CORRES. CONTROL
OUTGOING LTR NO.

DOE ORDER# 4700.1

94 RF 09915

DIST.	LTR	ENC
AMARAL, M.E.		
BURLINGAME, A.H.		
BUSBY, W.S. file	X	X
BRANCH, D.B.		
CARNIVAL, G.J.		
DAVIS, J.G.		
FERRERA, D.W.		
FRAY, R.E.		
GEIS, J.A.		
GLOVER, W.S.		
GOLAN, P.M.		
HANNI, B.J.		
HARMAN, L.K.		
HEALY, T.J.		
HEDAHL, T.		
HILBIG, J.G.		
HUTCHINS, N.M.		
JACKSON, D.T.		
KELL, R.E.		
KUESTER, A.W.		
MARX, G.E.		
McDONALD, M.M.		
McKENNA, F.G.		
MONTROSE, J.K.		
MORGAN, R.V.		
POTTER, G.L.		
PIZZUTO, V.M.		
RISING, T.L.		
SANDLIN, N.B.		
SCHWARTZ, J.K.		
SETLOCK, G.H.		
STEWART, D.L.		
STIGER, S.G.		
TOBIN, P.M.		
VOORHEIS, G.M.		
WILSON, J.M.		
Gaucin, P	X	X
Roberts, R	X	X
Volk, K	X	X
CORRES. CONTROL	X	X
ADMN RECORD/080	X	X
TRAFFIC		
PATS/T130G		

CLASSIFICATION:

UCNI		
UNCLASSIFIED		
CONFIDENTIAL		
SECRET		

AUTHORIZED CLASSIFIER SIGNATURE
DOCUMENT CLASSIFICATION REVIEW WAIVER PER CLASSIFICATION OFFICE
DATE 9/26/94

IN REPLY TO RFP CC NO:

ACTION ITEM STATUS
☐ PARTIAL/OPEN
☐ CLOSED

LTR APPROVALS:

ORIG & TYPIST INITIALS
PJL: pap

00004837

EG&G ROCKY FLATS

EG&G ROCKY FLATS, INC.
ROCKY FLATS PLANT, P.O. BOX 464, GOLDEN, COLORADO 80402-0464 • (303) 966-7000

September 26, 1994 94-RF-09915

S. M. Grace
OU-1, OU-2 Program Manager
DOE/RFFO

ANALYTICAL RESULTS AND SUMMARY STATISTICS FOR CHEMICALS OF CONCERN – WSB-097-94

Action: None

Per your request, EG&G is providing analytical results and summary statistics for Chemicals of Concern (COC) in Area of Concern (AOC) No. 2 (the East of Individual Hazardous Substance Site (IHSS) Area) to support using the entire data set in the Human Health Risk Assessment (HHRA) for this AOC rather than a subset within a 10-acre area. The reasons to use all samples collected in the East of IHSS Area to evaluate health risk rather than a subset from a smaller geographic area are:

The data set is relatively small. For example, there are 12 subsurface soil sampling locations, about 30 surface soil samples for radionuclides, 45 surface soil samples for metals, about 45 groundwater samples for Volatile Organic Compounds (VOCs), and about 22 groundwater samples for radionuclides. Very few sampling locations are present in any 10-acre area (for example, only one monitoring well or borehole might be present). A figure showing sampling locations is attached.

Although the data set is relatively small for such a large geographic area, inspection of the analytical results for chemicals of concern in the attached table shows that contaminant levels are generally low and the analytical results appear to characterize the area well. Except for Pu and Am in surface soil, concentrations of inorganics in surface and subsurface soil that exceed the background mean + two standard deviations are rare, and detections of chlorinated hydrocarbon COCs in groundwater are also rare. There is no evidence of "hot spots" or areas of waste-related contamination in surface or subsurface soil that warrant more detailed investigation. This is reasonable because no waste disposal occurred in the East of IHSS area.

Using all sample results permits a qualitative evaluation of isolated high concentrations in the context of other sampling results. For example, the arsenic concentration of 25.9 mg/kg in subsurface soil in borehole 41591 at Indiana Street, whether due to contamination or not, is evidently not characteristic of arsenic concentrations in soil in the East of IHSSs area.

Because detections of COCs above background levels in any media are rare, using all the data set, rather than a subset associated with a small geographic area, will incorporate maximum detected concentrations of all COCs in AOC No. 2 in the calculation of 95% UCL exposure concentrations. Pooling the data is justifiable because there are no subareas of high contamination that will be "diluted" by using the entire data set, nor are such areas expected to occur in the East of IHSS Area, based on site history.

ADMIN RECORD
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- Assuming the data characterize potential contaminant levels in AOC No. 2, using the entire data set permits estimating health risk for an entire area, with the probability of demonstrating no unacceptable risk using Reasonable Maximum Exposure (RME) concentrations and conservative exposure scenarios.

Additionally, Attachment 2 illustrates the maximum residential exposure area within OU-2 Area of Concern No. 1. Area of Concern No. 1 includes the 903 Pad, Mound, Northeast Trenches, and Southeast Trenches Source Areas. The maximum residential exposure area represents the 10-acre area which poses the maximum risk to human health. The conservative Risk Base Concentration (RBC) screen results, calculated in support of the Colorado Department of Public Health and Environment's requirements, were used to aid the selection of the maximum residential exposure area. The total carcinogenic ratio sum for soil (0 to 12 foot depth) and groundwater potential contaminants of concern in the 903 Pad Source Area was an order of magnitude higher than in the Mound or Northeast Trenches Source Areas. The total carcinogenic ratio sum for the 903 Pad Source Area was 3.4E+05, the Mound Source Area was 4.2E+04, the Northeast Trenches was 7.2E+04, and the Southeast Trenches was 6.4E+01.

Within the 903 Pad Source Area, the locations of the maximum concentrations for the contaminants of concern that pose the highest risk to human health, based on the ratios of the concentrations to the conservative RBCs (carcinogenic), were found in the following:

Soil to 12 Feet

- Tetrachloroethane in BH2587 at 0.13 mg/kg, carcinogenic ratio of concentration to RBC is 1.06E-02
- Aroclor-1254 in well 08691 at 5.9 mg/kg, carcinogenic ratio of concentration to RBC is 7.09E+01
- Americium-241 at PT029 (in IHSS 140) at 160 pCi/g, carcinogenic ratio of concentration to RBC is 6.75E+01
- Plutonium-239,240 at PT028 (east of the 903 Pad in IHSS 155) at 11,000 pCi/g, carcinogenic ratio of concentration to RBC is 3.22E+03
- Uranium-233,234 at well 07591 at 55 pCi/g, carcinogenic ratio of concentration to RBC is 1.23E+00

UHSU Groundwater

- 1,1-Dichloroethene at well 07391 at 0.38 mg/L, carcinogenic ratio of concentration to RBC is 2.28E+04
- Carbon tetrachloride at well 06691 at 20 mg/L, carcinogenic ratio of concentration to RBC is 7.69E+04
- Chloroform at well 06691 at 39 mg/L, carcinogenic ratio of concentration to RBC is 1.41E+05
- Methylene chloride at well 06691 at 35 mg/L, carcinogenic ratio of concentration to RBC is 5.63E+03
- Tetrachloroethane at well 08891 at 14 mg/L, carcinogenic ratio of concentration to RBC is 9.79E+03
- Trichloroethene at well 07391 at 140 mg/L, carcinogenic ratio of concentration to RBC is 5.49E+04

- Americium-241 at well 09091 at 46.54 pCi/L, carcinogenic ratio of concentration to RBC is 2.35E+02
- Plutonium-239,240 at well 09091 at 180 pCi/L, carcinogenic ratio of concentration to RBC is 8.70E+02

The maximum residential exposure area (10 acres) was selected to encompass the above mentioned maximum concentration locations.

If you have any questions or desire additional information, please contact Pete Laurin at extension 8702 or Rick Roberts at extension 8508.

W. S. Busby
Manager, OU-2 Closure
Environmental Restoration Program Division

PL:pap

Orig. and 1 cc - S. M. Grace

Attachment:
As Stated (3)

cc:
E.A. Dille - DOE/AEI

EAST OF IHSSs SOURCE AREA
ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN
SURFACE SOIL

			AMERICIUM-241(pCi/g)					PLUTONIUM-239/240 (pCi/g)				
Location	Field ID	Date	Result	DL	Error	Qual lab	Qual WC	Result	DL	Error	Qual lab	Qual WC
PT068	SS00799STU2	11/27/91	4.30	0.08	1.10		A	23.00	0.08	3.80		V
PT079	SS01169ST	11/11/92	3.71	0.01	0.40		A	22.96	0.02	2.24		A
PT080	SS00764STU2	10/14/91	1.26	0.00	0.17		A	8.74	0.03	1.61		
PT081	SS00765STU2	10/14/91	0.71	0.00	0.10		A	6.00	0.03	1.14		
PT084	SS00741STU2	10/10/91	0.31	0.01	0.05		A	1.58	0.01	0.23		V
PT085	SS00740STU2	10/10/91	0.90	0.00	0.12		A	3.35	0.03	0.71		A
PT086	SS00736STU2	10/8/91	0.93	0.00	0.12		A	8.74	0.01	1.13		V
PT087	SS00732STU2	10/8/91	2.07	0.01	0.23		A	10.30	0.03	2.12		A
PT088	SS00733STU2	10/8/91	3.14	0.00	0.34		A	20.34	0.02	3.91		A
PT092	SS01160ST	11/11/92	0.31	0.01	0.05		A	2.12	0.01	0.24		A
PT093	SS00743STU2	10/10/91	1.27	0.00	0.15		A	6.90	0.03	1.41		A
PT094	SS00734STU2	10/8/91	2.92	0.00	0.32		A	13.81	0.03	3.25		A
PT095	SS01115ST	11/10/92						5.06	0.01	0.53		A
PT096	SS01116ST	11/10/92	0.37	0.01	0.06			8.45	0.13	1.40		
PT100	SS00742STU2	10/10/91	0.18	0.01	0.03		A	0.78	0.01	0.13		A
PT101	SS01159ST	11/11/92	0.57	0.01	0.08			2.32	0.01	0.26		
PT102	SS01158ST	11/11/92	3.10	0.01	0.34		A	50.30	0.01	4.82		A
PT104	SS01134ST	11/11/92	0.47	0.00	0.08		A	2.94	0.01	0.35		A
PT105	SS01137ST	11/11/92	0.24	0.01	0.05		A	1.82	0.01	0.24		A
PT106	SS00744STU2	10/10/91	1.82	0.00	0.20		A	11.70	0.01	1.47		A
PT107	SS01114ST	11/10/92	0.53	0.01	0.08		A	3.14	0.01	0.34		A
PT108	SS00752STU2	10/11/91	0.37	0.01	0.06		A	2.71	0.03	0.53		A
PT109	SS01112ST	11/10/92	0.23	0.01	0.05		A	1.46	0.11	0.18		A
PT112	SS00746STU2	10/10/91	0.30	0.00	0.05		A	1.54	0.01	0.24		A
PT113	SS00745STU2	10/10/91	0.99	0.01	0.12		A	5.80	0.03	1.07		A
PT114	SS01138ST	11/11/92	0.75	0.01	0.10		A	4.47	0.01	0.51		A
PT115	SS00754STU2	10/11/91	0.09	0.00	0.02		A	0.61	0.03	0.10		
PT118	SS01156ST	11/11/92						0.66	0.01	0.11		A
PT119	SS01139ST	11/11/92	0.30	0.01	0.05		A	1.71	0.02	0.23		A
PT120	SS01157ST	11/11/92	0.99	0.01	0.14		A	7.20	0.01	0.85		A
PT121	SS00747STU2	10/10/91	0.59	0.00	0.08		A	2.61	0.01	0.34		A
PT122	SS00748STU2	10/10/91	0.39	0.01	0.06		A	2.26	0.01	0.33		A
PT123	SS01111ST	11/10/92	0.12	0.00	0.03		A	0.91	0.01	0.12		A
No. of samples			31					33				
No. of detects			31					33				
Minimum			0.09					0.61				
Maximum			4.3					50.3				
Average			1.10					7.46				
Standard Deviation			1.14					9.71				
t-value			1.697					1.697				
95% UCL			1.45					10.33				
RME			1.45					10.33				
Risk-based concentration			2.37					3.42				
Bkgnd UTL 99/99			0.06					0.133				
Bkgnd mean + 2 SD			0.039					0.094				

EAST OF IHSSs SOURCE AREA
ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN
SURFACE SOIL

		CHROMIUM (mg/kg)				LEAD (mg/kg)			
Location	Field ID	Result	DL	Qual lab	Qual WC	Result	DL	Qual lab	Qual WC
PT079	SS01169ST	10.60	2.00		V	44.00	1.00		V
PT092	SS01160ST	6.80	2.00		V	50.60	0.60		V
PT095	SS01115ST	6.00	2.00		V	38.40	1.00		V
PT096	SS01116ST	6.00	2.00		V	25.50	1.00		V
PT096	SS01117ST	32.10	2.00		V	29.40	1.00		V
PT101	SS01159ST	8.40	2.00		V	53.60	0.60		V
PT102	SS01158ST	8.90	2.00		V	42.30	1.00		V
PT104	SS01135ST	11.50	2.00 •		JA	32.60	0.60		V
PT104	SS01134ST	12.80	2.00 •		JA	35.70	0.60 S		V
PT105	SS01137ST	13.20	2.00 •		JA	45.20	0.60 S		V
PT107	SS01114ST	8.50	2.00		V	32.10	1.00		V
PT109	SS01112ST	7.90	2.00 •		JA	26.10	0.60 S		V
PT114	SS01138ST	13.90	2.00 •		JA	55.30	0.60		V
PT118	SS01156ST	7.20	2.00		V	27.10	1.00		V
PT119	SS01139ST	13.50	2.00 •		JA	45.30	0.60 S		V
PT120	SS01157ST	10.10	2.00		V	57.10	1.00		V
PT123	SS01111ST	19.20	2.00 •		JA	37.70	0.60		V
SS201093	SS20010WC	9.00	10.00		JA	30.50	2.00		V
SS201393	SS20013WC	14.20	10.00		V	35.20	2.00		JA
SS201493	SS20014WC	14.80	10.00		V	26.10	2.00		JA
SS201593	SS20015WC	13.80	10.00		JA	56.90	2.00		V
SS201693	SS20016WC	15.70	10.00		JA	48.00	2.00		V
SS201793	SS20017WC	13.90	10.00		V	39.50	2.00		JA
SS201893	SS20018WC	12.70	10.00		V	38.60	2.00		JA
SS201993	SS20019WC	15.90	10.00		JA	46.70	2.00		V
SS202093	SS20020WC	8.60	10.00		JA	50.90	2.00		V
SS202193	SS20021WC	12.80	10.00		JA	45.00	2.00		V
SS202293	SS20022WC	8.50	10.00		JA	46.20	2.00		V
SS202393	SS20023WC	12.00	10.00		V	33.40	2.00		JA
SS202493	SS20024WC	15.30	10.00		JA	40.90	2.00		V
SS202593	SS20025WC	16.30	10.00		JA	39.90	2.00		V
SS202693	SS20026WC	10.00	10.00		JA	38.80	2.00		V
SS202793	SS20027WC	12.50	10.00		JA	46.90	2.00		V
SS202893	SS20028WC	14.60	10.00		V	50.00	2.00		JA
SS202993	SS20029WC	17.40	10.00		JA	50.40	2.00		V
SS203093	SS20030WC	14.60	10.00		JA	37.80	2.00		V
SS203193	SS20031WC	14.80	10.00		JA	34.80	2.00		V
SS203293	SS20032WC	9.00	10.00		JA	33.00	2.00		V
SS203393	SS20033WC	8.60	10.00		JA	22.30	2.00		V
SS203493	SS20034WC	15.70	10.00		JA	40.10	2.00		V
SS203593	SS20035WC	10.60	10.00		JA	63.40	2.00		V
SS203693	SS20036WC	18.60	10.00		JA	46.10	2.00		V
SS203793	SS20037WC	13.70	2.00		V	48.00	0.50		V
SS203893	SS20038WC	13.60	10.00		V	32.10	2.00		JA
SS203993	SS20039WC	15.40	10.00		V	32.70	2.00		JA
No. of samples		45				45			
No. of detects		45				45			
Minimum		6.00				22.30			
Maximum		32.10				63.40			
Average		6.80				1.51			
Standard Deviation		3.92				0.62			
t-value		1.684				1.684			
95% UCL		7.78				1.66			
RME		7.78			—	1.66			
Risk-based concentration		274,000				-			
Bkgnd UTL 99/99		24.8				61.4			
Bkgnd mean + 2 SD		20				49.6			

[ ] Greater than background mean plus two standard deviations.

EAST OF IHSSs SOURCE AREA
ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN
SUBSURFACE SOIL

				ARSENIC (mg/kg)				CADMIUM (mg/kg)			
Location	Field ID	Date	Depth	Result	DL	Qual Lab	Qual WC	Result	DL	Qual Lab	Qual WC
0286	BP00042IT	7/9/92	0-11'	2.500	2.000		V	0.5	1.000	U	V
40391	BH00021EB	10/8/91	0-6'	4.700	2.000		V	0.43	1.000	UN	V
40491	BH00097EB	11/7/91	0-2.5	7.150	2.000	B	JA	1.1	1.000	B	JA
40491	BH00099EB	11/7/91	6-10.4'	7.900	2.000		V	0.225	1.000	U	V
40591	BH00031EB	10/9/91	0-6'	3.400	2.000		V	0.21	1.000	U	V
40591	BH00034EB	10/9/91	6-12'	1.900	2.000	B	V	0.23	1.000	U	V
40591	BH00036EB	10/9/91	12-14'	2.000	2.000	B	V	0.225	1.000	U	V
40691	BH00041EB	10/10/91	0-6'	4.900	2.000	N	JA	0.22	1.000	U	V
40691	BH00043EB	10/10/91	6-12'	1.300	2.000	BN	JA	0.225	1.000	U	V
41591	BH00087EB	11/6/91	0-5'	25.930	2.000	B	JA				
41691	BH00104EB	11/7/91	0-3.8'	4.700	2.000		V	0.225	1.000	U	V
No. of samples				11				10			
No. of detects				11				1			
Minimum				1.3				1.1			
Maximum				25.93				1.1			
Average				6.03				0.36			
Standard Deviation				6.61				0.27			
t-value				1.812				1.833			
95% UCL				9.65				0.51			
RME				9.65				0.51			
Risk-based concentration				0.36				137			
Bkgnd UTL 99/99				17				2			
Bkgnd mean + 2 SD				13.2				1.7			

Greater than background mean plus two standard deviations.

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EAST OF IHSSs SOURCE AREA
ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN
SUBSURFACE SOIL

Location	Field ID	Depth (ft)	Date	AMERICIUM-241(pCi/g) Result	DL	Error	Lab Qual	PLUTONIUM-239/240 (pCi/g) Result	DL	Error	Lab Qual
0286	BP00042IT	0-11	7/9/92	0.01380	0.0000	0.0061		0.0187	0.0000	0.0105	
11091	BH00002WCU2	8.8	8/29/91	0.00361	0.0200	0.0042	J	0.0017	0.0300	0.0033	J
40391	BH00021EB	0-6	10/8/91	0.18300	0.0528	0.0548		0.6920	0.0203	0.0617	
40491	BH00097EB	0-2.5	11/7/91	0.01600	0.0200	0.0320	U	0.1200	0.0030	0.0360	
40491	BH00099EB	6-10.4	11/7/91	0.05400	0.2100	0.1500	U	0.0020	0.0020	0.0040	J
40591	BH00031EB	0-6	10/9/91	0.04050	0.0294	0.0229		0.1010	0.0102	0.0298	
40591	BH00034EB	6-12	10/9/91	0.00000	0.0673	0.0243		0.0022	0.0100	0.0073	
40591	BH00036EB	12-14	10/9/91	0.00570	0.0499	0.0225		0.0029	0.0067	0.0056	
40691	BH00041EB	0-6	10/10/91	0.05600	0.0188	0.0180		0.2830	0.0073	0.0267	
40691	BH00043EB	0-6	10/10/91	0.01710	0.0320	0.0175		0.0000	0.0108	0.0064	
41591	BH00087EB	0-5	11/6/91	0.01200	0.0670	0.0460	U	0.1900	0.0050	0.0440	
41691	BH00104EB	0-4	11/7/91	0.85000	0.0580	0.6100		2.3000	0.0050	0.3500	
No. of samples				12				12			
No. of detects				12				12			
Minimum				0				0			
Maximum				0.85				2.3			
Average				0.1043				0.3095			
Standard Deviation				0.2299				0.6299			
t-value				1.796				1.796			
95% UCL				0.2235				0.6360			
RME				0.22348				0.6360194			
Risk-based concentration				2.4				3.4			
Bkgnd UTL 99/99				0.022				0.025			
Bkgnd Mean + 2 SD				0.012				0.018			

[ ] Activity exceeds background mean + two standard deviations.

EAST OF IHSSs SOURCE AREA
ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN
SUBSURFACE SOIL

Location	Field ID	Depth (ft)	Date	URANIUM-233,-234 (pCi/g) Result	DL	Error	Lab Qual	URANIUM-235 (pCi/g) Result	DL	Error	Lab Qual	URANIUM-238 (pCi/g) Result	DL	Error	Lab Qual
0286	BP00042IT	0-11	7/9/92	0.8450	0.0000	0.165		0.0650	0.0000	0.0382		0.8720	0.1690	0.169	
11091	BH00002WCU2	8.8	8/29/91	1.2010	0.3000	0.337		0.0673	0.3000	0.0694	J	1.1100	0.3000	0.321	
40391	BH00021EB	0-6	10/8/91												
40491	BH00097EB	0-2.5	11/7/91												
40491	BH00099EB	6-10.4	11/7/91												
40591	BH00031EB	0-6	10/9/91												
40591	BH00034EB	6-12	10/9/91												
40591	BH00036EB	12-14	10/9/91												
40691	BH00041EB	0-6	10/10/91												
40691	BH00043EB	0-6	10/10/91												
41591	BH00087EB	0-5	11/6/91												
41691	BH00104EB	0-4	11/7/91												
No. of samples				2				2				2			
No. of detects				2				2				2			
Minimum				0.845				0.065				0.872			
Maximum				1.201				0.0673				1.11			
Average				1.0230				0.0661				0.9910			
Standard Deviation				0.1780				0.0011				0.1190			
t-value				6.314				6.314				6.314			
95% UCL				1.8177				0.0712				1.5223			
RME				1.201				0.0673				1.11			
Risk-based concentration				4.5				0.17				4.6			
Bkgnd UTL 99/99				3.4				0.15				1.8			
Bkgnd Mean + 2 SD				2.6				0.11				1.5			

Activity exceeds background mean + 1

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EAST OF IHSSs SOURCE AREA
ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN
GROUNDWATER

			CHLOROFORM (µg/l)				METHYLENE CHLORIDE (µg/l)			
Location	Field ID	Date	Result	DL	Qual Lab	Qual WC	Result	DL	Qual Lab	Qual WC
0286	GW01454IT	6/19/91	2.5	5.00	U		2.5	5.00	U	
0286	GW01761IT	9/11/91	2.5	5.00	U	V	2.5	5.00	U	V
0286	GW02611IT	3/18/92	2.5	5.00	U	V	2.5	5.00	U	V
0286	GW02955IT	6/10/92	0.05	0.01	U	V	1	0.01	U	JA
0386	GW01455IT	6/20/91	2.5	5.00	U		2.5	5.00	U	
0386	GW01762IT	9/11/91	2.5	5.00	U	V	2.5	5.00	U	JA
0386	GW02026IT	11/13/91	2.5	5.00	U	V	2.5	5.00	U	JA
0386	GW02612IT	4/1/92	2.5	5.00	U	V	2.5	5.00	U	V
0386	GW02956IT	6/12/92	0.05	0.01	U	V	1	0.01	U	JA
0386	GW03392IT	9/16/92	2.5	5.00	U	V	2.5	5.00	U	V
0386	GW03810IT	11/17/92	2.5	5.00	U	V	2.5	5.00	U	V
06191	GW03352IT	8/14/92	0.1	0.20	U	V	1	0.60	U	JA
06191	GW03905IT	10/20/92	0.25	0.50	U	V	0.6	0.60		V
06291	GW02990IT	6/5/92	0.05	0.01	U	JA	1	0.01	U	JA
06291	GW03329IT	9/3/92	0.2	0.20		V	0.5	0.60	U	JA
06291	GW03894IT	10/13/92					0.5	0.60	U	JA
06391	GW02991IT	6/5/92	0.05	0.01	U	JA	1	0.01	U	JA
06391	GW03415IT	9/3/92	0.4	0.20		V	1	0.60	U	JA
06491	GW02089IT	12/7/91	0.05	0.01	U	V				
06491	GW02616IT	4/1/92	0.05	0.01	U		1	0.01	U	
06491	GW03049IT	6/22/92	0.05	0.10	U	V	0.1	0.20	U	V
06491	GW03375IT	9/10/92	0.1	0.20	U	V	0.5	0.60	U	JA
06491	GW03808IT	11/13/92	0.05	0.10	U	V	0.1	0.20	U	V
3786	GW01223IT	4/30/91	2.5	5.00	U	V	2.5	5.00	U	JA
3786	GW01521IT	7/17/91	2.5	5.00	U		2.5	5.00	U	
3786	GW01899IT	10/15/91	2.5	5.00	U	V	2.5	5.00	U	JA
3786	GW02229IT	1/23/92	2.5	5.00	U	V	2.5	5.00	U	V
3786	GW02656IT	4/14/92	0.05	0.01	U	V	1	0.01	U	JA
3786	GW03233IT	9/18/92	2.5	5.00	U	V	1	5.00	J	A
3786	GW03641IT	10/13/92	2.5	5.00	U	V	2.5	5.00	U	V
3986	GW01285IT	5/14/91	2.5	5.00	U	V	2.5	5.00	U	JA
3986	GW01592IT	8/16/91	2.5	5.00	U	V	2.5	5.00	U	V
3986	GW02049IT	12/5/91	0.05	0.01	U	V	1	0.01	U	V
3986	GW02241IT	1/21/92	2.5	5.00	U	V	2.5	5.00	U	V
3986	GW02668IT	4/16/92	0.05	0.01	U	V	1	0.01	U	JA
3986	GW03328IT	9/8/92	2.5	5.00	U	V	2.5	5.00	U	V
3986	GW03893IT	10/19/92	2.5	5.00	U		0.3	5.00	J	
41591	GW02091IT	12/6/91	0.05	0.01	U	V				
41591	GW02614IT	3/18/92	0.05	0.01	U	V	3.3	0.01		V
41591	GW02952IT	6/10/92	0.05	0.01	U	V	1	0.01	U	JA
41591	GW03395IT	9/15/92	0.1	0.20	U	V	1.5	0.60	U	JA
41591	GW03811IT	11/17/92	0.05	0.10	U	V	0.1	0.20	U	V
41691	GW02090IT	12/7/91	0.05	0.01	U	V				
41691	GW02615IT	4/1/92	0.05	0.01	U		1	0.01	U	
41691	GW02953IT	6/11/92	0.05	0.01	U	V	1	0.01	U	JA
41691	GW03396IT	9/16/92	0.1	0.20	U	V	1	0.60	U	JA
41691	GW03806IT	11/18/92	0.05	0.10	U	V	0.1	0.20	U	V
6786	GW03732IT	11/4/92	2.5	5.00	U	V	2.5	5.00	U	V
No. of samples			47				45			
No. of detects			2				4			
Minimum			0.2				0.3			
Maximum			0.4				3.3			
Average			1.16				1.56			
Standard Deviation			1.20				0.93			
t-value			1.684				1.684			
95% UCL			1.46				1.79			
RME			0.4				1.79			
Risk-based concentration			0.276				6.22			

[ ] = Detect

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EAST OF IHSSs SOURCE AREA
ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN
GROUNDWATER

			TETRACHLOROETHENE (µg/l)				TRICHLOROETHENE (µg/l)			
Location	Field ID	Date	Result	DL	Qual Lab	Qual WC	Result	DL	Qual Lab	Qual WC
0286	GW01454IT	6/19/91	2.5	5.00	U		2.5	5.00	U	
0286	GW01761IT	9/11/91	2.5	5.00	U	V	2.5	5.00	U	V
0286	GW02611IT	3/18/92	2.5	5.00	U	V	2.5	5.00	U	V
0286	GW02955IT	6/10/92	0.05	0.02	U	V	0.05	0.03	U	V
0386	GW01455IT	6/20/91	2.5	5.00	U		2.5	5.00	U	
0386	GW01762IT	9/11/91	2.5	5.00	U	V	2.5	5.00	U	V
0386	GW02026IT	11/13/91	2.5	5.00	U	V	2.5	5.00	U	V
0386	GW02612IT	4/1/92	2.5	5.00	U	V	2.5	5.00	U	V
0386	GW02956IT	6/12/92	0.05	0.02	U	V	0.05	0.03	U	V
0386	GW03392IT	9/16/92	2.5	5.00	U	V	2.5	5.00	U	V
0386	GW03810IT	11/17/92	2.5	5.00	U	V	2.5	5.00	U	V
06191	GW03352IT	8/14/92	0.1	0.10		V	0.15	0.30	U	V
06191	GW03905IT	10/20/92	0.25	0.50	U	V	0.25	0.50	U	V
06291	GW02990IT	6/5/92	0.05	0.02	U	JA	0.05	0.03	U	JA
06291	GW03329IT	9/3/92	0.05	0.10	U	V	0.7	0.30		V
06291	GW03894IT	10/13/92	0.25	0.50	U	V	0.25	0.50	U	V
06391	GW02991IT	6/5/92	0.05	0.02	U	JA	0.05	0.03	U	JA
06391	GW03415IT	9/3/92	0.1	0.10		V	0.15	0.30	U	V
06491	GW02089IT	12/7/91	0.05	0.02	U	V	0.05	0.03	U	V
06491	GW02616IT	4/1/92	0.05	0.02	U		0.05	0.03	U	
06491	GW03049IT	6/22/92	0.1	0.20	U	V	0.1	0.20	U	V
06491	GW03375IT	9/10/92	0.05	0.10	U	V	0.15	0.30	U	V
06491	GW03808IT	11/13/92	0.1	0.20	U	V	0.1	0.20	U	V
3786	GW01223IT	4/30/91	2.5	5.00	U	V	2.5	5.00	U	V
3786	GW01521IT	7/17/91	2.5	5.00	U		2.5	5.00	U	
3786	GW01899IT	10/15/91	2.5	5.00	U	V	2.5	5.00	U	V
3786	GW02229IT	1/23/92	2.5	5.00	U	V	2.5	5.00	U	V
3786	GW02656IT	4/14/92	0.05	0.02	U	V	0.05	0.03	U	V
3786	GW03233IT	9/18/92	2.5	5.00	U	V	2.5	5.00	U	V
3786	GW03641IT	10/13/92	2.5	5.00	U	V	2.5	5.00	U	V
3986	GW01285IT	5/14/91	2.5	5.00	U	V	2.5	5.00	U	V
3986	GW01592IT	8/16/91	2.5	5.00	U	V	2.5	5.00	U	V
3986	GW02049IT	12/5/91	0.62	0.02		V	0.05	0.03	U	V
3986	GW02241IT	1/21/92	2.5	5.00	U	V	2.5	5.00	U	V
3986	GW02668IT	4/16/92	0.4	0.02		JA	0.2	0.03		JA
3986	GW03328IT	9/8/92	2.5	5.00	U	V	2.5	5.00	U	V
3986	GW03893IT	10/19/92	0.5	5.00	J		2.5	5.00	U	
41591	GW02091IT	12/6/91	0.11	0.02		JA	0.05	0.03	U	V
41591	GW02614IT	3/18/92	0.05	0.02	U	V	0.05	0.03	U	V
41591	GW02952IT	6/10/92	0.05	0.02	U	V	0.05	0.03	U	V
41591	GW03395IT	9/15/92	0.05	0.10	U	V	0.15	0.30	U	V
41591	GW03811IT	11/17/92	0.1	0.20	U	V	0.4	0.20		V
41691	GW02090IT	12/7/91	0.05	0.02	U	V	0.05	0.03	U	V
41691	GW02615IT	4/1/92	0.05	0.02	U		0.05	0.03	U	
41691	GW02953IT	6/11/92	0.05	0.02	U	V	0.05	0.03	U	V
41691	GW03396IT	9/16/92	0.25	0.10	U	JA	0.15	0.30	U	V
41691	GW03806IT	11/18/92	0.1	0.20	U	V	0.1	0.20	U	V
6786	GW03732IT	11/4/92	2.5	5.00	U	V	2.5	5.00	U	V
No. of samples			48				48			
No. of detects			5				3			
Minimum			0.1				0.2			
Maximum			0.62				0.7			
Average			1.12				1.17			
Standard Deviation			1.17				1.18			
t-value			1.684				1.684			
95% UCL			1.40				1.45			
RME			0.62				0.70			
Risk-based concentration			1.43				2.55			

[ ] = Detect

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EAST OF IHSSs SOURCE AREA
ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN
GROUNDWATER

			NITRATE/NITRITE (mg/l)			
location	fieldid	Date	Result	DL	Qual lab	Qual WC
0286	GW01454IT	6/19/91	0.3	0.02		V
0286	GW01761IT	9/11/91	0.5	0.02		V
0286	GW02611IT	3/18/92	0.01	0.02	U	V
0286	GW02955IT	6/10/92	0.28	0.05		
06191	GW03352IT	8/14/92	0.71	0.10		V
06191	GW03905IT	10/20/92	1.8	0.10		V
06291	GW02990IT	6/5/92	2.7	0.02		V
06291	GW03329IT	9/3/92	0.89	0.10		V
06291	GW03894IT	10/13/92	3.4	0.50		V
06391	GW02991IT	6/5/92	2.2	0.02		V
06391	GW03415IT	9/3/92	1.3	0.10		V
06491	GW02616IT	4/1/92	1.6	0.02		V
06491	GW03049IT	6/22/92	2.1	0.02		V
06491	GW03375IT	9/10/92	1.6	0.10		JA
06491	GW03808IT	11/13/92	1.2	0.02		V
41591	GW02091IT	12/6/91	0.3	0.02		V
41591	GW02614IT	3/18/92	0.3	0.02		V
41591	GW02952IT	6/10/92	0.1	0.05		
41591	GW03395IT	9/15/92	0.05	0.10	U	V
41591	GW03811IT	11/17/92	0.25	0.10		V
41691	GW02090IT	12/7/91	0.02	0.02		V
41691	GW02615IT	4/1/92	0.01	0.02	U	V
41691	GW02953IT	6/11/92	0.025	0.05	U	
41691	GW03396IT	9/16/92	0.05	0.10	U	V
41691	GW03806IT	11/18/92	0.01	0.02	U	V
4186	GW01088IT	4/15/91	7.3	0.02		V
4186	GW01652IT	9/10/91	8.2	0.05		V
4186	GW02938IT	5/19/92	8.7	0.02		V
4186	GW03449IT	9/9/92	8.2	0.10		V
4286	GW01295IT	5/17/91	6	0.02		V
4286	GW01706IT	9/11/91	4.5	0.05		
4286	GW02044IT	12/4/91	4.2	0.02		V
4286	GW02398IT	2/10/92	4.3	0.02		V
4286	GW02846IT	5/29/92	3.3	0.02		V
4286	GW03385IT	8/17/92	3.7	0.10		V
4286	GW03925IT	11/30/92	4.2	0.10		V
4386	GW01670IT	8/20/91	4.9	0.02		V
4386	GW02860IT	5/12/92	7.3	0.02		V
4386	GW03258IT	7/26/92	5	0.02		V
No. of samples			39			
No. of detects			33			
Minimum			0.02			
Maximum			8.7			
Average			2.60			
Standard Deviation			2.67			
t-value			1.697			
95% UCL			3.33			
RME			3.33			
Risk-based concentration			58.4			

There were no detected concentrations greater than the MCL of 10 mg/l.

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EAST OF IHSSs SOURCE AREA
ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN
GROUNDWATER (UNFILTERED)

			AMERICIUM-241(pCi/l)					PLUTONIUM-239/240 (pCi/l)				
location	fieldid	Date	Result	DL	Error	Qual lab	Qual WC	Result	DL	Error	Qual lab	Qual WC
0286	GW01454IT	6/19/91	0.0038	0.000	0.0038	J	A	0.0013	0.0000	0.0026	J	V
0286	GW02611IT	3/18/92	0.0203	0.010	0.0122	X	A	0.0769	0.0100	0.0296	X	A
0286	GW02955IT	6/10/92	0.0030	0.001	0.0020	J	A	0.0000	0.0040	0.0040	U	A
0386	GW01455IT	6/20/91	0.0038	0.000	0.0044	J	A	0.0007	0.0070	0.0030	J	V
0386	GW01762IT	9/11/91	0.0017	0.000	0.0027	J	A	0.0009	0.0000	0.0032	J	V
0386	GW02026IT	11/13/91	0.0023	0.000	0.0033	J	A	0.0000	0.0000	0.0039	J	A
0386	GW02612IT	4/1/92	0.0014	0.000	0.0019	J	A	0.0015	0.0030	0.0021	J	A
0386	GW02956IT	6/12/92	0.0017	0.000	0.0034	J	V					
0386	GW03392IT	9/16/92	0.0052	0.000	0.0061	J	A	0.0012	0.0000	0.0024	J	A
0386	GW03810IT	11/17/92	0.0035	0.009	0.0051	U	A	0.0108	0.0181	0.0125	U	A
3986	GW01285IT	5/14/91	0.0020	0.000	0.0033	J	A	0.0008	0.0000	0.0023	J	V
3986	GW02668IT	4/16/92	0.0000	0.003	0.0020	J	A	0.0009	0.0000	0.0024	J	A
3986	GW03328IT	9/8/92	0.0038	0.000	0.0044	J	A	0.0995	0.0070	0.0262		A
3986	GW03893IT	10/19/92	0.0190	0.017	0.0220	Y	A	0.0037	0.0033	0.0042		A
41591	GW02091IT	12/6/91	0.0229	0.000	0.0207		A	0.0575	0.0000	0.0200		A
41591	GW02614IT	3/18/92	0.0154	0.010	0.0094	X	A	0.0152	0.0100	0.0132	X	A
41591	GW02952IT	6/10/92	0.0050	0.006	0.0060	U	A	0.0020	0.0060	0.0040	U	A
41591	GW03395IT	9/15/92	0.0064	0.000	0.0065	J	A	0.0037	0.0000	0.0068	J	A
41591	GW03811IT	11/17/92	0.0140	0.011	0.0094		A	0.0120	0.0053	0.0094		A
41691	GW02090IT	12/7/91	0.4695	0.000	0.0864		A	2.2040	0.0000	0.3130		A
41691	GW02615IT	4/1/92	0.2198	0.000	0.0506	X	A	1.2960	0.0050	0.1820	X	A
41691	GW03396IT	9/16/92	0.0804	0.000	0.0235		A	0.6774	0.0000	0.1340		A
41691	GW03806IT	11/18/92	0.1000	0.003	0.0231		A	0.3400	0.0053	0.0564		A
No. of samples			23					22				
No. of detects			21					19				
Minimum			0					0				
Maximum			0.4695					2.204				
Average			0.0437					0.2185				
Standard Deviation			0.1028					0.5258				
t-value			1.717					1.7221				
95% UCL			0.0805					0.4115				
RME			0.0805					0.4115				
Risk-based concentration			0.198					0.207				
Bkgnd UTL 99/99			0.037					0.064				
Bkgnd Mean + 2 SD			0.033					-				

Greater than background mean plus two standard deviations or UTL99/99.

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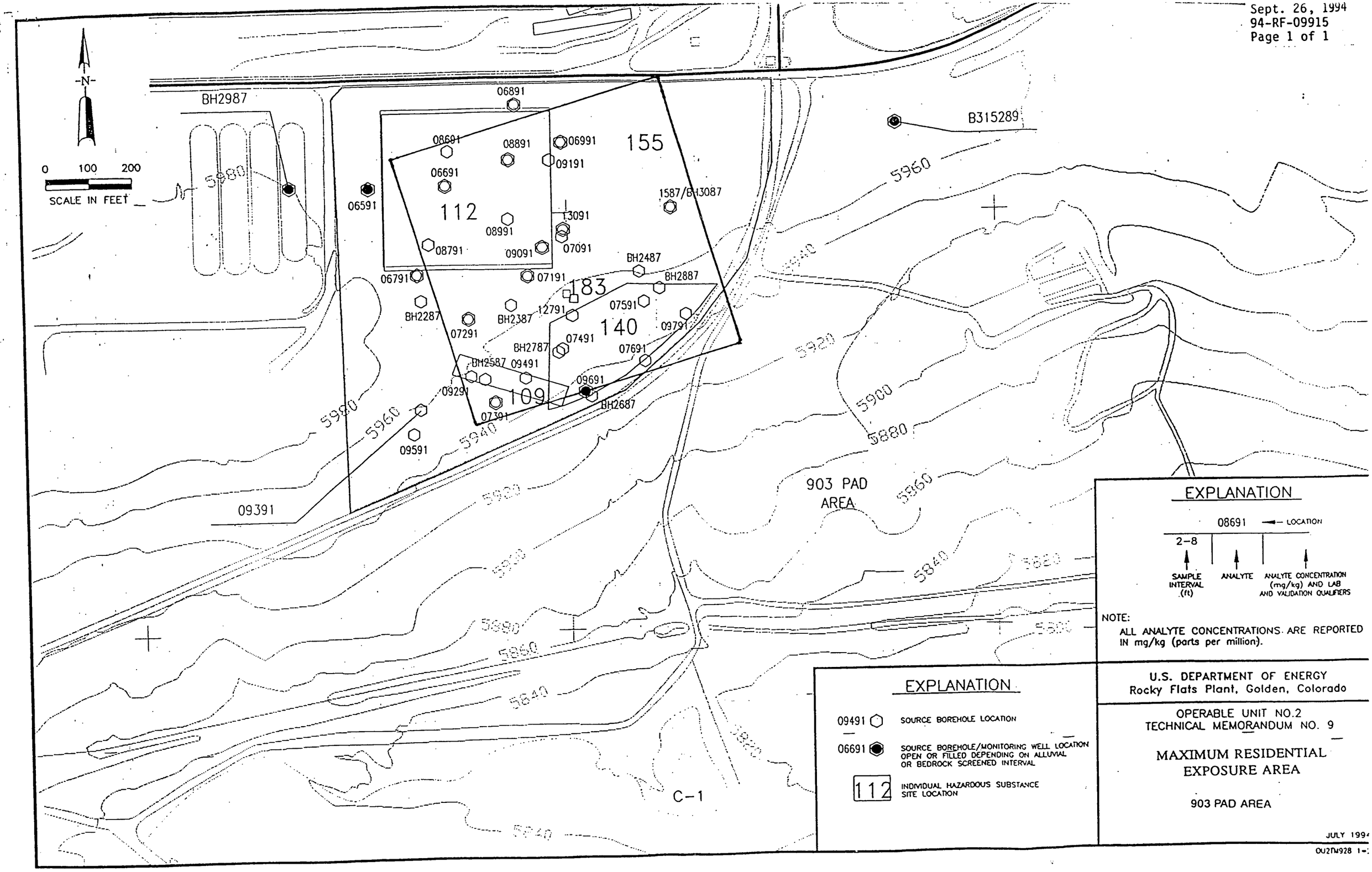


EXPLANATION

08691 ← LOCATION

2-8

SAMPLE INTERVAL (ft)

ANALYTE

ANALYTE CONCENTRATION (mg/kg) AND LAB AND VALIDATION QUALIFIERS

NOTE:
ALL ANALYTE CONCENTRATIONS ARE REPORTED IN mg/kg (parts per million).

EXPLANATION

09491 — SOURCE BOREHOLE LOCATION

06691 — SOURCE BOREHOLE/MONITORING WELL LOCATION OPEN OR FILLED DEPENDING ON ALLUVIAL OR BEDROCK SCREENED INTERVAL

112 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE LOCATION

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

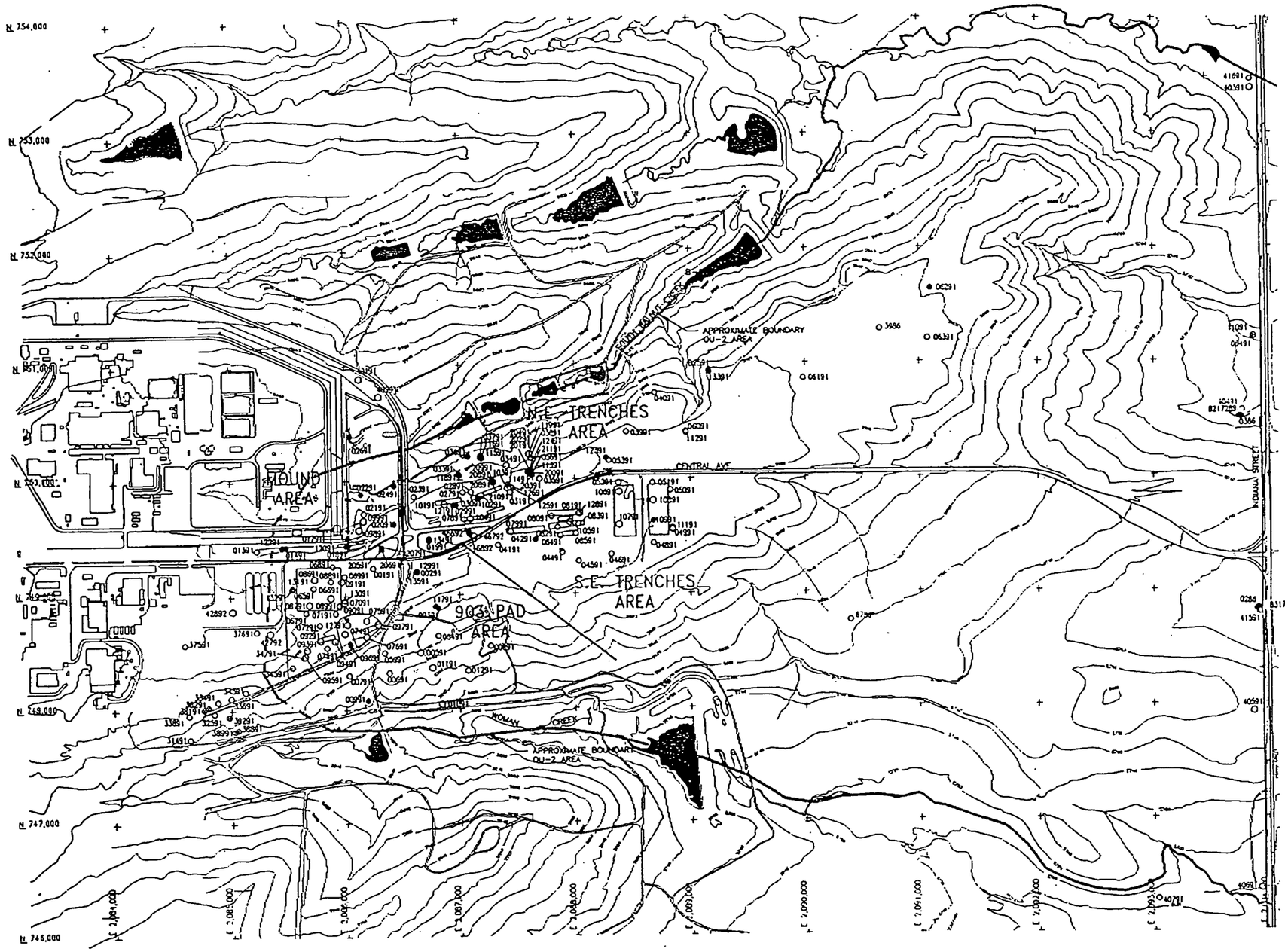
OPERABLE UNIT NO.2
TECHNICAL MEMORANDUM NO. 9

MAXIMUM RESIDENTIAL EXPOSURE AREA

903 PAD AREA

JULY 199

OU2TM928 1-



EXPLANATION

12491	●	1991–1992 BEDROCK MONITORING WELL
00691	○	1991 ALLUVIAL MONITORING WELL
11191	○	1991 AND 1992 BOREHOLE
38291	⊗	PIEZOMETER
20291	□	ALLUVIAL OBSERVATION WELL
20091	▲	BEDROCK PUMPING WELL
20191	■	BEDROCK OBSERVATION WELL
	□	INDIVIDUAL HAZARDOUS SUBSTANCE SITE LOCATION
	—	APPROXIMATE BOUNDARY OF OU-2 AREA

N

SCALE : 1 INCH = 1000 FEET

1000' 0 1000'

CONTOUR INTERVAL = 20'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

OPERABLE UNIT 2
REVISED BEDROCK WORK PLAN
TECHNICAL MEMORANDUM NO.8

PRE-1990 AND
1991 AND 1992 MONITORING WELL
AND BOREHOLE LOCATIONS

MARCH 1993

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