecosystems. Since animals bioaccumulate these lipid soluble compounds and sediments are difficult to analyze, primary screening for the presence of PCBs was best accomplished through the collection and analysis of animal tissue. However, the collection of the pond sediment samples is valuable in estimating the quantity of PCBs available for uptake by biota using a simplified food chain model. The preliminary data from the B-4 pond (see Attachments 2 and 5) are a classic example of the bioaccumulation of PCBs in food chains: Sediments 284 μg/kg–Plants 23 μg/kg–Insects 40 μg/kg–Fat head minnows 480 μg/kg. As PCBs move through the food chain, these lipid soluble compounds are accumulated in fatty tissues. Depending on food chain length and individual species bioconcentration and bioaccumulation factors, different organisms have very different PCB tissue levels from sites with the same source concentrations. For instance, fat head minnows, *Pimiphales promelas*, can bioconcentrate PCBs into their tissues 274,000 times higher that the concentrations found in their environment (EPA 1980).

Sediment Analyses

Results (unvalidated) from the current sediment sampling program (collected 0-6 inches deep) in both the A- and B-Series Ponds show a decreasing concentration of PCBs, primarily Aroclor-1254, with distance downstream (see Attachment 1 and below). The mean values of Aroclors-1254 and 1248 (given in μg/kg) in the A- and B-Series Ponds were as follows:

A Ponds	Mean* A-1254	Mean A-1248	B Ponds	Mean* A-1254	Mean* A-1248
A-1	75.9	ND	B-1	868	253.6
A-2	83.8	ND	B-2	2073	589
A-3	25	ND	B-3	572	ND
A-4	ND	ND	B-4	188	ND
			B-5	ND	ND

(*Calculated using 20 μg/kg, one-half of the instrument detection limits of 40 μg/kg, for nondetects where averaged with detects; n = 5. ND indicates that PCB was not detected in sediment samples of pond.)

As shown above, sediments collected from Pond B-2 have a considerably higher mean Aroclor-1254 concentration than those collected from either Pond B-1 or B-3. It is speculated

that this observation is due to the presence of an outfall that historically entered directly into Pond B-2, by-passing Pond B-1. Also, Ponds B-1 and B-2 contain the only sediment sampling locations where Aroclor-1248 was detected. It is important to note here that no PCBs were detected in either terminal ponds A-4 or B-5. In addition, no PCBs were detected in sediment samples collected from the C-1 and C-2 ponds during the current OU5 RFI/RI (Attachment 4).

As a basis for comparison of PCBs in sediment samples, sample-specific Sediment Quality Criterion (SQC) (see Attachment 3) were computed from EPA's SQC factor of 19 μg PCBs/g total organic carbon (TOC) (EPA 1980) and the sample-specific TOC percentage. EPA's SQC, as well as its Ambient Water Quality Criterion (AWQC) (0.014 μg/L), was developed to protect wildlife feeding in aquatic habitats (EPA 1980). Each of these criterion is based on preventing bioaccumulation of PCBs in aquatic invertebrates and fish to levels above 640 μg/kg. When mink consume organisms containing this level of PCBs, reproductive impairment in mink can result; this mammal is the most sensitive vertebrate species reported in the literature examined (Platonow and Karstad 1973). The only ponds containing PCB concentrations exceeding SQCs were B-1 through B-3. Although these PCB concentrations exceed their respective SQCs, none of the values exceed the action levels for remediation of PCBs in sediments established at other sites, which range from 34.4 to 65 mg PCBs/kg TOC (34,400 to 65,000 μg/g TOC) (Burton 1992; Baudo et. al. 1990).

Historical release information and the distribution patterns of PCB sediment concentrations suggest that the PCBs detected in the OU6 ponds have been derived from historic releases. As an example from the 1992 collection effort, in Pond B-1 the deeper sediment PCB concentration (Attachment 4) was five times higher than levels in the surface 2 feet. Pond B-2 had sediment less than 2 feet in depth, Pond B-3 had similar concentrations with depth, and Pond B-4 had concentrations over two times higher at depth than in the top 2 feet. The primary type of PCB found in the ponds, Aroclor-1254, is one of the heavier PCBs (contains more chlorine atoms) and is more resistant to biodegradation (ATSDR 1992). Only one slightly lighter and less resistant PCB, Aroclor-1248, is found in the pond sediments (B-1 and B-2). The absence of Aroclor-1248 in the other ponds containing Aroclor-1254 suggests that enough time has passed since the last spill for the less-resistant PCB to have biodegraded, which also suggests that the source of PCBs in the pond sediments is not from a recent spill. As further evidence of historical release sources, EG&G reviewed a summary of the historic timelines discussing construction, modifications, and incidents pertaining to the A- and B-Series Ponds (EG&G 1992). The above summary indicated that any PCB releases into the A-Series Ponds would likely have occurred prior to 1972 and that any releases into the B-Series Ponds would have likely occurred prior to 1980.

In summation, PCB concentrations in both the A- and B-Series Ponds decrease with distance downstream to the point where no PCBs were detected in either terminal ponds A-4 or B-5. In addition, no PCBs were detected in sediment samples collected from the C-1 and C-2 ponds. Therefore, it is highly unlikely that sediments derived from RFETS would be currently contributing PCBs to any of the offsite reservoirs.

Tissue Analyses

Attachment 2 presents the unvalidated PCB tissue results for the Walnut and Woman creeks drainages. For this study, an attempt was made to collect three of each species for whole body analyses. When additional numbers of the same species were sacrificed, they were used for filet or liver analyses. Therefore, in Attachment 2 all results are for the more conservative whole body analysis unless specified.

To give meaning to the current tissue data, literature values are first presented as a comparison. For fish tissue the literature suggests that reproductive impairment in rainbow trout may occur at concentrations above 400 μg/kg fresh weight (EPA 1980, as reported in Eisler 1986). Eisler (1986) recommends a maximum body burden for trout at 400 μg/kg fresh weight, but makes no recommendations for non-salmonid species, which appear to be less sensitive. However, it should also be noted that concentrations of PCBs in fish tissue are reported to be protective of human health after consumption if they are below 5,000 μg/kg (Hoeting 1983, as reported in Eisler 1986). Also, fish in the major rivers of the U.S. commonly have levels of PCBs greater than 1,000 μg/kg (Schmitt et al. 1983, as reported in Eisler 1986).

In the A- and B-Series Ponds four types of tissues (whole body) from aquatic biota were analyzed: large mouth bass (40-58 μg/kg), fat head minnows (14-479 μg/kg), tiger salamanders (26-134 μg/kg), and crayfish (BDL-9.5 μg/kg). No consistent trends could be observed through the A-Series Ponds; species were either present and collected in one pond only or the PCB concentrations were below detection limits. For the B-Series Ponds, the PCB concentrations increased in tiger salamanders from the B-1 to B-2 Ponds with no further specimens being found downstream; increased in plants from B-1 to B-4; and decreased in fat head minnows from B-4 to B-5. PCBs were detected in fat head minnows collected from the Walnut Creek terminal pond at Indiana Street in even lower concentrations than in B-5. Only one fish species (carp) was collected from Great Western Reservoir. Of the six carp specimen collected, only one contained detected quantities of PCBs (52.4 μg/kg). The only tissue samples collected on RFETS to exceed Eisler's (1986) recommended maximum body burden for trout (400 μg/kg fresh weight) were three fat head minnow specimen (464-498 μg/kg for whole body) collected from the B-4 Pond.

With regard to the remaining sampling results, fish tissue samples collected from Ponds C-1 and C-2 contained only low levels of PCBs ($\leq$100 μg/kg) and no PCBs were detected in fish tissues collected from Ponds D-1 and D-2 and Mower Reservoir. It is interesting to note that the highest concentration of PCBs collected in any animal tissue during this study was in a carp (1000 μg/kg) collected from Standley Lake Reservoir. In fact, this was the only offsite value that exceeded the recommended maximum body burden for trout at 400 μg/kg fresh weight . Historically, less than 5% of the water flowing into Standley Lake Reservoir came from RFETS, and all of the Woman Creek drainage above the divide on Woman Creek below C-2 dam has been diverted to Mower Reservoir since 1989. Since very little flow historically entered Standley Lake from RFETS and currently no surface water enters this reservoir, it is

highly unlikely that the PCBs found in the fish tissue samples collected from Standley Lake have been derived from RFETS. Furthermore, the scarcity of detected PCBs in fish tissues collected from Great Western Reservoir supports the hypothesis that RFETS is not contributing PCBs to any of the offsite reservoirs.

Potential Impacts on Special Species of Concern: Prebles Meadow Jumping Mouse and Predatory Birds

A sampling effort was undertaken to evaluate whether Prebles Meadow Jumping Mouse (PMJM) might be impacted by the presence of PCBs in the RFETS buffer zone. This was of some concern because a PMJM, which has been proposed as a threatened species under the Federal Threatened and Endangered Species Act, was recently live trapped on exposed Pond A-2 sediments. Since PMJM have a diet similar to deer mice, 13 deer mice were collected adjacent to Ponds A-1, A-3, B-1 and B-4 for whole body tissue analysis to evaluate possible PCB contamination in Prebles. In addition, 12 voles were collected from the same locations to determine if they represent a pathway of PCBs to predatory birds, which include voles in their diet. As seen in Attachment 2, no PCBs were detected in any of the small mammal tissue samples (whole body) collected from around these ponds, suggesting that PCBs have not bioaccumulated up the food chain further than the fish species collected at RFETS and that both the PMJM and predatory birds feeding onsite are not threatened with PCB contamination from RFETS. In addition, none of the PCB detections in fish tissue from RFETS sources exceeded the food concentration thresholds recommended by DOE (1994a) for fish-eating birds: Belted Kingfisher, 667 ppb; Great Blue Heron, 768 ppb.

Conclusions

Results from the recent surface sediment sampling (June-July 1994) reveal no detectable levels of PCBs in terminal ponds A-4, B-5 or C-2, indicating that it is not likely that sediments derived from RFETS are contributing PCBs to any of the offsite reservoirs or downstream ecosystems. Furthermore, the decreasing trend in PCB concentrations in fish tissue samples from the PCB source in sediments to downstream ecosystems supports this finding. Elevated PCB concentrations detected in fish tissue samples collected from Standley Lake are not likely due to RFETS sources since historically RFETS has contributed less than 5% of the surface water inputs to this reservoir and upstream sites closer to RFETS sources have lower or non-detectable PCB concentrations. In addition, since no PCBs were detected in any of the small mammal tissue samples collected from around Ponds A-1, A-3, B-1 and B-4, it is evident that PCBs have not bioaccumulated in terrestrial food chains. The PMJM and predatory birds feeding onsite are not threatened with PCB contamination from these terrestrial sources at RFETS. PCB levels in fish tissue from RFETS sources are also below effects threasholds for fish-eating birds (DOE 1994a).

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Attachment 1. UNVALIDATED RESULTS OF PCB PROJECT SEDIMENT SAMPLING

POND	LOCATION	SAMPLE #	SAMPLE DATE	CHEMICAL	RESULT	UNITS	QUAL	DET. LIMIT
A-1	SED60092	SD00009ST	6-Jun-94	% SOLIDS	30.4	%REC		0.1
	SED60092	SD00009ST	6-Jun-94	AROCLOR-1016	260	UG/KG	U	260
	SED60092	SD00009ST	6-Jun-94	AROCLOR-1221	260	UG/KG	U	260
	SED60092	SD00009ST	6-Jun-94	AROCLOR-1232	260	UG/KG	U	260
	SED60092	SD00009ST	6-Jun-94	AROCLOR-1242	260	UG/KG	U	260
	SED60092	SD00009ST	6-Jun-94	AROCLOR-1248	260	UG/KG	U	260
	SED60092	SD00009ST	6-Jun-94	AROCLOR-1254	86	UG/KG	J	520
	SED60092	SD00009ST	6-Jun-94	AROCLOR-1260	520	UG/KG	U	520
	SED60092	SD00009ST	6-Jun-94	TOT. ORG. CARBON	1.5	%REC		0.16
A-1	SED60192	SD00008ST	6-Jun-94	% SOLIDS	48.8	%REC		0.1
	SED60192	SD00008ST	6-Jun-94	AROCLOR-1016	160	UG/KG	U	160
	SED60192	SD00008ST	6-Jun-94	AROCLOR-1221	160	UG/KG	U	160
	SED60192	SD00008ST	6-Jun-94	AROCLOR-1232	160	UG/KG	U	160
	SED60192	SD00008ST	6-Jun-94	AROCLOR-1242	160	UG/KG	U	160
	SED60192	SD00008ST	6-Jun-94	AROCLOR-1248	160	UG/KG	U	160
	SED60192	SD00008ST	6-Jun-94	AROCLOR-1254	73	UG/KG	J	320
	SED60192	SD00008ST	6-Jun-94	AROCLOR-1260	320	UG/KG	U	320
	SED60192	SD00008ST	6-Jun-94	TOT. ORG. CARBON	1.6	%REC		0.1
A-1	SED60292	SD00011ST	6-Jun-94	% SOLIDS	33.1	%REC		0.1
	SED60292	SD00011ST	6-Jun-94	AROCLOR-1016	240	UG/KG	U	240
	SED60292	SD00011ST	6-Jun-94	AROCLOR-1221	240	UG/KG	U	240
	SED60292	SD00011ST	6-Jun-94	AROCLOR-1232	240	UG/KG	U	240
	SED60292	SD00011ST	6-Jun-94	AROCLOR-1242	240	UG/KG	U	240
	SED60292	SD00011ST	6-Jun-94	AROCLOR-1248	240	UG/KG	U	240
	SED60292	SD00011ST	6-Jun-94	AROCLOR-1254	86	UG/KG	J	480
	SED60292	SD00011ST	6-Jun-94	AROCLOR-1260	480	UG/KG	U	480
	SED60292	SD00011ST	6-Jun-94	TOT. ORG. CARBON	1.8	%REC		0.15
A-1	SED60392	SD00010ST	6-Jun-94	% SOLIDS	29.7	%REC		0.1
	SED60392	SD00010ST	6-Jun-94	AROCLOR-1016	260	UG/KG	U	260
	SED60392	SD00010ST	6-Jun-94	AROCLOR-1221	260	UG/KG	U	260
	SED60392	SD00010ST	6-Jun-94	AROCLOR-1232	260	UG/KG	U	260
	SED60392	SD00010ST	6-Jun-94	AROCLOR-1242	260	UG/KG	U	260
	SED60392	SD00010ST	6-Jun-94	AROCLOR-1248	260	UG/KG	U	260
	SED60392	SD00010ST	6-Jun-94	AROCLOR-1254	88	UG/KG	J	530
	SED60392	SD00010ST	6-Jun-94	AROCLOR-1260	530	UG/KG	U	530
	SED60392	SD00010ST	6-Jun-94	TOT. ORG. CARBON	1.7	%REC		0.16
A-1	SED60492	SD00007ST	6-Jun-94	% SOLIDS	56.6	%REC		0.1
	SED60492	SD00006ST	6-Jun-94	% SOLIDS	55.4	%REC		0.1
	SED60492	SD00007ST	6-Jun-94	AROCLOR-1016	140	UG/KG	U	140
	SED60492	SD00006ST	6-Jun-94	AROCLOR-1016	140	UG/KG	U	140
	SED60492	SD00007ST	6-Jun-94	AROCLOR-1221	140	UG/KG	U	140
	SED60492	SD00006ST	6-Jun-94	AROCLOR-1221	140	UG/KG	U	140
	SED60492	SD00007ST	6-Jun-94	AROCLOR-1232	140	UG/KG	U	140
	SED60492	SD00006ST	6-Jun-94	AROCLOR-1232	140	UG/KG	U	140
	SED60492	SD00007ST	6-Jun-94	AROCLOR-1242	140	UG/KG	U	140
	SED60492	SD00006ST	6-Jun-94	AROCLOR-1242	140	UG/KG	U	140
	SED60492	SD00007ST	6-Jun-94	AROCLOR-1248	140	UG/KG	U	140
	SED60492	SD00006ST	6-Jun-94	AROCLOR-1248	140	UG/KG	U	140
	SED60492	SD00007ST	6-Jun-94	AROCLOR-1254	49	UG/KG	J	280
	SED60492	SD00006ST	6-Jun-94	AROCLOR-1254	44	UG/KG	J	290
	SED60492	SD00007ST	6-Jun-94	AROCLOR-1260	280	UG/KG	U	280
	SED60492	SD00006ST	6-Jun-94	AROCLOR-1260	290	UG/KG	U	290
	SED60492	SD00007ST	6-Jun-94	TOT. ORG. CARBON	1	%REC		0.18

Note: All detection limit values are dry weight and adjusted for sample moisture content

Attachment 1. UNVALIDATED RESULTS OF PCB PROJECT SEDIMENT SAMPLING

POND	LOCATION	SAMPLE #	SAMPLE DATE	CHEMICAL	RESULT	UNITS	QUAL.	DET. LIMIT
	SED60492	SD00006ST	6-Jun-94	TOT. ORG. CARBON	1.1	%REC		0.09
A-2	SED60592	SD00004ST	1-Jun-94	% SOLIDS	33.4	%		0.1
	SED60592	SD00004ST	1-Jun-94	AROCLOR-1016	240	UG/KG	U	240
	SED60592	SD00004ST	1-Jun-94	AROCLOR-1221	240	UG/KG	U	240
	SED60592	SD00004ST	1-Jun-94	AROCLOR-1232	240	UG/KG	U	240
	SED60592	SD00004ST	1-Jun-94	AROCLOR-1242	240	UG/KG	U	240
	SED60592	SD00004ST	1-Jun-94	AROCLOR-1248	240	UG/KG	U	240
	SED60592	SD00004ST	1-Jun-94	AROCLOR-1254	480	UG/KG	U	480
	SED60592	SD00004ST	1-Jun-94	AROCLOR-1260	480	UG/KG	U	480
	SED60592	SD00004ST	1-Jun-94	TOT. ORG. CARBON	3.9	%		0.05
A-2	SED60692	SD00003ST	1-Jun-94	% SOLIDS	26.1	%		0.1
	SED60692	SD00003ST	1-Jun-94	AROCLOR-1016	300	UG/KG	U	300
	SED60692	SD00003ST	1-Jun-94	AROCLOR-1221	300	UG/KG	U	300
	SED60692	SD00003ST	1-Jun-94	AROCLOR-1232	300	UG/KG	U	300
	SED60692	SD00003ST	1-Jun-94	AROCLOR-1242	300	UG/KG	U	300
	SED60692	SD00003ST	1-Jun-94	AROCLOR-1248	300	UG/KG	U	300
	SED60692	SD00003ST	1-Jun-94	AROCLOR-1254	130	UG/KG	J	600
	SED60692	SD00003ST	1-Jun-94	AROCLOR-1260	600	UG/KG	U	600
	SED60692	SD00003ST	1-Jun-94	TOT. ORG. CARBON	3.2	%		0.05
A-2	SED60792	SD00002ST	1-Jun-94	% SOLIDS	23.1	%		0.1
	SED60792	SD00002ST	1-Jun-94	AROCLOR-1016	350	UG/KG	U	350
	SED60792	SD00002ST	1-Jun-94	AROCLOR-1221	350	UG/KG	U	350
	SED60792	SD00002ST	1-Jun-94	AROCLOR-1232	350	UG/KG	U	350
	SED60792	SD00002ST	1-Jun-94	AROCLOR-1242	350	UG/KG	U	350
	SED60792	SD00002ST	1-Jun-94	AROCLOR-1248	350	UG/KG	U	350
	SED60792	SD00002ST	1-Jun-94	AROCLOR-1254	89	UG/KG	J	690
	SED60792	SD00002ST	1-Jun-94	AROCLOR-1260	690	UG/KG	U	690
	SED60792	SD00002ST	1-Jun-94	TOT. ORG. CARBON	3.1	%		0.05
A-2	SED60892	SD00001ST	1-Jun-94	% SOLIDS	26.1	%		0.1
	SED60892	SD00001ST	1-Jun-94	AROCLOR-1016	300	UG/KG	U	300
	SED60892	SD00001ST	1-Jun-94	AROCLOR-1221	300	UG/KG	U	300
	SED60892	SD00001ST	1-Jun-94	AROCLOR-1232	300	UG/KG	U	300
	SED60892	SD00001ST	1-Jun-94	AROCLOR-1242	300	UG/KG	U	300
	SED60892	SD00001ST	1-Jun-94	AROCLOR-1248	300	UG/KG	U	300
	SED60892	SD00001ST	1-Jun-94	AROCLOR-1254	600	UG/KG	U	600
	SED60892	SD00001ST	1-Jun-94	AROCLOR-1260	600	UG/KG	U	600
	SED60892	SD00001ST	1-Jun-94	TOT. ORG. CARBON	3.3	%		0.05
A-2	SED60992	SD00005ST	1-Jun-94	% SOLIDS	26.5	%		0.1
	SED60992	SD00005ST	1-Jun-94	AROCLOR-1016	300	UG/KG	U	300
	SED60992	SD00005ST	1-Jun-94	AROCLOR-1221	300	UG/KG	U	300
	SED60992	SD00005ST	1-Jun-94	AROCLOR-1232	300	UG/KG	U	300
	SED60992	SD00005ST	1-Jun-94	AROCLOR-1242	300	UG/KG	U	300
	SED60992	SD00005ST	1-Jun-94	AROCLOR-1248	300	UG/KG	U	300
	SED60992	SD00005ST	1-Jun-94	AROCLOR-1254	160	UG/KG	J	550
	SED60992	SD00005ST	1-Jun-94	AROCLOR-1260	590	UG/KG	U	590
	SED60992	SD00005ST	1-Jun-94	TOT. ORG. CARBON	3.2	%		0.05
A-3	SED61092	SD00031ST	21-Jun-94	% SOLIDS	35.3	%REC		0.1
	SED61092	SD00031ST	21-Jun-94	AROCLOR-1016	230	UG/KG	U	[illegible]
	SED61092	SD00031ST	21-Jun-94	AROCLOR-1221	230	UG/KG	U	[illegible]
	SED61092	SD00031ST	21-Jun-94	AROCLOR-1232	230	UG/KG	U	[illegible]
	SED61092	SD00031ST	21-Jun-94	AROCLOR-1242	230	UG/KG	U	[illegible]

Note: All detection limit values are dry weight and adjusted for sample moisture content

Attachment 1. UNVALIDATED RESULTS OF PCB PROJECT SEDIMENT SAMPLING

POND	LOCATION	SAMPLE #	SAMPLE DATE	CHEMICAL	RESULT	UNITS	QUAL.	DET. LIMIT
	SED61092	SD00031ST	21-Jun-94	AROCLOR-1248	230	UG/KG	U	230
	SED61092	SD00031ST	21-Jun-94	AROCLOR-1254	450	UG/KG	U	450
	SED61092	SD00031ST	21-Jun-94	AROCLOR-1260	450	UG/KG	U	450
	SED61092	SD00031ST	21-Jun-94	TOT. ORG. CARBON	1.7	%REC		0.14
A-3	SED61192	SD00030ST	21-Jun-94	% SOLIDS	60.3	%REC		0.1
	SED61192	SD00030ST	21-Jun-94	AROCLOR-1016	130	UG/KG	U	130
	SED61192	SD00030ST	21-Jun-94	AROCLOR-1221	130	UG/KG	U	130
	SED61192	SD00030ST	21-Jun-94	AROCLOR-1232	130	UG/KG	U	130
	SED61192	SD00030ST	21-Jun-94	AROCLOR-1242	130	UG/KG	U	130
	SED61192	SD00030ST	21-Jun-94	AROCLOR-1248	130	UG/KG	U	130
	SED61192	SD00030ST	21-Jun-94	AROCLOR-1254	45	UG/KG	J	260
	SED61192	SD00030ST	21-Jun-94	AROCLOR-1260	260	UG/KG	U	260
	SED61192	SD00030ST	21-Jun-94	TOT. ORG. CARBON	1.6	%REC		0.08
A-3	SED61292	SD00029ST	21-Jun-94	% SOLIDS	48.2	%REC		0.1
	SED61292	SD00029ST	21-Jun-94	AROCLOR-1016	170	UG/KG	U	170
	SED61292	SD00029ST	21-Jun-94	AROCLOR-1221	170	UG/KG	U	170
	SED61292	SD00029ST	21-Jun-94	AROCLOR-1232	170	UG/KG	U	170
	SED61292	SD00029ST	21-Jun-94	AROCLOR-1242	170	UG/KG	U	170
	SED61292	SD00029ST	21-Jun-94	AROCLOR-1248	170	UG/KG	U	170
	SED61292	SD00029ST	21-Jun-94	AROCLOR-1254	330	UG/KG	U	330
	SED61292	SD00029ST	21-Jun-94	AROCLOR-1260	330	UG/KG	U	330
	SED61292	SD00029ST	21-Jun-94	TOT. ORG. CARBON	2.1			0.1
A-3	SED61392	SD00032ST	21-Jun-94	% SOLIDS	34.8	%REC		0.1
	SED61392	SD00032ST	21-Jun-94	AROCLOR-1016	230	UG/KG	U	230
	SED61392	SD00032ST	21-Jun-94	AROCLOR-1221	230	UG/KG	U	230
	SED61392	SD00032ST	21-Jun-94	AROCLOR-1232	230	UG/KG	U	230
	SED61392	SD00032ST	21-Jun-94	AROCLOR-1242	230	UG/KG	U	230
	SED61392	SD00032ST	21-Jun-94	AROCLOR-1248	230	UG/KG	U	230
	SED61392	SD00032ST	21-Jun-94	AROCLOR-1254	450	UG/KG	U	450
	SED61392	SD00032ST	21-Jun-94	AROCLOR-1260	450	UG/KG	U	450
	SED61392	SD00032ST	21-Jun-94	TOT. ORG. CARBON	1.4	%REC		0.14
A-3	SED61492	SD00028ST	21-Jun-94	% SOLIDS	63.3	%REC		0.1
	SED61492	SD00027ST	21-Jun-94	% SOLIDS	66.6	%REC		0.1
	SED61492	SD00028ST	21-Jun-94	AROCLOR-1016	120	UG/KG	U	120
	SED61492	SD00027ST	21-Jun-94	AROCLOR-1016	120	UG/KG	U	120
	SED61492	SD00028ST	21-Jun-94	AROCLOR-1221	120	UG/KG	U	120
	SED61492	SD00027ST	21-Jun-94	AROCLOR-1221	120	UG/KG	U	120
	SED61492	SD00028ST	21-Jun-94	AROCLOR-1232	120	UG/KG	U	120
	SED61492	SD00027ST	21-Jun-94	AROCLOR-1232	120	UG/KG	U	120
	SED61492	SD00028ST	21-Jun-94	AROCLOR-1242	120	UG/KG	U	120
	SED61492	SD00027ST	21-Jun-94	AROCLOR-1242	120	UG/KG	U	120
	SED61492	SD00028ST	21-Jun-94	AROCLOR-1248	120	UG/KG	U	120
	SED61492	SD00027ST	21-Jun-94	AROCLOR-1248	120	UG/KG	U	120
	SED61492	SD00028ST	21-Jun-94	AROCLOR-1254	250	UG/KG	U	250
	SED61492	SD00027ST	21-Jun-94	AROCLOR-1254	240	UG/KG	U	240
	SED61492	SD00028ST	21-Jun-94	AROCLOR-1260	250	UG/KG	U	250
	SED61492	SD00027ST	21-Jun-94	AROCLOR-1260	240	UG/KG	U	240
	SED61492	SD00028ST	21-Jun-94	TOT. ORG. CARBON	1.2	%REC		0.07
	SED61492	SD00027ST	21-Jun-94	TOT. ORG. CARBON	1.4	%REC		0.07
A-4	SED61592	SD00050ST	5-Jul-94	% SOLIDS	60.8	%		0.1
	SED61592	SD00050ST	5-Jul-94	AROCLOR-1016	130	UG/KG	U	130
	SED61592	SD00050ST	5-Jul-94	AROCLOR-1221	130	UG/KG	U	130

Note: All detection limit values are dry weight and adjusted for sample moisture content

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POND	LOCATION	SAMPLE #	SAMPLE DATE	CHEMICAL	RESULT	UNITS	QUAL.	DET. LIMIT
	SED61592	SD00050ST	5-Jul-94	AROCLOR-1232	130	UG/KG	U	130
	SED61592	SD00050ST	5-Jul-94	AROCLOR-1242	130	UG/KG	U	130
	SED61592	SD00050ST	5-Jul-94	AROCLOR-1248	130	UG/KG	U	130
	SED61592	SD00050ST	5-Jul-94	AROCLOR-1254	260	UG/KG	U	260
	SED61592	SD00050ST	5-Jul-94	AROCLOR-1260	260	UG/KG	U	260
	SED61592	SD00050ST	5-Jul-94	TOT. ORG. CARBON	1.3	%		0.08
A-4	SED61692	SD00049ST	5-Jul-94	% SOLIDS	30	%		0.1
	SED61692	SD00049ST	5-Jul-94	AROCLOR-1016	260	UG/KG	U	260
	SED61692	SD00049ST	5-Jul-94	AROCLOR-1221	260	UG/KG	U	260
	SED61692	SD00049ST	5-Jul-94	AROCLOR-1232	260	UG/KG	U	260
	SED61692	SD00049ST	5-Jul-94	AROCLOR-1242	260	UG/KG	U	260
	SED61692	SD00049ST	5-Jul-94	AROCLOR-1248	260	UG/KG	U	260
	SED61692	SD00049ST	5-Jul-94	AROCLOR-1254	530	UG/KG	U	530
	SED61692	SD00049ST	5-Jul-94	AROCLOR-1260	530	UG/KG	U	530
	SED61692	SD00049ST	5-Jul-94	TOT. ORG. CARBON	2.1	%		0.16
A-4	SED61792	SD00047ST	6-Jul-94	% SOLIDS	64.6	%		0.1
	SED61792	SD00047ST	6-Jul-94	AROCLOR-1016	120	UG/KG	U	120
	SED61792	SD00047ST	6-Jul-94	AROCLOR-1221	120	UG/KG	U	120
	SED61792	SD00047ST	6-Jul-94	AROCLOR-1232	120	UG/KG	U	120
	SED61792	SD00047ST	6-Jul-94	AROCLOR-1242	120	UG/KG	U	120
	SED61792	SD00047ST	6-Jul-94	AROCLOR-1248	120	UG/KG	U	120
	SED61792	SD00047ST	6-Jul-94	AROCLOR-1254	240	UG/KG	U	240
	SED61792	SD00047ST	6-Jul-94	AROCLOR-1260	240	UG/KG	U	240
	SED61792	SD00047ST	6-Jul-94	TOT. ORG. CARBON	1	%		0.07
A-4	SED61892	SD00048ST	5-Jul-94	% SOLIDS	33.9	%		0.1
	SED61892	SD00048ST	5-Jul-94	AROCLOR-1016	230	UG/KG	U	230
	SED61892	SD00048ST	5-Jul-94	AROCLOR-1221	230	UG/KG	U	230
	SED61892	SD00048ST	5-Jul-94	AROCLOR-1232	230	UG/KG	U	230
	SED61892	SD00048ST	5-Jul-94	AROCLOR-1242	230	UG/KG	U	230
	SED61892	SD00048ST	5-Jul-94	AROCLOR-1248	230	UG/KG	U	230
	SED61892	SD00048ST	5-Jul-94	AROCLOR-1254	460	UG/KG	U	460
	SED61892	SD00048ST	5-Jul-94	AROCLOR-1260	460	UG/KG	U	460
	SED61892	SD00048ST	5-Jul-94	TOT. ORG. CARBON	1.9	%		0.14
A-4	SED61992	SD00051ST	6-Jul-94	% SOLIDS	72	%REC		0.1
	SED61992	SD00051ST	6-Jul-94	AROCLOR-1016	46	UG/KG	U	46
	SED61992	SD00051ST	6-Jul-94	AROCLOR-1221	91	UG/KG	U	91
	SED61992	SD00051ST	6-Jul-94	AROCLOR-1232	46	UG/KG	U	46
	SED61992	SD00051ST	6-Jul-94	AROCLOR-1242	46	UG/KG	U	46
	SED61992	SD00051ST	6-Jul-94	AROCLOR-1248	46	UG/KG	U	46
	SED61992	SD00051ST	6-Jul-94	AROCLOR-1254	46	UG/KG	U	46
	SED61992	SD00051ST	6-Jul-94	AROCLOR-1260	46	UG/KG	U	46
	SED61992	SD00051ST	6-Jul-94	TOT. ORG. CARBON	8690	MG/KG		697
B-1	SED62092	SD00045ST	30-Jun-94	% SOLIDS	40.3	%		0.1
	SED62092	SD00045ST	30-Jun-94	AROCLOR-1016	200	UG/KG	U	200
	SED62092	SD00045ST	30-Jun-94	AROCLOR-1221	200	UG/KG	U	200
	SED62092	SD00045ST	30-Jun-94	AROCLOR-1232	200	UG/KG	U	200
	SED62092	SD00045ST	30-Jun-94	AROCLOR-1242	200	UG/KG	U	200
	SED62092	SD00045ST	30-Jun-94	AROCLOR-1248	88	UG/KG	J	200
	SED62092	SD00045ST	30-Jun-94	AROCLOR-1254	320	UG/KG	J	390
	SED62092	SD00045ST	30-Jun-94	AROCLOR-1260	390	UG/KG	U	390
	SED62092	SD00045ST	30-Jun-94	TOT. ORG. CARBON	1.7	%		0.12

Note: All detection limit values are dry weight and adjusted for sample moisture content

Attachment 1. UNVALIDATED RESULTS OF PCB PROJECT SEDIMENT SAMPLING

POND	LOCATION	SAMPLE #	SAMPLE DATE	CHEMICAL	RESULT	UNITS	QUAL.	DET. LIMIT
B-1	SED62192	SD00042ST	29-Jun-94	% SOLIDS	50.1	%		0.1
	SED62192	SD00042ST	29-Jun-94	AROCLOR-1016	160	UG/KG	U	160
	SED62192	SD00042ST	29-Jun-94	AROCLOR-1221	160	UG/KG	U	160
	SED62192	SD00042ST	29-Jun-94	AROCLOR-1232	160	UG/KG	U	160
	SED62192	SD00042ST	29-Jun-94	AROCLOR-1242	160	UG/KG	U	160
	SED62192	SD00042ST	29-Jun-94	AROCLOR-1248	290	UG/KG		160
	SED62192	SD00042ST	29-Jun-94	AROCLOR-1254	1400	UG/KG	E	310
	SED62192	SD00042ST	29-Jun-94	AROCLOR-1254	1600	UG/KG		630
	SED62192	SD00042ST	29-Jun-94	AROCLOR-1260	310	UG/KG	U	310
	SED62192	SD00042ST	29-Jun-94	TOT. ORG. CARBON	2.2	%		0.09
B-1	SED62292	SD00043ST	29-Jun-94	% SOLIDS	53	%		0.1
	SED62292	SD00043ST	29-Jun-94	AROCLOR-1016	150	UG/KG	U	150
	SED62292	SD00043ST	29-Jun-94	AROCLOR-1221	150	UG/KG	U	150
	SED62292	SD00043ST	29-Jun-94	AROCLOR-1232	150	UG/KG	U	150
	SED62292	SD00043ST	29-Jun-94	AROCLOR-1242	150	UG/KG	U	150
	SED62292	SD00043ST	29-Jun-94	AROCLOR-1248	470	UG/KG		150
	SED62292	SD00043ST	29-Jun-94	AROCLOR-1254	910	UG/KG		300
	SED62292	SD00043ST	29-Jun-94	AROCLOR-1260	300	UG/KG	U	300
	SED62292	SD00043ST	29-Jun-94	TOT. ORG. CARBON	1.3	%		0.09
B-1	SED62392	SD00044ST	30-Jun-94	% SOLIDS	36.7	%		0.1
	SED62392	SD00044ST	30-Jun-94	AROCLOR-1016	220	UG/KG	U	220
	SED62392	SD00044ST	30-Jun-94	AROCLOR-1221	220	UG/KG	U	220
	SED62392	SD00044ST	30-Jun-94	AROCLOR-1232	220	UG/KG	U	220
	SED62392	SD00044ST	30-Jun-94	AROCLOR-1242	220	UG/KG	U	220
	SED62392	SD00044ST	30-Jun-94	AROCLOR-1248	100	UG/KG	J	220
	SED62392	SD00044ST	30-Jun-94	AROCLOR-1254	410	UG/KG	J	430
	SED62392	SD00044ST	30-Jun-94	AROCLOR-1260	430	UG/KG	U	430
	SED62392	SD00044ST	30-Jun-94	TOT. ORG. CARBON	2.1	%		0.13
B-1	SED62492	SD00041ST	29-Jun-94	% SOLIDS	51.4	%		0.1
	SED62492	SD00041ST	29-Jun-94	AROCLOR-1016	150	UG/KG	U	150
	SED62492	SD00041ST	29-Jun-94	AROCLOR-1221	150	UG/KG	U	150
	SED62492	SD00041ST	29-Jun-94	AROCLOR-1232	150	UG/KG	U	150
	SED62492	SD00041ST	29-Jun-94	AROCLOR-1242	150	UG/KG	U	150
	SED62492	SD00041ST	29-Jun-94	AROCLOR-1248	320	UG/KG		150
	SED62492	SD00041ST	29-Jun-94	AROCLOR-1254	1100	UG/KG		310
	SED62492	SD00041ST	29-Jun-94	AROCLOR-1260	310	UG/KG	U	310
	SED62492	SD00041ST	29-Jun-94	TOT. ORG. CARBON	2.1	%		0.09
B-2	SED62592	SD00037ST	24-Jun-94	% SOLIDS	19.2	%REC		0.1
	SED62592	SD00037ST	24-Jun-94	AROCLOR-1016	410	UG/KG	U	410
	SED62592	SD00037ST	24-Jun-94	AROCLOR-1221	410	UG/KG	U	410
	SED62592	SD00037ST	24-Jun-94	AROCLOR-1232	410	UG/KG	U	410
	SED62592	SD00037ST	24-Jun-94	AROCLOR-1242	410	UG/KG	U	410
	SED62592	SD00037ST	24-Jun-94	AROCLOR-1248	1500	UG/KG		410
	SED62592	SD00037ST	24-Jun-94	AROCLOR-1254	2100	UG/KG		830
	SED62592	SD00037ST	24-Jun-94	AROCLOR-1260	830	UG/KG	U	830
	SED62592	SD00037ST	24-Jun-94	TOT. ORG. CARBON	5.9	%REC		0.26
B-2	SED62692	SD00039ST	24-Jun-94	% SOLIDS	45.7	%REC		0.1
	SED62692	SD00039ST	24-Jun-94	AROCLOR-1016	180	UG/KG	U	180
	SED62692	SD00039ST	24-Jun-94	AROCLOR-1221	180	UG/KG	U	180
	SED62692	SD00039ST	24-Jun-94	AROCLOR-1232	180	UG/KG	U	180
	SED62692	SD00039ST	24-Jun-94	AROCLOR-1242	180	UG/KG	U	180
	SED62692	SD00039ST	24-Jun-94	AROCLOR-1248	420	UG/KG		180

Note: All detection limit values are dry weight and adjusted for sample moisture content

Attachment 1. UNVALIDATED RESULTS OF PCB PROJECT SEDIMENT SAMPLING

POND	LOCATION	SAMPLE #	SAMPLE DATE	CHEMICAL	RESULT	UNITS	QUAL.	DET. LIMIT
	SED62692	SD00039ST	24-Jun-94	AROCLOR-1254	1900	UG/KG	E	350
	SED62692	SD00039ST	24-Jun-94	AROCLOR-1254	3800	UG/KG		1800
	SED62692	SD00039ST	24-Jun-94	AROCLOR-1260	350	UG/KG	U	350
	SED62692	SD00039ST	24-Jun-94	TOT. ORG. CARBON	4.2	%REC		0.1
B-2	SED62792	SD00035ST	23-Jun-94	% SOLIDS	20.2	%REC		0.1
	SED62792	SD00034ST	23-Jun-94	% SOLIDS	25.2	%REC		0.1
	SED62792	SD00035ST	23-Jun-94	AROCLOR-1016	390	UG/KG	U	390
	SED62792	SD00034ST	23-Jun-94	AROCLOR-1016	320	UG/KG	U	320
	SED62792	SD00035ST	23-Jun-94	AROCLOR-1221	390	UG/KG	U	390
	SED62792	SD00034ST	23-Jun-94	AROCLOR-1221	320	UG/KG	U	320
	SED62792	SD00035ST	23-Jun-94	AROCLOR-1232	390	UG/KG	U	390
	SED62792	SD00034ST	23-Jun-94	AROCLOR-1232	320	UG/KG	U	320
	SED62792	SD00035ST	23-Jun-94	AROCLOR-1242	390	UG/KG	U	390
	SED62792	SD00034ST	23-Jun-94	AROCLOR-1242	320	UG/KG	U	320
	SED62792	SD00035ST	23-Jun-94	AROCLOR-1248	650	UG/KG		390
	SED62792	SD00034ST	23-Jun-94	AROCLOR-1248	580	UG/KG		320
	SED62792	SD00035ST	23-Jun-94	AROCLOR-1254	1200	UG/KG		790
	SED62792	SD00034ST	23-Jun-94	AROCLOR-1254	930	UG/KG		630
	SED62792	SD00035ST	23-Jun-94	AROCLOR-1260	790	UG/KG	U	790
	SED62792	SD00034ST	23-Jun-94	AROCLOR-1260	630	UG/KG	U	630
	SED62792	SD00035ST	23-Jun-94	TOT. ORG. CARBON	5.7	%REC		0.24
	SED62792	SD00034ST	23-Jun-94	TOT. ORG. CARBON	5.6	%REC		0.19
B-2	SED62892	SD00036ST	23-Jun-94	% SOLIDS	39.1	%REC		0.1
	SED62892	SD00036ST	23-Jun-94	AROCLOR-1016	200	UG/KG	U	200
	SED62892	SD00036ST	23-Jun-94	AROCLOR-1221	200	UG/KG	U	200
	SED62892	SD00036ST	23-Jun-94	AROCLOR-1232	200	UG/KG	U	200
	SED62892	SD00036ST	23-Jun-94	AROCLOR-1242	200	UG/KG	U	200
	SED62892	SD00036ST	23-Jun-94	AROCLOR-1248	390	UG/KG		200
	SED62892	SD00036ST	23-Jun-94	AROCLOR-1254	1400	UG/KG		410
	SED62892	SD00036ST	23-Jun-94	AROCLOR-1260	410	UG/KG	U	410
	SED62892	SD00036ST	23-Jun-94	TOT. ORG. CARBON	4.3	%REC		0.12
B-2	SED62992	SD00038ST	24-Jun-94	% SOLIDS	45.5	%REC		0.1
	SED62992	SD00038ST	24-Jun-94	AROCLOR-1016	180	UG/KG	U	180
	SED62992	SD00038ST	24-Jun-94	AROCLOR-1221	180	UG/KG	U	180
	SED62992	SD00038ST	24-Jun-94	AROCLOR-1232	180	UG/KG	U	180
	SED62992	SD00038ST	24-Jun-94	AROCLOR-1242	180	UG/KG	U	180
	SED62992	SD00038ST	24-Jun-94	AROCLOR-1248	180	UG/KG	U	180
	SED62992	SD00038ST	24-Jun-94	AROCLOR-1254	1500	UG/KG	E	350
	SED62992	SD00038ST	24-Jun-94	AROCLOR-1254	2000	UG/KG		700
	SED62992	SD00038ST	24-Jun-94	AROCLOR-1260	350	UG/KG	U	350
	SED62992	SD00038ST	24-Jun-94	TOT. ORG. CARBON	3	%REC		0.1
B-3	SED63092	SD00025ST	14-Jun-94	% SOLIDS	47.5	%REC		0.1
	SED63092	SD00025ST	14-Jun-94	AROCLOR-1016	170	UG/KG	U	170
	SED63092	SD00025ST	14-Jun-94	AROCLOR-1221	170	UG/KG	U	170
	SED63092	SD00025ST	14-Jun-94	AROCLOR-1232	170	UG/KG	U	170
	SED63092	SD00025ST	14-Jun-94	AROCLOR-1242	170	UG/KG	U	170
	SED63092	SD00025ST	14-Jun-94	AROCLOR-1248	170	UG/KG	U	170
	SED63092	SD00025ST	14-Jun-94	AROCLOR-1254	260	UG/KG	J	330
	SED63092	SD00025ST	14-Jun-94	AROCLOR-1260	330	UG/KG	U	330
	SED63092	SD00025ST	14-Jun-94	TOT. ORG. CARBON	1.5	%REC		0.1
B-3	SED63192	SD00024ST	14-Jun-94	% SOLIDS	22.3	%REC		0.1
	SED63192	SD00024ST	14-Jun-94	AROCLOR-1016	360	UG/KG	U	360

Note: All detection limit values are dry weight and adjusted for sample moisture content

Attachment 1. UNVALIDATED RESULTS OF PCB PROJECT SEDIMENT SAMPLING

POND	LOCATION	SAMPLE #	SAMPLE DATE	CHEMICAL	RESULT	UNITS	QUAL.	DET. LIMIT
	SED63192	SD00024ST	14-Jun-94	AROCLOR-1221	360	UG/KG	U	360
	SED63192	SD00024ST	14-Jun-94	AROCLOR-1232	360	UG/KG	U	360
	SED63192	SD00024ST	14-Jun-94	AROCLOR-1242	360	UG/KG	U	360
	SED63192	SD00024ST	14-Jun-94	AROCLOR-1248	360	UG/KG	U	360
	SED63192	SD00024ST	14-Jun-94	AROCLOR-1254	230	UG/KG	J	710
	SED63192	SD00024ST	14-Jun-94	AROCLOR-1260	710	UG/KG	U	710
	SED63192	SD00024ST	14-Jun-94	TOT. ORG. CARBON	4.3	%REC		0.22
B-3	SED63292	SD00026ST	14-Jun-94	% SOLIDS	29.8	%REC		0.1
	SED63292	SD00026ST	14-Jun-94	AROCLOR-1016	260	UG/KG	U	260
	SED63292	SD00026ST	14-Jun-94	AROCLOR-1221	260	UG/KG	U	260
	SED63292	SD00026ST	14-Jun-94	AROCLOR-1232	260	UG/KG	U	260
	SED63292	SD00026ST	14-Jun-94	AROCLOR-1242	260	UG/KG	U	260
	SED63292	SD00026ST	14-Jun-94	AROCLOR-1248	260	UG/KG	U	260
	SED63292	SD00026ST	14-Jun-94	AROCLOR-1254	1300	UG/KG		520
	SED63292	SD00026ST	14-Jun-94	AROCLOR-1260	260	UG/KG	J	520
	SED63292	SD00026ST	14-Jun-94	TOT. ORG. CARBON	2.6	%REC		0.16
B-3	SED63392	SD00023ST	14-Jun-94	% SOLIDS	22	%REC		0.1
	SED63392	SD00023ST	14-Jun-94	AROCLOR-1016	360	UG/KG	U	360
	SED63392	SD00023ST	14-Jun-94	AROCLOR-1221	360	UG/KG	U	360
	SED63392	SD00023ST	14-Jun-94	AROCLOR-1232	360	UG/KG	U	360
	SED63392	SD00023ST	14-Jun-94	AROCLOR-1242	360	UG/KG	U	360
	SED63392	SD00023ST	14-Jun-94	AROCLOR-1248	360	UG/KG	U	360
	SED63392	SD00023ST	14-Jun-94	AROCLOR-1254	770	UG/KG		720
	SED63392	SD00023ST	14-Jun-94	AROCLOR-1260	720	UG/KG	U	720
	SED63392	SD00023ST	14-Jun-94	TOT. ORG. CARBON	4.1	%REC		0.22
B-3	SED63492	SD00022ST	14-Jun-94	% SOLIDS	62.2	%REC		0.1
	SED63492	SD00022ST	14-Jun-94	AROCLOR-1016	120	UG/KG	U	120
	SED63492	SD00022ST	14-Jun-94	AROCLOR-1221	120	UG/KG	U	120
	SED63492	SD00022ST	14-Jun-94	AROCLOR-1232	120	UG/KG	U	120
	SED63492	SD00022ST	14-Jun-94	AROCLOR-1242	120	UG/KG	U	120
	SED63492	SD00022ST	14-Jun-94	AROCLOR-1248	120	UG/KG	U	120
	SED63492	SD00022ST	14-Jun-94	AROCLOR-1254	300	UG/KG		250
	SED63492	SD00022ST	14-Jun-94	AROCLOR-1260	250	UG/KG	U	250
	SED63492	SD00022ST	14-Jun-94	TOT. ORG. CARBON	1.2			0.08
B-4	SED63592	SD00014ST	8-Jun-94	% SOLIDS	54.2	%REC		0.1
	SED63592	SD00014ST	8-Jun-94	AROCLOR-1016	150	UG/KG	U	150
	SED63592	SD00014ST	8-Jun-94	AROCLOR-1221	150	UG/KG	U	150
	SED63592	SD00014ST	8-Jun-94	AROCLOR-1232	150	UG/KG	U	150
	SED63592	SD00014ST	8-Jun-94	AROCLOR-1242	150	UG/KG	U	150
	SED63592	SD00014ST	8-Jun-94	AROCLOR-1248	150	UG/KG	U	150
	SED63592	SD00014ST	8-Jun-94	AROCLOR-1254	210	UG/KG	J	300
	SED63592	SD00014ST	8-Jun-94	AROCLOR-1260	300	UG/KG	U	300
	SED63592	SD00014ST	8-Jun-94	TOT. ORG. CARBON	1.4	%REC		0.09
B-4	SED63692	SD00012ST	8-Jun-94	% SOLIDS	64.4	%REC		0.1
	SED63692	SD00012ST	8-Jun-94	AROCLOR-1016	120	UG/KG	U	120
	SED63692	SD00012ST	8-Jun-94	AROCLOR-1221	120	UG/KG	U	120
	SED63692	SD00012ST	8-Jun-94	AROCLOR-1232	120	UG/KG	U	120
	SED63692	SD00012ST	8-Jun-94	AROCLOR-1242	120	UG/KG	U	120
	SED63692	SD00012ST	8-Jun-94	AROCLOR-1248	120	UG/KG	U	120
	SED63692	SD00012ST	8-Jun-94	AROCLOR-1254	120	UG/KG	J	250
	SED63692	SD00012ST	8-Jun-94	AROCLOR-1260	250	UG/KG	U	[illegible]
	SED63692	SD00012ST	8-Jun-94	TOT. ORG. CARBON	1	%REC		[illegible]

Note: All detection limit values are dry weight and adjusted for sample moisture content

Attachment 1. UNVALIDATED RESULTS OF PCB PROJECT SEDIMENT SAMPLING

POND	LOCATION	SAMPLE #	SAMPLE DATE	CHEMICAL	RESULT	UNITS	QUAL.	DET. LIMIT
B-4	SED63792	SD00015ST	8-Jun-94	% SOLIDS	45.5	%REC		0.1
	SED63792	SD00015ST	8-Jun-94	AROCLOR-1016	170	UG/KG	U	170
	SED63792	SD00015ST	8-Jun-94	AROCLOR-1221	170	UG/KG	U	170
	SED63792	SD00015ST	8-Jun-94	AROCLOR-1232	170	UG/KG	U	170
	SED63792	SD00015ST	8-Jun-94	AROCLOR-1242	170	UG/KG	U	170
	SED63792	SD00015ST	8-Jun-94	AROCLOR-1248	170	UG/KG	U	170
	SED63792	SD00015ST	8-Jun-94	AROCLOR-1254	190	UG/KG	J	350
	SED63792	SD00015ST	8-Jun-94	AROCLOR-1260	350	UG/KG	U	350
	SED63792	SD00015ST	8-Jun-94	TOT. ORG. CARBON	1.8	%REC		0.1
B-4	SED63892	SD00016ST	8-Jun-94	% SOLIDS	42.6	%REC		0.1
	SED63892	SD00016ST	8-Jun-94	AROCLOR-1016	180	UG/KG	U	180
	SED63892	SD00016ST	8-Jun-94	AROCLOR-1221	180	UG/KG	U	180
	SED63892	SD00016ST	8-Jun-94	AROCLOR-1232	180	UG/KG	U	180
	SED63892	SD00016ST	8-Jun-94	AROCLOR-1242	180	UG/KG	U	180
	SED63892	SD00016ST	8-Jun-94	AROCLOR-1248	180	UG/KG	U	180
	SED63892	SD00016ST	8-Jun-94	AROCLOR-1254	200	UG/KG	J	370
	SED63892	SD00016ST	8-Jun-94	AROCLOR-1260	370	UG/KG	U	370
	SED63892	SD00016ST	8-Jun-94	TOT. ORG. CARBON	2	%REC		0.11
B-4	SED63992	SD00013ST	8-Jun-94	% SOLIDS	53.8	%REC		0.1
	SED63992	SD00013ST	8-Jun-94	AROCLOR-1016	150	UG/KG	U	150
	SED63992	SD00013ST	8-Jun-94	AROCLOR-1221	150	UG/KG	U	150
	SED63992	SD00013ST	8-Jun-94	AROCLOR-1232	150	UG/KG	U	150
	SED63992	SD00013ST	8-Jun-94	AROCLOR-1242	150	UG/KG	U	150
	SED63992	SD00013ST	8-Jun-94	AROCLOR-1248	150	UG/KG	U	150
	SED63992	SD00013ST	8-Jun-94	AROCLOR-1254	220	UG/KG	J	300
	SED63992	SD00013ST	8-Jun-94	AROCLOR-1260	300	UG/KG	U	300
	SED63992	SD00013ST	8-Jun-94	TOT. ORG. CARBON	1.3	%REC		0.09
B-5	SED64092	SD00018ST	10-Jun-94	% SOLIDS	67.5	%REC		0.1
	SED64092	SD00018ST	10-Jun-94	AROCLOR-1016	120	UG/KG	U	120
	SED64092	SD00018ST	10-Jun-94	AROCLOR-1221	120	UG/KG	U	120
	SED64092	SD00018ST	10-Jun-94	AROCLOR-1232	120	UG/KG	U	120
	SED64092	SD00018ST	10-Jun-94	AROCLOR-1242	120	UG/KG	U	120
	SED64092	SD00018ST	10-Jun-94	AROCLOR-1248	120	UG/KG	U	120
	SED64092	SD00018ST	10-Jun-94	AROCLOR-1254	230	UG/KG	U	230
	SED64092	SD00018ST	10-Jun-94	AROCLOR-1260	230	UG/KG	U	230
	SED64092	SD00018ST	10-Jun-94	TOT. ORG. CARBON	1.1	%REC		0.07
B-5	SED64192	SD00019ST	15-Jun-94	% SOLIDS	63.3	%REC		0.1
	SED64192	SD00019ST	15-Jun-94	AROCLOR-1016	130	UG/KG	U	130
	SED64192	SD00019ST	15-Jun-94	AROCLOR-1221	130	UG/KG	U	130
	SED64192	SD00019ST	15-Jun-94	AROCLOR-1232	130	UG/KG	U	130
	SED64192	SD00019ST	15-Jun-94	AROCLOR-1242	130	UG/KG	U	130
	SED64192	SD00019ST	15-Jun-94	AROCLOR-1248	130	UG/KG	U	130
	SED64192	SD00019ST	15-Jun-94	AROCLOR-1254	250	UG/KG	U	250
	SED64192	SD00019ST	15-Jun-94	AROCLOR-1260	250	UG/KG	U	250
	SED64192	SD00019ST	15-Jun-94	TOT. ORG. CARBON	1.3	%REC		0.07
B-5	SED64292	SD00021ST	15-Jun-94	% SOLIDS	57.6	%REC		0.1
	SED64292	SD00021ST	15-Jun-94	AROCLOR-1016	140	UG/KG	U	140
	SED64292	SD00021ST	15-Jun-94	AROCLOR-1221	140	UG/KG	U	140
	SED64292	SD00021ST	15-Jun-94	AROCLOR-1232	140	UG/KG	U	140
	SED64292	SD00021ST	15-Jun-94	AROCLOR-1242	140	UG/KG	U	140
	SED64292	SD00021ST	15-Jun-94	AROCLOR-1248	140	UG/KG	U	140

Note: All detection limit values are dry weight and adjusted for sample moisture content

Attachment 1. UNVALIDATED RESULTS OF PCB PROJECT SEDIMENT SAMPLING

POND	LOCATION	SAMPLE #	SAMPLE DATE	CHEMICAL	RESULT	UNITS	QUAL.	DET. LIMIT
	SED64292	SD00021ST	15-Jun-94	AROCLOR-1254	280	UG/KG	U	280
	SED64292	SD00021ST	15-Jun-94	AROCLOR-1260	280	UG/KG	U	280
	SED64292	SD00021ST	15-Jun-94	TOT. ORG. CARBON	1.2	%REC		0.08
B-5	SED64392	SD00020ST	15-Jun-94	% SOLIDS	36.9	%REC		0.1
	SED64392	SD00020ST	15-Jun-94	AROCLOR-1016	220	UG/KG	U	220
	SED64392	SD00020ST	15-Jun-94	AROCLOR-1221	220	UG/KG	U	220
	SED64392	SD00020ST	15-Jun-94	AROCLOR-1232	220	UG/KG	U	220
	SED64392	SD00020ST	15-Jun-94	AROCLOR-1242	220	UG/KG	U	220
	SED64392	SD00020ST	15-Jun-94	AROCLOR-1248	220	UG/KG	U	220
	SED64392	SD00020ST	15-Jun-94	AROCLOR-1254	430	UG/KG	U	430
	SED64392	SD00020ST	15-Jun-94	AROCLOR-1260	430	UG/KG	U	430
	SED64392	SD00020ST	15-Jun-94	TOT. ORG. CARBON	2	%REC		0.13
B-5	SED64492	SD00017ST	10-Jun-94	% SOLIDS	63.9	%REC		0.1
	SED64492	SD00017ST	10-Jun-94	AROCLOR-1016	120	UG/KG	U	120
	SED64492	SD00017ST	10-Jun-94	AROCLOR-1221	120	UG/KG	U	120
	SED64492	SD00017ST	10-Jun-94	AROCLOR-1232	120	UG/KG	U	120
	SED64492	SD00017ST	10-Jun-94	AROCLOR-1242	120	UG/KG	U	120
	SED64492	SD00017ST	10-Jun-94	AROCLOR-1248	120	UG/KG	U	120
	SED64492	SD00017ST	10-Jun-94	AROCLOR-1254	240	UG/KG	U	240
	SED64492	SD00017ST	10-Jun-94	AROCLOR-1260	240	UG/KG	U	240
	SED64492	SD00017ST	10-Jun-94	TOT. ORG. CARBON	1.3	%REC		0.07

Note: All detection limit values are dry weight and adjusted for sample moisture content

Attachment 2. PRELIMINARY PCB TISSUE RESULTS FOR OU3, OU5, AND OU6

Location	Sample #	Organism	Species	Result (Aroclor-1254, ug/kg)	Detect Limit (ug/kg, CRDL)
Stanley Res.	BIO00001EG	Carp	*Cyprinus carpio*	33	15
Stanley Res.	BIO00014EG	Carp	*Cyprinus carpio*	99	15
Stanley Res.	BIO00015EG	Carp	*Cyprinus carpio*	1000	15
Stanley Res.	BIO00016EG	Carp	*Cyprinus carpio*	9.8	15
Stanley Res.	BIO00017EG	Channel Catfish	*Ictalurus punctatus*	BDL	15
Stanley Res.	BIO00018EG	Channel Catfish	*Ictalurus punctatus*	BDL	15
Stanley Res.	BIO00019EG	Channel Catfish	*Ictalurus punctatus*	BDL	15
Stanley Res.	BIO00020EG	Channel Catfish (filet)	*Ictalurus punctatus*	38.6	15
Stanley Res.	BIO00021EG	Channel Catfish (liver)	*Ictalurus punctatus*	13.4	15
Stanley Res.	BIO00013EG	Gizzard Shad	*Dorosoma cepedianum*	110	15
Stanley Res.	BIO00012EG	Gizzard Shad	*Dorosoma cepedianum*	194	15
Stanley Res.	BIO00010EG	Rainbow Trout	*Salmo Gairdneri*	29	15
Stanley Res.	BIO00011EG	Rainbow Trout	*Salmo Gairdneri*	15.3	15
Stanley Res.	BIO00009EG	Small Mouth Bass	*Micropterus dolomieu*	26.8	15
Stanley Res.	BIO00006EG	Wiper	*Morone americana x Morone saxatilis*	36	15
Stanley Res.	BIO00007EG	Wiper	*Morone americana x Morone saxatilis*	39	15
Stanley Res.	BIO00008EG	Wiper	*Morone americana x Morone saxatilis*	53	15
Stanley Res.	BIO00002EG	Wiper (filet)	*Morone americana x Morone saxatilis*	36.9	15
Stanley Res.	BIO00003EG	Wiper (filet)	*Morone americana x Morone saxatilis*	37.2	15
Stanley Res.	BIO00004EG	Wiper (filet)	*Morone americana x Morone saxatilis*	9.3	15
Stanley Res.	BIO00005EG	Wiper (liver)	*Morone americana x Morone saxatilis*	246	15
Mower Res.	BIO00022EG	Large Mouth Bass	*Micropterus salmoides*	BDL	15
Mower Res.	BIO00023EG	Large Mouth Bass	*Micropterus salmoides*	BDL	15
Mower Res.	BIO00024EG	Large Mouth Bass	*Micropterus salmoides*	BDL	15
Mower Res.	BIO00025EG	Large Mouth Bass (filet)	*Micropterus salmoides*	BDL	15
Mower Res.	BIO00026EG	Large Mouth Bass (filet)	*Micropterus salmoides*	BDL	15
Mower Res.	BIO00027EG	Large Mouth Bass (filet)	*Micropterus salmoides*	BDL	15
Mower Res.	BIO00029EG	Large Mouth Bass (liver)	*Micropterus salmoides*	BDL	15
Mower Res.	BIO00030EG	White Sucker	*Catostomus commersoni*	BDL	15
Mower Res.	BIO00031EG	White Sucker	*Catostomus commersoni*	BDL	15
Mower Res.	BIO00032EG	White Sucker	*Catostomus commersoni*	BDL	15
Great Western	BIO3861ST	Carp	*Cyprinus carpio*	BDL	20
Great Western	BIO3862ST	Carp	*Cyprinus carpio*	BDL	20
Great Western	BIO3863ST	Carp	*Cyprinus carpio*	BDL	20
Great Western	BIO3864ST	Carp	*Cyprinus carpio*	52.4	20
Great Western	BIO3865ST	Carp	*Cyprinus carpio*	BDL	20
Great Western	BIO3866ST	Carp	*Cyprinus carpio*	BDL	20

* All samples are whole body except where noted

Attachment 2. PRELIMINARY PCB TISSUE RESULTS FOR OU3, OU5, AND OU6

Location	Sample #	Organism	Species	Result (Aroclor-1254, ug/kg)	Detect Limit (ug/kg, CRDL)
A-1	BIO3835ST	deer mouse	*Peromyscus maniculatus*	BDL	20
A-1	BIO3837ST	deer mouse	*Peromyscus maniculatus*	BDL	20
A-1	BIO3843ST	deer mouse	*Peromyscus maniculatus*	BDL	20
A-1	BIO3844ST	vole	*Microtus pennsylvanicus*	BDL	20
A-1	BIO3850ST	deer mouse	*Peromyscus maniculatus*	BDL	20
A-1	BIO3855ST	n/a	*N/A (matrix spike)*	BDL	20
A-1	BIO3857ST	vole	*Microtus pennsylvanicus*	BDL	20
A-1	BIO3858ST	vole	*Microtus ochrogaster*	BDL	20
A-1	BIO3691ST	Plant	*N/A*	BDL	22
A-1	BIO3692ST	Plant	*N/A*	BDL	22
A-1	BIO3693ST	Plant	*N/A*	BDL	22
A-2	BIO3792ST	Large Mouth Bass	*Micropterus salmoides*	40	20
A-2	BIO3793ST	Large Mouth Bass	*Micropterus salmoides*	47	20
A-2	BIO3794ST	Large Mouth Bass	*Micropterus salmoides*	58	20
A-2	BIO3575ST	Insect	*N/A*	19.7	88
A-2	BIO3688ST	Plant	*N/A*	BDL	22
A-2	BIO3689ST	Plant	*N/A*	BDL	22
A-2	BIO3690ST	Plant	*N/A*	BDL	22
A-3	BIO3839ST	deer mouse	*Peromyscus maniculatus*	BDL	20
A-3	BIO3840ST	deer mouse	*Peromyscus maniculatus*	BDL	20
A-3	BIO3841ST	vole	*Microtus pennsylvanicus*	BDL	20
A-3	BIO3842ST	vole	*Microtus pennsylvanicus*	BDL	20
A-3	BIO3845ST	deer mouse	*Peromyscus maniculatus*	BDL	20
A-3	BIO3846ST	vole	*Microtus pennsylvanicus*	BDL	20
A-3	BIO3826ST	Crayfish	*Cambarus sp.*	6.3 (Aroclor-1260)	15
A-3	BIO3825ST	Crayfish	*Cambarus sp.*	BDL	15
A-3	BIO3827ST	Crayfish	*Cambarus sp.*	BDL	15
A-4	BIO3748ST	Plant	*N/A*	BDL	23
A-4	BIO3779ST	Fat head Minnow	*Pimephales promelas*	14	22
A-4	BIO3780ST	Fat head Minnow	*Pimephales promelas*	14	22
A-4	BIO3781ST	Fat head Minnow	*Pimephales promelas*	24	22
A-4	BIO3828ST	Crayfish	*Cambarus sp.*	BDL	15
A-4	BIO3829ST	Crayfish	*Cambarus sp.*	BDL	15
A-4	BIO3830ST	Crayfish	*Cambarus sp.*	BDL	15

* Samples are whole body except where noted

Attachment 2. PRELIMINARY PCB TISSUE RESULTS FOR OU3, OU5, AND OU6

Location	Sample #	Organism	Species	Result (Aroclor-1254, ug/kg)	Detect Limit (ug/kg, CRDL)
B-1	BIO3838ST	deer mouse	*Peromyscus maniculatus*	BDL	20
B-1	BIO3853ST	deer mouse	*Peromyscus maniculatus*	BDL	20
B-1	BIO3854ST	vole	*Microtus ochrogaster*	BDL	20
B-1	BIO3856ST	deer mouse	*Peromyscus maniculatus*	BDL	20
B-1	BIO3859ST	vole	*Microtus pennsylvanicus*	BDL	20
B-1	BIO3860ST	vole	*Microtus ochrogaster*	BDL	20
B-1	BIO3746ST	Plant	N/A	BDL	22
B-1	BIO3747ST	Plant	N/A	BDL	22
B-1	BIO3748ST	Plant	N/A	BDL	23
B-1	BIO3795ST	Tiger Salamanders	*Ambistoma tigrinum*	40	20
B-1	BIO3797ST	Tiger Salamanders	*Ambistoma tigrinum*	26	20
B-2	BIO3726ST	Plant	N/A	BDL	22
B-2	BIO3727ST	Plant	N/A	BDL	22
B-2	BIO3728ST	Plant	N/A	BDL	22
B-2	BIO3796ST	Tiger Salamanders	*Ambistoma tigrinum*	105	20
B-2	BIO3798ST	Tiger Salamanders	*Ambistoma tigrinum*	59	20
B-2	BIO3799ST	Tiger Salamanders	*Ambistoma tigrinum*	134	20
B-3	BIO3670ST	Plant	N/A	9	22
B-3	BIO3671ST	Plant	N/A	6	22
B-3	BIO3672ST	Plant	N/A	9	22
B-4	BIO3836ST	deer mouse	*Peromyscus maniculatus*	BDL	20
B-4	BIO3847ST	deer mouse	*Peromyscus maniculatus*	BDL	20
B-4	BIO3848ST	vole	*Microtus pennsylvanicus*	BDL	20
B-4	BIO3849ST	vole	*Microtus ochrogaster*	BDL	20
B-4	BIO3851ST	vole	*Microtus ochrogaster*	BDL	20
B-4	BIO3852ST	deer mouse	*Peromyscus maniculatus*	BDL	20
B-4	BIO3644ST	Fat head Minnow	*Pimephales promelas*	464	15
B-4	BIO3643ST	Fat head Minnow	*Pimephales promelas*	498	15
B-4	BIO3642ST	Fat head Minnow	*Pimephales promelas*	479	15
B-4	BIO3673ST	Insect	N/A	40.1	88
B-4	BIO3580ST	Plant	N/A	9	22
B-4	BIO3581ST	Plant	N/A	10	22
B-4	BIO3630ST	Plant	N/A	23	22
B-5	BIO3694ST	Fat head Minnow	*Pimephales promelas*	168	15
B-5	BIO3695ST	Fat head Minnow	*Pimephales promelas*	170	15
B-5	BIO3696ST	Fat head Minnow	*Pimephales promelas*	140	15
B-5	BIO3822ST	Crayfish	*Cambarus sp.*	9.5	15
B-5	BIO3824ST	Crayfish	*Cambarus sp.*	7.1 (Aroclor-1260)	15
B-5	BIO3823ST	Crayfish	*Cambarus sp.*	BDL	15

* All samples are whole body except where noted

Attachment 2. PRELIMINARY PCB TISSUE RESULTS FOR OU3, OU5, AND OU6

Location	Sample #	Organism	Species	Result (Aroclor-1254, ug/kg)	Detect Limit (ug/kg, CRDL)
C-1	BIO00051EG	Crayfish	*Cambarus sp.*	BDL	15
C-1	BIO00052EG	Crayfish	*Cambarus sp.*	BDL	15
C-1	BIO00053EG	Crayfish	*Cambarus sp.*	BDL	15
C-1	BIO00058EG	Blue Gill	*Lepomis macrochirus*	69	15
C-1	BIO00059EG	Blue Gill	*Lepomis macrochirus*	36	15
C-1	BIO00060EG	Chub	*Semotilus atromaculatus*	100	15
C-2	BIO00055EG	Crayfish	*Cambarus sp.*	BDL	15
C-2	BIO00056EG	Crayfish	*Cambarus sp.*	BDL	15
C-2	BIO00054EG	Fat head Minnow	*Pimephales promelas*	33	15
C-2	BIO00057EG	Fat head Minnow	*Pimephales promelas*	53	15
W&I	BIO00103EG	Crayfish	*Cambarus sp.*	BDL	15
W&I	BIO00104EG	Crayfish	*Cambarus sp.*	BDL	15
W&I	BIO00105EG	Crayfish	*Cambarus sp.*	BDL	15
W&I	BIO00107EG	Fat head Minnow	*Pimephales promelas*	41	15
W&I	BIO00108EG	Fat head Minnow	*Pimephales promelas*	59	15
D1	BIO00106EG	Fat head Minnow	*Pimephales promelas*	BDL	30
D2	BIO38675T	Fat head Minnow	*Pimephales promelas*	BDL	30
D2	BIO00101EG	Fat head Minnow	*Pimephales promelas*	BDL	15
D2	BIO00102EG	Fat head Minnow	*Pimephales promelas*	BDL	15

* Samples are whole body except where noted

Attachment 3. Sample-specific SQC Comparison						
Pond	Location	Sample #	TOC %	SQC (ug/kg)	Aroclor-1254 (ug/kg)	Aroclor-1248 (ug/kg)
A-1	SED60092	SD00009ST	1.5	292.5	86	U
A-1	SED60192	SD00008ST	1.6	312	73	U
A-1	SED60292	SD00011ST	1.8	351	86	U
A-1	SED60392	SD00010ST	1.7	331.5	88	U
A-1	SED60492	SD00007ST	1	195	49	U
A-1	SED60492	SD00006ST	1.1	214.5	44	U
A-2	SED60592	SD00004ST	3.9	760.5	U	U
A-2	SED60692	SD00003ST	3.2	624	130	U
A-2	SED60792	SD00002ST	3.1	604.5	89	U
A-2	SED60892	SD00001ST	3.3	643.5	U	U
A-2	SED60992	SD00005ST	3.2	624	160	U
A-3	SED61092	SD00031ST	1.7	331.5	45	U
A-3	SED61192	SD00030ST	1.6	312	U	U
A-3	SED61292	SD00029ST	2.1	409.5	U	U
A-3	SED61392	SD00032ST	1.4	273	U	U
A-3	SED61492	SD00028ST	1.2	234	U	U
A-3	SED61492	SD00027ST	1.4	273	U	U
A-4	No Aroclors detected					
B-1	SED62092	SD00045ST	1.7	331.5	320	88
B-1	SED62192	SD00042ST	2.2	429	1600	290
B-1	SED62292	SD00043ST	1.3	253.5	910	470
B-1	SED62392	SD00044ST	2.1	409.5	410	100
B-1	SED62492	SD00041ST	2.1	409.5	1100	320
B-2	SED62592	SD00037ST	5.9	1150.5	2100	1500
B-2	SED62692	SD00039ST	4.2	819	3800	420
B-2	SED62792	SD00035ST	5.7	1111.5	1200	650
B-2	SED62792	SD00034ST	5.6	1092	930	580
B-2	SED62892	SD00036ST	4.3	838.5	1400	390
B-2	SED62992	SD00038ST	3	585	2000	U
B-3	SED63092	SD00025ST	1.5	292.5	260	U
B-3	SED63192	SD00024ST	4.3	838.5	230	U
B-3	SED63292	SD00026ST	2.6	507	1300	U
B-3	SED63392	SD00023ST	4.1	799.5	770	U
B-3	SED63492	SD00022ST	1.2	234	300	U
B-4	SED63592	SD00014ST	1.4	273	210	U
B-4	SED63692	SD00012ST	1	195	120	U
B-4	SED63792	SD00015ST	1.8	351	190	U
B-4	SED63892	SD00016ST	2	390	200	U
B-4	SED63992	SD00013ST	1.3	253.5	220	U
B-5	No Aroclors detected					

ATTACHMENT 4. OU5 PCB SEDIMENT DATA

POND	LOCATION	SAMPLE #	SAMPLE DATE	CHEMICAL	RESULT	UNITS	DET LIMIT
C-1	SED508	SD50014WC	09-Nov-92	AROCLOR-1016	40	UG/KG	80
C-1	SED510	SD50017WC	09-Nov-92	AROCLOR-1016	40	UG/KG	80
C-2	SED511	SD50023WC	10-Nov-92	AROCLOR-1016	40	UG/KG	80
C-2	SED512	SD50024WC	10-Nov-92	AROCLOR-1016	40	UG/KG	80
C-1	SED508	SD50014WC	09-Nov-92	AROCLOR-1221	40	UG/KG	80
C-1	SED510	SD50017WC	09-Nov-92	AROCLOR-1221	40	UG/KG	80
C-2	SED511	SD50023WC	10-Nov-92	AROCLOR-1221	40	UG/KG	80
C-2	SED512	SD50024WC	10-Nov-92	AROCLOR-1221	40	UG/KG	80
C-1	SED508	SD50014WC	09-Nov-92	AROCLOR-1232	40	UG/KG	80
C-1	SED510	SD50017WC	09-Nov-92	AROCLOR-1232	40	UG/KG	80
C-2	SED511	SD50023WC	10-Nov-92	AROCLOR-1232	40	UG/KG	80
C-2	SED512	SD50024WC	10-Nov-92	AROCLOR-1232	40	UG/KG	80
C-1	SED508	SD50014WC	09-Nov-92	AROCLOR-1242	40	UG/KG	80
C-1	SED510	SD50017WC	09-Nov-92	AROCLOR-1242	40	UG/KG	80
C-2	SED511	SD50023WC	10-Nov-92	AROCLOR-1242	40	UG/KG	80
C-2	SED512	SD50024WC	10-Nov-92	AROCLOR-1242	40	UG/KG	80
C-1	SED508	SD50014WC	09-Nov-92	AROCLOR-1248	40	UG/KG	80
C-1	SED510	SD50017WC	09-Nov-92	AROCLOR-1248	40	UG/KG	80
C-2	SED511	SD50023WC	10-Nov-92	AROCLOR-1248	40	UG/KG	80
C-2	SED512	SD50024WC	10-Nov-92	AROCLOR-1248	40	UG/KG	80
C-1	SED508	SD50014WC	09-Nov-92	AROCLOR-1254	80	UG/KG	160
C-1	SED510	SD50017WC	09-Nov-92	AROCLOR-1254	80	UG/KG	160
C-2	SED511	SD50023WC	10-Nov-92	AROCLOR-1254	80	UG/KG	160
C-2	SED512	SD50024WC	10-Nov-92	AROCLOR-1254	80	UG/KG	160
C-1	SED508	SD50014WC	09-Nov-92	AROCLOR-1260	80	UG/KG	160
C-1	SED510	SD50017WC	09-Nov-92	AROCLOR-1260	80	UG/KG	160
C-2	SED511	SD50023WC	10-Nov-92	AROCLOR-1260	80	UG/KG	160
C-2	SED512	SD50024WC	10-Nov-92	AROCLOR-1260	80	UG/KG	160

ATTACHMENT 5. OU5 PCBs IN POND SEDIMENT CORES (1992)

POND	CORE DEPTH	TOTAL PCB CONCENTRATION UG/KG (PPB)
B1	0-2FT	1640
	2-4FT	8846
B2	0-2FT	2260
	SEDIMENT <2FT DEEP	
B3	0-6IN 1994	790
	0-2FT	1550
	2-4FT	1215
B-4	0-2FT	284
	2-4FT	660

APPENDIX M

RECENT PAPERS ON THE SOILS OF OU 3

Appendix M contains papers authored by RFETS employees regarding the distribution of actinides and other metals in OU 3.

Comprehensive Appraisal of Plutonium-239, -240 in Soils of Colorado: A Basis for Risk Analysis, Litaor, et. al. (1995) is in press in the Journal of Health Physics and due to be published in the December issue.

Analysis of Selected Metals in the Surficial Soils of OU 2, Allen and Litaor, (1995) was developed as an internal study for OU 2. This paper is relevant in that if OU 2 contains metals which exhibit an areal distribution pattern, this may be indicative of metal contamination in OU 3. The study shows that there is no indication that metals other than plutonium and americium were areally disbursed into OU 3.

Vertical Distribution of Actinides in the Soils of Operable Unit 3, Litaor, (1995) discusses the vertical movement of actinides in the soils. The data indicate that vertical movement of actinides is not occurring.

Comprehensive Appraisal of Americium-241 in Soils of Operable Units 1, 2, and 3: A Basis for Risk Analysis, Litaor and Allen, (1995) provides a distribution analysis of americium-241 using the same techniques as plutonium-239, -240. This publication is in press in the Journal of Health Physics.

Comprehensive Appraisal of Plutonium-239+240 in Soils of Colorado: A Basis For Risk Analysis

by

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ABSTRACT

Plutonium contamination of soils around Rocky Flats Environmental & Technology Site (REFTS), near Golden Colorado resulted from past outdoor storage practices and subsequent remobilization due to inadequate cleanup practices. Until now, human-health and ecological risk assessments have not been performed because of a lack of sufficient information regarding the spatial extent of Pu-239+240 in soils. The purpose of this work was to elucidate the extent of Pu-contamination in surficial soils, and to assess the uncertainty associated with the spatial distribution of Pu-239+240 around RFETS.

Four data sets were collected or compiled for this investigation: (1) samples collected from 240 plots of 1.01- or 4.05-hectare by compositing 25 evenly-spaced samples from the upper 0.64 cm in each plot, (2) samples collected from the upper 5 cm of soil in 167 of the same 240 plots by compositing 10 samples from the center of each plot, (3) historical data compiled from samples collected between 1969 and 1973, considered to be the most indicative of the original release, and (4) the exhaustive data set that contains the samples from 1, 2, and 3 as well as numerous unpublished data sets collected between 1974 and 1994. These latter samples varied in depth and method of sampling. Plutonium activity reported in the exhaustive data set ranged from 0.03 Bq/kg to 407000 Bq/kg with a mean of 1443 Bq/kg, median of 6.6 Bq/kg, standard deviation of 18463 Bq/kg, and a coefficient of variation of 12.6.

The technique of nonparametric indicator kriging was used to model four conditional cumulative distribution functions (ccdf) of Pu-239+240 in soils around RFETS. Each of the ccdf was used to generate an E-type (mean of the conditional cdf) surface. The resulted surfaces were consistent with the hypothesis that the westerly winds were the dominant mechanism of Pu dispersal. Other processes, such as downstream transport of sediment along local southeast-trending drainages, may have additionally moved small amounts of Pu.

The E-type surface configuration constructed in this study did not agree with the size and shape of the southeastern plume proposed by earlier studies. Results of these earlier studies were used to correlate rates of cancer incidence with activity of Pu in supposedly contaminated soils (based on the proposed plume) in the greater Denver area. The E-type maps generated in the current study illustrate the inadequacy of past investigations; which relied on small and poorly spaced data sets to formulate a human-health and ecological risk.

The ccdfs were also used to construct probability of exceedence maps of Pu-239+240 in soils. For the purpose of this report two threshold values for the probability maps were selected: (1) the mean and the highest measured global fallout of Pu (1.48 and 2.96 Bq/kg, respectively), and (2) the programmatic preliminary remediation goal for residential occupancy scenario (126 Bq/kg). The probability-of-exceedence maps provide estimates of spatial uncertainty associated with each threshold.

The E-type maps in conjunction with the probability-of-exceedence maps provide a robust framework for future cleanup options and landuse decisions.

Introduction

Plutonium contamination of soils around Rocky Flats Environmental & Technology Site (RFETS), located north of Golden, Colorado originated primarily from a former storage site where steel drums were used to store plutonium-contaminated industrial oils from 1958 to 1968 (Krey and Hardy, 1970; Seed et al., 1971). Plutonium-contaminated oils leaked from the deteriorating drums, resulting in contamination of surface soils. Plutonium particles entrapped in the fine fraction of the surface soils were subsequently airlifted by winds and deposited on soils in an east and southeast-trending plume (Krey and Hardy, 1970; Seed et al., 1971; Poet and Martell, 1972; Little et al., 1980).

Several studies have been conducted to assess the spatial distribution and total inventories of Pu in soils around RFETS. Krey and Hardy (1970) sampled 33 sites located as far as 64 km east, south, and north of RFETS, to establish a Pu-239+240 contour map around RFETS (Figure 1). The small number of soil samples resulted in significant extrapolation over large unsampled areas and relied heavily on a few individual data points. Krey and Hardy (1970) did not explain the method they used for construction of Pu-239+240 contour map.

Seed et al. (1971) produced an isopleth map using data from 135 soil samples. This map differed significantly from the previous contour map (Krey and Hardy, 1970), especially in the magnitude and extent of Pu activity in soils located off plantsite (Figure 1). The isopleth map (Seed et al., 1971) was

produced by dividing the area into 17 sectors where the soil data for each sector were curve-fitted using the least-squares method. This method estimated the activity of Pu in the soil as a function of radial distance from the source of the contamination. However, this interpolation technique did not provide any measure of the reliability of the estimates. Therefore, the probability of misclassification by interpolation error cannot be known.

Krey (1976) constructed a second isopleth map of Pu in soils around RFETS (Fig. 1), which represents the direct contribution of Pu from RFETS to the soil environment. That is, it shows RFETS Pu versus global-fallout Pu. Global-fallout Pu in the Denver area was estimated to be 0.62±0.18 Bq/kg. Krey's (1976) isopleth map was constructed using data from 22 soil samples taken from as far as 60 km north and southeast of RFETS. Once again, Krey (1976) did not describe the method by which the Pu-deposition contours were constructed or the error associated with each contour. This latter isopleth map was the premise of the cancer-incidence assessment for the Denver area (Johnson, 1981).

Johnson (1981) asserted that exposure of a large population in the Denver area to Pu released by RFETS increased the cancer incidence by more than 16 percent for population adjacent to the plant (Figure 1). The excess cases of cancer according to that study were leukemia, lymphoma, myeloma, and cancer of the lung, thyroid, breast, esophagus, stomach, and colon. The correlation between cancer incidence and Pu in soils was achieved by readjusting and superimposing census tracts on areas east and

southeast of the plant confined by Pu isopleths (Figure 1). Obviously, this paper generated tremendous controversy that embroiled federal, state, and local officials, as well as the scientific community (Hamilton, 1983; Crump et al. 1987; Johnson, 1983, 1984, 1987). One of the major criticisms regarding Johnson's paper was that the Pu isopleths depicted in Figure 1 were constructed with little data (< 18 soil samples) and no uncertainty analysis was ever performed.

The main goal of the current work is to provide a complete appraisal of the spatial extent of Pu-239+240 in soils around RFETS. This appraisal would form the basis for human health and ecological risk assessment. This work supports some of the remedial investigations and feasibility studies at RFETS. The objectives of the present study are to: (1) assess the spatial distribution of Pu-239+240 in soils around RFETS using robust geostatistical techniques, (2) provide a measure of uncertainty to the spatial estimation of Pu-239+240, and (3) ascertain the uncertainty associated with past and present estimates by comparing the present distribution of Pu-239+240 in the soils with published maps.

Geostatistical Approach

A determination of the spatial distribution of Pu-239+240 in the soil can be performed using geostatistical techniques such as kriging. Kriging is a generic name for a group of estimation techniques that design to minimize error-variance. Ordinary kriging (OK), which was recently used by Litaor (1993) to

estimate the spatial distribution of Pu-239+240 in soils of RFETS, is sensitive to strongly positively skewed distributions. This sensitivity may result in underestimation of Pu-239+240 in highly contaminated areas and overestimation in areas of low contamination. The most severe limitation of OK, however, is the difficulty of assessing the reliability and the risk associated with its estimates. The term risk is used here in the context of the probability of misclassifying an area below or above a certain cleanup threshold.

There are several geostatistical techniques that model the spatial uncertainty of a given contaminant in the environment rather than produce an 'optimal' estimator. These techniques include indicator cokriging, probability and indicator kriging. Indicator kriging (IK) was chosen for the present study because as a nonparametric method, it is free from any distributional assumptions and resistant to a highly skewed distribution and outliers. Indicator kriging is also a faster and simpler procedure, compared to more elaborate techniques such as indicator cokriging and probability kriging, but has similar accuracy (Goovaerts, 1994).

The following is a brief discussion of the principles of IK, as pertains to estimating the spatial distribution of Pu-239+240 in soils around RFETS. A complete mathematical treatment and formalism of IK and the theory behind parametric and nonparametric spatial-estimation techniques can be found in Journel (1987), Isaaks and Srivastava (1989), and Deutch and

Journel (1992) among others.

The spatial distribution of a contaminant Z(u) in the soil environment can be derived from its conditional cumulative distribution function (ccdf). The ccdf model is a function of the location u of the unkown and the threshold value z_k. The robustness of the ccdf relies on the sampling design and the location (u) of the samples. The ccdf is used to determine the probability that a contaminant (e.g., Pu-239+240) at an unsampled location is greater than a given threshold value, and is related to the proportion of the data above that threshold. This relationship accounts for the proximity of available information to the unsampled location, a given threshold value, and the overall sampling design.

The cumulative distribution function (cdf) of a contaminant Z(u) can be modeled by:

$$F(u;z_k|(n)) = Prob\ [Z(u) \le z_k|(n)] \qquad (1)$$

where |(n) represents conditional available information, z_k is the cutoff value, and u is the location of the available information. The notation $F(u;z_k|(n))$ represents a function of both the threshold value z_k and the available information |(n).

The essence of IK is the indicator coding, which transforms the concentration of the contaminant at each sample location into a ccdf of Z(u). The indicator coding of the ccdf is partitioned into a set of K indicator random functions $I(u;z_k)$ defined for

different cutoff values z_k:

$$I(u;z_k) = \begin{cases} 0 \text{ if } Z(u) \le z_k \\ 1 \text{ otherwise} \end{cases} \quad (2)$$

The indicator coding described in Equation 2, can be estimated at unsampled locations using IK, which provides a least-squares estimate of the ccdf at cutoff z_k:

$$I^*(u;z_k) = F(u;z_k|(n)) = Prob\,\{Z(u) \le z_k|(n)\} = \sum_{\alpha=1}^{n} \lambda_\alpha(u;z)I(u;z) \quad (3)$$

where, $I(u;z_k)$ is the indicator value, which is set to 1 if the Pu-239+240 activity at location u is higher than the specified cutoff z_k, and is set to 0 if it smaller or equal to this cutoff value (see equation 2), $I^*(u;z_k)$ is the estimated indicator value ranging between 0 and 1, and λ_α is the kriging weights. The kriging weights λ_α are constrained only by the following order relations:

$$F(u;z_k)|(n)) \in (0,1) \quad (4)$$

and

$$F(u;z_k|(n)) \ge F(u;z_{k_{k-1}}|(n)),\ for\ all\ z_k \ge z_{k-1} \quad (5)$$

where z_k and z_{k-1} are threshold values.

The IK is repeated for a series of K cutoff values z_k, which generate a discrete range of known contaminant values in the soil. The ccdf assembled from the K indicator kriging estimates

(defined in Equation 3) represents a probabilistic model for the uncertainty about the unsampled location z(u). The probability of exceedance of a given threshold K (e.g., global-fallout of Pu-239+240) is described by:

$$Prob\ (Z(u) > K|(n)) = 1 - F(K;u|(n)) \qquad (6)$$

In practice, the spatial distribution of Pu-239+240 in the soil environment of RFETS was assessed according to the following steps:

(1) A general exploratory data analysis in which univariate statistics were performed, and the benefits of data transformation and declustering were assessed;

(2) K threshold values for the calculated ccdf were selected. Generally, 9 cutoffs defining the standard ccdf were considered;

(3) Indicator semivariograms were computed for the 9 cutoffs z_k :

$$2\gamma I(h;z_k) = \frac{1}{n(h)} \sum_{\alpha=1}^{n(h)} [I(u;z_k) - I(u+h;z_k)]^2 \qquad (7)$$

where n(h) are data pairs separated by the distance h.

The indicator variogram for a particular threshold value $[2\gamma I(h;z_k)]$ measures the degree of spatial correlation of the indicator variable $I(h;z_k)$, over a given area. The indicator variable provides the relation of contaminant activity (e.g., Pu-239+240) in a given location with respect to a specific cutoff

z_k;

(4) The accuracy of IK in estimating the ccdf at the 9 cutoffs was examined by a cross-validation analysis. This analysis consisted of estimating the probability of exceedence of a given cutoff at a datum location where the Pu-239+240 activity was temporarily removed from the data set. This procedure was repeated at all data locations. The true probability of exceedence at a given cutoff was compared against a computed value at that cutoff;

(5) The ordinary indicator kriging algorithm was used to generate cumulative indicator functions as described by Equation 2, and compute the probability estimates for the unsampled area at specific locations. In general, a 5500-m search radius was used with a minimum of 4 and a maximum of 10 data points required to estimate a value at a point. The ordinary indicator kriging equations were solved for all the 9 cutoff values. This provided the uncertainty through the 9 discrete cdf values $F(u;z_k|(n))$. Order relation problems were corrected according to the constraints given in Equations 5 and 6;

(6) The cdf for any required quantile or probabilities of exceeding a threshold value of interest (e.g., global-fallout P. was obtained by linear interpolation:

$$F(u;z|(n)) = F(u;z_k|(n)) + \frac{z-z_k}{z_{k+1}-z_k} * [F(u;z_{k+1}|(n)) - F(u;z_k|(n))] \quad (8)$$

where z is the threshold value of interest between the comput

cutoff values z_k and z_{k+1}; and

(7) The E-type estimate (mean of the ccdf) was computed using the following equation:

$$z^*E(u) = \sum_{k=1}^{K} z'_k * [F(u; z_{k+1}|(n)) - F(u; z_k|(n))] \qquad (9)$$

where $z^*E(u)$ is the E-type estimate at location u, z'_k is the k_{th} class mean computed by Equation 8, and z_k and z_{k+1} are class bounds that define the interval of variability of Z(u). The cdf of Pu-239+240 activity in the soils around RFETS showed a large positively skewed distribution (see below), thus, the upper tail of this cdf was calculated using a hyperbolic model:

$$F_{\omega\varepsilon}(z) = 1 - \frac{\varepsilon}{z^{\omega}}, \ \omega \geq 1, \ z^{\omega} > \varepsilon > 0 \qquad (10)$$

where ε is a scaling parameter that allows identification of a pre-calculated quantile value, ω is a power parameter that controls how fast the cdf reaches its upper limit, and z represents Pu-239+240 activity.

The IK analysis was performed using GSLIB - the geostatistical software library and user's guide (Deutsch and Journel, 1992).

Field Sampling Techniques

Prior to the approval of construction activity, the State of Colorado requires ameliorative treatment of soils with Pu activity greater than 33.3 Bq/kg (CDH, 1975). To evaluate the

soil-Pu values relative to this guideline, the Colorado Department of Public Health and Environment (CDPHE) sampling protocol was used (CDH, 1977). This sampling protocol requires the collection of 25 equally-spaced subsamples, to be composited within a 4.05 ha area for Pu analysis. The soil at each individual location was sampled with the CDPHE sampler, which was designed to obtain a sample from the upper soil surface 0.64 cm deep, and from an area 5-cm wide by 6- cm long.

Because the CDPHE sampler collects only the top 0.64 cm of the soil, the sampler exhibited a serious problem in locating the boundary between the soil surface and the litter layer accumulated above. Hence, a comparative study was conducted to assess actinide activity using the CDPHE and the so-called Rocky Flats (RF) sampling techniques. The RF sampling protocol dictated that soil samples are collected by driving a 10 X 10-cm cutting tool 5-cm deep into undisturbed soil. Five sub-samples were collected from the corners and the center of two one-meter squares, which were spaced one meter apart in the middle of each sampling plot.

Soil Sampling Design for the CDPHE & RFP Data Sets

The soil sampling design in the area within RFETS was described by Litaor (1993). In summary, eighty four contiguous 4.05 ha plots in different directions and distances from the former storage site, and 34 1.01 ha plots in close proximity to the former storage site were sampled.

The optimal number of soil samples and the optimal distance

between the plots off plantsite was determined using sampling strategy algorithm for soil sampling suggested by McBratney et al. (1981). Past soil sampling programs in areas east of RFETS provided sufficient information (120 soil samples) to compute the optimal sampling design (DOE, 1992). Optimum sampling for the purpose of this report is defined as the statistically objective determination of a distance between samples that achieves the desired estimated error (16.6 Bq/kg).

The boundaries for the surficial soil sampling in areas east of RFETS were determined on the basis of the smallest contour value (11.1 Bq/kg) provided by Krey and Hardy (1970). The computed optimum sampling interval for the grid spacing between plots, within these boundaries was 1750 m. To reduce the estimation variance even further, the optimal sampling interval was decreased to 1000 m between grid plots. Because the semivariogram was isotropic, the 1000 m grid space was used in all directions. The actual location of the plots was also impacted by past and present land-use practices, access refusal by land owners, and significant growth in residential and commercial areas east of RFETS during the last 20 years.

Additional Data Used in Geostatistical Analysis

To increase the number of soil samples, so that the ccdf would be based on a larger data set, an additional 70 samples from earlier soil sampling programs in areas between the Great Western Reservoir and Standley Lake were added to the current study (see Fig. 1). These previous sampling programs included the

Jefferson County remedy-land study conducted in 1991 (Guillaume, 1991, unpublished data), the remedial-action program on Jefferson County open space (Illsley, 1987), and the soil sample collection and analysis for plutonium on lands adjacent to Great Western Reservoir (Illsley, 1985).

These earlier soil sampling programs used the CDPHE sampling protocols, but lacked formal QA/QC documentation. The benefits of increasing the number of data used to describe the ccdf outweighed the lack of QA/QC documentation for the earlier soil studies. Hence, 206 4.05-ha plots and 34 1.01-ha plots were used, for a total of 240 sampling plots.

Historical and Exhaustive Data Sets

To assess the difference between past work and the current effort, two additional data sets were compiled: (1) the historical data set, and (2) the exhaustive data set. The historical data set consists of soil samples that were collected between 1969 and 1973 and were identified (ChemRisk, 1994) to best represent the magnitude of release and transport of Pu-239+240 from the former storage site. All the data compiled by ChemRisk, 1994 was used in this analysis.

The exhaustive data set, includes the current soil sampling effort (CDPHE and RF sampling procedures), the historical data set, the annual soil sampling program (RFP, 1992), survey of Pu in Colorado soils by CDPHE (Jones and Zhang, 1994), and numerous other unpublished, past and recent soil sampling programs. The compilation of the exhaustive data set paid no attention to

sampling technique, time of collection, and location. The redundancy in Pu data of the current soil sampling (i.e., samples collected by CDPHE and RF sampling procedures in the same plot) was eliminated from the exhaustive data set, by including the highest activity per plot.

Laboratory Analysis

The Pu-239+240 activity in the soil samples was measured by alpha spectroscopy at several commercial laboratories. The soil samples were digested in HNO_3 and HF using a microwave dissolution procedure (Lamothe et al., 1986; Fischer, 1986), and the Pu oxidation state was adjusted with $NaNO_2$. The solution was then passed through an anion-exchange column to separate the Pu from the solution (Talvitie, 1971). The Pu was eluted from the column with HCl-NH_4I solution, acidified with HNO_3, and the resulting eluent was heated to dryness. The sample was redissolved and electroplated onto stainless-steel discs. Upon completion of the electroplating, NH_4OH was added to the solution to prevent redissolution of the Pu-bearing deposit.

RESULTS AND DISCUSSION

Exploratory Analysis

Plutonium activity in soils around RFETS is summarized in Table 1. All data sets exhibited a highly positive skewed distribution that required a nonparametric spatial-estimation technique to ascertain the spatial distribution and its uncertainty. The effect of few outliers on the mean and the variance of the ccdfs of these data sets are obvious. The

exploratory analysis also indicated that results from the current sampling program showed higher activities of Pu-239+240 in soils (i.e., mean, median, quantiles, and outliers) than did the historical information. These findings were expected because of the current extensive and contiguous sampling near the former storage site.

Variography

The ccdfs summarized in Table 1, provided the nine cutoffs from which nine indicator variograms for each data set were modelled. The nine indicator variograms showed strong spatial correlation of Pu-239+240 for each data set and cutoff examined (Figure 2).

Cross-Validation Analysis

The model parameters for indicator variograms were tested using the cross-validation technique. Indicator values at each cutoff were kriged and the mean of both actuals and estimates computed. Each cutoff represents a value of the underlying cdf, thus the mean estimated value should be favorably compared with the known mean at that cutoff. For example, if the first cutoff represents the value greater than or equal to ten percent of the data, the mean of the actual and estimated indicators should be approximately 0.10. Significant deviation from the underlying cdf would suggest a problem with the model variogram. The validation results using isotropic models are summarized in Table 2. The validation results for all data sets indicated that the models adequately represent the underlying cdfs. Cross-validation

analysis conducted on anisotropic models did not improve the estimation results, thus the isotropic indicator variograms were used in the IK analysis.

E-Type Estimate of Pu-239+240 in Soils Around RFETS

The E-type estimates of Pu-239+240 activity, which is the expected mean value of the ccdf at each specified grid point (Equation 9) for the 4 data sets, are depicted in Figures 3 through 6. The E-type estimate, $E(z^*(u))$, is considered the closest possible to the true value, $Z(u)$ (Goovaerts, 1994). The E-type estimates of Pu-239+240 calculated for the CDPHE and the RF soil data, as well as for the exhaustive data set, show a clear west-east trend. This trend is characterized by high values near the former storage area, with a rapid decline towards the eastern plant boundary and the residential areas east of Indiana Street. To the north and south of RFTES, Pu-239+240 activity rapidly decreased with increase distance from the site (Figures 3, 4, and 6). The E-type estimate generated from the exhaustive data set also suggested that the areas west of RFETS have not been significantly impacted from the plant activities (Figure 5).

The west-east pattern generated by the E-type estimates reflects wind dispersion consistent with the prevailing winds at RFETS (Krey and Hardy, 1970). These findings reaffirmed previous studies that suggested eolian transport of resuspended soil particles was the dominant process in the dispersion of Pu-239+240 in the environment (Seed et al., 1971; Little et al., 1980; Litaor, 1994; 1995a; 1995b).

The Pu-239+240 E-type estimates (illustrated in Figures 3, 4, and 6) differed significantly from the previously published maps (see Figure 1). The southeastern component of the plume reported by Krey and Hardy (1970), Seed et al. (1971), and Krey (1976) was not confirmed by the present work. Two samples in the southeast direction that were taken along the southeastren drainage system at different distances from former storage site (within RFETS' boundaries) exhibited Pu-239+240 values of 207 and 270 Bq/kg, but most of the surrounding plots exhibited significantly lower Pu-239+240 values (1.8 to 125 Bq/kg). Hence, the E-type estimate surfaces did not predict a southeast plume. The source of these somewhat higher values for Pu activity in the southeast direction is unclear. One possible mechanism within the RFETS boundaries is sediment transport along the local southeast-trending drainage. Johnson et al. (1976) showed that sediment samples taken from the Woman Creek drainage system approximately 2 km east of Indiana street, exhibited Pu- 239+240 activity from 3 to 67 times greater than soil samples taken away from the flood plains. Their finding strongly supports the interpretation that Pu-239+240 dispersion in the environment was facilitated by dominantly eolian processes, with some sediment transport along the southeast-trending drainage. These findings also illustrate the danger in using an inadequate data sampling and analysis design for estimating the extent of Pu dispersal in the soil environs.

The E-type estimate generated from the historical data set

(Figure 5) did, however, produce a southeastern plume somewhat similar to the map by Krey and Hardy (1970). This southeastern plume was predicted as a result of the inclusion of data from one soil sample near Indiana Street that exhibited Pu-239+240 higher than 185 Bq/kg (Figure 5). There are few soil samples around this locale, hence the E-type estimate configuration was heavily influenced by this outlier. The proximity of this soil sample to Woman Creek suggests that sediment transport down the southeast drainage system may have been the predominant process of Pu-239+240 transport in the southeast direction, rather than eolian transport.

This E-type estimated plume did not, however, extend as far south and southeast as the plume proposed by Krey (1976). Krey extrapolated the contours in the southeast direction to the equivalent of 0.11 and 0.07 Bq/kg. Johnson (1981) extrapolated even beyond Krey's map, and contoured a 0.03 Bq/kg isopleth to fit the censor tracts of cancer incidence in the Denver area within these isopleths of Pu-contaminated soils (see Figure 1). There are only few data points to support such an extrapolation. For example, in the historical data set, less than 1 percent of the data exhibit values in the range of 0.11 to 0.07 Bq/kg. Even in the exhaustive data set, less than 1 percent of the data exhibit values between 0.11 and 0.07 Bq/kg. Moreover, none of the E-type estimates regardless of data set used generated a southeastern plume similar to the one depicted by Krey (1976) and Johnson (1981). The isopleth patterns of 2.96 Bq/kg and 1.48

Bq/kg depicted in Figures 3 to 6 exhibit random distribution which is characteristic of global-fallout Pu rather than an eolian dispersion pattern attributable to RFETS rèleases. These findings cast a serious doubt on the very basic premise of Johnson's work; namely, there is a strong correlation between Pu-contaminated soils and the incidence of cancer in the Denver area.

There are several additional points that can be made from detailed analysis of the E-type maps of the four data sets. First, the upper limit contour of the isopleth maps produced by the E-type estimates was 370 Bq/kg, because only 10 percent of the data were higher than 370 Bq/kg (Table 3). All the values above 925 Bq/kg are clustered around the former storage site. Large variability of Pu-239+240 activity was observed in this area. For example, soil samples collected in a plot immediately east of the former storage site using the CDPHE sampler exhibit 53650 Bq/kg of Pu-239+240 (Litaor, 1995b). Two additional samples collected from the same plot using the RF sampling protocol exhibited 14060 Bq/kg, and 407000 Bq/kg of Pu-239+240. Several plots in this area featured similar variability. This large variability probably resulted from the 'hot particles' phenomenon of Pu-239+240 in highly contaminated soils. Hence, the assessment of the area characterized by Pu-239+240 values higher than 925 Bq/kg should be achieved from the actual observed data (mainly contiguous soil sampling plots) rather than spatial-estimation techniques.

Second, the source of the somewhat higher Pu-239+240 activity (as much as 12.9 Bq/kg) near the junction of Indiana Street and Highway 72 is unknown. Most of the soil samples around this locale are well within background activity of Pu-239+240 in soils of Colorado (Table 4). Eolian dispersion of a contaminant is usually a fairly continuous phenomenon; therefore, the lack of spatial support around this locale is inconsistent with the interpretation of eolian transport. This locale exhibited consistently higher values of Pu-239+240 (e.g., Krey and Hardy, 1970). Further study of Pu isotopic ratio is underway to assess the origin of the Pu at this locale.

Finally, the E-type estimate generated from the CDPHE soil sampling data (Figure 3) is remarkably similar to that of the RF soil sampling data (Figure 4). Moreover, there was no significant difference in Pu-239+240 activity in soils collected with the CDPHE sampler versus the RF sampler (Table 5). These findings suggest that for the purpose of spatial estimation of Pu-239+240 for human and ecological risk assessments, the soil sampling technique has little effect on the outcome of the analysis.

Probability of Exceeding a Threshold Value

Several maps of conditional probabilities were generated to provide areas of uncertainty around the isopleths of the E-type estimates. To create these maps, three threshold values were selected; the first two values represent values of global-fallout Pu in the Denver area, and the third is the programmatic

preliminary remediation goal (PPRG) value.

Global-Fallout Pu

The global-fallout Pu values are based on the work by Krey (1976) who calculated the global-fallout Pu in the Denver area using Pu-240/Pu-239 ratios, and found that areas as far as 17 km east and southeast of the plant were impacted by Pu from RFETS. The CDPHE has identified several remote locations thought to represent background levels of Pu-239+240. The Pu-239+240 activity for soils collected from these area in 1989 using the RF sampler, ranged from 0.51 Bq/kg to 2.84 Bq/kg, with a mean of 1.23 Bq/kg (Table 4). These values are higher than those reported by Krey (1976), even though the sites are considerably farther away from RFETS. These values are also higher than values reported by CDPHE for the same locations, when the CDPHE soil sampler was used (Schmidt, 1994 unpublished data). More recently, Purtymun et al. (1990) studied the impact of global-fallout Pu on remote areas in Southern Colorado and Northern New Mexico. They showed that Pu-239+240 activity collected from soils ranged from 0.04 Bq/kg to 2.99 Bq/kg, with a mean of 1.13 Bq/kg (Table 4). A background characterization study for surficial soils is currently being conducted along the Colorado Front Range and the Eastern Plains. Preliminary results of this background study indicate a Pu-239+240 activity that ranges from 0.62 Bq/kg to 2.66 Bq/kg with a mean of 1.4 Bq/kg and median of 1.25 Bq/kg (Table 4).

This survey of global-fallout Pu across the State of

Colorado suggests a large range of Pu-239+240 activities, probably due to weather patterns, surficial soil processes, and land-use practices in the last 30 years, as well as error associated with the various soil sampling techniques and laboratory methods employed. In the present study, we selected a threshold of 2.96 Bq/kg as the uppermost representation of global-fallout Pu and 1.29 Bq/kg as its mean.

Probability maps clearly demonstrate the large uncertainty associated with the E-type estimate isopleths (Figures 7 & 8). Areas within 4 km radius east of the plant's outer boundary (i.e., Indiana Street), exhibited a greater than 80 percent probability of exceedance the mean global-fallout Pu. However, areas, only 7 km east of the outer boundary exhibited a less than 20 percent probability of exceedance the mean global-fallout Pu. This uncertainty must be taken into account when attempting to correlate the potential environmental and human health risks from RFETS-derived Pu on the Greater Denver area.

Cleanup Options for Environmental Restoration

Risk-based programmatic preliminary remediation goals (PPRG) were computed for radionuclides in soils in RFETS (DOE, 1994). These PPRGs were based on both residential and commercial/ industrial scenarios. The PPRG calculations followed USEPA (1989; 1991) guidance and were supplemented with RFETS-specific information (Hopkins, 1994, personnel communication). A PPRG of 126 Bq/kg of Pu-239+240 in soil was computed to meet the stringent requirements of a residential scenario. Map showing the

probability of exceedance of the computed PPRG for residential scenario at RFETS has been produced (Figure 9). This map delineates the areas declared potentially hazardous, on the basis of the residential scenario using the estimate $Pu^*(u) > 126$ Bq/kg, providing the probability $1 - \alpha(u)$ to make a correct remediation decision for all locations (u) such that $Pu^* > 126$ Bq/kg at a given probability will follow:

$$1 - \alpha(u) = Prob(Pu(u) > 126\ (n)) \qquad (11)$$

Under these conditions, most of the land east of the former storage site within the buffer zone of RFETS will need to be remediated to meet the residential scenario requirements. The cleanup of such a large area (1,469,110 m2 at 80 percent probability) is probably unrealistic in terms of cost, waste generation and land reclamation to minimize slope erosion that must follow such a large-scale removal of the top soil.

Concluding Remark

This study has provided a comprehensive appraisal of the extent of Pu in the soil environs. This appraisal can serve as the basis for future human and ecological risk assessment. The study provided the background information required for selecting remedial actions and/or corrective measures for cleanup. It also clearly delinated the areas that might be addressed for Natural Resource Damages. The study demonstrated the importance of a comprehensive approach for characterizing the spatial extent of contaminants in the soil environs. This approach must rely on a large data set obtained from the analysis of reasonably spaced

samples, in order to build a robust ccdf. The ccdf was used to generate an E-type estimate (mean of the ccdf) and probability-of-exceedence maps. These maps illustrate the inadequacy of past investigations that relied on small data sets obtained from the analysis of poorly spaced soil samples to formulate a conclusive human or ecological risk statement. These probability-of-exceedance maps may also be used to support clean up and future land use decisions.

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Table 1. Summary statistics of Pu-239+240 in the four data sets. Units are in Bq/kg.

Statistics	CDPHE	RFP	Historical	Exhaustive
Number of Data	240	167	240	750
Mean	948	6068	836	1722
Std. Dev.	4477	40848	7437	19906
Coef. of Var.	4.7	6.7	8.8	11.5
Maximum	53761	407000	111000	407000
Upper Quartile	159	221	41.4	42.5
Median	35	22.6	6.6	7.03
Lower Quartile	7.2	2.7	2.6	1.85
Minimum	0.11	0.07	0.003	0.037
Skewness	8.9	8.0	13.7	16.2
Kurtosis	94.1	69.7	200.7	289.9

Table 2. Indicator Variogram Model Validation using the exhaustive data set. Similar analysis was performed for the other data sets with similar results (not shown).

CDF	Cutoff	Actual	Estimate
0.1	0.021	0.099	0.102
0.2	0.045	0.198	0.196
0.3	0.066	0.298	0.294
0.4	0.100	0.383	0.378
0.5	0.180	0.493	0.512
0.6	0.400	0.598	0.590
0.7	0.770	0.699	0.691
0.8	2.160	0.798	0.794
0.85	10.71	0.899	0.896

Table 3. Values of nine cutoffs in Bq/kg of the 4 data sets.

Decile	Cutoff for CDPHE	Cutoff for RF	Cutoff for the Historical Data Set	Cutoff for the Exhaustive Data
0.1	1.11	0.96	1.11	0.03
0.2	3.70	1.92	1.85	0.04
0.3	11.1	5.18	2.96	0.06
0.4	18.5	10.3	4.44	0.10
0.5	33.3	25.9	6.66	0.18
0.6	48.1	66.6	12.9	0.40
0.7	114	164	28.4	0.77
0.8	310	370	103	2.16
0.9	1100	1332	736	10.7

Table 4. Background activity of Pu-239+240 in soils of Colorado. Units are in Bq/kg.

Statistics	EG&G, 1994 (unpublished Data)	EG&G, 1989 (unpublished Data)	Krey, 1976	Purtymun et al., 1990
Number of Data	50	9	11	5
Mean	1.4	1.23	0.66	1.13
Std. Dev.	0.5	0.73	0.14	1.06
Coef. of Var.	0.37	0.59	0.21	0.9
Maximum	2.66	2.84	0.92	2.99
Upper Quartile	1.70	1.75	0.75	1.95
Median	1.25	0.99	0.63	0.57
Lower Quartile	0.99	0.64	0.59	0.34
Minimum	0.62	0.51	0.40	0.04
Skewness	0.78	1.77	1.06	1.1
Kurtosis	-0.21	4.07	1.17	2.5

Table 5. Comparison between Pu-239+240 activity in soil samples collected with the CDPHE versus RF sampler

Method	N	Sum of Scores	Wilcoxon 2-Sample Test	Kruskal-Wallis Test
RF CDPHE	167 167	27698.5 28246.5	S=27698.5 Z=-0.31 Prob > |Z| = 0.7	χ^2 = 0.09 Prob > χ^2 = 0.8

Figure List

Figure 1. The spatial distribution of Pu-239+240 east of RFETS as proposed by Krey and Hardy (1970), Seed et al. (1971), and Krey (1976) as modified by Jonhson (1981). The original units mCi/km^2 were converted to Bq/kg using 1 gm/cm^3 bulk density and 10- and 1-cm sampling depth respectively.

Figure 2. Indicator variograms and models for the 9 cutoffs, using the exhaustive data set. Similar analysis was performed for the the other data sets (not shown).

Figure 3. E-type estimate of Pu-239+240 using the CDPHE soil technique.

Figure 4. E-type estimate of Pu-239+240 using the RF soil technique.

Figure 5. E-type estimate of Pu-239+240 using the historical data set.

Figure 6. E-type estimate surface of Pu-239+240 using the exhaustive data set.

Figure 7. A contour map of the probabilities that the unknown Pu-239+240 activity exceeds 2.96 Bq/kg using the exhaustive data set. Similar analysis was performed with the other data sets which yielded similar results (not shown).

Figure 8. A contour map of the probabilities that the unknown Pu-239+240 activity exceeds 1.29 Bq/kg using the exhaustive data set. Similar analysis was performed with the other data sets which yielded similar results (not shown).

Figure 9. Contour map of the probabilities that the unknown Pu-239+240 activity exceeds 126 Bq/kg using the exhaustive data set. Similar analysis was performed with the other data sets which yielded similar results (not shown).

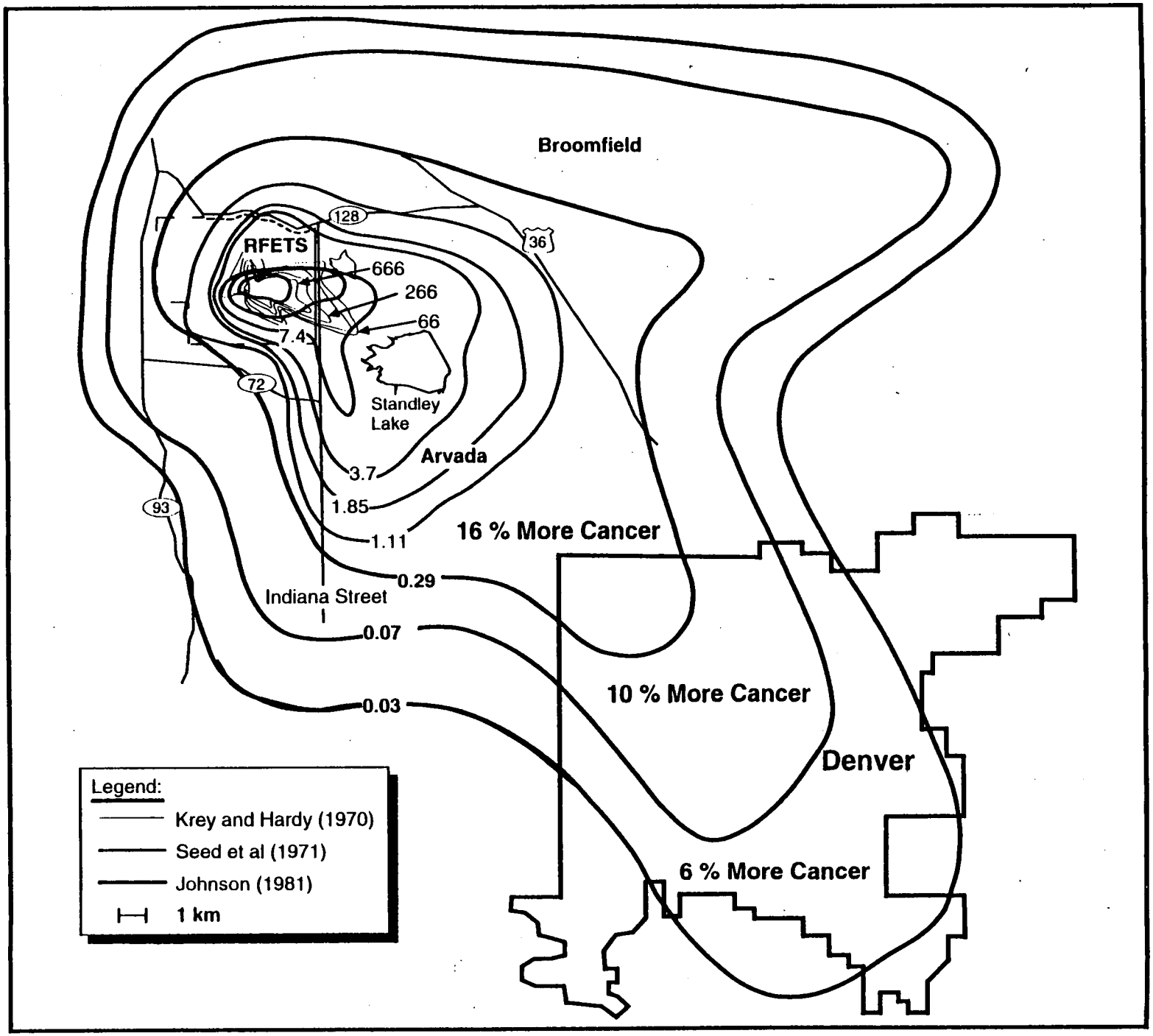
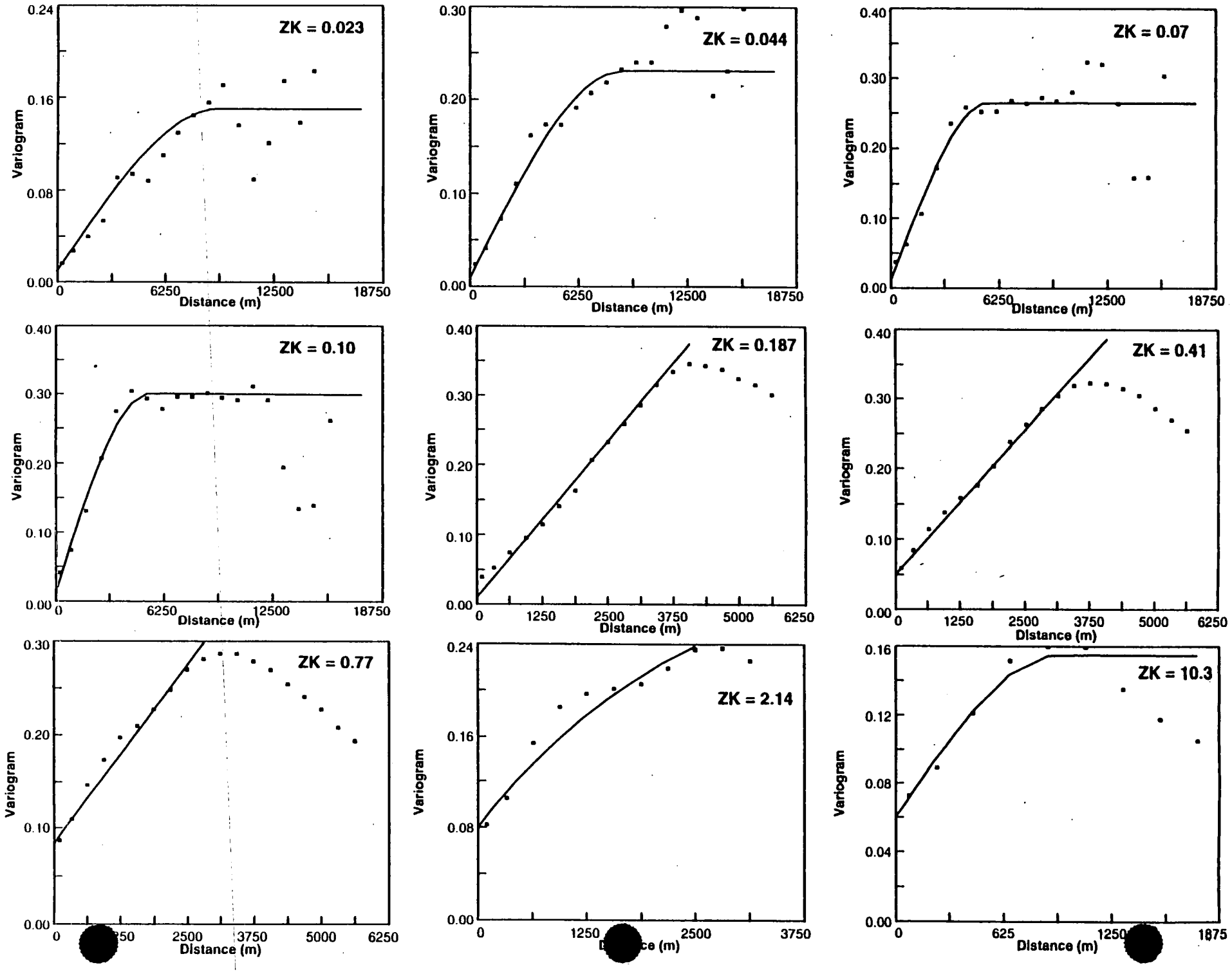
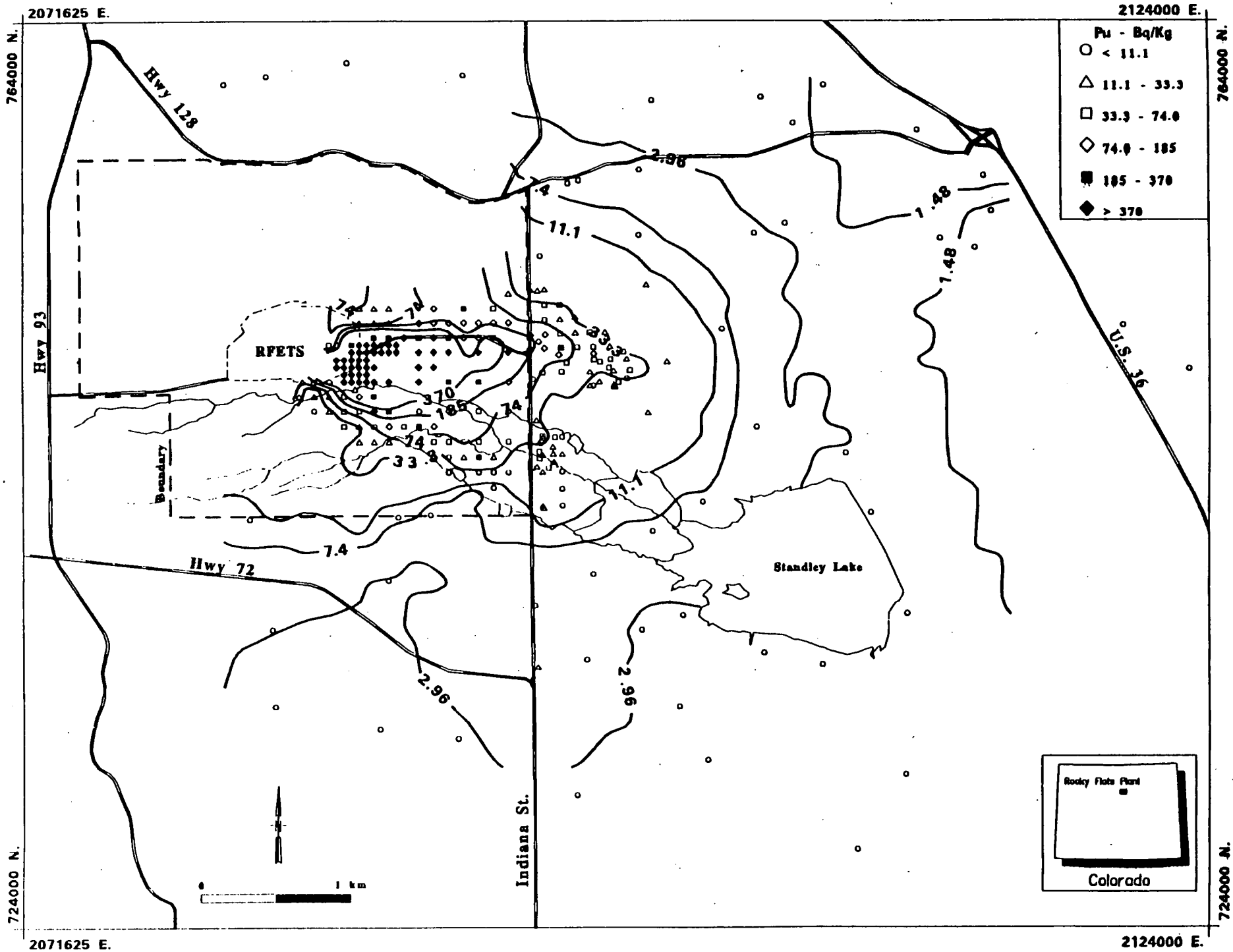

Broomfield
128
36
RFETS
666
266
66
7.4
72
Standley Lake
Arvada
3.7
1.85
1.11
93
16 % More Cancer
0.29
Indiana Street
0.07
10 % More Cancer
0.03
Denver
6 % More Cancer
Legend:
Krey and Hardy (1970)
Seed et al (1971)
Johnson (1981)
1 km

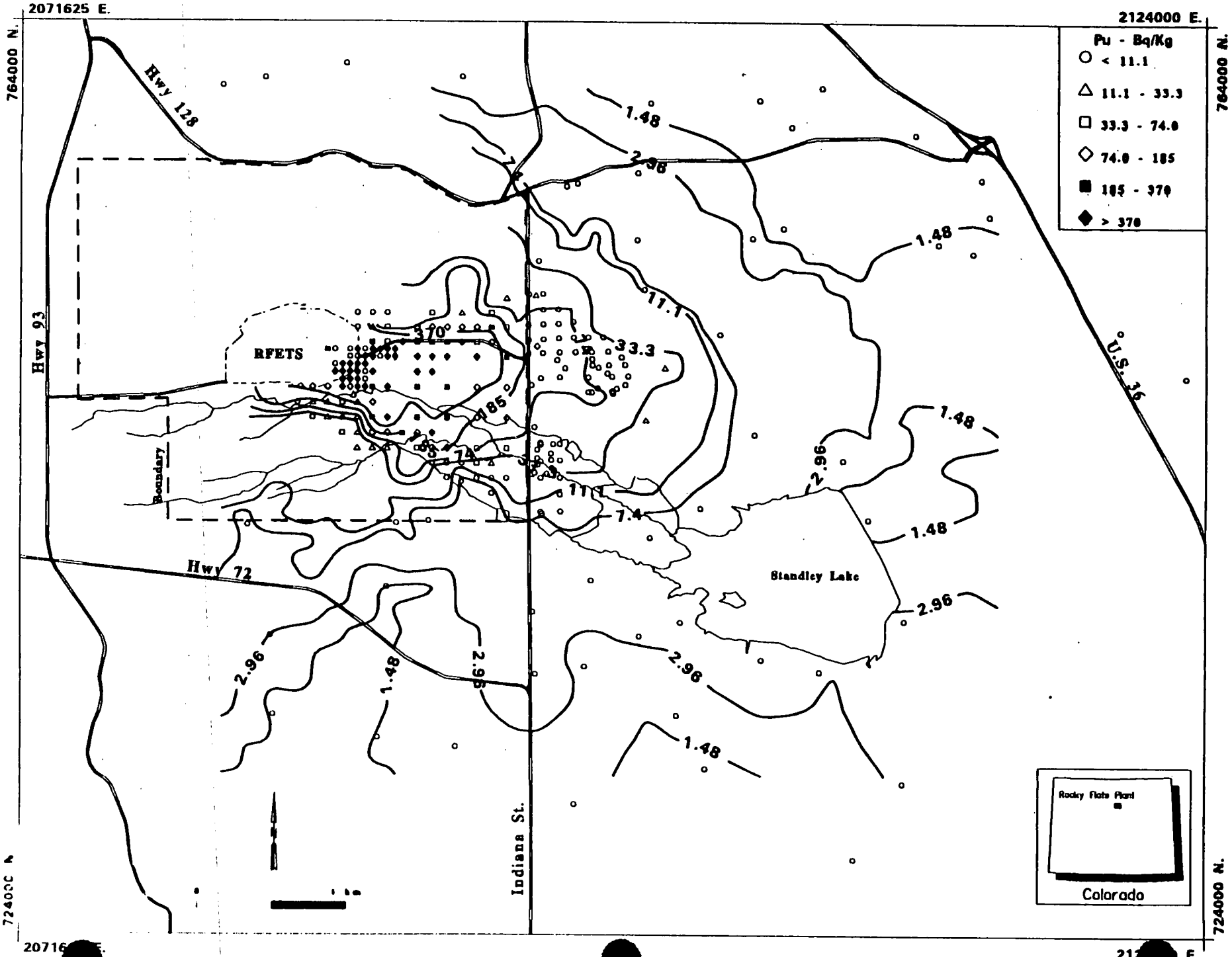
Figure 2


ZK = 0.023
ZK = 0.044
ZK = 0.07
ZK = 0.10
ZK = 0.187
ZK = 0.41
ZK = 0.77
ZK = 2.14
ZK = 10.3
Variogram
Distance (m)



2071625 E.
2124000 E.
764000 N.
724000 N.
Pu - Bq/Kg
< 11.1
11.1 - 33.3
33.3 - 74.0
74.0 - 185
185 - 370
> 370
Hwy 128
Hwy 93
Hwy 72
U.S. 36
RFETS
Boundary
Standley Lake
Indiana St.
2.96
1.48
11.1
7.4
33.3
74
185
370
1 km
Rocky Flats Plant
Colorado

Figure 4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Pu - Bq/Kg
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11.1 - 33.3
33.3 - 74.0
74.0 - 185
185 - 370
> 370
Hwy 128
Hwy 93
Hwy 72
U.S. 36
RFETS
Boundary
Indiana St.
Standley Lake
1.48
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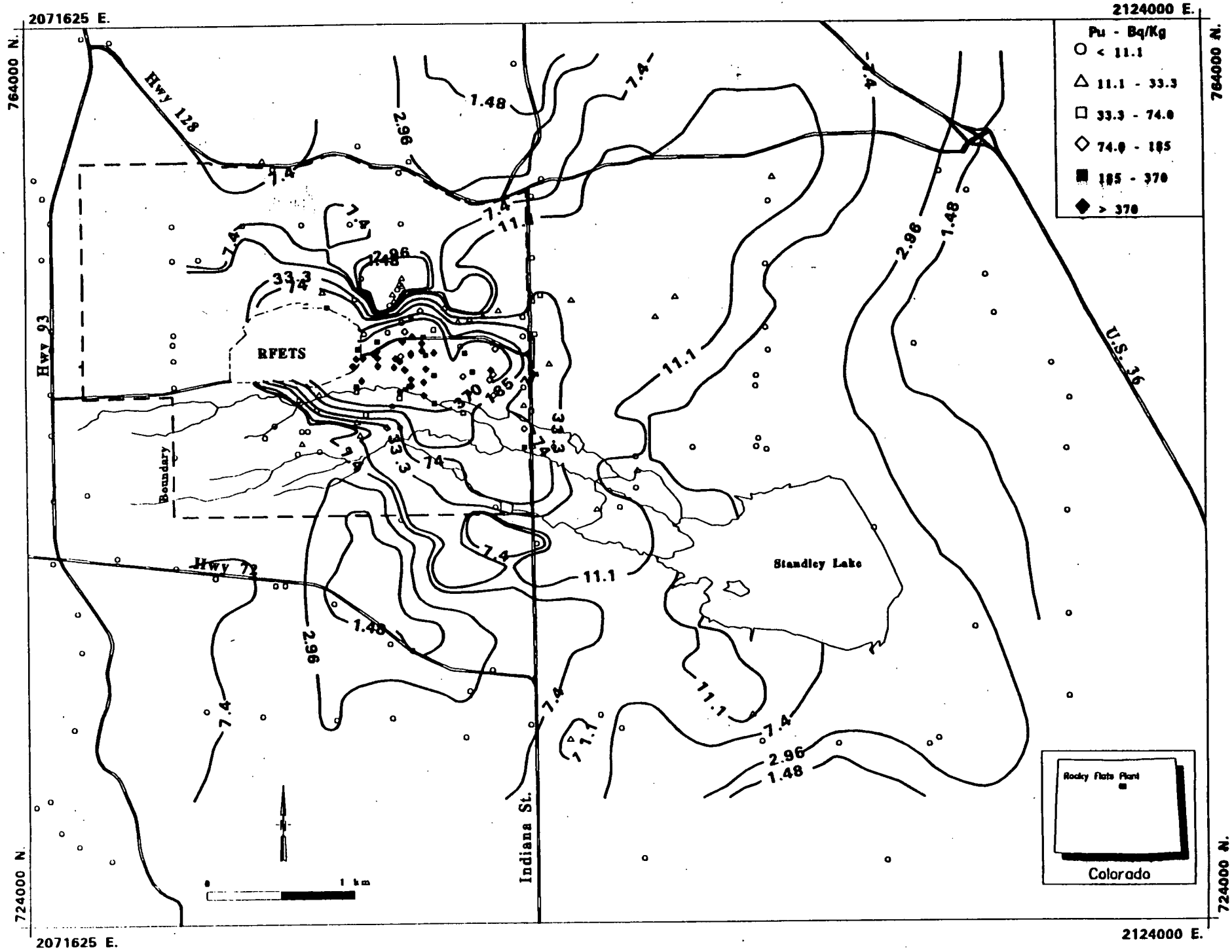
370
185
74
7.4
Rocky Flats Plant
Colorado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74.0 - 185
185 - 370
> 370
Hwy 128
Hwy 93
Hwy 72
U.S. 36
RFETS
Boundary
Standley Lake
Indiana St.
Rocky Flats Plant
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1.48
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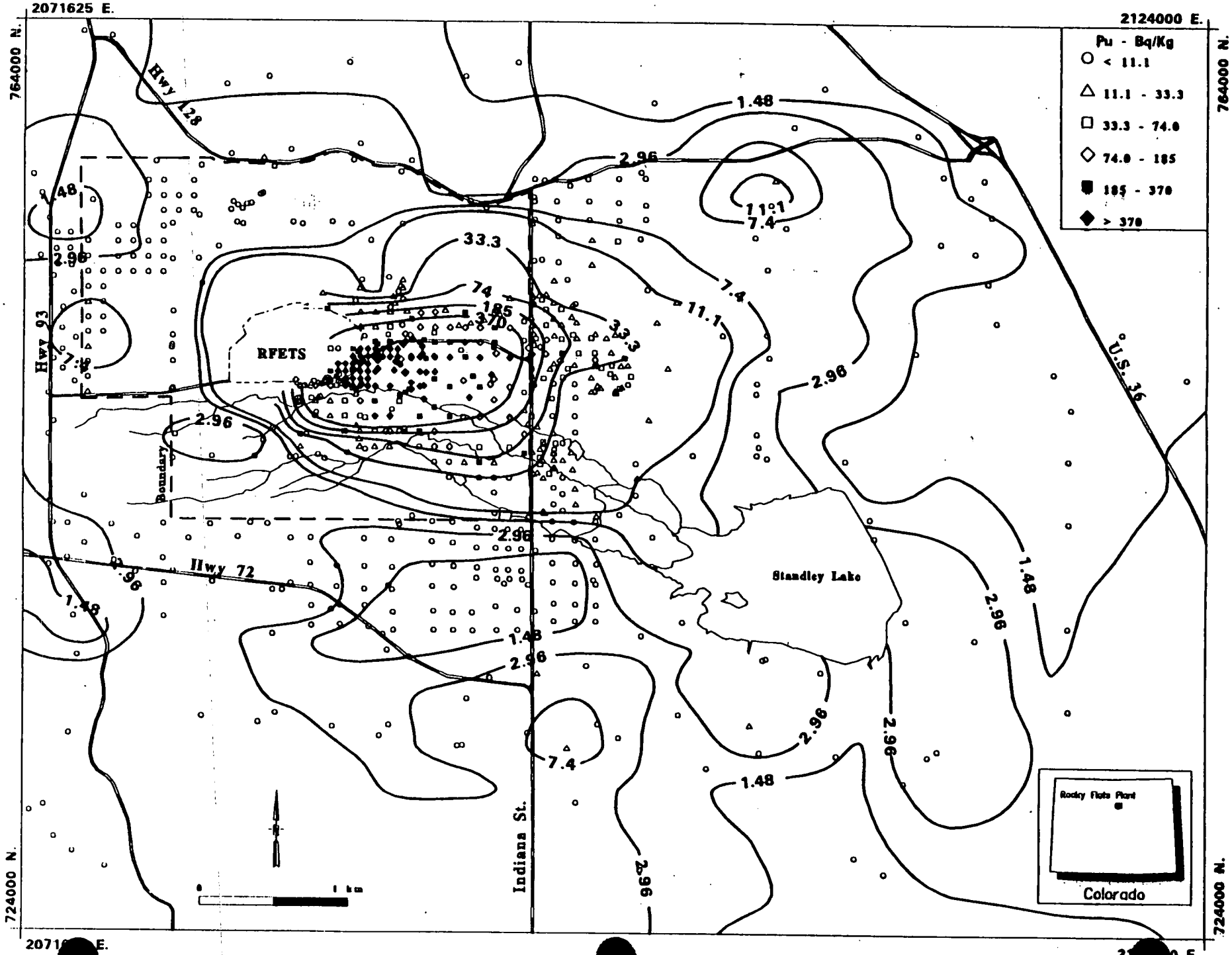
74
185
370

Figure 6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724000 N.
Pu - Bq/Kg
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33.3 - 74.0
74.0 - 185
185 - 370
> 370
Hwy 128
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Hwy 72
U.S. 36
RFETS
Boundary
Standley Lake
Indiana St.
1.48
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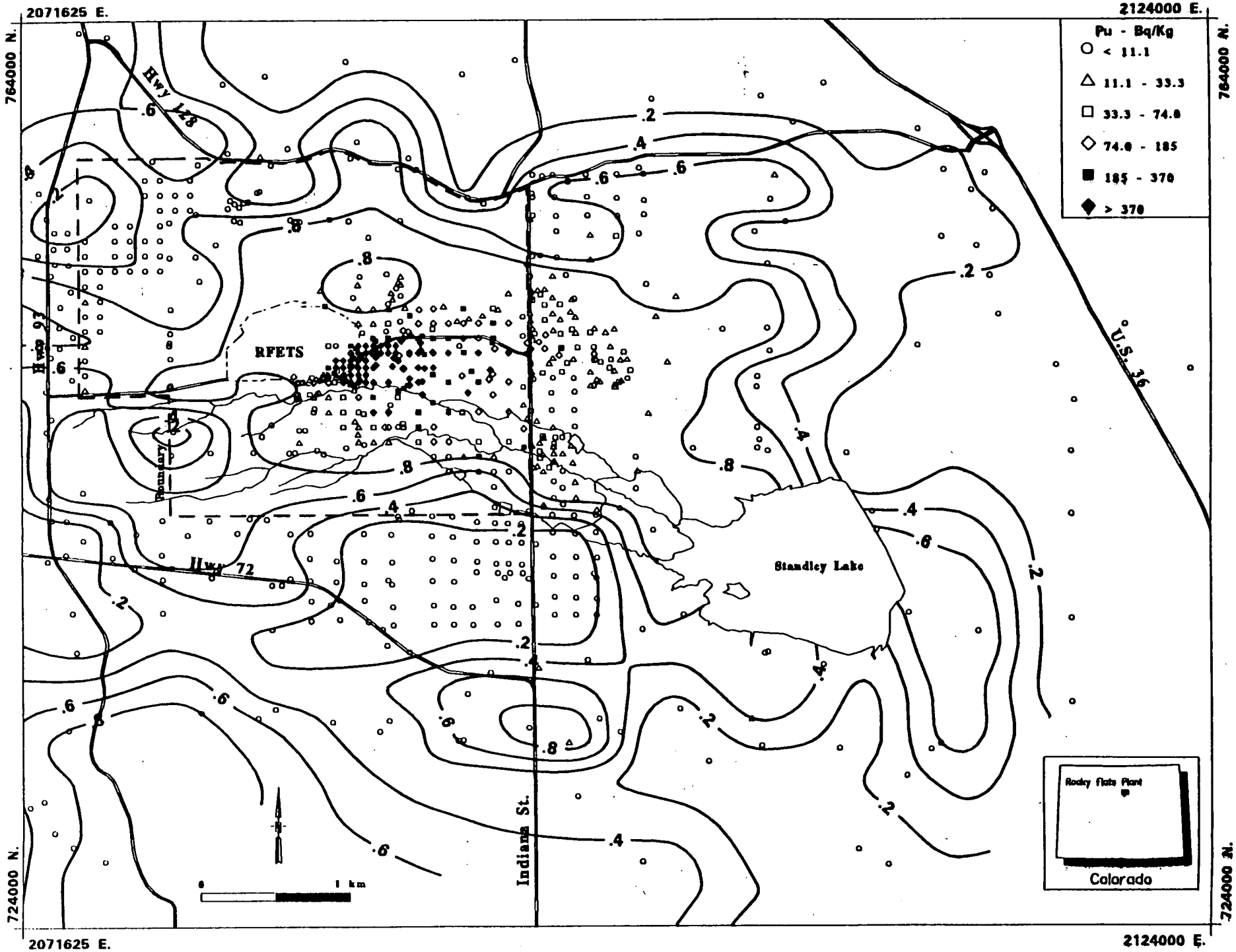
185
370
1 km
Rocky Flats Plant
Colorado

Figure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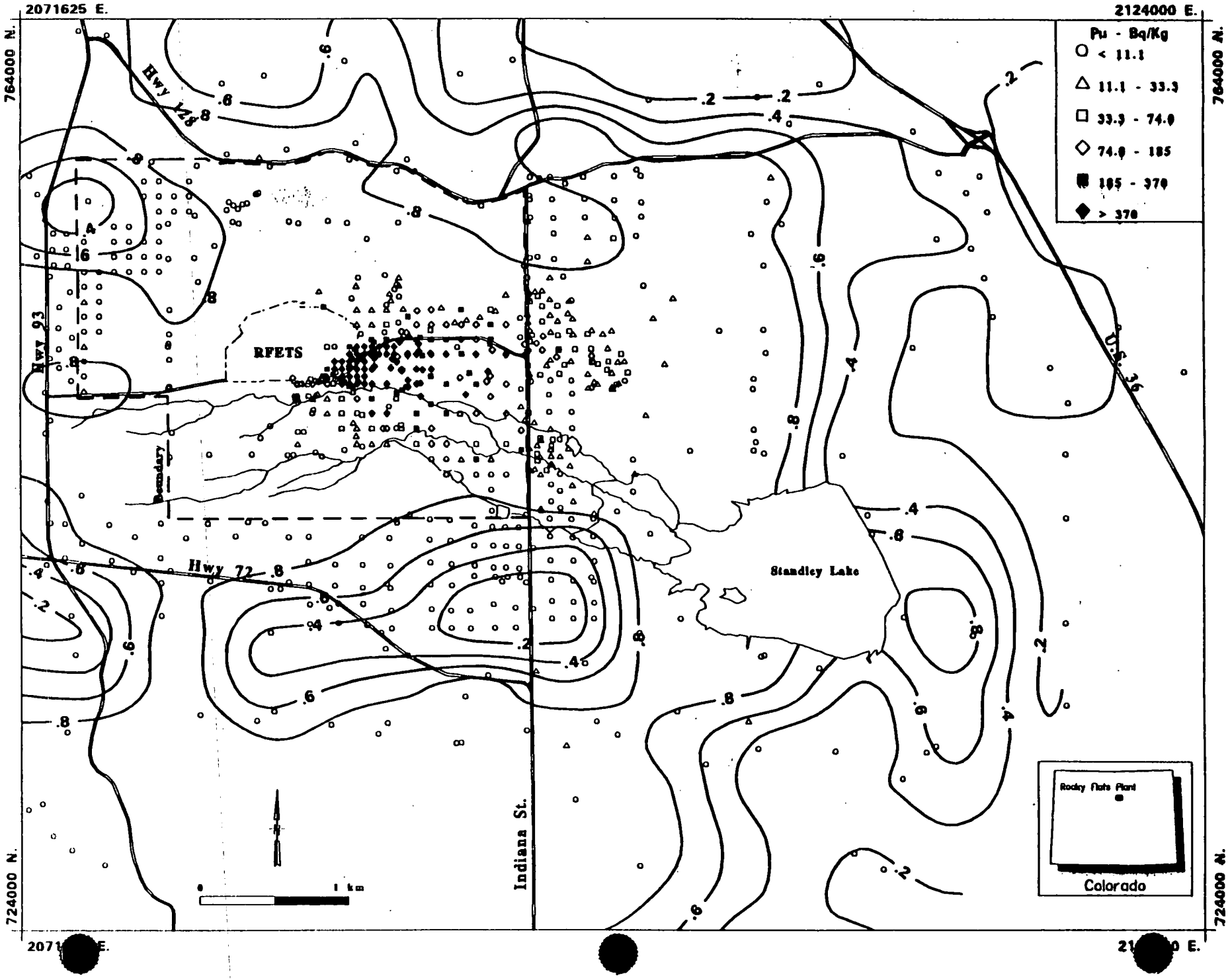
Pu - Bq/Kg
< 11.1
11.1 - 33.3
33.3 - 74.0
74.0 - 185
185 - 370
> 370
Hwy 128
Hwy 93
Boundary
Hwy 72
RFETS
Standley Lake
Indiana St.
U.S. 36
Rocky Flats Plant
Colorado
0
1 km

Figure 8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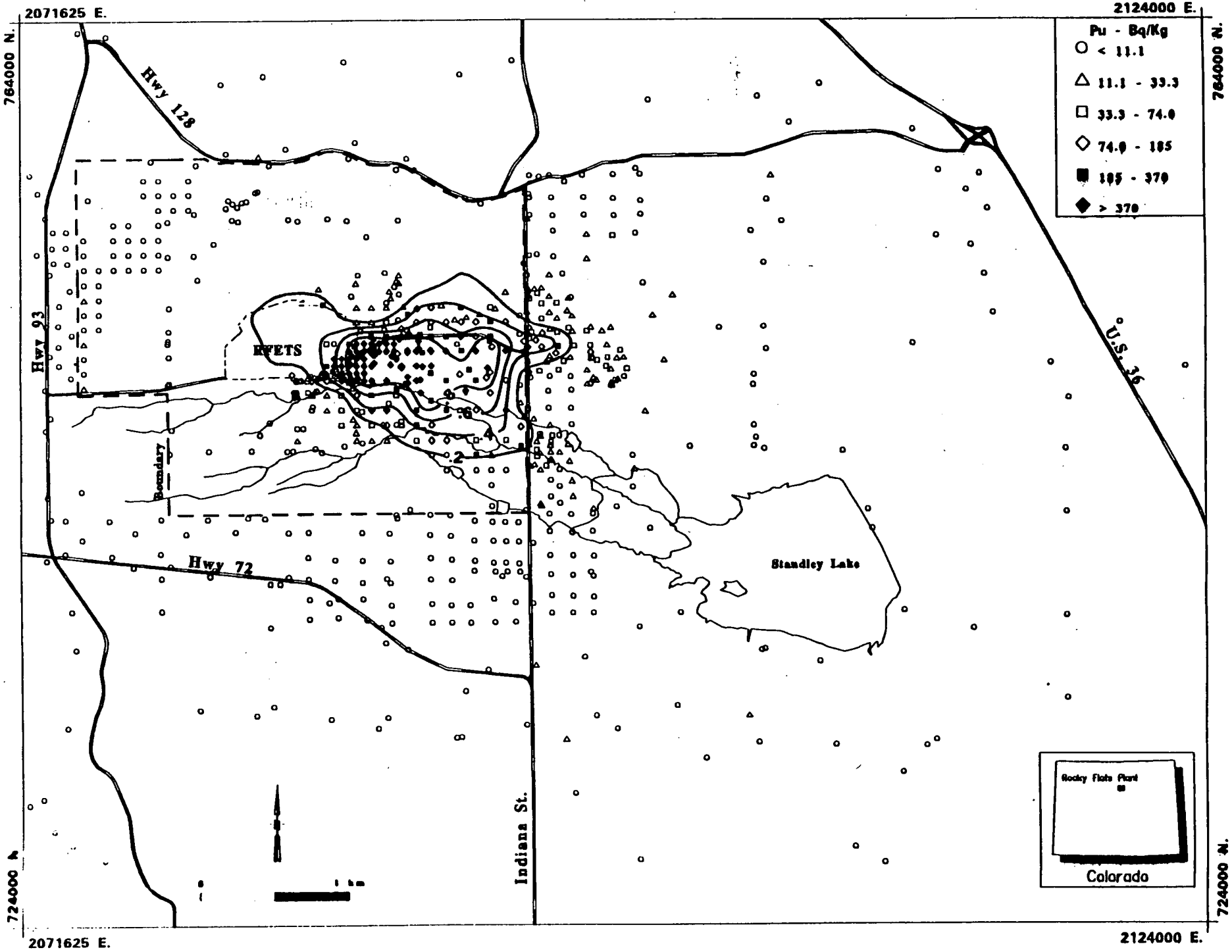
764000 N.
724000 N.
Pu - Bq/Kg
< 11.1
11.1 - 33.3
33.3 - 74.0
74.0 - 185
185 - 370
> 370
Hwy 128
Hwy 93
RFETS
Boundary
Hwy 72
Standley Lake
Indiana St.
U.S. 36
1 km
Rocky Flats Plant
Colorado


2071625 E.
2124000 E.
764000 N.
724000 N.
Pu - Bq/Kg
< 11.1
11.1 - 33.3
33.3 - 74.0
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185 - 370
> 370
Hwy 128
Hwy 93
Hwy 72
U.S. 36
RFETS
Boundary
Standley Lake
Indiana St.
Rocky Flats Plant
Colorado

Analysis of Selected Metals in the Surficial Soils of OU 2

by

L.E. Allen

M. Iggy Litaor

Introduction

During scoping of the Operable Unit 3 (OU 3) Work Plan, it was assumed that the likelihood of metals contamination in OU 3 soils resulting from activities at the Rocky Flats Environmental Technology Site (RFETS) was very low. Wind-borne transport of metal contaminants resulting from industrial activities at RFETS should show a distinct distributional trend of decreasing concentrations with increasing distance from the RFETS industrial area. To investigate potential contamination of surface soils from such wind-borne dispersal, as well as the potential for metals contamination in the offsite OU 3, a statistically based evaluation of metals distribution in Operable Unit 2 (OU 2) surface soils was conducted. Metals data for OU 2 soils were already available, and the behavior of wind-borne contaminants is such that if no spatial trends of metals contamination were evident in OU 2 soils, wind-borne contamination from RFETS would not be possible in OU 3 soils. Therefore, the necessity of a soil sampling program for metals contamination in OU 3 could be determined from pattern recognition analysis (Journel, 1988) of metals spatial distribution in OU 2 due to OU 2's proximity to the industrial area.

The metals analyzed were specified by the Environmental Protection Agency (EPA) and Colorado Department of Public Heath and the Environment (CDPHE). The EPA (USEPA, 1994) specified sampling for arsenic and beryllium in OU 2 surficial soils. Metals on the

CDPHE Health Advisory Panel short list of potential materials of concern have also been included, i.e. cadmium, chromium, lead, mercury, and nickel (Chemrisk, 1991).

Geostatistical Analysis

A total of 69 irregularly spaced locations (Figure 1) were sampled for metals in OU 2. The GSLIB software package for geostatistical analysis (Deutsch and Journel, 1992), was used with its graphical user interface developed by the EG&G Rocky Flats Soil Study Team (EG&G, 1995a) for all analyses. The commercial software package SURFER® was used for data posting and contouring (Golden Software, Inc., 1990). SPSS® for Windows™ was used for distributional testing (SPSS, Inc., 1993).

Exploratory data analysis was conducted for each metal using the following:

1. visual examination of concentration histogram and probability plot for each metal.
2. distributional testing to determine whether the soil metal concentrations adhere to a normal, log-normal, or nonparametric type distribution. The Lilliefors test (SPSS Inc., 1993) was used on the actual concentrations as well as their log-transforms. This test is related to the nonparametric Kolmogorov-Smirnov test and is used to evaluate the goodness-of-fit of data to hypothesized normal or lognormal distributions (Gilbert, 1987).
3. outlier testing according to ASTM standard procedures for treatment of outlying observations (ASTM, 1975).
4. comparison of OU 2 soils metal concentration statistics with those from the two

background studies: Rock Creek and Background Soils Characterization Project.(EG&G, 1995b). This would demonstrate if OU 2 samples were in the same range as established background values.

The Lilliefors statistic for goodness-of-fit compares the sample distribution to an hypothesized normal distribution. The Lilliefors statistic is interpreted in the same manner as the more common Chi-square test and should be close to zero.

Outlier testing by the ASTM method employs a statistic, Tn, defined as:

$$Tn = (x_n - x)/s$$

where x_n = suspected outlier

x = sample mean

s = sample standard deviation

This statistic is compared to critical values of a one-sided test where the standard deviation is calculated from the same sample.

Following exploratory data analysis, a spatial analysis was conducted on the distribution of each metal in OU 2 surface soils. The spatial analysis consisted of:

1. Contouring of concentrations for each metal.
2. Variogram analysis and variogram modeling.

3. Cross validation of the variogram model.

4. Estimation (stochastic modeling) of a grid of concentrations for each metal to provide a quantification of any metals contamination if spatial continuity was demonstrated.

Contouring of metal concentrations in surface soils provides a visual means of observing trends that may result from a contamination source. Because a variogram is a vector function, (i.e. oriented in a specified direction), this visual examination of soils metal concentrations may provide a starting point for variogram analysis. Maps of contoured concentrations for each metal are exhibited as Figures 2 through 8. Only sample locations are shown for mercury as there were too few samples for reliable contouring.

Variograms provide a measure of spatial variability of soil metal concentrations. The traditional experimental measure of variability is the semivariogram

$$\lambda(h) = \frac{1}{2N(h)} \sum_{i=1}^{N(h)} (x_i - y_i)^2$$

where N(h) is the number of concentration pairs, x_i is the concentration at the beginning of the vector, and y_i is the concentration at the ending point of the vector.

Typically, in the presence of extreme concentrations or in highly variable distributions, either a pair-wise relative variogram or a median indicator variogram will provide a better estimator of spatial continuity than the traditional variogram (Deutsch and Journel, 1992). In the

pair-wise relative semivariogram each pair is normalized by the squared average of the beginning and ending point concentrations:

$$\lambda(h) = 1/2n(h)\sum_{1}^{n(h)} \frac{(x_i - y_i)^2}{\left(\frac{(x_i + y_i)}{2}\right)^2}$$

The median indicator variogram is the traditional semivariogram calculated on an indicator transform, where each concentration location is assigned a value of 0 if below the population median and a 1 if above or equal to the median.

Directions were specified for variogram calculation in 45 degree increments, starting with an azimuth equal to 0. Change in spatial continuity with direction is known as geometric anisotropy and may indicate a contamination plume if observed for elevated concentrations. A tolerance window is allowed in calculation of a variogram in a specified direction because concentration locations are irregularly spaced. For this study, a 22.5 degree window on either side of the orientation angle was allowed. If a preferred orientation of greater continuity is not observed, the window may be increased to allow all data points into the variogram calculation, resulting in an average variogram. Calculated variogram values for all metals were tabled, showing the average distance at each lag interval with the corresponding variogram value and number of data pairs used in the variogram calculation.

A mathematical model, or function, is fitted to the experimental variogram. Typical functions used for modeling of soils metal concentrations include the spherical, exponential, and power models. These models are used for metals occurring in soils naturally, as well as those

resulting from contamination. In the case of contamination, an underlying model of the naturally occurring concentrations may be determined with an overlying imprint of higher concentrations described by a different model.

This fitted model may then be validated by using a point kriging procedure. Kriging is the linear technique used for estimation of a concentration grid from sample locations. Point kriging is the process of estimating a concentration at each sample location using data from surrounding locations, but ignoring the concentration at the location being kriged. The kriged estimate is then compared to the actual concentration and an error is measured. As this is performed for each sampled location, a distribution of errors is developed which is subsequently analyzed. This distribution should have a mean close to zero, with a variance approximately equal to the average kriging variance. A map of sample locations with posted errors should show spatial randomness.

In this study, after the variogram model was validated, linear kriging was used to estimate a grid of metal concentration throughout the OU 2 area. A grid spacing of 60.96 by 60.96 m (200 by 200 ft) was used. This grid was then contoured and examined for trends.

Objective

The objective of the sampling program and subsequent data analysis was to determine the absence or presence of spatial trends in metal concentrations in the surficial soils of OU 2. If metal concentrations in OU 2 soils were elevated above background values and if they exhibited

a spatial trend, (i.e. clearly recognized plume), OU 2 soils would be considered to exhibit metals contamination via wind transport and dispersal, and the sampling of soils for metals analysis would be required in OU 3. Alternatively, if all metals in OU 2 were determined to correspond to background values or if metal concentrations appeared to result from localized incidents of contamination, then a wind-transport mechanism could be ruled out, and the sampling of OU 3 surficial soils for metals analysis would not be necessary.

METHODS

Field Sampling Techniques

OU 2 soil samples were collected using the Rocky Flats sampling protocol. Using this method, soil samples were obtained by driving a 10 cm by 10 cm cutting tool 5 cm deep into undisturbed soil. The soil sample within the tool cavity was collected and placed into a new, one-gallon stainless steel can. Five sub-samples were collected from the corners and the center of two one-meter squares, which were spaced one meter apart in the middle of each sampling plot. The 10 subsamples were composited into one 5000 cm^3 sample for metals analysis. The composite sample was then split; one-half which was used for metals analysis, the other for plutonium analysis.

Soil Sampling Design

The sampling protocol for this study followed that described for the study of Pu-239+240 in soils (Litaor, 1995). A total of 47 regular plot locations were sampled according to the described protocol. The sample design also allowed for an additional 22 locations to be sampled where different soil types would be represented. This was done in the event that analysis by soil type may become pertinent to the detection and transport of potential metals contamination. Hence, the original density of sampling for Pu-239+240 was modified to include most of the soil types in the area between the industrial zone and Indiana Street, and to decrease the redundancy of sampling plots (EG&G, 1991).

Laboratory Analysis

Metals analysis of all OU 2 soil samples was done according to the USEPA Contract Laboratory Program, Statement of Work for Inorganics Analysis, Multi-Media/Multi-Concentration. This is document number ILM02.0.

DATA QUALITY

Quality Control Samples

Equipment rinsate blanks were collected to quantify possible cross-contamination, which could result from insufficient decontamination practices between samples. The blanks were collected by rinsing decontaminated sampling equipment with deionized water, placing the rinsate in the appropriate containers, and preserving as required. The data for equipment rinsate blanks indicate that the sampling practices did not produce a significant source of cross-

contamination between samples (Table 1). However, none of the data for mercury in the rinsate sample were validated and are not presented in this report.

Field Duplicates

Duplicate soil samples were collected systematically for the surficial soil sampling program (Table 2). The data from duplicate samples provide a measure of the sampling precision and sample homogeneity. Precision was quantified by calculating the relative percent difference (RPD). The RPD, expressed as a percentage, is the quotient of the difference between duplicate analytical results and the average of those results. A control limit of ±35 percent for the RPD in duplicate analysis was recommended by the laboratory data validation guideline drafted by the EPA (USEPA, 1988). There are no established criteria determining the overall precision of soil sampling and laboratory analysis. The highest metal concentration for each duplicate sample pair was used in the data analysis, so the most conservative estimate of each metal distribution was achieved.

Below-Detection-Limit Data

For purposes of constructing cumulative distribution functions for each metal, actual analytical results were used as opposed to an artificial truncation or value assignment below the detection limit. It is recognized that these low values result in higher precision errors than values above the detection limits, but they provide for a more natural-looking distribution (i.e., normal or lognormal without a low end spike) of values and allow for somewhat more straight-forward treatment during exploratory data analysis.

RESULTS AND DISCUSSION

The concentrations and spatial distributions of arsenic, beryllium, cadmium, chromium, lead, mercury, and nickel concentrations in soils of OU 2 are displayed in Figures 2 through 8 and are discussed in the following text. Results are summarized in Table 3.

Arsenic

The histogram and cumulative probability plot (Figures 9 and 10) of arsenic values suggest a distribution tending toward normal. This visual assessment is supported by the Lilliefors test for normality ($w=0.0771$, $p>0.2$). The sample mean is 4.05 mg kg^{-1} with a standard deviation of 1.32 mg kg^{-1} resulting in a coefficient of variation of 0.33. The minimum and maximum values are 0.71 and 7.40 mg kg^{-1} respectively.

Arsenic concentrations in soils of OU 2 are below those reported for soil samples collected from the Rock Creek drainage area. The Rock Creek mean concentration is 5.82 mg kg^{-1} with a maximum value of 8.50 mg kg^{-1}. All arsenic concentrations measured in soil samples from OU 2 are below the Upper Tolerance Limit (UTL) of 12.86 mg kg^{-1}, which was calculated using Rock Creek data. Comparison with the Background Soils Characterization Project (BSCP) (in progress) yields similar results; all OU 2 concentrations are below the BSCP UTL of 13.75 mg kg^{-1}. The mean of arsenic concentrations in the soils of OU 2 is lower than the BSCP mean of 6.09 mg kg^{-1}. The OU 2 mean for arsenic concentrations in soils is also below the geometric

mean of arsenic concentrations for surficial soils along the Front Range Urban Corridor as computed by the United States Geological Survey (USGS) (Severson and Tourtelot, 1994).

Arsenic concentrations reported for the OU 2 samples were contoured and did not show any apparent trends. The spatial continuity of arsenic in the soils of OU 2 was examined using traditional, pair-wise relative, and median indicator variograms. No spatial continuity was observed. Variogram values are shown in Table 4.

The absence of spatial continuity precluded the need for cross validation and kriging for plume definition. This lack of spatial continuity, coupled with the demonstration that all arsenic concentrations in the soils of OU 2 fall within background ranges, indicates a lack of arsenic contamination within the surface soils of OU 2.

Beryllium

Visual inspection of the histogram of the beryllium concentrations in the soils of OU 2 and of the cumulative probability plot (Figures 11 and 12) suggests a distribution tending toward normal. This is confirmed by a Lilliefors statistic, $w=0.0668$, $p>0.2$.

Surface soils in OU 2 have a mean beryllium concentration of 0.68 mg kg^{-1} with a standard deviation of 0.21 mg kg^{-1} and a coefficient of variation of 0.31. One extreme value of 1.50 mg kg^{-1} was determined as an outlier at the upper 0.5% significance level using ASTM procedures (ASTM, 1975).

The beryllium concentrations in OU 2 surface soils are similar to those for Rock Creek soil samples. The Rock Creek background data mean concentration is also 0.68 mg kg^{-1}, with a maximum concentration of 0.96 mg kg^{-1}. All OU 2 concentrations, with the exception of the outlier, are below the Rock Creek UTL value of 1.14 mg kg^{-1}. The BSCP results show a similar mean of 0.66 mg kg^{-1} and a UTL of 1.25 mg kg^{-1}. The 1.50 mg kg^{-1} maximum value in the OU 2 data set appears to be an isolated occurrence; surrounding sample concentrations are much lower. This high value is not within the boundaries or vicinity of any OU 2 Individual Hazardous Substance Sites (IHSS). The USGS geometric mean for beryllium concentrations in Front Range soils is 1.20 mg kg^{-1}.

Prior to variogram calculations, beryllium concentrations were contoured to visually determine if trends existed in the data. No apparent trends were observed. Traditional and median indicator variograms were computed; the traditional variogram shows no spatial continuity whereas the median indicator variogram (Table 5) exhibits spatial continuity, with a range out to 610 meters (Figure 13).

A cross validation procedure using point kriging indicated that the median indicator variogram would produce satisfactory results when used for modeling of beryllium concentrations. Cross validation statistics showed a mean error of 0.011 mg kg^{-1}, with a variance of errors equal to .0392 (mg $kg^{-1})^2$. Examination of an error map indicated no spatial bias.

A grid covering OU 2 has been estimated using linear kriging. Contouring of these results (Figure 14) showed no preferred direction of beryllium concentration in soils. Because all concentrations are within the range of background values, the spatial continuity can be attributed to the natural continuity of beryllium concentrations in soils. If metal concentrations were above background concentrations and had exhibited a trend, a plume would be evident.

Cadmium

The histogram and probability plot (Figures 15 and 16) of cadmium concentrations in the soils of OU 2 suggest multiple populations. These populations appear to be spatially intermixed overall with a localized zone of +0.95 mg kg^{-1} concentrations on the east side of the sampled area. The sample mean is 0.78 mg kg^{-1} with a standard deviation of 0.22 mg kg^{-1} resulting in a coefficient of variation of 0.28. the minimum concentration is 0.44 mg kg^{-1} and the maximum is 1.10 mg kg^{-1}.

These cadmium concentrations are similar to those for the Rock Creek and BSCP data sets. The Rock Creek mean is 0.73 mg kg^{-1} with a maximum of 1.80 mg kg^{-1}; the BSCP mean is 0.71 mg kg^{-1} , with a maximum of 2.3 mg kg^{-1}. All concentrations in the soils of OU 2 are below the Rock Creek UTL of 2.45 mg kg^{-1} and the BSCP UTL of 2.34 mg kg^{-1}. The USGS geometric mean for cadmium in Front Range soils was not available.

Cadmium concentrations in OU 2 surface soils were contoured and did not show apparent trends. Traditional semivariograms (Table 6) as well as median indicator variograms were also computed and did not show spatial continuity. Lack of cadmium contamination in OU 2 soils is indicated by a lack of spatial continuity and by all concentration values falling within the background range.

Chromium

The histogram and probability plot (Figures 17 and 18) of chromium concentrations in soils of OU 2 suggest a distribution tending toward normal. This is confirmed by the Lilliefors statistic, $w=0.0904, p>0.2$.

The sample mean is 10.29 mg kg^{-1} with a standard deviation of 3.43 mg kg^{-1} resulting in a coefficient of variation of 0.33. The minimum concentration value is 2.60 mg kg^{-1} and the maximum value is 19.90 mg kg^{-1}.

These chromium concentrations are below those reported for the Rock Creek samples. The Rock Creek mean is 15.03 mg kg^{-1} with a maximum concentration of 20.20 mg kg^{-1}. All chromium concentrations in OU 2 soils are below the Rock Creek UTL of 24.85. OU 2 concentrations are also below the BSCP values, where the mean is 11.29 mg kg^{-1} and the UTL is 22.21 mg kg^{-1}. The geometric mean determined by the USGS for chromium in surface soils along the Front Range Urban Corridor is 31.0 mg kg^{-1}.

Contoured chromium concentrations in OU 2 soils did not show any apparent trends. Traditional and median indicator (Table 7) variograms were calculated and did not show spatial continuity. Lack of chromium contamination in OU 2 soils is indicated by a lack of spatial continuity and by all concentration values falling within background ranges.

Lead

The histogram and probability plot (Figures 19 and 20) for lead in the OU 2 soils samples indicate a tendency toward a normal distribution, with two high concentrations of 98.3 and 145 mg kg^{-1}. These two data points are considerably higher than the remainder of the distribution. Testing of these two values according to ASTM procedures demonstrates them to be statistical outliers. The 98.3 mg kg^{-1} is an outlier at the upper 10.0% significance level, whereas the 145 mg kg^{-1} concentration is an outlier at the upper 0.1% significance level. Removal of these outliers results in a Lilliefors statistic for normality, $w=0.0771, p>0.2$.

The OU 2 sample mean of all lead concentrations is 38.03 mg kg^{-1}, with a standard deviation of 19.67 mg kg^{-1}, resulting in a coefficient of variation of 0.52. The minimum concentration is 15.40 mg kg^{-1}. These statistics were also computed after removing the two outlier concentrations, resulting in a mean of 35.53 mg kg^{-1} and a standard deviation of 13.03 mg kg^{-1}.

If the two outliers are included in statistical calculations, the mean of all lead concentrations in soils of OU 2 is somewhat higher than the Rock Creek mean; if the outliers are excluded, the re-computed mean is lower than the Rock Creek mean. The Rock Creek mean is 37.50 mg kg^{-1}, with a maximum value of 51.00 mg kg^{-1}. Three OU 2 concentrations exceed the Rock Creek UTL of 60.2. These are 63.9, 98.3, and 145.0 mg kg^{-1}. The BSCP mean is 33.6 mg kg^{-1}, with a UTL of 73.9 mg kg^{-1}. Therefore, only two OU 2 concentrations in soils are above the BSCP UTL. The USGS geometric mean of lead in Front Range soils is 35.0 mg kg^{-1}.

The 63.9 and 98.3 mg kg^{-1} concentrations occur in the vicinity of roads. A possible explanation of elevated concentrations of lead around roads is contamination from leaded gasoline (Chemrisk, 1992). The 145.0 mg kg^{-1} concentration appears to be an isolated outlier, surrounded by samples of much lower concentration. However, all of these concentrations fall within the range observed by the USGS for soils along the Front Range.

Contoured concentrations of lead show localized north-south trends within an overall isotropic background. Local "bulls-eyes" of the high concentrations are evident. Traditional, covariance, and pair-wise relative variograms were computed and indicate the same trends. The north-south direction (Table 8 and Figure 21) shows a variogram range of 550 meters, whereas in the east-west (Table 9 and Figure 22) direction, the range is 395 meters. The two outliers were removed prior to variogram analysis.

Cross validation results indicate that the fitted variogram model should provide a satisfactory estimate of gridded lead concentrations. Validation statistics indicate a mean error of 0.57 mg kg^{-1} with a variance of errors of 141.70 (mg $kg^{-1})^2$. The errors appear normally distributed around the mean.

Contouring of kriged grid points (Figure 23) suggests a mostly random pattern with some localized trending in the north-south direction. This trending is apparent after the removal of outliers and is apparently characteristic of background lead concentrations in OU 2 soils.

Mercury

Only 17 validated results were available for mercury analysis in the OU 2 soils sampling program. The mean mercury concentration is 0.06 mg kg^{-1} with a standard deviation of 0.02 mg kg^{-1} (Figures 24 and 25). One extreme value of 0.15 mg kg^{-1} was determined as an outlier at the upper 0.1% significance level using ASTM procedures.

Rock Creek statistics could not be computed because of the large number of non-detects for mercury. Comparison to BSCP values shows that the OU 2 mean concentration in soils is lower than the background mean of 0.07 mg kg^{-1}. All OU 2 concentrations in soil, including the outlier, are below the BSCP UTL of 0.19 mg kg^{-1}.

Contouring of mercury concentrations in OU 2 soils does not show any apparent trends. Traditional (Table 10) and median indicator variograms also do not show spatial continuity. However, this could be a result of the small number of samples available for analysis.

Nickel

The histogram and probability plots (Figures 26 and 27) suggest that nickel concentrations in soils of OU 2 follow a lognormal distribution. This is confirmed by a Lilliefors test, w=0.1027,p=0.0683. The concentration mean is 12.21 mg kg^{-1} with a standard deviation of 5.04 mg kg^{-1} resulting in a coefficient of variation of 0.41. The minimum concentration is 6.40 mg kg^{-1} and the maximum is 45.20 mg kg^{-1}. The ASTM procedure for outlier testing indicates that this maximum value is a statistical outlier, twice the value of the second highest concentration.

The mean concentration of nickel in soils of OU 2 is slightly less than the mean of the Rock Creek background (12.58 mg kg^{-1})and slightly more than the BSCP mean concentration of 9.63 mg kg^{-1}. Only the outlier falls above the Rock Creek UTL, while three OU 2 concentrations are above the BSCP UTL. The three highest concentrations occur in the same locale, on the southeastern side of the sampled area. The concentrations are not in the vicinity of an IHSS and the reason for elevated concentrations with respect to background and the remainder of the OU 2

concentration distribution is unknown. The USGS geometric mean for nickel concentrations in soils along the Front Range is 6.8 mg kg^{-1} with concentrations from 5 to 70 mg kg^{-1} observed.

Contoured nickel concentrations do not show any apparent spatial trends. Traditional and median indicator variograms indicate no spatial continuity. The values for the average traditional semivariogram are shown in Table 11.

The lack of spatial continuity of nickel concentrations within soils of OU 2 indicates lack of a wide-spread contamination plume. Three elevated concentrations located in the southeastern portion of the sampled area may be naturally high concentrations in soils, but this is unconfirmed.

Concluding Remark

None of the metals analyzed in samples of OU 2 surface soil show evidence of airborne contamination, which would warrant sampling of surficial soils in OU 3 for metals analysis. All spatial continuity occurs in the background range of values, indicating lack of a metals contamination plume. Lead and nickel concentrations each have one value above the Rock Creek background UTL. Three of the nickel concentrations are above the BSCP UTL. Two of the three elevated concentrations for lead appear to be related to roadways and occur as isolated samples, surrounded by samples of much lower concentration. The third elevated concentration for lead is also isolated, but has no apparent cause. The three highest nickel concentrations occur in the same locale, with no obvious reason for these elevated values. This lack of elevated

concentrations exhibiting spatial continuity confirms the OU 2 assessment that no metals in soils are contaminants-of-concern.

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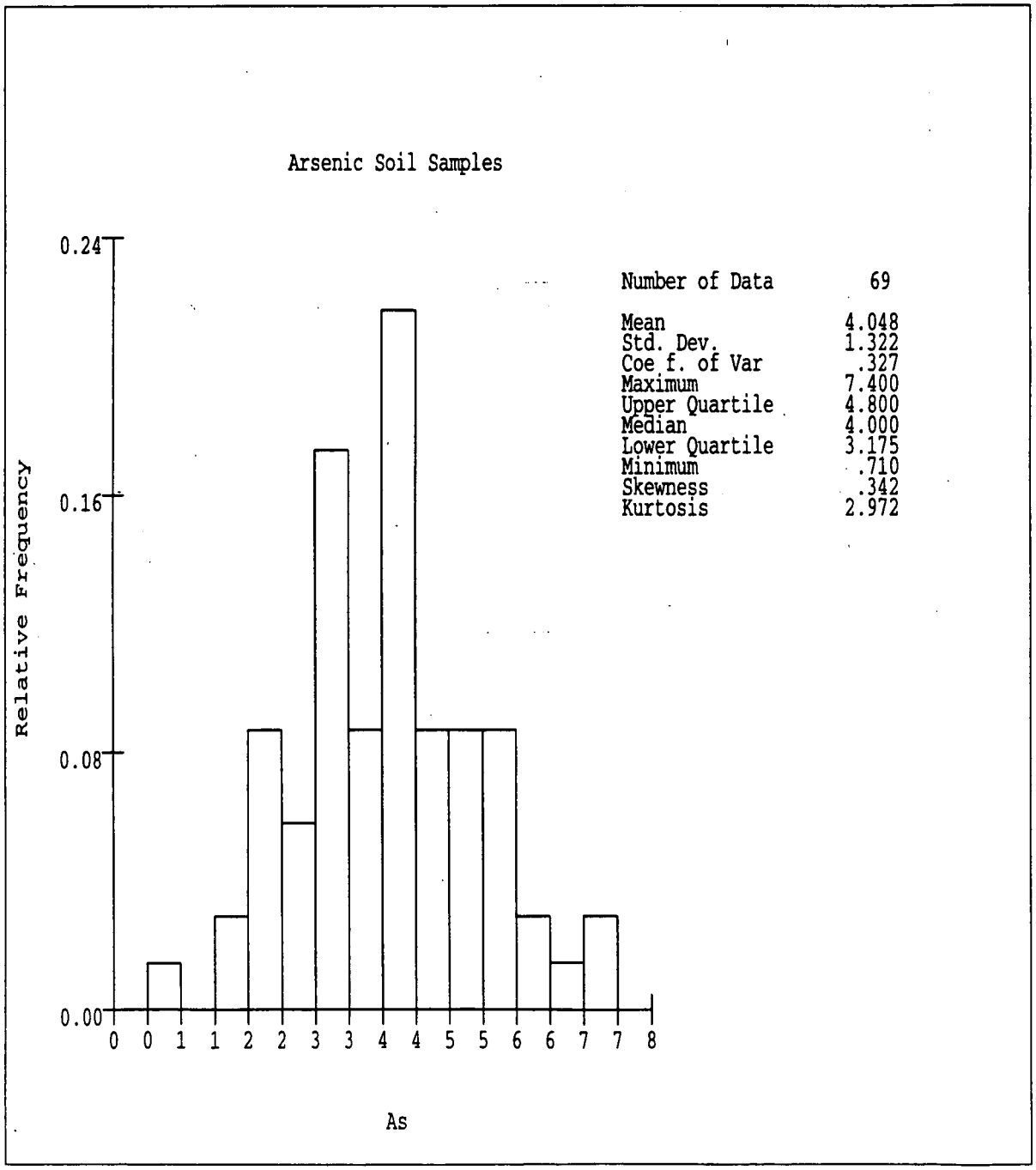
Figure 9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0.08
0.00
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As
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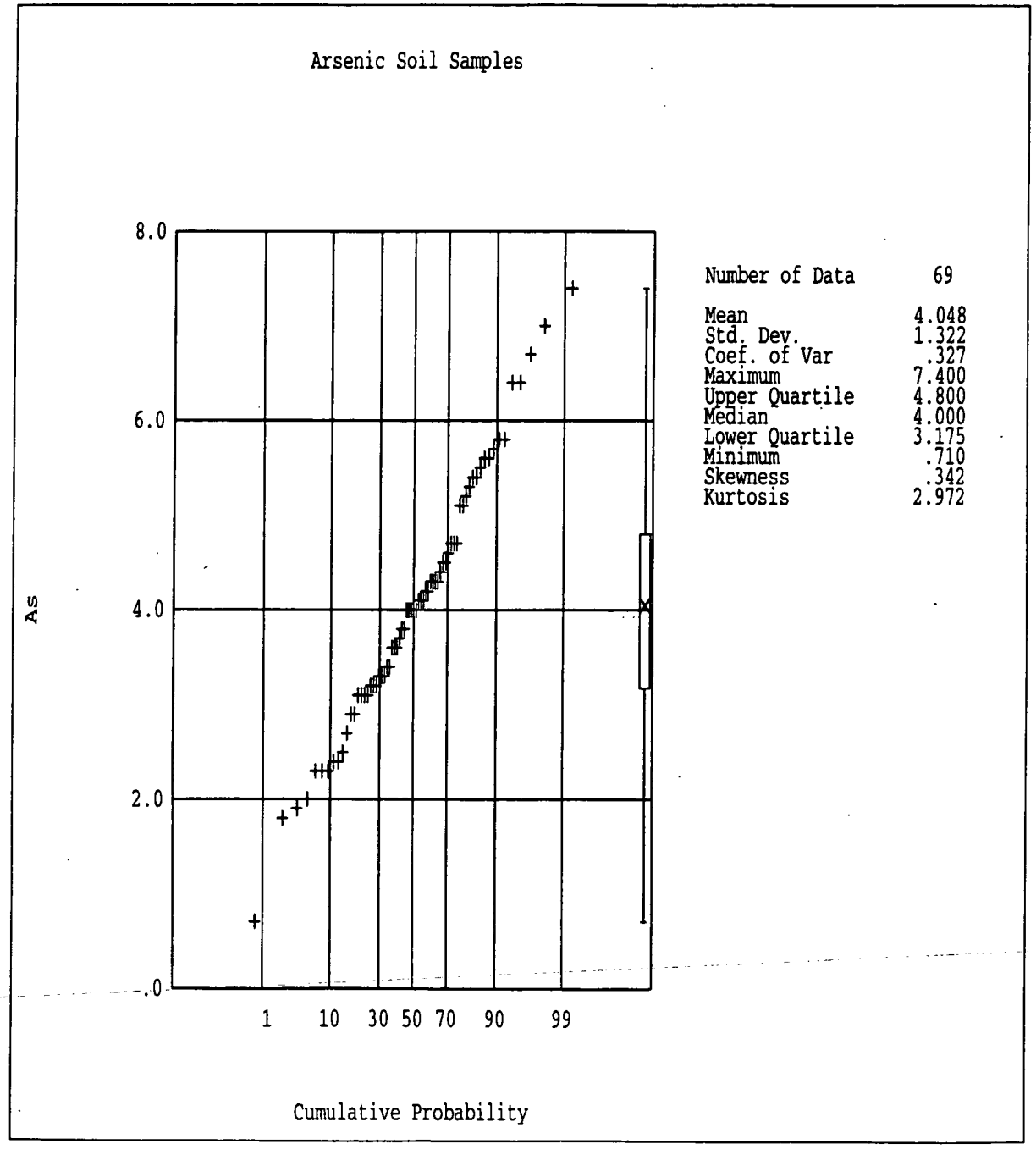
Mean 4.048
Std. Dev. 1.322
Coe f. of Var .327
Maximum 7.400
Upper Quartile 4.800
Median 4.000
Lower Quartile 3.175
Minimum .710
Skewness .342
Kurtosis 2.972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4.0
2.0
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As
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30
50
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90
99
Cumulative Probability
Number of Data 69
Mean 4.048
Std. Dev. 1.322
Coef. of Var .327
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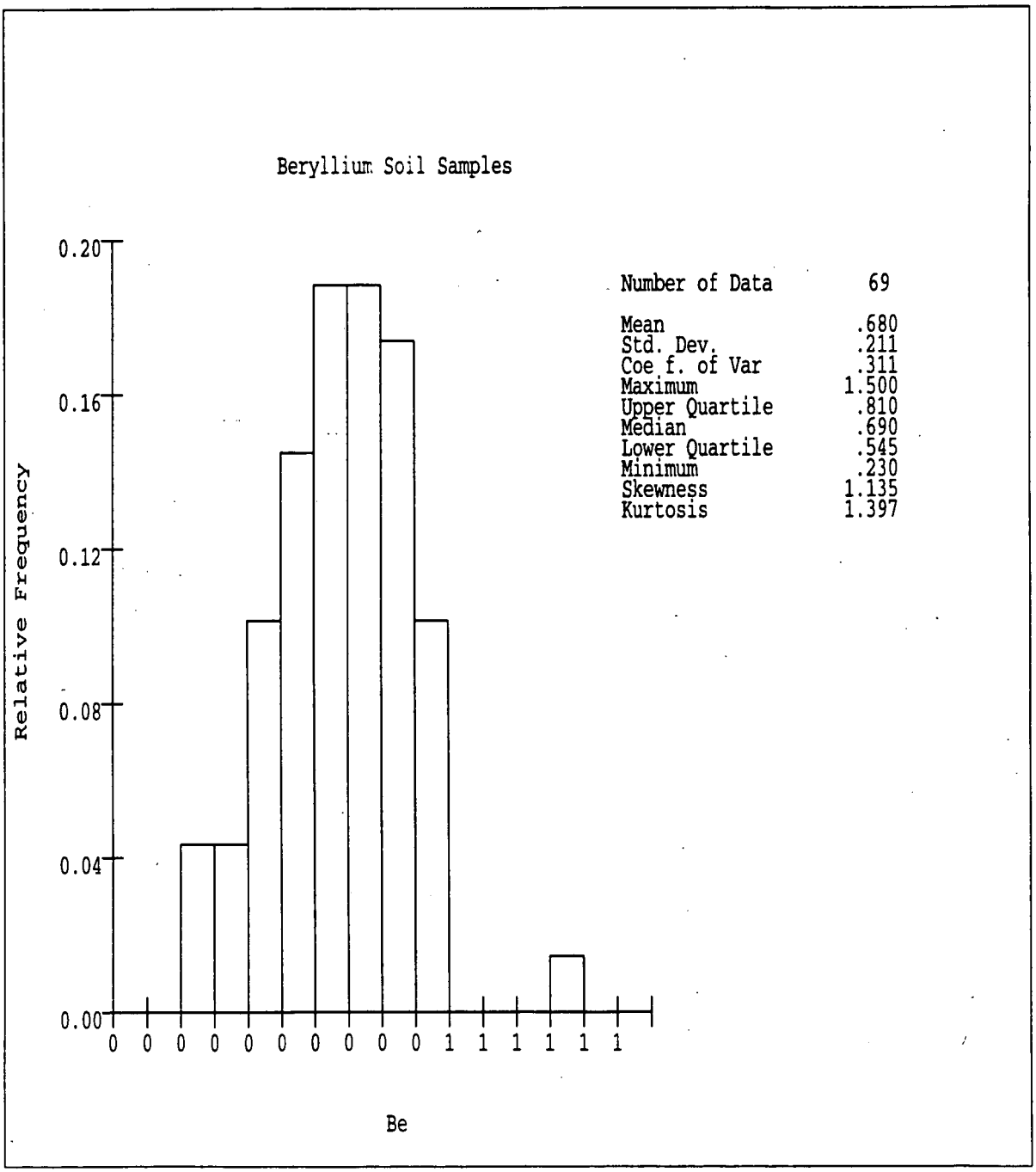
Upper Quartile 4.800
Median 4.000
Lower Quartile 3.175
Minimum .710
Skewness .342
Kurtosis 2.972

Figure 10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0.12
0.08
0.04
0.00
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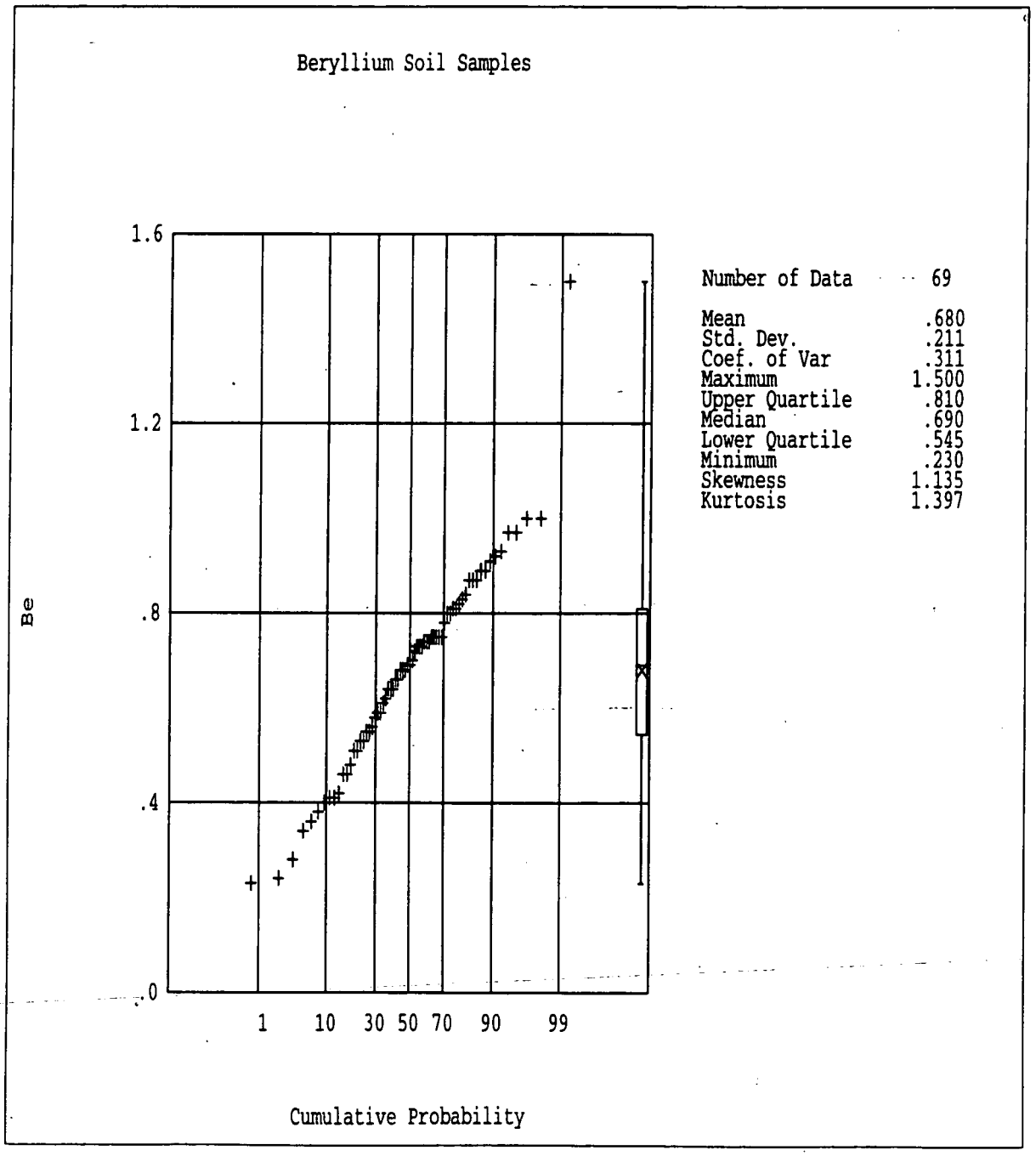
Be
Number of Data 69
Mean .680
Std. Dev. .211
Coe f. of Var .311
Maximum 1.500
Upper Quartile .810
Median .690
Lower Quartile .545
Minimum .230
Skewness 1.135
Kurtosis 1.397

Figure 11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1.2
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.4
.0
Be
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10
30
50
70
90
99
Cumulative Probability
Number of Data 69
Mean .680
Std. Dev. .211
Coef. of Var .311
Maximum 1.500
Upper Quartile .810
Median .690
Lower Quartile .545
Minimum .230
Skewness 1.135
Kurtosis 1.397

Figure 12

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Lag Tolerance:	500.000

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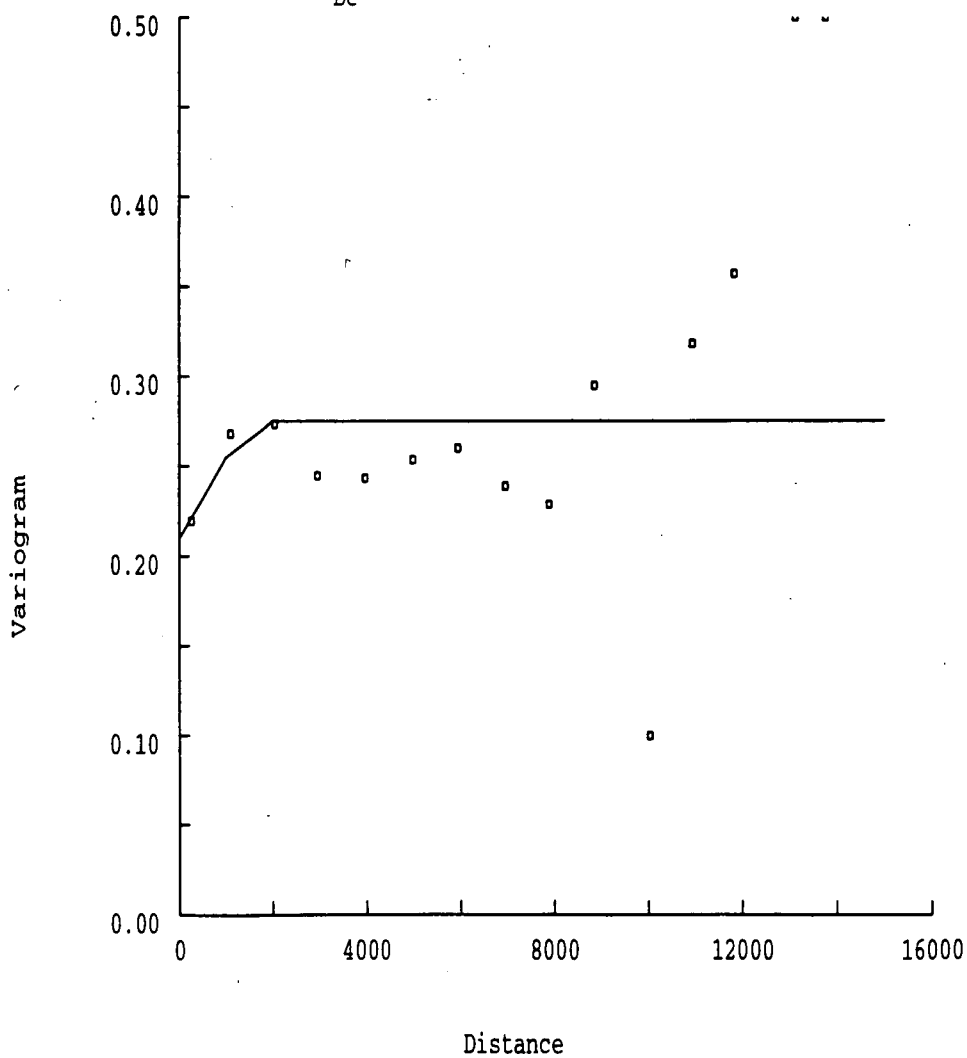
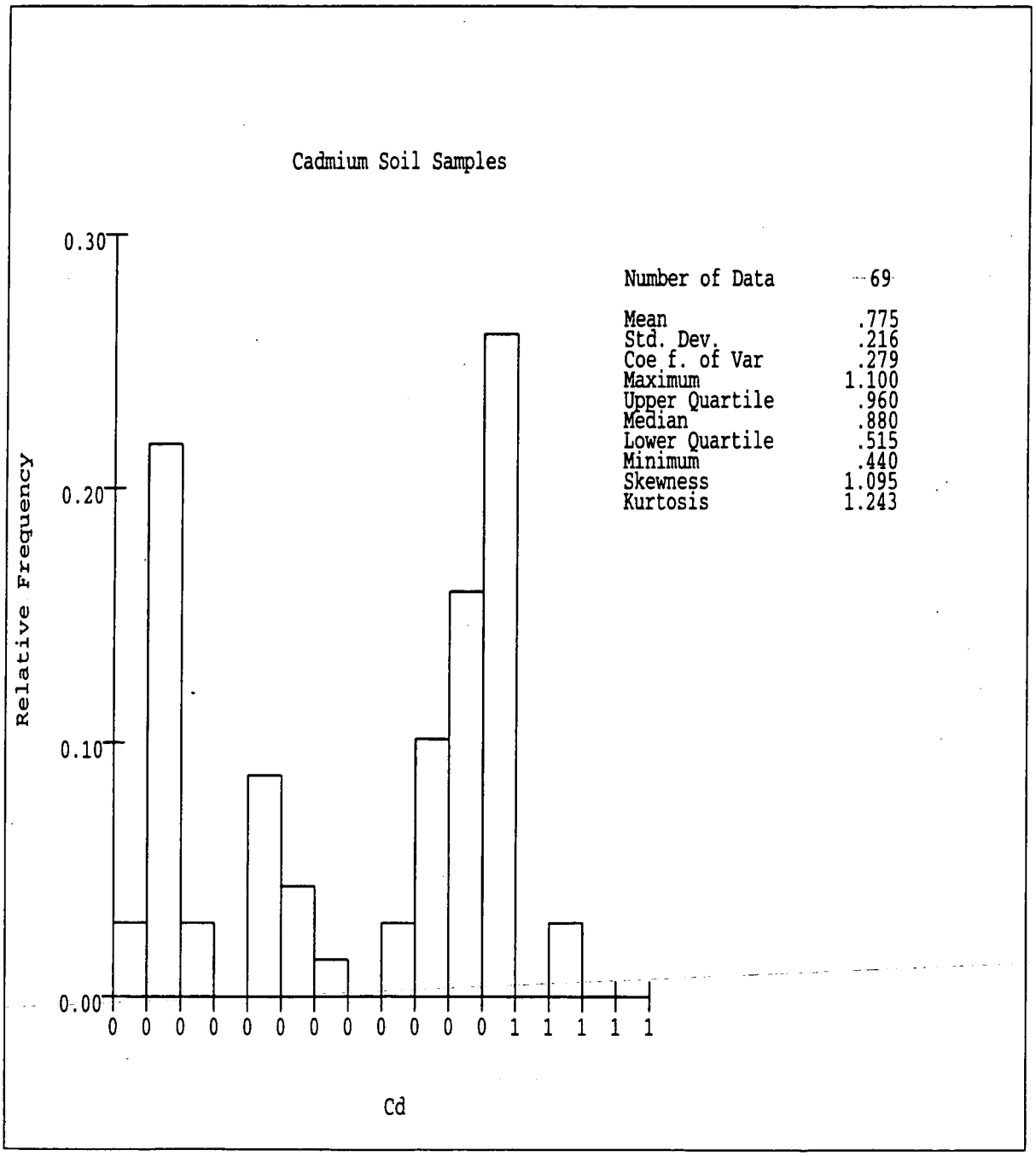


Figure 13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0.10
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Cd
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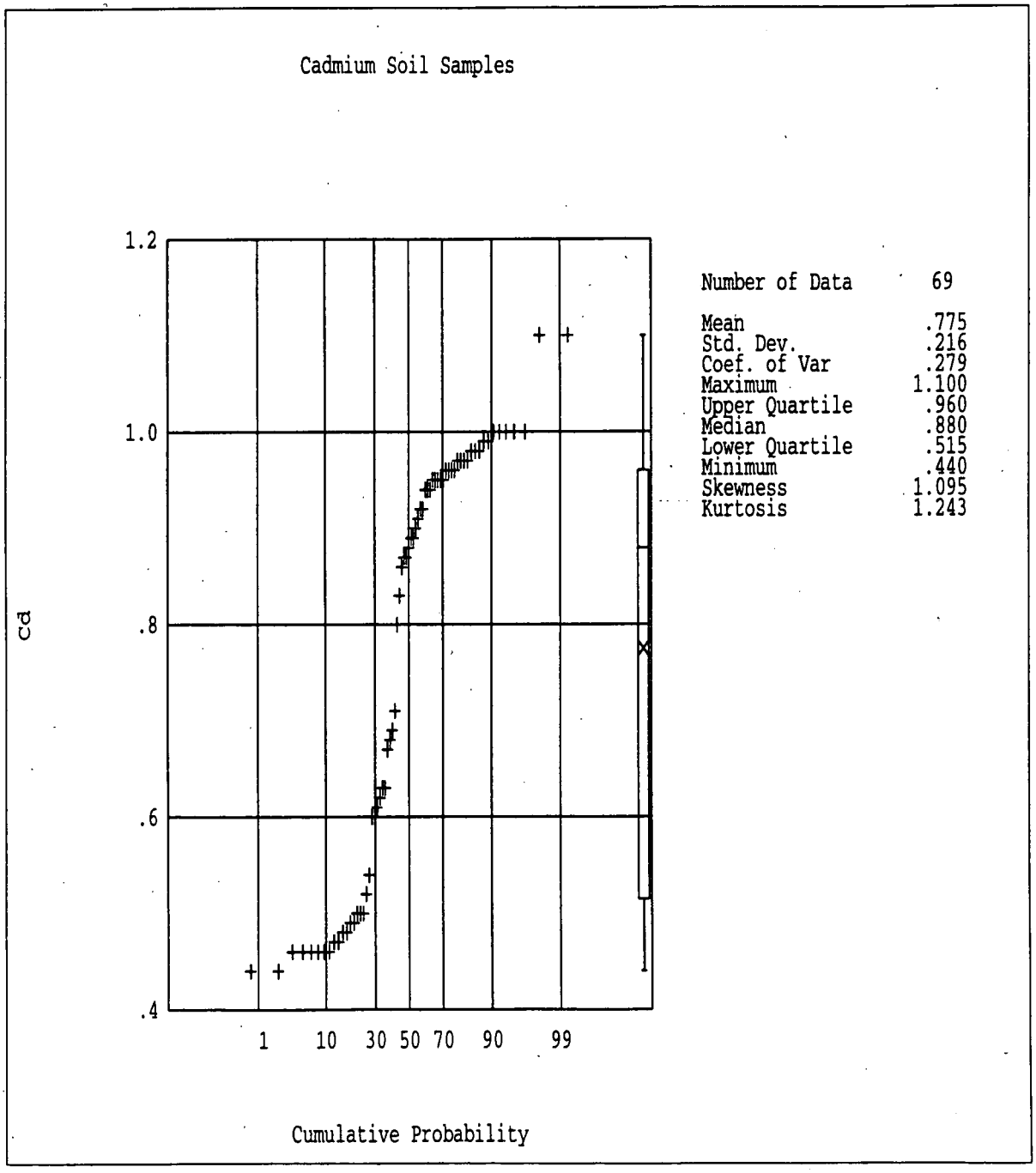
Mean .775
Std. Dev. .216
Coe f. of Var .279
Maximum 1.100
Upper Quartile .960
Median .880
Lower Quartile .515
Minimum .440
Skewness 1.095
Kurtosis 1.243

Figure 15


Cadmium Soil Samples
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1.0
.8
.6
.4
Cd
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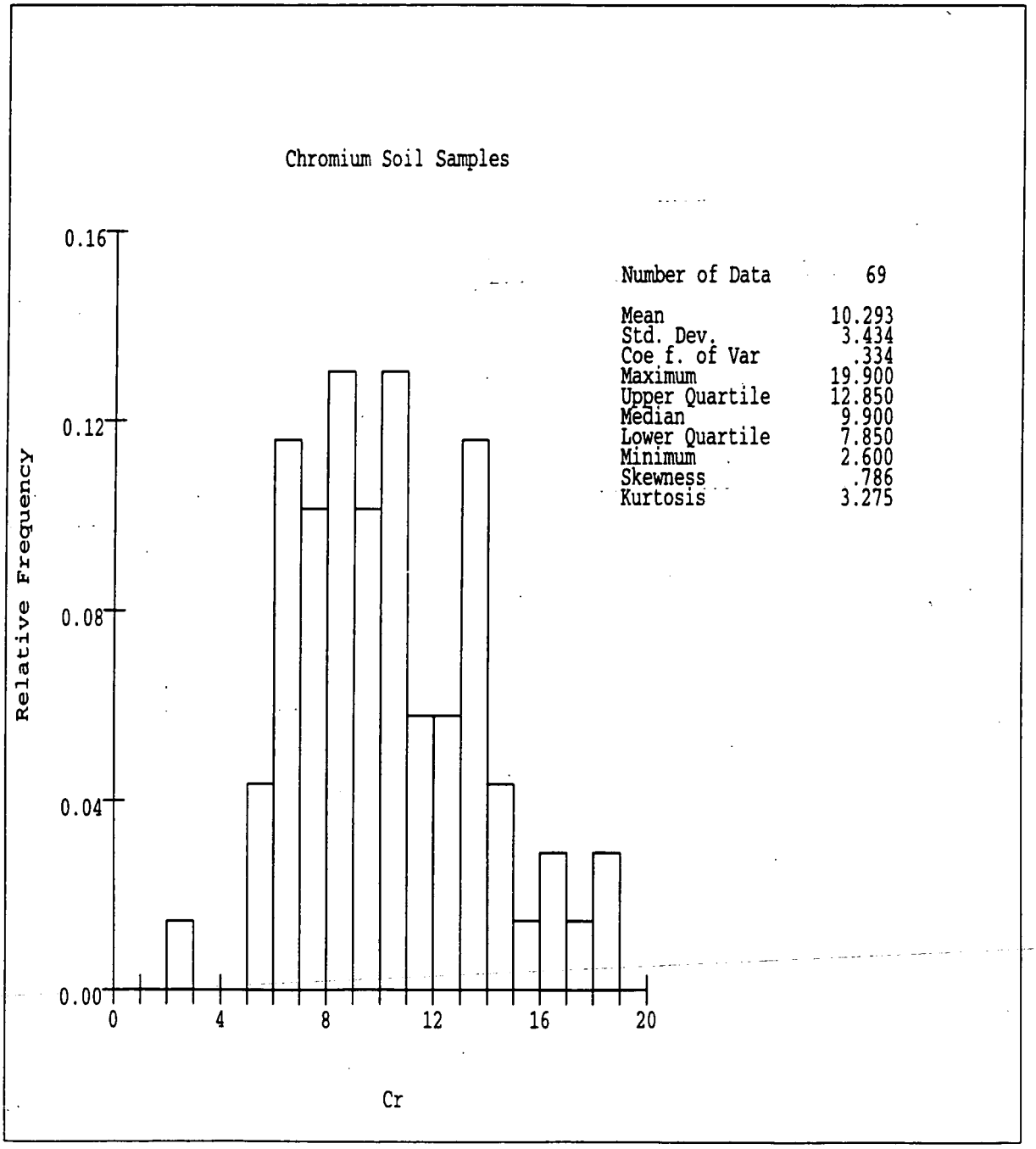
10
30
50
70
90
99
Cumulative Probability
Number of Data 69
Mean .775
Std. Dev. .216
Coef. of Var .279
Maximum 1.100
Upper Quartile .960
Median .880
Lower Quartile .515
Minimum .440
Skewness 1.095
Kurtosis 1.243

Figure 16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16
20
Cr
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Mean 10.293
Std. Dev. 3.434
Coe f. of Var .334
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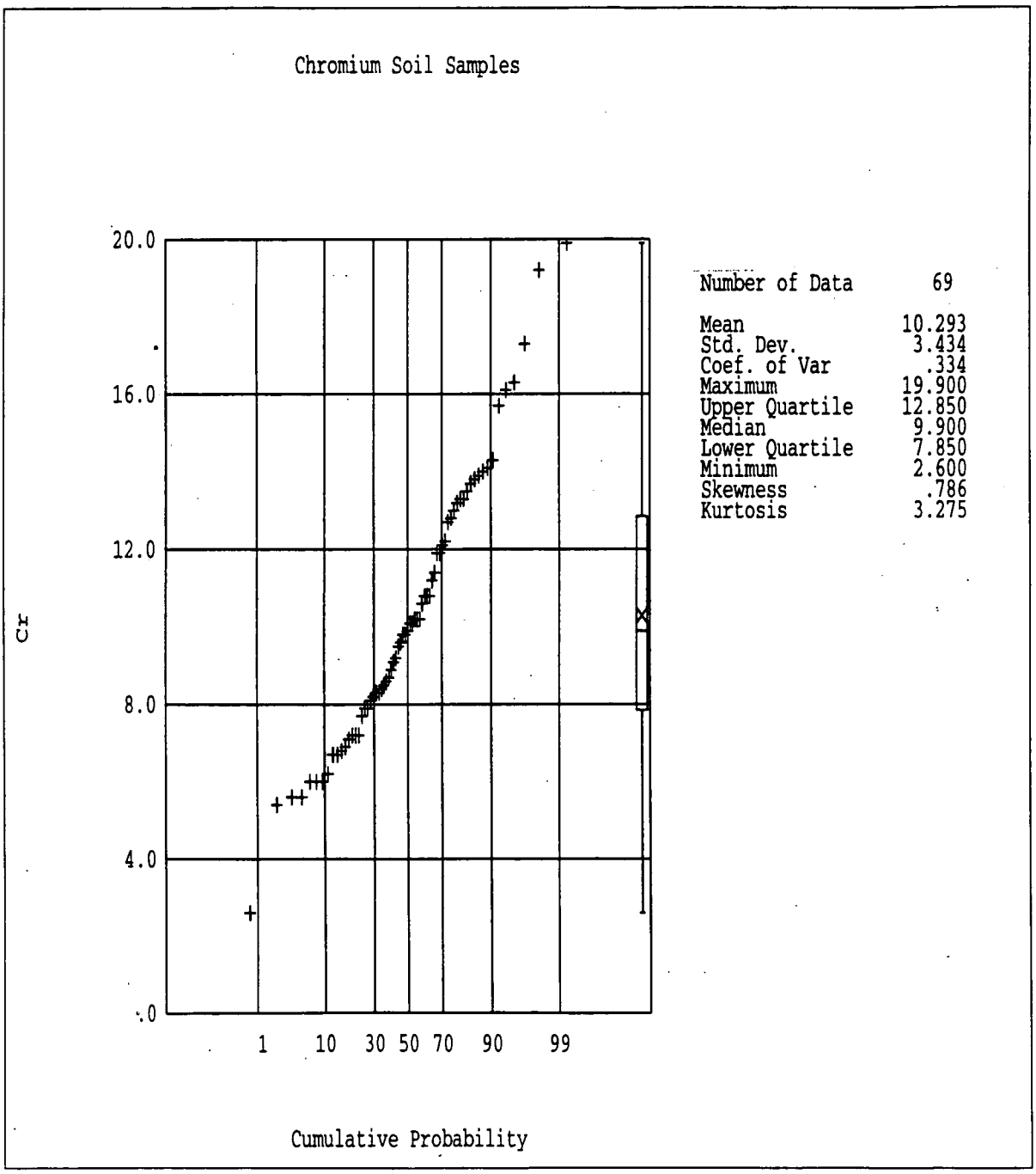
Upper Quartile 12.850
Median 9.900
Lower Quartile 7.850
Minimum 2.600
Skewness .786
Kurtosis 3.275

Figure 17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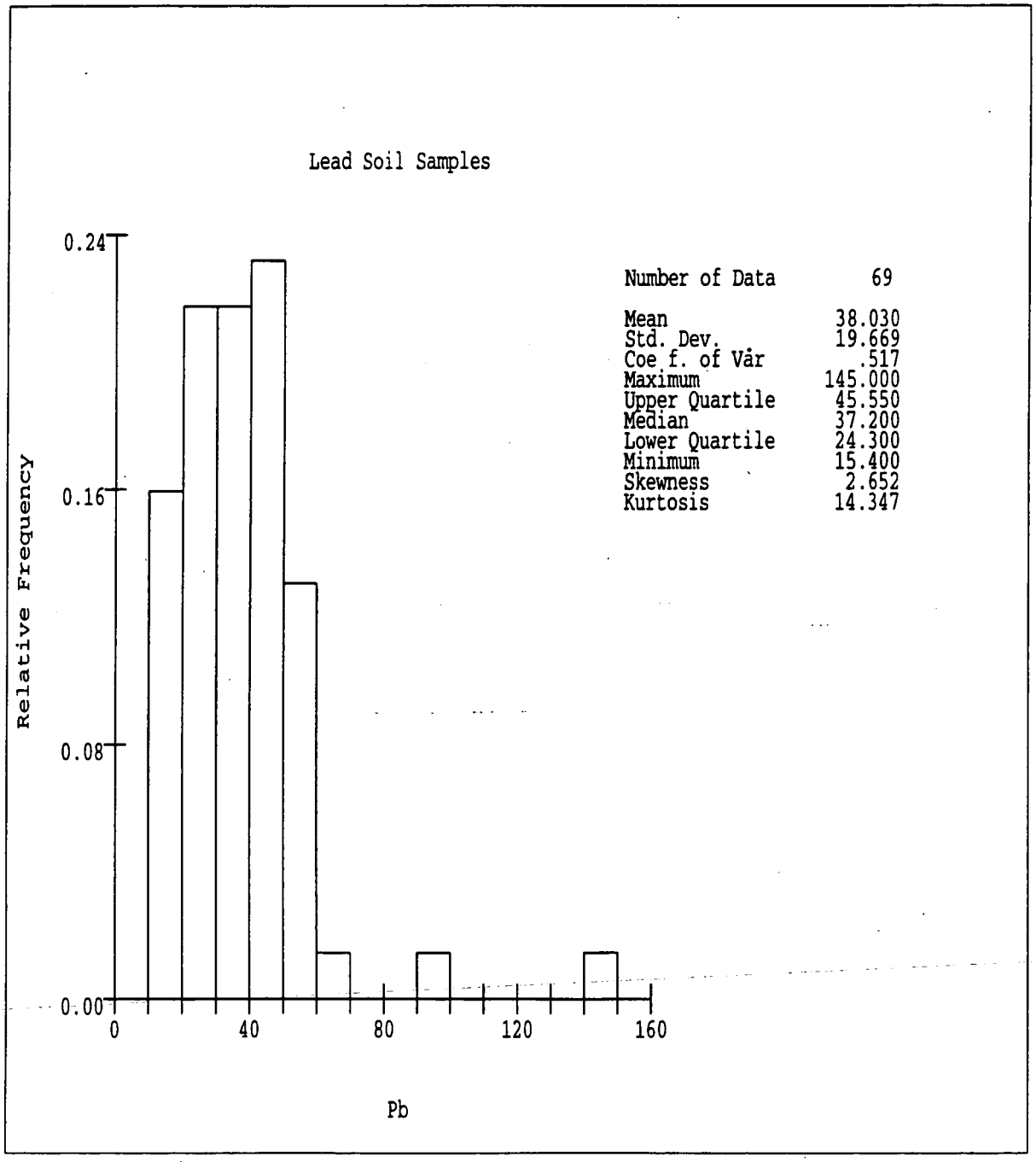
16.0
12.0
8.0
4.0
.0
Cr
1
10
30
50
70
90
99
Cumulative Probability
Number of Data 69
Mean 10.293
Std. Dev. 3.434
Coef. of Var .334
Maximum 19.900
Upper Quartile 12.850
Median 9.900
Lower Quartile 7.850
Minimum 2.600
Skewness .786
Kurtosis 3.275

Figure 18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0.08
0.00
0
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80
120
160
Pb
Number of Data 69
Mean 38.030
Std. Dev. 19.669
Coe f. of Vár .517
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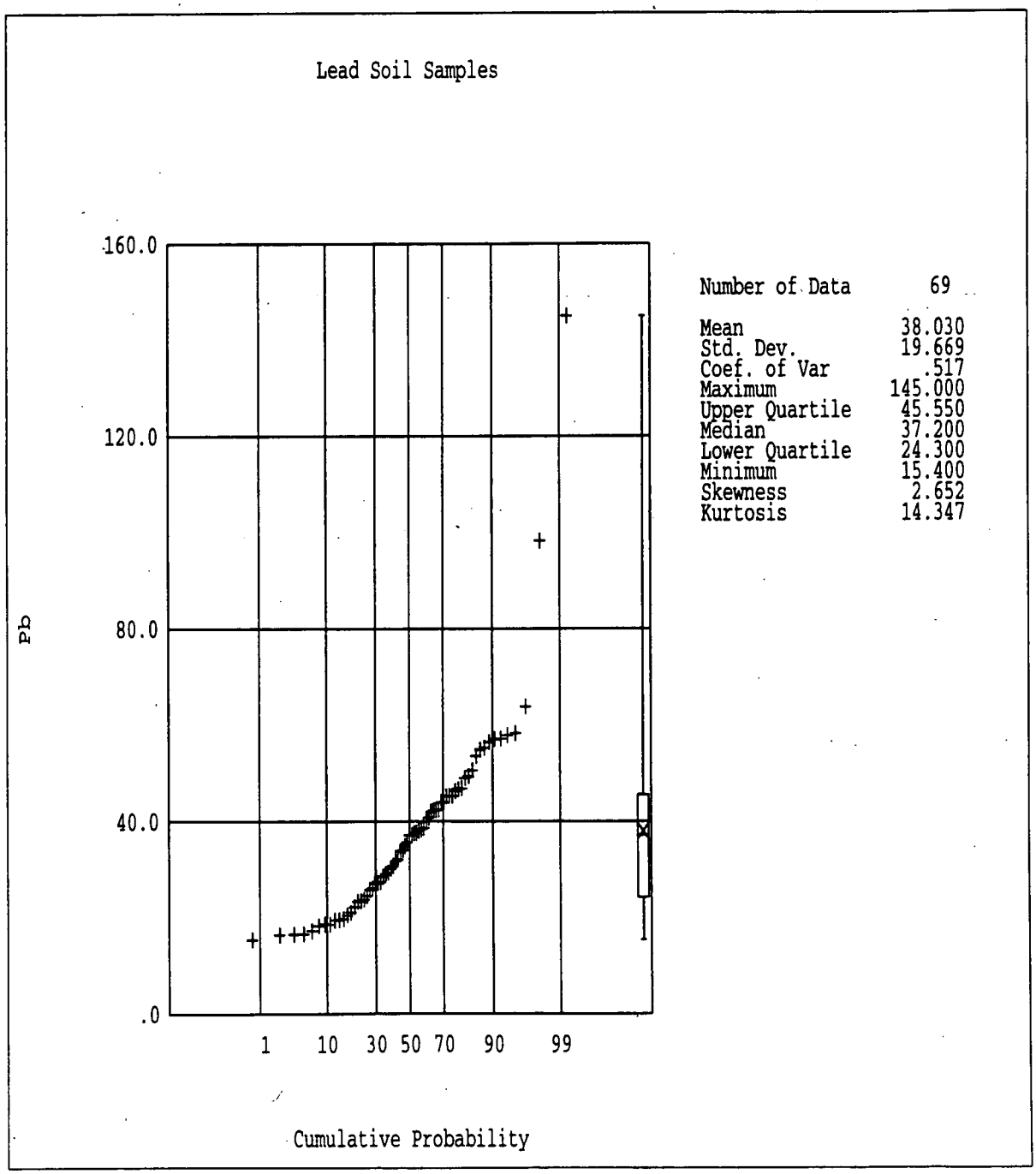
Upper Quartile 45.550
Median 37.200
Lower Quartile 24.300
Minimum 15.400
Skewness 2.652
Kurtosis 14.347

Figure 19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Pb
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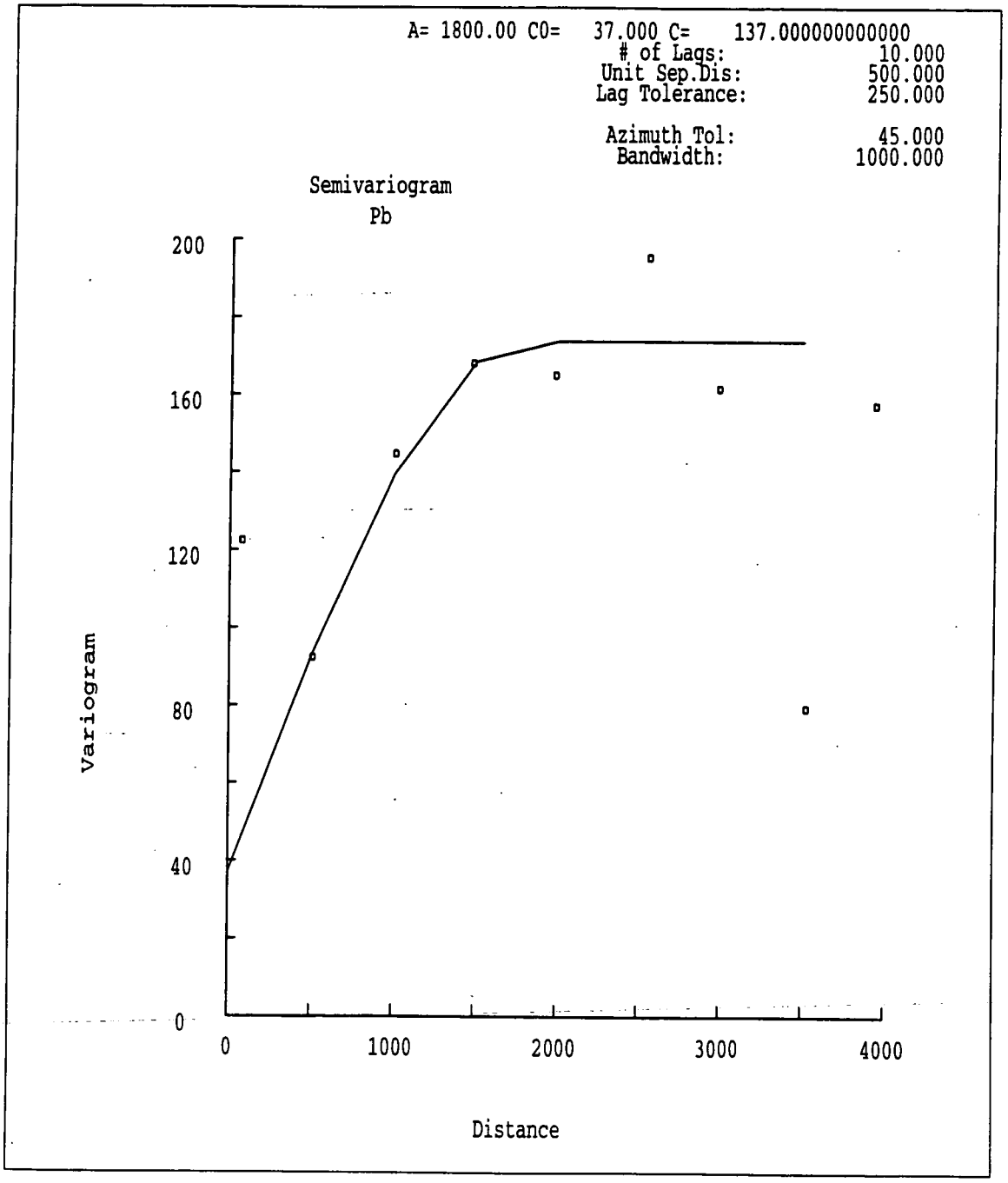
10
30
50
70
90
99
Cumulative Probability
Number of Data 69
Mean 38.030
Std. Dev. 19.669
Coef. of Var .517
Maximum 145.000
Upper Quartile 45.550
Median 37.200
Lower Quartile 24.300
Minimum 15.400
Skewness 2.652
Kurtosis 14.347

Figure 20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Pb
Variogram
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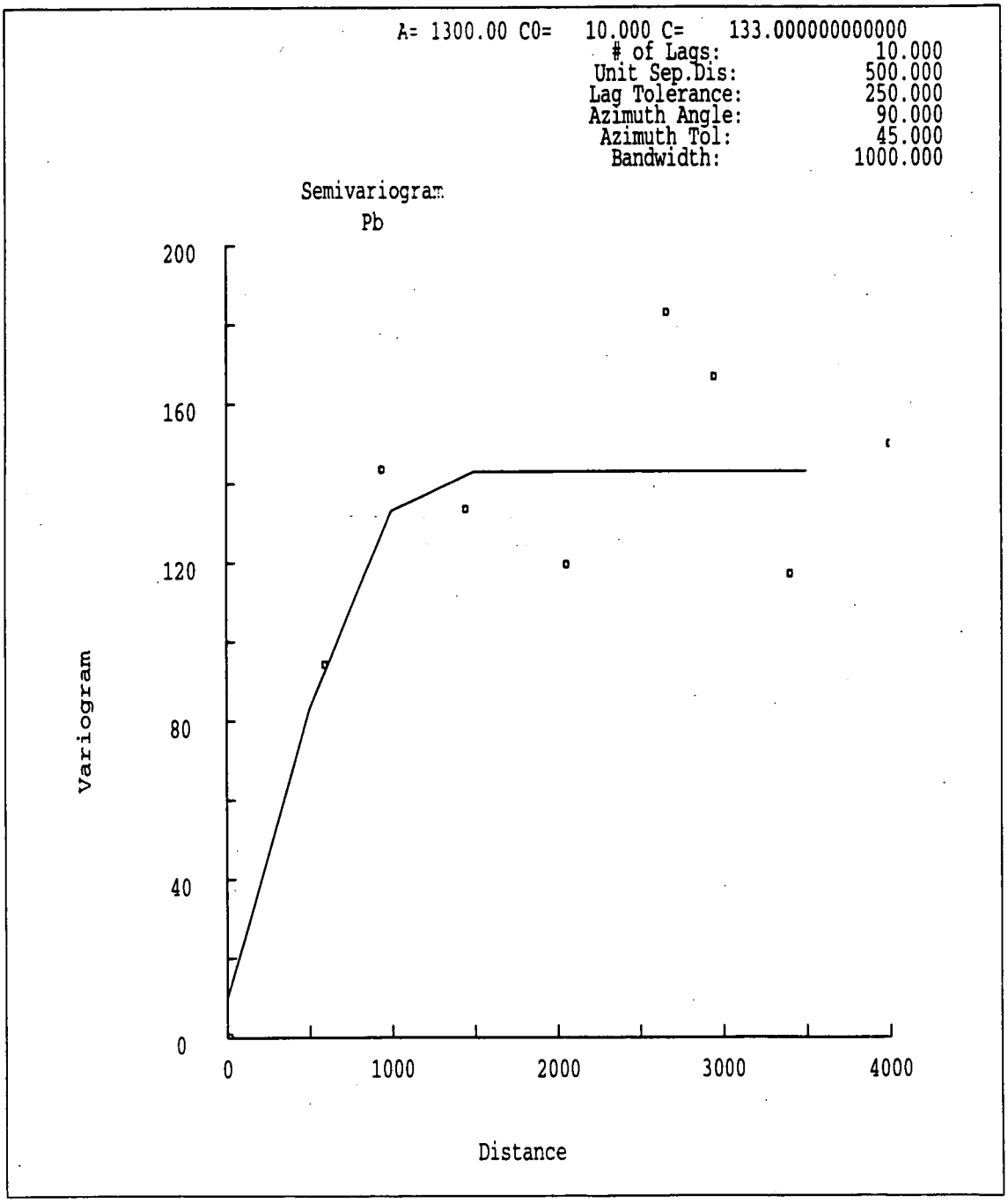
1000
2000
3000
4000
Distance

Figure 21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Semivariogram
Pb
Variogram
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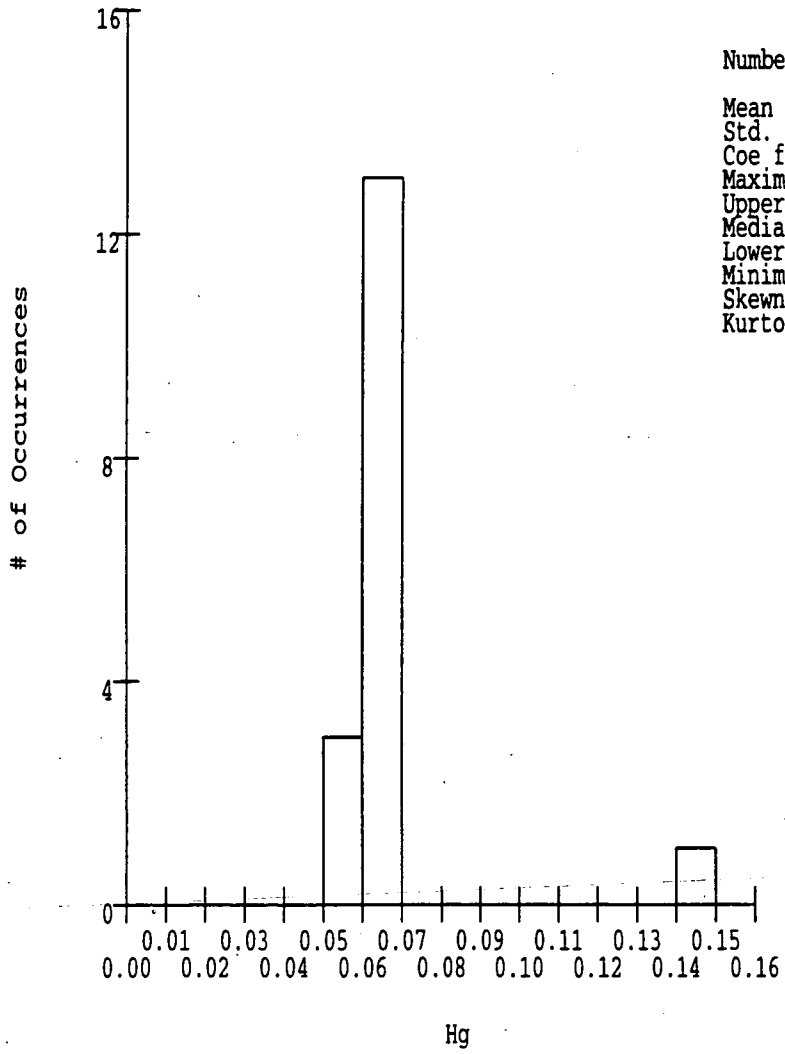
160
120
80
40
0
0
1000
2000
3000
4000
Distance

Figure 22

Mercury Soil Samples



Number of Data	17
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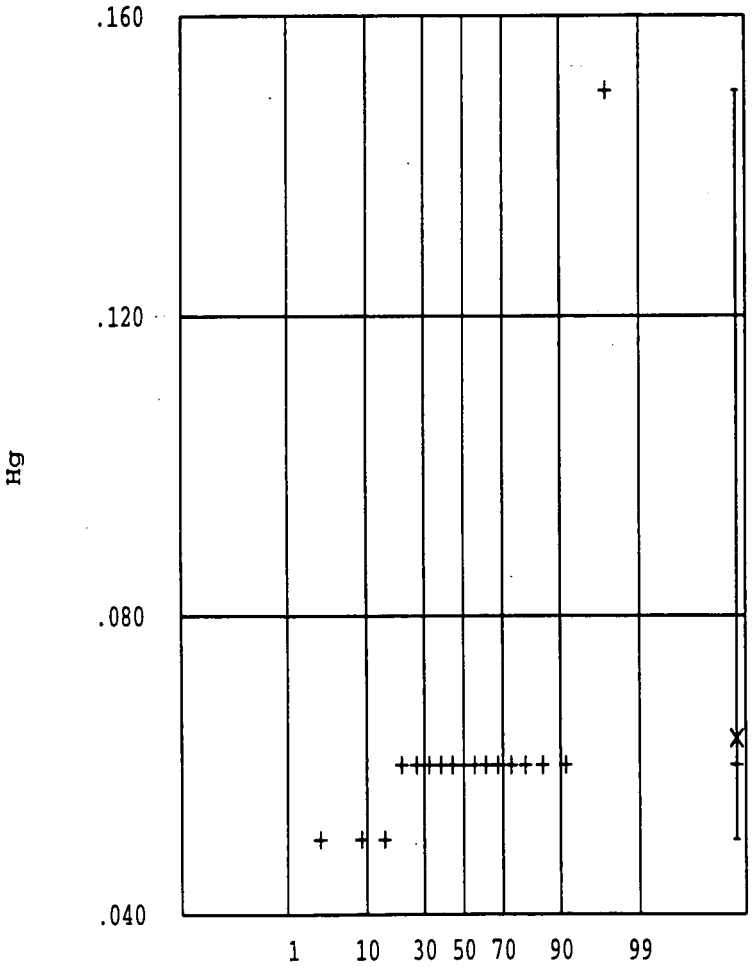
Std. Dev.	.022
Coe f. of Var	.345
Maximum	.150
Upper Quartile	.060
Median	.060
Lower Quartile	.060
Minimum	.050
Skewness	1.270
Kurtosis	1.999

Figure 24

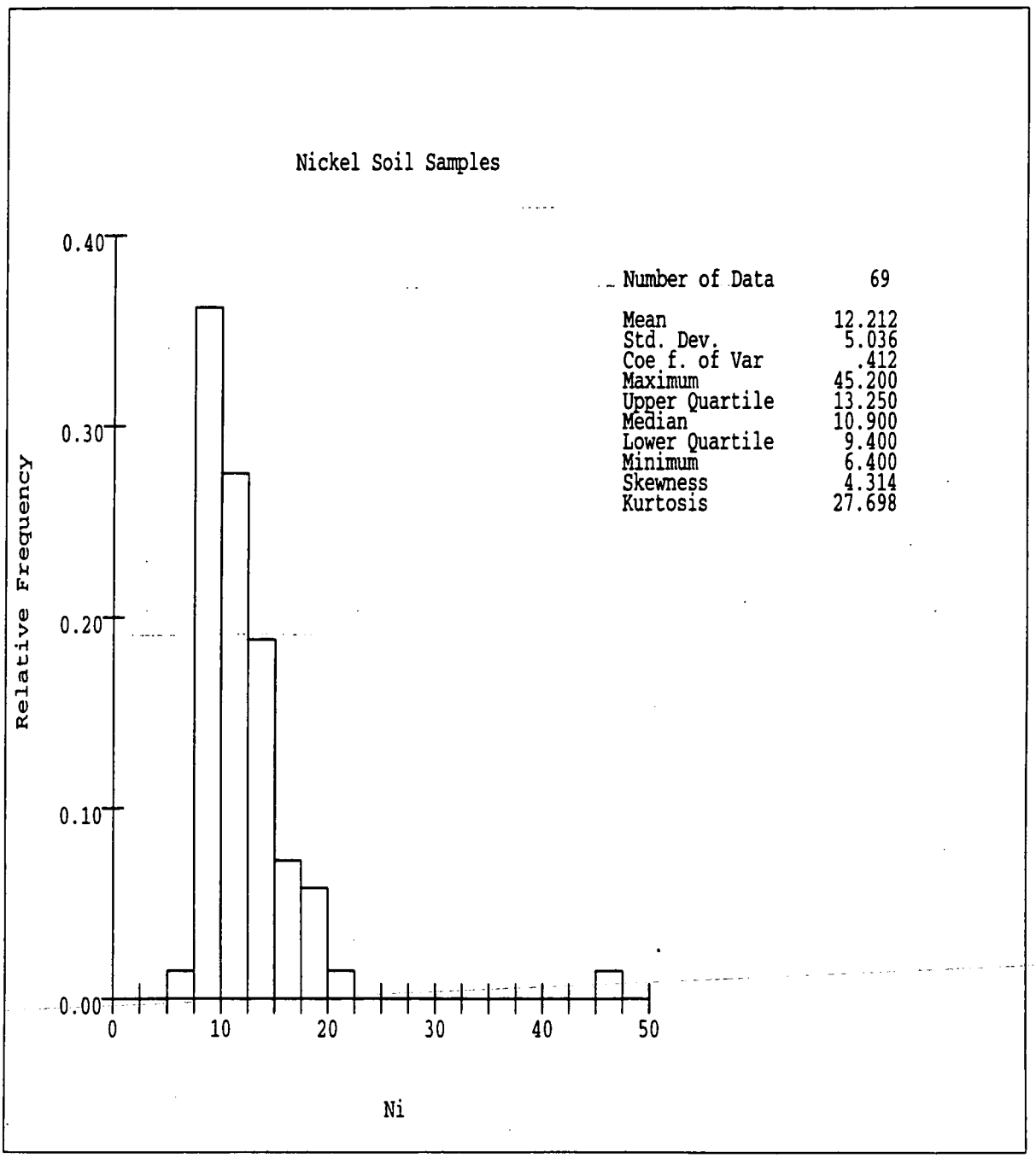
Mercury Soil Samples



Number of Data	17
Mean	.064
Std. Dev.	.022
Coef. of Var	.345
Maximum	.150
Upper Quartile	.060
Median	.060
Lower Quartile	.060
Minimum	.050
Skewness	1.270
Kurtosis	1.999

Cumulative Probability

Figure 25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Std. Dev. 5.036
Coe f. of Var .412
Maximum 45.200
Upper Quartile 13.250
Median 10.900
Lower Quartile 9.400
Minimum 6.400
Skewness 4.314
Kurtosis 27.698

Figure 26

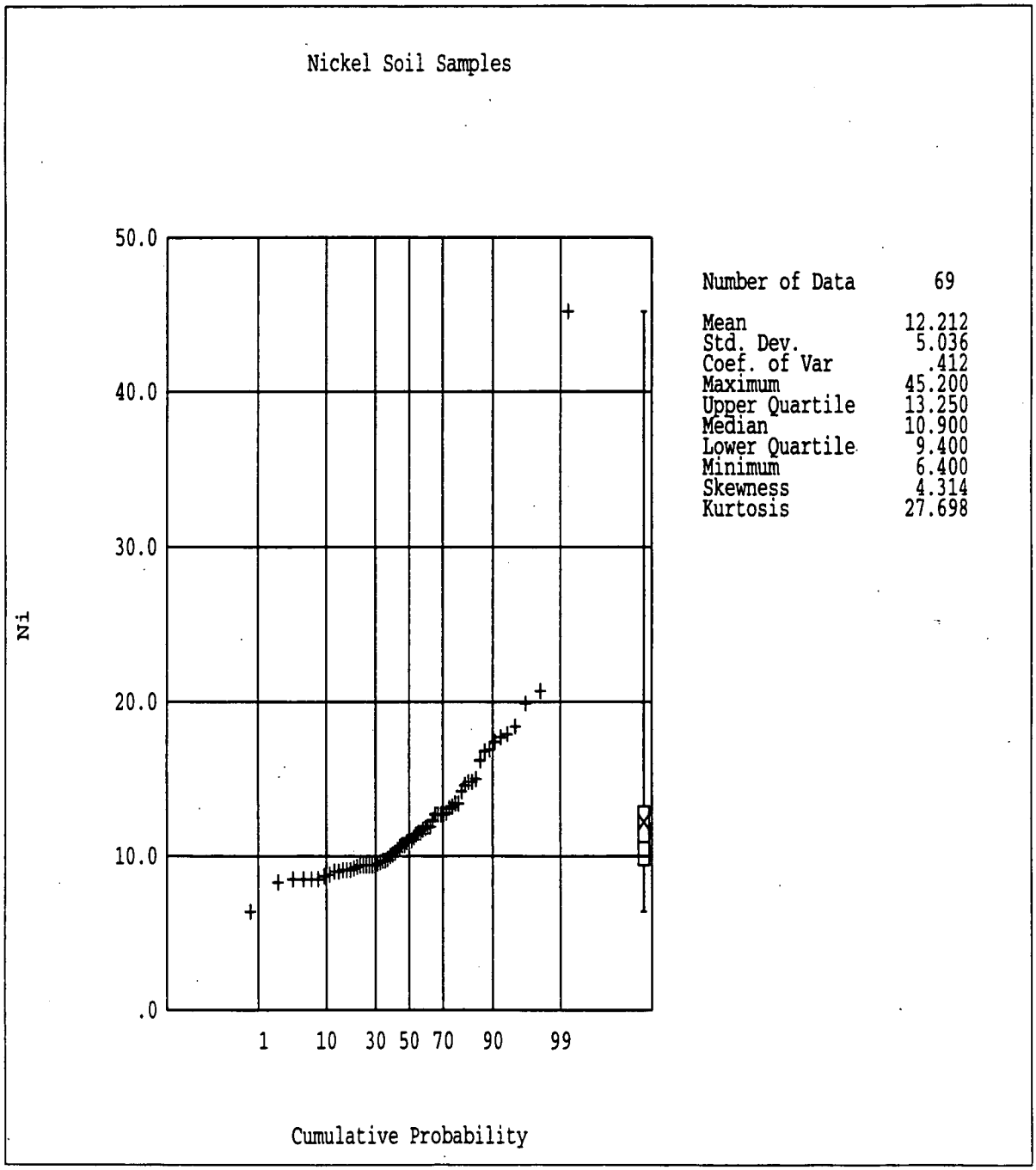

Nickel Soil Samples
50.0
40.0
30.0
20.0
10.0
.0
Ni
1
10
30
50
70
90
99
Cumulative Probability
Number of Data 69
Mean 12.212
Std. Dev. 5.036
Coef. of Var .412
Maximum 45.200
Upper Quartile 13.250
Median 10.900
Lower Quartile 9.400
Minimum 6.400
Skewness 4.314
Kurtosis 27.698

Figure 27

Table 1 Metal Concentration in Rinsate Samples

Metal	Location	North	East	QC	Result Ug/l	Detection Limits Ug/l	Validation
Arsenic	089	746029	2089765	RNS	1	10	V
Arsenic	099A	744997	2090425	RNS	1	10	V
Arsenic	104	750648	2091745	RNS	1	10	V
Arsenic	106A	749688	2091745	RNS	1	10	V
Beryllium	089	746029	2089765	RNS	1	5	V
Beryllium	099A	744997	2090425	RNS	1	5	V
Beryllium	104	750648	2091745	RNS	1	5	V
Beryllium	106A	749688	2091745	RNS	1	5	V
Cadmium	089	746029	2089765	RNS	2	5	V
Cadmium	099A	744997	2090425	RNS	2	5	V
Cadmium	104	750648	2091745	RNS	2	5	V
Cadmium	106A	749688	2091745	RNS	2	5	V
Chromium	089	746029	2089765	RNS	2	10	V
Chromium	099A	744997	2090425	RNS	2	10	V
Chromium	104	750648	2091745	RNS	2	10	V
Chromium	106A	749688	2091745	RNS	2	10	V
Lead	089	746029	2089765	RNS	1	3	V
Lead	099A	744997	2090425	RNS	1	3	V
Lead	104	750648	2091745	RNS	1	3	V
Lead	106A	749688	2091745	RNS	1	3	V
Mercury	089	746029	2089765	RNS	.2	.2	R
Mercury	099A	744997	2090425	RNS	.2	.2	R
Mercury	089	746029	2089765	RNS	.2	.2	R
Mercury	099A	744997	2090425	RNS	.2	.2	R
Nickel	089	746029	2089765	RNS	5	40	V
Nickel	099A	744997	2090425	RNS	5	40	V
Nickel	104	750648	2091745	RNS	5	40	V
Nickel	106A	749688	2091745	RNS	5	40	V

Table 2 Metal Duplicate Samples and Their Relative Percent Differences

Metal	Location	North	East	QC	Result Mg/Kg	RPD %	Detection Limits	Validation		
Arsenic	055A	749000	2087126	REAL	3.2	35.9	2	JA	12	52
Arsenic	055A	749000	2087126	DUP	4.6		2	JA	12	52
Arsenic	058	746689	2087126	REAL	4.7	6.6	2	JA	12	52
Arsenic	058	746689	2087126	DUP	4.4		2	JA	12	52
Arsenic	072	749658	2088116	REAL	5.5	5.3	2	V		
Arsenic	072	749658	2088116	DUP	5.8		2	V		
Arsenic	089	746029	2089765	REAL	4.1	5	2	V		
Arsenic	089	746029	2089765	DUP	3.9		2	V		
Arsenic	096	746689	2090425	REAL	2.5	14.8	2	V		
Arsenic	096	746689	2090425	DUP	2.9		2	V		
Arsenic	099B	744987	2090425	REAL	4	0	2	V		
Arsenic	099B	744987	2090425	DUP	4		2	V		
Arsenic	104	750648	2091745	REAL	3.1	13.8	2	V		
Arsenic	104	750648	2091745	DUP	2.7		2	V		
Arsenic	106A	749688	2091745	REAL	5.3	9.9	2	V		
Arsenic	106A	749688	2091745	DUP	4.8		2	V		
Beryllium	055A	749000	2087126	REAL	.74	0	1	JA	7	52
Beryllium	055A	749000	2087126	DUP	.74		1	JA	7	52
Beryllium	058	746689	2087126	REAL	.64	1.6	1	JA	7	52
Beryllium	058	746689	2087126	DUP	.65		1	JA	7	52
Beryllium	072	749658	2088116	REAL	.59	9.4	1	V		
Beryllium	072	749658	2088116	DUP	.68		1	V		
Beryllium	073A	749856	2088116	REAL	.69	36.7	1	V		
Beryllium	073A	749856	2088116	DUP	1		5	V		
Beryllium	089	746029	2089765	REAL	.7	13.3	1	V		
Beryllium	089	746029	2089765	DUP	.8		1	V		
Beryllium	096	746689	2090425	REAL	.53	23.2	1	JA	7	
Beryllium	096	746689	2090425	DUP	.42		1	JA	7	
Beryllium	099B	744987	2090425	REAL	.87	9.6	1	V		
Beryllium	099B	744987	2090425	DUP	.79		1	V		
Beryllium	104	750648	2091745	REAL	.61	8.6	1	V		
Beryllium	104	750648	2091745	DUP	.56		1	V		
Beryllium	106A	749688	2091745	REAL	.66	14.6	1	V		
Beryllium	106A	749688	2091745	DUP	.57		1	V		
Cadmium	055A	749000	2087126	REAL	.94	1.1	1	JA	5	52
Cadmium	055A	749000	2087126	DUP	.95		1	JA	5	52
Cadmium	058	746689	2087126	REAL	.97	2	1	JA	5	52
Cadmium	058	746689	2087126	DUP	.99		1	JA	5	52
Cadmium	072	749658	2088116	REAL	.48	11.8	1	V		
Cadmium	072	749658	2088116	DUP	.54		1	V		
Cadmium	073A	749856	2088116	REAL	.47	123.9	1	V		
Cadmium	073A	749856	2088116	DUP	2		5	V		
Cadmium	089	746029	2089765	REAL	.48	25.4	1	V		
Cadmium	089	746029	2089765	DUP	.62		1	V		
Cadmium	096	746689	2090425	REAL	.95	1.1	1	V		
Cadmium	096	746689	2090425	DUP	.96		1	V		
Cadmium	099B	744987	2090425	REAL	.44	2.2	1	V		
Cadmium	099B	744987	2090425	DUP	.45		1	V		
Cadmium	104	750648	2091745	REAL	.46	4.3	1	V		
Cadmium	104	750648	2091745	DUP	.48		1	V		
Cadmium	106A	749688	2091745	REAL	.51	30	1	V		
Cadmium	106A	749688	2091745	DUP	.69		1	V		
Chromium	055A	749000	2087126	REAL	7.7	20	2	V		52
Chromium	055A	749000	2087126	DUP	6.3		2	V		52
Chromium	058	746689	2087126	REAL	9.9	25	2	V		52
Chromium	058	746689	2087126	DUP	7.7		2	V		52
Chromium	072	749658	2088116	REAL	11.9	7.9	2	JA	11	
Chromium	072	749658	2088116	DUP	11		2	JA	11	

Table 2 Metal Duplicate Samples and Their Relative Percent Differences

Chromium	073A	749856	2088116	REAL	13.3	147.7	2	V				
Chromium	073A	749856	2088116	DUP	2		10	V				
Chromium	089	746029	2089765	REAL	11.6	4.2	2	JA	11			
Chromium	089	746029	2089765	DUP	12.1		2	JA	11			
Chromium	096	746689	2090425	REAL	6	137	2	V				
Chromium	096	746689	2090425	DUP	32.1		2	V				
Chromium	099B	744987	2090425	REAL	14.1	16.9	2	V				
Chromium	099B	744987	2090425	DUP	11.9		2	V				
Chromium	104	750648	2091745	REAL	12.8	10.7	2	JA	11			
Chromium	104	750648	2091745	DUP	11.5		2	JA	11			
Chromium	106A	749688	2091745	REAL	13.3	25.4	2	V				
Chromium	106A	749688	2091745	DUP	10.3		2	V				
Cadmium	055A	749000	2087126	REAL	45.7	2.2	1	V		79	52	
Cadmium	055A	749000	2087126	DUP	46.7		1	V		79	52	
Cadmium	058	746689	2087126	REAL	58.3	5.6	1	V		79	52	
Cadmium	058	746689	2087126	DUP	55.1		1	V		79	52	
Cadmium	072	749658	2088116	REAL	46.9	22.3	.6	V				
Cadmium	072	749658	2088116	DUP	37.5		.6	V				
Cadmium	073A	749856	2088116	REAL	42.5	190.8	.6	V				
Cadmium	073A	749856	2088116	DUP	1		3	V				
Cadmium	089	746029	2089765	REAL	44	5.1	.6	V				
Cadmium	089	746029	2089765	DUP	41.8		.6	V				
Cadmium	096	746689	2090425	REAL	25.5	14.2	1	V				
Cadmium	096	746689	2090425	DUP	29.4		1	V				
Cadmium	099B	744987	2090425	REAL	18.6	6.1	.6	V			52	
Cadmium	099B	744987	2090425	DUP	17.5		.6	V				
Cadmium	104	750648	2091745	REAL	32.6	9.1	.6	V				
Cadmium	104	750648	2091745	DUP	35.7		.6	V				
Cadmium	106A	749688	2091745	REAL	49.4	6	.6	V				
Cadmium	106A	749688	2091745	DUP	46.5		.6	V				
Lead	055A	749000	2087126	REAL	45.7	2.2	1	V		79	52	
Lead	055A	749000	2087126	DUP	46.7		1	V		79	52	
Lead	058	746689	2087126	REAL	58.3	5.6	1	V		79	52	
Lead	058	746689	2087126	DUP	55.1		1	V		79	52	
Lead	072	749658	2088116	REAL	46.9	22.3	.6	V				
Lead	072	749658	2088116	DUP	37.5		.6	V				
Lead	073A	749856	2088116	REAL	42.5	190.8	.6	V				
Lead	073A	749856	2088116	DUP	1		3	V				
Lead	089	746029	2089765	REAL	44	5.1	.6	V				
Lead	089	746029	2089765	DUP	41.8		.6	V				
Lead	096	746689	2090425	REAL	25.5	14.2	1	V				
Lead	096	746689	2090425	DUP	29.4		1	V				
Lead	099B	744987	2090425	REAL	18.6	6.1	.6	V			52	
Lead	099B	744987	2090425	DUP	17.5		.6	V				
Lead	104	750648	2091745	REAL	32.6	9.1	.6	V				
Lead	104	750648	2091745	DUP	35.7		.6	V				
Lead	106A	749688	2091745	REAL	49.4	6	.6	V				
Lead	106A	749688	2091745	DUP	46.5		.6	V				
Mercury	055A	749000	2087126	REAL	.06	0		.1	JA	1		52
Mercury	055A	749000	2087126	DUP	.06			.1	JA	1		52
Mercury	058	746689	2087126	REAL	.06	0		.1	JA	1		52
Mercury	058	746689	2087126	DUP	.06			.1	JA	1		52
Nickel	055A	749000	2087126	REAL	9.4	4.4		8	V			52
Nickel	055A	749000	2087126	DUP	9			8	V			52
Nickel	058	746689	2087126	REAL	9.3	1.1		8	V			52
Nickel	058	746689	2087126	DUP	9.4			8	V			52
Nickel	072	749658	2088116	REAL	8.9	21.1		8	V			
Nickel	072	749658	2088116	DUP	11			8	V			
Nickel	073A	749856	2088116	REAL	12.3	84.4		8	V			
Nickel	073A	749856	2088116	DUP	5			40	V			

Table 2 Metal Duplicate Samples and Their Relative Percent Differences

Nickel	089	746029	2089765	REAL	12.7	2.4	8	V
Nickel	089	746029	2089765	DUP	12.4		8	V
Nickel	096	746689	2090425	REAL	9.1	64.2	8	V
Nickel	096	746689	2090425	DUP	17.7		8	V
Nickel	099B	744987	2090425	REAL	16.9	13.9	8	V
Nickel	099B	744987	2090425	DUP	14.7		8	V
Nickel	104	750648	2091745	REAL	9.4	2.2	8	V
Nickel	104	750648	2091745	DUP	9.2		8	V
Nickel	106A	749688	2091745	REAL	11.5	6.3	8	V
Nickel	106A	749688	2091745	DUP	10.8		8	V

Table 3 Summary of Metals Statistics

Metal	Mean (mg/kg)	Std. Dev. (mg/kg)	Lilliefors Test Statistic	Maximum (mg/kg)	Rock Creek UTL	BSCP UTL
Arsenic	4.05	1.32	0.0771	7.4	12.86	13.75
Beryllium	0.68	0.21	0.668	1.5	1.14	1.25
Cadmium	0.78	0.22	not relevant	1.1	2.45	2.34
Chromium	10.29	3.43	0.0904	19.9	24.85	22.21
Lead	38.03	19.67	0.0771	145	60.2	73.9
Mercury	0.06	0.02	not available	0.15	not available	0.19
Nickel	12.21	5.04	0.1027	45.2	26.8	19.74

TABLE 4
SEMIVARIOGRAM VALUES
AVERAGE ARSENIC VARIOGRAM

Distance	Gamma(h)	Pairs
71.5	1.8640	30
568.1	1.6683	148
982.6	1.4864	152
1475.9	1.7731	294
2013.2	1.8610	318
2552.8	1.8897	402
2959.0	2.2267	314
3471.5	1.5678	382
4009.4	1.6610	394

TABLE 5
MEDIAN INDICATOR VALUES
AVERAGE BERYLLIUM VARIOGRAM

Distance	Gamma(h)	Pairs
262.1	0.2195	82
1103.3	0.2679	448
2046.1	0.2732	560
2955.9	0.2448	768
3977.9	0.2436	698
5005.6	0.2536	824
5951.8	0.2601	596
6968.0	0.2390	364
7896.8	0.2290	214

TABLE 6
SEMIVARIOGRAM VALUES
AVERAGE CADMIUM VARIOGRAM

Distance	Gamma(h)	Pairs
59.0	0.1667	15
559.0	0.1792	53
981.3	0.1379	58
1505.8	0.1800	100
1998.8	0.1911	123
2548.9	0.1576	184
2953.4	0.1667	132
3468.1	0.1818	154
4016.8	0.2211	147

TABLE 7
MEDIAN INDICATOR VALUES
AVERAGE CHROMIUM VARIOGRAM

Distance	Gamma(h)	Pairs
234.2	0.1061	33
1104.4	0.1171	175
2028.6	0.1557	183
2973.9	0.1293	259
3962.9	0.1142	254
5022.5	0.1655	281
5969.8	0.1020	201
6944.8	0.0714	126
7865.3	0.1056	71

TABLE 8
SEMIVARIOGRAM VALUES
NORTH-SOUTH LEAD VARIOGRAM

Distance	Gamma(h)	Pairs
75.3	122.45	14
511.2	92.45	29
1008.1	144.82	41
1481.7	168.21	51
1982.4	165.17	39
2549.4	195.54	49
2988.0	161.72	26
3525.7	79.39	24
3936.2	157.46	32

TABLE 9
SEMIVARIOGRAM VALUES
EAST-WEST LEAD VARIOGRAM

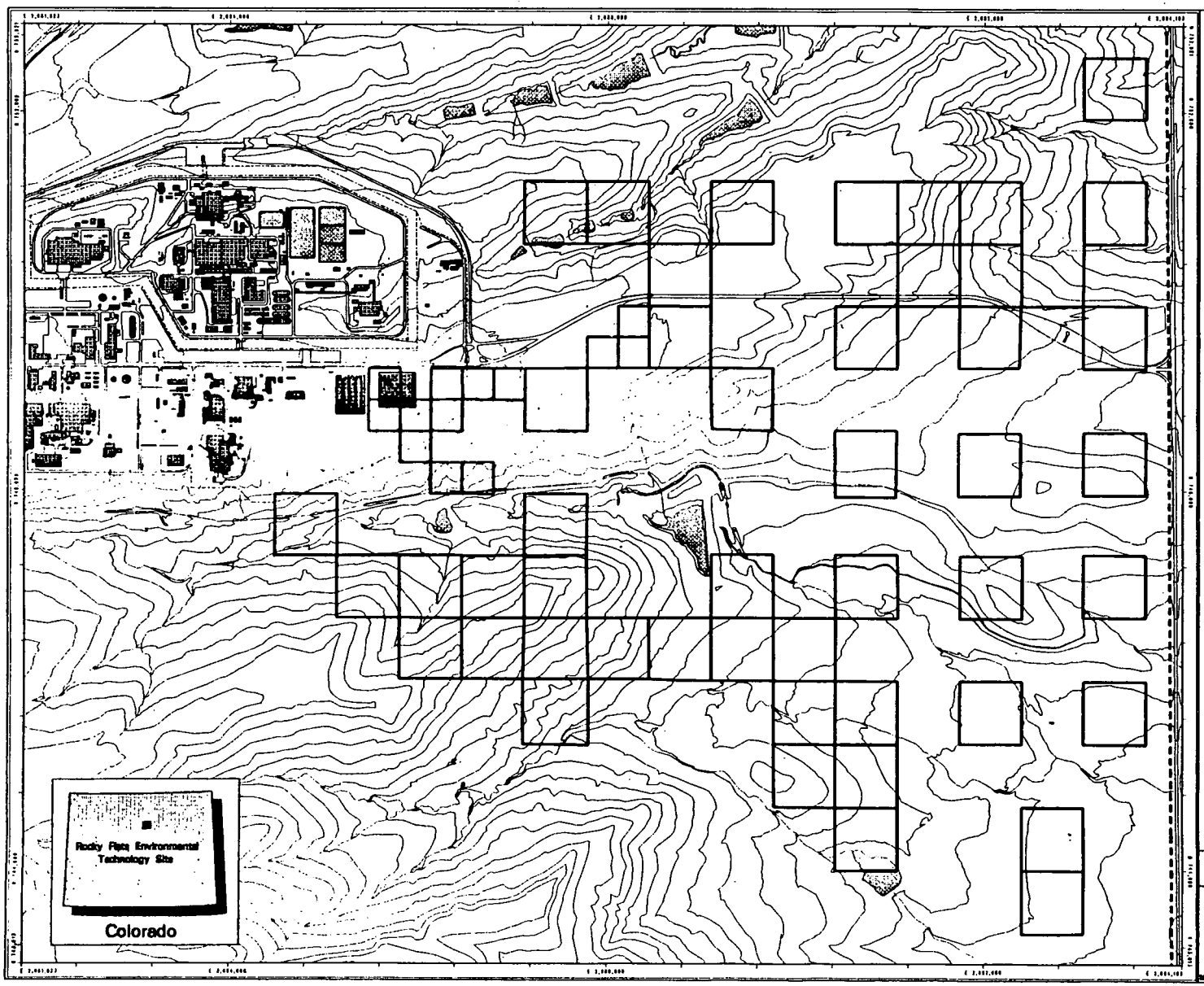
Distance	Gamma(h)	Pairs
15.1	0.13	2
595.7	94.30	42
943.4	143.63	40
1450.2	133.69	79
2057.1	119.60	64
2663.0	183.02	51
2946.8	166.81	25
3402.4	117.07	52
3998.9	149.86	44

TABLE 10
SEMIVARIOGRAM VALUES
AVERAGE MERCURY VARIOGRAM

Distance	Gamma(h)	Pairs
157.0	0.0000	6
1091.7	0.0016	26
2184.1	0.0001	36
2930.9	0.0004	56
3970.7	0.0001	28
5008.6	0.0006	38
5971.1	0.0009	42
7134.5	0.0003	22
7846.1	0.0010	10

TABLE 11
SEMIVARIOGRAM VALUES
AVERAGE NICKEL VARIOGRAM

Distance	Gamma(h)	Pairs
61.2	0.1000	15
592.2	0.1458	48
958.6	0.1482	54
1473.6	0.1372	113
2018.6	0.1435	115
2574.5	0.1182	165
2936.6	0.1454	110
3437.8	0.0909	154
4002.5	0.1164	159



Surficial Soils Metals Sampling Plots OU2

EXPLANATION

- 10 and 2.5 Acre sampling plot locations

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Contours (20' Intervals)
- Rocky Flats boundary
- Paved roads

DATA SOURCE:
Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by USGS - [illegible]

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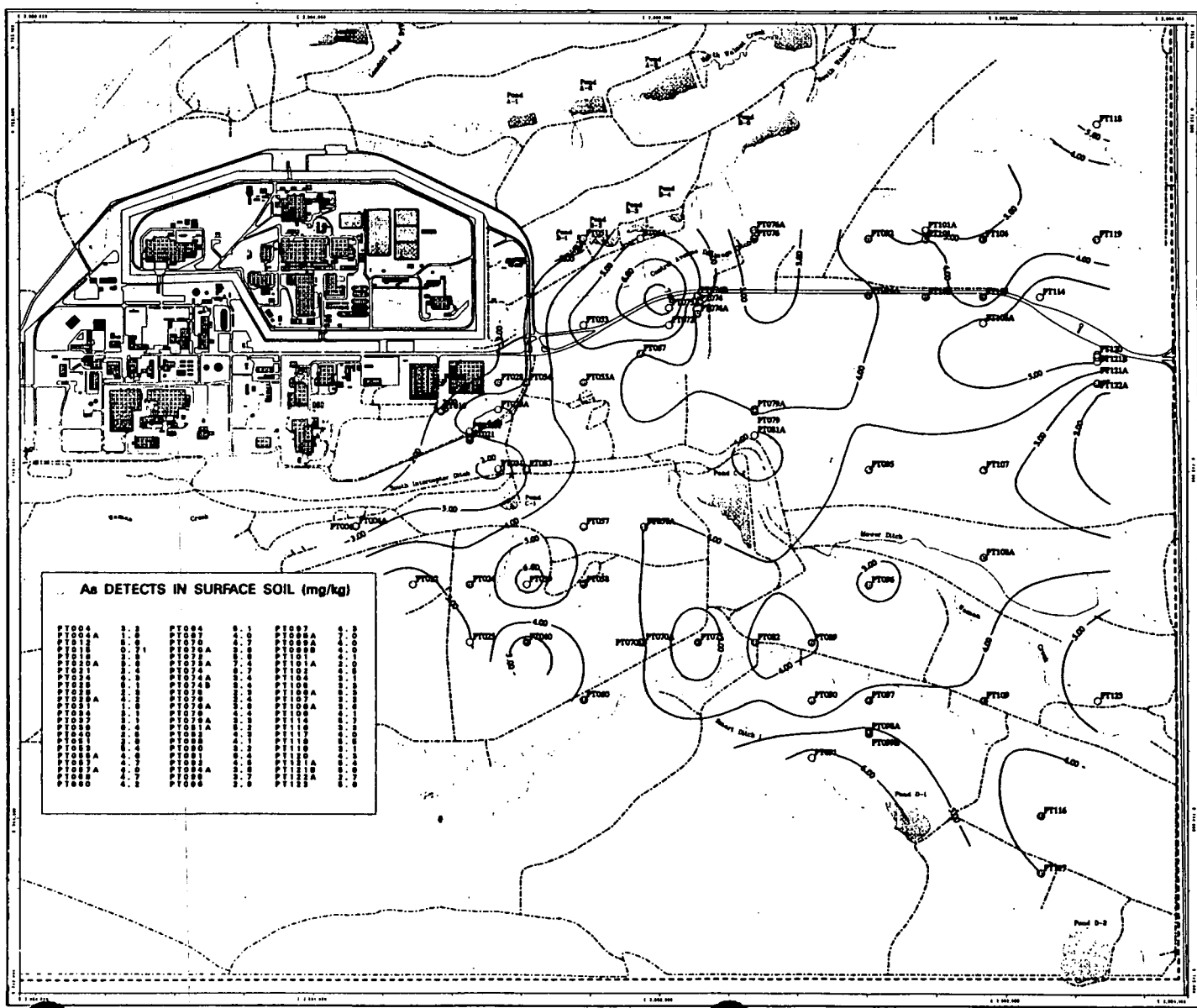
Figure 1

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
EG&G ROCKY FLATS
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, Colorado 80402-0464

MAP ID: [illegible]

January [illegible], 1995



OU3 Remedial Investigation
Surface Soils Data
Arsenic Study Locations

EXPLANATION

Concentration Isopleth (Interval = 1.0 mg/kg)

Arsenic Concentrations (Mg/Kg)

- < 1.0
- 1.0 - 5.0
- 5.0 - 10.0
- 10.0 - 25.0
- 25.0 - 50.0
- 50.0 - 100.0
- > 100.0

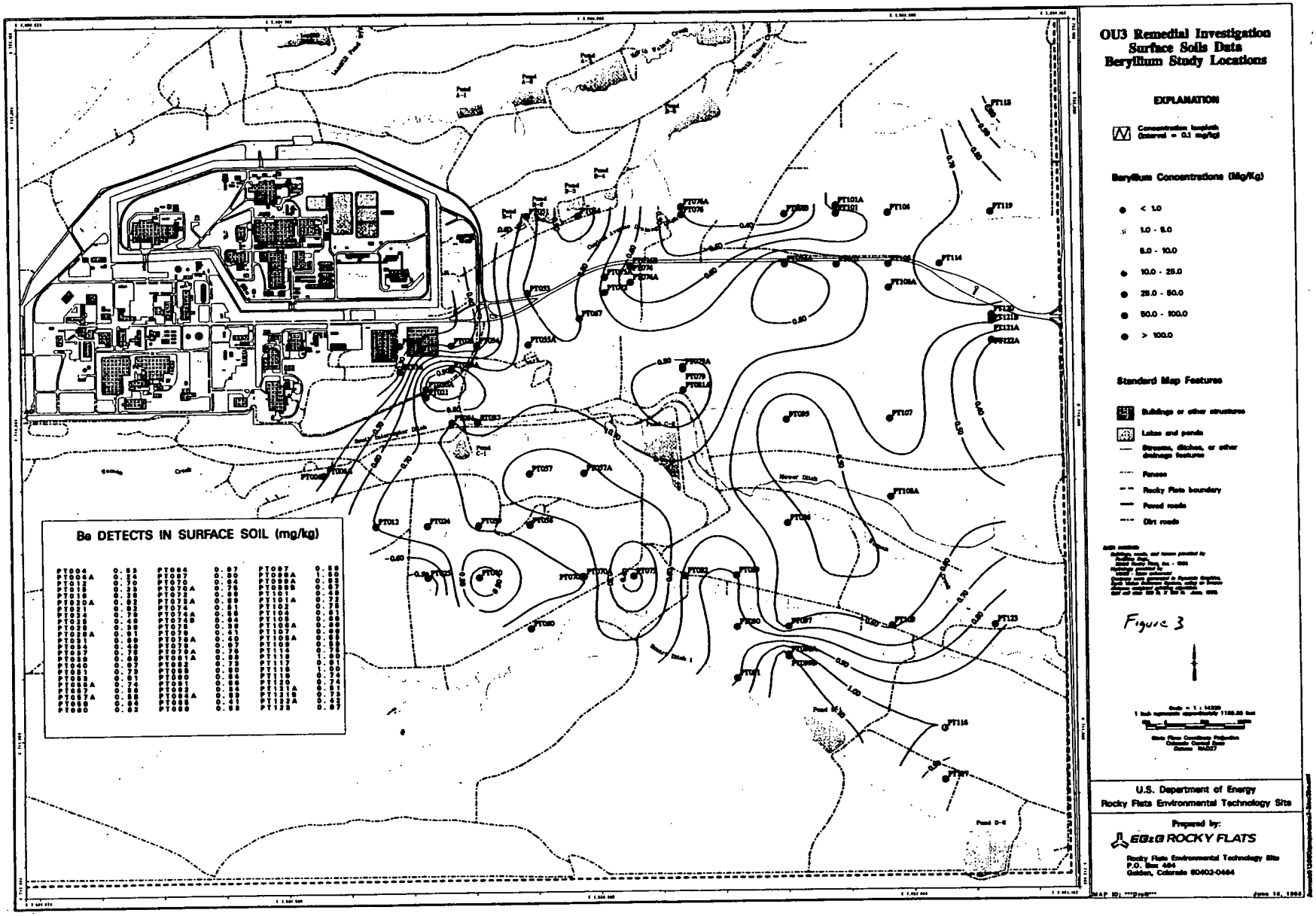
Standard Map Features

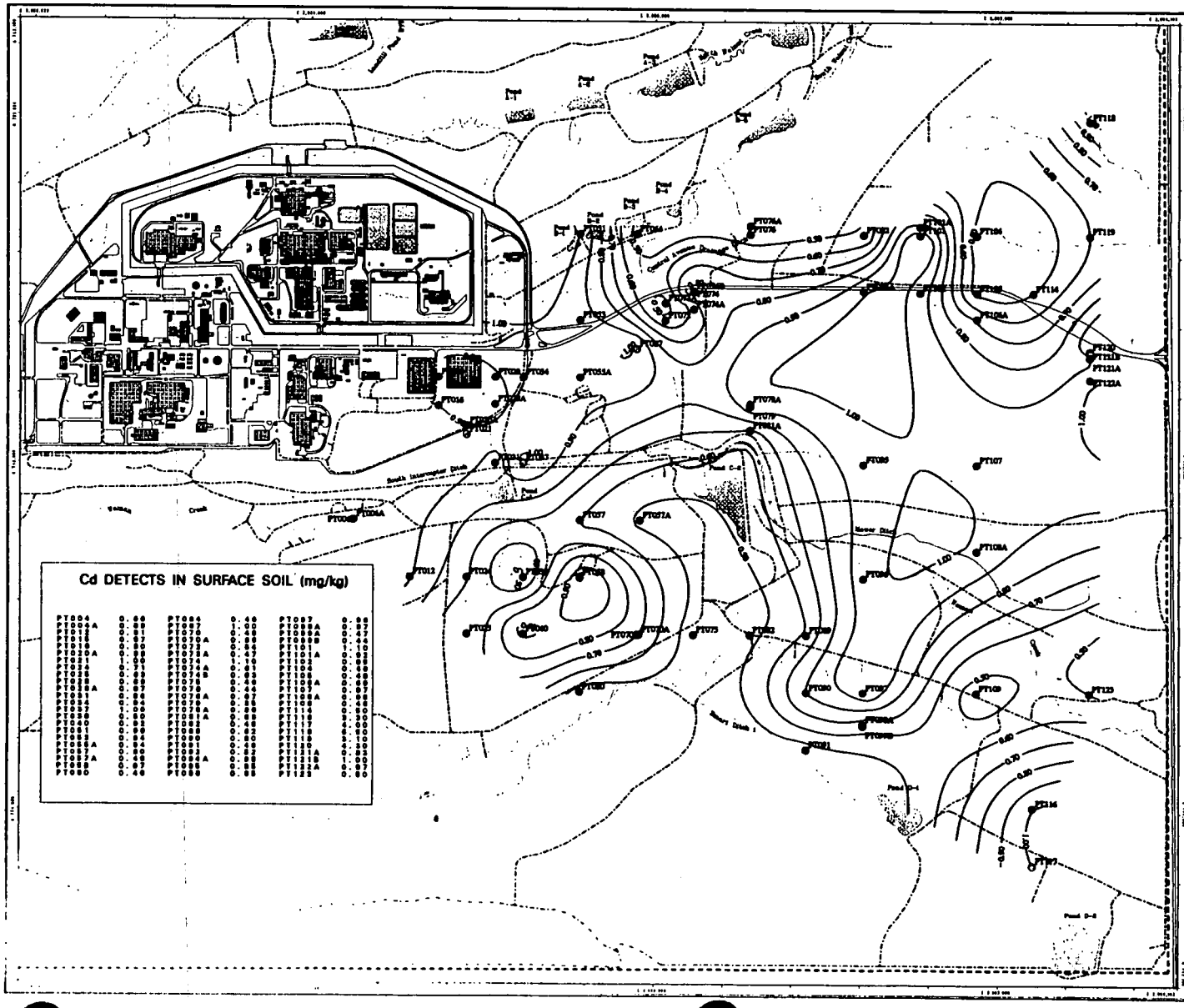
- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Paved roads
- Dirt roads

Figure 2

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
EG&G ROCKY FLATS
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, Colorado 80402-0464


Be DETECTS IN SURFACE SOIL (mg/kg)
OU3 Remedial Investigation
Surface Soils Data
Beryllium Study Locations
EXPLANATION
Concentration Isopleth (Interval = 0.1 mg/kg)
Beryllium Concentrations (Mg/Kg)
< 1.0
1.0 - 5.0
5.0 - 10.0
10.0 - 25.0
25.0 - 50.0
50.0 - 100.0
> 100.0
Standard Map Features
Buildings or other structures
Lakes and ponds
Streams, ditches, or other drainage features
Fences
Rocky Flats boundary
Paved roads
Dirt roads
Figure 3
U.S. Department of Energy
Rocky Flats Environmental Technology Site
Prepared by:
EG&G ROCKY FLATS
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, Colorado 80402-0464



OU3 Remedial Investigation Surface Soils Data Cadmium Study Locations

EXPLANATION

Concentration Isopleth Interval = 0.1 mg/kg

Cadmium Concentrations (Mg/Kg)

- < 1.0
- 1.0 - 5.0
- 5.0 - 10.0
- 10.0 - 25.0
- 25.0 - 50.0
- 50.0 - 100.0
- > 100.0

Standard Map Features

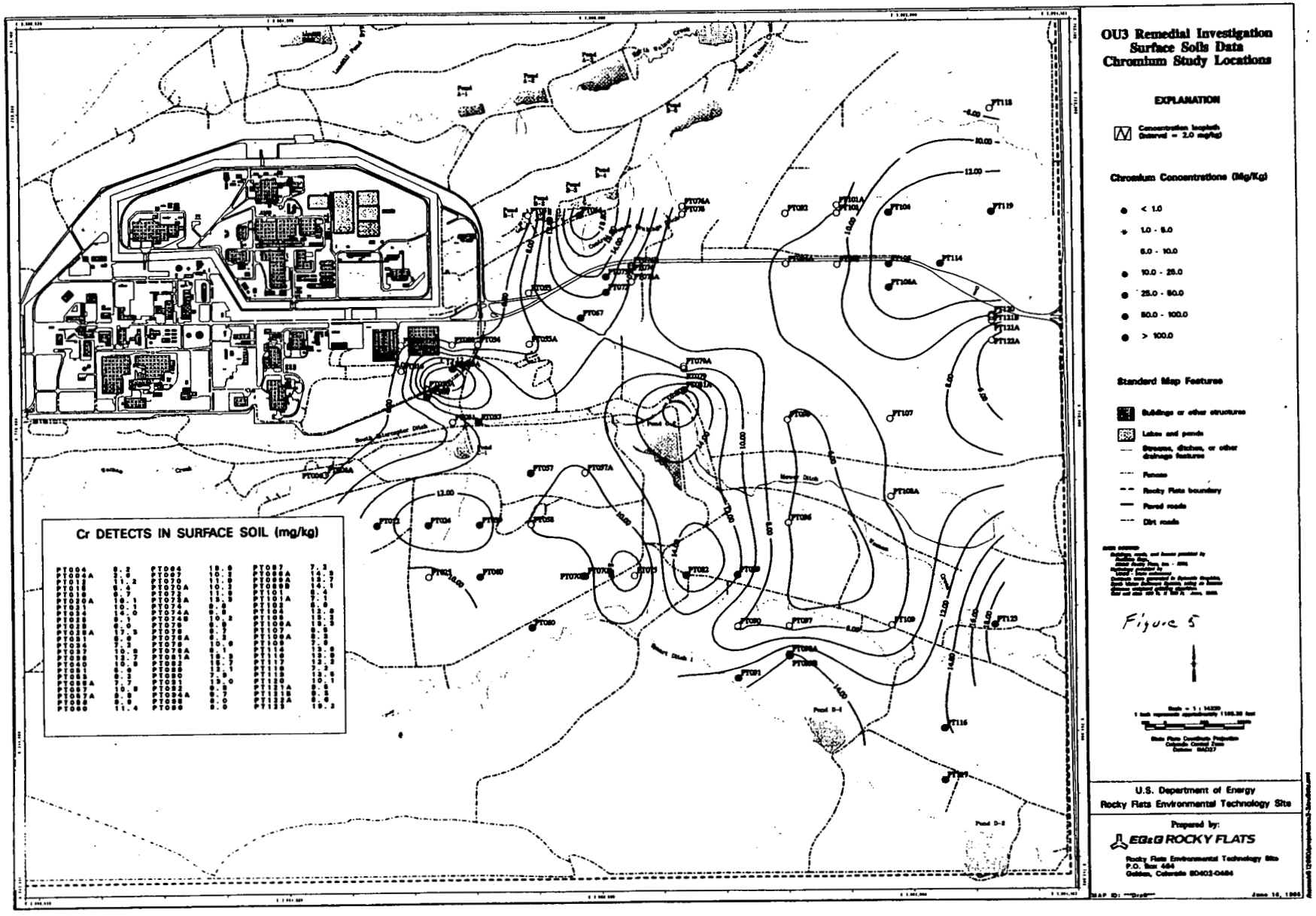
- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Paved roads
- Dirt roads

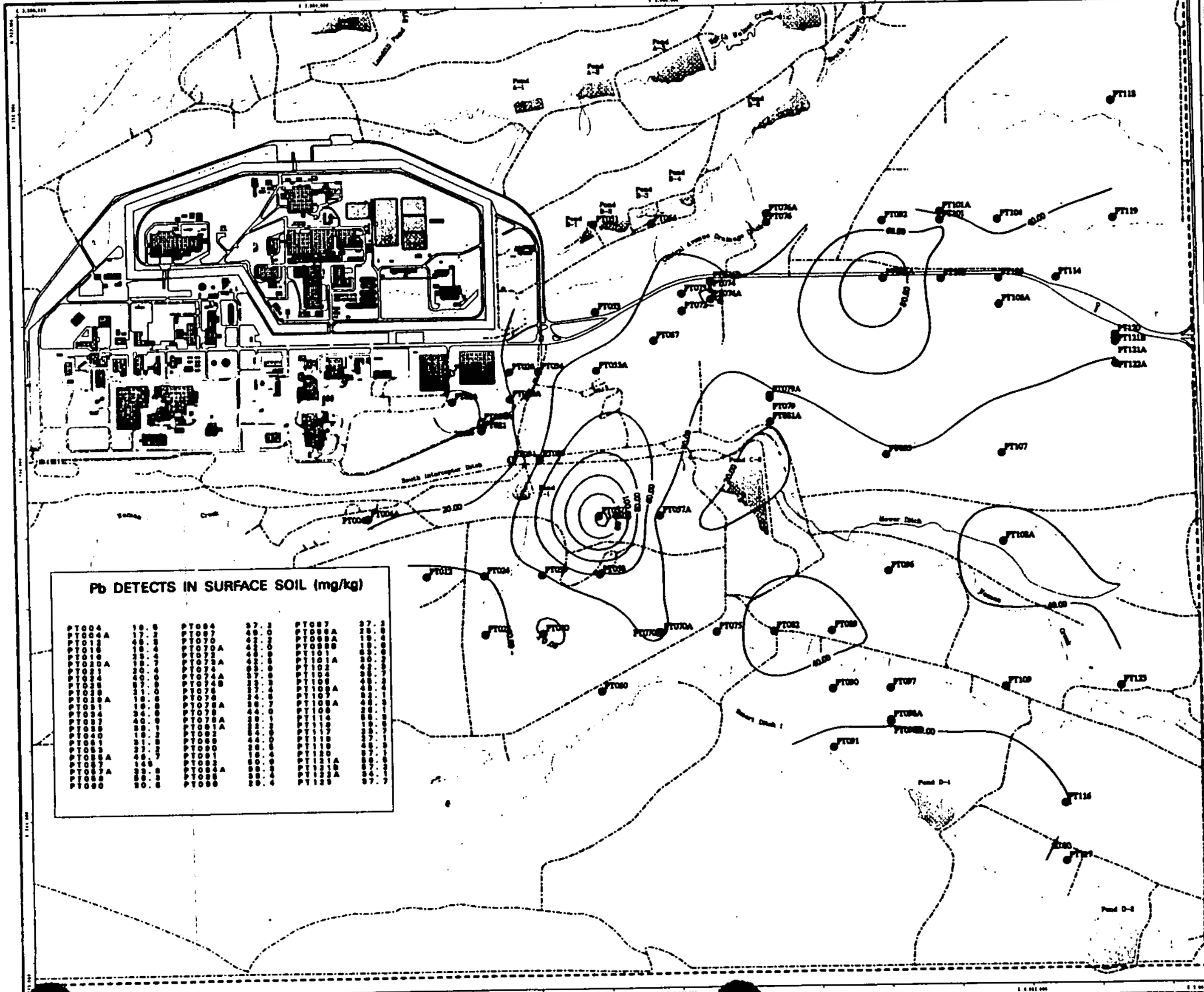
Figure 4

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
EG&G ROCKY FLATS

Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, Colorado 80402-0464


OU3 Remedial Investigation
Surface Soils Data
Chromium Study Locations
EXPLANATION
Concentration Isopleth Interval = 2.0 mg/kg
Chromium Concentrations (Mg/Kg)
< 1.0
1.0 - 5.0
5.0 - 10.0
10.0 - 25.0
25.0 - 50.0
50.0 - 100.0
> 100.0
Standard Map Features
Buildings or other structures
Lakes and ponds
Streams, ditches, or other drainage features
Fences
Rocky Flats boundary
Paved roads
Dirt roads
Figure 5
U.S. Department of Energy
Rocky Flats Environmental Technology Site
Prepared by:
EG&G ROCKY FLATS
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, Colorado 80402-0464
Cr DETECTS IN SURFACE SOIL (mg/kg)



Pb DETECTS IN SURFACE SOIL (mg/kg)

PT004	10.8	PT064	37.3	PT087	37.2
PT004A	17.2	PT067	49.0	PT088A	25.8
PT012	46.5	PT070	42.2	PT098A	19.4
PT016	10.4	PT070A	42.0	PT098B	19.0
PT019	23.4	PT072	46.8	PT101	63.0
PT020A	19.7	PT073A	42.5	PT101A	30.2
PT021	20.4	PT074	63.0	PT102	42.3
PT024	40.0	PT074A	57.8	PT104	35.7
PT025	57.9	PT074B	33.3	PT105	45.2
PT028	31.0	PT075	27.4	PT105A	45.4
PT028A	18.6	PT076	34.5	PT107	32.1
PT031	18.8	PT076A	38.7	PT108A	40.3
PT034	24.8	PT078	44.0	PT109	28.1
PT037	40.9	PT079A	29.1	PT114	55.3
PT038	38.1	PT081A	32.2	PT116	19.5
PT040	10.2	PT082	54.8	PT117	23.7
PT051	31.8	PT089	44.0	PT118	27.1
PT053	27.2	PT090	28.5	PT119	45.9
PT055A	48.7	PT091	18.4	PT120	57.1
PT057	148	PT093	60.9	PT121A	58.8
PT057A	33.8	PT094A	39.3	PT121B	57.2
PT058	58.3	PT095	38.4	PT122A	34.1
PT060	30.6	PT096	29.4	PT123	37.7

OU3 Remedial Investigation Surface Soils Data Lead Study Locations

EXPLANATION

Concentration isopleth (interval = 20.0 mg/kg)

Lead Concentrations (Mg/Kg)

- < 1.0
- 1.0 - 5.0
- 5.0 - 10.0
- 10.0 - 25.0
- 25.0 - 50.0
- 50.0 - 100.0
- > 100.0

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Paved roads
- Dirt roads

Figure 6

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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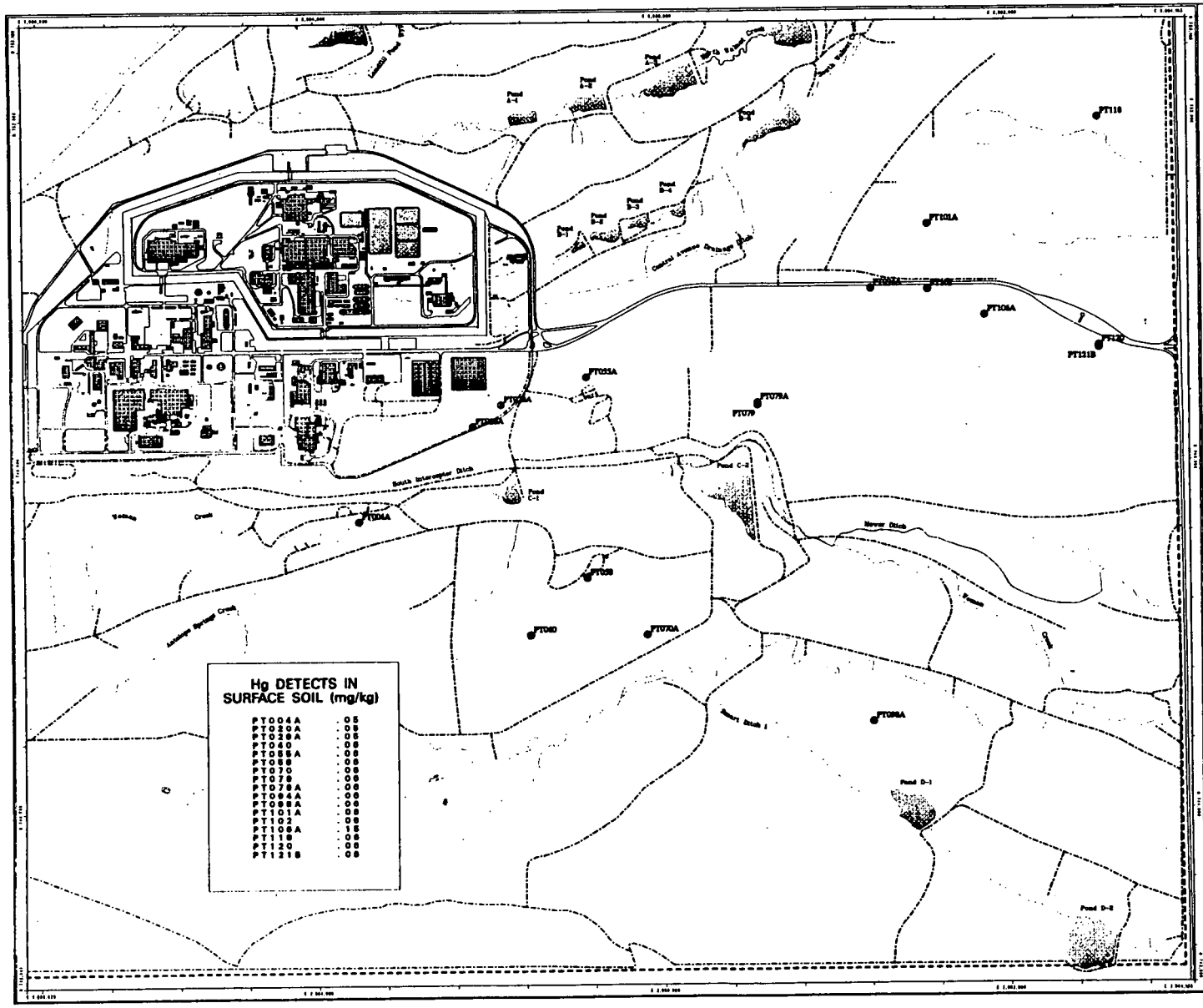
P.O. Box 464
Golden, Colorado 80402-0464



OU3 Remedial Investigation Surficial Soil Data Mercury Study Locations

EXPLANATION

Mercury Concentrations (Mg/Kg)

- < 1.0
- 1.0 - 5.0
- 5.0 - 10.0
- 10.0 - 25.0
- 25.0 - 50.0
- 50.0 - 100.0
- > 100.0

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Paved roads
- Dirt roads

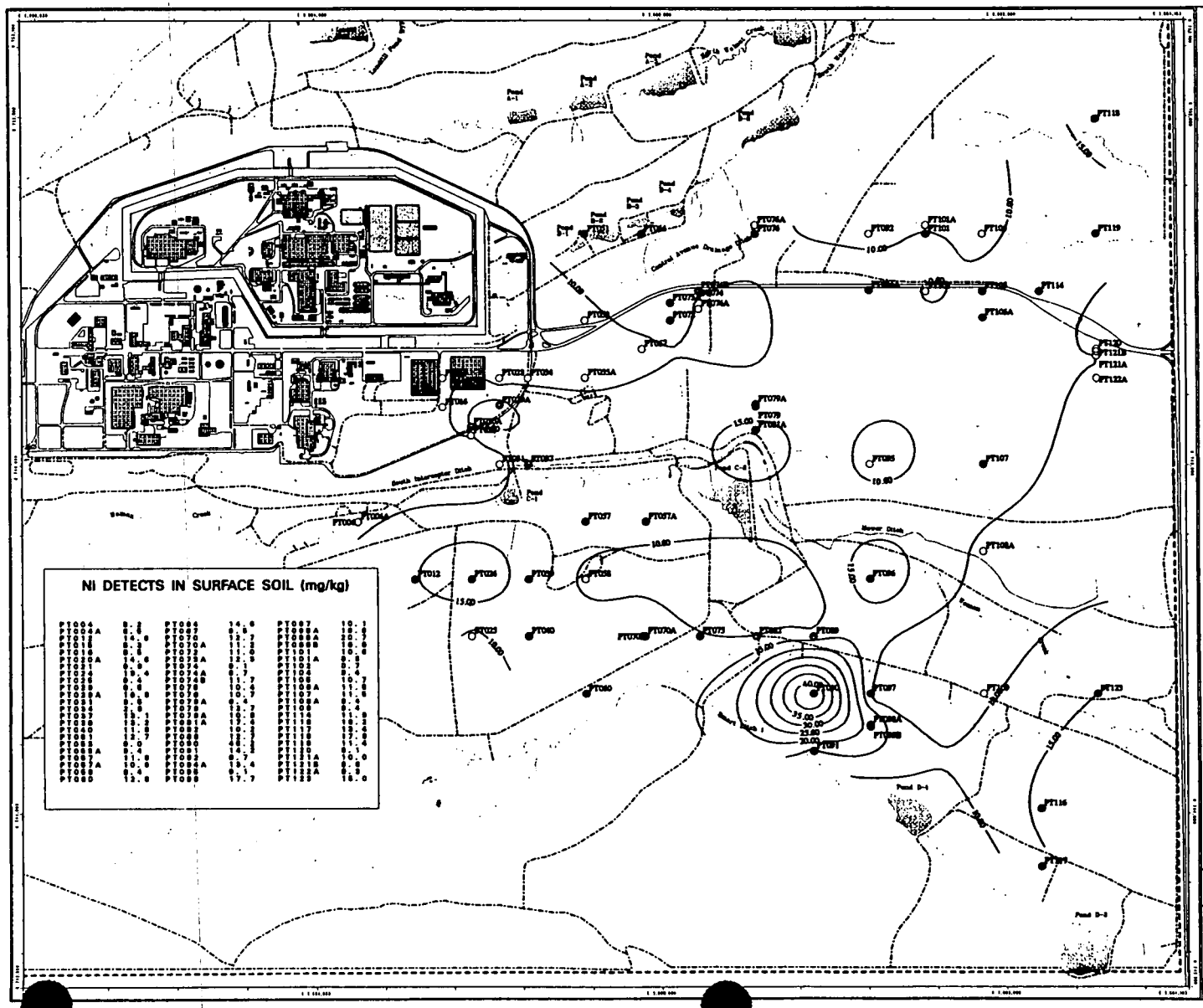
Figure 7

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
EG&G ROCKY FLATS
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, Colorado 80402-0464

MAP ID: Hg

June 21, 1995


NI DETECTS IN SURFACE SOIL (mg/kg)
PT0004 8.3
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PT0012 8.3
PT0013 8.4
PT0013A 4.6
PT0031 9.4
PT0032 19.4
PT0033 8.4
PT0034 8.4
PT0035 6.8
PT0035A 6.8
PT0036 8.5
PT0037 3.4
PT0037A 3.1
PT0038 13.3
PT0039 8.7
PT0040 8.7
PT0041 8.7
PT0042 8.7
PT0043A 8.7
PT0044 10.8
PT0044A 10.4
PT0045 12.8
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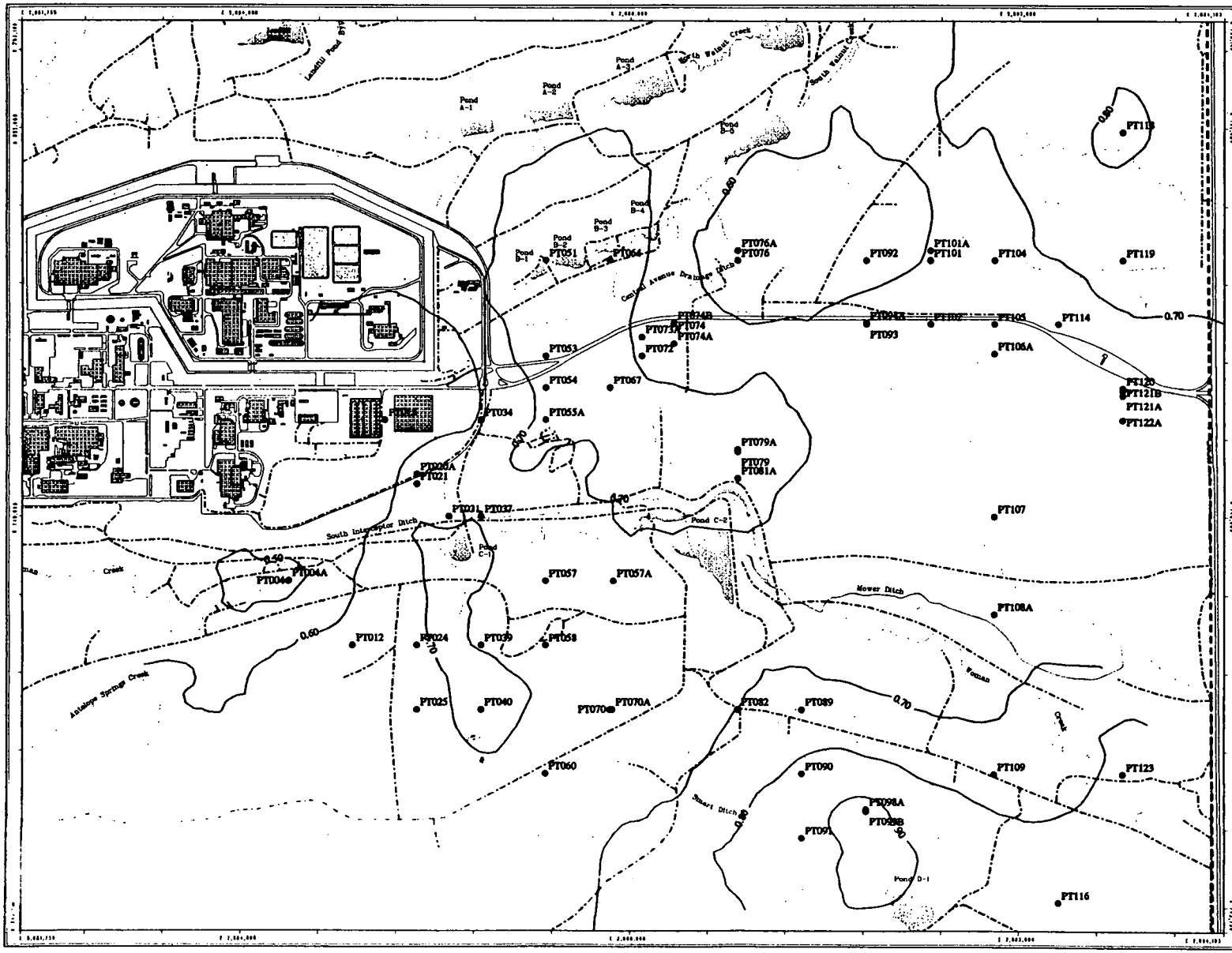


OU2 Area Surficial Soils
Linear Kriged Beryllium Concentrations

EXPLANATION

- Soil Sampling Plot

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Paved roads
- Dirt roads

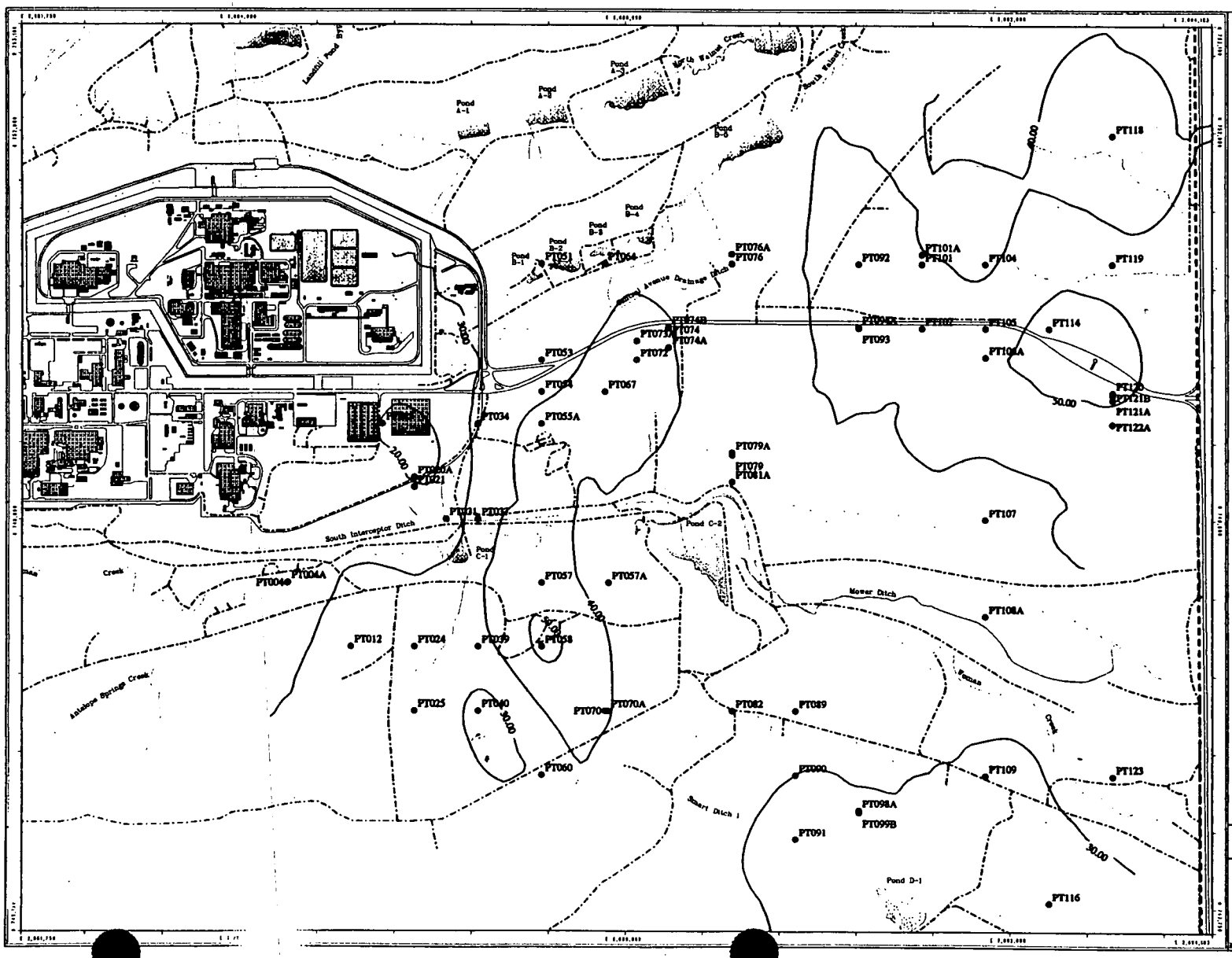
Figure 19

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
EG&G ROCKY FLATS
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, Colorado 80402-0464

MAP ID: ***Draft***

May 01, 1995



OU2 Area Surficial Soils
Linear Kriged Lead Concentrations

EXPLANATION

- Soil Sampling Plot

Standard Map Features

- Buildings or other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Paved roads
- Dirt roads

Figure 23

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
EG&G ROCKY FLATS
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, Colorado 80402-0464

MAP ID: ***Draft***

May 01, 1996

Vertical Distribution of Actinides in the Soils of Operable Unit 3

M. Iggy Litaor[1]

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ABSTRACT

Soils east of the Rocky Flats (RFETS) near Golden, Colorado were contaminated with Pu-239+240 and Am-241 as a result of past waste-storage practices. The vertical distribution of actinides in offsite soils are unknown. Eleven soi pits at various distances and directions from a contaminated site at RFETS were excavated, sampled, and analyzed for actinide activities as well as selected physical, chemical, and mineralogical attributes. More than 90 percent of the Pu-239+240 and Am-241 activities were confined to the upper 12 cm of the soil, regardless of the soil type, or distance and direction from the source. This pattern strongly suggests that little downward movement of Pu and Am have occurred within offsite soils during the last 25 years

INTRODUCTION

Most Pu-239+240 contamination of the soils near the Rocky Flats Environmental Technology Site (RFETS) was caused by leaking drums of Pu-contaminated oil stored at a former storage site (Krey and Hardy, 1970). Surficial soils in the area east of the former storage site (locally known as the '903 Pad') were contaminated with Pu due to wind dispersal of soil particles during cleanup operations (Krey and Hardy, 1970). Many studies have assessed the spatial distribution of actinides around RFETS, however only few studies investigated the vertical distribution and migration of Pu-239+240 in soils around RFETS. In the context of the present study, the term actinides refers only to the most significant transuranic contaminants in the soil of RFETS (i.e., Pu-239+240 and Am-241). Little and Whicker (1978) found that Pu-239+240 activity in soils east of the former storage site increased with decreasing particle size. For all depths, sampled in 7 increments of 3 cm each, the highest Pu-239+240 activity was associated with sub-micron-size soil particles. Two-thirds of the total Pu was found in the top 5 cm of the soils The relationship between Pu-239+240 activity and soil particle size distribution suggests that Pu-239+240 may be attached to the surface of soil particles. Krey et al. (1976) found that 90 percent of total activity of Pu was held in the upper 10 cm of the soil. They recommended more detailed studies of soil characteristics and additional measurement of Pu concentrations with depth and time. More recently, Litaor et al. (1994) found that over 90 percent of the Pu-239+240 and Am-241 activities in 24 pits excavated east of the former storage site were confined to the upper 12 cm of the soil, regardless of the soil characteristics, or distance and direction from the source.

The goal of the present study was to assess the nature and extent of actinide distributions in the soil environment of Operable Unit 3. This study is an expansion of the work done for the OU 2 RI report (Litaor et al., 1994) for the offsite areas.

METHODS

Field Sampling

Eleven soil pits were excavated, described, and sampled east of Indiana Street (Figure 1). The soil pits were excavated at undisturbed or minimally disturbed sites. Sampling soil for actinides characterization involves several crucial considerations: (1) potential cross-contamination of subsurface horizons from the more contaminated surface

horizons, (2) collection of sufficient material to obtain representative actinide activities and other soil parameters, an (3) selection of a realistic sampling design that considers the high cost of actinide analyses and provides sufficient information regarding the vertical distribution of actinides in the soil profile.

In light of these considerations, a special sampling method was employed. This method involved digging a pit, 3 to 5 m long, 1-m wide, and 1- to 1.1 m deep. The vegetation, at the surface of the pit wall selected for sampling, was clipped close to the ground and discarded. The surface of the selected wall was then thoroughly scraped with a stainless steel spade to reduce the possibility of cross-contamination. Ten soil samples were collected per pit, according to the following depth intervals (in cm): 0-3, 3-6, 6-9, 9-12, 12-18, 18-24, 24-36, 36-48, 48-72, and 72-96. A bottom-to-top sampling sequence was adopted to reduce further the risk of cross contamination. Each soil sample was collected from within a horizontal cavity dug into the pit face at a selected depth. An exception to th above sequence was made for near-surface samples (0-12 cm), where the soil was too friable to permit discrete sampling. To sample the top section of the profile, the sampling was begun at ground level using a knife and spatula to cut an area approximately 25 cm long, 20 cm wide, and 3 cm deep. The entire soil mass in this area was collected including roots and partially decomposed organic material. Sampling continued in this manner for intervals as deep a 12 cm.

Sampling for selected physical and chemical parameters was conducted by genetic horizons rather than by th incremental depth procedure. The soils were described according to guidelines established by the Soil Survey Staff (1975, 1981). Sampled soils fell into the following classifications: Aridic Argiustoll (pit 27, 31), Typic Argiaquoll (pit 28), Pachic Argiustoll (pits 32, 33, 37), Aridic Haplustoll (pit 29), Fluvaquentic Endoaquoll (pit 30), Torrertic Argiustoll (pit 34), Torrifluventic Haplustoll (pit 35),and Pachic Calcuistoll (pit 36). For further details regarding th soil taxonomy and classification see Attachment I.

Laboratory Analysis

Actinides

The Pu-239+240 and Am-241 activities in the soil samples were measured by alpha spectroscopy at several commercial laboratories. The soil samples were digested in HNO_3 and HF using a microwave dissolution procedure (Lamothe et al., 1986; Fischer, 1986), and the Pu oxidation state was adjusted with $NaNO_2$. The solution was then

passed through an anion exchange column to separate the Pu from the solution (Talvitie, 1971). The Pu was eluted from the column with HCl-NH_4I solution, was acidified with HNO_3, and the sample was heated to dryness. The sample was redissolved and electroplated onto stainless steel discs. Upon completion of the electroplating, NH_4OH was added to the solution to prevent redissolution of the deposit.

To isolate the Am-241 from the soil matrix the sample was leached with HNO_3. Hydroxides and carbonate-forming elements (e.g., Am) were precipitated out of the leachate with NH_4OH and $(NH_4)_2CO_3$ respectively. After drying the precipitate was redissolved with nitric acid and passed through an anion-exchange column to remove the non-trivalent actinides. Trivalent actinides and lanthanides were co-precipitated with Ca using oxalic acid, Ca carrier and NH_4OH. The precipitate was redissolved with HCl and passed through a column of mixed anion-cation resin to remove some of the Ca and all of the Fe. Cesium and the remainder of the Ca were extracted from the solution using double extraction into dibutyl-N,N-diethycarbamylphosphonate, a back extraction into dilute HNO_3, and then heatin to dryness. The sample was redissolved in a dilute-acid solution and passed through an anion-exchange column to ove trivalent lanthanides. This column was washed with mixture of alcohol, dilute acids, and NH_4SCN for parti separation of Am from Cm. The sample was then converted to a sulfate form and heated to dryness. Following this, the sample was redissolved and electroplated onto stainless-steel discs. Upon completion of the electroplating, NH_4OH was added to the solution to prevent redissolution of the deposit. In several cases where electroplating faile for both actinides, the samples were mounted for alpha spectrometric analysis using a neodymium fluoride co-precipitation technique (Hindman, 1983, 1986). Similar percent recoveries for Pu-239+240, Am-241 and Am-243 have been reported for the electroplating and co-precipitation techniques (Sill and Williams, 1981).

Soil Properties

Particle size distribution was determined by the pipette method (Soil Conservation Service, 1982). Soil bulk density was measured using the clod method described by Blake and Hartge (1986). Specific surface area was estimated on 1-g samples of P_2O_5-dried soil by the free-surface, ethylene glycol monoethyl ether method (Carter et al., 1986). The soil samples were given no chemical pretreatments (Cihacek and Bremner, 1979). Ca-saturated Wyoming bentonite (assumed to be 800 $m^2\ g^{-1}$) was used to calibrate each run. Cation exchange capacity (CEC) wa ermined by saturation with 0.4M NaOAc-0.1M NaCl, followed by washing with 60 percent ethanol, and

replacing the index cation by 0.5M $MgNO_3$ (Rhoades, 1982). Organic matter content was determined by dichromate oxidation and titration with $FeNH_4SO_4$ (Nelson and Sommers, 1982). The inorganic C was determined by a modified pressure calcimeter method described by Nelson (1982).

Statistical Analysis

Comparison between groups of soil pits and the 10 sampling intervals was conducted using two-way analys of variance (ANOVA)(SAS, 1992). Multiple comparisons among the sampling intervals were performed using Bonferroni's method, which controls the samplingwise error rate. The samplingwise error rate is defined as the ratic of the number of sample intervals in which at least one error was made to the total number of sample intervals analyzed. It is the probability of making at least one error in a test when there are no actual differences between the sampling intervals. The mathematical formalism of Bonferroni's method is given by Milliken and Johnson (1992).

DATA QUALITY

Quality Assurance and Quality Control Practices

A general description of the quality assurance and control pertained to this project is discussed in (**CH2M-Hill shall provide this information**).

Quality Control Samples

Equipment rinsate blanks were collected to quantify possible cross contamination due to potentially insufficient decontamination practices between samples. The blanks were collected by rinsing decontaminated sampling equipment with laboratory-grade water, placing it in the appropriate container, and preserving it as required. The data for equipment rinsate blanks indicate that the sampling practices did not produce a significant source of cross contamination among samples (Table 1).

Field Duplicates

Duplicate soil samples were collected systematically for the surficial soil sampling program of OU 3 (Table 2). The data from the sample and duplicate provide a measure of the sampling precision and sample homogeneity (i.e., a measure of the amount of error in the data attributable to sampling technique or to variability in the distributic of actinides in the soil environment). Precision was quantified by calculating the relative percent difference (RPD). The RPD is the quotient of the difference between duplicate analytical results, and the average of those results

expressed as a percentage . In the absence of established regulatory guidelines for QC criterion for actinide activities in soil samples, the common practice of ±35% was applied. Most of the RPDs calculated for Pu and Am far exceede this value (Table 2). This finding suggests that attaining the commonly used QC criterion for low level actinide activity in soil may be difficult.

Below-Detection-Limit Data

The presence of data below the detection limit is a result of the low levels, or absence, of a given actinide in the soil sample, as well as the analytical detection limit. For statistical analysis, all below-detection-limit data were replaced with one half the detection limit. The results of the actinide activity, counting error, error percent, detection limits, and other validation criteria are presented in Tables 3 and 4. The results of the physical, chemical, and mineralogical investigations are presented in Attachment I.

RESULTS AND DISCUSSION

Vertical and Spatial Distribution of Actinides

Plutonium-239+240 activity in the upper 3 cm of the eleven soil pits studied in OU 3 ranged from 3.83 pCi/g to 0.091 pCi/g, whereas Am-241 ranged from 0.84 pCi/g to 0.01 pCi/g (Tables 3 & 4). The vertical distribution profiles of these actinides in the 11 pits excavated in OU 3 are depicted in Figure 2. In general, Am-241 activity exhibited a similar distribution with depth to the vertical distribution observed for Pu-239+240. However, a somewhat less consistent vertical profile was observed, which probably can be explained by the greater counting error and the greater total analytical error associated with Am-241 measurements.

Summary statistics of Pu-239+240 and Am-241 in soils of OU 3 is summarized in Table 5 . Over 96 percent of Pu-239+240 and 93 percent of Am-241 activities were accounted for in the top 12 cm of the soil. This distribution clearly attests to the observed pattern of actinides in the soil environment around RFETS (e.g., Little et al., 1980; Litaor et al., 1994). This pattern strongly suggest that little downward movement of Pu and Am have occurred within these soils during the last 25 years.

To assess the vertical distribution pattern of actinides with distance and location from the 903 Pad, the 37 pits excavated in OU 1, 2, and 3 were divided among five regions of expected actinide activity (Figure 1). The five regions were determined using isopleth maps of Pu-239+240 and Am-241 (Litaor, 1995b). The length of area A, B

and C in the east direction is equal to the range (approx. 700 m) computed by a semi-variogram using 118 surficial soil samples (0.64 cm) between the former storage site and Indiana Street (Litaor, 1993; Litaor 1995b). Area C represents the least contaminated soil environs with Pu-239+240, which is located east of the 903 Pad and within th Buffer Zone of RFETS. Area D represents OU 1, whereas the area east of Indiana Street was designated as OU 3 (Figure 1).

Summary statistics of Pu-239+240 and Am-241 in soils of the five areas are depicted in Tables 5 & 6. There were no statistical differences in Pu-239+240 distribution with depth between OU 3 and Area C (Table 7), although there are major differences in soil types between OU 3 (Attachment I) and Area C (see Appendix D8 of OU 2 RI Report). Several soils in OU 3 exhibited highly stony and coarse texture that provides high potential for downward leaching (see Attachment I for field descriptions and physical parameters such as particle size distribution). Howeve because Pu-239+240 is strongly associated with organic matter and sesquioxide contents of the soil (Ibrahim and Litaor, in review), there has been little movement of Pu down the soil profile regardless of soil type.

Area A exhibited significantly higher activity of actinides than soils in areas B, C, and D. Soils in area B exhibited significantly higher activity of Pu-239+240 than soils in areas C and D, whereas soils in area C and D showed similar actinide activity (see Litaor et al., 1994, for details).

Am-241/Pu-239+240 ratio

The mean Am-241/Pu-239+240 activity ratio in the top 3 cm of all soil pits was 0.22, with a standard deviation of 0.19. Considerable increases in the Am-241/Pu-239+240 ratio was observed at greater depths (Figure 2). This large increase suggests that Am-241 may be more mobile than Pu-239+240. Similar observations were reported by Krey et al. (1978) who found that the Am-241/Pu-239+240 ratio increased with depth. They attributed the increase to a slightly greater mobility of the Am-241 in the soil. Krey et al. (1978) also found that the maximum enhancement of Am-241 over Pu-239+240 was about a factor of 2 at the greatest depth of sampling (25 cm). However, plots of the Am-241/Pu-239+240 ratio and their respective analytical errors showed remarkable similarity between the isotopic ratio and the analytical error. Hence, the Am-241/Pu-239+240 ratio is probably a poor indicato for the relative mobility of actinides in the soil. Somewhat similar results were reported by Essington et al. (1976), who used the change in ratio with depth to support the hypothesis that Am-241 moved more readily down the soil

profile than Pu-239+240. However, they recognized that the magnitude of the downward movement of Am-241 is difficult to resolve because of the larger analytical variability associated with Am-241, compared to Pu-239+240.

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Figure List

Figure 1. Location of the 37 soil pits denoted as Xn and the spatial distribution of Pu-239+240 in soils around RFETS.

Figure 2. The vertical distribution of actinides in eleven soil pits of OU 3.

Table 2	Pu-239+240 activity in rinsate samples							
Location	Pu-239	Error	Detection Limits	Validation		Qualifiers		
	pCi/L	pCi/L	pCi/L					
TR027	0.005	0.005	0.000	A	4			78
TR028	0.001	0.002	0.000	R	4	61		78
TR029	0.000	0.001	0.000	R	4	61		78
TR030	0.000	0.003	0.000	R	4	61		78
TR031	0.001	0.004	0.009	A	4			52
TR031	0.001	0.002	0.003	A	4			52
TR032	0.008	0.006	0.000	R	4	61		78
TR033	0.003	0.003	0.003	A	4			52
TR033	0.006	0.006	0.005	A	4			
TR034	0.001	0.003	0.000	R	4	61		78
TR034	0.000	0.003	0.006	R	4	61		78
TR035	0.011	0.008	0.000	R	4	61		78
TR036	0.000	0.006	0.000	A	4			78
TR036	0.002	0.004	0.000	A	4			78
TR037	0.003	0.004	0.000	R	4	61		78

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Table 2.	Am-241 activity in rinsate samples							
Location	Am-241	Error	Detection	Validation		Qualifiers		
			Limits					
	pCi/L	pCi/L	pCi/L					
TR027	0.005	0.005	0.000	A	4			78
TR028	0.003	0.004	0.000	A	4			78
TR029	0.005	0.006	0.000	A	4			78
TR030	0.004	0.005	0.000	A	4			78
TR031	0.029	0.057	0.078	Z	90			52
TR031	0.012	0.014	0.011	A	4	32	62	52
TR031	0.006	0.006	0.009	A	4	32	62	52
TR032	0.006	0.006	0.000	A	4			78
TR033	0.003	0.004	0.004	A	4	32	62	52
TR033	0.000	0.002	0.081	Z	90			52
TR033	0.028	0.056	0.076	R	27	4	32	52
TR034	0.006	0.005	0.000	A				78
TR034	0.004	0.005	0.000	A	4			78
TR035	0.004	0.005	0.000	A	4			78
TR036	0.005	0.005	0.000	A	4			78
TR036	0.005	0.005	0.000	A	4			78
TR037	0.003	0.004	0.000	A	4			78

ble 3. Relative percent difference (RPD) of Pu-239+240 in soils excavated in OU 3.													
cation	Depth		type	Results	RPD %	Error	Error %	Detection	Validation		Qualifiers		
	Start	end						Limits					
	cm	cm		pCi/g		pCi/g		pCi/g					
TR027	0	3	DUP	0.790	56.5	0.147	18.61	0.033	A	4	62	78	52
TR027	0	3	REAL	1.412		0.233	16.50	0.018	A	4	62	78	52
TR028	0	3	DUP	0.547	68.5	0.074	13.53	0.015	A	18	21		85
TR028	0	3	REAL	0.268		0.041	15.30	0.01	A	18	21		85
TR029	0	3	DUP	2.170	122.6	0.278	12.81	0	A	30	70	78	85
TR029	0	3	REAL	0.521		0.100	19.19	0	A	30	70	78	52
TR030	0	3	DUP	0.600	31.0	0.109	18.18	0	A	4	62	78	52
TR030	0	3	REAL	0.439		0.068	15.41	0.011	A	4	61	78	52
TR031	0	3	DUP	3.830	54.1	0.610	15.93	0	R	99	59	52	78
TR031	0	3	REAL	2.200		0.410	18.64	0	R	99	59	52	78
TR032	0	3	DUP	2.880	83.7	0.520	18.06	0	R	99	59	52	78
TR032	0	3	REAL	1.180		0.210	17.80	0	R	99	59	52	78
TR033	0	3	DUP	2.110	2.9	0.290	13.74	0	R	59	70	78	52
TR033	0	3	REAL	2.050		0.270	13.17	0	R	59	70	78	52
TR034	0	3	DUP	0.413	117.6	0.104	25.18	0	A	4	27	78	52
TR034	0	3	REAL	1.593		0.266	16.70	0	A	4	27	78	52
TR035	0	3	DUP	0.447	45.9	0.101	22.60	0.023	A	18	30		78
TR035	0	3	REAL	0.280		0.051	18.21	0	A	18	30		78
TR036	0	3	DUP	0.951	43.9	0.338	35.54	0.03				99	52
TR036	0	3	REAL	0.608		0.170	27.94	0.036	A	4	27	78	52
TR037	0	3	DUP	0.091	56.5	0.025	27.30	0.009	A	70	60		78
037	0	3	REAL	0.163		0.039	23.93	0	A	70	60		78

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Table 8. Relative percent difference (RPD) of Am-241 in soils excavated in OU 3.													
Location	Depth		type	Results	RPD %	Error	Error %	Detection	Validation		Qualifiers		
	start	end						Limits					
				pCi/g		pCi/g		pCi/g					
TR027	0	3	DUP	0.129	71.8	0.029	22.4	0.000	A	4	21	78	52
TR027	0	3	REAL	0.272		0.046	16.9	0.000	A	4	21	78	52
TR028	0	3	DUP	0.078	16.7	0.019	24.4	0.000	R	18	10		85
TR028	0	3	REAL	0.066		0.017	25.8	0.004	R	18	10		85
TR029	0	3	DUP	0.165	109.1	0.055	33.3	0.000	R	60	10	78	52
TR029	0	3	REAL	0.561		0.183	32.6	0.000	R	59	99	78	85
TR030	0	3	DUP	0.102	24.4	0.025	24.5	0.000	A	4		78	52
TR030	0	3	REAL	0.079		0.022	27.7	0.000	A	4		78	52
TR031	0	3	DUP	0.842	14.8	0.130	15.4	0.000	R	99	59	52	78
TR031	0	3	REAL	0.977		0.163	16.7	0.000	R	99	59	52	78
TR032	0	3	DUP	0.687	80.1	0.107	15.6	0.000	R	99	59	52	78
TR032	0	3	REAL	0.294		0.053	18.0	0.000	R	99	59	52	78
TR033	0	3	DUP	0.268	36.1	0.048	17.9	0.000	R	59	70	78	52
TR033	0	3	REAL	0.386		0.069	17.9	0.000	R	59	70	78	52
TR034	0	3	DUP	0.119	18.9	0.027	23.0	0.000	A	4	60	78	52
TR034	0	3	REAL	0.144		0.032	22.2	0.000	A	4	60	78	52
TR035	0	3	DUP	0.051	10.4	0.015	28.5	0.000	R	18	10	61	78
TR035	0	3	REAL	0.056		0.016	28.7	0.000	R	18	10	61	78
TR036	0	3	DUP	0.166	25.9	0.032	19.5	0.000	A	4		78	52
TR036	0	3	REAL	0.128		0.027	21.2	0.000	A	4		78	52
TR037	0	3	DUP	0.018	13.4	0.008	45.3	0.000	R	70	10		78
TR037	0	3	REAL	0.021		0.001	4.4	0.000	R	70	10		78

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le 4. Activity, counting errors, detection limits and QA/QC parameters for Pu-239+240 in 11 pits

excavated in OU 3

Location	Depth		type	Results	Error	Error %	Detection	Validation		Qualifiers		
	Start	end					Limits					
	cm	cm		pCi/g	pCi/g		pCi/g					
TR027	0	3	DUP	0.790	0.147	18.61	0.033	A	4	62	78	52
TR027	0	3	REAL	1.412	0.233	16.50	0.018	A	4	62	78	52
TR027	3	6	REAL	0.266	0.063	23.84	0	A	4	62	78	52
TR027	6	9	REAL	0.049	0.021	42.88	0.009	A	4	62	78	52
TR027	6	9	REAL	0.075	0.027	36.27	0.013	A	4	62	78	52
TR027	9	12	REAL	0.016	0.015	90.57	0	A	4	62	78	52
TR027	18	18	REAL	0.017	0.021	120.69	0.023	A	4	62	78	52
TR027	24	24	REAL	0.015	0.013	87.37	0.012	A	4	62	78	52
TR027	36	36	REAL	0.003	0.004	141.94	0	A	4	62	78	52
TR027	48	48	REAL	0.004	0.004	115.81	0	A	4	62	78	52
TR027	72	72	REAL	0.004	0.004	115.99	0	A	4	62	78	52
TR027	96	96	REAL	0.017	0.012	67.52	0.009	A	4	62	78	52
TR028	0	3	DUP	0.547	0.074	13.53	0.015	A	18	21		85
TR028	0	3	REAL	0.268	0.041	15.30	0.01	A	18	21		85
TR028	0	3	REAL	0.279	0.043	15.41	0.005	A	18	21		85
TR028	3	6	REAL	0.084	0.031	36.90	0.015	A	18	21		85
TR028	6	9	REAL	0.017	0.009	52.94	0	A	18	21		85
TR028	9	12	REAL	0.013	0.010	76.92	0.007	A	18	21		85
TR028	18	18	REAL	0.007	0.007	100.00	0.006	A	18	21		85
R028	24	24	REAL	0.008	0.008	100.00	0.007	A	18	21		85
028	36	36	REAL	0.003	0.004	133.33	0	A	18	21		85
TR028	48	48	REAL	0.001	0.004	400.00	0.008	A	18	21		85
TR028	72	72	REAL	0.002	0.004	200.00	0	A	18	21		85
TR028	96	96	REAL	0.005	0.007	140.00	0.007	A	18	21		85
TR029	0	3	DUP	2.170	0.278	12.81	0	A	30	70	78	85
TR029	0	3	REAL	0.521	0.100	19.19	0	A	30	70	78	52
TR029	3	6	REAL	0.204	0.047	23.04	0	A	30	70	78	52
TR029	6	9	REAL	0.036	0.017	46.78	0	A	30	70	78	52
TR029	9	12	REAL	0.017	0.012	71.93	0	A	30	70	78	52
TR029	18	18	REAL	0.027	0.013	48.69	0	A	30	70	78	52
TR029	18	18	REAL	0.003	0.006	200.32	0	R	30	70	78	52
TR029	18	18	REAL	0.027	0.013	48.69						
TR029	24	24	REAL	0.010	0.007	72.52	0	A	30	70	78	52
TR029	36	36	REAL	0.012	0.008	72.17	0	A	30	70	78	52
TR029	48	48	REAL	0.016	0.009	55.63	0	A	30	70	78	52
TR029	72	72	REAL	0.004	0.007	150.11	0	A	30	70	78	52
TR029	96	96	REAL	0.015	0.009	57.72	0	A	30	70	78	52
TR030	0	3	DUP	0.600	0.109	18.18	0	A	4	62	78	52
TR030	0	3	REAL	0.439	0.068	15.41	0.011	A	4	61	78	52
TR030	3	6	REAL	0.381	0.100	26.18	0	A	4	27	78	52
TR030	6	9	REAL	0.136	0.031	22.58	0	A	4	61	78	52
TR030	9	12	REAL	0.031	0.016	52.87	0	A	4	61	78	52
TR030	18	18	REAL	0.017	0.011	60.45	0	A	4	61	78	52
TR030	24	24	REAL	0.011	0.016	149.21	0.017	A	4	61	78	52
030	36	36	REAL	-0.006	0.012	200.35	0.023	A	4	61	78	52
TR030	48	48	REAL	0.000	0.008	N/A	0	A	4	61	78	52

TR030	72	72	REAL	0.015	0.016	100.91	0	A	4	61	78	52
TR030	96	96	REAL	0.004	0.009	200.41	0.01	A	4	61	78	52
TR031	0	3	DUP	3.830	0.610	15.93	0	R	99	59	52	78
TR031	0	3	REAL	2.200	0.410	18.64	0	R	99	59	52	78
TR031	3	6	REAL	0.331	0.410	123.87	0	R	99	59	52	78
TR031	6	9	REAL	0.057	0.019	33.57	0	R	99	59	52	78
TR031	9	12	REAL	0.010	0.009	88.24	0.006	R	99	59	52	78
TR031	18	18	REAL	0.011	0.009	77.88	0	R	99	59	52	78
TR031	24	24	REAL	0.018	0.012	64.84	0	R	99	59	52	78
TR031	36	36	REAL	0.006	0.005	90.82	0	A	30	70	78	52
TR031	48	48	REAL	0.008	0.009	106.63	0.006	A	30	70	78	52
TR031	72	72	REAL	0.009	0.007	77.23	0	A	30	70	78	52
TR031	96	96	REAL	0.004	0.004	101.15	0	A	30	70	78	52
TR032	0	3	DUP	2.880	0.520	18.06	0	R	99	59	52	78
TR032	0	3	REAL	1.180	0.210	17.80	0	R	99	59	52	78
TR032	3	6	REAL	0.516	0.096	18.60	0	R	59	70	78	52
TR032	6	9	REAL	0.169	0.040	23.67	0	R	59	70	78	52
TR032	9	12	REAL	0.029	0.012	39.86	0	R	59	70	78	52
TR032	18	18	REAL	0.007	0.006	91.09	0	R	99	59	52	78
TR032	24	24	REAL	0.010	0.006	61.76	0	R	99	59	52	78
TR032	36	36	REAL	0.013	0.008	60.16	0	R	99	59	52	78
TR032	48	48	REAL	0.062	0.021	34.03	0	R	99	59	52	78
TR032	72	72	REAL	0.026	0.015	58.59	0		99	59	52	
TR032	72	72	REAL	0.026	0.015	58.59						
TR032	72	72	REAL	0.010	0.011	116.33	0.007	R	99	59	52	78
TR032	96	96	REAL	0.008	0.006	72.40	0	R	99	59	52	78
TR033	0	3	DUP	2.110	0.290	13.74	0	R	59	70	78	52
TR033	0	3	REAL	2.050	0.270	13.17	0	R	59	70	78	52
TR033	3	6	REAL	0.890	0.129	14.49	0.006	R	59	70	78	52
TR033	6	9	REAL	0.349	0.068	19.48	0	R	59	70	78	52
TR033	9	12	REAL	0.095	0.025	26.34	0	R	59	70	78	52
TR033	18	18	REAL	0.027	0.014	51.82	0	R	59	70	78	52
TR033	24	24	REAL	0.005	0.005	116.16	0	R	59	70	78	52
TR033	36	36	REAL	0.003	0.006	200.32	0	R	59	70	78	52
TR033	48	48	REAL	0.004	0.007	175.00	0.009	R			78	85
TR033	72	72	REAL	0.006	0.006	100.89	0	R	59	70	78	52
TR033	72	72	REAL	0.000	0.004	N/A	0	R	59	70	78	52
TR033	96	96	REAL	0.008	0.006	76.57	0	R	59	70	78	52
TR034	0	3	DUP	0.413	0.104	25.18	0	A	4	27	78	52
TR034	0	3	REAL	1.593	0.266	16.70	0	A	4	27	78	52
TR034	3	6	REAL	0.328	0.087	26.44	0	A	4	27	78	52
TR034	6	9	REAL	0.108	0.031	28.37	0.013	A	4	27	78	52
TR034	6	9	REAL	0.174	0.038	21.86	0.011	A	4	61	78	52
TR034	9	12	REAL	0.084	0.034	40.57	0.018	A	4	61	78	52
TR034	18	18	REAL	0.040	0.020	51.38	0	A	4	10	78	52
TR034	24	24	REAL	0.010	0.008	76.35	0	A	4	62	78	52
TR034	36	36	REAL	0.012	0.013	116.12	0.026	A	4	62	78	52
TR034	48	48	REAL	0.009	0.009	100.61	0	A	4	62	78	52
TR034	72	72	REAL	0.002	0.004	200.00	0	A	4	62	78	52
TR034	96	96	REAL	0.000	0.007	N/A	0.012	A	4	62	78	52
TR035	0	3	DUP	0.447	0.101	22.60	0.023	A	18	30		78
TR035	0	3	REAL	0.280	0.051	18.21	0	A	18	30		78

[illegible]035	3	6	REAL	0.653	0.092	14.09	0	A	18	30		78
[illegible]035	6	9	REAL	0.066	0.022	33.33	0.007	A	18	30		85
TR035	9	12	REAL	0.211	0.042	19.91	0.009	A	18	30		78
TR035	9	12	REAL	0.308	0.070	22.73	0.012	A	18	30		78
TR035	18	18	REAL	0.014	0.010	71.94	0	A	18	30		78
TR035	24	24	REAL	0.007	0.007	100.00	0	A	18	30		85
TR035	36	36	REAL	0.005	0.005	100.56	0	A	18	30		78
TR035	48	48	REAL	0.001	0.005	346.26	0.007	A	18	30		78
TR035	72	72	REAL	0.003	0.006	200.65	0.007	A	18	30		78
TR035	96	96	REAL	0.000	0.006	N/A	0	A	18	30		78
TR036	0	3	DUP	0.951	0.338	35.54	0.03				99	52
TR036	0	3	DUP	0.939	0.336	35.80	0.112	R	27	4	78	52
TR036	0	3	REAL	0.608	0.170	27.94	0.036	A	4	27	78	52
TR036	0	3	REAL	0.688	0.226	32.86	0.077	R	27	4	78	52
TR036	0	3	REAL	0.596	0.211	35.41					99	52
TR036	0	3	REAL	0.773	0.219	28.34					99	52
TR036	3	6	REAL	0.428	0.136	31.81	0.036	A	4	27	78	52
TR036	3	6	REAL	0.484	0.152	31.43					99	52
TR036	6	9	REAL	0.341	0.118	34.62	0.064	R	27	4	78	52
TR036	6	9	REAL	0.314	0.150	47.80					99	52
TR036	9	12	REAL	0.092	0.035	37.90	0	R	27	4	78	52
TR036	18	18	REAL	0.109	0.039	36.09	0.025	A	4		78	52
TR036	24	24	REAL	0.002	0.013	528.26	0.02	A	4		78	52
TR036	36	36	REAL	0.016	0.016	94.80	0.013	A	4		78	52
TR036	48	48	REAL	0.000	0.008	N/A	0.013	A	4		78	52
[illegible]036	72	72	REAL	0.004	0.010	245.25	0.013	A	4		78	52
TR036	96	96	REAL	0.010	0.011	115.87	0.041	R	27	4	78	52
TR037	0	3	DUP	0.091	0.025	27.30	0.009	A	70	60		78
TR037	0	3	REAL	0.163	0.039	23.93	0	A	70	60		78
TR037	3	6	REAL	0.049	0.017	34.36	0	A	70	60		78
TR037	6	9	REAL	0.028	0.014	48.93	0.009	A	70	60		78
TR037	9	12	REAL	0.006	0.009	141.79	0.01	A	70	60		78
TR037	9	12	REAL	0.013	0.010	80.31	0.007	A	70	60		78
TR037	18	18	REAL	-0.004	0.004	115.91	0.01	A	70	60		78
TR037	24	24	REAL	0.006	0.006	100.54	0	A	70	60		78
TR037	36	36	REAL	0.000		N/A	0	A	70	60		78
TR037	48	48	REAL	0.069	0.024	34.06	0.011	A	70	60		78
TR037	72	72	REAL	0.002	0.004	200.00	0	A	70	60		78
TR037	96	96	REAL	0.002	0.006	347.57	0.009	A	70	60		78

Table 5. Activity, counting errors, detection limits, and QA/QC parameters for Am-241 in 11 pits excavated in OU 3.

Location	Depth start	Depth end	type	Results pCi/g	Error pCi/g	Error %	Detection Limits pCi/g	Validation	Qualifiers			
TR027	0	3	DUP	0.129	0.029	22.4	0.000	A	4	21	78	52
TR027	0	3	REAL	0.272	0.046	16.9	0.000	A	4	21	78	52
TR027	3	6	REAL	0.074	0.020	27.5	0.000	A	4	21	78	52
TR027	6	9	REAL	0.015	0.008	56.4	0.000	A	4	21	78	52
TR027	6	9	REAL	0.013	0.008	64.1	0.000	A	4	21	78	52
TR027	9	12	REAL	0.005	0.006	113.9	0.000	A	4	21	78	52
TR027	18	18	REAL	0.010	0.007	67.5	0.000	A	4	21	78	52
TR027	24	24	REAL	0.004	0.005	115.9	0.000	A	4	21	78	52
TR027	36	36	REAL	0.007	0.007	89.3	0.000	A	4	21	78	52
TR027	48	48	REAL	0.003	0.004	141.8	0.000	A	4	21	78	52
TR027	72	72	REAL	0.002	0.003	141.9	0.000	A	4	21	78	52
TR027	96	96	REAL	0.016	0.009	56.5	0.000	A	4	21	78	52
TR028	0	3	DUP	0.078	0.019	24.4	0.000	R	18	10		85
TR028	0	3	REAL	0.066	0.017	25.8	0.004	R	18	10		85
TR028	0	3	REAL	0.058	0.016	27.6	0.000	R	18	10		85
TR028	3	6	REAL	0.028	0.016	57.1	0.000	R	18	10		85
TR028	6	9	REAL	0.006	0.005	83.3	0.000	R	18	10		85
TR028	9	12	REAL	0.020	0.009	45.0	0.000	R	18	10		85
TR028	18	18	REAL	-0.001	0.002	200.0	0.005	R	18	10		85
TR028	24	24	REAL	0.003	0.003	100.0	0.000	R	18	10		85
TR028	36	36	REAL	0.004	0.004	100.0	0.000	R	18	10		85
TR028	48	48	REAL	0.003	0.003	100.0	0.000	R	18	10		85
TR028	72	72	REAL	0.008	0.006	75.0	0.000	R	18	10		85
TR028	96	96	REAL	0.003	0.003	100.0	0.000	R	18	10		85
TR029	0	3	DUP	0.165	0.055	33.3	0.000	R	60	10	78	52
TR029	0	3	REAL	0.561	0.183	32.6	0.000	R	59	99	78	85
TR029	0	3	REAL	0.124	0.027	21.8	0.000	R	60	10	78	52
TR029	3	6	REAL	0.548	0.232	42.3						
TR029	3	6	REAL	0.561	0.183	32.6	0.000	R	60	10	78	85
TR029	6	9	REAL	0.013	0.007	53.0	0.000	R	60	10	78	52
TR029	9	12	REAL	0.007	0.005	76.7	0.000	R	60	10	78	52
TR029	18	18	REAL	0.003	0.003	115.9	0.000	R	60	10	78	52
TR029	18	18	REAL	0.001	0.002	200.0	0.000	R	60	10	78	52
TR029	18	18	REAL	0.001	0.002	200.0						
TR029	24	24	REAL	0.005	0.005	106.7	0.000	R	60	10	78	52
TR029	36	36	REAL	0.032	0.014	42.6	0.000	R	60	10	78	52
TR029	48	48	REAL	0.008	0.007	86.6	0.000	R	60	10	78	52
TR029	72	72	REAL	0.052	0.015	28.6	0.000	R	60	10	78	52
TR029	96	96	REAL	0.003	0.004	116.1	0.000	R	60	10	78	52
TR030	0	3	DUP	0.102	0.025	24.5	0.000	A	4		78	52
TR030	0	3	REAL	0.079	0.022	27.7	0.000	A	4		78	52
TR030	3	6	REAL	0.093	0.024	26.0	0.000	A	4		78	52
TR030	6	9	REAL	0.037	0.015	39.3	0.000	A	4		78	52
TR030	9	12	REAL	0.010	0.007	67.4	0.000	A	4		78	52
TR030	18	18	REAL	0.004	0.005	115.9	0.000	A	4		78	52
TR030	24	24	REAL	0.004	0.004	116.0	0.000	A	4		78	52

TR030	36	36	REAL	0.004	0.008	200.4	0.000	A	4	27	78	52
TR030	48	48	REAL	0.002	0.004	184.2	0.000	A	4		78	52
TR030	72	72	REAL	0.004	0.005	113.7	0.000	A	4		78	52
TR030	96	96	REAL	0.004	0.005	116.1	0.000	A	4	71	78	52
TR031	0	3	DUP	0.842	0.130	15.4	0.000	R	99	59	52	78
TR031	0	3	REAL	0.977	0.163	16.7	0.000	R	99	59	52	78
TR031	3	6	REAL	0.085	0.163	191.8	0.006	R	99	59	52	78
TR031	6	9	REAL	0.011	0.007	64.3	0.000	R	99	59	52	78
TR031	9	12	REAL	0.008	0.007	82.6	0.000	R	99	59	52	78
TR031	18	18	REAL	0.006	0.006	95.1	0.000	R	99	59	52	78
TR031	24	24	REAL	0.004	0.005	116.1	0.000	R	99	59	52	78
TR031	36	36	REAL	0.003	0.004	100.6	0.000	R	60	10	78	52
TR031	48	48	REAL	0.004	0.004	100.7	0.000	R	60	10	78	52
TR031	72	72	REAL	0.001	0.002	201.1	0.000	R	60	10	78	52
TR031	96	96	REAL	0.003	0.004	142.1	0.000	R	60	10	78	52
TR032	0	3	DUP	0.687	0.107	15.6	0.000	R	99	59	52	78
TR032	0	3	REAL	0.294	0.053	18.0	0.000	R	99	59	52	78
TR032	3	6	REAL	0.077	0.023	29.9	0.000	R	59	70	78	52
TR032	6	9	REAL	0.015	0.009	61.7	0.000	R	59	70	78	52
TR032	9	12	REAL	0.006	0.008	142.0	0.007	R	59	70	78	52
TR032	18	18	REAL	0.009	0.007	71.9	0.000	R	99	59	52	78
TR032	24	24	REAL	0.007	0.008	116.5	0.000	R	99	59	52	78
TR032	36	36	REAL	0.007	0.008	106.7	0.000	R	99	59	52	78
TR032	48	48	REAL	0.001	0.002	200.8	0.000	R	99	59	52	78
TR032	72	72	REAL	0.184	0.047	25.5						
TR032	72	72	REAL	-0.003	0.004	142.4	0.006	R	99	59	52	78
TR032	72	72	REAL	0.186	0.042	22.6	0.000	R	99	59	78	85
TR032	96	96	REAL	0.008	0.006	82.7	0.000	R	99	59	52	78
TR033	0	3	DUP	0.268	0.048	17.9	0.000	R	59	70	78	52
TR033	0	3	REAL	0.386	0.069	17.9	0.000	R	59	70	78	52
TR033	3	6	REAL	0.172	0.032	18.6	0.000	R	59	70	78	52
TR033	6	9	REAL	0.062	0.017	27.8	0.000	R	59	70	78	52
TR033	9	12	REAL	0.008	0.007	90.5	0.000	R	59	70	78	52
TR033	18	18	REAL	0.006	0.531	8245.3	0.000	R	59	70	78	52
TR033	24	24	REAL	0.004	0.004	100.7	0.000	R	59	70	78	52
TR033	36	36	REAL	0.005	0.005	100.8	0.000	R	59	70	78	52
TR033	72	72	REAL	0.006	0.005	90.4	0.000	R	59	70	78	52
TR033	72	72	REAL	0.001	0.002	200.0	0.000	R	59	70	78	52
TR033	96	96	REAL	0.011	0.011	101.0	0.000	R	59	70	78	52
TR034	0	3	DUP	0.119	0.027	23.0	0.000	A	4	60	78	52
TR034	0	3	REAL	0.144	0.032	22.2	0.000	A	4	60	78	52
TR034	3	6	REAL	0.059	0.030	51.9	0.000	A	4	60	78	52
TR034	6	9	REAL	0.029	0.013	44.0	0.000	A	4		78	52
TR034	6	9	REAL	0.042	0.015	36.0	0.000	A	4		78	52
TR034	9	12	REAL	0.018	0.010	52.7	0.000	A	4		78	52
TR034	18	18	REAL	0.003	0.006	200.3	0.000	A	4	60	78	52
TR034	24	24	REAL	0.008	0.011	142.0	0.000	A	4	60	78	52
TR034	36	36	REAL	-0.002	0.004	200.0	0.008	A	4	60	78	52
TR034	48	48	REAL	0.011	0.016	142.1	0.000	A	4	27	78	52
TR034	72	72	REAL	0.002	0.003	141.8	0.000	A	4	60	78	52
TR034	96	96	REAL	0.006	0.005	82.3	0.000	A	4	27	78	52

TR035	0	3	DUP	0.051	0.015	28.5	0.000	R	18	10	61	78
TR035	0	3	REAL	0.056	0.016	28.7	0.000	R	18	10	61	78
TR035	3	6	REAL	0.077	0.020	25.6	0.000	R	18	10	61	78
TR035	6	9	REAL	0.015	0.008	55.0	0.006	A	18	10	61	78
TR035	9	12	REAL	0.034	0.012	35.5	0.000	R	18	10	61	78
TR035	9	12	REAL	0.041	0.013	31.0	0.000	R	18	10	61	78
TR035	18	18	REAL	0.007	0.005	71.8	0.000	R	18	10	61	78
TR035	24	24	REAL	0.012	0.007	59.2	0.000	R	18	10	61	78
TR035	36	36	REAL	0.005	0.005	106.6	0.004	R	18	10	61	78
TR035	48	48	REAL	0.003	0.004	149.2	0.004	R	18	10	61	78
TR035	72	72	REAL	0.002	0.003	142.2	0.000	R	18	10	61	78
TR035	96	96	REAL	0.002	0.003	142.2	0.008	R	18	10	61	78
TR036	0	3	DUP	0.166	0.032	19.5	0.000	A	4		78	52
TR036	0	3	REAL	0.128	0.027	21.2	0.000	A	4		78	52
TR036	0	3	REAL	0.136	0.029	21.0	0.000	A	4		78	52
TR036	3	6	REAL	0.112	0.026	22.9	0.000	A	4		78	52
TR036	6	9	REAL	0.030	0.012	40.5	0.000	A	4		78	52
TR036	9	12	REAL	0.017	0.009	54.4	0.000	A	4		78	52
TR036	18	18	REAL	0.011	0.007	67.5	0.000	A	4		78	52
TR036	24	24	REAL	0.002	0.003	184.0	0.000	A	4		78	52
TR036	36	36	REAL	0.007	0.006	82.3	0.000	A	4		78	52
TR036	48	48	REAL	0.001	0.002	200.4	0.000	A	4		78	52
TR036	72	72	REAL	0.001	0.002	358.5	0.000	A	4		78	52
TR036	96	96	REAL	0.003	0.004	136.9	0.000	A	4		78	52
TR037	0	3	DUP	0.018	0.008	45.3	0.000	R	70	10		78
TR037	0	3	REAL	0.021	0.001	4.4	0.000	R	70	10		78
TR037	3	6	REAL	0.048	0.015	30.2	0.000	R	70	10		78
TR037	6	9	REAL	0.012	0.008	65.3	0.006	R	70	10		78
TR037	9	12	REAL	0.005	0.004	90.2	0.000	R	70	10		78
TR037	9	12	REAL	0.007	0.005	71.8	0.000	R	70	10		78
TR037	18	18	REAL	0.005	0.005	90.4	0.000	R	70	10		78
TR037	24	24	REAL	0.010	0.006	61.5	0.000	R	70	10		78
TR037	36	36	REAL	0.002	0.004	200.5	0.004	R	70	10		78
TR037	48	48	REAL	0.005	0.004	90.2	0.000	R	70	10		78
TR037	72	72	REAL	0.006	0.005	76.6	0.000	R	70	10		78
TR037	96	96	REAL	0.011	0.006	61.0	0.000	R	70	10		78

Exploratory Statistics by Area by Depth

Summary statistics of Pu-239+240 and Am-241 in Soils of OU 3								
		Pu 239+240 pCi/g			Am241 pCi/g			
	Mean	Median	SD	Cummulative	Mean	Median	SD	Cummulative
	1.364	0.775	1.22	61.17	0.278	0.155	0.316	48.60
	0.579	0.432	0.625	25.96	0.219	0.085	0.306	38.29
	0.137	0.101	0.123	6.14	0.024	0.015	0.018	4.20
	0.069	0.03	0.091	3.09	0.014	0.009	0.009	2.45
	0.026	0.014	0.033	1.17	0.006	0.006	0.003	1.05
	0.009	0.009	0.004	0.40	0.006	0.005	0.003	1.05
	0.009	0.009	0.005	0.40	0.008	0.005	0.009	1.40
	0.024	0.008	0.029	1.08	0.004	0.003	0.003	0.70
	0.006	0.004	0.005	0.27	0.008	0.002	0.016	1.40
	0.007	0.006	0.007	0.31	0.005	0.004	0.003	0.87
	2.23				0.572			

Table 6. Summary statistics of Pu-239+240 and Am-241 in soils around RFETS								
		Pu 239+240 pCi/g				Am241 pCi/g		
Depth	Mean	Median	SD	Cummulative	Mean	Median	SD	Cummulative
Area A								
0-3	315.2	210.2	234.5	39.32	44.71	34.17	30.71	38.47
3-6	231.4	232	148.8	28.86	29.79	28.2	17.44	25.63
6-9	143.5	104.1	115.5	17.90	20.58	14.67	16.64	17.71
9-12	78.2	48.4	80.3	9.75	16.12	6.84	18.35	13.87
12-18	22.7	6.55	36	2.83	3.36	1.08	4.75	2.89
18-24	6.6	2.9	9.1	0.82	0.89	0.31	1.21	0.77
24-36	3.5	0.4	8.4	0.44	0.6	0.08	1.45	0.52
36-48	0.4	0.2	0.7	0.05	0.08	0.05	0.09	0.07
48-72	0.1	0.04	0.3	0.01	0.04	0.02	0.05	0.03
72-96	0.1	0.03	0.34	0.01	0.05	0.02	0.05	0.04
Total	801.7				116.22			
Area B								
0-3	11.08	6.99	10.01	61.28	1.29	0.74	1.59	40.82
3-6	4.82	2.06	6.42	26.66	1.3	0.57	1.55	41.14
6-9	0.85	1.09	0.47	4.70	0.19	0.17	0.11	6.01
9-12	0.69	0.7	0.54	3.82	0.1	0.09	0.07	3.16
12-18	0.24	0.16	0.17	1.33	0.05	0.04	0.03	1.58
18-24	0.17	0.14	0.18	0.94	0.04	0.03	0.04	1.27
24-36	0.12	0.04	0.16	0.66	0.04	0.06	0.02	1.27
36-48	0.04	0.01	0.04	0.22	0.03	0.02	0.02	0.95
48-72	0.02	0.02	0.01	0.11	0.08	0.02	0.11	2.53
72-96	0.05	0.01	0.07	0.28	0.04	0.04	0.02	1.27
Total	18.08				3.16			
Area C								
0-3	1.45	1.2	1.46	58.70	0.068	0.06	0.04	20.12
3-6	0.49	0.28	0.55	19.84	0.15	0.02	0.272	44.38
6-9	0.26	0.26	0.26	10.53	0.061	0.008	0.109	18.05
9-12	0.16	0.2	0.13	6.48	0.021	0.01	0.023	6.21
12-18	0.07	0.05	0.06	2.83	0.008	0.006	0.008	2.37
18-24	0.01	0.01	0.02	0.40	0.003	0.001	0.005	0.89
24-36	0.004	0.004	0.003	0.16	0.002	0.003	0.001	0.59
36-48	0.005	0.005	0.001	0.20	0.002	0.002	0.001	0.59
48-72	0.012	0.012	0.007	0.49	0.003	0.004	0.002	0.89
72-96	0.009	0.01	0.003	0.36	0.02	0.003	0.039	5.92
Total	2.47				0.338			
Area D								
0-3	1.244	1.214	0.605	39.90	0.108	0.119	0.102	22.31
3-6	0.835	0.855	0.452	26.78	0.15	0.157	0.003	30.99
6-9	0.454	0.548	0.296	14.56	0.09	0.101	0.038	18.60
9-12	0.243	0.296	0.119	7.79	0.048	0.046	0.014	9.92
12-18	0.237	0.108	0.3	7.60	0.026	0.027	0.012	5.37
18-24	0.065	0.034	0.076	2.08	0.012	0.008	0.013	2.48
24-36	0.021	0.006	0.03	0.67	0.01	0.01	0.007	2.07
36-48	0.013	0.01	0.008	0.42	0.023	0.01	0.029	4.75
48-72	0.006	0.006	0.001	0.19	0.005	0.005	0.001	1.03
72-96				0.00	0.012	0.004	0.017	2.48
Total	3.118				0.484			

Table 7. Summary statistics of two-way analysis of variance testing the classification of Pu-239+240 activity (Log Pu) with area and depth in OU 1, 2, & 3.

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR>F
Model	49	2894.42	59.07	45.05	.0001
Error	266	348.81	1.31		
Total	315	3243.23	10.3		
DEPTH	9	1103.72	122.64	93.52	.0001
AREA	4	1257.07	314.27	239.66	.0001
AREA BY DEPTH	36	203.08	5.64	4.30	.0001

Bonferroni correction for calculation of simultaneous confidence intervals. Alpha = .05, confidence = .95.

Area Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Conf Limit
OU 3 - A	4.538	4.981	5.424
OU 3 - B	1.473	1.932	2.391
OU 3 - C	-.391	0.125	.642
OU 3 - D	.180	0.842	1.504

Only the OU 3 - C comparison confidence interval encompasses zero, hence, the difference between these areas witl depth is insignificant at the stated threshold.

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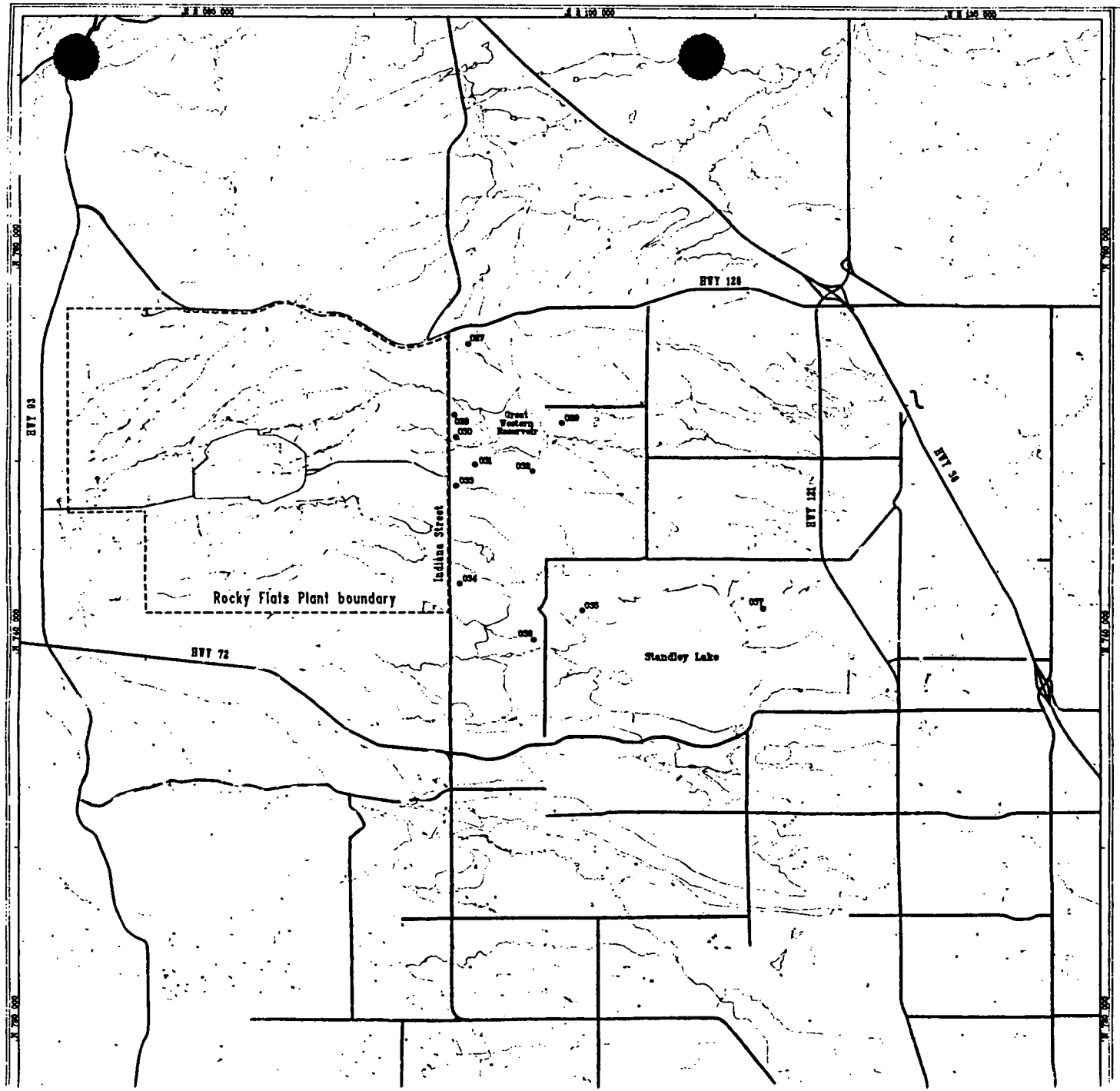


U.S. Department of Energy

Rocky Flats Plant

Soil profile pits

Figure 1

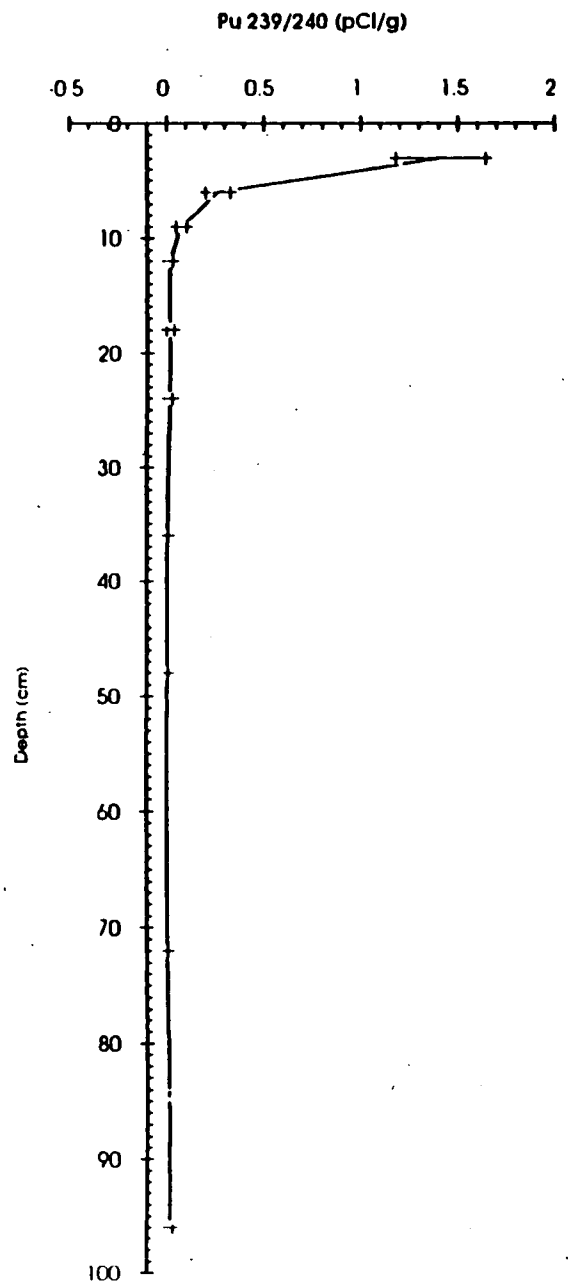
Prepared by:

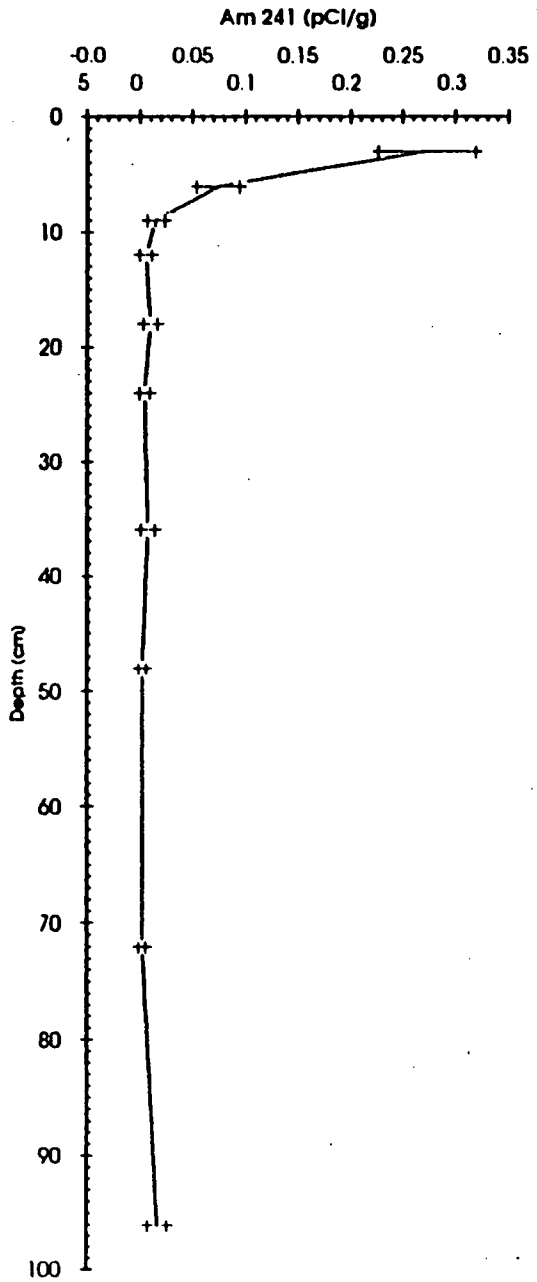
EG&G ROCKY FLATS

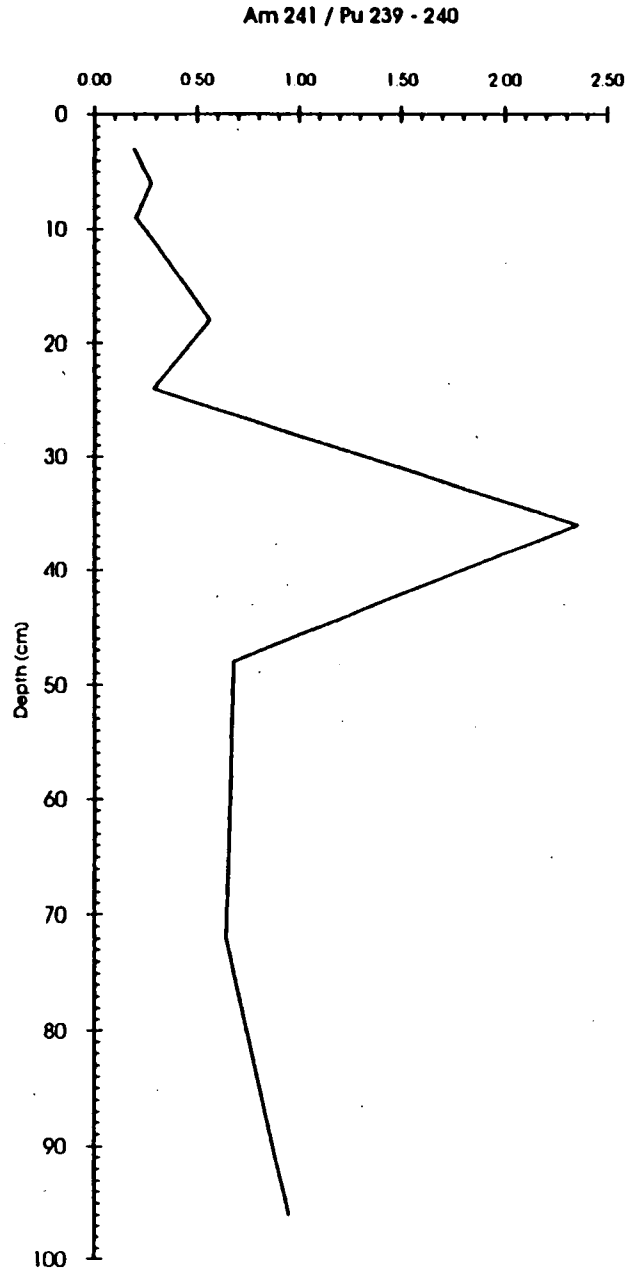
Rocky Flats Plant
P.O. Box 464

Fig 2a

TRENCH 02792







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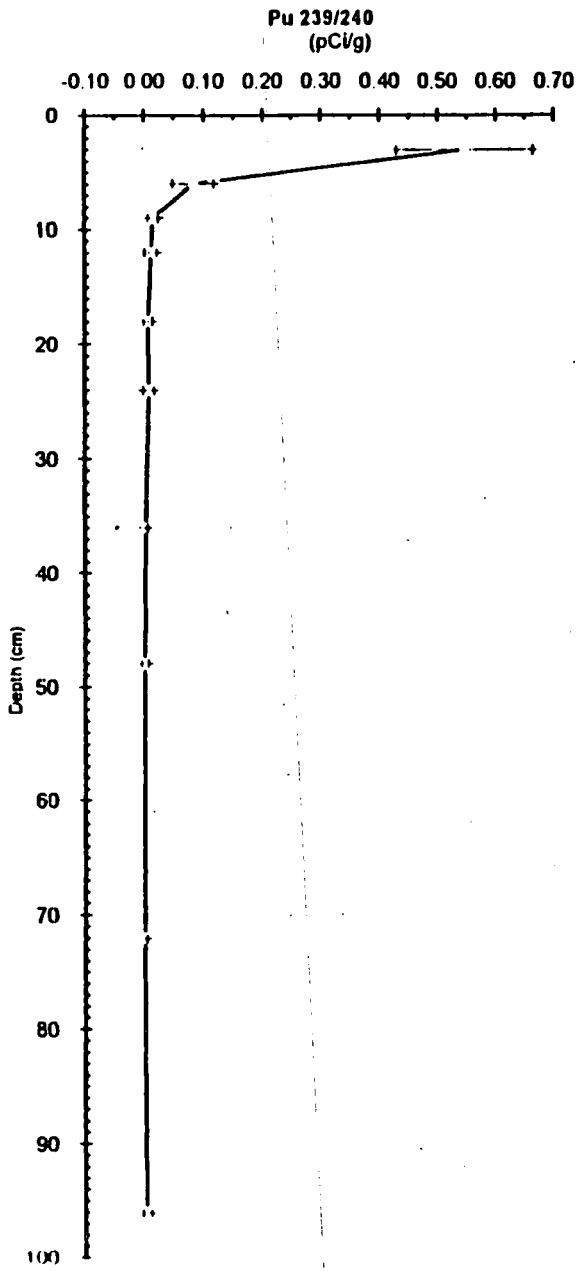

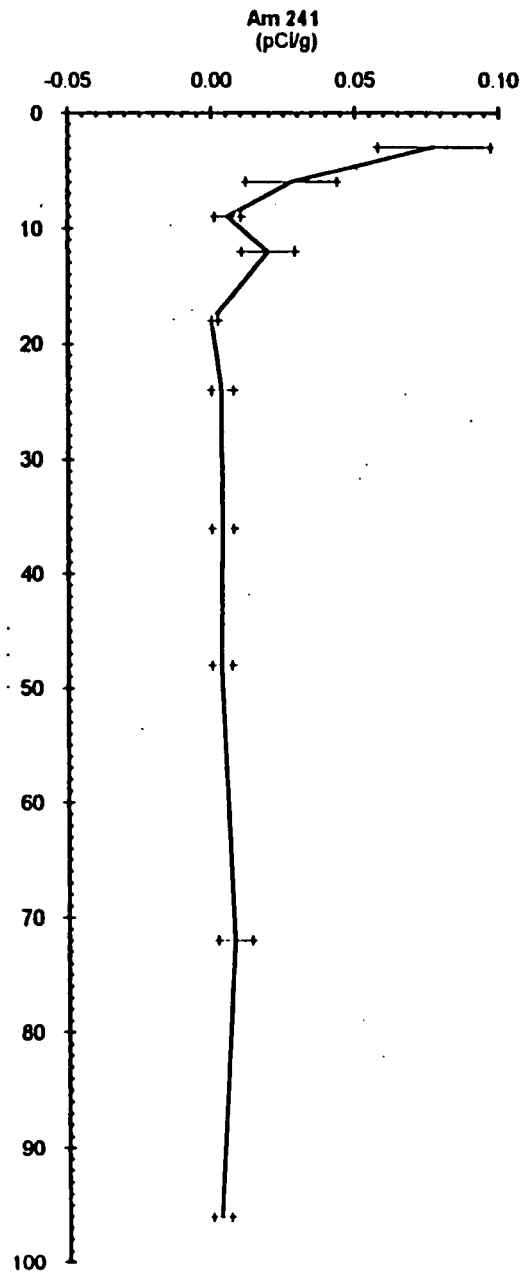

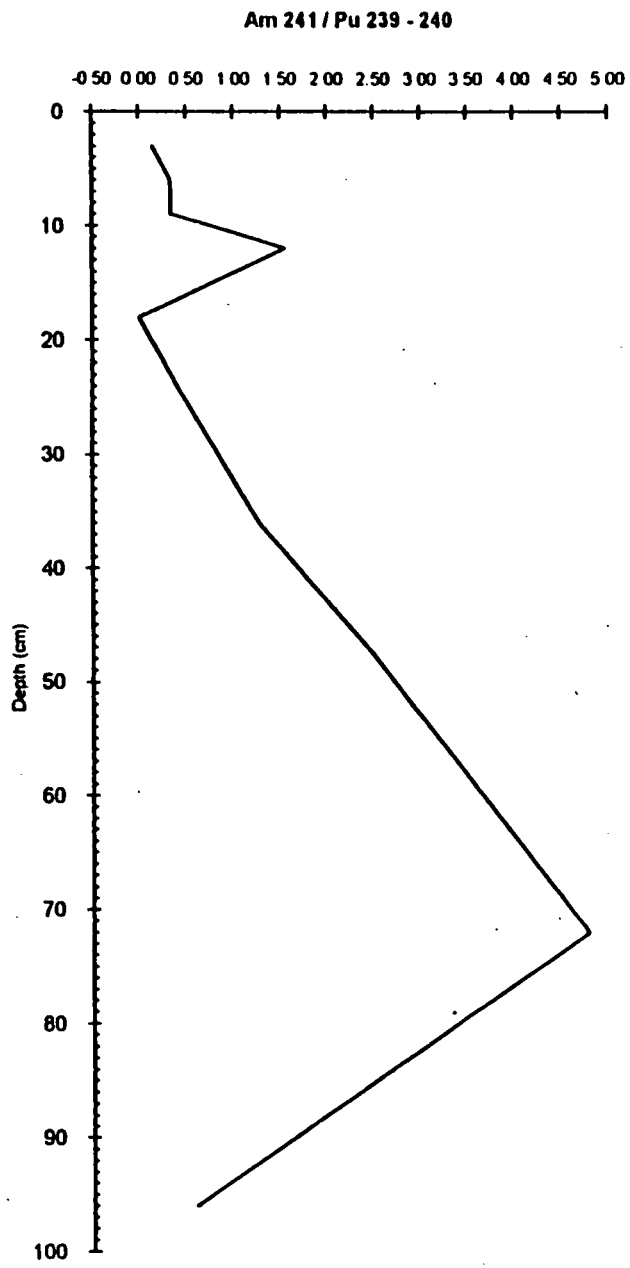

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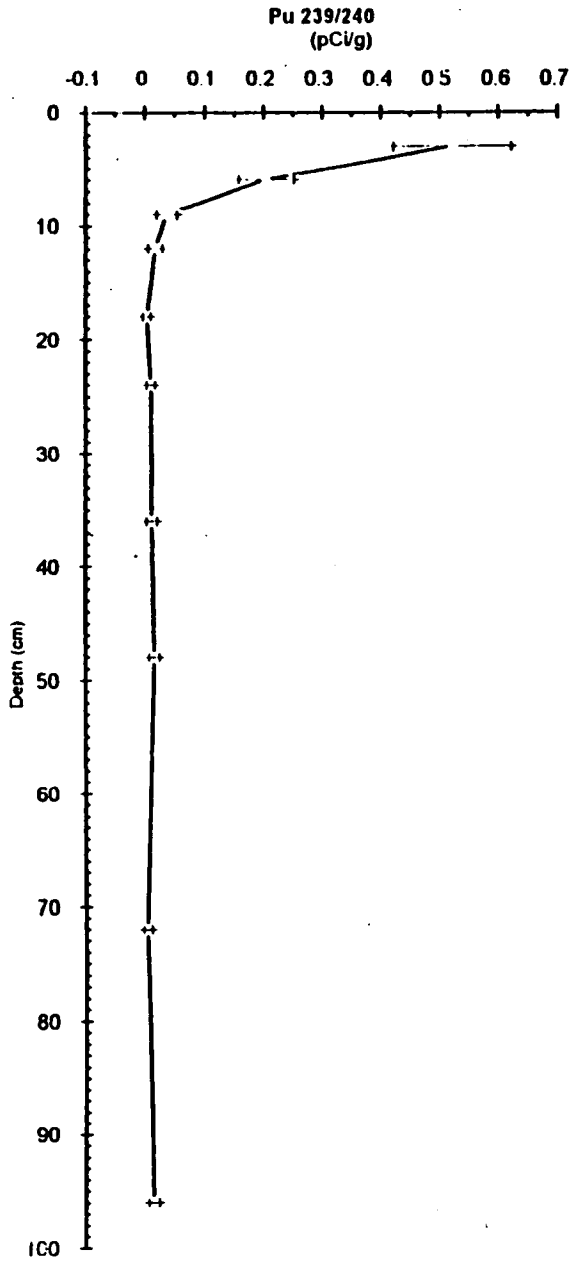
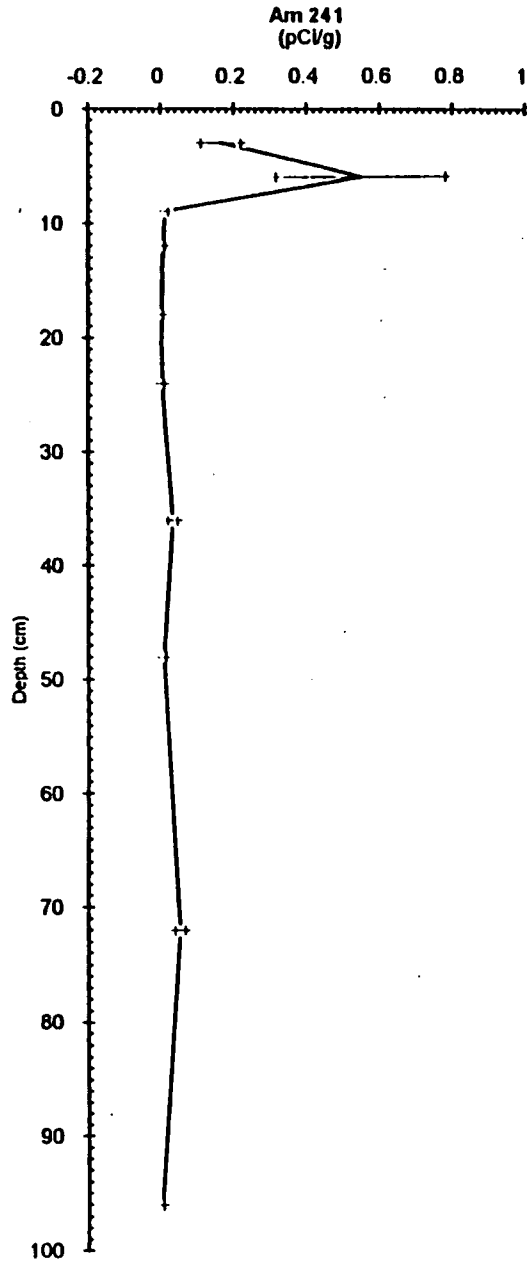

Pu 239/240
(pCi/g)
-0.1 0 0.1 0.2 0.3 0.4 0.5 0.6 0.7
Depth (cm)
0 10 20 30 40 50 60 70 80 90 100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(pCi/g)
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Depth (cm)
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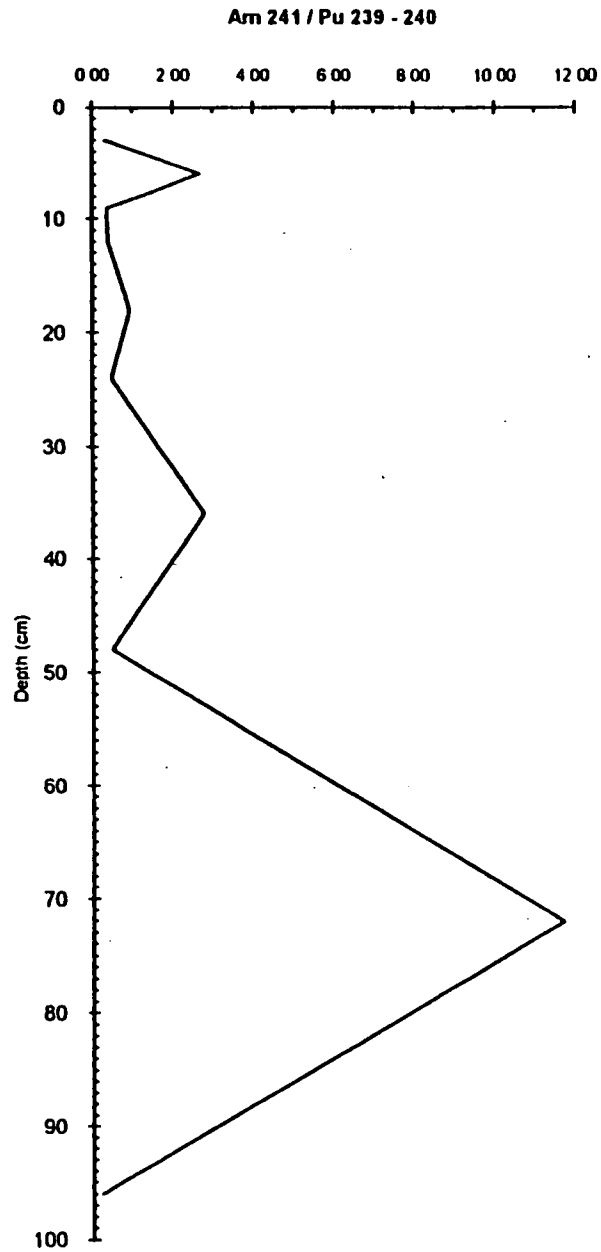
Am 241 / Pu 239 - 240
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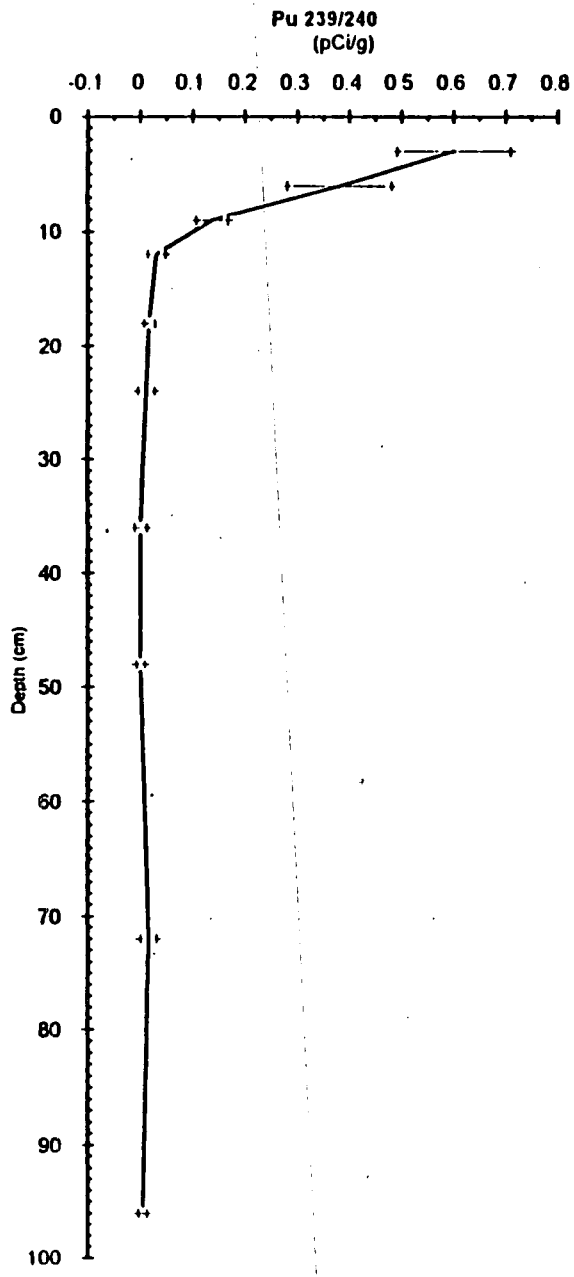
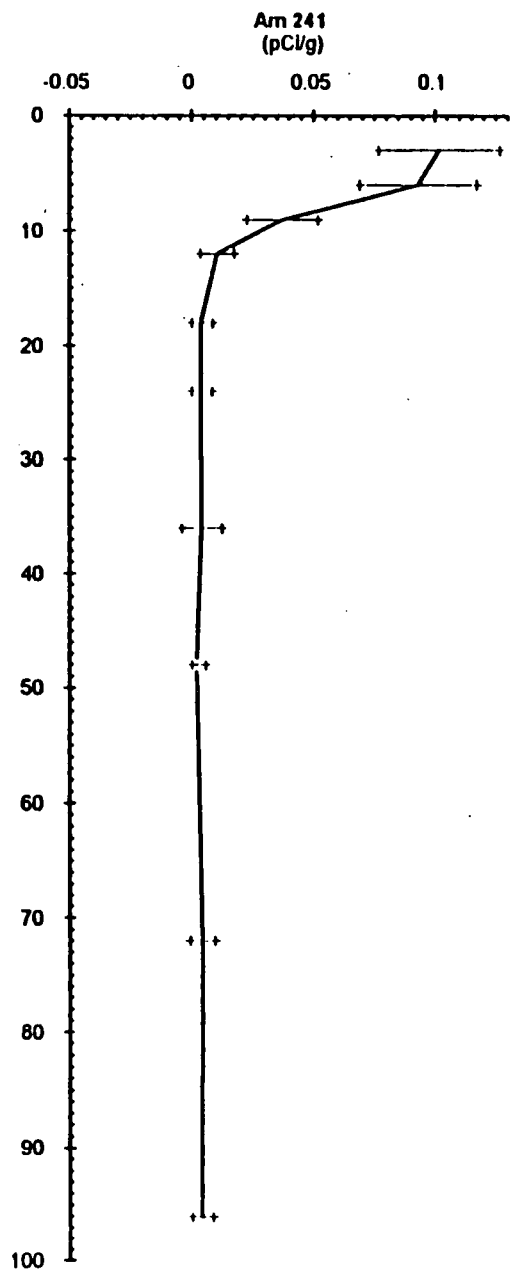
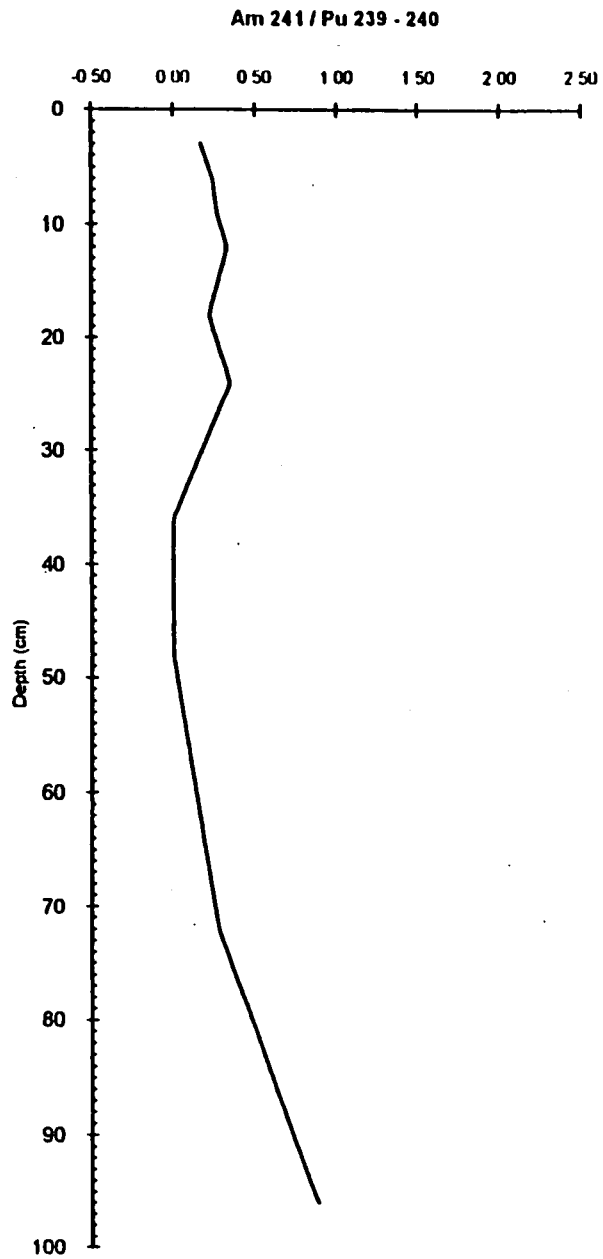
Depth (cm)
0 10 20 30 40 50 60 70 80 90 100

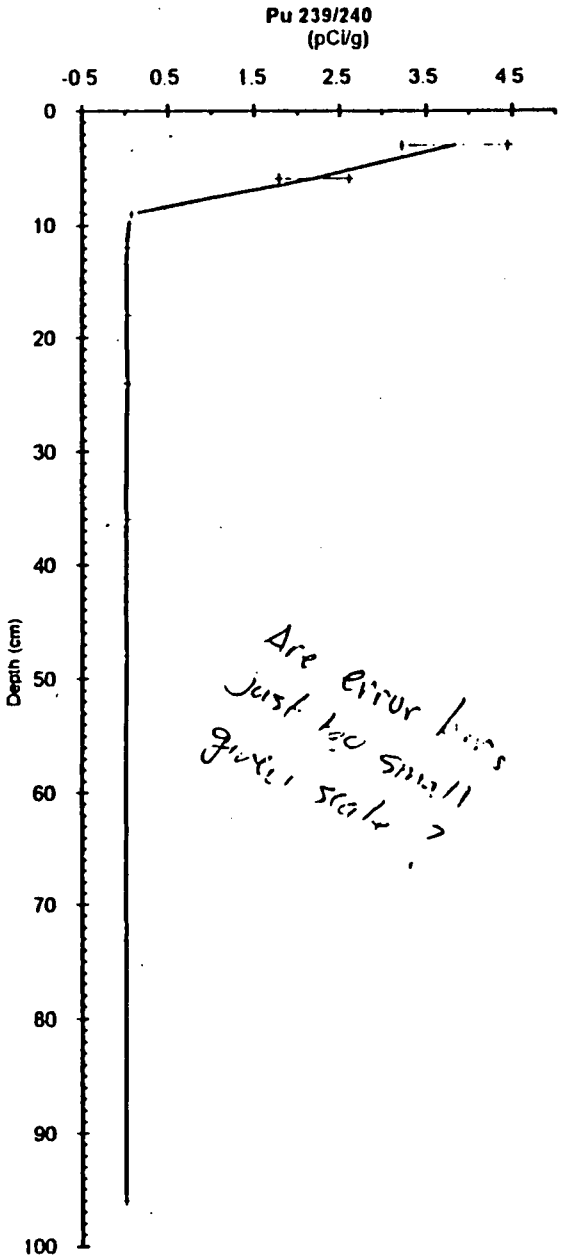
2d

TRENCH 03092

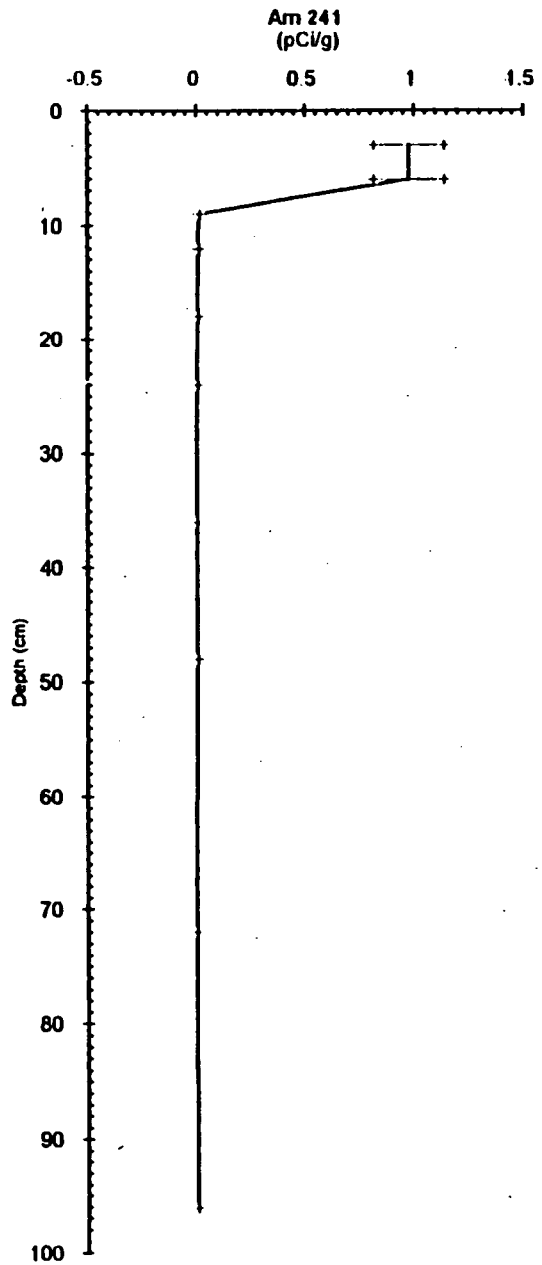


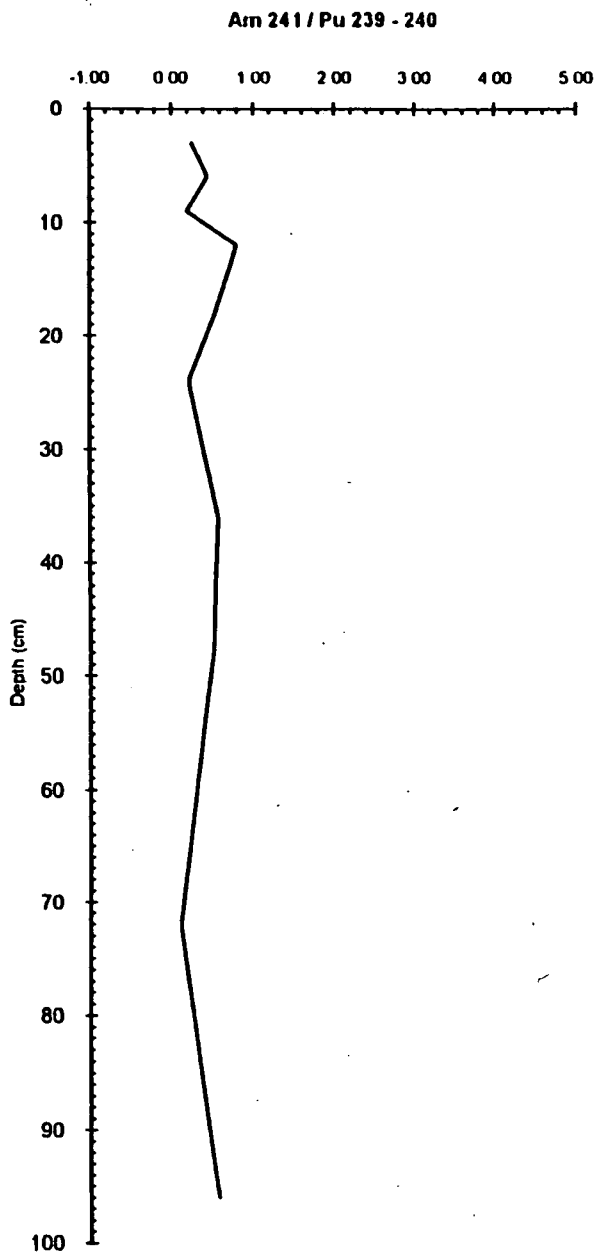






Are error bars just too small given scale?





2f

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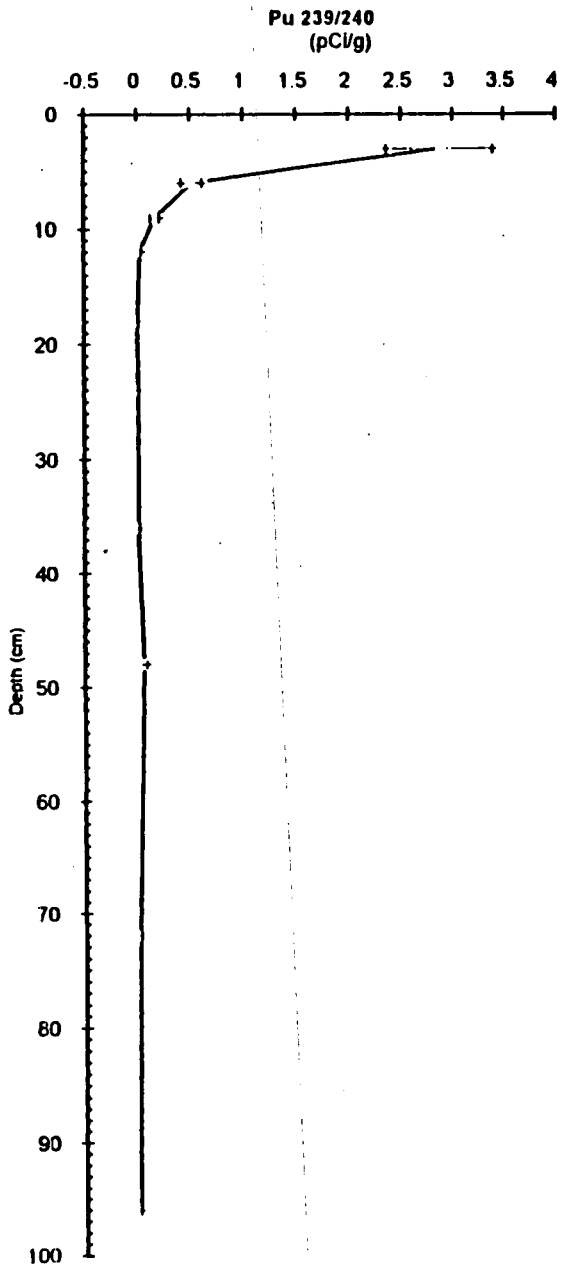

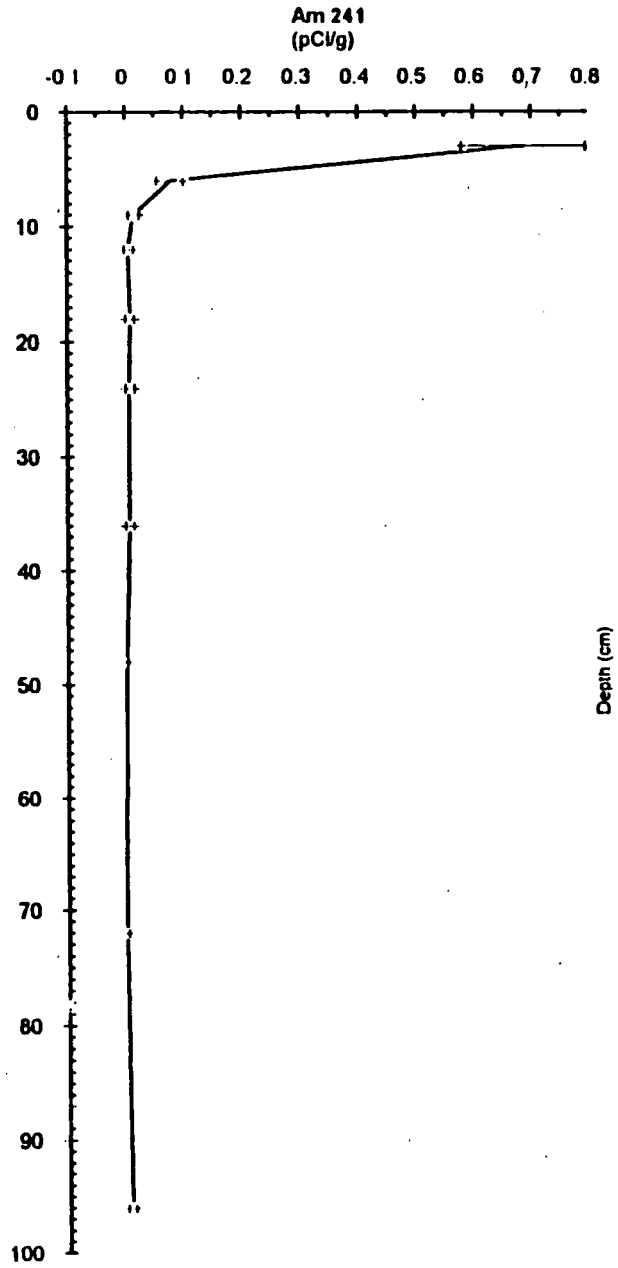

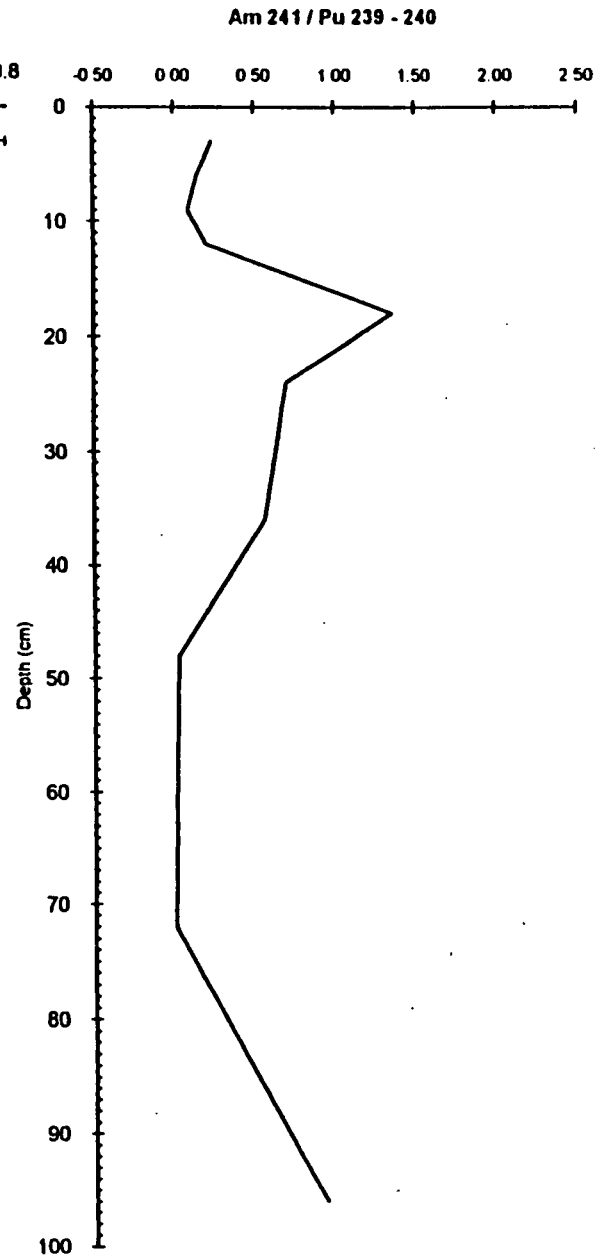

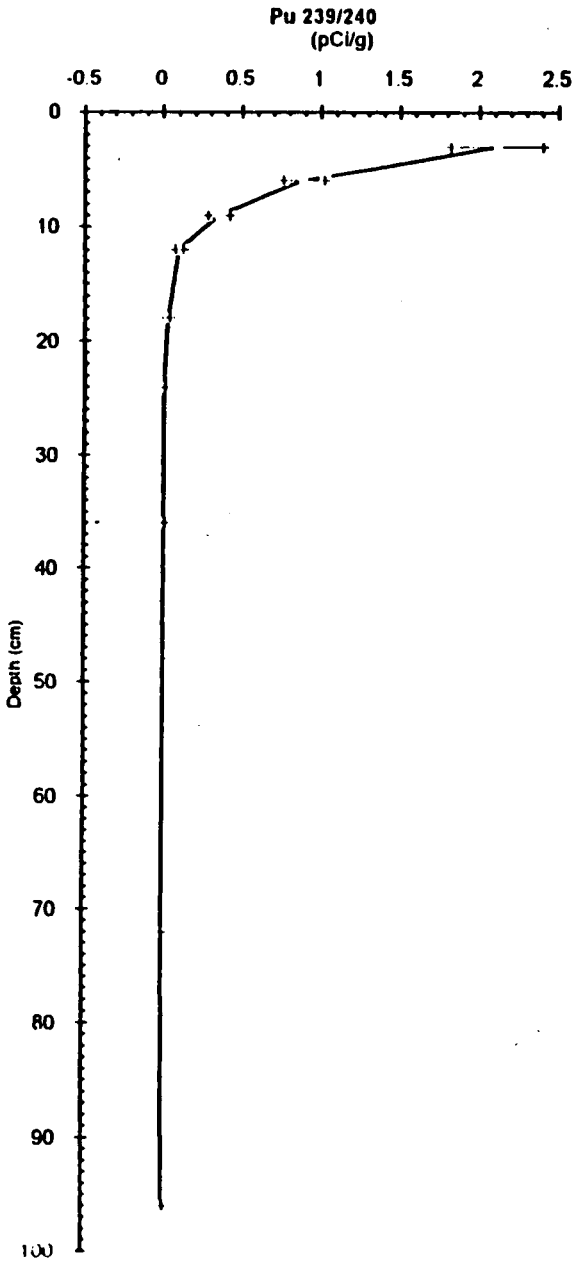
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(pCi/g)
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0
0.5
1
1.5
2
2.5
Depth (cm)
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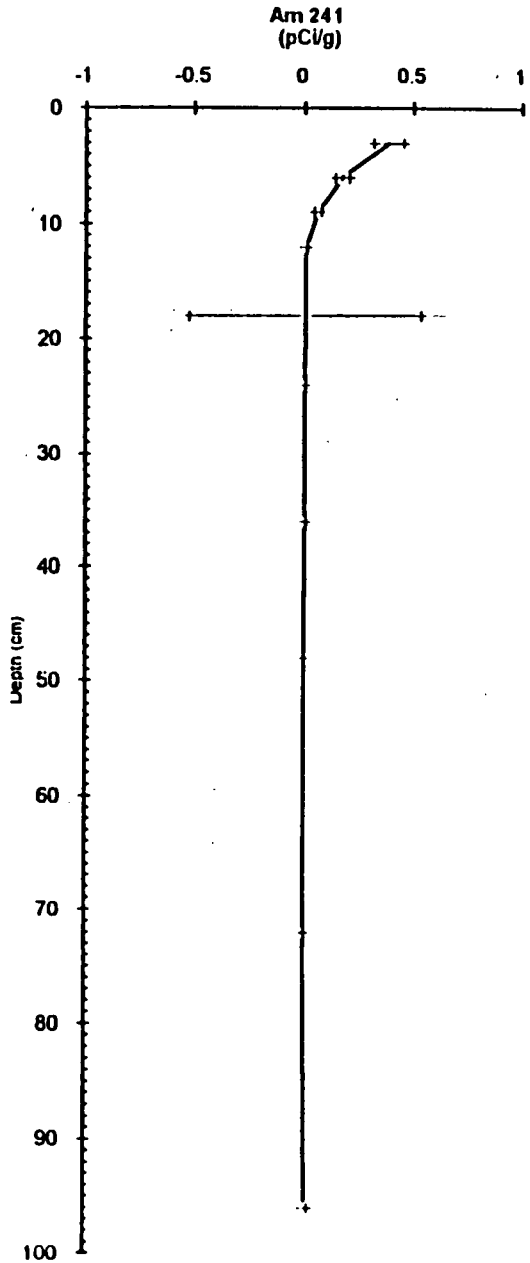
10
20
30
40
50
60
70
80
90
100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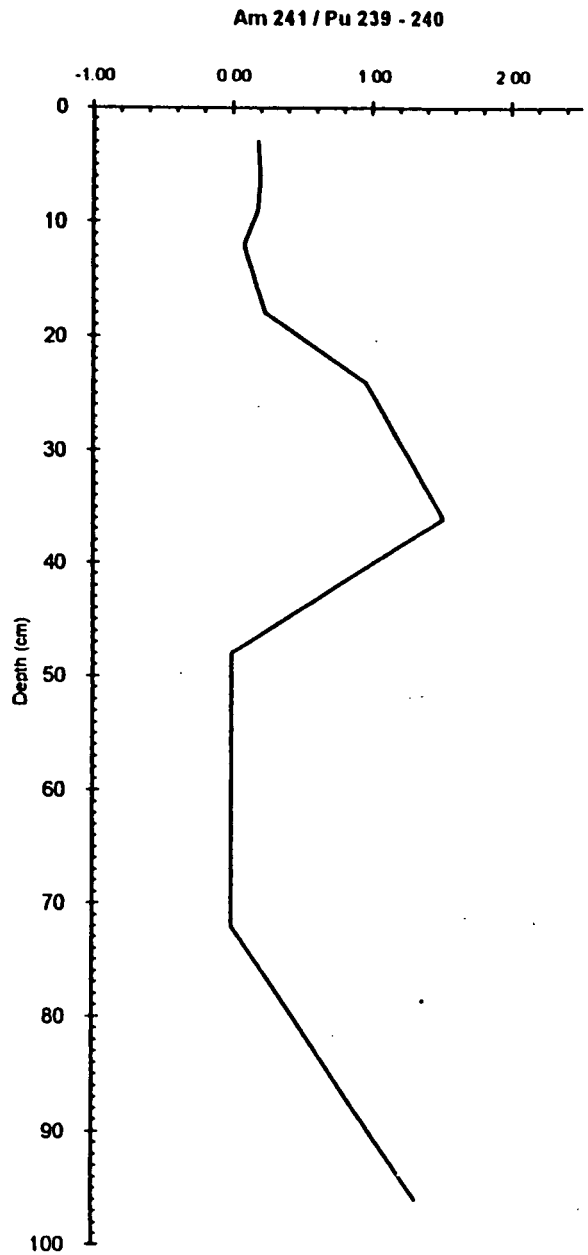
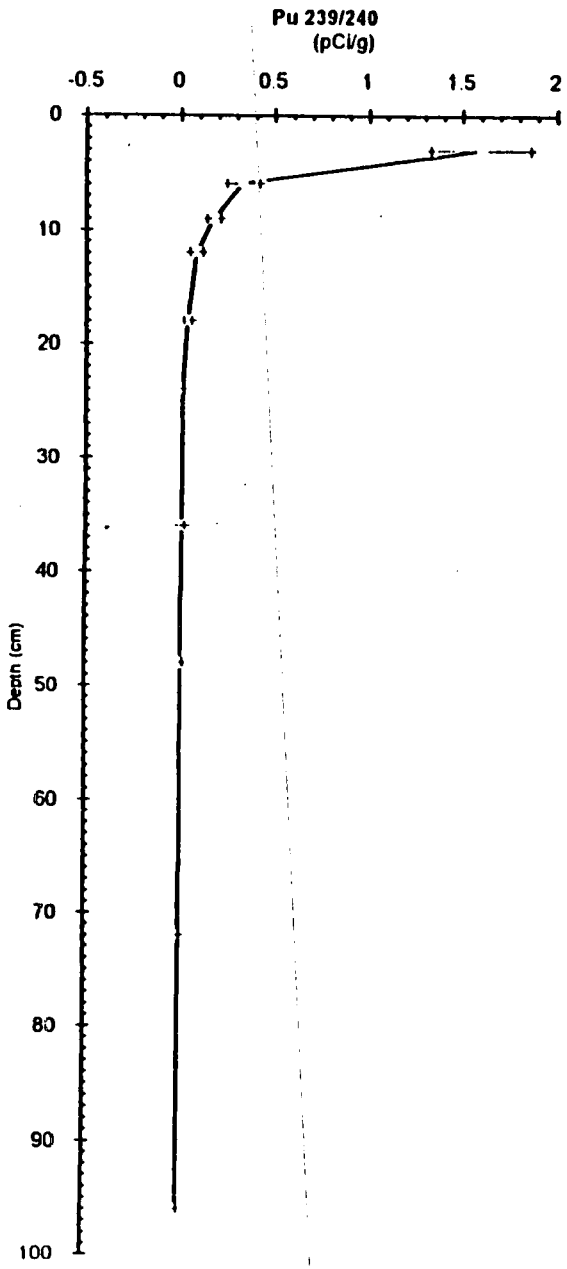
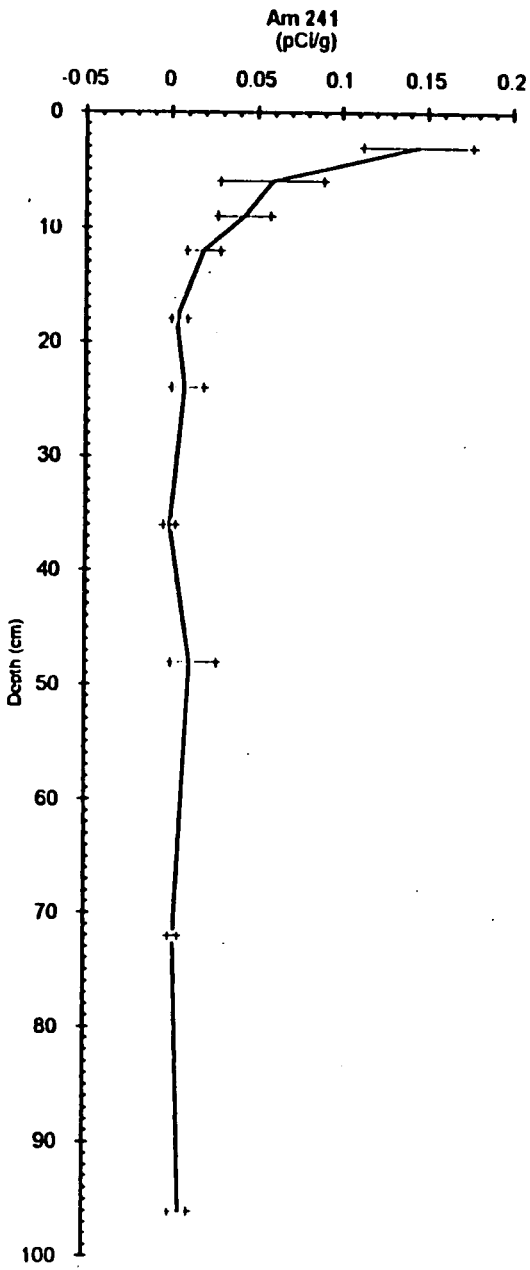
(pCi/g)
-1
-0.5
0
0.5
1
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100

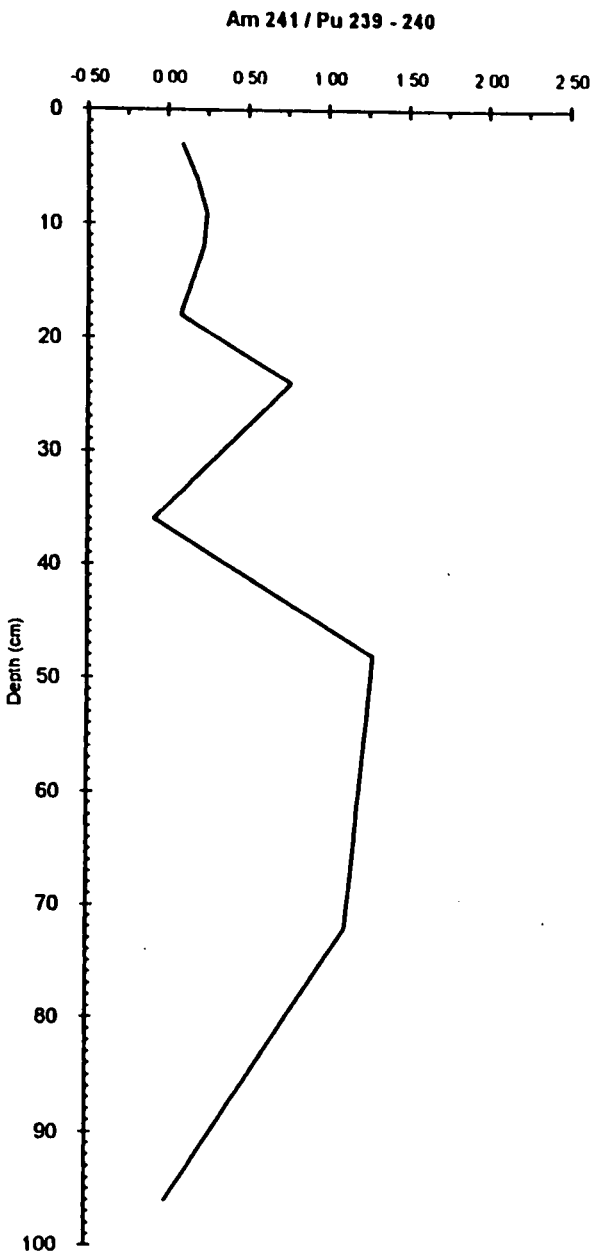

Am 241 / Pu 239 - 240
-1.00
0.00
1.00
2.00
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100

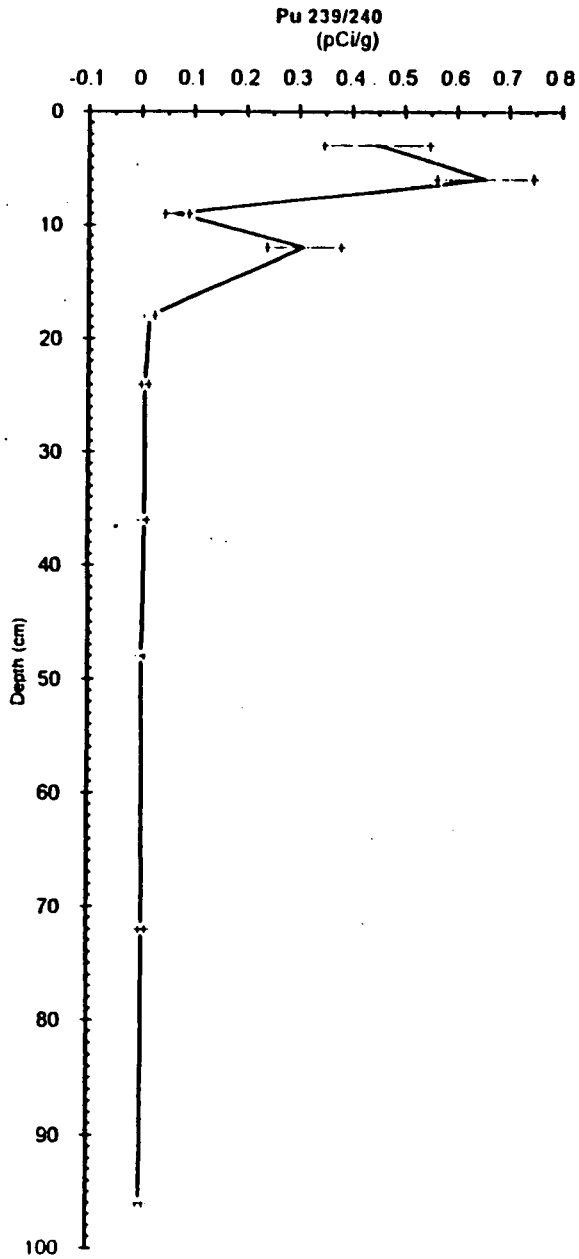
2h

TRENCH 03492








Pu 239/240
(pCi/g)
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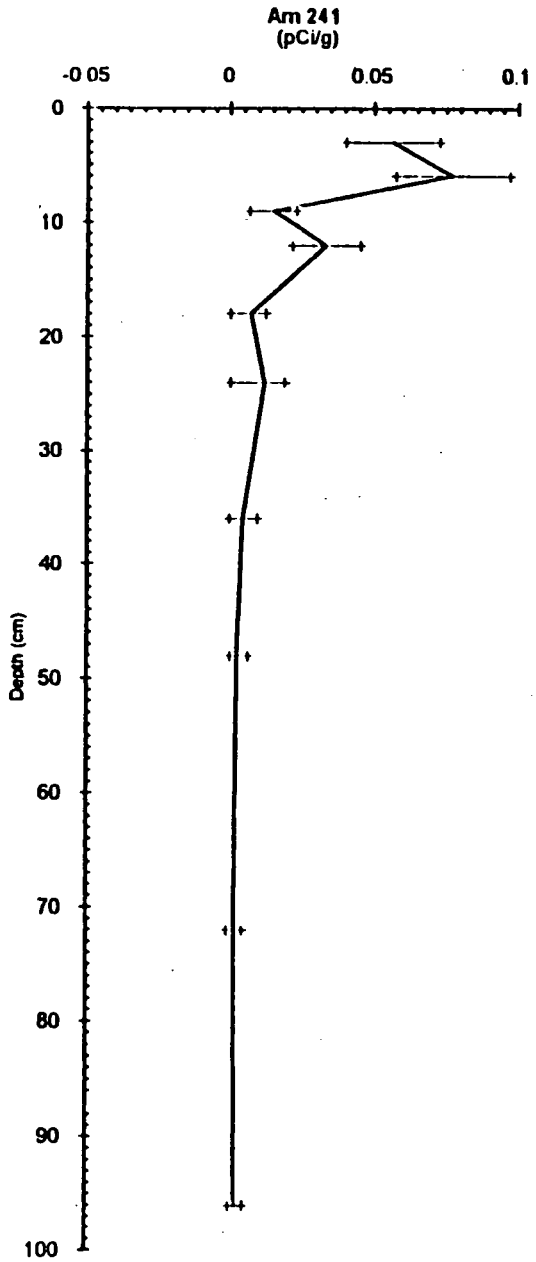
Depth (cm)
0 10 20 30 40 50 60 70 80 90 100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(pCi/g)
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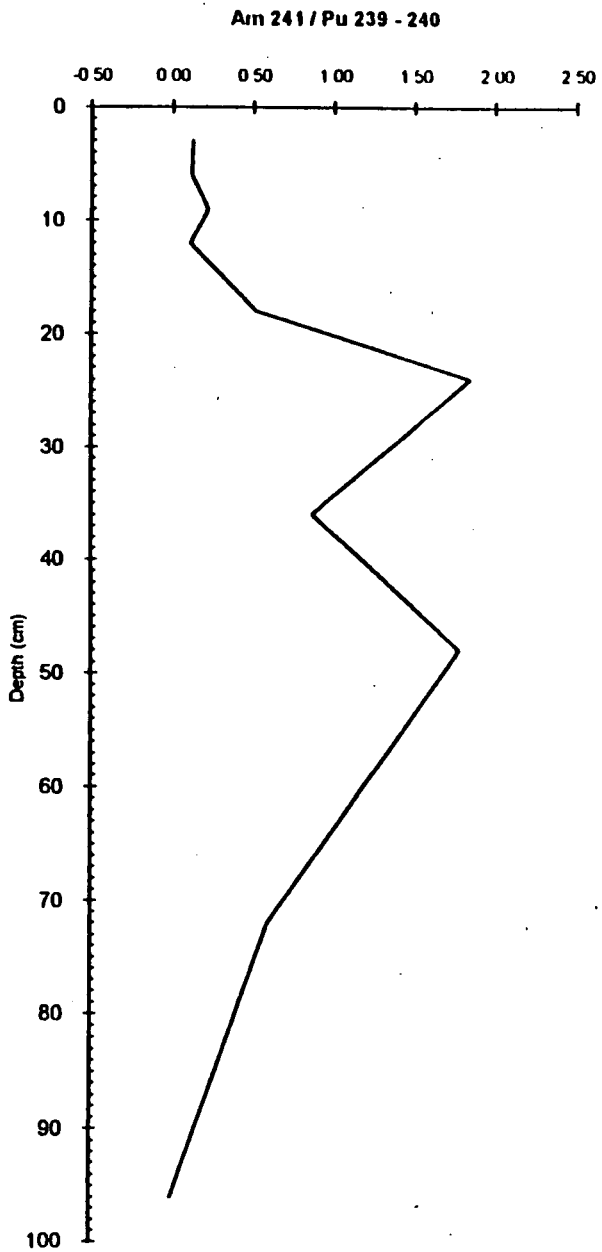
Depth (cm)
0 10 20 30 40 50 60 70 80 90 100


Am 241 / Pu 239 - 240
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Depth (cm)
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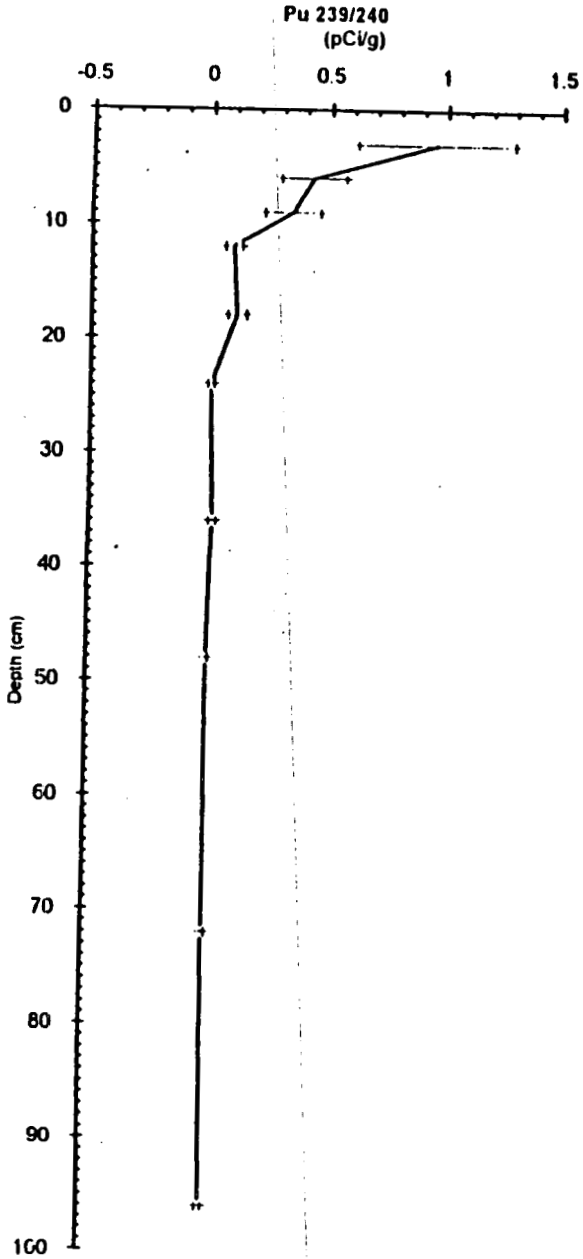
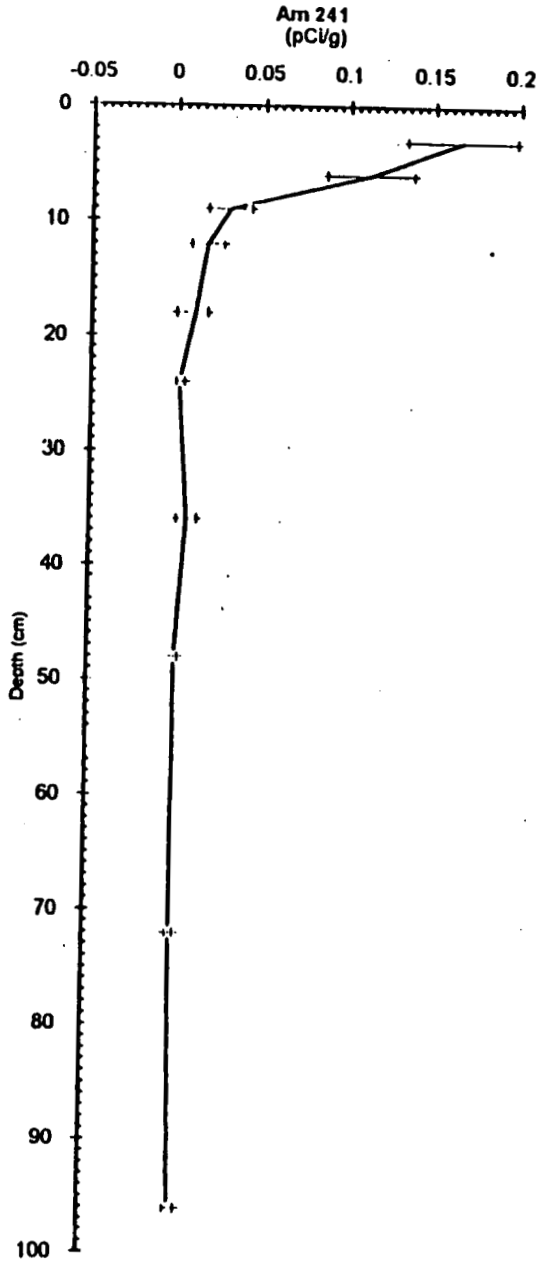
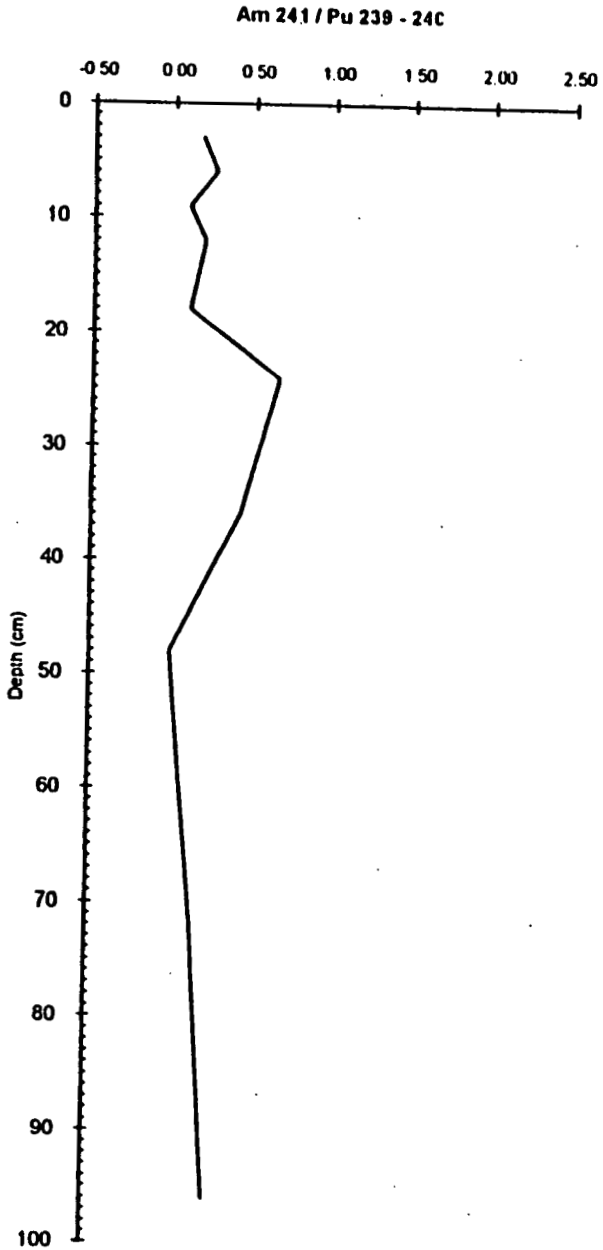
2j

TRENCH 03692

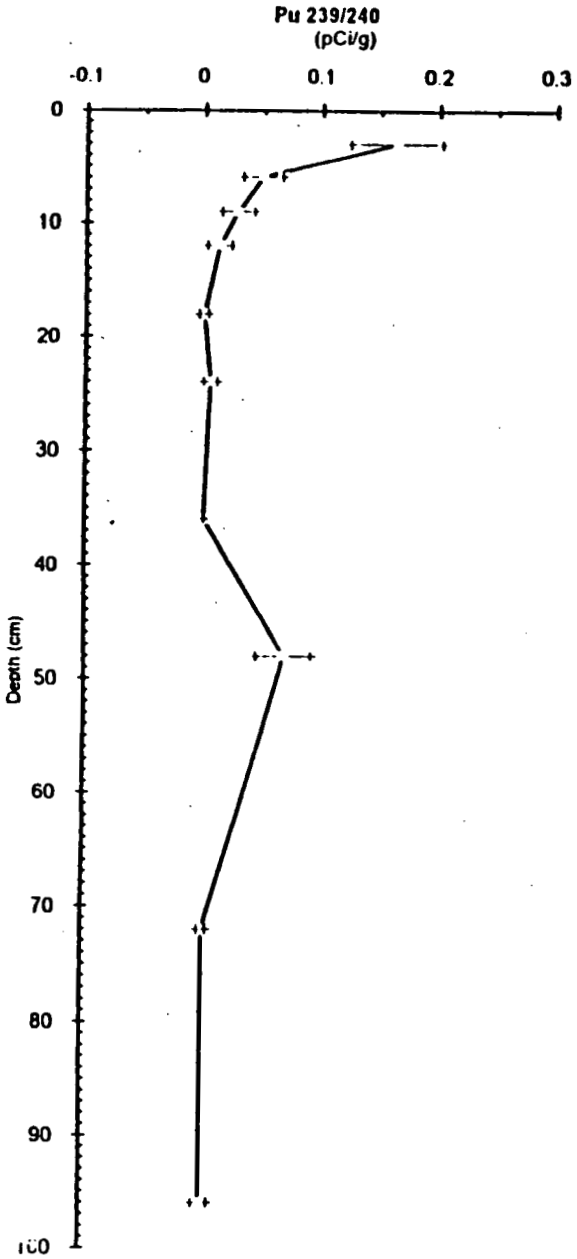


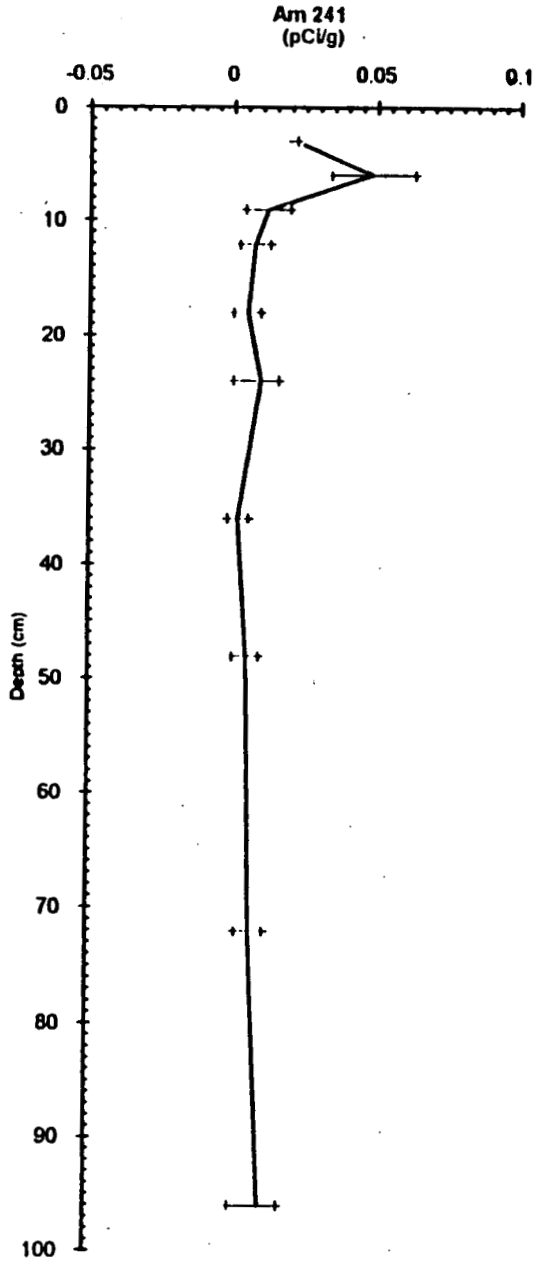




2h

TR[illegible] 03792


Pu 239/240
(pCi/g)
-0.1
0
0.1
0.2
0.3
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100


Am 241
(pCi/g)
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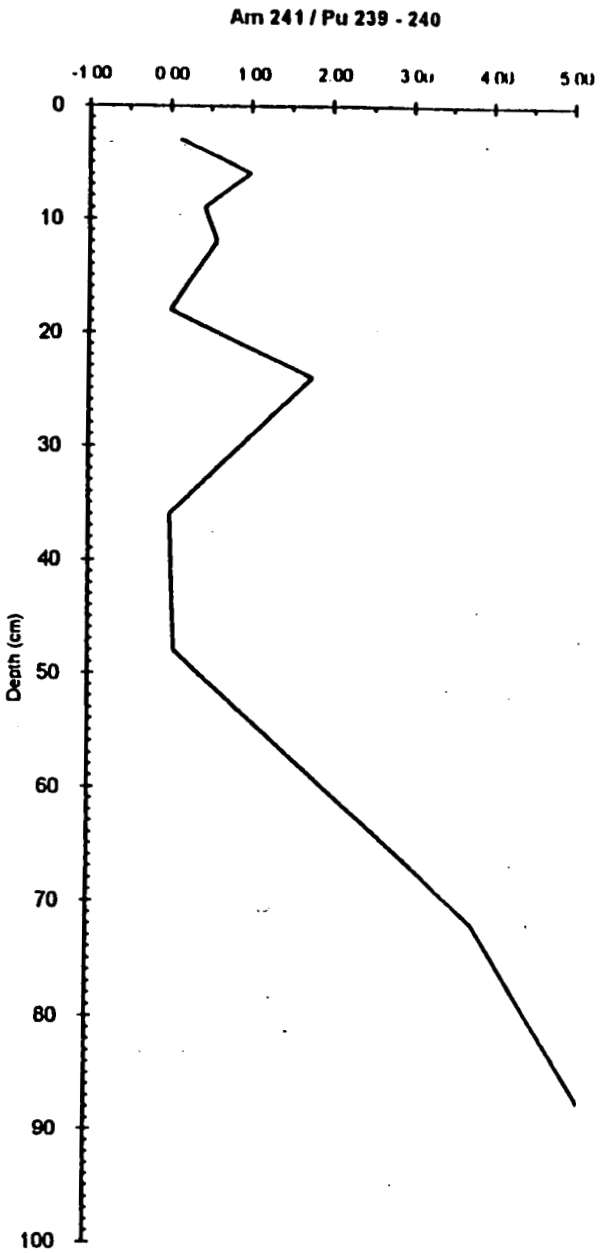
0
0.05
0.1
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100


Am 241 / Pu 239 - 240
-1.00
0.00
1.00
2.00
3.00
4.00
5.00
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100

Attachment I

Soil Classification

Most of the soils in this study were Argiustolls, i.e., soils formed in a semi-arid climate under the influence of prairi vegetation and containing subsurface accumulations of clay.

All of the soils exhibited mollic epipedons, i.e., relatively thick surficial horizons with abundant organic matter. Mollic epipedons reflect annual below-ground additions of organic matter to the soil by decomposition of the roots c prairie grasses and forbs. In general, mollic epipedons must be at least 18 cm thick and have moist colors with chroma and value <3.5.

Most of the soils were classified as having argillic horizons, reflecting accumulations of clay in the subsurface. Argillic horizons generally have at least 20 percent more clay than the soil horizons overlying them. The common occurrence of lithologic discontinuities (see below), however, suggested that not all the clay in the Bt horizons was illuvial. Most of the soils investigated had subsurface accumulations of calcium carbonate as well. In several soils that accumulation was great enough to formally identify calcic horizons (e. g., Pits 27, 32, 36).

Only one (Pit 34) of the eleven pedons investigated had no evidence of lithologic discontinuities. This fact suggests the importance of alluvial parent materials to the soils in the study area. Similarly, even though the fine-earth fractio (i.e., <2-mm material) was dominated by clay particles in most of the soils, there were usually abundant coarse fragments that resulted in classification of the soils in clayey-skeletal particle-size groups one soil (Pit 34) as ssified into torrertic subgroups because it had horizons near the soil surface that had high clay contents, making it ceptible to cracking in summer months.

Clay Mineralogy

Minerals in the clay fractions of the pedons in this study were identified by standard x-ray diffraction techniques. Smectitic minerals had d-spacings that expanded to about 1.8 nm upon glyceration. Vermiculite occurred in trace amounts in some samples, evidenced by a typically small peak at about 1.4 nm on the glycerated sample's x-ray diffraction pattern. Clay mica (illite) was identified by its normal reflections at 0.98 nm, 0.5 nm, and 0.33 nm. Kaolinite in the samples provided characteristic peaks at 0.71 nm and 0.356 nm. Quartz (0.426 nm) occurred ubiquitously in small amounts in all the samples. The presence or absence of hydroxy-interlayered 2:1 clay mineral: was determined by assessing the degree of collapse to 1.0 nm of the smectite and vermiculite d-spacings on K-saturated samples heated to 350 degrees C. Iron oxides were assessed by extraction of the soil material with citrate-bicarbonate-dithionite solution and calculating the amount of Fe_2O_3 removed, assuming that all occurred in the clay fraction. Abundances of the these minerals were estimated by relative areas of the characteristic x-ray diffraction peaks, specific surface area measurements, thermal gravimetric techniques, and selective dissolution analyses.

The majority of soil horizons had clay fractions consisting of a mixture of the clay minerals identified above. Still, i all horizons, smectite was the dominant clay mineral, typically accounting for about 60% of the clay fraction. The abundance of smectite in the soils probably reflects the many potential sources of smectite as well as its characteristic particle size. Smectite in these soils was probably derived partly from Cretaceous-age shale. the shale formed the parent material for many of the soils investigated, either directly or as a source of the colluvium or alluvium in whicl the soils developed. Smectite may also have formed by neoformation as primary minerals weathered and released S A1, Fe, Mg, and Ca. Finally, smectite commonly occurs in fine clay fractions, a size that makes smectite particles susceptible both to transport by wind and water erosion and to accumulation in lo-lying landscape positions.

With a few exceptions, clay mica contents were greatest near the soil surface and decreased with depth. This is the opposite trend from what one would expect in moderately to highly weathered soils, and it confirms the hypothesis that the soils have not significantly weathered since deposition of the parent materials.

Classification and Mineralogy of Soils

PIT	MAP UNIT	LANDSCAPE POSITION	EPIPEDON	SUBSURFACE HORIZON	DISCONTINUITIES	CLAY MINERALOGY	PARTICLE SIZE CLASS	PEDON CLASSIFICATION	CLOSEST SERIES AND CLASSIFICATION	REMARKS
27	Standley-Nunn	Summit	Mollic	Argillic Calcic	38 and 80 cm	smectitic (montmorillonitic)	Clayey-skeletal over sandy-skeletal	Clayey-skeletal over sandy skeletal, mixed, mesic Aridic Argiustoll	Valmont (clayey over loamy-skeletal, montmorillonitic, mesic Aridic Argiustolls)	
28	Denver-Kutch	Backslope	Mollic	Argillic	10 cm	smectitic (montmorillonitic)	Fine	Fine, montmorillonitic, mesic Typic Argiaquoll	Nunn Variant (fine, montmorillonitic, mesic Aquic Argiustolls)	The color of Ap horizon is 10YR 5/2 (dry) rather than 10YR 6/2, as described The Ap horizon has 1.98% O.C.
29	Layden Primn Standley	Backslope	Mollic	Cambic	15 and 100 cm	mixed	Fine-loamy	Fine-loamy, mixed, mesic Aridic Haplustoll	Manzano (fine-loamy, mixed, mesic Cumulic Haplustolls)	
30	Englewood	Toeslope	Mollic	Cambic	38 and 75 cm	mixed	Fine-loamy	Fine-loamy, mixed (calcareous), mesic Fluvaquentic Endoaquoll	Loveland (fine-loamy over sandy or sandy-skeletal, mixed (calcareous), mesic Fluvaquentic Haplaquolls)	
31	Standley-Nunn	Summit	Mollic	Argillic	47 and 107 cm	smectitic (montmorillonitic)	Clayey-skeletal	Clayey-skeletal , montmorillonitic, mesic Aridic Argiustoll	Standley (fine, montmorillonitic, mesic Aridic Argiustolls)	
32	Standley-Nunn	Summit	Mollic	Argillic Calcic	7 cm	smectitic (montmorillonitic)	Clayey-skeletal	Clayey-skeletal , montmorillonitic, mesic Pachic Argiustoll	Standley (fine, montmorillonitic, mesic Aridic Argiustolls)	
33	Nunn	Summit	Mollic	Argillic	29 cm	smectitic (montmorillonitic)	Fine	Fine , montmorillonitic, mesic Pachic Argiustoll	Standley (fine, montmorillonitic, mesic Aridic Argiustolls)	
34	Haverson	Toeslope	Mollic	Argillic	None	smectitic (montmorillonitic)	Fine	Fine, montmorillonitic, mesic Torrertic Argiustoll	Englewood (fine, montmorillonitic, mesic Torrertic Argiustolls)	
35	McClave	Toeslope	Mollic	Cambic	19, 43, 60, 74 cm	mixed	Loamy-skeletal	Loamy-skeletal, mixed, mesic Torrifluventic Haplustoll	Haverson (fine-loamy, mixed (calcareous), mesic Ustic Torrifluvents)	

Classification and Mineralogy of Soils

PIT	MAP UNIT	LANDSCAPE POSITION	EPIPEDON	SUBSURFACE HORIZON	DISCONTINUITIES	CLAY MINERALOGY	PARTICLE SIZE CLASS	PEDON CLASSIFICATION	CLOSEST SERIES AND CLASSIFICATION	REMARKS
36	Denver-Kutch	Footslope	Mollic	Cambic Calcic	7, 52, 92 cm	smectitic (montmorillonitic)	Clayey-skeletal	Clayey-skeletal, mixed, mesic Pachic Calciustoll	Lebsack (fine, montmorillonitic, mesic Pachic Haplustolls)	No argillic identified because this pedon did not have a significant fine-clay increase with depth. Assumes that 10 YR 5/4 colors are dry colors.
					7, 24, 92 cm		Fine	Fine, montmorillonitic, mesic Typic Calciustoll		Alternative Pedon (36) Classification for Part 2
37	Nunn	Footslope	Mollic	Argillic	51 cm	smectitic (montmorillonitic)	Fine	Fine, montmorillonitic, mesic Pachic Argiustoll	Nunn (fine, montmorillonitic, mesic Aridic Argiustolls)	
38		Summit	Ochric	Argillic Calcic	43, 66, 93 cm	mixed	Fine-loamy over clayey (skeletal)	Fine-loamy over clayey, mixed, mesic Aridic Haplustalf	Ascalon (fine-loamy, mixed, mesic Aridic Argiustolls)	There is no fine-loamy over clayey-skeletal particle size class officially reocognized, so we used the closest particle size class
39		Summit	Mollic	Argillic Calcic	101 cm	smectitic (montmorillonitic)	Fine	Fine, montmorillonitic, mesic Torrertic Argiustoll	Kutch (fine, montmorillonitic, mesic Torrertic Argiustolls)	
40		Summit	Mollic	Argillic Calcic	None	mixed	Fine-loamy	Fine-loamy, mixed, mesic Aridic Argiustoll	Ascalon (fine-loamy, mixed, mesic Aridic Argiustolls)	

Pit 27

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-8	A	51.3	12.0	8.9	8.9	11.8	6.7	48.2	18.9	14.7	33.6	9.9	8.4	18.3
7-38	Bt	39.7	5.3	5.5	7.6	8.9	4.9	32.2	12.1	6.8	18.9	21.3	27.6	48.9
38-80	2Bk	65.2	17.2	15.3	21.5	12.1	2.4	68.5	4.6	4.4	9.0	15.8	6.7	22.5
80-110	3BC	58.5	25.7	30.9	20.5	6.2	0.9	84.2	1.9	1.5	3.4	6.6	5.8	12.4

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-8	A	0.0	4.9	4.8	*	62	2.72	29.8	9.20	1.63	0.93	0.08
7-38	Bt	0.0	7.0	6.7	*	296	1.70	18.2	27.73	2.88	1.38	0.10
38-80	2Bk	17.7	8.0	7.6	*	128	0.50	12.4	**	**	**	**
80-110	3BC	5.2	8.1	7.6	*	71	0.26	23.5	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy						
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-8	A	7128	297	1104	790	58		24	9		6	3
7-38	Bt	9164	185	1454	753	47		24	14		3	12
38-80	2Bk	4343	83	488	467	62		19	12		3	4
80-110	3BC	3873	81	423	413	63		18	13		4	2

Pit 28

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-10	A	6.1	6.2	4.9	6.2	11.7	10.4	39.4	22.3	16.5	38.8	10.2	11.6	21.8
10-42	2Bt1	0.8	0.7	0.7	2.6	8.4	8.6	21.0	18.2	19.4	37.6	16.8	24.6	41.4
42-104	2Bt2	0.4	0.7	0.7	1.0	4.0	5.6	12.0	15.6	23.9	39.5	29.6	18.9	48.5
104-111	2Bt3	0.6	0.9	0.8	1.1	5.0	5.0	12.8	13.6	25.5	39.1	30.4	17.7	48.1

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-10	A	0.0	6.7	6.1	1.47	89	2.0	17.0	10.76	2.63	1.14	0.18
10-42	2Bt1	0.0	6.8	6.3	1.73	213	1.3	28.7	19.89	4.93	1.12	0.42
42-104	2Bt2	3.5	8.1	7.7	1.90	250	1.0	33.3	**	**	**	**
104-111	2Bt3	6.1	7.9	7.7	1.89	230	0.8	31.4	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy						
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-10	A	6986	284	600	1081	58		22	14		5	1
10-42	2Bt1	7436	255	748	957	66		18	11		3	2
42-104	2Bt2	6798	267	667	1101	66	Trace	20	9		2	4
104-111	2Bt3	7921	246	551	1002	63		19	13		2	3

Pit 29

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-7.5	A	0.8	1.0	1.1	2.4	7.6	6.1	18.2	20.7	22.4	43.1	20.1	18.6	38.7
7.5-15	Bw1	0.6	0.7	1.8	3.2	8.3	6.0	20.0	14.2	20.7	34.9	28.6	16.5	45.1
15-26	2Bw2	3.5	1.3	1.3	2.7	17.5	15.4	38.2	22.2	16.0	38.2	11.0	12.6	23.6
26-41	2Bw3	0.2	0.2	0.2	0.7	16.2	21.8	39.1	19.9	10.4	30.3	12.0	18.6	30.6
41-100	3Bw4	0.0	0.2	0.1	0.5	13.2	18.6	32.6	23.2	16.3	39.5	17.7	10.3	28.0
100-119	3Bw5	0.0	0.1	0.2	0.4	2.1	8.6	11.4	21.7	25.8	47.5	29.4	11.7	41.1

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-7.5	A	0.0	6.6	6.5	*	194	2.5	29.6	21.08	4.71	1.07	0.07
7.5-15	Bw1	3.4	7.8	7.4	1.70	218	1.3	30.9	**	**	**	**
15-26	2Bw2	4.0	7.6	7.2	1.37	94	1.4	17.7	**	**	**	**
26-41	2Bw3	2.5	7.8	7.5	1.70	148	0.9	22.1	**	**	**	**
41-100	3Bw4	7.9	8.2	7.8	1.59	121	0.5	18.9	**	**	**	**
100-119	3Bw5	6.2	8.1	7.7	1.90	187	0.3	26.9	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy						
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-7.5	A	7702	208	608	1183	65		18	12		3	2
7.5-15	Bw1	8129	243	722	1013	59		20	16		3	3
15-26	2Bw2	7286	244	555	877	57		21	16		4	2
26-41	2Bw3	8360	134	710	821	57		17	19		4	3
41-100	3Bw4	10053	178	611	679	53	Trace	17	20	Trace	5	5
100-119	3Bw5	13510	213	548	954	58	Trace	19	14		5	4

Pit 30

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-10	A	0.1	0.7	0.4	0.8	4.4	7.7	14.0	22.2	24.8	47.0	19.3	19.7	39.0
10-38	Bw1	0.0	0.7	0.4	1.0	5.3	6.7	14.1	23.6	24.0	47.6	17.2	21.1	38.3
38-48	2Bw2	27.3	10.7	9.1	7.9	11.2	6.1	45.0	13.9	14.7	28.6	12.4	14.0	26.4
48-75	2Bw3	10.3	4.8	4.5	7.8	17.6	10.5	45.2	15.6	13.8	29.4	11.2	14.2	25.4
75-110	3Bw4	4.2	2.5	2.9	2.9	7.4	7.0	22.7	16.6	17.6	34.2	21.8	21.2	43.0

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-10	A	1.6	7.6	7.3	1.54	194	2.5	31.7	**	**	**	**
10-38	Bw1	2.2	7.7	7.4	1.73	189	1.2	27.1	**	**	**	**
38-48	2Bw2	2.7	8.0	7.5	1.70	124	0.7	19.3	**	**	**	**
48-75	2Bw3	3.7	8.1	7.6	1.72	125	0.5	17.2	**	**	**	**
75-110	3Bw4	2.9	8.0	7.6	1.89	238	0.9	27.9	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy					
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-10	A	4967	193	491	1383	60		20	14		2	4
10-38	Bw1	6203	209	552	1357	61		19	13		2	4
38-48	2Bw2	7328	197	436	1034	55		19	16		4	6
48-75	2Bw3	8364	195	540	811	60		18	15		5	3
75-110	3Bw4	7275	219	830	877	64		21	10		2	2

Pit 31

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-12	A	54.4	13.4	9.2	7.7	10.2	6.9	47.4	17.0	17.9	34.9	9.6	8.1	17.7
12-47	Bt1	37.6	4.4	3.5	3.8	6.7	4.7	23.1	13.3	17.0	30.2	14.8	32.0	46.8
47-107	2Bt2	62.5	14.8	13.6	11.7	8.3	2.6	51.0	5.0	5.2	10.2	7.9	30.9	38.8
107-120	2BC	47.5	30.2	25.9	14.6	6.9	1.3	78.9	2.6	5.6	8.2	7.8	5.1	12.9

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil	Ca	Mg	K	Na
0-12	A	0.0	5.9	5.4	1.23	67	2.5	15.2	8.66	1.56	0.85	0.06
12-47	Bt1	0.0	6.6	6.1	*	254	1.2	29.4	21.00	3.90	1.29	0.11
47-107	2Bt2	0.0	6.7	6.1	*	275	0.9	27.5	17.10	4.66	1.38	0.09
107-120	2BC	13.4	8.1	7.5	*	64	0.3	13.2	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy						
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-12	A	7379	336	966	550	50		27	10		6	7
12-47	Bt1	10509	292	1339	706	63		24	7		3	3
47-107	2Bt2	9704	123	1548	612	65		21	8		4	2
107-120	2BC	3858	71	427	417	63		19	11		4	3

Pit 32

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-7	A	29.7	14.2	13.0	8.9	9.0	4.4	49.5	14.7	18.8	33.5	9.4	7.6	17.0
7-64	2Bt	43.8	10.8	11.4	7.6	5.2	2.1	37.1	3.4	5.2	8.6	14.0	40.3	54.3
64-110	2Btk	49.9	18.4	17.8	13.8	8.1	2.1	60.2	4.1	8.6	12.7	19.0	8.1	27.1

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-7	A	0.0	4.9	4.7	*	63	2.9	15.1	7.57	1.37	1.28	0.05
7-64	2Bt	0.0	6.1	5.7	*	338	1.2	33.4	21.11	3.97	1.47	0.08
64-110	2Btk	21.6	7.9	7.5	1.85	132	0.6	19.9	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy						
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-7	A	7520	289	1289	637	55		23	11		6	5
7-64	2Bt	11202	179	1956	708	62		25	8		3	2
64-110	2Btk	5212	90	813	469	59		22	13		3	3

Pit 33

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-12	A	19.4	15.7	16.0	7.9	8.7	3.6	51.9	11.8	15.6	27.4	10.3	10.4	20.7
12-29	Bt1	50.5	30.4	10.5	5.4	4.5	1.9	52.7	3.5	10.5	14.0	8.7	24.6	33.3
29-82	2Bt2	6.7	4.4	5.4	5.0	7.3	3.4	25.4	10.0	19.3	29.3	18.2	27.2	45.4
82-110	2Bt3	18.4	5.3	5.6	4.7	5.7	3.3	24.6	11.5	19.6	31.1	38.6	5.7	44.3

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-12	A	4.3	7.2	6.9	*	79	3.9	18.8	15.69	3.12	1.92	0.17
12-29	Bt1	0.0	7.0	6.6	*	189	1.5	25.3	15.94	4.40	1.57	0.60
29-82	2Bt2	0.0	6.8	6.6	1.79	268	0.9	31.3	22.84	5.30	1.10	0.85
82-110	2Bt3	5.5	7.8	7.7	1.62	275	0.8	36.1	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy						
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-12	A	5858	255	760	773	61		18	11		4	6
12-29	Bt1	6888	200	915	681	60		27	7		3	3
29-82	2Bt2	7914	291	1272	625	65		25	7		2	2
82-110	2Bt3	4058	72	895	618	64		26	7		1	1

Pit 34

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-14	A	21.1	5.5	4.3	7.7	14.5	9.9	41.9	18.8	15.5	34.3	11.0	12.8	23.8
14-56	Bt	2.2	3.2	3.8	4.5	8.1	5.2	24.8	15.0	13.9	28.9	12.4	33.9	46.3
56-96 part 2	Bt	9.1	3.6	3.9	6.3	12.7	7.7	34.2	15.0	16.5	31.5	13.1	21.2	34.3
56-96 part 1	Btk	21.8	8.5	6.6	6.5	10.4	6.6	38.6	14.2	17.0	31.2	15.9	14.3	30.2
96-110	B	13.4	4.1	4.9	7.6	15.3	8.9	40.8	16.1	14.4	30.5	17.9	10.8	28.7

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-14	A	0.0	6.0	5.7	1.48	95	2.2	18.4	11.16	3.03	1.21	0.06
14-56	Bt	0.0	6.8	6.4	1.84	282	1.1	29.2	20.07	7.80	1.14	0.14
56-96 part 2	Bt	1.6	7.9	7.5	1.79	201	0.7	26.8	**	**	**	**
56-96 part 1	Btk	3.0	8.0	7.7	1.79	171	0.6	22.6	**	**	**	**
96-110	B	3.2	8.0	7.7	1.81	156	0.4	21.3	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy						
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-14	A	8602	353	813	686	54		26	10		5	4
14-56	Bt	10501	294	1053	657	63		23	8		3	3
56-96 part 2	Bt	8788	334	770	651	65		20	8		4	3
56-96 part 1	Btk	8487	254	712	517	65		18	10		4	3
96-110	B	8483	302	603	517	67		16	10		4	4

Pit 35

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-6	A	0.1	1.8	1.9	3.0	6.0	5.1	17.8	23.3	27.3	50.6	20.0	11.6	31.6
6-19	Bw1	0.4	2.2	2.4	4.2	9.5	6.5	24.8	21.5	23.2	44.7	17.5	13.0	30.5
19-43	2Bw2	37.3	16.6	11.8	8.3	10.1	4.6	51.4	10.8	12.4	23.2	10.8	14.6	25.4
43-60	3Bw3	43.7	18.8	19.4	16.0	12.8	3.2	70.2	7.5	6.7	14.2	6.4	9.2	15.6
60-74	4Bw4	14.8	2.7	7.4	12.3	20.5	6.4	49.3	12.9	12.4	25.3	10.6	14.8	25.4
74-110	5Bw5	52.5	18.3	22.4	16.5	10.9	3.7	71.7	6.5	5.5	11.9	6.4	10.1	16.5

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-6	A	0.0	6.9	6.6	*	144	5.0	26.9	21.12	5.99	2.33	0.31
6-19	Bw1	1.6	7.1	6.8	1.57	148	2.5	23.7	18.34	5.02	1.70	0.49
19-43	2Bw2	3.0	8.0	7.5	*	147	1.2	20.8	**	**	**	**
43-60	3Bw3	2.2	8.3	7.6	1.69	89	0.5	15.6	**	**	**	**
60-74	4Bw4	2.8	8.3	7.7	1.77	145	1.0	21.2	**	**	**	**
74-110	5Bw5	2.7	8.3	7.8	1.72	103	0.4	13.8	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy						
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-6	A	6778	385	551	1135	58		22	13		3	4
6-19	Bw1	6872	306	494	1173	60		23	11		3	3
19-43	2Bw2	6748	181	652	903	61		23	10		4	3
43-60	3Bw3	6751	114	485	594	56		25	10		6	3
60-74	4Bw4	7709	223	706	686	65		21	8		4	3
74-110	5Bw5	7950	123	512	679	63		20	8		7	2

Pit 36

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-6	A	16.1	7.1	8.7	10.5	15.0	7.3	48.6	16.1	10.4	26.5	12.0	12.9	24.9
7-24	2Bw1	25.7	8.2	6.0	7.2	11.0	4.5	36.9	9.3	10.1	19.4	36.5	7.2	43.7
24-52 split part 1	2Bk	10.8	3.9	4.0	7.0	10.5	4.3	29.7	9.0	13.0	22.0	40.5	7.8	48.3
24-52 split part 2	2Bw2	70.6	23.9	14.1	9.3	7.1	2.4	56.8	5.6	7.2	12.8	24.8	5.6	30.4
52-92	3Bk2	0.2	0.4	1.4	4.9	13.6	5.7	26.0	10.1	18.2	28.3	38.6	7.1	45.7
92-112	4Bw4	41.5	11.1	9.5	11.9	15.2	5.0	52.7	8.9	10.4	19.3	19.6	8.4	28.0

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-6	A	0.0	6.7	6.6	*	124	2.9	21.6	16.46	2.50	0.97	0.06
7-24	2Bw1	5.1	7.4	7.1	1.44	266	1.9	31.2	**	**	**	**
24-52 split part 1	2Bk	38.4	8.0	7.6	*	147	0.9	19.0	**	**	**	**
24-52 split part 2	2Bw2	4.6	7.8	7.4	*	225	1.4	27.2	**	**	**	**
52-92	3Bk2	43.3	8.1	7.7	*	117	0.5	15.3	**	**	**	**
92-112	4Bw4	16.0	8.1	7.7	1.88	126	0.4	15.4	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy						
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-6	A	7859	233	816	731	58		23	11		5	4
7-24	2Bw1	9589	154	1164	568	64		20	10		3	2
24-52 split part 1	2Bk	4964	67	653	252	59		18	19	Trace	1	2
24-52 split part 2	2Bw2	8814	148	985	473	65		20	9		4	3
52-92	3Bk2	4172	62	380	251	55		16	24	Trace	1	3
92-112	4Bw4	7119	122	489	381	64		16	13	Trace	4	3

Pit 37

Depth	Horizon	>2mm Rock Fragments	Particle Size <2mm: Sand						Silt			Clay		
cm		% Total	% Very Coarse	% Coarse	% Medium	% Fine	% Very Fine	% Total	% Coarse	% Fine	% Total	% Coarse	% Fine	% Total
0-8	A	0.6	1.5	2.4	6.1	16.0	10.1	36.1	19.3	13.0	32.3	16.0	15.6	31.6
8-25	Bt1	6.8	1.9	3.0	6.6	15.7	8.6	35.8	14.2	11.7	25.9	27.7	10.8	38.3
25-51	Bt2	2.9	2.3	2.3	5.1	13.2	7.7	30.6	14.8	14.3	29.1	28.0	12.3	40.3
51-82	2Bt3	0.5	0.9	1.0	2.4	5.4	8.9	18.6	18.5	21.1	39.6	30.4	11.4	41.8
82-120	2Bt4	0.5	0.5	1.0	2.6	8.8	5.0	17.9	18.1	20.2	38.3	32.2	11.6	43.8

Depth	Horizon	$CaCO_3$ EQUIV	pH		Bulk Density	Specific Surface Area	OC	CEC	Exchangeable Bases			
									Ca	Mg	K	Na
cm		%	H_2O	$CaCl_2$	Mg/m^3	m^2/g	%	meq/100g soil				
0-8	A	2.5	7.7	7.4	*	174	3.0	23.1	**	**	**	**
8-25	Bt1	3.4	8.0	7.5	1.80	254	0.9	25.2	**	**	**	**
25-51	Bt2	11.3	8.3	7.8	1.73	210	0.6	23.4	**	**	**	**
51-82	2Bt3	9.6	8.4	7.9	1.74	240	0.2	26.6	**	**	**	**
82-120	2Bt4	5.7	8.2	7.9	1.57	191	0.7	22.3	**	**	**	**

** Not determined due to presence of free carbonates
* Not determined due to insufficient sample size

Depth	Horizon	Free Sesquioxides (Dithionite Extractable)				Clay Mineralogy					
		Fe	Mn	Al	Si	Smectite	Vermiculite	Clay mica	Kaolinite	Hydroxy-interlayered	Fe_2O_3	Quartz
cm		µg /g soil				%						
0-8	A	5887	272	492	777	60		25	9		3	3
8-25	Bt1	6302	195	610	523	67		21	7		2	2
25-51	Bt2	6020	195	553	565	69		18	9		2	1
51-82	2Bt3	6439	227	500	568	66		22	7		2	2
82-120	2Bt4	6561	251	440	649	63		25	8		2	2

A Comprehensive Appraisal of Americium-241 in Soils of Operable Units 1, 2, & 3: A Basis For Risk Analysis

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ABSTRACT

Soils east of Rocky Flats Plant (RFETS) near Golden, Colorado were contaminated with actinides because of accidental release of oils laden with Plutonium isotopes. Consequently, these soils were contaminated by Am-241 due to radioactive decay of Pu-241 ($t_{1/2}$ = 14.4 yrs). A spatial analysis of Am-241 activity in soils east of RFETS was conducted to elucidate the magnitude and the mode of Am-241 dispersion in the soil environment. Americium-241 activity of 178 soil samples ranged from 0.001 pCi/g to 270 pCi/g with a mean of 5.8 pCi/g , median of 0.19 pCi/g, standard deviation of 25.5 pCi/g, and a coefficient of variation of 4.3. The technique of nonparametric indicator kriging was used to model a conditional cumulative distribution function (ccdf) of Am-241 in soils around RFETS. The ccdf was used to generate an E-type (mean of the conditional cdf) surface. The resulted surfaces were consistent with the hypothesis that the westerly winds were the dominant mechanism of Am dispersal. The ccdf was also used to construct probability of exceedence maps of Am-241 in soils. For the purpose of this report two threshold values for the probability maps were selected: (1) the mean measured background activity of Am-241 (0.011 pCi/g), and (2) the programmatic preliminary remediation goal for residential occupancy ~~scenario~~ (2.37 pCi/g). The probability-of-exceedence maps provide estimates of spatial uncertainty associated with each threshold. The E-type maps in conjunction with the probability-of-exceedence maps provide a robust framework for future cleanup options and landuse decisions.

INTRODUCTION

Actinide contamination of surface soils at Rocky Flats Environmental Technology Site (RFETS), near Golden, Colorado resulted from leakage of plutonium-contaminated oils from drums stored in an outside storage area. The magnitude and the mode of Pu dispersion in the soil environment was discussed by Krey and Hardy, 1970, Seed et al., 1971, Little et al., 1980, and more recently by Litaor (1993; 1995b). The isotopic composition of weapon grade Pu processed at RFETS was reported to have isotopic composition of: 0.04% Pu-238, 93.3% Pu-239, 6% Pu-240, 0.58% Pu-241, and 0.04% Pu-242 (Krey and Krajewski, 1972 and Martell, 1975). The initial Am-241 activity in the weapons grade Pu processed at RFETS did not exceed 10^{-4} percent (Krey et al., 1976). Consequently, nearlly all the Am-241 activity in the soil around RFETS resulted from radioactive decay of Pu-241 ($t_{1/2}$ = 14.4 yrs) to Am-241.

The physicochemical characteristics of Am-241 in the environment are markedly different than those of Pu-239+240. Fowler and Essington (1974) ascertained that Am is more soluble than Pu and may become the radionuclide of prime concern because it has a faster migration rate in soils. Romney et al (1985) showed that root uptake of Am-241 by various plants was consistently greater than that of Pu. Am-241 exhibited a higher solubility than did Pu-238 and Pu-239+240, as observed in rumen contents of cattle grazing on actinide-contaminated desert vegetation (Barth et al., 1985).

The effectiveness of wind transport mechanisms in spreading the actinides across the landscape may vary among different radionuclides. For example, Am-241 was transported in the air across the Hanford site in different particle-sizes and reached maximum concentration at

different heights than those of Pu-239 (Sehmel, 1978). Hence, the spatial distribution of Am-241 in the soil environment at RFETS may vary considerably more than that of Pu isotopes.

Several studies assessed the spatial distribution and the total inventory of Pu in soils around RFETS, although no studies have assessed the spatial distribution and inventory of Am-241 in these soils. Human risk analysis was performed only with Pu data. For example, Johnson (1981) modified the isopleth map of Pu given by Krey (1976) to estimate cancer incidence rates in the Greater Denver area. Cancer potency comparison tables suggest that the carcinogenicity of Am-241 is approximately equal to that of Pu-239 for both inhalation and ingestion exposure routes (USEPA, 1992). The consistent presence of Am-241 with Pu-239+240 resulted in approximate 2 fold overall increase in cancer risk. Hence, an assessment of the spatial distribution of Am-241 in soils around RFETS is essential for future risk assessment of potential human risk associated with surface soils contaminated by Am-241.

The main goal of the current work is to provide a complete appraisal of the spatial extent of Am-241 in soils around RFETS. The appraisal would form the basis for human health risk assessment. This work supports the remedial investigations of actinides in surficial soils at RFETS for Opreable Units 1, 2, and 3. The objectives of the present study are to: (1) assess the spatial distribution of Am-241 in soils east of RFETS using robust geostatistical techniques, and (2) provide a measure of uncertainty to the spatial estimation of Am-241.

METHODS

Field Sampling

The sampling of Am-241 in soils east of RFETS followed the protocol of the Colorado Department of Public Health and Environment (CDPHE) (CDH, 1977). This sampling protocol

requires the collection of 25 equally-spaced subsamples, to be composited within a 4.05 ha area for Am analysis. The soil at each individual location was sampled with the CDPHE sampler, which was designed to obtain a sample from the upper soil surface 0.64 cm deep, and from an area 5-cm wide by 6- cm long. For this study, the southwest corner of each plot was located by survey and identified with an appropriately marked steel post. The 25 subsamples for the composite sample were located with a hand-held compass and tape measure, using the southwest corner as the starting point. Sampling of the top 6.4 mm of the soil may be difficult, especially in stony soils. The use of this technique was advocated by CDPHE because of the semi-arid conditions in eastern Colorado that increased the potential for wind-resuspension and subsequent inhalation of soil particles containing Am from the top soil. The rationale and density of sampling of Am-241 in soils was similar to that of Pu-239+240 (see Chapter I). One hundred and forty four 4.05 ha plots and 34 1.01 ha plots were used for a total of 178 plots (Figure 1).

Laboratory Analysis

The Am-241 activity in the soil samples was measured by alpha spectroscopy using various commercial laboratories. The soil samples were digested using a microwave dissolution procedure (Lamothe et al., 1986; Fischer, 1986), and the sample was leached with nitric acid. Hydroxides and carbonate forming elements (e.g., Am) were precipitated out of the solution with NH_4OH and $(NH_4)_2CO_3$ respectively. The dry precipitate was redissolved with nitric acid and passed through an anion exchange column to remove the non-trivalent actinides. Trivalent actinides and lanthanides were co-precipitated with calcium using oxalic acid, calcium carrier, and NH_4OH. The precipitate was redissolved using HCl and passed through a column of mixed anion-cation resin to remove some of the calcium and all of the iron. Cesium and the remaining

of the calcium were extracted from the solution using double extraction into DDCP (dibutyl-N,N-diethycarbamylphosphonate), a back extraction into dilute HNO_3, and then heating to dryness. The sample was redissolved in an alcoholic dilute-acid solution and passed through an anion-exchange column to remove trivalent lanthanides. This column was washed with mixture of alcohol, dilute acids, and NH_4SCN for partial separation of Am from Cm. The sample was then converted to a sulfate form and heated to dryness. The sample was redissolved and electroplated onto stainless steel discs. Upon completion of the electroplating, ammonium hydroxide was added to the solution to prevent redissolution of the deposit. In several cases where electroplating failed, the samples were mounted for alpha spectrometric analysis using a neodymium fluoride coprecipitation technique (Hindman, 1983, 1986). Similar percent recoveries for Am-241 and Am-243 were reported for electroplating and coprecipitation techniques (Sill and williams, 1981).

Geostatistical Approach

The spatial distribution of Am-241 in the soil environment of RFETS was assessed according to the following steps:

(1) A general exploratory data analysis in which univariate statistics was performed and the benefits of data transformation and declustering were assessed;

(2) Selection of K threshold values for the calculated conditional cummulative distribution function (ccdf) was performed using 8 cutoffs which define the Am-241 ccdf;

(3) Indicator semivariograms were computed for these 8 cutoffs (see Chapter I for details);

(4) The accuracy of IK in estimating the ccdf at the 8 cutoffs was examined by a cross validation analysis. This analysis consisted of estimating a ccdf at a datum location where the Am-241

activity was temporarily removed from the data set. This procedure repeated itself at all data locations. The true value at a given cutoff was compared against a computed value at that cutoff;

(5) The ordinary indicator kriging algorithm was used to generate cumulative indicator functions, and compute the probability estimates for the unsampled area according to certain grid specifications. In general, a 5500 m search radius was used with a minimum of 4 and a maximum of 10 data points required to estimate a grid point. The ordinary indicator kriging equations system were solved for all the 8 cutoff values. This provided the uncertainty through the 8 selected discrete ccdf values.

(6) The ccdf for any required quantile or probabilities of exceeding a threshold value of interest (e.g., Programmatic Remediation Goals) and the E-type estimate (mean of the ccdf) were computed (see Chapter I for details); The ccdf of Am-241 in the soils around RFETS showed large positively skewed distribution (see below), thus, the upper tail of this ccdf was calculated using a hyperbolic model (see Chapter I):

The IK analysis was performed using GSLIB-the geostatistical software library and user's guide (Deutsch and Journel, 1992). The original GSLIB software provided for data entry through parameter files entered in a specific format. Minimal internal documentation of parameter values and definitions was provided, and data entry with program parameter files was tedious and prone to execution errors. GSLIB did not provide an interactive display of the modelling results. Hence, a menu-driven windows interface was developed for GSLIB to facilitate the data entry, program execution, and display of data in tabular and graphical formats.

DATA QUALITY

Quality Assurance and Quality Control Practices

Quality Control Samples

Equipment rinsate blanks were collected to quantify possible cross contamination due to potentially insufficient decontamination practices between samples. The blanks were collected by rinsing decontaminated sampling equipment with laboratory-grade water, placing it in the appropriate container, and preserving it as required. The data for equipment rinsate blanks indicate that the sampling practices did not produce a significant source of cross contamination among samples (Table 1).

Field Duplicates

Duplicate soil samples were collected systematically for the surficial soil sampling program (Table 2). The data from the sample and duplicate provide a measure of the sampling precision and sample homogeneity (i.e., a measure of the amount of error in the data attributible to sampling technique or to variability in the distribution of actinides in the soil environment). Precision was quantified by calculating the relative percent difference (RPD). The RPD is the quotient of the difference between duplicate analytical results, and the average of those results expressed as a percentage. A control limit of ±35 percent for the RPD in laboratory duplicate analysis was recommended by the laboratory data validation guideline drafted by EPA in 1988. There is no established criteria for the overall soil sampling and laboratory precision analysis. This is because the large variability of metals distribution in soils. Indeed, the RPD values for all duplicate samples for OU 3 ranged from 8 to 156 percent. It should be noted, however, that the highest value in each

duplicate samples was used in the spatial analysis of Am-241 in the soil environment around RFETS.

Below-Detection-Limit Data

The presence of data below the detection limit is a result of the low levels or absence of a given actinide in the soil sample, as well as the analytical detection limit. For statistical analysis, all below-detection-limit data were replaced with one half the detection limit. The results of the actinide activity, counting error, error percent, detection limits, and other validation criteria are presented in Table 3. The errors reported in Table 3 indicate the counting error of each soil sample. Most of the counting errors were below 35 percent. In general, samples with low Am-241 activity were characterized by high counting errors.

RESULTS AND DISCUSSION

Exploratory Analysis

Americium activity in soils east of RFETS ranged from 270 pCi/g near the former storage site to 0.001 pCi/g at the far southeast corner of the sampling area. The mean activity of Am-241 was 5.8 pCi/g, median of 0.197 pCi/g, with a standard deviation of 25.4 pCi/g, a coefficient of skewness of 8.0 and a kurtosis of 75.7. The effect of few outliers on the mean and the variance of the ccdf can be clearly seen in Figure 2. The positively skewed distribution justified the use of nonparametric spatial estimation techniques such as IK.

Variography

The ccdf depicted in Figure 2, provided 8 cutoffs from which 8 indicator variograms were modelled. The eight indicator variograms with their models' parameters are summarized in Table 4 and illustrated in Figure 3.

Cross Validation Analysis

The Indicator variograms model parameters were tested using the cross-validation technique. Indicator values at each cutoff were kriged and the mean of both actuals and estimates computed. Each cutoff represents a point on the underlying ccdf, thus the mean estimated value should be favorably compared with the known mean at that cutoff. For example, if the first cutoff represents the ten percent point of the ccdf, the mean of the actual and estimated indicators should be approximately 0.10. Significant deviation from the underlying ccdf would suggest a problem with the modeling strategy. The validation results using isotropic models described in Table 4 and Figure 3 are summarized in Table 5. The validation results for all data sets indicated that the models adequately represent the underlying cdf. Cross validation analysis conducted on anisotropic models did not improve the estimation results, thus the isotropic indicator variograms were used in the IK analysis.

E-Type Estimate of Am-241 in Soils East of RFETS

The E-type estimate surfaces of Am-241, which is the mean value of the cdf at each specified grid point is depicted in Figure 4. The E-type estimate $E(z^*(u))$, is considered the closest possible to the true value $Z(u)$ (Goovaerts, 1994). The E-type estimates of Am-241 activity showed a clear west-east trend. This trend is characterized by high values near the former storage area with a rapid decline towards the eastern plant boundary and the residential areas east of Indiana Street. The Am-241 activity in the soils decreased rapidly in the north and south directions. This pattern reflected wind dispersion consistent with the prevailing winds at RFETS (Krey and Hardy, 1970). These findings reaffirmed previous studies that suggested

eolian transport of resuspended soil particles was the dominant process in the dispersion of actinides in the environment (Seed et al., 1971; Little et al., 1980; Litaor, 1995a; 1995b).

Probability of Exceeding a Threshold Value

Several maps of conditional probabilities were generated to provide areas of uncertainty around the isopleths of the E-type estimates. To create these maps, two threshold values were selected; the first value represents a background level of Am-241 in the Denver area, and the second is the programmatic preliminary remediation goal (PPRG) value.

Background Level of Am-241

Fifty soil samples from undisturbed areas along the Front Range of Colorado were collected to assess the background level of Am-241 (Whiting, 1994, personnel communication). The 50 locations ranged from 12 km to 170 km away from RFETS. All locations were upwind and upstream from RFETS, thus unaffected by the site's activities. The background level of Am-241 in soils is assumed to represent the global-fallout of Pu-241 that was originated from atmospheric testing of nuclear weapons. The distribution of Am-241 in background soils is presented in Figure 5. Based on the statistics presented in Figure 5 it was assumed that the arithmetic mean of Am-241 represents a reasonable background threshold value for the Denver area.

The probability map for the background concentrations of Am-241 clearly demonstrates the large uncertainty associated with the E-type estimate isopleths (Figure 6). Areas within 4 km radius east of the plant's outer boundary (i.e., Indiana Street), exhibited a greater than 80 percent probability of exceedance the mean global-fallout Am. However, areas, only 7 km east of the outer boundary exhibited a less than 20 percent probability of exceedance the mean global-

fallout Am. Similar pattern was observed for Pu-239+240 (see Chapter I & Litaor et al. in review). This uncertainty must be taken into account when attempting to correlate the potential environmental and human health risks from RFETS-derived Am on the Greater Denver area.

Cleanup Options for Environmental Restoration

Risk-based programmatic preliminary remediation goals (PPRG) were computed for radionuclides in soils in RFETS (DOE, 1995). These PPRGs were based on both residential and commercial/ industrial scenarios. The PPRG calculations followed USEPA (1989, 1991) guidance and were supplemented with RFETS specific information (DOE, 1995). A PPRG of 2.37 pCi/g of Am-241 in soil was computed to meet the stringent requirements of a residential scenario. Map showing the probability of exceedance of the computed PPRG for residential scenario at RFETS has been produced (Figure 7). This map delineates the areas declared potentially hazardous, on the basis of the residential scenario using the estimate $Am^{*}(u) > 2.37$ pCi/g, providing the probability $1 - \alpha(u)$ to make a correct remediation decision for all locations (u) such that $Am^{*} > 2.37$ pCi/g at a given probability will follow:

$$1 - \alpha(u) = \mathrm{Prob}(Am(u) > 2.37 \mid (n)) \qquad (1)$$

Under these conditions, significant portion of the land east of the former storage site within the buffer zone of RFETS would need to be remediated if meeting the residential scenario requirement is the land use decision. The cleanup of such a large area (358,801 m^2 at 80 percent probability, and 799,539 m^2 at 60 percent probability) is unrealistic in terms of cost, waste generation and land reclamation to minimize slope erosion that must follow such a large-scale removal of the top soil.

Am-241/Pu-239+240 Ratio

The mean Am-241/Pu-239+240 activity ratio in the 178 soil samples was 0.319 with a standard deviation of 0.531. This ratio did not agree with an earlier work by Litaor (1995b) who sampled 118 soil samples within the plant boundaries and reported a ratio of 0.19 (Table 6). Significantly larger activity ratios were calculated for off plant locations (Operable Unit 3). For example, the *lower quantile* of the Am-241/Pu-239+240 activity ratios calculated from 60 soil samples taken from off site locations exhibited similar value to the *mean* activity ratio calculated from samples taken within the plant boundaries (Table 6). From parent-daughter radioactive decay relationships, the history of the site, the isotopic composition inside the stored barrels, the initial amount of Pu released, and number of years since the initial release (see Appendix I for details), Litaor (1995a) calculated that in 1992 the Am-241/Pu-239-240 activity ratio in soils within the plant boundaries (OU 2) should have been 0.17, which agreed well with the 0.19 mean ratio measured in 1991 (see Table 6). The source of the apparent discrapency between off site and within plant boundary locations originated from the analytical uncertainty associated with measuring low actinide activities close to the detection limits. The analytical errors associated with the samples collected within the plant boundaries and those associated with off plant samples are also summaried in Table 6. Errors as high as 400 percent were recorded for samples taken off site, with mean error of 83 percent compared with mean error of 15 percent observed for soil samples taken within the plant boundaries. Hence, caution should be exercised when attempting to use the activity ratio to ascertain the history of release of actinides in the environment (see Litaor, 1995b).

Concluding Remark

This study has provided a comprehensive appraisal of the extent of Am in the soil environs. The major finding of this work was that the spatial distribution and dispersal mechanisms of Am-241 were similar to those of Pu-239+240. The area adjacent to the former storage site is the most significantly contaminated with Am-241 in spite of several soil removal operations (Baker, 1982). The ccdf was used to generate an E-type estimate (mean of the ccdf) and probability-of-exceedence maps. These probability-of-exceedance maps provided the background information required for selecting remedial actions and/or corrective measures for cleanup.

APPENDIX I : Radioactive Decay and Growth Calculations

The exponential law of decay for radionuclides is described by:

$$N_1 = N_1^0 e^{-lt} \qquad (I1)$$

where N_1 is the number of unchanged atoms at time t, N_1^0 is the number of atoms at t = 0, and l is a decay constant. The decay constant is conveniently described by the half life concept ($t_{1/2}$):

$$l = \ln 2/t_{1/2} \approx 0.693/t_{1/2} \qquad (I2)$$

where $t_{1/2}$ is the time required for an initial number of atoms to be reduced on the average to half that number by transformation.

N_1^0 is derived from the known weight (W) of the radionuclide under study, its molecular weight (M) and the Avogadro's number Ag:

$$N_1^0 = (W/M)Ag \qquad (I3)$$

In practice, the activity (A) of a radionuclide is measured, where

$$A = clN \qquad (I4)$$

and c is the detection coefficient which depends on the nature of the detection instrument.

The decay rate of a single radionuclide is described by

$$\frac{dN_1}{dt} = l_1 N_1 \qquad (I5)$$

The decay rate of a daughter isotope resulting from the transformation described by equation I5 is:

$$\frac{dN_2}{dt} + l_2 N_2 - l_1 N_1^0 e^{-lt} = 0 \qquad (I6)$$

where l_2 and N_2 are the decay constant and the number of atoms of the daughter isotope respectively.

The solution of this differential equation is:

$$N_2 = \frac{l_1}{l_2 - l_1} N_1^0 (e^{-l1t} - e^{-l2t}) + N_2^0 e^{-l2t} \qquad (I7)$$

Equations I1 through I7 were used to calculate the ratio of Am-241/Pu-239+240. Using equation I2 the l values for the radionuclide under study are: Pu-239; $l = 2.87 * 10^{-6}$ yr^{-1}, Pu-241; $l_1 = 0.0481$ yr^{-1}, and Am-241; $l_2 = 0.0016$ yr^{-1}.

Several assumptions were made in order to compute the Am-241/Pu-239+240 activity ratio in the soils at RFETS. First, the total amount of Pu released to the environment did not exceed 86 grams (Seed et al., 1971). Second, the weight percent of Pu-239+240 was 99.6 (Krey et al., 1976), and third, an equal detection coefficients (c) for the isotopes under study. Using equations I1, I3, and I4 the activity of Pu-239+240 35 yrs after the first release was $A_{Pu\text{-}239+240} = 6.2 * 10^{18}$. Assuming that the weighted percent of Pu-241 was 0.4, and that the initial weighted percent of Am-241 was 10^{-4} (Krey et al., 1976), the activity of Am-241 after 35 yrs since the initial release was calculated to be (using equation I7 and neglecting its second term): $A_{Am\text{-}241} = 1.066 * 10^{18}$. So, the calculated ratio of Am-241/Pu239+240 is 0.17.

A condition of non-equilibrium exists between Pu-241 ---> Am-241, because the parent isotope is shorter-lived ($t_{1/2}$ = 14.4 yrs) than the daughter isotope ($t_{1/2}$ = 433). In a case of non-equilibrium, the time (tm) that it takes for the daughter isotope to reach its maximum activity can be calculated by differentiating

equation I7:

$$\frac{dN_2}{dt} = -\frac{l_1}{l_2 - l_1} N_1^0 e^{-l_1 t} + \frac{l_1 l_2}{l_2 - l_1} \qquad (I8)$$

Setting $dN_2/dt = 0$ when $t = t_m$ and rearranging:

$$t_m = 1/(l_2 - l_1)\ln(l_2/l_1) \qquad (I9)$$

Solving equations I2 for l_1 and l_2 and I9 for tm suggests that Am-241 will reach its maximum activity by the year 2032. These calculations agreed well with Krey et al. (1976) who estimated in 1975 that Am-241 activity in the soils of RFETS will reach a maximum in the year 2033 and the Am-241/Pu239+240 ratio will reach 0.18.

Table 1 AM-241 Activity in Rinsate Samples for OU3 Using the CDH Method

Location	North	East	QC	Result pCi/g	Error	Error %	Detection Limits pCi/g	Validation	Qualifiers			
134	761609	2091083	RNS	0.15	0.01938	12.9	0.0014	A	4			
135	742201	2089620	RNS	0.0005	0.00313	626.0	0.0063	A	4			52
195	735437	2094350	RNS	0.002	0.002	100.0	0.001	V				

Table 2 AM-241 Duplicate Samples and Their Relative Percent Diferences for OU3 Using the CDH Method

Location	North	East	QC	Result pCi/g	RPD %	Error %	Detection Limits pCi/g	Validation	Qualifiers			
140	753634	2094474	Rea	0.002	155.6	200.0	0.006	V				
140	753634	2094474	Dup	0.016		62.5	0.002	V				
148	760490	2099421	Rea	0.002	120	300.0	0.007	A	61			
148	760490	2099421	Dup	0.008		100.0	0.004	A	61			
160	750348	2102495	Real	0.006	90.9	100.0	0.005	A	61	21		
160	750348	2102495	Dup	0.016		75.0	0.007	A	61	21		
161	745980	2104009	Real	0.01862	57.5	44.7	0	A	18	32	99	78
161	745980	2104009	Dup	0.0103		56.3	0	A	18	32	99	78
170	735567	2106887	Real	0.002	142.9	400.0	0.013	V				
170	735567	2106887	Dup	0.012		83.3	0.005	V				
194	739581	2096800	Real	0.013	8	61.5	0.007					
194	739581	2096800	Dup	0.012		50.0	0.004					
195	735437	2094350	Real	0.041	115.4	34.1	0.002					
195	735437	2094350	Dup	0.011		90.9	0.006					

Table 3 OU1, 2, and 3 Am-241 Activity, Counting Error Using the CDH Method

Plot Number	North	East	Am241 pCi/g	Error pCi/g	Error %	Detection Limits pCi/g	Validation *	Qualifiers			
0	748009	2083967	0.091	0.023	25	0.000	V	78			
1	747349	2083827	0.069	0.022	31	0.000	A	4	78		
3	748009	2084487	0.23	0.042	18	0.000	V	78			
4	747349	2084487	0.122	0.029	23	0.000	V	78			
5	746689	2084487	0.071	0.022	31	0.011	V	18	52	78	
6	749658	2085146	0.184	0.038	20	0.011	V	18	78		
10	748009	2085146	0.618	0.085	13	0.000	V	78			
11	747349	2085146	0.064	0.019	29	0.000	V	78			
12	746689	2085146	0.087	0.036	41	0.018	V	18	52	78	
13	749658	2085476	0.11	0.032	29	0.008	V	18	78		
15	748998	2085476	2.255	0.442	19	0.000	A	18	21	78	
16	748668	2085476	6.065	0.802	13	0.000	V	18	78		
19	748998	2085806	12.51	1.48	11	0.000	A	18	21	78	
20	748668	2085806	35.328	13.702	38	0.138	A	4	99	78	84
21	748339	2085806	19.322	6.956	36	0.215	A	4	99	78	84
22	748009	2085806	1.855	0.212	11	0.000	V	78			
23	747349	2085806	0.257	0.046	17	0.000	A	4	78		
24	746689	2085806	0.122	0.044	36	0.019	V	18	52	78	
25	746029	2085806	0.271	0.068	25	0.026	V	18	36	52	78
26	749658	2086136	1.355	0.19	14	0.019	V	18	78		
27	749328	2086136	9.369	2.536	27	0.092	A	18	4	36	78
28	748998	2086136	270.4	25.2	9	0.000	A	18	21	78	
29	748668	2086136	89.51	8.59	9	0.000	A	18	21	78	
30	748339	2086136	27.66	3.25	11	0.000	A	18	21	78	
31	748009	2086136	3.414	0.59	17	0.000	A	18	21	78	
32	749658	2086466	5.556	0.73	13	0.011	V	18	78		
33	749328	2086466	15.82	4.056	25	0.173	A	18	4	36	78
34	748998	2086466	164.1	15.4	9	0.000	A	18	21	78	
35	748668	2086466	66.3	6.46	9	0.000	A	18	21	78	
36	748339	2086466	14.736	5.358	36	0.090	A	4	99	78	84
37	748009	2086466	3.856	0.504	13	0.010	V	18	78		
38	747349	2086466	0.64	0.114	17	0.010	V	18	78		
39	746689	2086466	0.283	0.068	24	0.000	V	18	52	78	
40	746029	2086466	0.15	0.03	20	0.010	V	52	78		
41	745369	2086466	0.143	0.03	21	0.005	V	52	78		
42	751308	2086466	0.204	0.046	22	0.000	A	62	30	85	
43	750648	2086466	0.132	0.04	30	0.000	A	62	30	61	85
44	749658	2086796	5.84	0.71	12	0.017	V	18	78		
45	749328	2086796	26.34	2.75	10	0.000	A	18	21	78	
46	748998	2086796	54.18	5.43	10	0.094	A	18	21	78	
47	748668	2086796	25.55	2.73	10	0.000	A	18	21	78	
48	748339	2086796	9.498	1.08	11	0.000	V	78			
49	748009	2086796	4.681	0.603	12	0.000	V	78			
50	751308	2087126	0.192	0.074	38	0.016	A	62	30	61	85
51	750648	2087126	0.184	0.036	19	0.006	V	18	52	78	
52	749988	2087126	1.422	0.222	15	0.017	V	18	52	78	
53	749658	2087126	6.835	0.874	12	0.011	V	18	78		
54	749328	2087126	20.916	6.284	30	0.127	A	18	4	36	78
55	748668	2087126	11.998	3.772	31	0.287	A	18	4	36	78
56	748009	2087126	5.064	0.622	12	0.013	V	18	78		
57	747349	2087126	1.113	0.138	12	0.000	A	4	78		
58	746689	2087126	0.877	0.1	11	0.009	V	52	78		
59	746029	2087126	0.22	0.044	20	0.012	V	52	78		
60	745369	2087126	0.097	0.024	24	0.008	V	52	78		
61	749658	2087456	4.613	0.572	12	0.024	V	18	36	78	
62	749328	2087456	15.399	1.908	12	0.015	V	18	78		
63	751308	2087786	0.069	0.022	31	0.010	V	52	78		
64	750648	2087786	0.266	0.074	27	0.016	A	27	52	78	
65	749988	2087786	3.703	0.542	14	0.019	V	18	52	78	
66	749658	2087786	5.955	0.774	13	0.016	V	18	78		
67	749328	2087786	13.532	4.624	34	0.224	A	18	4	27	36
68	748009	2087786	3.212	0.43	13	0.021	V	18	78		
69	746689	2087786	0.973	0.138	14	0.008	V	18	78		
70	746029	2087786	0.501	0.072	14	0.006	V	52	78		
71	745369	2087786	0.087	0.026	29	0.007	V	52	78		
72	749658	2088116	5.939	1.516	25	0.110	V	36	52	78	
73	749328	2088116	2.169	0.22	10	0.000	V	52	78		
74	749988	2088446	2.249	0.624	27	0.170	V	36	52	78	
75	746029	2088446	0.186	0.038	20	0.000	A	4	78		
76	750648	2089105	0.489	0.071	14	0.000	V	78			
77	749988	2089105	1.202	0.15	12	0.000	V	78			
78	749328	2089105	2.913	0.313	10	0.000	A	4	78		
79	748668	2089105	5.296	1.186	22	0.060	V	36	52	78	
80	748009	2089105	2.091	0.202	9	0.009	V	18	52	78	
81	746689	2089105	0.497	0.072	14	0.000	R	10	78		
82	746029	2089105	0.642	0.088	13	0.006	V	78			
83	745369	2089105	0.264	0.046	17	0.000	A	30	32	78	

Table 3 (cont).

Plot Number	North	East	Am241 pCi/g	Error pCi/g	Error %	Detection Limits pCi/g	Validation *	Qualifiers			
84	751308	2089765	0.435	0.068	15	0.000	V	78			
85	750648	2089765	0.621	0.086	13	0.000	V	78			
86	749988	2089765	1.703	0.204	12	0.000	V	78			
87	749328	2089765	1.773	0.202	11	0.000	V	78			
88	748668	2089765	3.538	0.408	11	0.000	A	30	32	78	
89	746029	2089765	0.385	0.058	15	0.005	A	30	32	78	
90	745369	2089765	0.159	0.032	20	0.000	A	30	32	78	
91	744709	2089765	0.016	0.009	56	0.000	A	30	32	78	
92	750648	2090425	0.535	0.074	13	0.000	V	78			
93	749988	2090425	0.874	0.167	19	0.000	A	4	30	32	78
94	749328	2090425	3.361	0.39	11	0.000	A	30	32	78	
95	748009	2090425	1.324	0.161	12	0.000	A	4	30	32	78
96	746689	2090425	0.494	0.071	14	0.000	A	30	32	78	
97	745369	2090425	0.241	0.044	18	0.000	A	30	32	78	
98	744709	2090425	0.023	0.011	47	0.000	A	30	32	78	
99	744050	2090425	0.015	0.009	60	0.000	A	30	78		
100	751308	2091085	0.613	0.08	13	0.000	A	30	32	78	
101	750648	2091085	0.526	0.075	14	0.000	V	78			
102	749988	2091085	0.598	0.081	13	0.000	A	30	32	78	
103	744709	2091085	0.071	0.022	31	0.000	A	30	78		
104	750648	2091745	2.526	0.302	12	0.007	A	70	78		
105	749988	2091745	0.542	0.077	14	0.000	A	30	78		
106	749328	2091745	2.379	0.3	12	0.000	A	60	78		
107	748009	2091745	1.072	0.139	13	0.000	A	4	60	78	
108	746689	2091745	0.359	0.057	15	0.000	A	4	30	78	
109	745369	2091745	0.215	0.039	18	0.000	A	30	70	78	
110	744709	2091745	0.996	0.129	13	0.000	A	30	78		
111	744050	2091745	0.005	0.005	100	0.000	A	4	30	78	
112	751308	2092405	0.194	0.041	21	0.000	A	60	78		
113	750648	2092405	0.541	0.082	15	0.000	A	60	78		
114	749988	2092405	1.301	0.168	12	0.000	A	4	60	78	
115	744709	2092405	0.131	0.03	22	0.000	A	30	78		
116	744050	2092405	0.044	0.017	38	0.000	A	30	78		
117	743390	2092405	0.029	0.013	44	0.000	A	30	78		
118	751968	2093064	0.093	0.025	26	0.000	A	60	78		
119	750648	2093064	0.475	0.076	16	0.000	A	78			
120	749328	2093064	0.381	0.058	15	0.000	A	60	78		
121	748009	2093064	0.823	0.115	14	0.000	A	78			
122	746689	2093064	0.263	0.046	17	0.000	A	60	78		
123	745369	2093064	0.215	0.041	19	0.000	A	30	78		
124	744050	2093064	0.047	0.017	36	0.000	A	4	30		
125	761203	2080522	0.006	0.008	133.3	0.009					
126	761545	2082387	0.022	0.02	90.9	0.005					
127	742000	2081653	0.02129	0.01	47.0	0	A	18	21	99	78
128	737129	2082640	0.0245	0.0137	55.9	0	A	30			78
129	733634	2082776	0.01943	0.00833	42.9	0.0022	R	32	62	30	
130	762160	2085951	0.023	0.01	43.5	0.006					
131	742097	2088192	0.025	0.018	72.0	0.01	A	61			
132	739297	2087765	0.011	0.01	90.9	0.007	A	61			
133	732653	2087370	0.01291	0.00679	52.6	0	A	18	21	99	78
134	761609	2091083	0.002	0.008	400.0	0.012	A	61			
134	761609	2091083	0.15	0.01938	12.9	0.0014	A	4			85
135	742201	2089620	0.074	0.03	40.5	0.008	A	61			
135	742201	2089620	0.0005	0.00313	626.0	0.0063	A	4			
137	732241	2090822	0.01088	0.00613	56.3	0	A	18	21	99	78
139	756876	2095706	0.011	0.016	145.5	0.013	A	60			
140	753634	2094474	0.002	0.004	200.0	0.006	V				
140	753634	2094474	0.002	155.6	200.0	0.006	V				
140	753634	2094474	0.016		62.5	0.002	V				
141	749801	2094403	0.61	0.092	15.1	0.002	V				
142	746286	2094298	0.016	0.01	62.5	0.006	V				
143	742517	2094634	0.024	0.014	58.3	0.005	V				
144	738190	2094235	0.0401	0.0184	45.9	0	A	30			78
145	737119	2098927	0.024	0.016	66.7	0.003					
146	729733	2096066	0.016	0.022	137.5	0.018					
147	719222	2096499	0.005841	0.00445	76.2	0	A	18	21	99	78
148	760490	2099421	0.002	0.006	300.0	0.007	A	61			
148	760490	2099421	0.002	120	300.0	0.004	A	61			
148	760490	2099421	0.008		100.0			61			
149	757472	2098863	0.02185	0.00901	41.2	0	A	18	32	99	78
150	754574	2098836	0.0326	0.0115	35.3	0	A	18	32	99	78
151	749334	2098145	0.087	0.024	27.6	0.006	V				
152	746609	2099217	0.09745	0.0207	21.2	0	A	18	32	99	78
153	741479	2099410	0.034	0.016	47.1	0.002	A	60			
154	737757	2100740	0.024	0.014	58.3	0.007	V				
155	733655	2100576	0.01875	0.00839	44.7	0	A	18	21	99	78
156	731325	2101839	0.024	0.016	66.7	0.01	A	61			

Table 3 (concl).

Plot Number	North	East	Am241 pCi/g	Error pCi/g	Error %	Detection Limits pCi/g	Validation *	Qualifiers			
157	760627	2104237	-0.002	0.003	-150.0	0.014	A	61			52
158	754653	2103924	0.002	0.006	300.0	0.009	A	61	21		
159	752357	2099155	0.086	0.11	127.9	0.1	R	27	36	61	
160	750348	2102495	0.006	0.006	100.0	0.005	A	61	21		
160	750348	2102495	0.006	90.9	100.0	0.005	A	61	21		
160	750348	2102495	0.016		75.0	0.007	A	61	21		
161	745980	2104009	0.01862	0.00832	44.7	0	A	18	32	99	78
161	745980	2104009	0.01862	57.5	44.7	0	A	18	32	99	78
161	745980	2104009	0.0103		56.3	0	A	18	32	99	78
162	742771	2101624	0.038	0.032	84.2	0.017	V				
163	736084	2104316	0.054	0.022	40.7	0.006	V				
164	727371	2108410	0.0087	0.00531	61.0	0	A	18	21	99	78
165	761188	2107012	0.0131	0.0103	78.6	0	A	30			78
166	759484	2105659	0.0386	0.0188	48.7	0	A	30			78
167	755087	2105295	0	0.002	#DIV/0!	0.002	A	61	21		52
169	744848	2107931	0.002	0.006	300.0	0.007	V				
170	735567	2106887	0.002	0.008	400.0	0.013	V				
170	735567	2106887	0.002	142.9	400.0	0.013	V				
170	735567	2106887	0.012		83.3	0.005	V				
171	759170	2111149	0.0413	0.0201	48.7	0	A	30			78
172	754013	2113691	0.01381	0.0123	89.1	0.0127	R	32	62	30	
173	754426	2112162	0.004	0.008	200.0	0.008	A	61	21		
176	742292	2109042	0.005	0.006	120.0	0.005	A	60			
177	737822	2110641	-0.004	0.001	-25.0	0.025	R	27	60	36	
179	730669	2110572	0.01621	0.0076	46.9	0	A	18	32	99	78
185	752096	2094356	0.16	0.04	25.0	0.009	V				
186	748885	2100061	0.035	0.018	51.4	0.012	A	60			
187	757006	2096188	0.008065	0.00544	67.5	0	A	18	32	99	78
188	757216	2114077	0.00954	0.00877	91.9	0	A	30			78
189	755636	2114421	0.005732	0.00437	76.2	0.0022	R	32	62	30	78
190	748545	2123098	0.009959	0.00672	67.5	0	A	18	21	99	78
191	748115	2094161	0.0512	0.0219	42.8	0	A	30			78
192	744231	2094147	0.0807	0.0293	36.3	0	A	30			
193	750532	2120218	0.00484	0.00891	184.1	0.0156	R	32	62	30	
194	739581	2096800	-0.002	0.008	-400.0	0.014	V				
194	739581	2096800	0.013	0.008	61.5	0.007					
194	739581	2096800	0.013	8	61.5	0.007					
194	739581	2096800	0.012		50.0	0.004					
195	735437	2094350	0.041	0.014	34.1	0.002					
195	735437	2094350	0.002	0.002	100.0	0.001	V				
195	735437	2094350	0.041	115.4	34.1	0.002					
195	735437	2094350	0.011		90.9	0.006					
196	735774	2096511	0.005	0.006	120.0	0.005					

Legend: * A = Data Acceptable but Qualified V = Data Validated with No Qualifiers R = Data Rejected

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Table 4. Indicator variogram models.

Decile	Cutoff	Model	C_o	C	A
0.10	0.01	Power	0.001	1.0E-8	1.66
0.20	0.02	Power	0.001	1.0E-6	1.29
0.30	0.04	power	0.001	1.0E-6	1.35
0.40	0.09	Power	0.001	3.0E-4	1.00
0.50	0.20	Spherical	0.06	0.27	12000
0.60	0.49	Exponential	0.07	0.27	3200
0.70	0.97	Spherical	0.03	0.28	3000
0.80	2.91	Power	0.08	6.0E-5	1.0

where C_0 is the nugget effect, C is the variance component if spherical model, or positive slope if power model, and A is the range in meters if spherical model, or power in the power model.

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Table 5. Indicator Variogram Model Validation.

CDF	Cutoff	Actual	Estimate
0.1	0.010	0.09	0.10
0.2	0.020	0.197	0.215
0.3	0.040	0.292	0.310
0.4	0.090	0.393	0.413
0.5	0.200	0.500	0.483
0.6	0.490	0.601	0.585
0.7	0.970	0.697	0.703
0.8	2.910	0.798	0.703

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Table 6. Am-241/Pu-239+240 ratios and the analytical errors (percent) associated with these ratios.

Statistics	Am-241/Pu-239+240 Off- & On- site Locations (OU 1, 2, &3)	Am-241/Pu-239+240 Off site Locations (OU 3)	Am-241/Pu-239+240 On site Locations (OU 1 & 2)	Analytical Error Off Site Locations (OU 3)	Analytical Error On Site Locations (OU 1 & 2)
Number of Data	178	60	118	60	118
Mean	0.31	0.56	0.19	83.6	15.6
Std. Dev.	0.53	0.84	0.12	69.6	8.46
Coef. of Var.	1.66	1.50	0.63	0.83	0.54
Maximum	5.76	5.76	1.12	400	54.9
Upper Quantile	0.29	0.54	0.20	90.9	18.7
Median	0.19	0.36	0.16	62.0	11.9
Lower Quantile	0.14	0.18	0.14	44.7	10.7
Minimum	0.00	0.00	0.02	15.0	0.79
Skewness	5.75	3.81	2.0	2.63	1.84
Kurtosis	46.1	18.8	6.51	10.6	6.61

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Figure 6. A contour map of the probabilities that the unknown Am-241 activity exceeds the background concentration of 0.01 pCi/g.

Figure 7. A contour map of the probabilities that the unknown Am-241 activity exceeds the PPRG of 2.37 pCi/g.

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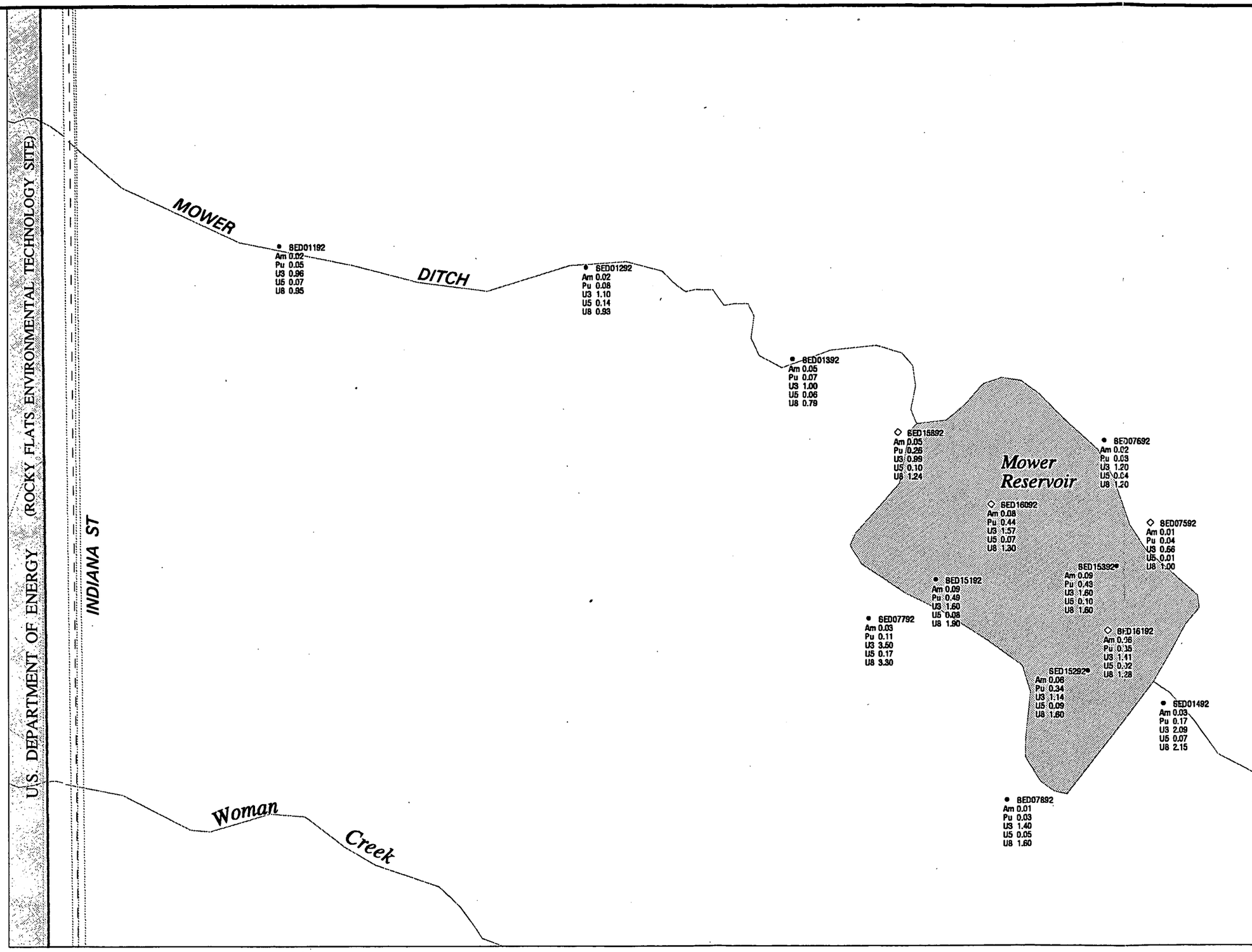

Figure I-6A

Analytical Results of Selected Radionuclides for Sediment Samples

Operable Unit 3
IHSS 202
Mower Reservoir

ROCKY FLATS
ENVIRONMENTAL TECHNOLOGY SITE
U.S. Department of Energy

Analyte Symbols:
Am Americium-241
Pu Plutonium-239/240
U3 Uranium-233/234
U5 Uranium-235
U8 Uranium-238

Units are pCi/g.

◇ 1992 Grab/Core samples
• 1992 Sediment Grab sample

Note: Data shown are for grab locations only.
Values of -999 Indicate rejected data.

DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 2400
1 inch = 200 ft

0 100 200 400
SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.

U.S. DEPARTMENT OF ENERGY (ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE)

DRAWN BY: M. Campbell
APPROVED BY:
October 04, 1995
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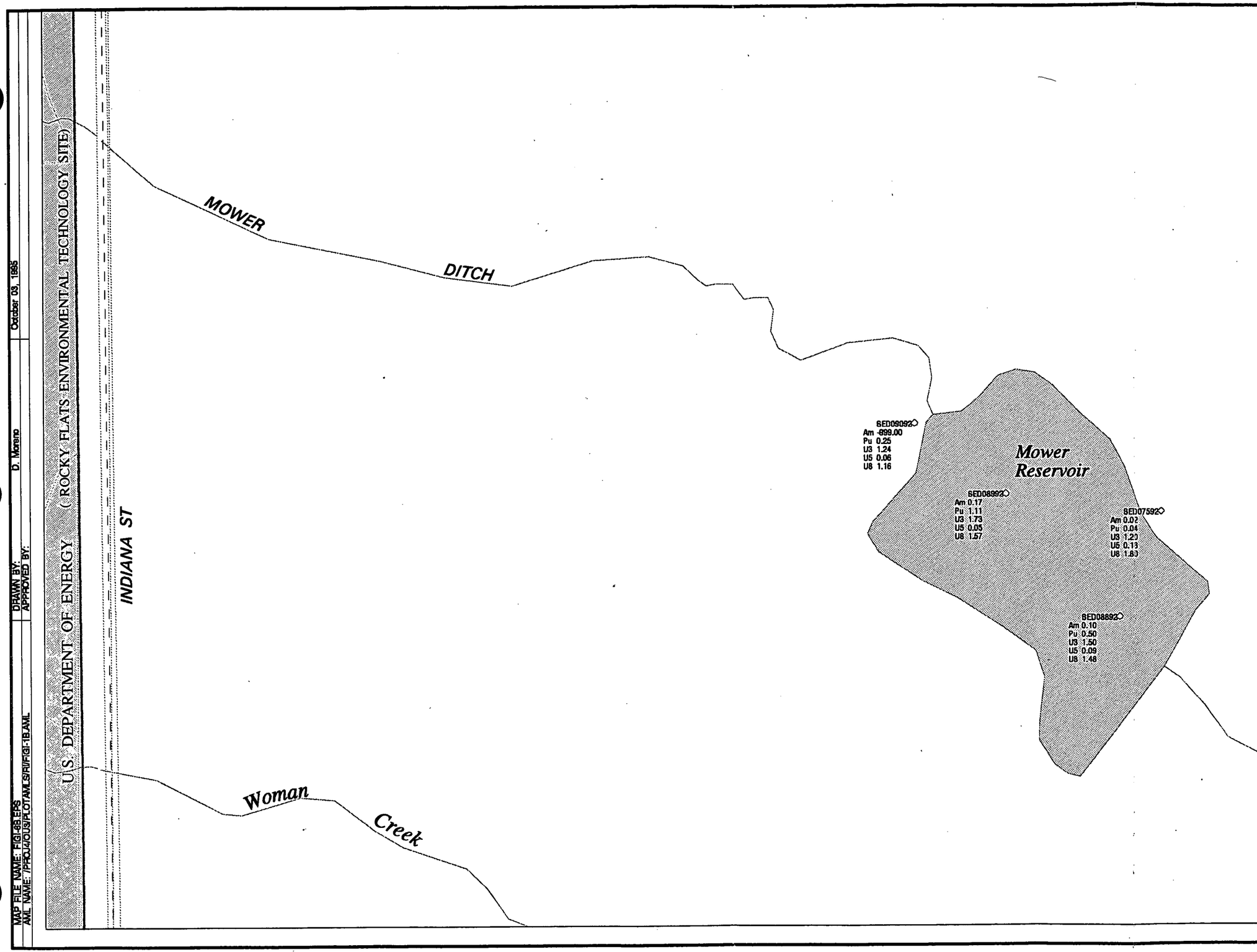


U.S. DEPARTMENT OF ENERGY (ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE)

DRAWN BY: D. Moreno
APPROVED BY:
October 03, 1995

MAP FILE NAME: FIGI-6B.EPS
AML NAME: /PROJ4/OU3/PLOTAML5/RI/FIGI-1B.AML

Figure I-6B

Analytical Results of Selected Radionuclides for Sediment Samples

Operable Unit 3
IHSS 202
Mower Reservoir

ROCKY FLATS
ENVIRONMENTAL TECHNOLOGY SITE
U.S. Department of Energy

Analyte Symbols:
Am Americium-241
Pu Plutonium-239/240
U3 Uranium-233/234
U5 Uranium-235
U8 Uranium-238

Units are pCi/g.

◇ 1992 Grab/Core samples
△ 1992 Sediment Core sample

Note: Data shown are maximum values for core locations only
Values of -999 indicate rejected data.

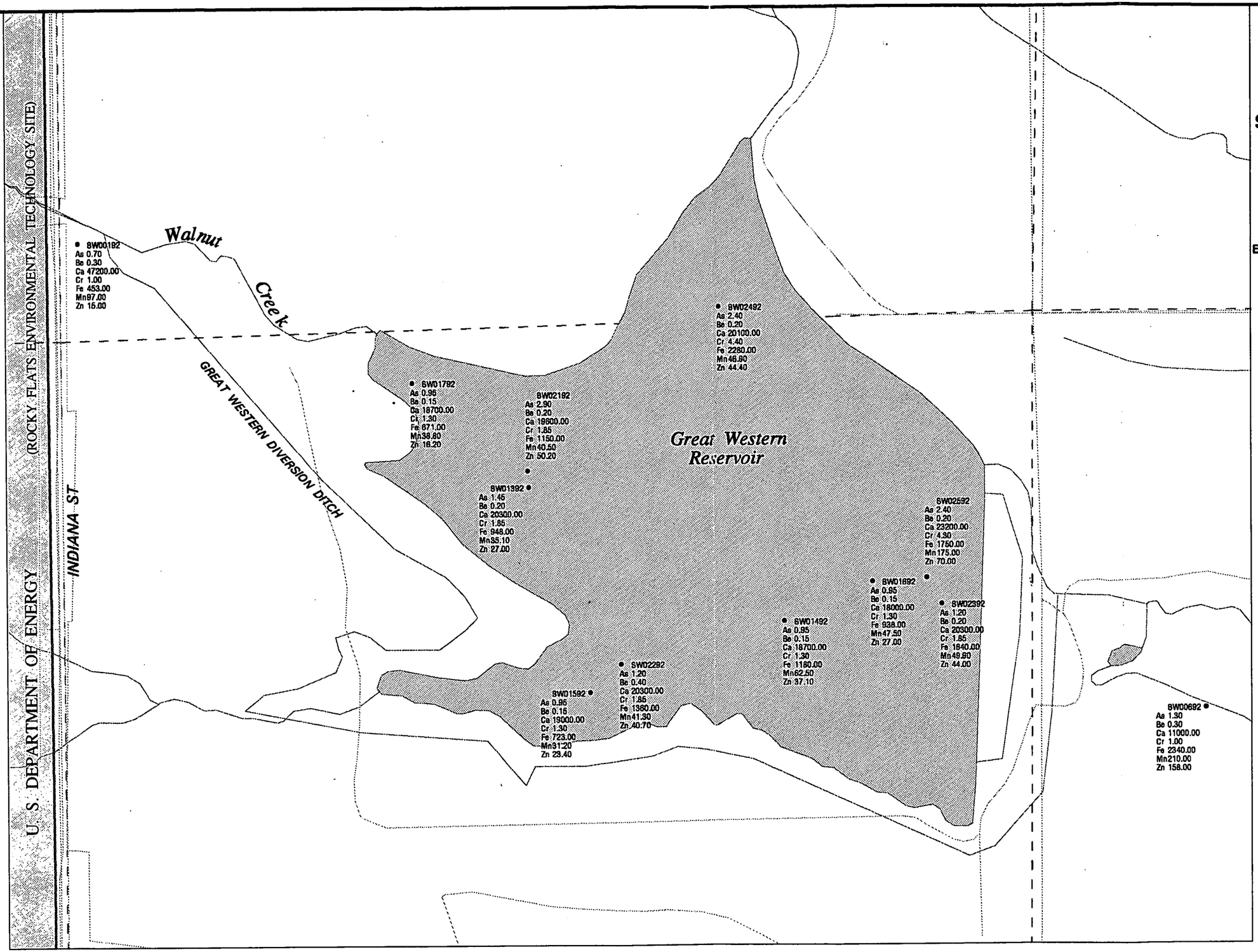
DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 2400
1 inch = 200 ft

0 100 200 400
SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.



U.S. DEPARTMENT OF ENERGY

(ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE)

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DRAWN BY: M. Campbell
APPROVED BY:
October 03, 1995

Figure I-7

Analytical Results of Selected Metals for Surface Water Samples

Operable Unit 3

IHSS 200

Great Western Reservoir

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

U.S. Department of Energy

Analyte Symbols:
- As Arsenic
- Be Beryllium
- Ca Calcium
- Cr Chromium
- Fe Iron
- Mn Manganese
- Zn Zinc

Values are results for total metals. Units are ug/l.

• Surface water sample

DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 6000
1 inch = 500 ft

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SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.

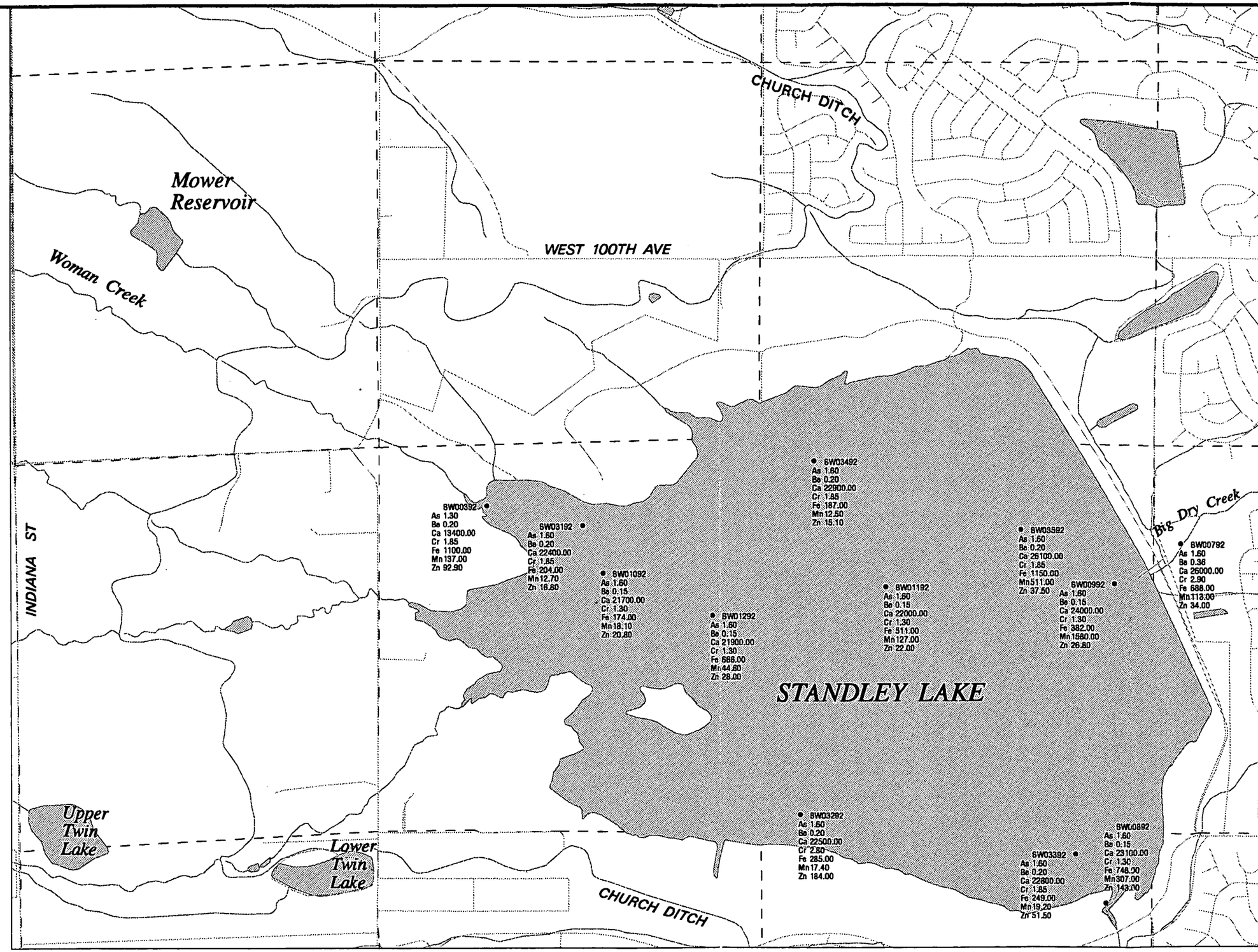

Figure I-8

Analytical Results of Selected Metals for Surface Water Samples

Operable Unit 3
IHSS 201
Standley Lake

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
U.S. Department of Energy

Analyte Symbols:
As Arsenic
Be Beryllium
Ca Calcium
Cr Chromium
Fe Iron
Mn Manganese
Zn Zinc

Values are results for total metals. Units are ug/l.

● Surface water sample

DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 15840
1 inch = 1320 ft or 0.25 mi

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SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.

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DRAWN BY: M. Campbell
APPROVED BY:
October 03, 1995

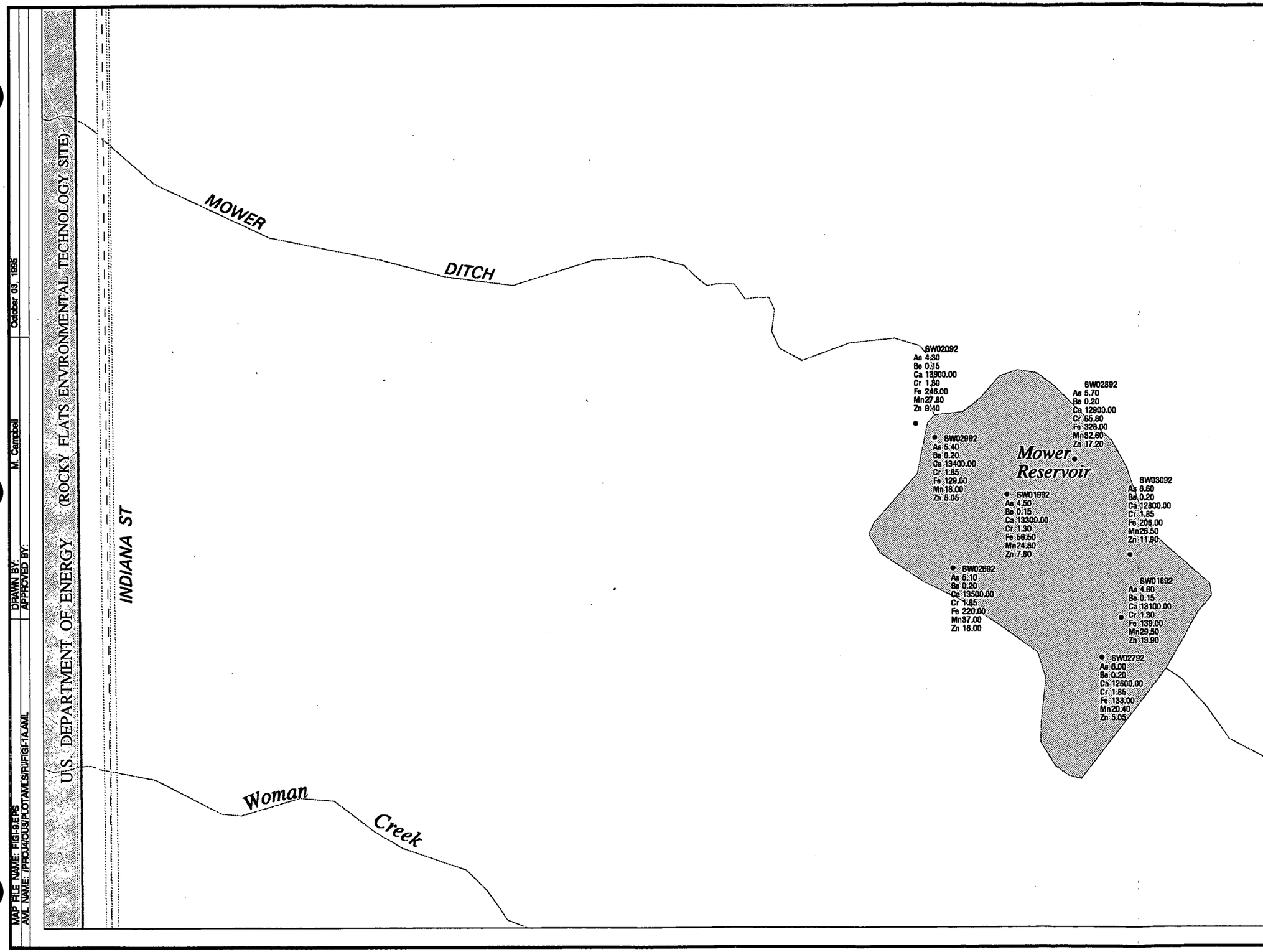

Figure I-9

Analytical Results of Selected Metals for Surface Water Samples

Operable Unit 3

IHSS 202

Mower Reservoir

ROCKY FLATS

ENVIRONMENTAL TECHNOLOGY SITE

U.S. Department of Energy

Analyte Symbols:
- As Arsenic
- Be Beryllium
- Ca Calcium
- Cr Chromium
- Fe Iron
- Mn Manganese
- Zn Zinc

Values are results for total metals. Units are ug/l.

• Surface water sample

DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 2400
1 inch = 200 ft

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SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.

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APPROVED BY:
October 03, 1995

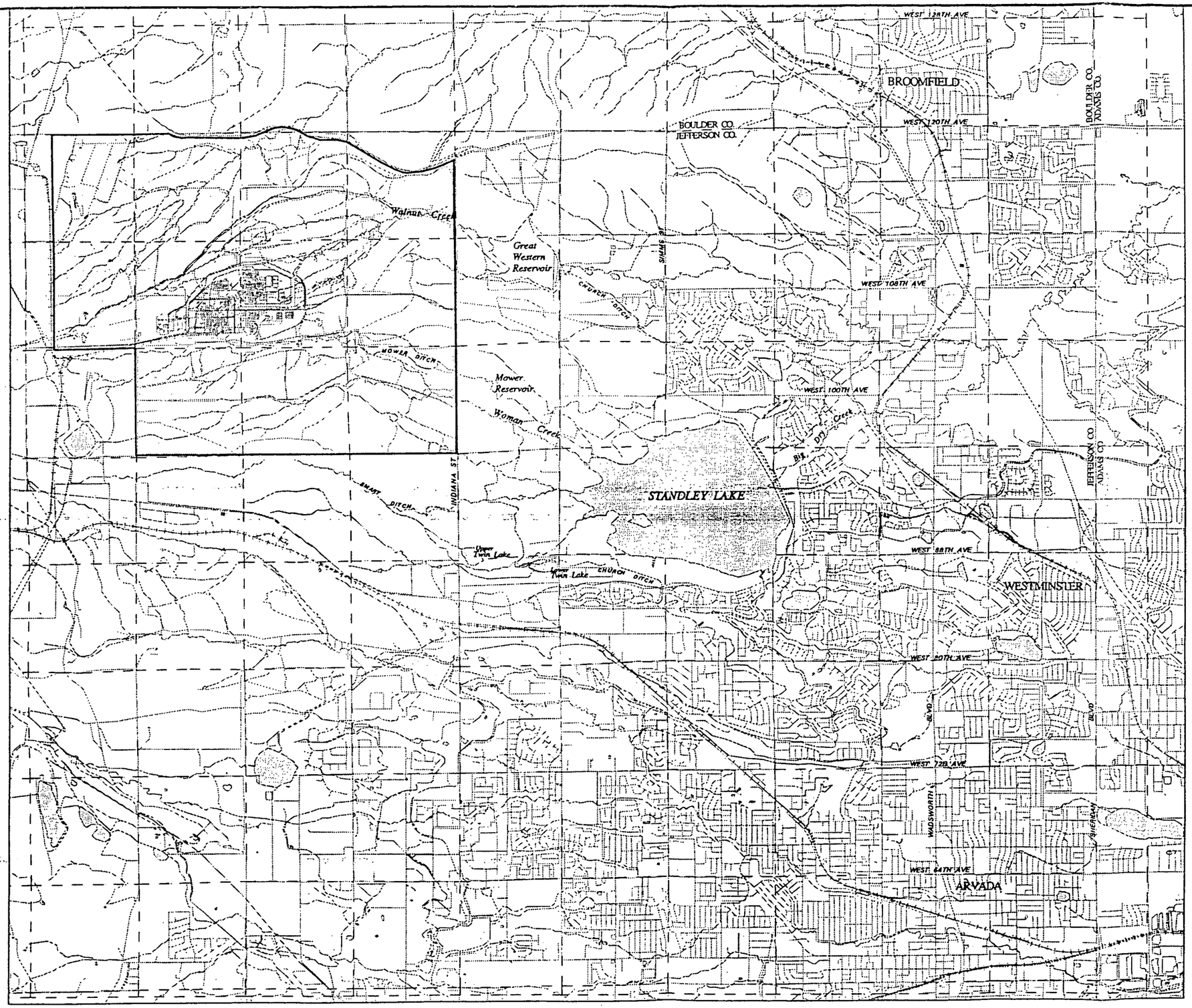

Figure 1

Location Map

OPERABLE UNIT 3
IHSS 199 Surface Soils Sampling Area
ROCKY FLATS
ENVIRONMENTAL TECHNOLOGY SITE
U.S. Department of Energy

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1:63360

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Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.

MAP FILE NAME: TM1.EPS
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Drawn by: M. Campbell
Approved by: A. Lang

November 09, 1994

Technical Memorandum No. 4 Figure 1

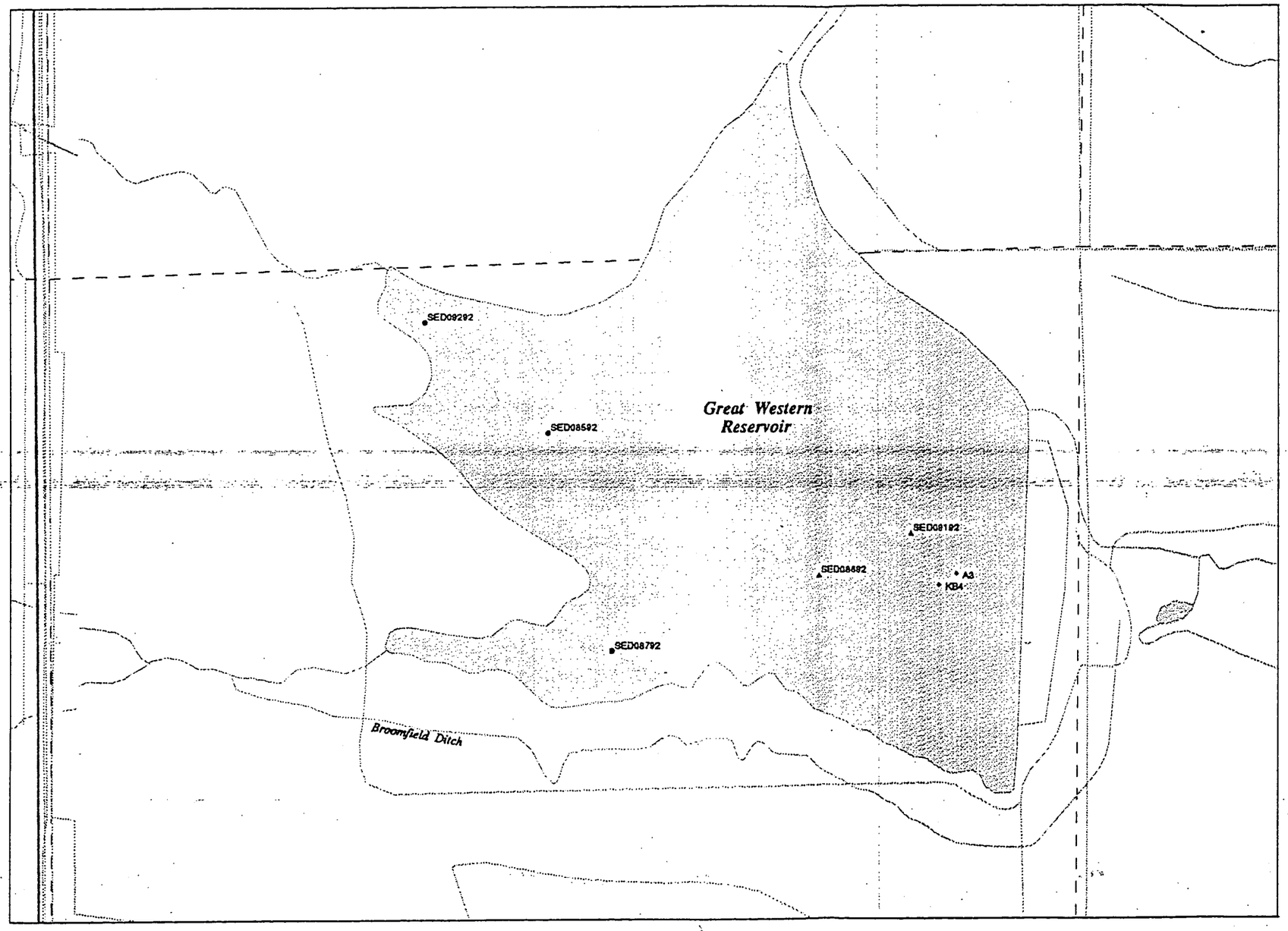

Figure 2
Approximate Locations of OU3 and Historical Sediment Cores

OPERABLE UNIT 3
IHSS 200 Great Western Reservoir
ROCKY FLATS PLANT
U.S. Department of Energy

Legend

- • OU3 sediment core sample
- ▲ OU3 core sample used for sediment age dating
- • A3 Battelle PNL (Thomas and Robertson, 1981.)
- • KB4 Rockwell, 1985.

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey
CH2M HILL, Inc.

N

Polyconic projection. 1927 North American datum.
Colorado central zone state plane coordinate system.

EG&G ROCKY FLATS
CH2M HILL

MAP FILE NAME: TM2.EPS
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Drawn by: D. Moreno
Approved by: A. Lange
August 04, 1994
August 04, 1994
EG&G Age Dating Appendix (Sediment Report) Figure 2

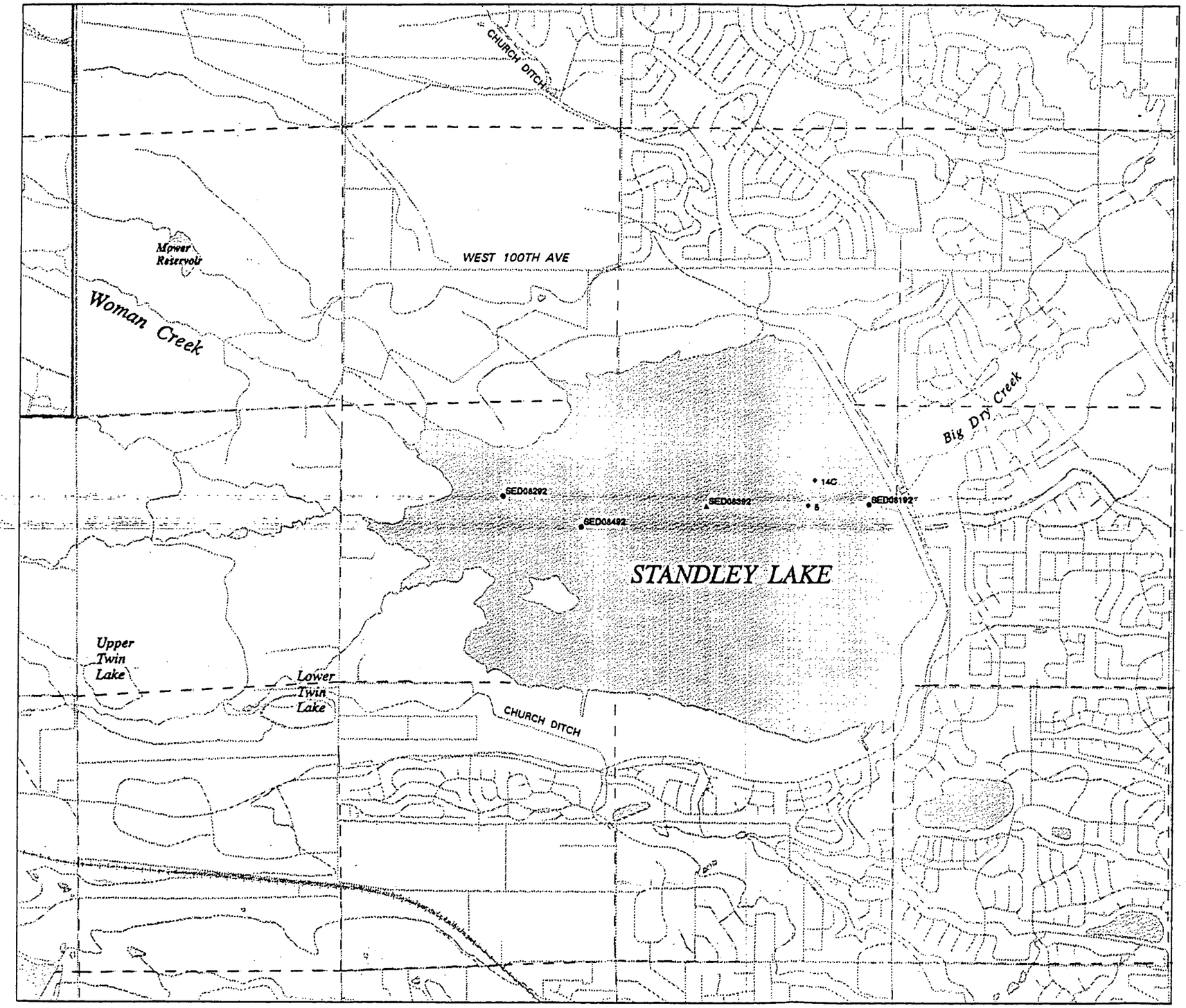


Figure 3
Approximate Locations of OU3 and Historical Sediment Cores

OPERABLE UNIT 3
IHSS 201 Standley Lake
ROCKY FLATS PLANT
U.S. Department of Energy

Legend

- • OU3 sediment core sample
- ▲ OU3 core sample used for sediment age dating
- • 5 Battelle PNL (Thomas and Robertson, 1981.)
- • 14C EPA, 1970.

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey
CH2M HILL, Inc.

N

Polyconic projection. 1927 North American datum.
Colorado central zone state plane coordinate system.

EG&G ROCKY FLATS
CH2M HILL

MAP NAME: TM3.EPS
AML NAME: /PROJ/OU3/PLOTS/RI/AMY-SD2.AML
Drawn by: D. Moreno
Approved by: A. Lange
August 04, 1994
August 04, 1994
EG&G Age Dating Appendix (Sediment Report) Figure 3

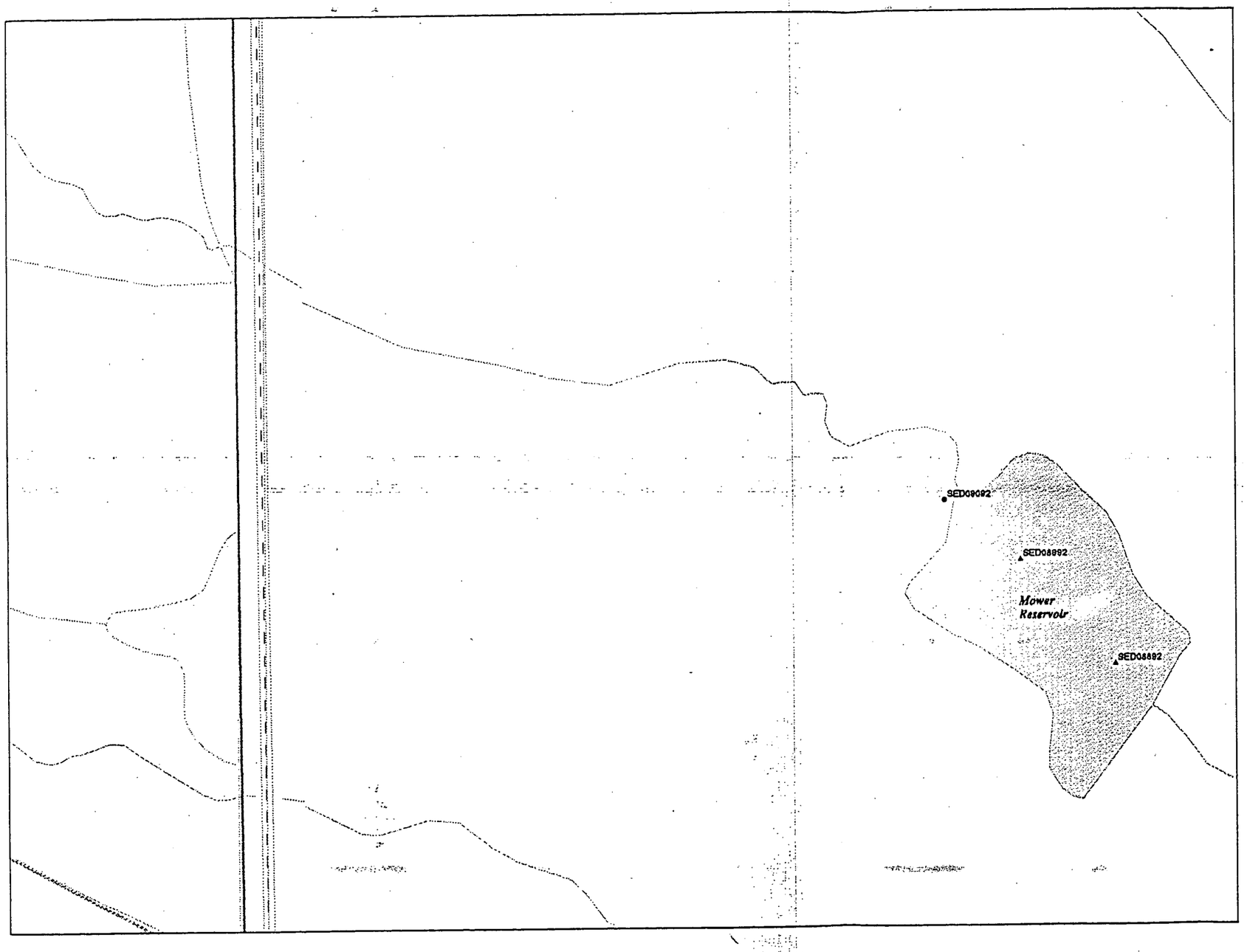


Figure 4
Approximate Locations of OU3 Sediment Cores

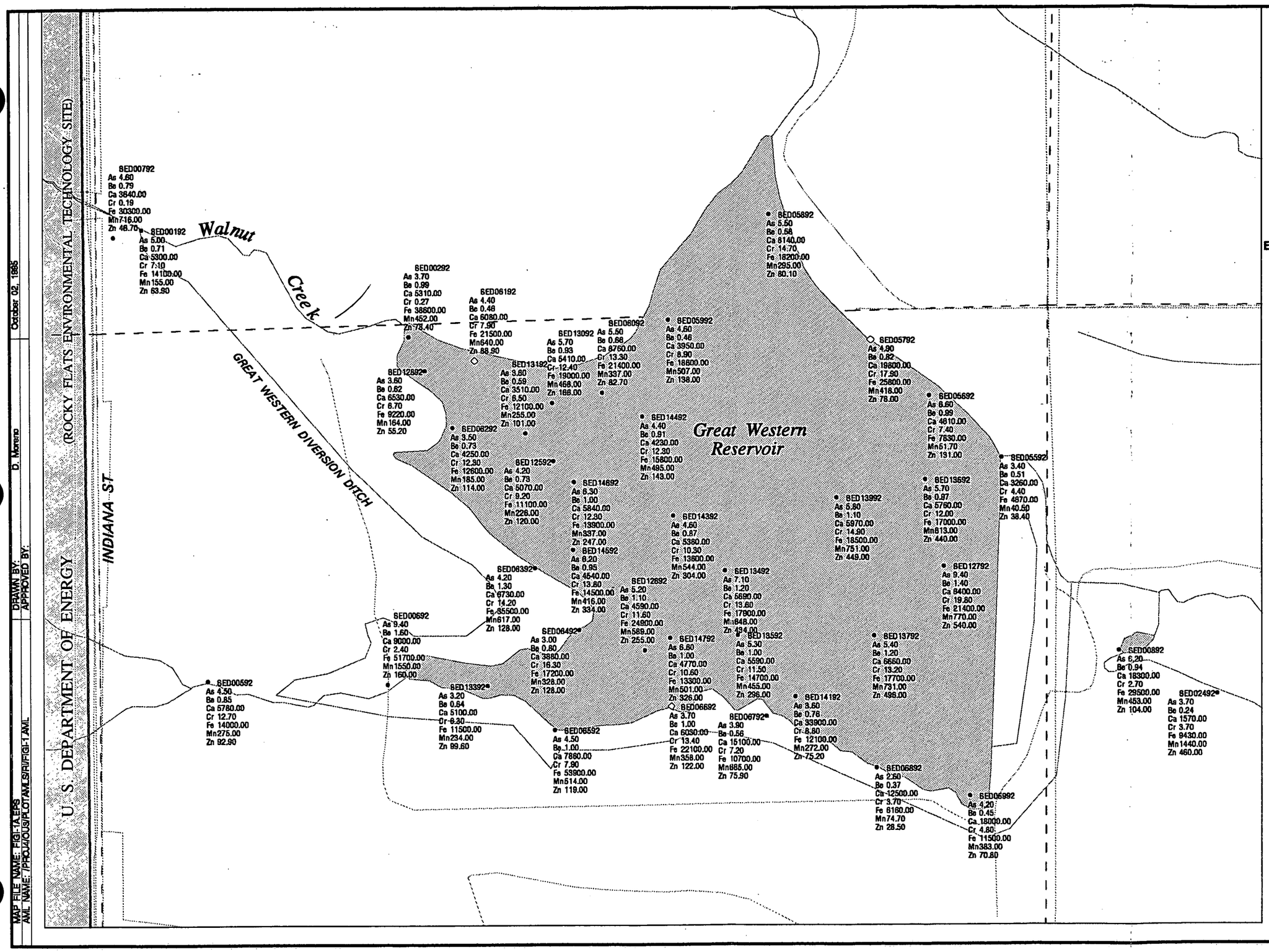
OPERABLE UNIT 3
IHSS 202 Mower Reservoir
ROCKY FLATS PLANT
U.S. Department of Energy

Legend

- OU3 sediment core sample
- OU3 core sample used for sediment age dating

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey
CH2M HILL, Inc.

Polyconic projection, 1927 North American datum
Colorado central zone state plane coordinate sys.



MAP FILE NAME: FIGI-1A.EPS
AML NAME: T:\PROJ\OUS\PLOT\AML\S\R\FIGI-1.AML
DRAWN BY: D. Moreno
APPROVED BY:
October 02, 1995

Figure I-1A

Analytical Results of Selected Metals for Sediment Samples

Operable Unit 3
IHSS 200
Great Western Reservoir

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
U.S. Department of Energy

Analyte Symbols:
- As Arsenic
- Be Beryllium
- Ca Calcium
- Cr Chromium
- Fe Iron
- Mn Manganese
- Zn Zinc

Units are mg/kg.

◇ 1992 Grab/Core samples
• 1992 Sediment grab sample

Note: Data shown are for grab locations only.

DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 6000
1 inch = 500 ft

0 250 500 1000
SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.

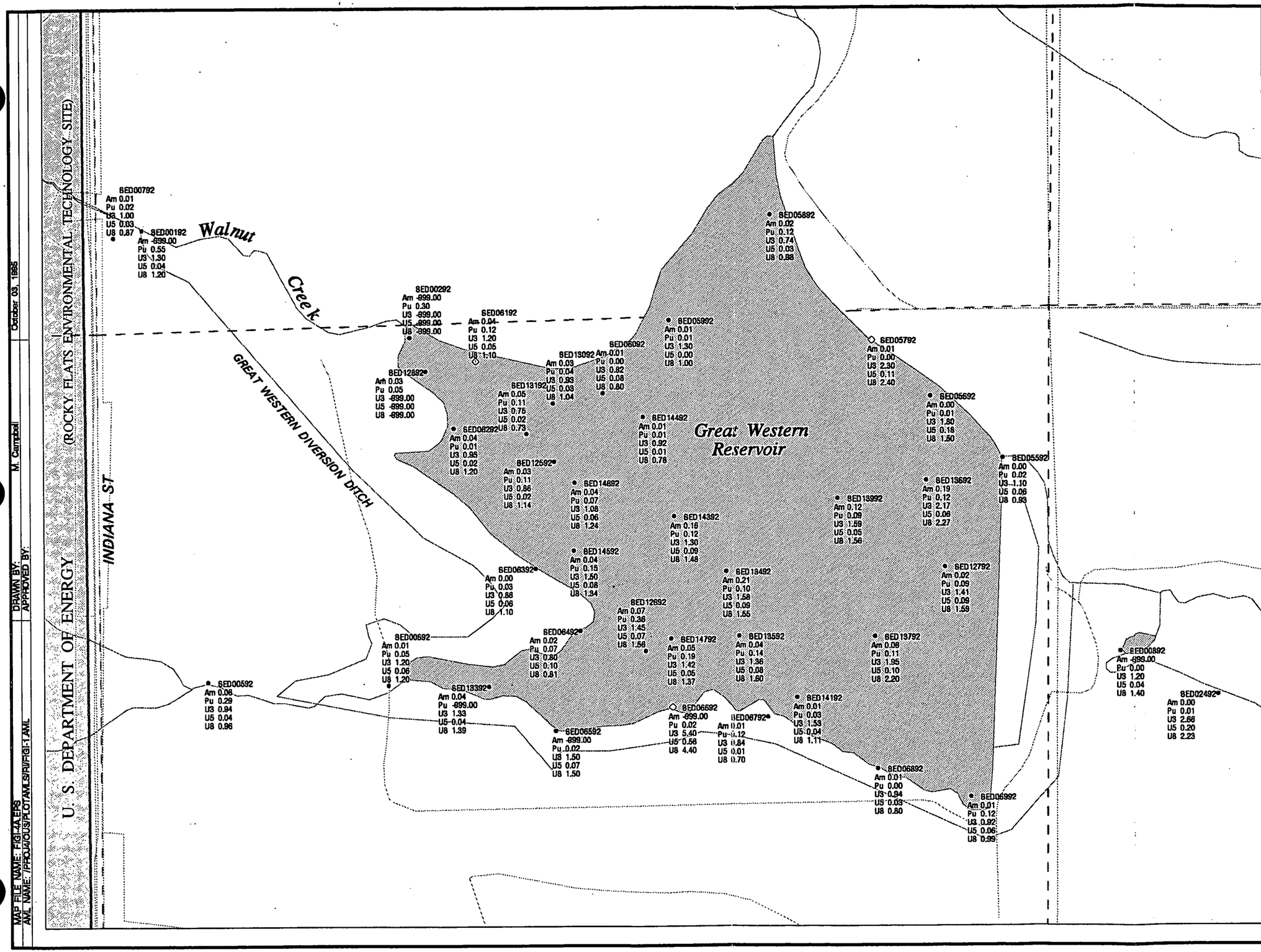


Figure I-4A

Analytical Results of Selected Radionuclides for Sediment Samples

Operable Unit 3

IHSS 200

Great Western Reservoir

ROCKY FLATS
ENVIRONMENTAL TECHNOLOGY SITE
U.S. Department of Energy

Analyte Symbols:
Am Americium-241
Pu Plutonium-239/240
U3 Uranium-233/234
U5 Uranium-235
U8 Uranium-238

Units are pCi/g.

◇ 1992 Grab/Core samples
• 1992 Sediment grab sample

Note: Data shown are for grab locations only.
Values of -999 indicate rejected data.

DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 6000
1 inch = 500 ft

0 250 500 1000
SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.

MAP FILE NAME: FIGI-4A.EPS
AML NAME: /PROJ4/OU3/PLOTAMLS/RI/FIGI-1.AML
DRAWN BY: M. Campbell
APPROVED BY:
October 03, 1995

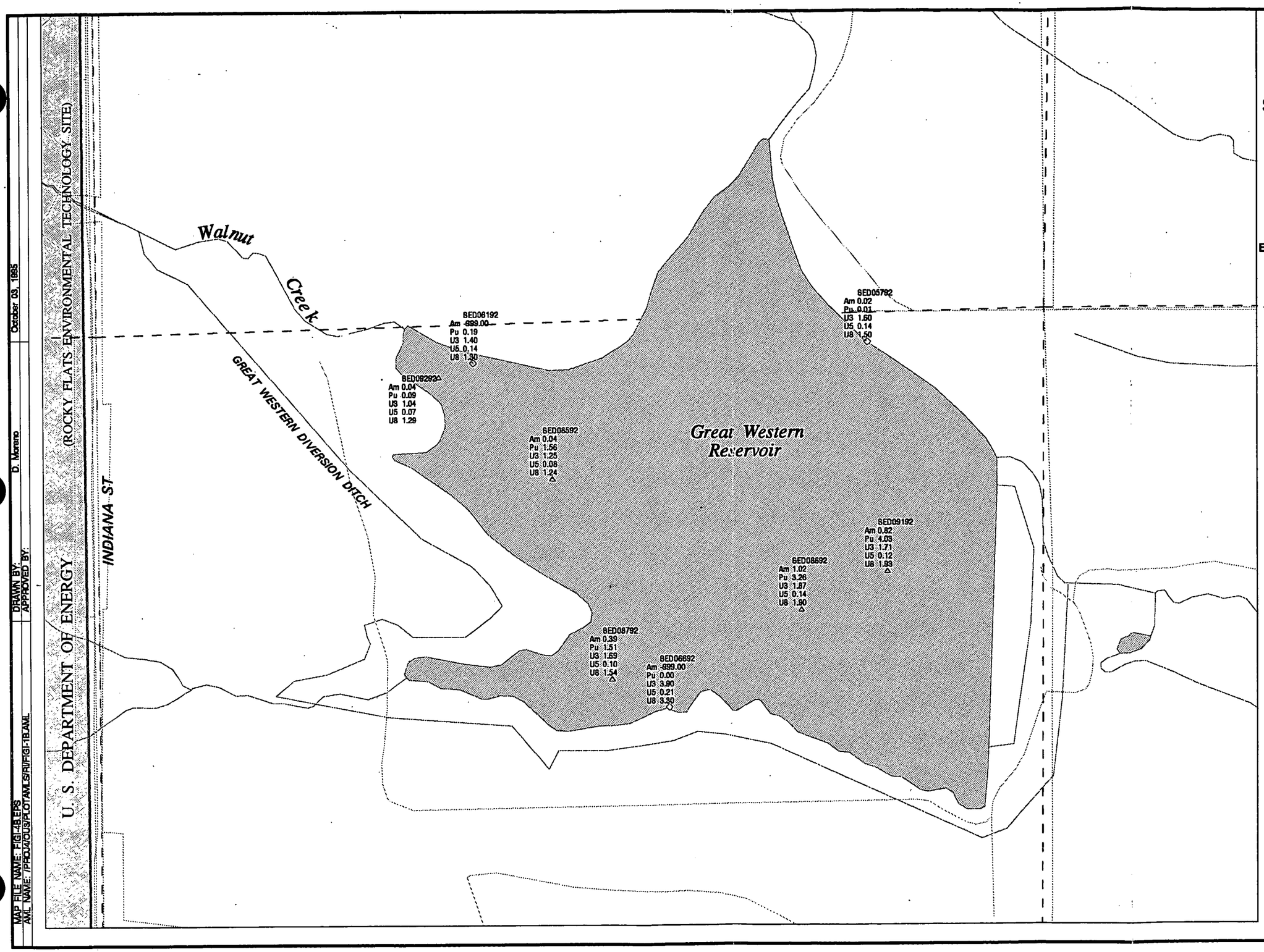


Figure I-4B

Analytical Results of Selected Radionuclides for Sediment Samples

Operable Unit 3
IHSS 200
Great Western Reservoir

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
U.S. Department of Energy

Analyte Symbols:
Am Americium-241
Pu Plutonium-239/240
U3 Uranium-233/234
U5 Uranium-235
U8 Uranium-238

Units are pCi/g.

◇ 1992 Grab/Core samples
△ 1992 Sediment Core sample

Note: Data shown are maximum values for core locations only
Values of -999 indicate rejected data.

DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 6000
1 inch = 500 ft

0 250 500 1000
SCALE IN FEET

N

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.

MAP FILE NAME: FIGI-4B.EPS
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DRAWN BY: D. Moreno
APPROVED BY:
October 03, 1995

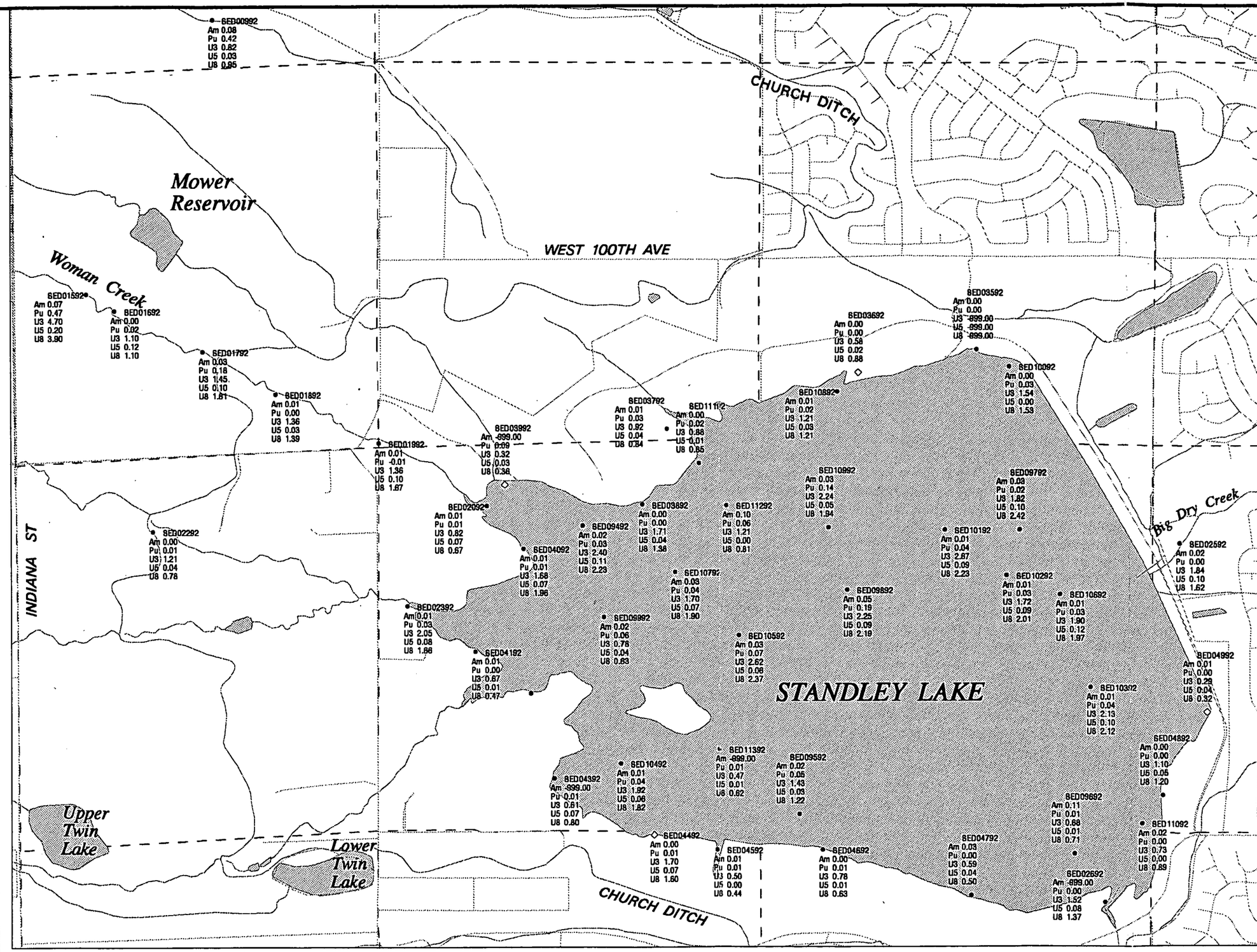


Figure I-5A

Analytical Results of Selected Radionuclides for Sediment Samples

Operable Unit 3
IHSS 201
Standley Lake

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
U.S. Department of Energy

Analyte Symbols:
Am Americium-241
Pu Plutonium-239/240
U3 Uranium-233/234
U5 Uranium-235
U8 Uranium-238

Units are pCi/g.

◇ 1992 Grab/Core samples
• 1992 Sediment grab sample

Note: Data shown are for grab locations only.
Values of -999 indicate rejected data.

DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 15840
1 inch = 1320 ft or 0.25 mi

0 500 1000 2000
SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.

MAP FILE NAME: FIGI-5A.EPS
AML NAME: /PROJ/OU3/PLOT/AML.S/RUN/FIGI-1.AML
DRAWN BY: M. Campbell
APPROVED BY:
October 03, 1995

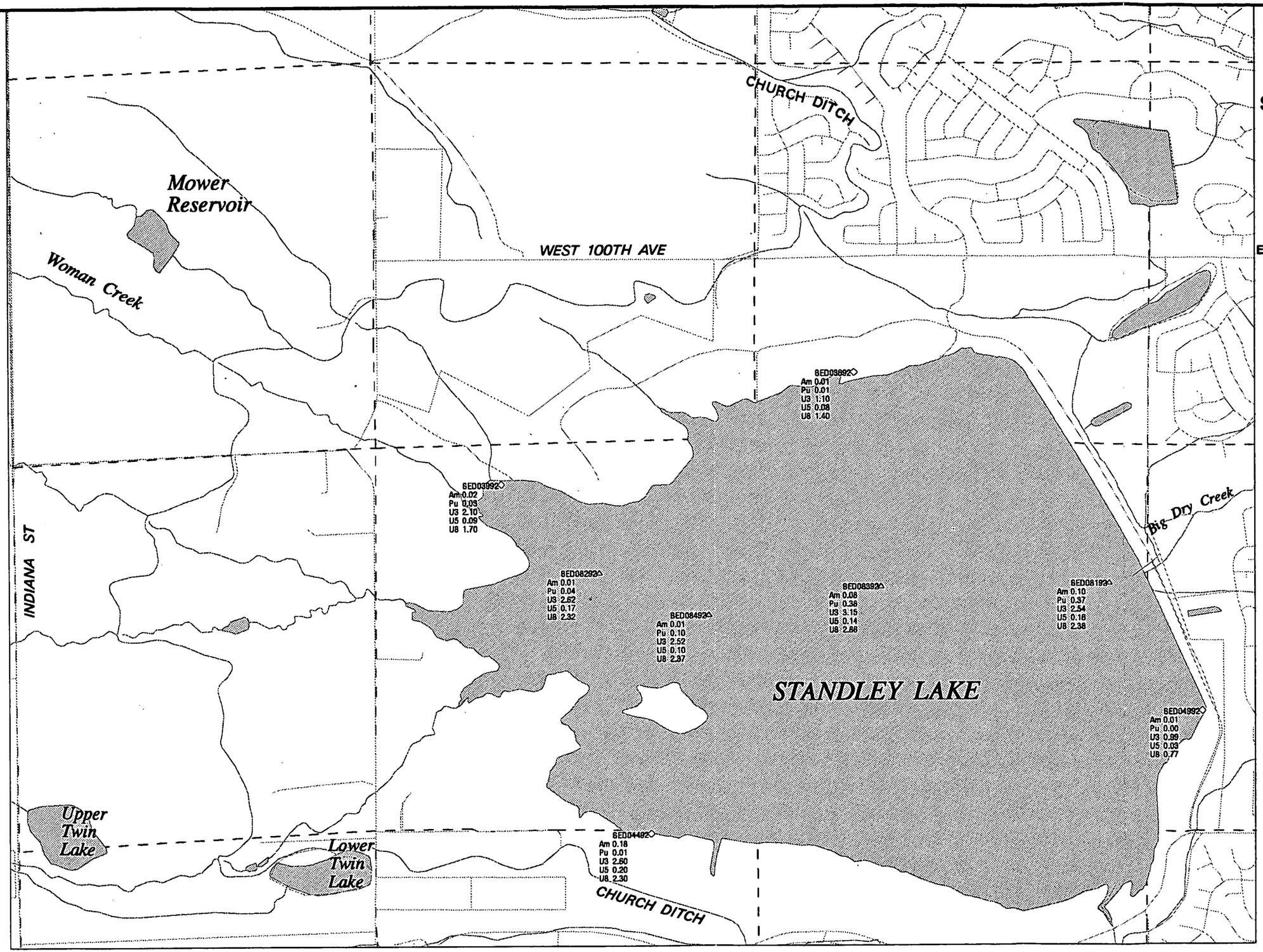


Figure I-5B

Analytical Results of Selected Radionuclides for Sediment Samples

Operable Unit 3

IHSS 201

Standley Lake

ROCKY FLATS

ENVIRONMENTAL TECHNOLOGY SITE

U.S. Department of Energy

Analyte Symbols:
Am Americium-241
Pu Plutonium-239/240
U3 Uranium-233/234
U5 Uranium-235
U8 Uranium-238

Units are pCi/g.

◇ 1992 Grab/Core samples

△ 1992 Sediment Core sample

Note: Data shown are maximum values for core locations only

Values of -999 indicate rejected data.

DRAFT

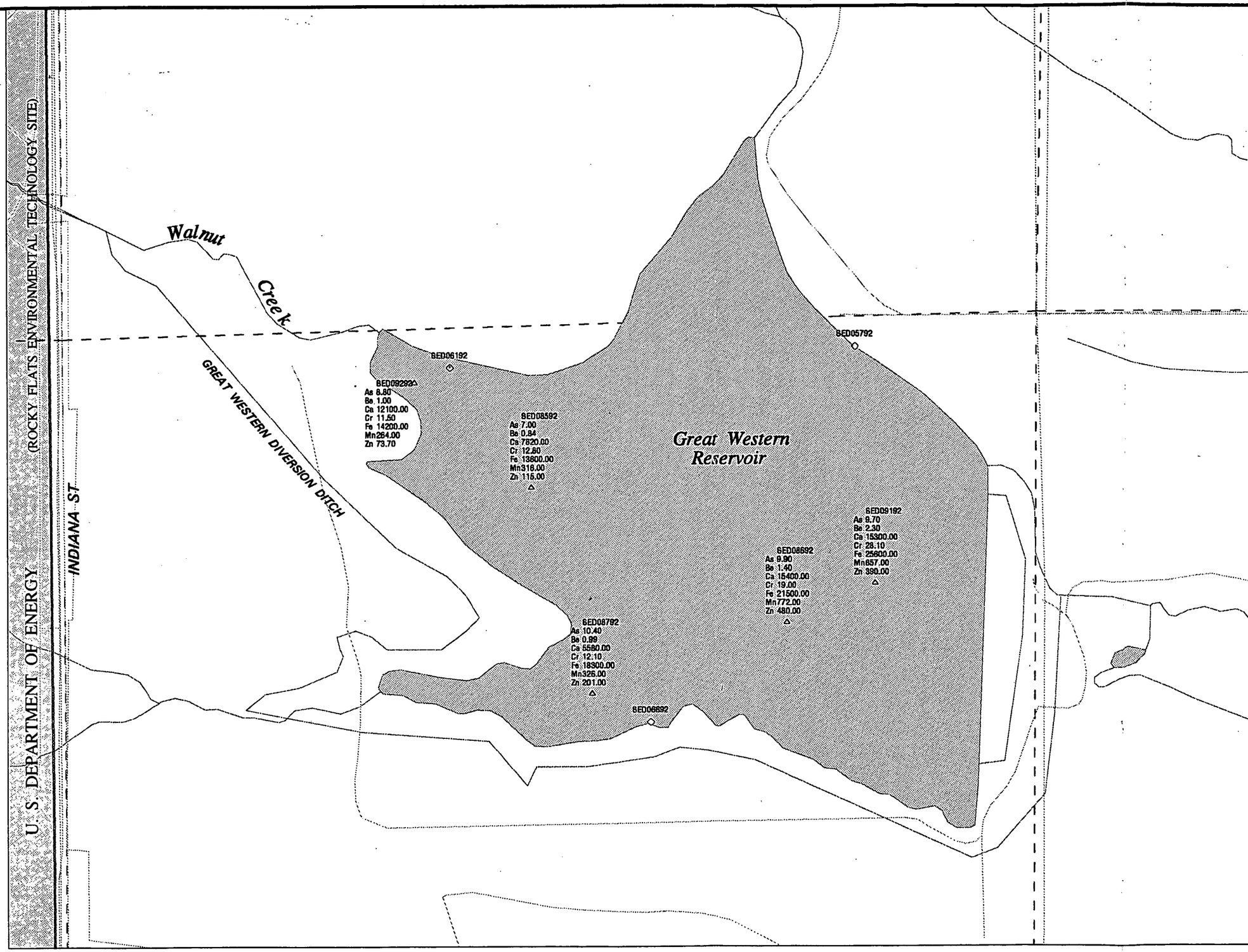
Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 15840
1 inch = 1320 ft or 0.25 mi

0 500 1000 2000
SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.

MAP FILE NAME: FIGI-5B.EPS
AML NAME: /PROJ4/OU3/PLOTAMLS/RI/FIGI-1B.AML
DRAWN BY: D. Moreno
APPROVED BY:
October 03, 1995



U.S. DEPARTMENT OF ENERGY
(ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE)

MAP FILE NAME: FIGI-1B.EPS
AML NAME: /PROJ/OUS/PLOTAML5/RI/FIGI-1B.AML
DRAWN BY: D. Moreno
APPROVED BY:
October 03, 1995

Figure I-1B

Analytical Results of Selected Metals for for Sediment Samples

Operable Unit 3
IHSS 200
Great Western Reservoir

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
U.S. Department of Energy

Analyte Symbols:
As Arsenic
Be Beryllium
Ca Calcium
Cr Chromium
Fe Iron
Mn Manganese
Zn Zinc

Units are mg/kg.

◇ 1992 Grab/Core samples
△ 1992 Sediment Core sample

Note: Data shown are maximum values for core locations only; not all core locations were analyzed for metals.

DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 6000
1 inch = 500 ft

0 250 500 1000
SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.

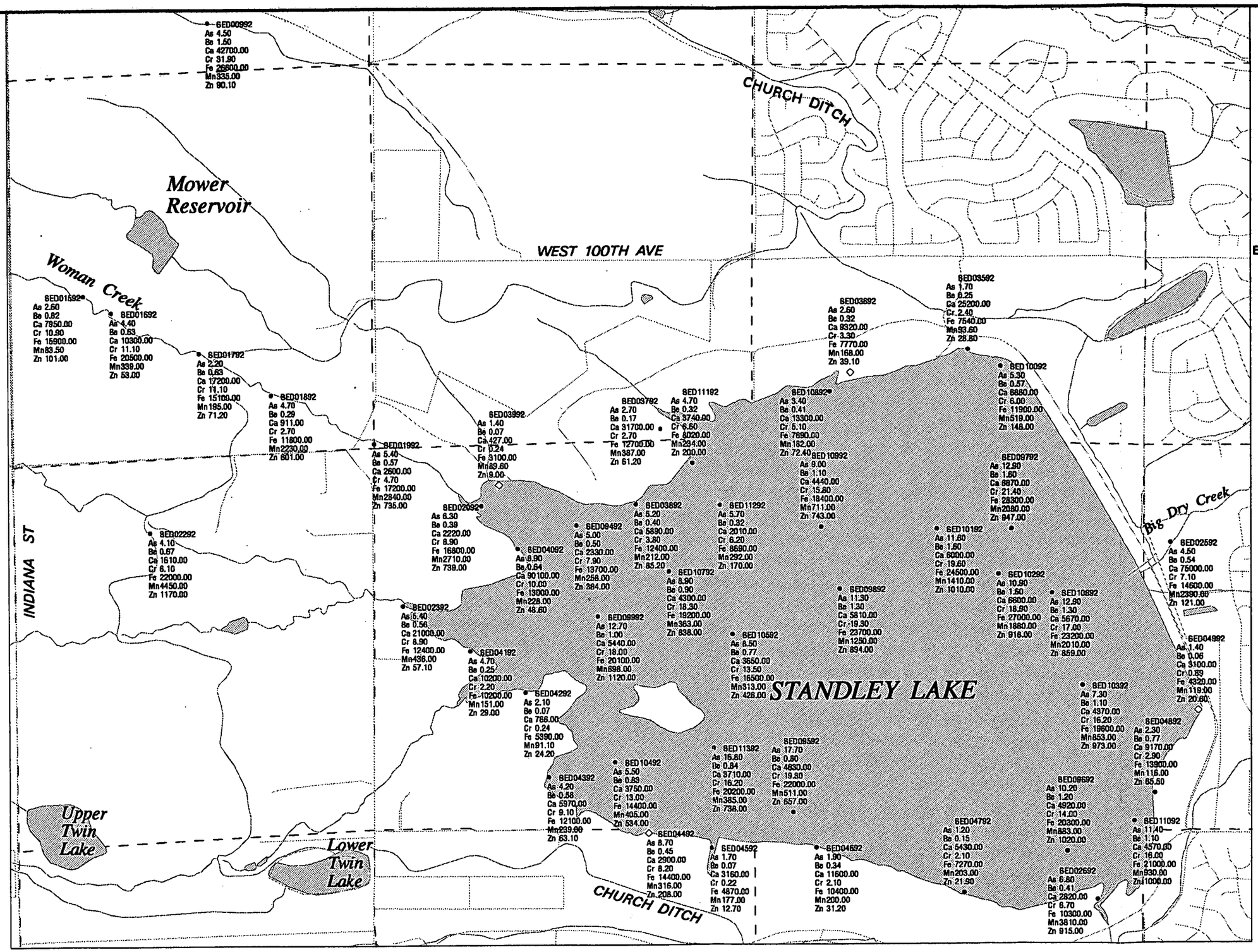


Figure I-2A

Analytical Results of Selected Metals for Sediment Samples

Operable Unit 3
IHSS 201
Standley Lake

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
U.S. Department of Energy

Analyte Symbols:

As	Arsenic
Be	Beryllium
Ca	Calcium
Cr	Chromium
Fe	Iron
Mn	Manganese
Zn	Zinc

Units are mg/kg.

◇ 1992 Grab/Core samples

• 1992 Sediment grab sample

Note: Data shown are for grab locations only.

DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 15840
1 inch = 1320 ft or 0.25 mi

0 500 1000 2000
SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.

MAP FILE NAME: FIGI-2A.EPS
AML NAME: TPROJ4/OUS/PLOTAML.S/PU/FIGI-1.AML
DRAWN BY: D. Moreno
APPROVED BY:
October 02, 1995

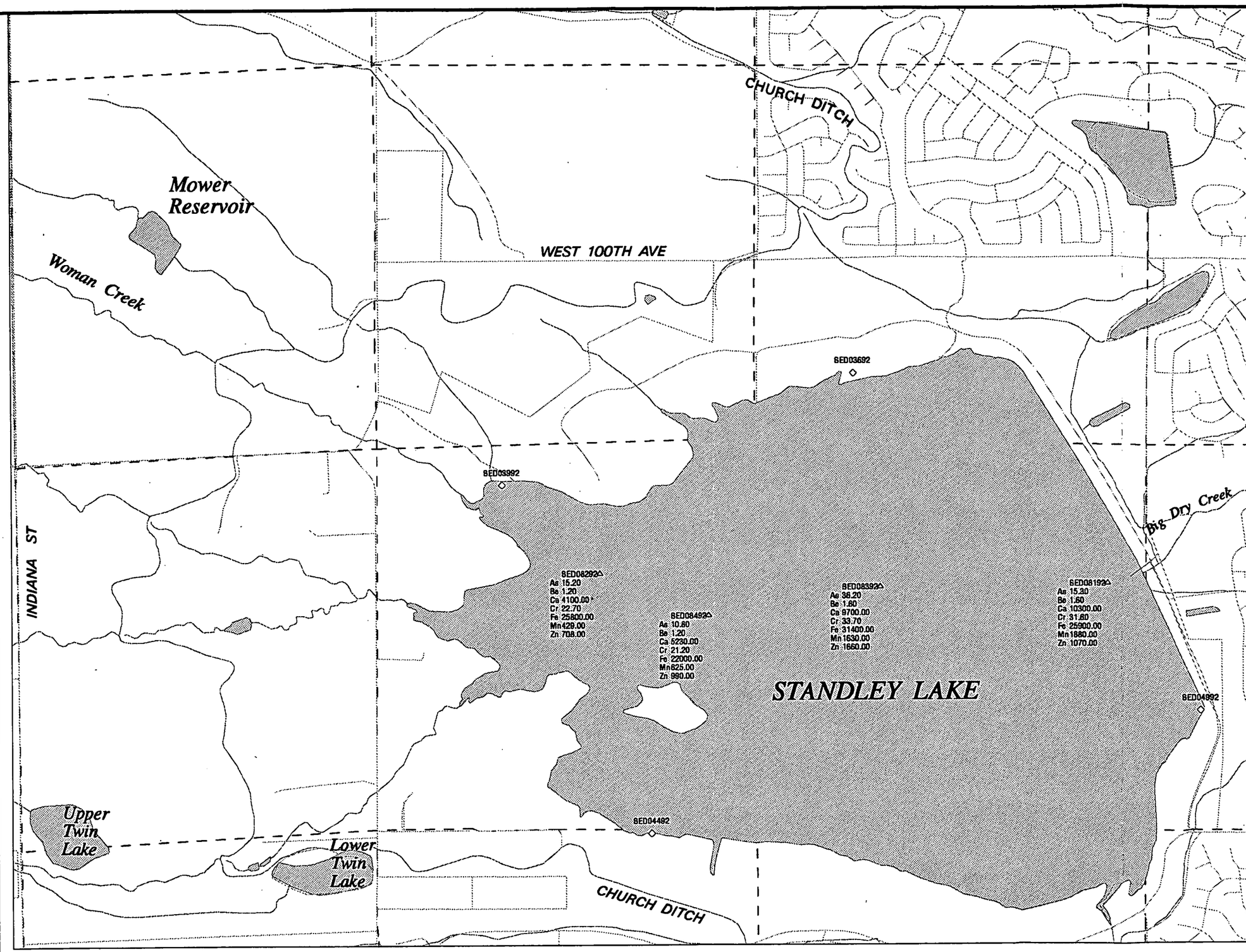


Figure I-2B

Analytical Results of Selected Metals for for Sediment Samples

Operable Unit 3

IHSS 201

Standley Lake

ROCKY FLATS

ENVIRONMENTAL TECHNOLOGY SITE

U.S. Department of Energy

Analyte Symbols:
- As Arsenic
- Be Beryllium
- Ca Calcium
- Cr Chromium
- Fe Iron
- Mn Manganese
- Zn Zinc

Units are mg/kg.

◇ 1992 Grab/Core samples

△ 1992 Sediment Core sample

Note: Data shown are maximum values for core locations only; not all core locations were analyzed for metals.

DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 15840
1 inch = 1320 ft or 0.25 mi

0 500 1000 2000
SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.

MAP FILE NAME: FIGI-2B.EPS
AML NAME: /PROJ4/OUS/PLOTAML5/RI/FIGI-1B.AML
DRAWN BY: D. Moreno
APPROVED BY:
October 03, 1995

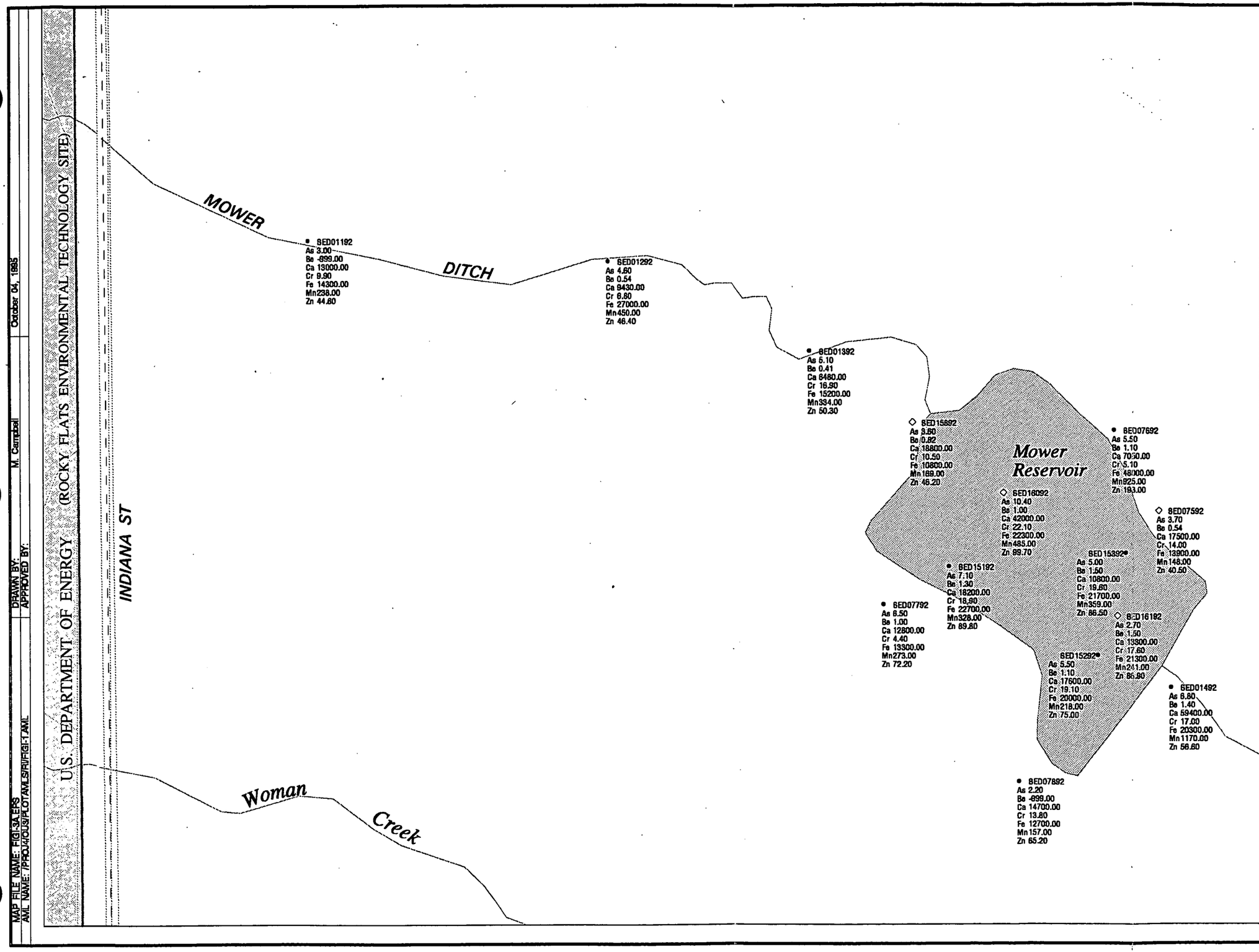


Figure I-3A

Analytical Results of Selected Metals for Sediment Samples

Operable Unit 3

IHSS 202

Mower Reservoir

ROCKY FLATS
ENVIRONMENTAL TECHNOLOGY SITE
U.S. Department of Energy

Analyte Symbols:
As Arsenic
Be Beryllium
Ca Calcium
Cr Chromium
Fe Iron
Mn Manganese
Zn Zinc

Units are mg/kg.

◇ 1992 Grab/Core samples
• 1992 Sediment Grab sample

Note: Data shown are for grab locations only.

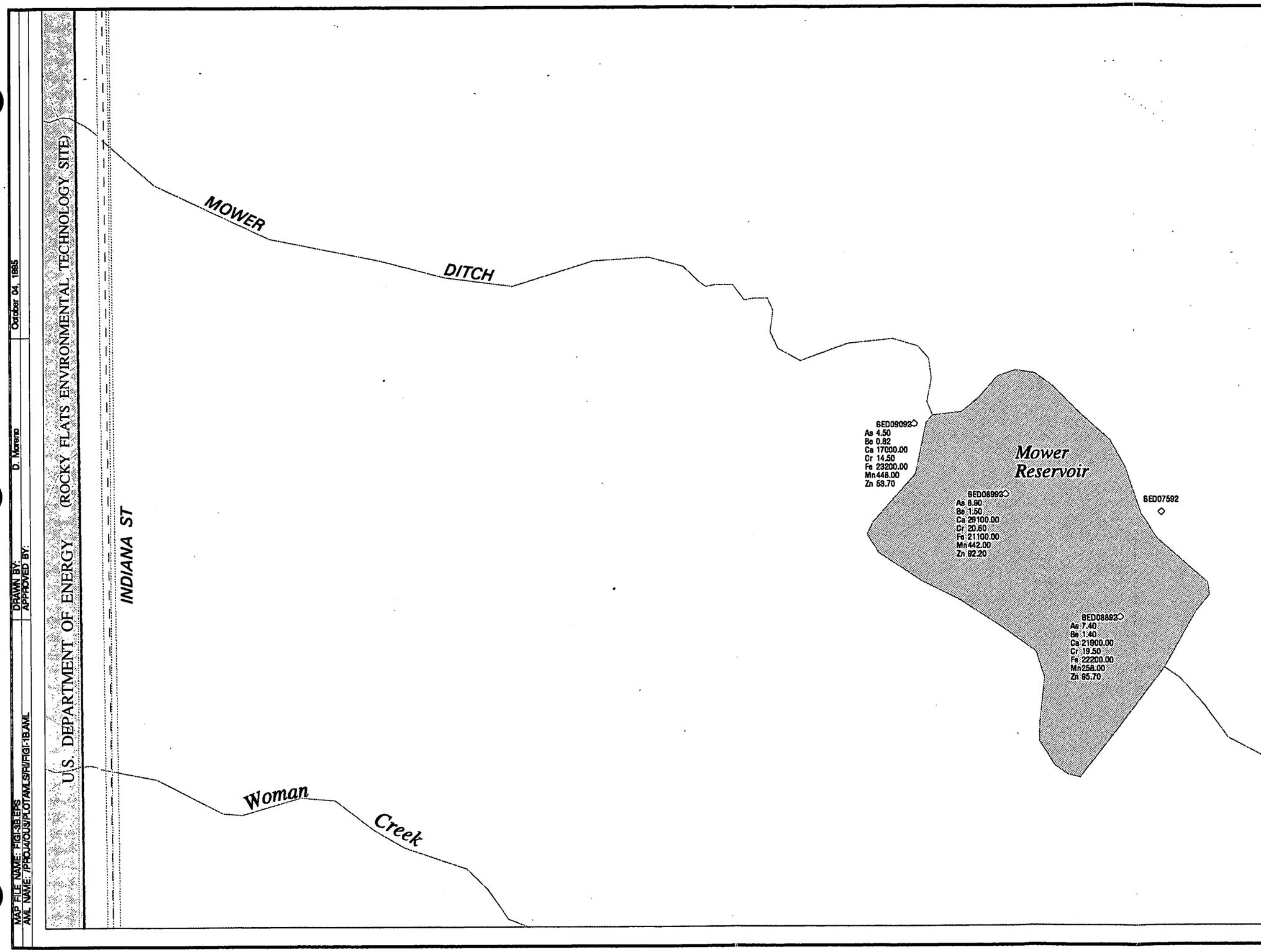
DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 2400
1 inch = 200 ft

0 100 200 400
SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.



U.S. DEPARTMENT OF ENERGY (ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE)

MAP FILE NAME: FIGI-3B.EPS
AML NAME: /PROJ4/OU3/PLOTAML S/PU/FIGI-1B.AML
DRAWN BY: D. Moreno
APPROVED BY:
October 04, 1995

Figure I-3B

Analytical Results of Selected Metals for for Sediment Samples

Operable Unit 3

IHSS 202

Mower Reservoir

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

U.S. Department of Energy

Analyte Symbols:
As Arsenic
Be Beryllium
Ca Calcium
Cr Chromium
Fe Iron
Mn Manganese
Zn Zinc

Units are mg/kg.

◇ 1992 Grab/Core samples

△ 1992 Sediment Core sample

Note: Data shown are maximum values for core locations only; not all core locations were analyzed for metals.

DRAFT

Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats
U.S. Geological Survey

Scale 1 : 2400
1 inch = 200 ft

0 100 200 400
SCALE IN FEET

Polyconic projection. 1927 North American datum. Colorado central zone state plane coordinate system.