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VOLUME II

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APPENDICES TO POND WATER MANAGEMENT INTERIM MEASURES/INTERIM REMEDIAL ACTION DECISION DOCUMENT

U S DEPARTMENT OF ENERGY

EG&G ROCKY FLATS, INC

NOVEMBER 22, 1993

A-OU06-000190

LIST OF APPENDICES

APPENDIX

APPENDIX A
BIG DRY CREEK
SEGMENT 4 AND 5 STREAM STANDARDS

APPENDIX A

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APPENDIX A

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STREAM CLASSIFICATIONS and WATER QUALITY STANDARDS

REGION: 3 Big Dry Creek Stream Segment Description		Desig	Classifications	NUMERIC STANDARDS						TEMPORARY MODIFICATIONS AND QUALIFIERS
				PHYSICAL and BIOLOGICAL	INORGANIC mg/l		METALS ug/l			
1	Mainstem of Big Dry Creek including all tributaries lakes and reservoirs, from the source to the confluence with the South Platte River, except for specific listing in Segment 2, 3, 4 and 6.	UP	Aq Life Warm 2 Recreation 2 Agriculture	D O =5 0 mg/l pH=6 5 9 0 F Coli=2000/100ml						
2	Standley Lake		Aq Life Warm 1 Recreation 1 Water Supply Agriculture	D O =5 0 mg/l pH=6 5-9 0 F Coli=200/100ml	NH_3(ac)=TVS NH_3(ch)=0 06 Cl_2(ac)=0 019 Cl_2(ch)=0 011 CN=0 005	S=0 002 B=0 75 NO_2=0 5 NO_3=10 Cl=250 SO_4=250	As(ac)=50(Trec) Cd(ac/ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=300(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=50(dis) Mn(ch)=1000(Trec) Hg(ch)=0.01(Tot)	Ni(ac/ch)=TVS Se(ac)=10(Trec) Ag(ac/ch)=TVS Zn(ac/ch)=TVS	See attached Tables 1A and 2 for additional standards for segment 2 Also, Beryllium=4 ug/l.
3	Great Western Reservoir		Aq Life Warm 1 Recreation 1 Water Supply	D O =5 0 mg/l pH=6 5 9 0 F Coli=200/100ml	NH_3(ac)=TVS NH_3(ch)=0 06 Cl_2(ac)=0 019 Cl_2(ch)=0 011 CN=0 005	S=0 002 B=0 75 NO_2=0 5 NO_3=10 Cl=250 SO_4=250	As(ac)=50(Trec) Cd(ac/ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=300(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=50(dis) Mn(ch)=1000(Trec) Hg(ch)=0.01(Tot)	Ni(ac/ch)=TVS Se(ac)=10(Trec) Ag(ac/ch)=TVS Zn(ac/ch)=TVS	See attached Tables 1A and 2 for additional standards for segment 3 Also, Beryllium=4 ug/l.
4	Mainstem and all tributaries to Woman and Walnut Creeks from sources to Standley Lake and Great Western Reservoir except for specific listings in Segment 5.	UP	Aq Life Warm 2 Recreation 2 Water Supply Agriculture	D O =5 0 mg/l pH=6 5-9 0 F Coli=2000/100ml	NH_3(ac)=TVS NH_3(ch)=0 10 Cl_2(ac)=0 019 Cl_2(ch)=0 011 CN=0 005	S=0 002 B=0 75 NO_2=0 5 NO_3=10 Cl=250 SO_4=250	As(ac)=50(Trec) Cd(ac/ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=300(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=50(dis) Mn(ch)=1000(Trec) Hg(ac)=0 01(Tot)	Ni(ac/ch)=TVS Se(ac)=10(Trec) Ag(ac/ch)=TVS Zn(ac/ch)=TVS	See attached Tables 1A and 2 for additional standards for segment 4 Also, Beryllium=4 ug/l ug/l
5	Mainstems of North and South Walnut Creek, including all tributaries, lakes and reservoirs from their sources to the outlets of ponds A-4 and B-5, on Walnut Creek, and Pond C-2 on Woman Creek All three ponds are located on Rocky Flats property	UP	Aq Life Warm 2 Recreation 2 Water Supply Agriculture	D O =5 0 mg/l pH=6 5 9 0 F Coli=2000/100ml	NH_3(ac)=TVS NH_3(ch)=0 10 Cl_2(ac)=0 019 Cl_2(ch)=0 011 CN=0 005	S=0 002 B=0 75 NO_2=0 5 NO_3=10 Cl=250 SO_4=250	As(ac)=50(Trec) Cd(ac/ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=300(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=50(dis) Mn(ch)=1000(Trec) Hg(ch)=0 01(Tot)	Ni(ac/ch)=TVS Se(ac)=10(Trec) Ag(ac/ch)=TVS Zn(ac/ch)=TVS	Radionuclide standards have the temp mod of ambient quality until 12/31/94 See attached Table 3 for temporary modifications until 4/1/96 See attached Tables 1A and 2 for additional standards for seg 5 Also Beryllium=4 ug/l Goal qualifier for all use classifications
6	Upper Big Dry Creek and South Upper Big Dry Creek from their source to Standley Lake	UP	Aq Life Warm 2 Recreation 2 Water Supply Agriculture	D O =5 0 mg/l pH=6 5-9 0 F Coli=2000/100ml	NH_3(ac)=TVS NH_3(ch)=0 10 Cl_2(ac)=0 019 Cl_2(ch)=0 011 CN=0 005	S=0 002 B=0 75 NO_2=0 5 NO_3=10 Cl=250 SO_4=250	As(ac)=50(Trec) Cd(ac/ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=300(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=50(dis) Mn(ch)=1000(Trec) Hg(ch)=0 01(Tot)	Ni(ac/ch)=TVS Se(ac)=10(Trec) Ag(ac/ch)=TVS Zn(ac/ch)=TVS	

Taken from: Colorado Department of Health-Water Quality Control Commission, Classification and Numeric Standards South Platte River Basin, Laramie River Basin, Republican River Basin, Smoky Hill River Basin 3.8.0 19c

TABLE 1A
SITE-SPECIFIC ORGANIC CHEMICAL STANDARDS
SEGMENTS 2, 3, 4, AND 5, BIG DRY CREEK[1]
(ug/l)

PARAMETER[2]	STANDARD[3]	PQL[4 5]
Acenaphthylene (PAH)[12]	0 0028	10
Acrylonitrile[6]	0 058	5
Aldrin	0 00013	0 1[9]
Anthracane (PAH)[12]	0 0028	1 0
Atrazine[6]	3 0	0 5[10]
Benzidine	0 00012	10
Benzo (a) anthracene (PAH)[12]	0 0028	10
Benzo (a) pyrene (PAH)[12]	0 0028	10
Benzo (b) fluoranthene (PAH)[12]	0 0028	10
Benzo (k) fluoranthene (PAH)[12]	0 0028	10
Benzo (g,h,i) perylene (PAH)[12]	0 0028	10
Bromodichloromethane (HM)[7]	0 3	1 0
Bromoform (HM)[7]	4	1 0
Chlordane[11]	0 00058	1 0
Chloroform (HM)[7]	6 0	1 0
Chloroethyl ether (BIS-2)	0 03	10
Chloromethyl ether (BIS)[8]	0 0000037	10
Chlorophenol	2000	50
Chrysene (PAH)[12]	0 0028	10
DDT	0 00059	1
Demeton	0 1	1 0[9]
Dibenzo (a,h) anthracene (PAH)[12]	0 0028	10
Dibromochloromethane (HM)[7]	6	1 0
Dichlorobenzidine	0 039	10
Dichlorophenoxyacetic acid (2,4,D)	70	1 0
Dieldrin	0 00014	0 1[9]
Dioxin (2,3,7,8 TCDD)	0 000000013	0 01[13]

Endosulfan	0 056	0 1[9]
Endrin	0 0023	0 1[9]
Fluoranthene (PAH)[12]	42	10
Fluorene (PAH)[12]	0.0028	10
Guthion	0 01	1 5
Heptachlor[11]	0 00021	0 05[9]
Hexachlorobenzene[6]	0 00072	10
Hexachlorobutadiene[6]	0 45	10
Hexachlorocyclohexane, Alpha[11]	0 0039	0 05[9]
Hexachlorocyclohexane, Beta[11]	0.014	0 05[9]
Hexachlorocyclohexane, Gamma[11]	0 019	0 05[9]
Hexachlorocyclohexane, Technical	0 012	0 2[9]
Hexachloroethane[6]	1.9	10
Indeno (1,2,3-cd) pyrene (PAH)[12]	0 0028	10
Malathion	0 1	0 2[9]
Methoxychlor	0 03	0 5[9]
Methyl bromide (HM)[7]	48	1 0
Methyl chloride (HM)[7]	5 7	1 0
Methylene chloride (HM)[7]	4 7	1 0
Mirex	0 001	0 1[9]
Napthalene (PAH)[12]	0 0028	10
Nitrosodibutylamine N[6]	0 0064	10
Nitrosodiethylamine N[6]	0 0008	10
Nitrosodimethylamine N	0 00069	10
Nitrosodiphenylamine N[6]	4 9	10
Nitrosopyrrolidine N[6]	0 016	10
Parathion[8]	0 4	
PCBs	0 000044	1
Phenanthrene (PAH)[12]	0 0028	10
Pyrene (PAH)[12]	0 0028	10
Simazine	4 0	0 5[10]
Tetrachloroethylene[6]	0 8	1 0[9]

Tetrachoroethane 1,1,2,2[6]	0 17	1
Toxaphene	0 0002	5
Trichloroethane 1,1,2[6]	0 6	1[9]
Trichlorophenol 2,4,6[11]	2.0	50[9]

1 In the absence of specific numeric standards for non-naturally occurring organics, the narrative standard "free from toxics" (section 3 1 11(1)(d)) shall be interpreted and applied in accordance with the provisions of (section 3 12.7(1)(c)(iv), so that the standard is interpreted consistently for surface and ground waters

2 All parameters are derived from the, basin-wide tables in 5 CCR 1002-8, §§ 3 8 5(2)(a) and (e) (10-91) or the site-specific Table 1 from 5 CCR 1002-8, § 3 8 5 (3/90), except as noted

3 The standard adopted is the statewide standard from the Basic Standards and Methodologies for Surface Water, 5 CCR 1002-8, § 3 1 0, if a statewide standard exists for the listed parameter, or is the lowest standard found in §§ 3 8 5(2)(a) and (e) (10-91), if no statewide standard exists for the listed parameter

4 PQL's are detection levels based on the Colorado Department of Health's laboratory's best judgment for Gas Chromatography/Mass Spectrophotometry (GC/MS) unless otherwise noted

5 The PQL adopted is the statewide PQL from the Basic Standards and Methodologies for Surface Water, 5 CCR § 3 2 0, if a statewide PQL exists for the listed parameter, or is the lowest detection level found in § 3 8 5 (2)(e) (10-91), if no statewide PQL exists for the listed parameter

6 The standard for this parameter does not change, but the PQL differs from the GC detection limits listed in § 3 8 5(2)(e)

7 The basin-wide standards provide one standard for all halomethanes (HM) See 5 CCR 1002-8, § 3 8 5(2)(e) (10-91), Additional Organic Chemical Standards table Halomethanes is actually a group of chemicals Thus, the standard for halomethanes is deleted and the statewide standards, 5 CCR 1002-8,§ 3 1 0 (11-91), for the individual chemicals are adopted as site specific standards

8 There is no statewide organic chemical standard for this parameter

9 Gas Chromatography (GC) PQL.

10 PQL is not published in existing state regulations Obtained by DOE/EG&G via personal communication with CDH

11 Both the standard and the PQL change

12 The original site-specific standards provided one standard for all Polynuclear Aromatic Hydrocarbons (PAH) See, 5 CCR 1002, § 3 8 5 (3-90), Table 1 PAH

statewide standards for individual chemicals constituting PAH, 5 CCR 1002-8, § 3 1 0 (11-91), are adopted as site-specific standards

13 The dioxin PQL is retained from 5 CCR 1002-8, § 3.8 5(e), Additional Organics Table

Table 2
SITE SPECIFIC RADIONUCLIDE STANDARDS*
(in Picocuries/Liter)

The radionuclides listed below shall be maintained at the lowest practical level and in no case shall they be increased by any cause attributable to municipal, industrial, or agricultural practices to exceed the site specific numeric standards

A Ambient based site-specific standards

	Segment 2 Standley Lake	Segment 3 Great Western Reservoir	Segment 4 Segment 5 Woman Creek	Segment 4 Segment 5 Walnut
Gross Alpha	6	5	7	11
Gross Beta	9	12	5	19
Plutonium	03	03	05	05
Americium	03	03	05	05
Tritium	500	500	500	500
Uranium	3	4	5	10
B Other site-specific standard applicable to segments 2,3,4 and 5				
Curium	244	60		
Neptunium	237	30		

*Statewide standards also apply for radionuclides not listed above

Table 3
Temporary Modifications
Big Dry Creek, Segment 5

parameter	ug/l
carbon tetrachloride	18
tetrachloroethane	76
trichloroethylene	66
copper (TR)	23
iron (TR)	13,200
lead (TR)	28
zinc (TR)	350
manganese (D)	560
Tr = total recoverable	D = dissolved
also,	
ammonia (un-ionized)	1 8 mg/l (March 1-June 30) 0 7 mg/l (July 1-April 31)

All temporary modifications apply until April 1, 1996

APPENDIX B
ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1-8, 10-14 AND 16 AND LOWER SOUTH INTERCEPTOR DITCHES

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1 8 10-14 AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**

Parameter	Groundwater (mg/L)			Surface Water (mg/L)			Soils (mg/kg)			Sediments (mg/kg)		
	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR
METALS (TOTAL AND DISSOLVED)												
Aluminum	4 75 BR (B)	0 200	5 0	293 (A)	0 200	0 200	70600 (B)	40		24800 (A)	40	
Antimony	0 208 (E)	0 060	0 01	0 416 (A)	0 060	0 146	39 6 (G)	12	3000	42 1 (A)	12	3000
Arsenic	1 6 J BR (B)	0 010	0 05	1 03 (A)	0 010	0 05	37 (B)	2		13 (A)	2	
Barium	0 9321 (B)	0 200	1 0	87 6 (E)	0 200	1 0	1899 (B)	40	4000	300 (A)	40	4000
Beryllium	0 029 (E)	0 005	0 1	0 09 (E)	0 005	0 005	15 5 (C)	1 0	0 143	15 5 (A)	1 0	0 143
Cadmium	0 0352 BR (F)	0 005	0 01	25 (A)	0 005	0 01	27 4 (G)	1 0		2 3 (C)(E)	1 0	
Calcium	1900 BR (F)	5 000		51200 (E)	5 000		312000 (E)	2000		32000 (C)	2000	
Cesium	0 4 (G)	1 000		12 (A)	1 000		274 (C)	200				
Chromium	0 172 BR (F)	0 010	0 05	0 298 (A)	0 010	0 05	58 (C)	2 0	400 (VI)	43 38 (C)	2 0	400 (VI)
Cobalt	0 14 (E)	0 050	0 05	0 489 (A)	0 050		36 BR (E)	10		12 (C)	10	
Copper	0 9515 (E)	0 025	1 0	0 908 (E)	0 025	1 0	30 62 (C)	5 0		40 4 (A)	5 0	
Iron	57 1 (F)	0 100	0 3	3220 (A)	0 100	0 30	67200 BR (E)	20		33300 (A)	20	
Lead	0 21 J BR (B)	0 005	0 05	0 516 (A)	0 005	0 050	45 6 (C)	1 0		68 4 (A)	1 0	
Lithium	0 7 (E)	0 100		85 2 (A)	0 100		47 (E)	20		27 8 (C)(E)	20	
Magnesium	788 (F)	5 000		7540 (E)	5 000		6490 BR (E)	2000		5970 (A)	2000	
Manganese	6 (F)	0 015	0 05	27 7 (A)	0 015	0 050	3540 (C)	3 0		1390 (A)	3 0	
Mercury	0 006 (E)	0 0002	0 002	3 97 (E)	0 0002	0 002	114 (C)	0 2		0 72 (C)	0 2	
Molybdenum	1 92 BR (B)	0 200		0 333 (A)	0 200		38 65 (C)	40		42 (E)	40	
Nickel	11 7 (E)	0 040	0 2	0 646 (A)	0 040	0 1	71 BR (E)	8 0	2000	34 (C)	8 0	2000
Potassium	633 BR (F)	5 000		4260 (A)	5 000		4440 (G)	2000		67000 (E)	2000	
Selenium	3 2 (E)	0 005	0 010	0 55 (A)	0 005	0 010	1 5 (C)	1 0		21 3 (A)	1 0	
Silicon	10 7 (F)											

= Present in laboratory blank
= No data available for OU9 or OU15 at the present time
= These are based on human health and environmental risk assessment criteria developed for screening purposes as discussed in Section 4 2 or applicable state or federal requirements
J = Analyzed below detection limit
BR = Bedrock (including some weathered bedrock)
+ = Maximum concentration may be a one-time measurement Values include both recent and historic data Letter in parentheses indicates reference source from list at end of table
++ = Value given is detection or quantitation limit for analysis in accordance with Statement of Work for General Radiochemistry and Routine Analytical Services Protocol (G R R A S P) v 1 1 1990 EG&G Rocky Flats Environmental Restoration Program
(a) = Plutonium 238 + 239 + 240
(b) = Radium 226 + 228

Taken from EG&G (1991) Final Treatability Studies Plan August 1991

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1 8 10-14, AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Continued)

Parameter	Groundwater (mg/L)			Surface Water (mg/L)			Soils (mg/kg)			Sediments (mg/kg)		
	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR
METALS (TOTAL AND DISSOLVED) (Continued)												
Silver	0 13 (B)	0 010	0 050	0 148 (A)	0 010	0 050	40 9 (C)	2 0	200	49 1 (A)	2 0	200
Sodium	924 (F)	5 000		17300 (E)	5 000		3680 (C)	2000		670 (E)	2000	
Strontium	7 7 BR (B)	0 200		11 9 (A)	0 200		226 (C)	40		179 (E)	40	
Thallium	0 016 (E)	0 050								13 (E)	2 0	
Tin	1 121 (E)	0 200		1 53 (A)	0 200		33 8 (C)	40		1080 (A)	40	
Vanadium	0 092 BR (B)	0 050		1 65 (A)	0 050		108 (C)	10		58 4 (C)	10	
Zinc	4 39 BR (F)	0 020	5 0	28 7 (E)	0 020	5 0	195 (G)	4 0		735 (C)	4 0	

= Present in laboratory blank
= No data available for OU9 or OU15 at the present time
= These are based on human health and environmental risk assessment criteria developed for screening purposes as discussed in Section 4 2 or applicable state or federal requirements
J = Analyzed below detection limit
BR = Bedrock (including some weathered bedrock)
\+ = Maximum concentration may be a one-time measurement. Values include both recent and historic data Letter in parentheses indicates reference source from list at end of table
\+ + = Value given is detection or quantitation limit for analysis in accordance with Statement of Work for General Radiochemistry and Routine Analytical Services Protocol (G R R A S P) v 1 1 1990 EG&G Rocky Flats Environment Restoration Program
(a) = Plutonium 238 + 239 + 240
(b) = Radium 226 + 228

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1 8 10-14 AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Continued)

Parameter	Groundwater (mg/L)			Surface Water (mg/L)			Soils (mg/kg)			Sediments (mg/kg)		
	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR
ANIONS												
Bicarbonate as $CaCO_3$	1100 (F)	10		1900 (A)	10							
Carbonate as $CaCO_3$	505 BR (B)	10		270 (A)	10							
Chloride	960 BR (F)	5	250	960 (A)	5	250						
Cyanide	10 2 (E)	10	10	21 J (E)	10	10	6 8 (E)					
Fluoride	1 7 (G)	5	5									
Nitrate as N	15 5 (C)	5	10	18593 (A)	5	10	4 3 (C)			35 86 (A)		
Nitrate + Nitrite as N	5000 (F)	5	10	9900 (A)	5	10	180 (G)			13 (A)		
Nitrite as N				24 (A)	5	5						
Sulfate	1900 (F)	5	250	1900 (E)	5	250						
Sulfide				120 (A)			13 (C)	4				

= Present in laboratory blank
= No data available for OU9 or OU15 at the present time
= These are based on human health and environmental risk assessment criteria developed for screening purposes as discussed in Section 4 2 or applicable state or federal requirements
J = Analyzed below detection limit
BR = Bedrock (including some weathered bedrock)
\+ = Maximum concentration may be a one-time measurement Values include both recent and historic data Letter in parentheses indicates reference source from list at end of table
\+ + = Value given is detection or quantitation limit for analysis in accordance with Statement of Work for General Radiochemistry and Routine Analytical Services Protocol (G R R A S P) v 1 1 1990 EG&G Rocky Flats Environmental Restoration Program.
(a) = Plutonium 238 + 239 + 240
(b) = Radium 226 + 228

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1 8 10-14 AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Continued)

Parameter	Groundwater (mg/L)			Surface Water (mg/L)			Soils (mg/kg)			Sediments (mg/kg)		
	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR
INDICATORS												
Conductivity Min (umho/cm)				73 7 (A)	1							
Conductivity Max (umho/cm)				37120 (A)	1							
Dissolved Oxygen (mg/L)												
Minimum				0 (A)								
Maximum				70 (A)	0 5							
Oil and Grease	6 7 (G)			321 (G)	5					2200 (A)		
Percent Solids (%)												
Minimum							78 9 (G)			14 7 (A)		
Maximum							96 4 (G)			96 4 (A)		
pH minimum (pH units)	5 98 (C)	0 1	6 5	3 4 (A)	0 1	6 5	5 65 (E)			6 1 (A)		
pH maximum (pH units)	12 (F)	0 1	8 5	10 2 (A)	0 1	8 5	10 14 (C)			9 03 (C)		
Temperature (degrees C)												
Minimum				2 (A)								
Maximum				33 (A)								
Total Dissolved Solids (mg/L)	22000 (F)	10	500	41000 (A)	10	500						
Total Suspended Solids (mg/L)	1800 (F)	5		7600 (A)	5							

= Present in laboratory blank
= *No data available for OU9 or OU15 at the present time*
= These are based on human health and environmental risk assessment criteria developed for screening purposes as discussed in Section 4 2 *or applicable state or federal requirements*
J = Analyzed below detection limit
BR = Bedrock (including some weathered bedrock)
\+ = Maximum concentration may be a one-time measurement. Values include both recent and historic data Letter in parentheses indicates reference source from list at end of table
\+ + = Value given is detection or quantitation limit for analysis in accordance with Statement of Work for General Radiochemistry and Routine Analytical Services Protocol (G R R A S P) v 1 1 1990 EG&G Rocky Flats Environmental Restoration Program.
(a) = Plutonium 238 + 239 + 240
(b) = Radium 226 + 228

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1 8 10-14, AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Continued)

Parameter	Groundwater (pCi/L)			Surface Water (pCi/L)			Soils (pCi/g)			Sediments (pCi/g)		
	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR
RADIONUCLIDES (TOTAL AND DISSOLVED)												
Americium 241	2 3 (E)	0 01		90 (A)	0 01	30	2273 (B)	0 02		0 04 (E)	0 02	
Cesium 137	3 1 (E)	1		25 (E)	1		3 1 (B)	0 1		3 2 (A)	0 1	
Gross Alpha	811 BR (E)	2	15	1900 (A)	2	15	480 (B)	4	5	77 (A)	4	5
Gross Beta	368 (F)	4	50	3800 (A)	4	5	49 9 (G)	10	50	50 (C)	10	50
Plutonium 239 + 240	4 6 (G)	0 01	15(a)	120 (A)	0 01	15(a)	20455 (B)	0 03	0 9	3 3 (A)	0 03	0 9
Radium 226	0 8 (E)(G)	0 5		30 (A)	0 5	5(b)	1 6 (G)	0 5		1 3 (C)	0 5	
Radium 228				24 (A)	0 5	5(b)	2 6 (G)	0 5		2 3 (A)	0 5	
Strontium 89 + 90	4 59 (G)	1 0		37 (C)	1 0		1 9 (E)	1		0 5 (C)	1	
Strontium 90	5 7 (G)	1 0	8	3 2 (A)	1 0	8	1 41 (G)	1		0 99 (A)	1	
Tritium	7710 (F)	400	20000	13000 (A)	400	500	3260 (G)	400		580 (E)	400	
Uranium 233 + 234	723 (G)	0 6		861 (A)	0 6		60 (E)	0 3		2 1 (A)	0 3	
Uranium 235	9 (F)	0 6		65 5 (A)	0 6		1 01 (G)	0 3		1 34 (A)	0 3	
Uranium 235 + 236	0 009 (G)	0 6		1 192 (G)	0 6							
Uranium 238	190 (F)	0 6		366 (A)	0 6		3000 (E)	0 3		2 7 (C)(A)(E)	0 3	
Uranium (Total)	63 7 (B)	0 6		1023 (A)	0 6	5	4 BR (E)	0 3		4 8 (E)	0 3	

[illegible] = Present in laboratory blank
[illegible] = No data available for OU9 or OU15 at the pr sent time
[illegible] = These are based on human health and environmental risk assessment criteria developed for screening purposes as discussed in Section 4 2, or applicable state or federal requirements
J = Analyzed below detection limit
BR = Bedrock (including some weathered bedrock)
\+ = Maximum concentration may be a one-time measurement Values include both recent and historic data Lett r in parentheses indicates reference source from list at end of table
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(a) = Plutonium 238 + 239 + 240
(b) = Radium 226 + 228

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1-8 10-14, AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Continued)

Parameter	Groundwater (ug/L)			Su face Wat r (ug/L)			Soils (ug/kg)			Sediments (ug/kg)		
	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR
VOLATILES												
1 1 Di hloro th ne	344 (E)	5		50 (A)	ɔ		32 (C)	ɔ				
1 1 Dichloroethene	48000 (E)	5	7	143 (C)	5	7	110 (C)	5	12000			
1 1 1 Trichloroethane	30250 (E)	5	200	42 (C)	5	200	250 (B)	5	7000000			
1 1 2 Trichloroethane	14740 (E)	5	28				62 (C)	5	120000			
1 1 2 2 Tetrachloroethane				440 (G)	ɔ							
1 2 Dichloroethane	16000 (E)	5	5				120 (B)	5	7700			
1 2 Dichloroethene (Total)	5070 (E)	5	70	56 (C)	5	70	140 (C)	5				
1 2 Dichloropropane	5 (F)	5	5									
1 3 Dichloropropene							6 J (C)	5	3900			
2 Butanone	110 (G)	10		24 (E)	10		390 (E)	10		12 (C)	10	
2 Chloroethylvinylether							31 J (B)	10				
2 Hexanone	975 (B)	10										
4-Methyl-2 Pentanone	35 (B)	10		15 (A)	10		68 BR (E)	10		220 (E)	10	
Acetone	1300 (B)	10	4000	180 (A)	10	4000	2400 (C)	10	8000000	220 (E)	10	800000C
Benzene	83 J (E)	5	5	83 (A)	5	5						
Bromodichloromethane				2 J (C)	5							
Bromomethane	7 J (G)											
Carbon Disulfide	21 (G)	5		19 (A)	5		40 (G)			6 J (E)	5	
Carbon Tetrachloride	28000 (E)	5	5	1005 (C)	5	5	180 (C)	5	5400			
Chlorobenzene				94 (A)	5	100	150 (C)	55				

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(a) = Plutonium 238 + 239 + 240
(b) = Radium 226 + 228

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1-8, 10-14 AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Continued)

Parameter	Groundwater (ug/L)				Surface Water (ug/L)				Soils (ug/kg)				Sediments (ug/kg)			
	Maximum		Minimum	Potential ARAR	Maximum		Minimum	Potential ARAR	Maximum		Minimum	Potential ARAR	Maximum		Minimum	Potential ARAR
VOLATILES (Continued)																
Chlo oethene	17	(F)	10		20	(A)	10		50	J (B)	10					
Chloroform	5427	(B)	5	100	82	(A)	5	100	130	J (B)	5	110000	18	(C)	5	110000
Chloromethane	4J	(G)			12 5	(A)	10						60	(E)	10	
Ethylbenzene	6	(E)	5	680	12 5	(A)	5	1400	780	(B)	5	8000000	1	J (C)	5	8000000
Methylene Chlonde	1500	(E)	5	5	44	(C)	5	5	590	BR (E)	5	93000	22	(E)	5	93000
Styrene	9	(B)	5						17	J (B)	5					
Tetrachloroethene	528000	(B)	5	10	280	(A)	5	5	10000	(B)	5	140000	8	(C)	5	140000
Toluene	270	J (E)	5	2420	12	(E)	5	14300	640	(B)	5	20000000	6	J (E)	5	20000000
Trichloroethene	221860	(B)	5	5	2500	(C)	5	5	17000	(B)	5	64000	39	(C)	5	64000
Vinyl Acetate	39	J (E)														
Vinyl Chlonde	930	(B)	10	10	25	(A)	10	10					5	J (C)	10	
Xylenes (Total)	4	J (B)	5	7000	13	(A)	5	7000	3300	(B)	5	200000000	7	J (C)	5	200000000

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(a) = Plutonium 238 + 239 + 240
(b) = Radium 226 + 228

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1 8 10-14 AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES** (Continued)

Parameter	Groundwater (ug/L)			Surface Water (ug/L)			Soils (ug/kg)			Sediments (ug/kg)		
	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR
SEMIVOLATILES (TOTAL, UG/L)												
Acenaphthene							57 J (E)	330				
Anthracene							81 J (E)	330				
Benzo (a) Anthracene							110 J (E)	330	224			
Benzo (b) Fluoranthene							89 J (E)	330				
Benzo (k) Fluoranthene							280 J (E)	330				
Benzo (g h,i) Perylene							50 J (E)	330				
Benzo (k) Pyrene							130 J (E)	330				
Bis (2 ethylhexyl) Phthalate	100 J BR (D)	10	10	220 (A)	10	15000	8700 (C)	330	83000			
Chrysene							91 J (E)	330				
Diethyl Phthalate							29 (E)	330	60000000			
Di-n-Butyl Phthalate	170 J BR (D)	10	4 0				3643 (E)	330	8000000			
Di n-Octyl Phthalate	58 J BR (D)	10					265 (E)	330				
Fluoranthene							290 J (E)	330				
Fluorene							350 (E)	330				
Indeno (1 2 3 cd) Pyrene							47 (E)	330				
2 Methylnaphthalene				15 (A)	10							
2 Methylphenol				43 (A)	10							
N Nitrosodiphenylamine	100 J BR (D)	10					370 (B)	330				
Phenanthrene							370 (E)	330				

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(a) = Plutonium 238 + 239 + 240
(b) = Radium 226 + 228

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1 8 10-14 AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Concluded)

Parameter	Groundwater (ug/L)			Surface Water (ug/L)			Soils (ug/kg)			Sediments (ug/kg)		
	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR	Maximum	Minimum	Potential ARAR
SEMI VOLATILES (TOTAL UG/L) (Continued)												
Phenol				18 (A)	10	3500						
Pyrene							270 J (E)	330				

REFERENCES

NOTE Analytical data received prior to October 1988 not subjected to validation procedure Some of the contaminant values reported in this table have not yet been validated and the analyte list may be changed after the data are validated

(A) EG&G February 22 1991a Surface Water and Sediment Geochemical Characterization Report, Draft Copy
(B) U S DOE April 2 1990c Final Phase II Remedial Investigation/Feasibility Study Workplan (Alluvial) OU2 Draft Copy
(C) U S DOE January 11 1991a Proposed Surface Water Interim Measures Interim Remedial Action Plan/Environmental Assessment and Decision Document South Walnut Creek Basin OU2 Final Draft
(D) U S DOE January 24 1991b Phase II Remedial Investigation/Feasibility Study Workplan (Bedrock) OU2 Draft Copy
(E) U S DOE October 1990d Phase III Remedial Investigation/Feasibility Study Workplan 881 Hillside Area OU1 Final Draft
(F) EG&G March 1 1991b 1990 Annual RCRA Groundwater Monitoring Report for Regulated Units at Rocky Flats Plant, Draft Copy
(G) EG&G May 1991 Unpublished data (See NOTE to references)

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APPENDIX C
CURRENT SURFACE WATER AND SEDIMENT SAMPLING AND MONITORING REQUIREMENTS

APPENDIX C

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Table 1 --Summary of NPDES/FFCA Compliance Sampling

LOCATION	ANALYTES	FREQUENCY
Pond A 3	Nitrate	daily during discharge
	Flow	daily during discharge
Pond B-3	5-Day Biological Oxygen Demand (BOD5)	daily
	Total Suspended Solids (TSS)	daily
	Nitrate	daily
	Total Residual Chlorine (TRC)	daily
	Flow	daily
Pond A-4	Whole Effluent Toxicity (WET)	quarterly at discharge
	Non Volatile Suspended Solids (NVSS)	daily during discharge
	Total Chromium	monthly during discharge
	Flow	daily during discharge
STP	pH	daily during discharge
	Total Residual Chlorine (TRC)	daily during discharge
	Total Suspended Solids (TSS)	three times per week
	Fecal Coliform	three times per week
	Total Phosphorous	three times per week
	Carbonaceous 5-Day BOD	three times per week
	Flow	daily
	Visible Oil and Grease	daily
	Target Analyte List Metals	two times per month
	Volatile Organic Analytes (CLP)	two times per month
	Total Chromium	weekly
	Whole Effluent Toxicity (WET)	quarterly
Pond B 5	Total Residual Chlorine (TRC)	daily during discharge when
		Pond B 3 is bypassed
	Nitrate	Same as TRC
	Whole Effluent Toxicity	quarterly at discharge
	Non-Volatile Suspended Solids	daily during discharge
	Total Chromium	monthly at discharge
	Flow	daily during discharge
Pond C 2	Whole Effluent Toxicity (WET)	quarterly at discharge
	Non Volatile Suspended Solids (NVSS)	daily during discharge
	Total Chromium	monthly at discharge
	Flow	daily during discharge

Taken from EG&G (1993) RFP Surface Water and Sediment Monitoring Program Summary January 1993

Table 2 --Summary of Agreement in Principle (AIP) Compliance Sampling		
LOCATION	ANALYTES	FREQUENCY
Pond A-3	Plutonium Uranium, Americium	weekly composite
	Tritium	daily during discharge
	gross alpha/beta	daily during discharge
	pH	daily during discharge
	Field Parameters	daily during discharge
Pond A-4	Plutonium, Uranium, Americium	weekly composite
	Tritium	daily during discharge
	gross alpha/beta	daily during discharge
	pH	daily during discharge
	Nitrate	daily during discharge
	Tot Suspended Solids/Tot Dissolved Solids	daily during discharge
	Field Parameters	daily during discharge
Pond B-5	Plutonium Uranium, Americium	weekly composite
	Tritium	daily during discharge
	gross alpha/beta	daily during discharge
	pH	daily during discharge
	Nitrate	daily during discharge
	Tot Suspended Solids/Tot Dissolved Solids	daily during discharge
	Field Parameters	daily during discharge
Pond C-2	Plutonium Uranium Americium	weekly composite
	Tritium	daily during discharge
	gross alpha/beta	daily during discharge
	pH	daily during discharge
	Nitrate	daily during discharge
	Tot Suspended Solids/Tot Dissolved Solids	daily during discharge
	Field Parameters	daily during discharge
Ponds A-4	TSS TDS Anions, Nitrate Alkalinity	Predischarge Splits with
B-5 & C-2	Gross alpha/beta	Colorado Department of
	Total Radionuclides (Pu U, Am etc)	Health (CDH), and weekly
	Semivolatile Organic Analytes (Method 625)	splits with CDH during
	Volatile Organic Analytes (Method 502 2)	discharge
	Pesticides (Method 608)	
	Herbicides (Method 615)	
	Triazine Herbicides	
	Total and Dissolved Metals (TAL-CLP)	
Building 124	Plutonium, Uranium, Americium	monthly composite
Raw Water	TSS TDS Anions Nitrate Alkalinity	weekly

Taken from EG&G (1993) RFP Surface Water and Sediment Monitoring Program Summary January 1993

Table 3 --Summary of Operational Monitoring for DOE Orders		
LOCATION	ANALYTES	FREQUENCY
STP	Gross alpha/beta	daily
Effluent	Nitrate	daily
	Chemical Oxygen Demand	daily
	Total Organic Carbon	daily
	Dissolved Oxygen	daily
	Tritium	daily
	Amonia	daily
	Hardness	daily
	Plutonium, Americium, Uranium	daily
	Field Parameters	daily
STP	Gross alpha/beta	daily
Influent	pH	daily
	Chemical Oxygen Demand	daily
	Total Organic Carbon	daily
	Dissolved Oxygen	daily
	Total Kjeldahl Nitrogen	daily
	Amonia	daily
	Carbonaceous 5-Day Biological Oxygen Demand	three times per week
	Volatile Organic Analytes (CLP)	two times per month
	Field Parameters	daily
Pond A-4	Plutonium, Uranium, Americium	weekly when not discharging
Pond C-2	Plutonium Uranium Americium	weekly 4 weeks prior to
		discharge
Pond C-1	Gross alpha/beta	daily
	Flow	daily
	Tritium	daily
	Plutonium, Uranium Americium	weekly composites
	Field Parameters	daily
750/904	gross alpha/beta	during precipitation events
Pad	pH	during precipitation events
Runoff	Nitrate	during precipitation events
	Cyanide	during precipitation events
	Target Analyte List Metals plus Mercury	during precipitation events
	Volatile Organic Analytes (CLP)	during precipitation events
	Amonia	during precipitation events
	Field Parameters	during precipitation events

Taken from EG&G (1993) RFP Surface Water and Sediment Monitoring Program Summary January 1993

Table 3 --Continued		
LOCATION	ANALYTES	FREQUENCY
750 Culvert	gross alpha/beta	weekly
	Total Dissolved Solids	weekly
	Nitrate	weekly
	Tritium	weekly
	pH	weekly
	Field Parameters	weekly
Footing	Gross alpha/beta	quarterly
Drains&	Tritium	quarterly
Building	pH	quarterly
Sumps	Target Analyte List Metals	quarterly
(18 sites)*	Volatile Organic Analytes (method 524 2)*	Three quarterly samples initially on an as-needed basis thereafter, minimum of annual analysis*
	Semi-Volatile Organic Analytes (CLP)*	
	Field Parameters (conductivity temperature)*	quarterly
	TDS Total Nitrates*	quarterly *
Building 124	Volatile Organic Analytes	bi-annually
Water	Unregulated Organics	quarterly
Treatment	gross alpha/beta	quarterly
Plant (Safe	Nitrate	annually, February
Drinking	Strontium-90	annually, February
Water Act)	Tritium	annually, February
	Metals	annually
	Anions, Alkalinity	annually
	Corrosivity	bi-annually
	Copper and Lead	Monthly July to December
	Micro Coliform	monthly
Onsite Tap	Total Coliform	quarterly
Water		
(SDWA)		
30 Sites		

*Changes as per telecom with Leslie Dunstan on November 18 1993

Taken from EG&G (1993) RFP Surface Water and Sediment Monitoring Program Summary January 1993

Table 4 --Summary of Surface-Water and Sediment Sampling for the Los Alamos National Laboratory (LANL) Research Program

LOCATION	ANALYTES	FREQUENCY
Sewage Treatment Plant, Pond A-4, Pond B-5, Pond C-2	LANL LIST	Monthly
Pond A-1, Pond A-2, Pond A-3, Pond B-1, Pond B-2, Pond B-3, Pond B-4, Pond C-1	LANL LIST	Quarterly
Stream Water per Project Manager	LANL LIST	40 per year
Sediment Samples per Project Manager	LANL LIST	40 per year

Taken from EG&G (1993) RFP Surface Water and Sediment Monitoring Program Summary January 1993

Table 6 —Sample Volume, Container, and Preservation Requirements for Analytes in the Event-Related Surface-Water Monitoring Program.

Class of Analytes	Volume of Individual Samples from Auto-sampler	Volume Required for Analytical Methods	Preservative	Container	Analytical Methods
Total Target Analyte List (TAL) Metals	1 Liter	100 ml	Nitric Acid to pH<2	Polyethylene	CLP-Metals SW846-GFAA
Total Non-TAL Metals	1 Liter	100 ml	Nitric Acid to pH<2	Polyethylene	CLP & SW846 ICPAES & GFAA
Total Radionuclides	4 Liters	4 Liters	Nitric Acid to pH<2	Polyethylene	GRRASP
-Pu U, Am					
-Gross Alpha					
-Gross Beta					
Tritium (only at GS11 GS12 and GS13)					
Water-Quality Parameters					
Anions	1 Liter for	1 Liter plus	Cool to 4 degrees	Polyethylene	300 0
Alkalinity	all con-	250 ml	"	Polyethylene	310 1
-Conductivity	stituents		"	Polyethylene	120 1
TSS TDS	plus 250 ml		"	Polyethylene	160.1 160.2
Nitrate/Nitrite - N	for Total P		"	Polyethylene	353 1
-Total P			"	Polyethylene	365
BOD	2 Liters	2 liters	Cool to 4 degrees	Poly or Glass	SW846
VOAs (Manually Collected)	120 ml*	3x40ml	Cool to 4 degrees HCl to pH<2	Glass VOA Vial	CLP 502.2
TCL Semi-VOAs (Manually Collected)	2 L*	2x1 L	Cool to 4 degrees	Amber Glass	624
Pesticides/PCB (Manually Collected)	350 ml	350 ml	Cool to 4 degrees	Amber Glass	505
[GRRASP = General Radiochemistry and Routine Analytical Services Protocol]					

*Changes as per written instructions by Greg Wetherbee on November 4 1992

Taken from EG&G (1993) RFP Surface Water and Sediment Monitoring Program Summary January 1993

APPENDIX D
SUPPLEMENTAL INFORMATION FOR RISK ASSESSMENT

APPENDIX D

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SUPPLEMENTAL INFORMATION FOR RISK ASSESSMENT (GENERAL)

APPENDIX D
SUPPLEMENTAL INFORMATION FOR RISK ASSESSMENT

This appendix contains supplemental information regarding calculation of RfDo's, background studies and models for chemical carginogency, and effects of radiation on human health

Calculation of Reference Doses

Oral Reference Dose (RfDo) values (in units of milligrams per kilograms per day [mg/kg/day]) are typically calculated by dividing a NOEL, NOAEL, or LOAEL dose (in units of mg/kg/day) by an uncertainty or safety factor that typically ranges from 10 to 10,000 Thereafter, the RfDo is rounded to one significant figure The NOEL, NOAEL, and LOAEL are defined as follows

NOEL	No Observed Effect Level-The dose at which there are no statistically or biologically significant increases in the frequency or severity of effects between the exposed population and the corresponding control population (i e , no measurable effects are produced at this dose)
NOAEL	No Observed Adverse Effect Level-The dose at which there are no statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and the corresponding control population Effects are produced at this dose, but they are not considered adverse
LOAEL	Lowest Observed Adverse Effect Level-The lowest dose of a chemical in a study or group of studies that produces statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and its appropriate control

RfDo values are derived from the NOEL, NOAEL, or the LOAEL for the critical toxic effect by the consistent, conservative application of uncertainty factors (UFs) and modifying factors (MFs), as follows

$$RfDo = CE/(UF \times MF) \qquad (1)$$

where

RfDo	=	Chronic (or subchronic) Oral Reference Dose (rounded to one significant figure)
CE	=	Lowest critical or no effect level (i e , NOEL, NOAEL, or LOAEL)
UF	=	The product of one or more uncertainty factors
MF	=	Modifying factor

UFs are generally applied as multiples of 10 (although values less than 10 are sometimes used), with each factor representing a specific range of uncertainty inherent in extrapolating data to derive a "safe concentration" for human exposure

To derive the RfDo values, UFs are applied as follows

- If the NOAEL is based on human data, a UF of 10 is usually applied to account for variation in sensitivities among individuals It is intended to protect sensitive subpopulations (e g , the elderly and children)

- If the NOAEL is based on animal data, an additional UF of 10 is used to account for the interspecies variability between humans and other animals

- If the NOAEL is derived from a subchronic instead of a chronic study, an additional UF of 10 is applied to extrapolate a subchronic value to a chronic value

- If an LOAEL is used instead of an NOAEL, an additional UF of 10 is used to account for the uncertainty associated with extrapolating from LOAELs to NOAELs

In addition to the UFs listed above, an MF can be arbitrarily applied. MFs range from 1 to 10 and reflect a qualitative professional assessment of additional uncertainties not specifically addressed by the above-mentioned UFs The default MF value is 1 0

Background Studies and Models for Chemical Carcinogenicy

Evidence of chemical carcinogenicity originates primarily from two sources: lifetime studies with laboratory animals and human (epidemiological) studies For most chemical carcinogens, animal data from laboratory experiments represent the primary basis for the extrapolation Major assumptions arise from the necessity of extrapolating experimental results across species (from laboratory animals to humans), from high-dose regions (to which laboratory animals are exposed) to low-dose regions (levels to which humans are likely to be exposed in the environment), and, across routes of administration (inhalation versus ingestion) Federal regulatory agencies have traditionally estimated human cancer risks associated with exposure to chemical carcinogens on the administered-dose basis according to the following approach

- The relationship between the administered dose and the incidence of cancer in animals is based on experimental animal bioassay results

- The relationship between the administered dose and the incidence of cancer in the low-dose range is based on mathematical models

- The dose-response relationship is assumed to be the same for both humans and animals, if the administered dose is measured in the proper units

Thus, effects from exposure to high (administered) doses are based on experimental animal bioassay results, while effects associated with exposure to low doses of a chemical are generally estimated from mathematical models

For chemical carcinogens, EPA assumes a small number of molecular events can evoke changes in a single cell that can lead to uncontrolled cellular proliferation and tumor induction This mechanism for carcinogenesis is referred to as stochastic, which means that there is theoretically no level of exposure to a given chemical that does not pose a small, but finite, probability of generating a carcinogenic response Since risk at low exposure levels cannot be measured directly either in laboratory animals or human epidemiology studies, various mathematical models have been proposed to extrapolate from high to low doses (i e , to estimate the dose-response relationship at low doses) The three most frequently used models are the one-hit model, the log-probit model, and the multistage model The one-hit model is based on the premise that a single molecule of a contaminant can be the single event that precipitates tumor induction (Cornfield, 1977) In other words, there is some finite response associated with any exposure The log-probit model assumes that a response is normally distributed with the logarithm of the dose (Mantel et al , 1971)

This theory seems to have little scientific basis, although some physiological parameters are lognormally distributed This model usually yields much lower potency estimates due to the implied threshold at lower doses

Currently, regulatory decisions are based on the output of the linearized multistage model The basis of the linearized multistage model is that multiple events (versus the single-event paradigm of the one-hit model) may be needed to yield tumor induction The linearized multistage model reflects the biological variability in tumor frequencies observed in animals or human studies The dose-response relationship predicted by this model at low doses is essentially linear Use of this model provides dose-response estimates intermediate between the one-hit and the log-probit models It should be noted that the slope factors (SFs) calculated for nonradiological carcinogens using the multistage model represent the 95th percentile upper confidence limit on the probability of a carcinogenic response Consequently, risk estimates based on these SFs are conservative estimates representing upper-bound estimates of risk where there is only a 5 percent probability that the actual risk is greater than the estimated risk

Most models produce quantitatively similar results in the range of observable data, but yield estimates that can vary by three or four orders of magnitude at lower doses Animal bioassay data are simply not adequate to determine whether any of the competing models are better than the others Moreover, there is no evidence to indicate that the precision of low-dose risk estimates increases through the use of more sophisticated models Thus, if a carcinogenic response occurs at the exposure level studied, it is assumed that a similar response will occur at all lower doses, unless evidence to the contrary exists

For radionuclides, human epidemiological data collected from the survivors of the Hiroshima and Nagasaki bomb attacks form the basis for the most recent extrapolation put forth by the National Academy of Science (1980) Conversely, for most nonradiological carcinogens, animal data from laboratory studies represent the primary basis for the extrapolation Furthermore, in the past, risk factors for radionuclides have generally been based on fatalities (i e , the number of people who actually died from cancer), while SFs for nonradiological carcinogens are based on incidence (i e , the number of people who developed cancer)

Effects of Radiation on Human Health

Ionizing radiation has sufficient energy to interact with matter and produce an ejected electron and a positively charged ion These positively charged ions, known as free radicals, are highly reactive and may combine with other elements or compounds within a cell to produce toxins or otherwise disrupt the chemical balance, which results in mutations or other deleterious effects Radionuclides are characterized by the type and energy level of the radiation emitted Radiation emissions fall into two major categories particulate (electrons, alpha particles, beta particles, protons) or electromagnetic (gamma and x-rays) radiation

The general health effects of radiation can be divided into stochastic and nonstochastic effects, i e , those health effects related to dose and those not related to the dose The risk of developing of cancer from exposure to any amount of radiation is a stochastic effect Examples of nonstochastic effects include acute radiation syndrome and cataract formation, both of which occur only at high levels of exposures

Radiation can damage cells in different ways First, the radiation can cause damage to the strands of genetic material, DNA, in the cell The cell may not be able to recover from this type of damage, or the cell may live on but function abnormally If the abnormally functioning cell divides and reproduces, a tumor or mutation in the tissue may develop The rapidly dividing cells that line the intestines and the stomach and the cells that make blood in the bone marrow are very sensitive to this kind of damage Organ damage results from the damage caused to the individual cells This type of damage has been reported with doses of 10 to 500 rads Acute radiation sickness is seen only after doses of greater than 50 rads This dose is usually only received by personnel in close proximity to serious nuclear accident

When the cells damaged by radiation are reproductive cells, genetic damage can occur in the offspring of the person exposed. The developing fetus is especially sensitive to radiation The type of malformation that may occur is related to the stage of fetal development and the cells that are differentiating at the time of exposure Radiation damage to children exposed while in the womb is related to the dose the pregnant mother received Mental retardation is another possible effect of fetal radiation exposure

APPENDIX D
SUPPORTING STATISTICAL INFORMATION FOR RISK ASSESSMENT

APPENDIX D
SUPPORTING STATISTICAL INFORMATION FOR RISK ASSESSMENT

All information in this introduction and appendix was excerpted or summarized directly from the following EG&G Statistical Application Reports created for the pond water quality risk assessment

SA 93-012 Statistical Determination of Proposed Contaminants of Concern for the Pond Water Quality IM/IRA June 7, 1993

SA-93 014 Summary Statistics for the Pond Water Quality IM/IRA July 30, 1993

SA 93-015 Summary Statistics in Support of the Risk Assessment for the Pond Water Quality IM/IRA July 30, 1993

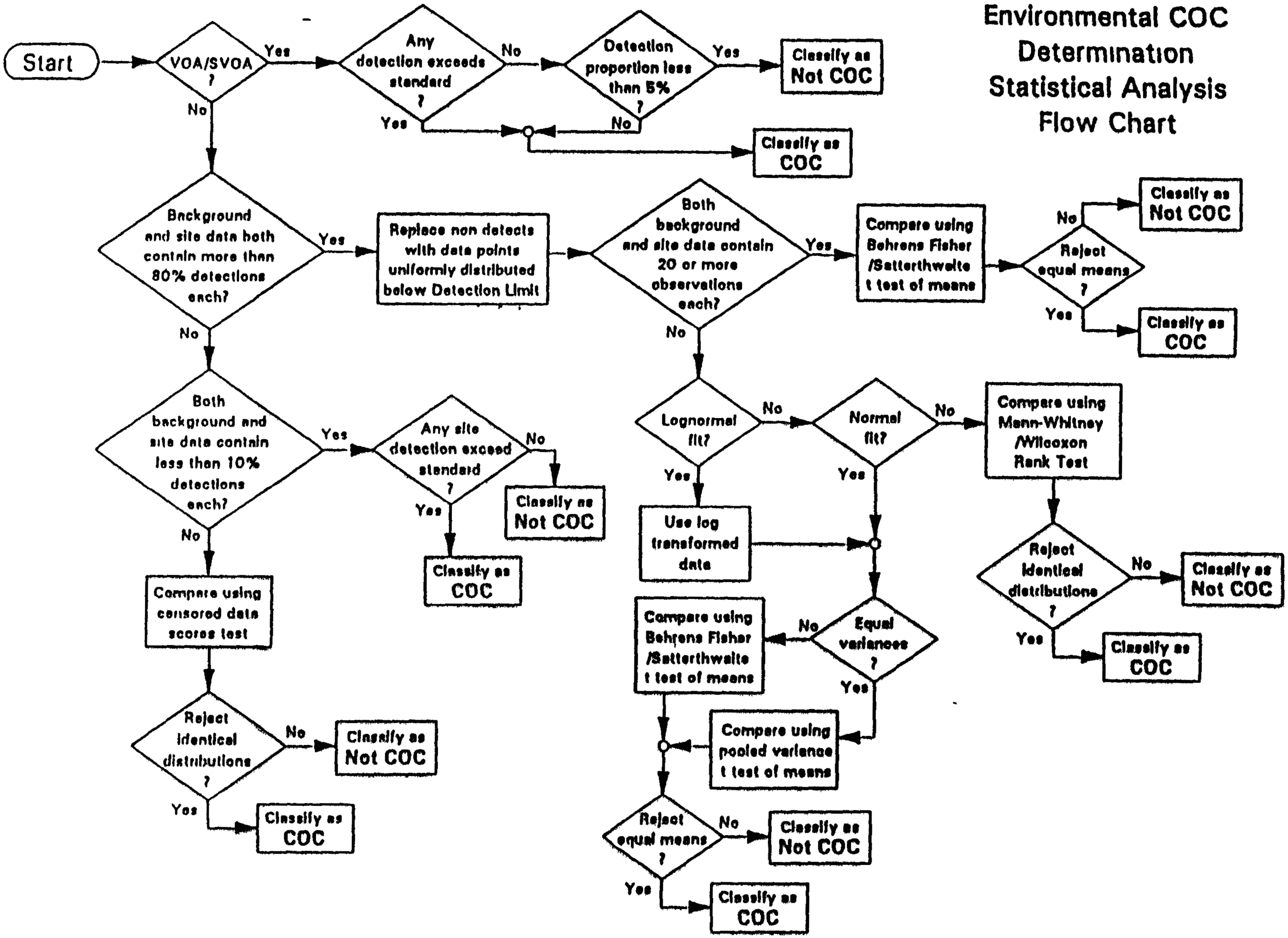
Determination of Proposed Contaminants of Concern (PCOCs)

PCOCs were identified in pond water through a statistical comparison of background and site data If levels of an analyte were statistically significantly greater in the site data, the analyte was classified as a PCOC and used in the risk assessment process described in Section 2 5 and in Tables D 1 1 through 1 8

The statistical determination of PCOCs through comparisons of background and site data were complicated bv the presence of nondetects at multiple detection limits The branching flowchart for selecting appropriate statistical methodologv was presented in the Statistical Applications report SA-93-010 for OU 2 and is contained on the following page In this flowchart, two cases use non-statistical criteria for PCOC determinations In the first case, for volatile organic analytes/semi volatile organic analytes (VOAs/SVOAs), no background levels are expected, therefore, no background comparison is made Instead, an administrative convention is used which labels analytes PCOCs if a standard is exceeded or if five percent or more detects are present In the second case, if fewer than ten percent detects have been observed for both site and background data, statistical comparisons are not practical, therefore, PCOC determination is based only on the exceedance of a standard In this latter case, the designation is referred to as a "potential COC '

For the remaining cases identified in the chart, statistical comparisons of site and background data are made For large numbers of non-detects, a nonparametric scores approach was recommended in the OU 2 report This scores approach reduces to the common Mann-Whitney/Wilcoxon nonparametric rank test for comparing two groups of data when no nondetects are present It was shown in the OU 2 report that essentially identical PCOC determinations result if the scores test approach is used, even for the cases of no or minimal numbers of nondetects For this reason, the scores approach was used in this report for all statistical comparisons, primarily to avoid the questionable practice of nondetect replacement and the tedious analvsis sequence including sample size considerations, goodness-of-fit testing, data transformations, and variance testing for the many analytes involved Again, it is emphasized that using the scores approach universally rather than branching to a t test or Mann-Whitney/Wilcoxon test in the flowchart will only very rarely generate a different PCOC conclusion, and in such cases anomalous data such as outliers are likely the cause of the different determination

Environmental COC Determination Statistical Analysis Flow Chart



SUPPORTING STATISTICAL INFORMATION FOR RISK ASSESSMENT
(Continued)

The p-values below 0 05 in Tables D 1 1 through D 1 8 indicate that site values are elevated relative to background or literature comparison values, and the result is a PCOC determination The statistical source of these p-values is the scores test described above The 0 05 level for the p-value is the Type I error probability of obtaining a sample which leads to a PCOC determination when in fact the underlying site analyte levels are not elevated relative to background

Determination of Mean Values in Summary Statistics

Means for background and site data were calculated to facilitate risk assessment However, it is crucial to note that means are fairly volatile estimates of the data set in the presence of nondetects and outliers, occurrences which are common in environmental data It could even be the case that a PCOC determination would be made by the nonparametric ranking methods when the background mean was greater than the site mean This would occur if extreme outliers were present in the background while the bulk of the site data was in fact elevated relative to the bulk of the background data Means are highly affected by such outlying values

In addition, it is essential to note that the mean, median, 85th percentile, and interquartile range values displayed in Tables 1 5 require special treatment for the non detect values at varying detection limits For small numbers of non detects (less than 20 percent), the statistical measures computed should be relatively insensitive to the handling of non-detects For larger numbers of non-detects, no good method of handling the many non detects at multiple detection limits exists The shortcomings of using such statistical measures in these cases should be realized

The convention for handling the non detect values when calculating mean values was uniform replacement For example, if four non-detects were observed at the detection limit value of 10 0, they were replaced by the values 2 0, 4 0, 6 0, and 8 0 Note that in many cases this could result in the maximum reported value for an analyte actually being a replacement value for a non detect Since this is a poor alternative, any non detects that were more than twice the maximum detected value for all pond locations were omitted from the summary statistics computation

SUPPORTING STATISTICAL INFORMATION FOR RISK ASSESSMENT
(Continued)

Other Information Not Included in This Text

Not all statistical information generated in support of the risk assessment is included in this appendix due to volume considerations, however the tables included in Section 2 5 and this appendix should provide adequate information for most purposes Information generated but not included in this appendix follows

1) Box and whisker plots used in PCOC determinations,

2) Various tables and graphs involving summary statistics for the ponds including minimum detect and nondetect values,

3) Statistical tables and graphs involving distribution tests for normal and lognormal distributions, and

4) Printout of the data set

TABLES D-1 1 THROUGH D-1.8
HUMAN HEALTH RISK ASSESSMENT COCs

Table L

(page 1of 2)

HUMAN HEALTH RISK ASSESSME OC's Site 1 - Ponds A1 and A2

Contaminant	SITE: SAMPLE MEAN	SITE: LOGNORMAL 95% UCL FOR MEAN	SITE: MAX DETEC	SITE: DETECTION FREQUENCY	SITE: SAMPLE IZE	SITE: PERCENT NONDETECT	BA ROUND: SAMPLE MEAN	BA ROUND: LOGNORMAL	BA ROUND: MAX DETE T	BA ROUND: DETECTION REQUENC	BA ROUND: SAMPLE ZE	BA ROUND: PERCENT NONDETE T	SCORES TEST P AL E	POTE TIAL COC	SENTIAL NUTRIENT	LITERATURE ALUE: MIN (1)	LITERATURE ALUE: MEAN (2)	LITERATURE ALUE: MAX (1)	HUMAN HEALTH COC	COMMENTS
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM 241	0 018	0 034	0 064		9		0.004	0.023	0 024		82		0 0016	YES					**YES**	max>UTL sig p value site=3 BG
CESIUM 137	0 108	0 247	0 58		12		0 096	1 158	1 7		76		0 4496	NO						
PLUTONIUM 239/240	0 022	0 028	0 042		14		0.004	0 017	0 04		83		0 0001	YES					**YES**	max>UTL sig p value site=4 BG
STRONTIUM 89 90	0 589	0.75	0 8919		12		0 546	1 893	1 8		57		0 2405	NO						
TRITIUM	55.75	173 774	130		4		51 452	1403 865	550		53		0 5435	NO						
URANIUM 233 234	3 346	3 872	4 952		14		0 458	1 364	2 59		60		0 0001	YES					**YES**	max UTL sig p value sit 7 BG
URANIUM 235	0 203	0 313	0 36		14		0 04	0 193	0 2		56		0 0001	YES					**YES**	max>UTL sig p value, site=4 BG
URANIUM 238	4 917	5 765	6 929		14		0 36	1 3	1 82		54		0 0001	YES					**YES**	max>UTL sig p value sit 10 BG
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)	(ug/l)		
ALUMINUM	209 635	499 4	1500	8	13	38 5	695 294	4404 622	5840	79	110	28 2	0 9656	NO				500		
ANTIMONY	9 392	14 935	N/A	0	13	100	14 23	55 28	26 5	9	91	90 1	N/A	NO				1		
ARSENIC	3 915	10 555	7 8	10	13	23 1	1 781	8 183	2 9	10	84	88 1	0 0001	YES		1		10	**NO**	sig p value site within BG liter range
BARIUM	50 477	63 678	76	13	13	0	67 617	148 877	306	84	103	18 4	0 9168	NO		9		152		
BERYLLIUM	0 369	0 62	N/A	0	13	100	0 943	4 756	8 4	6	87	93 1	N/A	NO		1		130		no detects
CADMIUM	1 462	2 091	N/A	0	8	100	1 744	6 426	N/A	0	80	100	N/A	NO						no detect
CALCIUM	27984.615	35650	46800	13	13	0	24924 572	96761 525	74600	125	125	0	0 1262	NO	YES					
CESIUM	153 462	660 581	120	1	13	92 3	247 467	1351 727	400	8	92	91 3	N/A	NO			0 02			
CHROMIUM	1 538	2 413	N/A	0	13	100	4 234	16 863	18 9	15	91	83 5	0 9576	NO		0.73	10	84		no detects
COBALT	1 312	2 527	N/A	0	13	100	2 398	9 256	7 9	6	88	93 2	N/A	NO			0 2	5 8		no detects
COPPER	2 068	3 127	3 7	1	11	90 9	6.198	28 468	15 6	34	93	63 4	0 9974	NO		0 83	10	105		
IRON	211 185	387 305	1100	7	13	46 2	1335 636	6637 829	26300	118 9	129	7 8	0 9994	NO	YES					
LEAD	2 023	4.62	11	4	13	69.2	2 044	8.567	21	37	104	64 4	0 6032	YES		0 1 (4)		30 (4)	**NO**	max slightly>UTL,insig p value
LITHIUM	44 777	48 778	56 2	13	13	0	13 711	63 036	11 6	47	98	52	0 0001	YES		0 076	1 1	37	**YES**	sig p value site 4 BG
MAGNESIUM	30046 154	33207 1	35500	13	13	0	5279.619	11266 249	16600	106	118	10 2	0 0001	YES	YES				**NO**	essential nutrient
MANGANESE	128 177	470 601	684	13	13	0	99 317	488 154	4060	112 1	123	8 9	0 1837	YES				1000	**NO**	max>UTL,insig p value
MERCURY	0.12	0 239	0 36	1	13	92.3	0 14	0 638	1 4	8	94	91.5	N/A	NO		0.01		10		
MOLYBDENUM	2 912	4 453	5 8	2	13	84 6	5 279	23 37	25 1	12	97	87 6	0 6833	NO				6 9		
NICKEL	5 969	10 139	23 7	6	13	53.8	7 384	33.254	12 1	14	92	84.8	0 0142	YES			10	71	**NO**	sig p value,only 1/13 elevated
POTASSIUM	7693 077	8565 485	10000	13	13	0	1775 375	5432 96	6700	68	100	32	0 0001	YES	YES				**NO**	essential nutrient
SELENIUM	1 4	2 334	1 8	2	13	84.6	1 378	5 462	2	4	92	95 7	0 0326	YES		0 1	0.2	400	**NO**	slightly sig p, max & mean BG
SILICON	1075 893	3380 199	2680	11	14	21 4	5861 897	19227 637	11700	39	39	0	1	NO						
SILVER	1 946	3 305	N/A	0	13	100	2 856	11 482	7 9	12	88	86.4	0 9195	NO		0 09 (3)		0 55 (3)		no detects
SODIUM	171384	185825 463	213000	13	13	0	17166 929	38052 976	45400	126	127	0.8	0 0001	YES	YES				**NO**	essential nutrient
STRONTIUM	339.615	394 417	486	13	13	0	195.594	472 439	408	89	106	16	0 0001	YES		6 3		802	**YES**	max>UTL sig p value site=2*BG
THALLIUM	1 545	2 728	2 1	1	13	92 3	1 043	3 866	3 4	3	96	96 9	N/A	NO						
TIN	7 746	11 367	N/A	0	12	100	22.609	92 862	180	17	90	81 1	0 989	NO						no detects
VANADIUM	3 369	5 608	7 1	7	13	46 2	7 836	42 095	18 2	27	92	70 7	0 2974	NO						
ZINC	5 7	14 143	26	3	13	76 9	38.291	182 699	480	87 9	123	28.5	0 9997	NO		5	10	45		
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
CYANIDE	0 006	0 011		0	14	100	0.006	0 031	0 0404	3	106	97 2	N/A	NO						no detects
NITRATE	N/A	N/A	N/A	N/A	N/A	N/A	0 15	N/A	0 25	1	2	50	N/A	N/A				83		no sample data
NITRATE/NITRITE	0.013	0 212	0.37	6	14	57 1	0.389	3 111	4 3	72	125	42.4	0 9397	NO						
NITRITE	0 011	0 022	0 03	1	14	92 9	0 012	0 054	0 058	3	75	96	N/A	NO						max UTL, no p value site BG

Table D (page 2 of 2)

HUMAN HEALTH RISK ASSESSMENT COC's Site 1 - Ponds A1 and A2

Contaminant	CWQCC STANDARD	SITE: SAMPLE MEAN	SITE: MAX DETECT	SITE: DETECTION FREQUENCY	SITE: SAMPLE SIZE	SITE: PERCENT DETECT	BACKGROUND: SAMPLE MEAN	BACKGROUND: LOGNORMAL 95% UTL	BACKGROUND: MAX DETEC	BACKGROUND: DETECTION FREQUENCY	BACKGROUND: SAMPLE E	BACKGROUND: PERCENT DETECT	SCORE TEST P-VALUE	NO OF EXCEEDANCES	POTENTIAL COC				HUMAN HEALTH COC	COMMENTS
VOA/ SVOA/ PESTICIDES	(g/l)	(g/l)	(ug/l)				(g/l)	(g/l)	(g/l)											
ACETONE	N/A	6 35	13	1	10	10								0	NO					1/10 detects
BIS(2 ETHYLHEXYL)PHTHALATE	1 8	22 875	220	1	12	8 33		27 528	N/A	0	16	0	N/A	1	YES				NO	1 c 1/10 detects. pot lab contan
1 2,3 TRICHLOROBENZENE	N/A	0 0565	0 11	1	11	9 09								0	NO					1/11 detects
1 2,4 TRICHLOROBENZENE	N/A	0 0558	0 12	1	12	8 33								0	NO					1/12 detects
BENZENE 1 2,4-TRIMETHYL	N/A	0 0564	0 12	1	11	9 09								0	NO					1/11 detects
HEXACHLOROBUTADIENE	0 45	0 07	0 29	1	12	8 33								0	NO					1/12detect
NAPHTHALENE	0 0028	0.1483	0 68	1	12	8 33								1	YES				NO	1 xo. 1/10detects
TETRACHLOROETHENE	0 8	0 0792	0 68	2	12	16 67								0	YES				YES	2/12 detects
TRICHLOROETHENE	66	0 0817	0 54	2	12	16 67								0	YES				YES	2/12 detects
CIS-1 3-DICHLOROPROPENE	10	0 08	0 41	1	12	8 33								0	NO					1/12 detect
N BUTYLBENZENE	N/A	0 1491	0 64	1	11	9 09								0	NO					1/11 detects
ATRAZINE	3	1 0458	3	10	12	83 33								0	YES				YES	10/12 detect

NOTES

1 Foust Samuel 1981 "Chemistry of Natural Waters Ann Arbor Science

2 Hem John USGS 1989 'Study and Interpretation of the Chemical Characteristics of Natural Water" Water Supply Paper 2254

3 EPA 1979 "Water related Environmental Fate of 129 Priority Pollutants Volume I Introduction and Technical Background Metals and Inorganics Pesticides and PCBs NTIS/PB80-204373

4 Fergussen Jack E 1989 The Heavy Elements Chemistry Environmental and Health Effects"

Table D

(page 1of 2)

HUMAN HEALTH RISK ASSESSMEN C's Site 2 - Ponds A3 and A4

Contaminant	SITE SAMPLE MEAN	SITE LOGNORMAL 95% UCL FOR MEAN	SITE MAX DETECT	SITE DETECTION FREQUENCY	SITE SAMPLE SIZE	SITE PERCENT NONDETECT	BA KGROUND SAMPLE ME N	BA KGROUND LOGNORMAL 95% UTL	BA KGROUND MAX ETECT	BA KGROUND DETECTION FREQUENCY	BA KGROUND SAMPLE SIZE	BA KGROUND PERCENT NONDETECT	SCORES TE P ALUE	POTENTIAL COC	ESSENTIAL NUTRIENT	LITERATURE ALUE MIN	LITERATURE ALUE MEAN	LITERATURE ALUE MAX	HUMAN HEALTH COC	COMMENTS
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM 241	0 004	0 006	0 03		48		0.004	0 023	0 0124		82		0 4836	YES					NO	insig p value
CESIUM 137	0 068	0 114	1 4		49		0 096	1 158	1 7		76		0 7959	YES					NO	insig p value
PLUTONIUM-239/240	0 005	0 006	0 026		55		0.004	0 017	0 04		83		0 2312	YES					NO	insig p value
STRONTIUM-89 90	0 353	0 405	0 99		46		0 346	1 893	1 8		57		0 9806	NO						
TRITIUM	121 293	183 45	1000		22		51 452	1403 863	550		53		0 2299	NO						
URANIUM 233 234	1 378	1 613	4 38		60		0 4.8	1 164	[illegible]		60		0 0001	YES					YES	sig p value site 3 BG
URANIUM 235	0 084	0.104	0 284		60		0.04	0 193	0 2		56		0 0001	YES					YES	sig p value site=2 BG
URANIUM 238	1 542	1 83	4 6		59		0 76	1 3	1 82		54		0 0001	YES					YES	sig p value site=3 BG
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)	(ug/l)		
ALUMINUM	320 029	1563	1100	15	21	28.6	695 294	4404 622	5840	79	110	28 2	0 6988	NO				500		
ANTIMONY	12 648	18 39	N/A	0	21	100	14 23	55 28	26 5	9	91	90 1	N/A	NO				1		no detect
ARSENIC	1 276	1 917	2	3	21	85 7	1 781	8 183	2 9	10	84	88 1	0 3669	NO		1		10		
BARIUM	84 324	88 61	104	20	21	4 8	67 617	148 877	306	84	103	18 4	0 0001	YES		9		132	YES	sig p value site=1 2 BG
BERYLLIUM	0 626	1 004	1 9	1	21	95 2	0 943	4 756	8 4	6	87	93 1	N/A	NO		1		130		
CADMIUM	1 589	2 134	N/A	0	18	100	1 744	6 426	N/A	0	80	100	N/A	NO						no detects
CALCIUM	45395	47979.5	56700	21	21	0	24924 572	96761 526	74600	125	125	0	0 0001	YES	YES				NO	essential nutrient
CESIUM	218 8	1378	1100	5	20	75	247 467	1551 727	400	8	92	91 3	0 014	YES			0 02		NO	sig p value 1 elevated of 5 /20 detect
CHROMIUM	2 269	3 321	2	1	21	95.2	4 234	16 863	18 9	15	91	83 5	0 9747	NO		0 73	10	84		
COBALT	2 258	3 505	N/A	0	21	100	2 398	9 256	7 9	6	88	93 2	N/A	NO			0 2	5 8		no detects
COPPER	5 045	9 955	17.2	6	20	70	6 198	28 468	15 5	34	93	63 4	0.7333	NO		0 83	10	105		
IRON	237 5	1204	800	16	21	23 8	1335 636	6637 829	26300	118 9	129	7 8	0 9999	NO	YES					
LEAD	2 456	5 385	19 1	8	20	60	2.044	8 567	21	37	104	64 4	0.3474	YES		0 1		30	NO	insig p value site max & mean=BG
LITHIUM	13 62	19 601	15 8	11	17	35 3	13 711	63 036	11.6	47	98	52	0 0001	YES		0 075	1 1	37	NO	sig p value site mean & max BG
MAGNESIUM	11530	12397	15000	21	21	0	5279.619	11266 249	16600	106	118	10 2	0 0001	YES	YES					essential nutrient
MANGANESE	53 21	113.3	150	21	22	4 5	99 317	488 154	4060	112 1	123	8 9	0 26	NO				1000		
MERCURY	0 096	0 153	N/A	0	24	100	0.14	0 638	1 4	8	94	91 5	N/A	NO		0 01		10		no detects
MOLYBDENUM	6 597	13 27	8 2	3	17	82 4	5 279	23 37	25 1	12	97	87 6	0 3752	NO				6 9		
NICKEL	7 236	11 161	6 5	5	21	76.2	7 384	33 254	12 1	14	92	84 8	0 2034	NO			10	71		
POTASSIUM	5435	6571	10100	20	21	4 8	1775 375	5432 96	6700	68	100	32	0 0001	YES	YES					ssential nutrient
SELENIUM	1 602	2 445	3 4	5	21	76.2	1 378	5 462	2	4	92	95 7	0 0001	YES		0.1	0 2	80	NO	sig p value 1 elevated of 5/21 detects
SILICON	2891	3377 286	3550	9	9	0	5861 897	19227 637	11700	39	39	0	0 9984	NO						
SILVER	1 96	2 787	N/A	0	21	100	2.856	11 482	7 9	12	88	86.4	0 9714	NO		0 09		0.55		no detects
SODIUM	38071	42187	52200	21	21	0	17166 929	38052 976	45400	126	127	0 8	0 0001	YES	YES				NO	essential nutrient
STRONTIUM	301 7	330.2	360	17	18	5 6	195 594	472 439	408	89	106	16	0 0001	YES		6 3		802		
THALLIUM	1 006	1 715	N/A	0	21	100	1 043	3 866	3 4	3	96	96 9	N/A	NO						no detect
TIN	13 65	22 73	23 1	1	16	93.8	22 609	92 862	180	17	90	81 1	0 9289	NO						
VANADIUM	3 717	5 138	6 1	7	21	66 7	7 836	42 096	18 2	27	92	70 7	0 7533	NO						
ZINC	20.33	34 401	106	14	21	33.3	38 291	182.699	480	87 9	123	28 5	0 7965	NO		5	10	45		
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
CYANIDE	2 873	N/A	0 6	1	13	92 3	0.006	0 031	0 0404	3	106	97 2	N/A	YES					NO	only 1/13 detects
NITRATE	110 7	N/A	430	4	4	0	0.15	N/A	0 25	1	2	50	0 032	YES				83	NO	sig p value only 1 elevated of 4/4 detec
NITRATE/NITRITE	2 942	3 724	8.2	106	107	0.9	0.389	3 111	4 3	72	125	42.4	0 0001	YES					YES	sig p value site=10*BG
NITRITE	0 125	0.196	1 4	51	55	7 3	0.012	0.054	0 058	3	75	96	0 0001	YES					YES	sig p value site=10 BG

Table D

(page 2 of 2)

HUMAN HEALTH RISK ASSESSMEN C's Site 2 - Ponds A3 and A4

Contaminant	CWQCC S ANDARD	SITE: SAMPLE MEAN	SITE: MAX DETECT	SITE: DETECTION REQUENCY	SITE: SAMPLE SIZE	SITE: PERCE T DETECT	BACKGROUND: SAMPLE MEAN	BACKGROUND: LOGNORMAL 95% UTL	BACKGROUND: MAX DETECT	BACKGROUND: DETECTION REQUENCY	BACKGROUND: SAMPLE ZE	BACKGROUND: PERCENT DETECT	SCORES: TE T VALUE	NO OF EXCEEDANCES	POTENTIAL COC				HUMAN HEALTH COC	COMMENTS
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
1 1 DICHLOROETHENE	0 057	2 6098	17	1	132	0 76								1	YES				**NO**	only 1/32 detects
METHYLENE CHLORIDE	4 7	2 9621	8	9	132	6 82	4 794	17 262	31	14	89	15 7	0 9944	9	YES				**NO**	insig p potential lab ont
TETRACHLOROETHENE	0 8	2 621	14	2	132	1 52								2	YES				**NO**	only 2/132 detects
BIS(2 ETHYLHEXYL)PHTHALATE	1 8	5 409	19	2	33	6 06	N/A	27 528	N/A	0	16	0	N/A	2	YES				**NO**	not RF wast -related
1 1 1 TRICHLOROETHANE	200	0 0888	42	1	16	6 25								0	NO					
1 1 DICHLOROETHENE	0 057	0.1381	17	1	16	6 25								1	YES				**NO**	only 1/16 detects
TETRACHLOROETHENE	0 8	0 08	N/A	1	16	6 25								0	NO					
DICAMBA	N/A	0 475	2 1	7	12	58 33								N/A	YES				**YES**	7/12 detects
DICHLOROPROP	N/A	0 475	1 8	1	12	8 33								N/A	YES				**NO**	only 1/12 detects
ATRAZINE	3	0 7281	4 6	45	76	59 21								5	YES				**YES**	45/76 detects
SIMAZINE	4	0 1563	0 97	8	64	12 5								0	YES				**YES**	8/64 detects

Table D

(page 1of 2)

HUMAN HEALTH RISK ASSESSMENT (, Site 3 - Ponds B1 and B2

Contaminant	SITE SAMPLE MEAN	SITE LOGNORMAL 95 UCL FOR MEAN	SITE MAX DETECT	SITE DETECTION FREQUENCY	SITE SAMPLE SIZE	SITE PERCENT NONDETECT	BACKGROUND SAMPLE MEAN	BACKGROUND LOGNORMAL 95% UTL	BACKGROUND MAX DETECT	BACKGROUND DETECTION FREQUENCY	BACKGROUND SAMPLE SIZE	BACKGROUND PERCENT NONDETECT	SCORES TEST VALUE	POTENTIAL COC	ESSENTIAL NUTRIENT	LITERATURE VALUE MIN	LITERATURE VALUE MEAN	LITERATURE VALUE MAX	HUMAN HEALTH COC	COMMENTS
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM 241	0.021	0 038	0 054		9		0 004	0 023	0 024		82		0 0002	YES					YES	
CESIUM-137	0 371	0 717	2 9		12		0 096	1 1 8	1 7		76		0 1085	YES					NO	only 1/12 elevated
PLUTONIUM 239/240	0 05	0 079	0 16		14		0 004	0 017	0 04		83		0 0001	YES					YES	
STRONTIUM 89 90	0 179	0 268	0 56		12		0 546	1 873	1 8		57		0 9996	NO						
TRITIUM	249 5	506 453	650		6		51 452	1403 865	550		53		0 0283	YES					NO	only 1/6 elevated
URANIUM 233 234	1 37	1 76	2 4		14		0 4.8	1 364	2 59		60		0 0001	YES					YES	sig p value sit =2 BG
URANIUM 235	[illegible]	0 126	14		14		14	1	[illegible]		[illegible]		[illegible]	YES					YES	sig p value, site=2*BG
URANIUM 238	1 754	1 481	1 9		14		0 36	1 3	1 87		54		0 0001	YES					YES	sig p value site=3 BG
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)	(ug/l)		
ALUMINUM	152 6	374 6	520	6	12	50	696 294	4404 622	5840	79	110	28 2	0 9388	NO				500		
ANTIMONY	10 98	17 81	N/A	0	12	100	14 23	55 28	26	9	91	90.1	N/A	NO				1		no detects
ARSENIC	2 144	4.813	4 1	5	9	44 4	1 781	8 183	2 9	10	84	88 1	0 0001	YES		1		10	NO	sig p value, site mean in lower range of lit BG
BARIUM	40 82	240 13	121	8	12	33 3	67 617	148 877	306	84	103	18 4	0 9591	NO		9		152		
BERYLLIUM	0 379	0 756	1 6	1	12	91 7	0.943	4 756	8 4	6	87	93 1	N/A	NO		1		130		
CADMIUM	1 58	2 251	N/A	0	10	100	1 744	6 426	N/A	0	80	100	N/A	NO						no detects
CALCIUM	21900	26788	47400	12	12	0	24924 572	96761 525	74600	125	125	0	0 9233	NO	YES					essential nutrient
CESIUM	233 3	821 5	N/A	0	12	100	247 467	1551 727	400	8	92	91 3	N/A	NO			0 02			no detects
CHROMIUM	1 955	3 028	N/A	0	11	100	4 234	16 863	18 9	15	91	83 5	0 9383	NO		0 73	10	84		no detects
COBALT	1 838	2 836	N/A	0	12	100	2 398	9 256	7 9	6	88	93 2	N/A	NO			0 2	5.8		no detects
COPPER	1.888	2 702	N/A	0	12	100	6 198	28 468	15 5	34	93	63 4	0 999	NO		0 83	10	105		no detects
IRON	271 8	452 6	491	8	12	33 3	1335 636	6637 829	26300	118 9	129	7 8	0 9883	NO	YES					essential nutrient
LEAD	2 171	6 163	11	6	12	50	2.044	8 567	21	37	104	64.4	0 5038	YES		0 1		30	NO	max>UTL, insig p value, mean=BG
LITHIUM	19 32	25 25	23 6	10	12	16 7	13 711	63 036	11 6	47	98	52	0 0001	YES		0 075	1 1	37	YES	sig p value, site=1 5 BG
MAGNESIUM	20142	23293	25600	12	12	0	5279 619	11266 249	16600	106	118	10 2	0 0001	YES	YES				NO	essential nutrient
MANGANESE	74 53	114	157	12	12	0	99 317	488 154	4060	112 1	123	8 9	0 0164	YES				1000	NO	sig p value max UTL mean<BG
MERCURY	0 1	0 191	N/A	0	12	100	0 14	0 638	1 4	8	94	91.5	N/A	NO		0.01		10		no detects
MOLYBDENUM	3.009	4 802	N/A	0	12	100	5 279	23 37	25 1	12	97	87 6	0 8895	NO				6 9		no detects
NICKEL	4.95	8.855	16.3	1	12	91 7	7 384	33 254	12 1	14	92	84.8	0 5	NO			10	71		
POTASSIUM	5366 7	6170	8140	12	12	0	1775 375	5432 96	6700	68	100	32	0 0001	YES	YES					essential nutrient
SELENIUM	0 895	1 481	N/A	0	11	100	1 378	5 462	2	4	92	95 7	N/A	NO		0 1	0.2	80		no detects
SILICON	1101	3756	3580	10	14	28 6	5861 897	19227 637	11700	39	39	0	1	NO						
SILVER	6.667	14 29	56.9	1	12	91 7	2.856	11 482	7 9	12	88	86.4	0 4396	YES		0.09		0 55	NO	max>UTL, insig p value, only 1/12 detect
SODIUM	62433	69057	81200	12	12	0	17166 929	38052 976	45400	126	127	0 8	0 0001	YES	YES					essential nutrient
STRONTIUM	273	308 8	301	11	12	8 3	195 594	472.439	408	89	106	16	0.0001	YES		6 3		802	YES	sig p value, max>UTL, site=1 5*BG
THALLIUM	0 827	1 158	N/A	0	12	100	1.043	3 866	3 4	3	96	96 9	N/A	NO						no detects
TIN	12.7	26 51	N/A	0	11	100	22 609	92 862	180	17	90	81 1	0 9728	NO						no detects
VANADIUM	2 308	3 53	2 9	1	12	91 7	7 836	42 095	18 2	27	92	70.7	0 9732	NO						
ZINC	6.658	24.09	24 8	2	12	83 3	38 291	182 699	480	87 9	123	28 5	0 999	NO		5	10	45		
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
CYANIDE	0.008	0.013	N/A	0	14	100	0 006	0.031	0.0404	3	106	97.2	N/A	NO						
NITRATE	N/A	N/A	N/A	N/A	0	N/A	0 15	N/A	0 25	1	2	50	N/A	N/A				83		
NITRATE/NITRITE	0.077	0 167	0 28	2	14	85.7	0 389	3 111	4 3	72	125	42 4	0 9964	NO						
NITRITE	0.016	0.035	0 084	2	14	85 7	0.012	0 064	0 058	3	75	96	0.0488	NO						

Table D

(page 2 of 2)

HUMAN HEALTH RISK ASSESSMENT ⸝ s Site 3 - Ponds B1 and B2

Contaminant	WQCC STANDARD	SITE: SAMPLE MEAN	SITE: MAX DETECT	SITE: DETECTION FREQUENCY	SITE: SAMPLE SIZE	SITE: PERCENT DETECT	BACKGROUND: SAMPLE MEAN	BACKGROUND: OGNORMAL 95% UTL	BACKGROUND: MAX DETECT	BACKGROUND: DETECTION FREQUENCY	BACKGROUND: SAMPLE SIZE	BACKGROUND: PERCENT DETECT	SCORE TEST ALUE	NO OF EXCEEDANCES	POTENTIAL COC				HUMAN HEALTH COC	COMMENTS
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
1 2 DICHLOROETHENE	N/A	2 906	6	1	16	6 25								0	NO					
ACETONE	N/A	37 038	240	4	13	30 77								0	YES				YES	4/13 detects
METHYL CHLORIDE	4 7	4 875	11	2	16	12 5	4 794	17 262	31	14	89	15 7	0 994	2	YES				NO	2 exceedances, insig p value, site=BG (pot lab contar
TRICHLOROETHENE	66	4.375	11	5	16	31 25								0	YES				YES	ע/16 detects
cis 1,2 DICHLOROETHENE	70	3 3		1	1	100								0	NO				YES	only 1/1 detects
1 2 4 TRICHLOROBENZENE	N/A	0 0567	0 13	1	12	8 33								0	NO					
CARBON TETRACHLORIDE	18	0 3083	1 5	2	12	16 67								0	YES				YES	2/12 detects
CHLOROFORM	6	0 2158	0 72	7	12	ע8 33								0	YES				YES	7/12 detects
NAPHTHALENE	0.0028	0 12	0.34	1	12	8 33								1	YES				NO	1/12 detects
TETRACHLOROETHENE	0 8	0 2133	0 87	7	12	58 33								1	YES				YES	7/12 detects
TOLUENE	1000	0 133	0.5	1	12	8 33								0	NO					
TRICHLOROETHENE	66	3 0775	13	6	12	ע0								0	YES				YES	6/12 detects
VINYL CHLORIDE	2	0 1783	0 94	2	12	16 67								0	YES				YES	2/12 detects
cis 1,2 DICHLOROETHENE	70	0 75	3 4	4	11	36 36								0	YES				YES	4/7 detects
ATRAZINE	3	0 3033	0.85	1	12	8 33								0	NO				NO	1/12 detects

Table 4 HUMAN HEALTH RISK ASSESSMŁ ƆC's Site 4 Pond B3

(page 1 of 2)

Contaminant	SITE SAMPLE MEAN	SITE OGNORMAL 95 UCL FOR MEAN	SITE MAX DETECT	SITE DETECTION REQUENCY	SITE SAMPLE SIZ	SITE PERCENT NONDETECT	BACKGROUND SAMPLE ME N	BACKGROUND OGNORMAL 5 UTL	BACKGROUND MAX DETECT	BACKGROUND DETECTION REQUENCY	BACKGROUND SAMPLE IZ	BACKGROUND PERCENT NOND TECT	SCORES S ALUE	POTENTIAL COC	ESSENTIAL NUTRIENT	LITERATURE LUE MIN	LITERATURE LUE MEAN	LITERATURE LUE MAX	HUMAN HEALTH COC	COMMENTS
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM 241	0.027	0.07	0 062		5		0 004	0 023	0 024		82		0 0008	YES					**YES**	sig p value
CESIUM 137	0 211	1 141	1 15		5		0 096	1 158	1 7		76		0 .624	NO						
PLUTONIUM 239/240	0 018	0 038	0.04		5		0 004	0.017	0 04		83		0 001	YES					**YES**	sig p value, site=4 BG
STRONTIUM-89 90	0 15	0 319	0 91		5		0 546	1 893	1 8		57		0 9916	NO						
TRITIUM	51 5	1166 87	160		2		51 452	1403 866	550		53		0 4731	NO						
URANIUM 233 234	0 279	0 8	0 93		6		0 458	1 364	2 59		60		0 8904	NO						
URANIUM-235	0 027	0 07	0 064		6		0.04	0.193	0.2		56		0 5506	NO						
URANIUM-238	0 288	0 607	0 93		6		0 36	1 3	1 82		54		0 .	NO						
METALS	(ug/l)	(ug/l)	(ig/l)				(ig/l)	(ig/l)	(ig/l)							(ig/l)	(ig/l)	(ig/l)		
ALUMINUM	526 6	2364	1000	5	5	0	695 294	4404 622	5840	79	110	28 2	0 1119	NO				500		
ANTIMONY	11 84	31 13	N/A	0	5	100	14 23	56 28	26 5	9	91	90 1	N/A	NO				1		
ARSENIC	0.975	13 19	A/A	0	4	100	1 781	8 183	2 9	10	84	88 1	0 7568	NO		1		10		no detects
BARIUM	16 49	54 93	30	4	5	20	67 617	148 877	306	84	103	18 4	1	NO		9		152		
BERYLLIUM	0.37	0 725	N/A	0	5	100	0 943	4 756	8 4	6	87	93 1	N/A	NO		1		130		no detects
CADMIUM	1 867	9 33	N/A	0	3	100	1 744	6 426	N/A	0	80	100	N/A	NO						no detects
CALCIUM	33940	40134	40000	5	5	0	24924 572	96761 525	74600	125	125	0	0 0057	YES	YES				**NO**	essential nutrient
CESIUM	165	4196	50	1	5	80	247 467	1551 727	400	8	92	91 3	0 543	NO			0 02			
CHROMIUM	3 17	9 352	6 4	1	5	80	4 234	16 863	18 9	15	91	83 5	0 5718	NO		0 73	10	84		
COBALT	2 07	4 748	2 1	1	5	80	2 398	9 256	7 9	6	88	93 2	0 6807	NO			0 2	5 8		
COPPER	4 713	19 944	7 3	2	4	50	6 198	28 468	15 5	34	93	63 4	0 3374	NO		0 83	10	105		
IRON	136 2	492 96	254	2	5	60	1335 636	6637 829	26300	119	129	7 8	0 991	NO	YES					ssential nutrient
LEAD	3 72	8 358	6 6	6	6	0	2 044	8.567	21	37	104	64 4	0 0016	YES		0 1		30	**NO**	sig p value, 6/6 d tects, site mean is within lower rang of lit
LITHIUM	8 86	173 7	1	3	.	40	3 711	63 036	11 6	47	98	52	0 0081	YES		0 075	1 1	37	**NO**	sig p alue, mean<BG
MAGNESIUM	6624	7619	8100	5	6	0	5279 619	11266.249	16600	106	118	10 2	0 0106	YES	YES				**NO**	essential nutrient
MANGANESE	43 36	67 01	63	5	.	0	99 317	488 154	4060	112	123	8 9	0 2865	NO				1000		
MERCURY	0 1	0 315	N/A	0	5	100	0 14	0.638	1 4	8	94	91 5	N/A	NO		0 01		10		no detects
MOLYBDENUM	4 88	17 22	N/A	0	.	100	5 279	23 37	25 1	12	97	87 6	0 7518	NO				6 9		o detects
NICKEL	6 35	15 75	9 2	1	6	80	7 384	33 254	12 1	14	92	84 8	0 1507	NO			10	71		
POTASSIUM	13404	17824	16000	5	5	0	1775 375	5432 96	6700	68	100	32	0	YES	YES				**NO**	ssential nutrient
SELENIUM	1 14	5 392	N/A	0	5	100	1 378	5.462	2	4	92	95 7	N/A	NO		0 1	0 2	80		no detects
SILICON	4413	4874	5010	6	6	0	5861 897	19227 637	11700	39	39	0	0 8074	NO						
SILVER	2.38	6 607	N/A	0	5	100	2 866	11 482	7 9	12	88	86 4	0 7349	NO		0 09		0 65		no detects
SODIUM	30300	35657	36000	.	5	0	17166 929	38052 976	45400	126	127	0 8	0 0007	YES	YES				**NO**	essential nutrient
STRONTIUM	169 6	210 23	230	5	5	0	195 594	472.439	408	89	106	16	0 0093	YES		6 3		802	**NO**	sig p alue, mean<BG
THALLIUM	1 14	2 899	N/A	0	5	100	1 043	3 866	3 4	3	96	96 9	N/A	NO						o det cts
TIN	10.19	22 566	N/A	0	5	100	22 609	92.862	180	17	90	81 1	0 8832	NO						no detects
VANADIUM	5 7	18 87	9 7	3	5	40	7 836	42 095	18 2	27	92	70 7	0 0371	YES					**NO**	slightly sig p alue, mean<BG
ZINC	45 9	62 03	59 9	4	5	20	38 291	182.699	480	88	129	28 5	0 0302	YES		5	10	45	**NO**	slightly sig p value, max<BG, site=BG
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ig/l)	(ug/l)											
CYANIDE	0.005	0 013	N/A	0	6	100	0.006	0.051	0 0404	3	106	97 2	N/A	NO						no d tects
NITRATE	N/A	N/A	N/A	0	0	0	0.15	N/A	0 25	1	2	50	N/A	N/A				83		
NITRATE/NITRITE	7 32	65.381	9 6	5	6	0	0.389	3 111	4.3	72	125	42 4	0 0001	NO						
NITRITE	0 636	1 298	1 4	4	4	0	0 012	0 064	0 068	3	75	96	0 0001	YES					**YES**	sig p value, sit 50 BG
TOTAL																				

Table . 4 **HUMAN HEALTH RISK ASSESSME OC's Site 4 - Pond B3**

(page 2 of 2)

Contaminant	CWQCC STANDARD	SITE: SAMPLE MEAN	SITE: MAX DETECT	SITE: DETECTION FREQUENCY	SITE: SAMPLE SIZE	SITE: PERCENT DETECT	BACKGROUND: SAMPLE MEAN	BACKGROUND: LOGNORMAL 95 TL	BACKGROUND: MAX DETECT	BACKGROUND: DETECTION FREQUENCY	BACKGROUND: SAMPLE SIZE	BACKGROUND: PERCENT DETECT	SCORES: TEST P-VALUE	NO OF EXCEEDANCES	POTENTIAL COC				HUMAN HEALTH COC	COMMENTS
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
ACETONE	N/A	8 167	24	1	6	16 7								0	NO					
CHLOROFORM	6	3	5	1	6	16 7								0	NO					
METHYLENE CHLORIDE	4 7	3 667	8	1	6	16 7	4 794	17 262	31	14	89	15 7	0 4845	1	YES				NO	Insig p value potential lab contam.
HEPTACHLOR	0 00021	N/A	0	1	6	16 7								0	NO					
alpha BHC	0 0039	N/A	0	1	6	16 7								0	NO					
alpha CHLORDANE	N/A	N/A	0	1	6	16 7								0	NO					
beta BHC	0 014	N/A	0	1	6	16 7								0	NO					
gamma BHC (LINDANE)	0 019	0 0219	0 16	1	6	16 7								0	NO					
gamma CHLORDANE	N/A	0 2192	0 17	1	6	16.7								0	NO					
1 4 DICHLOROBENZENE	75	0 092	0 14	3	5	60								0	YES				YES	3/5 d tect
BROMODICHLOROMETHANE	0 3	0 17	0 3	2	5	40								0	YES				YES	2/5 detects
CHLOROFORM	6	2 9	3 4	5	5	100								0	YES				YES	5/5 detects
TETRACHLOROETHENE	0 8	0 04	0.06	3	5	60								0	YES				YES	3/5 detects
TRICHLOROETHENE	66	0 078	0 16	4	5	80								0	YES				YES	4/5 d t cts
cis 1 2 DICHLOROETHENE	70	0 06	0 17	1	4	25								0	NO					
PROPAZINE	N/A	0 32	1	1	5	20								0	NO					

Table L ɔ HUMAN HEALTH RISK ASSESSN COC's Site 5 - Ponds B4 and B5

(page 1of 2)

Contaminant	SITE: SAMPLE MEAN	SITE: LOGNORMAL 95% UCL FOR MEAN	SITE: MAX DETECT	SITE: DETECTION FREQUENCY	SITE: SAMPLE SIZE	SITE: PERCENT NONDETECT	BACKGROUND: SAMPLE MEAN	BACKGROUND: LOGNORMAL 95% UTL	BACKGROUND: MAX DETECT	BACKGROUND: DETECTION FREQUENCY	BACKGROUND: SAMPLE SIZE	BACKGROUND: PERCENT NONDETECT	SCORES EST P VALUE	POTENTIAL COC	ESSENTIAL NUTRIENT	LITERATURE VALUE: MIN	LITERATURE VALUE: MEAN	LITERATURE VALUE: MAX	HUMAN HEALTH COC	COMMENTS
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM 241	0 007	0 015	0 027		28		0 004	0 023	0 024		82		0 0733	YES					NO	max>UTL Insi p value site=BG
CESIUM 137	0 097	0 177	0 79		32		0 096	1 18	1 7		76		0 5349	NO						
PLUTONIUM-239/240	0.009	0 012	0 045		36		0 004	0 017	0 04		83		0.0005	YES					YES	sig p value site=2*BG
STRONTIUM-89 90	0 26	0 321	0 75		30		0 546	1 893	1 8		57		0 9997	NO						
TRITIUM	197.83	287 482	1200		23		51 452	1403 865	550		53		0 0165	YES					YES	sig p value site=4 BG
URANIUM 233,234	0 906	1 079	3 86		35		0 458	1 364	2 9		60		0 0001	YES					YES	sig p alue site 2 BG
URANIUM 235	0 056	0 077	0 29		35		0 04	0 193	0 2		66		0 1394	YES					NO	max UTL insig p value site BG
URANIUM 238	0 774	0 897	2 98		35		0 36	1 3	1 82		54		0 0001	YES					YES	sig p value site 2 BG
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)	(ug/l)		
ALUMINUM	336 8	1136	1680	19	24	20 8	695 294	4404 622	6840	79	110	28 2	0 6283	NO				500		
ANTIMONY	12 04	16 64	N/A	0	25	100	14 23	28	26	9	91	90 1	N/A	NO				1		no detect
ARSENIC	1 362	2 155	2 7	4	24	83.3	1 781	8 183	2 9	10	84	88 1	0 1905	NO		1		10		
BARIUM	65 13	80 37	94 7	22	24	8 3	67 617	148 877	306	84	103	18 4	0 0162	YES		9		132	NO	sig p value mean BG
BERYLLIUM	0.564	0 881	1	1	25	96	0 943	4 736	8 4	6	87	93 1	N/A	NO		1		130		
CADMIUM	1 68	2 27	N/A	0	22	100	1 744	6 426	N/A	0	80	100	N/A	NO						no detect
CALCIUM	42540	45462	62800	25	25	0	24924 572	96761 526	74600	125	125	0	0 0001	YES	YES				NO	essential nutrient
CESIUM	200 3	477	1200	4	26	84 6	247 467	1351 727	400	8	92	91 3	0 1122	NO			0 02			
CHROMIUM	2.322	3 333	N/A	0	25	100	4 234	16 863	18 9	15	91	83 5	0 9845	NO		0 73	10	84		no detects
COBALT	2 665	3 93	4 3	2	25	92	2 398	9 256	7 9	6	88	93 2	N/A	NO			0 2	5 8		
COPPER	5.412	8 684	12 7	12	25	52	6 198	28 468	15 5	34	93	63 4	0 252	NO		0 83	10	105		
IRON	261 4	791 3	791	17	25	32	1335 636	6637 829	26300	119	129	7 8	0 9998	NO	YES				NO	essential nutrient
LEAD	2.043	3 712	6	10	23	56 5	2 044	8 567	21	37	104	64 4	0 2861	NO		0 1		30		
LITHIUM	14 36	21 91	36 9	14	22	36 4	13 711	63 036	11 6	47	98	52	0 0001	YES		0 075	1 1	37	YES	sig p value sit detects=2* BG
MAGNESIUM	9194	10096	16700	25	25	0	5279 619	11266 249	16600	106	118	10 2	0.0001	YES	YES				NO	essential nutrient
MANGANESE	89 52	537	255	22	25	12	99 317	488 154	4060	112	123	8 9	0 0088	YES				1000	NO	sig p value site mean & max BG
MERCURY	0.121	0 195	0 7	1	26	96 2	0 14	0 638	1 4	8	94	91 5	N/A	NO		0 01		10		
MOLYBDENUM	7 967	12.38	17	2	22	90 9	5 279	23 37	25 1	12	97	87 6	0 2219	NO				6 9		
NICKEL	5.912	9 05	8 2	2	25	92	7 384	33 254	12 1	14	92	84 8	0.7616	NO			10	71		
POTASSIUM	9146 8	10864	12100	24	25	4	1775 375	5432 96	6700	68	100	32	0 0001	YES	YES				NO	essential nutrient
SELENIUM	1.64	2 392	4.7	5	25	80	1 378	5 462	2	4	92	95 7	0.0007	YES		0 1	0 2	80	NO	sig p value site detect BG detec
SILICON	4122 5	4438 8	4910	8	8	0	5861 897	19227 637	11700	39	39	0	0 9467	NO						
SILVER	2.152	3 139	5.1	2	24	91 7	2 856	11 482	7 9	12	88	86 4	0.8581	NO		0 09		0 55		
SODIUM	33988	44824	61200	25	25	0	17166 929	38052 976	45400	126	127	0 8	0 0001	YES	YES				NO	essential nutrient
STRONTIUM	255	284 4	396	20	22	9 1	195 594	472 439	408	89	106	16	0.0001	YES		6 3		802	YES	sig p value, site 1.3 BG
THALLIUM	0.961	1 623	2 3	1	25	96	1 043	3 866	3 4	3	96	96 9	N/A	NO						
TIN	12.364	16 969	11.5	1	22	95.5	22.609	92 862	180	17	90	81 1	0 9814	NO						
VANADIUM	4 376	6 318	9 2	9	25	64	7 836	42 095	18 2	27	92	70 7	0 4487	NO						
ZINC	35.324	52 871	87 7	18	25	28	38 291	182.699	480	88	123	28 5	0 006	YES		5	10	45	NO	sig p value mean< BG
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
CYANIDE	9.359	9799112	33 2	5	16	68.8	0.006	0 031	0.0404	3	106	97 2	0.0001	YES					YES	sig p value site 1000*BG
NITRATE	2 767	3 642	3 2	3	3	0	0 15	N/A	0 25	1	2	50	0 0416	YES				83	YES	sig p value site 10*BG
NITRATE/NITRITE	3.359	4 975	18.4	91	94	3 2	0.389	3 111	4 3	72	125	42 4	0.0001	YES					YES	sig p value site 10*BG
NITRITE	0 409	0 576	2 1	64	64	0	0 012	0 054	0 058	3	75	96	0.0001	YES					YES	sig p value site =40 BG

Table D (page 2 of 2)

HUMAN HEALTH RISK ASSESSM COC's Site 5 - Ponds B4 and B5

Contaminant	CWQCC STANDARD	SITE SAMPLE MEAN	SITE MAX DETECT	SITE DETECTION FREQUENCY	SITE SAMPLE SIZE	SITE PERCENT DETECT	BACKGROUND SAMPLE MEAN	BACKGROUND LOGNORMAL 95 UTL	BACKGROUND MAX DETECT	BACKGROUND DETECTION FREQUENCY	BACKGROUND SAMPLE SIZE	BACKGROUND PERCENT DETECT	SCORES TEST P VALUE	NO OF EXCEEDANCES	POTENTIAL COC				HUMAN HEALTH COC	COMMENTS
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
ACETONE	N/A	15.36	92	12	120	10								N/A	YES				YES	12/120 detects
METHYLENE CHLORIDE	4 7	2 797	17	7	121	5 79	4 794	17 262	31	14	89	15 7	0 9961	7	YES				NO	Insig p value pot lab contamina
TETRACHLOROETHENE	0 8	2 6	11	2	121	1 65								2	YES				NO	only 2/121 detects
BIS (2 ETHYLHEXYL) PHTHALATE	1 8	6 316	20	3	31	9 68	[illegible]	6 183	N/A	0	16	0	N/A	3	YES				YES	3/31 detect
alpha BHC	0 0039	0 0238	0	1	18	5 56								0	NO					lab reported 1/18 detect at 0 ug/l
alpha CHLORDANE	N/A	0 2238	0	1	8	12 5								N/A	NO					lab reported 1/18 detect at 0 ug/l
beta BHC	0 014	0 0268	0 061	1	18	5 56								1	YES					only 1/18 detects
gamma BHC (LINDANE)	0 019	0 0238	0	1	18	5 56								0	NO					lab eported 1/18 detect at 0 ug/l
gamma CHLORDANE	N/A	0 2238	0	1	8	12 5								N/A	NO					lab reported 1/18 detect at 0 ug/l
CHLOROFORM	6	0 7428	2 4	18	29	62 07								0	YES				YES	18/24 detects
TETRACHLOROETHENE	0 8	0 1339	0 76	7	28	25								0	YES				YES	7/28 detects
TRICHLOROETHENE	66	0 3831	2 1	8	29	27 59								0	YES				YES	8/29 detect
DICAMBA	N/A	0.2195	0 48	3	22	13 64								N/A	YES				YES	3/22 detects
ATRAZINE	3	0 556	3 83	18	21	83 52								1	YES				YES	18/21 detects
SIMAZINE	4	0 1461	1 3	12	80	15								0	YES				YES	12/80 detects

Table . 6 **HUMAN HEALTH RISK ASSESSML .OC's Site 6 - Ponds C1**

(page 1of 2)

Contaminant	SITE: SAMPLE MEAN	SITE: LOGNORMAL 95 UCL FOR MEAN	SITE: MAX DETECT	SITE: DETECTION FREQUE CY	SITE: SAMPLE SIZE	SITE: PERCENT NONDETECT	BAC GROUND: SAMPLE MEAN	BAC GROUND: LOGNORMAL 95% UTL	BAC GROUND: MAX DETECT	BAC GROUND: DETE TION FREQUENCY	BAC GROUND: SA PLE SIZE	BAC GROUND: PERCENT NONDETECT	SCORES: ST P-ALUE	POTENTIAL COC	ESSENTIAL UTRIENT	ITERATURE LUE: MIN	ITERATURE LUE: MAX	HUMAN HEALTH COC	COMMENTS
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)										
AMERICIUM-241	0.008	0.034	0.023		4		0.004	0.023	0.024		82		0.2599	NO					
CESIUM-137	0.261	1.685	0.92		5		0.096	1.158	1.7		76		0.2398	NO					
PLUTONIUM 239/240	0.006	0.011	0.014		6		0.004	0.017	0.04		83		0.0266	YES				YES	sig p value, site=1.5 BG
STRONTIUM-89 90	0.377	0.607	0.53		5		0.346	1.893	1.8		57		0.7997	NO					
TRITIUM	187.6	1948.258	330		2		51.452	1403.865	550		53		0.1842	NO					
URANIUM 233 234	0.796	1.214	1.1		[illegible]		0.4[illegible]	1.[illegible]	[illegible]		[illegible]		[illegible]	YES				YES	sig p value site 1.8 BG
URANIUM-235	0.07	0.099	0.098		6		0.04	0.193	0.2		56		0.0341	YES				YES	sig p value, site=1.8*BG
URANIUM-238	0.599	0.909	0.88		6		0.36	1.3	1.82		54		0.014	YES				YES	sig p value site 1.2*BG
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)		
ALUMINUM	531.2	1450.7	1040	6	6	0	695.294	4404.622	5840	79	110	28.2	0.0879	NO					
ANTIMONY	15.72	68.24	32.2	1	5	80	14.23	55.28	26.3	9	91	90.1	0.0131	YES				NO	sig p value only 1/5 detects, all BG
ARSENIC	0.96	3.644	0.9	1	6	80	1.781	8.183	2.9	10	84	88.1	0.7183	NO		1	10		
BARIUM	91.32	121.9	120	5	5	0	67.617	148.877	306	84	103	18.4	0.0009	YES				YES	sig p value site 1.3 BG
BERYLLIUM	0.6	1.491	1.2	2	6	60	0.943	4.766	8.4	6	87	93.1	0.0866	NO					
CADMIUM	1.826	67.64	N/A	[illegible]	2	100	1.744	6.426	N/A	[illegible]	80	100	N/A	NO					[illegible] detect
CALCIUM	44420	50377	48500	5	5	0	24924.572	96761.523	74600	125	125	0	0.0006	YES	YES			NO	essential nutrient
CESIUM	166	4196	50	1	6	80	247.467	1.61.727	400	8	92	91.3	0.543	NO					
CHROMIUM	1.8	3.701	N/A	0	5	100	4.234	16.863	18.9	1[illegible]	91	83.6	0.8618	NO					no detects
COBALT	1.8[illegible]	6.111	N/A	0	5	100	2.398	9.256	7.9	6	88	93.2	N/A	NO					no detects
COPPER	2.226	4.404	N/A	0	4	100	6.198	20.468	16.6	14	93	63.4	0.9698	NO					no detects
IRON	904.8	1343	1230	[illegible]	[illegible]	0	1335.636	6637.829	26300	117	129	7.8	0.107[illegible]	NO	YES			NO	essential nutrient
LEAD	2.96	7.931	5.4	6	[illegible]	0	2.044	8.567	21	37	104	64.4	0.0154	YES		0.1	30	NO	sig p value due to nondetect in BG with low detection l
LITHIUM	5.4	8.034	8.3	4	5	20	13.711	63.036	11.6	47	98	52	0.0546	NO					
MAGNESIUM	9036	10033	10100	5	5	0	5279.619	11266.249	16600	106	118	10.2	0.0001	YES	YES			NO	essential nutrient
MANGANESE	136.5	361.9	240	5	5	0	99.317	488.154	4060	112	123	8.9	0.0066	YES			1000	NO	sig p value value well within literature range
MERCURY	0.1	0.315	N/A	0	6	100	0.14	0.638	1.4	8	94	91.6	N/A	NO					no detects
MOLYBDENUM	3.59	10.526	6.6	1	5	80	5.279	23.37	25.1	12	97	87.6	0.4547	NO					
NICKEL	3.83	10.84	N/A	0	5	100	7.384	33.254	12.1	14	92	84.8	0.8326	NO					no detects
POTASSIUM	1624	3070.8	2300	3	5	40	1775.375	5432.96	6700	68	100	32	0.3959	NO	YES			NO	essential nutrient
SELENIUM	1.33	4.497	1.5	1	5	80	1.378	5.462	2	4	92	95.7	0.0403	YES				NO	only 1/5 detects, mean BG
SILICON	6815	8229	8950	7	7	0	5861.897	19227.637	11700	39	39	0	0.1677	NO					
SILVER	2.38	6.607	N/A	0	5	100	2.856	11.482	7.9	12	88	86.4	0.7349	NO					no detects
SODIUM	22920	26428	26400	5	5	0	17166.929	38062.976	45400	126	127	0.8	0.0169	YES	YES			NO	essential nutrient
STRONTIUM	241.8	260.4	260	5	5	0	195.694	472.439	408	89	106	16	0.0001	YES				YES	sig p value site=1.2*BG
THALLIUM	1.14	2.899	N/A	0	5	100	1.043	3.866	3.4	3	96	96.9	N/A	NO					no detects
TIN	9.25	22.67	N/A	0	5	100	22.609	92.862	180	17	90	81.1	0.916	NO					no detects
VANADIUM	2.77	7.473	3.9	1	5	80	7.836	42.095	18.2	27	92	70.7	0.7444	NO					
ZINC	2.65	6.827	N/A	0	5	100	38.291	182.699	480	88	123	28.5	0.9969	NO					no detects
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)										
CYANIDE	0.007	0.016	N/A	0	7	100	0.006	0.031	0.0404	3	106	97.2	N/A	NO					no detects
NITRATE	N/A	N/A	N/A	0	0	0	0.15	N/A	0.2[illegible]	1	2	50	N/A	N/A					no sample data
NITRATE/NITRITE	0.05	0.119	N/A	0	7	100	0.389	3.111	4.3	72	125	42.4	0.9993	NO					no detects
NITRITE	0.01	0.024	N/A	0	7	100	0.012	0.054	0.058	3	73	96	N/A	NO					no detects

Table . 6 **HUMAN HEALTH RISK ASSESSM. .OC's Site 6 - Ponds C1**

(page 2 of 2)

Contaminant		SITE					BAC GROUND						SCORES						
	CWQCC STANDARD	SAMPLE MEAN	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT DETECT	SAMPLE MEAN	OGNORMAL 95% UTL	MAX DETECT	DETECTION FREQUE CY	SAMPLE SIZE	PERCENT DETECT	TEST ALUE	NO OF XCEEDANCES	PO NTIAL COC			HUMAN HEALTH COC	COMMENTS
VOA/ SVOA/ PESTICIDES	(ıg/l)	(ug/l)	(ug/l)				(ıg/l)	(ıg/l)	(ıg/l)										
NONE																			

Table 7 HUMAN HEALTH RISK ASSES IT COC's Site 7 - Pond C2

(page 1 of 2)

Contaminant	SITE						BACKGROUND						SCORES	POTENTIAL	ESSENTIAL	LITERATURE VALUE			HUMAN	COMMENTS
	SAMPLE MEAN	LOGNORMAL 95% UCL FOR MEAN	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT NONDETECT	SAMPLE MEAN	LOGNORMAL 95% UTL	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT NONDETECT	TEST P-VALUE	COC	NUTRIENT	MIN	MEAN	MAX	HEALTH COC	
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM-241	0.012	0.018	0.082		19		0.004	0.023	0.024		82		0.0736	YES					NO	max>UTL, insig p value, mean<BG
CESIUM 137	0.094	0.172	0.51		26		0.096	1.58	1.7		76		0.4074	NO						
PLUTONIUM 239/240	0.022	0.029	0.13		32		0.004	0.017	0.04		83		0.0001	YES					YES	sig p value site 5 BG
STRONTIUM 89 90	0.432	0.51	0.84		24		0.346	1.893	1.8		57		0.7065	NO						
TRITIUM	85.109	142.63	540		20		51.452	1403.865	550		53		0.3507	NO						
URANIUM 233 234	1.211	1.48	2.6		27		0.458	1.364	2.59		60		0.0001	YES					YES	sig p value site 3 BG
URANIUM 235	0.128	0.185	0.62		27		0.04	0.193	0.2		56		0.0001	YES					YES	sig p value site 3 BG
URANIUM 238	1.514	1.849	4.06		27		0.36	1.3	1.82		4		0.0001	YES					YES	sig p value site 4 BG
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)	(ug/l)		
ALUMINUM	176.7	547.5	641	17	22	22.7	695.294	4404.622	5840	79	110	28.2	0.9267	NO				500		
ANTIMONY	12.39	17.75	N/A	0	22	100	14.23	55.28	26.5	9	91	90.1	N/A	NO				1		no detects
ARSENIC	2.436	3.859	4.9	14	22	36.4	1.781	8.183	2.9	10	84	88.1	0.0001	YES		1		10	NO	slightly elevated, within BG literature rang
BARIUM	83.86	92.25	202	22	22	0	67.617	148.877	306	84	103	18.4	0.0001	YES		9		152	YES	sig p value site 1.2 BG
BERYLLIUM	0.595	1.004	0.6	1	22	95.5	0.943	4.756	8.4	6	87	93.1	N/A	NO		1		130		
CADMIUM	1.702	2.451	2.9	1	21	95.2	1.744	6.426	N/A	0	80	100	N/A	NO						
CALCIUM	45259	51047	109000	22	22	0	24924.572	96761.525	74600	125	125	0	0.0001	YES	YES				NO	essential nutrient
CESIUM	198.4	361	1100	4	23	82.6	247.467	1361.727	400	8	92	91.3	0.0613	NO			0.02			
CHROMIUM	2.409	3.567	N/A	0	22	100	4.234	16.863	18.9	15	91	83.5	0.9765	NO		0.73	10	84		no detects
COBALT	2.788	4.291	N/A	0	22	100	2.398	9.256	7.9	6	88	93.2	N/A	NO			0.2	5.8		no detects
COPPER	4.184	7.331	11.6	6	22	72.7	6.198	28.468	15.5	34	93	63.4	0.8686	NO		0.83	10	105		
IRON	272.045	728.3	1140	18	22	18.2	1335.636	6637.829	26300	119	129	7.8	0.9993	NO	YES				NO	essential nutrient
LEAD	5.598	11.96	73	7	22	68.2	2.044	8.567	21	37	104	64.4	0.3823	YES		0.1		30	NO	only 1 detect elevated out of 7/22 detec
LITHIUM	13.56	17.85	13.6	11	18	38.9	13.711	63.036	11.6	47	98	52	0.0001	YES		0.075	11	37	NO	sig p value mean=BG
MAGNESIUM	14304	15295	17000	22	22	0	5279.619	11266.249	16600	106	118	10.2	0.0001	YES	YES				NO	essential nutrient
MANGANESE	241.4	1563	1000	19	22	13.6	99.317	488.154	4060	112	123	8.9	0.0012	YES				1000	NO	sig p value well below literature value
MERCURY	0.12	0.202	0.5	2	22	90.9	0.14	0.638	1.4	8	94	91.5	N/A	NO		0.01		10		
MOLYBDENUM	9.203	18.81	35	2	18	88.9	5.279	23.37	25.1	12	97	87.6	0.2641	YES				6.9	NO	max>UTL, insig p value
NICKEL	6.277	10.52	7	2	22	90.9	7.384	33.254	12.1	14	92	84.8	0.6925	NO			10	71		
POTASSIUM	6265	6994	11700	21	22	4.5	1775.375	5432.96	6700	68	100	32	0.0001	YES	YES				NO	essential nutrient
SELENIUM	1.85	2.865	10.2	4	22	81.8	1.378	5.462	2	4	92	95.7	0.0007	YES		0.1	0.2	80	YES	sig p value site 1.3 BG
SILICON	910	N/A	910	1	1	0	5861.897	19227.637	11700	39	39	0	0.9544	NO						
SILVER	2.027	2.965	3.1	1	22	95.5	2.866	11.482	7.9	12	88	86.4	0.9314	NO		0.09		0.55		
SODIUM	48968	52875	61000	22	22	0	17166.929	38052.976	45400	126	127	0.8	0.0001	YES	YES				NO	essential nutrient
STRONTIUM	331.5	355.6	400	18	20	10	195.594	472.439	408	89	106	16	0.0001	YES		6.3		802	YES	sig p value, site 1.7 *BG
THALLIUM	0.925	1.913	N/A	0	22	100	1.043	3.866	3.4	3	96	96.9	N/A	NO						no detects
TIN	12.15	18.38	N/A	0	18	100	22.609	92.862	180	17	90	81.1	0.9769	NO						no detects
VANADIUM	3.309	4.945	6	4	22	81.8	7.836	42.095	18.2	27	92	70.7	0.9707	NO						
ZINC	40.39	88.5	396	11	22	50	38.291	182.699	480	88	123	28.5	0.9684	YES		5	10	45	NO	max UTL, insig p value
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
CYANIDE	5.175	10.53	N/A	0	10	100	0.006	0.031	0.0404	3	106	97.2	N/A	NO						no detects
NITRATE	104.4	N/A	310	3	3	0	0.15	N/A	0.25	1	2	50	0.0416	YES				83	YES	sig p value, only 1/2 detects in BG
NITRATE/NITRITE	0.235	0.321	3.1	18	64	71.9	0.389	3.111	4.3	72	125	42.4	0.9993	NO						
NITRITE	0.008	0.024	0.024	3	51	94.1	0.012	0.054	0.058	3	75	96	N/A	NO						

Table 7 HUMAN HEALTH RISK ASSES NT COC's Site 7 - Pond C2

(page 2 of 2)

Contaminant	CWQCC STANDARD	SITE SAMPLE MEAN	SITE MAX DETECT	SITE DETECTION FREQUENCY	SITE SAMPLE SIZE	SITE PERCENT DETECT	BACKGROUND SAMPLE MEAN	BACKGROUND LOGNORMAL 95% UTL	BACKGROUND MAX DETECT	BACKGROUND DETECTION FREQUENCY	BACKGROUND SAMPLE SIZE	BACKGROUND PERCENT DETECT	SCORES TEST VALUE	NO OF EXCEEDANCES	POTENTIAL COC				HUMAN HEALTH COC	COMMENTS
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
METHYLENE CHLORIDE	4 7	2 882	10	7	105	6 67	2 882	17 26	31	14	89	15 7	0 9907	7	YES				NO	Insig p value, pot lab contaminant
TETRACHLOROETHENE	0 8	2 586	13	1	105	0 95								1	YES				NO	only 1/105 detects
BIS (2 ETHYLHEXYL) PHTHALATE	1 8	8.304	44	4	23	17 39	8 104	11 82	N/A	0	16	0	0 0414	4	YES				NO	pot lab contaminant
1 1 1 TRICHLOROETHANE	200	0.1468	0 83	2	22	9 09								0	YES				YES	2/22 detects
ATRAZINE	3	0.2109	1	45	68	66 18								0	YES				YES	45/68 detects

Table 8 HUMAN HEALTH RISK ASSESSMEN C's Site 8 - Landfill Pond

(page 1 of 2)

Contaminant	SITE						BACKGROUND						SCORES	POTENTIAL	ESSENTIAL	ITERATURE ALUE			HUMAN	COMMENTS
	SAMPLE MEAN	OGNORMAL 95 UCL FOR MEAN	MAX ETECT	DETECTION REQUENCY	SAMPLE SIZ	PERCENT NONDETECT	SAMPLE MEAN	OGNORMAL 95 UTL	MAX DETECT	DETECTION REQUENCY	SAMPLE SIZE	PERCENT NONDETECT	ST ALUE	COC	NUTRIENT	MIN	MEAN	MAX	HEALTH COC	
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM-241	0 006	0.01	0 021		13		0 004	0 023	0 024		82		0 0973	NO						
CESIUM 137	0 159	0 321	0 5		12		0 096	1 158	1 7		76		0 129	NO						
PLUTONIUM 239/240	0 006	0.008	0 013		13		0 004	0 017	0 04		83		0 0026	YES					YES	sig p value, sit 1 5 BG
STRONTIUM-89 90	0 93	1 202	1 71		9		0 546	1 893	1 8		57		0 0044	YES					YES	sig p value, sit 1 8 BG
TRITIUM	484 691	770 894	1500		8		51 452	1403 865	550		63		0 0001	YES					YES	sig p value site 9*BG
URANIUM 233 234	0 255	0 372	0 434		9		0 468	1 364	2 59		60		0 8942	NO						
URANIUM-235	0 034	0 073	0 084		9		0 04	0 193	0 2		56		0.6321	NO						
URANIUM 238	0 103	0 166	0 3		9		0 36	1 3	1 82		54		0 9891	NO						
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)	(ug/l)		
ALUMINUM	2615	32636	26900	13	17	23 5	695 294	4404 622	6840	79	110	28.2	0 2406	YES				500	NO	max>UTL, insig p alue, only 1 elevated of 13/17 detects
ANTIMONY	19 23	25 5	27 7	3	17	82 4	14 23	55 28	26 5	9	91	90 1	0 0034	YES				1	NO	sig p value due to higher detection limit in site than BG
ARSENIC	2 64	4.63	4 6	7	15	53 3	1 781	8 183	2 9	10	84	88 1	0.0001	YES		1		10	NO	sig p value, but site bottom f the BG literature range
BARIUM	637 4	737 5	1550	17	17	0	67 617	148 877	306	84	103	18 4	0 0001	YES		9		152	YES	sig p value, site 9 BG
BERYLLIUM	0 791	1 634	N/A	0	17	100	0 943	4 756	8 4	6	87	93 1	N/A	NO						no detects
CADMIUM	2 543	4 48	7 6	3	16	81 3	1 744	6 426	N/A	0	80	100	0 0001	YES		1		130	NO	sig p value, sit has 3/16 detects, sit in lower ange f lit
CALCIUM	161412	161396	212000	17	17	0	24924 572	96761 525	74600	125	125	0	0 0001	YES	YES				NO	essential nutrient
CESIUM	252 9	655 5	N/A	0	17	100	247 467	1551 727	400	8	92	91 3	N/A	NO			0 02			no detects
CHROMIUM	8 969	22 5	29 6	5	17	70.6	4 234	16 863	18 9	13	91	83 5	0 0274	YES		0.73	10	84	YES	sig p alue, 3 elevated of 5/17 detects, site 2*BG
COBALT	7 419	12 65	19 1	8	16	50	2 398	9 256	7 9	6	88	93 2	0 0001	YES			0 2	5 8	YES	sig p value, sit 3 BG
COPPER	12 076	25.79	94 9	6	17	70 6	6 198	28 468	15 5	34	93	63 4	0 2647	YES		0 83	10	106	NO	max>UTL, insig p alue, only 1 elevated of 6/17 detects
IRON	78476	86238	155000	17	17	0	1335 636	6637 829	26300	119	129	7 8	0 0001	YES	YES				NO	sential utrient
LEAD	4 159	6.328	10 4	13	17	23 5	2 044	8 567	21	37	104	64 4	0 0001	YES		0 1		30	NO	sig p value, but site lower part f the BG literature range
LITHIUM	46 22	56 86	107	13	17	23 5	13 711	63 036	11 6	47	98	52	0 0001	YES		0 075	1 1	37	YES	sig p alue, site 2 BG
MAGNESIUM	34682	37046	49000	17	17	0	5279 619	11266 249	16600	106	118	10.2	0 0001	YES	YES				NO	essential nutrient
MANGANESE	1619	1735	2490	17	17	0	99 317	488 154	4060	112	123	8 9	0 0001	YES				1000	YES	sig p value, above literatur ange, sit 16 BG
MERCURY	0 108	0 187	0 28	1	17	94 1	0 14	0 638	1 4	8	94	91 6	N/A	NO		0 01		10		no p test, only 1/17 detects, mean< BG
MOLYBDENUM	10 07	24 56	28 5	5	17	70 6	5 279	23 37	25 1	12	97	87 6	0 0005	YES				6 9	YES	sig p value, sit 2 BG
NICKEL	11 75	19 7	31	4	17	76 5	7 384	33 264	12 1	14	92	84 8	0.0012	YES			10	71	YES	sig p value, 2 elevated out of 4/17 detects, site 1 5 BG
POTASSIUM	6404 7	7454 7	11700	16	17	5 9	1775 375	5432 96	6700	68	100	32	0 0001	YES	YES				NO	essential nutrient
SELENIUM	2 122	4.14	7	1	17	94 1	1 378	5 462	2	4	92	95 7	N/A	YES		0 1	0 2	80	NO	no p value, only 1/17 detects
SILICON	10385	11494	13000	10	10	0	5861 897	19227 637	11700	39	39	0	0 0001	YES					NO	sig p value, sit is well within the BG liter tur values
SILVER	6 682	9 152	16 7	5	17	70.6	2 856	11 482	7 9	12	88	86 4	0.0012	YES		0 09		0 56	YES	sig p value, sit 2* BG
SODIUM	71006	76650 9	110000	17	17	0	17166 929	38052 976	45400	126	127	0 8	0 0001	YES	YES				NO	sential nutrient
STRONTIUM	906 8	1062	1370	15	17	11 8	195 594	472 439	408	89	106	16	0 0001	YES		6.3		802	YES	sig p value, sit 4 5 BG
THALLIUM	0.868	1 225	N/A	0	17	100	1 043	3 866	3 4	3	96	96 9	N/A	NO						no d tects
TIN	49 2	127 206	243	7	17	58 8	22 609	92 862	180	17	90	81 1	0.0001	YES					YES	sig p value sit 2*BG
VANADIUM	25 02	50 854	211	10	17	1 2	7 836	42 096	18 2	27	92	70 7	0 0001	YES					YES	sig p alue sit 3 BG
ZINC	3194 6	4009	16000	17	17	0	38 291	182 699	480	68	123	28 5	0.0001	YES		5	10	45	YES	sig p value, sit 80 BG
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
CYANIDE	0 009	0.02	0 037	1	19	94 7	0 006	0 031	0 0404	3	106	97 2	N/A	YES					NO	only 1/19 detects
NITRATE	0 06	N/A	N/A	0	1	100	0 15	N/A	0 25	1	2	50	0 7602	N/A				83		d t ct
NITRATE/NITRITE	0 186	0.86	0 87	8	16	50	0 389	3 111	4 3	72	125	42 4	0 832	NO						
NITRITE	0 029	0 066	0 063	6	12	50	0 012	0 054	0 058	3	75	96	0 0001	NO						

Table 8 HUMAN HEALTH RISK ASSESSMEN ...'s Site 8 - Landfill Pond

(page 2 of 2)

Contaminant	CWQCC Standard	Site: Sample Mean	Site: Max Detect	Site: Detection Frequency	Site: Sample Size	Site: Percent Detect	Background: Sample Mean	Background: Lognormal 95 UTL	Background: Max Detect	Background: Detection Frequency	Background: Sample Size	Background: Percent Detect	Scores ST UR	No of Exceedances	Potential COC				Human Health COC	Comments
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
1 1 DICHLOROETHANE	N/A	6 382	10	13	17	76 47								0	YES				YES	13/17 detects
1,2 DICHLOROETHENE	N/A	4 3.3	14	6	17	35 29								0	YES				YES	6/17 det ct
2 BUTANONE	N/A	10.65	76	3	17	17 65								0	YES				YES	3/17 detects
4 METHYL 2 PENTANONE	N/A	9 03	12	2	17	11 76								0	YES				YES	2/17 detects
ACETONE	N/A	34.91	120	5	16	31 25								0	YES				YES	13/17 detects
CARBON DISULFIDE	N/A	2 706	6	1	17	5 88								0	NO					
CHLOROETHANE	N/A	15.24	34	10	17	58 82								0	YES				YES	5/16 detects
ETHYL BENZENE	680	12 97	19	14	17	82 35								0	YES				YES	14/17 detects
METHYLENE CHLORIDE	4 7	15.62	190	5	17	29 41	4 794	17 262	31	14	89	15 7	0 9944	5	NO				NO	Insig p value, potential lab contaminant
TOLUENE	1000	44 32	88	15	17	88.24								0	YES				YES	15/17 detects
TOTAL XYLENES	N/A	14.76	24	13	17	76 47								0	YES				YES	13/17 detects
VINYL ACETATE	N/A	7 588	49	1	17	5 88								0	NO					
0 XYLENE	N/A	5.167	8	2	3	66.67								0	YES				YES	2/3 detects
2 METHYLNAPTHALENE	N/A	22 333	29	3	3	100								0	YES				YES	3/3 detects
4 METHYLPHENOL	N/A	11	24	1	3	33 33								0	NO					
NAPHTHALENE	0 0028	20 67	29	3	3	100								3	YES				YES	3/3 detects

TABLES D-2 1 THROUGH D-2.8
HUMAN HEALTH CANCER AND NONCANCER RISK

TABLE D-2.1

HUMAN HEALTH CANCER AND NONCANCER RISKS Site 1 - Ponds A1 and A2

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
AMERICIUM 241	0 018	0 034	0 065	2 4E 10	N/A	8 6E 08	3 4%	N/A	3 6E-03	0 087
PLUTONIUM 239/240	0 022	0 028	0 054	2 3E 10		6 8E-08	2 7%		3 5E-03	0 069
URANIUM 233 234	3 346	3 872	7 426	1 6E 11		6 5E 07	25 5%		2 9E 04	0 783
URANIUM 235	0 203	0 313	0 600	1 6E 11		5 3E 08	2 1%		2 7E-04	0 058
URANIUM 238	4 917	5 765	11 056	2 8E 11		1 7E-06	66 4%		2 5E 04	1 027
					TOTAL	**2 6E-06**	**100%**		**TOTAL**	**2 025**
METALS,INORGANICS VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg day)	SFo (risk/(mg/kg day))	RfDo (mg/kg-day)	(LECR)	(%)	(HQ)		
LITHIUM	44 777	48 778	1 3E 03						N/A	N/A
STRONTIUM	339 615	394 417	1 1E 02		0 6			0 018		
TETRACHLOROETHENE	0 0792	0 23	6 3E-06	5 20E 02	0 01	1 4E-07	3%	0 001		
TRICHLOROETHENE	0 0817	0 328	9 0E 06	1 10E-02		4 2E-08	1%			
ATRAZINE	1 0458	1 815	5 0E 05	2 22E 01	0 035	4 7E 06	96%	0 001		
					TOTAL	**4 9E-06**	**100%**	**0 020**		

TABLE D-2.2

HUMAN HEALTH CANCER AND NONCANCER RISKS Site 2 - Ponds A3 and A4

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE PT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
URANIUM 233 234	1 378	1 613	3 093	1 6E 11		2 7E-07	32 8%	N/A	2 9E-04	0 326
URANIUM 235	0 084	0 104	0 199	1 6E 11		1 7E-08	2 1%		2 7E-04	0 019
URANIUM 238	1 542	1 83	3 510	2 8E 11		5 4E-07	65 1%		2 5E 04	0 326
					TOTAL	8 3E-07	100 0%		TOTAL	0 672
METALS INORGANICS VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg day)	SFo (risk/(mg/kg-day))	RfDo (mg/kg day)	(LECR)	(%)	(HQ)		
BARIUM	84 324	88 61	2 4E 03		7 00E-02			0 035	N/A	N/A
NITRATE/NITRITE	2 942	3 724	1 0E-04		1 60E+00			0 000		
NITRITE	0 125	0 196	5 4E 06		1 00E-01			0 000		
DICAMBA	0 475	3 5	9 6E 05		3 00E-02			0 003		
ATRAZINE	0 7281	1 525	4 2E-05	2 22E-01	3 50E-02	4 0E-06	90%	0 001		
SIMAZINE	0 1563	0 308	8 4E-06	1 20E-01	2 00E-03	4 3E-07	10%	0 004		
					TOTAL	4 4E-06	100 0%	0 043		

TABLE D-2.3

HUMAN HEALTH CANCER AND NONCANCER RISKS Site 3 - Ponds B1 and B2

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
AMERICIUM 241	0 021	0 038	0 073	2 4E 10	N/A	9 6E-08	9%	N/A	3 6E-03	0 097
PLUTONIUM 239/240	0 05	0 079	0 152	2 3E 10		1 9E-07	18%		3 5E-03	0 196
URANIUM 233 234	1 37	1 76	3 375	1 6E 11		3 0E-07	28%		2 9E-04	0 356
URANIUM 235	0 092	0 125	0 240	1 6E 11		2 1E-08	2%		2 7E-04	0 023
URANIUM 238	1 254	1 481	2 840	2 8E 11		4 4E-07	42%		2 5E-04	0 264
					TOTAL	**1 0E-06**	**100%**		**TOTAL**	**0 936**
METALS INORGANICS VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg day)	SFo (risk/(mg/kg-day))	RfDo (mg/kg day)	(LECR)	(%)	(HQ)		
LITHIUM	19 32	25 25	6 9E-04						N/A	N/A
STRONTIUM	273	308 8	8 5E 03		6 00E-01			0 014		
ACETONE	37 038	156 6	4 3E-03		1 00E-02			0 429		
TRICHLOROETHENE	4 375	5 48	1 5E-04	1 10E-02	1 10E-02	7 1E-07	5%	0 014		
cis 1 2 DICHLOROETHENE	3 3	1 631	4 5E-05		1 00E-02			0 004		
CARBON TETRACHLORIDE	0 3083	1 103	3 0E-05	1 30E-01	7 00E-04	1 7E-06	12%	0 043		
CHLOROFORM	0 2158	0 708	1 9E-05	6 10E-03	1 00E-02	5 1E-08	0%	0 002		
TETRACHLOROETHENE	0 2133	1 857	5 1E-05	5 20E-02	1 00E-02	1 1E-06	8%	0 005		
TRICHLOROETHENE	3 0775	8 35	2 3E-04	1 10E-02	1 10E-02	1 1E-06	8%	0 021		
VINYL CHLORIDE	0 1783	0 414	1 1E-05	1 9		9 2E-06	66%			
cis 1 2 DICHLOROETHENE	0 75	3 4	9 3E-05		1 00E-02			0 009		
					TOTAL	**1 4E-05**	**100%**	**0 542**		

TABLE D-2.4

HUMAN HEALTH RISK ASSESSMENT COC's Site 4 - Pond B3

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
AMERICIUM 241	0 027	0 070	0 134	2 4E 10		1 8E-07	65 8%	N/A	3 6E-03	0 178
PLUTONIUM 239/240	0 018	0 038	0 073	2 3E 10		9 2E-08	34 2%		3 5E 03	0 094
					TOTAL	2 7E-07	100%		TOTAL	0 272
METALS INORGANICS VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg day)	SFo (risk/(mg/kg day))	RfDo (mg/kg day)	(LECR)	(%)	(HQ)		
NITRITE	0 636	1 298	2 489		1 00E-01			0 0004	N/A	N/A
1 4 DICHLOROBENZENE	0 092	0 243	0 466	2 40E 02	8 00E 01	6 8E-08	7%	0 000		
BROMODICHLOROMETHANE	0 17	0 714	1 369	6 20E-02	2 00E-02	5 2E-07	52%	0 001		
CHLOROFORM	2 9	3 809	7 305	6 10E-03	1 00E-02	2 7E-07	27%	0 010		
TETRACHLOROETHENE	0 04	0 122	0 234	5 20E-02	1 00E-02	7 4E-08	8%	0 000		
TRICHLOROETHENE	0 078	0 442	0 848	1 10E-02		5 7E-08	6%			
					TOTAL	9 9E-07	100%	0 012		

TABLE D-2.5

HUMAN HEALTH CANCER AND NONCANCER RISKS Site 5 - Ponds B4 and B5

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
PLUTONIUM 239/240	0 009	0 012	0 023	2 3E 10	N/A	2 9E-08	4 5%	N/A	3 5E-03	0 030
TRITIUM	197 830	287 482	551 335	5 4E 14		1 6E-07	25 6%		6 4E-08	0 013
URANIUM 233 234	0 906	1 079	2 069	1 6E 11		1 8E-07	28 5%		2 9E-04	0 218
URANIUM 238	0 774	0 897	1 720	2 8E 11		2 6E-07	41 4%		2 5E 04	0 160
					TOTAL	6 4E-07	100%		TOTAL	0 421
METALS INORGANICS VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg day)	SFo (risk/(mg/kg day))	RfDo (mg/kg day)	(LECR)	(%)	(HQ)		
LITHIUM	14 36	21 91	6 0E-04							
STRONTIUM	255	284 4	7 8E 03		6 00E-01			0 013	N/A	N/A
CYANIDE	9 359	14 752	4 0E-04	2 00E-02	2 00E-02	3 5E-06	46%	0 020		
NITRATE	2 767	3 642	1 0E 04		1 60E+00			0 0001		
NITRATE/NITRITE	3 359	4 975	1 4E-04		1 60E+00			0 000		
NITRITE	0 409	0 576	1 6E-05		1 00E-01			0 0002		
ACETONE	15 36	20 3	5 6E-04		1 00E-01			0 006		
BIS (2 ETHYLHEXYL) PHTHALATE	6 316	6 316	1 7E 04	1 40E 02	2 00E-02	1 0E-06	14%	0 009		
CHLOROFORM	0 743	1 93	5 3E 05	6 10E-03	1 00E-02	1 4E-07	2%	0 005		
TETRACHLOROETHENE	0 134	0 205	5 6E-06	5 20E-02	1 00E-02	1 3E-07	2%	0 001		
TRICHLOROETHENE	0 3831	0 823	2 3E-05	1 10E-02		1 1E-07	1%			
DICAMBA	0 2195	0 385	1 1E-05		3 00E-02			0 000		
ATRAZINE	0 556	0 857	2 3E-05	2 22E 01	3 50E-02	2 2E-06	30%	0 001		
SIMAZINE	0 1461	0 256	7 0E-06	1 20E-01	2 00E-03	3 6E-07	5%	0 004		
					TOTAL	7 5E-06	100%	0 058		

TABLE D-2.6

HUMAN HEALTH CANCER AND NONCANCER RISKS Site 6 - Pond C1

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
PLUTONIUM 239/240	0 006	0 011	0 021	2 3E 10	N/A	2 7E-08	5 2%	N/A	3 5E-03	0 027
URANIUM 233 234	0 796	1 214	2 328	1 6E 11		2 0E-07	39 6%		2 9E-04	0 246
URANIUM 235	0 07	0 099	0 190	1 6E 11		1 7E-08	3 2%		2 7E-04	0 018
URANIUM 238	0 599	0 909	1 743	2 8E 11		2 7E-07	52 0%		2 5E-04	0 162
					TOTAL	**5 1E-07**	**100%**		**TOTAL**	**0 453**
METALS INORGANICS VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg day)	SFo (risk/(mg/kg day))	RfDo (mg/kg day)	(LECR)	(%)	(HQ)		
BARIUM	91 32	121 9	3 3E 03		7 00E-02			0 048	N/A	N/A
STRONTIUM	241 8	260 4	7 1E 03		6 00E-01			0 012		
					TOTAL	**0 00E+00**	**0%**	**0 060**		

TABLE D-2.7

HUMAN HEALTH CANCER AND NONCANCER RISKS Site 7 - Pond C2

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
PLUTONIUM 239/240	0 022	0 029	0 056	2 3E 10	N/A	7 0E-08	7 8%	N/A	3 5E-03	0 072
URANIUM 233 234	1 211	1 48	2 838	1 6E 11		2 5E-07	27 8%		2 9E 04	0 299
URANIUM 235	0 128	0 185	0 355	1 6E 11		3 1E-08	3 5%		2 7E 04	0 034
URANIUM 238	1 514	1 849	3 546	2 8E 11		5 4E-07	60 8%		2 5E-04	0 329
					TOTAL	**8 9E-07**	**100%**		**TOTAL**	**0 735**
METALS INORGANICS VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg day)	SFo (risk/(mg/kg day))	RfDo (mg/kg day)	(LECR)	(%)	(HQ)		
BARIUM	83 86	92 25	2 5E 03		7 0E-02			0 036	N/A	N/A
SELENIUM	1 85	2 885	7 9E 05		5 0E-03			0 016		
STRONTIUM	331 5	355 6	9 7E 03		6 0E-01			0 016		
NITRATE	104 4	N/A	2 9E 03		1 6E+00			0 002		
1 1 1 TRICHLOROETHANE	0 1468	0 26	7 1E 06	1 9E+00		5 8E-06	68%			
ATRAZINE	0 2109	1 047	2 9E 05	2 2E 01	3 5E 02	2 7E-06	32%	0 001		
					TOTAL	**8 5E-06**	**100%**	**0 071**		

TABLE D-2.8

HUMAN HEALTH RISK ASSE: .NT COC's Site 8 - Landfill Pond

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
PLUTONIUM 239/240	0 006	0 008	0 015	2 3E 10	N/A	1 9E-08	2 1%	N/A	3 5E-03	0 020
STRONTIUM 89 90	0 93	1 202	2 305	3 60E 11		4 5E-07	49 9%		1 4E-04	0 120
TRITIUM	484 691	770 894	1478 427	5 4E 14		4 4E-07	48 0%		6 4E-08	0 035
					TOTAL	9 1E 07	100%		TOTAL	0 174
METALS INORGANICS VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg day)	SFo (risk/(mg/kg-day))	RfDo (mg/kg day)	(LECR)	(%)	(HQ)		
BARIUM	637 4	737 5	2 0E-02		7 00E-02			0 289	N/A	N/A
CHROMIUM	8 959	22 5	6 2E-04		0 005 (VI)			0 123		
COBALT	7 419	12 65	3 5E-04							
LITHIUM	46 22	55 86	1 5E-03							
MANGANESE	1619	1735	4 8E-02		5 00E-03			9 507		
MOLYBDENUM	10 07	24 56	6 7E-04		5 00E-03			0 135		
NICKEL	11 75	19 7	5 4E-04		2 00E-02			0 027		
SILVER	5 682	9 152	2 5E-04		5 00E-03			0 050		
STRONTIUM	905 5	1052	2 9E-02		6 00E-01			0 048		
TIN	49 2	127 206	3 5E-03		6 00E-01			0 006		
VANADIUM	25 02	50 854	1 4E-03		7 00E-03			0 199		
ZINC	3194 6	4009	1 1E-01		3 00E-01			0 366		
1 1 DICHLOROETHANE	6 382	7 464	2 0E-04		1 00E-01			0 002		
1 2 DICHLOROETHENE	4 353	5 611	1 5E-04		9 00E-03			0 017		
2 BUTANONE	10 65	18 1	5 0E-04							
4 METHYL 2 PENTANONE	9 03	13 36	3 7E-04	7 80E-02	2 00E-03	1 2E-05	100 0%	0 183		
ACETONE	34 91	60 79	1 7E-03		1 00E-01			0 017		
CHLOROETHANE	15 24	19 46	5 3E-04							
ETHYL BENZENE	12 97	15 08	4 1E-04							
TOLUENE	44 32	53 7	1 5E-03							
TOTAL XYLENES	14 76	17 3	4 7E-04							
0 XYLENE	5 167	9 81	2 7E-04							
2 METHYLNAPTHALENE	22 33	34 18	9 4E-04							
NAPHTHALENE	20 67	30 97	8 5E-04							
					TOTAL	1 2E-05	100%	10 968		

Table 1 Total Radiochemistry
(First of five pages)

Pond	Analyte	Sample Size	CWQCC Standard	Percent Above Standard	Mean	Median	85th Percentile	Inter-Quartile Range
BACKGROUND	AMERICIUM-241	82	0 05	0	0 0044	0 0029	0 01	0 008
	CESIUM-137	76	80	0	0 0961	0 0659	0 3	0 3039
	GROSS ALPHA	67	11	5 97	3 4365	1	3	1 5964
	GROSS BETA	63	19	3 17	4 6234	3	5 5	2 441
	PLUTONIUM-239/240	83	0 05	0	0 0044	0 0019	0 01	0 0049
	STRONTIUM-89,90	57	8	0	0 5458	0 5	0 92	0 64
	TRITIUM	53	500	3 77	51 4518	71 7449	200	210
	URANIUM-233,234	60	10	0	0 4577	0 3055	0 7865	0 2897
	URANIUM-235	58	10	0	0 0396	0	0 1	0 0779
	URANIUM-238	54	10	0	0 3601	0 2	0 6584	0 3
A1/A2	AMERICIUM-241	9	0 05	11 11	0 0181	0 0091	0 0371	0 012
	CESIUM-137	12	80	0	0 1075	0 018	0 53	0 2775
	GROSS ALPHA	8	11	12 5	6 3954	6 15	8 1	4 3385
	GROSS BETA	10	19	10	13 5209	13	17 69	4 84
	PLUTONIUM-239/240	14	0 05	0	0 0217	0 0193	0 035	0 02
	STRONTIUM-89,90	12	8	0	0 5888	0 68	0 81	0 3184
	TRITIUM	4	500	0	55 75	69 5	130	138 5
	URANIUM-233,234	14	10	0	3 3456	3 25	4 1	1 395
	URANIUM-235	14	10	0	0 2034	0 26	0 3206	0 2356
	URANIUM-238	14	10	0	4 9166	4 9705	6 5	1 854

Table 1: Total Radiochemistry
(Second of five pages)

Pond	Analyte	Sample Size	CWQCC Standard	Percent Above Standard	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	AMERICIUM-241	48	0 05	0	0 0042	0 0033	0 0082	0 0052
	CESIUM-137	49	80	0	0 0681	0 0274	0 17	0 1883
	GROSS ALPHA	332	11	0 3	3 7709	3 6875	6 076	2 7755
	GROSS BETA	332	19	0 3	6 083	5 3865	8 161	2 8635
	PLUTONIUM-239/240	55	0 05	0	0 0046	0 003	0 0098	0 0069
	STRONTIUM-89,90	46	8	0	0 3533	0 31	0 56	0 25
	TRITIUM	22	500	4 55	121 2927	83 3024	181 7035	98
	URANIUM-233,234	60	10	0	1 3781	1 2815	2 2495	0 9574
	URANIUM-235	60	10	0	0 0842	0 0729	0 1488	0 0735
	URANIUM-238	59	10	0	1 5419	1 231	3 007	0 95
B1/B2	AMERICIUM-241	9	0 05	11 11	0 0214	0.0142	0.045	0 0246
	CESIUM-137	12	80	0	0 371	0.115	0 665	0 236
	GROSS ALPHA	6	11	0	2 4158	2.245	4.2	1 395
	GROSS BETA	8	19	12 5	8 5975	6.6015	9.2	1 7905
	PLUTONIUM-239/240	14	0 05	35 71	0 0498	0.0374	0 06	0.0393
	STRONTIUM-89,90	12	8	0	0 1786	0 16	0 29	0 1298
	TRITIUM	6	500	16 67	249 5	215	650	396
	URANIUM-233,234	14	10	0	1 3701	1 2095	2 2	0 827
	URANIUM-235	14	10	0	0 0916	0 1018	0 13	0 065
	URANIUM-238	14	10	0	1 2537	1 1825	1 8	0 63

Table 1 Total Radiochemistry
(Third of five pages)

Pond	Analyte	Sample Size	CWQCC Standard	Percent Above Standard	Mean	Median	85th Percentile	Inter-Quartile Range
B3	AMERICIUM-241	5	0 05	20	0 027	0 023	0 062	0 0155
	CESIUM-137	5	80	0	0 211	-0 0432	1 15	0 132
	GROSS ALPHA	3	11	0	0 3296	0 51	0 69	0 9012
	GROSS BETA	4	19	25	17 2075	14 455	32 02	13 015
	PLUTONIUM-239/240	5	0 05	0	0 0181	0 015	0 0399	0 0026
	STRONTIUM-89,90	5	8	0	0 1495	0 18	0 31	0 165
	TRITIUM	2	500	0	51 5	51 5	160	217
	URANIUM-233,234	6	10	0	0 2794	0 2281	0 93	0 335
	URANIUM-235	6	10	0	0 0272	0 0223	0 0635	0 055
	URANIUM-238	6	10	0	0 2881	0 1705	0 93	0 1125
B4/B5	AMERICIUM-241	28	0 05	0	0 0071	0 0051	0 022	0 0088
	CESIUM-137	32	80	0	0 0966	0 013	0 3937	0 2694
	GROSS ALPHA	185	11	0	3 6247	3 268	5 848	3 416
	GROSS BETA	186	19	0	7 6701	7 8205	9 004	2 06
	PLUTONIUM-239/240	36	0 05	0	0 0089	0 0059	0 0174	0 0079
	STRONTIUM-89,90	30	8	0	0 2597	0 2018	0 45	0 2405
	TRITIUM	23	500	8 7	197 8304	124 5024	310	193 3164
	URANIUM-233,234	35	10	0	0 9056	0 72	1 46	0 6238
	URANIUM-235	35	10	0	0 0547	0 0428	0 1105	0 0808
	URANIUM-238	35	10	0	0 7736	0 61	1 114	0 3257

Table 1 Total Radiochemistry
(Fourth of five pages)

Pond	Analyte	Sample Size	CWQCC Standard	Percent Above Standard	Mean	Median	85th Percentile	Inter-Quartile Range
C1	AMERICIUM-241	4	0 05	0	0 0077	0 0032	0 0233	0 0134
	CESIUM-137	5	80	0	0 2612	0 11	0 92	0 5041
	GROSS ALPHA	3	7	0	2 0793	1 828	4 2	3 99
	GROSS BETA	4	5	50	7 076	6 84	12	8 528
	PLUTONIUM-239/240	6	0 05	0	0 0063	0 005	0 0142	0 004
	STRONTIUM-89,90	5	8	0	0 3765	0 41	0 53	0 0875
	TRITIUM	2	500	0	187 5	187.5	330	285
	URANIUM-233,234	6	5	0	0 7965	0 8735	1 1	0 622
	URANIUM-235	6	5	0	0 0704	0 0744	0 098	0 0457
	URANIUM-238	6	5	0	0 5993	0 6129	0 88	0 51
C2	AMERICIUM-241	19	0 05	5 26	0 0117	0 0052	0.017	0 0092
	CESIUM-137	26	80	0	0 094	0 046	0 404	0.1711
	GROSS ALPHA	160	7	10 63	4 4328	4 335	6 6195	3 028
	GROSS BETA	159	5	96 86	7 0019	6 94	8 015	1 397
	PLUTONIUM-239/240	32	0 05	12 5	0 022	0 0127	0 045	0 0169
	STRONTIUM-89,90	24	8	0	0 4519	0.3973	0 67	0 2406
	TRITIUM	20	500	5	85 1089	76 8401	159 9391	132 3759
	URANIUM-233,234	27	5	0	1 2115	1 2	1 798	0 98
	URANIUM-235	27	5	0	0 1277	0.0953	0 2202	0 1482
	URANIUM-238	27	5	0	1 5136	1 3	2	1 0083

Table 1. Total Radiochemistry
(Fifth of five pages)

Pond	Analyte	Sample Size	CWQCC Standard	Percent Above Standard	Mean	Median	85th Percentile	Inter-Quartile Range
LANDFILL	AMERICIUM-241	13	0 05	0	0 0064	0 004	0 0123	0 0053
	CESIUM-137	12	80	0	0 1586	0 1908	0 42	0 3053
	GROSS ALPHA	8	11	0	3 6331	3 2	4 6	2 5955
	GROSS BETA	8	19	0	9 5318	9 4655	12 67	5 235
	PLUTONIUM-239/240	13	0 05	0	0 0063	0 0061	0 009	0 0035
	STRONTIUM-89,90	9	8	0	0 9296	0 89	1 18	0 44
	TRITIUM	8	500	12 5	484 6911	364 9144	500	211 85
	URANIUM-233,234	9	10	0	0 2549	0 23	0 43	0 19
	URANIUM-235	9	10	0	0 0338	0 05	0 08	0 052
	URANIUM-238	9	10	0	0 1028	0 07	0 1737	0 097

Table 2· Total Metals
(First of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
BACKGROUND	ALUMINUM	110	28 18		0 00	0	695 2936	180 0000	1450 0000	549 1000
	ANTIMONY	91	90 11	14	2 20	0	14 2297	9 4000	28 1333	13 1306
	ARSENIC	84	88 10	50	0 00	0	1 7810	1 0000	3 1250	1 4929
	BARIUM	103	18 45	1000	0 00	0	67 8165	57 4000	85 7000	26 9412
	BERYLLIUM	87	93 10	0 0076	6 90	0	0 9425	0 4688	1 9000	0 6471
	CADMIUM	80	100 00	1 5	0 00	0	1 7438	1 5561	2 9905	1 4071
	CALCIUM	125	0 00		0 00	0	24924 5720	23000.0000	33900 0000	10300 0000
	CESIUM	92	91 30		0 00	1	247 4670	173 9130	471 4286	341 3043
	CHROMIUM	91	83 52	50	0 00	0	4 2341	3 0000	7 3000	4 2857
	COBALT	88	93 18		0 00	16	2 3979	1 7889	3 7143	1 8659
	COPPER	93	63 44	16 05	0 00	0	6 1984	4 6286	11 7847	6 8092
	IRON	129	7 75	1000	27 91	0	1335 6364	561 0000	1700 0000	952 0000
	LEAD	104	64 42	6 46	3 85	0	2 0438	1 2583	3 8000	1 8542
	LITHIUM	98	52.04		0 00	0	13 7107	4 3800	28 5714	6 6238
	MAGNESIUM	118	10 17		0 00	0	5279 6186	5090 0000	7140 0000	1720 0000
	MANGANESE	123	8.94	1000	1 63	0	99 3171	32 2000	125 0000	70 4000
	MERCURY	94	91 49	0 01	8 51	0	0 1397	0 1096	0 1855	0 1084
	MOLYBDENUM	97	87 63		0 00	21	5 2789	3 7182	8 6667	5 0526
	NICKEL	92	84.78	125	0 00	0	7 3842	4 7029	13 1000	6 6435
	POTASSIUM	100	32 00		0 00	0	1775.3750	1455 2941	3100 0000	1389 5000

Table 2 Total Metals
(Second of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
BACKGROUND	SELENIUM	92	95 65	10	0 00	0	1 3777	0 9488	2 5000	1 2833
	SILICON	39	0 00		0 00	0	5861 8974	4930 0000	10000 0000	4820 0000
	SILVER	88	86 36	0 59	13 64	0	2 8562	2 3077	5 1000	2 9860
	SODIUM	127	0 79		0 00	0	17166 9291	15400 0000	24800 0000	9400 0000
	STRONTIUM	106	16 04		0 00	0	195 5943	140 0000	222 2222	49 6667
	THALLIUM	96	96 88	0 012	3 13	16	1 0431	0 8944	1 7889	0 9834
	TIN	90	81 11		0 00	0	22 6094	13 4111	35 0000	17 6667
	VANADIUM	92	70 65		0 00	0	7 8359	3 5313	14 9000	6 5701
	ZINC	123	28 46	45	20 33	0	38 2911	16 0000	67 6000	24 6000
A1/A2	ALUMINUM	13	38 46		0 00	0	209 6346	81 0000	320 0000	116 5000
	ANTIMONY	13	100 00	14	0 00	0	9 3923	8 8000	20 4800	5 5733
	ARSENIC	13	23 08	50	0 00	0	3 9154	4 1000	6 8000	4 6000
	BARIUM	13	0 00	1000	0 00	0	50 4769	53 0000	60 9000	13 4000
	BERYLLIUM	13	100 00	0 0076	0 00	0	0 3692	0 3000	0 7143	0 2143
	CADMIUM	8	100 00	1 5	0 00	0	1 4625	1 3500	2 2000	1 0500
	CALCIUM	13	0 00		0 00	0	27984 6154	25800 0000	43200 0000	13400 0000
	CESIUM	13	92 31		0 00	0	153 4615	120 0000	375 0000	216 6667
	CHROMIUM	13	100 00	50	0 00	0	1 5385	1 4500	2 7500	0 8667
	COBALT	13	100 00		0 00	0	1 5115	1 4286	2 8800	1 0095
	COPPER	11	90 91	16 05	0 00	0	2 0682	1 8800	3 7000	1 7700

Table 2 Total Metals
(Third of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A1/A2	IRON	13	46 15	1000	7 69	0	211 1846	120 0000	248 0000	100 0000
	LEAD	13	69 23	6 46	7 69	0	2 0231	0 9333	4 1000	1 2000
	LITHIUM	13	0 00		0 00	0	44 7769	45 0000	51 1000	6 5000
	MAGNESIUM	13	0 00		0 00	0	30046 1538	30000 0000	35100 0000	3900 0000
	MANGANESE	13	0 00	1000	0 00	0	128 1769	46.0000	422 0000	49 0000
	MERCURY	13	92 31	0 01	7 69	0	0 1200	0.1077	0 1846	0 0923
	MOLYBDENUM	13	84 62		0 00	0	2 9115	2 6867	5 0000	2 7000
	NICKEL	13	53 85	125	0 00	0	5 9692	4 8000	9 8000	3 6000
	POTASSIUM	13	0 00		0 00	0	7693 0769	7850 0000	8870 0000	700 0000
	SELENIUM	13	84 62	10	0 00	0	1 4000	1 1429	2 8571	1 2000
	SILICON	14	21 43		0 00	0	1075 8929	532 5000	2380 0000	1674 0000
	SILVER	13	100.00	0 59	0 00	0	1 9462	1 6000	3 5714	1 8905
	SODIUM	13	0 00		0 00	0	171384 6154	170000 0000	209000 0000	35000 0000
	STRONTIUM	13	0 00		0 00	0	339 6154	330 0000	432 0000	94 0000
	THALLIUM	13	92 31	0 012	7 69	2	1 5455	1 0667	3 0000	1 4667
	TIN	12	100 00		0 00	0	7 7458	6 7187	11 8400	4 8317
	VANADIUM	13	46 15		0 00	0	3 3692	3 2000	6 6000	1 6200
	ZINC	13	76 92	45	0 00	0	5 7000	3 3333	19 0000	3 3000

Table 2 Total Metals
(Fourth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	ALUMINUM	21	28 57		0 00	0	320 0286	307 0000	630 0000	506 2000
	ANTIMONY	21	100 00	14	0 00	0	12 6476	9 3333	24 6500	10 9000
	ARSENIC	21	85 71	50	0 00	0	1 2762	1 0000	2 0000	0 9056
	BARIUM	21	4 76	1000	0 00	0	84 3238	82 8000	100 0000	12 2000
	BERYLLIUM	21	95 24	0 0076	4 76	0	0 6262	0 4667	0 8667	0 4333
	CADMIUM	18	100 00	1 5	0 00	0	1 5889	1 3750	2 5000	1 0000
	CALCIUM	21	0 00		0 00	0	45395 2381	45500 0000	51700 0000	6300 0000
	CESIUM	20	75 00		0 00	0	218 8000	65 8333	450 0000	219 0476
	CHROMIUM	21	95 24	50	0 00	0	2 2690	2 0000	3 5000	1 5500
	COBALT	21	100 00		0 00	1	2 2575	1 7071	3 6250	1 8619
	COPPER	20	70 00	16 05	5 00	0	5 0450	2 4250	12 8000	6 6750
	IRON	21	23 81	1000	0 00	0	237 5357	142 0000	480 0000	367 2000
	LEAD	20	60 00	6 46	5 00	0	2 4550	1 4500	3 1000	2 1472
	LITHIUM	17	35 29		0 00	0	13 6206	9 6000	16 6667	6 4000
	MAGNESIUM	21	0 00		0 00	0	11530 4762	11400 0000	14200 0000	3260 0000
	MANGANESE	22	4 55	1000	0 00	0	53 2091	39 2000	92 5000	61 4000
	MERCURY	24	100 00	0 01	0 00	0	0 0958	0 0913	0 1652	0 0957
	MOLYBDENUM	17	82 35		0 00	1	6 5969	6 5000	13 0000	5 9167
	NICKEL	21	76 19	125	0 00	0	7 2357	4 9500	15 3333	4 1667
	POTASSIUM	21	4 76		0 00	0	5435 7143	4130 0000	7900 0000	3930 0000

Table 2 Total Metals
(Fifth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	SELENIUM	21	76 19	10	0 00	0	1 6024	1 5000	2 5000	1 4500
	SILICON	9	0 00		0 00	0	2891 1111	2950 0000	3450 0000	920 0000
	SILVER	21	100 00	0 59	0 00	0	1 9595	1 5000	2 9500	1 4667
	SODIUM	21	0 00		0 00	0	38071 4286	38300 0000	47700 0000	15600 0000
	STRONTIUM	18	5 56		0 00	0	301 6667	295 0000	360 0000	77 0000
	THALLIUM	21	100 00	0 012	0 00	3	1 0056	0 8333	1 5000	0 9500
	TIN	16	93 75		0 00	0	13 6531	8 1250	26 6667	12 6667
	VANADIUM	21	66 67		0 00	0	3 7167	2 5000	4 5000	1 8000
	ZINC	21	33 33	45	9 52	0	20 3286	14 5500	29 0000	14 5000
B1/B2	ALUMINUM	12	50 00		0 00	0	152 6458	84 2000	350 0000	187 9000
	ANTIMONY	12	100 00	14	0 00	0	10 9833	8 7667	20 4600	8 6033
	ARSENIC	9	44 44	50	0 00	0	2 1444	1 9000	3 6000	1 7667
	BARIUM	12	33 33	1000	0 00	0	40 8167	41 8500	79 3000	49 6500
	BERYLLIUM	12	91 67	0 0076	8 33	0	0 3792	0 2813	0 5000	0 2625
	CADMIUM	10	100 00	1 5	0 00	0	1 5800	1 5667	2 2000	0 7000
	CALCIUM	12	0 00		0 00	0	21900.0000	19000.0000	30000 0000	8250 0000
	CESIUM	12	100 00		0 00	0	233 3333	225 0000	450 0000	300 0000
	CHROMIUM	11	100 00	50	0 00	0	1 9545	1.8333	3 2800	1 9000
	COBALT	12	100 00		0 00	0	1 6375	1 4200	2 8800	1 2700
	COPPER	12	100 00	16 05	0 00	0	1 8875	1 6750	3 6000	1 3100

Table 2 Total Metals
(Sixth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B1/B2	IRON	12	33 33	1000	0 00	0	271 8333	239 0000	470 0000	206 0000
	LEAD	12	50 00	6 46	8 33	0	2 1708	0 9167	4 8000	2 0667
	LITHIUM	12	16 67		0 00	0	19 3167	16 5500	23 6000	10 0000
	MAGNESIUM	12	0 00		0 00	0	20141 6667	21450 0000	24500 0000	8550 0000
	MANGANESE	12	0 00	1000	0 00	0	74 5250	55 8500	138 0000	70 4500
	MERCURY	12	100 00	0 01	0 00	0	0 1000	0 1000	0 1692	0 0923
	MOLYBDENUM	12	100 00		0 00	1	3 0091	2 9000	4 5600	2 9000
	NICKEL	12	91 67	125	0 00	0	4 9500	3 8167	9 8000	3 1667
	POTASSIUM	12	0 00		0 00	0	5366 6667	5315 0000	6410 0000	1425 0000
	SELENIUM	11	100 00	10	0 00	0	0 8955	0 8250	1 3333	0 5000
	SILICON	14	28 57		0 00	0	1101 3571	845 0000	2140 0000	1473 5000
	SILVER	12	91 67	0 59	8 33	0	6 6667	2 2208	4 5333	1 8333
	SODIUM	12	0 00		0 00	0	62433 3333	63300 0000	73200 0000	16100 0000
	STRONTIUM	12	8 33		0 00	0	273 0000	245 5000	301 0000	58 0000
	THALLIUM	12	100 00	0 012	0 00	1	0 8273	0 7000	1 2667	0 5667
	TIN	11	100 00		0 00	0	12 7000	7 8000	25 9333	8 6333
	VANADIUM	12	91 67		0 00	0	2 3083	2 2083	4 3333	1 9183
	ZINC	12	83 33	45	0 00	0	6 6583	4 1500	22 0000	4 8750

Table 2 Total Metals
(Seventh of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B3	ALUMINUM	5	0 00		0 00	0	526.6000	520 0000	1000 0000	481 0000
	ANTIMONY	5	100 00	14	0 00	0	11 8400	8 5333	21 1000	10 0667
	ARSENIC	4	100 00	50	0 00	0	0 9750	0 8000	2 0000	1 0500
	BARIUM	5	20 00	1000	0 00	0	16 4900	16 0000	30 0000	12 7000
	BERYLLIUM	5	100 00	0 0076	0 00	0	0 3700	0 3333	0 6667	0 1500
	CADMIUM	3	100 00	1 5	0 00	0	1 8667	2 2000	2 3000	1 2000
	CALCIUM	5	0 00		0 00	0	33940 0000	36000 0000	40000 0000	5500 0000
	CESIUM	5	80 00		0 00	0	165 0000	125 0000	375 0000	200 0000
	CHROMIUM	5	80 00	50	0 00	0	3 1700	2 7500	6 4000	1 4000
	COBALT	5	80 00		0 00	0	2 0700	2 1000	3 6500	1 2000
	COPPER	4	50 00	18 05	0 00	0	4 7125	4 6000	7 3000	4 3750
	IRON	5	80 00	1000	0 00	0	138 2000	79.5000	254.0000	152.5000
	LEAD	5	0 00	6 46	20 00	0	3 7200	3 8000	6.6000	2.3000
	LITHIUM	5	40 00		0 00	0	8 8600	9 1000	18 0000	9 0333
	MAGNESIUM	5	0 00		0 00	0	6624 0000	6390.0000	8100 0000	560.0000
	MANGANESE	5	0 00	1000	0 00	0	43 3600	37.0000	63 0000	21 3000
	MERCURY	5	100.00	0 01	0 00	0	0.1000	0 1000	0 1667	0.0667
	MOLYBDENUM	5	100 00		0 00	0	4 8800	5 0000	9 0000	3 1000
	NICKEL	5	80 00	125	0 00	0	6 3500	5 3500	9 8000	4 3000
	POTASSIUM	5	0 00		0 00	0	13404 0000	14000 0000	16000 0000	2500 0000

Table 2 Total Metals
(Eighth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B3	SELENIUM	5	100 00	10	0 00	0	1 1400	0 7333	2 6667	0 7333
	SILICON	6	0 00		0 00	0	4413 3333	4525 0000	5010 0000	500 0000
	SILVER	5	100 00	0 59	0 00	0	2 3800	2 5000	3 7500	2 1500
	SODIUM	5	0 00		0 00	0	30300 0000	32000 0000	36000 0000	5200 0000
	STRONTIUM	5	0 00		0 00	0	169 6000	158 0000	230 0000	22 0000
	THALLIUM	5	100 00	0 012	0 00	0	1 1400	0 9333	2 0000	0 7000
	TIN	5	100 00		0 00	0	10 1900	7 4000	19 4500	5 6000
	VANADIUM	5	40 00		0 00	0	5 7000	4 8000	9 7000	4 5000
	ZINC	5	20 00	45	60 00	0	45 9000	46 5000	59 9000	14 4000
B4/B5	ALUMINUM	24	20 83		0 00	0	336 8292	241 5000	500 0000	420 0000
	ANTIMONY	25	100 00	14	0 00	0	12 0440	8 8000	21 1000	10 1667
	ARSENIC	24	83 33	50	0 00	0	1 3625	1 1000	2 4000	1 1500
	BARIUM	24	8 33	1000	0 00	0	65 1312	66 7000	83 6000	15 9500
	BERYLLIUM	25	96 00	0 0076	4 00	0	0 5640	0 4500	0 9000	0 5000
	CADMIUM	22	100 00	1 5	0 00	0	1 6795	1 4187	2 6250	1 2500
	CALCIUM	25	0 00		0 00	0	42540 0000	41800 0000	48000 0000	7800 0000
	CESIUM	26	84 62		0 00	0	200 3077	61 2500	437 5000	216 6667
	CHROMIUM	25	100 00	50	0 00	0	2 3220	2 0000	3 5000	1 7000
	COBALT	25	92 00		0 00	1	2 6646	1 9333	4 3000	2 5583
	COPPER	25	52 00	16 05	0 00	0	5 4120	4 5000	10 4000	6 2000

Table 2 Total Metals
(Ninth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B4/B5	IRON	25	32 00	1000	0 00	0	261 3640	206 0000	515 0000	364 1000
	LEAD	23	56 52	6 46	0 00	0	2 0435	1 8000	3 6000	2 5857
	LITHIUM	22	36 36		0 00	1	14 3643	9 9000	32 2000	11 3667
	MAGNESIUM	25	0.00		0 00	0	9193 6000	8380.0000	14200 0000	1030 0000
	MANGANESE	25	12 00	1000	0 00	0	89 5220	70 2000	175 0000	80 9000
	MERCURY	26	96 15	0 01	3 85	0	0 1212	0 1000	0 1760	0 1020
	MOLYBDENUM	22	90 91		0 00	2	7 9675	6 5000	15 1667	9 5583
	NICKEL	25	92 00	125	0 00	0	5 9120	4.6000	10 0000	5 2500
	POTASSIUM	25	4 00		0 00	0	9146 8000	10100 0000	11900 0000	3840 0000
	SELENIUM	25	80 00	10	0 00	0	1 6400	1 1429	3 2000	1 8190
	SILICON	8	0 00		0 00	0	4122 5000	4045 0000	4580 0000	830 0000
	SILVER	24	91 67	0 59	8 33	0	2 1521	1 7708	3 7500	2 1375
	SODIUM	25	0 00		0 00	0	33988 0000	33000 0000	44900 0000	9900 0000
	STRONTIUM	22	9 09		0 00	0	255 0000	228 5000	370 0000	40 0000
	THALLIUM	25	96 00	0 012	4 00	6	0 9605	0 8000	2 0000	1 0000
	TIN	22	95 45		0 00	1	12 3643	10 0000	19 4500	6 5000
	VANADIUM	25	64 00		0 00	0	4 3780	3 5000	6 7000	3 1000
	ZINC	25	28 00	45	20 00	0	35 3240	36 8000	52 9000	19 6000

Table 2 Total Metals
(Tenth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C1	ALUMINUM	5	0 00		0 00	0	531 2000	411 0000	1040 0000	180 0000
	ANTIMONY	5	80 00	14	20 00	0	15 7200	12 8000	32 2000	14 1000
	ARSENIC	5	80 00	50	0 00	0	0 9600	0 9000	2 0000	0 4000
	BARIUM	5	0 00	1000	0 00	0	91 3200	94 2000	120 0000	17 8000
	BERYLLIUM	5	60 00	0 0076	40 00	0	0 6000	0 5000	1 2000	0 3333
	CADMIUM	2	100 00	1 5	0 00	0	1 8250	1 8250	2 3000	0 9500
	CALCIUM	5	0 00		0 00	0	44420 0000	46800 0000	48500 0000	3200 0000
	CESIUM	5	80 00		0 00	0	165 0000	125 0000	375 0000	200 0000
	CHROMIUM	5	100 00	50	0 00	0	1 8000	1 3667	2 7500	1 5833
	COBALT	5	100 00		0 00	0	1 8500	1 3333	3 6500	1 2000
	COPPER	4	100 00	16 05	0 00	0	2 2250	2 1333	3 1333	1 3833
	IRON	5	0 00	1000	40 00	0	904 8000	970 0000	1230 0000	370 0000
	LEAD	5	0 00	6 46	0 00	0	2 9600	2 9000	5 4000	1 7000
	LITHIUM	5	20 00		0 00	0	5 4000	4 4000	8 3000	2 0000
	MAGNESIUM	5	0 00		0 00	0	9036 0000	8540 0000	10100 0000	1700 0000
	MANGANESE	5	0 00	1000	0 00	0	136 5200	135 0000	240 0000	105 0000
	MERCURY	5	100 00	0 01	0 00	0	0 1000	0 1000	0 1667	0 0667
	MOLYBDENUM	5	80 00		0 00	0	3 5900	2 8500	6 6000	3 0000
	NICKEL	5	100 00	125	0 00	0	3 8300	2 5000	7 3500	3 3500
	POTASSIUM	5	40 00		0 00	0	1524 0000	1366 6667	2300 0000	670 0000

Table 2 Total Metals
(Eleventh of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C1	SELENIUM	5	80 00	10	0 00	0	1 3300	1 3333	2 6667	0 9000
	SILICON	7	0 00		0 00	0	6815 7143	7060 0000	7330 0000	1380 0000
	SILVER	5	100 00	0 59	0 00	0	2 3800	2 5000	3 7500	2 1500
	SODIUM	5	0 00		0 00	0	22920 0000	22000 0000	26400 0000	5500 0000
	STRONTIUM	5	0 00		0 00	0	241 8000	241 0000	260 0000	28 0000
	THALLIUM	5	100 00	0 012	0 00	0	1 1400	0 9333	2 0000	0 7000
	TIN	5	100 00		0 00	0	9 2500	6 5000	19 4500	4 3667
	VANADIUM	5	80 00		0 00	0	2 7700	3 2500	3 9000	1 9000
	ZINC	5	100 00	45	0 00	0	2 6500	3 1000	3 6000	0 8500
C2	ALUMINUM	22	22 73		0 00	0	176 7250	141.5000	385 0000	177 5000
	ANTIMONY	22	100 00	14	0 00	0	12 3864	10 1667	22 2000	9 3333
	ARSENIC	22	36 36	50	0 00	0	2 4364	2 4500	4 4000	2 0000
	BARIUM	22	0 00	1000	0 00	0	83 8636	81.4000	90 3000	10 1000
	BERYLLIUM	22	95 45	0 0076	4 55	0	0 5955	0 5478	0 8571	0 4762
	CADMIUM	21	95 24	1 5	4 76	0	1 7024	1 5000	2 7000	1 5000
	CALCIUM	22	0 00		0 00	0	45259 0909	41650.0000	56000.0000	16200 0000
	CESIUM	23	82 61		0 00	0	198 3913	50 0000	400 0000	275 0000
	CHROMIUM	22	100 00	50	0 00	0	2 4091	2 0000	4 2000	1 8000
	COBALT	22	100 00		0 00	1	2 7881	2 2222	4 5000	1 7000
	COPPER	22	72 73	16 05	0 00	0	4 1841	3 0000	7 6000	4 4500

Table 2 Total Metals
(Twelfth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C2	IRON	22	18 18	1000	4 55	0	272 0455	220 0000	466 0000	206 3000
	LEAD	22	68 18	6 46	18 18	0	5 5977	1 0750	7 4000	2 3444
	LITHIUM	18	38 89		0 00	1	13 5559	9 2000	16 6667	4 7000
	MAGNESIUM	22	0 00		0 00	0	14304 0909	14350 0000	16400 0000	2600 0000
	MANGANESE	22	13 64	1000	0 00	0	241 4114	94 5500	629 0000	245 0000
	MERCURY	22	90 91	0 01	9 09	0	0 1205	0 1050	0 1800	0 1100
	MOLYBDENUM	18	88 89		0 00	2	9 2031	5 7500	17 3333	10 0417
	NICKEL	22	90 91	125	0 00	0	6 2773	4 5500	10 0000	8 8000
	POTASSIUM	22	4 55		0 00	0	6265 0000	6005 0000	7070 0000	1320 0000
	SELENIUM	22	81 82	10	4 55	0	1 8500	1 4643	2 8571	1 5000
	SILICON	1	0 00		0 00	0	910 0000	910 0000	910 0000	0 0000
	SILVER	22	95 45	0 59	4 55	0	2 0273	1 7946	3 1250	2 0000
	SODIUM	22	0 00		0 00	0	48968 1818	48600 0000	57300 0000	13900 0000
	STRONTIUM	20	10 00		0 00	0	331 4500	326 0000	380 0000	44 5000
	THALLIUM	22	100 00	0 012	0 00	8	0 9250	0 6833	1 4500	0 9333
	TIN	18	100 00		0 00	1	12 1471	9 7500	15 0000	6 8333
	VANADIUM	22	81 82		0 00	0	3 3091	2 1667	3 7500	1 9500
	ZINC	22	50 00	45	13 64	0	40 3932	6 8500	28 9000	14 8000

Table 2 Total Metals
(Thirteenth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
LANDFILL	ALUMINUM	17	23 53		0 00	0	2614 9059	301 0000	4090 0000	1283 3333
	ANTIMONY	17	82 35	14	17 65	1	19 2344	15 0000	30 0000	15 9167
	ARSENIC	15	53 33	50	0 00	0	2 6400	2 4000	4 6000	1 8000
	BARIUM	17	0 00	1000	5 88	0	637 4118	584 0000	780 0000	69 0000
	BERYLLIUM	17	100 00	0 0076	0 00	0	0 7912	0 4500	1 2500	0 5714
	CADMIUM	16	81 25	1 5	18 75	1	2 5433	1 7000	3 9000	2 4000
	CALCIUM	17	0 00		0 00	0	151411 7647	142000 0000	185000 0000	7000 0000
	CESIUM	17	100 00		0 00	1	252 9375	193 7500	437 5000	307 2500
	CHROMIUM	17	70 59	50	0 00	0	8 9588	5 0000	21 8000	8 8000
	COBALT	16	50 00		0 00	3	7 4192	5 8000	15 9000	1 9333
	COPPER	17	70 59	16 05	11 76	0	12 0765	5 0000	16 6667	7 5000
	IRON	17	0.00	1000	100 00	0	78476 4706	75000 0000	84300.0000	12500.0000
	LEAD	17	23 53	6 46	17 65	0	4 1588	3 0000	9 5000	3 5000
	LITHIUM	17	23 53		0 00	0	46 2176	38 7000	75.0000	10 1000
	MAGNESIUM	17	0 00		0 00	0	34682 3529	33000 0000	41600 0000	2800 0000
	MANGANESE	17	0 00	1000	100 00	0	1619 4118	1570 0000	1840.0000	280 0000
	MERCURY	17	94 12	0 01	5 88	0	0 1076	0 1000	0 1750	0 1000
	MOLYBDENUM	17	70 59		0 00	5	10 0708	6 5833	21 3000	13 6083
	NICKEL	17	76 47	125	0 00	0	11 7500	9 8000	21 6000	9 2500
	POTASSIUM	17	5 88		0 00	0	6404 7059	6100 0000	7970 0000	850 0000

Table 2· Total Metals
(Fourteenth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter Quartile Range
LANDFILL	SELENIUM	17	94 12	10	0 00	1	2 1219	0 9500	3 7500	1 6250
	SILICON	10	0 00		0 00	0	10385 0000	10300 0000	11900 0000	1500 0000
	SILVER	17	70 59	0 59	29 41	0	5 6824	4 0000	11 1000	4 2333
	SODIUM	17	0 00		0 00	0	71005 8824	67100 0000	83300 0000	11800 0000
	STRONTIUM	17	11 76		0 00	0	905 4706	872 0000	1150 0000	95 0000
	THALLIUM	17	100 00	0 012	0 00	3	0 8679	0 7500	1 3333	0 5667
	TIN	17	58 82		0 00	1	49 2062	37 1000	75 0000	46 3250
	VANADIUM	17	41 18		0 00	0	25 0265	14 4000	27 3000	18 7000
	ZINC	17	0 00	45	100 00	0	3194 6471	2360 0000	3110 0000	440 0000

Table 3 Dissolved Metals
(First of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC-Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
BACKGROUND	ALUMINUM	104	61 54	87	7 69	0	65 6784	31 4500	100 0000	39 9786
	ANTIMONY	68	77 94		0 00	8	15 4642	12 3000	23 7229	11 4071
	ARSENIC	66	95 45		0 00	0	1 5795	0 9345	2 5000	1 0545
	BARIUM	117	36 75		0 00	0	51 1179	43 4000	67 8000	25 8500
	BERYLLIUM	61	90 16		0 00	0	1 4328	0 7692	2 1000	1 3487
	CADMIUM	49	95 92		0 00	0	1 9582	1 8000	3 1818	1 6606
	CALCIUM	125	0 00		0 00	0	24639.5200	22800 0000	33900 0000	10800 0000
	CESIUM	69	89 86		0 00	47	82 7955	66.6667	200 0000	105 8333
	CHROMIUM	61	88 52		0 00	0	4 1869	2 9500	7 4571	3 7831
	COBALT	58	98 28		0 00	10	3 8104	2 1250	6 9375	3 3173
	COPPER	97	62 89		0 00	0	7 2402	5 0000	13 8000	8 6500
	IRON	125	33 60	300	14 40	0	150.9772	69.9000	298 0000	145.7000
	LEAD	87	81 61		0.00	0	1 3534	0 9333	2 5000	1 4000
	LITHIUM	91	56 04		0 00	0	19 6725	4 9000	56 2500	25 1250
	MAGNESIUM	122	14 75		0 00	0	5056 9672	5035 0000	6780 0000	1950 0000
	MANGANESE	121	25 62	50	17 36	0	38 5832	14 3000	58 6000	32 2500
	MERCURY	54	85 19		0 00	0	0 1319	0 1170	0 1957	0 1149
	MOLYBDENUM	65	89 23		0 00	6	30 8475	17 0633	73 5294	50 6324
	NICKEL	57	94 74		0 00	0	8 8860	5 5500	18 1818	10 0333
	POTASSIUM	97	37 11		0 00	0	1609 4227	1280 0000	2727 2727	1485 0000

Table 3 Dissolved Metals
(Second of fourteen pages)

Pond	Analyte	Sample Size	Percent Non Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
BACKGROUND	SELENIUM	57	98 25		0 00	1	1 6071	1 2250	2 6667	1 2429
	SILICON	42	4 76		0 00	0	5887 8571	4840 0000	10000 0000	5210 0000
	SILVER	70	90 00		0 00	5	2 6854	2 0667	4 4667	2 3000
	SODIUM	124	0 81		0 00	0	17485 8871	15600 0000	26100 0000	8800 0000
	STRONTIUM	110	23 64		0 00	0	210 4291	141 0000	333 3333	53 0000
	THALLIUM	69	97 10		0 00	0	2 0217	1 2667	3 5714	1 7571
	TIN	75	78 67		0 00	0	66 0113	27 4000	82 0513	56 5000
	VANADIUM	78	83 33		0 00	9	3 1667	2 3125	5 7375	2 4375
	ZINC	111	40 54		0 00	0	17 5239	9 0000	27 0000	16 1000
A1/A2	ALUMINUM	11	81 82	87	0 00	0	33 8455	21 6000	64 8000	49 6667
	ANTIMONY	13	100 00		0 00	0	9 3923	8 8000	20 4800	5 5733
	ARSENIC	12	16 67		0 00	0	4 0167	4 5500	5 9000	4 0000
	BARIUM	13	0 00		0 00	0	43 6615	48 3000	60 0000	15 1000
	BERYLLIUM	13	100 00		0 00	0	0 3769	0 3571	0 7143	0 2143
	CADMIUM	12	91 67		0 00	0	1 3875	1 4250	2 2000	0 9125
	CALCIUM	13	0 00		0 00	0	27792 3077	25500 0000	43300 0000	12800 0000
	CESIUM	13	92 31		0 00	0	150 0000	82 5000	375 0000	212 5000
	CHROMIUM	13	92 31		0 00	0	1 6038	1 6400	2 7500	1 4333
	COBALT	13	100 00		0 00	0	1 5115	1 4286	2 8800	1 0095
	COPPER	12	75 00		0 00	0	2 7825	2 2900	4 5000	2 7883

Table 3 Dissolved Metals
(Third of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A1/A2	IRON	12	66 67	300	0 00	0	18 6500	16 0000	31 5000	18 9500
	LEAD	13	61 54		0 00	0	1 3462	0 9000	2 6000	1 5000
	LITHIUM	13	0 00		0 00	0	43 4385	44 1000	51 2000	11 9000
	MAGNESIUM	13	0 00		0 00	0	30269 2308	31000 0000	34100 0000	2900 0000
	MANGANESE	13	23 08	50	15 38	0	62 6077	15 3000	190 0000	40 4000
	MERCURY	13	92 31		0 00	0	0 1415	0 1077	0 1846	0 0923
	MOLYBDENUM	13	69 23		0 00	0	3 6423	2 8500	6 8000	3 0667
	NICKEL	13	76 92		0 00	0	4 4077	3 3333	9 8000	2 9333
	POTASSIUM	13	0 00		0 00	0	7676 9231	7800 0000	8600 0000	900 0000
	SELENIUM	13	100 00		0 00	0	1 2538	0 8800	2 8571	1 1429
	SILICON	14	21 43		0 00	0	935 1071	478 0000	1840 0000	1195 5000
	SILVER	13	100 00		0 00	0	1.9462	1.8000	3 5714	1.8905
	SODIUM	13	0 00		0 00	0	173307 6923	180000 000	200000 000	22000 000
	STRONTIUM	13	0.00		0 00	0	345 5385	340 0000	442 0000	125.0000
	THALLIUM	13	100 00		0 00	0	3 0385	1 2667	9 0000	2 2000
	TIN	13	100 00		0 00	0	7.4192	6 9333	11 8400	5 2133
	VANADIUM	13	61 54		0.00	0	2 6500	3 0000	3 8000	1.9667
	ZINC	11	100 00		0 00	0	3 0182	2 0000	7 5000	2 4000

Table 3 Dissolved Metals
(Fourth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	ALUMINUM	32	68 75	87	0 00	0	23 8234	18 3333	36 0000	19 1333
	ANTIMONY	32	93 75		0 00	0	13 9141	10 6667	25 0000	13 1750
	ARSENIC	32	81 25		0 00	0	1 4281	1 0625	2 6000	1 3750
	BARIUM	32	3 13		0 00	0	77 2453	74 5000	91 4000	16 2000
	BERYLLIUM	32	96 88		0 00	0	0 5406	0 4600	0 8400	0 4100
	CADMIUM	30	96 67		0 00	0	1 6300	1 4250	2 5385	1 3846
	CALCIUM	32	0 00		0 00	0	43712 5000	44350 0000	51700 0000	10450 0000
	CESIUM	28	92 86		0 00	1	90 0370	50 0000	142 8571	75 0000
	CHROMIUM	32	100 00		0 00	0	2 4219	2 0250	4 5000	1 6321
	COBALT	32	96 88		0 00	1	2 9742	1 8000	5 1429	2 3500
	COPPER	32	78 13		0 00	0	5 0008	2 4857	10 7500	3 1071
	IRON	30	73 33	300	0 00	0	14 0825	4 9500	28 2000	13 2500
	LEAD	32	71 88		0 00	0	1 0125	0 8438	1 9000	1 0000
	LITHIUM	25	36 00		0 00	2	12 1370	8 4000	14 5000	7 4000
	MAGNESIUM	32	0 00		0 00	0	10944 3750	10500 0000	13600 0000	3665 0000
	MANGANESE	35	20 00	50	17 14	0	28 5329	11 0000	54 5000	41 8000
	MERCURY	33	84 85		0 00	0	0 3133	0 1143	0 1929	0 1071
	MOLYBDENUM	25	84 00		0 00	2	9 0630	6 5000	14 8571	8 0429
	NICKEL	32	90 63		0 00	0	6 6797	4 4875	14 2000	7 2929
	POTASSIUM	32	3 13		0 00	0	6488 7500	7135 0000	9290 0000	4150 0000

Table 3· Dissolved Metals
(Fifth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	SELENIUM	32	78 13		0 00	0	1 7969	1 5528	3 4000	1 6944
	SILICON	9	0 00		0 00	0	2426 6667	2230 0000	3260 0000	850 0000
	SILVER	32	96 88		0 00	0	2 0734	1 7222	3 7500	1 8389
	SODIUM	32	0 00		0 00	0	37703 1250	36250 0000	48400 0000	10650 0000
	STRONTIUM	26	11 54		0 00	0	286 3077	274 0000	348 0000	90 0000
	THALLIUM	31	100 00		0 00	0	1 8468	0 8571	3 3333	1 6500
	TIN	24	95 83		0 00	2	13 3273	7 6000	25 0000	8 0000
	VANADIUM	32	84 38		0.00	1	2 5129	2 0000	4 2857	2 3714
	ZINC	32	46 88		0 00	0	17 8422	10 2500	30 9000	14 4500
B1/B2	ALUMINUM	9	88 89	87	0 00	0	38 4889	33 8000	64 8000	21 6000
	ANTIMONY	12	91 67		0 00	0	12 1333	10 2950	20 4800	10 4800
	ARSENIC	11	45 45		0.00	0	1 7636	1 1000	4 1000	2 9250
	BARIUM	11	45 45		0 00	0	34 8182	28 6000	70 6000	52 7500
	BERYLLIUM	11	100 00		0 00	0	0 3182	0 3125	0 5000	0 2500
	CADMIUM	10	100 00		0 00	0	1 5600	1 5667	2 2000	0 7000
	CALCIUM	12	0 00		0 00	0	20666.6667	18700 0000	26100 0000	7550 0000
	CESIUM	12	100 00		0 00	1	209 0909	200 0000	400 0000	300 0000
	CHROMIUM	12	100 00		0 00	0	1 8750	1 7367	3 2800	1 8200
	COBALT	12	100 00		0 00	0	1 8375	1 4200	2 8800	1 2700
	COPPER	12	83 33		0 00	0	2 5750	2 0150	3 7600	2 2375

Table 3· Dissolved Metals
(Sixth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B1/B2	IRON	12	50 00	300	0 00	0	35 4750	32 4250	63 5000	24 7000
	LEAD	12	58 33		0 00	0	2 7625	0 8250	3 1500	1 1500
	LITHIUM	11	27 27		0 00	0	16 5455	12 7000	21 0000	9 3500
	MAGNESIUM	12	0 00		0 00	0	19891 6667	22500 0000	23800 0000	8750 0000
	MANGANESE	11	36 36	50	0 00	0	18 2091	5 9000	43 0000	30 7500
	MERCURY	12	100 00		0 00	0	0 1000	0 1000	0 1692	0 0923
	MOLYBDENUM	12	91 67		0 00	0	7 4208	3 1167	8 8000	3 7833
	NICKEL	12	91 67		0 00	0	4 2542	3 7500	7 1333	3 6417
	POTASSIUM	12	8 33		0 00	0	4991 6667	5230 0000	6790 0000	2055 0000
	SELENIUM	12	100 00		0 00	0	0 8667	0 7700	1 3333	0 4800
	SILICON	14	14 29		0 00	0	1112 3214	639 5000	2360 0000	1434 0000
	SILVER	12	100 00		0 00	0	2 1333	2 0875	4 0000	1 5583
	SODIUM	12	8 33	—	0 00	0	60254 1667	65000 0000	74400 0000	13250 0000
	STRONTIUM	12	8 33		0 00	0	269 0833	241 0000	295 0000	48 5000
	THALLIUM	12	91 67		0 00	0	1 0333	1 0000	1 5000	0 9083
	TIN	12	100 00		0 00	0	12 2583	8 2333	25 9333	7 6367
	VANADIUM	12	91 67		0 00	0	2 2167	1 9500	4 3333	1 5300
	ZINC	12	83 33		0 00	0	4 2750	2 8125	7 0000	3 8250

Table 3. Dissolved Metals
(Seventh of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B3	ALUMINUM	4	75 00	87	25 00	0	86 6000	54 0000	220 0000	118 8000
	ANTIMONY	5	80 00		0 00	0	13 5400	14 0000	21 1000	8 5333
	ARSENIC	5	100 00		0 00	0	0 8500	0 6000	2 0000	0 6500
	BARIUM	5	40 00		0 00	0	13 6200	12.0000	30 0000	13 9500
	BERYLLIUM	5	100 00		0 00	0	0 3700	0 3333	0 6667	0 1500
	CADMIUM	3	100 00		0 00	0	1 8667	2 2000	2 3000	1 2000
	CALCIUM	5	0 00		0 00	0	33780 0000	34000 0000	43000 0000	6600 0000
	CESIUM	5	100 00		0 00	0	163.0000	125 0000	375 0000	210 0000
	CHROMIUM	5	100 00		0 00	0	2 0500	2 0500	3 4500	1 4167
	COBALT	5	100 00		0 00	0	1.8500	1 3333	3 6500	1 2000
	COPPER	5	40 00		0 00	0	5 8900	2 7000	17 0000	2 6000
	IRON	5	40 00	300	0 00	0	80 3800	37 0000	188 0000	36 0000
	LEAD	5	40 00		0 00	0	1 6700	1 5000	3 0000	2 4000
	LITHIUM	5	40 00		0 00	0	8 2200	7 6000	19 0000	7 3333
	MAGNESIUM	5	0 00		0 00	0	6618 0000	6510 0000	8500 0000	680 0000
	MANGANESE	5	0 00	50	20 00	0	40 3000	33 0000	66 0000	8 7000
	MERCURY	5	100 00		0 00	0	0 1000	0 1000	0 1667	0 0667
	MOLYBDENUM	5	40 00		0 00	0	9 4300	6 6500	16 0000	10 1000
	NICKEL	5	100 00		0 00	0	4 9100	4 9000	9 8000	2 8500
	POTASSIUM	5	0 00		0 00	0	13128 0000	14100 0000	15000 0000	2100 0000

Table 3 Dissolved Metals
(Eighth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B3	SELENIUM	5	100 00		0 00	0	1 1400	0 7333	2 6667	0 7333
	SILICON	6	0 00		0 00	0	4330 0000	4535 0000	4710 0000	550 0000
	SILVER	5	100 00		0 00	0	2 3800	2 5000	3 7500	2 1500
	SODIUM	5	0 00		0 00	0	30220 0000	31000 0000	36000 0000	6400 0000
	STRONTIUM	5	0 00		0 00	0	168 6000	156 0000	230 0000	19 0000
	THALLIUM	4	100 00		0 00	0	0 6750	0 6500	0 9333	0 3833
	TIN	5	100 00		0 00	0	10 1900	7 4000	19 4500	5 6000
	VANADIUM	5	60 00		0 00	0	4 6500	3 8000	9 0000	2 0500
	ZINC	5	20 00		0 00	0	45 4600	55 8000	58 9000	7 0000
B4/B5	ALUMINUM	53	54 72	87	7 55	0	35 9255	20 9091	61 0000	24 0000
	ANTIMONY	56	92 86		0 00	0	11 4437	9 0288	21 1000	11 2806
	ARSENIC	54	81 48		0 00	0	1 4139	1 2707	2 6667	1 2621
	BARIUM	53	3 77		0 00	0	63 7689	62 0000	83 0000	12 4000
	BERYLLIUM	54	96 30		0 00	0	0 5598	0 4896	0 8542	0 5208
	CADMIUM	45	95 56		0 00	0	1 5067	1 3846	2 4375	1 2933
	CALCIUM	54	0 00		0 00	0	41521 2963	41050 0000	46600 0000	6800 0000
	CESIUM	48	85 42		0 00	2	90 4935	45 3125	200 0000	63 3000
	CHROMIUM	54	94 44		0 00	0	2 4296	1 9412	4 6667	2 4412
	COBALT	54	87 04		0 00	1	2 6396	2 0000	5 0000	2 1333
	COPPER	54	59 26		0 00	0	5 0167	3 4667	8 9000	4 9333

Table 3· Dissolved Metals
(Ninth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B4/B5	IRON	53	60 38	300	0 00	0	21 4396	11 5000	37 7000	20 8000
	LEAD	54	61 11		0 00	0	1 3537	0 9423	2 1500	1 3000
	LITHIUM	43	23 26		0 00	3	13 6313	8 9500	22 7000	8 1000
	MAGNESIUM	54	0 00		0 00	0	8693 7963	8485 0000	9380 0000	1090.0000
	MANGANESE	54	12 96	50	27 78	0	45 2954	15 4500	110 0000	58 4000
	MERCURY	53	96 23		0 00	0	0 1047	0 1020	0 1765	0 1020
	MOLYBDENUM	43	51 16		0 00	3	12 7200	6 4500	13 2667	6 2750
	NICKEL	54	92 59		0 00	0	4 9694	3 7500	9 0000	4 0000
	POTASSIUM	54	1 85		0 00	0	9559 0741	9525 0000	11400 0000	2550 0000
	SELENIUM	54	90 74		0 00	0	1 4806	1.0819	2 5000	1 2639
	SILICON	9	0 00		0 00	0	3910 0000	4150 0000	4320 0000	740 0000
	SILVER	54	98 15		0 00	0	1 8204	1 5817	3 3000	1 7917
	SODIUM	54	0 00		0 00	0	32759.2593	32600 0000	37200 0000	6000 0000
	STRONTIUM	42	9 52		0 00	0	243 5476	230 0000	268.0000	40 0000
	THALLIUM	53	96 23		0 00	0	2 2132	0 9000	4 2857	1 5929
	TIN	43	83.72		0 00	3	27 3813	9 0476	22 5250	7 7583
	VANADIUM	54	51 85		0 00	1	3 4698	3 5000	5 4000	2 5455
	ZINC	53	15 09		0 00	0	27 6302	23 8000	44 2000	18 5000

Table 3 Dissolved Metals
(Tenth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C1	ALUMINUM	4	100 00	87	0 00	0	33 7250	28 9500	72 0000	40 5500
	ANTIMONY	5	80 00		0 00	0	12 9400	11 0000	21 1000	8 5333
	ARSENIC	4	100 00		0 00	0	0 9750	0 8000	2 0000	1 0500
	BARIUM	5	0 00		0 00	0	85 8000	88 6000	110 0000	12 6000
	BERYLLIUM	5	100 00		0 00	0	0 3600	0 3333	0 6667	0 0333
	CADMIUM	3	100 00		0 00	0	1 7667	1 6500	2 3000	0 9500
	CALCIUM	5	0 00		0 00	0	46120 0000	47200 0000	48800 0000	3400 0000
	CESIUM	5	80 00		0 00	0	173 0000	125 0000	375 0000	160 0000
	CHROMIUM	5	100 00		0 00	0	1 7700	1 3667	2 7500	1 4000
	COBALT	5	100 00		0 00	0	1 8500	1 3333	3 6500	1 2000
	COPPER	5	60 00		0 00	0	4 4500	2 7000	9 7000	4 1500
	IRON	5	40 00	300	0 00	0	35 5300	38 0000	67 0000	24 7000
	LEAD	5	60 00		0 00	0	1 0100	0 7000	1 8000	1 1000
	LITHIUM	5	20 00		0 00	0	8 4700	8 8000	10 2000	2 2000
	MAGNESIUM	5	0 00		0 00	0	9284 0000	9400 0000	10200 0000	1490 0000
	MANGANESE	5	0 00	50	80 00	0	77 0400	92 0000	114 0000	41 2000
	MERCURY	5	100 00		0 00	0	0 1000	0 1000	0 1667	0 0667
	MOLYBDENUM	5	100 00		0 00	0	2 8400	2 0000	5 0000	1 9000
	NICKEL	5	100 00		0 00	0	3 8300	2 5000	7 3500	3 3500
	POTASSIUM	5	40 00		0 00	0	1522 0000	1600 0000	2100 0000	493 3333

Table 3 Dissolved Metals
(Eleventh of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C1	SELENIUM	5	80 00		0 00	0	1 2700	1 2000	2 6667	0 7333
	SILICON	7	0 00		0 00	0	6058 5714	6270 0000	6810 0000	1450 0000
	SILVER	5	100 00		0 00	0	2 3800	2 5000	3 7500	2 1500
	SODIUM	5	0 00		0 00	0	23420 0000	24000 0000	27000 0000	6000 0000
	STRONTIUM	5	0 00		0 00	0	245 6000	250 0000	270 0000	15 0000
	THALLIUM	4	100 00		0 00	0	0 6750	0 6500	0 9333	0 3833
	TIN	5	100 00		0 00	0	9 2500	6 5000	19 4500	4 3667
	VANADIUM	5	100 00		0 00	0	2 1900	1 9000	3 8000	1 9167
	ZINC	5	80 00		0 00	0	3 6200	2 5000	9 6000	2 1000
C2	ALUMINUM	51	52 94	87	1 96	0	35 2284	17 0500	35 5000	22 6000
	ANTIMONY	52	84 62		0 00	0	12 4058	10 0500	22 2727	11 7045
	ARSENIC	52	53 85		0 00	0	2 0817	2 0000	3 5000	1 8500
	BARIUM	52	1 92		0 00	0	72 5135	72 1000	87 1000	16 2000
	BERYLLIUM	52	100 00		0 00	0	0 5500	0 5100	0 8800	0 5000
	CADMIUM	46	97 83		0 00	0	1 5033	1 3810	2 5000	1 2857
	CALCIUM	52	0 00		0 00	0	41379 8077	40000 0000	54000 0000	15350 0000
	CESIUM	44	81 82		0 00	2	77 1476	39 7368	166 6667	58 9474
	CHROMIUM	52	96 15		0 00	0	2 3856	1 8831	4 3750	2 3030
	COBALT	52	100 00		0 00	1	2 2784	1 7333	4 0000	2 0000
	COPPER	52	55 77		0 00	0	6 5519	3 6667	12 5000	7 0667

Table 3 Dissolved Metals
(Twelfth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C2	IRON	51	60 78	300	0 00	0	21 0147	5 7333	50 0000	27 6000
	LEAD	52	69 23		0 00	0	1 1269	0 8448	2 0000	1 2690
	LITHIUM	39	23 08		0 00	2	12 2500	10 0000	13 0000	3 4000
	MAGNESIUM	52	0 00		0 00	0	14909 6154	14850 0000	16900 0000	2250 0000
	MANGANESE	52	9 62	50	51 92	0	120 0654	57 5000	193 0000	149 2500
	MERCURY	50	92 00		0 00	0	0 1198	0 1089	0 1867	0 1111
	MOLYBDENUM	39	82 05		0 00	2	7 4784	4 4000	14 4444	6 7000
	NICKEL	52	96 15		0 00	0	4 9856	3 0909	10 0000	4 7159
	POTASSIUM	52	1 92		0 00	0	6217 0192	6220 0000	7180 0000	1122 5000
	SELENIUM	51	90 20		0 00	0	1 5304	1 1111	2 7368	1 2697
	SILICON	4	0 00		0 00	0	949 0000	811 0000	1370 0000	286 0000
	SILVER	52	98 08		0 00	0	1 7769	1 5625	3 2000	1 6775
	SODIUM	52	0 00		0 00	0	51372 1154	52100 0000	59400 0000	11500 0000
	STRONTIUM	41	7 32		0 00	0	338 5976	331 0000	402 0000	56 0000
	THALLIUM	52	96 15		0 00	0	2 5894	1 1000	6 0000	2 5952
	TIN	39	82 05		0 00	2	13 7797	10 0000	23 9000	8 8889
	VANADIUM	52	78 85		0 00	1	2 2588	2 0000	4 0000	2 5000
	ZINC	51	56 86		0 00	0	11 9275	3 1333	14 1000	7 2333

Table 3 Dissolved Metals
(Thirteenth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
LANDFILL	ALUMINUM	16	87 50	87	0 00	0	40 2062	20 9250	73 8000	46 7500
	ANTIMONY	16	87 50		0 00	1	18 9833	15 0000	30 0000	17 1333
	ARSENIC	14	64 29		0 00	0	2 2643	1 5000	4 6000	1 7667
	BARIUM	16	0 00		0.00	0	580 3750	570 0000	641 0000	84 0000
	BERYLLIUM	14	92 86		0 00	0	1 2679	0 5250	2 5000	0 9167
	CADMIUM	16	93 75		0 00	1	2 0633	1 6500	3 3333	1 7167
	CALCIUM	16	0 00		0 00	0	148125 000	141500 000	163000 000	22500 000
	CESIUM	16	93 75		0 00	5	167 1364	100 0000	357 1429	214 2857
	CHROMIUM	16	93 75		0 00	0	5 6000	2 8250	10 2500	7 3333
	COBALT	16	62 50		0 00	3	5 3808	4 7000	12 6000	4 2333
	COPPER	16	87 50		0 00	0	5 3375	3 6500	10 0000	5.2917
	IRON	16	0 00	300	100 00	0	68293 7500	69200 0000	78600 0000	13000.0000
	LEAD	16	75 00		0 00	0	2 5812	0 8417	3 8000	1 8917
	LITHIUM	16	25 00		0 00	0	45 8844	38 9500	75 0000	11.5000
	MAGNESIUM	16	0 00		0 00	0	34400 0000	32750.0000	40600 0000	7650 0000
	MANGANESE	16	0 00	50	100 00	0	1568 7500	1500 0000	1740 0000	300.0000
	MERCURY	16	100 00		0 00	0	0 0969	0 0938	0 1625	0 0938
	MOLYBDENUM	16	87 50		0 00	1	17 0600	6 5000	40 0000	17 1500
	NICKEL	16	81 25		0 00	0	10 2125	7 2417	16 7000	9 6917
	POTASSIUM	16	12 50		0 00	0	5575 0000	5835 0000	6370 0000	1235 0000

Table 3 Dissolved Metals
(Fourteenth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
LANDFILL	SELENIUM	15	100 00		0 00	1	1 3571	1 1000	2 5000	0 8500
	SILICON	11	0 00		0 00	0	10000 0000	10300 0000	10900 0000	1230 0000
	SILVER	16	93 75		0 00	1	3 6833	2 5000	5 0000	2 8667
	SODIUM	16	0 00		0 00	0	71400 0000	67200 0000	83600 0000	15500 0000
	STRONTIUM	16	6 25		0 00	0	927 1875	924 0000	1130 0000	181 0000
	THALLIUM	16	100 00		0 00	0	1 8094	1 1667	2 5000	1 2917
	TIN	16	68 75		0 00	0	85 4844	25 3667	183 0000	55 5167
	VANADIUM	16	68 75		0 00	3	5 6115	3 5000	9 5500	3 9667
	ZINC	16	0 00		0 00	0	1637 4375	1590 0000	2260 0000	785 0000

Table 4 Water Quality Parameters
(First of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
BACKGROUND	BICARBONATE	55	0 00		0 00	0	89 9073	86 0000	130 0000	54 0000
	BICARBONATE AS CACO3	73	0 00		0 00	0	89 4890	90 0000	115 0000	30 0000
	CARBONATE	58	98 28		0 00	0	2 6486	2 5000	4 4118	2 7451
	CARBONATE AS CACO3	70	70 00		0 00	20	4 8700	4 4318	8 4091	5.8818
	CHLORIDE	127	6 30	250000	0 00	0	17 0756	12 0000	29 0000	16 4000
	CYANIDE	106	97 17	5	0 00	0	0 0081	0 0048	0 0098	0 0065
	DISSOLVED ORGANIC CARBON	9	0 00		0 00	0	5 7778	5 0000	8 0000	3 0000
	FLUORIDE	76	7 89	2000	0 00	0	0 3393	0 3200	0 4300	0.0950
	NITRATE	2	50 00	10000	0 00	0	0 1500	0 1500	0 2500	0 2000
	NITRATE/NITRITE	125	42 40	10000	0 00	0	0 3893	0 1000	0 8700	0 5079
	NITRITE	75	96 00	500	0 00	0	0 0116	0 0100	0 0179	0 0108
	OIL AND GREASE	80	73 75		0 00	0	2.9937	2.6750	4 7000	3.1583
	ORTHOPHOSPHATE	67	94 03		0 00	0	0 0211	0.0170	0 0404	0.0277
	PHOSPHORUS	76	61 84		0 00	0	0 0372	0.0282	0 0600	0 0317
	SILICA	24	8 33		0 00	0	8 0171	4.7000	12 0000	7 9000
	SULFATE	127	1 57	250000	0 00	0	19 3929	17 8000	27.0000	12 0000
	SULFIDE	55	89 09	2	9 09	5	0 7800	0 5667	0 9556	0 5556
	TOTAL DISSOLVED SOLIDS	125	0 00		0 00	0	174 168	160 000	212 0000	50 0000
	TOTAL ORGANIC CARBON	19	0 00		0 00	0	6 5737	6 0000	11 3000	5 1000
	TOTAL SUSPENDED SOLIDS	132	37 12		0 00	0	21 1174	7 0000	26 0000	12 0455

Table 4 Water Quality Parameters
(Second of thirteen pages)

Pond	Analyte	Sample Size	Percent Non Detect	CWQCC Standard	Percent Above Standard	Number of Non Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A1/A2	AMMONIA	10	10 00	60	0 00	0	0 4850	0 3850	0 5200	0 2200
	BICARBONATE AS CACO3	14	0 00		0 00	0	183 057	194 500	253 0000	59 0000
	CARBONATE AS CACO3	14	7 14		0 00	0	75 3714	75 4500	85 8000	41 4000
	CHLORIDE	14	0 00	250000	0 00	0	129 143	127 500	142 0000	16 0000
	CYANIDE	14	100 00	5	0 00	0	0 0061	0 0054	0 0092	0 0050
	DISSOLVED ORGANIC CARBON	6	0 00		0 00	0	16 1667	16 5000	17 0000	2 0000
	FLUORIDE	12	0 00	2000	0 00	0	2 8833	2 7500	3 6000	0 4500
	HEXAVALENT CHROMIUM	8	100 00	11	0 00	0	0 0094	0 0088	0 0150	0 0088
	NITRATE/NITRITE	14	57 14	10000	0 00	0	0 1029	0 0833	0 1600	0 0758
	NITRITE	14	92 86	500	0 00	0	0 0114	0 0107	0 0171	0 0100
	OIL AND GREASE	14	78 57		0 00	0	3 9000	3 0500	6 1000	1 2500
	ORTHOPHOSPHATE	14	64 29		0 00	0	0 0460	0 0375	0 0850	0 0640
	PHOSPHORUS	14	21 43		0 00	0	0 0825	0 0745	0 1200	0 0700
	SULFATE	14	0 00	250000	0 00	0	163 0786	153 5000	212 0000	118 0000
	SULFIDE	14	100 00	2	0 00	0	0 5000	0 5000	0 8000	0 4667
	TOTAL DISSOLVED SOLIDS	14	0 00		0 00	0	703 8571	694 0000	782 0000	88 0000
	TOTAL ORGANIC CARBON	6	0 00		0 00	0	19 1667	19 5000	21 0000	2 0000
	TOTAL SUSPENDED SOLIDS	14	28 57		0 00	0	8 7143	7 0000	14 0000	8 0000

Table 4 Water Quality Parameters
(Third of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	ALKALINITY AS CACO3	1	100 00		0 00	0	5 0000	5 0000	5 0000	0 0000
	AMMONIA	95	15 79	60	0 00	0	2 5453	1 3000	5 5000	3 6800
	BICARBONATE	25	0 00		0 00	0	106 7600	106 0000	125 0000	30 0000
	BICARBONATE AS CACO3	31	3 23		0 00	0	104 4774	112.0000	135 0000	40.0000
	CARBONATE AS CACO3	35	97 14		0 00	0	5 5429	4 6875	8 4375	5 0000
	CHLORIDE	53	0 00	250000	0 00	0	49 5264	46 0000	61 0000	18.0000
	CYANIDE	13	92 31	5	0 00	0	2 8731	0 0150	10 0000	5 5607
	DISSOLVED ORGANIC CARBON	3	0 00		0 00	0	5 0000	5 0000	6 0000	2.0000
	FLUORIDE	55	43 64	2000	0 00	0	0 4077	0 4400	0.6000	0 2200
	HEXAVALENT CHROMIUM	30	100 00	11	0 00	1	0 0053	0 0054	0 0088	0 0046
	HYDROGEN SULFIDE	1	100 00		0 00	0	0 5000	0 5000	0 5000	0 0000
	NITRATE	4	0 00	10000	0 00	0	110.7000	4 9000	430.0000	214.6000
	NITRATE/NITRITE	107	0 93	10000	0 00	0	2.9416	3.2000	4.2000	2.1000
	NITRITE	55	7 27	500	0 00	0	0 1247	0 0700	0.1800	0 1000
	OIL AND GREASE	17	82 35		0 00	0	5 1588	3 0500	6 3000	2.0000
	ORTHOPHOSPHATE	44	70 45		0 00	0	0 0315	0.0172	0 0600	0 0341
	PHOSPHATE	31	54 84		0 00	0	0 0355	0 0200	0 0660	0 0513
	PHOSPHORUS	16	50 00		0 00	0	0 0689	0 0417	0 1000	0 0700

Table 4 Water Quality Parameters
(Fourth of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	SILICON	10	0 00		0 00	0	4 0200	4 0000	4 2000	0 0000
	SULFATE	53	0 00	250000	0 00	0	57 2660	54 0000	68 0000	20 0000
	SULFIDE	9	100 00	2	0 00	0	0 5000	0 5000	0 8000	0 4000
	TOTAL ALKALINITY	46	2 17		0 00	0	104 0326	105 0000	125 0000	35 0000
	TOTAL DISSOLVED SOLIDS	55	0 00		0 00	0	320 5091	300 0000	350 0000	80 0000
	TOTAL ORGANIC CARBON	3	0 00		0 00	0	6 6667	7 0000	8 0000	3 0000
	TOTAL SUSPENDED SOLIDS	383	46 48		0 00	0	8 5561	4 6094	16 0000	9 0469
B1/B2	AMMONIA	10	0 00	60	0 00	0	0 7100	0 4050	0 7800	0 3400
	BICARBONATE AS CACO3	14	0 00		0 00	0	96 7786	89 8000	148 0000	76 5000
	CARBONATE AS CACO3	14	21 43		0 00	0	63 1786	58 0000	106 0000	87 7000
	CHLORIDE	14	0 00	250000	0 00	0	76 4500	81 2500	88 6000	15 9000
	CYANIDE	14	100 00	5	0 00	0	0 0075	0 0069	0 0125	0 0063
	DISSOLVED ORGANIC CARBON	6	0 00		0 00	0	13 3333	14 0000	16 0000	3 0000
	FLUORIDE	14	0 00	2000	0 00	0	0 9750	1 0000	1 1000	0 1800
	HEXAVALENT CHROMIUM	8	100 00	11	0 00	0	0 0100	0 0100	0 0156	0 0089
	HYDROGEN SULFIDE	2	100 00		0 00	0	0.5000	0 5000	0 6667	0 3333
	NITRATE/NITRITE	14	85 71	10000	0 00	0	0 0771	0 0577	0 0923	0 0538
	NITRITE	14	85 71	500	0 00	0	0 0164	0 0115	0 0185	0 0108

Table 4 Water Quality Parameters
(Fifth of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B1/B2	OIL AND GREASE	14	92 86		0 00	0	3 2821	2 8750	3 3600	0 6000
	ORTHOPHOSPHATE	14	57 14		0 00	0	0 0589	0 0417	0 1000	0 0598
	PHOSPHATE	2	0 00		0 00	0	0 1415	0 1415	0 1900	0 0970
	PHOSPHORUS	14	14 29		0.00	0	0 1120	0.1085	0.1700	0.0830
	SODIUM SULFATE	2	0 00		0 00	0	23 7000	23 7000	28 7000	10 0000
	SULFATE	14	0 00	250000	0 00	0	21 9786	21 4000	30 9000	14 1000
	SULFIDE	14	100 00	2	0 00	0	0 5000	0.5000	0.8000	0 4667
	TOTAL DISSOLVED SOLIDS	14	0 00		0 00	0	338.2857	319.0000	374.0000	82 0000
	TOTAL ORGANIC CARBON	6	0 00		0 00	0	18 8333	18 5000	22.0000	7 0000
	TOTAL SUSPENDED SOLIDS	14	50 00		0 00	0	6 5357	5 1875	13 0000	8 5000
B3	AMMONIA	3	0 00	60	0 00	0	15 3333	19 3000	23 0000	19 3000
	BICARBONATE AS CACO3	6	0 00		0 00	0	100 8167	111 0000	142 0000	40.3000
	CARBONATE AS CACO3	6	100 00		0 00	0	5 0000	5 0000	8 5714	4 2857
	CHLORIDE	6	0 00	250000	0 00	0	55 9500	58 2000	64 6000	6.3000
	CYANIDE	6	100 00	5	0 00	0	0 0050	0 0050	0 0086	0.0043
	DISSOLVED ORGANIC CARBON	3	0 00		0.00	0	7.3333	8.0000	9 0000	4.0000
	FLUORIDE	6	0 00	2000	0 00	0	0 3467	0 3350	0.4200	0 0900
	HEXAVALENT CHROMIUM	3	100 00	11	0 00	0	0 0100	0 0100	0 0150	0 0100
	HYDROGEN SULFIDE	1	100 00		0 00	0	0 5000	0 5000	0 5000	0 0000
	NITRATE/NITRITE	5	0 00	10000	0 00	0	7.3200	8 7000	9.6000	1 9000
	NITRITE	4	0 00	500	0 00	0	0 6363	0 5450	1 4000	0 7475

Table 4 Water Quality Parameters
(Sixth of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B3	OIL AND GREASE	6	83 33		0 00	0	5 1750	3 0750	17 2000	0 8000
	ORTHOPHOSPHATE	6	0 00		0 00	0	0 2750	0 2850	0 3500	0 1000
	PHOSPHATE	1	0 00		0 00	0	0 2800	0 2800	0 2800	0 0000
	PHOSPHORUS	6	16 67		0 00	0	0 3075	0 3100	0 5100	0 1900
	SODIUM SULFATE	1	0 00		0 00	0	67 5000	67 5000	67 5000	0 0000
	SULFATE	6	0 00	250000	0 00	0	77 1500	75 0500	96 6000	17 0000
	SULFIDE	6	100 00	2	0 00	0	0 5000	0 5000	0 8571	0 4286
	TOTAL DISSOLVED SOLIDS	6	0 00		0 00	0	282 3333	285 0000	314 0000	44 0000
	TOTAL ORGANIC CARBON	3	0 00		0 00	0	13 0000	12 0000	19 0000	11 0000
	TOTAL SUSPENDED SOLIDS	6	66 67		0 00	0	3 5000	3 5000	6 0000	3 0000
B4/B5	2 3 7,8-TCDD	6	100 00		0 00	0	0 5675	0 5375	1 0500	0 4900
	AMMONIA	85	3 53	60	0 00	0	6 8512	5 9000	11 1000	6 0000
	BICARBONATE	36	0 00		0 00	0	109 2500	106 5000	135 0000	24 5000
	BICARBONATE AS CACO3	38	2 63		0 00	0	96 2789	97 5000	120 0000	31 6000
	CARBONATE AS CACO3	46	100 00		0 00	0	4 7935	4 6591	8 4091	5 0000
	CHLORIDE	67	0 00	250000	0 00	0	48 0313	43 0000	62 0000	20 0000
	CYANIDE	16	68 75	5	31 25	0	9 3591	3 7500	29 4000	14 7433
	DISSOLVED ORGANIC CARBON	17	0 00		0 00	0	6 2353	6 0000	7 0000	1 0000
	FLUORIDE	68	47 06	2000	0 00	0	0 3958	0 4297	0 6000	0 2972
	HEXAVALENT CHROMIUM	51	98 04	11	0 00	0	0 0055	0 0053	0 0089	0 0052

Table 4 Water Quality Parameters
(Seventh of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B4/B5	HYDROGEN SULFIDE	1	100.00		0.00	0	0.5000	0.5000	0.5000	0.0000
	NITRATE	3	0.00	10000	0.00	0	2.7667	2.6000	3.2000	0.7000
	NITRATE/NITRITE	94	3.19	10000	0.00	0	3.3593	3.2000	4.3000	1.4000
	NITRITE	64	0.00	500	0.00	0	0.4095	0.3350	0.6800	0.3800
	OIL AND GREASE	30	83.33		0.00	0	4.1817	2.7974	5.4000	2.2105
	ORTHOPHOSPHATE	45	17.78		0.00	0	0.0941	0.0800	0.1600	0.0967
	PHOSPHATE	42	42.86		0.00	0	0.1207	0.0350	0.2900	0.1642
	PHOSPHORUS	30	6.67		0.00	0	0.1773	0.1700	0.2800	0.1300
	SILICA, DISSOLVED	2	0.00		0.00	0	6.2000	6.2000	9.0000	5.6000
	SILICON	14	0.00		0.00	0	4.2857	4.0000	5.0000	1.0000
	SODIUM SULFATE	1	0.00		0.00	0	69.9000	69.9000	69.9000	0.0000
	SULFATE	66	0.00	250000	0.00	0	58.3333	58.5000	74.0000	24.0000
	SULFIDE	20	95.00	2	0.00	0	0.5300	0.5526	0.8684	0.4737
	TOTAL ALKALINITY	60	0.00		0.00	0	105.8750	102.0000	133.5000	22.5000
	TOTAL DISSOLVED SOLIDS	70	0.00	-	0.00	0	348.0429	279.0000	340.0000	80.0000
	TOTAL ORGANIC CARBON	17	0.00	.	0.00	0	8.4118	8.0000	10.0000	1.0000
	TOTAL SUSPENDED SOLIDS	242	13.64		0.00	0	16.4649	11.2500	30.0000	15.0000

Table 4 Water Quality Parameters
(Eighth of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C1	ALKALINITY AS CACO3	1	0 00		0 00	0	165 0000	165 0000	165 0000	0 0000
	AMMONIA	7	28 57	60	0 00	0	0 3186	0 2600	0 4100	0 2787
	BICARBONATE	1	0 00		0 00	0	165 0000	165 0000	165 0000	0 0000
	BICARBONATE AS CACO3	6	0 00		0 00	0	141 0167	153 0000	194 0000	44 0000
	CARBONATE AS CACO3	7	85 71		0 00	0	6 2143	5 7143	8 5714	5 7143
	CHLORIDE	7	0 00	250000	0 00	0	24 9000	24 6000	29 3000	8 7000
	CYANIDE	7	100 00	5	0 00	0	0 0071	0 0060	0 0100	0 0060
	DISSOLVED ORGANIC CARBON	4	0 00		0 00	0	5 5000	5 5000	7 0000	2 0000
	FLUORIDE	7	0 00	2000	0 00	0	0 4529	0 4500	0 4900	0 0700
	HEXAVALENT CHROMIUM	4	100 00	11	0 00	0	0 0088	0 0075	0 0150	0 0075
	NITRATE/NITRITE	7	100 00	10000	0 00	0	0 0500	0 0500	0 0750	0 0500
	NITRITE	7	100 00	500	0 00	0	0 0100	0 0100	0 0150	0 0100
	OIL AND GREASE	7	85 71		0 00	0	3 4714	3 0500	3 3000	0 6500
	ORTHOPHOSPHATE	7	85 71		0 00	0	0 0294	0 0286	0 0429	0 0286
	PHOSPHORUS	6	50 00		0 00	0	0 0388	0 0438	0 0540	0 0290
	SULFATE	7	0 00	250000	0 00	0	17 9286	15 8000	23 6000	10 1000
	SULFIDE	7	85 71	2	0 00	0	0 4829	0 5000	0 6667	0 3867
	TOTAL DISSOLVED SOLIDS	7	0 00		0 00	0	240 2857	256 0000	256 0000	36 0000
	TOTAL ORGANIC CARBON	4	0 00		0 00	0	8 2500	7 5000	12 0000	4 5000
	TOTAL SUSPENDED SOLIDS	7	14 29		0 00	0	15 5000	18 0000	18 0000	8 0000

Table 4 Water Quality Parameters
(Ninth of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C2	2,3,7,8-TCDD	6	100 00		0 00	0	2 1858	0 7500	6 5000	4,2100
	AMMONIA	61	39 34	60	0 00	0	1 2052	0 4474	2 8000	1 2158
	BICARBONATE	37	0 00		0 00	0	173 7297	168 0000	205 0000	38 0000
	BICARBONATE AS CACO3	27	3 70		0 00	0	141 3293	140 0000	180,0000	46,0000
	CARBONATE AS CACO3	40	100 00		0 00	0	4 7625	4 6053	8 2895	5 0000
	CHLORIDE	59	0 00	250000	0 00	0	49 5593	50,0000	56 0000	9,0000
	CYANIDE	10	100 00	5	0 00	0	5 1750	5 0000	8 8889	5 5556
	DISSOLVED ORGANIC CARBON	13	0 00	.	0 00	0	8 1538	8 0000	10,0000	2 0000
	FLUORIDE	58	3 45	2000	0 00	0	0 6517	0 6000	0 8000	0 1000
	HEXAVALENT CHROMIUM	45	97 78	11	0 00	0	0 0057	0 0052	0 0089	0 0050
	NITRATE	3	0 00	10000	0 00	0	104 4000	1 9000	310 0000	308 7000
	NITRATE/NITRITE	64	71 88	10000	0.00	0	0 2347	0,0638	0 3400	0,0713
	NITRITE	51	94 12	500	0 00	0	0 0075	0 0059	0 0100	0 0059
	OIL AND GREASE	21	61 90		0 00	0	6 2524	3 9286	12 0000	5 9571
	ORTHOPHOSPHATE	29	51 72		0 00	0	0 0354	0 0200	0 0850	0 0438
	PHOSPHATE	34	47 06		0 00	0	0,0404	0 0100	0 1100	0.0747
	PHOSPHORUS	20	5 00		0 00	0	0 1308	0,0900	0 1900	0 1100
	SILICA, DISSOLVED	3	0 00		0 00	0	6 2000	6 0000	9 0000	5,4000
	SILICON	11	54 55		0 00	0	1 9091	1 7143	4 0000	2 1429

Table 4 Water Quality Parameters
(Twelfth of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
LANDFILL	HEPTACHLOR	1	100 00		0 00	0	0 0000	0 0000	0 0000	0 0000
	HEPTACHLOR EPOXIDE	2	100 00		0 00	0	0 0000	0 0000	0 0000	0 0000
	METHOXYCHLOR	2	100 00		0 00	0	0 0003	0 0003	0 0003	0 0000
	NITRATE	1	100 00	10000	0 00	0	0 0500	0 0500	0 0500	0 0000
	NITRATE/NITRITE	16	50 00	10000	0 00	0	0 1856	0 0950	0 5100	0 1700
	NITRITE	12	50 00	500	0 00	0	0 0294	0 0280	0 0500	0 0295
	OIL AND GREASE	18	61 11		0 00	0	4 9417	2 0333	4 1333	2 9500
	ORTHOPHOSPHATE	8	87 50		0 00	0	0 0318	0 0250	0 0429	0 0286
	PHOSPHATE	5	20 00		0 00	0	0 0960	0 1000	0 1500	0 0100
	PHOSPHORUS	14	14 29		0 00	0	0 3308	0 1100	0 5900	0 2215
	SILICA, DISSOLVED	3	0 00		0 00	0	19 5667	8 3000	43 0000	35 6000
	SULFATE	16	75 00	250000	0 00	0	6 0469	2 5000	13 8000	8 7083
	SULFIDE	8	100 00	2	0.00	1	0 5000	0 5000	0.7500	0 5000
	TOTAL DISSOLVED SOLIDS	17	0 00		0 00	0	772 7059	760 0000	940 0000	142 0000
	TOTAL ORGANIC CARBON	4	0 00		0 00	0	21 7000	21 6500	24 5000	5 4000
	TOTAL SUSPENDED SOLIDS	16	0 00		0 00	0	400 5625	126 0000	750 0000	152 5000
	TOXAPHENE	2	100 00		0 00	0	0 0005	0 0005	0 0007	0 0003

Table 5 POND WATER IM/IRA VOA/SVOA PROPOSED CONTAMINANTS OF CONCERN

(First of six pages)

Site	Group	Analyte	CWQCC Standard	Sample Size	Percent Detect	Number of Exceedances	Mean (µg/L)
A1-A2	CLP Volatiles (1)	ACETONE		10	10	0	6 55
	CLP Semi-Volatiles (2)	BIS(2-ETHYLHEXYL)PHTHALATE	1 8	12	8 33	1	22 875
	Selected Compounds-EPA 502 2 (9)	1,2,3-TRICHLOROBENZENE		11	9 09	0	0 0555
	Selected Compounds-EPA 502 2 (9)	1,2,4-TRICHLOROBENZENE		12	8 33	0	0 0558
	Selected Compounds-EPA 502 2 (9)	BENZENE, 1,2,4-TRIMETHYL		11	9 09	0	0 0564
	Selected Compounds-EPA 502 2 (9)	HEXACHLOROBUTADIENE	0 45	12	8 33	0	0 07
	Selected Compounds-EPA 502 2 (9)	NAPHTHALENE	0 0028	12	8 33	1	0 1483
	Selected Compounds-EPA 502 2 (9)	TETRACHLOROETHENE	0 8	12	16 67	0	0 0792
	Selected Compounds-EPA 502 2 (9)	TRICHLOROETHENE	66	12	16 67	0	0 0817
	Selected Compounds-EPA 502 2 (9)	cis-1,3-DICHLOROPROPENE	10	12	8 33	0	0 08
	Selected Compounds-EPA 502 2 (9)	n-BUTYLBENZENE		11	9 09	0	0 1491
	Tri-Pesticides-EPA 619 (15)	ATRAZINE	3	12	83 33	0	1 0458

Table 5 POND WATER IM/IRA VOA/SVOA PROPOSED CONTAMINANTS OF CONCERN

(Second of six pages)

Site	Group	Analyte	CWQCC Standard	Sample Size	Percent Detect	Number of Exceedances	Mean (µg/L)
A3 A4	CLP Volatiles (1)	1,1 DICHLOROETHENE	0 057	132	0 76	1	2 6098
	CLP Volatiles (1)	METHYLENE CHLORIDE	4 7	132	6 82	9	2 9621
	CLP Volatiles (1)	TETRACHLOROETHENE	0 8	132	1 52	2	2 6212
	CLP Semi-Volatiles (2)	BIS(2-ETHYLHEXYL)PHTHALATE	1 8	33	6 06	2	5 4091
	Selected Compounds-EPA 502 2 (9)	1,1,1 TRICHLOROETHANE	200	16	6 25	0	0 0888
	Selected Compounds-EPA 502 2 (9)	1,1 DICHLOROETHENE	0 057	16	6 25	1	0 1381
	Selected Compounds-EPA 502 2 (9)	TETRACHLOROETHENE	0 8	16	6 25	0	0 08
	Herbicides-EPA 615 (11)	DICAMBA		12	58 33	0	0 83
	Herbicides-EPA 615 (11)	DICHLOROPROP		12	8 33	0	0 475
	Tri Pesticides-EPA 619 (15)	ATRAZINE	3	76	59 21	5	0 7281
	Tri Pesticides-EPA 619 (15)	SIMAZINE	4	64	12 5	0	0 1563

Table 5 POND WATER IM/IRA VOA/SVOA PROPOSED CONTAMINANTS OF CONCERN

(Third of six pages)

Site	Group	Analyte	CWQCC Standard	Sample Size	Percent Detect	Number of Exceedances	Mean (µg/L)
B1 B2	CLP Volatiles (1)	1,2-DICHLOROETHENE		16	6 25	0	2 9063
	CLP Volatiles (1)	ACETONE		13	30 77	0	37 0385
	CLP Volatiles (1)	METHYLENE CHLORIDE	4 7	16	12 5	2	4 875
	CLP Volatiles (1)	TRICHLOROETHENE	66	16	31 25	0	4 375
	CLP Volatiles (1)	cis-1,2-DICHLOROETHENE	70	1	100	0	3 3
	Selected Compounds-EPA 502 2 (9)	1,2,4-TRICHLOROBENZENE		12	8 33	0	0 0567
	Selected Compounds-EPA 502 2 (9)	CARBON TETRACHLORIDE	18	12	16 67	0	0 3083
	Selected Compounds-EPA 502 2 (9)	CHLOROFORM	6	12	58 33	0	0 2158
	Selected Compounds-EPA 502 2 (9)	NAPHTHALENE	0 0028	12	8 33	1	0 12
	Selected Compounds-EPA 502 2 (9)	TETRACHLOROETHENE	0 8	12	58 33	1	0 2133
	Selected Compounds-EPA 502 2 (9)	TOLUENE	1000	12	8 33	0	0 1333
	Selected Compounds-EPA 502 2 (9)	TRICHLOROETHENE	66	12	50	0	3 0775
	Selected Compounds-EPA 502 2 (9)	VINYL CHLORIDE	2	12	16 67	0	0 1783
	Selected Compounds-EPA 502 2 (9)	cis-1,2 DICHLOROETHENE	70	11	36 36	0	0 75
	Tri-Pesticides-EPA 619 (15)	ATRAZINE	3	12	8 33	0	0 3033

Table 5
(Fourth of six pages)

POND WATER IM/IRA VOA/SVOA PROPOSED CONTAMINANTS OF CONCERN

Site	Group	Analyte	CWQCC Standard	Sample Size	Percent Detect	Number of Exceedances	Mean (µg/L)
B3	CLP Volatiles (1)	ACETONE		6	16 67	0	8 1667
	CLP Volatiles (1)	CHLOROFORM	6	6	16 67	0	3
	CLP Volatiles (1)	METHYLENE CHLORIDE	4 7	6	16 67	1	3 6667
	CLP Pesticides/PCBs (7)	HEPTACHLOR	0 00021	6	16 67	0	0 0219
	CLP Pesticides/PCBs (7)	alpha-BHC	0 0039	6	16 67	0	0 0219
	CLP Pesticides/PCBs (7)	alpha-CHLORDANE		6	16 67	0	0 2192
	CLP Pesticides/PCBs (7)	beta-BHC	0 014	6	16 67	0	0 0219
	CLP Pesticides/PCBs (7)	gamma BHC (LINDANE)	0 019	6	16 67	0	0 0219
	CLP Pesticides/PCBs (7)	gamma-CHLORDANE		6	16 67	0	0 2192
	Selected Compounds-EPA 502 2 (9)	1,4 DICHLOROBENZENE	75	5	60	0	0 092
	Selected Compounds-EPA 502 2 (9)	BROMODICHLOROMETHANE	0 3	5	40	0	0 17
	Selected Compounds-EPA 502 2 (9)	CHLOROFORM	6	5	100	0	2 9
	Selected Compounds-EPA 502 2 (9)	TETRACHLOROETHENE	0 8	5	60	0	0 04
	Selected Compounds-EPA 502 2 (9)	TRICHLOROETHENE	66	5	80	0	0 078
	Selected Compounds-EPA 502 2 (9)	cis-1,2-DICHLOROETHENE	70	4	25	0	0 08
	Tri-Pesticides-EPA 619 (15)	PROPAZINE		5	20	0	0 32

Table 5
(Fifth of six pages)

POND WATER IM/IRA VOA/SVOA PROPOSED CONTAMINANTS OF CONCERN

Site	Group	Analyte	CWQCC Standard	Sample Size	Percent Detect	Number of Exceedances	Mean (µg/L)
B4 B5	CLP Volatiles (1)	ACETONE		120	10	0	15 3575
	CLP Volatiles (1)	METHYLENE CHLORIDE	4 7	121	5 79	7	2 7967
	CLP Volatiles (1)	TETRACHLOROETHENE	0 8	121	1 65	2	2 5992
	CLP Semi-Volatiles (2)	BIS(2-ETHYLHEXYL)PHTHALATE	1 8	31	9 68	3	6 3161
	CLP Pesticides/PCBs (7)	alpha BHC	0 0039	18	5 56	0	0 0238
	CLP Pesticides/PCBs (7)	alpha-CHLORDANE		8	12 5	0	0 2238
	CLP Pesticides/PCBs (7)	beta-BHC	0 014	18	5 56	1	0 0268
	CLP Pesticides/PCBs (7)	gamma-BHC (LINDANE)	0 019	18	5 56	0	0 0238
	CLP Pesticides/PCBs (7)	gamma-CHLORDANE		8	12 5	0	0 2238
	Selected Compounds-EPA 502 2 (9)	CHLOROFORM	6	29	62 07	0	0 7428
	Selected Compounds-EPA 502 2 (9)	TETRACHLOROETHENE	0 8	28	25	0	0 1339
	Selected Compounds-EPA 502 2 (9)	TRICHLOROETHENE	66	29	27 59	0	0 3831
	Herbicides-EPA 615 (11)	DICAMBA		22	13 64	0	0 2195
	Tri-Pesticides-EPA 619 (15)	ATRAZINE	3	91	83 52	1	0 556
	Tri-Pesticides-EPA 619 (15)	SIMAZINE	4	80	15	0	0 1461
C1		NONE					
C2	CLP Volatiles (1)	METHYLENE CHLORIDE	4 7	105	6 67	7	2 8819
	CLP Volatiles (1)	TETRACHLOROETHENE	0 8	105	0 95	1	2 5857
	CLP Semi-Volatiles (2)	BIS(2-ETHYLHEXYL)PHTHALATE	1 8	23	17 39	4	8 3043
	Selected Compounds-EPA 502 2 (9)	1,1,1-TRICHLOROETHANE	200	22	9 09	0	0 1468
	Tri-Pesticides-EPA 619 (15)	ATRAZINE	3	68	66 18	0	0 2109

Table 5
(Sixth of six pages)

POND WATER IM/IRA VOA/SVOA PROPOSED CONTAMINANTS OF CONCERN

Site	Group	Analyte	CWQCC Standard	Sample Size	Percent Detect	Number of Exceedances	Mean (µg/L)
SW097*	CLP Volatiles (1)	1,1-DICHLOROETHANE		17	76 47	0	6 3824
	CLP Volatiles (1)	1,2-DICHLOROETHENE		17	35 29	0	4 3529
	CLP Volatiles (1)	2 BUTANONE		17	17 65	0	10 6471
	CLP Volatiles (1)	4 METHYL-2-PENTANONE		17	11 76	0	9 0294
	CLP Volatiles (1)	ACETONE		16	31 25	0	34 9063
	CLP Volatiles (1)	CARBON DISULFIDE		17	5 88	0	2 7059
	CLP Volatiles (1)	CHLOROETHANE		17	58 82	0	15 2353
	CLP Volatiles (1)	ETHYLBENZENE	680	17	82 35	0	12 9706
	CLP Volatiles (1)	METHYLENE CHLORIDE	4 7	17	29 41	5	15 6176
	CLP Volatiles (1)	TOLUENE	1000	17	88 24	0	44 3235
	CLP Volatiles (1)	TOTAL XYLENES		17	76 47	0	14 7647
	CLP Volatiles (1)	VINYL ACETATE		17	5 88	0	7 5882
	CLP Volatiles (1)	o XYLENE		3	66 67	0	5 1667
	CLP Semi-Volatiles (2)	2-METHYLNAPHTHALENE		3	100	0	22 3333
	CLP Semi Volatiles (2)	4 METHYLPHENOL		3	33 33	0	11
	CLP Semi-Volatiles (2)	NAPHTHALENE	0 0028	3	100	3	20 6667

*SW097=Landfill Pond

APPENDIX E

TABLE OF CONTENTS

TABLE E-1 A
POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS
GROUNDWATER QUALITY STANDARDS

TABLE E-1.A

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
GROUNDWATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			FEDERAL STANDARDS					STATE STANDARDS							
								CDH WQCC Groundwater Quality Standards (d)							
								Statewide	Site Specific (g)						
Parameter	Type (a)	Method (b)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goal	RCRA Subpart Limit (c)	Table (d) (f)	Table Human Health	Table 2 Secondary Drinking	Table 3 Agriculture	able TDS	Table 5 Chronic	Table 6 Radionuclides Woman Creek	Walnut Creek
Chloride		E325	250,000 (a)							250,000					
Cyanide (Free)		E335	200 (h)		200 (h)				200						
Fluoride		E340	4,000; 2,000* (a)		000 (a)				000		2,000				
N as Nitrate		E353.		000 (b)		0,000 (b)			000						
as Nitrate Nitrite	A	E353.		0,000 (b)		0,000 (b)					00,000				
as Nitrite	A	E354.		000 (b)		000 (b)			000		0,000				
Sulfate		E375.4	250,000* (a)							250,000					
Sulfide, H2S Undissociated		E376.													
Coliform (Fecal)	B	SM9221C	/100 ml (a)***						/100 ml						
Ammonia as	C	E350													
Dioxin	D	(5)	0E-5 (h)		0 (h)			00000022					3E-08		
Boron	E	SW6010(5B)									750				
Chlorine, Total Residual	E	SM4500													
Sulfur	E														
Dissolved Oxygen	FP	SM4500													
pH (Standard Units)	FP	E 50.	5-8. (a)							6.5-8.	6.5-8.				
Specific Conductance	FP	E120.													
Temperature (Degrees Celsius)	FP														
Alkalinity	IN	E31													
Asbestos	IN			7MF/l (b)		7MF/l (b)									
Total Dissolved Solids (TDS)	IN	E 60.	500,000* (a)									400,000 (1)			
Total Organic Carbon (TOC)	IN	E													
Aluminum		(5)		50 to 200* (b)							5,000				
Antimony	M	(5)	(h)		(h)										
Arsenic	M	(5)	50 (a)				50		50		00				
Arsenic	M														
Arsenic	M														
Barium	M	(5)	2,000 (a)			2,000 (a)	000		000						
Beryllium	M	(5)	(h)		(h)						00				
Cadmium		(5)	(a)	(b)		(b)					0				
Calcium	M	(5)													
Cesium	M	(5)													
Chromium	M	(5)	50 (a)	00 (b)		00 (b)	50		50		00				
Chromium III	M														
Chromium VI	M	E21													
Cobalt	M	(5)									50				
Copper	M	(5)	000 (a)	.300 (f)		300 (f)				.000	200				
Iron	M	(5)	300 (a)							300	5,000				
Lead	M	(5)	50 (a)	(f)		(f)	50		50		00				
Lithium	M	(5)									2,500				
Magnesium	M	(5)													
Manganese	M	(5)	50 (a)							50	200				
Mercury	M	(5)	(a)	(b)		(b)									
Molybdenum		(5)													
Nickel	M	(5)	00 (h)		00 (h)						200				
Potassium		(5)													
Selenium		(5)	(a)	50 (b)		50 (b)					20				
Silver	M	(5)	50 (a)	00 (b)			50		50						
Sodium		(5)													
Strontium		(5)													
Thallium	M	(5)	(h)		0. (h)										
Tin	M	(5)													
Titanium		SW6010(5B)													
ungsten		SW6010(5B)													
Vanadium	M	(5)									00				
Zinc		(5)	5,000 (a)							5,000	2,000				

TABLE E-1.A (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
GROUNDWATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			FEDERAL STANDARDS					STATE STANDARDS							
								CDH WQCC Groundwater Quality Standards (d)							
								Statewide	Site-Specific (g)						
Parameter	Type (4)	Method (5)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goal	RCRA Subpart Limit (c)	Table A (d) (f)	Table 1 Human Health	able 2 Secondary Drinking	Table 3 Agriculture	Table TDS	able Chronic	Table 6 Radionuclides Woman Creek	Table 6 Radionuclides Walnut Creek
Aldicarb			(i)		(i)										
Aldicarb Sulfone	P		(i)		(i)										
Aldicarb Sulfoxide			(i)		(i)										
Aldrin	P	(5)						002					0000784		
Carbofuran	P	(5C)		40 (b)		40 (b)		35							
Chloranil	P														
Chlordane	P	(5)		(b)		(b)		03					00046		
Chlorpyrifos	P	(5)													
DDT		(5)						0.					0.000024		
DDT Metabolite (DDD)		(5)													
DDT Metabolite (DDE)	P	(5)						0.1							
Demeton		(5)													
Diazinon		(5)													
Dieldrin	P	(5)						0.002					000071		
Endosulfan	P	(5)													
Endosulfan		(5)													
Endosulfan sulfate	P	(5)													
Endrin	P	(5)	(h)		2 (h)										
Endrin Aldehyde	P	(5B)						0.2							
Endrin Ketone	P	(5B)													
Guthion (Azinphos methyl)		(5)													
Heptachlor	P	(5)		(b)		(b)		0.008					00028		
Heptachlor Epoxide	P	(5)		(b)		(b)		0.09							
Hexachlorocyclohexane, Alpha	P	(5)						0.006					0092		
Hexachlorocyclohexane, Beta	P	(5)											0163		
Hexachlorocyclohexane (HCH or BHC)	P														
Hexachlorocyclohexane, Delta		(5)													
Hexachlorocyclohexane, Technical (Total)	P	(5E)											0123		
Hexachlorocyclohexane, Gamma (Lindane)	P	(5)	(a)	0.2 (b)		0. (b)		0.					0186		
Malathion		(5B)													
Methoxychlor		(5)	00 (a)	40 (b)		40 (b)	00	40							
Mirex															
Oxamyl (Vydate)	P		200 (h)		200 (h)										
Parathion	P	(5B)													
Toxaphene	P	(5)		(b)		(b)		03							
Vapenite	P														
Aroclor 01	PP	(5)													
Aroclor 221	PP	(5)													
Aroclor 232	PP	(5)													
Aroclor 1242	PP	(5)													
Aroclor 248	PP	(5)													
Aroclor 254	PP	(5)													
Aroclor 260	PP	(5)													
PCBs (Total)	PP	(5)		0. (b)		(b)		0.005					000079		
2, TP silver		(5C)	(a)	50 (b)		50 (b)		50							
2,4-Dichlorophenoxyacetic Acid (2, -D)	H	(5C)	00 (a)	70 (b)		70 (b)	00	70							
Acrolein															
Atrazine		(5D)		(b)		(b)									
Bromacil															
Dalapon		(5)	200 (h)		200 (h)										
Dinoseb	H	(5)	(h)		(h)										
Diquat	H		20 (h)		20 (h)										
Endothall			00 (h)		00 (h)										
Glyphosate			700 (h)		700 (h)										
Picloram			500 (h)		500 (h)										
Simazine	H	(5D)	(h)		(h)										
Americium (total) (pCi/l)	R													05	05
Americium 24 (pCi/l)														80	80
Cesium 34 (pCi/l)	R		(8)					80							
Cesium 37 (pCi/l)			(8)												

TABLE E-1.A (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
GROUNDWATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			FEDERAL STANDARDS					STATE STANDARDS							
								CDH WQCC Groundwater Quality Standards (d)							
								Statewide	Site-Specific (g)						
Parameter	Type (4)	Method (5)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goal	RCRA Subpart Limit (c)	Table A (d) (6)	Table 1 Human Health	Table 2 Secondary Drinking	Table 3 Agriculture	Table TDS	Table 5 Chronic	Table 6 Radionuclides Woman Creek	Table 6 Radionuclides Walnut Creek
Gross Alpha (pCi/l)			(a)(7)												
Gross Beta (pCi/l)			50 (a)(2)(8)						5(7)						
Plutonium (total) (pCi/l)									(8)						
Plutonium 238+239+240 (pCi/l)	R													05	05
Radium 226+228 (pCi/l)	R	(3)	20 (a)(8)												
Strontium 89+90 (pCi/l)			(a)(2)(8)												
Strontium 90 (pCi/l)			(a)(2)(8)												
Thorium 230+232 (pCi/l)			(a)(8)					60						60	60
Tritium (pCi/l)			20,000 (a)(2)(8)					20,000						500	500
Uranium 233+234 (pCi/l)	R														
Uranium 235 (pCi/l)															
Uranium 238 (pCi/l)															
Uranium (Total) (pCi/l)	R														
etrachlorobenzene	SV	(5B)													
2,4-Trichlorobenzene	SV	(5)	70 (h)		70 (h)										
-Dichlorobenzene (Ortho)	SV	(5)		600 (b)		600 (b)		620							
-Diphenylhydrazine	SV	(5B)						05							
3-Dichlorobenzene (Meta)	SV	(5)						620							
4-Dichlorobenzene (Para)	SV	(5)	75 (a)		75 (a)			75							
2, richlorophenol	SV	(5)													
2,4,6-Trichlorophenol	SV	(5)													
2,4-Dichlorophenol	SV	(5)						21							
2,4-Dimethylphenol	SV	(5)													
2,4-Dinitrophenol	SV	(5)													
2,4-Dinitrotoluene	SV	(5)													
6-Dinitrotoluene	SV	(5)													
2-Chloronaphthalene	SV	(5)													
2-Chlorophenol	SV	(5)													
2-Methylnaphthalene	SV	(5)													
2-Methylphenol	SV	(5)													
-Nitroaniline	SV	(5)													
-Nitrophenol	SV	(5)													
3, -Dichlorobenzidine	SV	(5)													
3-Nitroaniline	SV	(5)													
6-Dinitro-2-methylphenol	SV	(5)													
4-Bromophenyl-phenyl-ether	SV	(5)													
4-Chloroaniline	SV	(5)													
-Chlorophenyl-phenyl-ether	SV	(5)													
-Chloro-3-methylphenol	SV	(5)													
-Methylphenol	SV	(5)													
-Nitroaniline	SV	(5)													
-Nitrophenol	SV	(5)													
Acenaphthene	SV	(5)													
Anthracene	SV	(5)													
Benzidine	SV	(5bc)						0.0002					0001		
Benzoic Acid	SV	(5)													
Benzo(a)anthracene	SV	(5)													
Benzo(a)pyrene	SV	(5)	0.2 (h)		(h)										
Benzo(b)fluoranthene	SV	(5)													
Benzo(g,h,i)perylene	SV	(5)													
Benzo(k)fluoranthene	SV	(5)													
Benzyl Alcohol	SV	(5)													
bis(2-Chloroethoxy)methane	SV	(5)													
bis(Chloroethyl)ether	SV	(5)						03					0000037		
bis(2-Chloroisopropyl)ether	SV	(5)													
bis(2-Ethylhexyl)phthalate (Di(2-ethylhexyl)phthalate)	SV	(5)	(h)		(h)										
Butadiene	SV														
Butylbenzylphthalate	SV	(5)													
Chlorinated Ethers	SV	(5)													
Chlorinated Napthalenes	SV	(5)													
Chloroalkylethers	SV	(5)													

TABLE E-1.A (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
GROUNDWATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (a)	Method (f)	FEDERAL STANDARDS: SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goal	RCRA Subpart F Limit (c)	STATE STANDARDS: CDH WQCC Groundwater Quality Standards (d) — Statewide: Table A (d) (l)	Site-Specific (g): Table 1 Human Health	Table 2 Secondary Drinking	Table 3 Agriculture	Table 4 TDS	Table 5 Chronic	Table 6 Radionuclides: Woman Creek	Walnut Creek
Chlorophenol (Total)	SV	(5)													
Chrysene	SV	(5)													
Dibenzofuran	SV	(5)													
Dibenz(a,h)anthracene	SV	(5)													
Dichlorobenzenes	SV	(5)													
Dichlorobenzidine (Total)	SV	(5)											0.01		
Diethylphthalate	SV	(5)													
Di(2-ethylhexyl)adipate	SV	(5)	400 (h)		400 (h)										
Dimethylphthalate	SV	(5)													
Di-n-butylphthalate	SV	(5)													
Di-n-octylphthalate	SV	(5)													
Ethylene Glycol	SV	(5C)													
Fluoranthene	SV	(5)													
Fluorene	SV	(5)													
Formaldehyde	SV														
Haloethers	SV	(5)													
Hexachlorobenzene	SV	(5)	(h)		0 (h)			6					00072		
Hexachlorobutadiene	SV	(5)											45		
Hexachlorocyclopentadiene	SV	(5)	50 (h)		50 (h)										
Hexachloroethane	SV	(5)													
Hydrazine	SV														
Indeno(1,2,3-cd)pyrene	SV	(5)													
Isophorone	SV	(5)						050							
Naphthalene	SV	(5)													
Nitrobenzene	SV	(5)						3.5							
Nitrophenols	SV	(5)													
Nitrosamines	SV	(5)													
N-Nitrosodibutylamine	SV	(5B)											0064		
N-Nitrosodiethylamine	SV	(5B)											0008		
N-Nitrosodimethylamine	SV	(5B)											001		
N-Nitrosopyrrolidine	SV	(5B)											01		
-Nitrosodiphenylamine	SV	(5B)													
N-Nitroso-di-n-propylamine	SV	(5B)													
Pentachlorinated Ethanes	SV	(5B)													
Pentachlorobenzene	SV	(5B)						6 (d)							
Pentachlorophenol	SV	(5)		(e)		(e)		200							
Phenanthrene	SV	(5)													
Phenol	SV	(5)													
Phthalate Esters	SV	(5)													
Polynuclear Aromatic Hydrocarbons	SV	(5)											0028		
Pyrene	SV	(5)													
Vinyl Chloride		(5)	(a)		0 (a)										
Trichloroethane		(5)	200 (a)		200 (a)			200							
1 1,2,2-Tetrachloroethane	V	(5)													
.2-Trichloroethane		(5)	(h)		3 (h)										
-Dichloroethane	V	(5)													
-Dichloroethene		(5)	(a)		(a)										
.2-Dichloroethane		(5)	(a)		(a)										
.2-Dichloroethene (cis)	V	(5)		70 (b)		70 (b)		70							
.2-Dichloroethene (total)		(5)													
.2-Dichloroethene (trans)		(5)		00 (b)		00 (b)		00							
.2-Dichloropropane		(5)		(b)		(b)		0.56							
3-Dichloropropene (cis)		(5)													
3-Dichloropropene (trans)		(5)													
2-Butanone	V	(5)													
2-Hexanone	V	(5)													
4-Methyl-2-pentanone		(5)													
Acetone		(5)													
Acrylonitrile		(5)											000		
Benzene	V	(5)	(a)		0 (a)										
Bromodichloromethane		(5)	00* (a)					0.3							

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TABLE E-1.A (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
GROUNDWATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (4)	Method (5)	FEDERAL STANDARDS: SDWA Maximum Contaminant Level	FEDERAL STANDARDS: SDWA Maximum Contaminant Level	FEDERAL STANDARDS: SDWA Maximum Contaminant evel Goals	FEDERAL STANDARDS: SDWA Maximum Contaminant Level Goal	FEDERAL STANDARDS: RCRA Subpart Limit (c)	STATE STANDARDS, CDH WQCC Groundwater Quality Standards (d), Statewide: Table A (d) (f)	STATE STANDARDS, Site-Specific (g): Table 1 Human Health	Site-Specific: Table 2 Secondary Drinking	Site-Specific: Table 3 Agriculture	Site-Specific: Table TDS	Site-Specific: Table 5 Chronic	Site-Specific: Table 6 Radionuclides, Woman Creek	Site-Specific: Table 6 Radionuclides, Walnut Creek
Bromoform		(5)	00** (a)												
Bromomethane		(5)													
Carbon Disulfide		(5)													
Carbon etrachloride		(5)	(a)		(a)										
Chlorinated Benzenes	V/SV	(5)													
Chlorobenzene		(5)		00 (b)		00 (b)		00							
Chloroethane		(5)													
Chloroform		(5)	00** (a)												
Chloromethane		(5)													
Dibromochloromethane		(5)	00** (a)												
Dichloroethenes		(5)													
Ethyl Benzene		(5)		700 (b)		700 (b)		680							
Ethylene Dibromide	V	(5C)		05 (b)		(b)									
Ethylene Oide															
Halomethanes		(5)	00 (a)										0. 9		
Methylene Chloride		(5)	(h)		(h)										
Styrene		(5)		00 (b)		00 (b)									
Tetrachloroethanes		(5)													
Tetrachloroethene		(5)		(b)		(b)									
Toluene		(5)		000 (b)		000 (b)		000							
Trichloroethanes		(5)													
Trichloroethene		(5)	(a)		(a)			5							
Vinyl Acetate		(5)													
Xylenes (total)		(5)		0,000 (b)		0,000 (b)									

TABLE E-1.A (continued)

EXPLANATION OF TABLE A AND ENDNOTES

- = secondary maximum contaminant level TBC
- = total trihalomethanes chloroform, bromoform, bromodichloromothane dibromochloromethane
- = Positive sample no more than once/month (< 40 samples/month)

ARAR = Applicable on Relev nt and Appropriat Requireme t
CDH – Colorado Department of Health
CERCLA – Comprehensive Environmental Response Compensation and Liability Act
CFR Code of Federal Regulations
EPA = Environmental Protection Agency
NCP = National Contingency Plan
pCi/l = picocurie per liter
PCB = polychlorinated biphenyl
RFP = Rocky Flats Plant
SDWA = Safe Drinking Water Act
SW = Solid Waste
TIC = Tentatively Identified Compound
ug/l = micrograms per liter
WQCC = Water Quality Control Commission
MF/l = million fibers/liter

(1) TDS standard see Table 4 in (d) standard is 400 mg/l or 1 25 times the background level, whichever is least r strictive
(2) If both strontium-90 and tritium are present, the sum of their annual dose equivalents to bone marrow shall not exceed 4 mrem/yr
(3) MDL for Radium 226 is 0.5 MDL for radium 228 is 1
(4) Type abbreviations are A=anion B=bacteria C=cation D=dioxin E=element FP=field parameter H=herbicide IN=inorganic M=metal P=pesticide PP=pesticide/PCB R=radionuclide SV=semi-volatile V=volatile
(5) See Attachment 1 for analytical methods with corresponding analyt and detection limits
abbreviations are E=EPA, SW=SW846, A=detect d as total B=detected as TICs or with method modifications C=not outinely monitor d D=monitored i discharge ponds E= mixture-individual isomers detected
(6) Where the standard is below (more stringent than) the PQL, the PQL s interpreted to be compliance level
(7) Value for gross alpha excludes uranium
(8) Average annual concentration of beta particle and photon adi activity cannot xceed 4 millirem/year dose equivalent

(a) EPA National Primary and Secondary Drinking Wate Regulations 40 CFR 141 and 40 CFR 143 (as of 5/19/90)
(b) EPA National Primary and Secondary Drinking Water Regulations 40 CFR Parts 141 142, 143, Final Rule Effective July 30, 1992 (56 Federal Register 3526 1/30/1991)
(c) NCP 40 CFR 300 NCP Preamble 55 FR 8764 CERCLA Compliance with Other Laws Manual EPA/540/G-89/006, August 1988, 40 CFR 264 94
(d) CDH/Water Quality Control Commission, The Basic Standards for Ground Water 3.11 0 (5 CCR 1002-8) 1/5/1987 effective 11/30/1991 statewide radio ctive standards listed in 3.11 5(c)(2)
(e) EPA National Primary and Secondary Drinking Water Regulations 40 CFR Parts 141 142, 143, Final Rule Effective January 1 1993 (56 FR 30266 7/1/1991)
(f) EPA Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper 40 CFR 141 and 142 (56 FR 26460 6/7/91) and 57 FR 28785, 6/29/92 effective 12/7/92 and 11/6/91 Action le
MCLGs effective 11/6/91 Action level in 10% or le s of tap sample for small and medium-sized systems
(g) CDH/Water Quality Control Commission, Classifications and Water Quality Standards for Ground Water 3.12.0 (9/19/1991)
(h) EPA National Primary Drinking Water Regulations, 40 CFR 141 and 142, Final Rule Effective January 17 1994
(i) EPA National Primary Drinking Water Regulations, 40 CFR 141 Postponement of Final Rule and Reconsideration (57 FR 22178) no effective date stablished.

TABLE E-1 B
POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS
FEDERAL SURFACE WATER QUALITY STANDARDS

TABLE E-1 B

POTENTIAL CHEMICAL SPECIFIC BENCHMARKS (December 16 1992)
FEDERAL SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (7)	Method (8)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goals	CWA AWQC for Protection of Aquatic Life (c) Acute Value	CWA AWQC for Protection of Aquatic Life (c) Chronic Value	CWA AWQC for Protection of Human Health (c) Water and Fish Ingestion	CWA AWQC for Protection of Human Health (c) Fish Consumption Only
Chloride	A	E325	250 000 ( )				860 000 (i)	230 000 (q)		
Cyanide (Free)	A	E335	200 (h)		200 (h)		22	5.2	200	
Flouride	A	E340	4 000 2,000 ( )		4 000 (a)					
N as Nitrate	A	E353.1		10 000 (b)		10,000 (b)			10 000	
N as Nitrate+Nitrite	A	E353.1		10 000 (b)		10,000 (b)				
N as Nitrite	A	E354.1		1 000 (b)		1 000 (b)				
Sulfate	A	E375.4	250,000* (a)							
Sulfide H2S Undissociated	A	E376.1						2		
Coliform (Fecal)	B	SM9221C	1/100 ml (a)							
Ammonia as N	C	E350								
Dioxin	D	(8)	3.0E-5 (f)		0 (h)		0 01	0 00001	0 000000013	0 000000014
Boron	E	SW6010(8B)								
Chlorine Total Residual	E	SM4500					19	11		
Sulfur	F									
Dissolved Oxygen	FP	SM4500					5,000			
pH (Standard Units)	FP	E150.1	6.5-8.5 ( )					6.5-9		
Specific Conductance	FP	E120.1								
Temperature (Degrees Celsius)	FP						SS	SS		
Alkalinity	IN	E310.1						20 000		
Asbestos	IN			7MFL (b)		7MFL (b)				300 000 FA
Total Dissolved Solids	IN	E160.1	500 000* (a)				SS	SS	250 000	
Total Organic Carbon	IN	E415.1								
Aluminum	M	(8)		50 to 200* (b)			750	87		
Antimony	M	(8)	6 (h)		6 (h)		9 000	1 600	146	45,000
Arsenic	M	(8)	50 (a)						0 0022	0 0175
Arsenic III	M						360	190		
Arsenic V	M						850	48		
Barium	M	(8)	2,000 ( )		2,000 ( )				1 000	
Beryllium	M	(8)	4 (h)		4 (h)		130	5.3	0068	117*
Cadmium	M	(8)	10 (a)	5 (b)		5 (b)	3.9 (3)	1 1 (3)	10	
Calcium	M	(8)								
Cesium	M	(8)								
Chromium	M	(8)	50 (a)	100 (b)		100 (b)				
Chromium III	M						1 700 (3)	210 (3)	170 000	3 433 000
Chromium VI	M	E218.5					16	11	50	
Cobalt	M	(8)								
Copper	M	(8)	1 000 (a)	1 300 (f)		1 300 (f)	18 (3)	12 (3)		
Iron	M	(8)	300 (a)					1 000	300	
Lead	M	(8)	50 (a)	15 (f)		0 (f)	82 (3)	3.2 (3)	50	
Lithium	M	(8)								
Magnesium	M	(8)								
Manganese	M	(8)	50 (a)						50	100
Mercury	M	(8)	2 (a)	2 (b)		2 (b)	2.4	0.012	0.144	0 146
Molybdenum	M	(8)								
Nickel	M	(8)	100 (h)		100 (h)		1 400 (3)	160 (3)	13.4	100
Potassium	M	(8)								
Selenium	M	(8)	10 (a)	50 (b)		50 (b)	20 (d)	5 (d)	10	
Silver	M	(8)	50 (a)	100* (b)			4 1 (3)	0.12	50	
Sodium	M	(8)								
Strontium	M	(8)								
Thallium	M	(8)	2 (h)		0 5 (h)		1 400 (1)	40 (1)	13	48
Tin	M	(8)								
Titanium	M	SW6010(8B)								
Tungsten	M	SW6010(8B)								
Vanadium	M	(8)								
Zinc	M	(8)	5,000 (a)				120 (3)	110 (3)		

TABLE E-1 B (continued)

POTENTIAL CHEMICAL SPECIFIC BENCHMARKS (December 16 1992)
FEDERAL SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (7)	Method (8)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goals	CWA AWQC for Protection of Aquatic Life (c) Acute Value	CWA AWQC for Protection of Aquatic Life (c) Chronic Value	CWA AWQC for Protection of Human Health (c) Water and Fish Ingestion	CWA AWQC for Protection of Human Health (c) Fish Consumption Only
Aldicarb	P		3 (i)		1 ()					
Aldicarb Sulfone	P		2 ()		1 ()				10	
Aldicarb Sulfoxide	P		4 (i)		1 ()				100	
Aldrin	P	(8)					3.0		0.000074	0.000079
Carbofuran	P	(8C)		40 (b)		40 (b)				
Chloranil	P									
Chlordane	P	(8)		2 (b)		0 (b)	2.4	0.0043	0.00046	0.00048
Chlorpyifos	P	(8)					0.083	0.041		
DDT	P	(8)					1.1	0.001	0.000024	0.000024
DDT metabolite (DDD)	P	(8)					0.06			
DDT metabolite (DDE)	P	(8)					1.050			
Demeton	P	(8)						0.1		
Diazinon	P	(8)								
Dieldrin	P	(8)					2.5?	0.0019	0.000071	0.000076
Endosulfan I	P	(8)					0.22	0.056	74	153
Endosulfan II	P	(8)								
Endosulfan Sulfate	P	(8)								
Endrin	P	(8)	2 (h)		2 (h)		0.18	0.0023	1	
Endrin Aldehyde	P	(8B)								
Endrin Ketone	P	(8B)								
Guthion (Azinphos methyl)	P	(8)						0.01		
Heptachlor	P	(8)		0.4 (b)		0 (b)	0.52	0.0038	0.00028	0.00029
Heptachlor Epoxide	P	(8)		0.2 (b)		0 (b)				
Hexachlorocyclohexane Alph	P	(8)							0.0092	0.031
Hexachlorocyclohexane Beta	P	(8)							0.0163	0.0547
Hexachlorocyclohexane (HCH or BHC)	P						100			
Hexachlorocyclohexane Delta	P	(8)								
Hexachlorocyclohexane Technical (Total)	P	(8?)							0.0123	0.0414
Hexachlorocyclohexane Gamma (Lindane)	P	(8)	4 (a)	0.2 (b)		0.2 (b)	2	0.08	0.0186	0.0625
Malathion	P	(8B)						0.01		
Methoxychlor	P	(8)	100 (a)	40 (b)		40 (b)		0.03	100	
Mirex	P							0.001		
Oxamyl (Vydate)	P		200 (h)		200 (h)			0.001		
Parathion	P	(8B)					0.06 ?	0.013		
Toxaphene	P	(8)		3 (b)		0 (b)	0.73	0.0002	0.00071	0.00073
Vaporite 2	P									
Aroclor 1016	PP	(8)								
Aroclor 1221	PP	(8)								
Aroclor 1232	PP	(8)								
Aroclor 1242	PP	(8)								
Aroclor 1248	PP	(8)								
Aroclor 1254	PP	(8)								
Aroclor 1260	PP	(8)								
PCBs (Total)	PP	(8)		0.5 (b)		0 (b)	2	0.014	0.000079*	0.000079
2,4 5-TP Silvex	H	(8C)	10 (a)	?0 (b)		?0 (b)			10	
2,4-Dichlorophenoxy cetic Acid (2,4-D)	H	(8C)	100 (a)	70 (b)		70 (b)			100	
Acrolein	H						68(1)	21(1)	320	780
Atrazine	H	(8D)		3 (b)		3 (b)				
Bromacil	H									
Dalapon	H	(8)	200 (h)		200 (h)					
Dinoseb	H	(8)	7 (h)		7 (h)					
Diquat	H		20 (h)		20 (h)					
Endothall	H		100 (h)		100 (h)					
Glyphosate	H		700 (h)		700 (h)					
Picloram	H		500 (h)		500 (h)					
Simazine	H	(8D)	4 (h)		4 (h)					
Americium (total) (pCi/l)	R									
Americium 241 (pCi/l)	R									

TABLE E-1 B (continued)

POTENTIAL CHEMICAL SPECIFIC BENCHMARKS (December 16 1992)
FEDERAL SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (7)	Method (8)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goals	CWA AWQC for Protection of Aquatic Life (c)		CWA AWQC for Protection of Human Health (c)	
							Acute Value	Chronic Value	Water and Fish Ingestion	Fish Consumption Only
Cesium 134 (pCi/l)	R		(4)							
Cesium 137 (pCi/l)	R		(4)							
Gross Alpha (pCi/l)	R		15 (a)(9)							
Gross Beta (pCi/l)	R		50 (a)(4)(6)							
Plutonium (total) (pCi/l)	R									
Plutonium 238+239+240 (pCi/l)	R									
Radium 226+228 (pCi/l)	R	(10)	5 (a)(4)							
Strontium 89+90 (pCi/l)	R		(a)(4)(6)							
Strontium 90 (pCi/l)	R		8 (a)(6)							
Thorium 230+232 (pCi/l)	R		(a)(4)							
Tritium (pCi/l)	R		20,000 (a)(4)(6)							
Uranium 233+234 (pCi/l)	R									
Uranium 235 (pCi/l)	R									
Uranium 238 (pCi/l)	R									
Uranium (total) (pCi/l)	R									
1 2,4 5-Tetrachlorobenzene	SV	(8B)							38	48
1 2,4 Trichlorobenzene	SV	(8)	70 (h)		70 (h)					
1 2-Dichlorobenzene (Ortho)	SV	(8)		600 (b)		600 (b)				
1 2-Diphenylhydrazine	SV	(8B)					270 (1)		0 042	0 56
1 3-Dichlorobenzene (Meta)	SV	(8)								
1 4-Dichlorobenzene (Para)	SV	(8)	75 (a)		75 (a)					
2,4 5-Trichlorophenol	SV	(8)							2,600	
2,4 6-Trichlorophenol	SV	(8)						970 (1)	1 2	3.6
2,4-Dichlorophenol	SV	(8)					2,020 (1)	365 (1)	3,090	
2,4-Dimethylphenol	SV	(8)					2,120 (1)			
2,4-Dinitrophenol	SV	(8)								
2,4-Dinitrotoluene	SV	(8)					330(1)	230(1)	0.11 *	9 1
2,6-Dinitrotoluene	SV	(8)					330 (1)	230 (1)	70	14 300
2-Chloronaphthalene	SV	(8)								
2-Chlorophenol	SV	(8)					4 380 (1)	2,000 (1)		
2-Methylnaphthalene	SV	(8)								
2-Methylphenol	SV	(8)								
2-Nitroaniline	SV	(8)								
2-Nitrophenol	SV	(8)					230(1)	150(1)		
3,3'-Dichlorobenzidine	SV	(8)							0 01	0.02
3-Nitroaniline	SV	(8)								
4 6-Dinitro-2-methylphenol	SV	(8)							13.4	765
4 Bromophenyl-phenyl ether	SV	(8)								
4 Chloroaniline	SV	(8)								
4-Chlorophenyl-phenyl ether	SV	(8)								
4-Chloro 3-methylphenol	SV	(8)					30 (1)			
4-Methylphenol	SV	(8)								
4-Nitroaniline	SV	(8)								
4-Nitrophenol	SV	(8)					230 (1)	150 (1)		
Acenaphthene	SV	(8)					1 700 (1)	520 (1)		
Anthracene	SV	(8)								
Benzidine	SV	(8B C)					2,500		0 00012	0.00053
Benzoic Acid	SV	(8)								
Benzo(a)anthracene	SV	(8)								
Benzo(a)pyrene	SV	(8)	0 2 (h)		0 (h)					
Benzo(b)fluoranthene	SV	(8)								
Benzo(g,h,i)perylene	SV	(8)								
Benzo(k)fluoranthene	SV	(8)								
Benzyl Alcohol	SV	(8)								
bis(2-Chloroethoxy)methane	SV	(8)								
bis(2-Chloroethyl)ether	SV	(8)							0.03	1 36
bis(Chloromethyl)ether	SV								0.00376	0 00184
bis(2 Chloroisopropyl)ether	SV	(8)							34 7	4 360
bis(2-Ethylhexyl)phthalate (Di(2 ethylhexyl)phthalate)	SV	(8)	6 (h)		0 (h)					
Butadiene	SV									
Butylbenzylphthalate	SV	(8)								

TABLE E-1 B (continued)

POTENTIAL CHEMICAL SPECIFIC BENCHMARKS (December 16 1992)
FEDERAL SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (7)	Method (8)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goals	CWA AWQC for Protection of Aquatic Life (c) Acute Value	Chronic Value	CWA AWQC for Protection of Human Health (c) Water and Fish Ingestion	Fish Consumption Only
Chlorinated Ethers	SV	(8)								
Chlorinated Napthalene	SV	(8)					1 600 (1)			
Chloroalkylethers	SV	(8)					238,000 (1)			
Chlorophenol (Total)	SV	(8)								
Chrysene	SV	(8)								
Dibenzofuran	SV	(8)								
Dibenz(a,h)anthracen	SV	(8)								
Dichlorobenzenes	SV	(8)					1 120 (1)	763 (1)	400	2,600
Dichlorobenzidine (Total)	SV	(8)							0 01	0 02
Diethylphthalate	SV	(8)							350,000	1 800,000
Di(2-ethylhexyl)adipate	SV	(8)	400 (h)		400 (h)					
Dimethylphthalate	SV	(8)							313,000	2,900,000
Di-n butylphthalate	SV	(8)							35,000	154 000
Di-n-octylphthalate	SV	(8)								
Ethylene Glycol	SV	(8C)								
Fluoranthene	SV	(8)					3,980 (1)		42	54
Fluorene	SV	(8)								
Formaldehyde	SV									
Haloethers	SV	(8)					360 (1)	122 (1)		
Hexachlorobenzene	SV	(8)	1 (h)		0 (h)				0.00072*	0.00074
Hexachlorobutadiene	SV	(8)					90 (1)	9 3 (1)	0.45**	50 *
Hexachlorocyclopentadiene	SV	(8)	50 (h)		50 (h)		7 (1)	5.2 (1)	206	
Hexachloroethane	SV	(8)					980 (1)	540 (1)	1 9	8.74
Hydrazine	SV									
Indeno(1 2,3-cd)pyrene	SV	(8)								
Isophorone	SV	(8)					117 000 (1)		5,200	520,000
Naphthalene	SV	(8)					2,300 (1)	620 (1)		
Nitrobenzene	SV	(8)					27 000 (1)		19,800	
Nitrophenols	SV	(8)					230 (1)	150 (1)		
Nitrosamines	SV	(8)					5,850 (1)			
N Nitrosodibutylamine	SV	(8B)							0.0064	0.587
N-Nitrosodiethylamine	SV	(8B)							0.0008	1 24
N Nitrosodimethylamin	SV	(8B)							0.0014	16
N-Nitrosopyrrolidine	SV	(8B)							0 016	91 9
N Nitrosodiphenylamine	SV	(8B)							4 9	16.1
N-Nitroso-di n-propylamine	SV	(8B)								
Pentachlorinated Ethanes	SV	(8B)					7 240 (1)	1 100 (1)		
Pentachlorobenzene	SV	(8B)							74	85
Pentachlorophenol	SV	(8)		1 ( )		0 ( )	20	13 *	1 010	
Phenanthrene	SV	(8)								
Phenol	SV	(8)					10 200 (1)	2,560 (1)	3 500	
Phthalate Esters	SV	(8)					940 (1)	3 (1)		
Polynuclear Aromatic Hydrocarbons	SV	(8)							0.0028	0.0311
Pyrene	SV	(8)								
Vinyl Chloride	V	(8)	2 (a)		0 (a)				2 *	525 *
1 1 1 Trichloroethane	V	(8)	200 (a)		200 (a)				18,400	1 030 000
1 1 2,2 Tetrachloroethane	V	(8)						2,400	0.17**	10.7
1 1 2 Trichloroethane	V	(8)	5 (h)		3 (h)			9,400	0.6*	41 8 *
1 1-Dichloroethane	V	(8)								
1 1-Dichloroethene	V	(8)	7 (a)		7 (a)					
1 2-Dichloroethane	V	(8)	5 (a)		0 (a)		118,000	20,000	0.94	243
1 2-Dichloroethene (cis)	V	(8)		70 (b)		70 (b)				
1 2-Dichloroethene (total)	V	(8)								
1 2-Dichloroethene (trans)	V	(8)		100 (b)		100 (b)				
1 2-Dichloropropane	V	(8)		5 (b)		0 (b)	23,000	5,700		
1 3-Dichloropropene (cis)	V	(8)					6,060	244 (1)	87	14 100
1 3-Dichloropropene (trans)	V	(8)					6,060	244 (1)	87	14 100
2-Butanone	V	(8)								
2-Hexanone	V	(8)								
4-Methyl 2-pentanone	V	(8)								
Acetone	V	(8)								

TABLE E-1 B (continued)

POTENTIAL CHEMICAL SPECIFIC BENCHMARKS (December 16 1992)
FEDERAL SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (7)	Method (8)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goals	CWA AWQC for Protection of Aquatic Life (c)		CWA AWQC for Protection of Human Health (c)	
							Acute Value	Chronic Value	Water and Fish Ingestion	Fish Consumption Only
Acrylonitril	V	(8)					7 550	2,600	0.058	0.65
Benzene	V	(8)	5 ( )		0 ( )		5,300		0 66*	40
Bromodichlorom thane	V	(8)	100 (2)( )							
B omoform	V	(8)	100 (2)(a)							
Bromomethane	V	(8)								
Carbon Disulfide	V	(8)								
Carbon Tetrachloride	V	(8)	5 ( )		0 (a)		35,200 (1)		0 4	6.94
Chlorinated B nzen s	V/SV	(8)					250 (1)	50 (1)		
Chlorobenzene	V	(8)		100 (b)		100 (b)			488	
Chloroethane	V	(8)								
Chloroform	V	(8)	100 (2)( )				28,900 (1)	1 240 (1)	0 19	15.7
Chloromethane	V	(8)								
Dibromochloromethane	V	(8)	100 (2)(a)							
Dichloroethenes	V	(8)					11 600 (1)		0 033	1 8
Ethylbenzene	V	(8)		700 (b)		700 (b)	32,000 (1)		1 400	3,280
Ethylene Dibromi le	V	(8C)		0 05 (b)		0 (b)				
Ethylene Oxid	V									
Halomethanes	V	(8)	100 (a)				11 000 (1)		0 19*	15 7
Methylene Chloride	V	(8)	5 (b)		0 (b)					
Styron	V	(8)		100 (b)		100 (b)				
Tetrachloroethanes	V	(8)					9 320 (1)			
Tetrachloroethene	V	(8)		5 (b)		0 (b)	5,280 (1)	840 (1)	0 80*	8.85
Toluene	V	(8)		1 000 (b)		1 000 (b)	17 500 (1)		14 300	424 000
Trichloroethanes	V	(8)					18,000 (1)			
Trichloroethene	V	(8)	5 ( )		0 (a)		45,000 (1)	21 900 (1)	2.7	80.7
Vinyl Acetate	V	(8)								
Xylenes (total)	V	(8)		10,000 (b)		10 000 (b)				

TABLE E-1 B (continued)

EXPLANATION OF TABLE B AND END NOTES

econdary maximum ontaminant level, TBC
Human health riteria for carcinogens port d for th I k lev l Value pl tt the 0.5 I k l v .
Conce tration s pl l depend t

ARAR Applicable R leve t and Approp i t R quire t
AWQC Ambient Wate Quality C it l
CERCLA Comprehe ive Envi on ntal R pon C mp ti I li bility A t
CFR Code of F d ral R g lati ns
CWA Clean Wate Act
EPA Environmental P tection Ag y
pCi/l picocuries per liter
PCB polychlorinated biphenyl
SDWA Safe Drinking Water Act
SS Specie Specific
SW Solid Waste
TIC Tentatively Identified Compound
ug/l micrograms per liter
MF/L million fibers/liter

(1) Criteria not developed alue pre ented is low t b ved ff ts level (LOEL)
(2) Total trihalomethane hloroform, br moform bromodichl rom thane dibro ochloro ethane
(3) Hardnes dependent riteria, alculated assuming 50mg/l alcium arbonate
(4) Average annual concentration of beta particle and photon adi activity annot ce 4 illi n/year to quiv l nt.
(5) Standard is ot adequately protective when hlorid l ciat l with potas m, alcium or agne ium ath than dium
(6) If both trontium 90 and tritium are pre e t, the um of their nnu l do q iv lent to bon arrow h ll not xc d rem/yr
(7) Type abbreviations ar A anion B ba t ria C atio D di E I et H h b I IN organi FP field paramet M t l P p sticid PP pe ticide/PCB
R adionuclide SV emi v latil V latile
(8) See Attachment 1 for analytical method with corr sponding I I n limit
abbreviations are E EPA SW SW846 A dete ted total R d te I TIC with t h f t dif atio C ol ati ly ionit I D no ito ed in ischarg p d F mixture-individu l som rs d te t d
(9) Value for gross alph ex l d nium
(10) MDL for adium 226 is 0.5 MDL for dium 228 I 1.0
(11) Where the standard is below (more tring t than) th PQL, th PQL l int p t d t b th pliant l l

(a) EPA National Primary and Se ond ry Drinking Water R gulation 40 CFR 1 1 and 40 CFR 1 3 (of M y 1990) gme t 4 MCLs are ARAR S gment 5 MCL are TBC all MCLGs are TBC
(b) EPA National Primary and Se ondary Drinking Water Regulations 40 CFR P rts 42 n 1 143 Final Rule eff ctive July 30, 1992 (56 F d al Regi ter 3526 1/30/1991)
(c) EPA, Quality Criteria for Protection of Aquatic Life 1986
(d) EPA, National Ambient Water Quality Criteria for Sel nium 1987
( ) EPA National Primary and Second ry Drinking Water Regul tio 40 CFR Parts 141 142 an 1 3, Final Rule (56 FR 30266 7/1/1991) ff tive 1/1/1993
(f) EPA Maximum Contaminant Level Goals and National Primary D inking Wate R gulation for L ad and Copper 40 CFR 141 and 142 (56 FR 26460 6/7/1991) ffective 12/7/92 and 11/6/91 Action levels effective 12/7/92
MCLG effective 11/6/91 Action level in 10% or le of tap ampl for mall and medium i d ystem
(g) EPA, National Ambient Wate Quality Criteria for Chloride 1988
(h) EPA National Primary Drinking Wat R gulations 40 CFR 141 and 1 2, Fin l R le Eff tive Ja u ry 7 1994
(i) EPA National Primary Drinking Wate R gulation 40 CFR 141 P tpon t of F t R le n t R ld atio (57 FR 22178) ff tive dat stabli hed

TABLE E-1 C
POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS
STATEWIDE AND BASIN (CDH/CWQCC)
SURFACE WATER QUALITY STANDARDS

TABLE E-1 C

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
STATEWIDE AND BASIN (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Statewide Standards (a)								Basin Standards (b)	
			Human Health Carcinogens/ Noncarcinogens (2) (8)		Aquatic Life (8)		Tables I,II,III (1) Aquatic Life (11)				Organics (7)	
Parameter	Type (5)	Method (6)	Water Supply	Water and Fish	Acute Value	Chronic Value	Acute Value (2)	Chronic Value (2)	Agricultural Standard (3,12)	Domestic Water Supply (4,12)	Aquatic Life	Water Supply
Chloride	A	E325								250,000		
Cyanide (Free)	A	E335					5		200	200		
Fluoride	A	E340								2,000		
N as Nitrate	A	E353.1							100,000	10,000		
N as Nitrate+Nitrite	A	E353.1							100,000	10,000		
N as Nitrite	A	E354.1					SS	SS	10,000	1 000		
Sulfate	A	E375.4								250,000		
Sulfide, H2S Undissociated	A	E376.1						2		50		
Coliform (Fecal)	B	SM9221C								2000/100 ml		
Ammonia, Total	C	E350					TVS	60		500		
Dioxin	D	(6)	0.00000022	0.000000013	0.01	0.00001						
Boron	E	SW6010(6B)							750			
Chlorine, Total Residual	E	SM4500					19	11				
Sulfur	E											
Dissolved Oxygen	FP	SM4500					5,000	>5,000	>3,000	>3,000		
pH (Standard Units)	FP	E150.1					6.5-9.0	6.5-9.0		5.0-9.0		
Specific Conductance	FP	E120.1										
Temperature (Degrees Celsius)	FP						30 degrees	30 degrees				
Alkalinity	IN	E310.1										
Asbestos	IN											
Total Dissolved Solids	IN	E160.1										
Total Organic Carbon	IN	E415.1										
Aluminum	M	(6)					750	87				
Antimony	M	(6)								14		
Arsenic	M	(6)					360	150	100	50		
Arsenic III	M											
Arsenic V	M											
Barium	M	(6)								1 000		
Beryllium	M	(6)							100	0.0076		
Cadmium	M	(6)					TVS	TVS	10	10		
Calcium	M	(6)										
Cesium	M	(6)										
Chromium	M	(6)										
Chromium III	M						TVS	TVS	100	50		
Chromium VI	M	E218.5					16	11	100	50		
Cobalt	M	(6)										
Copper	M	(6)					TVS	TVS	200	1 000		
Iron	M	(6)						1 000 (Trec)		300 (dis)		
Lead	M	(6)					TVS	TVS	100	50		
Lithium	M	(6)										
Magnesium	M	(6)										
Manganese	M	(6)						1 000	200	50 (dis)		
Mercury	M	(6)					2.4	0.1		2.0		
Molybdenum	M	(6)										
Nickel	M	(6)					TVS	TVS	200			
Potassium	M	(6)										
Selenium	M	(6)					135	17	20	10		
Silver	M	(6)					TVS	TVS		50		
Sodium	M	(6)										
Strontium	M	(6)										
Thallium	M	(6)						15		0.012		
Tin	M	(6)										
Titanium	M	SW6010 (6B)										
Tungsten	M	SW6010 (6B)										
Vanadium	M	(6)										
Zinc	M	(6)					TVS	TVS	2,000	5,000		

TABLE E-1 C (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
STATEWIDE AND BASIN (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Statewide Standards (a)								Basin Standards (b)	
			Human Health Carcinogens/ Noncarcinogens (3) (8)		Aquatic Life (8)		Tables I, II, III (1) Aquatic Life (11)				Organics (7)	
Parameter	Type (5)	Method (6)	Water Supply	Water and Fish	Acute Value	Chronic Value	Acute Value (2)	Chronic Value (2)	Agricultural Standard (3,12)	Domestic Water Supply (4,12)	Aquatic Life	Water Supply
Aldicarb	P		10									
Aldicarb Sulfone	P											
Aldicarb Sulfoxide	P											
Aldrin	P	(6)	0.002 (8)	0.00013	1 5						<0.003	
Aldrin & Dieldrin combined	P	(6)									<0.003	
Carbofuran	P	(6C)	36									
Chloranil	P											
Chlordane	P	(6)	0.03 (8)		1 2	0.0043						
Chlorpyifos	P	(6)			0.083	0.041						
DDT	P	(6)	0.1	0.00059	0.55	0.001					0.001	
DDT Metabolite (DDD)	P	(6)		0.00083	0.6						0.001	
DDT Metabolite (DDE)	P	(6)	0.1	0.00059	1 050						0.001	
Demeton	P	(6)				0.1					0.1	
Diazinon	P	(6)										
Dieldrin	P	(6)	0.002	0.00014	1 3	0.0019					<0.003	
Endosulfan I	P	(6)		0.93	0.11	0.056					0.003	
Endosulfan II	P	(6)										
Endosulfan Sulfate	P	(6)		0.93								
Endrin	P	(6)	0.2		0.09	0.0023					0.004	
Endrin Aldehyde	P	(6B)	0 2	0.2								
Endrin Ketone	P	(6B)										
Guthion (Azinphos methyl)	P	(6)				0.01					0.01	
Heptachlor	P	(6)	0.008	0.00021	0.26	0.0038					0.001	0 2
Heptachlor Epoxide	P	(6)	0.09	0.0001	0.26	0.0038						
Hexachlorocyclohexane, Alpha	P	(6)	0.006		0.0039							
Hexachlorocyclohexane, Beta	P	(6)		0.014								
Hexachlorocyclohexane (HCH or BHC)	P				100							
Hexachlorocyclohexane, Delta	P	(6)										
Hexachlorocyclohexane, Technical (Total)	P	(6E)		0.012								
Hexachlorocyclohexane Gamma (Lindane)	P	(6)	0.2	0.019	1 0	0.08					0.01	4
Malathion	P	(6B)				0.1					0.1	
Methoxychlor	P	(6)	40			0.03					0.03	100
Mirex	P					0.001					0.001	
Oxamyl (Vydate)	P											
Parathion	P	(6B)									0.04	100
Toxaphene	P	(6)	0.03	0.00073	0.73	0 0002					0.005	5
Vaponite 2	P											
Aroclor 1016	PP	(6)										
Aroclor 1221	PP	(6)										
Aroclor 1232	PP	(6)										
Aroclor 1242	PP	(6)										
Aroclor 1248	PP	(6)										
Aroclor 1254	PP	(6)										
Aroclor 1260	PP	(6)										
PCBs (Total)	PP	(6)	0.005	0.000044	2.0	0.014					0.001	
2,4,5-TP Silvex	H	(6C)	50									
2,4-D	H	(6C)	70									100
Acrolein	H			320	68	21						
Atrazine	H	(6D)										
Bromacil	H											
Dalapon	H	(6)										
Dinoseb	H	(6)										
Diquat	H											
Endothall	H											
Glyphosate	H											
Picloram	H											
Simazine	H	(6D)										

TABLE E-1 C (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
STATEWIDE AND BASIN (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (5)	Method (6)	Statewide Standards (a): Human Health Carcinogens/ Noncarcinogens (2) (8): Water Supply	Water and Fish	Aquatic Life (8): Acute Value	Chronic Value	Tables I,II,III (1): Aquatic Life (11): Acute Value (2)	Chronic Value (2)	Agricultural Standard (3,12)	Domestic Water Supply (4,12)	Basin Standards (b): Organics (7): Aquatic Life	Water Supply
Americium (Total) (pCi/l)	R											
Americium 241 (pCi/l)	R											
Cesium 134 (pCi/l)	R		80 (10)									
Cesium 137 (pCi/l)	R											
Gross Alpha (pCi/l)	R											
Gross Beta (pCi/l)	R											
Plutonium (Total) (pCi/l)	R											
Plutonium 238+239+240 (pCi/l)	R		15 (10)									
Radium 226+228 (pCi/l)	R	(9)	5 (10)									
Strontium 89+90 (pCi/l)	R											
Strontium 90 (pCi/l)	R		8 (10)									
Thorium 230+232 (pCi/l)	R		60 (10)									
Tritium (pCi/l)	R		20,000 (10)									
Uranium 233+234 (pCi/l)	R											
Uranium 235 (pCi/l)	R											
Uranium 238 (pCi/l)	R											
Uranium (Total) (pCi/l)	R						TVS	TVS				
1 2,4 5-Tetrachlorobenzene	SV	(6B)	2 (8)									
1 2,4-Trichlorobenzene	SV	(6)										
1 2-Dichlorobenzene (Ortho)	SV	(6)	620	620								
1 2-Diphenylhydrazine	SV	(6B)	0.05	0.04	270							
1 3-Dichlorobenzene (Meta)	SV	(6)	620	400								
1 4-Dichlorobenzene (Para)	SV	(6)	75	75								
2,4,5-Trichlorophenol	SV	(6)										
2,4,6-Trichlorophenol	SV	(6)	2	2		970						
2,4-Dichlorophenol	SV	(6)	21	21	2,020	365						
2,4-Dimethylphenol	SV	(6)			2,120							
2,4-Dinitrophenol	SV	(6)	14	14								
2,4-Dinitrotoluene	SV	(6)		0.11								
2,6-Dinitrotoluene	SV	(6)			330	230						
2-Chloronaphthalene	SV	(6)										
2-Chlorophenol	SV	(6)			4,380	2,000						
2-Methylnaphthalene	SV	(6)										
2-Methylphenol	SV	(6)										
2-Nitroaniline	SV	(6)										
2-Nitrophenol	SV	(6)										
Dichlorobenzidine (Total)	SV	(6)		0.039								
3-Nitroaniline	SV	(6)										
4 6-Dinitro-2-methylphenol	SV	(6)		13								
4-Bromophenyl-phenyl-ether	SV	(6)										
4-Chloroaniline	SV	(6)										
4-Chlorophenyl-phenyl-ether	SV	(6)										
4-Chloro-3-methylphenol	SV	(6)			30							
4-Methylphenol	SV	(6)										
4-Nitroaniline	SV	(6)										
4-Nitrophenol	SV	(6)										
Acenaphthene	SV	(6)			1 700	520						
Anthracene	SV	(6)		0.0028							0.1	0.01
Benzidine	SV	(6B,C)	0.0002	0.00012(8)	2,500							
Benzoic Acid	SV	(6)										
Benzo(a)anthracene	SV	(6)		0.0028								
Benzo(a)pyrene	SV	(6)		0.0028								
Benzo(b)fluoranthene	SV	(6)		0.0028								
Benzo(g,h,i)perylene	SV	(6)		0.0028								
Benzo(k)fluoranthene	SV	(6)		0.0028								
Benzyl Alcohol	SV	(6)										
bis(2-chloroethoxy)methane	SV	(6)										
bis(2-Chloroethyl)ether	SV	(6)	0.03 (8)	0.03 (8)								
bis(2-Chloroisopropyl)ether	SV	(6)		1 400								
bis(2-Ethylhexyl)phthalate (Di(2-ethylhexyl)phthalate)	SV	(6)		1 8 (8)								

TABLE E-1 C (continued)

POTENTIAL CHEMICAL SPECIFIC BENCHMARKS (December 16 1992)
STATEWIDE AND BASIN (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Statewide Standards (a)								Basin Standards (b)	
			Human Health Carcinogens/ Noncarcinogens (2) (8)		Aquatic Life (8)		Tables I,II,III (1) Aquatic Life (11)				Organics (7)	
Parameter	Type (5)	Method (6)	Water Supply	Water and Fish	Acute Value	Chronic Value	Acute Value (2)	Chronic Value (2)	Agricultural Standard (3,12)	Domestic Water Supply (4,12)	Aquatic Life	Water Supply
Butadiene	SV											
Butylbenzylphthalate	SV	(6)		3,000								
Chlorinated Ethers	SV	(6)										
Chlorinated Napthalenes	SV	(6)										
Chloroalkylethers	SV	(6)										
Chlorophenol (Total)	SV	(6)										
Chrysene	SV	(6)		0.0028							1	1
Dibenzofuran	SV	(6)										
Dibenz(a,h)anthracene	SV	(6)		0.0028								
Dichlorobenzenes	SV	(6)										
Diethylphthalate	SV	(6)		23,000								
Di(2-ethylhexyl)adipate	SV	(6)										
Dimethylphthalate	SV	(6)		313,000								
Di-n-butylphthalate	SV	(6)		2,700								
Di n-octylphthalate	SV	(6)										
Ethylene Glycol	SV	(6C)										
Fluoranthene	SV	(6)		42	3,980							
Fluorene	SV	(6)		0.0028								
Formaldehyde	SV											
Haloethers	SV	(6)										
Hexachlorobenzene	SV	(6)	6	0.00072								
Hexachlorobutadiene	SV	(6)	1	0.45	90	9.3						
Hexachlorocyclopentadiene	SV	(6)		240	7	5						
Hexachloroethane	SV	(6)		1 9	980	540						
Hydrazine	SV											
Indeno(1 2,3-cd)pyrene	SV	(6)		0.0028								
Isophorone	SV	(6)	1 050	8.4	117 000							
Naphthalene	SV	(6)		0.0028	2,300	620						
Nitrobenzene	SV	(6)	3.5	3.5	27 000							
Nitrophenols	SV	(6)										
Nitrosamines	SV	(6)										
N-Nitrosodibutylamine	SV	(6B)		0.0064								
N-Nitrosodiethylamine	SV	(6B)		0.0008								
N-Nitrosodimethylamine	SV	(6B)		0.00069								
N-Nitrosopyrrolidine	SV	(6B)		0.016								
N-Nitrosodiphenylamine	SV	(6B)		4.9								
N-Nitroso-di-n-propylamine	SV	(6B)		0.005								
Pentachlorinated Ethanes	SV	(6B)										
Pentachlorobenzene	SV	(6B)	6 (8)									
Pentachlorophenol	SV	(6)	200		9	5.7						
Phenanthrene	SV	(6)		0.0028								
Phenol	SV	(6)		21 000	10,200	2,560						
Phthalate Esters	SV	(6)									500	1
Polynuclear Aromatic Hydrocarbons	SV	(6)		0.0028								
Pyrene	SV	(6)		0.0028								
Vinyl Chloride	V	(6)	2	2								
1 1 1 Trichloroethane	V	(6)	200	200								
1 1 2,2 Tetrachloroethane	V	(6)		0.17		2,400						
1 1 2 Trichloroethane	V	(6)	3	0.6	9,400							
1 1-Dichloroethane	V	(6)										
1 1-Dichloroethene	V	(6)	7	0.057								
1 2-Dichloroethane	V	(6)	0.4	0.4	118,000	20,000						
1 2-Dichloroethene (cis)	V	(6)	70									
1 2-Dichloroethene (total)	V	(6)										
1 2-Dichloroethene (trans)	V	(6)	100									
1 2-Dichloropropane	V	(6)	0.56 (8)	0.56	23,000	5,700						
1 3-Dichloropropene (cis)	V	(6)		10	6,060	244						
1 3-Dichloropropene (trans)	V	(6)		10	6,060	244						
2-Butanone	V	(6)										
2-Hexanone	V	(6)										

TABLE E-1 C (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
STATEWIDE AND BASIN (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Statewide Standards (a)								Basin Standards (b)	
			Human Health Carcinogens/ Noncarcinogens (2) (9)		Aquatic Life (8)		Tables I,II,III (1)				Organics (7)	
							Aquatic Life (11)					
Parameter	Type (5)	Method (6)	Water Supply	Water and Fish	Acute Value	Chronic Value	Acute Value (2)	Chronic Value (2)	Agricultural Standard (3,12)	Domestic Water Supply (4,12)	Aquatic Life	Water Supply
4-Methyl-2-pentanone	V	(6)										
Acetone	V	(6)										
Acrylonitrile	V	(6)		0.058	7 500	2,600						
Benzene	V	(6)	1	1	5,300							
Bromodichloromethane	V	(6)	0.3	0.3								
Bromoform	V	(6)	4	4								
Bromomethane	V	(6)		48								
Carbon Disulfide	V	(6)										
Carbon Tetrachloride	V	(6)	0.3	0.25	35,200							
Chlorinated Benzenes	V/SV	(6)										
Chlorobenzene	V	(6)	100	100								
Chloroethane	V	(6)										
Chloroform	V	(6)	6	6	28,900	1 240						
Chloromethane	V	(6)		5.7								
Dibromochloromethane	V	(6)	14	6								
Dichloroethenes	V	(6)										
Ethylbenzene	V	(6)	680	3,100	32,000							
Ethylene Dibromide	V	(6C)										
Ethylene Oxide	V											
Halomethanes	V	(6)										
Methylene Chloride	V	(6)		4.7								
Styrene	V	(6)										
Tetrachloroethanes	V	(6)										
Tetrachloroethene	V	(6)	5	0.8	5,280	840						
Toluene	V	(6)	1 000	1 000	17 500							
Trichloroethanes	V	(6)										
Trichloroethene	V	(6)	5	2.7	45,000	21 900						
Vinyl Acetate	V	(6)										
Xylenes (Total)	V	(6)										

TABLE E-1 C (continued)

EXPLANATION OF TABLE

ARAR	= Applicable or Relevant and Appropriate Requirements
CDH	= Colorado Department of Health
dis	= dissolved
EPA	= Environmental Protection Agency
pCi/l	= picocuries per liter
PCB	= polychlorinated biphenyl
SS	= species specific
SW	= Solid Waste
TIC	= Tentatively Identified Compound
Trec	= Total recoverable
TVS	= Table Value Standard (hardness dependent) see Table III in (a)
ug/l	= micrograms per liter
WQCC	= Water Quality Control Commission

(1) Table I = physical and biological parameters
Table II = inorganic parameters
Table III = metal parameters
Values in Tables I, II, and III for recreational uses and cold water biota are not included.
(2) N/A Endnote deleted.

(3) All are 30-day values except for nitrate, nitrite and cyanide
(4) Ammonia, sulfide, chloride, sulfate, copper iron, manganese antimony beryllium, selenium, thallium, and zinc are 30-day standards, all others are 1-day standards
(5) type abbreviations are A=anion B=bacteria C=cation IN=inorganic FP=field parameter H=herbicide M=metal P= pesticide PP=pesticide/PCB R=radionuclide SV=semi-volatile V=volatile
(6) See Attachment 1 for analytical methods and corresponding detection limits
abbreviations are E=EPA, SW=SW846 a=detected as total b=detected as TICs or with method modifications c=not routinely monitored d=monitored in discharge ponds e=mixture-individual isomers detected
(7) Basic Standards for Organic Chemicals (reference a) apply as stream standards where none are listed in Table 1A (reference b) See section 3.8.5(2)(f)
In the absence of specific numeric standards for non-naturally occurring organics the narrative standard "free from toxics (section 3.1 11(1)(d)) shall be interpreted and applied in accordance with the provisions of section 3.12 7(1)(c)(

(8) Where the standard is below (more stringent than) the PQL, the PQL is interpreted to be the compliance level.
(9) MDL for Radium 226 is 0 5, MDL for Radium 228 is 1 0
(10) These parameters are to be maintained at the lowest practical level See section 3.1 11(2) in (a)
(11) Metals for aquatic life use are stated as dissolved unless otherwise specified.
(12) Metals for agricultural and domestic us are stated as total recoverable unless otherwise pecified

TABLE E-1 D
POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS
STREAM SEGMENT (CDH/CWQCC)
SURFACE WATER QUALITY STANDARDS

TABLE E-1.D

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
STREAM SEGMENT (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (4)	Method (3)	Segment 4 & 5 Stream Classification and Water Quality Standards (5) (2)			
			Stream Segment Table (7)		Table 2 Radionuclides (6)	
			Acute Value	Chronic Value	Woman Creek	Walnut Creek
Chloride	A	E325		250,000		
Cyanide (Free)	A	E335		5		
Fluoride	A	E340				
N as Nitrate	A	E353.1		10,000		
N as Nitrate+Nitrite	A	E353.1				
N as Nitrite	A	E354 1		500		
Sulfate	A	E375.4		250,000		
Sulfide H2S Undissociated	A	E376.1		2		
Coliform (Fecal)	B	SM9221C		2,000/100ml		
Ammonia as N	C	E350	TVS	100		
Dioxin	D	(3)		0.000000013		
Boron	E	SW6010(3B)		750		
Chlorine Total Residual	E	SM4500	19	11		
Sulfur	E			2		
Dissolved Oxygen	FP	SM4500	>5,000	>5,000		
pH (Standard Units)	FP	E150 1	6.5-9	6.5-9		
Specific Conductance	FP	E120 1				
Temperature (Degrees Celsius)	FP					
[illegible]inity	IN	E310 1				
[illegible]estos	IN					
Total Dissolved Solids	IN	E160 1				
Total Organic Carbon	IN	E415.1				
Aluminum	M	(3)				
Antimony	M	(3)				
Arsenic (Total Recoverable)	M	(3)	50			
Arsenic III	M					
Arsenic V	M					
Barium	M	(3)				
Beryllium	M	(3)	4			
Cadmium	M	(3)	TVS	TVS		
Calcium	M	(3)				
Cesium	M	(3)				
Chromium	M	(3)				
Chromium III (Total Recoverable)	M		50			
Chromium VI	M	E218.5	16	11		
Cobalt	M	(3)				
Copper	M	(3)	TVS	TVS		
Iron (Dissolved)	M	(3)	300	50		
Iron (Trec)	M	(3)	1 000	1 000		
Lead	M	(3)	TVS	TVS		
Lithium	M	(3)				
Magnesium	M	(3)				
Manganese (Dissolved)	M	(3)	300	50		
Manganese (Trec)	M	(3)	1 000	1 000		
Mercury	M	(3)		0.01 (Total)		
Molybdenum	M	(3)				
Nickel	M	(3)	TVS	TVS		
Potassium	M	(3)				
Selenium (Total Recoverable)	M	(3)	10			
[illegible]er	M	(3)	TVS	TVS		
[illegible]um	M	(3)				
[illegible]ntium	M	(3)				
Thallium	M	(3)				
Tin	M	(3)				
Titanium	M	SW6010(3B)				
Tungsten	M	SW6010(3B)				
Vanadium	M	(3)				

TABLE E-1.D (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
STREAM SEGMENT (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Segment 4 & 5 Stream Classification and Water Quality Standards (6) (2)			
			Stream Segment Table (7)		Table 2 Radionuclides (8)	
Parameter	Type (4)	Method (5)	Acute Value	Chronic Value	Woman Creek	Walnut Creek
Zinc	M	(3)	TVS	TVS		
Aldicarb	P					
Aldicarb Sulfone	P					
Aldicarb Sulfoxide	P					
Aldrin	P	(3)		0.000074		
Carbofuran	P	(3C)				
Chloranil	P					
Chlordane	P	(3)		0.00046		
Chlorpyifos	P	(3)				
DDT	P	(3)		0.000024		
DDT Metabolite (DDD)	P	(3)				
DDT Metabolite (DDE)	P	(3)				
Demeton	P	(3)				
Diazinon	P	(3)				
Dieldrin	P	(3)		0.000071		
Endosulfan I	P	(3)				
Endosulfan II	P	(3)				
Endosulfan Sulfate	P	(3)				
Endrin	P	(3)				
Endrin Aldehyde	P	(3B)				
Endrin Ketone	P	(3B)				
Guthion (Azinphos methyl)	P	(3)				
Heptachlor	P	(3)		0.00028		
Heptachlor Epoxide	P	(3)				
Hexachlorocyclohexane Alpha	P	(3)		0.0092		
Hexachlorocyclohexane Beta	P	(3)		0.0163		
Hexachlorocyclohexane (HCH or BHC)	P					
Hexachlorocyclohexane Delta	P	(3)				
Hexachlorocyclohexane, Technical (Total)	P	(3E)		0.0123		
Hexachlorocyclohexane Gamma (Lindane)	P	(3)		0.0186		
Malathion	P	(3B)				
Methoxychlor	P	(3)				
Mirex	P					
Oxamyl (Vydate)	P					
Parathion	P	(3B)				
Toxaphene	P	(3)				
Vaponite 2	P					
Aroclor 1016	PP	(3)				
Aroclor 1221	PP	(3)				
Aroclor 1232	PP	(3)				
Aroclor 1242	PP	(3)				
Aroclor 1248	PP	(3)				
Aroclor 1254	PP	(3)				
Aroclor 1260	PP	(3)				
PCBs (Total)	PP	(3)		0.000079		
2,4 5-TP Silvex	H	(3C)				
2,4-Dichlorophenoxyacetic Acid (2,4-D)	H	(3C)				
Acrolein	H					
Atrazine	H	(3D)		3		
Bromacil	H					
Dalapon	H	(3)				
Dinoseb	H	(3)				
Diquat	H					
Endothall	H					
Glyphosate	H					
Picloram	H					
Simazine	H	(3D)		4		
Americium (Total) (pCi/l)	R				0.05	0.05

TABLE E-1.D (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
STREAM SEGMENT (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (4)	Method (3)	Segment 4 & 5 Stream Classification and Water Quality Standards (b) (2) — Stream Segment Table (7) Acute Value	Segment 4 & 5 — Stream Segment Table (7) Chronic Value	Table 2: Radionuclides (6) Woman Creek	Table 2: Radionuclides (6) Walnut Creek
Americium 241 (pCi/l)	R					
Cesium 134 (pCi/l)	R				80	80
Cesium 137 (pCi/l)	R					
Gross Alpha (pCi/l)	R				7	11
Gross Beta (pCi/l)	R				5	19
Plutonium (Total) (pCi/l)	R				0.05	0.05
Plutonium 238+239+240 (pCi/l)	R				15(a)	15(a)
Radium 226+228 (pCi/l)	R	(5)			5(a)	5(a)
Strontium 89+90 (pCi/l)	R					
Strontium 90 (pCi/l)	R				8	8
Thorium 230+232 (pCi/l)	R				60(a)	60(a)
Tritium (pCi/l)	R				500	500
Uranium 233+234 (pCi/l)	R					
Uranium 235 (pCi/l)	R					
Uranium 238 (pCi/l)	R					
Uranium (Total) (pCi/l)	R				5	10
1 2,4 5-Tetrachlorobenzene	SV	(3B)				
1 2,4-Trichlorobenzene	SV	(3)				
1 2-Dichlorobenzene (Ortho)	SV	(3)				
1 2-Diphenylhydrazine	SV	(3B)				
3-Dichlorobenzene (Meta)	SV	(3)				
Dichlorobenzene (Para)	SV	(3)				
5-Trichlorophenol	SV	(3)				
2,4 6-Trichlorophenol	SV	(3)		1 2		
2,4-Dichlorophenol	SV	(3)				
2,4-Dimethylphenol	SV	(3)				
2,4-Dinitrophenol	SV	(3)				
2,4-Dinitrotoluene	SV	(3)				
2,6-Dinitrotoluene	SV	(3)				
2-Chloronaphthalene	SV	(3)				
2-Chlorophenol	SV	(3)				
2-Methylnaphthalene	SV	(3)				
2-Methylphenol	SV	(3)				
2-Nitroaniline	SV	(3)				
2-Nitrophenol	SV	(3)				
3-Nitroaniline	SV	(3)				
4 6-Dinitro 2-methylphenol	SV	(3)				
4-Bromophenyl-phenyl-ether	SV	(3)				
4-Chloroaniline	SV	(3)				
4-Chlorophenyl-phenyl-ether	SV	(3)				
4-Chloro-3-methylphenol	SV	(3)				
4-Methylphenol	SV	(3)				
4-Nitroaniline	SV	(3)				
4-Nitrophenol	SV	(3)				
Acenaphthene	SV	(3)				
Anthracene	SV	(3)				
Benzidine	SV	(3B C)		0 00012		
Benzoic Acid	SV	(3)				
Benzo(a)anthracene	SV	(3)				
Benzo(a)pyrene	SV	(3)				
Benzo(b)fluoranthene	SV	(3)				
Benzo(g,h,i)perylene	SV	(3)				
Benzo(k)fluoranthene	SV	(3)				
Benzyl Alcohol	SV	(3)				
(2-Chloroethoxy)methane	SV	(3)				
2-Chloroethyl)ether	SV	(3)		0.0000037		
(Chloromethyl)ether	SV					
bis(2-Chloroisopropyl)ether	SV	(3)				
bis(2-Ethylhexyl)phthalate (Di(2-ethylhexyl)p	SV	(3)				
Butadiene	SV					
Butyl Benzylphthalate	SV	(3)				

TABLE E-1.D (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
STREAM SEGMENT (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Segment 4 & 5 Stream Classification and Water Quality Standards (5) (2)			
			Stream Segment Table (7)		Table 2 Radionuclides (8)	
Parameter	Type (4)	Method (3)	Acute Value	Chronic Value	Woman Creek	Walnut Creek
Chlorinated Ethers	SV	(3)				
Chlorinated Napthalenes	SV	(3)				
Chloroalkylethers	SV	(3)				
Chlorophenol (total)	SV	(3)				
Chrysene	SV	(3)				
Dibenzofuran	SV	(3)				
Dibenz(a,h)anthracene	SV	(3)				
Dichlorobenzenes	SV	(3)				
Dichlorobenzidine (Total)	SV	(3)		0.01		
Diethylphthalate	SV	(3)				
Di(2-ethylhexyl)adipate	SV	(3)				
Dimethylphthalate	SV	(3)				
Di-n-butylphthalate	SV	(3)				
Di-n-octylphthalate	SV	(3)				
Ethylene Glycol	SV	(3C)				
Fluoranthene	SV	(3)				
Fluorene	SV	(3)				
Formaldehyde	SV					
Haloethers	SV	(3)				
Hexachlorobenzene	SV	(3)		0.00072		
Hexachlorobutadiene	SV	(3)		0.45		
Hexachlorocyclopentadiene	SV	(3)				
Hexachloroethane	SV	(3)		1 9		
Hydrazine	SV					
Indeno(1 2,3-cd)pyrene	SV	(3)				
Isophorone	SV	(3)				
Naphthalene	SV	(3)				
Nitrobenzene	SV	(3)				
Nitrophenols	SV	(3)				
Nitrosamines	SV	(3)				
N-Nitrosodibutylamine	SV	(3B)		0.0064		
N-Nitrosodiethylamine	SV	(3B)		0.0008		
N-Nitrosodimethylamine	SV	(3B)		0.0014		
N-Nitrosopyrrolidine	SV	(3B)		0.016		
N-Nitrosodiphenylamine	SV	(3B)		4 9		
N-Nitroso-di-n-propylamine	SV	(3B)				
Pentachlorinated Ethanes	SV	(3B)				
Pentachlorobenzene	SV	(3B)				
Pentachlorophenol	SV	(3)				
Phenanthrene	SV	(3)				
Phenol	SV	(3)				
Phthalate Esters	SV	(3)				
Polynuclear Aromatic Hydrocarbons	SV	(3)				
Pyrene	SV	(3)				
Vinyl Chloride	V	(3)				
1 1 1 Trichloroethane	V	(3)				
1 1 2,2 Tetrachloroethane	V	(3)		0.17		
1 1 2 Trichloroethane	V	(3)		0.60		
1 1-Dichloroethane	V	(3)				
1 1-Dichloroethene	V	(3)				
1 2-Dichloroethane	V	(3)				
1 2-Dichloroethene (cis)	V	(3)				
1 2-Dichloroethene (total)	V	(3)				
1 2-Dichloroethene (trans)	V	(3)				
1 2-Dichloropropane	V	(3)				
1 3-Dichloropropene (cis)	V	(3)				
1 3-Dichloropropene (trans)	V	(3)				
2-Butanone	V	(3)				
2-Hexanone	V	(3)				
4-Methyl-2-pentanone	V	(3)				
Acetone	V	(3)				

TABLE E-1.D (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16 1992)
STREAM SEGMENT (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Segment 4 & 5 Stream Classification and Water Quality Standards (b) (2)			
			Stream Segment Table (7)		Table 2 Radionuclides (6)	
Parameter	Type (4)	Method (3)	Acute Value	Chronic Value	Woman Creek	Walnut Creek
Acrylonitrile	V	(3)		0.058		
Benzene	V	(3)				
Bromodichloromethane	V	(3)				
Bromoform	V	(3)				
Bromomethane	V	(3)				
Carbon Disulfide	V	(3)				
Carbon Tetrachloride	V	(3)				
Chlorinated Benzenes	V/SV	(3)				
Chlorobenzene	V	(3)				
Chloroethane	V	(3)				
Chloroform	V	(3)		0.19		
Chloromethane	V	(3)				
Dibromochloromethane	V	(3)				
Dichloroethenes	V	(3)				
Ethylbenzene	V	(3)				
Ethylene Dibromide	V	(3C)				
Ethylene Oxide	V					
Halomethanes	V	(3)		0 19		
Methylene Chloride	V	(3)				
Styrene	V	(3)				
Tetrachloroethanes	V	(3)		0.8		
1 2,2 Tetrachloroethene	V	(3)				
iene	V	(3)				
hloroethanes	V	(3)				
1 1 Trichloroethene	V	(3)				
Vinyl Acetate	V	(3)				
Xylenes (Total)	V	(3)				

TABLE E-1.D (continued)

EXPLANATION OF TABLE AND ENDNOTES

CDH = Colorado Department of Health
EPA = Environmental Protection Agency
pCi/l = picocuries per liter
PCB = polychlorinated biphenyl
RFP = Rocky Flats Plant
SS = specific species
THM = Total Trihalomethanes bromoform, chloroform, bromodichloromethane dibromochloromethane
TIC = Tentatively Identified Compound
TVS = Table Value Standard (hardness dependent) see Table III in (a)
ug/l = micrograms per liter
WQCC = Water Quality Control Commission

(1) In the absence of specific, numeric standards for non-naturally occurring organics, the narrative standard is interpreted as zero with enforcement based on practical quantification levels (PQLs) as defined by CDH/WQCC or EPA
(2) Segment 5 has a goal qualifier for all use classifications.
(3) See Attachment 1 for analytical methods with corresponding detection limits.
abbreviations are E=EPA, SW=SW846; a=detected as total, b=detected as TICs or with method modifications; c=not routinely monitored d=monitored in discharge ponds e=mixture-individual isomers detected
(4) Type abbreviations are: A=anion B=bacteria; C=cation; D=dioxin, E=element; FP=field parameter H=herbicide IN=inorganic; M=metal, P=pesticide PP=pesticide/PCB R=radionuclide SV=semi-volatile V=volatile
(5) MDL for Radium 226 is 0.5, MDL for Radium 228 is 1 0
(6) These parameters are to be maintained at the lowest practical level. See section 3.1 11 (f) (2) in (a)
(7) Where the standard is below (more stringent than) the PQL, the PQL is interpreted to be the compliance level.

(a) CDH/WQCC Colorado Water Quality Standards 3.1 0 (5 CCR 1002-8) 1/15/1974 amended 10/8/1991
(b) CDH/WQCC Classifications and Numeric Standards for S Platte River Basin, Laramie River Basin, Republican River Basin, Smoky Hill River Basin 3.8.0 (5 CCR 1002-8) 4/6/1981 amended 7/16/1992 Site-specific standards may become basin-wide in 1993 with modifications.

TABLE E-1 E
POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS
SOIL CONTAMINANT CRITERIA

TABLE E-1.E

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
SOIL CONTAMINANT CRITERIA
ALL VALUES ARE IN mg/Kg UNLESS OTHERWISE NOTED

Parameter	Type (1)	Method (2)	FEDERAL BENCHMARKS (a) Maximum allowed Concentration SOLIDS (PPM)	FEDERAL BENCHMARKS (a) Maximum allowed Concentration LIQUIDS (mg/l)	STATE BENCHMARKS (b) Maximum allowed Concentration SOLIDS (PPM)	STATE BENCHMARKS (b) Maximum allowed Concentration LIQUIDS (mg/l)
Chloride	A	E325				
Cyanide (Free)	A	E335	4.416 E+0	4.416 E+0		
Fluoride	A	E340				
N as Nitrate	A	E353.1				
N as Nitrate+Nitrite	A	E353.1				
N as Nitrite	A	E354.1				
Sulfate	A	E375.4				
Sulfide H2S Undissociated	A	E376.1				
Coliform (Fecal)	B	SM9221C				
Ammonia as N	C	E350				
Dioxin	D	(2)				
Boron	E	SW6010(2B)				
Chlorine Total Residual	E	SM4500				
Sulfur	E					
Dissolved Oxygen	FP	SM4500				
pH (Standard Units)	FP	E150.1				
Specific Conductance	FP	E120.1				
Temperature (Degrees Celsius)	FP					
...inity	IN	E310.1				
...bestos	IN					
Total Dissolved Solids	IN	E160.1				
Total Organic Carbon	IN	E415.1				
Aluminum	M	(2)				
Antimony	M	(2)	6.309 E 02	6.309 E 02		
Arsenic	M	(2)	3.155 E-01	3.155 E-01		
Arsenic III	M					
Arsenic V	M					
Barium	M	(2)	6.309 E+0	6.309 E+0		
Beryllium	M	(2)				
Cadmium	M	(2)	6.309 E-02	6.309 E-02		
Calcium	M	(2)				
Cesium	M	(2)				
Chromium	M	(2)	3.155 E-01	3.155 E-01		
Chromium III	M					
Chromium VI	M	E218.5				
Cobalt	M	(2)				
Copper	M	(2)				
Iron	M	(2)				
Lead	M	(2)	J	J		
Lithium	M	(2)				
Magnesium	M	(2)				
Manganese	M	(2)				
Mercury	M	(2)	1.262 E-02	1.262 E-02		
Molybdenum	M	(2)				
Nickel	M	(2)	J	J		
Potassium	M	(2)				
Selenium	M	(2)	6.309 E-02	6.309 E-02		
Silver	M	(2)	3.155 E-01	3.155 E-01		
Sodium	M	(2)				
...ntium	M	(2)				
...ium	M	(2)	1.893 E-02	1.893 E-02		
	M	(2)				
Titanium	M	SW6010(2B)				
Tungsten	M	SW6010(2B)				
Vanadium	M	(2)				
Zinc	M	(2)				

TABLE E-1.E (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
SOIL CONTAMINANT CRITERIA
ALL VALUES ARE IN mg/Kg UNLESS OTHERWISE NOTED

Parameter	Type (1)	Method (2)	FEDERAL BENCHMARKS (b) Maximum allowed Concentration SOLIDS (PPM)	FEDERAL BENCHMARKS (b) Maximum allowed Concentration LIQUIDS (mg/l)	STATE BENCHMARKS (b) Maximum allowed Concentration SOLIDS (PPM)	STATE BENCHMARKS (b) Maximum allowed Concentration LIQUIDS (mg/l)
Aldicarb	P		1.253 E+0	6.309 E-02		
Aldicarb Sulfone	P					
Aldicarb Sulfoxide	P					
Aldrin	P	(2)	1.351 E-03	1.262 E-05		
Carbofuran	P	(2C)				
Chloranil	P					
Chlordane	P	(2)	1.944 E+01	1.262 E-02		
Chlorpyrifos	P	(2)				
DDT	P	(2)	3.109 E+0	6.309 E-04		
DDT Metabolite (DDD)	P	(2)	5.962 E-02	6.309 E-04		
DDT Metabolite (DDE)	P	(2)	9.902 E-01	6.309 E-04		
Demeton	P	(2)				
Diazinon	P	(2)				
Dieldrin	P	(2)	1.292 E-03	1.262 E-05		
Endosulfan I	P	(2)				
Endosulfan II	P	(2)				
Endosulfan sulfate	P	(2)				
Endrin	P	(2)	1.004 E+0	1.262 E-03		
Endrin Aldehyde	P	(2B)				
Endrin Ketone	P	(2B)				
Guthion (Azinphos methyl)	P	(2)				
Heptachlor	P	(2)	3.345 E+0	2.524 E-03		
Heptachlor Epoxide	P	(2)	8.346 E-01	1.262 E-03		
Hexachlorocyclohexane Alpha	P	(2)				
Hexachlorocyclohexane, Beta	P	(2)				
Hexachlorocyclohexane (HCH or BHC)	P					
Hexachlorocyclohexane, Delta	P	(2)				
Hexachlorocyclohexane Technical (Total)	P	(2E)				
Hexachlorocyclohexane Gamma (Lindane)	P	(2)				
Malathion	P	(2B)				
Methoxychlor	P	(2)	2.633 E+04	6.309 E-01		
Mirex	P					
Oxamyl (Vydate)	P					
Parathion	P	(2B)				
Toxaphene	P	(2)	7.909 E+01	3.155 E-02		
Vaponite 2	P					
Aroclor 1016	PP	(2)				
Aroclor 1221	PP	(2)				
Aroclor 1232	PP	(2)				
Aroclor 1242	PP	(2)				
Aroclor 1248	PP	(2)				
Aroclor 1254	PP	(2)				
Aroclor 1260	PP	(2)				
PCBs (Total)	PP	(2)	1.223 E+01	3.155 E-03		
2,4,5-TP Silvex	H	(2C)	9.905 E+0	6.309 E-02		
2,4-Dichlorophenoxyacetic Acid(2,4-D)	H	(2C)	1.069 E+02	6.309 E-04		
Acrolein	H		1.181 E+0	3.15 E+0		
Atrazine	H	(2D)				
Bromacil	H					
Dalapon	H	(2)				
Dinoseb	H	(2)				
Diquat	H					
Endothall	H					
Glyphosate	H					
Picloram	H					
Simazine	H	(2D)				
Americium (Total) (pCi/l)	R					

TABLE E-1.E (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
SOIL CONTAMINANT CRITERIA
ALL VALUES ARE IN mg/Kg UNLESS OTHERWISE NOTED

			FEDERAL BENCHMARKS (a)		STATE BENCHMARKS (b)	
			Maximum allowed Concentration		Maximum allowed Concentration	
Parameter	Type (1)	Method (2)	SOLIDS (PPM)	LIQUIDS (mg/l)	SOLIDS (PPM)	LIQUIDS (mg/l)
Americium 241 (pCi/l)	R					
Cesium 134 (pCi/l)	R					
Cesium 137 (pCi/l)	R					
Gross Alpha (pCi/l)	R				5 0 pCi/g	
Gross Beta (pCi/l)	R				50.0 pCi/g	
Plutonium (Total) (pCi/l)	R					
Plutonium 238+239+240 (pCi/l)	R				0.9 pCi/g	
Radium 226+228 (pCi/l)	R					
Strontium 89+90 (pCi/l)	R					
Strontium 90 (pCi/l)	R					
Thorium 230+232 (pCi/l)	R					
Tritium (pCi/l)	R					
Uranium 233+234 (pCi/l)	R					
Uranium 235 (pCi/l)	R					
Uranium 238 (pCi/l)	R					
Uranium (Total)(pCi/l)	R					
1 2,4,5-Tetrachlorobenzene	SV	(2B)	5 603 E+01	6 309 E-02		
1,2,4-Trichlorobenzene	SV	(2)	1.217 E+04	4.4165 E+0		
1 2-Dichlorobenzene (Ortho)	SV	(2)	4 999 E+03	3.785 E+0		
iphenylhydrazine	SV	(2B)	6 976 E-04	2.524 E-04		
ichlorobenzene (Meta)	SV	(2)	4 790 E+04	1.893 E+0		
Dichlorobenzene (Para)	SV	(2)	2.650 E+02	4 732 E 01		
2,4 5-Trichlorophenol	SV	(2)	2.101 E+04	2.524 E+01		
2,4,6-Trichlorophenol	SV	(2)	3.536 E-01	1.262 E 02		
2,4-Dichlorophenol	SV	(2)	4.329 E+04	6.309 E-01		
2,4-Dimethylphenol	SV	(2)	1.248 E+01	1.262 E 01		
2,4-Dinitrophenol	SV	(2)	2.296 E+01	4.416 E-04		
2,4-Dinitrotoluene	SV	(2)				
2,6-Dinitrotoluene	SV	(2)				
2-Chloronaphthalene	SV	(2)				
2-Chlorophenol	SV	(2)	4 412 E+04	1.262 E+0		
2 Methylnaphthalene	SV	(2)				
2-Methylphenol	SV	(2)				
2-Nitroaniline	SV	(2)				
2 Nitrophenol	SV	(2)				
3,3 Dichlorobenzidine	SV	(2)	5 656 E-02	5 047 E-04		
3-Nitroaniline	SV	(2)				
4 6-Dinitro-2 methylphenol	SV	(2)				
4-Bromophenyl phenyl-ether	SV	(2)				
4-Chloroaniline	SV	(2)				
4-Chlorophenyl phenyl-ether	SV	(2)				
4-Chloro-3-methylphenol	SV	(2)				
4-Methylphenol	SV	(2)				
4-Nitroaniline	SV	(2)				
4-Nitrophenol	SV	(2)				
Acenaphthene	SV	(2)				
Anthracene	SV	(2)	7 701 E+01	1.262 E-02		
Benzidine	SV	(2BC)	1 262 E-06	1.262 E-06		
Benzoic Acid	SV	(2)				
Benzo(a)anthracene	SV	(2)	9 690 E-02	6.309 E-05		
Benzo(a)pyrene	SV	(2)	3.8675 E-02	1 893 E 05		
Benzo(b)fluoranthene	SV	(2)	1.643 E-04	1.262 E-04		
Benzo(g,h,i)perylene	SV	(2)				
o(k)fluoranthene	SV	(2)	7 790 E+02	2.524 E-02		
yl Alcohol	SV	(2)				
(2-Chloroethoxy)methane	SV	(2)				
bis(2-Chloroethyl)ether	SV	(2)	1 893 E-04	1.893 E-04		
bis(Chloromethyl)ether	SV					
bis(2-Chloroisopropyl)ether	SV	(2)	2.234 E+03	6.309 E+0		
bis(2-Ethylhexyl)phthalate (Di(2-ethylhexyl)phthal	SV	(2)	4.210 E+01	1 893 E-02		

TABLE E-1.E (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
SOIL CONTAMINANT CRITERIA
ALL VALUES ARE IN mg/Kg UNLESS OTHERWISE NOTED

			FEDERAL BENCHMARKS (a) Maximum allowed Concentration		STATE BENCHMARKS (b) Maximum allowed Concentration	
Parameter	Type (1)	Method (2)	SOLIDS (PPM)	LIQUIDS (mg/l)	SOLIDS (PPM)	LIQUIDS (mg/l)
Butadiene	SV					
Butylbenzylphthalate	SV	(2)	6.375 E+04	5.678 E+0		
Chlorinated Ethers	SV	(2)				
Chlorinated Napthalenes	SV	(2)				
Chloroalkylethers	SV	(2)				
Chrysene	SV	(2)	1.516 E+01	1.262 E-03		
Dibenzofuran	SV	(2)				
Dibenz(a,h)anthracene	SV	(2)	7.318 E-03	4.416 E-06		
Dichlorobenzenes	SV	(2)				
Diethylphthalate	SV	(2)	4.795 E+05	1.893 E+02		
Di(2-ethylhexyl)adipate	SV					
Dimethylphthalate	SV	(2)	9.232 E+06	2.524 E+03		
Di n butylphthalate	SV	(2)				
Di n-octylphthalate	SV	(2)	3.441 E+04	3.785 E+0		
Ethylene Glycol	SV	(2C)				
Fluoranthene	SV	(2)	2.971 E+04	1.262 E+0		
Fluorene	SV	(2)	1.048 E+01	1.262 E 02		
Formaldehyde	SV					
Haloethers	SV	(2)				
Hexachlorobenzene	SV	(2)	2.619 E-01	1.262 E-04		
Hexachlorobutadiene	SV	(2)	5 139 E+0	3.155 E-03		
Hexachlorocyclopentadiene	SV	(2)	8.283 E+03	1.262 E+0		
Hexachloroethane	SV	(2)	2.956 E+0	1.893 E-02		
Hydrazine	SV		6.309 E-05	6.309 E-05		
Indeno(1,2,3-cd)pyrene	SV	(2)	2.970 E+04	1.262 E-03		
Isophorone	SV	(2)	1.345 E+04	4.416 E+01		
Naphthalene	SV	(2)	5 738 E+05	6.309 E+01		
Nitrobenzene	SV	(2)	6.557 E+0	1.262 E-01		
Nitrophenols	SV	(2)				
Nitrosamines	SV	(2)				
N Nitrosodibutylamine	SV	(2B)				
N Nitrosodiethylamine	SV	(2B)				
N Nitrosodimethylamine	SV	(2B)				
N Nitrosopyrrolidine	SV	(2B)	1.262 E-04	1.262 E-04		
N Nitrosodiphenylamine	SV	(2B)	6.309 E-05	6.309 E-05		
N Nitroso-di n-dipropylamine	SV	(2B)				
Pentachlorinated Ethanes	SV	(2B)				
Pentachlorobenzene	SV	(2B)	2.284 E+03	1.893 E-04		
Pentachlorophenol	SV	(2)	2.917 E+03	1.262 E+0		
Phenanthrene	SV	(2)	1.398 E+01	1.262 E-02		
Phenol	SV	(2)	2.051 E+04	1.262 E-02		
Phthalate Esters	SV	(2)				
Polynuclear Aromatic Hydrocarbons	SV	(2)				
Pyrene	SV	(2)	4.076 E+05	6.309 E+0		
Vinyl Chloride	V	(2)	1.822 E-01	1.262 E-02		
1,1,1 Trichloroethane	V	(2)	2.229 E+02	1.262 E+0		
1,1,2,2-Tetrachloroethane	V	(2)	5.832 E-03	1.262 E-03		
1,1,2-Trichloroethane	V	(2)	2.315 E-02	3.785 E-03		
1,1 Dichloroethane	V	(2)	1.140 E-02	2.254 E-03		
1,1 Dichloroethene	V	(2)	1.270 E+0	4.416 E-02		
1,2-Dichloroethane	V	(2)	3.717 E-01	3.155 E-02		
1,2-Dichloroethene (cis)	V	(2A)	2.973 E+01	4.416 E-7		
1,2-Dichloroethene (total)	V	(2)				
1,2-Dichloroethene (trans)	V	(2A)	3.641 E+01	6.309 E-01		
1,2-Dichloropropane	V	(2)	6.995 E-01	3.155 E-02		
1,3-Dichloropropene (cis)	V	(2)				
1,3-Dichloropropene (trans)	V	(2)				
2-Butanone	V	(2)				
2-Hexanone	V	(2)				
4-Methyl 2-pentanone	V	(2)				

TABLE E-1.E (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
SOIL CONTAMINANT CRITERIA
ALL VALUES ARE IN mg/Kg UNLESS OTHERWISE NOTED

			FEDERAL BENCHMARKS (a) Maximum allowed Concentration		STATE BENCHMARKS (b) Maximum allowed Concentration	
Parameter	Type (1)	Method (2)	SOLIDS (PPM)	LIQUIDS (mg/l)	SOLIDS (PPM)	LIQUIDS (mg/l)
Acetone	V	(2)	5.170 E+02	2.524 E+01		
Acrylonitrile	V	(2B)	3.785 E-04	3.785 E-04		
Benzene	V	(2)	8.879 E-01	3.156 E-02		
Bromodichloromethane	V	(2)	7.546 E+02	4.4165 E+0		
Bromoform	V	(2)				
Bromomethane	V	(2)	3.606 E+01	3.155 E-01		
Carbon Disulfide	V	(2)	1.277 E+04	2.524 E+01		
Carbon Tetrachloride	V	(2)	1 408 E+0	3.155 E-02		
Chlorinated Benzenes	V/SV	(2)				
Chlorobenzene	V	(2)	1.526 E+02	6.309 E-01		
Chloroethane	V	(2)				
Chloroform	V	(2)	4.968 E-01	3.785 E-02		
Chloromethane	V	(2)				
Dibromochloromethane	V	(2)				
Dichloroethenes	V	(2)				
Ethylbenzene	V	(2)	4.984 E+03	4.416 E+0		
Ethylene Dibromide	V	(2C)	6.078 E-04	3.155 E-04		
Ethylene Oxide	V		6.309 E-04	6.309 E-04		
Halomethanes	V	(2)				
Methylene Chloride	V	(2)				
[illegible]ene	V	(2)	2.343 E+0	3.155 E-02		
[illegible]chloroethanes	V	(2)				
[illegible]achloroethene	V	(2)	3.480 E+0	3.155 E-02		
Toluene	V	(2)	1.173 E+04	1.262 E+01		
Trichloroethanes	V	(2)				
Trichloroethene	V	(2)	1.146 E+0	3.155 E-02		
Vinyl Acetate	V	(2)				
Xylenes (total)	V	(2)				

TABLE E-1.E (continued)

EXPLANATION OF TABLE AND ENDNOTES

CDH = Colorado Department of Health
EPA = Environmental Protection Agency
pCi/g = picocuries per gram
PCB = polychlorinated biphenyl
RCRA = Resource Conservation Recovery Act
RFP = Rocky Flats Plant
SDWA = Safe Drinking Water Act
TIC = Tentatively Identified Compound
mg/Kg = milligrams per kilogram

(1) Type abbreviations are: A=anion; B=bacteria; C=cation; D=dioxin; E=element; FP=field parameter H=herbicide; IN=inorganic; M=metal; P=pesticide; PP= pesticide/PCB, R=radionuclide; SV=semi-volatile; V=volatile
(2) See Attachment 1 for analytical methods with corresponding analytes and detection limits
abbreviations are: E=EPA; SW=SW846; A=detected as total; B=detected as TICs; C=not routinely monitored; D=monitored in discharge ponds;
E=mixture-individual isomers detected

(a) EPA Guidance 9347.3-09FS, A Guide to Delisting of RCRA Wastes for Superfund Remedial Responses: Based on Health-based 10-6 risk, developed for delisting hazardous wastes and waste residuals.
(b) Value derived from Colorado Radiation Control Rules and Regulations, 1985 as amended 1990.

TABLE E-2
COLORADO AIR QUALITY CONTROL COMMISSION STANDARDS, REGULATION 3

TABLE E-2
COLORADO AIR QUALITY CONTROL COMMISSION STANDARDS

(State of Colorado, Regulation 3)

Criteria Pollutants (NAAQS)

CO, SO_2, NO_x, Particulate Matter (TSP), O_3, Pb

<u>TSP (Total Suspended Particulates) - Colorado SIP for Metropolitan Denver</u>

	Primary Std	Secondary Std	
Annual	75 μg/m³	60 μg/m³	Annual arithmetic mean
24-Hour	260 μg/m³	150 μg/m³	Not exceeded more than 1x/year

<u>SO_2 (Sulfur Dioxide) - Colorado SIP</u>

Incremental --->	Category 1	Category 2	Category 3
Annual Arithmetic Mean	2 μg/m³	10 μg/m³	15 μg/m³
24-Hour Maximum	5 μg/m³	50 μg/m³	100 μg/m³
3-Hour Maximum	25 μg/m³	300 μg/m³	700 μg/m³

<u>O_3 (Ozone, Oxidant) - Colorado SIP for Metropolitan Denver</u>

Averaging Time/Standard	1 hour	160 μg/m³

<u>CO (Carbon Monoxide) - Colorado SIP for Metropolitan Denver</u>

Averaging Time/Standard	8 hour	10 μg/m³
Averaging Time/Standard	1 hour	40 μg/m³

<u>NO_2 (Nitrogen Dioxide) - Colorado SIP for Metropolitan Denver</u>

Averaging Time/Standard	Annual	100 μg/m³

<u>Pb (Lead) Colorado SIP</u>

Averaging Time/Standard	Quarter	1.5 μg/m³

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TABLE E-2
COLORADO AIR QUALITY CONTROL COMMISSION STANDARDS

(State of Colorado, Regulation 3)

Colorado PSD (Prevention of Significant Deterioration) Requirements

Significant rate of emissions per emissions unit that would equal or exceed any of the following in tons per year (tpy), emit or potential to emit.

CO 100 tpy
NO_x. 40 tpy ($NO + NO_2$)
SO_2. 40 tpy

Particulate Matter· 25 tpy of PM emissions (TSP)
PM-10 Emissions. 15 tpy, particulate aerodynamic diameter ≤ 10 μm

Ozone 40 tpy of VOC (precursor for O_3)

Pb 0 6 tpy

Fluorides 3 tpy

H_2SO_4 mist 7 tpy

H_2S 10 tpy

Total reduced sulfur, including H_2S 10 tpy
Reduced sulfur compounds, including H_2S 10 tpy

Total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans. 3.2 grams/year, $3.5x10^{-6}$ tpy
  2,3,7,8 -TCDD (tetrachlorodibenzo-p-dioxin)
  Municipal waste combustor organics

Metals, measured as particulate matter· 14 Mgrams/year, 15 tpy
  Municipal waste combustor metals

Acid gases, measured as SO_2 and HCl. 36 Mgrams/year, 40 tpy
  Municipal waste combustor acid gases

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TABLE E-2
COLORADO AIR QUALITY CONTROL COMMISSION STANDARDS

(State of Colorado, Regulation 3)

Colorado PSD Requirements for Particular Pollutants

New Stationary Source Emissions or Net Emissions Increase from a Modification --> PSD

Particular pollutant emissions from a new major source or major modification, which would cause air quality impacts in any area of Colorado, less than the following amounts, not subject to BACT, monitoring and analysis requirements (Amounts at 25 ● C and at one atmosphere (1013 millibars))

CO	8 hour average	575 $\mu g/m^3$
NO_2	Annual average	14 $\mu g/m^3$
PM TSP	24-hour average	10 $\mu g/m^3$
PM 10	24-hour average	10 $\mu g/m^3$
SO_2	24-hour average	13 $\mu g/m^3$
Pb	3-month average	0 1 $\mu g/m^3$
Hg	24-hour average	0 25 $\mu g/m^3$
Be	24-hour average	1 ng/m^3, 0 001 $\mu g/m^3$
Fluorides	24-hour average	0.25 $\mu g/m^3$
Vinyl chloride	24-hour average	15 $\mu g/m^3$
Total reduced sulfur	1 hour average	10 $\mu g/m^3$
H_2S	1 hour average	0.2 $\mu g/m^3$
Reduced sulfur compounds	1-hour average	10 $\mu g/m^3$

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TABLE E-2
COLORADO AIR QUALITY CONTROL COMMISSION STANDARDS

(State of Colorado, Regulation 3)

Ambient Air Increments Over Baseline Concentrations in Colorado

Maximum allowable increases over baseline concentrations for the following:

Any Class I Area (National Parks, Wilderness and Primitive Areas)

PM - TSP	Annual geometric mean	5 μg/m³
	24-hour maximum	10 μg/m³
SO_2	Annual arithmetic mean	2 μg/m³
	24-hour maximum	5 μg/m³
	3-hour maximum	25 μg/m³
NO_2	Annual arithmetic mean	2.5 μg/m³

Any Class II Area (Nearly Everywhere Else)

PM - TSP	Annual geometric mean	19 μg/m³
	24-hour maximum	37 μg/m³
SO_2	Annual arithmetic mean	20 μg/m³
	24-hour maximum	91 μg/m³
	3-hour maximum	512 μg/m³
NO_2	Annual arithmetic mean	25 μg/m³

901-004 450
(TableE2)

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TABLE E-3
POTENTIAL LOCATION SPECIFIC BENCHMARKS

Location	Requirement	Citation
Fault zones	RCRA regulations specify that hazardous waste treatment, storage, or disposal must not take place within 200 feet of a Holocene fault	40 CFR 2645 18(a)
Flood plain	Any RCRA treatment, storage or disposal facility which lies within a 100-year floodplain must be designed, constructed and operated to avoid washout	40 CFR 264 18(b)
Siting of Hazardous Waste Disposal Sites	Outlines siting criteria for hazardous waste disposal sites	Colorado Hazardous Waste Act, Sections 25 15 101, 203, 208 302
Siting of Wastewater Treatment Facilities	CDH Water Quality Control Division must approve locations of wastewater treatment facilities	Colorado Water Quality Control Act Section 25 8 202 and 25 8 702
Siting within an area where action may cause irreparable harm loss or destruction of significant articles	Planned actions must avoid threatening significant scientific, prehistorical, historical, or archeological data	36 CFR Part 65, National Historic Preservation Act
ing on or near historic property owned or controlled by Federal agency	Action to preserve historic properties, planning of action to minimize harm to National Historic Landmarks, included in or eligible for the National Register of Historic Places	36 CFR Part 800 National Historic Preservation Act
Siting on critical habitat of endangered or threatened species	Action to conserve endangered or threatened species	50 CFR Parts 200, 402, 33 CFR Parts 320-330
Wetlands	Actions must minimize the destruction loss, or degradation of wetlands as defined by Executive Order 11990, Section 7	40 CFR Part 6, Appendix A
	Actions must not discharge dredged or fill material into wetlands without permit	40 CFR Parts 230, 231
Area affecting stream or river	Action must protect fish or wildlife	40 CFR 6 302

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequsites for Applicability[c,d]	Citation
Air Stripping	(CAA requirements to be provided.)		
Closure with No Post-closure Care (e g., Clean Closure)	General performance standard requires elimination of need for further maintenance and control, elimination of post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products	Applicable to land-based unit containing hazardous waste [d] Applicable to RCRA hazardous waste (listed or characteristic) placed at site after the effective date of the requirements, or placed into another unit. Not applicable to material treated, stored, or dis posed only before the effective date of the requirements, or if treated in-situ, or consolidated within area of contamination. De signed for cleanup that will not require long-term management Designed for cleanup to health based standards	40 CFR 264 111
	Disposal or decontamination of equipment, structures, and soils Removal or decontamination of all waste residues, contaminated contain ment system components (e g., liners, dikes) contaminated subsoils, and structures and equipment contaminat ed with waste and leachate, and man agement of them as hazardous waste	May apply to surface impound ments and container or tank liners and hazardous waste residues, and to contaminated soil, including soil from dredging or soil disturbed in the course of drilling or excavation, and returned to land	40 CFR 264 111 40 CFR 264 178 40 CFR 264 197 40 CFR 264.288(o)(1) and 40 CFR 264.258
	Meet health-based levels at unit		40 CFR 264.259

[a]Currently on RCRA, CHA, and SDWA requirements are included Additional action-specific requirements will be added as additional statutes are analyzed

[b]Action alternatives from ROD keyword index, FY1986 Record of Decision Annual Report, January 1987, Hazardous Site Control Division, EPA.

Requirements have been proposed but not promulgated for air stripping, hybrid closure, gas collection and miscellaneous treatment When these regulations are promulgated, they will be included in the matrix.

[d]Some action specific requirements listed may be relevant and appropriate event if RCRA definitions of storage, disposal, or hazardous waste are not met, or if the waste at the site is similar to but not identifiable as a RCRA hazardous waste

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Closure with Waste In-place	Eliminate free liquids by removal or solidification. Stabilization of remaining waste and waste residues to support cover	Applicable to land disposal of hazardous waste. Applicable to RCRA hazardous waste (listed or characteristic) placed at site after the effective date of the requirements, or placed into another unit. Not applicable to material treated, stored, or disposed only before the effective date of the requirements, or if treated in-situ or consolidated within area of contamination.	40 CFR 264.228(a)(2) 40 CFR 264.228(a)(2) 40 CFR 264.258(b)
	Installation of final cover to provide long-term minimization of infiltration		40 CFR 264.310
	30-year post-closure care and ground-water monitoring.[e]		40 CFR 264.310
Comprehensive Environmental Response, Compensation and Liability Act Program	Establishes basic requirements for implementation of the Superfund at DOE facilities.		DOE 5480 14
Container Storage	Containers of RCRA hazardous waste must be • Maintained in good condition, • Compatible with hazardous waste to be stored, and • Closed during storage (except to add or remove waste) Inspect container storage areas weekly for deterioration.	Storage of RCRA hazardous waste (listed or characteristic) not meeting small quantity generator criteria held for a temporary period greater than 90 days before treatment, disposal, or storage elsewhere (40 CFR 264 10), in a container (i.e., any portable device in which a material is stored, transported, disposed of, or handled) A generator who accumulates or stores hazardous waste on-site for 90 days or less in compliance with 40 CFR 262.34(a)(1-4) is not subject to full RCRA storage requirements Small quantity generators are not subject to the 90-day limit (40 CFR 262.34 (c),(d), and (e))	40 CFR 264 171 40 CFR 264 172

[e]Regional administrator may revise length of post-closure care period (40 CFR 264 117)

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Container Storage (Continued)	Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10% of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system		40 CFR 264 175
	Keep containers or ignitable or reactive waste at least 50 feet from the facility's property line		40 CFR 264 176
	Keep incompatible materials separate Separate incompatible materials stored near each other by a dike or other barrier		40 CFR 264 177
	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers, liners		40 CFR 264 178
	Storage of banned wastes must be in accordance with 40 CFR 268 When such storage occurs beyond one year the owner/operator bears the burden of proving that such storage is solely for the purpose of accumulating sufficient quantities to allow for proper recovery, treatment, and disposal		40 CFR 268.50
Construction of a New Surface Impoundment (see Closure with Waste In-place and Closure with No Post-closure Care)	<u>Minimum Technology Requirements</u> Use two liners, a top liner that prevents waste migration into the liner and a bottom liner that prevents waste migration through the liner (throughout the post-closure period)	RCRA hazardous waste (listed or characteristic) currently being placed in a new surface impoundment, or use of replacement or lateral extension of existing landfills or surface impoundments.	40 CFR 264.220
	Design liners to prevent failure due to pressure gradients, contact with the waste, climatic conditions, and the stress of installation and daily operations		40 CFR 264.221
	Provide a leachate collection system between the two liners		40 CFR 264.221
	Use a leak detection system that will detect leaks at the earliest possible time		40 CFR 264.222

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Construction of a New Surface Impoundment (see Closure with Waste In-place and Closure with No Post-closure Care) (Continued)	Groundwater Monitoring: Establish a detection monitoring program (264.98) Establish a compliance monitoring program (264.99) and corrective action monitoring program (264 100) when required by 40 CFR 264.91. All monitoring programs must meet RCRA general groundwater monitoring requirements (264 97)	Creation of a new landfill unit to treat, store, or dispose of RCRA hazardous wastes as part of a remedial action.	40 CFR 264 91-264 100
Dike Stabilization	Design and operate facility to prevent overtopping due to overfilling; wind and wave action, rainfall, run-on, malfunctions of level controllers, alarms, and other equipment; and human error	Existing surface impoundment containing hazardous waste, or creation of a new surface impoundment.	40 CFR 264.221
	Construct dikes with sufficient strength to prevent massive failure		40 CFR 264.221
	Inspect liners and cover systems during and after construction.		40 CFR 264.226
	Inspect weekly for proper operation and integrity of the containment devices.		40 CFR 264.226
	Remove surface impoundment from operation if the dike leaks or there is a sudden drop in liquid level.		40 CFR 264.227
	At closure, remove or decontaminate all waste residues and contaminated materials. Otherwise, free liquids must be removed, the remaining wastes stabilized, and the facility closed in the same manner as a landfill.		40 CFR 264.228
	Manage ignitable or reactive wastes so that it is protected from materials or conditions that may cause it to ignite or react.		40 CFR 264.227

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Discharge of Treatment System Effluent	Best Available Technology Use of best available technology economically achievable is required to control toxic and non-conventional pollutants Use of best conventional pollutant control technology is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis	Point source discharge to waters of the United States.[f,g]	40 CFR 122.44(a)
	Water Quality Standards Applicable Federally-approved State water quality standards must be complied with These standards may be in addition to or more stringent than other Federal standards under the CWA [h]		40 CFR 122 44 and State regulations approved under 40 CFR 131
	Discharge limitations must be established at more stringent levels then technology based standards for toxic pollutants		40 CFR 122.44(e)
	Best Management Practices Develop and implement a Best Management Practices program to prevent the release of toxic constituents to surface waters		40 CFR 125 100
	The Best Management Practices program must • Establish specific procedures for the control of toxic and hazardous pollutant spills	Discharge to waters of the U.S	40 CFR 125 104

[f]"Waters of the U S is defined broadly in 40 CFR 122.2 and includes essentially any water body and wetland

[g]Section 121 of SARA exempts on-site CERCLA activities from obtaining permits However, the substantive requirements of a law or regulation must be met In particular on-site discharges to surface waters are exempt from procedural NPDES permit requirements Off site discharges would be required to apply for and obtain an NPDES permit

[h]Federal Water Quality Criteria (FWQC) may be relevant and appropriate depending on the designated or potential use of the water, the media affected, the purposes of the criteria, and current information. (CERCLA Section 121(d)(2)(B)(1)) FWQC he protection of aquatic life will be relevant and appropriate when environmental factors (e g., protection of aquatic ...nisms) are being considered. (50 FR 30784 (July 29, 1951))3

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Discharge of Treatment System Effluent (Continued)	• Include a prediction of direction, rate of flow, and total quantity of toxic pollutants where experience indicates a reasonable potential for equipment failure • Assure proper management of solid and hazardous waste in accordance with regulations promulgated under RCRA.		
	Monitoring Requirements. Discharge must be monitored to assure compliance Discharge will monitor: • The mass of each pollutant • The volume of effluent • Frequency of discharge and other measurements as appropriate		40 CFR 122.41(i)
	Approved test methods for waste constituent to be monitored must be followed. Detailed requirements for analytical procedures and quality controls are provided.		40 CFR 136 1-136 4
	Sample preservation procedures, container materials, and maximum allowable holding times are prescribed.		
	Comply with additional substantive conditions such as. • Duty to mitigate any adverse effects of any discharge, and • Proper operation and maintenance of treatment system		40 CFR 122.41(i)
Discharge of Dredge and Fill Material to Waters of the United States and Ocean Waters	The four conditions that must be satisfied before dredge and fill is an allowable alternative are: • There must be no practical alternative. • Discharge of dredged or fill material must not cause a violation of State water quality standards, violate any applicable toxic effluent standards, jeopardize an endangered species, or injure a marine sanctuary	Capping, dike stabilization, construction of beams and levees, and disposal of contaminated soil, waste material or dredged material are examples of activities that may involve a discharge of dredged or fill material.	40 CFR 230 33 CFR 320-330

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Discharge of Dredge and Fill Material to Waters of the United States and Ocean Waters (Continued)	• No discharge shall be permitted that will cause or contribute to significant degradation of the water • Appropriate steps to minimize adverse effects must be taken Determine long- and short-term effects on physical, chemical, and biological components of the aquatic ecosystem		
Dredging	Removal of all contaminated soil	RCRA hazardous waste placed at site after the effective date of the requirements, or placed into another unit.	See Closure in this Exhibit
	Dredging must comply with Section 10 of the Rivers and Harbors Act and U.S Army Corps of Engineers regulations	Dredging in navigable waters of the United States	33 U S C 403 33 CFR 320-330
rgency Plan , Preparedness and Response for Operations	Provide coordination direction of planning, preparedness, and response to operational emergencies in which there is a potential for personal injury, destruction of property, theft or release of toxic, radioactive, or other hazardous material which present a potential threat to health, safety, or the environment		DOE 5500.2
Environmental Compliance Issue Coordination	Establishes DOE requirements for coordination of significant environmental compliance issues		DOE 5400.2A
Environmental Protection Safety and Health Protection Information Reporting Requirements	Establishes requirements and procedures for reporting information having environmental protection, safety, or health significance for DOE operations		DOE 5484 1
Excavation	Movement of excavated materials to new location and placement in or on land will trigger land disposal restrictions for the excavated waste or closure requirements for the unit in which the waste is being placed.	Materials containing RCRA hazardous wastes subject to land disposal restrictions are placed in another unit	40 CFR 268 (Subpart D)
	Area from which materials are excavated may require cleanup to levels established by closure requirements	RCRA hazardous waste placed at site after the effective date of the requirements.	See Closure in this Exhibit

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
General Environmental Protection Program	Establishes environmental protection program requirements, authorities, and responsibilities for DOE operations for ensuring compliance with federal and state environment protection laws and regulations, federal executive orders, and internal department policies.		DOE 5400.1
Land Treatment	Prior to land treatment, the waste must be treated to BDAT levels or meet a no migration standard.	RCRA hazardous waste being treated or placed into another unit.	See Closure in this Exhibit.
	Ensure that hazardous constituents are degraded, transformed, or immobilized within the treatment zone		40 CFR 264.271
	Maximum depth of treatment zone must be no more than 1.5 meters (5 feet) from the initial soil surface and more than 1 meter (3 feet) above the seasonal high water table		40 CFR 264.271
	Demonstrate that hazardous constituents for each waste can be completely degraded, transformed, or immobilized in the treatment zone		40 CFR 264.271
	Minimize runoff of hazardous constituents.		40 CFR 264.273
	Maintain runon/runoff control and management system		40 CFR 264.273
	Special application conditions if food-chain crops are grown in or on treatment zone		40 CFR 264.276
	Unsaturated zone monitoring.		
	Special requirements for ignitable or reactive waste.		
	Special requirements for incompatible wastes.		40 CFR 264.282
	Special testing and location requirements for certain hazardous materials.	RCRA waste numbers F020, F021, F022, F023, F026, F027 (dioxin-containing wastes)	40 CFR 264.283

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
National Ambient Air Quality	National ambient air quality standards have been set to attain and maintain primary and secondary standards to protect public health and the environ ment Requirements include a major source permit, prevention of signifi cant deterioration permit, non-attain-able area permit, and visibility permit	Remedial actions at Operable Unit 2 that may result in new sources of air emissions include incineration, excavation, and air stripping of contaminated ground water	CAA Section 109 and 40 CFR 50
National Environ mental Policy Act - All New Projects	• Determination of level of docu mentation required • Screen, review and assess potential environmental impacts • Early submittal of an environmen tal checklist to NEPA compliance committee		
Operation and Maintenance	30-year post-closure care to ensure that site is maintained and monitored	Land disposal closure	40 CFR 264.310
Slurry Wall	Excavation of soil for construction of slurry wall may trigger land disposal restrictions	Materials containing RCRA haz-ardous waste subject to land dis-posal restrictions are placed in another unit (See Treatment section for LDR schedule Also see Consolidation, Excavation sections in this Exhibit)	
Surface Water Control	Prevent runon and control and collect runoff from a 24-hour 25-year store (waste piles, land treatment facilities, landfills)	RCRA hazardous waste treated, stored, or disposed after the effec-tive date of the requirements	40 CFR 264.251(c),(d) 40 CFR 264.273(c),(d) 40 CFR 264.301(c),(d)
	Prevent over-topping of surface im poundment		40 CFR 264.221(c)
Tank Storage (On-site)	Tanks must have sufficient structural strength to ensure that they do not obilapse, rupture, or fail.	Storage of RCRA hazardous waste (listed or characteristic) not meet-ing small quantity generator crite ria held for a temporary period greater than 90 days before treat ment, disposal, or storage else-where (40 CFR 264 10), in a tank (i e., any portable device in which a material is stored, transported, disposed of, or handled) A gen-erator who accumulates or stores hazardous waste on-site for 90 days or less in compliance with 40 CFR 262.34(a) (1-4) is not subject to full RCRA	40 CFR 264 190
	Waste must not be incompatible with the tank material unless the tank is protected by a liner or by other means		40 CFR 264 191
	Tanks must be provided with second-ary containment and controls to pre-vent overfilling, and sufficient free board maintained in open tanks to prevent overtopping by wave action or precipitation		40 CFR 264 193-194

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Tank Storage (On-site) (Continued)	(1-4) is not subject to full RCRA storage requirements. Small quantity generators are not subject to the 90-day limit (40 CFR 262.34(c), (d), and (e))		
	Inspect the following: overfilling control, control equipment, monitoring data, waste level (for uncovered tanks), tank condition, above-ground portions of tanks (to assess their structural integrity), and the area surrounding the tank (to identify signs of leakage)		40 CFR 264.195
	Repair any corrosion, crack, or leak.		40 CFR 264 196
	At closure, remove all hazard waste and hazardous waste residues from tanks, discharge control equipment, and discharge confinement structures.		40 CFR 264.197
	Store ignitable and reactive waste so as to prevent the waste from igniting or reacting. Ignitable or reactive wastes in covered tanks must comply with buffer zone requirements in "Flammable and Combustible Liquids Code," Tables 2-1 through 2-6 (National Fire Protection Association, 1976 or 1981)		40 CFR 264.198
	Storage Prohibitions. Storage of banned wastes must be in accordance with 40 CFR 268. When such storage occurs beyond one year, the owner/operator bears the burden of proving that such storage is solely for the purpose of accumulating sufficient quantities to allow for proper recovery, treatment and disposal.		40 CFR 268.50
Treatment (In a unit)	Design and operating standards for unit in which hazardous waste is treated. (See citations at right for design and operating requirements for specific unit.)	Treatment of hazardous waste in a unit.	40 CFR 264 190-192 (Tanks) 40 CFR 264.221 (Surface Impoundments) 40 CFR 264 251 (Waste Piles) 40 CFR 264.273 (Lan. Treatment Unit) 40 CFR 264.343-345 (Incinerators)

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Treatment (in a unit) (Continued)			40 CFR 264.601 (Miscellaneous Treatment Units) 40 CFR 265.573 (Thermal Treatment Units)
Treatment (when Waste will be Land Disposal)	Treatment of waste subject to ban on land disposal must attain levels achievable by best demonstrated available treatment technologies (DBAT) for each hazardous constituent in each listed waste, if residual is to be land disposed If residual is to be further treated, initial treatment and any subsequent treatment that produces residual to be treated need not be DBAT, if it does not exceed value in constituent concentration in waste extract Table for each applicable water (See 51 FR 40642, November 6, 1986)	Disposal of contaminated soil and debris resulting from CERCLA response actions or RCRA corrective actions is not subject to land disposal prohibitions and/or treatment standards for solvents, dioxins, or California list wastes unit November 8, 1990 (and for certain first third wastes until August 8, 1990)	40 CFR 268 10 40 CFR 268 11 40 CFR 268 12 40 CFR 268 41 40 CFR 268 (Subpart D)
		All wastes listed as hazardous in 40 CFR 261 as of November 8, 1984, except for spent solvent wastes and dioxin-containing wastes, have been ranked with respect to volume and intrinsic hazards, are scheduled for land disposal prohibition and/or treatment standard determinations as follows Solvents and dioxins — Nov 8, 1986 California list wastes — Jul 8, 1987 One-third of all ranked and hazardous wastes — Aug 8, 1988 Underground injection of solvents and dioxins and California list wastes — Aug 8, 1988 CERCLA response action and RCRA corrective action soil and debris — Nov 8, 1988 Two-thirds of all ranked and listed hazardous wastes — Jul 8, 1989 All remaining ranked and listed hazardous wastes identified by characteristic under RCRA section 3001 — May 8, 1990	51 FR 40641 52 FR 25760

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]		Citation
Treatment (when Waste will be Land Disposal) (Continued)		Any hazardous waste or identified waste RCRA section 3001 after November 8, 1984	Within 6 months of the date of identification or listing	
Treatment (when Waste will be Land Disposal) (Continued)	BDAT standards for spent solvent wastes and dioxin-containing wastes are based on one of four technologies or combinations. for waste waters, (1) stem stripping, (2) biological treatment, or (3) carbon absorption [alone or in a combination with (1) or (2)], and for all other wastes, (4) incineration. Any technology may be used however, if it will achieve the concentration levels specified.			40 CFR 268.30 RCRA Sections 3004 (d)(3), (e)(3) 42 U.S.C. 6924(d)(3), (e)(3)
Worker Safety	Occupational Safety and Health program for DOE contractor employees at government-owned contractor-operated facilities.			DOE 5483 1A
	Health and Safety Plan must be submitted.			29 CFR 1910.120

TABLES E-5A AND E-5B
F039 HAZARDOUS WASTE STANDARDS
FROM 40 CFR 268 41 AND 268 43

268 41 TABLE CCWE —CONSTITUENT CONCENTRATIONS IN WASTE EXTRACT—Continued

Waste code	Commercial chemical name	See also	Regulated hazardous constituent	CAS No for regulated hazardous constituent	Wastewaters		Nonwastewaters	
					Concentration (mg/l)	Notes	Concentration (mg/l)	Notes
F011	NA	Table CCW in 268 43	Cadmium	7440-43 9	NA		0 066	
			Chromium (Total)	7440 47 32	NA		5 2	
			Lead	7439 92 1	NA		0 51	
			Nickel	7440 02 0	NA		0 32	
			Silver	7440-22 4	NA		0 072	
F012	NA	Table CCW in 268 43	Cadmium	7440-43 9	NA		0 066	
			Chromium (Total)	7440-47-32	NA		5 2	
			Lead	7439 92 1	NA		0 51	
			Nickel	7440 02-0	NA		0 32	
			Silver	7440-22 4	NA		0 072	
F019	NA	Table CCW in 268 43	Chromium (Total)	7440 47 32	NA		5 2	
F020 F023 and F026 F028 dioxin containing wastes	NA	NA	HxCDD All Hexachloro dibenzo-p dioxins		<1 ppb		<1 ppb	
			HxCDF All Hexachloro-dibenzofurans					
			PeCDD All Pentachloro dibenzo p-dioxins		<1 ppb		<1 ppb	
			PeCDF All Pentachloro-dibenzofurans					
			TCDD All Tetrachloro-dibenzo p dioxins		<1 ppb		<1 ppb	
			TCDF All Tetrachloro dibenzofurans					
			2 4 5 Trichlorophenol		<1 ppb		<1 ppb	
			2 4 6 Trichlorophenol					
			2 3 4 6 Tetrachlorophenol		<1 ppb		<1 ppb	
			Pentachlorophenol					
				95 95 4	<1 ppb		<1 ppb	
				88 06 2	<0 05 ppm		<0 05 ppm	
				58 90-2	<0 05 ppm		<0 05 ppm	
				87 86-5	<0 01 ppm		<0 01 ppm	
F024	NA	Table CCW in 268 43	Chromium (Total)	7440 47-32	NA		0 073	
			Lead	7439 92 1	NA		[Reserved]	
			Nickel	7440-02-0	NA		0 088	
F039	NA	Table CCW in 268 43	Antimony	7440 36 0	NA		0 23	
			Arsenic	7440 38 2	NA		5 0	
			Barium	7440 39 3	NA		52	
			Cadmium	7440 43 9	NA		0 066	
			Chromium (Total)	7440 47 32	NA		5 2	
			Lead	7439 92 1	NA		0 51	
			Mercury	7439 97 6	NA		0 025	
			Nickel	7440 02 0	NA		0 32	
			Selenium	7782 49 2	NA		5 7	
			Silver	7440 22 4	NA		0 072	
K001	NA	Table CCW in 268 43	Lead	7439 92 1	NA		0 51	

TABLE E-5A

F024 (Spent Filters or Aids and Desicants Subcategory)	NA	NA	Chloroform	67-66 3	0 046	(6)	6 2	(1)
			Methylene chloride	75 9 2	0 089	(6)	31	(1)
			Carbon tetrachloride	56 23-5	0 057	(6)	6 2	(1)
			1 1 2 Trichloroethane	79 00-5	0 054	(6)	6 2	(1)
			Trichloroethylene	79-01-6	0 054	(6)	5 6	(1)
			Vinyl chloride	75 01 4	0 27	(6)	33	(1)
			Hexachlorobenzene	118 74 1	0 055	(6)	37	(1)
			Hexachlorobutadiene	87-68-3	0 055	(6)	28	(1)
			Hexachoroethane	67 72 1	0 055	(6)	30	(1)
F039	NA	Table CCWE in 268 41	Acetone	67 64 1	0 28	(6)	160	(1)
			Acenaphthalene	208 96-8	0 059	(6)	3 4	(1)
			Acenaphthene	83 32 9	0.059	(6)	4 0	(1)
			Acetonitrile	75 05 8	0.17	(6)	NA	
			Acetophenone	96-86-2	0 010	(6)	9 7	(1)
			2 Acetylaminofluorene	53 96-3	0.059	(6)	140	(1)
			Acrolein	107-02 8	0.29	(6)	NA	
			Acrylonitrile	107 13 1	0 24	(6)	84	(1)
			Aldrin	309 00 2	0 021	(6)	0 066	( )
			4 Aminobiphenyl	92 67 1	0 13	(6)	NA	
			Aniline	62 53-3	0 81	(6)	14	(1)
			Anthracene	120-12 7	0 059	(6)	4 0	(1)
			Aramite	140 57 8	0 36	(6)	NA	
			Aroclor 1016	12674 11 2	0.013	(6)	0 92	(1)
			Aroclor 1221	11104 28 2	0 014	(6)	0 92	(1)
			Aroclor 1232	11141 16-5	0 013	(6)	0 92	(1)
			Aroclor 1242	53469 21-9	0.017	(6)	0 92	(1)
			Aroclor 1248	12672 29-6	0.013	(6)	0 92	(1)
			Aroclor 1254	11097-69 1	0 014	(6)	1.8	(1)
			Aroclor 1260	11096 82 5	0.014	(6)	1 8	(1)
			alpha BHC	319-84 6	0.00014	(6)	0 066	(1)
			beta-BHC	319-85-7	0.00014	(6)	0.066	(1)
			delta-BHC	319-86-8	0.023	(6)	0 066	(1)
			gamma BHC	58-89-9	0 0017	(6)	0.066	(1)
			Benzene	71-43-2	0.14	(6)	36	(1)
			Benz(a)anthracene	56 55-3	0.059	(6)	8.2	(1)
			Benzo(b)- fluoranthene	205-99-2	0 055	(6)	3 4	(1)
			Benzo(k)- fluoranthene	207-08-9	0.059	(6)	3.4	(1)
			Benzo(g,h,i) perylene	191-24 2	0.0055	(6)	1 5	(1)
			Benzo(a)pyrene	50 32 8	0.061	(6)	8 2	(1)
			Bromodichloromethane	75-27 4	0.35	(6)	15	(1)
			Bromoform (Tribromomethane)	75-25 2	0 63	(6)	15	(1)
			Bromomethane (methyl bromide)	74 83-9	0 11	(6)	15	(1)

TABLE E-5A (continued)

268 43 TABLE CCW —CONSTITUENT CONCENTRATIONS IN WASTES—Continued

Waste code	Commercial chemical name	See also	Regulated hazardous constituent	CAS number for regulated hazardous constituent	Wastewaters		Nonwastewaters	
					Concentration (mg/l)	Notes	Concentration (mg/kg)	Notes
			4 Bromophenyl phenyl ether	101 55 3	0 055	(²)	15	(¹)
			n Butyl alcohol	71 36-3	5 6	(²)	2 6	(¹)
			Butyl benzyl phthalate	85 68 7	0 017	(²)	7 9	(¹)
			2 sec Butyl-4 6 dinitrophenol	88 85 7	0 066	( )	2 5	(¹)
			Carbon tetrachloride	56-23 5	0 057	(²)	5 6	(¹)
			Carbon disulfide	75-15-0	0 014	(²)	NA	--
			Chlordane	57 74 9	0 0033	(²)	0 13	(¹)
			p-Chloroaniline	106 47 8	0 46	(²)	16	(¹)
			Chlorobenzene	108 90-7	0 057	(²)	5 7	( )
			Chlorobenzilate	510 15 6	0 10	(²)	NA	--
			2 Chloro-1 3 butadiene	126 99 8	0 057	( )	NA	--
			Chlorodibromomethane	124 48 1	0 057	(²)	15	(¹)
			Chloroethane	75-00-3	0 27	(²)	6 0	(¹)
			bis(2 Chloroethoxy) methane	111 91 1	0 036	( )	7 2	( )
			bis(2 Chloroethyl) ether	111 44 4	0 033	( )	7 2	(¹)
			Chloroform	67 66 3	0 046	(²)	5 6	( )
			bis(2 Chloroisopropyl) ether	39638 32 9	0 055	( )	7 2	(¹)
			p Chloro m-cresol	59 50-7	0 018	(²)	14	(¹)
			Chloromethane (Methyl chloride)	74 87-3	0 19	(²)	33	(¹)
			2 Chloronaphthalene	91 58 7	0 055	(²)	5 6	( )
			2 Chlorophenol	95 57 8	0 044	(²)	5 7	(¹)
			3 Chloropropylene	107 05 1	0 036	(²)	28	(¹)
			Chrysene	218-01 9	0 059	(²)	8 2	(¹)
			o-Cresol	95-48 7	0 11	(²)	5 6	(¹)
			Cresol (m- and p-isomers)	.	0 77	(²)	3 2	(¹)
			Cyclohexanone	108 94 1	0 36	(²)	NA	--
			1 2 Dibromo-3 chloropropane	96-12 8	0 11	(²)	15	(¹)
			1 2 Dibromoethane (Ethylene dibromide)	106-93 4	0 028	(²)	15	(¹)
			Dibromomethane	74 95 3	0 11	(²)	15	(¹)
			2 4 Dichlorophenoxy-acetic acid (2, 4 D)	94 75 7	0 72	(²)	10	(¹)
			o,p DDD	53 19-0	0 023	(²)	0 087	(¹)
			p,p DDD	72 54 8	0 023	(²)	0 087	( )

TABLE E-5B

o p DDE	3424 82 6	0 031	( )	0 087	( )
p p DDE	72 55 9	0 031	( )	0 087	( )
o p DDT	789 02 6	0 0039	( )	0 087	(1)
p p DDT	50-29 3	0 0039	(2)	0 087	(1)
Dibenz(a h) anthracene	53 70 3	0 055	(2)	8 2	( )
Dibenzo(a e) pyrene	192 65 4	0 061	(2)	NA	
m Dichlorobenzene	541 73 1	0.036	(2)	6 2	(1)
o Dichlorobenzene	95 50-1	0 088	(2)	6 2	(1)
p Dichlorobenzene	106 46 7	0 090	(2)	6 2	(1)
Dichlorodifluorometh-ane	75 71 8	0 23	(2)	7 2	( )
1 1 Dichloroethane	75 34 3	0 059	(2)	7 2	(1)
1 2 Dichloroethane	107 06 2	0 21	(2)	7 2	(1)
1 1 Dichloroethylene	75 35-4	0 025	(2)	33	(1)
trans-1 2 Dichloroethylene		0 054	(2)	33	(1)
2 4 Dichlorophenol	120-83 2	0 044	(2)	14	(1)
2 6 Dichlorophenol	87 65 0	0.044	(2)	14	(1)
1 2 Dichloropropane	78 87 5	0 85	(2)	18	(1)
cis 1 3 Dichloropropene	10061-01 5	0 036	( )	18	( )
trans-1 3 Dichloropropene	10061 02 6	0 036	(2)	18	(1)
Dieldrin	60-57 1	0.017	(2)	0 13	(1)
Diethyl phthalate	84 66 2	0 20	(2)	28	( )
2,4 Dimethyl phenol	105-67 9	0 036	(2)	14	(1)
Dimethyl phthalate	131 11 3	0 047	(2)	28	(1)
Di n-butyl phthalate	84 74 2	0 057	(2)	28	(1)
1 4 Dinitrobenzene	100 25-4	0 32	(2)	2.3	(1)
4 6 Dinitro-o-cresol	534 52 1	0 28	(2)	160	(1)
2 4 Dinitrophenol	51 28 5	0.12	(2)	160	(1)
2 4 Dinitrotoluene	121 14 2	0 32	(2)	140	(1)
2 6-Dinitrotoluene	606 20-2	0 55	(2)	28	(1)
Di n-octyl phthalate	117 84 0	0 017	(2)	28	(1)
Di n propylnitrosoamine	621 64 7	0 40	(2)	14	(1)
Diphenylamine	122 39-4	0 52	(2)	NA	
1 2-Diphenyl hydrazine	122 66 7	0.087	(2)	NA	
Diphenyl nitrosamine	621 64 7	0 40	(2)	NA	
1 4 Dioxane	123 91 1	0 12	(2)	170	(1)
Disulfoton	298-04 4	0 017	(2)	6 2	( )
Endosulfan I	939 98 8	0 023	(2)	0 066	(1)
Endosulfan II	33213 6 5	0 029	(2)	0 13	(1)
Endosulfan sulfate	1031 07 8	0 029	(2)	0 13	(1)
Endrin	72 20 8	0.0028	(2)	0.13	(1)
Endrin aldehyde	7421 93 4	0 025	(2)	0 13	(1)
Ethyl acetate	141 78-6	0 34	(2)	33	(1)
Ethyl cyanide	107 12 0	0 24	(2)	360	(1)
Ethyl benzene	100-41 4	0 057	(2)	6.0	(1)
Ethyl ether	60 29 7	0 12	(2)	160	(1)

TABLE E-5B (continued)

268 43 TABLE CCW —CONSTITUENT CONCENTRATIONS IN WASTES—Continued

Waste code	Commercial chemical name	See also	Regulated hazardous constituent	CAS number for regulated hazardous constituent	Wastewaters		Nonwastewaters	
					Concentration (mg/l)	Notes	Concentration (mg/kg)	Notes
			bis(2 Ethylhexyl) phthalate	117 81 7	0 28	(2)	28	(1)
			Ethyl methacrylate	97 63 2	0 14	(2)	160	(1)
			Ethylene oxide	75 21 8	0 12	(2)	NA	.
			Famphur	52 85-7	0 017	(2)	15	(1)
			Fluoranthene	206 44 0	0 068	(2)	8 2	(1)
			Fluorene	86 73 7	0 059	( )	4 0	( )
			Fluorotrichloromethane	75 69 4	0 020	(2)	33	(1)
			Heptachlor	76 44 8	0 0012	( )	0 066	(1)
			Heptachlor epoxide	1024 57 3	0 016	(2)	0 066	( )
			He achlorobenzene	118 74 1	0 055	(2)	37	(1)
			He achlorobutadiene	87 68 3	0 055	( )	28	( )
			Hexachlorocyclopenta diene	77 47 4	0 057	(2)	3 6	(1)
			Hexachlorodibenzo-furans		0 000063	(2)	0 001	(1)
			Hexachlorodibenzo-p dioxins		0 000063	( )	0.001	(1)
			Hexachloroethane	67 72 1	0 055	(2)	28	(1)
			Hexachloropropene	1888 71 7	0 035	(2)	28	(1)
			Indeno(1 2 3 c d)pyrene	193 39 5	0 0055	(2)	8 2	(1)
			Iodomethane	74 88 4	0 19	(2)	65	(1)
			Isobutanol	78 83 1	5 6	(2)	170	(1)
			Isodrin.	465 73-6	0 021	(2)	0 066	(1)
			Isosafrole	120 58 1	0 081	(2)	2 6	(1)
			Kepone	143 50-8	0 0011	(2)	0 13	(1)
			Methacrylonitrile	126 98 7	0 24	(2)	84	(1)
			Methanol	67 56 1	5 6	(2)	NA	
			Methapyrilene	91 80 5	0 081	(2)	1 5	(1)
			Methoxychlor	72 43 5	0 25	(2)	0 18	(1)
			3 Methylcholanthrene	56 49 5	0 0055	(2)	15	(1)
			4 4 Methylene bis (2 chloroaniline)	101 14 4	0 50	(2)	35	(1)
			Methylene chloride	75-09 2	0 089	(2)	33	(1)
			Methyl ethyl ketone	78 93 3	0 28	(2)	36	(1)
			Methyl isobutyl ketone	108 10 1	0 14	(2)	33	( )
			Methyl methacrylate	80 62 6	0 14	(2)	160	(1)
			Methyl methansulfonate	66 27 3	0 018	(2)	NA	.
			Methyl parathion	298-00-0	0 014	(2)	4 6	(1)
			Naphthalene	91 20-3	0 059	(2)	3 1	( )

TABLE E-5B (continued)

2 Naphthylamine	91 59 8	0 52	( )	NA	...
p Nitroaniline	100-01 6	0 028	( )	28	( )
Nitrobenzene	98 95-3	0 068	(¹)	14	( )
5 Nitro-o-toluidine	99 55 8	0 32	( )	28	(¹)
4 Nitrophenol	100 02 7	0 12	(¹)	29	(¹)
N-Nitrosodiethylamine	55-18 5	0 40	(¹)	28	(¹)
N Nitrosodimethylamine	62 75-9	0 40	(¹)	NA	...
N Nitroso-di n-butylamine	924 16 3	0 40	(¹)	17	(¹)
N Nitrosomethylethylamine	10595 95 6	0 40	(¹)	2 3	(¹)
N Nitrosomorpholine	59-89 2	0 40	(¹)	2.3	(¹)
N Nitrosopiperidine	100-75 4	0.013	(¹)	35	(¹)
N Nitrosopyrrolidine	930-55 2	0 013	(¹)	35	(¹)
Parathion	56 38 2	0 014	(¹)	4 6	(¹)
Pentachlorobenzene	608 93 5	0 055	(¹)	37	(¹)
Pentachlorodibenzo-furans		0 000063	( )	0 001	( )
Pentachlorodibenzo p-dioxins		0 000063	(¹)	0 001	(¹)
Pentachloronitrobenzene	82-68 8	0 055	(¹)	4 8	( )
Pentachlorophenol	87 86-5	0 089	(¹)	7 4	(¹)
Phenacetin	62 44 2	0 081	(¹)	16	(¹)
Phenanthrene	85 01 8	0 059	(¹)	3 1	(¹)
Phenol	108 95 2	0 039	(¹)	6 2	(¹)
Phorate	298-02 2	0 021	(¹)	4 6	(¹)
Phthalic anhydride	85 44 9	0 069	(¹)	NA	
Pronamide	23950 58 5	0 093	(¹)	1 5	(¹)
Pyrene	129 00-0	0 067	(¹)	8 2	(¹)
Pyridine	110 86 1	0 014	(¹)	16	(¹)
Safrole	94 59 7	0 081	(¹)	22	(¹)
Silvex (2 4 5 TP)	93 72 1	0 72	(¹)	7 9	(¹)
2 4 5-T	93 76 5	0 72	( )	7 9	(¹)
1 2 4 5 Tetrachlorobenzene	95 94 3	0 055	(¹)	19	(¹)
Tetrachlorodibenzo-furans		0 000063	(¹)	0 001	(¹)
Tetrachlorodibenzo p dioxins		0 000063	(¹)	0 001	(¹)
1 1 1 2 Tetrachloroethane	630 20 6	0 057	(¹)	42	(¹)
1 1 2 2 Tetrachloroethane	79 34 5	0 057	(¹)	42	(¹)
Tetrachloroethylene	127 18 4	0 056	(¹)	5 6	( )
2 3 4 6-Tetrachlorophenol	58 90 2	0 030	(¹)	37	(¹)
Toluene	108 88 3	0 080	(¹)	28	(¹)

TABLE E-5B (continued)

268 43 TABLE CCW—CONSTITUENT CONCENTRATIONS IN WASTES—Continued

Waste code	Comme cial chemical name	See also	Regulated hazardous constituent	CAS number for regulated hazardous constituent	Wastewaters		Nonwastewaters	
					Concentration (mg/l)	Notes	Concentration (mg/kg)	Notes
			Toxaphene	8001 35 1	0 0095	(2)	1 3	(1)
			1 2 4 Trichlorobenzene	120 82 1	0 055	( )	19	(1)
			1 1 1 Trichloroethane	71 55 6	0 054	(2)	5 6	(1)
			1 1 2 Trichloroethane	79 00 5	0 054	(2)	5 6	(1)
			Trichloroethylene	79 01 6	0 054	(2)	5 6	( )
			2 4 5 Trichlorophenol	95 95 4	0 18	(2)	37	( )
			2 4 6 Trichlorophenol	88 06 2	0 035	(2)	37	(1)
			1 2 3 Trichloropropane	96 18 4	0 85	(2)	28	(1)
			1 1 2 Trichloro 1 2 2	76 13 1	0 057	(2)	28	( )
			I fluoro ethar e				28	( )
			Tris(2 3 dibromopropyl) phosphate	126 72 7	0 11	(2)	NA	
			Vinyl chloride	75 01 4	0 27	(2)	33	(1)
			Xylene(s)		0 32	(2)	28	(1)
			Cyanides (Total)	57 12 5	1 2	(2)	1 8	(1)
			Fluoride	16984 48 8	35	(2)	NA	
			Sulfide	8496 25 8	14	(2)	NA	
			Antimony	7440 36-0	1 9	( )	NA	
			Arsenic	7440 38 2	1 4	(2)	NA	
			Barium	7440 39 3	1 2	(2)	NA	
			Beryllium	7440 41 7	0 82	(2)	NA	
			Cadmium	7440 43 9	0 20	( )	NA	
			Chromium (Total)	7440 47 32	0 37	(2)	NA	
			Copper	7440 50-8	1 3	(2)	NA	
			Lead	7439 92 1	0 28	(2)	NA	
			Mercury	7439 97 6	0 15	(2)	NA	
			Nickel	7440-02 0	0 55	(2)	NA	
			Selenium	7782 49 2	0 82	(2)	NA	
			Silver	7440 22 4	0 29	(2)	NA	
			Thallium	7440 28 0	1 4	(2)	NA	
			Vanadium	7440 62 2	0 042	(2)	NA	
			Zinc	7440 66 6	1 0	(2)	NA	
K001	NA	Table CCWE in 268 41	Naphthalene	91 20 3	0 031	(1)	1 5	(1)
			Pentachlorophenol	87 86 5	0 18	(1)	7 4	(1)
			Phenanthrene					
			Pyrene	85 01 8	0 031	(1)	1 5	(1)
			Toluene	129 00 0	0 028	(1)	1 5	( )
			Xylenes (Total)	108 88 3	0 028	(1)	28	( )
			Lead		0 032	(1)	33	(1)
				7439 92 1	0 037	....	NA	
K002	NA	Table CCWE in 268 41	Chromium (Total)	7440 47 32	0 9	(2)	NA	
			Lead	7439 92 1	3 4	( )	NA	

APPENDIX F
DESCRIPTION OF RETAINED OPTIONS

APPENDIX F

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APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS

Spill Control Options

Option 4 4 3 Construct Centralized Tank Farm for Spill Control/Capture

A Option Components and Basis of Conceptual Design

Storage - The volume of tankage required for this option could vary between wide limits For instance, to provide the existing "live" capacity in the spill control ponds (A-1, A-2, B-1, B-2 and C-2) would require 69 5 acre-feet of storage

For the A- and B-series ponds, 20 5 acre-feet is required This volume is equivalent to the basin runoff generated by a 1- to 2-year storm which would require 6 7 million gallons of tankage and a major construction effort The peak runoff rate associated with a 1- to 2-year, 6-hour storm is approximately 80 cfs in each drainage, but, it is not practical to pump at 80 cfs because of the size of pump required Since this pumping rate cannot practically be achieved, runoff contaminated by spills will still need to be diverted to the existing spill ponds for temporary storage

The C-2 pond accepts both spills and normal stormwater runoff To equal its live capacity of 49 acre-feet in tanks would be impractical The peak runoff rate to C-2 is also beyond the practical scope for diverting stormwater (i e , 40 cfs for a 5-year event)

This option could be altered enough to be beneficial and feasible by using a lower pumping rate and smaller storage tanks (250,000 gallons) The dimensions of a 250,000-gallon tank are 42 feet in diameter and 24 feet high A single tank would serve each of the A-, B- and C-series drainages as a primary response measure The existing spill control ponds would be maintained for initial capture and reserve capacity Water in the tanks would be sampled, treated if necessary and then either discharged or disposed

Piping - Approximately 4500 feet of 8-inch diameter PVC pipe would be required to carry flows from Ponds A 1, B-1 and C-2 to the centralized tanks

Pumps - Three pump stations rated at 1600 gallons per minute (gpm) each would be utilized to pump water from A-1, B-1 and C-2 to the centralized tanks These high-volume pumps would be effective in isolating a nominal amount of contaminated runoff

B Conceptual Cost Estimate

Tankage @ $1/gallon	$750,000
Piping @ $30/foot	135,000
Pumps @ $70,000/cfs or $250,000/pump station	750,000
	$1,635,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C Comparative Analysis Criteria

C 1 Risk Reduction

This option would provide additional spill control/capture facilities since the existing spill containment pond network would need to remain in place as a back-up system. The use of tanks would allow a spill to be isolated from the environment to a greater extent than is possible with the ponds

C 2 Funding and Schedule Constraints

A centralized tank can be implemented over a period of time since the existing spill control ponds will remain as a back-up system Additional tanks could be added later Earthwork will be required to prepare a site for the tanks

C 3 Cost-effectiveness

A centralized tank farm would require more piping than the placement of separate tanks on each drainage, but less site preparation for tank construction

C 4 Versatility

This option would add versatility to Rocky Flats Plant's (RFP's) pond management system since it would allow a spill to be contained and isolated while allowing the existing ponds to be available to capture a second spill or contaminated storm runoff event

C 5 Operable Unit (OU) Interactions

This option would be independent of all known OU actions

C 6 Waste Generation

Sediments would be deposited in the existing ponds and would require maintenance over time Significant sediment accumulations would not be expected in the tanks

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Option 4 4 4 Construct Tanks for Spill Control/Capture on Each Drainage

A Option Components and Basis of Conceptual Design

Storage - The volume of tankage required for this option could vary To equal the existing "live" capacity in the basin spill ponds (A-1, A-2, B-1, B-2 and C-2) would require 69 5 acre-feet of storage For the A- and B-series ponds, this volume is equivalent to the runoff generated by a 1- to 2-year storm and would require 6 7 million gallons of tankage and a major construction effort The peak runoff rate associated with a 1- to 2-year, 6-hour storm is approximately 80 cfs in each drainage, but, it is not practical to pump 80 cfs because of the size of pumps required Since this pumping rate cannot practically be achieved, runoff contaminated by spills would still need to be diverted to the existing spill ponds for temporary storage

Similar conditions exist on the C drainage where 49 acre-feet of the live storage is currently available The peak inflow rate for a 5-year storm is 40 cfs Pumping at the peak flow rate and providing equivalent storage would not be practically feasible

This option could be altered enough to be beneficial and feasible by using a lesser pumping rate and smaller storage tank capacity in each of the basins (250,000 gallons) The dimensions of each tank in each of the three drainage basins would be 42 feet in diameter and 24 feet high

Piping - Approximately 500 feet of 8-inch diameter PVC pipe will be required to carry flows from a pump station just upstream of each of the ponds (A-1, B-1 and C-2) to the tanks

Pumps - Three pumps, one for each tank, would be required These pumps would be rated at 1600 gpm so that they could be able to isolate a nominal amount of contaminated runoff

B Conceptual Cost Estimate

Tankage @ $1/gallon	$ 750,000
500 feet Piping @ $30/foot	15,000
Pumps @ $70,000/cfs or $250,000/pump station	750,000
	$1,515,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C Comparative Analysis Criteria

C 1 Risk Reduction

This option would provide additional spill control/capture facilities since the existing spill containment pond network will need to remain in place as a back-up system The use of a tank allows a spill to be isolated from the environment to a greater extent than is possible with the ponds This option provides larger storage capacity compared to Option 4 4.3

C 2 Funding and Schedule Constraints

Tanks could be installed over a period of time, since the existing spill containment ponds would remain as a back-up system Additional tanks could be added later A considerable amount of earthwork would be required to prepare a site for tanks of this size

C 3 Cost-effectiveness

Tanks placed in each basin would require less piping than a centralized tank farm, but a centralized tank location would require less site preparation for construction This option can be compared directly to Option 4 4 3 (construct centralized tank farm for spill control/capture) for cost-effectiveness This option results in a greater expense since a higher percentage of cost would be devoted to tanks rather than pumps and piping

C 4 Versatility

This option is versatile since it would allow a spill to be contained and isolated and keep the existing ponds available to capture a second spill or contaminated storm runoff event This option provides more versatility than a centralized tank farm because it places a separate spill containment tank in each basin and provides a greater total volume of tanks

C 5 OU Interactions

This option would be independent of all known OU actions

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C 6 Waste Generation

Sediments would tend to accumulate in the existing ponds and would require maintenance over time Significant sediment accumulations would not be expected in the tanks

Option 4 4 8 Utilize Existing Ponds A-1, A-2, B-1 and B-2 for Spill Control/Capture

A Option Components and Basis of Conceptual Design

Storage - Utilize existing ponds for storage and maximize "live" storage to the extent possible The current maximum drawdown is to the 30 percent capacity level for all spill containment ponds An analysis should be conducted to determine if this maximum drawdown can be increased for any or all of the spill containment ponds in order to provide more "live" storage

B Conceptual Cost Estimate

Negligible costs would be required to implement this option

C Comparative Analysis Criteria

C 1 Risk Reduction

This option would provide two storage facilities in series on each of the A and B drainages The C drainage would have a single storage pond This would allow for system redundancy which increases the opportunity for isolation of a spill This option could provide additional spill control/capture volume by utilizing more "live" storage than currently exists and would not depend on pumps or pipes to capture contaminated runoff

C 2 Funding and Schedule Constraints

This option requires minimal expenditure and could be implemented immediately Funding should be provided to address dam maintenance and dam safety concerns which were raised in the Army Corps of Engineers (COE) report released in 1993 (COE, 1993)

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C 3 Cost-effectiveness

This option could be implemented for minimal cost and would provide effective spill control storage Providing storage in ponds is more economical than storage in tanks

C 4 Versatility

The use of four spill control/capture ponds is a versatile option because it allows for runoff contaminated by spills to be isolated from the remainder of the pond system

C 5 OU Interactions

This option would be independent of all known OU actions

C 6 Waste Generation

Sediments would accumulate in the ponds and would require maintenance over time

Option 4 4 9 Consolidate Existing Spill Control Ponds to One Per Drainage

A Option Components and Basis of Conceptual Design

Storage - Consolidation of ponds would most likely involve enlargement of the largest spill pond on each drainage, namely Ponds A-2 and B-2 Providing a comparable storage volume to that provided by the existing ponds would require an increase in Pond A-2's volume by 3 acre-feet (a 20 percent enlargement), resulting in a depth increase of 1 foot, and an increase to Pond B-2's volume by 1 1 acre-feet (a 20 percent enlargement), resulting in a 1-foot increase in depth

B Conceptual Cost Estimate

A-2 enlargement @ $50,000/acre-foot	$150,000
B-2 enlargement @ $50,000/acre-foot	60,000
	$210,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C Comparative Analysis Criteria

C 1 Risk Reduction

This option could provide a simplified operating procedure for spill control/ capture and would reduce the number of sampling locations However, this option would limit system redundancy by leaving no volume in reserve for spills and less ability to isolate spills as compared to two ponds per drainage

C 2 Funding and Schedule Constraints

Should modification of the dams be required for safety, these activities could disturb or cover existing sediment which may be contaminated (COE 1993) The dam might have to be bypassed during construction

C 3 Cost-effectiveness

The cost of consolidating storage facilities would not be offset by any increase in spill volume

C 4 Versatility

This option would be less versatile operationally for isolating spilled material than Option 4 4 8 (Utilize Existing Ponds A-1, A-2, B-1, B-2 and C-2 for Spill Control/Capture) It would also be less versatile for longer-term clean-up operations which may require the use of one pond for spill control while the other is remediated

C 5 OU Interactions

This option would be independent of all known OU actions

C 6 Waste Generation

Future sediment deposition would go to only one spill containment pond location per basin rather than two per basin The amount of sediment deposited would not increase or decrease from existing conditions

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Stormwater Collection and Storage Options

Option 4 5 1 Maintain and Continue Using Existing On-line Stormwater Ponds

A Option Components and Basis of Conceptual Design

Monitoring - This option would implement recommendations from the Corps of Engineers report (COE 1993) concerning increased monitoring of the phreatic water surface in the terminal ponds dam embankments through the installation of piezometers and continued analysis of structural integrity to assure dam safety

Surface Water System Improvements - This option would provide modifications to the following bypass pipes or channels as follows

- A-series Ponds - Increase the capacity of the A-series bypass pipe which normally carries flow past the spill containment ponds (A-1 and A-2) to Pond A-3 This is a 42-inch corrugated metal pipe (CMP) with a capacity of 90 cfs When the capacity is exceeded, which begins to occur during a six-hour storm event with a return period of two years, excess flows begin to fill A-1 and sometimes A-2 This can reduce or eliminate the available live volume for spill control/capture and may increase the volume of water requiring treatment

  Improvements would include modifications to the existing gate structure and a concrete-lined channel Details of this option are contained in the Drainage and Flood Control Master Plan (EG&G, 1992)

- B-series Ponds - Increase the capacity of the B-series bypass pipe which normally carries flow around Ponds B-1, B-2 and B-3 to B-4 and B-5 This bypass pipe is a 48-inch CMP with a capacity of 160 cfs When the capacity is exceeded, which begins to occur for a six-hour storm event with a return period of five to ten years, excess flows will enter B-1, B-2 and B-3 This can reduce or eliminate available live volume for spill control/capture and for isolation of STP effluent storage

  These improvements would include a new concrete-lined channel as detailed in the Drainage and Flood Control Master Plan (EG&G, 1992)

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

- C-series Ponds - The Woman Creek Bypass Canal (WCBC) is designed to carry flow from Woman Creek around Pond C-2 Pond C-2 captures flow from the south side of the plant site via the South Interceptor ditch WCBC features a concrete stream diversion structure immediately upstream of Pond C-2 which diverts Woman Creek flows through seven 60-inch culverts to the bypass canal As originally constructed, the capacity of the WCBC was in excess of the 100-year, 6-hour peak flow of 730 cfs A recent EG&G report, "Woman Creek Bypass Canal Report 1991" (SWD-008-92), dated June 18, 1992 by Doug Murray (EG&G), describes large reductions in the flow capacity due to vegetation growth and related vegetative debris The report also states that current flow capacity is estimated at 260 cfs, or slightly less than the 25-year return period flow When this capacity is exceeded, flows begin to enter C-2, potentially reducing the ability of C-2 to contain stormwater runoff of spills from the south side of the plant site and mixing stormwater with potentially contaminated water requiring testing and possibly treatment

  A component of this option would be to take immediate measures to restore the capacity of the WCBC There are also deficiencies due to vegetative growth in the West Interceptor Canal and the West Walnut Creek Bypass Canal (both are west of the plant site) and the South Interceptor Ditch leading to Pond C-2 These problems should also be remedied as part of this option The components of this improvement are detailed in the Drainage and Flood Control Master Plan (EG&G, 1992)

B Conceptual Cost Estimate

Dam Safety Monitoring	$ 100,000
Surface Water System Improvements	
A-series ponds	1,000,000
B-series ponds	900,000
C-series ponds (restore capacity of South Interceptor Ditch and Woman Creek Bypass Channel)	500,000
Clean out 2 channels west of plant site	500,000
	$3,000,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C Comparative Analysis Criteria

C 1 Risk Reduction

The measures included in this option would increase the ability of the stormwater ponds to receive the stormwater, thereby allowing the spill ponds to be available for their intended purpose The improved bypass capacity would reduce the potential for stormwater flows to overwhelm the spill control ponds and carry contaminants downstream

C 2 Funding and Schedule Constraints

Existing systems could remain operational during the construction phase and would not impede current pond management Projects could be implemented in phases

C 3 Cost-effectiveness

This option would provide immediate, recognizable benefits for a relatively low cost

C 4 Versatility

This option would provide versatility by addressing problems associated with stormwater management, as well as spill control/capture This option would increase the ability to isolate and monitor STP effluent as needed

C 5 OU Interactions

This option would be independent of all known OU actions

C 6 Waste Generation

Sediments would accumulate in the ponds and bypass canals and would require periodic maintenance Erosion would be controlled during construction activities

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Option 4 5 4 Consolidate Existing Stormwater Ponds to One Per Drainage

A Option Components and Basis of Conceptual Design

Storage - Consolidation of ponds would most likely involve enlargement of the largest of the existing ponds, namely A-4 and B-5 Pond C-2 would not be modified since it is currently the only stormwater pond on the C drainage receiving core area runoff To provide a comparable volume of storage provided by the existing ponds would require an increase in Pond A-4's volume by 35 acre-feet (a 35 percent enlargement), resulting in a depth increase of 7 5 feet, and an increase of 1 acre-foot to Pond B-5's volume (a 2 percent enlargement), resulting in a 0 2-foot increase in depth

B Conceptual Cost Estimate

A-4 enlargement @ $50,000/acre-foot	$1,750,000
B-5 enlargement @ $50,000/acre-foot	50,000
	$1,800,000

C Comparative Analysis Criteria

C 1 Risk Reduction

Consolidating stormwater ponds can provide a simplified operating procedure The safety of the existing stormwater dam can also be addressed by this option However, hazards associated with a dam failure would be increased since all basin storage would be located in one pond This option would reduce the number of sampling points

Consolidating the ponds could result in contamination to larger volumes of water, possibly resulting in increased treatment requirements This option would reduce system redundancy and lessen reserve storage potential in the event of contamination

For this option, future sediment deposition would accumulate in only one stormwater location per basin This option would mean the loss of the capability to isolate STP effluent in Pond B-3

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C 2 Funding and Schedule Constraints

The proposed modification of the terminal dam could disturb existing sediment which may be contaminated Flows would have to bypass the terminal pond during construction

C 3 Cost-effectiveness

The costs would not be offset by any increase in storage volume

C 4 Versatility

This option would be less versatile for isolating incoming flows for monitoring and/or treatment than Option 4 5 1 (maintain and continue using existing on-line stormwater ponds)

C 5 OU Interactions

This option would be independent of all known OU actions

C 6 Waste Generation

Future sediment deposition would accumulate in only one pond location per basin This project would require moving large quantities of earth, and may create waste which may not be disposed on-site

Option 4 5 12 Construct Storage Tanks for STP Effluent Only

A Option Components and Basis of Conceptual Design

Storage - The volume of storage required for this option is a function of the incoming effluent flow rate and the required holding time Assuming these tanks would be used on a routine basis (rather than for "upsets" or spill collection) and that any tank must be batch-sampled rather than continuously-sampled, the tanks would be sized by computing the product of inflow and holding time A reasonable turnaround time for Segment 5 analytes which include organics, metals and radionuclides is 21 days Using a design flow of 0 15 million gallons per day (MGD) and a contingency factor of 25 percent, a storage volume of 4 million gallons would be required Four one-million-gallon tanks (each sized at 80 feet diameter and 28 feet tall) would occupy at least 1 acre of land

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Pumps - A pump station rated at 250 gpm would be required to keep pace with the rate of STP effluent discharge and to deliver the discharge to the tanks

B Conceptual Cost Estimate

Tanks @ $1/gallon	$4,000,000
Pump station @ $50,000 each	50,000
	$4,050,000

C Comparative Analysis Criteria

C 1 Risk Reduction

Reducing or eliminating STP effluent discharges from the B-series pond system would reduce nutrient loadings which routinely cause algae blooms in the ponds Discharges from the tanks could be sent directly to Segment 4 following sampling

Potential STP effluent upsets would be independently contained and would not impact routine stormwater management operations

C 2 Funding and Schedule Constraints

This option's use of four tanks would allow it to be implemented over a period of time Each tank could come on-line at different times

C 3 Cost-effectiveness

There would be a high cost to this option without substantial justification High operations and maintenance costs would be incurred for repairing, cleaning, disinfecting, inspecting and operating these tanks

C 4 Versatility

These tanks would need to be dedicated to STP effluent and would not be available for stormwater-related spill control (in order to avoid commingling of clean effluents with contaminated stormwater) and thus the option would have limited versatility

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C 5 OU Interactions

This option would be independent of all known OU actions

C 6 Waste Generation

Soil disturbance would occur during site preparation for tank construction Maintenance activities would include periodic disposal of accumulated sediment in the tanks

Treatment Options

Option 4 6 1 Construct Mobile Treatment Units for Multi-pond Use

A Option Components and Basis of Conceptual Design

Mobile treatment units would be utilized as needed to address stormwater (or spills in spill containment ponds) which does not meet water quality standards for discharge or transfer

Pumps - Two to three portable/submersible pumps of varying sizes (15/50/100 gpm) would be required for pond pumping

Piping - Approximately 200 to 300 feet of flexible piping would be needed to transfer water to mobile unit from the pond(s) and to the discharge point from the mobile unit

Treatment Units - Single or multiple mobile units would be necessary for processes including pretreatment and multi-stage treatment depending on constituents and volumes to be treated A rented mobile treatment unit used at RFP may not be able to be cost-effectively decontaminated and used elsewhere The purchase cost is therefore a consideration of this option

Power Source - 220 volt wiring or a generator would be required.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

B Conceptual Cost Estimate

Rental of a 15-gpm multi-stage (e g , ion exchange/GAC/precipitation) system with operator	$750 to 1000/day
Purchase of a mobile 15-gpm multi-stage exchange/GAC/precipitation) system with operator	150,000
Pumps and piping	20,000
	Total Costs are dependent on the duration of treatment operations

C Comparative Analysis Criteria

C 1 Risk Reduction

Minor risk reduction is expected from this option because it is unlikely that treatment could reduce contaminants of concern (COCs) to significantly lower levels than the capabilities of the current technology and facilities However, mobile treatment unit(s) offer the most strategic method for addressing COCs at problem areas when detected This option may also reduce risk associated with slug discharges resulting from spills

C 2 Funding and Schedule Constraints

Renting a few portable treatment systems would minimize capital construction costs Construction/Assembly of the system could involve a long lead time because of the uniqueness of the system and the small number of contractors with this type of design/construction expertise

C 3 Cost-effectiveness

Mobile treatment units could allow treatment of multiple sources with one unit, thereby resulting in higher cost effectiveness over using individual systems for each source Mobile treatment systems could also contracted from suppliers of such services which would be economical Cost-effectiveness would nonetheless be low, however, due to the low COC levels Cost-effectiveness would be further reduced if a variety of portable systems are required to ensure treatment for an acceptable range of COCs Another reduction in cost-effectiveness would occur if numerous systems are required to treat a single source if portable systems are purchased for stand-by use, or if extensive influent storage is required

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

It is possible that if a mobile treatment unit is used to treat a highly-contaminated volume of water, the unit could not be decontaminated to an acceptable level for use by the contractor elsewhere and would need to be purchased

C 4 Versatility

This option would be extremely versatile because multiple sources could be addressed with a single system Multiple stage systems would be most versatile because they would be applicable to a wide range of COCs Treatment could also be contracted on an as-needed basis

C 5 OU Interactions

This option is independent of all known OU actions

C 6 Waste Generation

Depending on the treatment type implemented, filter cake or spent medias may be classified as low-level wastes Waste volumes would be minor because of low constituent levels

Option 4 6 2 Construct Individual Treatment Facilities at Each Pond

A Option Components and Basis of Conceptual Design

Storage - 1000 to 2000 gallons of influent storage (equalization) would be required at each treatment facility

Piping - To transfer water to the treatment system from influent storage and to the discharge point from treatment system, approximately 1000 total feet of piping would be required

Pump Stations - Pumps and controls would be required at each pond with approximately 100 gpm capacity each A 100-gpm pumping rate would be consistent with the expected treatment rate

Treatment Systems - Multi-stage treatment facilities would be housed in a completely enclosed structure Facilities could be shared by 2 to 3 ponds, depending on locations, to reduce costs

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Power Source - 220-volt wiring or a generator would be required

B Conceptual Cost Estimate

4-5 Storage facilities @ $20,000 each	$100,000
Piping @ $30/foot	30,000
Pumps @ $70,000/cfs or $20,000 each	100,000
4-5 Treatment facilities @ $5M-$10M each	35,000,000
	$35,230,000
Annual operation and maintenance costs	$250,000

C Comparative Analysis Criteria

C 1 Risk Reduction

Only minor risk reduction is expected because it is unlikely that treatment could reduce COCs to significantly lower levels than the capabilities of the current technology and facilities This option may reduce risk associated with slug discharges resulting from spills Individual treatment systems will allow for optimum design capacity and technology

C 2 Funding and Schedule Constraints

Individual treatment systems would be relatively expensive with total costs for all required facilities ranging from $5-50 million and would stretch the 5-year time frame due to construction requirements

C 3 Cost-effectiveness

Placement of individual systems near sources would be cost-effective with respect to piping and pumping costs Cost-effectiveness would be low, however, because the already low COC levels are not likely to be greatly reduced Cost-effectiveness would be further reduced if extensive influent storage is required Individual permanent systems would also be relatively expensive when compared to a mobile treatment unit

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C 4 Versatility

Versatility would be less than for mobile rented (or purchased) treatment units because those units could be requested for a specific treatment need following sampling

C 5 OU Interactions

This option is independent of all known OU actions

C 6 Waste Generation

Depending on the treatment type implemented, filter cake or spent medias could be classified as low-level wastes Waste volumes would be relatively minor because of low constituent levels

Option 4 6 7 Use Existing OU Treatment Facilities

A Option Components and Basis of Conceptual Design

Treatment Systems - This option would utilize treatment systems currently available at the RFP including OU 1, OU 2 and OU 4 treatment facilities

In addition to OU treatment facilities, the 374 Evaporator was also evaluated for available capacity and potential use The following table shows the characteristics of the existing OU treatment facilities and the 374 Evaporator

Facility	Available Capacity	Technology	Influent Storage
OU 1 Treatment Facility	30 gpm, 16 hrs /day	ion exchange, UV oxidation	15,000 gal
OU 2 Treatment Facility	45 gpm, 24 hrs /day, 330 days/yr	neutralization, precip /co-precip , sedimentation, microfiltration, GAC	10,000 gal
OU 4 Treatment Facility	51,000 gal/day, 150 - 365 days/yr	straining, evaporation (VC and flash evap)	1,380,000 gal
374 Evaporator	None	decontamination, evaporation	850,000 gal

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Piping - 20,000 feet of piping would be required to transfer pond water to treatment systems for maximum versatility

Pump Stations - Pumps and controls are required at each pond with approximately 100-gpm capacity each

Tank Trucks - Tanker truck(s) to haul source water to treatment systems could be a viable alternative to pipe systems

B Conceptual Cost Estimate

Piping @ $30/foot	$300,000
Pump stations @ $70,000/cfs	160,000
Treatment systems	0
Tank trucks @ $100,000/truck	200,000
	$360,000-460,000

C Comparative Analysis Criteria

C 1 Risk Reduction

This option would likely result in minor risk reduction because it is unlikely that treatment could reduce COCs to significantly lower levels This option could reduce risk of slug discharges resulting from spills Existing treatment facilities would reduce risks associated with COCs for which there is on-site treatment technology with available capacity

Coordination of treatment of new influent sources with the influent source that existing facilities were originally designed to treat would not necessarily reduce overall site risks

C 2 Funding and Schedule Constraints

Funding would not be a major issue for this option because only operational and maintenance (O&M) costs would increase O&M cost data for existing facilities is not available for evaluation, but it is likely that incremental O&M costs would be minimal

C 3 Cost-effectiveness

Use of existing systems makes the treatment component of this option cost-effective The piping needed to convey water from the ponds to the treatment facilities and additional influent storage are the most costly components of this option Trucking water to be treated could be a more cost-effective approach

C 4 Versatility

This option is versatile because it expands capabilities of existing systems to include treatment of additional sources

C 5 OU Interactions

This option may impact OU planning efforts by utilizing the remaining capacity at existing facilities This option would require changes to the ROD

C 6 Waste Generation

Waste volumes such as filter cakes and spent media would be increased with increased treatment rates Wastes generated from new sources would be additive to current wastes and, therefore, classified similarly to low-level wastes

Option 4 6 8 Expand Existing OU Treatment Facilities

A Option Components and Basis of Conceptual Design

This option contains the same basic components which were required for Option 4 6 7, including expansion of existing treatment facilities

Treatment Systems - OU facilities with potential for expansion include OU 1 (expand by 30 gpm), OU 2 (expand by 20 gpm) and OU 4 Additionally, the 374 Evaporator (expand by 10 to 15 gpm) which is located out of the OUs was evaluated for expansion

B Conceptual Cost Estimate

Discussions with RFP treatment personnel indicate that it would require significant capital costs to expand most existing treatment facilities Costs to expand buildings housing treatment equipment may be particularly costly Expansion costs are wide-ranging depending on technologies expanded or added to existing OUs Such costs are estimated in the range of $100,000 to add additional ion exchange or GAC units to $20 million to add new technologies in expanded buildings

Expansion of the 374 Evaporator facility from 32 gpm to 45 gpm would cost approximately $22 million

All expansion costs would be additive to costs summarized in Option 4 6 7 which would be required to distribute pond water to existing OU treatment facilities

C Comparative Analysis Criteria

C 1 Risk Reduction

Minor risk reduction is expected because it is unlikely that treatment could reduce COCs to significantly lower levels This option could reduce risk associated with slug discharges resulting from spills Existing treatment facilities would reduce risks associated with COCs for which there is on-site treatment technology that could be expanded

Coordination of treatment of new influent sources with the influent sources that existing facilities were originally designed to treat might not reduce overall site risks

C 2 Funding and Schedule Constraints

Expansion of the A-4 tent facility to include new treatment technologies (i e , radionuclide removal) would provide a versatile and strategically located facility

C 3 Cost-effectiveness

Expansion of existing facilities, where possible, would be most cost-effective than constructing new facilities Costs to transfer wastes to existing facilities would not be prohibitive

C 4 Versatility

This option would be versatile because it expands capabilities of existing systems to include treatment of additional sources and allows centralized treatment for multiple source streams

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C 5 OU Interactions

This option would require changes to the ROD

C 6 Waste Generation

Waste volumes such as filter cakes and spent media would be increased with increased treatment Wastes generated from new sources would be additive to current wastes and, therefore, classified as low-level waste

Option 4 6 9 Consolidate Treatment Facilities at Pond A-4 for Use by Entire Pond System

A Option Components and Basis of Conceptual Design

Treatment Systems - This option would use the existing A-4 system including filter bags and GACs The A-4 system currently contains a fully available capacity of approximately 1 7 MGD for organics treatment This capacity could potentially be expanded

At a minimum, radionuclides and metals treatment should be added to A-4's treatment capabilities

Piping - Approximately 10,500 feet of piping would be required to collect pond water at Pond A-4 facilities

Pump Stations - Pumps and controls at each pond with approximately 100 gpm capacity would be required

Influent Storage - A relatively large influent storage tank with an approximate 1 MGD capacity would be necessary to fully utilize the A-4 treatment facility

B Conceptual Cost Estimate

Storage facility	$ 250,000
Piping @ $30/foot	315,000
Pump stations @ $70,000/cfs	160,000
Treatment facility expansion	2,000,000
	$2,725,000
Operation and maintenance costs	$ 250,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C Comparative Analysis Criteria

C 1 Risk Reduction

Risks associated with slug discharges resulting from spills could be reduced A comprehensive and strategically located treatment facility with expanded treatment capacity could provide effective risk reduction

C 2 Funding and Scheduling Constraints

A single, large treatment system could be prohibitively expensive, however, because the existing A-4 organics treatment system could be expanded for multi-stage treatment it would reduce capital costs

C 3 Cost-effectiveness

A single, large system at Pond A-4 would reduce piping and pumping costs Use of A-4 facilities would offer a convenient, centrally located treatment system at which there would be no conflicting treatment objectives other than treating pond water Also, there is significant capacity (1 7 MGD) currently available at A-4

C 4 Versatility

A single system designed to treat multiple sources would be inherently versatile Simultaneous treatment of multiple sources could be difficult

C 5 OU Interactions

This option would be independent of all known OU actions

C 6 Waste Generation

Wastes generated from new sources would be similar to wastes previously generated by the system Upgrades to the existing system to expand treatment capabilities would generate different types of wastes (e g , metals sludge, radionuclides, etc)

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Alternative Water Transfer Options

Option 4 7 1 1 Recycle STP Effluent for On-site Industrial Use

A Option Components and Basis of Conceptual Design

Pumping - Two pumping stations would be required for this option One pumping station of approximately 200 gpm would be required to transfer STP effluent from surface storage to the recycle system surge tank A second pump station of approximately 100 gpm would pump water out of the surge tank, through backflow preventers, and into the industrial water system against an existing head of approximately 50 feet

Piping - Approximately 4000 feet of 8-inch diameter piping would be required to transfer water to the surge tank This pipeline could be surface layed, or buried, depending on the design life of the system and type of pipe material selected

Storage - Storage facilities would be required for this option for STP effluent prior to recycling efforts Additional water storage required for this option would include a surge tank estimated at a 100,000-gallon capacity, located adjacent to and connected to the plant's industrial water supply header

Treatment - STP effluent meeting Segment 5 criteria and other benchmarks identified in Table 3-1 would require no treatment other than suspended solids removal prior to its use as non-potable industrial water This would be accomplished by a 4-stage, multi-media filter located just after the first pump station, and sized at 200 gpm

Controls - Automatic/Manual controls would be required to prevent overfilling of the surge tank Manual operation of the system would be required to protect pumping equipment and monitor effluent storage levels and filter performance

B Conceptual Cost Estimate

Construction	$1,500,000
Operations and maintenance/year	200,000
	$1,700,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C Comparative Analysis Criteria

C 1 Risk Reduction

Health-based reductions in risk would be nominal STP effluents under this option would already meet Segment 5 water quality criteria, and no additional treatment (other than sediment filtration) would be employed Minor risk reduction would be possible through reduced downstream discharges A minimal reduction could occur in pond storage levels, thereby reducing dam failure risks

C 2 Funding and Schedule Constraints

This option would have minor cost and schedule constraints due to its relatively low cost, use of standard construction techniques and use of accepted technology

C 3 Cost-effectiveness

This option would be a cost-effective approach to reducing downstream discharges and dam safety concerns and would also provide cost savings through decreased raw water purchases However, the demand for recycled water for industrial use would likely decrease as industrial operations are phased out

C 4 Versatility

Due to the availability of other recycle sources (from the 374 Evaporators) and the limited usage of raw water, this option cannot accomplish the total recycle of STP effluent The maximum available raw water demand at RFP would be approximately 17 MG/yr, whereas the STP effluent volume would be approximately 55 MG/yr STP effluent not being recycled would be discharged off-site according to current practices

C 5 OU Interactions

This option would be independent of all known OU actions

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C 6 Waste Generation

This option would generate a small volume of waste in the form of used filter media and backflush waters from the multi-media filter Estimated volumes would be approximately 5 cubic yards of low-hazard granular filter material (sand, grit, etc) and 800-1000 gallons of non-toxic backwash water annually

Option 4 7 1 2 Recycle Pond Water to RFP Industrial Water Supply

A Option Components and Basis of Conceptual Design

The components and basis of design for this option are identical to those for recycling STP discharges (Option 4 7 1 1) Any surface water for which recycling is proposed, would require a pump station and filter at the water source location, piping, surge tank and controls

B Conceptual Cost Estimate

A-3, A-4 or B-5 recycling	
Recycling facilities	$2,800,000
Operations and maintenance	200,000
	$3,000,000
C-2 recycling	
Recycling facilities	$1,100,000
Operations and maintenance	200,000
	$1,300,000

C Comparative Analysis Criteria

C 1 Risk Reduction

This option has the same risk reduction potential as Option 4 7 1 1, with the following addition

Average annual stormwater runoff collected and discharged at RFP is approximately 120 million gallons (MG) Runoff is divided between drainages as follows A-series - 55 MG, B-series - 45 MG, C-series - 20 MG With an estimated industrial usage of 17 mg per year, no drainage could routinely achieve zero discharge, although during drier years, zero discharge of Pond C-2 would be achievable

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Option 4 7 1 4 Directly Spray Evaporate Pond Water (Aerosol Spray Method) On-site

A Option Components and Basis of Conceptual Design

Storage - This option assumes that storage facilities would be the existing surface water impoundments

Piping - Piping to supply water to the spray heads would use 6-inch diameter aluminum or high-density polyethylene pipe A 6-inch centrifugal pump would supply approximately 1200 linear feet of pipe with spray heads at 30- to 40-foot intervals

Pumps - Either diesel-powered or electric-powered pumps capable of delivering 200-gpm flow rates and 30-35 psi pressure would be required for an aerosol spray system

Spray Heads - Spray heads would be high-volume, riser-type atomizing spray, in order to maximize the volume of water evaporated

System Layout - The system would spray water over the pond from which it came Piping with spray heads could be located adjacent to the pond, or designed to float in the pond Edge-located piping would be easier to install, maintain and operate

Controls Spray systems would be manually operated (start and stop) to ensure they are not operated in weather conditions which are not suitable for evaporation

B Conceptual Cost Estimate

Construction cost is estimated at $300,000 to $400,000 per pond Utilizing 4 ponds will result in a total cost of $1,200,000 to $1,600,000

O&M costs are estimated at $30,000 to $40,000 annually using plant site staff

C Comparative Analysis Criteria

C 1 Risk Reduction

Health-based reductions in risk would not be expected for water meeting Segment 5 standards Spray evaporation operations would reduce or eliminate transfers between non-discharging ponds Reduced pond storage levels would also improve dam safety

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C 2 Funding and Schedule Constraints

This option would have no cost or schedule constraints due to its low cost, low level of technology and ease of installation

C 3 Cost-effectiveness

This option would not be a cost-effective method of reducing downstream discharges from stormwater ponds, and would only be cost-effective for small-volume ponds (i e , spill control ponds) for which lowered pond levels may prevent the need to discharge or transfer from these ponds

C 4 Versatility

Spray evaporation systems could be installed and operated at any pond meeting the required water quality criteria Each spray head would be capable of evaporating 100 to 150 gallons per day (gpd) on an average basis Limitations due to climatic conditions would result in seasonal operations (approximately April-October) and a need to store water prior to evaporation A typical system comprising 40 heads and operated 180 days per year could evaporate approximately 900,000 gallons annually

C 5 OU Interactions

This option interacts with planning and management aspects of OUs 5, 6 and 7, but does not preclude any actions to be taken during characterization or remediation of those OUs

C 6 Waste Generation

No wastes would be generated by this option

Option 4 7 1 5 Mechanically Evaporate Pond Water (Evaporative Coolers) On-site

A Option Components and Basis of Conceptual Design

Pumping - Either diesel or electric-powered pumps would be required to pump water from storage to a new evaporator

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Evaporator Design - Mechanical evaporators would require heat inputs to promote evaporation An evaporator capable of evaporating 10 MG/year (a typical size) would require a dependable source of energy in the form of waste heat, electrical energy, or other sources of power System components would typically include pumping and feed controls, heat exchangers, heating elements, controls, recirculation piping, pre-filtration equipment and corrosion protection features

B Conceptual Cost Estimate

A 10 MG/year evaporator is conceptually estimated at $20-25 million, based on previously prepared estimates and industry guidelines

O&M costs are estimated at $400-500 thousand per year using plant site staff

C Comparative Analysis Criteria

C 1 Risk Reduction

The risk reduction potential for mechanical evaporation would be minimal Evaporated water would meet Segment 5 water quality criteria and other benchmarks identified in Table 3 1 prior to evaporation

C 2 Funding and Schedule Constraints

The high level of funding required for this option, the large scale of construction effort involved, and the expected permitting requirements for this option all impose significant schedule constraints on this option An estimated completion schedule is 3 to 5 years

C 3 Cost-effectiveness

Mechanical evaporation of water meeting Table 3-1 benchmarks would not be cost-effective and would not represent a reasonable reduction in risk for the money spent

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C 4 Versatility

Mechanical evaporators are large facilities that would require a high level of operational control to ensure they are functioning properly, cannot be relocated, and cannot be expanded beyond design capacity Their versatility in addressing changing water management needs would be low These evaporators could not be used for contaminated water

C 5 OU Interactions

This option wold be independent of all known OU actions

C 6 Waste Generation

Waste generated from operations (in the form of concentrates or sludges) or cleaning could be regulated and difficult to dispose or store

Option 4 7 1 8 Transfer Interior Ponds to Pond A-3 to Maintain Spill Control Capacity

A Option Components and Basis of Conceptual Design

This option transfers water meeting imposed water quality control criteria from interior spill control ponds to Pond A-3 for eventual discharge

Pumping - A portable pump station of approximately 500 gpm would be required to transfer water from Pond A-2 to Pond A-3 Due to lack of electrical power availability, this pump would operate on gasoline or diesel fuel

Piping - Transfer piping consisting of approximately 300 additional feet of 6-inch diameter high density polyethylene (HDPE) pipe would be required to create a discharge point to Pond A-3

B Conceptual Cost Estimate

Pump station	$40,000
Valving	1,000
Piping	1,000
	$42,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C Comparative Analysis Criteria

C 1 Risk Reduction

Transferring water that meets benchmarks identified in Table 3-1 would present no significant risk to human health and the environment

C 2 Funding and Schedule Constraints

Due to its low cost, there would be no cost or schedule constraints for this option

C 3 Cost-effectiveness

This option is a cost-effective method of maximizing available spill control capacity, thereby providing maximum protection to downstream waters

C 4 Versatility

The pipeline used for this option could also be used to transfer water which requires treatment

C 5 OU Interactions

This option has no OU interactions

C 6 Waste Generation

No wastes would be generated by this option

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Option 4 7 2 9 Discharge Stormwater Ponds to Segment 4

A Option Components and Basis of Conceptual Design

This option focuses on reduction of sampling efforts by discharging directly from ponds which meet Segment 4 standards and other benchmarks identified in Table 3-2 to downstream receiving waters

Piping - Surface-laid piping necessary to discharge Ponds A-4, B-5 and C-2 to Segment 4 currently exists Additional surface piping would be installed from Pond A-3 to a connection with the A-4 discharge piping north of Pond A-4

Pumps - Pumps currently exist at Pond A-4, B-5 and C-2 for use in transfer or discharge operations An additional pump would be installed at Pond A-3

B Conceptual Cost Estimate

Piping (A-3) at $30/foot (1000')	$30,000
Pump at A-3	25,000
	$55,000

C Comparative Analysis Criteria

C 1 Risk Reduction

Ponds A-4 and C-2 are currently discharged to Segment 4 in accordance with Segment 4 standards Under current operational management, Ponds B-5 and A-3 would be monitored for a limited suite of indicator parameters (consistent with Segment 5 Standards) prior to transfer to Pond A-4 and discharge Monitoring of these ponds for Segment 4 Standards and other Table 3-2 benchmarks, as required for discharges, is a more stringent requirement than currently exists More stringent monitoring requirements are presumably more protective and thus represent a reduction in risk compared to current conditions

C 2 Funding and Schedule Constraints

This option has no cost or schedule constraints due to its low cost, high use of existing facilities and ease of installation

C 3 Cost-effectiveness

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

This option is a cost-effective method of managing stormwater discharges Redundant sampling of Ponds A-3 and B-5 prior to transfer to Pond A-4 (which is in turn sampled prior to discharge) is eliminated in favor of a single, more stringent sampling event at Ponds A-3 and B-5 Operational costs would also be reduced by not handling A-3 and B-5 water a second time in Pond A-4

C 4 Versatility

This option would provide greater versatility and flexibility than the current operational system By discharging Ponds B-5 and A-3 directly to Segment 4, Pond A-4 would receive only a limited amount of routine inflow, making it available for non-routine storage of high flows resulting from spring runoff or large storm events This pond would also be available to accept transfers of water from Ponds A-3, B-5 and C-2 that do not meet discharge standards, and would provide a central storage location that is adjacent to the existing A-4 treatment facilities

C 5 OU Interactions

This option would maintain current capabilities to capture, store and monitor discharges and runoff from upstream OUs prior to off-site discharge This option also would improve the operational flexibility of the ponds for dealing with future OU 5 and OU 6 remediation efforts and is consistent with expected final actions for water control and water management during cleanup operations

C 6 Waste Generation

No wastes would be generated by this option

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Option 4 7 2 10 Pipe Water from Pond C-2 to Walnut Creek in On-Site Pipeline

A Option Components and Basis of Conceptual Design

This option utilizes the existing transfer piping between C-2 and the Walnut Creek drainages to eliminate discharges to the Standley Lake basin

Pumping - A permanent pump station of approximately 500 gpm would be required to transfer water from Pond C-2 directly to the Walnut Creek drainage below Pond A-4 or B-5 Due to lack of electrical power availability, this pump station would operate on gasoline or diesel fuel

Piping - Transfer piping consisting of 8-inch diameter high density polyethylene (HDPE) pipe which currently exists between Pond C-2 and Ponds B-5 and A-4 A tee, two gate valves and approximately 300 additional feet of pipe would be required to create a discharge point below Pond A-4 or B-5

B Conceptual Cost Estimate

Pump station	$80,000
Valving	10,000
Piping	1,000
	$91,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C Comparative Analysis Criteria

C 1 Risk Reduction

Transferring water that meets benchmarks identified in Table 3-1 would present no significant risk to human health and the environment and would eliminate a perceived risk from residents in the Standley Lake basin

C 2 Funding and Schedule Constraints

There would be no cost or schedule constraints for this option

C 3 Cost-effectiveness

This option is a cost-effective method of reducing Pond C-2 discharges to Woman Creek and Standley Lake This option cannot assure that Pond C-2 would not overtop during a flood event since runoff volume from an extreme event could exceed the storage capacity of C-2

C 4 Versatility

The pipeline used for this option could also be used to transfer water to Pond B-5, Pond A-4 or directly to the Broomfield Diversion Ditch

C 5 OU Interactions

This option would transfer water from the jurisdiction of OU 5 (Woman Creek) to the jurisdiction of OU 6 (Walnut Creek), but could be discontinued at any time and would not impact actions or planning efforts for these OUs under the Interagency Agreement (IAG)

C 6 Waste Generation

No wastes would be generated by this option

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Monitoring Options

Option 4 8 3 Monitor Influent Streams

A Basis of Conceptual Monitoring Plan

Influent stream water would be sampled and analyzed for the water quality parameters that are currently monitored at RFP during a pre-discharge sampling event with Colorado Department of Health (CDH) These parameters include gross alpha, gross beta, ammonia, nitrate/nitrite, sulfate, sulfide, TDS, TSS, bicarbonate/carbonate, chloride, fluoride, semi-volatile organics, volatile organics, cyanide, HSL metals, triazine herbicides, organochlorine herbicides, and organophosphorus pesticides

Influent streams would also be monitored in real-time for flow and indicator parameters (pH, temperature, conductivity) using instrumented flumes, weirs and water quality probes

Samples would be taken monthly on each of the three RFP drainages

B Conceptual Cost Estimate

Laboratory Analytical Costs	$2500
Field (Sampling) Costs	300
	$2800 per sample
36 samples per year	$100,800

C Comparative Analysis Criteria

C 1 Risk Reduction

No risk reduction associated with potential chemical exposure would be achieved by this option Influent stream monitoring does not provide earlier detection capabilities than monitoring pond water directly due to the fact real-time analytical methods are unavailable for chemical constituents of concern at the low detection limits required Monitoring of indicator parameters could provide early indication of potential water quality problems

C 2 Funding and Schedule Constraints

There would be no funding or schedule constraints associated with this option

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C 3 Cost-effectiveness

Flow monitoring would promote efficient and cost effective pond water management by maximizing the planning time for pond water transfer or discharge operations Monitoring of indicator parameters would be a cost-effective method for early identification of potential water quality problems

C 4 Versatility

This option would provide versatility by monitoring a large number of water quality parameters and would allow time for remedial action prior to transfer or release

C 5 OU Interactions

This option would be independent of all known OU actions

C 6 Waste Generation

No waste would be generated by this option

Option 4 8 4 Monitor Ponds

A Basis of Conceptual Monitoring Plan

Pond water would be sampled and analyzed at regular intervals (monthly, quarterly, or annually) for COCs and Segment 5 analytes to demonstrate compliance with the ambient water quality requirements of Table 3-1 Pond volumes, dam piezometers, and indicator parameters (pH, temperature, conductivity) would be monitored in real time to assist operational management and stay apprized of changing conditions

Sampling efforts for this option include radionuclide-specific analysis for plutonium, americium and uranium which results in higher analytical costs

Ponds A-1, A-2, B-1 and B-2 would be sampled quarterly Ponds A-3, A-4 and B-5 and the Landfill Pond will be sampled monthly

B Conceptual Cost Estimate

Laboratory Analytical Costs	$4000
Field (Sampling) Costs	300
	$4300 per sample
64 samples per year	$275,200

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C Comparative Analysis Criteria

C 1 Risk Reduction

This option would ensure that contaminants in ponds that are not transferred or discharged would be detected and remedial actions could be implemented as needed Pond volume and dam piezometer monitoring would ensure dam safety considerations are accounted for and uncontrolled discharges would not occur This option would be protective of human health and environment and would promote compliance with the numeric water quality criteria adopted for this Interim Measures/Interim Remedial Action (IM/IRA) Decision Document

C 2 Funding and Schedule Constraints

There would be no funding or schedule constraints associated with this option

C 3 Cost-effectiveness

Cost effectiveness is a function of the frequency of routine water quality monitoring compared to the frequency with which operational monitoring is conducted Monthly or quarterly monitoring at ponds which are also monitored at a similar frequency for operational reasons is redundant and not cost effective Quarterly or annual monitoring of non-discharging ponds would be cost effective in determining compliance with ambient water quality criteria Frequent volume and piezometer monitoring would be very cost-effective compared to the potential impacts from a dam failure

C 4 Versatility

This option would provide versatility by monitoring different ponds at different frequencies depending on the frequency in which a particular pond undergoes monitoring for operational purposes

C 5 OU Interactions

This option would be independent of all known OU actions

C 6 Waste Generation

No wastes would be generated by this option

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Option 4 8 5 Monitor Transfers

A Basis of Conceptual Monitoring Plan

Ambient pond water quality would be sampled and analyzed prior to transfer operations for the parameters that are currently monitored at RFP during a pre-discharge sampling event with CDH These parameters would include gross alpha, gross beta, ammonia, nitrate/nitrite, sulfate, sulfide, TDS, TSS, bicarbonate/ carbonate, chloride, fluoride, semi-volatile organics, volatile organics, cyanide, HSL metals, triazine herbicides, organochlorine herbicides, and organophosphorus pesticides Analytical results would be compared against Segment 5 criteria and other benchmarks identified in Table 3-1 During transfers, flows and indicator parameters (pH, temperature, conductivity) would be monitored in real time to assist operational management and provide early warning of changing water quality conditions

B Conceptual Cost Estimate

Laboratory Analytical Costs	$2500
Field (Sampling) Costs	300
	$2800 per sample
12 samples per year	$33,600

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C Comparative Analysis Criteria

C 1 Risk Reduction

This option would ensure that contaminants that are both regulated and of particular concern would be detected in time to take remedial action prior to transfer to other ponds This option would be protective of human health and the environment and would promote compliance with the numeric water quality criteria adopted for this IM/IRA Decision Document

C 2 Funding and Schedule Constraints

There would be no funding or schedule constraints associated with this option

C 3 Cost-effectiveness

This option would be a cost-effective method of determining compliance with benchmarks compared to monitoring for all Segment 5 parameters, many of which have never been detected in RFP waters

C 4 Versatility

This option would provide versatility by monitoring a large suite of parameters prior to transfers and only indicator parameters (which would allow early detection of water quality problems) during transfers

C 5 OU Interactions

This option would be independent of known OU actions

C 6 Waste Generation

No wastes would be generated by this option

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Option 4 8 6 Monitor Discharges

A Basis of Conceptual Monitoring Plan

Ambient pond water quality would be sampled and analyzed prior to discharge operations for the parameters that are currently monitored at RFP during a pre-discharge sampling event with CDH These parameters would include gross alpha, gross beta, ammonia, nitrate/nitrite, sulfate, sulfide, TDS, TSS, bicarbonate/ carbonate, chloride, fluoride, semi-volatile organics, volatile organics, cyanide, HSL metals, triazine herbicides, organochlorine herbicides, and organophosphorus pesticides Analytical results would be compared against Segment 4 criteria and other benchmarks identified in Table 3-2 During discharges, flows and indicator parameters (pH, temperature, conductivity) would be monitored in real time to assist operational management and provide early warning of changing water quality conditions Whole Effluent Toxicity Tests (WET) would also be conducted on discharged water as a check on overall water quality (toxicity), and to comply with current Federal Facilities Compliance Agreement (FFCA) requirements

B Conceptual Cost Estimate

Laboratory Analytical Costs	$2500
Field (Sampling) Costs	300
	$2800 per sample
18 samples per year	$50,400

Laboratory Analytical Costs	
for *Cenodaphnia sp*	$275
fathead minnows	500
field (Sampling) costs	300
	$1075 per sample
18 samples per year	$19,350

C Comparative Analysis Criteria

C 1 Risk Reduction

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

This monitoring option would ensure that contaminants are detected in time to take remedial action prior to downstream discharge, and would achieve regulatory compliance Biomonitoring would provide an assessment of overall water quality, but would be insufficient to determine compliance with chemical-specific numerical standards and overall risk to downstream water

C 2 Funding and Schedule Constraints

There would be no funding or schedule constraints associated with this option

C 3 Cost-effectiveness

This option would be a cost-effective method of determining compliance with Segment 4 criteria compared to monitoring for all Segment 4 parameters, many of which have never been detected in RFP waters. Biomonitoring provides information on the overall toxicity and water quality at a minimal cost

C 4 Versatility

This option would provide versatility by monitoring a large suite of parameters prior to discharge and only indicator parameters (which would allow early detection of water quality problems) during discharge

C 5 OU Interactions

This option would be independent of known OU actions

C 6 Waste Generation

No wastes would be generated by this option

APPENDIX G
EVALUATION OF PERSONNEL EXPOSURE FROM PROPOSED ALTERNATIVES

APPENDIX G
EVALUATION OF PERSONNEL EXPOSURE FROM PROPOSED ALTERNATIVES

Evaluation of Risks to Personnel due to Inhalation

August 3, 1992 EG&G Memorandum from R S Roberts to S A Pettis Risks due to Spray Evaporation of B-2 Pond

September 29, 1993 WWE Calculation Sheets on Estimated Air Emissions

October 8, 1993 EG&G Memorandum From R M Garren to G V Porter Pond Water IM/IRA Air Emissions Evaluation

Evaluation of Risks to Personnel due to Water Ingestion

AUGUST 3, 1992 EG&G MEMORANDUM
FROM R.S ROBERTS TO S A PETTIS:
RISKS DUE TO SPRAY EVAPORATION OF B-2 POND

EG&G ROCKY FLATS

INTEROFFICE CORRESPONDENCE

DATE. August 3, 1992

TO S A Pettis, Surface Water, Bldg 80, X8615

FROM R S Roberts, Remediation Programs, Bldg 80, X8508

SUBJECT RISKS DUE TO THE SPRAY EVAPORATION OF B-2 POND - RSR-016-92

A risk analysis was performed to evaluate the potential human health risk due to the spray evaporation of the B 2 pond The results of this evaluation show that the carcinogenic risk due to this activity is 2 7E 10 and the Hazard Index is 4 5E-07 These values are well below the acceptable carcinogenic range of 1E-04 to 1E-06 and the acceptable Hazard Index of 1 0

In order to calculate the above risks, it was assumed that an individual will live at the Rocky Flats Plant fence line for the next thirty years and that spray evaporation will continue for that period of time This individual will be exposed to volatile organic compounds (VOC) that are volatilized from the spray head when water is sprayed over the B 2 pond The VOCs volatilized during spray evaporation are transported from the spray head to the hypothetical individual at the fence line This exposure scenario was reviewed and approved by the Department of Energy (DOE) and the Colorado Department of Health (CDH) All assumptions used in this analysis are outlined in Attachment I

Attachment II shows the analytical results used in this risk analysis Methylene Chloride, Acetone 1,2 Dichloroethene and Trichloroethene were evaluated in this risk assessment J and B qualified data were assumed to be present at the reported value

If you have any questions or need support in presenting this information, please contact me

dmf

Attachments
As Stated (2)

cc
G M Anderson
M B Arndt
R C. Flory
D S Murray
D M Smith

SPRAY EVAPORATION RISK ASSUMPTIONS

A) Spray Evaporation Specifications

Average Flowrate = 1000 gallons\minute
Daily Exposure Duration = 10 hours\day
Annual Exposure Duration = 125 days\year
Duration of Spray Evaporation Activities = 30 years

B) Dispersion of Volatiles

CHI\Q = (1\(PI)(U)(SIGMA-Y)(SIGMA-Z))

PI = 3 1416
U = 4 7 meters\second
SIGMA-Y = 110 meters
SIGMA-Z = 43 meters
Distance to Individual = 1 6 kilometers
Stability Class = D

Assumptions were taken from the Plan For Prevention Of Contaminant Dispersion, dated February, 1992

Assume 100% volatilization from water

C) Inhalation of Volatilized Constituents

$$\text{Intake} = \frac{(ER)(CHI\backslash Q)(IR)(DEF)(AEF)(ED)}{(BW)(AT)}$$

ER = Emission Rate = Chemical Specific Value
CHI\Q = Dispersion Value
IR = Inhalation Rate = 0 83 m^3\hour
DEF = Daily Exposure Frequency = 10 hours\day
AEF = Annual Exposure Frequency = 125 days\year
ED = Exposure Duration = 30 years
BW = Body Weight = 70 kg
AT = Averaging Time = 70 Years (Carcinogens)
AT = Averaging Time = 30 Years (Non-Carcinogens)

Carcinogenic Risk = (Intake)(Slope Factor)

Hazard Index = Intake\Reference Dose

Slope Factors and Reference Doses used in this analysis were taken from the Integrated Risk Information System (IRIS) and the Health Effects Assessment Summary Tables (HEAST) The primary source was IRIS Slope Factors and Reference Doses are current as of 7\30\92

JUN 24 92 02 34PM IT ANALYTICAL ST LOUIS

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO
Pond B-2 6/22/92
NP50631WC

Lab Name ITAS-ST LOUIS Contract 262 01

Lab Code ITAS Case No -- SAS No SDG No ---

Matrix (soil/water) Water Lab Sample ID 2109-001

Sample wt/vol 5 (g/ml) ml Lab File ID >E4065

Level (low/med) LOW Date Received ~~00/00/00~~ 06/23/92

% Moisture not dec - Date Analyzed 06/23/92

Column (pack/cap) CAP Dilution Factor 1

CONCENTRATION UNITS (ug/L or ug/Kg) ------

CAS NO	COMPOUND	CONCENTRATION	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	11	B
67-64-1	Acetone	18	
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	4	J
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	4	J
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U

J - below detect level

DRAFT

WRIGHT WATER ENGINEERS, INC
2490 West 26th Ave - Suite 100-A
Denver, Colorado 80211
Tel (303) 480-1700

Date 9-29-93 Sheet ____ of ____
Proj No 901 004 450
Proj Name IM/IRA
Des. By Mende Ckd By ____

Subject Estimated Air Emmisions

Potential Air Emmisions for IM/IRA Combined (Preferred) Option

1) Spray Evaporation

7 systems - 2 at Landfill, 2 at A-2, 1 each at A-1, B-1, and B-2

Each system will evaporate ~ 900,000 gallons over 180 days (5000 gal/day)

A) Water Quality of Evaporated Water - Use sample mean from Table 1.1, 1.3, or 1.8 (attached) for ambient concentration

B) Diesel Pumps - 1 Diesel Pump per system
Usage - 8 hr/day x 180 days = 1440 hrs
Fuel Consumption ~ 1.1 gal/hr

2) A-4 Discharge

A) Diesel Pump
Usage - 24 hr/day ~ 13 days/month = 3744 hr/year
Fuel Consumption ~ 3.3 gal/hr

B) Diesel Generator for A-4 Tent (50 kw)
Usage - 10 hr/day for 80 days/year = 800 hr/year
Fuel Consumption ~ 1.2 gal/hr

3) B-5 Transfer

A) Diesel Pump
Usage - 24 hr/day ~ 9 days/month = 2592 hr/year
Fuel Consumption ~ 3.3 gal/hr

B) Diesel Light Plant (15 kw)
Usage 10 hr/day ~ 9 days/month = 1080 hr/year
Fuel Usage ~ [illegible] .35 gal/hr

4) C-2 Recycle System

A) ~~Gasoline Powered Pump~~ Propane Powered Pump 96 HP
~~Usage~~ Propane Usage = 11.4 lb/hr
Usage 25 days/month for 6 months 10 hr/day = 1500 hr/yr

5) A-4 Tent Propane System
Usage 10 hr/day x 180 days (est) = 1800 hr/year
Fuel Consumption ~ [illegible] 7.2 lb/hr

* 6) Disregard aeration option - 'll be deleted

WRIGHT WATER ENGINEERS, INC
2490 West 26th Ave - Suite 100-A
Denver, Colorado 80211
Tel. (303) 480-1700

Date 9-29-93 Sheet ____ of ____
Proj No 901 004 450
Proj Name IM/IRA
Des. By Mende Ckd. By ____
Subject ____

Calculation Sheet for Air Emissions Estimate

Spray Evaporation Systems (Per Doug Murray - EG&G)

Operational April - September ~ 180 days

Evaporation estimate is 900,000 gal per system @ A-2 & LF

Pumps (Diesel) are run 8 hr/day (daylight hours only)

Fuel Usage estimate is 40 gal/wk (1 gal/hr)

B-5 Transfer and A-4 Discharge

Pump Fuel Usage is 10 gal/3 hrs @ ~ 800 gpm (Doug Lee - Riedel)

Light Plant Fuel Usage 15 kW / 144,000 BTU/gal x 2928 ~~kw-hr~~ = .35 gal/hr

OCTOBER 8, 1993 EG&G MEMORANDUM
FROM R.M GARREN TO G V PORTER
POND WATER IM/IRA AIR EMISSIONS EVALUATION

EG&G ROCKY FLATS

INTEROFFICE CORRESPONDENCE

DATE October 8, 1993

TO G V Porter, Surface Water Division, Bldg T893A, X5661

FROM R M Garren, Air Quality Division, Bldg 080, X8512 RMG

SUBJECT POND WATER IM/IRA AIR EMISSIONS EVALUATION - RMG-013-93

This correspondence accompanies the attached set of calculations used to evaluate potential air emissions from a list of proposed options provided by the Surface Water Division (SWD) for the Pond Water Management Interim Measures/Interim Remedial Action (IM/IRA) The proposed options were evaluated to determine if an Air Pollutant Emission Notice (APEN) or permit application would be required for spray evaporation activities and the operation of propane and diesel fired equipment The options were outlined in a correspondence from Wright Water Engineers, Inc dated September 29, 1993 The following is a summary of the evaluation

- Evaluation of spray evaporation activities described in option 1 of the letter indicate that emissions are well below reportable levels and the impact on air quality is negligible

- The diesel-fired pump mentioned in part B of option 1 will not require an APEN or permit application based on the actual hours of operation In order to demonstrate compliance to the Colorado Department of Health (CDH), an operating log documenting hours of operation and fuel consumption (if possible) must be maintained

- The diesel-fired pump mentioned in options 2 and 3 **will require an APEN** A permit application will not be required based on the actual hours of operation The Air Quality Division will require proper notification of implementation plans in order to prepare and submit the appropriate paperwork to the CDH

- The diesel-fired generator mentioned in part B of option 2 will not require an APEN or permit application based on the actual hours of operation In order to demonstrate compliance to the CDH, an operating log documenting hours of operation and fuel consumption (if possible) must be maintained

- The diesel-fired light plant mentioned in part B of option 3 will not require an APEN or permit application An operating log for this unit is not necessary

- The propane-fired pump mentioned in option 4 will not require an APEN or permit application based on the actual hours of operation In order to demonstrate compliance to the CDH, an operating log documenting hours of operation and fuel consumption (if possible) must be maintained

- The Pond A-4 tent propane system mentioned in option 5 will not require an APEN or permit application An operating log for this unit is not necessary

Any deviation in the hours of operation or the equipment listed in these options that will affect air emissions will require a re-evaluation by the Air Quality Division Please notify the Air Quality Division immediately if an option is selected that requires an APEN If you have any questions concerning this correspondence, please contact me at X8512 or digital page 4281

RMG

Attachment
As Stated

cc
R C Nininger
C A Patnoe

OCTOBER 7, 1993 WWE CALCULATION SHEETS
ON PROPOSED OPTIONS

<u>Option 1</u> – Spray Evaporation

$1 \times 10^{-6}\ g/\ell \times 0.0022046\ lb/g \times \frac{1\ \ell}{0.26418\ gal} = 8.345E{-9}\ lb/gal$

8.345E-9 lb/gal or 0.008345 lb/gal E6 per 1 μg/ℓ

5000 gal/day × 180 days = 900,000 gal/yr

<u>Landfill total</u> VOC concentration ≈ 238 μg/ℓ

238 (.008345 lb/gal E6)(.9 gal E6/yr) = 1.79 lb/yr

2 units (1.79 lb/yr) = <u>3.58</u> lb/yr TOTAL VOC BASED on 100% Vol

<u>A-2 total</u> VOC concentration ≈ 32 μg/ℓ

32 (.008345)(.9) = 0.24 lb/yr Total VOC

2 units (0.24 lb/yr) = <u>0.48</u> lb/yr Total VOC

<u>A-1 total</u> VOC Conc ≈ 32 μg/ℓ

32 (.008345)(.9) = <u>0.24 lb</u>/yr Total VOC

<u>B-1 total</u> VOC Conc ≈ 58 μg/ℓ

58 (.008345)(.9) = <u>0.44 lb</u>/yr Total VOC

<u>B-2 total</u> VOC Conc ≈ 58 μg/ℓ

58 (.008345)(.9) = <u>0.44 lb</u>/yr Total VOC

In order to exceed reporting limits for HAPs, VOCs & lead, µg/l concentrations would have to be:

250 lbs/yr HAP = 33.287 µg/l

100 lbs/yr lead = 13.315 µg/l

2000 lbs/yr Criteria VOC = 266,294 µg/l

Individual pollutant levels are well below any of these levels

---

Option 1 Part B

Diesel Pump

1440 hrs/yr (1.1 gal/hr)(.469 lb NOx/gal) = 742.9 lb/yr
= 0.37 tons/yr NOx

At 8760 hr/yr = 2.26 ton/yr NOx

Option 2 A-4 Discharge

A Diesel Pump

3744 hr/yr (3.3 gal/hr)(.469 lb NOx/gal) = 5,794.58 lb/yr
= 2.90 ton/yr NOx

At 8760 hr/yr = 6.78 ton/yr NOx

B Diesel generator for A-4 tent (50 kw)

800 hr/yr (1.2 gal/hr)(.469 lb NOx/gal) = 450 lb/yr
= 0.22 tons/yr NOx

At 8760 hr/yr = 2.47 ton/yr NOx

Option 3 B-5 Transfer

A Diesel Pump

2592 hr/yr (3 3 gal/hr)(.469 lb Nox/gal) = 4011 6 lb/yr NOx

200 Ton/yr NOx

AT 8760 hrs = 6 78 ton/yr NOx

B Diesel light plant

1080 hr/yr (.35 gal/hr) (469 lbNOx/gal) = 177 3 lb/yr NOx

= 0.089 Ton/yr NO

AT 8760 hrs = 0 72 ton/yr NOx

Option 4 C-2 Recycle System

Propane Powered pump (96 HP)

Propane usage = 11.4 lb/hr

$\frac{11\ 4\ \text{lb/hr}}{4\ 235\ \text{lb/gal}} = 2.7$ gal/hr

1500 hr/yr (2.7 gal/hr)(.139 lb Nox/gal) = 562 95 lb/yr NOx

= 0.28 ton/yr NOx

At 8760 hrs - 1.64 ton/yr NOx

Option 5 A-4 Tent Propane System

propane usage 7 2 lb/hr $\frac{7\ 2\ \text{lb/hr}}{4\ 235\ \text{lb/gal}} = 1.7$ gal/hr

1800 hr/yr (1 7 gal/hr)(.139 lb NOx /gal) = 425 3 lb/yr NOx

= 0 213 ton/yr NOx

At 8760 hrs - 1 035 ton/yr NOx

G 1 Summary

A CERCLA risk analysis was performed to evaluate the resulting differences in risk from pond water management alternatives described in the Interim Measures/ Interim Remedial Action (IM/IRA) Decision Document A steady state model of the pond water flow and the risk results from the Baseline Risk Assessment were used together to predict changes in risk resulting from different water management actions "Worst case" large volume spills were postulated to occur in each drainage area and the risks calculated for different spill control alternatives Water storage, collection, and transfer options for non-spill conditions were also evaluated

G 2 Introduction

A CERCLA human health risk comparison was performed where applicable for the retained options discussed in Chapter 5 and described in Appendix F of this document The purpose of this risk evaluation was to provide quantitative assessment on risks relative to each proposed alternative as a tool for the IM/IRA Decision process on proposed actions A compartmental flow model of the Rocky Flats surface water ponds was developed in order to predict the contaminant concentrations in the individual ponds and the resulting human health risks for a variety of pond management alternatives Current baseline risk levels calculated in the Baseline Risk Assessment (Appendix D, summarized in Section 2 5), were used together with the flow model to predict the resulting risk reductions of proposed alternatives for spill capture and water storage/ transfer

G 3 Model Description

A flow model was developed for the surface water ponds on North Walnut Creek South Walnut Creek and Woman Creek The ponds included in the model are Ponds A-1, A-2, A-3, A-4, B-1, B-2, B-3, B-4, C-1, C-2, and the Landfill Pond The model base case represents steady state flow averaged over the calendar year 1992 and is given in Figure G-1 Pond Flow Model The flow data used in model are given in the following tables

- Table G-1 S Walnut Creek Flows
- Table G-2 N Walnut Creek Flows
- Table G-3 Regulated Discharges and Woman Creek Flows
- Table G-4 Average Pond Capacities

The sources of data used for water release rates, pond capacities, and transfer between ponds include the 1992 Rocky Flats Environmental Report, EG&G Surface Water Operating Logs and Summaries, and the EG&G Surface Water flow monitoring network The values for annual precipitation and evaporation used in the model were the average values for the Rocky Flats Plant site of 16 inches and 40 inches respectively

G 4 Model Use and Method of Comparison

The model described above was developed to predict the results of introducing perturbations in the system, changes in water flow (re-routing water, spray evaporation, or elimination of ponds) and the addition of a contaminant (spills) were evaluated Other IM/IRA option categories such as treatment and monitoring options were not evaluated since the model could not be as easily applied to these cases

For simplicity in modeling spills, the assumption is made that the entire amount of chemical considered is dumped into the receiving pond and then the spill action alternative occurs Since spills are not steady state events, then only those flows appropriate to the spill event are carried from the base model to the spill model Restated, credit is taken for pond operator actions to implement the spill control measures according to the spill control alternative being evaluated The risks associated with spills are then compared for each alternative quantitatively

The Baseline Risk Assessment for the pond water was limited to the future residential land use scenario and the ingestion of surface water only Even though this is a highly unlikely scenario, it served as the upper-bound of risk for any scenarios on-site as well as any current or future scenarios for receptors using the water off the Rocky Flats plant site However, when comparing alternatives which differ in the amount of water which is released off plant site, then one must select which receptor, future on-site, or current off-site is to be the basis of comparison For this analysis, the future on-site receptor drinking water from the ponds is the scenario for comparison since the baseline risks were calculated in this way
In addition, the retained options are also evaluated and compared for the potential to spread contamination off the Rocky Flats plant site

G 5 Spills

The following three sections model spills of carbon tetrachloride, trichloroethylene (TCE), and nitric acid In the case of each spill, the contaminant has two or three possible fates based on the spill capture alternative

- Captured by the existing ponds (Ponds A-1 and A-2 in the cases of the carbon tetrachloride spill, pond C-2 in the TCE spill, and Ponds B-1 and B-2 in the nitric acid spill) This is the no action alternative)
- Captured by a tank
- Captured by a single pond equivalent to the existing ponds (The TCE spill analysis does not model an equivalent pond)

The analysis assumes that 100% of the contaminant enters the applicable interceptor pond, that there is no loss of contaminant en route Additionally, the only pathway analyzed is ingestion of contaminated water

Table G-1 below summarizes the different values of risk and hazard quotients (HQs) to a hypothetical on-site resident individual who ingests the contaminated pond water The values for risk and HQs were obtained from Sections G 5 1, G 5 2 and G 5 3

The baseline risk is derived from the risk assessment contained in Chapter 2 This risk assessment assumes that concentrations are as summarized in Tables D-2 1 through D-2 8 in Appendix D of this report

Table G-1
Comparison of Risks and HQs from Different
Contaminant Spills and Different Pond Configurations

	Existing Ponds	Single Spill Control Pond	Tanks
Carbon Tetrachloride	1 7E-5	1 7E-5	4 9E-6
TCE	HQ=0 071	Not Analyzed	HQ=0 071
Nitric Acid	2 13E-5	HQ=0 54	HQ=0 54

It is noted that the risk/hazard is identical for the existing two-pond configuration and the equivalent pond Therefore, the construction of a single spill control pond cannot be justified from the basis of risk alone Also, the tank option does not reduce the hazard from a spill, compared to the pond configuration, for spills of TCE or nitric acid, and has only marginally reduced risk compared to the pond configuration for a spill of carbon tetrachloride Because of this, it may be difficult the extra expense of capturing tanks

G 5 1 Building 707 Carbon Tetrachloride Tank Spill Into North Walnut Creek

This section of the appendix models a release of carbon tetrachloride from a 5040 gallon tank at Building 707 The entire tank contents are assumed to flow into North Walnut Creek without any carbon tetrachloride dissipating into the atmosphere, which is a simplifying if very conservative assumption because water ingestion is the only pathway analyzed Three separate scenarios are used in this model, all of which are identical except for the receiving pond configuration In all scenarios, the pathway modeled is ingestion, in other words, it is assumed that an individual living on plant site drinks 2 liters per day of contaminated water

In the first scenario (analyzed in Section 5 1 1, No Action Alternative), the carbon tetrachloride flows into the presently used configuration of Ponds A-1 and A-2 There the contaminant mixes with the ponds Since the ingestion period is extremely long (30 years in this model), it is assumed that both ponds reach equilibrium, and the carbon tetrachloride concentrations will be the same in all ponds

In the second scenario (analyzed in Section 5 1 2, Replace Existing Ponds A-1 and A-2 With One Spill Control Pond), the carbon tetrachloride flows into a single spill control pond, with the same volume as present-day Ponds A-1 and A-2 There the contaminant mixes with the pond to form a homogeneous solution

In the third scenario (analyzed in Section 5 1 3, Use of Tanks to Capture Spill), tanks are used to contain the spill It is assumed that the tanks are 100 percent effective, and none of the carbon tetrachloride escapes containment

G 5 1 1 Capture Using Existing Ponds

The ultimate carbon tetrachloride concentration is equal to the total amount of carbon tetrachloride released, divided by the total volume of the ponds The resulting concentration of carbon tetrachloride is

Conc = (5040 gal x 1 595[1] x 3 785 liters/gal x 1 gram/1000 liters) / [(0 33E6 gal + 2 04E6 gal) x 3 785 liters/gal] = 3 39E-6 g/L = 3 39 ug/L

The cancer risk associated with daily ingestion of water contaminated with 3 39 ug/L of carbon tetrachloride is calculated using the following formula taken from EPA's Risk Assessment Guide for Superfund[2], modified for ingestion only The oral slope factor for carbon tetrachloride is taken from the IRIS database [3] The cancer risk is

Risk = [Conc x EF x ED x IR_w x SF_o]/[BW x AT x 365 day/yr x (1000 ug/mg)]

where
Conc = contaminant concentration = 3 39 ug/l
EF = exposure frequency = 350 day/yr
ED = exposure duration = 30 yr
IR_w = water drinking rate = 2 l/day
SF_o = oral slope factor = 0 13 kg-day/mg
BW = receptor body weight = 30 kg
AT = averaging time = 70 yr

Inserting these values into the equation

Risk = [(3 39 ug/L) x (350 day/yr) x (30 yr) x (2 L/day) x (0 13 kg-day/mg)]/[(70 kg) x (70 yr) x (365 day/yr) x (1000 ug/mg)] = 1 21E-5 excess risk of contracting cancer When added to the baseline risk of 4 9E-6, this comes to 1 7E-5 total risk

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[1]The specific gravity of carbon tetrachloride at 20 C, taken from Page 3-25 of Perry's *Chemical Engineers' Handbook*, Fifth Edition

[2]Environmental Protection Agency, Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December 1989

[3]IRIS Database Update, dated June 30, 1993

Assumptions

1 It is assumed that all of the carbon tetrachloride goes to the ponds Actually, much of the contaminant will volatilize

2 It is assumed that the ponds' concentration of carbon tetrachloride remains undiluted for 30 years of ingestion The actual concentration will be diluted quickly from volatilization, inflow of precipitation water, etc

3 It is assumed that an individual will use water from the ponds for his drinking water source In fact, it is highly doubtful that a resident at Rocky Flats would wish to drink the pond water, as opposed to using municipally supplied water

4 All pathways are ignored except for water ingestion

G 5 1 2 Replace Existing Ponds A-1 and A-2 With One Spill Control Pond

The ultimate carbon tetrachloride concentration is equal to the total amount of carbon tetrachloride released, divided by the total volume of the single pond This pond's volume is equivalent to the volume of existing ponds A-1 and A-2 The resulting concentration of carbon tetrachloride is identical to that calculated in Section 5 1 1, and is equal to 3 39 ug/l

The cancer risk associated with daily ingestion of water contaminated with 3 39 ug/l of carbon tetrachloride is identical to that calculated in Section 5 1 1, and equals 1 21E-5 risk of contracting cancer When added to the background risk of 5 1E-6, this comes to 1 7E-5 total risk

Assumptions

1 It is assumed that all of the carbon tetrachloride goes to the ponds Actually, much of the contaminant will volatilize

2 It is assumed that the ponds' concentration of carbon tetrachloride remains undiluted for 30 years of ingestion The actual concentration will be diluted quickly from volatilization, inflow of precipitation water, etc

3 It is assumed that an individual will use water from the ponds for his drinking water source In fact, it is highly doubtful that a resident at Rocky Flats would wish to drink the pond water, as opposed to using municipally supplied water

4 All pathways are ignored except for water ingestion

G 5 1 3 Use of Tanks to Capture Spill

It is assumed that all of the spill is contained in the tanks, and that none of it is subsequently released Under this assumption, there is no pathway to a receptor, and there is no risk So the total risk is equal to baseline, and equals 4 9E-6

Assumptions
1 All pathways are ignored except for water ingestion
2 It is assumed that all of the carbon tetrachloride is captured by the tanks, and that the tanks never release any contaminated water

G 5 1 4 Comparison of Risk

Table G-2 below compares the different risks after a carbon tetrachloride spill under each of the different scenarios

Table G-2
Risks After a CCl_4 Spill

	Existing Ponds	Single Spill Control Pond	Tanks
Risk	1 7E-5	1 7E-5	4 9E-6

G 5 2 Trichloroethylene Spill into the South Interceptor Ditch

This section of the appendix models a release of 110 gallons of trichloroethylene (TCE) The entire tank contents are assumed to flow into the South Interceptor Ditch without any

TCE dissipating into the atmosphere, a simplifying assumption Two separate scenarios are used in this model, which are identical except for the receiving pond configuration In both scenarios, the pathway modeled is ingestion, in other words, it is assumed that an individual living on plant site drinks 2 liters per day of contaminated water

In the first scenario (analyzed in Section 5 2 1, No Action Alternative), the TCE flows into the presently used configuration of Pond C-2 There the contaminant mixes with the pond and its concentration is assumed to become uniform

In the second scenario (analyzed in Section 5 2 2, Use of Tanks to Capture Spill), a tank is used to contain the spill It is assumed that the tank is 100 percent effective, and none of the TCE escapes containment

G 5 2 1 Capture by Existing Pond

The ultimate TCE concentration is equal to the total amount of TCE released, divided by the total volume of the pond The resulting concentration of TCE is

Conc = (110 gal x 1 466[4] x 3 785 liters/gal x 1 gram/1000 liters)/[4 96E6 gal x 3 785 liters/gal] = 3 25E-8 g/L = 0 033 ug/L

The non-cancer risk associated with daily ingestion of water contaminated with 0 033 ug/l of TCE is calculated as a hazard quotient using the following formula taken from EPA's Risk Assessment Guide for Superfund[5] The reference doses for TCE are taken from EPA's memo, Risk-Based Concentration Table, Third Quarter 1993 [6] The hazard quotient is

$$HQ = [Conc \times EF \times ED \times (IR_w/RfD_o)]/[BW \times AT \times 365\ day/yr \times (1000\ ug/mg)]$$

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[4]The specific gravity of TCE at 20 C, taken from Page 3-43 of Perry's *Chemical Engineers' Handbook*, Fifth Edition

[5]Environmental Protection Agency, Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual (Part A), Interim Final, EPA/550/1-89/002, December 1989

[6]Memo from Roy L Smith, entitled "Risk-Based Concentration Table, Third Quarter 1993, dated July 9, 1993

where

Conc = contaminant concentration = 0 033 ug/L

EF = exposure frequency = 350 day/yr

ED = exposure duration = 30 yr

IR_w = water drinking rate = 2 l/day

RfD_o = oral reference dose = 6E-3 kg-day/mg

BW = receptor body weight = 70 kg

AT = averaging time = 70 yr

Inserting these values into the equation

HQ = [(0 033 ug/l) x (350 day/yr) x (30 yr) x (2 l/day)/(6E-3 kg-day/mg)]/[(70 kg) x (70 yr) x (365 day/yr) x (1000 ug/mg)] = 6 56E-5 When added to the baseline Hazard Index of 0 071, the total hazard is 0 071

G 5 2 2 Use of Tanks to Capture Spill

It is assumed that all of the spill is contained in the tanks, and that none of it is subsequently released Under this assumption, there is no pathway to a receptor, and there is no excess hazard So the hazard is equal to baseline, which is 0 071

Assumptions

1 All pathways are ignored except for water ingestion

2 It is assumed that all of the TCE is captured by the tanks, and that the tanks never release any contaminated water

G 5 2 3 Comparison of Hazard

Table 5 3 below compares the different Hazard Indices after a TCE spill under both scenarios The difference in Hazard Index is not significant

Table G-3

Hazard Indices After a Spill of Trichloroethylene

	Existing Ponds	Tanks
Hazard Index	0 071	0 071

G 5 3 Building 910 Nitric Acid Spill Into South Walnut Creek

This section of the appendix models a release of nitric acid from a 2000 gallon tank outside Building 910 The entire tank contents are assumed to degrade to nitrate, and flow into South Walnut Creek without any nitrate dissipating into the atmosphere or ground, a simplifying if very conservative assumption Three separate scenarios are used in this model, all of which are identical except for the receiving pond configuration In all scenarios, the pathway modeled is ingestion, in other words, it is assumed that an individual living on plant-site drinks 2 liters per day of contaminated water

In the first scenario (analyzed in Section 5 3 1, No Action Alternative), the nitrate flows into the presently used configuration of Ponds B-1 and B-2 There the contaminant mixes with the ponds Since the ingestion period is extremely long (30 years in this model), it is assumed that all ponds reach equilibrium, and the nitrate concentrations will be the same in all ponds

In the second scenario (analyzed in Section 5 3 2, Replace Existing Ponds B-1 and B-2 With One Spill Control Pond), the nitrate flows into a single spill control pond, with the same volume as present-day ponds B-1 and B-2 There the contaminant mixes with the pond

In the third scenario (analyzed in Section 5 3 3, Use of Tanks to Capture Spill), tanks are used to contain the spill It is assumed that the tanks are 100% effective, and none of the nitrate escapes containment

G 5 3 1 Capture by Existing Ponds

The ultimate nitrate concentration is equal to the total amount of nitrate released, divided by the total volume of the ponds The resulting concentration of nitrate is

Conc = (2000 gal x 1 502[7] x 3 785 liters/gal x 1 gram/1000 liters) / [(0 35E6 gal + 1 01E6 gal) x 3 785 liters/gal] = 2 21E-6 g/L = 2 21 ug/L

The non-cancer hazard quotient associated with daily ingestion of water contaminated with 2 21 ug/L of nitrate is calculated as a hazard quotient using the following formula taken from EPA's Risk Assessment Guide for Superfund[8] The reference doses for nitrate are taken from the IRIS database [9] The hazard quotient is

$$HQ = [Conc \times EF \times ED \times (IR_w/RfD_o)]/[BW \times AT \times 365\ day/yr \times (1000\ ug/mg)]$$

where
Conc = contaminant concentration = 2 21 ug/L
EF = exposure frequency = 350 day/yr
ED = exposure duration = 30 yr
IR_w = water drinking rate = 2 l/day
RfD_o = oral reference dose = 1 60 kg-day/mg
BW = receptor body weight = 70 kg
AT = averaging time = 70 yr

Inserting these values into the equation

HQ = [(2 21 ug/L) x (350 day/yr) x (30 yr) x (2 l/day)/(1 60 kg-day/mg)]/[(70 kg) x (70 yr) x (365 day/yr) x (1000 ug/mg)] = 1 6E-5 When added to the baseline hazard index of 0 54, the resulting Hazard Index is 0 54

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[7]The specific gravity of nitric acid at ambient (15 to 20 C), taken from Page 3-17 of Perry's *Chemical Engineers' Handbook*, Fifth Edition

[8]Environmental Protection Agency, Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual (Part A), Interim Final, EPA/550/1-89/002, December 1989

[9]IRIS Database Update, dated June 30, 1993

Assumptions

1 It is assumed that all of the nitrate goes to the ponds. Actually, much of the contaminant will seep into the ground, etc

2 It is assumed that the ponds' concentration of nitrate remains undiluted for 30 years of ingestion The actual concentration will be diluted quickly from inflow of precipitation water, etc

3 It is assumed that an individual will use water from the ponds for his drinking water source In fact, it is highly doubtful that a resident at Rocky Flats would wish to drink the pond water, as opposed to using municipally supplied water

4 All pathways are ignored except for water ingestion

G 5 3 2 Replace Existing Ponds B-1 and B-2 With One Spill Control Pond

The ultimate nitrate concentration is equal to the total amount of nitrate released, divided by the total volume of the single pond The pond's volume is equivalent to the volume of existing Ponds B-1 and B-2 The resulting concentration of nitrate is identical to that calculated in Section 5 3 1, and is equal to 2 21 ug/L

The hazard associated with daily ingestion of water contaminated with 2 21 ug/L of TCE is identical to that calculated in Section 5 3 1, and the Hazard Quotient equals 1 64E-5 When added to the baseline hazard of 0 54, the resulting Hazard Index is 0 54

Conservative Assumptions

1 It is assumed that all of the nitrate goes to the pond Actually, much of the contaminant will seep into the ground, etc

2 It is assumed that the pond's concentration of nitrate remains undiluted for 30 years of ingestion The actual concentration will be diluted quickly from inflow of precipitation water, etc

3 It is assumed that an individual will use water from the pond for his drinking water source It is highly doubtful that a resident at Rocky Flats would wish to drink the pond water, as opposed to using municipally supplied water

Nonconservative Assumption

1 All pathways are ignored except for water ingestion

G 5 3 3 Use of Tanks to Capture Spill

It is assumed that all of the spill is contained in the tanks, and that none of it is subsequently released Under this assumption, there is no pathway to a receptor, and there is no hazard So the Hazard Index equals baseline, which is 0 54

Assumptions

1 All pathways are ignored except for water ingestion

2 It is assumed that all of the nitrate is captured by the tanks, and that the tanks never release any contaminated water

G 5 3 4 Comparison of Hazard

Table 5 4 below compares the different risks posed by the nitrate spill under each of the different scenarios Differences in Hazard Indices are unnoticeable

Table G-4

Hazard Resulting From a Nitrate Spill

	Existing Ponds	Single Spill Control Pond	Tanks
Hazard Index	0 54	0 54	0 54

G 7 Water Storage /Transfer Options

Water storage and transfer involves the routine collection and storage of the Rocky Flats sewage treatment plant (STP) effluent and stormwater runoff from the plant site Water is then transferred to a location where it can be isolated for proper monitoring before being released off-site Water storage and transfer alternatives analyzed include recycling all or part of the STP and stormwater on-site, changing pond water release points, and spray evaporating more of the pond water on-site in leu of releasing it off-site The alternatives in this category were presented in Section 5 of the IM/IRA Report as proposed additional management tools rather than mutually exclusive alternatives Hence each alternative will be evaluated for potential risk reduction relative to the no action or baseline risk given in Appendix D of this report

G 7 1 Existing Pond Water Management Plan

The risks resulting from existing pond water management for routine collection, storage and transfer operations (described in Section 2 2) were assumed to be the risks calculated in the baseline risk assessment from the chemical concentration data measured in each pond These total cancer and non-cancer risks are given in Appendix D in Tables D-1 1 to D-1 8

G 7 2 Recycle / Tank STP Water

From Figure G-1 and Table G-1, the current flow from the STP into S Walnut Creek occurs at Pond B-3 at the average flow rate of 141 kgal/day (thousand gallons per day)
It can also be seen that this is currently the major source of water to Pond B-3 The Pond B-3 water then flows to Pond B-4 and then B-5 where it is held until being transferred to Pond A-4 for release

The contaminants of concern (COCs) for Pond B-3 (Site 4) in the baseline risk assessment included two radionuclides with a combined lifetime excess cancer risk (LECR) of 5 4E-7 See Table D-2 4 in Appendix D The metal, inorganic, and organic COCs combined to produce a hazard index of 0 0004 Since these risk levels are low compared to EPA standards, reducing or eliminating the STP effluent flow into the pond system by recycling the water to use on plant site or collecting the effluent in a tank will not appreciably reduce the human health risk for a future on-site receptor However , it could reduce the release of water and spread of contamination off-site

G 7 3 Direct Spray Evaporate Ponds

Currently spray evaporation is used to limit the amount of water transferred and released from Pond A-2 and the Landfill Pond One proposed action is to use spray evaporation in smaller Ponds A-1, A-2, B-1, B-2 to keep these ponds at lower levels between precipitation events The net effect of spray evaporation on contaminant levels in the pond being sprayed is normally an increase However, if the volume sprayed is limited to the precipitation inflow, then spraying does not concentrate contaminants in the pond and so does not affect risk at the pond Spray evaporating Ponds B-1 and B-2 under normal conditions (no spill) would reduce or eliminate the need to transfer water from Pond B-2 to A-2 and reduce the potential to spread low level contamination In a previous analysis, the additional risk posed to off-site receptors from spray evaporation via the direct inhalation pathway was evaluated for Pond B-2 for several volatile organics and was shown to be below the EPA acceptable risk range for carcinogenic and noncarcinogenic risk A copy of this analysis, "Risks Due To Spray Evaporation of B-2 Pond" -RSR-016-92 is attached

M 7 4 Redirect Water from Woman Creek to Walnut Creek Downstream of Pond A-4

One water transfer alternative is to divert water in Woman Creek to Walnut Creek down stream of A-4 through an on-site pipeline Since this action would not reroute water flowing into any of the ponds on plant-site or introduce contaminants, then the contaminant concentrations in the ponds and hence the risk would not be expected to change

Table G-1. South Walnut Creek Flows

	Monthly Pond Flow Data								
	S Walnut Creek Flows								
	Waste Water Treatment Plant Effluent	Central Ave Drain Ditch from Plantsite	B1 Bypass Pipeline to B4	Central Ave Drain Ditch to B5	B1 Transfer to B2	B2 Transfer To A2	B3 Natural Flow to B4	B4 Natural Flow to B5	B5 Discharge to A4
		SW022	GS010					GS009	
	(Mgal)	(Mgal)	(Mgal)	(Mgal)	(Mgal)	(Mgal)	(Mgal)	(Mgal)	(Mgal)
1991									
January	6 41								
Feburary	4 96								
March	6 03								
April	6 00								
May	6 14								
June	5 07		0 78						
July	4 03		3 42						
August	3 41		5 82						
September	3 00		1 79						
October	3 41	0 25	1 25						
November	3 30	8 53	1 86						7 20
December	3 41	3 10	1 01						11 40
1991 Total Flow	55.17								
Yearly Ave Flow Rate (kgal/day)	**151**								
1992									
January	3 9	0 03	1 22		0 00	0 00		n d	3 60
Feburary	3 5	0 00	1 14		0 00	0 00		n d	5 90
March	5 0	5 41	12 60		0 00	0.00		n. d.	5.76
April	3 9	0 14	3 32		0 00	0 00		n d	5 89
May	4 0	1 51	n d		0 00	0.00		13 33	0 00
June	4.5	0.34	7 87		0 00	0 00		16 14	10 02
July	4 3	0 00	15.01		0 00	0 00		14 90	8.60
August	4 7	0 94	n d		0 00	0 00		21 49	0 00
September	3 9	0 00	16.76		0 00	0 00		11 69	9 35
October	4 0	0 53	n d		0 02	0 33		n d	0 00
November	4 5	3 29	1 15		0 00	0.00		n d	5 63
December	5 3	0 89	0 81		0 00	0.00		n d	9 74
1992 Total Flow	51 5	13.07			0 02	0.33			64.49
Yearly Ave Flow Rate (kgal/day)	**141**	**36**	**219**		**0 05**	**0 90**	**141**	**507**	**177**

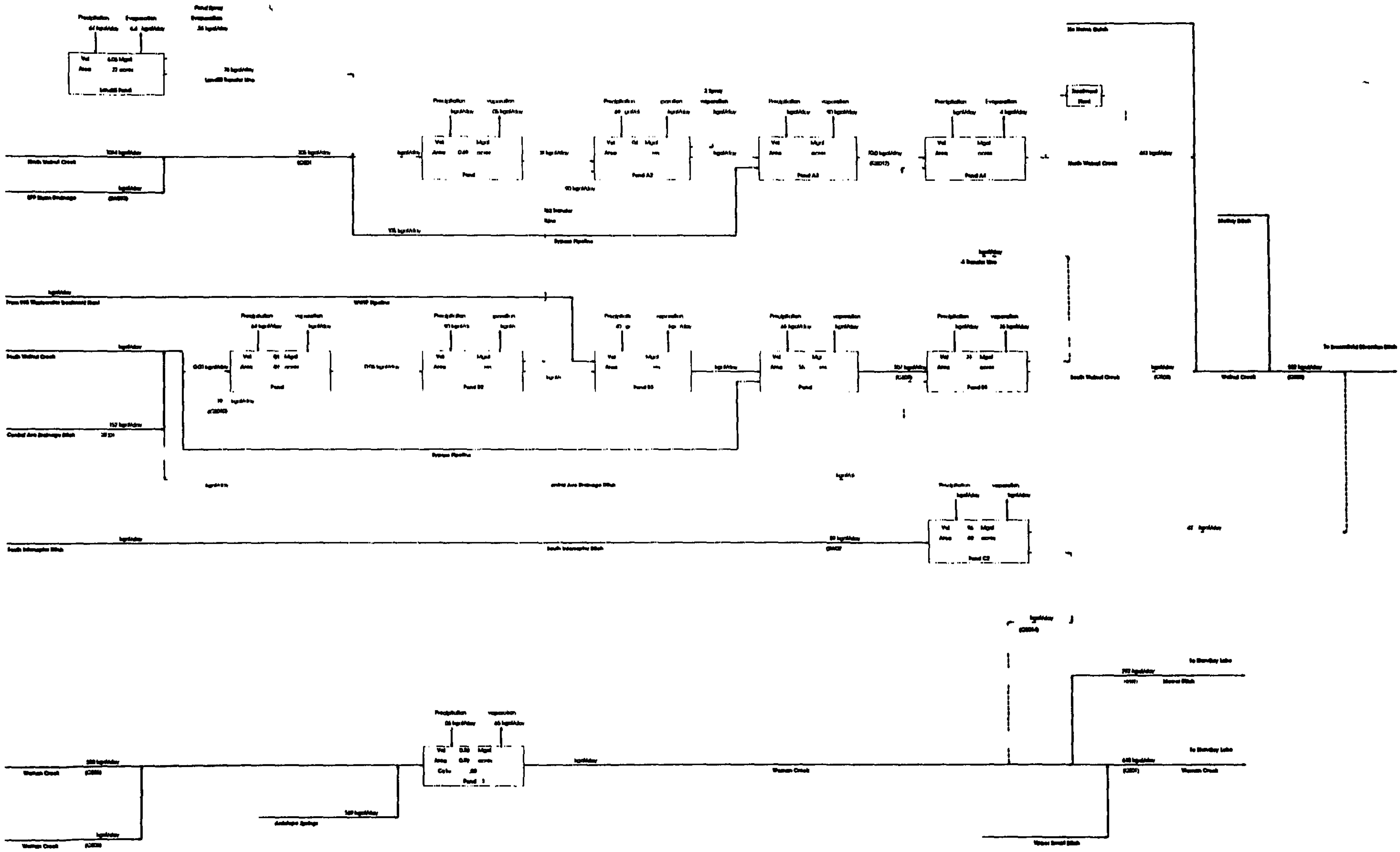
Table G-2 North Walnut Creek Flows

	Monthly Pond Flow Data								
	N Walnut Creek Flows								
	North Walnut Creek SW093 (Mgal)	A1 Bypass Pipeline to A3 GS013 (Mgal)	A1 Bypass Pipeline to A1 (Mgal)	A1 Outlet leak to A2 (Mgal)	A2 Spray Evap (Mgal)	Landfill Pond Effluent to A3 (Mgal)	Landfill Pond Effluent to A1 (Mgal)	Landfill Spray Evap (Mgal)	A3 Discharge to A4 (GS012) (Mgal)
1991									
January									
Feburary									
March									
April									
May		50 70							
June		34 30							
July		23 60							
August		30 90							
September		14 80							
October	2 80	n d							
November	6 78	54 00							
December	7 81	24 70							11 30
1991 Total Flow									
Yearly Ave Flow Rate (kgal/day)		**1089**							
1992									
January	6 81	21 80	0 00	0 00	0 00		0 00	0 00	0 00
Feburary	5 81	15 70	0 00	0 00	0 00		0 00	0 00	2 50
March	26 09	125 60	0 00	0 00	0 00		0 87	0 00	9 59
April	9 08	45 30	0 00	0 00	0 00		0 00	0 00	3 09
May	8 85	39 30	0 41	0 25	0 00		0 00	0 00	0 00
June	6 23	58 30	0 81	0 51	0 26		0 00	0 00	2 45
July	4 02	68 00	0 00	0 00	0 37		0 00	0 00	0 00
August	8 14	9 94	0 00	0 00	0 37		0 00	0 00	1 79
September	2 67	12 10	0 00	0 00	0 36		0 00	0 25	5 16
October	5 14	n d	0 00	0 00	0 00		0 00	0 32	0 00
November	7 00	1 19	0 00	0 00	0 00		0 00	0 00	1 04
December	9 24	39 80	0 00	0 00	0 00		0 00	0 00	0 00
1992 Total Flow	**99 07**		**1 22**	**0 76**	**1 36**		**0 87**	**0 57**	**25.62**
Yearly Ave Flow Rate (kgal/day)	**271**	**1305**	**3 3**	**2 1**	**3 7**		**2 4**	**1 6**	**70 0**

Table G-3 . Regulated Discharges and Woman Creek Flows

	Monthly Pond Flow Data									
	Regulated Discharges				Woman Creek Flows					
	Pond A4 (GS011) (Mgal)	Pond C1 (GS007) (Mgal)	Pond C2 To BDD (Mgal)	Walnut Creek at Indiana GS003 (Mgal)	Woman Creek at Indiana GS001 (Mgal)	Mower Ditch at Indiana GS002 (Mgal)	N Woman Creek GS005 (Mgal)	S Woman Creek GS006 (Mgal)	South Interceptor Ditch Input to C2 SW027 (Mgal)	Antelope Springs GS016 (Mgal)
1991										
January	1 05	8 95	0 00							
Feburary	11 52	9 77	0 00							
March	13 19	2 94	0 00							
April	7 16	4 46	0 00							
May	14 93	8 32	0 00			7 17	20 50			
June	46 34	7 10	10 77			9 60	61 09			
July	3 92	1 53	0 00		0 00	0 30	5 38			
August	7 16	3 37	0 00		0 00	1 98	5 05			
September	12 52	0 67	0 00		0 00	0 20	6 15			
October	7 95	2 45	0 00		0 00	0 04	n d		0 02	
November	0 00	8 86	0 00		0 00	31 11	26 46		3 24	
December	27 08	5 90	0 00		1 57	15 17	20 61		0 75	
1991 Total Flow	152 80	64 31	10 77							
Yearly Ave Flow Rate (kgal/day)	**419**	**176**	**30**			**268**	**679**			
1992										
January	1 08	7 33	0 00	8 13	35 61	5 88	23 48		1 03	
Feburary	5 31	5 76	0 00	4 34	32 80	3 64	17 19		0 26	
March	44 31	15 83	8 48	77 77	49 99	20 17	47 77		25 57	
April	17 49	12 91	7 60	20 72	40 49	8 00	14 06		0 37	
May	11 80	3 55	0 00	11 23	11 84	20 31	9 75		0 25	
June	5 15	1 85	0 00	6 42	14 60	24 78	10 21		0 58	
July	16 28	0 05	0 00	16 71	0 00	8 02	6 31		0 01	
August	0 00	1 22	0 00	0 86	0 00	0 19	8 13		3 49	
September	27 83	low flow	0 00	25.51	0 01	0 34	9 51		0 00	
October	8 91	1 60	0 00	7 77	n d	n d	n d		0 00	
November	0 00	3 33	0 00	0 00	0 02	3 05	25.39		0 50	
December	24.12	5.69	0.00	22.54	n d	3 61	25 92		0 39	
1992 Total Flow	162.27	59 10	16.08	202.00					32.46	
Yearly Ave Flow Rate (kgal/day)	**443**	**161**	**44**	**552**	**610**	**293**	**590**		**89**	

FIGURE G-1. Rocky Flats P ater Flow Model



APPENDIX H
STANDARD OPERATING PROCEDURES FOR POND WATER MANAGEMENT

APPENDIX H
STANDARD OPERATING PROCEDURES FOR POND WATER MANAGEMENT

1-C90-EPR-SW 03
Containment of Spills Within the Rocky Flats Drainages

This procedure describes actions that should be taken to contain a spill which has entered a drainage and is threatening to enter the surface water detention ponds in the Buffer Zone These actions will help to minimize damage to the environment and to plant operations

Driver(s)

a) Agreement in Principle (AIP)
b) DOE Order 5400 1, General Environmental Protection Program

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1-C91-EPR-SW 01
Requirement for Control and Disposition of Incidental Waters

This procedure contains the actions required for the control and disposition of incidental waters The purpose of this procedure is to assure environmental protection by controlling, containing, sampling, analyzing, and/or discharging incidental waters originating from Rocky Flats sources

Driver(s)

a) Best Management Practices (BMPs)
b) Safe Drinking Water Act (SDWA)
c) Clean Water Act (CWA)

1-C92-EPR-SW 02
Control of Rocky Flats Flood Waters

This procedure is intended to provide instructions for controlling and containing excessive runoff and to minimize flooding This instruction falls within the context of Rocky Flats water management plans

Driver(s)

a) Colorado State regulations on dam safety
b) DOE Order 5400 1, General Environmental Protection Program

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APPENDIX H
STANDARD OPERATING PROCEDURES FOR
POND WATER MANAGEMENT
(Continued)

5-21000-OPS-SW 01
Surface Water Data Collection Activities

This Standard Operation Procedure (SOP) describes procedures that will be used at the Rocky Flats Plant (RFP) in performance of field activities at surface water collection sites This SOP describes initial site evaluation procedures and outlines an order of data collection activities to be performed at each site by a two or three member field crew Details are provided in this document so that all sampling personnel following these procedures will deliver samples to the laboratory and will perform discharge and field parameter measurements in a consistent manner

Driver(s)

a) DOE Order 5400 1, General Environmental Protection Program
b) EPM/SWD NPDES-FFCA Operations Sampling Plan

5-21000-OPS-SW 02
Field Measurements of Surface Water Field Parameters

This SOP describes procedures that will be used at RFP to obtain measurements of surface water parameters in the field These parameters are temperature, dissolved oxygen, pH, alkalinity, specific conductance, total residual chlorine, free chlorine, turbidity, hardness and nitrates This SOP describes field measurement procedures, personnel responsibilities and qualifications, and quality assurance/quality control (QA/QC)

Driver(s)

a) NPDES-FFCA Operations Sampling Plan
b) DOE Order 5400 1, General Environmental Protection Program

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APPENDIX H
STANDARD OPERATING PROCEDURES FOR POND WATER MANAGEMENT
(Continued)

5-21000-OPS-SW 03
Surface Water Sampling

This SOP describes procedures, documentation and equipment that will be used to collect water quality samples from surface water data collection sites at RFP More than one sampling method is required because flow conditions vary from site to site In consideration of these varied conditions, this SOP describes methods that are to be used on the site-specific flow conditions

Driver(s)
a) NPDES-FFCA
b) DOE Order 5400 1, General Environmental Protection Program

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5-21000-OPS-SW 04
Discharge Measurement

This SOP describes procedures that will be used at RFP to measure surface water discharge in streams and ditches or from seeps and pipes Discharge is defined as the volume rate of flow of water, including any substances suspended or dissolved in the water This document outlines a set of standard methods for various flow conditions at RFP

This SOP describes equipment and procedures that will be used for field data collection and documentation in order to attain acceptable standards of accuracy, precision, comparability, representativeness and completeness

Driver(s)
a) NPDES-FFCA
b) DOE Order 5400 1, General Environmental Protection Program

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APPENDIX H
STANDARD OPERATING PROCEDURES FOR
POND WATER MANAGEMENT
(Continued)

5-21000-OPS-SW 08
Pond Sampling

This SOP describes procedures that will be used to collect surface water samples and measure field parameters from ponds at RFP Specifically, this SOP describes methods to be used for pond sampling and for measurement of field parameters in water from ponds that will be used for field data collection and documentation to attain acceptable standards of accuracy, comparability, representativeness and completeness

Driver(s)
a) DOE Order 5400 1, General Environmental Protection Program

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5-21000-OPS-SW 16
Sampling of Incidental Waters

This SOP describes procedures that will be used at RFP for the collection of water samples from incidental sources These would include water collected as a result of (1) construction activities that require excavation below the groundwater table and subsequent dewatering, (2) collection and dewatering of precipitation and stormwater runoff in excavations, pits, trenches, ditches or depressions that do not intercept the electrical vaults, or manholes that require pumping as described in the "Procedures for the Control and Disposition of Incidental Waters" (EG&G, May, 1990)

This SOP describes personnel responsibilities and qualifications, sample collection and preservation procedures, and QA/QC and documentation requirements that will be used for field data collection to attain acceptable standards of accuracy, precision, comparability, representativeness and completeness

Driver(s)
a) Best Management Practices (BMPs)
b) Safe Drinking Water Act (SDWA)
c) Clean Water Act (CWA)

APPENDIX H
STANDARD OPERATING PROCEDURES FOR POND WATER MANAGEMENT
(Continued)

5-21000-OPS-SW 19
Control Procedure for Water Discharges from Surface Water Control Ponds A 3, A 4, B 3, B 5, C 1 and C 2

This procedure describes sampling, analytical, reporting and approval activities required prior to initiating discharges, and describes operational and monitoring activities during actual discharges

Driver(s)
- a) Agreement in Principle (AIP)
- b) DOE Order 5400 1, General Environmental Protection Program

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5 21000-OPS-SW 20
Control Procedure for Water Spraying from the Landfill Pond and Pond A 2 and for Internal Pond Water Transfers

This procedure describes pre-operational activities including sampling, analytical and approval requirements, and describes operational controls governing actual operations

Driver(s)
- a) Agreement in Principle (AIP)
- b) DOE Order 5400 1, General Environmental Protection Program

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5-21000-OPS-SW 27
Dam Inspection and Monitoring Procedure

The purpose of the dam inspection procedure is to identify existing or potential dam safety concerns and to provide a shorter frequency between formalized dam inspections currently performed by other groups or agencies Dam safety monitoring is performed for previously identified dam safety concerns

Driver(s)
- a) Colorado State regulations on dam safety
- b) DOE Order 5400 1, General Environmental Protection Program

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APPENDIX H
STANDARD OPERATING PROCEDURES FOR POND WATER MANAGEMENT
(Continued)

1-15200-EPIP-12 14
Water Detention Pond Dam Failure

This procedure describes emergency response actions to be taken in the event of actual or potential unplanned releases of detention pond dam water from RFP. It also defines seven action levels (0 through 6) for categorizing conditions at the dams up to and including dam failure

Driver(s)

a) Colorado Radiological Emergency Response Plan, Rocky Flats Plant
b) DOE Order 5500 1B, Emergency Management System
c) DOE Order 5500 3A, Planning and Preparedness for Operational Emergencies