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REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 1 VOLUME 6 APPENDICES F AND G OCTOBER 1993

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REPORT

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REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 1

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

VOLUME 6
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U.S. DEPARTMENT OF ENERGY
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Boiling Point[5], °C
Density[5] (300 K), g/cm³ — for gases: g/L, 273.15 K, 1 atm
Electronegativity

8
VIIIA
VIII

55.847 **26**
A1/B1 bcc
1538 2,3
2862
7.86
1.83
Fe
$[Ar]3d^6 4s^2$
Iron

Group Classifications[4]
Atomic Number
Oxidation States — bold indicates most stable state
Symbol[1]
Electronic Configuration
Name

1 IA IA	2 IIA IIA	3 IIIA IIIB	4 IVA IVB	5 VA VB	6 VIA VIB	7 VIIA VIIB	8	9 VIIIA VIII	10	11 IB IB	12 IIB IIB	13 IIIB IIIA	14 IVB IVA	15 VB VA	16 VIB VIA	17 VIIB VIIA	18 VIII 0
1.00794 **1** A1/B1 hcp −259.34^{TP} 1 −252.88 0.0899 2.20 **H** $1s^1$ Hydrogen																	4.002602 **2** hcp −272.375 (25 atm) −268.928 0.1787 — **He** $1s^2$ Helium
6.941 **3** B3 bcc 180.6 1 1342 0.53 0.98 **Li** $[He]2s^1$ Lithium	9.012182 **4** A1/B1 hcp 1289 2 2472 1.85 1.57 **Be** $[He]2s^2$ Beryllium											10.811 **5** A2 tet 2092 3 4002 2.535 2.04 **B** $[He]2s^2 2p^1$ Boron	12.011 **6** A2 hex 3826^{SP} 2,±4 3827 2.62 2.55 **C** $[He]2s^2 2p^2$ Carbon	14.00674 **7** A3 hex −210.0042^{TP} 2,±3,4,5 −195.80 1.251 3.04 **N** $[He]2s^2 2p^3$ Nitrogen	15.9994 **8** cub −218.789^{TP} −2 −182.97 1.429 3.44 **O** $[He]2s^2 2p^4$ Oxygen	18.9984032 **9** mon −219.67^{TP} −1 −188.20 1.696 3.98 **F** $[He]2s^2 2p^5$ Fluorine	20.1797 **10** fcc −248.587^{SP} −246.054 0.901 — **Ne** $[He]2s^2 2p^6$ Neon
22.989768 **11** B3 bcc 97.8 1 883 0.9712 0.93 **Na** $[Ne]3s^1$ Sodium	24.3050 **12** B3 hcp 648.8 2 1089.8 1.741 1.31 **Mg** $[Ne]3s^2$ Magnesium											26.981539 **13** A1/B1 fcc 660.452 3 2520 2.70 1.61 **Al** $[Ne]3s^2 3p^1$ Aluminum	28.0855 **14** A1/B1 fcc 1414 4 3267 2.33 1.90 **Si** $[Ne]3s^2 3p^2$ Silicon	30.973762 **15** A2 cub 44.14 ±3,4,5 277 1.82 2.19 **P** $[Ne]3s^2 3p^3$ Phosphorus	32.066 **16** A3 orh 115.22 ±2,4,6 444.60 2.07 2.58 **S** $[Ne]3s^2 3p^4$ Sulfur	35.4527 **17** A3 tet −100.97^{TP} ±1,3,5,7 −34.05 3.17 3.16 **Cl** $[Ne]3s^2 3p^5$ Chlorine	39.948 **18** fcc −189.352^{TP} −185.9 1.784 — **Ar** $[Ne]3s^2 3p^6$ Argon
39.0983 **19** B3 bcc 63.71 1 759 0.86 0.82 **K** $[Ar]4s^1$ Potassium	40.078 **20** B3 fcc 842 2 1494 1.55 1.00 **Ca** $[Ar]4s^2$ Calcium	44.955910 **21** B1 hcp 1541 3 2831 3.0 1.36 **Sc** $[Ar]3d^1 4s^2$ Scandium	47.88 **22** A1/B1 hcp 1670 3,4 3289 4.50 1.54 **Ti** $[Ar]3d^2 4s^2$ Titanium	50.9415 **23** A1/B1 bcc 1910 2,3,4,5 3409 5.8 1.63 **V** $[Ar]3d^3 4s^2$ Vanadium	51.9961 **24** A3 bcc 1863 2,3,6 2672 7.19 1.66 **Cr** $[Ar]3d^5 4s^1$ Chromium	54.93805 **25** A3 cub 1246 2,3,4,6,7 2062 7.43 1.55 **Mn** $[Ar]3d^5 4s^2$ Manganese	55.847 **26** A1/B1 bcc 1538 2,3 2862 7.86 1.83 **Fe** $[Ar]3d^6 4s^2$ Iron	58.93320 **27** A1/B1 fcc 1495 2,3 2928 8.90 1.88 **Co** $[Ar]3d^7 4s^2$ Cobalt	58.6934 **28** B2 fcc 1455 2,3 2914 8.90 1.91 **Ni** $[Ar]3d^8 4s^2$ Nickel	63.546 **29** B2 fcc 1084.87 1,2 2563 8.96 1.90 **Cu** $[Ar]3d^{10} 4s^1$ Copper	65.39 **30** A1/B1 hcp 419.58 2 907 7.14 1.65 **Zn** $[Ar]3d^{10} 4s^2$ Zinc	69.723 **31** A1/B1 orh 29.7741^{TP} 3 2205 5.91 1.81 **Ga** $[Ar]3d^{10} 4s^2 4p^1$ Gallium	72.61 **32** A1/B1 fcc 938.3 4 2834 5.32 2.01 **Ge** $[Ar]3d^{10} 4s^2 4p^2$ Germanium	74.92159 **33** A2 rhm 603^{SP} ±3,5 — 5.72 2.18 **As** $[Ar]3d^{10} 4s^2 4p^3$ Arsenic	78.96 **34** A3 hex 221 −2,4,6 685 4.80 2.55 **Se** $[Ar]3d^{10} 4s^2 4p^4$ Selenium	79.904 **35** A3 orh −7.25^{TP} ±1,5 59.10 3.12 2.96 **Br** $[Ar]3d^{10} 4s^2 4p^5$ Bromine	83.80 **36** fcc −157.385 −153.35 3.74 — **Kr** $[Ar]3d^{10} 4s^2 4p^6$ Krypton
85.4678 **37** B3 bcc 39.48 1 688 1.53 0.82 **Rb** $[Kr]5s^1$ Rubidium	87.62 **38** B3 fcc 769 2 1382 2.6 0.95 **Sr** $[Kr]5s^2$ Strontium	88.90585 **39** B1 hcp 1522 3 3338 4.5 1.22 **Y** $[Kr]4d^1 5s^2$ Yttrium	91.224 **40** A1/B1 hcp 1855 4 4409 6.49 1.33 **Zr** $[Kr]4d^2 5s^2$ Zirconium	92.90638 **41** A2 bcc 2469 3,5 4744 8.55 1.6 **Nb** $[Kr]4d^4 5s^1$ Niobium	95.94 **42** A3 bcc 2623 2,3,4,5,6 4639 10.2 2.16 **Mo** $[Kr]4d^5 5s^1$ Molybdenum	(97.9072) **43** A3 hcp 2204 7 4265 11.5 1.9 **Tc** $[Kr]4d^5 5s^2$ Technetium	101.07 **44** A2 hcp 2334 2,3,4,6,8 4150 12.2 2.2 **Ru** $[Kr]4d^7 5s^1$ Ruthenium	102.90550 **45** A1/B1 fcc 1963 2,3,4 3697 12.4 2.28 **Rh** $[Kr]4d^8 5s^1$ Rhodium	106.42 **46** B2 fcc 1555 2,4 2964 12.0 2.20 **Pd** $[Kr]4d^{10}$ Palladium	107.8682 **47** A1/B2 fcc 961.93 1 2163 10.5 1.93 **Ag** $[Kr]4d^{10} 5s^1$ Silver	112.411 **48** B2 hcp 321.108 2 767 8.648 1.69 **Cd** $[Kr]4d^{10} 5s^2$ Cadmium	114.818 **49** A1/B2 tet 156.634 3 2073 7.31 1.78 **In** $[Kr]4d^{10} 5s^2 5p^1$ Indium	118.710 **50** A1/B1 fcc 231.9681 2,4 2603 7.30 1.96 **Sn** $[Kr]4d^{10} 5s^2 5p^2$ Tin	121.757 **51** A2 rhm 630.755 ±3,5 1587 6.618 2.05 **Sb** $[Kr]4d^{10} 5s^2 5p^3$ Antimony	127.60 **52** A2 hcp 449.57 −2,4,6 988 6.24 2.1 **Te** $[Kr]4d^{10} 5s^2 5p^4$ Tellurium	126.90447 **53** A3 orh 113.6^{TP} ±1,5,7 185.25 4.92 2.66 **I** $[Kr]4d^{10} 5s^2 5p^5$ Iodine	131.29 **54** fcc −111.7582^{TP} −108.12 5.89 — **Xe** $[Kr]4d^{10} 5s^2 5p^6$ Xenon
132.90543 **55** B3 bcc 28.39 1 671 1.87 0.79 **Cs** $[Xe]6s^1$ Cesium	137.327 **56** B3 bcc 729 2 1805 3.78 0.89 **Ba** $[Xe]6s^2$ Barium	138.9055 **57** B3 hex 918 ° 3 3457 6.7 1.10 **La** $[Xe]5d^1 6s^2$ Lanthanum	178.49 **72** A1/B1 hcp 2231 4 4603 13.1 1.3 **Hf** $[Xe]4f^{14} 5d^2 6s^2$ Hafnium	180.9479 **73** A2 bcc 3020 5 5458 16.6 1.5 **Ta** $[Xe]4f^{14} 5d^3 6s^2$ Tantalum	183.84 **74** A2 bcc 3422 2,3,4,5,6 5730 19.3 2.36 **W** $[Xe]4f^{14} 5d^4 6s^2$ Tungsten	186.207 **75** A2 hcp 3186 −1,2,4,6,7 5596 21.0 1.9 **Re** $[Xe]4f^{14} 5d^5 6s^2$ Rhenium	190.23 **76** A2 hcp 3033 2,3,4,6,8 5012 22.59 2.2 **Os** $[Xe]4f^{14} 5d^6 6s^2$ Osmium	192.22 **77** B2 fcc 2447 2,3,4,6 4428 22.42 2.20 **Ir** $[Xe]4f^{14} 5d^7 6s^2$ Iridium	195.08 **78** B2 fcc 1769.0 2,4 3827 21.4 2.28 **Pt** $[Xe]4f^{14} 5d^9 6s^1$ Platinum	196.96654 **79** A1/B1 fcc 1064.43 1,3 2857 19.3 2.54 **Au** $[Xe]4f^{14} 5d^{10} 6s^1$ Gold	200.59 **80** B2 rhm −38.836 1,2 356.66 13.546 2.00 **Hg** $[Xe]4f^{14} 5d^{10} 6s^2$ Mercury	204.3833 **81** B2 hcp 304 1,3 1473 11.85 2.04 **Tl** $[Xe]4f^{14} 5d^{10} 6s^2 6p^1$ Thallium	207.2 **82** A1/B1 fcc 327.502 2,4 1750 11.34 2.33 **Pb** $[Xe]4f^{14} 5d^{10} 6s^2 6p^2$ Lead	208.98037 **83** A2 rhm 271.422 3,5 1564 9.781 2.02 **Bi** $[Xe]4f^{14} 5d^{10} 6s^2 6p^3$ Bismuth	(208.9824) **84** A1/B1 cub 254 2,4 962 9.4 2.0 **Po** $[Xe]4f^{14} 5d^{10} 6s^2 6p^4$ Polonium	(209.9871) **85** — 302 ±1,3,5,7 337 — 2.2 **At** $[Xe]4f^{14} 5d^{10} 6s^2 6p^5$ Astatine	(222.0176) **86** fcc −71 −62 9.91 — **Rn** $[Xe]4f^{14} 5d^{10} 6s^2 6p^6$ Radon
(223.0197) **87** B3 bcc 27 1 677 — 0.7 **Fr** $[Rn]7s^1$ Francium	(226.0254) **88** B3 bcc 700 2 1536 5.0 0.9 **Ra** $[Rn]7s^2$ Radium	(227.0278) **89** fcc 1051 °° 3 3200 10.07 1.1 **Ac** $[Rn]6d^1 7s^2$ Actinium	(261.11) **104** — — 4 — — — **Unq** $[Rn]5f^{14} 6d^2 7s^2$ Unnilquadium	(262.114) **105** — — — — — — **Unp** $[Rn]5f^{14} 6d^3 7s^2$ Unnilpentium	(263.118) **106** — — — — — — **Unh** $[Rn]5f^{14} 6d^4 7s^2$ Unnilhexium	(262.12) **107** — — — — — — **Uns** $[Rn]5f^{14} 6d^5 7s^2$ Unnilseptium	— **108** — — — — — — **Uno** $[Rn]5f^{14} 6d^6 7s^2$ Unniloctium	— **109** — — — — — — **Une** $[Rn]5f^{14} 6d^7 7s^2$ Unnilennium									

1. Element coding: **black** = solid; **red** = gas; **blue** = liquid; **outline** = synthetically prepared. For carbon, the graphite allotrope was selected; for phosphorus and tin, the white allotrope was selected. The names and symbols for elements 104–109 are those recommended by IUPAC.
2. Acidity & basicity of representative oxides: **A** = acid; **B** = basic; **A/B** = amphoteric. Relative strength: **1** = low; **2** = moderate; **3** = high.
3. Crystal structures: **mcl** = monoclinic; **orh** = orthorhombic; **tet** = tetragonal; **bct** = body centered tetragonal; **cub** = cubic; **hex** = hexagonal; **rhm** = rhombohedral; **fcc** = faced-centered cubic; **bcc** = body-centered cubic; **hcp** = hexagonal close-packed; **dcp** = dodecahedral close-packed.
4. Two older group classification systems still in use today rely on an A/B coding scheme to categorize periodic properties (i.e., VIIA, IIB, etc.). Because of the potential for confusion between these two systems, the International Union of Pure & Applied Chemistry (IUPAC) recommends the use of a 1–18 group classification system.
5. Unless otherwise stated, melting and boiling points are at 1 atm. Superscripts on selected values are defined as: **SP** = sublimation point at 1 atm; **TP** = triple point. Brac indicate approximate value.

140.115 **58** B2 fcc 798 3,4 3426 6.78 1.12 **Ce** $[Xe]4f^1 5d^1 6s^2$ Cerium	140.90765 **59** B2 hex 931 3,4 3512 6.77 1.13 **Pr** $[Xe]4f^3 6s^2$ Praseodymium	144.24 **60** B2 hex 1021 3 3068 7.00 1.14 **Nd** $[Xe]4f^4 6s^2$ Neodymium	(144.9127) **61** B2 dcp 1042 3 3512 6.475 1.13 **Pm** $[Xe]4f^5 6s^2$ Promethium	150.36 **62** B2 rhm 1074 2,3 1791 7.54 1.17 **Sm** $[Xe]4f^6 6s^2$ Samarium	151.965 **63** B2 bcc 822 2,3 1597 5.26 1.2 **Eu** $[Xe]4f^7 6s^2$ Europium	157.25 **64** B2 hcp 1313 3 3266 7.89 1.20 **Gd** $[Xe]4f^7 5d^1 6s^2$ Gadolinium	158.92534 **65** B1 hcp 1356 3,4 3223 8.27 1.2 **Tb** $[Xe]4f^9 6s^2$ Terbium	162.50 **66** B1 hcp 1412 3 2562 8.54 1.22 **Dy** $[Xe]4f^{10} 6s^2$ Dysprosium	164.93032 **67** B1 hcp 1474 3 2695 8.80 1.23 **Ho** $[Xe]4f^{11} 6s^2$ Holmium	167.26 **68** B1 hcp 1529 3 2863 9.05 1.24 **Er** $[Xe]4f^{12} 6s^2$ Erbium	168.93421 **69** B1 hcp 1545 2,3 1947 9.33 1.25 **Tm** $[Xe]4f^{13} 6s^2$ Thulium	173.04 **70** B1 fcc 819 2,3 1194 6.98 1.1 **Yb** $[Xe]4f^{14} 6s^2$ Ytterbium	174.967 B1 hcp 1663 3395 9.84 1.27 $[Xe]4f^{14} 5d^1$ Lutetiu
232.0381 **90** B1 fcc 1755 4 4788 11.7 1.3 **Th** $[Rn]6d^2 7s^2$ Thorium	231.03588 **91** B1 bct 1572 4,5 — 15.4 1.5 **Pa** $[Rn]5f^2 6d^1 7s^2$ Protactinium	238.0289 **92** A1/B1 bcc 1132.3 3,4,5,6 3818 19.07 1.38 **U** $[Rn]5f^3 6d^1 7s^2$ Uranium	(237.0482) **93** A1/B1 orh 639 3,4,5,6 — 20.4 1.36 **Np** $[Rn]5f^4 6d^1 7s^2$ Neptunium	(244.0642) **94** A1/B1 mcl 640 3,4,5,6 3230 19.8 1.28 **Pu** $[Rn]5f^6 7s^2$ Plutonium	(243.0614) **95** A1/B1 hcp 1176 3,4,5,6 2607 13.6 1.3 **Am** $[Rn]5f^7 7s^2$ Americium	(247.0703) **96** A1/B1 dcp 1345 3 — 13.511 1.3 **Cm** $[Rn]5f^7 6d^1 7s^2$ Curium	(247.0703) **97** dcp 1050 3,4 — — 1.3 **Bk** $[Rn]5f^9 7s^2$ Berkelium	(251.0796) **98** — 900 3 — — 1.3 **Cf** $[Rn]5f^{10} 7s^2$ Californium	(252.083) **99** — 860 3 — — 1.3 **Es** $[Rn]5f^{11} 7s^2$ Einsteinium	(257.0951) **100** — (1527) 3 — — 1.3 **Fm** $[Rn]5f^{12} 7s^2$ Fermium	(258.10) **101** — (827) 2, 3 — — 1.3 **Md** $[Rn]5f^{13} 7s^2$ Mendelevium	(259.1009) **102** — (827) 2, 3 — — 1.3 **No** $[Rn]5f^{14} 7s^2$ Nobelium	(262.11) — (1627) — — — $[Rn]5f^{14} 6d^1 7$ Lawrenci

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CHEMICAL PERIODIC TABLE, 3rd Edition   Product No. LCH-02F   ISBN 1-55080-065-5
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Speed of Light (vacuum)	c	$2.99792458\cdot10^{8}$ m/s
Permeability (vacuum)	μ_o	$4\pi\cdot10^{-7}$ N/A^2
Permittivity (vacuum)	ε_o	$8.854188\cdot10^{-12}$ C/V·m
Planck Constant	h	$6.626076\cdot10^{-34}$ J·s
Gravitational Constant	G	$6.67259\cdot10^{-11}$ m^3/kg·s^2
Standard Gravity	g_o	9.80665 m/s^2 (32.17405 ft/s^2)
Proportionality Constant	g_c	32.17405 ft·lb$_m$/lb$_f$·s^2
		9.80665 cm·kg/kg$_f$·s^2

Electromagnetic & Atomic Constants

Elementary Charge	e	$1.60218\cdot10^{-19}$ C
Magnetic Flux Quantum	Φ_o	$2.06783\cdot10^{-15}$ V·s (Wb)
Bohr Radius	a_o	$0.529177\cdot10^{-10}$ m
Electron Mass	m_e	$9.10939\cdot10^{-31}$ kg
Proton Mass	m_p	$1.67262\cdot10^{-27}$ kg
Neutron Mass	m_n	$1.67493\cdot10^{-27}$ kg
Deuteron Mass	m_d	$3.34359\cdot10^{-27}$ kg

Physico-Chemical Constants

Avogadro Constant	N_A, L	$6.02214\cdot10^{23}$ mol^{-1}
Atomic Mass Constant	m_u	$1.66054\cdot10^{-27}$ kg
Faraday Constant	F	96485.31 C/mol
Boltzmann Constant	k	$1.38066\cdot10^{-23}$ J/K
Stefan-Boltzmann Constant	σ	$5.67051\cdot10^{-8}$ W/m^2·K^4
		$1.71232\cdot10^{-9}$ Btu/h·ft^2·°R^4
Molar Gas Constant	R	8.31451 J/mol·K
		8.31451 m^3·Pa/mol·K
		1.98589 cal(I.T.)/mol·K
		1545.36 ft·lb$_f$/lb-mol·°R
		0.082058 L·atm/mol·K
		0.730244 ft^3·atm/lb-mol·°R
		10.7316 ft^3·psi/lb-mol·°R
		82.0578 cm^3·atm/mol·K
Molar Volume of Ideal Gas (at STP: 0 C, 1 atm)	V_m	22.4141 L/mol (= m^3/kg-mol)
		359.039 ft^3/lb-mol

Conversion Factors

Length	1 m	10^{10} Å	39.370 in.	3.28084 ft	$6.21371\cdot10^{-4}$ mi
Area	1 m^2	10^4 cm^2	1550.0031 in^2	10.7639 ft^2	$2.47105\cdot10^{-4}$ acre
Volume	1 m^3	1000 L	$6.10237\cdot10^4$ in^3	264.172 gal (U.S.)	219.969 gal (Imp.)
Mass	1 kg	2.20462 lb$_m$	35.274 oz	$1.10231\cdot10^{-3}$ ton	$6.02204\cdot10^{26}$ u
Density	1 g/cm^3	1000 kg/m^3	1000 g/L	62.4280 lb$_m$/ft^3	8.34541 lb$_m$/gal (U.S.)
Velocity	1 m/s	3.6 km/h	3.2808 ft/s	196.850 ft/min	2.23694 mi/h
Force	1 kg·m/s^2 (N)	10^5 g·cm/s^2 (dyn)	0.224809 lb$_f$	0.10197 kg$_f$	7.23301 lb$_m$·ft/s^2 (pdl)
Pressure	1 atm	101325 kg/m·s^2 (Pa)	1.01325 bar	14.6959 lb$_f$/in^2 (psi)	760 mm Hg
Energy	1 kg·m^2/s^2 (J)	$9.4782\cdot10^{-4}$ Btu (I.T.)	0.23885 cal (I.T.)	0.737561 ft·lb$_f$	$6.24145\cdot10^{18}$ eV
Power	1 J/s (W)	1 kg·m^2/s^3	3.4121 Btu/h	$1.34102\cdot10^{-3}$ hp	10^7 erg/s
Specific Heat	1 kJ/kg·K	0.23885 cal/g·°C	0.13269 cal/g·°F	0.23885 Btu/lb$_m$·°F	185.863 ft·lb$_f$/lb$_m$·°F
Viscosity (dynamic)	1 Pa·s	1 kg/m·s	1000 cp	0.671969 lb$_m$/ft·s	0.671969 pdl·s/ft^2
Viscosity (kinematic)	1 m^2/s	10^4 Stokes	10^4 cm^2/s	10.7639 ft^2/s	1550.0031 in^2/s
Amount of Substance	1 kg-mol	1000 mol (g-mol)	10^6 mmol	10^9 μmol	2.20462 lb-mol
Concentration	1 wt%	0.01 mass fraction	10 ppt	10^4 ppm	10^7 ppb
Angular Measure	1°	π/180 rad (radians)	60'	3600"	1.1111g
Time	1 h	60 min	3600 s	0.04167 d	$5.95238\cdot10^{-3}$ wk
Luminance	1 cd/m^2	1.0194 candles/m^2	$9.2903\cdot10^{-2}$ cd/ft^2	0.29186 fL	10^4 sb
Illuminance	1 lx	1 lm/m^2	$9.2903\cdot10^{-2}$ lm/ft^2	$9.2903\cdot10^{-2}$ fc	10^{-4} phot
Absorbed Dose	1 Gy	1 J/kg	100 rd (rad)	10^4 erg/g	$6.24181\cdot10^{15}$ eV/g
Activity (radioactive)	1 Bq	1 s^{-1}(disintegration/s)	$2.7027\cdot10^{-11}$ Ci	$2.7027\cdot10^{-8}$ mCi	0.027027 GCi
Temperature	°C = 5/9(°F − 32)	°F = (9/5)°C + 32	K = °C + 273.15	°R = °F + 459.67	°r = (4/5)K − 218.52

Chemical Structures

Alcohol	R – OH
Acyl Halide	R – C(=O) – X
Aldehyde	R – C(=O) – H
Alkane	$R_3C - CR'_3$
Alkene	$R_2C = CR'_2$
Alkyne	$RC \equiv CR'$
Alkyl Halide	R – X
Amide	R – C(=O) – NR'_2
Am[illegible]	[illegible] – NH_2
Carbonyl	C = O
Carboxylic	R – C(=O) – OH
Ester	R – C(=O) – O – R'
Ether	R – O – R'
Grignard	R – Mg – X
Ketone	R – C(=O) – R'
Nitrile	R – CN
Nitro	$R - NO_2$
Thiol	R – SH

0005

Properties of Air & Water

Property	Range	Water	Air	Units
Molar Mass		18.015	28.966	g/mol
Density	20°C	998.23	1.204	kg/m3
	100°C	958.38	0.9459	kg/m3
Viscosity	20°C	1.005	0.0182	cp
	100°C	0.2818	0.0326	cp
Melting Point		0	—	°C
Boiling Point		100	—	°C
Specific Heat	0–100°C	4.22	1.01	kJ/kg·K
Thermal Conductivity	0°C	0.569	0.0242	W/m·K
	100°C	0.681	0.0316	W/m·K
ΔH Fusion		6.013	—	kJ/mol
ΔH Vaporization		40.627	—	kJ/mol
Vapor Pressure	20°C	2.338	—	kPa
	100°C	101.325	—	kPa
Dielectric Constant	18°C	81.07	1.0006	—
Prandtl Number	20°C	7.21	0.709	—

EDI[illegible]

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APPENDIX F.2
SAMPLE CALCULATIONS

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LIST OF SAMPLE CALCULATIONS
(Continued)

LIST OF ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
ci/g	Curie per gram
cm	centimeter
cm^2	square centimeter
cm/s	centimeter per second
cm^3	cubic centimeter
COC	constituents of concern
CPC	constituents of potential concern
CR	concentration ratio
CRU	CERCLA/RCRA Unit
DOE	U.S. Department of Energy
d/y	days per year
EPA	U.S. Environmental Protection Agency
FEMP	Fernald Environmental Management Project
ft	foot/feet
g	gram
GMA	Great Miami Aquifer
ha	hectare
HELP	Hydrologic Evaluation of Landfill Performance
hr	hour
hr/d	hour per day
IT	IT Corporation
km	kilometer
L	liter
µg	microgram
µg/g	microgram per gram
µg/kg	microgram per kilogram
µg/L	microgram per liter
m	meter
m^3	cubic meter
mg/kg	milligrams per kilogram
mg/L	milligram per liter
mL	milliliter
min	minute (s)
MUSLE	Modified Universal Soil Loss Equation

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LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

OU1	Operable Unit 1
ODAST	one-dimensional analytical solution transport
pCi/g	picocuries per gram
pCi/L	picocuries per liter
$pCi/m^2/s$	picocuries per square meter per second
pCi/μg	picocuries per microgram
RI	Remedial Investigation
ROI	Region of Interest
SI	Saturation index
SCS	Soil Conservation Service
Sec	second
SOWC	Southwestern Ohio Water Company
SWIFT	Sandia Waste Isolation Flow and Transport
tan	tangent
UCL	upper confidence level
y	year

0011

ENGLISH/METRIC AND METRIC/ENGLISH CONVERSION

Multiply	By	To Obtain
English/Metric Equivalents		
acres	0.4047	hectares (ha)
cubic feet (ft^3)	0.02832	cubic meters (m^3)
cubic yards (yd^3)	0.7646	cubic meters (m^3)
degrees Fahrenheit (°F) -32	0.5555	degrees Celsius (°C)
feet (ft)	0.3048	meters (m)
gallons (gal)	3.785	liters (L)
gallons (gal)	0.003785	cubic meters (m^3)
inches (in)	2.540	centimeters (cm)
miles (mi)	1.609	kilometers (km)
pounds (lb)	0.4536	kilograms (kg)
short tons (tons)	907.2	kilograms (kg)
short tons (tons)	0.9072	metric tons (t)
square feet (ft^2)	0.09290	square meters (m^2)
square yards (yd^2)	0.8361	square meters (m^2)
square miles (mi^2)	2.590	square kilometers (km^2)
yards (yd)	0.9144	meters (m)
Metric/English Equivalents		
centimeters (cm)	0.3937	inches (in)
cubic meters (m^3)	35.31	cubic feet (ft^3)
cubic meters (m^3)	1.308	cubic yards (yd^3)
cubic meters (m^3)	264.2	gallons (gal)
degrees Celsius (°C) + 17.78	1.8	degrees Fahrenheit (°F)
hectares (ha)	2.471	acres

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ENGLISH/METRIC AND METRIC/ENGLISH CONVERSION
(Continued)

Multiply	By	To Obtain
Metric/English Equivalents		
kilograms (kg)	2.205	pounds (lb)
kilograms (kg)	0.001102	short tons (tons)
kilometers (km)	0.6214	miles (mi)
liters (L)	0.2642	gallons (gal)
meters (m)	3.281	feet (ft)
meters (m)	1.094	yards (yd)
metric tons (t)	1.102	short tons (tons)
metric tons (t)	2204.6	pounds (lb)
square kilometers (km^2)	0.3861	square miles (mi^2)
square meters (m^2)	10.76	square feet (ft^2)
square meters (m^2)	1.196	square yards (yd^2)

0018

INTRODUCTION

This remedial investigation (RI) report utilizes numerous calculations which are necessary to adequately discuss the components of the RI. Components of the RI that required the use of calculated values include the following:

- Characterization of site conditions
- Determination of nature and extent of the waste
- Characterization of the waste
- Assessment of risk to human health and the environment.

The calculations involved results from sampling and analyses. Also, the use of conversion factors, constants, and assumptions were necessary for many calculations, particularly fate and transport modeling and risk assessment results. Methods used for fate and transport modeling and the risk assessment and their results are presented in detail in Appendix D and E.

This appendix was assembled to provide the reader with an assortment of sample calculations. The sample calculations presented show the method used to calculate volume, mean, hydraulic conductivity, retardation factors, geotechnical properties, and many other results. Some values used in the RI were obtained from mathematical models. These have been identified and it is not practical to present the entire model, input parameters, calculations, and results in this appendix. However, these are discussed quantitatively to a limited extent.

The sole purpose of the sample calculations provided in this appendix is to furnish the reader with the basis of how selected values were calculated so that he may gain a better understanding of how information was used for the RI. The sample calculations are organized in a standardized format. The sample calculation format is as follows:

- Title
- Explanation/Application
- Variables, constants, and conversion factors
- Units and equivalents table
- Citation location
- Collateral equation source references
- Formula
- Calculation
- Notes
- Visual aids/diagrams.

The format was followed except in a few cases where the presentation was simplified by deviating from the format. This appendix also contains a table of English/Metric and Metric/English equivalents so that units may be converted if desired.

SAMPLE CALCULATION 1

Title: **WASTE PIT AREAS AND VOLUMES**

Explanation/Application:

The surface area of the top and bottom of each waste pit was taken off the drawing of each waste pit by Intergraph Microstation. The volume of cover, waste, and low permeability material for each waste pit in the OU-1 area was calculated with Intergraph Corporation InRoads/InSite version 4.01.01.00 software. The surface of each material was created by the surface modeling portion of the InRoads/InSite software.

InRoads/InSite takes the surface models of each material, then calculates a volume by the triangulation method between any two surfaces. The triangulation method is a highly accurate volume calculation method.

Details of the geometric configuration of the waste pits are included in the notes section below.

Units, Variables, Constants, and Conversion Factors:

V = volume
H = distance between the two surfaces
S_0 and S_2= the cross sectional areas of the corresponding pairs of triangles
S_1 = the cross sectional area of the mid-section
CY = cubic yard
SF = square feet

Related Sections:

Chapters 1, 3, and 4

Collateral Equation Source References:

Intergraph Corporation InRoads/InSite version 4.01.01.00 software.

Hodgman, Charles D., M.S., Samuel M. Selby, PhD, and Robert C. Weast, PhD, ed., 1959. *C.R.D. Standard Mathematical Tables, Twelfth Edition*, Cleveland: Chemical Rubber Publishing Company, pg. 402.

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Intergraph, October 1992a. *InRoads/InSite Reference Guide Volume I*, Huntsville: Intergraph, pg. 1:5-4.

Intergraph, October 1992b. *InRoads/InSite Reference Guide Volume II*, Huntsville: Intergraph, pg. 2:6-104.

Formula:

The surface modeling portion takes the graphic design file, which is a set of points, and produces a triangulated model to define a terrain surface. The software connects the points in the graphic file to generate three-dimensional triangular planes. The formation of these planes is done with an algorithm known as Delauney's criteria. Briefly, the criteria states that after all triangles are formed, and a circle is drawn through the three vertices of any triangle in the network, no other point can be inside the circle. Once the surface models are complete the volumes (cut & fill) can be calculated between any two surfaces (Intergraph 1992a).

The volumes are calculated between any two surfaces that are loaded into the triangle volume command. The volume generated from this command is a prismoidal volume. A prismoidal is a solid whose ends are parallel and whose sides are plane or warped surfaces. The triangles from one surface are projected to the triangles on another surface forming small prismoids that represent the exact volume between the two surfaces. The total volume is determined by calculating the volume of each prismoid formed by the corresponding pairs of triangles in the two surfaces and then totaling these prismoid volumes (Intergraph 1992b). The formula for the prismoidal volume is $V = 1/6 \times H \times (S_0+4S_1+S_2)$, H is the distance between the two surfaces (parallel planes), S_0 and S_2 are the cross sectional areas of the corresponding pairs of triangles, and S_1 is the cross sectional area of the mid-section (Hodgman et al. 1959). For example, the volume for the Waste Pit 3 cover was calculated from the prismoids volumes created from the existing soil surface and the existing waste surface.

Calculation:

Each waste pit has an individual geometry that was determined from a variety of sources. The information for each of the waste pits' geometry can be found in the notes section below. Summary of waste pit volumes is presented in Table F-1.1.

Notes:

The geometric configurations, cover thickness, the bottom elevations, and the low permeability material thickness of the pits were determined from the best available data at this time. These data were assembled from construction, as-build, survey, and the feasibility study drawings (1/31/92, rev. 1), boring logs, and from the existing plant engineering files.

The dike crest and top edges shown around the waste pits (see drawings SK-G-01766 and SK-G-01767) represent conditions built at the time of the respective pit construction. Many of these dikes and top edges have been covered with materials of different thickness.

These drawings show the top of the aquifer as located by CRU-5.

Waste Pit 1

1. The geometric configuration, such as the footprint, depth and sides slopes, of Waste Pit 1, was determined by as-built drawing (08C-5500-G-00864) for Waste Pit 1. This drawing is supported by its similarity to Waste Pit 2 construction drawings 08C-5500-G-00233 and 08C-5500-G-01110.

   The bottom elevation on the west side of Waste Pit 1 was obtained from construction drawing (21A-1450-G-00081). The top of dike elevation and bottom elevation of the east side were set by as-built drawing G00864 and the construction drawing G00233.

2. The as-built drawing (G00864) for Waste Pit 1 shows reference elevations. The survey drawing for Waste Pit 4 (08C-5500-G-01302) and construction drawing for Waste Pit 3 and Clearwell (21X-5500-G-00234/08X-5500-G-01196) were used to determine the approximate elevations of the reference elevations. The survey drawing shows the elevation of the northern top edge of Waste Pit 2 at 577 +/- 1 foot mean sea level and Waste Pit 3 and Clearwell drawing shows an elevation of 575 +/- 1 foot for the northern and western top edge of Waste Pit 2. The as-built drawing, G00864, shows this same dike as a relative elevation of 98 feet. Hence, we conclude that the relative elevation of 98 feet is approximately 575 +/- 1 foot mean sea level.

3. The as-built drawing (08C-5500-G-00864) shows an irregular shape of 4-feet-thick low permeability material (clay) in the southeast corner. The drawing also shows a 10-feet-deep by 12-feet-wide trench on the east and south side and an 11-foot-wide trench on the west side that was backfilled with a low permeability material (clay) at the time the waste pit was constructed. A sump area located in the southwest corner of Waste Pit 1, is shown in the as-built drawing to have a 6 +/- 1-foot-thick layer of low permeability material (clay).

4. Although the Waste Pit 1 as-built drawing (08C-5500-G-00864) shows the bottom of the pit at elevation of 563 +/- 1 foot, the boring log nos. 1765, 1766, and 1767 indicate waste below this elevation. Material between the elevations of 563 feet and 552 feet will be considered as low permeability material or liner and not waste material.

5. The as-built drawing of Waste Pit 1 shows that the west side of the Waste Pit was constructed with a 3:1 slope and then seeded, where as the east side was constructed with a 3:1 slope and paved. The material used to pave the east slope was not given. Waste Pit 2 drawing 08C-5500-G-01110 shows that the height of the Waste Pit 1 west dike was increased by approximately 5 +/- 1 foot during the construction of Waste Pit 2. Therefore, the slope of the dike is not 3:1 near the top edge of the pit, as indicated in drawing G00864. The drawing SK-G-01767 shows the slope is approximately 1.5H:1V near the top.

6. Boring logs (stated above) indicate that Waste Pit 1 has waste material in the top 1 foot. The cover material should be included as a waste quantity. A cover material 6 inches thick is shown.

Waste Pit 2

1. The coordinates for the center line of the top edge of Waste Pit 2 were taken from

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construction drawing (21A-5500-G-00233). These coordinates were checked against the survey coordinates shown in the survey drawing for Waste Pit 4 (08C-5500-G-01302). The coordinates were very similar. Therefore the coordinates given on the Waste Pit 2 construction drawing are assumed to be accurate.

2. The survey drawing for Waste Pit 4 (08C-5500-G-01302) shows the elevation for the northern top edge of Waste Pit 2 to be 577 +/- 1 foot. The construction drawing (21A-5500-G-00233) for Waste Pit 3 and Clearwell drawing indicates a height of 575 +/- 1 foot for the north and west sides of Waste Pit 2. Boring logs 1768 and 1769 indicate waste at an elevation of 577 +/- 1 foot. Therefore, we assumed that the top edge of Waste Pit 2 is at an elevation of 577 +/- 1 foot (and not at 575).

3. In determining the depth of Waste Pit 2 additional information was found in the engineering file CP-F-56-24:

   A letter dated Oct. 15, 1956, stated that the location of Waste Pit 2 as shown in the construction drawing 8-4069 (21A-5500-G-00233) will cause the contractor problems and the waste pit location should be shifted.

   In a letter dated Oct. 26, 1956, The contract was to be approved with a clay liner being eliminated and the pit relocated.

   The revised construction proposal dated Nov. 13, 1956, stated that the new pit location can be found on 8-4069 (21A-5500-G-00233) and the old location is in drawing 8-4032.

   The revised CP-f-56-24, dated Dec. 11, 1956, stated that the depth of Waste Pit 2 is approximately 16 feet.

   In a change order dated May 20, 1957, it was stated that Waste Pit 2 was excavated deeper than that shown in the construction drawing 8-4069 (21A-5500-G-00233). Also, a clay liner was added to the pit.

   Due to the conflicting and inadequate information dealing with the existence of low permeability material or thickness, the thickness of 4.5 +/- 1 foot as shown in the March 10, 1992 Feasibility Study drawings revision 1, will be used until additional information can be found.

4. According to the Waste Pit 2 construction drawing 8-4069 (21A-5500-G-00233) the existing road was built only 4 feet from the edge of Waste Pit 2. Therefore, with roadway improvements over the years, the location of the road could be on top of Waste Pit 2, as shown in drawing SK-G-01767.

5. Boring logs 1768 and 1769 indicate that the top of the low permeability material for Waste Pit 2 is at an elevation of 561 +/- 1 foot.

6. The top of waste in Waste Pit 2 is assumed to be level at an elevation of 577+/- 1 foot (top edge of Waste Pit 2 as per note 2).

Waste Pit 3 and Clearwell

1. Construction drawing (21X-5500-G-00234/08X-5500-G-01196) for Waste Pit 3 was utilized in determining the footprint of Clearwell and the footprint of the west and north sides of Waste Pit 3. This construction drawing was compared to the existing topography of the area. The configuration of the outside slopes of the north and west sides of Waste Pit 3 match on both the construction drawing and the aerial topography. Hence, we assumed that the inside slope of the north and west dike is also correct as shown in the construction drawing.

2. The construction drawing of Waste Pit 3 shows that the bottoms of the Clearwell and Waste Pit 3 do not have a clay liner. The engineer's file CP-58-40, dated July 11, 1958, states that the bottom of Waste Pit 3 and the Clearwell are composed of an existing layer of clay. (Not a constructed clay liner).

3. The issues stated above were discussed in a meeting with FERMCO representatives on April 5, 1993. The volumes of low permeability material were calculated using a 1-foot-thick layer on the bottoms and sides of Waste Pit 3 and the Clearwell.

4. The depth of waste material in the Clearwell (elevation 559 +/- 1 foot) was taken from the March 10, 1992 Feasibility Study (FS) drawing revision 1. The depth will probably increase due to continual surface sediment transport to the Clearwell.

5. The top of waste in Waste Pit 3 is assumed to be at a level elevation of 575 +/- 1 foot (top of the dike).

Waste Pit 4

1. Construction drawings 08C-5500-G-01303 and 40A-1900-G-00021 of Waste Pit 4 were utilized in determining the configuration of Waste Pit 4.

2. Since the configuration is visible the 1992 aerial photography was utilized in constructing the geometry of Waste Pit 4.

3. Boring logs 1773, 1774, 1775 of Waste Pit 4 indicates that the top of low permeability material for Waste Pit 4 is at elevation 559 +/- foot.

4. The top of the waste in Waste Pit 4 is assumed to be at a level elevation of 584 +/- 1 foot (top of dike).

Waste Pit 5

1. The construction drawings 21X-5500-G-00196 and 21X-5500-G-00197-00199 of Waste Pit 5 were utilized in determining the configuration of Waste Pit 5. The coordinates that are shown in drawing 21X-5500-G-00196 vary from the 1992 topography by approximately 25 feet. Waste Pit 5 is still visible and open, hence the aerial photography is assumed to be more accurate and was used to determine the coordinate of Waste Pit 5.

2. The 1992 topography was utilized in constructing the geometry configuration of Waste

Pit 5.

3. The construction drawing 21X-5500-G-00196 indicates that the bottom elevation of the east side of Waste Pit 5 is 560 feet and at west side elevation is 558.5 feet. The volume for Waste Pit 5 accounts for is sloped bottom.

4. The top of waste elevation, 588 +/- 1 foot, for Waste Pit 5 was taken from construction drawing 91X-5900-M-00060 for Removal Action 18 (project order 30). This removal action was completed 1/93 and hence supersedes the aerial topography.

Waste Pit 6

1. The construction drawing 21A-5500-G-00222 of Waste Pit 6 was utilized in determining the configuration of Waste Pit 6.

2. The 1992 topography was utilized in constructing the geometric configuration of Waste Pit 6.

3. The top os waste elevation, 580 +/- 1 foot, for Waste Pit 6 was taken from the March 10, 1992 Feasibility Study drawings revision 1.

Burn Pit

1. The southern end of the Burn Pit footprint was taken from the survey drawing of Waste Pit 4 08C-5500-G-01302.

2. Boring logs 1776 and 1777 indicated debris, such as glass, ceramics, metal, wood, etc., to at least an elevation of 558 depth +/- 1 foot. The borings did not establish a definitive because the borings were terminated at an elevation of 558 feet.

3. Boring logs indicate debris to a depth of 558 +/- 1 foot and photos of the Burn Pit indicating waste along the slopes. The perimeter of the Burn Pit is assumed to begin at the boundary of Waste Pits 3 and 4. It was assumed that the Burn Pit slopes along the perimeter at a 1H:1V slope to an elevation of 558 +/- 1 foot.

Visual Aids/Diagrams: Drawings SK-G-01766
SK-G-01767

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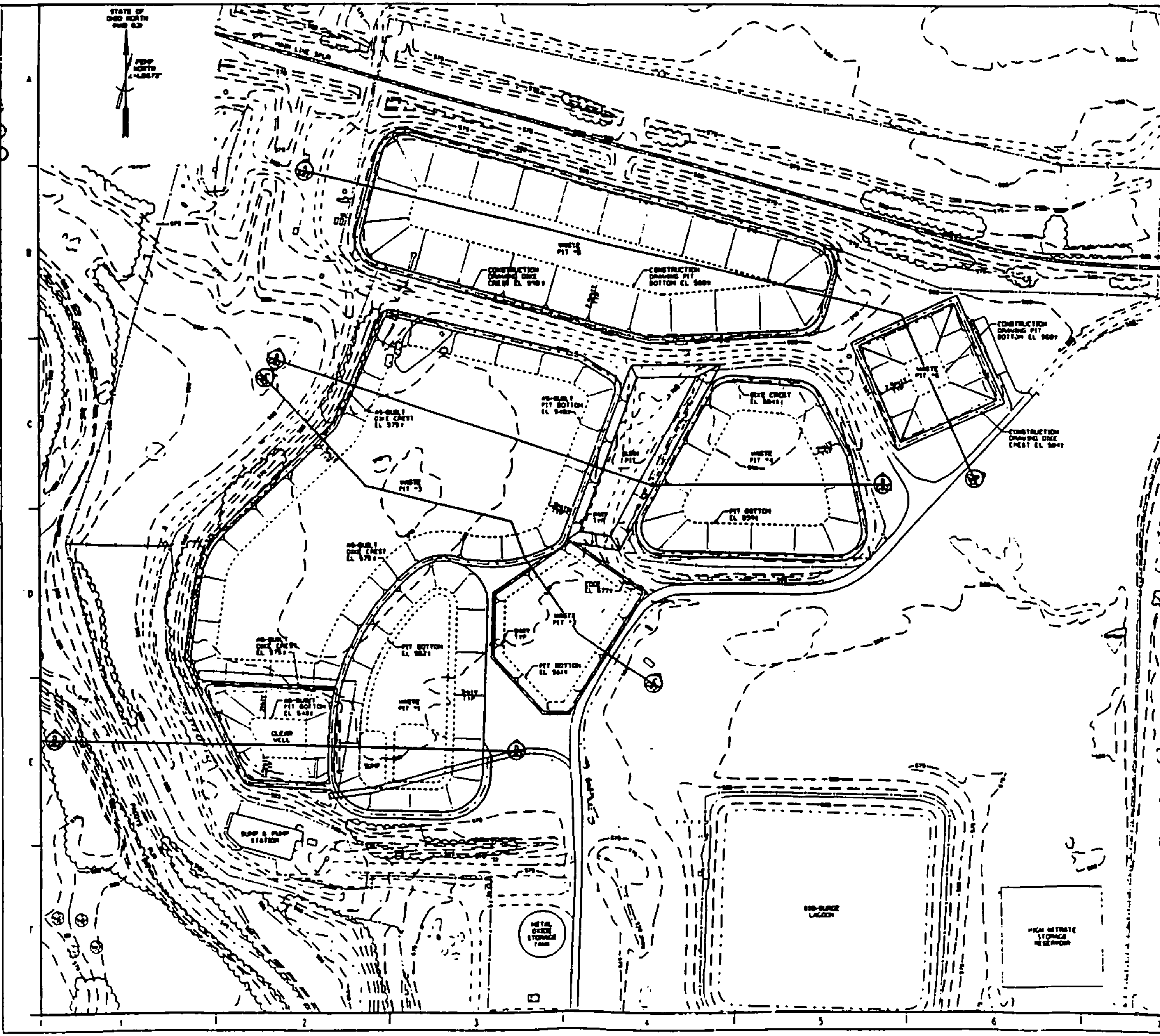
TABLE F-2.1.1
SUMMARY OF WASTE PIT VOLUMES

Waste Pit	Cover Material (CY)	Waste Material (CY)	Liner Material (CY)	Total (CY)
Waste Pit 1	1700	48,500	18,200	68,400
Waste Pit 2	4200	24,200	9,000	37,400
Waste Pit 3	93,700	204,100	9,700	307,500
Clearwell	N/A	3,700	600	4,300
Waste Pit 4	14,600	55,100	3,100	72,800
Waste Pit 5	N/A	97,900	N/A	97,900
Waste Pit 6	N/A	9,600	N/A	9.600
Burn Pit	N/A	30,300	N/A	30,300
Total	113,500	473,200	40,600	627,300

N/A - Not applicable.



1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

EXISTING SITE DATA SOURCE ON PLANT FILES
PARSONS TOPOGRAPHY
FEMP CADD GRID/UTILITY DRAWINGS
FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS

2. FOR DRAWING INDEX, SEE SHEET 1G2.

3. FOR NOTES ABOUT THE GEOMETRIC CONFIGURATION OF THE WASTE PIT AREA, SEE SHEET 1G3.

LEGEND

EXISTING		PROPOSED
	PIT OUTLINE DIKE	
	PIT OUTLINE BOTTOM	
	SLOPE	
	MAJOR CONTOUR	
	FENCE	
	RAILROAD	
	PAVED ROAD	
	GRAVEL ROAD	
	TREE LINE	
	TREE	

REF SHEET NO.	DRAWING TITLE
1G2	DRAWING INDEX
1G3	NOTES GEOMETRIC CONFIGURATION OF THE WASTE PITS
CG2	CROSS SECTIONS EXISTING

PRELIMINARY
NOT FOR CONSTRUCTION

B	ISSUED FOR 60% DESIGN REVIEW
A	ISSUED FOR 30% DESIGN REVIEW

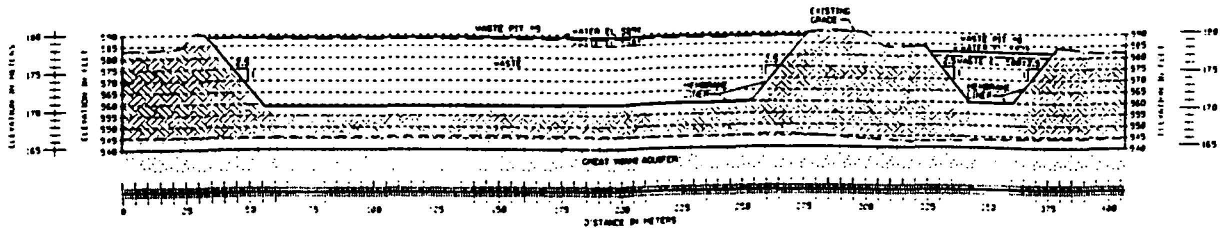
UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN INC. - ENGINEERING-SCIENCE, INC
CINCINNATI, OHIO

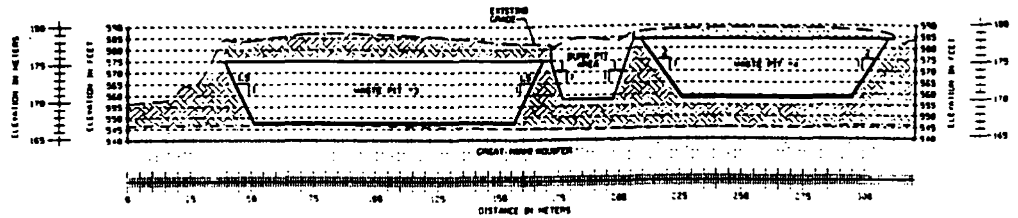
SITE RESTORATION
CRU5/PODS

CIVIL
SITE PLAN
EXISTING

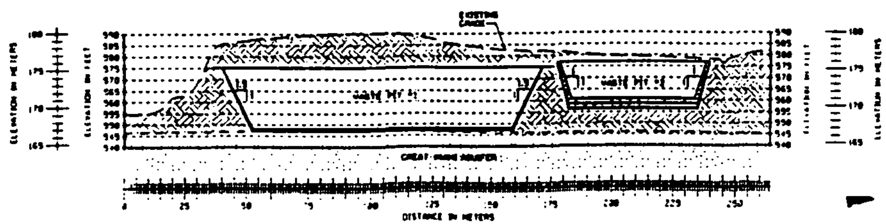
00-90701 SK-G-01766 G01 B



SECTION A



SECTION B



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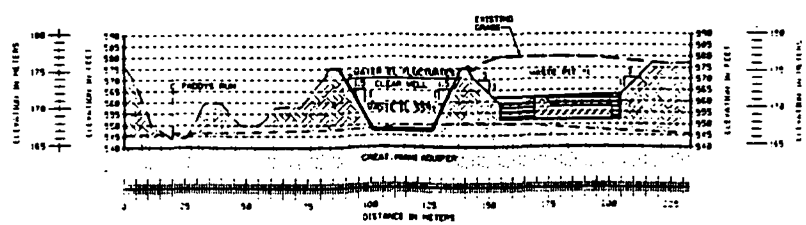

SECTION D

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   EXISTING SITE DATA SOURCE (IN PLANT FILES):
   PARSONS TOPOGRAPHY, 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS

2. FOR DRAWING INDEX, SEE SHEET X02.

3. FOR NOTES ABOUT THE GEOMETRIC CONFIGURATION OF THE WASTE PITS, SEE SHEET X03.

LEGEND

- EXISTING SOIL
- LOW PERMEABILITY MATERIAL
- SAND AND/OR GRAVEL
- WASTE
- SOIL MIXED WITH WASTE (TO BE REMOVED)

REFER DWG NO.	REFERENCE DWG TITLE
X02	DRAWING INDEX
X03	NOTES GEOMETRIC CONFIGURATION OF THE WASTE PITS
C01	SITE PLAN EXISTING

PRELIMINARY
NOT FOR CONSTRUCTION

B	ISSUED FOR 60% DESIGN REVIEW
A	ISSUED FOR 30% DESIGN REVIEW

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

PARSONS
THE RALPH M. PARSONS CO. - CHAS. T. MAIN INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

SITE RESTORATION
CRU1/PO88

CIVIL
CROSS SECTIONS
EXISTING

NOTED

20-90701 SK-G-01767 G02 B

24
28

00023

SAMPLE CALCULATION 2

Title: **TOTAL WEIGHT OF URANIUM IN GROUNDWATER**

Explanation/Application:

The total weight of uranium is essential for the identification of the source of above-background uranium concentrations in three off-site wells in the first task of a comprehensive groundwater study at the FEMP.

Units, Variables, Constants, and Conversion Factors:

L	liter
µg	micrograms
µg/L	micrograms/liter
pCi	picoCuries

Related Sections:

Refer to Section 2.0 for the calculation method of total uranium.

Pit Leachate Radiological Results (page A.1.2.1)
Well Boring: 1766, Sample ID: 063904, Sample Date: 28-AUG-91

Collateral Equation Source References:

Radiological Health Handbook, Bureau of Radiological Health and the Training Institute, U.S. Department of Health, Education, and Welfare.

RI/FS Risk Assessment Work Plan, Date: 06/12/92,
Vol. WP-Section 7.0, Page 26 of 37 for specific activity of U-234, U-235, and U-238.

Formula:

Calculate total uranium on a weight basis by summing the mass of U-238, U-234, and U-235/236 per liter based upon the mass of each isotope from alpha spectrometric data (pCi/L). The mass of each isotope is obtained by dividing the concentration of the isotope (pCi/L) by the respective specific activity (pCi/ug).

$$\text{Total uranium} = \frac{\textit{Isotope Concentration}}{\textit{Specific Activity}} = \frac{pCi/L}{pCi/\mu g} = \frac{\mu g}{L}$$

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Calculation:

$$U\text{-}234 \quad \frac{3760\ pCi}{L} \ x\ \frac{ug}{6.22\ x\ 10^3\ pCi} = 0.605\ ug/L$$

$$U\text{-}235/236 \quad \frac{268\ pCi}{L} \ x\ \frac{ug}{2.16\ pCi} = 124\ ug/L$$

$$U\text{-}238 \quad \frac{3990\ pCi}{L} \ x\ \frac{ug}{3.36\ x\ 10^{-1}\ pCi} = 1.19\ x\ 10^4\ ug/L$$

Total Uranium: $(0.605 + 124 + 1.19 \times 10^4)\ \mu g/L$
$= 1.2 \times 10^4\ \mu g/L$

Notes: N/A

Visual Aids/Diagrams: None Included

0025

SAMPLE CALCULATION 3

Title: WATER CONTENT, SPECIFIC GRAVITY, ATTERBERG LIMITS, AND PERCENT PASSING #200 SIEVE.

Explanation/Application:

Geotechnical properties may be used to help characterize the soil (hydraulic conductivity infiltration rate etc.) and are used for soil classification. Geotechnical results may assist in the following:

- Evaluation of fate and transport of constituents as they migrate from the Operable Unit 1 waste areas through the vadose zone and into the Great Miami Aquifer
- Identification of the hydrologic processes governing the fate and transport of the constituents within each hydrostratigraphic unit based on information about constituents present in the waste area and its location-specific geologic setting
- Estimation of the rate constants describing constituent retardation attributable to interactions with organic carbon in the geological formation, since these constants are based upon the grain-size distribution and organic carbon content of the glacial overburden matrix.

Units, Variables, Constants, and Conversion Factors:

K = correction factor = 1.001 at temperature = 15°C
n = number of blows = 24
M_w = mass of water
M_s = mass of solids
k = correction factor based on the density of water
k = 1.001 (approximately) for T=15°C (ASTM D 854)
W_{bw} = weight of pycnometer plus water at test temperature in grams
W_s = weight of soil
W_{bws} = weight of pycnometer, water, and soil
$\tan\beta$ is the slope of the flow curve = 0.121
W_n = Water Content

Related Sections:

Sections 2.0 and 3.0

Collateral Equation Source References:

ASTM D 2216, ASTM D 854.

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Formula:

(A) A water content test was made on a soil sample. The weight of the wet soil plus container was 891.59 grams, and the weight of the dry soil plus container was 771.22 grams. The weight of the empty container was 13.18 grams. Calculate the water content of the sample.

$$Water\ Content = W_n = \frac{M_w}{M_s} \times 100\%\ (ASTM\ D\ 216)$$

where:

M_w = mass of water, and
M_s = mass of solids

(B) Calculate the specific (G_s) given the weight of oven-dry soil is 55.90 grams, the weight of the pycnometer filled with water at 15°C is 675.72 grams, and the weight of the pycnometer with water and soil at 15°C is 711.56 grams.

$$Gs = \frac{W_s K}{W_s + W_{bw} - W_{bws}}\ (ASTM\ D\ 854)$$

where

k = correction factor based on the density of water
k = 1.001 (approximately) for T=15°C (ASTM D 854)
W_{bw} = weight of pycnometer plus water at test temperature in grams
W_s = weight of soil
W_{bws} = weight of pycnometer, water, and soil

(C) Calculate the Liquid Limit given the following data for Test 1 and Test 2.

	Test 1	Test 2
weight of wet soil + tare	16.72 grams	17.01 grams
weight of dry soil + tare	13.01 grams	13.23 grams
weight of tare	1.37 grams	1.42 grams
number of blows	24	24

$$LL = W_n \left(\frac{n}{25}\right)^{\tan\beta}$$

where:

$\tan\beta$ is the slope of the flow curve = 0.121
n = the blow count

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$$W_n = Water\ Content = \frac{mass\ of\ water}{mass\ of\ solids} \times 100\%$$

(D) Calculate the Plastic Limit given the following data at which the soil begins to crumble when rolled into a thread 1/8 inch in diameter. Plastic limit (PL) is the average of water content of two samples.

	Test 1	Test 2
weight of tare plus wet soil	17.3 grams	14.9 grams
weight of tare plus dry soil	14.4 grams	12.49 grams
weight of tare	1.40 grams	1.45 grams

$$Water\ Content = \frac{mass\ of\ water}{mass\ of\ solids} \times 100\%$$

(E) Given the following data calculate the percent passing a number 200 sieve.

Total dry weight = 758.04 grams
Cumulative weight retained on #10 sieve = 22.74 grams
Hydrometer weight = 68.07 grams
Cumulative weight retained on #200 sieve = 14.30 grams

(ASTM D 422)

$$\%\ finer\ \#200\ sieve = \frac{cumulative\ weight\ retained\ on\ \#200\ sieve}{\begin{array}{c}dry\ weight\ used\ for\ hydrometer\ analysis\\ corrected\ to\ total\ weight\ used\ for\ analysis\end{array}} \times 100\%$$

$$\%\ finer\ \#10\ sieve = \frac{total\ weight - cumulative\ weight\ on\ \#10\ sieve}{Total\ Weight} \times 100\%$$

Calculation:

(A) $$Wn = \frac{891.59g - 771.22g}{771.22g - 13.18g} \times 100\% = 15.9\%$$

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(B) $$G_s = \frac{(55.90g)\ (1.001)}{55.90g + 675.72g - 711.56g} = 2.789$$

(C) Test 1

$$W_n = \frac{16.72g - 13.01g}{13.01g - 1.37g} \ x\ 100\% = 31.9\%$$

$$LL = 31.9(\frac{24}{25})^{0.121} = 32.0$$

Test 2

$$W_n = \frac{17.01g - 13.23g}{13.23g - 1.42g} \ x\ 100\% = 32.0\%$$

$$LL = 32(\frac{24}{25})^{0.121} = 32.0$$

LL = 32 (always expressed as whole number).

(D)

$$(Test\ 1)\ W = \frac{17.3g - 14.4g}{14.4g - 1.40g} \ x\ 100\% = 22.3\%$$

$$(Test\ 2)\ W = \frac{14.9g - 12.49g}{12.49g - 1.45g} \ x\ 100\% = 21.8\%$$

$$PL_{AVG} = \frac{22.3 + 21.8}{2} = 22\ (\textit{always expressed as whole number})$$

0029

(E)

$$\% \ finer \ \#10 \ sieve = \frac{758.04g - 22.74g}{758.04g} \ x \ 100\% = 97.0\%$$

Dry weight used for hydrometer analysis corrected to total dry weight used for grain size analysis = hydrometer sample weight divided by percent passing #10 sieve = $\frac{68.07g}{97\%} \ x \ 100 = 70.175g$

$$\% \ finer \ \#200 \ sieve = 97.0 - (\frac{14.30g}{70.175g} \ x \ 100) = 76.6\%$$

Notes: N/A

Visual Aids/Diagrams: None Included.

SAMPLE CALCULATION 4

Title: **DETERMINATION OF THE AVERAGE AMBIENT AIR TEMPERATURE AT THE FEMP IN 1992.**

Explanation/Application:

Climatological conditions are necessary for determining transport of contaminants through various pathways.

Units, Variables, Constants, and Conversion Factors:

$$°F = (\frac{9}{5})°C + 32$$

$\bar{x}$ = *average value*

n = number of values to complete average

Related Sections: Section 3.0

Collateral Equation Source References:

Gieck, Kurt and Reiner Gieck, 1990, Engineering Formulas 6th Edition, McGraw-Hill, Inc.

TABLE F.2.4.1 AMBIENT AIR TEMPERATURE, 1992

MONTH	TEMPERATURE (°C)
January	0.36
February	3.5
March	6.1
April	11
May	16
June	19
July	22
August	20
September	16
October	11
November	6.9
December	1.6

Source: FEMP Meteorological System

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Formula:

$$\bar{x} = \left(\frac{1}{n}\right) x_1 + x_2 + \ldots\ldots + x_n$$

where

$$\bar{x} = \textit{average value}$$

n = number of values used to compute average

Calculation:

$$AverageTemp = \frac{0.36 + 3.5 + 6.1 + 11 + 16 + 19 + 22 + 20 + 16 + 11 + 6.9 + 1.6}{12}$$

$$Average\ Temp = \frac{133.46°C}{12} = 11.12°C$$

$$°F = \frac{(°C) \times (9)}{5} + 32$$

$$°F = \frac{(11.12)\ (9)}{5} + 32 = 52.0°F$$

Average Temp for 1992 = 52.0°F

Notes: N/A

Visual Aids/Diagrams: None Included

0032

SAMPLE CALCULATION 5

Title: **DETERMINATION OF THE AVERAGE RADON-FLUX DENSITY FOR WASTE PIT 1.**

Explanation/Application:

Radon-flux density used to characterize the waste material.

Units, Variables, Constants, and Conversion Factors:

$\bar{x}$ = *computed average*
n = *number of data points*

Related Sections:

Sections 3.0 and 4.0

Collateral Equation Source References:

U.S. Dept. of Energy, 1988, "Health Physics Manual of Good Practices for Uranium Facilities, prepared by EG&G Idaho, Inc., Idaho Falls, Idaho.

Data points taken from Table 1, Standard LAACC Measurement Results for Waste Pit 1. Measurements conducted on paved portion of waste pit not used.

Formula:

$$\bar{x} = (\frac{1}{n})\, x_1 + x_2 + \ldots\ldots + x_i$$

where

$\bar{x}$ = *computed average*
n = *number of data points*

0033

Calculation:

$$\bar{x} = \textit{average radon-flux density} = \frac{900.3}{99}\ pCi\ m^2/sec$$

$$\bar{x} = 9.1\ pCi\ m^2/sec$$

Notes:

Data presented in Table 1 is calculated through a program called FLUX4.BAS. This program inputs the reference points for the three region of interest (ROIs) and the blank count from the appropriate files. The net counts in the three ROIs are then computed and supplied to the following formula to calculate the measured radon-flux density.

$$J = \frac{C\lambda^2}{KA\ (1-e^{-\lambda T_1})\ (e^{-\lambda(T_2-T_1)} - e^{-\lambda(T_3-T_1)})}$$

where:

J = measured radon-flux density
C = net counts for the ROI
D = Decay constant for Rn-222
K = Calibration factor for the ROI
A = Area of the collector
T_1= Exposure time
T_2= Δt, start of exposure to start of counting
T_3= Δt, end of exposure to end of counting

Visual Aids/Diagrams: None Included

4600

SAMPLE CALCULATION 6

Title: DETERMINATION OF HYDRAULIC CONDUCTIVITY VALUES FROM SLUG TESTS

Explanation/Application:

Slug tests were performed on monitoring wells and piezometers, and the data were analyzed to determine values of hydraulic conductivity for the glacial overburden materials.

Units, Variables, Constants, and Conversion Factors:

K	=	hydraulic conductivity (ft/min)
r	=	radius of well (ft)
R	=	radius of borehole (ft)
L_1	=	depth to bottom of piezometer (ft)
L_2	=	depth to top of screened interval (ft)
H_G	=	depth to static water level in well measured from top of casing prior to the start of test (ft)
H_1	=	depth to water from top of casing at time t_1 (ft)
H_2	=	depth to water from top of casing at time t_2 (ft)
t_1	=	time from start of slug test when measurement 1 was made (min)
t_2	=	time from start of slug test when measurement 2 was made (min)
1 cm/s	=	0.508 ft/min
1 ft/min	=	0.016 ft/sec

Related Sections:

Section 3.0

Collateral Equation Source References:

Hvorslev, M. J., 1951, "Time Lag and Soil Permeability in Ground-Water Observations," U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi, Bulletin No. 36.

Formula:

$$K = \frac{r^2}{2(L_1 - L_2)(t_2 - t_1)} \ln\left(\frac{L_1 - L_2}{R}\right) \ln\left(\frac{H_1 - H_G}{H_2 - H_G}\right)$$

Calculation:

Slug test analysis for Well No. 1197

r	=	0.167 ft
L_1	=	15.0 ft

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L_2	=	10.3 ft
t_1	=	0.1 min
t_2	=	10.0 min
R	=	0.417 ft
H_1	=	8.406 ft
H_2	=	8.601 ft
H_G	=	8.62 ft

$$K = \frac{(0.167)^2}{2\,(15.0 - 10.3)(10 - 0.1)} \ln\left(\frac{15.0 - 10.3}{0.417}\right) \ln\left(\frac{8.406 - 8.620}{8.601 - 8.620}\right)$$

K = (0.0003)(2.42)(2.42) ft/min
K = 1.76×10^{-3} ft/min
K = 2.93×10^{-5} ft/sec
K = 8.9×10^{-4} cm/s

Notes: N/A

Visual Aids/Diagrams: See Page F-28.

0036

FIELD PERMEABILITY TESTS
FALLING HEAD*

PROJECT FMPC LIFS
TESTED BY MS/GA
DATE 8-18-90

PROJECT NO. 602 ~~3.24~~ 3.7+ ET 12-5-90
CALCULATED BY MS
DATE 10-23-90

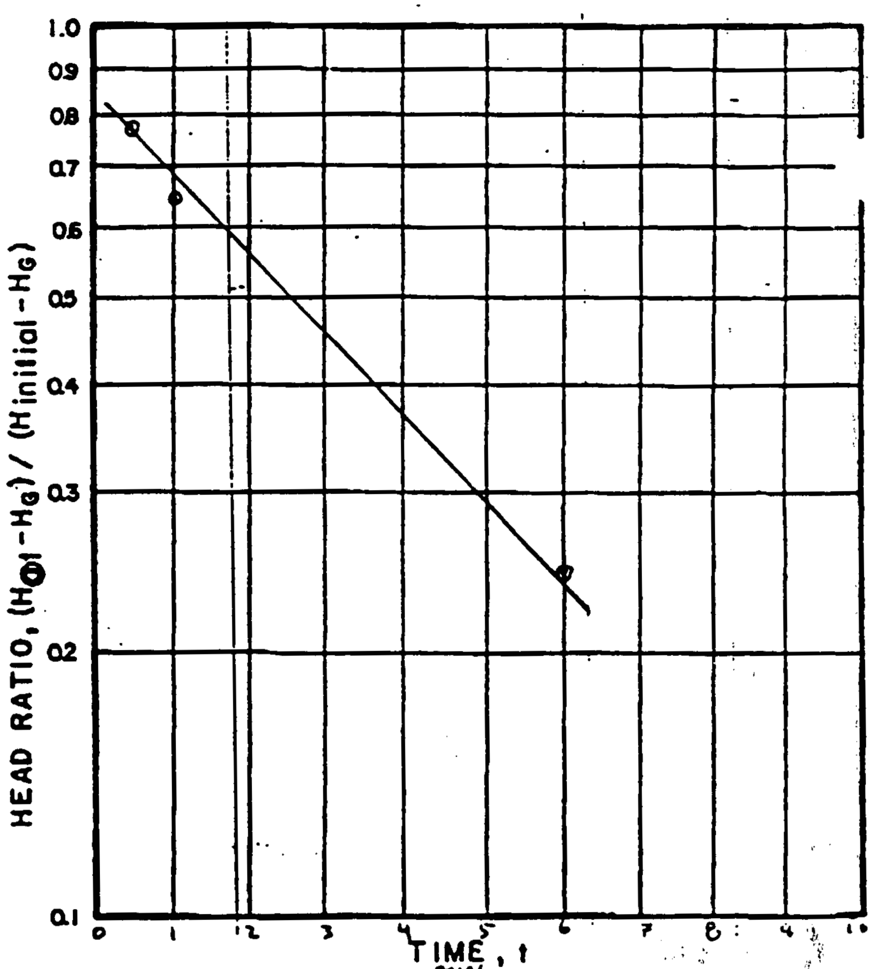
BORING NO. 1197
CHECKED BY
DATE 11/2/90

RADIUS OF WELL, ~~R~~ r = 2 in = 0.167 ft
RADIUS OF TEST BORING, R = 5 in = 0.417 ft
HEIGHT OF CASING (REF. LEVEL) ABOVE GROUND SURFACE, H_C 0.0 ft
DEPTH TO BOTTOM OF TEST POCKET, L_1 15.0 ft
DEPTH TO TOP OF TEST POCKET, L_2 10.3 ft
DEPTH TO GROUNDWATER TABLE FROM TOP OF CASING, H_G 8.66 ft

HYDRAULIC CONDUCTIVITY, K 2.92×10^{-5} ft/sec

*CASED HOLE, UNCASED OR PERFORATED EXTENSION OF LENGTH, $L_1 - L_2$.

ELAPSED TIME t ~~SEC.~~ MIN	DEPTH TO WATER IN CASING H FEET
0	8.393
.1	8.406
.5	8.444
1	8.475
2	8.526
4	8.563
6	8.582
8	8.584
10	8.601
12	8.601
14	8.608
16	8.608
18	8.608
20	8.614
25	8.614
30	8.620



H_1 = DEPTH TO WATER IN CASING FROM TOP OF CASING AT TIME, t_1
H_2 = DEPTH TO WATER IN CASING FROM TOP OF CASING AT TIME, t_2

$$K = \frac{r^2}{2(L_1 - L_2)(t_2 - t_1)} \ln\left[\frac{L_1 - L_2}{R}\right] \ln\left[\frac{H_1 - H_G}{H_2 - H_G}\right]$$

NOTE: THE EQUATION ASSUMES THE HORIZONTAL AND VERTICAL PERMEABILITIES ARE EQUAL.

400-8-87

0037

SAMPLE CALCULATION 7

Title: URANIUM ACTIVITY RATIO

Explanation/Application:

The activity ratio between uranium isotopes indicates whether the uranium is natural, depleted, or enriched. If the uranium is enriched or depleted, it has undergone a process.

Units, Variables, Constants, and Conversion Factors:

μg = micrograms
piC = picoCuries
Ci = Curies
Ci/g= Curies/gram

Related Section:

Section 4.0

Collateral Equation Source References:

Draft Manual of Good Practices at Uranium Facilities, EGG-2530

RI/FS Risk Assessment Work Plan,
Date: 06/12/92, Vol. WP-Section

Formula:

Natural Uranium Activity Ratio for U-238: U-235

$$\frac{(Mass\ U\text{-}238)\ (Specific\ Activity\ of\ U\text{-}238)}{(Mass\ U\text{-}235)\ (Specific\ Activity\ of\ U\text{-}235)}$$

Calculation:

From the Draft Manual of Good Practices at Uranium Facilities, EGG-2530, Table 2-5, the specific activities for U-235 in a natural, depleted, or enriched state are as follows:

Type	Percent U-235 (E)	Specific Activity (Ci/g)
Natural	0.72	6.75×10^{-7}
Depleted	0.20	3.6×10^{-7}
Enriched	2.0	1.17×10^{-6}
Enriched	20	9.36×10^{-6}

Specific Activity of U-238 = 3.36 x 10^{-1} pCi/µg
Specific Activity of U-235 = 2.16 pCi/µg

For uranium in a natural state, the activity ratio can be calculated assuming 1 µg of uranium as follows:

$$For\ U\text{-}235:\ \frac{(1\ ug)(0.0072\ ug\ natural\ U\text{-}235)}{ug\ U\text{-}Total}\left(\frac{2.16\ pCi}{ug}\right)$$

= 0.0156 pCi

$$For\ U\text{-}238:\ \frac{(1\ ug)(0.9928\ ug\ U\text{-}238)}{ug\ U\text{-}Total}\left(\frac{3.36\ x\ 10^{-1}\ pCi}{ug}\right)$$

0.334 pCi

Notes: N/A

Visual Aids/Diagrams: None Included

0039

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SAMPLE CALCULATION 8

Title: **FREQUENCY OF DETECTION**

Explanation/Application:

Frequency of detection is the number of times the constituent was detected out of the total number of samples analyzed. This is a good indicator of the presence or absence of a consituent and identifying anomalous results.

Units, Variables, Constants, and Conversion Factors:

F = Frequency of detection
x = number of samples detected

Related Sections:

Section 4.0

Collateral Equation Source References:

N/A

Formula:

$$\text{Frequency of Detection} = \frac{\textit{Number of Samples Detected}}{\textit{Total Number of Samples Analyzed}}$$

Calculation:

RI/FS Pit 1 Materials
DATA: 13.4, 76.9, 92.3, 20.9, 1.3 U, 99.6
Frequency of detection = 5/6.

Notes: "1.3 U" indicates below the detection limit of 1.3.

Visual Aids/Diagrams: None Included.

000040

SAMPLE CALCULATION 9

Title: **RANGE OF DETECTION**

Explanation/Application:

The minimum and maximum detected values. The range is the simplest statistical parameter which describes the variation in observed data. The range is found by subtracting the smallest value from the largest. Range is used here to describe the limits of possible variations of concentrations.

Units, Variables, Constants, and Conversion Factors:

N/A

Related Sections:

Section 4.0

Collateral Equation Source References:

N/A

Formula:

Range = Smallest Value - Largest Value

Calculation:

RI/FS Pit 1 Materials
DATA: 13.4, 76.9, 92.3, 20.9, 1.3 U, 99.6
Range of Detection = 13.4 - 99.6

Notes: "1.3 U" indicates below the detection limit of 1.3

Visual Aids/Diagrams: None Included.

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SAMPLE CALCULATION 10

Title: SAMPLE DISTRIBUTION DETERMINATION

Explanation/Application:

Determination of the proper statistical analytical procedure hinges on the datasets being analyzed. The method of choosing the statistical analysis to determine constituents of potential concern and the calculation of the source term depend on the distribution of the data.

The distribution type (normal, lognormal, or other) is necessary to determine the upper confidence level. A histogram is constructed from the data set, which is visually inspected to determine if the distribution appears to be normal, lognormal, or other. In addition, a probability plot of the data set is constructed using a linear scale. If a straight line fits the plotted points reasonably well (highly correlated), a normal distribution is assumed. If the data do not follow a straight line on a linear probability plot, the data are replotted on a logarithmic probability plot. A quantitative determination of the "linearity" of the data is performed by calculating the correlation coefficient of the plotted points on the normal probability plot or on the lognormal probability plot. The type of distribution is selected from the plot with the higher correlation coefficient.

Units, Variables, Constants, and Conversion Factors:

N/A

Related Sections:

Section 4.0

Collateral Equation Source References:

Dixon, W. D. and Massey F. J. Jr., 1969, Introduction to Statistical Analyses, Third Edition, New York: McGraw-Hill.

Gilbert (1987), SYSTAT statistical software (SYSTAT, Inc., 1990).

Lilliefors, H. W., 1967, "On the Kulnogorov-Smirnov Test for Normality with Mean and Variance Unknown" Journal of American Statistical Association, Vol. 64, pp. 399-402.

Formula:

The nonparametric Kolmogorov-Smirnov test was used to assess the Normality or Lognormality of the data. See reference for more information and procedures.

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Calculation:

Generated with SYSTAT software.

Notes: None.

Visual Aids/Diagrams: None Included.

0043

SAMPLE CALCULATION 11

Title: **SAMPLE MEAN**

Explanation/Application:

The sample mean refers to the result obtained by dividing a sum by the number of quantities added. For analytical data, the detects are added with half the value of the contract required detection limit for nondetected values, then this sum is divided by the total number of samples analyzed for that particular constituent.

Units, Variables, Constants, and Conversion Factors:

None.

Related Sections:

Section 4.0

Collateral Equation Source References:

Gilbert (1987).

Formula:

$$\bar{X} = \frac{1}{n} \sum_{i=1}^{n} X_i$$

where

$\bar{x}$ = *sample mean*
n = number of samples
X_i = i_{th} sample result

Calculation:

RI/FS Pit 1 Pit Materials
DATA: 13.4, 76.9, 92.3, 20.9, 1.3 U, 99.6

$$\bar{x} = \frac{1}{6}(13.4 + 76.9 + 92.3 + 20.9 + 0.65 + 99.6)$$

$$= \frac{303.75}{6} = 50.6$$

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Notes: "1.3 U" indicates below the detection limit of 1.3. Since half the detection limit is used in the equations for nondetects, a value of 0.65 was used for the result of 1.3 U.

Visual Aids/Diagrams: None Included.

0045

SAMPLE CALCULATION 12

Title: UPPER 95% CONFIDENCE LEVEL (UCL) ON THE SAMPLE MEAN

Explanation/Application:

The UCL is used to estimate the source term concentration for individual constituents.

Units, Variables, Constants, and Conversion Factors:

N/A

Related Sections:

Section 4.0

Collateral Equation Source References:

Gilbert (1987).

Formula:

$$UCL_{95} = \bar{x} + t_{(.95,n-1)}\, x\, \frac{s}{\sqrt{n}}$$

where

n = *number of samples*
$\bar{x}$ = *sample mean concentration*
t = $(.95,n-1)$ = *percentage point the t distribution*
S = *sample standard deviation*

$$= \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

0046

Calculation:

RI/FS Pit 1 Materials
DATA: 13.4, 76.9, 92.3, 20.9, 1.3 U, 99.6

$\bar{x}$ = 50.6 (*see above*)
n = 6
$t_{(95,5)}$ = 2.015

$$S = \sqrt{\frac{1}{5}} \ x \ [(13.4 - 50.6)^2 + (76.9 - 50.6)^2 + (92.3 - 50.6)^2 + (20.9 - 50.6)^2 + (0.65 - 50.6)^2 + (99.6 - 50.6)^2]$$

$$= 43.8$$

$$UCL_{95} = 50.6 + 2.015 \ x \ \frac{43.8}{\sqrt{6}}$$

$$= 86.7$$

Notes: "1.3 U" indicates constituent below the detection limit of 1.3 and half the detection level is used in the equations for nondetects. Consequently, a value of 0.65 was used in the equation for the result 1.3 U.

Visual Aids/Diagrams: None Included.

0047

SAMPLE CALCULATION 13

Title: **CALCULATION TO DETERMINE THE AMOUNT OF U-238 A RECEPTOR TAKES IN VIA INHALATION ASSUMING U-238 PRESENT IS 1 pCi/m^3**

Explanation/Application:

The amount of contaminants inhaled, ingested, etc. are essential for calculating the risk to human health.

Variables, Constants, Conversion Factors:

I_{ai} = intake from inhalation (pCi)
C_{ai} = concentration in air (pCi/m^3)
IR = inhalation rate (m^3/hr)
ET = exposure time (hr/d)
EF = exposure frequency (d/y)
ED = exposure duration (y)

Citation Location:

Appendix E

Collateral Equation Source References:

Equations 7-5 and 7-6 from the FEMP Risk Assessment Work Plan Addendum (DOE 1992).

Formula:

$$(radionuclides)\ I_{ai} = (C_{ai})(IR)(ET)(EF)(ED)$$

where

I_{ai} = intake from inhalation (pCi)
C_{ai} = concentration in air (pCi/m^3) = 1 pCi/m^3
IR = inhalation rate (m^3/hr) = 0.83 m^3/hr
ET = exposure time (hr/d) = 5.7 hr/d
EF = exposure frequency (d/y) = 350 d/y
ED = exposure duration (y) = 70 y/lifetime

Calculation:

$$I_{ai} = (1\ \text{pCi/m}^3)(0.83\ \text{m}^3\text{/hr})(5.7\ \text{hr/d})(350\ \text{d/y})(70\ \text{y/lifetime})$$
$$I_{ai} = 115{,}909.5\ \text{pCi}$$

Notes:

N/A

Visual Aids/Diagrams:

None Included.

SAMPLE CALCULATION 14

Title: **COMPARISON OF SAMPLE POPULATIONS**

Explanation/Application:

A comparison of sample populatins was accomplished by comparing the site data versus background data with use of the Mann-Whitney U Test. The theory behind distribution independent Mann-Whitney procedure is that if the two datasets are from the same distribution (i.e. that the site data is in fact the same as background) then the ranked concentrations would be evenly distributed between each other. SYSTAT PC-based software (Systat, Inc.) was employed to calculate the probabilities that any observed difference may be attributable to random chance. A small probability would indicate that there is sufficient evidence to conclude that the two datasets were not drawn from the same population and conclude that the site data demonstrates a significantly increased level of contamination.

Units, Variables, Constants, and Conversion Factors:

N/A

Related Sections:

Section 4.0

Collateral Equation Source References:

Mendenhall and Scheaffer (1973), SYSTAT statistical software (SYSTAT, Inc., 1990).

Formula:

The non-parametric Mann-Whitney U test was used to compare site data to background data. See reference for more information and procedures.

Calculation:

Generated with SYSTAT software.

Notes: None.

Visual Aids/Diagrams: None Included.

SAMPLE CALCULATION 15

Title: CALCULATION TO DETERMINE THE AVERAGE ANNUAL RADON CONCENTRATION GIVEN QUARTERLY RESULTS

Explanation/Application:

Average radon concentration is necessary to determine the risk to potential receptors.

Units, Variables, Constants, and Conversion Factors:

n = *number of points*
$\bar{x}$ = *average*

Related Sections:

See Section 4.0 for discussion of average quarterly radon concentrations.

Collateral Equation Source References:

Gieck, Kurt and Reiner Gieck, 1990, Engineering Formulas 6th Edition, McGraw-Hill, Inc.

Selected Data from Terradex Radon Monitoring Report from 1992 Fernald Environmental Management Project by Environmental Monitoring and Surveilance.

Formula: $\bar{x} = (\frac{1}{h})\ X_1 + X_2 + ...+ X_n$

where

n = number of data points:

$$\text{Average Annual Concentration} = \frac{\textit{sum of Average Quarterly Concentrations}}{4}$$

Calculation:

From selected data of the Terradex Radon Monitoring Report

Year	OTR	Detector Location	Detector Serial Number	Average Concentration (pCi/L)
1991	1	AMS-01	974907	0.60
1991	2	AMS-01	980525	1.10
1991	3	AMS-01	980519	1.00
1991	4	AMS-01	978605	0.30

$$\text{Average Annual Radon at AMS-01} = \frac{0.60 + 1.10 + 1.00 + 0.30\ pCi/L}{4} = 0.75\ pCi/L$$

Notes: N/A

Visual Aids/Diagrams: None Included

SAMPLE CALCULATION 16

Title: CALCULATION USED TO DETERMINE CONCENTRATION RATIOS FOR THE BIOACCUMULATION OF RADIONUCLIDES BY PLANTS

Explanation/Application:

Bioaccumulation is the accumulation of chemicals by plants or animals directly from the medium in which they live. Food-chain transfer of contaminants represents a potential exposure route that should be addressed in assessing the ecological effects of a site. The processes involved in the accumulation and transfer of chemicals in food webs are complex, and it should be noted that direct comparison of concentration ratios is only appropriate in a general sense due to inter- and intraspecies differences in plant uptake, limited number of samples, the collection of different vascular structures and potential measurement biases relating to wet weight versus dry weight.

The concentration ratio (CR) is the ratio of the concentration of a contaminant in the organism to the contaminant concentration in the immediate environment (i.e., soil, water, sediments). For some terrestrial species CRs as little as 0.03 can be significant if the residue is very toxic. For other species, CRs greater than 300 can be considered significant. A CR greater than one, however, suggests potential bioaccumulation of radionuclides by plants.

Units, Variables, Constants, and Conversion Factors:

pCi/g = picoCuries/gram

Related Sections:

See Section 4.0 for discussion of concentration ratios.

Collateral Equation Source Reference:

U.S. EPA, 1989, Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual, Interim Final, EPA/540/1-89/001, Office of Emergency and Remedial Response, Washington, D.C.

Formula:

The CR is defined as follows:

$$CR = \frac{\textit{total contaminant concentration in sampled organism}}{\textit{total contaminant concentration in medium in which organism resides}}$$

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Calculation:

Sampling of a cattail leaf, and soil of the same site, results in the estimation of total isotopic uranium as follows:

Cattail Leaf	- 1.4 picoCuries per gram (pCi/g) dry weight
Soil	- 16.3 pCi/g dry weight

Determine the concentration ratio (CR)[b] for the organism of concern (i.e., the cattail leaf).

Step 1 Determine the concentration of the contaminant in the sampled organism of concern. The concentration of total isotopic uranium in the cattail is estimated as presented in the sample problem:

Cattail, total isotopic uranium = 1.4 pCi/g

Step 2 Determine the concentration of the contaminant in the environment of the organism. The concentration of total isotopic uranium in the immediate soil was estimated as presented in the same problem:

Soil, total isotopic uranium = 16.3 pCi/g

Step 3 The estimated CR for the organism of concern is therefore as follows:

$$CR = \frac{1.4\ pCi/g}{16.3\ pCi/g}$$

$$= \mathbf{0.09}$$

Thus the CR for the sampled organism and the medium in which it resides is defined as:

CR = 0.09

Notes: N/A

Visual Aids/Diagrams: None Included

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SAMPLE CALCULATION 17

Title: PADDYS RUN DILUTION SCREENING OF CPCS

Explanation/Application:

Potential constituents of concern (CPCs) that follow the surface water pathway through the Paddys Run stream bed to the Great Miami Aquifer (GMA) are first screened to remove those constituents that pose insignificant risk. This screening is performed by taking the Paddys Run modeled concentrations from the Modified Universal Soil Loss Equation (MUSLE), and applying a GMA dilution factor to this concentration to determine a theorectical GMA concentration. If the theorectical GMA concentration is less than the 10^{-7} risk based concentration or 0.1 hazard quotient for tap water, then the CPC is screened out and not modeled in the aquifer.

This screening step involves determining the GMA dilution factor by a mixing equation. The mixing equation is calculated from the flow rate from the minimum thickness block from SWIFT layer 1 (Upper GMA) in close proximity to the OU1 waste areas divided by the maximum mass loading as modeled by the MUSLE from Paddys Run after a 24-hour storm event.

Units, Variables, Constants, and Conversion Factors:

D = Dilution factor between Paddy Run and the GMA (gram/day)
Q = flow rate (gram/day)
V = Velocity (feet/day)
H = Thickness (feet)
W = Width (feet)
ρ = Density of water (1 gram/cm^3)
ϕ = Porosity (unitless)

Related Sections:

See Appendix D for further discussion and results.

Collateral Equation Source References:

See above discussion and formulas below.

Formula:

The dilution factor - mixing equation is given by:

$$D = Q_{PR}/Q_{GMA}$$

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where: Q_{GMA} = The upper GMA flow rate of the minimum thickness block from SWIFT layer 1 in close proximity to Operable Unit 1 along Paddys Run (gram/day)
Q_{PR} = The maximum mass loading from Paddys Run 24-hour storm event as modeled by MUSLE

The upper GMA flow rate is calculated from the following equation:

$$Q_{GMA} = (V_x^2 + V_y^2)^{0.5} (S_{GMA})(H)(W)(\rho)(\phi)(30.48)^3$$

Where:

V_x	=	Darcy velocity of the upper GMA in the x-direction as calculated by SWIFT (feet/day)
V_y	=	Darcy velocity of the upper GMA in the y-direction as calculated by SWIFT (feet/day)
S_{GMA}	=	Percentage of the upper GMA that is saturated (unitless)
H	=	Maximum thickness of the upper GMA (120 feet)
W	=	Width of SWIFT cell block (125 feet)
ρ	=	Density of water (1 gram/cm^3)
ϕ	=	Porosity of the upper GMA (0.25) (unitless)
$(30.48)^3$	=	Conversion factor from ft^3 to cm^3 (cm^3/ft^3)

Calculation:

For Uranium-238

$$Q_{GMA} = [(0.00824^2 \text{ feet/day}) + (0.03901^2 \text{ feet/day})]^{0.5} (0.27773)(120 \text{ feet})(125 \text{ feet})(1 \text{ gram/cm}^3)(0.25)(30.48)^3$$
$$= 1.176E+06 \text{ gram/day}$$

$$Q_{PR} = 1.0092E-01 \text{ gram/day}$$

$$D = 1.0092E-01 \text{ gram/day} / 1.176E+06 \text{ gram/day}$$
$$= 8.582E-08 \text{ gram/gram}$$

Notes: N/A

Visual Aids/Diagrams: None Included.

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SAMPLE CALCULATION 18

Title: **VERTICAL HYDRAULIC CONDUCTIVITY (VADOSE ZONE MODELING)**

Explanation/Application:

Vadose Zone Model (ODAST)

Estimates of the vertical hydraulic conductivity and layer thickness values are required for the vadose zone modeling. Since sand lenses exist within the clay till beneath the OU1 waste areas, the sand lenses are included in the derivation of vertical hydraulic conductivity. Layer thicknesses were scaled from conceptual cross sections of OU1 waste areas. An average water level in the Great Miami Aquifer of 523 feet above mean sea level in the vicinity of the OU1 waste areas was used.

Vadose Zone Layer 1

Vertical hydraulic conductivities values for the clay till in Vadose Zone Layer 1 were obtained by dividing the horizontal hydraulic conductivity values (representing the average results of slug tests conducted in 1000-series wells 1008, 1025, 1034, 1035 and 1079 which are in the vicinity of OU1) derived for each OU1 waste area by 10. Sand lenses which are present beneath Waste Pits 4, 5, 6 and the Burn Pit were also considered in the calculation using separate horizontal hydraulic conductivity values derived from slug test data collected from 1000-series wells completed in apparent sand lenses (wells 1185, 1186, 1196, 1199, 1208, 1209, 1212, 1213, 1224 and 1233) divided by 10. The factor of 10 represents a typical horizontal to vertical hydraulic conductivity ratio. The overall Vadose Zone Layer 1 vertical hydraulic conductivity was calculated from the harmonic mean for the clay and sand layer hydraulic conductivities.

Vadose Zone Layer 2

The vertical hydraulic conductivity for Vadose Zone Layer 2 was obtained by dividing the horizontal hydraulic conductivity for the Upper Great Miami Aquifer (450 feet/day) by 10.

Units, Variables, Constants, and Conversion Factors:

L = thickness in feet, K = hydraulic conductivity in feet/day

Related Sections:

See Appendix D for further discussion of vertical hydraulic conductivity and a listing of the vadose zone media parameters and results.

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Collateral Equation Source References:

Bear, J. and A. Verruijt, Model Groundwater Flow and Pollution, Theory and Applications of Transport in Porous Media, D. Reidel Publishing Company, Boston, MA, 1992.

Formula:

The harmonic mean is calculated using the following formula:

$$K_{effective} = (L_c + L_s) / (L_c/K_c + L_s/K_s)$$

Where:
- L_c = Thickness of the clay till in Vadose Zone Layer 1 (feet)
- L_s = Thickness of the sand lense in Vadose Zone Layer 1 (feet)
- K_c = Vertical hydraulic conductivity of the clay till in Vadose Zone Layer 1 (0.0114 feet/day)
- K_s = Vertical hydraulic conductivity of the sand lense in Vadose Zone Layer 1 (0.2474 feet/day)

Calculation:

For Waste Pit 4 Vadose Zone layer 1

Notes: N/A

Visual Aids/Diagrams: None Included

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SAMPLE CALCULATION 19

Title: **PERCENT URANIUM THAT IS U-238 IN OU1**

Explanation/Application:

ODAST and SWIFT modeling input uses Uranium-Total concentrations rather than individual uranium isotopes. therfore a mass average ratio of U-234, U-235, and U-238 for each OU1 area is based on the sum of the masses derived for each isotope using RI/FS or CIS data.

Units, Variables, Constants, and Conversion Factors:

Mass unit (M) = milligrams = mg
M_T = Total mass of U-234, U-235 and U-238 (mg)
R = Ratio of uranium isotope mass/M_T (%)

Related Sections:

See Appendix D for waste inventory (mass) and discussion regarding use of Uranium-Total for a simplified modeling application.

Collateral Equation Source References:

Simple addition and division.

Formula:

For Waste Pits 1 through 6, Burn Pit and Clearwell

$$M_T = \Sigma M_{U\text{-}234\ +\ U\text{-}235\ +\ U\text{-}238}$$

where M_T is the Total Mass of U-234, U-235 and U-238 for OU1

and

$$M_{U\text{-}234} = M_{U\text{-}234 \text{ for Pit 1}} + \dots + M_{U\text{-}234 \text{ for Clearwell}}$$

$$M_{U\text{-}235} = M_{U\text{-}235 \text{ for Pit 1}} + \dots + M_{U\text{-}235 \text{ for Clearwell}}$$

$$M_{U\text{-}238} = M_{U\text{-}238 \text{ for Pit 1}} + \dots + M_{U\text{-}238 \text{ for Clearwell}}$$

where M_U is sum of mass for all waste units for each isotope, so that the ratio of uranium isotope masses (%) for OU1 is

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$$R_{U-234} = M_{U-234}/M_T$$
$$R_{U-235} = M_{U-235}/M_T$$
$$R_{U-238} = M_{U-238}/M_T$$

Calculation:

For U-238

M_T =
1.6854E+08 mg of U-234 + 1.1284E + 11 mg of U-235 + 1.4874E+13 mg of U-238 = 1.4987E+13 mg

M_{U-238} =
1.9176E+12 mg in Pit 1 + 8.6270E+11 mg in Pit 2 + 8.0180E+11 mg in Pit 3 + 1.0231E+13 mg in Pit 4 + 1.9316E+11 mg in Pit 5 + 6.9766E+11 mg in Pit 6 + 1.4032E+11 mg in Burn Pit + 3.0344E+10 mg in Clearwell = 1.4874E+13 mg

R_{U-238} = 1.4874E+13 mg/1.4987E+13 mg = 99.246 %

Notes: N/A

Visual Aids/Diagrams: None Included

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SAMPLE CALCULATION 20

Title: RETARDATION FACTORS FOR URANIUM (SWIFT MODEL)

Explanation/Application:

The retardation factor (R_f) accounts for transport delays due to reversible reactions between the constituent and the vadose zone solid matrix. It is dependent upon both solute and medium characteristics, and is calculated as a function of the partitioning coefficient, the vadose zone bulk density and the vadose zone moisture content. The R_f can be expressed as the ratio between the rate of groundwater movement and the rate of contaminant movement.

Units, Variables, Constants, and Conversion Factors:

Milliliters (ml) are approximately equivalent to cubic centimeters (cm^3).

ρ = Bulk density (gram/cm^3)
K_d = Distribution coefficient (ml/gram)
M_c = Moisture content (%)

Related Sections:

See Appendix D for detailed discussion of retardation factors in fate and transport modeling and a listing of constituent retardation factors.

Collateral Equation Source References:

The R_f is calculated using the formula described by Walton (1984) and Mills et al. (1982).

Formula:

$R_f = 1 + [(\rho)(K_d)/M_c]$
where

R_f = Retardation factor (unitless)
K_d = Distribution coefficient of vadose zone material (ml/gram)
ρ = Bulk density equals 1.78 grams/cm^3 for vadose zone layer 1 and 1.60 grams/cm^3 for vadose zone layer 2
M_c = Moisture content equals 0.34 for vadose zone layer 1 and 0.26 for vadose zone layer 2

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Calculation:

For Uranium-238 in vadose zone layer 2

$$R_f = 1 + [(1.60 \text{ grams/cm}^3)(1.48 \text{ ml/gram})(0.26) = 10.1$$

Notes: N/A

Visual Aids/Diagrams: None Included.

SAMPLE CALCULATION 21

Title: **HYDRAULIC CONDUCTIVITIES IN MODEL LAYERS**

Explanation/Application:

Vadose Zone Model (ODAST)

Estimates of the vertical hydraulic conductivity and layer thickness values are required for the vadose zone modeling. Since sand lenses exist within the clay till beneath the OU1 waste areas, the sand lenses are included in the derivation of vertical hydraulic conductivity. Layer thicknesses were scaled from conceptual cross sections of OU1 waste areas and an average water level in the Great Miami Aquifer of 523 feet above mean sea level in the vicinity of the OU1 waste areas.

Vadose Zone Layer 1

Vertical hydraulic conductivities values for the clay till in Vadose Zone Layer 1 were obtained by dividing the horizontal hydraulic conductivity values (representing the average results of slug tests conducted in 1000-series wells 1008, 1025, 1034, 1035 and 1079 which are in the vicinity of OU1) derived for each OU1 waste area by 10. Sand lenses which are present beneath Waste Pits 4, 5, 6 and the Burn Pit were also considered in the calculation using separate horizontal hydraulic conductivity values derived from slug test data collected from 1000-series wells completed in apparent sand lenses (wells 1185, 1186, 1196, 1199, 1208, 1209, 1212, 1213, 1224 and 1233) divided by 10. The factor of 10 represents a typical horizontal to vertical hydraulic conductivity ratio. The overall Vadose Zone Layer 1 vertical hydraulic conductivity was calculated from the harmonic mean for the clay and sand layer hydraulic conductivities.

Vadose Zone Layer 2

The vertical hydraulic conductivity for Vadose Zone Layer 2 was obtained by dividing the horizontal hydraulic conductivity for the Upper Great Miami Aquifer (450 feet/day; see b1 below) by 10.

Aquifer Modeling (SWIFT)

Calibration of the groundwater flow model was performed by comparing hydraulic heads calculated by the model against heads measured in numerous monitoring wells throughout the FEMP and surrounding areas. Reasonable estimates of hydraulic conductivity and recharge were initially input into the model and then varied within an acceptable range to adjust model-computed heads into agreement with observed monitoring well heads.

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SWIFT Layers 1 and 2 (Upper Great Miami Aquifer)

Based on the results of model calibration, Layers 1 and 2 of the aquifer model were assigned horizontal hydraulic conductivity values of 450 ft/day.

SWIFT Layer 3 (Clay Interbed - Semiconfining layer)

Based on the results of the model calibration, Layer 3 was assigned a horizontal hydraulic conductivity value of 0.0003 ft/day.

SWIFT Layers 4 and 5 (Lower Great Miami Aquifer)

Based on the results of the model calibration, Layers 4 and 5 were assigned horizontal hydraulic conductivity values of 600 ft/day.

Units, Variables, Constants, and Conversion Factors:

L = Thickness is feet, K = Hydraulic conductivity in feet/day

Related Sections:

See Appendix D for further discussion of hydraulic conductivities in model layers and listing of vadose zone media parameters.

Collateral Equation Source References:

Bear, J. and A. Verruijt, Modeling Groundwater Flow and Pollution, Theory and Applications of Transport in Porous Media, D. Reidel Publishing Company, Boston, MA, 1992.

Formula:

The harmonic mean is calculated using the following formula:

$$K_{effective} = (L_c + L_s) / (L_c/K_c + L_s/K_s)$$

where

L_c = Thickness of the clay till in Vadose Zone Layer 1 (feet)
L_s = Thickness of the sand lense in Vadose Zone Layer 1 (feet)
K_c = Vertical hydraulic conductivity of the clay till in Vadose Zone Layer 1 (0.0114 feet/day)
K_s = Vertical hydraulic conductivity of the sand lense in Vadose Zone Layer 1 (0.2474 feet/day)

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Calculation:

For Waste Pit 4 Vadose Zone layer 1

$K_{effective}$ = (7.7 feet + 5.3 feet)/[7.7 feet/0.0114 feet/day) + (5.3 feet/0.2474 feet/day)] = 0.0186 feet/day

Notes: N/A

Visual Aids/Diagrams: None Included.

SAMPLE CALCULATION 22

Title: **INFILTRATION RATE BY HELP MODEL OR ANALYTICAL SOLUTION**

Explanation/Application:

To estimate source depletion and to calculate seepage velocity for the vadose zone modeling, leachate infiltration rates were calculated using either the Hydrologic Evaluation of Landfill Performance (HELP) Model (US EPA 1984) or an analytical solution using Darcy's Law for waste areas with standing water (Waste Pits 5, 6 and the Clearwell).

a. HELP Model

The HELP Model is a quasi-two-dimensional hydrologic model of water movement across, into, through and out of a waste unit. HELP modeling for OU1 included separate runs for Waste Pits 1 through 4 and the Burn Pit. The soil physical parameters and the design data used in the simulations were varied for each waste unit to reflect the varying conditions of each unit. In general, layers were defined for an earth cover (if present), pit waste material, clay liner (if present), glacial till, and the upper Great Miami Aquifer sands. Permeabilities, soil physical parameters and design data were defined based on the Waste Pit Contents Study (Parsons 1993).

HELP was run to "steady state", that is until successive simulations showed no appreciable change in the moisture content in any of the layers. HELP results presented as infiltration rates are provided on Table D.3-2 of Appendix D. Infiltration rates varied from 2.8 inches/year for the Burn Pit to 10.7 inches/year for Waste Pit 4.

b. Ponded Calculations

Because the HELP model was unable to perform calculations in cases where standing water existed, a simple application of Darcy's Law in one dimension was used to calculate the flow rate for Waste Pits 5, 6 and the Clearwell.

It was assumed that conditions beneath a waste pit with standing water would be saturated until the bottom of the first restrictive (low hydraulic conductivity) layer (clay liner if present) and would be unsaturated beneath this restrictive layer. The gradient was calculated as the difference in head between the water surface and the bottom of the restrictive layer divided by the length of the saturated material. The effective hydraulic conductivity was calculated as the harmonic mean of the hydraulic conductivity of the waste and liner layers.

The infiltration rates values as calculated above ranged from 10.1 inches/year in the Clearwell to 23.5 inches/year in Waste Pit 6. The higher infiltration rates for the ponded cases is consistent with the fact that the head produced by the surface water would result in increased infiltration rates.

Units, Variables, Constants, and Conversion Factors:

q = Flow rate (feet/day)
K = Hydraulic conductivity (feet/day)
H = Total head = $L + H_p$ (feet)
L = Length of saturated material (feet)
H_p = Depth of pond liquid (feet)
L_i = Depth of the individual layers (feet)

Related Sections:

HELP model input parameters and HELP model and ponded calculation descriptions and results are further discussed in Appendix D.

Collateral Equation Source References:

HELP Model - U.S. EPA, 1984; ponded calculations (Darcy's equation) - Bear, J. and A. Verruijt, Modeling Groundwater Flow and Pollution, Theory and Applications of Transport in Porous Media, D. Reidel Publishing Company, Boston, MA, 1992.

Formula:

HELP model input parameters and model description are further discussed in Sections D.3.3.1 and D.3.6 of Appendix D. Model calculations are not presented here.

For ponded calculations, the following application of Darcy's Law was used:

$$q = (K_{eff})H/L$$

where

q = Flow rate (feet/day)
K_{eff} = Effective hydraulic conductivity (feet/day)
H = Total head = $L + H_p$ (feet)
L = Length (thickness) of saturated material (feet)
H_p = Depth of pond liquid (feet)

The effective hydraulic conductivity was calculated as the harmonic mean of the hydraulic conductivity of the waste and liner layers for each waste unit as follows:

$$K_{eff} = \Sigma L_i / \Sigma (L_i/K_i)$$

where

L_i = Length (thickness) of the individual layers (feet)
K_i = Saturated hydraulic conductivity of individual layer (feet/second)

Calculation:

For the Clearwell where the depth of the Clearwell is 11 feet and the depth of the clay liner is 1 foot, so that

K_{eff} = (11 feet for Clearwell) + (1 foot for clay liner)/ [(11 feet/3.281E-08 feet/second) + (1 foot/3.281E-09 feet/second)]
= 1.875E-08 feet/second

q = (1.875E-08 feet/second)(12 feet + 5 feet)/(12 feet) = 2.656E-08 feet/second (12 inches/foot)(31,536,000 seconds/year)
= 10.05 inches/year

Notes: N/A

Visual Aids/Diagrams: None Included.

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SAMPLE CALCULATION 23

Title: CRITICAL RETARDATION FACTORS FOR TRANSPORT TO GMA

Explanation/Application:

Potential constituents of concern (COCs) are screened in several ways to eliminate constituents that pose insignificant risk from further analysis. The screening steps are performed because vadose zone and aquifer modeling require long computational times and to allow the analysis to focus on the constituents that cause the highest percentage of risk.

Potential COCs are screened based upon travel time to determine those that would not reach the Great Miami Aquifer (GMA) within 1,000 years in significant concentrations under conservative conditions. Any constituent that fails to reach the GMA in 1,000 years is screened out.

The mean travel time (t_m) in years for a non-decaying COC is the sum of the travel time through vadose zone layer 1 and layer 2, as follows

$$t_m = R_1L_1/V_1 + R_2L_2/V_2$$

A characteristic dispersion parameter is D_L/VL which will be referred to as N_D. Depending on N_D, a fraction, M, can be multiplied by t_m to give a time before which exiting concentrations will be negligible. Consequently, if Mt_m is set at 1,000 years, exiting concentrations prior to 1,000 years will be negligible. This analysis is conservative in that one-dimensional flow is assumed, and any depletion by biodegradation or decay is ignored. Table D.3-8 of Appendix D shows the input assumptions for the OU1 waste areas.

The retardation factor accounts for transport delays due to reversible reactions between the constituent and the vadose zone solid matrix. It is dependent upon both solute and medium characteristics, and is calculated as a function of the partitioning coefficient and the vadose zone bulk density and moisture content.

Units, Variables, Constants, and Conversion Factors:

Variables that are used in the screening step are:

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R_f	=	Retardation Factor for COCs in the Vadose Zone layers (unitless)
V	=	Soil Seepage Velocity (feet/day)
L	=	Soil Thickness between COC Concentration and Aquifer (thickness of vadose zone layer 1 or layer 2) (feet)
q	=	Infiltration rate (feet/day)
K_s	=	Saturated hydraulic conductivity for vadose zone layers (0.02636 for layer

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		1; 45 for layer 2) (ft/day)
1/2b+3=		Soil dependent parameter (0.039 for layer 1; 0.09 for layer 2) (unitless)
ρ	=	Porosity of vadose zone layers (unitless)
D	=	Axial Dispersion Coefficient (ft^2/day)
N_D	=	Characteristic Dispersion Parameter (unitless)
M	=	Brenner Multiplier (unitless)
t_m	=	Mean Travel Time (years)
ρ	=	Bulk density of vadose zone material ($gram/cm^3$)
K_d	=	Distribution coefficient for COC in vadose zone material (ml/gram)
M_c	=	Moisture content of vadose zone material (%)
K_{oc}	=	Sediment/water partition coefficient (ml/gram)
X_{oc}	=	Organic carbon content of vadose zone material (%)
F	=	Fines passing through < 200 mesh (%)
K_{oc}	=	$K_{ow}(0.63)$
K_{ow}	=	Octanol-water partition coefficient for vadose zone material (ml/gram)
X_{oc}	=	1% for vadose zone layer 1 and 0.5% for vadose zone layer 2
F	=	70% for vadose zone layer 1 and 16% for vadose zone layer 2

Related Sections:

See Appendix D for further discussion of the screening process and results of the travel time screening.

Collateral Equation Source References:

K_{ow}
Aquatic Fate Process Data for Organic Priority Pollutants (Final Report) 1982

Handbook of Environmental Fate and Exposure Data for Organic Chemicals (Volume II, solvents), Philip H. Howard, copyright 1990

Superfund Public Health Evaluation Manual, EPA 540/1-86/060

Handbook of Environmental Fate and Exposure Data for Organic Chemicals (Volume III, pesticides), Philip H. Howard, copyright 1991

Handbook of Environmental Fate and Exposure Data for Organic Chemicals (Volume I, Large Production and Priority Pollutants), copyright 1989

Estimating Exposure to Dioxin-like Compounds; Review Draft

Handbook of Chemical Property Estimation Methods, ACS, Washington, D.C., 1980

R_f and K_d - Mills et al, 1985.

D - Fate and Transport Modeling Transition Report (Parsons February 1993)

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M - "The diffusion model of longitudinal mixing in beds of finite length numerical values" by Howard Brenner; Chemical Engineering Science, 1962, Vol. 17, pp. 229-243.

Formula:

The mean travel time (t_m) in years for a non-decaying COC is

$$t_m = R_{f1}L_1/V_1 + R_{f2}L_2/V_2$$

The soil seepage velocity (V) for each vadose zone layer is calculated from:

$$V = q^{(1-1/2b+3)} K_s^{(1/2b+3)}$$

The dispersion coefficient (D) is calculated from:

$$D = 6.458E\text{-}04 + 0.14V^{1.11}$$

where D must be given in ft^2/day.

A characteristic dispersion parameter is D_L/VL which will be referred to as N_D.

$$N_D = D/VL$$

Depending on N_D, a fraction, M, can be multiplied by t_m to give a time negligible. Consequently, if Mt_m is set at 1,000 years, exiting concentrations prior to 1,000 years will be negligible.

Thus, if Mt_m is less than 1,000 years, then the COC will reach the GMA and will require further modeling.

Where

$$Mt_m = (M_1)R_{f1}L_1/V_1 + (M_2)R_{f2}L_2/V_2$$

The retardation factor for each constituent is calculated for vadose zone layer 1 and layer 2 as follows:

$$R_f = 1 + [(\rho)(K_d)/M_c]$$

where

$R_{f1,2}$ = Retardation factor for layer 1 or 2 (unitless)
ρ = Bulk density of vadose zone material (gram/cm^3)
K_d = Distribution coefficient of vadose zone material (ml/gram)
M_c = Moisture content of vadose zone material (%)

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and where

ρ = 1.78 grams/cm^3 for vadose zone layer 1 and 1.60 grams/cm^3 for vadose zone layer 2
M_c = 0.34 for vadose zone layer 1 and 0.26 for vadose zone layer 2

The distribution coefficient is calculated from:

$$K_d = 0.2(K_{oc})(X_{oc})(1 + 4F)$$

where

K_{oc} = Sediment/water partition coefficient (ml/gram)
X_{oc} = Organic carbon content of vadose zone material (%)
F = Fines passing through < 200 mesh (%)

and where

K_{oc} = $K_{ow}(0.63)$
K_{ow} = Octanol-water partition coefficient for vadose zone material (ml/gram)
X_{oc} = 1% for vadose zone layer 1 and 0.5% for vadose zone layer 2
F = 70% for vadose zone layer 1 and 16% for vadose zone layer 2

Calculation:

For tetrachlorethene in Waste Pit 1

$$K_{d2} = 0.2(339 \text{ ml/gram})(0.63)(0.005)(1 + 4(0.16))$$
$$= 0.3503 \text{ ml/gram}$$

$$R_{f2} = 1 + [(1.60 \text{ gram/cm}^3)(0.3503 \text{ ml/gram})/0.26)]$$
$$= 3.16$$

$$V_1 = 7.491\text{E-}04^{\ (1-0.039)} \text{ ft/day } (0.02636^{0.039} \text{ ft/day})/0.34$$
$$= 2.531\text{E-}03 \text{ ft/day}$$

$$D_1 = 6.458\text{E-}04 + 0.14(2.531\text{E-}03)^{1.11}$$
$$= 8.29\text{E-}04 \text{ ft}^2\text{/day}$$

$$N_{D1} = 8.29\text{E-}04 \text{ ft}^2\text{/day} / [(2.531\text{E-}03 \text{ ft/day})(2.0 \text{ ft})$$
$$= 0.1638$$

where L_1 is 2.0 feet

$$Mt_m = 9.5(0.1)(2.0 \text{ ft}) / (2.531\text{E-}03 \text{ ft/day}) + [3.16(0.5)(24.3 \text{ ft}) / (5.171\text{E-}03 \text{ ft/day})]$$
$$= 8{,}175.56 \text{ days (year/365 days)}$$

= 22.40 years which is less than 1,000 years, therefore tetrachlorethene requires further modeling

where R_{f1} is 9.5, R_{f2} is 3.16; M_1 is 0.1, M_2 is 0.5; L_2 is 24.3 feet; and V_2 is 5.171E-03 ft/day.

Notes: N/A

Visual Aids/Diagrams: None Included.

0073

SAMPLE CALCULATION 24

Title: **CRITICAL RETARDATION FACTORS FOR TRANSPORT TO FENCE LINE**

Explanation/Application:

Potential constituents of concern (COCs) are screened in several ways to eliminate constituents that pose insignificant risk from further analysis. The screening steps are performed because vadose zone and aquifer modeling require long computational times and to allow the analysis to focus on the constituents that cause the highest percentage of risk.

Potential COCs are screened based upon travel time to determine those that would not reach the Great Miami Aquifer (GMA) within 1,000 years in significant concentrations under conservative conditions. Any constituent that fails to reach the GMA in 1,000 years is screened out.

However, for potential COCs that were screened out that have been detected in groundwater in selected 2000-series wells in the vicinity of OU1 above background levels, an additional travel time screening was performed to determine whether these constituents reached to nearest FEMP property boundary (fence line) above background levels in 1,000 years. This screening step involves calculating a critical retardation factor (R_{crit}) and comparing it to the constituent retardation factor (R_f). If R_{crit} is greater than R_d this indicates the potential COC reaches the FEMP fence line within 1,000 years and requires further modeling.

Units, Variables, Constants, and Conversion Factors:

V	=	Groundwater flow velocity (feet/day)
K_h	=	Average horizontal hydraulic conductivity (feet/day)
I	=	Hydraulic gradient (0.000769 feet/foot)
n	=	Average effective porosity (unitless)
L	=	Travel distance (feet)
TT	=	Travel time to FEMP fence line (years)
R_{crit}	=	Critical retardation factor (unitless)

Related Sections:

The critical retardation factors and the results of the travel time screening are presented in Appendix D.

Collateral Equation Source References:

Groundwater flow velocity equation from Freeze and Cherry (1979, p.71).

Formula:

Travel time calculations to the fence line were performed as follows:

$$V = (K_h)I/n$$

where

V	=	Groundwater flow velocity (feet/day)
K_h	=	Average horizontal hydraulic conductivity of the upper GMA (450 feet/day)
I	=	Hydraulic gradient from OU1 to the FEMP fence line (0.000769 feet/foot)
n	=	Average effective porosity of the GMA (0.25)

As scaled from a site map, the travel distance (L) from OU1 to the fence line is 3,250 feet. Therefore, travel time to the fence line (TT in years) is:

$$TT = L/V$$

where

TT	=	Travel time to FEMP fence line (years)
L	=	Travel distance from OU1 to FEMP fence line (feet)

and the critical retardation factor R_{crit} is:

$$R_{crit} = 1{,}000 \text{ years}/TT$$

Calculation:

V = 450 feet/day (0.000769 feet/foot)/0.25
= 1.3842 feet/day (365 days/year)
= 505.23 feet/year
TT = L/V = 3250 feet/505.23 feet/year = 6.43 years

R_{crit} = 1,000 years/TT = 1000 years/6.43 years = 155

Notes: N/A

Visual Aids/Diagrams: None Included.

4788

SAMPLE CALCULATION 25

Title: NUMBER OF HALF LIVES PAST BEFORE REACHING GMA

Explanation/Application:

Potential constituents of concern (COCs) are screened in several ways to eliminate constituents that pose insignificant risk from further analysis. The screening steps are performed because vadose zone and aquifer modeling require long computational times and to allow the analysis to focus on the constituents that cause the highest percentage of risk.

Potential COCs are screened based upon travel time to determine those that would not reach the Great Miami Aquifer (GMA) within 1,000 years in significant concentrations under conservative conditions. Any constituent that fails to reach the GMA in 1,000 years is screened out. A second screening step involves comparing the organic or radiological decay constants for potential COCs to the calculated travel time to the GMA. If a constituent has gone through 30 or more half lives during this travel time, then it is screened out of further modeling due to the negligible mass remaining.

Units, Variables, Constants, and Conversion Factors:

$T_{1/2}$	=	Constituent half life (days)
λ	=	decay constant (1/day)
t_m	=	Travel time (day)
R_f	=	Constituent retardation factor (unitless)
L	=	Thickness (feet)
V	=	Groundwater velocity (feet/day)

Related Sections:

See Appendix D for further discussion of the half life screening, results of the screening, and input assumptions for the OU1 waste areas in performing the screening.

Collateral Equation Source References:

Half life equation from M.P. Anderson and W.W. Woessner, Applied Groundwater Modeling, Simulation of Flow and Advective Transport, Academic Press, Inc., NY, 1992, page 326.

Travel time equation from H. Brenner, "The Diffusion Model of Longitudinal Mixing in Beds of Finite Length Numerical Values", Chemical Engineering Science, 1962, Vol 17., pp 229-243.

Formula: 0076

For the half life screening, a half life for each potential COC is calculated from the organic or radiological decay constant as follows:

$$T_{1/2} = \ln 2/\lambda$$

where

$T_{1/2}$ = Constituent half life (days)
λ = Organic or radiological decay constant (1/day)

then, a travel time to the GMA is calculated from:

$$t_m = [R_{f1}(L_1/V_1)] + [R_{f2}(L_2/V_2)]$$

where

t_m = Travel time (day)
R_{f1} = Constituent retardation factor for vadose zone layer 1 (unitless)
L_1 = Thickness of vadose zone layer 1 (feet)
V_1 = Groundwater velocity in vadose zone layer 1 (feet/day)
R_{f2} = Constituent retardation factor for vadose zone layer 2 (unitless)
L_2 = Thickness of vadose zone layer 2 (feet)
V_2 = Groundwater velocity in vadose zone layer 2 (feet/day)

and if $t_m/30$ is less than $T_{1/2}$ then the constituent is further modeled (ie. the minimum travel time divided by 30 is less than the half life of the constituent which indicates it reaches the aquifer in significant mass to be considered for further modeling).

Calculation:

For Technetium-99 in Waste Pit 1

$$T^{1/2} = \ln 2/8.916\text{E-09 decays per day} = 7.774\text{E+07 days}$$

and

$$t_m = [1.62(2.00 \text{ feet}/2.531\text{E-03 feet per day})] + [1.43(24.30 \text{ feet}/5.171\text{E-03 feet per day})] = 8001 \text{ days}$$

and

$t_m/30$ = 266.7 days which is less $T_{1/2}$, and therefore passes the screening step.

Notes: N/A

Visual Aids/Diagrams: None Included.

0077

SAMPLE CALCULATION 26

Title: SOLUBILITY LIMIT BY EQ3/6 MODEL

Explanation/Application:

Mineral solubility calculations were performed to estimate leachate compositions using the EQ3/6 computer code and thermodynamic data on mineral solubilities. The calculation of contaminant concentrations from mineral solubility data was restricted to inorganic chemicals and radionuclides, as thermodynamic data for organic constituents are unavailable. Mineral solubility calculations were performed with the EQ3/6 industry-standard geochemical computer code. EQ3/6 was developed at Lawrence Livermore National Laboratory (Wolery 1983; Wolery and Daveler 1989) for predicting the behavior of metals, radionuclides, and other contaminants in the natural environment. The EQ3/6 computer code performs solubility and speciation (aqueous form) calculations and reaction-path modeling. These calculations involve the simultaneous solution of equations describing the mass balance of each component, mass action expressions for solubility equilibrium, oxidation/reduction reactions, and electrical balance constraints. Activity coefficients of aqueous species are approximated with the B-dot equation of Helgeson (1969), which are valid up to the ionic strength of seawater (about 0.7). None of the leachate samples modeled for OU1 waste units exceeded an ionic strength of 0.2.

The EQ3/6 code accesses a data base containing the thermodynamic properties of 78 elements, 862 aqueous species, 886 minerals, and 76 gases. This data base includes 57 aqueous uranium species and 160 uranium-bearing minerals, constituting the most complete data base available for modeling the behavior of uranium in natural waters. EQ3/6 has been validated using standard geochemistry problems, such as the speciation of seawater (Nordstrom 1979), basalt/seawater interactions (Bowers et al. 1985), and numerous comparisons with experimentally determined mineral solubilities (Jackson 1988). Benchmark comparisons with the results of similar codes (e.g., PHREEQE) have been performed by INTERA (1983), Nordstrom (1979), Kincaid and Morey (1984), and Kerrisk (1981).

EQ3 is the portion of the code that calculates the initial aqueous species distribution with user- provided concentration data and computes the saturation indices (SI) of pertinent minerals. The SI is defined as log (Q/K), where Q equals the ion activity product and K equals equilibrium constant. An SI of greater than zero, zero, and less than zero corresponds to a mineral that is supersaturated, saturated, and undersaturated, respectively. After computing the speciation model, EQ3 computes a mass balance for each chemical element and performs a charge balance. This information is stored in a file that is used as input to EQ6. EQ3 differs from EQ6 in that EQ3 identifies minerals that are supersaturated and undersaturated, but (unlike EQ6) EQ3 cannot precipitate and dissolve the pertinent minerals.

The EQ6 code performs reaction-path calculations. Reaction-path (chemical evolution) modeling simulates a sequence of thermodynamic equilibrium problems in reacting systems consisting of water and minerals or other solids. The reacting system may consist of water that migrates through, and equilibrates with, waste solids and natural minerals in compositionally distinct horizons. For this case, rainwater reacts with OU1 waste to form Leachate A followed by migration and reaction with underlying glacial overburden minerals to form Leachate B. The chemical evolution of the reacting system is driven by dissolution and precipitation of minerals or solids and/or by changes in temperature and pressure. Along each step of the reaction path, the EQ6 code computes the precipitation and dissolution of minerals based on mass action expressions for solubility equilibrium with water. Thus, EQ6 differs from EQ3 by allowing supersaturated minerals (SI greater than 0) to precipitate from solution and undersaturated minerals (SI less than 0) to dissolve.

Units, Variables, Constants, and Conversion Factors:

See Appendix D.

Related Sections:

Appendix D

Collateral Equation Source References:

See above for model references.

Formula:

Description of model is provided in lieu of actual calculations performed by the model.

Calculation: N/A

Notes: None included.

4788

SAMPLE CALCULATION 27

Title: **VADOSE ZONE TRANSPORT BY ODAST MODEL**

Explanation/Application:

The model selected to evaluate flow in the vadose zone was ODAST (Javendel et al. 1984). ODAST, a one-dimensional analytical solution, was used for determining fate and transport of the constituents not previously screened out in the unsaturated zone. This computer code is based on the solution originally developed by Ogata and Banks (1961) and calculates the normalized concentrations of a given constituent in a uniform flow field from a source having a constant or varying concentration in the initial layer. ODAST evaluates the basic one-dimensional analytical solute transport equation as a function of seepage velocity, dispersion coefficient, source decay, retardation factor, depletion time, and source rate. ODAST has been extensively verified against STRIP1B (Batu 1989).

The ODAST model implements an analytical solution to the partial differential equation

$$D\frac{\partial^2 C}{\partial x^2} - V\frac{\partial C}{\partial x} - \lambda RC = R\frac{\partial C}{\partial t}$$

where
C = solute concentration (mass/volume)
and with the constant coefficients
D = dispersion coefficient (length^2/time)
V = seepage velocity (length/time)
R = retardation factor (dimensionless)
λ = solute decay factor (time^{-1})

The solution must satisfy the initial and boundary conditions

$$C(x,0) = 0$$

$$-D\frac{\partial C}{\partial x} + VC\Big|_{x=0} = \begin{cases} VC_o\, e^{-\alpha t} & 0 \le t \le \tau_o \\ 0, & t > \tau_o \end{cases}$$

$$\frac{\partial C}{\partial x}\Big|_{x\to\infty} = 0$$

where the constants
C_o = initial source concentration (mass/vol)
α = source depletion factor (time^{-1})
τ_o = source depletion time (time)

0080

The solution is obtained using a Laplace transform technique and involves products of exponential and complementary error functions (Javandel et al. 1984). The solution for C is divided by C_0 to yield normalized concentrations.

Because the coefficients in the governing equation are constant and the solution must satisfy a zero concentration gradient condition as x approaches infinity, ODAST is only strictly applicable to one-dimensional transport in homogeneous, semi-infinite media. However, the present application of ODAST is intended only to provide conservative estimates of aquifer mass loading histories.

ODAST is run only for those constituents whose top layer retardation factors are lower than the estimated critical retardation factor determined with the screening of potential COCs. Model runs can be executed for only one COC at a time, and the solution may be applied over any arbitrary segment of a waste area that is judged to contain an unchanging subsurface. A superposition technique is used to combine calculations for the two homogeneous layers comprising the vadose zone conceptual model. The ODAST solution at the bottom of layer 1 is divided into 1,000 small time steps and a layer 2 run is performed for each of these steps. Each of these layer 2 runs assumes no source decay, a recharge period 1/1,000 of the total modeling time, and a source concentration equal to the averaged layer 1 solution for that time period. The solution at the bottom of layer 2 is obtained by summing the results of the 1,000 layer 2 runs at specified time steps. For RI/FS modeling, concentrations are calculated up to 1,000 years, typically in steps of 20 years. Constituents that migrate quickly, such as organics, require smaller time steps for accurate representation of loading curves.

ODAST requires a formatted ASCII file containing the input parameters for a particular problem. Likewise, output is contained in a single formatted ASCII file. The unit conventions for the input file parameters are: specified calculation times and source depletion time are expressed in years, all other parameters use days, and any consistent length scale may be used.

The first parameters appearing in the input file are specifications of the values of the independent variables for which the calculations are desired. These include the number of x positions, number of times, and the actual x positions (measured positive downward from the top of the layer) and times. Because concentrations are required at the bottom of the layer, only one x position, representing layer thickness, is used. Layer thicknesses vary among and within the waste areas and are obtained from interpolated measurements at the FEMP. As previously stated, times up to 1,000 years in 20 year increments are normally used. The number of times may be greater and increments smaller if the constituent migrates rapidly.

The final line of the input file contains the waste area, solute, and medium dependent parameters. In order of appearance in the file, they are the dispersion coefficient, seepage velocity, retardation factor, source depletion time, solute decay factor, and source depletion factor.

0081

See page velocity and the dispersion coefficient depend upon the characteristics of the waste area and the vadose zone medium. Seepage velocity is calculated as an empirical function of the percolation rate obtained from the HELP model, saturated hydraulic conductivity, and porosity (US EPA 1988). The dispersion coefficient is obtained as an empirical function of seepage velocity (Biggar and Nielsen 1976).

The retardation factor accounts for transport delays due to reversible reactions between the chemical constituent and the vadose zone solid matrix. It is thus dependent on both solute and medium characteristics, and is calculated as a function of the constituent's partitioning coefficient and the vadose zone bulk density and moisture content (Walton 1984 and Mills et al. 1985).

The solute decay factor is constituent dependent only. This parameter accounts for biodegradation in organics and radioactive decay in radionuclides, and is zero for stable inorganics (ASI/IT 1992b).

Source depletion time and factor control the mass flux history of the constituent at the top of the modeled layer. As can be seen from the upstream boundary condition, source mass flux decays exponentially. To calculate depletion time and factor for the waste at the top of layer 1, the time dependent expression for mass flow from the source is integrated from zero to the source depletion time. This integral is equated to the depleted mass of the constituent to provide a single equation in two unknowns. A second equation is obtained by arbitrarily specifying a mass depletion fraction. This is the level (very close to, but less than one) at which the source is declared depleted; technically, the source is depleted only as time approaches infinity. As stated previously, depletion factor is zero and depletion time is 1/1,000 of the total modeling time for the layer 2 runs.

For the 1,000-year scenario, the projected concentration of the leachate entering the Great Miami Aquifer beneath the waste area was calculated by multiplying the normalized concentration at the base of the lowest layer by the source term (initial contaminant concentration at the source). The loading rates were calculated by multiplying the projected concentration beneath the waste area by the volumetric recharge rate from the source. The plots of loading rates versus time were then produced for the constituents which were projected to reach the aquifer within 1,000 years. The peak values in these plots were considered as the maximum loading rates to be observed in the aquifer for the contaminants over 1,000 years.

Units, Variables, Constants, and Conversion Factors:

N/A

Related Sections:

Appendix D

0082

4788

Collateral Equation Source References:

See Above.

Formula:

See above for model references.

Calculation:

N/A

Notes: N/A

Visual Aids/Diagrams: None Included.

0083

SAMPLE CALCULATION 28

Title: SATURATED ZONE TRANSPORT BY SWIFT MODEL

Explanation/Application:

Aquifer modeling was performed on both COCs defined for the vadose zone pathway and COCs from the surface water pathway (Paddys Run).

Groundwater modeling for the OU1 risk analysis was performed with the calibrated groundwater flow model for the FEMP. This model utilizes the Sandia Waste-Isolation Flow and Transport Model (SWIFT) (Geotrans 1987) and was previously calibrated using groundwater elevations obtained during the April 1986 monitoring period.

The groundwater modeling program was initiated to define groundwater transport in and around the FEMP. The selection, verification, calibration, and results of groundwater modeling are presented in two separate reports (IT 1990 and DOE 1990), and in the Groundwater Modeling Report - Summary of Model Development (DOE 1993). The groundwater model used in support of the risk analysis is a finite-difference computer model of groundwater flow and solute transport. The computer program used is SWIFT/386 Version 2.51. A comprehensive verification study of the SWIFT code has been completed and a report issued (IT 1990). A detailed presentation of the model, its development, and the baseline input data was issued as a part of the overall modeling report prepared under the RI/FS (DOE 1990) and revised and issued as a separate report (DOE 1993). Only the most pertinent information is presented here.

Steps in the development of the model for application to the FEMP have included:

- Construction and calibration of a regional, two-dimensional, steady-state groundwater flow model

- Construction and calibration of a regional, three-dimensional, steady-state groundwater flow model

- Application of a local, two-dimensional, analytical solute transport model to help strategize the numerical solute transport model

- Construction of a local, two-dimensional, transient solute transport model

- Construction and calibration of a local, three-dimensional, transient solute transport model with uranium concentration data from the monitoring wells.

The regional model covers an area of 28.7 square miles (74.3 km^2), including the FEMP, the Southern Ohio Water Company (SOWC) collector wells, and a portion of the Great Miami River. The regional model's grid spacing varies between 250 feet and 2,000 feet (76 m and 610 m), and has the closest grid spacing in the area of the SOWC collector wells. It was calibrated against field data using a steady-state flow condition and calibration results were incorporated into the local area model.

The local model covers a smaller area than the regional model and uses a tighter grid spacing, with grid cells 125 feet (38 m) on a side. The smaller grid was established to include the area of the existing uranium plume, and extends from the northern part of the FEMP to approximately 1,500 feet (460 m) north of the Great Miami River (Figure D.3-12). The grid size was selected based on the need to simulate a uranium dispersivity of 100 feet (30 m) longitudinally, which was the preferred value based on literature review (IT 1990). Using this dispersivity value, the grid size was selected to accommodate dispersivity values as low as 62.5 feet (19 m), or half the distance of the local grid area of 125 feet (38 m). The relationship between the local and regional models was established by imposing the steady-state flow field predicted by the regional model onto the local solute transport model.

The regional and local models each contain five layers. These layers are conceptually shown in Figure D.3-4. The uppermost two layers represent the upper and lower parts of the upper Great Miami Aquifer that underlies the area. The middle layer represents a clay interbed that is present in the immediate vicinity of the FEMP site, and the lowermost two layers represent the upper and lower parts of the Great Miami Aquifer. In regions where the clay interbed is not present, the middle layer has the same characteristics as the upper two layers. The layers extend laterally into bedrock to the edges of the buried valley that contains the aquifer. The number of aquifer cells in each layer was decreased with depth in the aquifer to simulate the narrowing bedrock valley. This was done using bedrock topography maps of the region and simulated the U-shaped buried valley which contains the Great Miami Aquifer.

Pumping wells are located in the area spanned by both the regional and local models. These include a FEMP production well (there are four total, but only one pumps significant quantities of water) and three industrial wells located south of the FEMP site in both models. Pumping from each of these wells was assigned to the proper cell and layer in the model. In addition, the regional model also simulates the presence of two large capacity collector wells owned by the SOWC located by the Great Miami River. Although they are not directly included in the local model, they do influence its results by way of the boundary conditions brought in from the regional model.

The calibration of the groundwater flow model was performed by comparing hydraulic heads calculated by the model against heads measured in numerous monitoring wells throughout the FEMP and surrounding areas. This calibration was performed using the regional flow model. Reasonable estimates of hydraulic conductivity and recharge were initially input into the model and then varied within an acceptable range to adjust model-computed heads into agreement with observed monitoring well heads.

The model used varying hydraulic conductivity values for the five layers based on the results of the calibration. The uppermost and middle layers were assigned hydraulic conductivity values of 450 feet per day (140 m/day), and the lowermost layers used 600 feet per day (180 m/day). In addition, a portion of the middle layer which underlies the FEMP was assigned 0.0003 feet per day (9×10^{-5} m/day) as a hydraulic conductivity value to represent the clay interbed (as shown by geologic borings). This simulated the presence of a low permeability clay and created a semi-confining layer underneath part of the FEMP and its surrounding area.

Recharge rates set as a result of the regional model calibration were assigned to several different zones. In areas where the sand and gravel aquifer is overlain by glacial overburden, a recharge of 6 inches per year (0.15 m/yr) was used. Regions where the Great Miami Aquifer is exposed at the surface use 14 inches per year (0.36 m/yr), with Paddys Run channel being assigned a value of 32 inches per year (0.81 m/yr) in the local model to simulate its increased infiltration. An additional region, the area covered by the FEMP was also included as a consequence of the sensitivity analysis. This region was assigned a value of 2 inches per year (0.05 m/yr) to simulate the developed nature of the site and the effects of storm water drainage into the storm sewer system.

Groundwater flow conditions simulated by the model were successful and reproduced the observed flow conditions throughout the study area. Based on water levels from 55 wells, the arithmetic mean residual (observed head minus calculated head at the monitoring well) for the calibrated flow model was 0.33 feet (0.1 m). The excellent match portrayed by this residual value is realized when compared to a total change in hydraulic head of approximately 20 feet (6.1 m) over the modeling area. The mean of the absolute values of the residuals was 1.08 feet (0.33 m), with a standard deviation of 1.36 feet (0.41 m). Water balances performed using the model showed total inflow and total outflow from the model to agree within 0.2 percent.

000086

To maintain hydraulic similarity between the regional and local flow models, a computer program was used to check, cell by cell, the correspondence of heads in the local model with heads in the regional model. The program verified that the regional flow model calibration was preserved in the local model which was used for solute transport; thus, no new flow calibration was necessary. The local model used hydraulic parameters identical to those used in the calibrated regional model. Boundary conditions for the local model were set from corresponding cells in the regional model to maintain the hydraulic similarity.

The calibrated groundwater flow model for the FEMP is used to simulate the solute transport of the compounds in the Great Miami Aquifer. Based on the aquifer loading rates derived from the vadose zone modeling, loading periods are defined for each compound to reduce the amount of data entry required. Saturated flow modeling for the OU1 risk analysis was initiated by dividing each of the loading curves generated by the vadose zone modeling into loading periods. In general, loading periods range from 10 to 200 years in length and were defined in direct proportion to the changes in loading rates for each compound. Thus, compounds with steady loading rates have long loading periods, while compounds with variable loading rates use short loading periods. This allows the simulation of short loading "spikes" while at the same time minimizing data input and run times. Loading rates for each period were calculated by averaging the results of the vadose zone modeling over the length of each period. In this way, total mass inflow into the aquifer was maintained. Compounds are simulated for a total of 1,000 years in the Great Miami Aquifer or until their concentrations reduce below 1 microgram per liter ($\mu g/\ell$).

Loading rates were assigned to each of the potential source areas in the model and were adjusted to account for the varying surface area occupied by each waste area. Model source areas were calculated by dividing the area of the actual source by the area of a model grid cell, which is 125 feet (38 m) on a side (a total of 15,625 square feet [1450 m^2]). This defined the number of cells needed for each source area in the model as shown in Table D.3-13. Cells in the model were then assigned to each source area to correspond with the physical location of the source. The loading rate for each compound was then divided by the number of model cells in each source area to derive the adjusted loading rate for each cell in the source area.

In the case of U-234, U-235, and U-238, all three uranium isotopes were modeled as one compound to simplify the modeling and to allow the use of the previously calibrated total-uranium solute transport model. Because the previous model utilizes total-uranium and because the uranium at the FEMP is mostly U-238 (approximately 99 percent by mass), this approach was used.

Initial background concentrations of each compound in the aquifer were set at zero. The model simulations for the OU1 COCs used dispersivity values of 100 feet (30 m) longitudinal and 10 feet (3 m) in the transverse direction. These values were determined during the solute transport calibration for uranium and are based on values taken from literature review (DOE 1990 and Walton 1985). Distribution coefficients (Kd) and decay factors for simulated compounds were also taken from literature review and are shown in Table D.3-14.

Model simulations were performed using SWIFT/386 on a Powerbox PC microcomputer. Simulation execution times varied between 18 and 37 hours and required extensive computing capacity. Output was written to a single file from which relevant data was extracted using data manipulation programs written for that purpose.

Units, Variables, Constants, and Conversion Factors:

N/A

Related Sections:

Appendix D

Collateral Equation Source References:

See Above.

Formula:

See above for model references.

0088

Calculation:

Description of model is provided in lieu of actual calculations performed by the model.

Notes: N/A

Visual Aids/Diagrams: None Included.

0089

4788

SAMPLE CALCULATION 29

Title: **SURFACE RUNOFF BY MUSLE**

Explanation/Application:

The soil loss model, MUSLE, obtained from the US EPA "Superfund Exposure Assessment Manual," (US EPA 1988b), was used to model the amount of contaminated soil migrating to Paddys Run from erosion by precipitation runoff. The MUSLE model calculates the total mass of soil transported by surface water in a single rainfall event using event-specific runoff volume, storm duration, and flow rate variables.

The MUSLE model is based on the following assumptions:

- Constituents adsorbed to soils in runoff remain adsorbed in the stream sediments.
- Constituents dissolved in runoff water remain in the water column in the receiving stream.

Units, Variables, Constants, and Conversion Factors:

$Y(s)_E$	=	Soil loss in runoff (metric tons per event)
CF	=	Conversion factor (11.8 for metric units)
V_r	=	Volume of runoff (m^3)
q_p	=	Peak runoff flow rate (m^3/s)
K	=	Soil erodibility factor (metric tons/hectare [ha]/unit R_T)
LS	=	Product of slope length factor and slope steepness factor (0.25, unitless)
C	=	Cover factor (unitless)
P	=	Erosion control practice factor (unitless)
CF	=	Conversion factor (100 for metric units)
A	=	Contaminated surface area (ha)
Q_r	=	Depth of runoff (cm)
R_t	=	Depth of rainfall event (cm)
S_w	=	Soil water retention factor (cm)
CN	=	SCS runoff curve number (unitless)
T_r	=	Rainfall duration (hours)

0090

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Related Sections:

See Appendix D for further discussion of MUSLE modeling and model variables and values.

Collateral Equation Source References:

Superfund Assessment Exposure Manual (EPA 1988b). See individual references listed with equations.

Formula:

The MUSLE model is based on the following equation.

$Y(s)_E = (CF)[(V_r)(q_p)]^{0.56})(K)(LS)(C)(P)$ (Williams 1975)

The MUSLE employs event-specific runoff volume and flow rate variables:

$Y(s)_E$	=	Soil loss in runoff (metric tons per event)
CF	=	Conversion factor (11.8 for metric units)
V_r	=	Volume of runoff (m^3)
q_p	=	Peak runoff flow rate (m^3/s)
K	=	Soil erodibility factor (metric tons/hectare [ha]/unit R_T)
LS	=	Product of slope length factor and slope steepness factor (0.25, unitless)
C	=	Cover factor (unitless)
P	=	Erosion control practice factor (unitless)

Intermediate parameters V_r and q_p are calculated by:

$V_r = (CF)(A)(Q_r)$ (Mills et al., 1982)

where

$Q_r = (R_t - 0.2S_w)^2/(R_t + 0.8S_w)$ (Mockus 1972)

and

$S_w = (2.54)[(1000/CN)-10]$ (Mockus 1972)

q_p is calculated by

$q_p = [(0.028)(A)(R_t)(Q_r)]/[(T_r)(R_t - 0.2\ S_w)]$ (Haith 1980)

0091

For the calculations of V_r and q_p:

CF	=	Conversion factor (100 for metric units)
A	=	Contaminated surface area (ha)
Q_r	=	Depth of runoff (cm)
R_t	=	Depth of rainfall event (cm)
S_w	=	Soil water retention factor (cm)
CN	=	SCS runoff curve number (unitless)
T_r	=	Rainfall duration (hours)

Based on these values, the calculated soil loss $Y(s)_E$ is 0.53 metric tons per event for the OU1 area.

Calculation:

$S_w =$ (2.54)x[(1000/71)-10] = 10.4

$Q_r =$ $(6.35\text{ cm} - (0.2)\text{x}10.4\text{ cm})^2/(6.35\text{ cm} + (0.8)\text{x}10.4\text{ cm})$
$Q_r =$ 1.25 cm

$V_r =$ (11.8)x(17.2 hectares)x(1.25 cm)
$V_r =$ 253.7 m^3

$q_p =$ [(0.028)x(17.2 hectares)x(6.35 cm)x(1.25 cm)]/[(24 hours) x (6.35 cm - 0.2 x (10.4 cm))]
$q_p =$ 0.04 m^3/s

Notes: N/A

Visual Aids/Diagrams: None Included.

0092

SAMPLE CALCULATION 30

Title: SEDIMENT CONCENTRATIONS

Explanation/Application:

Sediment concentrations were calculated using the computer model MUSLE which was obtained from the US EPA "Superfund Exposure Assessment Manual," (US EPA 1988b). This model computes the portion of contaminant from the eroded soil that remains with the sediment or is dissolved in the water.

This model is based on the following assumptions:

- Constituents adsorbed to soils in runoff remain adsorbed in the stream sediments.
- Constituents dissolved in runoff water remain in the water column in the receiving stream.

Units, Variables, Constants, and Conversion Factors:

S_s	=	Available quantity of contaminant absorbed to sediment (g)
M_s	=	Available quantity of contaminant dissolved in water (g)
θ_c	=	Available water capacity in top cm of soil (unitless)
K_d	=	Chemical-specific sorption partition coefficient (cm^3/g)
ρ	=	Bulk soil density (g/cm^3)
C_i	=	Concentration of contaminant in soil (mg/kg)
A'	=	Contaminated volume (ha-cm)
CF	=	Conversion factor (100 $kg/mg \cdot cm^2/ha$)
C_s	=	Concentration of contaminant in sediment (mg/kg)
PX_i	=	Absorbed quantity of contaminant (g)
PQ_i	=	Dissolved substance available per event (g)
$Y(s)_E$	=	Soil loss in runoff (metric tons per event)
Q_r	=	Depth of runoff (cm)
R_t	=	Depth of rainfall event (cm)

0093

Related Sections:

See Appendix D for further discussion of sediment concentration determination, model variables and values, and sediment concentrations.

Collateral Equation Source References:

Superfund Assessment Exposure Manual (EPA 1988b). See individual references listed with equations.

Formula:

The portion of contaminant from the eroded soil that remains with the sediment or is dissolved in the water is estimated using the following equations, respectively:

$S_s = [1/(1+\theta_c/(K_d \cdot \rho))]\ (C_i)(\rho)(A')(CF)$ (Haith 1980)

and

$M_s = [1/(1+(K_d \cdot \rho)/\theta_c)](C_i)(\rho)(A')(CF)$ (Haith 1980)

where

S_s	=	Available quantity of contaminant absorbed to sediment (g)
M_s	=	Available quantity of contaminant dissolved in water (g)
θ_c	=	Available water capacity in top cm of soil (unitless)
K_d	=	Chemical-specific sorption partition coefficient (cm^3/g)
ρ	=	Bulk soil density (g/cm^3)
C_i	=	Concentration of contaminant in soil (mg/kg)
A'	=	Contaminated volume (ha-cm)
CF	=	Conversion factor (100 $kg/mg \cdot cm^2/ha$)

The mass of absorbed contaminant in the source area is:

$PX_i = [Y(S)_E/100(\rho)(A')](S_s)$ (Haith 1980)

The contaminant concentration in sediment of the receiving water body is:

$C_s = PX_i/Y(s)_E$ (DOE 1993a)

where

C_s = Concentration of contaminant in sediment (mg/kg)
PX_i = Absorbed quantity of contaminant (g)
$Y(s)_E$ = Soil loss in runoff (metric tons per event)

The mass of dissolved contaminant from the source area is:

$$PQ_i = M_s(Q_r/R_t) \qquad \text{(Haith 1980)}$$

where

PQ_i = Dissolved substance available per event (g)
Q_r = Depth of runoff (cm)
R_t = Depth of rainfall event (cm)

Calculation:

the example calculations were calculated for antimony

S_s = [1/(1 + 0.15/(2.5E+02 ml/g x 1.48 g/cm^3))] x (27.2 mg/kg) x (1.48 g/cm^3) x (17.2 hectares) x (100)

S_s = 69.21E+03 g

M_s = [1/(1+(2.5E+02 ml/g x 1.48 g/cm^3)/0.15)] x (27.2 mg/kg) x (1.48 g/cm^3) X (17.2 hectares) x (100)

M_s = 28.1 g

PX_i = [0.53 metric tons per event)/(100 X 1.48 g/cm^3 x 17.2 hectares)] x 69.2E+03 g

PX_i = 14.4 g

C_s = 14.4 g/0.53 = 27.2 mg/kg

PQ_i = 28.1 g x (1.25 cm/6.35 cm) = 5.5 g

Notes: N/A

Visual Aids/Diagrams: None Included.

0095

SAMPLE CALCULATION 31

Title: SURFACE WATER RUNOFF CONCENTRATIONS

Explanation/Application:

The soil loss model, MUSLE, obtained from the US EPA "Superfund Exposure Assessment Manual," (US EPA 1988b), is used to model the amount of contaminated soil migrating to Paddys Run from erosion by precipitation runoff. The MUSLE model calculates the total mass of soil transported by surface water in a single rainfall event using event-specific runoff volume, storm duration, and flow rate variables.

Additional equations were used to describe contaminant partitioning between soil and water in the runoff flow. These partitioning equations provide an estimate of the contaminant concentration dissolved in water runoff and adsorbed to the soil that is carried with the runoff and deposited in the sediment of receiving surface water bodies (Haith 1980; Mills et al. 1982). The volume of runoff is also estimated to determine both the amount that stream flow may be increased by a runoff event, and to estimate dissolved contaminant loading. The depth of runoff is calculated as a function of the depth of rainfall and a soil water retention factor. In effect, the amount of water retained by the soil is subtracted from the total amount of rainfall and the remainder is available as runoff flow. A certain amount of rainfall, depending on soil conditions, is required before any runoff occurs. The dissolved contaminant concentration in the receiving stream is estimated as a simple dilution of runoff concentration by the flow in the stream.

These models are based on the following assumptions:

- Constituents adsorbed to soils in runoff remain adsorbed in the stream sediments.

- Constituents dissolved in runoff water remain in the water column in the receiving stream.

Units, Variables, Constants, and Conversion Factors:

PQ_i	=	Dissolved substance available per event (g)
C_e	=	Concentration of contaminant in runoff (g/m^3)
V_r	=	Volume of runoff (m^3)

Related Sections: 0096

See Appendix D for further discussion of surface water runoff concentrations, model variables, and Paddys Run concentrations.

Collateral Equation Source References:

OU4 Remedial Investigation (DOE 1993a)

Formula:

The contaminant concentration in the runoff effluent is:

$$C_e = PQ_i/V_r$$

where

PQ_i	=	Dissolved substance available per event (g)
C_e	=	Concentration of contaminant in runoff (g/m^3)
V_r	=	Volume of runoff (m^3)

Calculation:

For antimony in surface soil:

$$C_e = 5.53 \text{ g}/2146 \text{ m}^3 = 0.0026 \text{ g/m}^3$$

Notes: N/A

Visual Aids/Diagrams: None Included.

0097

SAMPLE CALCULATION 32

Title: **DILUTION FACTOR BY PADDY'S RUN**

Explanation/Application:

The soil loss model, MUSLE, obtained from the EPA "Superfund Exposure Assessment Manual," (US EPA 1988b), was used to model the amount of contaminated soil migrating to Paddys Run from erosion by precipitation runoff. The MUSLE model calculates the total mass of soil transported by surface water in a single rainfall event using event-specific runoff volume, storm duration, and flow rate variables.

These models are based on the following assumptions:

- Constituents adsorbed to soils in runoff remain adsorbed in the stream sediments.
- Constituents dissolved in runoff water remain in the water column in the receiving stream.

As part of this model, the dilution factor of Paddys Run was computed.

Units, Variables, Constants, and Conversion Factors:

C_w = Concentration of contaminant in water downstream (mg/L)
C_e = Concentration of contaminant in runoff (g/m^3)
Q_e = Average effluent flow rate (V_r/T_r; m^3/hr)
Q_t = Flow rate of receiving water body (m^3/hr)

Related Sections:

See Appendix D for further discussion of dilution of contaminants in Paddys Run, model variables, and Paddys Run concentrations.

0098

Collateral Equation Source References:

OU4 Remedial Investigation (DOE 1993a)

Formula:

The contaminant concentration in the receiving water body (Paddys Run) downstream is:

$$C_w = (C_e)(Q_e)/(Q_t + Q_e)$$

where

C_w	=	Concentration of contaminant in water downstream (mg/L)
C_e	=	Concentration of contaminant in runoff (g/m^3)
Q_e	=	Average effluent flow rate (V_r/T_r; m^3/hr)
Q_t	=	Flow rate of receiving water body (m^3/hr)

Calculation:

For antimony in surface soil:

$$C_w = (2.57E\text{-}03\ g/m^3 \times 2146/24\ m^3/hr)/(410\ m^3/hr + 2146/24\ m^3/hr)$$

$$C_w = 4.60E\text{-}04\ g/m^3 = 4.60E\text{-}04\ mg/L$$

Notes: N/A

Visual Aids/Diagrams: None Included.

0099

4788

SAMPLE CALCULATION 33

Title: **DILUTION FACTOR BY GREAT MIAMI RIVER**

Explanation/Application:

The soil loss model, MUSLE, obtained from the US EPA "Superfund Exposure Assessment Manual," (US EPA 1988b), was used to model the amount of contaminated soil migrating to Paddys Run from erosion by precipitation runoff. The MUSLE model calculates the total mass of soil transported by surface water in a single rainfall event using event-specific runoff volume, storm duration, and flow rate variables.

These models are based on the following assumptions:

- Constituents adsorbed to soils in runoff remain adsorbed in the stream sediments.
- Constituents dissolved in runoff water remain in the water column in the receiving stream.

As part of this model, the dilution factor of the Great Miami River was computed.

Units, Variables, Constants, and Conversion Factors:

Cgmr	=	Concentration of contaminant in the Great Miami River (mg/L)
Q_t	=	Flow rate of Paddys Run (m^3/hr)
Qgmr	=	Flow rate of the Great Miami River (m^3/hr)

Related Sections:

See Appendix D for further discussion of dilution of contaminants in the Great Miami River, model variables, and Great Miami River concentrations.

0100

Collateral Equation Source References:

OU4 Remedial Investigation (DOE 1993a).

Formula:

The contaminant concentration in the Great Miami River is estimated by:

$$Cgmr = (C_w)(Q_t)/(Qgmr + Q_t)$$

where

Cgmr	=	Concentration of contaminant in the Great Miami River (mg/L)
Q_t	=	Flow rate of Paddys Run (m^3/hr)
Qgmr	=	Flow rate of the Great Miami River (m^3/hr)

An average flow rate of 340,000 m^3/hr was used for the Great Miami River. For modeling purposes, it was assumed that all flow and contaminant mass in Paddys Run empties into the Great Miami River.

Calculation:

Cgmr = (4.65E-04 mg/L) x (410 m^3/hr)/(340,000 m^3/hr + 410 m^3/hr)
Cgmr = 5.6E-7 mg/L

Notes: N/A

Visual Aids/Diagrams: None Included.

0101

SAMPLE CALCULATION 34

Title: QUANTITY OF DRY WASTE IN PITS BY WEIGHT

Explanation/Application:

The concentration of radionuclides, inorganic and organic contaminants in Tables 4.1.1.A through 4.1.8.C are reported in pCi/g, mg/kg, and µg/kg, respectively. Waste material volumes are reported in cubic yards. These volumes are required to be converted to kilograms unit for the generation of the total weight of contaminants in each pit.

Units, Variables, Constants, and Conversion Factors:

kg	=	kilogram
yd^3	=	cubic yard
ft^3	=	cubic feet
lb	=	pound
pCi/g	=	picoCuries/gram
mg/kg	=	milligrams/kilogram
µg/kg	=	micrograms/kilogram

Related Sections:

Chapter 4.0 (Tables 4.1.A, 4.1.B, 4.1.C)

Collateral Equation Source References:

Sample Calculation 1, "Waste Pit Areas and Volumes"
Appendix A of this report
Appendix C, Tables C-1 through C-8 in "Feasibility Study Report for Operable Unit 1, Task 15," report dated April 1991

Formula:

Waste material (in cubic yards) is used in the calculation to estimate the total weight of contaminants in each pit. Waste material is assumed to be "wet."

Cover material and liner material are not included in the calculation.

Total waste quantity in pits is calculated as followed:

$$M = (V \times SG \times F) / (1 + Wa/100) \quad \text{(equation 1)}$$

where:

- M = Total dry waste quantity in each pit (kg)
- V = Volume of waste in pit (yd^3) (from Sample Calculation 1)
- SG = Specific gravity of waste in pit, refer to the notes section below for the specific gravity values of all pits
- F = Conversion factor [27 (ft^3/yd^3) x 62.4 lb/ft^3 x 0.454 (kg/lb)]
- Wa = Water content (%) (weight of water / dry weight) (refer to the notes section below for the water content values of all pits)
- H = Weight of water

Equation 1 is derived from:

(Wa/100)	=	weight of water (H) / dry weight (M)
(Wa/100) x M	=	H
H + M	=	wet weight = V x SG or
(Wa/100) x M + M	=	V x SG
M (Wa/100 + 1)	=	V x SG
M	=	(V x SG) / (1 + Wa/100)

Calculation:

1. Total waste mass in Waste Pit 1:

   Example of total waste quantity in Waste Pit 1:

   (48,500 yd^3 x 3.04 x 27 ft3/yd3 x 62.4 lb/ft^3 x 0.454 kg/lb) / (1 + 22.4/100) = 92,137,858 kg

2. Total waste mass other waste pits:

   The same calculation is applied to other waste pits. A summary of total waste quantity in pits is shown in Table F.2.34.1.

TABLE F.2.34.1
SUMMARY OF TOTAL WASTE QUANTITY IN PITS

Pit No.	Wet Waste Volume (yd^3)	Dry Waste (kg)
1	48,500	92,137,858
2	24,200	17,515,000
3	204,100	235,071,000
4	55,100	98,591,000
5	97,900	117,626,000
6	9600	16,806,000
Burn Pit	30,300	67,772,000
Clearwell	3700	2,892,000

0104

4788

Notes:

Averaged specific gravity and water content of wastes in Waste Pits 1, 2, 3, 4, and Burn Pit are based on data from Appendix A of this report. Specific gravity and water content of wastes in Waste Pits 5 and 6 are based on data from Appendix C in "Feasibility Study Report for Operable Unit 1, Task 15 Report," dated April 1991. Specific gravity and water content of wastes in Clearwell are based on data from Ecotek Lab Report, 1992. A summary of these data is shown in Table F.2.34.2.

TABLE F.2.34.2
SUMMARY OF GEOTECHNICAL DATA

Pit No.	Specific Gravity	(Wa) Water Content (%)	Source
1	3.04	22.4	Appendix A
2	2.62	176.9	Appendix A
3	2.62	74	Appendix A
4	3.02	29.1	Appendix A
5	2.43	54.7	OU1 FS, 1991
6	2.87	25.4	OU1 FS, 1991
Burn Pit	3.74	27.9	Appendix A
Clearwell	1.44	40.9	Ecotek Lab Report, 1992

Visual Aids/Diagrams:

Not applicable

0105

SAMPLE CALCULATION 35

Title: ESTIMATED RADIONUCLIDES QUANTITY IN SOLID WASTE PITS

Explanation/Application:

Total weight of radiological contaminants in each pit is essential for the evaluation of remedial actions, and material handling and disposal purposes.

Units, Variables, Constants, and Conversion Factors:

Ci = Curies (1 Curie = 10^{12} picoCuries)
pCi = picoCuries
g = gram
kg = kilogram

Related Sections:

Chapter 4.0 (Tables 4.1.1.A to 4.1.8.A)

Collateral Equation Source References:

Sample Calculation 1, "Waste Pit Areas and Volumes"

Sample Calculation 34, "Quantity of Dry Waste in Pits By Weight"

Appendix C, Tables C-1 through C-8 in "Feasibility Study Report for Operable Unit 1, Task 15 Report," April 1991

Formula:

Total radionuclides quantity in pits are calculated as followed:

0106

$$Ws = M \times C \times F$$

where:

Ws = Total radionuclides quantity in pits (kg)

M = Total dry waste in pit (kg)
(from Sample Calculation 34)

C = Concentration of contaminants (pCi/g of dry waste)

F = Conversion factor (1000 g/kg x Ci/10^{12} pCi)

Calculation:

1. Estimated radionuclides quantity in Waste Pit 1

Example of calculation of cesium-137 quantity in Waste Pit 1:

Ws = 92,137,858 kg x 0.64 pCi/g x 1000 g/kg x Ci/10^{12} pCi = 0.06 Ci

2. Estimated radionuclides quantity in other waste pits:

The same calculation is applied to other waste pits.

Quantities of all radionuclides in pits are summarized in Tables 4.1.1.A through 4.1.8.A.

Notes:

Not applicable

Visual Aids/Diagrams:

Not applicable

0107

SAMPLE CALCULATION 36

Title: ESTIMATED INORGANICS (METALS) QUANTITY IN SOLID WASTE PITS

Explanation/Application:

Total weight of metals in each pit is essential for the evaluation of remedial actions, and material handling and disposal purposes.

Units, Variables, Constants, and Conversion Factors:

g = gram
mg = milligram
µg = microgram
kg = kilogram

Related Sections:

Chapter 4.0 (Tables 4.1.1.B to 4.1.8.B)

Collateral Equation Source References:

Sample Calculation 1, "Waste Pit Areas and Volumes"

Sample Calculation 34, "Quantity of Dry Waste in Pits by Weight"

Appendix C, Tables C-1 through C-8 in "Feasibility Study Report for Operable Unit 1, Task 15 Report," April 1991

Formula:

Total metal quantity in pits are calculated as followed:

0108

$$Ws = M \times C \times F$$

where:

Ws = Total metals quantity in pits (kg)
M = Total dry waste in pit (kg)
(from Sample Calculation 34)
C = Concentration of metal (mg/kg)
F = Conversion factor (kg/10^6 mg)

Calculation:

1. Estimated metal quantity in Waste Pit 1:

   Example of calculation of Antimony quantity in Waste Pit 1:

   $Ws = 92{,}137{,}858 \text{ kg} \times 49 \text{ mg/kg} \times \text{kg}/10^6 \text{ mg} = 4515 \text{ kg}$

2. Estimated metal quantity in other waste pits:

   The same calculation is applied to other waste pits.

   Quantities of all metals in waste pits are summarized in Tables 4.1.1.B to 4.1.8.B.

Notes:

Not applicable

Visual Aids/Diagrams:

Not applicable

0109

SAMPLE CALCULATION 37

Title: **ESTIMATED ORGANICS QUANTITY IN SOLID WASTE PITS**

Explanation/Application:

Total weight of organics in each pit is essential for the evaluation of remedial actions, and material handling and disposal purposes.

Units, Variables, Constants, and Conversion Factors:

g = gram
mg = milligram
μg = microgram
kg = kilogram

Related Sections:

Chapter 4.0 (Tables 4.1.1.C to 4.1.8.C)

Collateral Equation Source References:

Sample Calculation 1, "Waste Pit Areas and Volumes"

Sample Calculation 34, "Quantity of Dry Waste in Pits by Weight"

Appendix C, Tables C-1 through C-8 in "Feasibility Study Report for Operable Unit 1, Task 15 Report," dated April 1991

Formula:

Total quantity of organics in pits are calculated as followed:

$$Ws = M \times C \times F$$

0110

where:

Ws = Total organic quantity in pits (kg)

M = Total dry waste in pit (kg)
(from Sample Calculation 34)

C = Concentration of organic (μg/kg)

F = Conversion factor (kg/10^9 μg)

Calculation:

1. Estimated furans quantity in Waste Pit 1:

Example of calculation of 2,3,7,8-TCDF quantity in Waste Pit 1:

$$Ws = 92{,}137{,}858 \text{ kg} \times 3.3 \ \mu g/kg \times kg/10^9 \ \mu g = 0.30 \text{ kg}$$

2. Estimated organics quantity in other waste pits:

The same calculation is applied to other waste pits.

Quantities of all organics in waste pits are summarized in Tables 4.1.1.C to 4.1.8.C.

Notes:

Not applicable

Visual Aids/Diagrams:

Not applicable

0111

SAMPLE CALCULATION 38

Title: RADIOLOGICAL AND CHEMICAL PARAMETERS

Explanation/Application:

This section contains tables of radiological and chemical parameters described in Section 2.

Units, Variables, Constants, and Conversion Factors:

N/A

Related Sections:

Section 2.0

Collateral Equation Source References:

N/A

Formula:

N/A

Calculation:

N/A

Notes: None.

Visual Aids/Diagrams: None Included.

0112

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TABLE F-2.38.1

RADIOLOGICAL PARAMETERS

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling
Actinium-227			
Cerium-144			
Cesium-134			
Cesium-137	X	X	X
Gross Alpha		X	X
Gross Beta		X	X
Lanthanum-138			
Lead-210			
Molybdenum-99			
Neptunium-237	X		X
Plutonium-238	X	X	X
Plutonium-239/240	X	X	X
Plutonium-242			X
Polonium-210			
Potassium-40			X
Protactinium-231			
Radium Total			
Radium-224			
Radium-226	X	X	X
Radium-228	X	X	X
Rubidium			
Ruthenium-106	X	X	X
Strontium-90	X	X	X
Technetium-99	X	X	X
Thorium			
Thorium-228	X	X	X
Thorium-230	X	X	X
Thorium-232	X	X	X
Thorium-234			
Thorium-Total		X	X
Uranium			
Uranium-234	X	X	X
Uranium-235	X		
Uranium-235/236		X	X
Uranium-236			

0113

TABLE F-2.38.1
(Continued)

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling
Uranium-238	X	X	X
Uranium-Total		X	X
Ytterbium			

TABLE F-2.38.2

HERBICIDE PARAMETERS

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling
2,4,5-T	X	X	X
2,4,5-TP (Silvex)	X	X	X
2,4-D	X	X	X
Alachlor			
Atrazine			
Cyanazine			
Dinoseb		X	X
Linuron			
Metolachlor			
Metribuzin			
Simazine			

TABLE F-2.38.3
DIOXIN/FURAN PARAMETERS

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling
1,2,3,4,6,7,8-HpCDF		X	
1,2,3,4,6,7,8-HpCDD		X	
1,2,3,4,7,8,9-HpCDF		X	
1,2,3,4,7,8-HxCD		X	
1,2,3,4,7,8-HxCDF		X	
1,2,3,6,7,8-HxCDF		X	
1,2,3,6,7,8-HxCDp		X	
1,2,3,7,8,9-HxCDF		X	
1,2,3,7,8,9-HxCDp		X	
1,2,3,7,8-PeCDF		X	
1,2,3,7,8-PeCDp		X	
2,3,4,6,7,8-HxCDF		X	
2,3,4,7,8-PeCDF		X	
2,3,7,8-TCD		X	
2,3,7,8-TCDF		X	
HEPTACHLORODIBENZO-p-DIOXIN			
HEPTACHLORODIBENZOFURAN			
HEXACHLORODIBENZO-p-DIOXIN			
HEXACHLORODIBENZOFURAN		X	
OCTACHLORODIBENZO-P-DIOXIN		X	
OCTACHLORODIBENZOFURAN		X	
PENTACHLORODIBENZO-p-DIOXIN		X	
PENTACHLORODIBENZOFURAN		X	
TETRACHLORODIBENZO-p-DIOXIN		X	
TETRACHLORODIBENZOFURAN		X	

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TABLE F-2.38.4
METAL PARAMETERS

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling
ALUMINUM	X	X	X
ALUMINUM (Dissolved)			
ANTIMONY	X	X	X
ANTIMONY (Dissolved)			
ARSENIC	X		X
ARSENIC (Dissolved)			
BARIUM	X	X	X
BARIUM (Dissolved)			
BERYLLIUM	X	X	X
BERYLLIUM (Dissolved)			
BORON		X	
CADMIUM	X	X	X
CADMIUM (Dissolved)			
CALCIUM	X	X	X
CALCIUM (Dissolved)			
CHROMIUM	X	X	X
CHROMIUM (Dissolved)			
COBALT	X	X	X
COBALT (Dissolved)			
COPPER	X	X	X
COPPER (Dissolved)			
HEXAVALENT CHROMIUM			
IRON	X	X	X
IRON (Dissolved)			
LEAD	X	X	X
LEAD (Dissolved)			
LITHIUM			
MAGNESIUM	X	X	X
MAGNESIUM (Dissolved)			
MANGANESE	X	X	X
MANGANESE (Dissolved)			
MERCURY	X		
MERCURY (Dissolved)		X	X
MOLYBDENUM		X	X
MOLYBDENUM (Dissolved)			
NICKEL	X	X	X

TABLE F.2.38.4
(Continued)

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling
NICKEL (Dissolved)			
NIOBIUM			
OSMIUM	X		
POTASSIUM	X	X	X
POTASSIUM (Dissolved)			
SELENIUM	X		X
SELENIUM (Dissolved)			
SILICON		X	
SILVER	X		X
SILVER (Dissolved)			
SODIUM	X	X	X
SODIUM (Dissolved)			
THALLIUM	X	X	X
THALLIUM (Dissolved)			
TIN	X	X	X
TIN (Dissolved)			
TITANIUM			
VANADIUM	X	X	X
VANADIUM (Dissolved)			
YTTRIUM			
ZINC	X	X	X
ZINC (Dissolved)			
ZIRCONIUM			

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TABLE F-2.38.5
ORGANOPHOSPHORUS PESTICIDE PARAMETERS

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling	RI/FS Other Media[a]
Azinphosmethyl		X		X
Demeton		X		X
Diazinon	X	X		X
Dimethoate	X	X	X	X
Disulfoton		X	X	X
Ethion		X		X
Famphur		X	X	X
Malathion	X	X		X
Parathion		X	X	X
Parathion, Ethyl	X			X
Parathion, Methyl	X			X
Sulfotepp				X
Tetraethylpyrophosphate				X
Thionazin				X

[a]Other media includes surface soil, subsurface soil, groundwater, sediment, and ecological samples collected under the RI/FS Program.

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TABLE F-2.38.6
PESTICIDES/PCBs

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling	RI/FS Other Media[a]
4,4-DDD	X	X	X	X
4,4-DDE	X	X	X	X
4,4-DDT	X	X	X	X
Aldrin	X		X	X
Alpha-BHC	X	X	X	X
Alpha-Chlordane		X	X	X
Aroclor 1016	X	X	X	X
Aroclor 1221	X	X	X	X
Aroclor 1232	X	X	X	X
Aroclor 1242	X	X	X	X
Aroclor 1248	X	X	X	X
Aroclor 1254	X	X	X	X
Aroclor 1260	X	X	X	X
Beta-BHC	X		X	X
Chlordane	X		X	X
Delta-BHC	X	X	X	X
Dieldrin	X	X	X	X
Endosulfan I	X	X	X	X
Endosultan II	X	X	X	X
Endosulfan Sulfate	X	X	X	X
Endrin	X	X	X	X
Endrin Aldehyde			X	X
Endrin Ketone	X	X	X	X
Gamma-BHC(Lindane)	X	X	X	X
Gamma-Chlordane		X	X	X
Heptachlor	X	X	X	X
Heptachlor Epoxide	X	X	X	X
Isodrin		X		X
Kepone		X		X
Methoxychlor	X	X	X	X
Toxaphene	X	X	X	X

[a]Other media includes surface soil, subsurface soil, groundwater, sediment, and ecological samples collected under the RI/FS Program.

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TABLE F-2.38.7

SEMI-VOLATILE PARAMETERS

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling	RI/FS Other Media[a]
0,0,0-Triethylphosphorothioate			X	X
0,0-Diethyl-0,2-Pyrazinylphose			X	X
0-Dichlorobenzene				X
1,2,4,5-Tetrachlorobenzene		X	X	X
1,2,4-Trichlorobenzene	X		X	X
1,2-Dichlorobenzene	X	X	X	X
1,3,5-Trinitrobenzene		X	X	X
1,3-Dichlorobenzene	X	X	X	X
1,3-Dinitrobenzene		X	X	X
1,3-Dioxolane-2-Butanol,2-M				X
1,3-Dioxolane-2-Proanol,2-M				X
1,4-Dichlorobenzene	X	X	X	X
1,4-Naphthoquinone		X	X	X
1-Naphthylamine		X	X	X
18,19-Secoyohimban-19-Oic Ac				X
2(5H)-Furanone,5,5-Dimethyl				X
2,2'-Oxybispentane				X
2,3,4,6-Tetrachlorophenol		X	X	X
2,4,5-Trichlorophenol	X	X	X	X
2,4,6-Trichlorophenol	X	X	X	X
2,4-Dichlorophenol	X	X	X	X
2,4-Dimethylphenol	X	X	X	X
2,4-Dinitrophenol	X	X	X	X
2,4-Dinitrotoluene	X	X	X	X
2,4-Heptanedione				X
2,6,10-Dodecatrien-1-Ol, 3,7				X
2,6-Decadiene-4,5-Diol, 6-Et				X
2,6-Dichlorophenol		X	X	X
2,6-Dinitrotoluene	X	X	X	X
2-Acetylaminofluorene		X	X	X
2-Chloronaphthalene	X	X	X	X
2-Chlorophenol	X	X	X	X
2-Ethoxylethyl Acetate				X
2-Heptanol, Acetate				X
2-Methylnaphthalene	X	X	X	X
2-Methylphenol	X	X	X	X
2-Naphthylamine		X	X	X
2-Nitroaniline		X	X	X

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TABLE F-2.38.7
(Continued)

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling	RI/FS Other Media[a]
2-Nitrobenzene	X			X
2-Nitrophenol	X	X	X	X
2-Picoline		X	X	X
2H-Pyran-2,3-Diol,Tetrahydr				X
3,3-Dichlorobenzidine	X	X	X	X
3,3-Dimethylbenzidine		X		X
3-Hexen-2-One,5-Methyl-				X
3-Methylcholanthrene		X	X	X
3-Methylphenol		X	X	X
3-Nitroaniline	X	X	X	X
3-Pentenal, 4-Methyl-				X
4,6-Dinitro-2-Methylphenol	X	X	X	X
4-Aminobiphenyl		X	X	X
4-Bromophenyl Phenyl Ether	X	X	X	X
4-Chloro-3-Methylphenol	X	X	X	X
4-Chloroaniline	X	X	X	X
4-Chlorophenol Phenyl Ether	X	X	X	X
4-Methylphenol	X	X	X	X
4-Nitroaniline	X	X	X	X
4-Nitrophenol	X	X	X	X
4-Nitroquinoline 1-Oxide		X	X	X
5-Nitro-o-Toluidine		X	X	X
7,12-Dimethylbenz(a)anthracene		X	X	X
9-Octadecenamide				X
A,A-Dimethylphenethylamine		X	X	X
Acenaphthene	X	X	X	X
Acenaphthylene	X	X	X	X
Acetophenone		X	X	X
Aldol Condensation Product				X
Aldrin	X	X		X
Aniline		X	X	X
Anthracene	X	X	X	X
Aramite		X		X
Benzidine				X
Benzo(A)Anthracene	X	X	X	X
Benzo(A)Pyrene	X	X	X	X
Benzo(B)Fluoranthene	X	X	X	X
Benzo(G,H,I)Perylene	X	X	X	X
Benzo(k)Fluroanthene	X	X	X	X

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TABLE F-2.38.7
(Continued)

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling	RI/FS Other Media[a]
Benzoic Acid	X	X	X	X
Benzyl Alcohol	X	X	X	X
Bis(2-Chloroethoxy)Methane	X		X	X
Bis(2-Chloroethyl)Ether	X	X	X	X
Bis(2-Chloroethyl)Phthalate	X	X		X
Bis(2-Chloroisopropyl)Ether	X	X	X	X
Bis(2-Ethylhexyl)Phthalate	X		X	X
Bis(Chloromehtyl)Ether	X			X
Butyl Benzyl Phthalate	X	X	X	X
C-10 Unk. Hydrocarbon	X			X
Carbamic Acid, Methyl-, 2,3-di				X
Carbazole			X	X
Carbofuran				X
Chlordane	X			X
Chlorobenzilate		X	X	X
Chrysene	X	X	X	X
Di-N-Butylphthalate	X	X	X	X
Di-N-Octylphthalate	X	X	X	X
Diallate		X	X	X
Dibenzo(A,H)Anthracene	X	X	X	X
Dibenzofuran	X		X	X
Dichlorobenzene	X			X
Diethyl Phthalate	X	X	X	X
Diisoamylene				X
Dimethyl Phthalate	X	X	X	X
Dimethylaminoazobezene				X
Dimethylbenz(a)anthracene				X
Diphenylamine		X	X	X
Ethanone, 1-(3-Ethyloxiranyl				X
Ethanone, 1-(Trimethyloxiran				X
Ethyl Methanesulfonate		X	X	X
Fluoranthene	X	X	X	X
Fluorene	X	X	X	X
Furan, 2,5-Dimethyl-				X
Heptachloroepoxide	X			X
Heptanoic Acid				X
Hexachlorethane		X		X
Hexachlorobenzene	X	X	X	X
Hexachlorobutadiene	X	X	X	X

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TABLE F-2.38.7
(Continued)

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling	RI/FS Other Media[a]
Hexachlorocyclopentadiene	X	X	X	X
Hexachloroethane	X		X	X
Hexachlorophene		X	X	X
Hexachloropropene		X	X	X
Hexadecane, 2,6,10-Trimethyl				X
Hexanedioic Acid				X
Hydroxylamine, O-Decyl-				X
Indeno(1,2,3-CD)Pyrene		X		X
Isodrine			X	X
Isophorone	X	X	X	X
Isosafrole	X	X	X	X
Kepone			X	X
Methapyrilene		X	X	X
Methoxychloro	X			X
Methyl Methanesulfonate		X	X	X
Methyl Parathion		X	X	X
N-Nitroso-Di-N-Butylamine		X	X	X
N-Nitroso-Di-N-Propylamine	X	X	X	X
N-Nitrosodiethylamine				X
N-Nitrosodimethylamine		X	X	X
N-Nitrosodiphenylamine	X	X	X	X
N-Nitrosomethylethylamine		X	X	X
N-Nitrosomorpholine		X	X	X
N-Nitrosopiperidine		X	X	X
N-Nitrosopyrrolidine		X	X	X
N-Nitrosos-Di-N-Propylamine				X
Naphthalene	X	X	X	X
Nitrobenzene	X	X	X	X
Nitrophenol				X
Parathion			X	X
Pentachlorobenzene		X	X	X
Pentachloroethane		X	X	X
Pentachloronitrobenzene		X	X	X
Pentachlorophenol	X	X	X	X
Pentanoic Acid, 2-Hydroxy-4-				X
Pentone				X
Phenacetin		X	X	X
Phenanthrene	X	X	X	X
Phenol	X	X	X	X

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TABLE F-2.38.7
(Continued)

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling	RI/FS Other Media[a]
Phorate		X	X	X
Phosphonodithioic Acid, Ethyl-				X
Phosphorodithioic Acid, 0,0-DI				X
Prometon				X
Pronamide		X	X	X
Pyrene	X	X	X	X
Pyridine			X	X
Safrole		X	X	X
Tetrachlorophenol				X
Total Methylphenol.				X
Toxaphene	X			X
Tributyl Phosphate		X		X
Unknown				X
Unknown C13H28				X
Unknown C19H40				X
Unknown C6H10				X
Unknown C7H8				X
Unknown C9H1405				X
Unknown Hydrocarbon				X
o-Toluidine		X	X	X
p-Dichlorobenzene				X
p-Dimethylaminoazobenzene		X	X	X
p-Phenylenediamine				X

[a]Other media includes surface soil, subsurface soil, groundwater, sediment, and ecological samples collected under the RI/FS Program.

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TABLE F-8
VOLATILE PARAMETERS

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling	RI/FS Other Media[a]
0,0,0-Triethylphosphorothioate		X		X
1,1,1,2-Tetrachloroethane			X	X
1,1,1-Trichloroethane	X		X	X
1,1,2,2-Tetrachloroethane	X		X	X
1,1,2-Trichloro-1,2,2-Trifluor	X			X
1,1,2-Trichloroethane	X		X	X
1,1-Dichloroethane	X		X	X
1,1-Dichloroethene	X		X	X
1,2,3-Trichloropropane			X	X
1,2-Dibromo-3-Chloropropane			X	X
1,2-Dibromoethane			X	X
1,2-Dichloroethane	X		X	X
1,2-Dichloroethene	X		X	X
1,2-Dichloropropane	X		X	X
1,2-Dichloropropene	X		X	X
1,2-Dichloropropylene	X			X
1,3-Dichloropropane	X			X
1,3-Dichloropropene	X			X
1,3-Dichloropropylene	X			X
1,4-Dichloro-2-Butene			X	X
1,4-DioXane			X	X
1-HeXadecyne				X
2-Butanone	X		X	X
2-Butanone, 3-Methyl-				X
2-Chloro-1,3-Butadiene				X
2-Chloro-N-(2,6-Diethylphenyl)				X
2-Chloroethyl Vinyl Ether	X		X	X
2-HeXanone	X		X	X
4-Mehtyl-2-Pentanone	X		X	X
4-Methylphenolprophyl Ether	X			X
Acetate				X
Acetone	X		X	X
Acetonitrile	X		X	X
Acrolein	X		X	X
Acrylonitrile			X	X
Allyl Chloride			X	X

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TABLE F-2.38.8
(Continued)

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling	RI/FS Other Media[a]
Arolein				X
Benzene	X		X	X
Bromochloromethane	X			X
Bromodichloromethane			X	X
Bromoethane	X			X
Bromoform	X		X	X
Bromomethane	X		X	X
Butanoic Acid, Methyl Ester	X			X
Carbon DioXide-Purge Artif				X
Carbon Disulfide	X		X	X
Carbon Tetrachloride	X		X	X
Chlorobenzene	X		X	X
Chloroethane	X		X	X
Chloroform	X		X	X
Chloromethane	X		X	X
Chloroprene			X	X
Cis-1,2-Dichloroethene	X			X
Cis-1,2-Dichloroethylene	X			X
Cis-1,2-Dichloropropylene	X			X
Cis-1,3-Dichloropropene	X			X
Cumene				X
Dibromochloromethane	X		X	X
Dibromomethane			X	X
Dichlorodifluoromethane	X		X	X
Dichlorodiisopropyl Ether				X
Ethyl Cyanide				X
Ethyl Methacrylate			X	X
Ethylbenzene	X		X	X
Fluorotrichloromethane				X
Fonofos				X
Iodomethane			X	X
Isobutyl Alcohol			X	X
lbph as gasoline				X
Methacrylonitrile			X	X
Methyl Ethyl Ketone				X
Methyl Isobutyl Ketone				X

TABLE F-2.38.8
(Continued)

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling	RI/FS Other Media[a]
Methyl Methacrylate			X	X
Methylene Bromide				X
Methylene Chloride	X		X	X
Mix of 2-Methylpropane & 4-p				X
Propionitrile			X	X
Siloxane				X
Siloxane(column bleed)				X
Styrene	X		X	X
T-1,4-Dichloro-2-Butene				X
Tech-Chlorodane	X			X
Tetrachlorethene	X		X	X
Tetrachloroethane	X			X
Tetrachloroethene				X
Toluene	X		X	X
Total Petroleum Hydrocarbon			X	X
Total Xylene	X		X	X
Trans-1,2-Dichloroethene	X			X
Trans-1,3-Dichloropropene	X			X
Trichloroethene	X		X	X
Trichlorofluoromethane	X		X	X
Trichlowethane	X			X
Vinyl Acetate	X		X	X
Vinyl Chloride	X		X	X

[a]Other media includes surface soil, subsurface soil, groundwater, sediment, and ecological samples collected under the RI/FS Program.

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TABLE F-2.38.9
GENERAL CHEMISTRY PARAMETERS

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling	RI/FS Other Media*
Alkalinity As CaCo3				X
Ammonia, As Nitrogen		X	X	X
Bicarbonate Ion (CaCo3)				X
Bromide			X	X
Carbamic Acid	X			X
Carbon Dioxide	X			X
Carbonate ion (CaCo3)				X
Cation Exchange Capacity				X
Chemical Oxygen Demand				X
Chloride			X	X
Combustion (btu)				X
Conductivity				X
Cyanide	X	X	X	X
Fecal Coliform				X
Flashpoint				X
Fluoride				X
Ignitability				X
Nitrate				X
Nitrate/Nitrite			X	X
Nitrite				X
Oil & Grease			X	X
Organic Content				X
Oxidation-Reduction Potential				X
Phosphate				X
Phosphorus				X
Silica				X
Silicon			X	X
Specific Conductivity				X
Specific Gravity			X	X
Sulfate		X	X	X
Sulfide				X
Sulfite				X
Sulfur				X
Total Kjeldahl Nitrogen		X	X	X
Total Organic Carbon		X		X

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TABLE F-2.38.9
(Continued)

Analyte	CIS	1991 RI/FS Waste Pit Sampling	1992 RI/FS Waste Pit Sampling	RI/FS Other Media[a]
Total Organic Halogen				X
Total Organic Nitrogen				X
Total Phosphorus			X	X
pH			X	X

[a]Other media includes surface soil, subsurface soil, groundwater, sediment, and ecological samples collected under the RI/FS Program.

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TABLE F-3.28.10

APPENDIX IX, HSL, AND PRIORITY POLLUTANT PARAMETERS

Analyte	APPX. IX	HSL	Priority Pollutants
Metals			
Potassium (total)	X	X	
Fluoride (total)	X		
Aluminum (total)	X	X	
Barium (total)	X	X	
Beryllium (total)	X	X	X
Cadmium (total)	X	X	X
Calcium (total)	X	X	
Chromium (total)	X	X	X
Cobalt (total)	X	X	
Copper (total)	X	X	X
Iron (total)	X	X	
Magnesium (total)	X	X	
Manganese (total)	X	X	
Nickel (total)	X	X	X
Silver (total)	X	X	X
Sodium (total)	X	X	
Vanadium (total)	X	X	
Zinc (total)	X	X	X
Antimony (total)	X	X	X
Arsenic (total)	X	X	X
Lead (total)	X	X	X
Mercury (total)	X	X	X
Osmium (total)	X		
Selenium (total)	X	X	X
Thallium (total)	X	X	X
Tin (total)	X	X	
Pesticides/PCBs/Herbicides			
Aldrin	X	X	X
Alpha-bhc	X	X	X
Aroclor 1016	X	X	X
Aroclor 1221	X	X	X
Aroclor 1232	X	X	X
Aroclor 1242	X	X	X

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TABLE F-2.38.10
(Continued)

Analyte	APPX. IX	HSL	Priority Pollutants
Pesticides (continued)			
Aroclor 1248	X	X	X
Aroclor 1254	X	X	X
Aroclor 1260	X	X	X
Beta-bhc	X	X	X
Chlordane	X	X	X
4,4'-ddd	X	X	X
4,4'-dde	X	X	X
4,4'-ddt	X	X	X
Delta-bhc, (pcb)	X	X	X
Dieldrin	X	X	X
Endosulfan I	X	X	X
Endosulfan II	X	X	X
Endosulfan Sulfate		X	X
Endrin	X	X	X
Endrin Aldehyde	X		X
Endrin Ketone		X	
Gamma-bhc, (lindane)	X	X	X
Heptachlor	X	X	X
Heptachlor Eroxide	X	X	X
Isodrin	X		
	X		
MethoXychlor	X	X	
Toxaphene	X	X	X
0,0-Diethyl 0-2-Pyrazinyl Phosphorothioate	X		
Disulfoton	X		
Famphur	X		
Methyl Parathion	X		
Parathion	X		
Phorate	X		
Tetraethyldithiopyrophosphate	X		
Tris (2,3-dibromopropyl) Phosphate	X		
2,4,5-T	X		
2,4-DichlorophenoXyacetic Acid, (2,4-d)	X		
Silvex	X		

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TABLE F-2.38.10
(Continued)

Analyte	APPX. IX	HSL	Priority Pollutants
Volatile Organics			
Acetone	X	X	
Acetonitrile	X		
Acrolein	X		X
Acrylonitrile	X		X
Allyl Alcohol	X		
Benzene	X	X	X
Bromodichloromethane	X	X	X
Bromomethane, (methyl bromide)	X	X	X
Carbon Disulfide	X	X	
Carbon Tetrachloride	X	X	X
2-Chloro-1,3-Butadiene	X		
Chlorobenzene	X	X	X
Chlorodibromomethane	X	X	X
Chloroethane	X	X	X
2-Chloroethyl Vinyl Ether	X	X	X
Chloroform	X	X	X
Chloromethane, (Methyl Chloride)	X	X	X
3-Chloropropene	X		
Cis-1,3-Dichloropropene	X	X	
1,2-Dibromo-3-Chloropropane	X		
1,2-Dibromoethane	X		
Dibromomethane	X		
Dichlorodifluoromethane	X		
1,1-Dichloroethane	X	X	X
1,2-Dichloroethane	X	X	X
1,1-Dichloroethylene	X	X	X
Dichloromethane, (methylene chloride)	X	X	X
1,2-Dichloropropane	X	X	X
1,4-Dioxane	X		
Ethyl Benzene	X	X	X
Ethyl Cyanide	X		
Ethylene Oxide	X		
2-Hexanone	X	X	
4-Methyl-2-Pentanone	X	X	
Volatile Organics (continued)			

TABLE F-2.38.10
(Continued)

Analyte	APPX. IX	HSL	Priority Pollutants
Methylethyl Ketone, (2-butanone)	X	X	
2-Propyn-1-ol	X		
Pyridine	X		
1,1,1,2-Tetrachloroethane	X		
1,1,2,2-Tetrachloroethane	X	X	X
Tetrachloroethene	X	X	X
Toluene	X	X	X
Trans-1,2-dichloroethene	X	X	X
Trans-1,3-dichloropropene	X	X	
Trans-1,4-dichloro-2-butene	X		X
Tribromomethane, (bromoform)	X	X	X
1,1,1-Trichloroethane	X	X	X
1,1,2-Trichloroethane	X	X	X
Trichloroethene	X	X	X
Trichloromonofluoromethane	X		
1,2,3-trichloropropane	X		
Vinyl Acetate	X	X	
Vinyl Chloride	X	X	X
Xylene (total)	X	X	
Semivolatile Organics			
Acenaphthanlene, (acenaphthylene)	X	X	X
Acenaphthene	X	X	X
Acetaphenone	X		
2-Acetylaminofluorene	X		
Alpha, Alpha-dimethylphenethylamine	X		
4-Aminobiphenyl	X		
Aniline	X		
Anthracene	X	X	X
Aramite	X		
Benzo[a]anthracene	X	X	X
Benzenethiol	X		
Benzidine	X		X
Benzo[a]pyrene	X	X	X
Benzo[b]fluoranthene	X	X	X
Semivolatile Organics (continued)			
Benzo[ghi]perylene	X	X	X

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TABLE F-2.38.10
(Continued)

Analyte	APPX. IX	HSL	Priority Pollutants
Benzoic Acid	X	X	
Benzo[k]fluoranthene	X	X	X
P-Benzoquinone	X		
Benzyl Alcohol	X	X	
Bis(2-ethylheXyl)phthalate	X	X	X
Bis(2-chloroethyl)ether	X	X	X
Bis(2-chloroethyoXy)methane		X	X
Bis(2-chloroisopropyl)ether	X	X	X
4-Bromophenyl Phenylether	X	X	X
Butyl Benzyl Phthalate	X	X	X
P-Chloroaniline	X	X	
Chlorobenzilate	X		
2-Chloronaphthalene	X	X	X
2-Chlorophenol	X	X	X
4-Chlorophenyl-Phenylether	X	X	X
3-Chloropropionitrile	X		
Chrysene	X	X	X
Dibenz[a,h]anthracene	X	X	X
Dibenzo[a,h]pyrene	X		
Dibenzo[a,i]pyrene	X		
Dibenzofuran	X	X	
Dibenzo[a,e]pyrene	X		
O-Dichlorobenzene, (1,2-dichlorobenzene)	X	X	X
M-Dichlorobenzene, (1,3-dichlorobenzene)	X	X	X
P-Dichlorobenzene, (1,4-dichlorobenzene)	X	X	X
3,3'-Dichlorobenzidine	X	X	X
2,4-Dichlorophenol	X	X	X
2,6-Dichlorophenol	X		
Diethyl Phthalate	X	X	X
3,3'-DimethoXybenzidine	X		
P-Dimethylaminoazobenzene	X		
7,12-Dimethylbenz[a]anthracene	X		
3,3'-Dimethylbenzidine	X		
Semivolatile Organics (continued)	X	X	X
2,4-Dinitrophenol	X	X	X
Dimethyl Phthalate	X	X	X

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TABLE F-2.38.10
(Continued)

Analyte	APPX. IX	HSL	Priority Pollutants
Di-n-butyl Phthalate	X	X	X
4,6-Dinitro-0-Cresol	X	X	X
2,4-Dinirophenol	X	X	X
2,6-Dinitrotoluene	X	X	X
2,4-Dinitrotoluene	X	X	X
Di-n-octyl phthalate	X	X	X
Diphenylamine	X		
1,2-Diphenylhydrazine	X		X
Ethyl Methacrylate	X		
Fluoranthene	X	X	X
Fluorene	X	X	X
Hexachlorobenzene	X	X	X
Hexachlorobutadiene	X	X	X
Hexachlorocyclopentadiene	X	X	X
Hexachloroethane	X	X	X
Hexachlorophene	X		
Hexachloropropene	X		
Indeno[1,2,3-c,d]pyrene	X	X	X
Iodomethane	X		
Isobutyl Alcohol	X		
Isophorone	X	X	X
Isosafrole	X		
Malononitrile	X		
4,4'-Methylene bis(2-chloroaniline)	X		
Methacrylonitrile	X		
Methapyrilene	X		
3-Methylcholanthrene	X		
Methyl Methacrylate	X		
Methyl Methanesulfonate	X		
2-Methylnaphthalene	X	X	
Naphthalene	X	X	X
1,4-Naphthoquinone	X		
Semivolatile Organics (continued)			
1-Naphthylamine	X		
2-Naphthylamine	X		
2-Nitroaniline	X	X	

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TABLE F-2.38.10
(Continued)

Analyte	APPX. IX	HSL	Priority Pollutants
3-Nitroaniline	X	X	
P-Nitroaniline	X	X	
Nitrobenzene	X	X	X
5-Nitro-O-Toluidine	X		
2-Nitrophenol	X	X	X
4-Nitrophenol	X	X	X
N-Nitrosodiethylamine	X		
N-Nitrosodimethylamine	X		X
N-Nitrosodi-n-butylamine	X		
N-nitrosodiphenylamine	X	X	X
N-nitrosomethylethylamine	X		
N-nitrosomorpholine	X		
N-nitrosopiperidine	X		
N-nitrosopyrrolidine	X		
Ortho-cresol, (2-methylphenol)	X	X	
Parachlorophenol			X
Para-cresol, (4-methylphenol)	X	X	
Para-dinitrobenzene	X		
P-chloro-m-cresol	X	X	
Pentachlorobenzene	X		
Pentachloroethane	X		
Pentachloronitrobenzene	X		
Pentachlorophenol	X	X	X
Phenacetin	X		
Phenanthrene	X	X	X
Phenol	X	X	X
2-Picoline	X		
Pronamide	X		
Di-n-propylnitrosamine, (n-nitrosodimethlamine)	X	X	X
Pyrene	X	X	X
Resorcinol	X		
Semivolatile Organics (continued)			
Safrole	X		
2-Sec-Butyl-4,6-Dinitrophenol	X		
Styrene	X	X	
1,2,4,5-Tetrachlorobenzene	X		

TABLE F-2.38.10
(Continued)

Analyte	APPX. IX	HSL	Priority Pollutants
2,3,4,6-Tetrachlorophenol	X		
1,2,4-Trichlorobenzene	X	X	X
Trichloromethanethiol	X		
2,4,5-Trichlorophenol	X	X	
2,4,6-Trichlorophenol	X	X	X
Dioxins/furans			
Hexachlorodebenzo-p-dioXins	X		
Hexachlorodibenzofurns	X		
Pentachlorodibenzofurans	X		
Pentachlorodibenzo-p-dioXins	X		
Tetrachlorodibenzofurans	X		
Tetrachlorodibenzo-p-dioXins	X		
2,3,7,8-Tetrachlorodibenzo-p-dioXin	X		X
General Chemistry			
Cyanide	X	X	X
Sulfide	X		
Asbestos			X

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APPENDIX F.3
LITERATURE COMPENDIUM

APPENDIX F.3.1

SECTION 4.0 LITERATURE REFERENCE

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APPENDIX F.3.2
COMPENDIUM

SUMMARY OF POSSIBLE SOURCES AND FORMATION MECHANISM OF CONTAMINANTS OF POTENTIAL CONCERN REPORTED FROM THE LITERATURE

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SUMMARY OF POSSIBLE SOURCES AND FORMATION MECHANISM OF CONTAMINANTS OF POTENTIAL CONCERN REPORTED FROM THE LITERATURE

This section compiles useful information reported in the literatures such as author's important statements or findings. This information includes possible sources and formation mechanism of the contaminant of potential concern particularly chlorinated dibenzo-p-dioxins and dibenzofurans (CDD/CDF), polychlorinated biphenyls (PCBs), pentachlorophenols, polynuclear aromatic hydrocarbons (PNAs), DDT and metabolites, and halogenated volatile organic compounds. References related to each group will be included at the end of each subsection.

CONTENTS

F.3.2.1

SUMMARY OF DIOXINS AND FURANS INFORMATION

1. Exner (1987), Hutzinger (1988), Rappe (1978), Pereira (1984), Korte (1992):

- Dioxins and furans are nearly insoluble in water (0.000008 parts per million [ppm]); they are soluble in hydrocarbon (570 ppm in benzene), and most soluble in chlorinated organic solvents (1400 ppm in ortho-dichloro benzene). They are soluble in lipids, easily sorbed onto soil, environmentally stable, and metabolized slowly. The half-life of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in soil is about 1 year (Pereira).

- Soil mobility studies indicate that both 2,7-dichlorodibenzo-p-dioxin (DCDD) and TCDD are <u>immobile</u> in various soils. These chemicals will adsorb tightly to particulate matter such as charcoal or soil, and even in very porous soil no significant leaching has ever been detected. These compounds tend to remain on or near the soil surface; hence they would not be leached by rainfall or irrigation into groundwater as halogenated solvents.

  Photodegradation studies also indicate that, on bare surfaces of soil, dust, or rock, there is little degradation of TCDD by sunlight.

  Dioxins and furans are not easily degraded by microorganisms. Dioxin degradation is slow and inefficient. The rate of removal from soil depends upon the concentration of dioxin present, the climate, the soil type, and the numbers and species of microorganisms present.

- Dioxins are unwanted by-products of chlorophenol (mainly 2,4,5-trichlorophenol and pentachlorophenol [PCP]) production and of combustion processes.

  PCP has been used in wood preservative for many years. PCP contains octa-, hepta-, hexa-, and pentachlorinated dioxins.

- Polychlorinatedibenzodioxin (PCDD) and polychlorinatedibenzofuran (PCDF) were detected in particulate emissions from municipal solid waste (MSW) incinerators. At present, municipal incinerators, hazardous waste incinerators, and metal smelters discharge from 1 to 100 nanograms per cubic meter (ng/N-m3) of PCDD (in exhaust emissions) (about 1 to 100 grams [g] TCDD/year per normal size MSW incinerator, or 50,000 to 200,000 tons/year).

  Industrial high-temperature processes such as metal smelters and electrical arcing furnaces in steel mills are identified as sources of environmental contamination of PCDDs and PCDFs.

  The major chlorine source in the MSW are plastic materials such as polyvinyl chloride (PVC) and bleached and unbleached paper.

  The copper smelter used scrap copper containing PVC-coated wires and cords. In the steel mill, a high portion of alloys or stainless steel was recycled. This recycled material was contaminated by PVC or polychlorinated parafins.

- PCDDs and PCDFs were found in technical products like 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and other chlorophenoxy acids, PCP and other chlorinated phenols, and PCB. PCPs were found to be the most contaminated products; level were reported in the range of 1,000 ppm, mainly octa-CDD.

PCDDs and PCDFs were found in flyash samples collected in the electrostatic precipitators of municipal solid waste incinerators (0.2 ppm PCDDs, 0.1 ppm PCDFs. The levels were 0.6 ppm and 0.3 ppm, respectively, in the industrial incinerator).

2. "Understanding dioxin", 1987, by Legislative Commission on Toxic Substances and Hazardous Wastes (Nilsson), Exner (1987), Rappe (1978), Stoddart:

- Dioxins and furans can be degraded by either natural or artificial ultraviolet light if they are first dissolved in a suitable solvent. Herbicides have the potential to act as suitable solvents. Pure dioxin applied to soil will bind to particulate matter and is not as susceptible to photochemical degradation. Consequently, the elimination of undissolved dioxin from soil is very slow.

  TCDD is extremely heat stable. Dioxins have been shown to form in incinerators at temperature as high as 400°C. TCDD will decompose completely if exposed to temperature of 800°C for 21 seconds. At 700°C, the same exposure will yield only 50 percent decomposition.

- Many common herbicides (e.g. 2,4,5-T, 2,4-dichlorophenoxyacetic acid [2,4-D], herbicide Agent Orange [HO was a mixture of equal parts of 2,4,5-T and 2,4-D]) contain dioxins (2 milligrams per liter (mg/L) in HO [Stoddart], 0.1 to 50 ppm in HO [Exner]) and furans.

  2,4,5-trichlorophenol is an intermediate in the production of 2,4,5-T (Exner).

  Chlorophenols (widely used as fungicides, antiseptics, disinfectants, insecticides, and wood preservatives) are contaminated with both TCDDs and TCDFs.

  Hexachlorophene (a bactericide once used in hospitals to prevent staph infections, and in the cosmetics industry as a preservative) had TCDD measured up to 0.03 ppm.

3. Shaub (1983), Vogg (1987), Wong (1984), Dubinsky (1987):

Likely major routes of formation of PCDDs and polychlorinated dibenzo furan (PCDF) are from chemically related compounds such as chlorobenzenes, chlorophenols, and polychlorinated biphenyls (PCBs) (chlorinated precursor) (via municipal solids waste incinerators, PCDD and PCDF were found in flyash).

The probability of formation of PCDDs will likely be very low at high temperatures (greater than 927°C), if mixing with fuel and air is efficient (Shaub).

Production of PCDDs from chlorophenols depends upon the square of the chlorophenol concentration (Shaub).

PCDDs and PCDFs have been found in incinerator emissions and other combustion sources (Shaub).

Substantial PCDD formation is indicated at intermediate temperatures (Shaub).

In actual cases, PCDD emissions sometimes exceed the levels predicated (Shaub).

Surface reactions (such as with flyash and other solid materials) seem to be strong candidates as sources for PCDD and PCDF formation (Shaub).

Formation path can be from De Novo synthesis from organics with natural chlorine donors.

4. Tschirley (1986):

TCDD is a by-product of the manufacture of trichlorophenol (which serves in the manufacture of 2,4,5-T). The amount of TCDD formed increased as the temperature of the reaction and the pH increase.

The processes that degrade TCDD in soil are not well known. Microorganism do degrade the substance, but at a low rate. Sunlight degrades TCDD rapidly by splitting off the clorine atoms. The reaction requires a hydrogen donor, which is usually available in water or in the wax on leaves (laboratory tests supported this finding).

In places where TCDD is protected from light, it is an extremely persistent material (Tschirley).

TCDD is known to be strongly held by most soils (Tschirley).

5. Acharya (1991), Ross (1989):

- PCDDs and PACFs do not have any known technical use and none are produced intentionally. They are formed in trace amounts as unwanted by-products of certain chemical processes and during the combustion of fuels, especially chlorinated materials.

  Average emissions of PCDD and PCDFs from municipal waste incinerators were three orders of magnitude greater than the highest values reported for hazardous waste incinerators (Acharya).

- In incinerators, PCDD and PCDF precursors are believed to form at a temperature of approximately 500°C. Dioxins can be formed downstream of the combustion chamber as the flue gases are cooled (an energy recovery boiler)(250 to 400°C) by reactions between components such as oxygen, water, hydrochloric acid gas, and products of incomplete combustion.

  Any of the multiplicity of tracc metals present may act as a catalyst, with copper possibly the most influential. Isomer rearrangement may also occur as well as dechlorination (e.g., octachlorodibenzofurans [OCDF] may be readily transformed into lower chlorinated species).

- De Novo formation of dioxins. Hutzinger defines De Novo formation as "dioxin formation from the pyrolysis of a variety of chemically unrelated precursors including naturally occurring precursors together with a chlorine donor." PCDD and PCDF have been detected from thermal reactions of a variety of precursors; the following list ranks systems that yielded dioxins from the most likely to the least likely.

  - 2,4,5-T
  - Halogenated aliphatics
  - Benzene + AlCl3

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- Short chain alkanes + hydrochloric acid (HCl)
- Carbon + catalyst
- Carbon dioxide (CO_2) + catalyst

Temperature, oxygen concentration, water vapor, carbon and chlorine in flyash, hydrochloric acid, and carbon dioxide have a major influence on the formation and structure of PCDDs and PCDFs on flyash.

6. Eklund (1988):

- Methane (CH_4), hydrogen chloride, and oxygen at high temperature (400 to 950°C) yield a mixture of chlorinated alkanes, alkenes, aromatics as well as polynuclear aromatic hydrocarbons (PAHs), PCBs, PCDDs, and PCDFs. The pattern of products formed is similar to the distribution of chlorinated micropollutant found in flue gases from municipal waste incinerators.

It was previously shown that hydrochloric acid and phenol at 550°C in sealed quart ampoule, yield essentially all the components found in flue gases.

- Propane flame spiked with HCl was shown to produce a large number of chlorinated organic compounds including a number of chlorophenols, which are well known as precursors to PCDDs and PCDFs. The results suggest that PCDDs and PCDFs are formed in a chain of reversible reactions starting with chloromethanes.

Methyl radicals + flame + HCl → Chloromethyl radicals →

chlorinated molecules

7. Ross (1989):

It was shown (Eiceman) that 1,2,3,4-TCDD reacted over flyash in the presence of HCl to produce a full range of tetra to octa PCDD isomers at low temperature (50 to 250°C).

A series of polychlorinated diphenylethers (PCDPE) were reacted over flyash in air at 300°C. It was found that the amount of dioxins formed increases with the increasing number of chlorine atoms on the starting PCDPE.

8. Altwicker (1990):

Literature reports suggest that compounds containing almost any combination of C, H, O, and Cl can form PCDD/PCDFs under suitable conditions.

Global rates observed in incinerators are 10 micrograms (μg) of PCDD/PCDF/(g of solid)/minute (min). Laboratory data observed are 0.1 μg PCDD/PCDF/g solid/min.

9. Pereira (1984):

The wood-preservation industry generates significant quantities of chemical wastes in its effluents. These effluents are often discharged into surface impoundments. The U.S. Environmental Protection Agency (EPA) estimates that there are more than 415 wood-preserving plants in the United States. This industry applies various chemical compounds to wood products to impart fungicidal, insecticidal, and fire-retardant properties. These chemicals include creosote, pentachlorophenol, water-soluble formulation of salts of copper, chromium and arsenic, and fire retardants such as borates, phosphates, and ammonium compounds. Creosote is a distillate of coal tar, consisting of various classes of compounds such as phenols, alkylated phenols, and PAH compounds.

The discharge of effluents containing creosote and pentachlorophenol into two unlined surface impoundments at one of the wood-treatment facilities resulted in contamination of the underlying sand and gravel aquifer. These waste contained significant amounts of chlorinated dioxins, such as isomers of hexa- and heptachlorodibenzo-p-dioxins and octachlorodibenzo-p-dioxin, which probably derived from commercial pentachlorophenol.

10. Wong (1984):

PCDDs and PCDFs have been detected in flyash from municipal incinerators. Investigators at a chemical company have claimed that PCDDs are by-product of all types of combustion, such as those that occur in refuse incinerators, fossil-fuelled powerhouses, gasoline and diesel engines, fireplaces, charcoal grills, and cigarette smoking.

Dioxins can form at low temperature (below 800°C); however, they are effectively destroyed at high temperatures (above 900°C) (Wong).

Quantities of PCDDs and PCDFs have been measured in the effluents of municipal incinerators operating at relatively low temperatures. To reduce PCDD/PCDF emissions, incinerators must operate at temperatures above 900°C (Wong).

Data suggest that a conventional coal-fired power unit is not a significant source of dioxins (Wong).

a. PCDDs and PCDFs are produced during combustion and pyrolysis of chemically related compounds such as chlorobenzenes, chlorophenols, and PCBs (chlorinated precursor).

In refuse incineration:

PVC, lignin etc. + O2 and/or chlorine → chlorobenzene →

chlorophenol and/or PCBs

b. PCDDs and PCDFs are formed in the thermal process from two nonchlorinated precursors (A and B) and inorganic forms of chlorine in the fuel.

Precursor A + Precursor B → PCDD, PCDF

Precursor A (e.g. phenol, polyphenol structure)
Precursor B (e.g. chlorine donor such as PVC, hydrogen chloride, or other inorganic form of chlorine).

11. Esposito (1980):

- Heating the sodium salt of pentachlorophenol produces octachlorodibenzo-p-dioxin (OCDD). Sodium pentachlorophenate is converted to essentially pure OCDD at approximately 360°C.

  Dioxins can be formed from chlorinated catechols and o-chloronitrobenzenes at 180°C, or direct combustion of herbicides or impregnated sawdust, especially if there is a deficiency of oxygen (Esposito).

- Heat, pressure, photostimulation, and catalytic action all have been shown to encourage the reactions from chlorinated precursors to predioxins and then to dioxins (Esposito).

  Pressure is needed to retain some precursor compounds in the liquid state to permit dioxin formation (Esposito).

  Irradiation of pentachlorophenol with ultraviolet light (UV) has caused the formation of OCDD. It has been postulated that although dichloro, trichloro, and tetrachloro dioxins may be formed by irradiation, they do not accumulate because they decompose rapidly by the same mechanism. The less-chlorinated dioxins are unstable when exposed to UV light.

  Once formed, the dioxin nucleus is quite stable. Laboratory tests have shown that it is not decomposed by heat or oxidation in a 700°C incinerator, but pure compounds are largely decomposed at 800°C. A recent report states that the nucleus survives intact through incineration up to 1150°C (Esposito).

12. Bridle (1984):

Disposal of chlorophenol contaminated wastes poses a serious problem in Canada. The residues of major concern are diptank sludges and wood shavings, which can contain total chlorophenol concentrations up to 35,000 milligram per kilogram (mg/kg).

PCDDs can be formed as products of the incomplete pentachlorophenol combustion.

Approximately 2,000 μg TCDD were produced per g of 2,4,6 trichloro-phenate (2,4,6 TCP) burned.

<u>Laboratory study</u>: Pure chlorophenols, two wood-preserving fluids (Alchem 4135 and Woodbrite 24), and two wood-preserving industry residues treated with Woodbrite 24 (diptank sludge were generated from Woodbrite 24 preservation and wood chips) were used and analyzed for dioxins and furans. PCP had the highest dioxin and furan content (3,000 mg/kg TCP, which is much higher than that reported in the literature). The diptank sludge contained a total concentration of 134 mg/kg TCP.

<u>Results of laboratory study</u>: Combustion of chlorophenol contaminated wood wastes produces 0.9 to 1.7 percent dioxins and furans with penta, hexa, and hepta homologues predominating (as a percentage of the chlorophenol content of the waste). On the assumption that 1 to 10 percent of the chlorophenols used by the industry (Canadian) (33 to 330 tonnes) are combusted with wood wastes, total dioxin/furan production from this source is estimated at between 300 to 5,600 kg annually.

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These studies have indicated that significant production of dioxins and furans will occur from burning of chlorophenol contaminated residues. Thermal regimes up to 900°C and gas retention time of 3 seconds were not adequate to destroy these combustion by-products. This regime will provide excellent chlorophenol destruction.

13. Kooke (1981):

Soxhlet extraction of PCDDs and PCDFs from flyash with benzene or toluene gave the best results, and highest extraction efficiencies were found on acid (HCl) treatment of flyash prior to extraction.

Methods which involve simple shaking or ultrasonic treatment of flyash in an organic solvent were found unsuitable for maximum recovery of these PCDDs and PCDFs.

14. Dickson (1989):

The catalyzed formation of dioxins from pentachlorophenol results in yields several orders of magnitude greater than the De Novo synthesis of dioxins from particulate carbon, inorganic chlorides, and copper (II) under identical conditions of temperature, air flow rate, and heating time.

Particulate carbon can catalyse the formation of dioxins from pentachlorophenol and promote the dechlorination of octachlorodioxin to heptachloro and hexachlorodioxins.

15. Gullett (1990):

Laboratory results showed that PCDDs and PCDFs have been formed from low temperature (350°C) reactions between Cl_2 and phenol precursors.

The experimental results also indicated that the presence of copper compounds in municipal waste combustion flyash lead to the conversion of HCl to Cl_2 via the Deacon process. Previous study shown that Cl_2 is the predominant chlorinating specie in the formation of chlorinated precursors to PCDDs and PCDFs. Therefore, reducing the amount of HCl present in the PCDD/PCDF formation region should decrease the levels of PCDDs and PCDFs in municipal waste combustors.

Other +2 charge metals such as Mg, Zn, Fe, Mn, Hg, Cd, Ni, Sn, and Pb tested show PCDD and PCDF concentrations remained below detection limits.

16. Hites (1991):

PCDD/PCDF are stable when adsorbed to flyash and to atmospheric particulate matter. Particulate-bound PCDD/PCDF do not photodegrade.

Total concentration of dissolved PCDD/PCDF in rain water in Indianapolis was 17 picogram (pg)/L. The total concentration of particulate-bound PCDD/PCDF was 110 pg/L.

Any incomplete combustion in the presence of an organic chlorine source can lead to PCDD/PCDF formation. Chlorine is a constituent of leaded fuel in the form of dichloromethane. The production rate of PCDD/PCDF measured was 315 pg/km in exhaust

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from light-duty vehicles burning commercial mixtures of unleaded fuels and 2760 pg/km in exhaust from vehicles burning leaded fuels.

Soil samples taken at a distance from State Road 37 in Indiana had OCDD concentration significantly higher than background levels (200 pg/g), ranging from 900 to 5,000 pg/g.

The concentrations of PAH in the sugar maple tree bark sample (in the high traffic density site in Indiana) sample range from 3 to 180 ng/g of bark.

17. Stehl (1972, 1977):

Results indicate that octachlorodibenzo-p-dioxin (OCDD) concentration did not increase as the result of combusting either wood or paper treated with pentachlorophenol; the concentration of OCDD concentration was actually decreased during combustion (Stehl).

Combustion of wood or paper treated with pentachlorophenol resulted in no increase and more probably a decrease in OCDD concentrations, while OCDD increased slightly in paper treated with sodium pentaclorophenate (Stehl).

The 2,3,7,8 isomer is seemingly stable towards air oxidation but was destroyed at 800 C and was, along with the 2,7 isomer, unstable in the presence of UV light, with the 2,7- and 2,3,7,8-chlorinated dibenzo-p-dioxins having a half-life of 40 and 45 min, respectively. The OCDDs seems stable towards UV radiation (Stehl).

18. Whitworth (1992):

The air pollution control system (APCS) discharge flue gas from the incineration of the sediments contained low levels of PCDDs and higher levels of PCDFs, chiefly total TCDF, total PeCDF, and total HxCDF. The 2,3,7,8-TCDD toxicity equivalent levels were in the nominal 0.05 to 0.10 ng/dscm range. PCDD/PCDF emissions were not affected by kiln temperature (Whitworth).

19. Murray (1993):

The pulp and paper industry produces large quantities of organic and chlorinated organic wastes (Murray).

PCDDs and PCDFs have been identified in emissions from the pulp industry (Murray).

The pulp industry primarily produces 2,3,7,8-PCDD and PCDF (Murray).

There is some indication that PCDDs increase the risk of soft-tissued sarcomons in heavily exposed industrial workers (Murray).

The high organic content of pulp mill waste coupled with the presence of chlorine results in the production of many highly toxic chlorinated organic compounds such as phenols, furans, dioxins, and aliphatic hydrocarbons (Murray).

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20. Milligan (1993):

Incinerator flyashes showed increasing yields of chlorobenzenes with temperature and an optimum temperature window for PCDD/F formation in the range of 300^0 to 325^oC (Milligan).

Gas phase precursors such as chlorophenols (most likely) react with flyash to form PCDD/F (Milligan).

The ratio of PCDD to PCDF was variable as a function of both flyash and temperature (Milligan).

21. Beard (1993):

PCDFs can form by De novo synthesis from chlorinated hydrocarbons like TCE, DCM, and CCl_2 in the presence of $FeCl_3$ and HCl or Cl_2 (Beard).

22. Buser (1978), Rappe (1978):
Due to their thermal and chemical stability, PCBs were used in a variety of applications, such as heat transfer fluids and casting waxes (Baser, Bosshardt, Rappe).

In the 1980s, PCDFs were reported as toxic impurities at the ppm level in PCBs (Baser, Rappe).

Results from experimentation suggest that uncontrolled burning of PCBs can be an important source of PCDFs, which have been identified in flyash from municipal incinerators and industrial heating facilities (Baser, Rappe).

23. Presidents Science Advisory Committee (PSAC), (1971) "Report on 2,4,5,-T."

One of the important impurities in 2,4,5-T is a polychlorinated dioxin, resulting from impurities in the starting material and from the making of 2,4,5-T (PSAC).

Technical grade 2,4,5-T contains 90 to 92 percent Tric. acid and 8 to 10 percent impurities (see Table in the references) (PSAC).

One source of information concerning the toxicity of dioxin comes from observations of occupational exposures in plants manufacturing 2,4,5-T. Dioxin has possibly caused chloracne (PSAC).

24. Buser (1979):

PCDDs/Fs have been identified in flyash and flue gases of municipal and industrial waste incinerators, and it has been reported that they are possibly products of combustion processes (Buser).

Since chlorobenzenes are used in fairly large quantities as solvents and as starting materials in a variety of chemical processes, this formation of PCDDs/Fs may be of some importance; the disposal of chlorobenzenes through incineration should be strictly controlled in order to prevent environmental and occupational exposure from PCDDs/Fs (Buser).

25. De Leer (1988):

During thermal decontamination of soils polluted with organochlorine compounds, very toxic TCDF and PCDF compounds may be produced (De Leer).

The production and emissions of PCDD and PCDF can be prevented if proper incineration conditions are selected (De Leer).

26. Commoner (1985):

At the low levels encountered in the environment, the relevant activity is their effect on the incidence of cancer (Commoner).

The health effects of PCDD/F from incinerator emissions depends on several factors (Commoner).

A considerable number of MSW incinerators have been tested, and in almost every case, PCDDs/Fs have been detected (Commoner).

Laboratory combustion experiments suggest that PCDD/Fs are synthesized in incinerator systems from unchlorinated aromatic precursors and a source of chlorine (Commoner).

Available data indicate that the methods of controlling PCDD/F emissions that have been proposed thus far (high furnace temperature, supplementary burner, ESP, or scrubber equipment) fail to do so (Commoner).

27. Rappe (1978):

Chlorophenols contain a variety of contaminants and by-products, having PCDDs and PCDFs in the range of tens to hundreds of PPM (Rappe,).

Large quantities of chlorophenols are used as fungicides in the wood industry (Rappe, Marland).

In this investigation, PCDDs were formed during the uncontrolled open burning of leaves and wood wool impregnated with chlorophenates (Rappe).

The burning of chlorophenates or materials such as wood shavings, plywood, or waste oil containing chlorophenates seems to be an important source to environmental pollution by PCDDs (Rappe).

28. Stieglitz (1986), Vogg (1987):

Besides dioxins and furans that already exist in particulates from waste incineration, there is a potential of additional formation of these compounds due to the presence of precursor compounds (chlorinated compounds) (Stieglitz, Vogg).

The formation of PCDDs/Fs in the flyash from refuse incineration is found to occur mainly at 300°C (Vogg).

The oxidation of carbon in flyash may serve as a basis for the mechanism of PCDD/F formation (Vogg).

29. Czuczwa (1984):

The congener distributions of dioxins and furans indicate that combustion is most likely the major source of these compounds. Concentration profiles in sediment cores shows that emission of dioxins and furans has increased greatly since 1940 (Czuczwa).

PCDD and PCDF are found in chlorophenols, herbicides, and PCBs. PCDDs and PCDFs have entered the environment through accidental release during chlorophenol production, application of herbicides, and improper disposal of waste. Recently, PCDDs and PCDFs have been identified in effluents from combustion processes, particularly in flyash and flue gas of municipal incinerators (Czuczwa).

Researchers have concluded that PCDDs and PCDFs are products of the combustion of organic materials (Czuczwa).

Dioxin and furan inputs have changed considerably over time; much more has been deposited since 1940 (Czuczwa).

The input of dioxins and furans to the sedimentary environment is probably due to the combustion of chlorinated organic products present in various wastes (Czuczwa).

30. Thompson (1986):

PCDDs and PCDFs are formed during fires involving electrical equipment containing PCBs. PCDFs have been identified as the major combustion product in soot from PCB fires (Thompson).

Recent occurrences of transformer fires in the United States have resulted in widespread contamination of buildings with PCBs, PCDDs, and PCDFs (Thompson).

The use of total PCBs as an indicator of total PCDDs and PCDF is justified (Thompson).

Generally, in a PCB transformer fire, the levels of PCDFs produced are significantly greater than the level of PCDDs. This also holds true for incinerators normally (Thompson).

31. See Table in Eiceman (1981) (Figure 4).

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F.3.2.2

SUMMARY OF PCB INFORMATION

1. Draper (1988), Dubinsky (1987), Buser (1978), Rappe (1978), and Stephens (in Exner [1987]):

PCBs are noted for their stability. They are resistant to heat, oxidation, and attack by strong acids and bases.

PCBs have been used widely as dielectric fluids, fire retardants, heat transfer agents, hydraulic fluids, plasticizers, and in other applications.

PCBs containing five or more chlorines per molecule tend to persist in the environment (Dubinsky, Chapter 11, PCBs).

PCBs are remarkably reactive when exposed to ultraviolet (UV) light (sunlight), but not to blacklight lamps. PCBs were photolabile in either organic solvents or neat thin films. In a field test on concrete contaminated with Aroclor 1260 (81 μg/100 square centimeters [cm^2] approximately 10 years ago), a phototype reactor destroyed 47 percent of the residues after 21 hours of treatment. The majority of PCB photodegradation studies have been carried out in solution with organic or combined solvents preferred due to their low water solubility.

2. Erickson (1989):

Real-world incidents:

Binghamton (NY): Samples of soot were found to contain 20 mg PCDDs/g, 700 to 2,200 mg PCDFs/g, and polychlorinated biphenylenes (54 mg/g).

From literature: PCDFs are formed from PCBs at temperature as low as 300°C, optimum conversion occurs between 500 and 700°C with reaction time in the low-second range and excess oxygen present in the atmosphere. Under the optimized conditions in the laboratory, the concentration of these compounds can reach 1 percent of the initial PCB concentration.

3. Campbell (1987):

Chlorobenzenes and PCBs do not form PCDDs and PCDFs when heated in the <u>absence</u> of oxygen. With exposure to oxygen, PCBs can produce PCDFs, and chlorobenzenes can produce PCDDs. The particular isomers of PCDDs and PCDFs formed are related to the number of chlorine substituents in the reacting material.

PCDDs and PCDFs are not formed in transformers containing PCBs under normal operating conditions. Their formation requires thermally stressful conditions and the presence of oxygen.

Electrical arcing in transformers do not lead to the formation of PCDDs and PCDFs.

Optimal formation of PCDFs can be at 600 to 680°C, and a resident time of 0.8 second or longer.

By heating Aroclor 1248 to 300°C in a sealed glass ampoule, PCDFs formation reached a maximum of 0.2 percent conversion. Dichloro and trichlorodibenzofurans were also formed from tetrachlorobiphenyls in Aroclor 1248.

4. Korte (1992), Lee (1985):

In 1970, the year of peak production, more than 85 million pounds of PCBs were produced in the United States alone, 57 percent of which were in the form of Aroclor 1242 (A-1242). A-1242 is a colorless liquid and was used primarily as a heat transfer media because of its thermal stability.

Dioxins and furans are formed only under pyrolytic conditions and only from trichlorobenzene present in dielectric fluids. Dioxins and furans are secondary contaminants where PCBs are found.

a. Five potential sources of dioxins/furan were evaluated:

a1. As impurities in A-1242: Levels of furan impurities in the Aroclors range from 0.7 to 5.6 ppm. The maximum concentration reported for A-1242 (Therminol FR-1) was 4.5 ppm.

a2. Formation in heat transfer operation: Analyses revealed a total furan concentration of 12.4 ppm, which represents more than a four-fold increase above the 2.8 ppm furan concentration found in unused A-1248 samples.

a3. As pyrolysis products from A-1242: Buser has documented the formation of furans from the pyrolysis of PCBs. At temperatures of 550 to 650°C, the total yield of furans from A-1254 ranged from 3 to 25 percent with mono- to penta-furans being formed.

a4. As impurities in PCB fluids in transformers and capacitors: Two common PCBs containing dielectric fluids are Pyranol and Inerten. These fluids are mixtures of A-1260 (60 to 70 percent) and trichlorobenzene (30 to 40 percent). Furans, as impurities in A-1260, range from 1.0 to 2.2 ppm.

a5. As pyrolysis products from PCB/chlorobenzene mixtures in transformers and capacitors: At temperature 620°C, trichlorobenzene produced dioxin and furan quantities equivalent to 0.03 percent and 1.05 percent, respectively (in the present of air). Approximately 45 percent dioxins and 20 percent furans formed from trichlorobenzenes pyrolysis.

b. Travis reported total dioxin/furan level in background soil samples from the suburban United States as 1.32 parts per billion (ppb). The half-life for dioxin in soils is estimated to range 1 to 10 years.

c. It is normally assumed that PCB soil contamination is rarely as high as 10,000 ppm (PCB/soil) at facilities that employed heat transfer operations with PCB fluids. The majority of PCB-contaminated samples are assumed to contain less than 100 ppm. Therefore, with maximum of 4.5 ppm furan impurity in A-1242, the amount of furans can be estimated in PCB contaminated soil. Similar estimates can be applied to other sources.

Results:

Source	Estimated Furan in contaminated soil (With 10,000 ppm PCB in soil)
a1	45 ppb
a2	180 ppb
a3	300 to 2,500 ppm
a4	14 ppb
a5	195 to 1625 ppm (contributed by PCBs)
	37 ppm (contributed by trichlorobenzenes)
	1.05 ppm total dioxins

5. New PCBs regulations (1990). The Hazardous Waste Consultant (March/April 1990):

- Approximately 1.25 billion pounds of PCBs were used in the United States from 1929 to the 1970s; approximately 965 million pounds of PCBs were used as dielectric fluids in electrical transformers and capacitors, of which 310 million pounds are still in service. 100 million pounds PCBs were used as hydraulic and heat transfer fluids, 45 million pounds were used in carbonless copy papers, and 115 million pounds were used in a variety of diverse applications ranging from plasticizers to printing inks.

- Biological treatment of PCB is a slow process but has the potential to be less expensive than other PCB treatment technologies. Laboratory tests on PCBs similar in composition to Aroclor 1248 showed approximately 50 percent of the PCBs (initial concentration of 50 ppm) were destroyed within 3 days. Tests simulating in situ conditions reported a 50 percent PCB destruction in 100 days from initial concentration of 500 ppm PCB.

  Studies of sediments containing 700 ppm Aroclor 1242 in the Hudson River (with total meta and para chlorine atoms per biphenyl molecule decreased from 1.98 to 0.31 after 16 weeks) suggested that anaerobic dechlorination of highly chlorinated PCBs can occur naturally in river sediments overtime.

  PCB concentrations were reported to decrease from 300 ppm to 20 ppm in 50 days in sandy and heavy loam soil with white rot fungus train.

6. PCBs Treatment Technologies (1992). The Hazardous Waste Consultant (May/June 1992):

Most PCB wastes are either incinerated or disposed of in Toxic Substances Control Act (TSCA) permitted landfills (PCB Treatment Technologies).

Possible ways of disposing of PCB wastes are incineration, chemical dechlorination, catalytic hydro dechlorination, photochemical dechlorination, radiolytic dechlorination, ultrasonic detoxification, solvent extraction, and biological treatment (PCB Treatment Technologies).

Many electrical transformers and capacitors still contain significant levels of PCBs and may continue to be used (PCB Treatment Technologies).

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7. Lee (1985):

Since commercial introduction in the late 1920s, over 1.25 billion pounds of PCBs have been manufactured and used in the United States primarily in mixtures with chlorobenzenes known as Askarels, which are used as dielectric fluids for electrical transformers and capacitors, heat transfer system, and hydraulic systems. Askarels usually have 70 percent PCBs (Aroclor 1254) and 30 to 40 percent trichlorobenzenes.

PCBs are also present in mineral oil transformers; 70 percent of the transformers contain less than 10 ppm PCBs. About 6 percent contain PCB concentrations of 100 to 500 ppm.

Baghouse ash at 5.3 µg PCDDs/g was found in test burns of pentachlorophenol waste, with the lower chlorinated PCDDs predominate. The higher chlorinated PCDDs were found in the bottom ash.

8. Sebastian:

PCB properties are inertness, insolubility, adhesiveness, heat resistance, toxicity, and stability (Sebastian).

PCBs have been used in industrial processes because of their unique properties. However, some of these same properties promulgate the toxic properties, which have caused the present concerns over their environmental impact (Sebastian).

The more highly chlorinated PCB's are more persistent while the less chlorinated ones are more toxic (Sebastian).

In some cases small traces of PCBs have increased the toxicity of DDT by 100 percent (Sebastian).

PCBs were first commercially produced in the United States in 1929. In 1966, PCBs were identified in some food products, and since that time have been found throughout the environment (Sebastian).

PCBs in the environment (U.S.):

Air	20,000 tons
Land	250,000 tons
Water	30,000 tons (Sebastian)

PCBs are no longer used in carbonless paper paints, or glues; and the only use currently is in electrical equipment (Sebastian).

Cycle through the environment:

Electrical systems → Receiving water → Aquatic
Organisms → Fish → Animals → Man. (Sebastian)

PCBs tend to concentrate in the fatty tissues of the various food chain levels (Sebastian).

9. Rubey (1985):

When samples of PCBs were thermally decomposed in atmospheres containing different concentrations of oxygen, a variety of products were formed. PCDF congeners represented a considerable portion of these products (Rubey).

The degradation of Aroclor 1254 samples resulted in the formation of PCDF with di, tri, and tetra - CDFs being the common congeners (Rubey).

Incorporation of O_2 is necessary for the formation of PCDFs from PCBs (Rubey).

For the range of O_2 levels studied, the PCDF yield increased with equivalence ratio (Rubey).

Open burning or incineration of PCBs may provide an atmosphere with more oxygen available to participate in the formation of partially oxidized products such as PCDFs (Rubey).

Yields of PCDFs formed from high temperature gas-phase degradation of PCBs can be on the order of several percent, and maximum yields increase as the oxygen concentration increases within the range studied (Rubey).

It appears that PCDFs can be destroyed at temperatures near those required for the destruction of parent PCBs (Rubey).

10. Muto (1991):

The presence of PCDDs in stack emissions and flyash will constitute a human health problem for the general population living near the facilities of MSW incinerators, and for the workers in these facilities (Muto).

11. The Legal Affairs and Enforcement Division (1980):

A serious concern in incinerating PCBs is the possibility of creating toxic by-products by incomplete combustion. The chemical structure of PCB lends itself to the creation of very toxic by-products such as PCDFs, and possibly PCDDs, both of which are more toxic than PCBs (The Legal Affairs and Enforcement Division).

Various studies done recently (1980 report) have identified the formation of PCDFs from the incomplete combustion of PCBs, primarily under pyrolysis conditions (The Legal Affairs and Enforcement Division).

Of concern is that studies have shown formation of PCDFs from PCBs being used in transformers. This formation of PCDFs results from the fact that PCBs are exposed for years to constant high temperatures and that metals present in the heat transfer tubing might act as catalysts in the reaction of PCB (The Legal Affairs and Enforcement Division).

If PCB materials contain unknown amounts of PCDFs, any amount of PCB feed which is not completely combusted will add to the amount of PCDFs being emitted (The Legal Affairs and Enforcement Division).

12. Hooper (1990):

PCBs present an environmental health hazard of global scale and man-made origin (Hooper).

PCBs are toxic, mutagenic, and teratogenic agents with proven bioaccumulation and bioconcentration abilities, and these compounds have a negative impact on nearly every member of the biota (Hooper).

Most nations that are industrialized have synthesized PCBs for commercial use. PCBs are or were used as electrical insulators, lubricants, hydraulic fluids, diffusion pump oils, cutting oils, plasticizers, liquid seals. PCBs have been used in households as flame retardants in plastics, as preservatives and protectants in rubber, in weather proof coatings and stucco, in steel coatings, waxes, varnishes, inks, duplicating fluids, and other everyday items (Hooper).

Higher substituted biphenyls persist in the environment for longer periods of time (Hooper).

In the United States, PCBs were produced as congener mixtures by Monsanto Corporation under the trade name Aroclor (Hooper).

PCBs are lipophilic and resistant to breakdown, so these compounds can biomagnify as they move up the food chain (Hooper).

PCBs present the greatest human health hazard in chronic, rather than acute, doses (Hooper).

Effects of acute PCB poisoning are chloracne, atropic epidermis, hyperkeratinosis, melanin deposition in layers of the skin, changes in the sweat glands, liver necrosis, hemorrhage of visceral organs, and possibly pericarditis (Hooper).

The potential for PCDF formation also complicates disposal by incineration. Incomplete combustion of PCBs may yield PCDFs in the incinerator exhaust (Hooper).

13. Gauger (1990):

Findings indicate the bioremediation potential of PCB-contaminating soil and sediments by anaerobic microorganisms (Gauger).

14. Ashley (1989):

PCB-contaminated natural gas liquids have been found in metering equipment of an eastern distribution utility (Ashley).

Twelve companies found elevated PCB concentrations in their pipe line liquids. This apparently resulted from connection with natural gas pipelines where fire-retarding lubricants containing PCBs were used in centrifugal compressors (Ashley).

15. Bedard (1987):

PCBs have attracted concern because of their worldwide distribution, their persistence in the environment, and their possible health effects (Bedard).

16. Battelle Columbus Laboratories:

PCBs are currently indicated as potential carcinogens (PCB Disposal Alternatives).

The manufacture and distribution of PCBs was prohibited after May, 1979 (PCB Disposal Alternatives).

Over the next 40 years, the utility industry will have 375 million pounds of PCB-containing dielectric fluid that will require disposal (PCB Disposal Alternatives).

PCBs can leach out of equipment into clean oil, resulting in a secondary contamination problem (PCB Disposal Alternatives).

Use of improper incineration techniques could disperse the PCBs over a wide area by vaporization in an incinerator and emissions from the stack. So far, PCB destruction has been oriented toward incineration (PCB Disposal Alternatives).

17. Abramowicz (1990):

PCBs, commonly believed to be indestructible, have been shown to be biodegradable under a variety of conditions. Aerobic and an aerobic microorganisms have been shown to be effective (Abramowicz).

In general, most PCB degrading aerobic bacteria are able to degrade only the lower chlorinated PCB congeners (Abramowicz).

18. Monsanto Technical Bulletin:

Aroclor is resistant to alkalis, acids, temperature, and is insoluble in water (The Aroclor PCBs).

The hazard of potential toxic exposure varies with their volability (of the Aroclor); the lower chlorinated ones, being more volatile, present more of a potential problem from the standpoint of both inhalation and skin contact. Chloracne may result from skin contact (The Aroclor PCBs).

19. Clark (1962):

Registered trademarks for commercial brands of PCBs in the United States are the following: Aroclor, Chlorextol, Dykanol, Inerteen, Noflamol, Pyranol, and Therminol (PCBs and Related Compounds).

Askarel is a class name which is applied in the United States to designate a synthetic nonflammable insulating liquid, which when decomposed by electric arc, evolves only nonflammable gaseous mixtures (Clark).

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F.3.2.2.R

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F.3.2.3

SUMMARY OF PENTACHLOROPHENOL (PCP) INFORMATION

1. Dubinsky (1987):

Pentachlorophenol (PCP) is used in a variety of agricultural and industrial uses as a fungicide, bactericide, insecticide, herbicide, and molluscicide (Chapter 8, PCP).

PCP is used for wood preservation, and for slime control in pulp and paper production (Chapter 8, PCP).

PCP in solution (a carrier solvent, petroleum based) will be carried along, increasing the amount reaching the environment (Chapter 8, PCP).

There is evidence that PCP is attacked by bacteria and fungi, with release of chloride and CO_2 (Chapter 8, PCP).

2. Draper (1988):

- PCP combustion samples in the laboratory have revealed that OCDD is the principal PCDD/PCDF product.

  Technical PCP contains numerous byproducts including tetra and trichlorophenols, hexachlorobenzene, and PCDD/PCDF. Recent European production batches of PCP contain less than 1 mg PCDD/PCDF per gram of technical product.

  Pyrolysis or low temperature combustion (less than 900°C) of PCP greatly increases the pCDD/PCDF content.

- The chemical composition of the combustion products at the California PCP fire (4,500 kg PCP were consumed (5 percent) with 85 percent (w/w) of liquified butane, 5 percent of isopropyl ether, and 5 percent of No 2 fuel oil). The charred material was analyzed; the pyrolyzed product contained <u>321 ppm</u> TCDD equivalents, while the technical material was estimated to contain <u>2.9 ppm</u> TCDD equivalents.

- PCP is highly water soluble (2C,000,000 ng/L), readily photodegraded in natural sun light, and can be metabolized by soil microbes (half life is 30 to 50 days).

  Half life of PCDD/PCDF including TCDD/OCDD may reach 10 to 12 years. Background values of OCDD can be as high as 5 μg/kg in the United States (in Lake Ontario sediments).

3. Jackson (The American Chemical Society Publication):

Hexa, hepta, and octachlorodibenzo-p-dioxin were found in a technical grade of commercially available PCP; they measured approximately 40, 21, and 9 ppm, respectively. They were also found in analytical grade PCP at 0.03, 0.07, 0.03 ppm, respectively.

4. Arsenault (1976):

- Eighty percent of PCP produced is used in the wood preserving industry (over 48 million pounds were used in the United States in 1974).

  It is reported that when 5 g of PCP is heated at a temperature of 300°C for 12 hours, it is capable of generating 1.5 g of octachlorodibenzo-p-dioxin (OCDD).

- Kearney reported that TCDD is not taken up from soil by plants and not translocated. It is immobile in soils and does not leach down into the soil profile. TCDD is photodecomposed under natural conditions, but slowly.

  Another significant analytical problem has been recognized. The analytical equipment used can, through heating the sample, <u>generate</u> dioxins that were <u>never</u> in the sample before analysis.

- The PCP on the surface of the wood is subject to the degradation effects of sunlight. Light will cause photodegradation of both PCP and the chlorodioxins to harmless byproducts, especially if water is present.

  Irradiation of a thin hexadecane film containing 400 ppm of PCP floating on the surface of deionized water in a closed flash resulted in a very rapid loss of PCP, but no detectable photodecomposition products.

  Laboratory test has shown that OCDD is decomposed fairly rapidly on filter paper by both laboratory UV light and sunlight (more than in laboratory UV light) when the filter paper has been treated with a solution of OCDD either in purified mineral oil or an petroleum solvent. In outdoor exposure, about 66 percent of the OCDD in oil was decomposed in 16 hours of sunlight. In the absence of oil, about 20 percent of the OCDD was decomposed in 16 hours. TCDD was not detected as a breakdown product of OCDD.

  Higher processing temperatures could lead to dioxin formation, especially if PCP is in the form of the sodium salt.

  PCP ---→ 180 to 500°C ---→ forms OCDD
  PCP ---→ 550 to 880°C ---→ does not form OCDD
  Na PCP ---→ 550 to 800°C ---→ forms OCDD

- PCP is not persistent in the environment. It is readily biodegradable in both water and soil. Data showed that 98 percent of the PCP contained in the sludges (200 ppm) from commercial wood-treating operations was destroyed in 205 days when the sludges were <u>composted</u> in permeable soil.

  It was also reported that PCP degraded in soil in 7 days from 4 ppm to 2 ppm. Laboratory tests also showed that when wood-treating process waters containing up to 35 ppm of PCP have been percolated through soil columns 3 feet long, effluent waters have consistently contained less than 1 ppb over 2.5 year period.

  PCP also can be degraded in a sewage treatment plant. Tests showed PCP concentration fell from 39.5 ppm to 0.5 ppm in 3 days, and from 81 ppm to 0.6 ppm in 30 hours.

- TCDD does not leach in soils by rainfall. It is immobile in soil (test in Maryland soil), including sandy loam. It is not taken up into the plants growing on contaminated soils nor is it translocated within the plants. It can be degraded (slowly) by soil microorganisms to about 50 percent of the initial concentration after 1 year (even at a high rate of 1 to 100 ppm).

Typical grade PCP contains 1.1 parts of OCDD per 1000 parts of PCP.

5. Stretz (1984):

Test results showed no detectable production of TCDDs or TCDFs at detection limits in sample extracts of 1 and 5 ppb, respectively, in a complete thermal destruction of PCP (combustion efficiency greater than 99.99 percent, destruction efficiency greater than 99.99 percent).

6. Dubinsky (1987):

Chlorophenols (CPs) are used as antifungal agents and are often applied as a preservative to fresh lumber. They are also used as herbicides and to control mold (Chapter 7, CPs).

7. Stehl (1972):

Grass and paper coated with several compounds containing the 2,4,5-T have been subjected to combustion. The average was 0.6 part per trillion (pede) (pede) of TCDD formed per 1 ppm of 2,4,5-T burned.

8. Stoddart, Tremblay:

Herbicide orange is a 50:50 mixture of the normal butyl esters of 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-T. A total of 2.2 million gallons of HO left from South Viet Nam was disposed at Johnston Island by incineration. No TCDD was detected in any ambient air samples.

F.3.2.3.R

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F.3.2.4

SUMMARY OF POLYNUCLEAR AROMATIC HYDROCARBONS (PAHs) INFORMATION (PAHs is used interchangeably with PNAs)

1. Roy (1984):

Flyash samples derived from high-sulfur Illinois Basin coals and Western United States coals were found to contain a variety of paraffins, aryl esters, phenols, and PAHs including phenanthrene, pyrene, and chrysene, but all at very low concentrations (less than 1 ppm).

2. Mamantoy (1991, 1992):

PAHs are much less susceptible to photochemical transformation when sorbed on coal flyash than when sorbed on most other types of particulate matter. One plausible explanation is that coal ash particles (especially carbonaceous particles) are porous and dark in color. Therefore, it is possible for sorbed PAH molecules to penetrate into pores and thus be "shielded" from the incident light.

3. Griest (1985):

Studies with carbon-14 labeled PAH radiotracers demonstrated that the extraction recoveries of PAH from stack ash (from coal-fired power plants) are inversely proportional to the number of rings in the PAH molecules, and that aromatic compounds are more strongly sorbed than aliphatic hydrocarbon. The strong sorption property of PAH to flyash limits the amounts of these compounds that can be extracted from the ash.

Carbonaceous particles (ranging from uncombusted coal to coal coke) are the species principally responsible for the strong sorptivity of ash for PAH. THe total organic content of the carbonaceous particles ranged up to 1.6 mass percent.

Major components identified in the extractable organic content in coal-fired flyash included C18 to C32 n-paraphins (0.04 to 0.2 μg/g each), 3 to 5 ring PAH (0.08 to 0.2 μg/g each), fatty acids, n-heterocyclics, PAH-ketones, and 1-nitropyrene and total mononito PAH (0.06 to 2.6 μg/g each).

It has been estimated that in 1974, more than 2 millions metric tons of flyash were emitted to the atmosphere as a result of coal combustion for electric power generation. Coal consumption by the electric utilities was approximately 390 million short tons in 1974.

4. Lucas (1985):

No PCDDs or PCDFs were detected in any specimens acquired from influents and effluents from seven coal-fired utility boilers. PCBs were found in the flue gas emissions. Total national annual emissions of the industry was estimated 7,500 kg PCBs.

Naphthalene was the most prevalent PAH compound detected in the flue gas emissions. Total national annual emissions was estimated at 11,000 kg. Other PAHs were also detected in the coal.

Bis(2-ethylhexyl)phthalate was the most frequently detected phthalate compound. Total national annual emissions was estimated 104,000 kg.

5. Wild (1992):

The organic fraction of municipal solids waste (MSW) has been reported to contain between 0.06 to 187 mg PAHs/kg municipal refuse. PAH concentrations in bottom ash, boiler/economiser ash, and precipitator ash are 0.1 to 0.5, 0.03 to 0.2, and 0.2 to 0.5 μg/g, respectively. Quenched grade ash residue and arrested flyash residues contained a PAH content of .876 μg/g. In general, incineration of MSW and sewage sludge can produce an arrested flyash residue with PAH content 1 to 1,000 μg/kg. Generally, benzo[ghi]perylene, pyrene, phenanthrene, and coronene are the most abundant.

6. Epri (Electric Power Research Institute) (1990):

Coal tar samples from former manufactured gas plant (MGP) processes were collected and analyzed for a variety of organic and inorganic constituents. Concentration of monocyclic aromatic hydrocarbons (e.g. benzene, toluene, xylene) ranged from 2 to 6,000 ppm. PAH concentrations varied significantly from site to site, generally ranging from 300 to 71,000 ppm in tars.

Arsenic, chromium, lead, nickel, selenium, and vanadium are the common metals found in tars. Their concentrations range from 1 to 36 ppm with the exception that lead and vanadium concentration was highly variable (ranging from 1 to 930 ppm).

Results of laboratory studies indicated that precipitator (20 percent by mass of total ash generated) was the primary source of the proton, metal ion, and arsenic and boron loading of the disposal pond at a coal fire power plant in the United States.. Arsenic concentration in precipitator and cyclone ash recorded 425 and 106 mg/g respectively. Arsenic will leach readily from ash.

7. Harrison (1983):

Significant amounts of n-alkanes through C30 and PAHs up to 4 rings were found in solid wastes from the coal-fired power plant (22.5 percent of ash content in the coal).

Organic compounds in acidic, basic, and neutral fractions of extracts of liquid waste were low in molecular weight and included alkanes, alcohols, ketones, and phthalates.

8. Howes (1986):

The particulate emissions from the three types of refuse-to-energy incineration units are similar in inorganic chemical composition. The group of elements that are unique to municipal refuse incinerator emissions include zinc, titanium, bromine, tin, antimony, cadmium, and lead. Arsenic ranged from 7 to 700 μg/g ash.

PAH compounds found in the stack emission particulates include naphthalene, phenanthrene, anthracene, pyrene, acenapthylene. The compounds ranged from 7 to 12,000 ng/dry standard cubic meter (dscm), with the lowest values observed in the modular unit.

The average total TCDD concentrations measured in the units ranged from 11 to 245 ng/dscm; TCDF emissions ranged from 73 to 458 ng/dscm. O'Connell, in summarizing the data from other references, reported extremes of 0.3 to 10,536 ng/dscm of total TCDD in incinerator emissions.

9. Bjorseth A. (1985):

Formation of PAHs is based on two major mechanisms: pyrolysis (or incomplete combustion) and carbonization processes (during the generation of mineral oil and coal).

Similar ratios of PAH formed at a defined temperature, irrespective of the type of material to be burned. For example, thermal decomposition of pit coal, cellulose, tobacco, polyethylene, and polyvinyl chloride carried out at 1,000°C yields very similar PAH profiles. Consequently, PAH profiles seem to depend more on the combustion conditions than on the type of organic material burned.

The absolute amount of PAH formed under defined pyrolysis conditions depends on the reaction temperature as well as the material (1 gr tobacco yields 44 ng of benzo[a]pyrene [BaP] at 400°C, and 183,500 ng of BaP at 1,000°C).

The main sources of PAHs are divided into stationary and mobile sources. The stationary sources include industrial sources, power and heat generation, residential heating, incineration, and open fires. The mobile sources include gasoline automobiles, diesel-engine automobiles, trucks, airplanes, and sea traffic.

10. Boldrin (1993):

Mycobacterium sp. strain BB1 was isolated from a former coal gasification site. It was able to use phenanthrene, pyrene, and fluoranthene as sole sources of carbon and energy and to degrade fluorene cometabolically. Fluorene was degraded from 420 mg/L after 21 days; 330 mg/L was degraded after 15 days.

11. Jones:

Bioremediation of PAHs in creosote-contaminated soils (a former railroad tie-treating facility) showed that degradation (95 percent removal) of 2,3-ring PAH was attained by landfarming operation. Only 40 to 70 percent removal were obtained for the higher-ring PAHs.

Pilot-scale slurry reactor reported a degradation of 90 percent on the 4- to 6-ring compounds. The 2- and 3-ring PAH levels in these soils were 5,890 g/kg dry soil, and the 4- to 6-ring PAHs were 5,080 g/kg.

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F.3.2.4.R

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F.3.2.5

SUMMARY OF DDT AND METABOLITES

1. Dubinsky (1987):

Dichloro-diphenyl-trichloroethane (DDT), a chlorinated aromatic, is one of the most persistent pesticides in the environment (Chapter 12, DDT) (Dubinsky).

DDT readily accumulates in microorganisms and invertebrates, and undergoes biomagnification as animals higher in the food chain ingest DDT-contaminated organisms (Chapter 12, DDT) (Dubinsky).

Widespread effects of DDT poisoning include eggshell thinning and birth defects (Chapter 12, DDT) (Dubinsky).

2. Golovleva:

The removal of DDT from the biosphere has not been solved (Golovleva).

It has not yet been possible to achieve degradation of DDT to nonchlorinated, easily degradable compounds (Golovleva).

Complete degradation of DDT requires a complex gradient of conditions which is practically impossible to achieve in nature (Golovleva).

3. Leigh (1969):

Pesticides may enter water through direct application, or indirect application during treatment of adjacent areas, percolation, and runoff from treated areas (Leigh).

4. Sharma (1987):

DDT is a persistent insecticide with the ability of biomagnification in living beings (Sharma).

DDT continues to be used in significant quantities in developing countries to control insect-borne diseases (Sharma).

5. Beunink (1988):

The use of DDT as an insecticide was prohibited since 1972 in most industrialized countries (Beunink).

6. Helling:

DDT is readily absorbed and accumulated by organisms and their predators because the insecticide is both lipophilic and persistent (Helling).

The physical transport of pesticides occurs by leaching, volatilization, and runoff (Helling).

Most biological systems cannot cope with the molecule (DDT) so it progresses into higher members of the food chain (Helling).

Studies of DDT degradation in soil have shown only partial degradation with most of the systems involved (Helling).

The two most frequently detected degradation products of DDT found in the environment are dichlorodiphenyldichloroethane (DDD) and 1,1-bis(p-chlorophenyl)-2-chloroethylene (DDE) (Helling).

Some bacteria and fungi are highly effective in converting DDT to DDD, especially under anaerobic conditions (Helling).

F.3.2.5.R

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F.3.2.6

SUMMARY OF CHLORINATED COMPOUNDS DEGRADATION INFORMATION

1. Baugh (1988):

Chlorinated solvents have been used for a wide range of industrial application for many years. Widespread use in combination with their resistance to degradation by either chemical or biological processes has resulted in these compounds becoming one of the nations most common groundwater contaminants (Baugh).

Chlorinated alkenes (tetrachloroethylene or perchloroethylene [PCE] and trichloroethylene [TCE]) do not appear to undergo hydrolysis under environmental conditions (Baugh).

Chlorinated ethanes undergo reductive dehalogenation. Under suitable environmental conditions, reductive dehalogenation of PCE and TCE results in the formation of dichloroethene (both 1,1 and 1,2-DCE), vinyl chloride, and carbon dioxide (Baugh, as referenced from Vogel and McCarty, 1985).

Transformations of the highly chlorinated (oxidized) compounds requires anaerobic (highly reducing) conditions, while transformations under aerobic (oxidizing) conditions are most rapid on the more reduced (less chlorinated) members of the class (Baugh).

2. Fathepure (1988):

PCE is subject to reductive dechlorination reactions in a variety of anaerobic habitats. PCE can be dechlorinated to TCE by biological reaction (Fathepure).

Chlorinated ethylenes and ethanes are among the most common organic groundwater contaminants known. These compounds were used as industrial degreasers, dry-cleaning fluids, fumigants, and in other applications. These compounds are highly mobile in soils and aquifer materials and often move into groundwater (Fathepure).

In degradation, the relative rate of dechlorination decreases as chlorine molecules are sequentially removed (Fathepure).

Less chlorinated compounds tend to persist longer in anaerobic environments than highly chlorinated compounds (Fathepure).

PCE and TCE were dechlorinated to DCEs under methanogenic conditions (Fathepure).

3. Barrio-Lage (1986):

Transformation of chlorinated alkenes in microcosms simulating underground environments indicated that PCE and TCE undergo reductive dehalogenation to form cis- and trans-1,2-dichloroethene. Further transformation to vinyl chloride was indicated but not proven. This means that if cis- and trans-1,2-dichloroethene were transformed to vinyl chloride, the resulting concentration of vinyl chloride was too small for detection by the methods used (Barrio-Lage).

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Chlorinated ethanes transform very slowly, and apparently with several simultaneous removal reactions. All of the intermediate products of biotransformation between PCE and vinyl chloride, including vinyl chloride itself, that were observed in laboratory studies have been found in groundwater (Barrio-Lage).

In microcosms spiked with 1,1-DCE and TRANS, only the formation of vinyl chloride was observed. In microcosms spiked with CIS, the concentration of vinyl chloride remained low and nearly constant after 2 weeks of incubation, while chloroethane increased slowly (Barrio-Lage).

Not all the substrate that was depleted was transformed to vinyl chloride, indicating that mechanisms of transformation other than reductive dechlorination were taking place. Transformation of substrate by biooxidation or hydrolysis are possible removal mechanisms (Barrio-Lage).

The study has shown that 1,1-DCE, CIS, and TRANS, subjected to the indigenous microbiota of uncontaminated environmental organic sediments, under anoxic conditions undergo reductive dechlorination leading to the formation of vinyl chloride (Barrio-Lage).

Isomers undergo different transformations; CIS led to the formation of CE and only traces of vinyl chloride; 1,1-DCE yielded greater concentrations of vinyl chloride and no CE; TRANS produced vinyl chloride only (Barrio-Lage).

Results of the study confirm that PCE can be transformed by reductive dehalogenation to TCE, dichloroethylene, and vinyl chloride under anaerobic conditions. TCE was the major intermediate formed, but traces of dichloroethylene isomers and vinyl chloride were also found (Vogel).

4. Vogel (1987):

At elevated levels, partial conversion of PCE to TCE was observed. In addition, the study demonstrated the formation of traces of dichloroethylene isomers and vinyl chloride after the disappearance of PCE (Vogel).

Evidence from the small anaerobic continuous-flow fixed film column study indicates that a major intermediate in the transformation of PCE is TCE. Up to 74 percent of influent PCE was found present as TCE in some effluent samples. This process of reductive dehalogenation was suggested previously, and if continued would transform TCE to DCE and then to vinyl chloride (Vogel).

Reductive dehalogenation of 1,1-DCE to vinyl chloride is confirmed. 1,1-DCE is abiotically formed as a result of trichloroethane (TCA) elimination. Results show that 1,1-DCE can then undergo complete biological reductive dehalogenation to form vinyl chloride (Vogel).

If TCA is approximately 120 μg/L and the subsequent concentration of 1,1-DCE after 1 year is about 5 μg/L, then expected concentrations of vinyl chloride would be difficult to detect (Vogel).

5. The Installation Restoration Program Toxicology Guide, 1987, Pentachlorophenol, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, 1987, Vol. 2, Arthur D. Little, Inc., Cambridge, Massachusetts.

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Vinyl chloride is expected to be highly mobile in soil and groundwater. In surface soils, most of the vinyl chloride will be in the soil-air phase and removal by volatilization will be important. In deep soils, transport with soil-water is important. Transportation processes such as hydrolysis and biodegradation are not expected to be significant in natural soils.

Approximately 96 percent of the vinyl chloride produced in the U.S.is used in the manufacture of polyvinyl chloride (PVC) and other vinyl polymers. The remainder is used in the synthesis of 1,1,1-trichloroethane. The major uses of PVC have been in the building and construction industries, in consumer goods, packaging and electrical wire insulation.

The use of PVC for packaging of alcoholic beverages has been banned in the U.S. because of migration of vinyl chloride monomer into the alcohol.

6. Verschueren (1977):

4-nitroaniline (1-amino-4-nitrobenzene) is use as intermediate for dyes and antioxidants, gasoline gum inhibitors, and corrosion inhibitor; it is used as medicinals for poultry.

F.3.2.6.R

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APPENDIX F.4

GLOSSARY

APPENDIX F.4

GLOSSARY OF DEFINITIONS AND TERMS

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GLOSSARY OF DEFINITIONS AND TERMS

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT (FEMP)

As Appended

October 12, 1993

for the

Operable Unit 1 Draft Remedial Investigation Report

Forms and Procedures Development
Administration Division

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Restoration Management Corporation

GLOSSARY OF DEFINITIONS AND TERMS

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT (FEMP)

As Appended

October 1, 1993

for the

Operable Unit 1 Draft Remedial Investigation Report

FORMS and PROCEDURES DEVELOPMENT

ADMINISTRATION DIVISION

GLOSSARY of DEFINITIONS and TERMS

This glossary has been prepared as part of the effort to familiarize the reader with vocabulary pertinent to cleanup activities at the FEMP, as well as specific terms used in the Operable Unit 1 Remedial Investigation Report.

Definition - ...an act of determining; a statement of the meaning of a word or word group or a sign or a symbol; the action or the power of describing, explaining, or making definite and clear...Webster's Ninth New Collegiate Dictionary, 1985.

Each definition is followed by an identifying code in parenthesis, ().

Glossary - a collection of textual glosses or of specialized terms with their meanings...Webster's Ninth New Collegiate Dictionary, 1985.

Term - ...a word or expression that has a precise meaning in some uses or is peculiar to a science, art, profession, or subject...Webster's Ninth New Collegiate Dictionary, 1985.

GLOSSARY OF ENVIRONMENTAL AND FERNALD ENVIRONMENTAL MANAGEMENT PROJECT (FEMP) DEFINITIONS AND TERMS is provided and maintained by:

> Forms and Procedure Development, a site document group within the Administration Division. Direct questions pertaining to the glossary to
> 864-6436.

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SOURCE DOCUMENTS for DEFINITIONS and TERMS

NOTE:

The Environmental Protection Agency (EPA) September 1992 source document is simply a glossary of definitions.

The other source documents referenced may provide the user with additional information that determines if the definition being considered or used fulfills requirements.

For this document, the Environmental Protection Agency is referenced as the "EPA" within a definition.

IDENTIFIER	SOURCE DOCUMENT
DOE 5480.18A, 07-19-91	Accreditation of Performance-Based Training for Category A Reactors and Nuclear Facilities, issued 07-19-91
DOE 5480.5, 09-23-86	Safety of Nuclear Facilities, issued 09-23-86
DOE 5480.11, 12-21-88	Radiation Protection for Occupational Workers, Issued 12-21-88
DOE 5700.6C, 08-21-91	Quality Assurance, issued 08-21-91
DOE 5820.2A, 09-26-88	Radioactive Waste Management, issued 09-26-88
DOE/EH-0256T, 0692	DOE Radiological Control Manual, June 1992
EPA 0992	Environmental Protection Agency (EPA) Sept 1992; Terms of Environment; EPA 175-B-92-001
FMPC-0102, 01-16-91	Training, Revision 1, Effective 01-16-91
FMPC-0307, 12-19-91	Control and Accountability of Nuclear Materials, Rev. 4, Issue Date: 12-19-91
FMPC-0708, 12-15-89	Personnel Certification, Revision 2, Issued 12-15-89
FMPC-2116 0189	Implementing FMPC Policies and Procedures for System Safety Analysis, Rev. 0, January 1989
FMPC-2117 0189	Topical Manual for Nuclear Criticality Safety, January 1989
OSHA 1910.120 55; 57	Occupational Safety & Health; 1910.120; Change 55; Change 57
PL-2194, 04-30-93	FMPC Spill Prevention Control and Countermeasure Plan Effective 04-30-93
PP-0314, 12-20-91	Packaging, On-Site Movement and Off-Site Shipment of Material, Rev. 0, Issue date: 12-20-91
RM-0009, 05-13-92	Radiological Controls Manual, Rev. 1, Effective 05-13-92
RM-0012, 04-30-93	Quality Assurance Program Description, Rev. 2, Effective 04-30-93
SSOP-0002, 10-22-91	Completing the Material Evaluation Form, Rev. 3, Effective 10-22-91
SSOP-0018, 05-07-92	Processing the Site-Wide Analysis Request/Custody Record for Sample Control, Rev. 1, Effective: 05-07-92
SSOP-0027, 02-07-92	Control of Box-Type Waste Containers, Rev. 0, Effective: 02-07-92
SSOP-0044, 06-19-92	Management of Soil, Debris, and Waste from a Project, Rev. 0, Effective 06-19-92
SSOP-0051, 09-04-92	Controlling Access to the Fernald Environmental Management Project (FEMP), Effective 09-04-92

SSOP-0075, 12-14-92	Packaging Low Level Radioactive Waste (LLRW) in Drums for Offsite Shipment, Rev. 0, Effective 12-14-92
SSOP-0078, 12-14-92	Packaging Low Level Radioactive Waste (LLRW) into ISO containers for Offsite Shipment, Rev. 0, Effective 12-14-92
SSOP-0098, DRAFT	Site Radiation Work Permits, Rev. , DRAFT
SSOP-0099, DRAFT	Visitor Tour Access, Rev. , DRAFT
SSOP-0103, 10-14-92	FEMP SITE DOCUMENT SYSTEM, Effective 10-14-92
W Abv&Acro 1992	Westinghouse Abbreviations and Acronyms, Revision 3, January 30, 1992
Webster's 9th, 1985	Webster's Ninth New Collegiate Dictionary, 1985
	McGraw-Hill Dict. of Scientific and Technical Terms, Fourth Edition, Sybil P. Parker, editor in chief, 1989

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A

1000-series wells - Groundwater monitoring wells extending into the perched groundwater within the till.

2000-series wells - Groundwater monitoring wells that extend into and monitor the upper portion of the Great Miami Aquifer.

3000-series wells - Groundwater monitoring wells that extend into and monitor the middle portion of the Great Miami Aquifer.

4000-series wells - Groundwater monitoring wells that extend into and monitor the lower portions of the Great Miami Aquifer near bedrock.

A-scale sound level - A measurement of sound approximating the sensitivity of the human ear, used to note the intensity or annoyance level of sounds. (EPA 0992)

abandoned well - A well whose use has been permanently discontinued or which is in a state of such disrepair that it cannot be used for its intended purpose. (EPA 0992)

abatement - Reducing the degree or intensity of, or eliminating, pollution. (EPA 0992)

abnormal situation - Unplanned event or condition that adversely affects, potentially affects or indicates degradation in the safety, security, environmental or health protection performance or operation of a facility. (DOE/EH-0256T 0692)

absorbed dose (D) - Energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest in that material. The units of absorbed dose are the rad and the gray (Gy.) (1 rad = 0.01 gray) (DOE/EH-0256T, 0692 and DOE 5480.11 12-21-88)

absorption - The passage of one substance into or through another; e.g., an operation in which one or more soluble components of a gas, liquid, or solid mixture are dissolved in a liquid. (EPA 0992)

accelerator - In radiation science, a devise that speeds up charged particles such as electrons or protons. (EPA 0992)

access controls - Measures taken to limit the accessibility of a area. Examples of access controls are fences and security patrols.

accident site - The location of an unexpected occurrence, failure or loss, either at a plant or along a transportation route, resulting in a release of hazardous materials. (EPA 0992)

acclimatization - The physiological and behavioral adjustments of an organism to changes in its environment. (EPA 0992)

accountability - The functions of nuclear materials management which pertain to the measurement, recording and reporting system of transfers and inventories which provide current and accurate information as to the chemical and physical form, disposition, quantity and availability of nuclear materials. (FMPC-0307, Issued 12-19-91)

accuracy - The closeness of a measured value to the accepted true value. (RM-0012, 04-30-93)

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acetylcholine - A substance in the human body having important neurotransmitter effects on various internal systems; often used as a bronchoconstrictor. (EPA 0992)

acid deposition - A complex chemical and atmospheric phenomenon that occurs when emissions of sulfur and nitrogen compounds and other substances are transformed by chemical processes in the atmosphere, often far from the original sources, and then deposited on earth in either wet or dry form. The wet forms, popularly called "acid rain," can fall as rain, snow, or fog. The dry forms are acidic gases or particulates. (EPA 0992)

acid rain - (See: acid deposition, EPA 0992) (EPA 0992)

action levels - 1. Regulatory levels recommended by EPA for enforcement by FDA and USDA when pesticide residues occur in food or feed commodities for reasons other than the direct application of the pesticide. As opposed to "tolerances" which are established for residues occurring as a direct result of proper usage, action levels are set for inadvertent residues resulting from previous legal use or accidental contamination. (EPA 0992) 2. In the Superfund program, the existence of a contaminant concentration in the environment high enough to warrant action or trigger a response under SARA and the National Oil and Hazardous Substances Contingency Plan. The term is also used in other regulatory programs. (See: tolerances, EPA 0992) (EPA 0992)

action memo - A transmittal form used to initiate specific activities during the processing of documents in the Site Document System, including review, comment resolution, and approval. (SSOP-0103, 10-14-92)

activated carbon - A highly adsorbent form of carbon used to remove odors and toxic substances from liquid or gaseous emissions. In waste treatment, it is used to remove dissolved organic matter from waste water. It is also used in motor vehicle evaporative control systems. (EPA 0992)

activated sludge - Product that results when primary effluent is mixed with bacteria-laden sludge and then agitated and aerated to promote biological treatment, speeding the breakdown of organic matter in raw sewage undergoing secondary waste treatment. (EPA 0992)

activation - Process of producing a radioactive material by bombardment with neutrons, protons, or other nuclear particles. (DOE/EH-0256T 0692)

activator - A chemical added to a pesticide to increase its activity. (EPA 0992)

active ingredient - In any pesticide product, the component that kills, or otherwise controls, target pests. Pesticides are regulated primarily on the basis of active ingredients. (EPA 0992)

activity plans - Written procedures in a school's asbestos-management plan that detail the steps a Local Education Agency (LEA) will follow in performing the initial and additional cleaning, operation and maintenance-program tasks; periodic surveillance; and reinspections required by the Asbestos Hazard Emergency Response Act (AHERA). (EPA 0992)

acute exposure - A single exposure to a toxic substance which results in severe biological harm or death. Acute exposures are usually characterized as lasting no longer than a day, as compared to longer, continuing exposure over a period of time. (EPA 0992)

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acute toxicity - The ability of a substance to cause poisonous effects resulting in severe biological harm or death soon after a single exposure or dose. Also, any severe poisonous effect resulting from a single short-term exposure to a toxic substance. (See: chronic toxicity, toxicity, EPA 0992) (EPA 0992)

ad hoc - for a specific case, situation, or purpose. (RM-0012, 04-30-93)

adaptation - Changes in an organism's structure or habits that help it adjust to its surroundings. (EPA 0992)

add-on control device - An air pollution control device such as carbon absorber or incinerator that reduces the pollution in an exhaust gas. The control device usually does not affect the process being controlled and thus is "add-on" technology, as opposed to a scheme to control pollution through altering the basic process itself. (EPA 0992)

adequately wet - Asbestos containing material that is sufficiently mixed or penetrated with liquid to prevent the release of particulates. (EPA 0992)

adhesion - Molecular attraction that holds the surfaces of two substances in contact. (EPA 0992)

administrative control level - Level of radiation exposure established well below regulatory limits by management to help reduce individual and collective radiation dose. (DOE/EH-0256T 0692)

Administrative Controls for Safety (ACS) - Safety procedures controlling actions of personnel who are required, in lieu of equipment, to perform a function in conjunction with, similar to, or in place of a Safety System. (FMPC-2116 0189)

administrative order - A legal document signed by EPA directing an individual, business, or other entity to take corrective action or refrain from an activity. It describes the violations and actions to taken, and can be enforced in court. Such orders may be issued, for example, as a result of an administrative complaint whereby the respondent is ordered to pay a penalty for violations of a stature. (EPA 0992)

administrative order on consent - A legal agreement signed by EPA and an individual, business, or other entity through which the violator agrees to pay for correction of violations, take the required corrective or cleanup actions, or refrain from an activity. It describes the actions to be taken, may be subject to a comment period, applies to civil actions, and can be enforced in court. (EPA 0992)

Administrative Procedures Act - A law that spells out procedures and requirements related to promulgation of regulations. (EPA 0992)

administrative record - 1. All documents which EPA considered or relied on in selecting the response action at a Superfund site, culminating in the record of decision for remedial action or, an action memorandum for removal actions. (EPA 0992) 2. An organized collection of records open to public review, that documents Fernald Environmental Management Project (FEMP) compliance with the requirements set forth by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. (SSOP-0044, 06-19-92)

adsorption - 1. Adhesion of molecules of gas, liquid, or dissolved solids to a surface. 2. An advanced method of treating waste in which activates carbon and removes organic matter from wastewater. (EPA 0992) adulterants - Chemical impurities or substances that by law do not belong in a food, or pesticide. (EPA 0992)

adulterated - 1. Any pesticide whose strength or purity falls below the quality stated on its label. 2. A food, feed, or product that contains illegal pesticide residues. (EPA 0992)

advanced wastewater treatment - Any treatment of sewage that goes beyond the secondary or biological water treatment stage and includes the removal of nutrients such as phosphorus and nitrogen and a high percentage of suspended solids. (See: primary, secondary treatment.) (EPA 0992)

adverse finding - A finding made during a nuclear criticality safety inspection of a facility where fissile material is processed, stored, or handled, which affects the degree of nuclear criticality safety control. Four severity levels are defined in increasing order of severity: Level 1 - Deviation; Level 2 - Infraction; Level 3 - Violation; Level 4 - Near Criticality. (FMPC-2117 0189)

advisory - A non-regulatory document that communicates risk information to those who may have to make risk management decisions. (EPA 0992)

aeolian - Giving forth or marked by a moaning or sighing sound or musical tone produced by or as if by the wind.

aerated lagoon - A holding and/or treatment pond that speeds up the natural process of biological decomposition of organic waste by stimulating the growth and activity of bacteria that degrade organic waste. (EPA 0992)

aeration - A process which promotes biological degradation of organic matter in water. The process may be passive (as when waste is exposed to air), or active (as when a mixing or bubbling device introduces the air. (EPA 0992)

aeration tank - A chamber used to inject air into water. (EPA 0992)

aerobic - Life or processes that require, or are not destroyed by, the presence of oxygen. (See: anaerobic, EPA 0992) (EPA 0992)

aerobic treatment - Process by which microbes decompose complex organic compounds in the presence of oxygen and use the liberated energy for reproduction and growth. (Such processes include extended aeration, trickling filtration, and rotating biological contractors.) (EPA 0992)

aerosol - A suspension of liquid or solid particles in a gas. (EPA 0992)

affected public - The people who live and/or near a hazardous waste site. (EPA 0992)

afterburner - In incinerator technology, a burner located so that the combustion gases are made to pass through its flame in order to remove smoke and odors. It may be attached to or be separated form the incinerator proper. (EPA 0992)

Agent Orange - A toxic herbicide and defoliant used in the Vietnam conflict, containing 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and 2-4 dichlorophenoxyacetic acid (2,4-D) with trace amounts of dioxin. (EPA 0992) agglomeration - The process by which precipitation particles grow larger by collision or contact with cloud particles or other precipitation particles. (EPA 0992)

agglutination - The process of uniting solid particles coated with a thin layer of adhesive material or of arresting solid particles by impact on a surface coated with an adhesive. (EPA 0992)

agricultural pollution - Farming wastes, including runoff and leaching of pesticides and fertilizers; erosion and dust from plowing; improper disposal of animal manure and carcasses; crop residues, and debris. (EPA 0992)

AHERA designated person (ADP) - A person designated by a Local Education Agency to ensure that the AHERA requirements for asbestos management and abatement are properly implemented. (EPA 0992)

air changes per hour (ACH) - The movement of a volume of air in a given period of time; if a house has one air change per hour, it means that all of the air in the house will be replaced in a one-hour period. (EPA 0992)

air contaminant - Any particulate matter, gas, or combination thereof, other than water vapor. (See: air pollutant) (EPA 0992)

air curtain - A method of containing oil spills. Air bubbling through a perforated pipe causes an upward water flow that slows the spread of oil. It can also be used to stop fish from entering polluted water. (EPA 0992)

air dispersion modeling - The process of predicting ambient air concentrations using source emissions data and meteorological data in mathematical air quality computer models that simulate pollutant dispersion.

air mass - A large volume of air with certain meteorological or polluted characteristics-e.g., a heat inversion or smogginess-while in one location. The characteristics can change as the air mass moves away. (EPA 0992)

air monitoring - (See: monitoring, EPA 0992) (EPA 0992)

air plenum - Any space used to convey air in a building, furnace, or structure. The space above a suspended ceiling is often used as an air plenum. (EPA 0992)

air pollutant - Any substance in air that could, in high enough concentration, harm man, other animals, vegetation, or material. Pollutants may include almost any natural or artificial composition of airborne matter capable of being airborne. They may be in the form of solid particles, liquid droplets, gases, or in combination thereof. Generally, they fall into two main groups: (1.) those emitted directly from identifiable sources and (2.) those produced in the air by interaction between two or more primary pollutants, or by reaction with normal atmospheric constituents, with or without photo-activation. Exclusive of pollen, fog, and dust, which are of natural origin, about 100 contaminants have been identified and fall into the following categories: solids, sulfur compounds, volatile organic chemicals, nitrogen compounds, oxygen compounds, halogen compounds, radioactive compounds, and odors. (EPA 0992)

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air pollution - The presence of contaminant or pollutant substances in the air that do not disperse properly and interfere with human health or welfare, or produce other harmful environmental effects. (EPA 0992)

air pollution episode - A period of abnormally high concentration of air pollutants, often due to low winds and temperature inversion, that can cause illness and death. (See: episode, pollution.) (EPA 0992)

air pollution control device - Mechanism or equipment that cleans emissions generated by an incinerator by removing pollutants that would otherwise be released to the atmosphere. (EPA 0992)

air quality control region - An area designated by the federal government in which communities share a common air pollution problem, sometimes embracing several states. (EPA 0992)

air quality criteria - The levels of pollution and lengths of exposure above which adverse health and welfare effects may occur. (EPA 0992)

air quality standards - The level of pollutants prescribed by regulations that may not be exceeded during a given time in a defined area. (EPA 0992)

air stripping - A treatment system that removes volatile organic compounds (VOCs) from contaminated ground water or surface water by forcing an airstream through the water and causing the compounds to evaporate. (EPA 0992)

air toxics - Any air pollutant for which a national ambient air quality standard (NAAQS) does not exist (i.e., excluding ozone, carbon monoxide, PM-10, sulfur dioxide, nitrogen oxide) that may reasonably be anticipated to cause cancer, developmental effects, reproductive dysfunctions, neurological disorders, heritable gene mutations, or other serious or irreversible chronic or acute health effects in humans (EPA 0992)

airborne particulates - Total suspended particulate matter found in the atmosphere as solid particles or liquid droplets. Chemical composition of particulates varies widely, depending on locations and time of year. Airborne particulates include: windblown dust, emissions from industrial processes, smoke from the burning of wood and coal, and motor vehicle or non-road engine exhausts, exhaust of motor vehicles. (EPA 0992)

airborne radioactivity - Radioactive material in any chemical or physical form that is present in ambient air, above natural background. (DOE/EH-0256T 0692)

airborne radioactivity area - 1. Area where the measured concentration of airborne radioactivity, above natural background, exceeds either: (1) 10 percent of the Derived Air Concentration (DAC) averaged over 8 hours or (2) a peak concentration of 1 DAC. DAC values are contained in Attachment 1 of DOE 5480.11, Radiation Protection for Occupational Workers. (DOE/ER-0256T) 2. An area within a radiological area where the routine potential exists for airborne radioactivity concentrations greater that 10 percent of the Derived Air Concentrations (DAC). (RM-0009, 05-13-92)

airborne release - Release of any chemical into the air. (EPA 0992)

alachlor - A herbicide, marketed under the trade name Lasso, used mainly to control weeds in corn and soybean fields. (EPA 0992) alar - Trade name for daminozide, a pesticide that makes apples redder, firmer, and less likely to drop off trees before growers are ready to pick them. It is also used to a lesser extent on peanuts, tart cherries, concord grapes, and other fruits. (EPA 0992)

albedo - Ability of a surface to reflect incoming electromagnetic radiation, measured from 0 to 1; surfaces with albedos of 1 reflect all incoming radiation, those with 0 albedo absorb all of it. (EPA 0992)

aldicarb - An insecticide sold under the trade name Temik. It is made from ethyl isocyanate. (EPA 0992)

algae - Simple rootless plants that grow in sunlit waters in proportion to the amount of available nutrients. They can affect water quality adversely by lowering the dissolved oxygen in the water. They are food for fish and small aquatic animals. (EPA 0992).

algal blooms - Sudden spurts of algal growth, which can affect water quality adversely and indicate potentially hazardous changes in local water chemistry. (EPA 0992)

algorithm - A procedure for solving a mathematical problem in a finite number of steps that involves repetition of an operation.

aliens - Non-immigrant - A citizen of another country who is in the United States on a temporary basis. Stateless Persons - Individuals who have renounced their foreign citizenship and have been granted permanent residence in the United States or in another country. Permanent Resident - An immigrant, stateless person, or refugee who is permanently residing in the United States. Immigrant - A citizen of another country who has emigrated to the United States for the purpose of becoming an American citizen. (SSOP-0051, 09-04-92)

aliquot - A representative sample of a larger quantity.

alpha particle - A positively charged particle composed of 2 neutrons and 2 protons released by some atoms undergoing radioactive decay. The particle is identical to the nucleus of a helium atom. (EPA 0992)

alternate fuels - Fuels such as ethanol, methane, LPG, and natural gas that can be used instead of gasoline to run automobiles and other engines. (EPA 0992)

alternate method - Any method of sampling and analyzing for an air pollutant that is not a reference or equivalent method but that has been demonstrated in specific cases to EPAs satisfaction to produce results adequate for compliance monitoring. (EPA 0992)

alternative remedial contract strategy contractors - Government contractors who provide project management and technical services to support remedial response activities at National Priorities List sites. (EPA 0992)

ambient air - Any unconfined portion of the atmosphere: open air, surrounding air. (EPA 0992)

ambient air quality standards - (See: Criteria Pollutants and National Ambient Air Quality Standards, EPA 0992) (EPA 0992)

Amended Consent Agreement - The modified Consent Agreement signed in September, 1991, which includes the renegotiation framework and schedules for developing, implementing, and monitoring appropriate response actions at the Fernald Environmental Management Project (FEMP), and to facilitate cooperation, exchange of information and participation of the U.S. EPA and the U.S. DOE in such actions. (RM-0012, 04-30-93)

anadromous - Fish that spend their adult life in the sea but swim upriver to freshwater spawning grounds to reproduce. (EPA 0992)

anaerobic - A life or process that occurs in or is not destroyed by, the absence of oxygen. (EPA 0992)

anemometer - An instrument for measuring and indicating the force, speed, and direction of the wind.

ANL - The Fernald Environmental Management Project (FEMP) Analytical Laboratories Section. (SSOP-0018, 05-07-92)

analysis code book - A pocket-size, bound book issued as an information manual that contains the codes of matrices, units, preservatives, and analytes. (SSOP-0018, 05-07-92)

annealed - To heat and then cool (as steel or glass), usually for making less brittle.

annual dose equivalent - The dose equivalent received in a year. Annual dose equivalent is expressed in units of rem (or sievert.) (DOE 5480.11 12-21-88)

annual effective dose equivalent - The effective dose equivalent received in a year. The annual effective dose equivalent is expressed in units of rem (or sievert.) (DOE 5480.11 12-21-88)

annual limit on intake (ALI) - The quantity of a single radionuclide which, if inhaled or ingested in 1 year, would irradiate a person, represented by reference man (ICRP Publication 23), to the limiting value for control of occupational exposure. (DOE/EH-0256T 0692 and DOE 5480.11 12-21-88)

ANSI - American National Standards Institute. (RM-0012, 04-30-93)

antagonism - The interaction of two chemicals having an opposing, or neutralizing effect on each other. (EPA 0992)

antarctic "ozone hole" - Refers to the seasonal depletion of ozone in a large area over Antarctica. (EPA 0992)

anti-degradation clause - Part of federal air quality and water quality requirements prohibiting deterioration where pollution levels are above the legal limit. (EPA 0992)

antibodies - Proteins produced in the body by immune system cells in response to antigens, and capable of combining with antigens. (EPA 0992)

applicable or appropriate requirements (ARARs) - Any state or federal statute that pertains to protection of human life and the environment in addressing specific conditions or use of a particular cleanup technology at a Superfund site. (EPA 0992)

aquifer - An underground geological formation, or group of formations, containing usable amounts of groundwater that can supply wells and springs. (EPA 0992) arbitration - Resolution of disputes by means of an impartial arbitrator selected by the parties; the decisions are usually binding. (See: mediation, EPA 0992) (EPA 0992)

area of review - In the Underground Injection Control (UIC) program, the area surrounding an injection well that is reviewed during the permitting process to determine if flow between aquifers will be induced by the injection operation. (EPA 0992)

area source - Any small source of non-natural air pollution that is released over a relatively small area but which cannot be classified as a point source. Such sources may include vehicles and other small engines, small businesses and household activities. (EPA 0992)

aromatics - A type of hydrocarbon, such as benzene or toluene, added to gasoline in order to increase octane. Some aromatics are toxic. (EPA 0992)

arsenicals - Pesticides containing arsenic. (EPA 0992)

as low as reasonably achievable (ALARA) - An approach to radiological control to manage and control exposures (individual and collective) to the work force and to the general public at levels as low as is reasonable, taking into account social, technical, economic, practical, and public policy considerations. As used in this manual, ALARA is not a dose limit but a process that has the objective of attaining dose far below the applicable controlling limits as is reasonably achievable. (DOE/EH-0256T 0692; DOE 5480.11 12-21-88 and RM-0009, 05-13-92)

as low as reasonably achievable (ALARA) committee - Multidisciplined forum that reviews and advises management on improving progress toward minimizing radiation exposure and radiological releases. (DOE/EH-0256T 0692)

asbestos - A mineral fiber that can pollute air or water and cause cancer or asbestosis when inhaled. EPA has banned or severely restricted its use in manufacturing and construction. (EPA 0992)

asbestos abatement - Procedures to control fiber release from asbestos-containing materials in a building or to remove them entirely, including removal, encapsulation, repair enclosure, encasement, and operations and maintenance programs. (EPA 0992)

asbestos-containing waste materials (ACWM) - Mill tailings or any waste that contains commercial asbestos and is generated by a source covered by the Clean Air Act Asbestos NESHAPS. (EPA 0992)

asbestosis - A disease associated with inhalation of asbestos fibers. The disease makes breathing progressively more difficult and can be fatal. (EPA 0992)

asbestos program manager - A building owner or designated representative who supervises all aspects of the facility asbestos management and control program. (EPA 0992)

ash - The mineral content of a product remaining after complete combustion. (EPA 0992)

ASME - American Society of Mechanical Engineers. (RM-0012, 04-30-93)

assessment - 1. Evaluation or appraisal of a process, program or activity to estimate its acceptability. (DOE/EH-0256T 0692) 2. In the asbestos-in-schools program, the evaluation of the physical condition and potential for damage of all friable asbestos containing materials and thermal insulation systems. (EPA 0992) assessment/verification - The act of reviewing, inspecting, testing, checking, conducting surveillances, auditing, and otherwise determining and documenting whether items, processes, or services meet specified requirements. The terms assessment and verification, as used in 5700.6C, 08-21-91, are synonymous; their use is determined by who is performing the work. Assessments are performed by or for senior management. Verifications are performed by the line organization. (DOE 5700.6C, 08-21-91 and RM-0012, 04-30-93)

assimilation - The ability of a body of water to purify itself of pollutants. (EPA 0992)

assimilative capacity - The capacity of a natural body of water to receive wastewaters or toxic materials without deleterious effects and without damage to aquatic life or humans who consume the water. (EPA 0992)

assistant emergency duty officer (AEDO) - 1. Normally, the Utilities Engineer who is the 24-hour, onsite and offsite management authority with responsibility for abnormal events. (FMPC-2117 0189) 2. Field commander of the Fernald Environmental Management Project (FEMP) emergency response activities. (PL-2194, 04-30-93)

atmosphere [an] - A standard unit of pressure representing the pressure exerted by a 29.92-inch column of mercury at sea level at 45-degrees N latitude and equal of 1000 grams per square centimeter. (EPA 0992)

atmosphere [the] - The whole mass of air surrounding the earth, comprising oxygen, nitrogen, carbon dioxide, and trace gases. (EPA 0992)

atomize - To divide a liquid into extremely minute particles, either by impact with a jet of steam or compressed air, or by passage through some mechanical device. (EPA 0992)

attainment area - An area considered to have air quality as good as or better than the national ambient air quality standards as defined in the Clean Air Act. (CAA). An area may be an attainment area for one pollutant and a non-attainment area for others. (EPA 0992)

attenuation - The process by which a compound is reduced in concentration over time, through absorption, adsorption, degradation, dilution, and /or transformation. (EPA 0992)

attractant - A chemical or agent that lures insects or other pests by stimulating their sense of smell. (EPA 0992)

attrition - Wearing or grinding down of a substance by friction. Dust from such processes contributes to air pollution. (EPA 0992)

audit - A planned and documented activity systematically performed to determine by investigation, examination, or evaluation of objective evidence the quality of operation of some function or activity. Audits may be of two basic types: (1) performance audits in which quantitative data are independently obtained for comparison with routinely obtained data in a measurement system, or (2) system audits of a qualitative nature that consists of an onsite review of the quality assurance system and physical facilitates for sampling, calibration, and measurement. (RM-0012, 04-30-93)

auger - A method of drilling in which penetration is accomplished by the cutting or gouging of chisel-type cutting edges forced into the substance by rotation of the auger bit.

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authorized personnel - Personnel who have successfully completed all training requirements to perform work related to this procedure and have been authorized by the Facility Owner (FO) to perform this work. (SSOP-0002, 10-22-91)

autotroph - An organism that produces its food nutrients from inorganic substances. (EPA 0992)

availability session - Informal meeting at a public location where interested citizens can talk with EPA and state officials on a one-to-one basis. (EPA 0992)

B

background concentration - The concentration of constituents occurring naturally in soils and bedrock.

background level - In air pollution control, the concentration of air pollutants in a definite area during a fixed period of time prior to the starting up or on the stoppage of a source of emission under control In toxic substances monitoring, the average presence in the environment, originally referring to naturally occurring phenomena. (EPA 0992)

background radiation - Radiation from cosmic sources; naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material); and global fallout as it exists in the environment from the testing of nuclear explosive devices. "Background radiation" does not include radiation from source, byproduct, or special nuclear materials. (DOE/EH-0256T 0692)

BACT-best available control technology - An emission limitation based on the maximum degree of emission reduction (considering energy, environmental, and economic impacts) achievable through application of production processes and available methods, systems, and techniques. BACT does not permit emissions in excess of those allowed under any applicable Clean Air Act (CAA) provisions. Use of the BACT concept is allowable on a case by case basis for major new or modified emissions sources in attainment areas and applies to each regulated pollutant. (EPA 0992)

bacteria (Singular: bacterium) - Microscopic living organisms that can aid in pollution control by metabolizing organic matter in sewage, oil spills or other pollutants. However, bacteria in soil, water or air can also cause human, animal and plant health problems. (EPA 0992)

baffle chamber - In incinerator design, a chamber designed to promote the settling of fly ash and coarse particulate matter by changing the direction and/or reducing the velocity of the gases produced by the combustion of the refuse or sludge. (EPA 0992)

baghouse filter - Large fabric bag, usually made of glass fibers, used to eliminate intermediate and large (greater than 20 microns in diameter) particles. This device operates like the bag of an electric vacuum cleaner, passing the air and smaller particles while entrapping the larger ones. (EPA 0992)

baler - A method of material collection where the material is of a sludge-like or semi-solid consistency. It is used with a crane.

baling - Compacting solid waste into blocks to reduce volume and simplify handling. (EPA 0992)

ballistic separator - A machine that sorts organic from inorganic matter for composting. (EPA 0992)

band application - The spreading of chemicals over, or next to, each row of plants in a field. (EPA 0992)

banking - A system for recording qualified air emission reductions for later use in bubble, offset, or netting transactions. (See: emissions trading, EPA 0992) (EPA 0992)

bar screen - In wastewater treatment, a device used to remove large solids. (EPA 0992) barrier coatings(s) - A layer of a material that obstructs or prevents passage of something through a surface that is to be protected, e.g. grout, caulk, or various sealing compounds; sometimes used with polyurethane membranes to prevent corrosion or oxidation of metal surfaces, chemical impacts on various materials, or, for example, to prevent radon infiltration through walls, cracks, or joints in a house. (EPA 0992)

basal application - In pesticides, the application of a chemical on plant stems or tree trunks just above the soil line. (EPA 0992)

baseline configuration - A configuration and reference point established by formal approval of design criteria, and Title II and III design (Certified for Construction [CFC] drawings and specifications and/or redline drawings) and Safety Documentation [i.e. the Preliminary Safety Analysis Report (PSAR) for new projects in progress, or the Final Safety Study (FSAR) and Operational Safety Requirements (OSR) for plant facilities or processes that are existing and in operation.] All changes must be specifically related to the established reference point. Baselining a Safety System, Design Feature for Safety, or Operational Safety Requirements (OSR)-Affected Procedure establishes it under configuration control. (FMPC-2116 0189)

baseline risks - Potential health threats that would occur if no remedial actions are taken.

baseline risk assessment - The study undertaken to characterize the current and potential threats to human health and the environment that may be posed by contaminants within an area. It provides a framework for developing risk information necessary to assist in developing remedial alternatives, and considers the risks that currently exist at the site, if no further response actions or institutional controls are applied. There are five steps in the baseline risk assessment process: data collection and analysis; exposure assessment; toxicity assessment; toxicity assessment; and risk characterization. The baseline risk assessment contributes to site characterization and subsequent development, evaluation, and selection of appropriate response alternatives.

becquerel (Bq) - The International System (SI) unit for activity of radioactive material. One becquerel is that quantity of radioactive material in which one atom is transformed per second or undergoes one disintegration per second. (DOE/EH-0256T, 0692)

below regulatory concern - A definable amount of low-level waste that can be deregulated with minimal risk to the public. (DOE 5820.2A)

BEN - EPA's computer model for analyzing a violator's economic gain from not complying with the law. (EPA 0992)

benchmark - A point of reference in which measurements may be made.

bench-scale tests - Laboratory testing of potential cleanup technologies. (See: treatability studies.) (EPA 0992)

benthic microinvertebrates - Of, relating to, or occurring at the bottom of a body of water. All of the animals lacking a spinal column.

benthic organism - A form of aquatic plant or animal life that is found at or near the bottom of a stream, lake, or ocean. (EPA 0992)

benthic region - The bottom layer of a body of water. (EPA 0992) berm - A narrow shelf, path, or ledge typically at the top or bottom of a slope; also: a mound or wall of earth.

beryllium - An airborne metal hazardous to human health when inhaled. It is discharged by machine shops, ceramic and propellant plants, and foundries. (EPA 0992)

best available control measures (BACM) - A term used to refer to the most effective measures (according to EPA guidance) for controlling small or dispersed particulates from sources such as roadway dust, soot and ash from woodstoves and open burning of rush, timber, grasslands, or trash. (EPA 0992)

best demonstrated available technology (BDAT) - As identified by EPA, the most effective commercially available means of treating specific types of hazardous waste. The BDATs may change with advances in treatment technologies. (EPA 0992)

best management practices (BMP) - Schedules of activities, maintenance procedures, prohibitions of practices, and other management practices taken to prevent or reduce the pollution of U.S. Waters. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. (PL-2194, 04-30-93)

beta particle - An elementary particle emitted in radioactive decay that may cause skin burns, but can be halted by a thin sheet of paper or foil. (EPA 0992)

billet - The top section of each ingot is cropped to remove shrinkage cavities and impurities. These "billets" are machined, heat treated, and sent off site for extrusion.

bindweed - Any of various twining plants that mat or interlace with plants among which they grow.

bimetal - Beverage containers with steel bodies and aluminum tops; handled differently from pure aluminum in recycling. (EPA 0992)

bioaccumulants - Substances that increase in concentration in living organisms as they take in contaminated air, water, or food because the substances are very slowly metabolized or excreted. (See: biological magnifications, EPA 0992) (EPA 0992)

bioaccumulation - How a chemical is accumulated or assimilated through the food chain.

bioassay - 1. Measurement of radioactive material deposited within or excreted from the body. This process includes whole body and organ counting as well as urine, fecal, and other specimen analysis. (DOE/EH-0256T, 0692) 2. Study of living organisms to measure the effect of a substance, factor, or condition by comparing before-and-after exposure or other data. (EPA 0992)

biochemical oxygen demand (BOD) - A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. The greater the BOD, the greater the degree of pollution. (EPA 0992)

biodegradable - Capable of decomposing rapidly under natural conditions. (EPA 0992)

biological control - In pest control, the use of animals and organisms that eat or otherwise kill or out-compete pests. (EPA 0992) biological magnification - Refers to the process whereby certain substances such as pesticides or heavy metals move up the food chain, work their way into rivers or lakes, and are eaten by aquatic organisms such as fish, which in turn are eaten by large birds, animals or humans. The substances become concentrated in tissues or internal organs as they move up the chain. (See: bioaccumulative, EPA 0992)

biological oxidation - Decomposition of complex organic materials by microorganisms. Occurs in self-purification of water bodies and in activated sludge wastewater treatment. (EPA 0992)

biological treatment - A treatment technology that uses bacteria to consume organic waste. (EPA 0992)

biologicals - Vaccines, cultures and other preparations made from living organisms and their products, intended for use in diagnosing, immunizing, or treating humans or animals, or in related research. (EPA 0992)

biomass - All of the living material in a given area; often refers to vegetation. (EPA 0992)

biome - Entire community of living organisms in a single major ecological area. (See: biotic community, EPA 0992)

biomonitoring - 1. The use of living organisms to test the suitability of effluents for discharge into receiving waters and to test the quality of such waters downstream from the discharge. (EPA 0992) 2. Analysis of blood, urine, tissues, etc., to measure chemical exposure in humans. (EPA 0992)

bioremediation - Use of living organisms to clean up oil spills or remove other pollutants from soil, water, or wastewater; use of organisms such as non-harmful insects to remove agricultural pests or counteract diseases of trees, plants, and garden soil. (EPA 0992)

biosphere - The portion of Earth and its atmosphere that can support life. (EPA 0992)

biostabilizer - A machine that converts solid waste into compost by grinding and aeration. (EPA 0992)

biota - The animal and plant life of a given region. (EPA 0992)

biotechnology - Techniques that use living organisms or parts of organisms to produce a variety of products (from medicines to industrial enzymes) to improve plants or animals or to develop microorganisms to remove toxics from bodies of water, or act as pesticides. (EPA 0992)

biotic community - A naturally occurring assemblage of plants and animals that live in the same environment and are mutually sustaining and interdependent. (See: biome, EPA 0992) (EPA 0992)

black lung - A disease of the lungs caused by habitual inhalation of coal dust. (EPA 0992)

blackwater - Water that contains animal, human, or food waste. (EPA 0992)

blood Products - Any product derived from human blood, including but not limited to blood plasma, platelets, red or white corpuscles, and derived licensed products such as interferon. (EPA 0992) bloom - A proliferation algae and/or higher aquatic plants in a body of water; often related to pollution, especially when pollutants accelerate growth. (EPA 0992)

blowdown - Water from the boiler in the boiler plant.

BOD5 - The amount of dissolved oxygen consumed in five days by biological processes breaking down organic matter. (EPA 0992)

bog - A type of wetland that accumulates appreciable peat deposits. Bogs depend primarily on precipitation for their water source, and are usually acidic and rich in plant residue with a conspicuous mat of living green moss. (EPA 0992)

book inventory - The quantity of nuclear material shown in the accounting records to be present at a given time. (FMPC-0307, 12-19-91)

boom - 1. A floating device used to contain oil on a body of water. (EPA 0992) 2. A piece of equipment used to apply pesticides from a tractor or truck. (See: sonic boom.) (EPA 0992)

borehole - A hole bored or drilled in the earth; esp: an exploratory well.

botanical pesticide - A pesticide whose active ingredient is a plant-produced chemical such as nicotine or strychnine. Also called a plant-derived pesticide. (EPA 0992)

bottle bill - Proposed or enacted legislation which requires a returnable deposit on beer or soda containers and provides for retail store or other redemption. Such legislation is designed to discourage use of throwaway containers. (EPA 0992)

bottom ash - The non-airborne combustion residue from burning pulverized coal in a boiler; the material which falls to the bottom of the boiler and is removed mechanically; a concentration of the non-combustible materials, which may include toxics. (EPA 0992)

bottom land hardwoods - Forested freshwater wetlands adjacent to rivers in the southeastern United States, especially valuable for wildlife breeding, nesting and habitat. (EPA 0992)

brackish water - A mixture of fresh and salt water. (EPA 0992)

brine mud - Waste material, often associated with well-drilling or mining, composed of mineral salts or other inorganic compounds. (EPA 0992)

buddy system - A system of organizing employees into work groups in such a manner that each employee of the work group is designated to be observed by at least one other employee in the work group. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency. (OSHA 1910.120 57)

buffer zone - The smallest region beyond the disposal unit that is required as controlled space for monitoring and for taking mitigative measures, as may be required. (DOE 5820.2A)

building cooling load - The hourly amount of heat that must be removed from a building to maintain indoor comfort (measured in British Thermal Units [Btus]). (EPA 0992)

broadcast application - The spreading of pesticides over an entire area. (EPA 0992) bubble - A system under which existing emissions sources can propose alternate means to comply with a set of emissions limitations; under the bubble concept, sources can control more than required at one emission point where control costs are relatively low in return for a comparable relaxation of controls at a second emission point where costs are higher. (EPA 0992)

bubble policy - (See: emissions trading, EPA 0992) (EPA 0992)

buffer strips - Strips of grass or other erosion-resisting vegetation between or below cultivated strips or fields. (EPA 0992)

bulk sample - A small portion (usually thumbnail in size) of a suspect asbestos-containing building material collected by an asbestos inspector for laboratory analysis to determine asbestos content. (EPA 0992)

bulky waste - Large items of waste materials, such as appliances, furniture, large auto parts, trees, stumps. (EPA 0992)

burial ground (graveyard) - A disposal site for radioactive waste materials that uses earth or water as a shield. (EPA 0992)

by-product or byproduct material - 1. a. Any radioactive materials (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident or to the process of producing or utilizing special nuclear material. For purposes of determining the applicability of the Resource Conservation and Recovery Act to any radioactive waste, the term "any radioactive material" refers only to the actual radionuclides dispersed or suspended in the waste substance. The nonradioactive hazardous waste component of the waste substance will be subject to regulation under the Resource Conservation and Recovery Act. b. The tailings or waste produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. Ore bodies depleted by uranium solution extraction operations and which remain underground do not constitute "byproduct material." (Attachment 1, pages 4 and 5, paragraphs 38 and 49; DOE 5820.2A) 2. Material, other than the principal product, generated as a consequence of an industrial process. (EPA 0992)

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C

cadmium - A heavy metal element that accumulates in the environment. (EPA 0992)

cancellation - Refers to Section 6(b) of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) which authorizes cancellation of a pesticide registration if unreasonable adverse effect to the environment and public health develop when a product is used according to widespread and commonly recognized practice, or if its labeling or other material required to be submitted does not comply with FIFRA provisions. (EPA 0992)

cancer slope factor (CSF) - Factor that relates the increased probability of contracting cancer per increased unit dose.

cap - A layer of clay, or other impermeable material installed over the top of a closed landfill to prevent entry of rainwater and minimize leachate. (EPA 0992)

capacity assurance plan - A statewide plan which supports a state's ability to manage the hazardous waste generated within its boundaries over a twenty year period. (EPA 0992)

capture efficiency - The fraction of organic vapors generated by a process that are directed to an abatement or recovery device. (EPA 0992)

carbon absorber - An add-on control device that uses activated carbon to absorb volatile organic compounds (VOCs) from a gas stream. (The VOCs are later recovered from the carbon.) (EPA 0992)

carbon adsorption - A treatment system that removes contaminants from groundwater or surface water by forcing it through tanks containing activated carbon treated to attract the contaminants. (EPA 0992)

carbon dioxide (CO2) - A colorless, odorless, non-poisonous gas, which results from fossil fuel combustion and is a normal constituent of the ambient air. (EPA 0992)

carbon monoxide (CO) - A colorless, odorless, poisonous gas produced by incomplete fossil fuel combustion. (EPA 0992)

carboxyhemoglobin - Hemoglobin in which the iron is bound to carbon monoxide (CO) instead of oxygen. (EPA 0992)

carcinogen - Any substance that can cause or aggravate cancer. (EPA 0992)

carcinogenic - Cancer-producing. (EPA 0992)

carrier - 1. The inert liquid or solid material added to an active ingredient in a pesticide. (EPA 0992) 2. Any person engaged in the transportation of passengers or property as common, contract, or private charter, or freight forwarder, as defined in the Interstate Commerce Act, as amended, or by the United States Postal Service. (PP-0314, 12-20-91)

carrying capacity - 1. In recreation management, the amount of use a recreation area can sustain without loss of quality. (EPA 0992) 2. In wildlife management, the maximum number of animals an area can support during a given period. (EPA 0992)

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cask - A thick-walled container (usually lead) used to transport radioactive material. Also called a coffin. (EPA 0992)

catalytic converter - An air pollution abatement device that removes pollutants from motor vehicle exhaust, either by oxidizing them into carbon dioxide and water or reducing them to nitrogen and oxygen. (EPA 0992)

catalytic incinerator - A control device that oxidizes volatile organic compounds (VOCs) by using a catalyst to promote the combustion process. Catalytic incinerators require lower temperatures than conventional thermal incinerators, thus saving fuel and other costs. (EPA 0992)

catanadramous fish - Those that swim downstream to spawn. (EPA 0992)

categorical exclusion - A class of actions which either individually or cumulatively would not have a significant effect on the human environment and therefore would not require preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act (NEPA). (EPA 0992)

categorical pretreatment standard - A technology-based effluent limitation for an industrial facility discharging into a municipal sewer system. Analogous in stringency to Best Availability Technology (BAT) for direct dischargers. (EPA 0992)

cathodic protection - A technique to prevent corrosion of a metal surface by making it the cathode of an electrochemical cell. (EPA 0992)

caustic soda - Sodium hydroxide, an alkaline substance; the cleaning agent in some detergents. (EPA 0992)

cells - 1. In solid waste disposal, holes where waste is dumped, compacted, and covered with layers of dirt on a daily basis. (EPA 0992) 2. The smallest structural part of living matter capable of functioning as an independent unit. (EPA 0992)

cementitious - Densely packed and nonfibrous friable materials. (EPA 0992)

central collection point - Location where a generator of regulated medical waste consolidates wastes originally generated at various locations in his facility. The wastes are gathered together for treatment on-site or for transportation elsewhere for treatment and/or disposal. This term could also apply to community hazardous waste collections, industrial and other waste management systems. (EPA 0992)

central tendency (CT) - (applied to receptor) Tending toward the average in exposure for a certain receptor.

centrifugal collector - A mechanical system using centrifugal force to remove aerosols from a gas stream or to de-water sludge. (EPA 0992)

certification - The act of determining, verifying, and attesting in writing to the qualifications of employees. (FMPC-0102, 01-16-91 and FMPC-0708, 12-15-89)

certified for construction (CFC) - A designation that indicates that the design of the project has been approved for use by the construction contractor after the Construction Work Order (CWO) is processed and the drawings and the construction specifications have been so marked. (FMPC-2116 0189) certified waste - Waste that has been confirmed to comply with disposal site waste acceptance criteria (e.g., the Waste Isolation Pilot Plant-Waste Acceptance Criteria for transuranic waste) under an approved certification program. (DOE 5820.2A, 09/26/88)

cesium - A silver-white, soft ductile element of the alkali metal group that is the most electropositive element known. Used especially in photoelectric cells. (EPA 0992)

chain-of-custody procedure - A procedural sequence of events which tracks sample custody or possession. A sample is considered in custody if it is in an authorized person's possession; locked so that no one can tamper with it; after having been in physical custody; and/or in a secured area, restricted to authorized personnel. (RM-0012, 04-30-93)

chain-of-custody process - A mechanism for providing documentation of sample possession to assure the integrity of the individual samples against contamination, tampering, or misidentification. (SSOP-0018, 05-07-92)

Change Control Board (CCB) - A committee composed of the Technical Department (TECH) Manager, Production Operations (PO) Manager, and Department of Energy/Feed Materials Production Center (DOE/FMPC) Site Manager to be responsible for review, evaluation, and disposition. (FMPC 2116 0189)

channelization - Straightening and deepening streams so water will move faster, a marsh-drainage tactic that can interfere with waste assimilation capacity, disturb fish and wildlife habitats, and aggravate flooding. (EPA 0992)

characteristic - Any one of the four categories used in defining hazardous waste; ignitability, corrosivity, reactivity, and toxicity. (EPA 0992)

charter (CH) - 1. A document approved by the Fernald Environmental Management Corporation (FERMCO) President defining the work scope and responsibilities of a particular department or committee. (RM-0012, 04-30-93) 2. A document identifying the functions of a department, committee, or board. (SSOP-0103, 10-14-92)

chemical affinity - The strength of the attractive forces between chemicals.

chemical oxygen demand (COD) - A measure of the oxygen required to oxidize all compounds, both organic and inorganic, in water. (EPA 0992)

chemical treatment - Any one of a variety of technologies that use chemicals or a variety of chemical processes to treat waste. (EPA 0992)

chemnet - Mutual aid network of chemical shippers and contractors that assigns a contracted emergency response company to provide technical support if a representative of a firm whose chemicals are involved in an incident is not readily available. (EPA 0992)

chemosterilant - A chemical that controls pests by preventing reproduction. (EPA 0992)

CHEMTERC - The industry-sponsored Chemical Transportation Emergency Center; provides information and/or emergency assistance to emergency responders. (EPA 0992) chilling effect - The lowering of the Earth's temperature because of increased particles in the air blocking the sun's rays. (See: greenhouse effect, EPA 0992) (EPA 0992)

chlorinated hydrocarbons - These include a class of persistent, broad-spectrum insecticides that linger in the environment and accumulate in the food chain. Among them are DDT (dichloro-diphenyl-trichloro-ethane), aldrin, dieldrin, heptachlor, chlordane, lindane, endrin, mirex, hexachloride, and toxaphene. Other examples include TCE (trichloroethylene), used as an industrial solvent. (EPA 0992)

chlorinated solvent - An organic solvent containing chlorine atoms, e.g., methylene chloride and 1,1,1-trichloromethane, used in aerosol spray containers in highway paint. (EPA 0992)

chlorination - The application of chlorine to drinking water, sewage, or industrial waste to disinfect or to oxidize undesirable compounds. (EPA 0992)

chlorinator - A device that adds chlorine, in gas or liquid form, to water or sewage to kill infectious bacteria. (EPA 0992)

chlorine-contact chamber - That part of a water treatment plant where effluent is disinfected by chlorine. (EPA 0992)

chlorobenzene - A colorless flammable volatile toxic liquid (C_6H_5Cl) used in organic synthesis (as DDT) and as a solvent.

chlorofluorocarbons (CFCs) - A family of inert, nontoxic, and easily liquified chemicals used in refrigeration, air conditioning, packaging, insulation, or as solvents and aerosol propellants. Because CFCs are not destroyed in the lower atmosphere they drift into the upper atmosphere where their chlorine components destroy ozone. (EPA 0992)

chlorosis - Discoloration of normally green plant parts caused by disease, lack of nutrients, or various air pollutants. (EPA 0992)

cholinesterase - An enzyme found in animals that regulates nerve impulses. Cholinesterase inhibition is associated with a variety of acute symptoms such as nausea, vomiting, blurred vision, stomach cramps, and rapid heat rate. (EPA 0992)

chromium - (See: Heavy metals, EPA 0992) (EPA 0992)

chronic effect - An adverse effect on a human or animal in which symptoms recur frequently or develop slowly over a long period of time. (EPA 0992)

chronic toxicity - The capacity of a substance to cause long-term poisonous human health effects. (See: acute toxicity, EPA 0992) (EPA 0992)

clamshell - a: a bucket or grappe (as on a dredge) having two hinged jaws
b: an excavating machine having a clamshell

clamshell crane - A system of sampling involving collection of samples in situations where the material to be collected is of a semi-solid or solid consistency.

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clarification - Clearing action that occurs during wastewater treatment when solids settle out. This is often aided by centrifugal action and chemically induced coagulation in wastewater. (EPA 0992)

clarifier - A tank in which solids settle to the bottom and are subsequently removed as sludge. (EPA 0992)

clay lens - A body of clay with the general form of a lens, thick in the central part and thinning toward the edges.

clean coal technology - Any technology not in widespread use prior to the Clean Air Act amendments of 1990. This Act will achieve significant reductions in pollutants associated with the burning of coal. (EPA 0992)

clean fuels - Blends or substitutes for gasoline fuels, including compressed natural gas, methanol, ethanol, liquified petroleum gas, and others. (EPA 0992)

cleanup - Actions taken to deal with a release or threat of release of a hazardous substance that could affect humans and/or the environment. The term "cleanup" is sometimes used interchangeably with the terms remedial actions, removal action, response action, or corrective action. (EPA 0992)

clean-up operation - an operation where hazardous substances are removed, contained, incinerated, neutralized, stabilized, cleared-up, or in any other manner processed or handled with the ultimate goal of making the site safer for people or the environment. (OSHA 1910.120 57)

clear cut - Harvesting all the trees in one area at one time, a practice that can encourage fast rainfall or snowmelt runoff, erosion, sedimentation of streams and lakes, flooding, and destroys vital habitat. (EPA 0992)

Clean Water Act (CWA) hazardous substance - See: "Hazardous Substance" definition. (PL-2194, 04-30-93)

cloning - In biotechnology, obtaining a group of genetically identical cells from a single cell; making identical copies of a gene. (EPA 0992)

close reflection by water - Immediate contact by water of sufficient thickness to reflect a maximum number of neutrons. (FMPC-2117 189)

closed-loop recycling - Reclaiming or reusing wastewater for non-potable purposes in an enclosed process. (EPA 0992)

closure - The procedure a landfill operator must follow when a landfill reaches its legal capacity for solid waste: ceasing acceptance of solid waste and placing a cap on the landfill site. (EPA 0992)

closure, operational - Those actions that are taken upon completion of operations to prepare the disposal site or disposal unit for custodial care, (e.g., addition of cover, grading, drainage, erosion control.) (DOE 5820.2A)

closure, final site - Those actions that are taken as part of a formal decommissioning or remedial action plan, the purpose of which is to achieve long-term stability of the disposal site and to eliminate to the extent practical the need for active maintenance so that only surveillance, monitoring, and minor custodial care are required. (DOE 5820.2A) coagulation - Clumping of particles in wastewater to settle out impurities, often induced by chemicals such as lime, alum, and iron salts. (EPA 0992)

coal-fired boilers - Facilities using coal as their energy source (e.g., public utility and private industry power plants.) (EPA 1992)

coastal zone - Lands and waters adjacent to the coast that exert an influence on the uses of the sea and its ecology, or whose uses and ecology are affected by the sea. (EPA 0992)

Code of Federal Regulations (CFR) - An index and individual volumes of subject/agency rules currently codified. A list of agencies and a list of Acts requiring publication in the Federal Register. (CFR Index)

coefficient of haze (COH) - A measurement of visibility interference in the atmosphere. (EPA 0992)

coke oven - An industrial process which converts coal into coke, one of the basic materials used in blast furnaces for the conversion of iron ore into iron. (EPA 0992)

cold temperature - A standard for automobile carbon monoxide (CO) emissions to be met at a low temperature (i.e., 20 degrees Fahrenheit). Conventional automobile catalytic convertors are less efficient upon start-up at low temperatures. (EPA 0992)

coliform index - A rating of the purity of water based on a count of fecal bacteria. (EPA 0992)

coliform organism - Microorganisms found in the intestinal tract of humans and animals. Their presence in water indicates fecal pollution and potentially adverse contamination by pathogens. (EPA 0992)

collective dose equivalent - The sum of the dose equivalents of all individuals in an exposed population. Collective dose equivalent is expressed in units of person-rem (or person-sievert.) (DOE 5480.11 12-21-88)

collective effective dose equivalent - The sum of the effective dose equivalents of all individuals in an exposed population. Collective effective dose equivalent is expressed in units of person-rem (or person-sievert.) (DOE 5480.11 12-21-88)

collector sewers - Pipes used to collect and carry wastewater from individual sources to an interceptor sewer that will carry it to a treatment facility. (EPA 0992)

combined sewer overflows - Discharge of a mixture of stormwater and domestic waste when the flow capacity of a sewer system is exceeded during rainstorms. (EPA 0992)

combined sewers - A sewer system that carries both sewage and storm-water runoff. Normally, its entire flow goes to a waste treatment plant, but during a heavy storm, the volume of water may be so great as to cause overflows of untreated mixtures of storm water and sewage into receiving waters. Storm-water runoff may also carry toxic chemicals from industrial areas or streets into the sewer system. (EPA 0992)

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combustion - 1. Burning, or rapid oxidation, accompanied by release of energy in the form of heat and light. A basic cause of air pollution. (EPA 0992) 2. Refers to controlled burning of waste, in which heat chemically alters organic compounds, converting into stable inorganics such as carbon dioxide and water. (EPA 0992)

combustion chamber - The actual compartment where waste is burned in an incinerator. (EPA 0992)

combustion product - Substance produced during the burning or oxidation of a material. (EPA 0992)

command post - Facility located at a safe distance upwind from an accident site, where the on-scene coordinator, responders, and technical representatives make response decisions, deploy manpower and equipment, maintain liaison with news media, and handle communications. (EPA 0992)

comment period - Time provided for the public to review and comment on a proposed EPA action or rule making after publication in the Federal Register. (EPA 0992)

commercial waste - All solid waste emanating from business establishments such as stores, markets, office buildings, restaurants, shopping centers, and theaters. (EPA 0992)

commercial waste management facility - A treatment, storage, disposal, or transfer facility which accepts waste from a variety of sources, as compared to a private facility which normally manages a limited waste stream generated by its own operations. (EPA 0992)

commingled recyclables - Mixed recyclables that are collected together. (EPA 0992)

comminuter - A machine that sheds or pulverizes solids to make waste treatment easier. (EPA 0992)

comminution - Mechanical shredding or pulverizing of waste. Used in both solid waste management and wastewater treatments. (EPA 0992)

committed does equivalent ($H_{T,50}$) - 1. The dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by a person during the 50-year period following the intake. (DOE/EH-0256T, 0692) 2. The calculated dose equivalent projected to be received by a tissue or organ over a 50-year period after an intake of radionuclide into the body. It does not include contributions from external dose. Committed dose equivalent is expressed in units of rem (or sievert.) (DOE 5480.11 12-21-88)

committed effective dose equivalent ($H_{E,50}$) - 1. The sum of the products of the weighing factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues ($H_{E,50}$=(Summation)$W_T H_{T,50}$). (DOE/EH-0256T, 0692) 2. The sum of the committed dose equivalents to various tissues in the body, each multiplied by its weighing factor. It does not include contributions from external dose. Committed effective dose equivalent is expressed in units of rem (or sievert.) (DOE 5480.11 12-21-88)

community relations - The EPA effort to establish two-way communication with the public to create understanding of EPA Programs and related actions, to assure public input into decision-making processes related to affected communities, and to make certain that the Agency is aware of and responsive to public concerns. Specific community relations activities are required to relation to Superfund remedial actions. (EPA 0992)

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community waste system - A public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. (EPA 0992)

compaction - Reduction of the bulk of solid waste by rolling and tamping. (EPA 0992)

company-issued clothing - Clothing provided by the company, such as work coveralls and shoes. For radiological control purposes, company-issued clothing shall be considered the same as personal clothing. (DOE/EH-0256T, 0692)

comparability - A measure which expresses the confidence with which one data set can be compared to another. Comparability for a program is achieved by ensuring that all sampling and analysis use specified uniform procedures. (RM-0012, 04-30-93)

completeness - A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. (RM-0012, 04-30-93)

compliance - Adherence to mandatory regulatory orders and directives. (RM-0012, 04-30-93)

compliance coating - A coating whose volatile organic compound content does not exceed that allowed by regulation. (EPA 0992)

compliance schedule - A negotiated agreement between a pollution source and a government agency that specifies dates and procedures by which a source will reduce emissions and, thereby, comply with a regulation. (EPA 0992)

composite sample - A series of water samples taken over a given period of time and weighted by flow rate. (EPA 0992)

compost - A relatively stable humus material that is produced from a composting process in which bacteria in soil mixed with garbage and degradable trash break down the mixture into organic fertilizer. (EPA 0992)

composting - The controlled biological decomposition of organic material in the presence of air to form a humus-like material. Controlled methods of composing include mechanical mixing and aerating, ventilating the materials by dropping them through a vertical series of aerated chambers, or placing the compost out in the open air and mixing it and turning it periodically. (EPA 0992)

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 1980 - 1. An act enabling the EPA to investigate and cleanup abandoned or uncontrolled hazardous waste sites. (RM-0012, 04-30-93) 2. The law that mandates the development of organizational structure and procedures to respond to releases, or threats of releases of hazardous substances or pollutants/contaminants. (SSOP-0044, 06-19-92)

computer program - A sequence of instructions suitable for processing by a computer. Processing may include the use of an assembler, a compiler, an interpreter, or a translator to prepare the program for execution as well as to execute it. Computer programs impacted by the Fernald Environmental Restoration Management Corporation (FERMCO) Quality Assurance (QA) Program Description are those used for design analysis, process or operations control, or data base or document control registers when used as the controlled source of quality information. (RM-0012, 04-30-93) concentration - The relative amount of a specific substance mixed into another and usually larger substance. An example is five parts per million (ppm) of carbon monoxide in air. (EPA 0992)

conditional registration - Under special circumstances, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) permits registration of pesticide products that is "conditional" upon the submission of addition data. These special circumstances include a finding by the EPA Administration that a new product or use of an existing pesticide will not significantly increase the risk of unreasonable adverse effects. A product containing a new (previously unregistered) active ingredient may be conditionally registered only if the Administration finds that such conditional registration is in the public interest, that a reasonable time for conducting the additional studies has not elapsed, and the use of the pesticide for the period of conditional registration will not present an unreasonable risk. (EPA 0992)

conditionally exempt generators (CE) - Persons or enterprises which produce less that 220 pounds of hazardous waste per month. Exempt from most regulation, they are required merely to determine whether their waste is hazardous, notify appropriate state or local agencies, and ship it by permitted facility for proper disposal. (See: an authorized transporter to a mall quantity generator, EPA 0992) (EPA 0992)

conditions of concern - Conditions which could pose a risk to the safety of the operating personnel, the general public, or the environment; as related in the Safety Documentation for the facility/system in question. Generally, conditions which have warranted the application of Safety Systems, Design Features for Safety, or Operational Safety Requirements (OSR)-Affected procedures for the purposes of risk reduction. (FMPC-2116 0189)

cone of depression - A depression in the water table that develops around a pumped well. (EPA 0992)

configuration - The relative functional and/or physical arrangement of parts or elements of a facility, system, or subsystem. A facility, system, or subsystem is composed of "plant" (e.g. equipment, software), "procedures," and "people." (FMPC-2116 0189)

configuration control - The systematic evaluation, coordination, and disposition of all proposed configuration changes in Safety Systems, Design Features for Safety, and Operational Safety Requirements (OSR)-Affected Procedures (see Note under 2.5, FMPC-2116, Implementing FMPC Policies and Procedures for System Safety Analysis, Rev. 0, January 1989) and verification of approved change incorporation after the formal establishment of baselines. (FMPC-2116 0189)

configuration management function (CMF) - The organizational group responsible for maintaining the latest baseline configuration, processing Engineering Change Proposals (ECPs) and Construction Change Proposals (CCPs), and maintaining/updating the configuration management database. (FMPC-2116 0189)

confined aquifer - An aquifer in which ground water is confined under pressure which is significantly greater than atmospheric pressure. (EPA 0992)

Consent Agreement - The Consent Agreement is an agreement between the U.S. EPA and DOE: (1) To ensure the environmental impacts associated with the past and present activities at Fernald Environmental Management Project (FEMP) are thoroughly investigated and appropriate response action(s) taken are necessary to protect the public health, welfare, and the environment. (2.) To establish a procedural framework and schedule for developing, implementing, and monitoring appropriate response action at FEMP in accordance with Comprehensive Environmental Response, Compensation, and Liability Act 1980 (CERCLA), the National Contingency Plan (NCP), and the EPA Superfund guidance and policy; and (3.) To facilitate cooperation, exchange of information and participation between the parties involved. (RM-0012, 04-30-93)

consent decree - A legal document, approved by a judge, that formalizes an agreement reached between EPA and potentially responsible parties (PRPs) through which PRPs will conduct all or part of a cleanup action at a Superfund site; cease or correct actions or processes that are polluting the environment; or otherwise comply with EPA initiated regulatory enforcement actions to resolve the contamination at the Superfund site involved. The consent decree describe the actions PRPs will take and may be subject to a public comment period. (EPA 0992)

conservancy - a: conservation
b: an organization or area designated to conserve and protect natural resources

conservation - Preserving and renewing, when possible, human and natural resources. The use, protection, and improvement of natural resources according to principles that will assure their highest economic or social benefits. (EPA 0992)

consignee - The person or organization designated in the shipping papers to receive a shipment. (PP-0314, 12-20-91)

constituent - An essential part or component of a system or group.

constituents of potential concern - Chemical or radiological Constituents that are above background concentrations and have potentially toxic or carcinogenic properties.

construction change proposal (CCP) - A document used to identify a proposed revision to a project after a Construction Work Order (CWO) has been issued, and it amends the CWO. (FMPC-2116 0189)

construction excavation/penetration permit - A permit that lists known hidden hazards or obstructions in an area where excavation or penetration activities will take place. (SSOP-0044, 06-19-92)

construction and demolition waste - Waste building materials, dredging materials, tree stumps, and rubble resulting from construction, remodeling, repair, and demolition of homes, commercial buildings and other structures and pavements. May contain lead, asbestos, or other hazardous substances. (EPA 0992)

contact pesticide - A chemical that kills pests when it touches them, instead of by ingestion. Also, soil that contains the minute skeletons of certain algae that scratch and dehydrate waxy-coated insects. (EPA 0992)

contact-handled transuranic waste - Packaged transuranic waste whose external surface dose rate does not exceed 200 mrem per hour. (DOE 5820.2A)

container - Any portable device in which a material is stored, transported, treated, disposed of, or otherwise handled. (PL-2194, 04-30-93)

containment device - Barrier such as a glovebag, glovebox, or tent for inhibiting the release of radioactive material from a specific location. (DOE/EH-0256T, 0692) containment vessel - Classification of a package or shipment of fissile materials according to the controls needed to provide nuclear criticality safety during transportation. See Fissile Class I; Fissile Class II; and Fissil Class III [Glossary of Definitions and Terms, August 1, 1993 and FMPC-2116, Implementing FMPC Policies and Procedures for System Safety Analysis, January 1989]

contaminant - Any physical, chemical, biological, or radiological substance or matter that has an adverse affect on air, water, or soil. (EPA 0992)

contamination area - 1. Area where contamination levels are greater than the values specified in DOE/EH-0256T, DOE Radiological Control Manual, Issued June 1992, Chapter 2/Table 2-2, but less than or equal to 100 times those levels. (DOE/EH-0256T, 0692) 2. Any area within a radiological area where high potential for contamination exists, or where known levels of contamination exceed the radiological area limits. (See: Section 12, RM-0009) (RM-0009, 05-13-92)

contamination reduction corridor - A defined pathway through a hazardous waste site Contamination Reduction Zone (CRZ) where decontamination occurs. (DOE/EH-0256T, 0692)

contamination survey - Use of swipes or direct instrument surveys to identify and quantify radioactive material on personnel, or equipment or in areas. (DOE/EH-0256T, 0692)

contingency - A possible but unlikely change in condition originally specified as essential to the nuclear criticality safety of a specified operation such that its nuclear criticality safety is impacted. (FMPC-2117 0189)

contingency plan - (1.) A document setting out an organized, planned, and coordinated course of action to be followed in case of a fire, explosion, or other accident that releases toxic chemicals, hazardous waste, or radioactive materials that threaten human health or environment. (See: National Oil and Hazardous Substances Contingency Plan [NO&HSCP]). (EPA 0992) (2.) For the purposes of "FMPC Spill Prevention Control and Countermeasure Plan", Effective 04-05-93, a contingency plan is a written document that sets forth policies and procedures for responding to incidents which could threaten human health or the environment. (PL-2194, 04-30-93)

continuing training - Training scheduled over a specified time such as over a 2 year period for the purpose of maintaining and improving technical knowledge and skill. (DOE/EH-0256T, 0692 and RM-0009, 05-13-92)

continuous air monitor (CAM) - Instrument that continuously samples and measures the levels of airborne radioactive materials on a "real-time" basis and has alarm capabilities at preset levels. (DOE/EH-0256T, 0692 and RM-0009, 05-13-92)

continuous discharge - A routine release to the environment that occurs without interruption, except for infrequent shutdowns for maintenance, process changes, etc. (EPA 0992)

contour plowing - Soil tilling method that follows the shape of the land to discourage erosion. (EPA 0992)

contract labs - Laboratories under contract to EPA, which analyze samples taken from waste, soil, air, and water or carry out research projects. (EPA 0992)

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contractor senior site executive - The person at a DOE contractor-operated facility or site who has final on-site corporate authority and is often called President, General Manager, Site Manager, or Director. (DOE/EH-0256T, 0692)

contrails - Long, narrow vapor trails caused by high-flying in a jet aircraft. (EPA 0992)

control technique guidelines (CTG) - A series of EPA documents designed to assist states in defining reasonable available control technology (RACT) for major sources of volatile organic compounds (VOC). (EPA 0992)

controlled area - 1. Any area to which access is controlled in order to protect individuals from exposure to radiation and radioactive materials. (DOE/EH-0256T 0692; DOE 5480.11 12-21-88, and RM-0009, 05-13-92) 2. Areas within the FEMP to which access is controlled in order to protect individuals from exposure to radiation and radioactive materials. This includes, but is not limited to, all buildings and open spaces within the former FEMP process area and certain areas in the Laboratory Building. The former FEMP process area is defined as the area North of the East-West interior fence line. (SSOP-0051, 09-04-92)

controlled document - Any document for which distribution and status are to be kept current by the issuer in order to ensure that authorized holders or users of the document have available the most up-to-date version for accomplishment of work action. (RM-0012, 04-30-93)

controlled holding area - The area designated for holding uncharacterized material and staging characterized material (excluding backlog material and material generated from a soil boring activity) for a maximum period of 90 calendar days. (SSOP-0002, 10-22-91)

controlled reaction - A chemical reaction under temperature and pressure conditions maintained within safe limits to produce a desired product or process. (EPA 0992)

conventional pollutants - Statutorily listed pollutants understood well by scientists. These may be in the form of organic waste, sediment, acid, bacteria, viruses, nutrients, oil and grease, or heat. (EPA 0992)

conventional systems - Systems that have been traditionally used to collect municipal wastewater in gravity sewers and convey it to a central primary or secondary treatment plant prior to discharge to surface waters. (EPA 0992)

coolant - A liquid or gas used to reduce the heat generated by power production in nuclear reactors, electric generators, various industrial and mechanical processes, and automobile engines. (EPA 0992)

cooling electricity use - Amount of electricity used to meet the building cooling load. (See: building cooling load.) (EPA 0992)

cooling tower - A structure that helps remove heat from water used as a coolant; e.g., in electric power generating plants. (EPA 0992)

cooperative agreement - An assistance agreement whereby EPA transfers money, property, services or anything of value to a state for the accomplishment of CERCLA-authorized activities or tasks. (EPA 0992)

core - The uranium-containing heart of a nuclear reactor, where energy is released. (EPA 0992) core program cooperative agreement - An assistance agreement whereby EPA supports states or tribal governments with funds to help defray the cost of non-ite-specific administrative and training activities. (EPA 0992)

corrective action - Measures taken to rectify significant conditions adverse to quality and, where necessary, to preclude repetition. (RM-0012, 04-30-93)

corrosion - 1. The dissolution and wearing away of metal caused by a chemical reaction such as between water and the pipes, chemicals touching a metal surface, or contact between two metals. (EPA 0992) 2. Aqueous (water based) wastes with a pH ≤ 2 or ≥ 12.5. (SSOP-0002, 12-22-91)

cost-effective alternative - An alternative control and corrective method identified after analysis as being the best available in terms of reliability, performance, and cost. Although costs are one important consideration, regulatory and compliance analysis does not require EPA to choose the least expensive alternative. For example, when selecting a method for cleaning up a site on the Superfund National Priorities List, the Agency balances costs with the long term effectiveness of the methods proposed. (EPA 0992)

cost recovery - A legal process by which potentially responsible parties who contributed to contamination at a Superfund site can be required to reimburse the Trust Fund for money spent during any cleanup actions by the federal government. (EPA 0992)

counseling - Advice, information exchange and guidance provided to employees on radiologically related topics, such as dose perspectives; potential health effects from radiation exposure; skin contaminations; contaminated wounds; internally deposited radioactivity; pregnancy; and radiation exposure. This advice and guidance is normally provided by knowledgeable, senior professionals from the Radiological Control Organization (RCO) and other organizations, such as Medical, as appropriate. (DOE/ED-0256T, 0692)

cover - Vegetation or other material providing protection as ground cover. (EPA 0992)

cover material - Soil used to cover compacted solid waste in a sanitary landfill. (EPA 0992)

cradle-to-grave or manifest system - A procedure in which hazardous materials are identified and followed as they are produced, treated, transported, and disposed of by a series of permanent, linkable, descriptive documents (e.g., manifests). Commonly referred to as the cradle-to-grave system. (EPA 0992)

crawl space - In some types of houses, which are constructed so that the floor is raised slightly above the ground, an area beneath the floor which allows access to utilities and other services. This is in contrast to slab-on-grade or basement-type houses. (EPA 0992)

criteria - Descriptive factors taken into account by the EPA in setting standards for various pollutants. These factors are used to determine limits on allowable concentration levels, and to limit the number of violations per year. When issued by the EPA, the criteria provides guidance to the states on how to establish their standards. (EPA 0992)

criteria pollutants - The 1970 amendments to the Clean Air Act required EPA to set National Ambient Air Quality Standards for certain pollutants known to be hazardous to human health. EPA has identified and set standards to protect human health and welfare for six pollutants: ozone, carbon monoxide, total suspended particulates, sulfur dioxide, lead, and nitrogen oxide. The term, "criteria pollutants" derives from the requirement that EPA must describe the characteristics and potential health and welfare effects of these pollutants. It is on the basis of these criteria that standards are set or revised. (EPA 0992)

critical component - A component of a Safety System or Design Feature for Safety (see Note under 2.5, FMPC-2116, Implementing FMPC Policies and Procedures for System Safety Analysis, January 1989) which has been identified by the Technical Department (TECH) and the Nuclear & System Safety (N&SS) as being critical for the operation or purpose of that system or feature. (FMPC-2116 0189)

critical component list (CCL) - A list of components (see Note under 2.5, FMPC-2116, Implementing FMPC Policies and Procedures for System Safety Analysis, January 1989) of Safety Systems and Design Features for Safety which have been identified by the Technical Department (TECH) and/or Site Remediation (SR) and Nuclear & Safety Systems (N&SS) as being essential for the operation or purpose of those systems and/or features. (FMPC-2116 0189)

critical mass - The smallest mass of fissionable material that will support a self-sustaining chain reaction under specified conditions. (DOE 5480.5, 09-23-86 and DOE/EH-0256T, 0692)

critical tasks - Those activities which, in the judgement of responsible management, could have a significant effect on the quality of the product, the health and safety of site personnel, or the offsite environment, and which require qualified and certified personnel. (FMPC-0708, 12-15-89)

criticality accident - Release of energy as a result of accidentally producing a self-sustaining chain reaction under specified conditions. (FMPC-2117 0189)

criticality safety analysis (CSA) - An analysis performed before starting a new operation involving fissile materials or before an existing operation or piece of equipment involving fissile materials is changed to determine whether the entire process will be subcritical under both normal and credible abnormal conditions. (FMPC-2117 0189)

critique - Meetings of personnel involved in or knowledgeable about an event (either a success or an abnormal event) to document a chronological listing of the facts. (DOE/EH-0256T, 0692)

cubic feet per minute - A measure of the volume of a substance flowing through air within a fixed period of time. With regard to indoor air, refers to the amount of air, in cubic feet, that is exchanged with indoor air in a minute's time, i.e., the air exchange rate. (EPA 0992)

cullet - Crushed glass. (EPA 0992)

cultural eutrophication - Increasing rate at which water bodies "die" by pollution from human activities. (EPA 0992)

cultures and stocks - Infectious agents and associated biologicals including: cultures from medical and pathological laboratories; cultures and stocks of infectious agents from research and industrial laboratories; waste from the production of biologicals; discarded live and attenuated vaccines; and culture dishes and devices used to transfer, inoculate, and mix cultures. (See: regulated medical waste, EPA 0992) (EPA 0992)

culvert - A transverse drain: a conduit for a culvert.

cumulative annual effective dose equivalent - The sum of the annual effective dose equivalents recorded for an individual for each year of employment at a Department of Energy (DOE) or DOE contractor facility since 5480.11, Radiation Protection for Occupational Workers, Issued 12-21-88 was issued. (DOE 5480.11 12-21-88)

cumulative working level months (CWLM) - The sum of lifetime exposure to radon working levels expressed in total working level months. (EPA 0992)

curbside collection - Method of collecting recyclable materials at homes, community districts or businesses. (EPA 0992)

curie (Ci) - 1. A quantitative measure of radioactivity equal to 3.7×10^{10} disintegrations of radioactive particles per second. (EPA 0992) 2. The basic unit used to describe the amount of radioactivity in a sample of material. It is based upon the approximate decay rate of 1 gram of radium which is 37 billion disintegrations per second. See RM-0009, 05-13-92, APPENDIX D-D.1.20 for disintegrations conversion factors. (RM-0009, 05-13-92)

custody - Physical possession or control of a sample. A sample is considered under custody if the sample is in your possession; is in your view, after coming into your possession; or was received into your possession and was subsequently secured by lock. (SSOP-0018, 05-07-92)

cutie-pie or cutey pie - An instrument used to measure radiation levels. (EPA 0992)

cyclone collector - A device that uses centrifugal force to pull large particles for polluted air. (EPA 0992)

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data call-in - A part of the Office of Pesticide Programs (OPP) process of developing key required test data, especially on the long-term, chronic effects of existing pesticides, in advance of scheduled Registration Standard reviews. Data Call-In from manufactures is an adjunct of the Registrations Standards program intended to expedite reregistrations. (EPA 0992)

data quality - The totality of features and characteristics of data that bears on its ability to satisfy a given purpose. The characteristics of major importance are accuracy, precision, completeness, representativeness, comparability, traceability, and authenticity. (RM-0012, 04-30-93)

data quality objectives - (See DQOs).

dead ice - Remnant glacial ice occupying a closed topographic depression.

debris - Solid materials that have been manufactured or processed (excluding treatment residuals.) Natural geological material that exceeds a 9.5 mm sieve size such as gravel, cobbles, and boulders, or an inseparable mixture of such material with soil, liquid, sludge, or other solid waste materials. (SSOP-0044, 06-19-92)

decant - To draw off without disturbing the sediment or the lower liquid layers. To pour from one vessel to another.

decay products - Degraded radioactive materials, often referred to as "daughters" or "progeny"; radon decay products of most concern from a public health stand-point are polonium-214 and polonium-218. (EPA 0992)

dechlorination - Removal of chlorine from a substance by chemically replacing it with hydrogen or hydroxide ions in order to detoxify a substance. (EPA 0992)

decibel (dB) - A unit for measuring the relative loudness of sound, approximately to the smallest degree of difference of loudness ordinarily detectable by the human ear, the range of which includes about 130 decibels on a scale beginning with 1 for the faintest available sound. (EPA 0992)

deciduous (Woodlots) - Falling off or sheds seasonally or at a certain stage of development.

decladding blue water - Neutralized copper/nitric acid residue generated by the decladding operation in Plant 9 and following uranium recovery in the refinery.

declared pregnant worker - A woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception. (DOE/EH-0256T, 0692)

decommissioning - Actions taken to reduce the potential health and safety impacts of DOE contaminated facilities, including activities to stabilize, reduce, or remove radioactive materials or to demolish the facilities. (DOE 5820.2A)

decomposition - The breakdown of matter by bacteria and fungi, changing the chemical makeup and physical appearance of materials. (EPA 0992) decontamination - 1. Process of removing radioactive contamination and materials from personnel, equipment, or areas. (DOE/EH-0256T, 0692) 2. The removal of radioactive contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical actions, mechanical cleaning, or other techniques. (DOE 5820.2A, 09-26-88) 3. Removal of harmful substances such as noxious chemicals, harmful bacteria or other organisms, or radioactive material from exposed individuals, rooms and furnishings in buildings or the exterior environment. (EPA 0992) 4. The removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health affects. (OSHA 1910.120 57)

deep dose - The dose equivalent from external radiation determined at a tissue depth of 1 cm. (DOE/EH-0256T, 0692 and RM-0009, 05-13-92)

deep-well injection - Deposition of raw or treated, filtered hazardous waste by pumping it into deep wells, where it is contained in the pores of permeable subsurface rock. (EPA 0992)

deflocculating agent - A material added to suspension to prevent settling. (EPA 0992)

defoliant - A herbicide that removes leaves from trees and growing plants. (EPA 0992)

degradation - The process by which a chemical is reduced to a less complex form. (EPA 0992)

degrease - To remove grease from.

delamination - Separation of one layer from another. (EPA 0992)

delegated state - A state (or other governmental entity such as a tribal government) that has received authority to administer an environmental regulatory program in lieu of a federal counterpart. As used in connection with NPDES, UIC, and PWS programs, the term does not connote any transfer of federal authority to a state. (EPA 0992)

delist - Use of the petition process to have a facility's toxic designation rescinded. (EPA 0992)

demand-side waste management - Prices whereby consumers use purchasing decisions to communicate to product manufacturers that they prefer environmentally sound products packaged with the least amount of waste, made from recycled or recyclable materials, and containing no hazardous substances. (EPA 0992)

denitrification - The anaerobic biological reduction of nitrate to nitrogen gas. (EPA 0992)

denuded plains - plains created by the wearing away or removing overlying matter from underlying rocks, exposing them to view.

department document - A document detailing administrative, technical, or operational activities within a department. (SSOP-0103, 10-14-92)

Department of Energy Contractor - Includes any prime contractor or subcontractor subject to the contractual provisions of 48 CFR 923.70, 48 CFR 970.23, or other contractual provisions where the Department of Energy (DOE) has elected to enforce environmental, safety and health (ES&H) requirements by specific negotiated contract provisions. [48 CFR, Federal Acquisition Regulations Systems]-(FMPC-2116 0189)

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Department of Energy Operations - Those Department of Energy (DOE)-funded activities for which DOE has assumed responsibility for the environment, safety, and health (ES&H) programs. (FMPC-2116 0189)

Department of Energy Waste - Radioactive waste generated by activities of the Department (or its predecessors), waste for which the Department is responsible under law or contract, or other waste for which the Department is responsible. Such waste may be referred to as DOE waste. (DOE 5820.2A)

Department of Transportation (DOT) reportable quantity - The quantity of a substance specified in U.S. Department of Transportation regulation that triggers labelling, packaging and other requirements related to shipping such substances. (EPA 0992)

depleted uranium - Uranium having less than 0.711 percent by weight of the isotope U-235. (FMPC-0307, 12-19-91)

depletion curve - In hydraulics, a graphical representation of water depletion from storage-stream channels, surface soil, and groundwater. A depletion curve can be drawn for base flow, direct runoff, or total flow. (EPA 0992)

depressurization - A condition that occurs when the air pressure inside a structure is lower than the air outside. Depressurization can occur when household appliances such as fireplaces or furnaces, that consume or exhaust house air, are not supplied with enough makeup air. Radon may be drawn into a house more rapidly under depressurized conditions. (EPA 0992)

derby - UF_4 is blended with magnesium granules and placed in a closed reduction pot; the reduction pot is heated in a furnace until the contents react to produce uranium metal shaped in a form called a derby.

derived airborne concentration (DAC) - 1. The concentration of a radionuclide in air that, if breathed over the period of a work year, would result in the Annual Limit on Intake (ALI) for that radionuclide being reached. The DAC is obtained by dividing the ALI by the volume of air breathed by an average worker during a working year (2400 m^3). (DOE/EH-0256T, 0692) 2. Quantity obtained by dividing the Annual Limit on Intake (ALI) for any given radionuclide by the volume of air breathed by an average worker during a working year ($2.4 \times 10^3 m^3$.) (DOE 5480.11 12-21-88) 3. The average concentration of a radionuclide suspended in air that if inhaled or ingested for a 2000-hour working year, would irradiate a person to the limiting radiation dose value for control of the workplace. Exposed to airborne radioactivity is measured in DAC-hours, that is the time (hours) at the DAC value. (RM-0009, 05-13-92)

dermal toxicity - The ability of a pesticide or toxic chemical to poison people or animals by contact with the skin. (See: contact pesticide, EPA 0992) (EPA 0992)

DES - A synthetic estrogen, diethylstilbestrol is used as a growth stimulant in food for animals. Residues in meat are thought to be carcinogenic. (EPA 0992)

desalinization - Removing salt from ocean or brackish water. (EPA 0992)

desiccant - A chemical agent that absorbs moisture; some desiccants are capable of drying out plants or insects, causing death. (EPA 0992)

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design capacity - The average daily flow that a treatment plant or other facility is designed to accommodate. (EPA 0992)

design features for safety (DFS) - Hardware items and/or equipment which are identified in a Safety Analysis Report (SAR) as providing a safety function by preventing or mitigating accidents thus ensuring that the operation of the facility will not cause an unacceptable risk to the safety and health of employees or the general public. Design Features for Safety (DFS) are generally passive in nature. (FMPC-2116 0189)

designated pollutant - An air pollutant which is neither a criteria nor hazardous pollutant, as described in the Clean Air Act (CAA), but for which new source performance standards exist. The CAA does require states to control these pollutants, which include acid mist, total reduced sulfur (TRS), and fluorides. (EPA 0992)

designated uses - Those water uses identified in state water quality standards that must be achieved and maintained as required under the Clean Water Act (CWA). Uses can include cold water fisheries, public water supply, irrigation, etc. (EPA 0992)

designer bugs - Popular term for microbes developed through biotechnology that can degrade specific toxic chemicals at their source in toxic waste dumps or in ground water. (EPA 0992)

destination facility - the facility to which regulated medical waste is shipped for treatment and destruction, incineration, and/or disposal. (EPA 0992)

destroyed medical waste - Regulated medical waste that has been ruined, torn apart, or mutilated through thermal treatment, melting, shredding, grinding, tearing, or breaking, so that it is no longer generally recognized as medical waste, but has not yet been treated (excludes compacted regulated medical waste). (EPA 0992)

destruction and removal efficiency (DRE) - A percentage that represents the number of molecules of a compound removed or destroyed in an incinerator relative to the number of molecules entered the system (e.g., a DRE of 99.99 percent means that 9,999 molecules are destroyed for every 10,000 that enter; 99.99 percent is known as "four nines." For some pollutants, the RCRA removal requirement may be as stringent as "six nines.") (EPA 0992)

destruction facility - A facility that destroys regulated medical waste by mashing or mutilating it. (EPA 0992)

desulfurization - Removal of sulfur from fossil fuels to reduce pollution. (EPA 0992)

detectable leak rate - The smallest leak (from a storage tank), expressed in terms of gallons- or liters-per-hour, that a test can reliably discern with a certain probability of detection or false alarm. (EPA 0992)

detection criterion - A predetermined rule to ascertain whether a tank is leaking or not. Most volumetric tests use a threshold value as the detection criterion. (See: volumetric tank tests, EPA 0992)) (EPA 0992)

detergent - Synthetic washing agent that helps to remove dirt and oil. Some contain compounds which kill useful bacteria and encourage algae growth when they are in wastewater that reaches receiving waters. (EPA 0992) developer - A person, government unit, or company that proposes to build a hazardous waste treatment, storage, or disposal facility. (EPA 0992)

development effects - Adverse effects such as altered growth, structural abnormality, functional deficiency, or death observed in a developing organism. (EPA 0992)

deviation - A departure from specified requirements. (RM-0012, 04-30-93)

dewater - To remove water from.

diatomaceous earth (diatomite) - A chalk-like material (fossilized diatoms) used to filter out solid waste in wastewater treatment plants, also used as an active ingredient in some powdered pesticides. (EPA 0992)

diazinon - An insecticide. In 1986, EPA banned its use on open areas such as sod farms and golf courses because it posed a danger to migratory birds. The ban did not apply to agricultural, home lawn or commercial establishment uses. (EPA 0992)

dibenzofurans - A group of highly toxic organic compounds. (EPA 0992)

dichloro-diphenyl-trichloroethane (DDT) - The first chlorinated hydrocarbon insecticide. It has a half-life of 15 years and can collect in fatty tissues of certain animals. EPA banned registration and interstate sale of DDT for virtually all but emergency uses in the United States in 1972 because of its persistence in the environment and accumulation in the food chain. (EPA -0992)

dicofol - A pesticide used on citrus fruits. (EPA 0992)

diene - A compound containing two double bonds between carbon atoms: esp diolefin.

differentiation - The process by which single cells grow into particular forms of specialized tissue, e.g., root, stem, leaf. (EPA 0992)

diffused air - A type of aeration that forces oxygen into sewage by pumping air through perforated pipes inside a holding tank. (EPA 0992)

digester - In wastewater treatment, a closed tank; in solid waste conversion, a unit in which bacterial action is induced and accelerated in order to break down organic matter and establish the proper carbon to nitrogen ratio. (EPA 0992)

digestion - The biochemical decomposition of organic matter, resulting in partial gasification, liquefaction, and mineralization of pollutants. (EPA 0992)

dike - 1. A low wall that can act as a barrier to prevent a spill from spreading. (EPA 0992) 2. An embankment or ridge of either natural or man-made materials used to prevent the movement of liquids, sludges, solids, or other materials. (PL-2194, 04-05-93)

diluent - Any liquid or solid material used to dilute or carry an active ingredient. (EPA 0992)

dilution - Increasing the proportion of solvent to solute in any solution and thereby decreasing the concentration of the solute per unit volume.

dilution ratio - The relationship between the volume of water in a stream and the volume of incoming water. It affects the ability of the stream to assimilate waste. (EPA 0992)

dinocap - A fungicide used primarily by apple growers to control summer diseases. EPA proposed restrictions on its use in 1986 because it posed the risk of birth defects and sterility. (EPA 0992)

dinoseb - A herbicide that is also used as a fungicide and insecticide. It was banned by EPA in 1986 because it posed the risk of birth defects and sterility. (EPA 0992)

dioxin - Any of a family of compounds known chemically as dibenzo-p-dioxins. Concern about them arises from their potential toxicity and contaminants in commercial products. Tests on laboratory animals indicate that it is one of the more toxic man-made compounds. (EPA 0992)

direct discharger - A municipal or industrial facility which introduces pollution through a defined conveyance or system such as outlet pipes; a point source. (EPA 0992)

discharge - Means accidental or intentional spilling, leaking, pumping, pouring, emitting, emptying or dumping. This does not include any discharge of oil which is authorized by a permit issued pursuant to Section 13 of the River and Harbor Act of 1899 (30 Stat. 1121, 33 U.S.C.), or Sections 402 or 405 of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972 (86 State. 816 et seg., 22 U.S.C. 1251 et seq.). (PL-2194, 04-30-93)

discharges of oil - Defined in 40 Code of Federal Regulations (CFR) Part 110.3, "Protection of the Environment/Water Programs" [in compliance with Statute Section 311(b) of the Clean Water Act], as discharges that: "(a) violate applicable water quality standards or (b) cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines." (40 CFR, Part 110) (PL-2194-04-30-93)

discretionary training - Training for an employee as assigned by the responsible manager that could benefit his/her functional group through increased productivity or proficiency of the employee or group. (FMPC-0102, 01-16-91)

disinfectant - A chemical or physical process that kills pathogenic organisms in water. Chlorine is often used to disinfect sewage treatment effluent, water supplies, wells, and swimming pools. (EPA 0992)

disintegration per minute (dpm) - The rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation. (DOE/EH-0256T, 0692)

dispersant - A chemical agent used to break up concentrations of organic material such as spilled oil. (EPA 0992)

disposables - Consumer products, other items, and packaging used one or a few times and discarded. (EPA 0992)

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disposal - 1. Emplacement of waste in a manner that assures isolation from the biosphere for the foreseeable future with no intent of retrieval and that requires deliberate action to regain access to the waste. (DOE 5820.2A) 2. Final placement or destruction of toxic, radioactive, or other wastes; surplus or banned pesticides or other chemicals; polluted soils; and drums containing hazardous materials from removal actions or accidental releases. Disposal may be accomplished through use of approved secure landfills, surface impoundments, land farming, deep-well injection, ocean dumping, or incineration. (EPA 0992)

disposal facility - The land, structures, and equipment used for the disposal of waste. (DOE 5820.2A)

disposal site - That portion of a disposal facility which is used to dispose of waste. For low-level waste, it consists of disposal units and a buffer zone. (DOE 5820.2A)

disposal unit - A discrete portion (e.g., a pit, trench, timulus, vault, or bunker) of the disposal site into which waste is placed for disposal. (DOE 5820.2A)

disposition location - A location designated on the Construction Waste Identification and Disposition (CWID) form for the storage or disposal of waste. (SSOP-0044, 06-19-92)

dissolved oxygen (DO) - The oxygen freely available in water, vital to fish and other aquatic life and for the prevention of odors. DO levels are considered a most important indicator of a water body's ability to support desirable aquatic life. Secondary and advanced waste treatment are generally designed to ensure adequate DO in waste-receiving waters. (EPA 0992)

dissolved solids - Disintegrated organic and inorganic material in water. Excessive amounts make water unfit to drink or use in industrial processes. (EPA 0992)

distillation - The act of purifying liquids through boiling, so that the steam condenses to a pure liquid and the pollutants remain in a concentrated residue. (EPA 0992)

diversion rate - The percentage of waste materials diverted from traditional disposal such as landfilling or incineration to be recycled, composted, or re-used. (EPA 0992)

deoxyribonucleic acid (DNA) hybridization - Use of a segment of DNA, called a DNA probe, to identify its complementary DNA; used to detect specific genes. (EPA 0992)

document - Any written or pictorial information describing, defining, specifying, reporting, or certifying activities, requirements, procedures, or results. A document is not considered to be a Quality Assurance Record until it satisfies the definition of a Quality Assurance Record as defined in Appendix C, RM-0012, 04-30-93. (RM-0012, 04-30-93)

document review coordinator (DRC) - An individual assigned to represent a department for tracking the internal review, comment resolution, and approval of a site document. (SSOP-0103, 10-14-92)

documentational - The usual printed instructions, comments, and information for using a particular piece or system of computer software or hardware.

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DOE reservation - A location consisting of a DOE-controlled land area including DOE-owned facilities (e.g., the Oak Ridge Reservation) in some cases referred to as a Site, such as the Nevada Test Site (NTS), the Hanford Site; or as a Laboratory, such as the Idaho National Engineering Laboratory; or as a Plant, such as Rocky Flats Plant; or as a Centre, such as the Feed Materials Production Center. (DOE 5820.2A)

DOELAP - Department of Energy Laboratory Accreditation Program for personnel dosimetry under DOE 5480.15, Department of Energy Laboratory Accreditation Program for Personnel Dosimetry. (DOE/EH-0256T, 0692)

dose - 1. The amount of energy deposited in body tissue due to radiation exposure. Various technical terms, such as dose equivalent, effective dose equivalent, and collective dose, are used to evaluate the amount of radiation and exposed worker receives. [These various technical terms are list appropriately throughout this Glossary of Definitions] These terms are used to describe the differing interactions of radiation with tissue as well as to assist in the management of personnel exposure to radiation. Some types of radiation, such as neutron and alpha, deposit their energy more densely in affected tissue than gamma radiation and thereby causing more damage to tissue. (DOE/EH-0256T, 0692) 2. In radiology, the quantity of energy or radiation absorbed. (EPA 0992) 3. (See: Radiation Dose Terms and Units, RM-0009, 05-13-92)

dose assessment - Process of determining radiological dose and uncertainty included in the dose estimate, through the use of exposure scenarios, bioassay results, monitoring data, source term information and pathway analysis. (DOE/EH-0256T, 0692)

dose equivalent (DE) (H_T) - 1. The product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and sievert (SV). Dose Equivalent is measured in units of rem. The DE is used to take into account the differences in tissue damage. Therefore, 1 rem from gamma radiation causes damage equivalent to 1 rem from alpha radiation. However, it takes one-twentieth as much energy from alpha radiation, as compared with gamma radiation, to produce this 1 rem dose equivalent. The (DOE/EH-0256T, 0692)
2. The product of absorbed dose (D) in rads (or gray) in tissue, a quality factor (Q), and other modifying factors (N.) Dose equivalent (H) is expressed in units of rem (or sievert.) (DOE 5480.11 12-21-88)

dose response - How a biological organism's response to a toxic substance quantitatively shifts as its overall exposure to the substance changes (e.g., a small dose of carbon monoxide may cause drowsiness; a large dose can be fatal. (EPA 0992)

dosimeter - An instrument that measures exposure to radiation. (EPA 0992)

double contingency principle - The philosophy requiring that process designs incorporate sufficient factors of safety to require at least two highly unlikely, independent, and concurrent changes in process condition before a criticality accident is possible. (FMPC-2117 0189)

double signature transfer - A transfer of samples from one person to another that is documented on the chain-of-custody record form by signatures of both persons involved in the sample exchange. (SSOP-0018, 05-07-92)

draft permit - A preliminary permit drafted and published by EPA; subject to public review and comment before final action on the application. (EPA 0992) drainage - A device for draining: drain; also: a system of drains, an area or district drained.

dredging - Removal of mud from the bottom of water bodies. This can disturb the ecosystem and causes silting that kills aquatic life. Dredging of contaminated muds can expose biota to heavy metals and other toxics. Dredging activities may be subject to regulation under Section 404 of the Clean Water Act CWA.) (EPA 0992)

driver - Operational, technical, and administrative standards imposed on FERMCO or the FEMP by agreement, law, contract, regulations, DOE Directives, or Corporate Directives. (SSOP-0103, 10-14-92)

drop-off - Recyclable materials collection method in which individuals bring them to a designated collection site. (EPA 0992)

drum - A cylindrical, metal open-head container which meets Department of Transportation (DOT) and Environmental Protection Agency (EPA) requirements, and Nevada Test Site (NTS) acceptance criteria. (SSOP-0075, 12-14-92)

dump - A site used to dispose of solid waste without environmental controls. (EPA 0992)

dust - Particles light enough to be suspended in air. (EPA 0992)

dustfall jar - An open container used to collect large particles from the air for measurement and analysis. (EPA 0992)

dystrophic lakes - Acidic, shallow bodies of water that contain much humus and/or other organic matter; contain many plants but few fish. (EPA 0992) ecological impact - The effect that a man-made or natural activity has on living organisms and their non-living (abiotic) environment. (EPA 0992)

ecology - The relationship of living things to one another and their environment, or the study of such relationships. (EPA 0992)

economic discard limit - The value of U-235 and uranium assay at which a uranium residue may be declared a waste material. (FMPC-0307, 12-19-91)

economic poisons - Chemicals used to control pests and to defoliate cash crops such as cotton. (EPA 0992)

ecosphere - The "bio-bubble" that contains life on earth, in surface waters, and in the air. (See: biosphere EPA 0992) (EPA 0992)

ecosystem - The interacting system of a biological community and its non-living environmental surroundings. (EPA 0992)

effective dose equivalent (H_E) - 1. The sum of the products of the dose equivalent to the organ or tissue (H_T) and the weighing factors (W_T) applicable to each of the body organs or tissues that are irradiated (H_E = (Summation)W_TH_T). (DOE/EH-0256T, 0692) 2. The sum over specific tissues of the products of the dose equivalent in a tissue (H_t) and the weighing factor (W_t) for that tissue, i.e., H_E = (Summation)W_t H_t. The effective dose equivalent is expressed in units of rem (or sievert.) DOE 5480.11 12-21-88)

effluent - Wastewater-treated or -untreated that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters. (EPA 0992)

effluent guidelines - Technical EPA documents which set effluent limitations for given industries and pollutants. (EPA 0992)

effluent limitation - Restrictions established by a State or EPA on quantities, rates, and concentrations in wastewater discharges. (EPA 0992)

effluent standard - (See: effluent limitation, EPA 0992) (EPA 0992)

elastomeric - Any of various elastic substances resembling rubber.

electrodialysis - A process that uses electrical current applied to permeable membranes to remove minerals from water. Often used to desalinize salty or brackish water. (EPA 0992)

electrostatic precipitator (ESP) - A device that removes particles from a gas stream (smoke) after combustion occurs. The ESP imparts an electrical charge to the particles, causing them to adhere to metal plates inside the precipitator. Rapping on the plates causes the particles to fall into a hopper for disposal. (EPA 0992)

eligible costs - The construction costs for wastewater treatment works upon which EPA grants are based. (EPA 0992)

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eligible escort - Any trained person designated to perform the duties of escorting visitors, vendors, and subcontractors within the FEMP. (SSOP-0051, 09-04-92)

embryo/fetus - Developing human organism from conception until birth. Same as unborn child. (DOE/EH-0256T, 0692)

emergency - 1. An emergency is defined for the purposes of FMPC-2116, Implementing FMPC Policies and Procedures for System Safety Analysis, Rev. 0, January 1989 as a set of circumstances which have the potential for causing imminent harm to plant personnel or the general public, or which can lead to a serious insult to the environment. Under emergency conditions, field changes to systems, devices, and procedures under configuration control are permitted only for the purposes of, and to the extent necessary for, eliminating or mitigating potential imminent dangers. This shall not be construed to permit changes necessary only to maintain operation. (FMPC-2116 0189) 2. An unforeseen combination of circumstances or the resulting state that calls for immediate action; an urgent need for assistance or relief. (Webster's 9th 1985)

emergency (chemical) - A situation created by an accidental release or spill of hazardous chemicals that poses a threat to the safety of workers, residents, the environment, or property. (EPA 0992)

emergency duty officer (EDO) - Trained member of FEMP management responsible for the management and oversight of FEMP emergency response activities until the FEMP Emergency Operations Center (EOC) is declared operational. (PL-2194, 04-30-93)

emergency episode - (See: air pollution episode, EPA 0992) (EPA 0992)

emergency response - A response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual-aid groups, local fire departments, etc.) to an occurrence which results or is likely to result, in an uncontrolled release of a hazardous substance. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel are not considered to be emergency responses within the scope of this standard. Responses to release of hazardous substances where there is no potential safety or health hazard (i.e., fire, explosion, or chemical exposure) are not considered to be emergency responses. (OSHA 1910.120 57)

emergency response values - Concentrations of chemicals, published by various groups, defining acceptable levels for short-term exposures in emergencies. (EPA 0992)

eminent domain - Government taking or forced acquisition of private land for public use, with compensation paid to the landowner. (EPA 0992)

emission - Pollution discharged into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities; from residential chimneys; and from motor vehicle, locomotive, or aircraft exhausts. (EPA 0992)

emission factor - The relationship between the amount of pollution produced and the amount of raw material processed. For example, an emission factor for a blast furnace making iron would be the number of pounds of particulates per ton of raw materials. (EPA 0992)

emission inventory - A listing, by source, of the amount of air pollutants discharged into the atmosphere of a community; used to establish emission standards. (EPA 0992) emissions standard - The maximum amount of air polluting discharge legally allowed from a single source, mobile or stationary. (EPA 0992)

emissions trading - EPA policy that allows a plant complex with several facilities to decrease pollution from some facilities while increasing it from others, so long as total results are equal to or better than previous limits. Facilities where this is done are treated as if they exist in a bubble in which total emissions are averaged out. Complexes that reduce emissions substantially may "bank" their "credits" or sell them to other industries. (EPA 0992)

employee - A worker who may be exposed to hazardous chemicals under normal operating conditions or in foreseeable emergencies. Workers such as office workers or bank tellers who encounter hazardous chemicals only in non-routine, isolated instances are not covered. (29 CFR 1910.1200)

employer - A person engaged in a business where chemicals are either used, distributed, or are produced for use or distribution, including a contractor or subcontractor. (29 CFR 1910.1200)

encapsulation - The treatment of asbestos-containing material with a liquid that covers the surface with a protective coating or embeds fibers in an adhesive matrix to prevent their release into the air. (EPA 0992)

enclosure - Putting an airtight, impermeable, permanent barrier around asbestos-containing materials to prevent the release of asbestos fibers into the air. (EPA 0992)

endangered species - Animals, birds, fish, plants, or other living organisms threatened with extinction by man-made or natural changes in their environment. Requirements for declaring a species endangered are contained in the Endangered Species Act. (EPA 0992)

endangerment assessment - A study to determine the nature and extent of contamination at a site on the National Priorities List and the risks posed to public health or the environment. EPA or the state conduct the study when a legal action is to be taken to direct potentially responsible parties to clean up a site or pay for it. An endangerment assessment supplements a remedial investigation. (EPA 0992)

energy recovery - Obtaining energy from waste through a variety of processes (e.g., combustion.) (EPA 0992)

enforceable requirements - Conditions or limitations in permits issued under the Clean Water Act (CWA), Section 402 or 404 that, if violated, could result in the issuance of a compliance order or initiation of a civil or criminal action under federal or applicable state laws. If a permit has not been issued, the term includes any requirement which, in the Regional Administrator's (RA) judgement, would be included in the permit when issued. Where no permit applies, the term includes any requirement which the RA determines is necessary for the best practical waste treatment technology to meet applicable criteria. (EPA 0992)

enforcement - EPA, state, or local legal actions to obtain compliance with environmental laws, rules, regulations, or agreements and/or obtain penalties or criminal sanctions for violations. Enforcement procedures may vary, depending on the requirements of different environmental laws and related implementing regulations. Under CERCLA, for example, EPA will seek to require potentially responsible parties to clean up a Superfund site, or pay for the cleanup, whereas under the Clean Air Act (CAA) the agency may invoke sanctions against cities failing to meet ambient air quality standards that could prevent certain types of construction or federal funding. In other situations, if investigations

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by EPA and state agencies uncover willful violations, criminal trials and penalties are sought. (EPA 0992)

enforcement decision document (EDD) - A document that provides an explanation to the public of EPA's selection of the cleanup alternative at enforcement sites on the National Priorities List. Similar to a Record of Decision (ROD). (EPA 0992)

engineered barrier - A man-made structure or device that is intended to improve the performance of a disposal facility. (DOE 5820.2A)

engineering change proposal (ECP) - A document in a specific format used to propose the establishment of, or change to, the current baseline. (FMPC-2116 0189_

engineering controls - Use of components and systems to reduce airborne radioactivity and the spread of contamination by using piping, containments, ventilation, filtration, or shielding. (DOE/EH-0256T, 0692)

enhanced inspection and maintenance (I&M) - An improved automobile inspection and maintenance program aimed at reducing automobile emissions that contains, at a minimum, more vehicle types and model years, tighter inspection, and better management practices.. It may also include annual computerized or centralized inspections, under-the-hood inspection for signs of tampering with pollution control equipment, and increased repair waiver cost. (EPA 0992)

enriched material - Uranium, or material containing uranium, at a U-235 enrichment greater than 0.711%. (FMPC- 2117 0189)

enriched uranium - Uranium containing greater that 0.711 percent by weight of the isotope U-235. (FMPC-0307, 12-19-91)

enrichment - The addition of nutrients (e.g., nitrogen, phosphorus, carbon compounds) from sewage effluent or agricultural runoff to surface water, greatly increase the growth potential for algae and other aquatic plants. (EPA 0992)

environment - The sum of all external conditions affecting the life, development and survival of an organism. (EPA 0992)

environmental assessment - An environmental analysis prepared pursuant to the National Environmental Policy Act (NEPA) to determine whether a federal action would significantly affect the environment and thus require a more detailed environmental impact statement. (EPA 0992)

environmental audit - An independent assessment of the current status of a party's compliance with applicable environmental requirements or of a party's environmental compliance policies, practices, and controls. (EPA 0992)

environmental compliance - Adherence to those requirements established by DOE Orders and Federal and State Regulatory Agencies that address environmental protection of the Fernald Environmental Management Project (FEMP) and environs. (RM-0012, 04-30-93)

environmental impact statement (EIS) - 1. A document required of federal agencies by the National Environmental Policy Act (NEPA) for major projects or legislative proposals significantly affecting the environment. A tool for decision making, it describes the positive and negative effects of the undertaking and cites alternative actions. (EPA 0992) 2. A concise, analytical document which serves as the means of assessing in detail the environmental impact of proposed Department of Energy (DOE) actions. An EIS is the result of an Environmental Assessment (EA) which has concluded that the risks involved in the proposed project are significant enough to require a more detailed study. Alternatives to the proposal and their potential impacts are included in FMPC-2116, Implementing FMPC Policies and Procedures for System Safety Analysis, Rev. 0, January 1989. (FMPC-2116 0189)

environmentally related measurements - A term used to describe essentially all field and laboratory measurement of chemical, physical, or biological parameters in the environment; determining the presence or absence of priority pollutants in waste streams; health and ecological effect studies; clinical studies involving laboratory simulation of environmental events; and studies or measurements of pollutant transport, including diffusion models. (RM-0012, 4-30-93)

environmental response team - EPA experts located in Edison, New Jersey and Cincinnati, Ohio, who can provide around-the-clock technical assistance to EPA regional offices and states during all types of hazardous waste site emergencies and spills of hazardous substances. (EPA 0992)

epidemiology - Study of the distribution of disease, or other health-related states and events in human populations, as related to age, sex, occupation, ethnic, and economic status in order to identify and alleviate health problems and promote better health. (EPA 0992)

episode (pollution) - An air pollution incident in a given area caused by a concentration of atmospheric pollutants under meteorological conditions that may result in a significant increase in illnesses or deaths. May also describe water pollution events or hazardous material spills. (EPA 0992)

equilibrium - In relation to radiation, the state at which the radioactivity of consecutive elements within a radioactive series is neither increasing nor decreasing. (EPA 0992)

equivalent method - Any method of sampling and analyzing for air pollution which has been demonstrated to the EPA Administrator's satisfaction to be, under specific conditions, and acceptable alternative to normally used reference methods. (EPA 0992)

estuary - Regions of interaction between rivers and nearshore ocean waters, where tidal action and river flow mix fresh and salt water. Such areas include bays, mouths of rivers, salt marshes, and lagoons. These brackish water ecosystems shelter and feed marine life, birds, and wildlife. (See: wetlands.) (EPA 0992)

ethylene dibromide (EDB) - A chemical used as an agricultural fumigant and in certain industrial processes. Extremely toxic and found to be a carcinogen in laboratory animals, EDB has been banned for most agricultural uses in the United States. (EPA 0992)

eutrophic lakes - Shallow, murky bodies of water with concentrations of plant nutrients causing excessive production of algae. (See: dystrophic lakes, EPA 0992) (EPA 0992)

eutrophication - The slow aging process during which a lake, estuary, or bay evolves into a bog or marsh and eventually disappears. During the later stages of eutrophication the water body is choked with abundant plant life due to higher levels of nutritive compounds such as nitrogen and phosphorus. Human activities can accelerate the process. (EPA 0992) evaluation - The act of assessing the adequacy and effectiveness of a program, process or service as compared to a standard of control or other criteria model. (FMPC-0708, 12-15-89)

evaporation ponds - Areas where sewage sludge is dumped and dried. (EPA 0992)

evapotranspiration - the loss of water from the soil both by evaporation and by transpiration from the plants growing in the soil. (EPA 0992)

event - An instance of mechanical or human failure, whereby the degree of nuclear criticality safety control is decreased. Five levels of events are defined in increasing order of severity: Level 1-Deviation; Level 2-Infraction; Level 3-Violation; Level 4-Near Criticality; Level 5-Criticality. (FMPC-2117 0189)

exceedance - Violation of the pollutant levels permitted by environmental protection standards. (EPA 0992)

excess material - A substance which has exceeded its recommended shelf life or intended use. (SSOP-0002, 10-22-91)

exclusion - In the asbestos program, one of several situations that permit a Local Education Agency (LEA) to delete one or more of the items required by the Asbestos Hazard Emergency Response Act (AHERA), e.g., records of previous asbestos sample collection and analysis may be used by the accredited inspector in lieu of AHERA bulk sampling. (EPA 0992)

exclusionary ordinance - Zoning that excludes classes of persons or businesses from a particular neighborhood or area. (EPA 0992)

exempt solvent - Specific organic compounds not subject to requirements of regulation because they are deemed by EPA to be negligible photochemical reactivity. (EPA 0992)

exempted aquifer - Underground bodies of water defined in the Underground Injection Control (UIC) program as aquifers that are potential sources of drinking water though not being used as such, and thus exempted from regulations barring underground injection activities. (EPA 0992)

Existing-site Final Safety Analysis Report (existing-site FSAR) - A safety document which systematically identifies the hazards associated with all Department of Energy (DOE) operations which occur on the Feed Materials Production Center (FMPC) site, describes and analyzes the adequacy of the measures taken to eliminate, control, or mitigate identified hazards, and analyzes and evaluates potential accidents and their associated risks. The Existing-Site FSAR will consist of information from Safety Assessments, Safety Studies, and project FSARs generated as a result of the safety analysis work done at the FMPC. Work will begin on this document when all existing facilities have been analyzed. When completed, it will be the culmination of the WMCO safety analysis program. (FMPC-2116, 0189)

experimental use permit - Obtained by manufacturers for testing new pesticides or uses thereof whenever they conduct experimental field studies to support registration on 10 acres or more on land or one acre or more of water. (EPA 0992)

explosive limits (chemical) - The amounts of vapor in the air that form explosive mixtures; limits are expressed as lower and upper limits and give the range of vapor concentration in air that will explode if an ignition source is present. (EPA 0992) exposure - (1.) The amount of radiation or pollutant present in a given environment that represents a potential health threat to living organisms. (EPA 0992) (2.) An employee is subjected to a hazardous chemical in the course of employment through any route of entry (inhalation, ingestion, skin contact, or absorption, etc.) and includes potential (e.g. accidental or possible) exposure. (29 CFR 1910.1200)

exposure assessment - That portion of the risk assessment that determines doses of constituents of potential concern are determined for each receptor.

external audit - An audit of the Quality Assurance (QA) Program activities of suppliers of materials and services to the Fernald Environmental Management Project (FEMP.) Included within this definition are the contractor(s) performing remediation and/or restoration services and the contractor(s) performing architect/engineer services. (RM-0012, 04-30-93)

external radiation exposure - The dose of radiation received by an individual from a source of ionizing radiation outside the body. Measurements of external radiation doses are made for penetrating and nonpenetrating radiation. (RM-0009, 05-13-92)

extraction procedures E P toxic - Determining toxicity by a procedure which stimulates leaching; if a certain concentration of a toxic substance can be leached from a waste, that waste is considered hazardous, i.e., "E P Toxic." (EPA 0992)

extremely hazardous substances - Any of 406 chemicals identified by EPA as toxic, and listed under SARA Title III. The list is subject to periodic revision. (EPA 0992)

extremity/extremities - Includes hands and feet, arms below the elbow and legs below the knee. (DOE 5480.11, 12-21-88 & DOE/EH-0256T, 0692)

extrusion - The process of forming metal into tubes.

eye dose equivalent - Applies to the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 cm. (DOE/EH-0256T, 0692)

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fabric filter - A cloth device that catches dust particles from industrial emissions. (EPA 0992)

facilities plans - Plans and studies related to the construction of treatment works necessary to comply with the Clean Water Act (CWA) or Resource Conservation Recovery Act (RCRA). A facilities plan investigates needs and provides information on the cost effectiveness of alternatives, a recommended plan, an environmental assessment of the recommendations, and descriptions of the treatment works, costs, and a completion schedule. (EPA 0992)

facility - 1. Any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft, (OSHA 1910.120 57) or 2. Any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any water-borne vessel. (OSHA 1910.120 57)

facility emergency coordinator - Representative of a facility covered by environmental law (e.g., a chemical plant) who participates in the emergency reporting process with the Local Emergency Planning Committee (LEPC). (EPA 0992)

facility owner - The person designated as building custodian or the senior supervisor on shift in a plant. (PL-2194, 04-30-93)

fact sheet - (1.) A document prepared by EPA to inform the public about its permitting process and EPA's tentative decision with regard to permit application. (EPA 0992) (2.) Document distributed with newly promulgated rules and/or newly enacted laws to summarize the relevant facts for interested parties and the public. (EPA 0992)

fate and transport modeling - A mathematical process for simulating the behavior of contaminants in various environments to predict contaminant concentrations and mobility. Models range from relatively simple analytical solutions to complex numerical models.

feasibility study - (1.) Analysis of the practicability of a proposal; e.g., a description and analysis of potential cleanup alternatives for a site such as one on the National Priorities List (NPL). The feasibility study usually recommends selection of a cost effective alternative. It usually starts as soon as the remedial investigation is underway; together, they are commonly referred to as the "RI/FS." (EPA 0992) (2.) A small-scale investigation of a problem to ascertain whether a proposed research approach is likely to provide useful data. (EPA 0992)

fecal coliform bacteria - Bacteria found in the intestinal tracts of mammals. Their presence in water or sludge is an indicator of pollution and possible contamination by pathogens. (EPA 0992)

Federal Facilities Compliance Agreement (FFCA) - An agreement between the EPA and the DOE pertaining to the Fernald Environmental Management Project (FEMP) to: (1.) Ensure compliance by DOE, Oak Ridge Operations, Oak Ridge, Tennessee (DOE-ORO), with existing environmental statutes, and implementing regulations to include the Clean Air Act (CAA), Resource Conservation Recovery Act (RCRA), and Comprehensive Environmental Restoration Conservation Liability Act (CERCLA) 1980 at the FEMP. (2.) To ensure environmental impacts associated with past and present activities at the FEMP are thoroughly investigated, and appropriate remedial response action taken as contemplated by CERCLA. (RM-0012, 04-30-93)

Federal Implementation Plan (FIP) - Under current law, a federally implemented plan to achieve attainment of air quality standards, used when a state is unable to develop an adequate plan. (EPA 0992)

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Pesticide Ingredient - An ingredient of a pesticide that must be registered with EPA under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA.) Products making pesticide claims must register under FIFRA and may be subject to labeling and use requirements. (EPA 0992)

feedlot - A confined area for the controlled feeding of animals. Tends to concentrate large amounts of animal waste that cannot be absorbed by the soil and, hence, may be carried to nearby streams or lakes by rainfall runoff. (EPA 0992)

Feed Materials Production Center (FMPC) Work Request Order (WRO) - A document used to define impacts (e.g., cost, schedule, inoperation, etc.) and sources required to perform variable/infrequent repairs and maintenance work; or, with approved changed documentation (e.g. Engineering Change Proposals (ECP), Request for Engineering Services (RES)), alterations, improvements, development, and new construction, or other modifications to equipment or plant facilities. (FMPC-2116 0189)

fen - A type of wetland that accumulates peat deposits. Fens are less acidic than bogs, deriving most of their water from groundwater rich in calcium and magnesium. (See: wetlands, EPA 0992) (EPA 0992)

fermentation - Chemical reactions produced by living microbes that are supplied with nutrients in the presence of heat, pressure, and light. (EPA 0992)

Fernald Environmental Management Project (FEMP) - All areas within the perimeter of the DOE located at Fernald, Ohio. This site comprises secured areas, protected areas, and controlled area. Secured areas are enclosed by a fence and entered through the reception area in the Administration Building, the personnel turnstiles (near the Security Building) or the vehicle gates, and are controlled by security guards. Protected areas consist of the parking lots, the construction management trailer area, the site access roads, and the adjacent land. (SSOP-0051, 09-04-92)

Fernald Environmental Restoration Management Company (FERMCO) - Took over the Fernald Environmental Management Project (FEMP) on December 1, 1992 from Westinghouse Environmental Management Corporation (WEMCO).

fertile female - Any woman below the age of 50, unless exempted by the Medical Services Section. (RM-0009, 05-13-92)

fertilizer - Materials such as nitrogen and phosphorus that provide nutrients for plants. Commercial fertilizers may contain other chemicals or may be sold in the form of processed sewage sludge. (EPA 0992)

filling - Depositing dirt, mud or other materials into aquatic areas to create more dry land, usually for agricultural or commercial development purposes, often with ruinous ecological consequences. (EPA 0992)

filter integrity test - Test performed on High-Efficiency Particulate Air (HEPA) filters to identify any damage to the filter or leakage around the filter. Techniques used to conduct the test are described in ANSI/UL 586-1990, "High Efficiency Particulate Air Units." (DOE/EH-0256T, 0692) filtration - A treatment process, under the control of qualified operators, for removing solid (particulate) matter from water by means of porous media such as sand or a man-made filter; often used to remove particles that contain pathogens. (EPA 0992)

Final Safety Analysis Report (FSAR) - A safety document which systematically identifies the hazards associated with a facility; describes and analyzes the adequacy of the measures taken to eliminate, control, and mitigate identified hazards; and analyzes and evaluates potential accidents and the associated risks. (FMPC-2116 0189)

Financial Assurance for Closure (FAC) - Documentation or proof that an owner or operator of a facility such as a landfill or other waste repository is capable of paying the projected costs of closing the facility and monitoring it afterwards as provided in the Resource Conservation Recovery Act (RCRA). (EPA 0992)

finding of no significant impact (FNSI) - a document prepared by a federal agency showing why a proposed action would not have a significant impact on the environment and thus would not require preparation of an Environmental Impact Statement (EIS). An FNSI is based on the results of an environmental assessment (EA). (EPA 0992)

fingerprint analysis - An analytical process providing a brief description of material parameters as listed in Table 5 of SSOP-0002, Completing the Material Evaluation Form, Rev. 3, Effective 10-22-91. (SSOP-0002, 10-22-91)

first draw - The water that comes out when a tap is first opened, likely to have the highest level of lead contamination from plumbing materials. (EPA 0992)

fissile class I - Packages that may be transported in unlimited numbers and in any arrangement and that require no nuclear criticality safety control during transportation. For purposes of nuclear criticality safety control, a transport index is not assigned to Fissile Class I packages. However, the external radiation levels may require a transport index number. (FMPC-2116 0189)

fissile class II - Packages that may be transported in any arrangement but in numbers that do not exceed a transport index of 50. For purposes of nuclear criticality safety control, individual packages may have a transport index of not less than 0.1 and not more than 10. Such shipments require no nuclear criticality safety control during transportation. (FMPC-2116 0189)

fissile class III - Shipments of packages that do not meet the requirements of Fissile Class I and II and that are controlled in transportation by special arrangements between the shipper and the carrier to provide nuclear criticality safety. (FMPC-2116 0189)

fissile material - Any material containing uranium-235 or other fissile radionuclides. Other fissile radionuclides are plutonium-239, plutonium-241, and Uranium-233. (FMPC-2117 0189)

fissile material worker - An individual who handles fissile materials or manipulates the controls of equipment used to produce, process, transfer, store, or package significant quantities of such materials. (FMPC-2117 0189)

fissionable materials - Nuclides capable of sustaining a neutron induced fission chain reaction (e.g., uranium-233, uranium-235, plutonium-239, plutonium-238, plutonium-241, neptunium-237, americium-241, and curium-244). (DOE 5480.5, 09-23-86) fissionable materials handler - An individual officially designated by management to manipulate or handle significant quantities of fissionable process, transfer, store, or package significant quantities of such materials. (DOE 5480.5, 09-23-86)

fission products - Transuranics.

fixed contamination - 1. Radioactive material that cannot be readily removed from surfaces by nondestructive means, such as casual contact, wiping, brushing, or washing. (DOE/EH-0256T, 0692) 2. Radioactive contamination that is not readily removable. (SSOP-0044, 06-19-92)

flammable liquid - A liquid having a flash point below 100 degrees F (37.8 degrees C) and a vapor pressure not exceeding 40 psia (at 100 degrees F. (PL-2194, 04-30-93)

flare - A control device that burns hazardous materials to prevent their release into the environment; may operate continuously or intermittently, usually on top of a stack. (EPA 0992)

flash point - The lowest temperature at which combustible vapors ignite in air when exposed to flame. (EPA 0992)

flash X-ray unit - Any device that is capable of generating pulsed X-rays. (DOE/EH-0256T, 0692)

floc - A clump of solids formed in sewage by biological or chemical action. (EPA 0992)

flocculation - Process by which clumps of solids in water or sewage aggregate through biological or chemical action so they can be separated from water or sewage. (EPA 0992)

floor sweep - Capture of heavier-than-air gases that collect at floor level. (EPA 0992)

flow rate - The rate, expressed in gallons- or liters-per-hour, at which a fluid escapes from a hole or fissure in a tank. Such measurements are also made of liquid waste, effluent, and surface water movement. (EPA 0992)

flowmeter - A gauge indicating the velocity of wastewater moving through a treatment plant or of any liquid moving through various industrial processes. (EPA 0992)

flue gas desulfurization - A technology that employs a sorbent, usually lime or limestone, to remove sulfur dioxide from the gases produced by burning fossil fuels. Flue gas desulfurization is the current state-of-the-art technology for major SO2 emitters, like power plants. (EPA 0992)

flue gas - The air coming out of a chimney after combustion in the burner it is venting. It can include nitrogen oxides, carbon oxides, water vapor, sulfur oxides, particulates, and many chemical pollutants. (EPA 0992)

fluidized bed incinerator - An incinerator that uses a bed of hot sand or other granular material to transfer heat directly to waste. Used mainly for destroying municipal sludge. (EPA 0992)

flume - A natural or man-made channel that diverts water. (EPA 0992)

fluorides - Gaseous, solid, or dissolved compounds containing fluorine that result from industrial processes. Excessive amounts in food can lead to fluorosis. (EPA 0992) fluorocarbon (FCs) - Any of a number of organic compounds analogous to hydrocarbons in which one or more hydrogen atoms are replace by fluorine. Once used in the United States as a propellant for domestic aerosols, they are now found mainly in coolants and some industrial processes. FCs containing chlorine are called chlorofluorocarbons (CFCs). They are believed to be modifying the ozone layer in the stratosphere, thereby allowing more harmful solar radiation to reach the Earth's surface. (EPA 0992)

fluorosis - An abnormal condition caused by excessive intake of fluorine, characterized chiefly by mottling of the teeth. (EPA 0992)

flush - 1. To open a cold-water tap to clear out all the water which may have been sitting for a long time in the pipes. In new homes, to flush a system means to send large volumes of water gushing through the unused pipes to remove loose particles of solder and flux. (EPA 0992) 2. To force large amounts of water through liquid to clean out piping or tubing, storage or process tanks. (EPA 0992)

flyash - Non-combustible residual particles expelled by flue gas. (EPA 0992)

Feed Material Production Center (FMPC) Work Request Order (FMPC WRO) - A document used to define impacts (e.g., cost, schedule, inoperation, etc.) and sources required to perform variable/infrequent repairs and maintenance work; or, with approved changed documentation (e.g., Engineering Change Proposal (ECP), Request of Engineering Services (RES)), alterations, improvements, development, new construction, or other modifications to equipment or plant facilities. (FMPC-2116 0189)

fogging - Applying a pesticide by rapidly heating the liquid chemical so that it forms very fine droplets that resemble smoke or fog. Used to destroy mosquitoes, black flies, and similar pests. (EPA 0992)

food chain - A sequence of organisms, each of which uses the next, lower member of the sequence as a food source. (EPA 0992)

formaldehyde - A colorless, pungent, and irritating gas, CH_20, used chiefly as a disinfectant and preservative and in synthesizing other compounds like resins. (EPA 0992)

foreign national - For the purpose of this procedure, a foreign national is a nonimmigrant alien who is a citizen of another country or who is a stateless person permanently residing in another country. (SSOP-0051, 09-04-92)

formulation - The substances comprising all active and inert ingredients in a pesticide. (EPA 0992)

free liquids - 1. Liquids which readily separate from the solid portion of a waste under ambient temperature and pressure. (DOE 5820.2A) 2. Any free flowing liquid or any liquid that readily separates from the solid portion of a waste under ambient temperature and pressure conditions. Ice is also considered a free liquid. (SSOP-0075, SSOP-0078, and SSOP-0079, 12-14-92)

fresh water - Water that generally contains less that 1,000 milligrams-per-liter of dissolved solids. (EPA 0992)

friable - Capable of being crumbled, pulverized, or reduced to powder by hand pressures. (EPA 0992)

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friable asbestos - Any material containing more than one percent asbestos, and that can be crumbled or reduced to powder by hand pressure. (May include previously non-friable material which becomes broken or damaged by mechanical force.) (EPA 0992)

frisk or frisking - Process of monitoring personnel for contamination. Frisking can be performed with hand-held survey instruments, automated monitoring devices or by a Radiological Control Technician. (DOE/EH-0256T, 0692)

fuel economy standard - The Corporate Average Fuel Economy Standard (CAFE) effective in 1978. It enhanced the national fuel conservation effort imposing a miles-per-gallon floor for motor vehicles. (EPA 0992)

fugitive emissions - Emissions not caught by a capture system. (EPA 0992)

fume - tiny particles trapped in vapor in a gas stream. (EPA 0992)

fumigant - A pesticide vaporized to kill pests. Used in buildings and greenhouses. (EPA 0992)

functional equivalent - Term used to describe EPA's decision-making process and its relationship to the environmental review conducted under the National Environmental Policy Act (NEPA). A review is considered functionally equivalent when it addresses the substantive components of a NEPA review. (EPA 0992)

fungi - (Singular: Fungus) Molds, mildews, yeasts, mushrooms, and puffballs, a group of organisms lacking in chlorophyll (i.e., are not photosynthetic) and which are usually non-mobile, filamentous, and multicellular. Some grow in soil, others attach themselves to decaying trees and other plants whence they obtain nutrients. Some are pathogens, others stabilize sewage and digest composted waste. (EPA 0992)

fungicide - Pesticides which are used to control, deter, or destroy fungi. (EPA 0992)

fungistal - A chemical that keeps fungi from growing. (EPA 0992)

future liability - Refers to potentially responsible parties' obligations to pay for additional response activities beyond those specified in the Record of Decision (ROD) or Consent Decree. (EPA 0992)

future use material - Reusable material held for anticipated use in the plant and/or in projects. (SSOP-0044, 06-19-92)

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G

game fish - Species like trout, salmon, or bass, caught for sport. Many of them show more sensitivity to environmental change than "rough" fish. (EPA 0992)

gamma radiation - Gamma rays are similar to x-rays, are the most energetic and most penetrating electromagnetic waves of radiant nuclear energy. Best blocked by dense materials such as lead. (EPA 0992)

garbage - Animal and vegetable waste resulting from the handling, storage, sale, preparation, cooking, and serving of foods. (EPA 0992)

gas chromatograph/mass spectrometer - Highly sophisticated instrument that identifies the molecular composition and concentrations of various chemicals in water and soil samples. (EPA 0992)

gasification - Conversion of solid material such as coal into a gas for use as a fuel. (EPA 0992)

gasoline volatility - the property of gasoline whereby it evaporates into a vapor. Gasoline vapor is a volatile organic compound. (EPA 0992)

Geiger counter - A device that detects the presence of certain types of radioactivity. (EPA 0992)

gene - A segment of DNA that directs the synthesis of a protein. (EPA 0992)

gene library - A collection of DNA fragments from living cells or organisms. So far, no simple way for sorting the contents of gene libraries has been devised. However, DNA pieces can be moved into bacterial cells where sorting according to gene function becomes feasible. (EPA 0992)

general permit - A permit applicable to a class or category of discharges. (EPA 0992)

general reporting facility - A facility having one or more hazardous chemicals above the 10,000 pound threshold for planning quantities. Such facilities must file Material Safety Data Sheet (MSDS) and emergency inventory information with the State Emergency Response Commission (SERC) and Local Emergency Planning Committee (LEPC) and local fire departments. (EPA 0992)

generator - 1. A facility or mobile source that emits pollutants into the air or releases hazardous waste into water or soil. (EPA 0992) 2. Any person, by site, whose act or process produces regulated medical waste or whose act first causes such waste to become subject to regulation. In a case where more than one person (e.g., doctors with separate medical practices) is located in the same building, each business entity is a separate generator. (EPA 0992)

genetic engineering - A process of inserting new genetic information into existing cells in order to modify any organism for the purpose of changing one of its characteristics. (EPA 0992)

germicide - Any compound that kills disease-causing microorganisms. (EPA 0992)

gestation period - The time from conception to birth, for humans is approximately 9 months. (DOE/EH-0256T, 0692)

glacial outwash - Drift deposited by melt water streams beyond active glacier ice.

glacial overburden - Materials deposited by glacial activity, consolidated or unconsolidated, that overlie bedrock or a deposit or other useful material.

glovebag - A polyethylene or polyvinyl chloride bag-like enclosure affixed around an asbestos-containing source (most often thermal system insulation) permitting the material to be removed while minimizing release of airborne fibers in the surrounding atmosphere. (EPA 0992)

grain loading - the rate at which particles are emitted from a pollution source. Measurement is made by the number of grains per cubic foot of gas emitted. (EPA 0992)

granular activated carbon (GAC) treatment - A filtering system often used in small water systems and individual homes to remove organics. GAC can be highly effective in removing elevated levels of radon from water. (EPA 0992)

graphite - A soft black lustrous carbon that conducts electricity and is used in lead pencils, crucibles, electrolytic anodes, as a lubricant, and used for slowing down neutrons in a nuclear reactor.

gray (Gy) - SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram (100 rads.) (DOE/EH-0256T, 0692)

gray water - Domestic wastewater composed of washwater from kitchen, bathroom, and laundry sinks, tubs, and washers. (EPA 0992)

greenhouse effect - The warming of the Earth's atmosphere attributed to a build-up of carbon dioxide or other gases; some scientists think that this buildup allows the sun's rays to heat the Earth, while infra-red radiation makes the atmosphere opaque to a counterbalancing loss of heat. (EPA 0992)

grinder pump - A mechanical device that shreds solids and raises sewage to a high elevation through pressure sewers. (EPA 0992)

gross alpha particle activity - Total activity due to emission of beta particles, used as a screening measurement for radioactivity generally due to naturally-occurring radionuclides. Commonly measured in picocuries. (EPA 0992)

gross beta particle activity - Total activity due to emission of alpha particles, used as a screening measurement for radioactivity from man-made radionuclides such as beta particle and gamma ray emitters. Activity is commonly measured in picocuries. (EPA 0992)

ground cover - Plants grown to keep soil from eroding. (EPA 0992)

groundwater - The supply of fresh water found beneath the Earth's surface, usually in aquifers, which supplies wells and springs. Because ground water is a major source of drinking water, there is growing concern over contamination from leaching agricultural or industrial pollutants or leaking underground storage tanks. (EPA 0992)

H

habitat - The place where a population (e.g., human, animal, plant, microorganism) lives and its surroundings, both living and non-living. (EPA 0992)

half-life - 1. The time required for a pollutant to lose half its affect on the environment. For example, the biochemical half-life of Dichlorodiphenytrichloroethane (DDT) in the environment is 15 years, of Radium, 1,580 years. (EPA 0992) 2. The time required for half of the atoms of a radioactive element to undergo self-transmutation or decay. (EPA 0992) 3. The time required for the elimination of one half a total dose from the body. (EPA 0992)

halogen - Any of a group of five chemically related nonmetallic elements that includes bromine, fluorine, chlorine, iodine, and astatine. (EPA 0992)

halon - Bromine-containing compounds with long atmospheric lifetimes whose breakdown in the stratosphere causes depletion of ozone. Halons are used in fire fighting. (EPA 0992)

hammermill - A high-speed machine that uses hammers and cutters to crush, grind, chip, or shred solid waste. (EPA 0992)

hard water - Alkaline water containing dissolved salts that interfere with some industrial processes and prevent soap from sudsing. (EPA 0992)

hauler - Garbage collection company that offers complete refuse removal service; many also will collect recyclables. (EPA 0992)

hazard communication standard - An OSHA regulation that requires chemical manufacturers, suppliers, and importers to assess the hazards of the chemicals that they make, supply, or import, and to inform employers, customers, and workers of these hazards through MSDS sheets. (EPA 0992)

hazard index (HI) - The sum of all Hazard quotients.

hazard label - A visual indicator consisting of easily recognized and understood markings which identify the tank and process equipment contents and indicates the degree of hazard. (PL-2194, 04-30-93)

hazard quotient - The ratio of dose of a certain toxin compared to the reference dose.

hazardous air pollutants - Air pollutants which are not covered by ambient air quality standards but which, as defined in the Clean Air Act (CAA), may reasonably be expected to cause or contribute to irreversible illness or death. Such pollutants include asbestos, beryllium, mercury, benzene, coke oven emissions, radionuclides, and vinyl chloride. (EPA 0992)

hazardous chemical - An EPA designation for any hazardous material requiring an MSDS under OSHA's Hazard Communication Standard. Such substances are capable of producing fires and explosions or adverse health effects like cancer and dermatitis. Hazardous chemicals are distinct from hazardous waste. (See: Hazardous Waste, EPA 0992) (EPA 0992)

hazardous material - A material or substance, including a hazardous substance, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, or property during transport. (PP-0314, 12-20-91)

Hazardous Materials Response Team (HAZMAT) - An organized group of employees, designated by the employer, who are expected to perform work to handle and control actual or potential leaks or spills of hazardous substances requiring possible close approach to the substance. The team members perform responses to releases or potential releases of hazardous substances for the purpose of control or stabilization of the incident. A HAZMAT team is not a fire brigade nor is a typical fire brigade a HAZMAT team. A HAZMAT team, however, may be a separate component of a fire brigade or fire department. (OSHA 1910.120 55)

hazardous ranking system (HRS) - The principle screening tool used by EPA to evaluate risks to public health and the environment associated with abandoned or uncontrolled hazardous waste sites. The HRS calculates a score based on the potential of hazardous substances spreading from the site through the air, surface water, or groundwater, and on other factors such as density and proximity of human population. This score is the primary factor in deciding if the site should be on the National Priorities List and, if so, what ranking it should have compared to other sites on the list. (EPA 0992)

hazardous substance - 1. Any material that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, ignitable, explosive, or chemically reactive. (EPA 0992) 2. Any substance designated by EPA to be reported if a designated quantity of the substance is spilled in the waters of the United States or if otherwise released into the environment. (EPA 0992) 3. For the purposes of FMPC Spill Prevention Control and Countermeasure Plan, a hazardous substance is designated as any toxic pollutant listed under Statute Section 307(a) of the Federal Water Pollution Control Act (FWPCA) or any hazardous substance listed in 40 CFR 116, "Protection of Environment/Water Programs." All hazardous substances for purposes of this document are listed in Appendix C of this document.

(PL-2194, 04-30-93) 4. A material, including its mixtures and solutions, as defined in 49 CFR 171.8, section 101 (14) and 102 of CERCLA, section 311 (b) (2) (a) of the Clean Water Act (CWA). (PP-0314, 12-20-91) 5. A substance designated for special consideration under the Clean Air Act (CAA), Clean Water Act (CWA), or Toxic Substance Control Act (TSCA), any waste that Resource Conservation and Recovery Act (RCRA) designates as hazardous, and any material that the Environmental Protection Agency (EPA) lists as presenting a substantial danger to health and the environment and a material, including its mixtures and solutions as listed in 49 CFR, Transportation. (SSOP-0044, 06-19-92)

hazardous waste - 1. Those wastes that are designated hazardous by EPA regulations, 40 CFR 261, "Protection of the Environment/Solid Waste." (DOE 5820.2A) 2. By-products of society that can pose a substantial or potential hazard to human health or the environment when improperly managed. Possesses at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity), or appears on special EPA lists. (EPA 0992) 3. A waste material exhibiting the characteristics of ignitability, corrosivity, reactivity, or toxicity or listed in 40 CFR Part 261, "Protection of Environment/Solid Waste/Resource Conservation and Recovery Act (RCRA)" or identified in applicable state regulations. (PL-2194, 04-30-93) 4. Any waste material that is designated as hazardous by the Administrator of the Environmental Protection Agency (EPA) in 40CFR Part 261 and that is subject to the Hazardous Waste Manifest requirements of 40CFR Part 262. (PP-0314, 12-20-91) 5. A discarded material which is listed in the Environmental Protection Agency Hazardous Waste List which exhibits characteristics of ignitability, corrosivity, or reactivity. Both "listed" and "characteristic" wastes are regulated under RCRA. (SSOP-0002) 6. Discardable material containing or exhibiting hazardous or toxic waste characteristics or listed as defined in Title 40 of the Code of Federal Regulations (CFR), Part 261, Resource conservation Recovery Act (RCRA. (SSOP-0044, 06-19-92)

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hazardous waste landfill - An excavated or engineered site where hazardous waste is deposited and covered. (EPA 0992)

hazards analysis - Procedures used to: (1.) identify potential sources of release of hazardous materials from fixed facilities or transportation accidents; (2.) determine the vulnerability of a geographical area to a release of hazardous materials; and (3.) compare hazards to determine which present greater or lesser risks to a community. (EPA 0992)

hazards identification - Providing information on which facilities have extremely hazardous substances, what those chemicals are, how much there is at each facility, how the chemicals are stored, and whether they are used at high temperatures. (EPA 0992)

health assessment - An evaluation of available data on existing or potential risks to human health posed by a Superfund site. The Agency for Toxic Substances and Disease Registry (ATDR) of the Department of Health and Human Services (DH-HS) is required to perform such an assessment at every site on the National Priorities List. (EPA 0992)

heat island effect - A "dome" of elevated temperatures over an urban area caused by structural and pavement heat fluxes, and pollutant emissions. (EPA 0992)

heat-treat quench water - Water used to cool uranium ingots following NuSal heat treating in a 50 percent potassium chloride/50% sodium chloride bath in Plant 6, 9, or the Pilot Plan.

heavy metals - Metallic elements with high atomic weights, e.g., mercury, chromium, cadmium, arsenic, and lead; can damage living things at low concentrations and tend to accumulate in the food chain. (EPA 0992)

heptachlor - An insecticide that was banned on some food products in 1975 and all of them by 1978. It is allowed for use in seed treatment until 1983. More recently, it was found in milk and other diary products in Arkansas and Missouri where diary cattle were illegally fed treated seed. (EPA 0992)

herbicide - A chemical pesticide designed to control or destroy plants, weeds, or grasses. (EPA 0992)

herbivore - An animal that feeds on plants. (EPA 0992)

heterogeneity - Composed of many different phases or parts.

heterotrophic organisms - Species that are dependent on organic matter for food. (EPA 0992)

high contamination area - Area where contamination levels are greater that 100 times the values specified in Chapter 2, Table 2-2, of DOE/EH-0256T, DOE Radiological Control Manual issued June 1992. (DOE/EH-0256T, 0692)

High Efficiency Particulate Air (HEPA) filter - Throwaway extended pleated medium dry-type filter with 1) a rigid casing enclosing the full depth of the pleats, 2) a minimum particle removal efficiency of 99.97 percent for thermally generated monodisperse DOP smoke particles with a diameter of 0.3 micrometer, and 3) a maximum pressure drop of 1.0 inch Hg when clean and operated at its rated airflow capacity. (DOE/EH-0256T, 0692) high radiation area - An area, accessible to personnel, in which radiation levels could result in a person receiving a dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates. (DOE/EH-0256T, 0692)

high-density polyethylene - A materials used to make plastic bottles and other products that produces toxic fumes when burned. (EPA 0992)

high-level radioactive waste (HLW) - Waste generated in core fuel of a nuclear reactor, found at nuclear reactors or by nuclear fuel reprocessing; is a serious threat to anyone who comes near the waste without shielding. (See: low-level radioactive waste, EPA 0992) (EPA 0992)

high-level waste - The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation. (DOE 5820.2A)

histograms - A representation of a frequency distribution by means of rectangles whose widths represent class intervals and whose area are propositional to the corresponding frequencies.

holding pond - A pond or reservoir, usually made of earth, built to store polluted runoff. (EPA 0992)

homeowner water system - Any water system which supplies piped water to a single residence. (EPA 0992)

homogeneous area - In accordance with Asbestos Hazard and Emergency Response Act (AHERA) definitions, an area of surfacing materials, thermal surface insulation, or miscellaneous materials that is uniform in color and texture. (EPA 0992)

hood capture efficiency - Ratio of the emissions captured by a hood and directed into a control or disposal device, expressed as a percent of all emissions. (EPA 0992)

host - 1. In genetics, the organism, typically a bacterium, into which a gene from another organism is transplanted. (EPA 0992) 2. In medicine, an animal infected or parasitized by another organism. (EPA 0992)

hot particle - Fuel, activated corrosion product, or other particles of small size that have a high specific activity as a result of nuclear fission or neutron activation. (DOE/EH-0256T, 0692)

hot spot - Localized source of radiation or radioactive material normally within facility piping or equipment. The radiation levels of hot spots exceed the general area radiation level by more than a factor of 5 and are greater that 100 mrem (mSv) per hour on contact. (DOE/EH-0256T, 0692)

household waste (domestic waste) - Solid waste, composed of garbage and rubbish, which normally originated in a private home or apartment house. Domestic waste may contain a significant amount of toxic or hazardous waste. (EPA 0992)

humus - Decomposed organic material. (EPA 0992)

hummocky topography - An area consisting of glacial knobs (rounded hills) and kettles (bowl-shaped depressions); may have been produced by either moving or stagnant ice.

hybrid - A cell or organism resulting from a cross between two unlike plant or animal cells or organisms. (EPA 0992)

hybridoma - A hybrid cell that produces monoclonal antibodies in large quantities. (EPA 0992)

hydraulic barrier - Strata such as clays and shales which will not permit the penetration of water, petroleum, or gas.

hydraulic conductivity - The capacity of rock or soil to transmit a liquid.

hydraulic gradient - In general, the direction of groundwater flow due to changes in the depth of the water table. (EPA 0992)

hydrocarbons - Chemical compounds that consist entirely of carbon and hydrogen. (EPA 0992)

hydrogen sulfide (HS) - Gas emitted during organic decomposition. Also a by product of oil refining and burning. Smells like rotten eggs and, in heavy concentration, can kill or cause illness. (EPA 0992)

hydrogeology - The geology of ground water, with particular emphasis on the chemistry and movement of water. (EPA 0992)

hydrology - The science dealing with the properties, distribution, and circulation of water. (EPA 0992)

hydrolysis - Decomposition or alteration of a chemical substance by water.

I

Identification Code or EPA I.D. Number - The unique code assigned to each generator, transporter, and treatment, storage, or disposal facility by regulating agencies to facilitate identification and tracking of chemicals or hazardous waste. (EPA 0992)

ignitable - 1. Capable of burning or causing a fire. (EPA 0992) 2. Liquid waste with closed-cup flash points < 60 degrees (140 degrees F), or non-liquid waste capable of causing fire through friction, absorption of moisture, or spontaneous chemical changes. (SSOP-0002, 10-22-91)

immediately dangerous to life and health (IDLH) - The maximum level to which a healthy individual can be exposed to a chemical for 30 minutes and escape without suffering irreversible health effects or impairing symptoms. Used as a "level of concern." (See: level of concern, EPA 0992)

impervious - Describes a material that does not allow another substance to penetrate or pass through. (EPA 0992)

impoundment - A body of water or sludge confined by a dam, dike, floodgate, or other barrier. (EPA 0992)

in situ - In the original location.

in vitro - 1. "In glass"; a test-tube culture. (EPA 0992) 2. Any laboratory test using living cells taken from an organism. (EPA 0992)

in vivo - In the living body of a plant or animal. In vivo tests are those laboratory experiments carried out on whole animals or human volunteers. (EPA 0992)

incident command post - A facility located at a safe distance from an emergency site, where the incident commander, key staff, and technical representatives can make decisions and deploy emergency manpower and equipment. (EPA 0992)

incident command system (ICS) - The organizational arrangement wherein the person, normally the Fire Chief of the impacted district, is in charge of an integrated, comprehensive emergency response organization and the emergency incident site, backed by an Emergency Operations Center staff with resources, information, and advice. (EPA 0992)

incineration - A treatment technology involving destruction of waste by controlled burning at high temperatures, e.g., burning sludge to remove the water and reduce the remaining residues to a safe, non-burnable ash that can be disposed of safely on land, in some waters, or in underground locations. (EPA 0992)

incineration at sea - Disposal of waste by burning at sea on especially-designed incinerator ships. (EPA 0992)

incinerator - A furnace for burning waste under controlled conditions. (EPA 0992)

incompatible waste - A waste unsuitable for mixing with another waste or material because it may react to form a hazard. (EPA 0992) independent safety review (ISR) - The review safety documentation associated with facilities/systems by a committee comprised of knowledgeable individuals who have not participated in the preparation of said documents and are not directly involved in the operation of the facility/system under review. The Independent Safety Review (ISR) Committee is also charged with reviewing and approval or disapproval of safety documentation describing proposed configuration changes in Safety Systems, Design Features for Safety, and Operational Safety Requirements (OSR)-Affected Procedures placed under configuration control to ensure compatibility between the applicable safety documentation and the physical configuration of the systems. (FMPC-2116 0189)

indicator - In biology, an organism, species, or community whose characteristics show the presence of specific environmental conditions, good or bad. (EPA 0992)

indirect discharge - Introduction of pollutants from a non-domestic source into a publicly owned waste-treatment system. Indirect discharges can be commercial or industrial facilities whose waste enter local sewers. (EPA 0992)

indoctrination - Activities provided by the supervisor/manager to acquaint new employees with the correct procedures for performing the assigned jobs/tasks. (FMPC-0102, 01-16-91)

indoor air - The breathing air inside a habitable structure or conveyance. (EPA 0992)

indoor air pollution - Chemical, physical, or biological contaminants in indoor air. (EPA 0992)

indoor climate - Temperature, humidity, lighting, and noise levels in a habitable structure or conveyance. Indoor climate can affect indoor air pollution. (EPA 0992)

industrial pollution prevention - Combination of industrial source reduction and toxic chemical use substitution. (EPA 0992)

industrial source reduction - Practices that reduce the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment; also reduces the threat to public health and the environment associated with such releases. Term includes equipment or technology modifications, substitution of raw materials, and improvements in housekeeping, maintenance, training or inventory control. (EPA 0992)

industrial waste - Unwanted materials from an industrial operation; may be liquid, sludge, solid, or hazardous waste. (EPA 0992)

inert - Lacking the ability to chemically react with other substances. (EPA 0992)

inertial separator - A device that uses centrifugal force to separate waste particles. (EPA 0992)

infectious agent - Any organism, such as a virus or bacterium, that is pathogenic and capable of being communicated by invasion and multiplication in body tissues. (EPA 0992)

infectious waste - Hazardous waste with infectious characteristics, including: contaminated animal waste; human blood and blood products; isolation waste, pathological waste; and discarded sharps (needles, scalpels or broken medical instruments.) (EPA 0992)

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infiltration - 1. The penetration of water through the ground surface into sub-surface soil or the penetration of water from the soil into sewer or other pipes through defective joints, connections, or manhole walls. (EPA 0992) 2. The technique of applying large volumes of waste water to land to penetrate the surface and percolate through the underlying soil. (See: percolation, EPA 0992.) (EPA 0992)

inflow - Entry of extraneous rain water into a sewer system from sources other than infiltration, such as basement drains, manholes, storm drains, and street washing. (EPA 0992)

influent - Water, wastewater, or other liquid flowing into a reservoir, basin, or treatment plant. (EPA 0992)

information file - In the Superfund program, a file that contains accurate, up-to-date documents on a Superfund site. The file is usually located in a public building (school, library, or city hall) convenient for the local residents. (EPA 0992)

information manual (IM) - A site document providing information on a subject for FEMP personnel. (SSOP-0103, 10-14-92)

infrequent or first-time activities - Radiological work activities or operations that require special management attention and consideration of new or novel radiological controls. The designation of infrequent or first-time activities is specifically applicable to facilities that conduct routine and recurring process operations, and is not applicable to facilities that routinely conduct first-time activities, such as experimental or research facilities. (DOE/EH-0256T, 0692)

ingot - An ingot is formed by melting a debry, with other metals until the metal reaches the proper temperature to be poured into a graphite mold to form an ingot. Ingots vary in weight, size, and shape depending on how they will be used.

injection well - A well into which fluids are injected for purposes such as waste disposal, improving the recovery of crude oil, or solution mining. (EPA 0992)

injection zone - A geological formation receiving fluids through a well. (EPA 0992)

innovative technologies - New or inventive methods to treat effectively hazardous waste and reduce risks to human health and the environment. (EPA 0992)

inoculum - 1. Bacterium placed in compost to start biological action. (EPA 0992) 2. A medium containing organisms that is introduced into cultures or living organisms. (EPA 0992)

inorganic chemicals - Chemical substances of mineral origin, not of basically carbon structure. (EPA 0992)

insecticide - A pesticide compound specifically used to kill or prevent the growth of insects. (EPA 0992)

inspection and maintenance (I/M) - 1. Activities to assure that vehicles' emission-controls work properly. (EPA 0992) 2. Also applies to wastewater treatment plants and other anti-pollution facilities and processes. (EPA 0992)

0269

instream use - Water use taking place within a stream channel, e.g., hydro-electric power generation, navigation, water quality improvement, fish propagation, recreation. (EPA 0992)

in-situ stripping - Treatment system that removes or "strips" volatile organic compounds from contaminated ground or surface water by forcing an airstream through the water and causing the compounds to evaporate. (EPA 0992)

institutional control - A period of time, assumed to be about 100 years, during which human institutions continue to control waste management facilities. (DOE 5820.2A, 09-26-88)

integrated pest management (IPM) - A mixture of chemical and other, non-pesticide, methods to control pests. (EPA 0992)

integrated waste management (IWM) - Using a variety of practices to handle municipal solid waste; can include source reduction, recycling, incineration, and landfilling. (EPA 0992)

interceptor sewers - Large sewer lines that, in a combined system, control the flow of sewage to the treatment plant. In a storm, they allow some of the sewage to flow directly into a receiving stream, thus keeping it from overflowing onto the streets. Also used in separate systems to collect the flows from main and trunk sewers and carry them to treatment points. (EPA 0992)

interim (permit) status - Period during which treatment, storage and disposal facilities coming under RCRA in 1980 are temporarily permitted to operate while awaiting a permanent permit. Permits issued under these circumstances are usually called "Part A" or "Part B" permits. (EPA 0992)

internal audit - An audit of a Fernald Environmental Restoration Management Corporation (FERMCO) organization's activities by representatives of another FERMCO organization to determine the status and assess the adequacy and effectiveness of the implementation of FERMCO procedures and compliance to requirements. (RM-0012, 04-30-93)

internal project - Umbrella term encompassing General Plant Projects (GPP) or Capital and Expense Projects (C&EP) generally costing less that $1.2 million. For purposes of Safety Analysis Documentation (SAD), Plant Test Authorizations (PTAs), Work Order (WO), or other similar proposed changes to a process or facility will fall into this category. (FMPC-2116 0189)

internal radiation exposure - The dose of radiation received to the internal organs of the body from radionuclides ingested, inhaled or absorbed into the body. (RM-0009, 05-13-92)

international shipping organization containers - Containers (previously identified by a trade name, "Sea/Land Containers") utilized for bulk shipment of wastes. (SSOP-0002 and SSOP-0027, 02-07-92)

interstate carrier water supply - A source of water for drinking and sanitary use on planes, trains, and ships operating in more than one state. These sources are federally regulated. (EPA 0992)

interstate commerce clause - A clause of the U.S. Constitution which reserves to the federal government the right to regulate the conduct of business across state lines. Under this clause, for example, the U.S. Supreme court has ruled that states may not inequitably restrict the disposal of out-of-state wastes in their jurisdictions. (EPA 0992)

interstate waters - Waters that flow across or form part of state or international boundaries, e.g., the Great Lakes, the Mississippi River, or coastal waters. (EPA 0992) interstitial monitoring - The continuous surveillance of the space between the walls of an underground storage tank. (EPA 0992)

interworks requisition (IWR) - Refers to the process whereby Westinghouse Corporate personnel periodically come to the Fernald Environmental Management Project (FEMP) to work. (SSOP-0051, 09-04-92)

intrusive/nonintrusive - 1) Projecting inward, 2) Of a rock having been forced while in a plastic state into cavities or between layers. Opposite of intrusive.

inventory (TSCA) - Inventory of chemicals produce pursuant to Section 8(b) of the Toxic Substances Control Act. (EPA 0992)

inversion - A layer of warm air preventing the rise of cooling air and pollutants trapped beneath it. Can cause an air pollution episode. (EPA 0992)

ion - An electrically charged atom that can be drawn from wastewater during electro-dialysis. (EPA 0992)

ion exchange treatment - A common water-softening method often found on a large scale at water purification plants that remove some organics and radium by adding calcium oxide or calcium hydroxide to increase the ph to a level where the metal will precipitate out. (EPA 0992)

ionization chamber - A device that measures the intensity of ionizing radiation. (EPA 0992)

ionizing radiation - 1. Radiation that can strip electrons from atoms, i.e., alpha, beta, and gamma radiation. (EPA 0992) 2. Any radiation capable of displacing electrons either directly or indirectly from atoms or molecules, thereby producing ions. Examples: alpha, beta, gamma, X-rays, and neutrons. (RM-0009, 05-13-92)

irradiated food - Food subject to brief radioactivity, usually gamma rays, to kill insects, bacteria, and mold, and to permit storage without refrigeration. (EPA 0992)

irradiation - Exposure to radiation of wavelengths shorter than those of visible light (gamma, x-ray, or ultraviolet), for medical purposes, to sterilize milk or other foodstuffs, or to induce polymerization of monomers or vulcanization of rubber. (EPA 0992)

irradiator - Sealed radioactive material that has the potential to create a radiation level exceeding 500 rad (5 grays) in 1 hour at 1 meter. Although not addressed in DOE/EH-0256T, DOE Radiological Control Manual, Issued June 1992, acceptable radiological controls for irradiator use are specified in Title 10, Code of Federal Regulations, Part 20.1603, Energy. (DOE/EH-0256T, 0692)

irrigation - Applying water or wastewater to land areas to supply the water and nutrient needs of plants. (EPA 0992)

irritant - A substance that can cause irritation of the skin, eyes, or respiratory system. Effects may be acute from a single high level exposure, or chronic for repeated low-level exposures to such compounds as chlorine, nitrogen dioxide, and nitric acid. (EPA 0992)

ISO container - An Intermodal container (Dry Cargo Type.) Those used at the Fernald Environmental Management Project (FEMP) typically measure 8-1/2 feet high X 8 feet wide X 20 feet long with two doors on the end. Although frequently referred to as a "Sea/Land" container at the FEMP, and ISO container may be, but is not necessarily, a Sea-Land container. (SSOP-0075 and SSOP-0078, 12-14-92)

isotope - A variation of an element that has the same atomic number of protons but a different weight because of the number of neutrons. Various isotopes of the same element may have different radioactive behaviors, some are highly unstable. (EPA 0992)

isotopic crossover - Any accidental or intended mixing of uranium materials having different percentages of U-235 with the result of downgrading the material having the higher enrichment. (FMPC-0307, 12-19-91)

isotopic thorium - Nuclide/a radioactive metallic element that occurs combined in minerals and is usually associated with rare earth elements.

isotopic uranium - Nuclide/a silvery, heavy radioactive polyvalent metallic elements that consists of three isotopes of mass #234, 235, and 238.

item - An all-inclusive term used in place of any of the following: appurtenance, facility, sample, assembly, component, equipment, material, module, part, structure, subassembly, subsystem, system, unit, documented concepts, or data. (DOE 5700.6C, 08-21-91 and RM-0012, 04-30-93)

J

job and task analysis (JTA) - A systematic procedure for determining what employees do on their jobs, the conditions under which they perform their job tasks, standards for adequate employee performance, and the skills and knowledge employees must possess to perform the job adequately. WMCO has established a computerized database management system to store and retrieve its JTA data. (FMPC-0102, 01-16-91)

joint - Fracture in rocks or soils generally more or less vertical or horizontal to bedding, along which no appreciable movement has occurred.

K

Kansan Glaciation - Second of four classical glacial stages of the Pleistocene of North America.

Karst - A geologic formation of irregular limestone deposits with sinks, underground streams, and caverns. (EPA 0992)

kinetic rate coefficient - A number that describes the rate at which a water constituent such as a biochemical oxygen demand or dissolved oxygen rises or falls. (EPA 0992)

L

lacustine - Pertaining to, produced by, or formed in a lake or lakes.

lagoon - 1. A shallow pond where sunlight, bacterial action, and oxygen work to purify wastewater; also used for storage of wastewater or spent nuclear fuel rods. (EPA 0992) 2. Shallow body of water, often separated from the sea by coral reefs or sandbars. (EPA 0992)

land application - Discharge of wastewater onto the ground for treatment or reuse. (See: irrigation, EPA 0992) (EPA 0992)

land ban - Phasing out of land disposal of most untreated hazardous waste, as mandated by the 1984 RCRA amendments. (EPA 0992)

land farming (of waste) - A disposal process in which hazardous waste deposited on or in the soil is degraded naturally by microbes. (EPA 0992)

landfills - 1. Sanitary landfills are disposal sites for non-hazardous solid wastes spread in layers, compacted to the smallest practical volume, and covered by material applied at the end of each operating day. (EPA 0992) 2. Secure chemical landfills are disposal sites for hazardous waste, selected and designed to minimize the chance of release of hazardous substances into the environment. (EPA 0992)

large quantity generator - Person or facility generating more than 2200 pounds of hazardous waste per month. Such generators produce about 90 percent of the nations's hazardous waste, and are subject to all RCRA requirements. (EPA 0992)

lateral sewers - Pipes that run under city streets and receive the sewage from homes and businesses, as opposed to domestic feeders and main trunk lines. (EPA 0992)

LC 50/lLethal concentration - Median level concentration, a standard measure of toxicity. It tells how much of a substance is needed to kill half of a group of experimental organisms in a given time. (LD 50.) (EPA 0992)

LD 50/lethal dose - The dose of a toxicant that will kill 50 percent of the test organisms within a designated period. The lower the LD 50, the more toxic the compound. (EPA 0992)

leach - To dissolve out by the action of a percolating liquid.

leachate - Water that collects contaminants as it trickles through wastes, pesticides or fertilizers. Leaching may occur in farming areas, feedlots, and landfills, and may result in hazardous substances entering surface water, ground water, or soil. (EPA 0992)

leachate collection system - A system that gathers leachate and pumps it to the surface for treatment. (EPA 0992)

leaching - The process by which soluble constituents are dissolved and filtered through the soil by a p percolating fluid. (See: leachate, EPA 0992) (EPA 0992) lead (Pb) - A heavy metal that is hazardous to health if breathed or swallowed. Its use in gasoline, paints, and plumbing compounds has been sharply restricted or eliminated by federal laws and regulations. (See: heavy metals, EPA 0992) (EPA 0992)

leaded gasoline - Gasoline to which lead has been added to raise its octane level. (EPA 0992)

level of concern (LOC) - The concentration in air of an extremely hazardous substance above which there may be serious immediate health effects to anyone exposed to it for short periods. Lift: In a sanitary landfill, a compacted layer of solid waste and the top layer of cover material. (EPA 0992)

lifetime dose - Total occupational exposure over a worker's lifetime, including external and committed internal dose. (DOE/EH-0256T, 0692)

lifting station - (See: pumping station, EPA 0992) (EPA 0992)

limestone scrubbing - Use of a limestone and water solution to remove gaseous stackpipe sulfur before it reaches the atmosphere. (EPA 0992)

limited degradation - An environmental policy permitting some degradation of natural systems but terminating at a level well beneath an established health standard. (EPA 0992)

limiting factor - A condition whose absence or excessive concentration, is incompatible with the needs or tolerance of a species or population and which may have a negative influence on their ability to thrive, survive. (EPA 0992)

limnology - The study of the physical, chemical, hydrological, and biological aspects of fresh water bodies. (EPA 0992)

liner - 1. A relatively impermeable barrier designed to keep leachate inside a landfill. Liner materials include plastic and dense clay. (EPA 0092) 2. An insert or sleeve for sewer pipes to prevent leakage or infiltration. (EPA 0992)

lipid solubility - The maximum concentration of a chemical that will dissolve in fatty substances. Lipid soluble substances are insoluble in water. They will very selectively disperse through the environment via uptake in living tissue. (EPA 0992)

liquefaction - Changing a solid into a liquid. (EPA 0992)

liquid injection incinerator - Commonly used system that relies on high pressure to prepare liquid wastes for incineration breaking them up into tiny droplets to allow easier combustion. (EPA 0992)

list - Shorthand term for EPA list of violating facilities or firms debarred from obtaining government contracts because they violated certain sections of the Clean Air Act (CAA) or Clean Water Act (CWA). The list is maintained by The Office of Enforcement and Compliance Monitoring. (EPA 0992)

listed waste - Wastes listed as hazardous under Resource Conservation and Recovery Act (RCRA) but which have not been subject to the Toxic Characteristics Listing Process because the dangers they present are considered self-evident. (EPA 0992) litter - The highly visible portion of solid waste carelessly discarded outside the regular garbage and trash collection and disposal system. (EPA 0992)

local education agency (LEA) - In the asbestos program, an educational agency at the local level that exists primarily to operate schools or to contract for educational services, including primary and secondary public and private schools. A single, unaffiliated school can be considered an LEA for AHERA purposes. (EPA 0992)

Local Emergency Planning Committee (LEPC) - A committee appointed by the state emergency response commission, as required by SARA Title III, to formulate a comprehensive emergency plan for its jurisdiction. (EPA 0992)

loci - Place, locality. A center of activity or concentration. The set of all points whose location is determined by set points.

loess - A consistent, nonstratified, fine-grained silt which lacks any bedding but often has vertical joints. Transported by wind from deserts, from dried-up flood plains, from river courses, or from glacial deposits.

lot marking and color coding system - The method used at the Fernald Environmental Management Project (FEMP) for nuclear material identification by assigning a 15 digit alphanumeric code number (11 digit for thorium) and using colors to assure complete separation of depleted, normal, and enriched uranium or thorium materials. See RM-0005,FEMP Lot Marking and Color Coding System, Effective 05-05-93. (FMPC-0307, Issued 12-19-91)

low NO* burners - One of several combustion technologies used to reduce emissions of Nitrogen Oxides (NO*.) (EPA 0992)

low-level radioactive waste (LLRW) - 1. Waste that contains radioactivity and is not classified as high-level waste, transuranic (TRU) waste, spent nuclear fuel or byproduct material as defined in Section 11e(2) of the Atomic Energy Act (AEC), as amended and DOE Order 5820.2A, Radioactive Waste Management. Test specimens of fissionable material irradiated only for research and development and not for production of power or plutonium may be classified as low-level waste provided the concentration of transuranic activity is less than 100 nanocuries per gram (nCi/g.) DOE/EH-0256T, 0692 and SSOP-0078 & SSOP-0079, 12-14-92) 2. Wastes less hazardous than most of those associated with nuclear reactor; generated by hospitals, research laboratories, and certain industries. The Department of Energy (DOE), Nuclear Regulatory Commission (NRC), and Environmental Protection Agency (EPA) share responsibilities for managing them. (See: high-level radioactive wastes, EPA 0992. (EPA 0992) 3. A term applied to nuclear materials which have been evaluated and determined to be uneconomical to recover. This term also applies to such materials as trash, construction rubble, and soil that is contaminated with nuclear materials. Materials designated for shipment off-site must meet criteria in QA-87001, Waste Certification Program Plan, Rev. 4.2, Issued 11-92. (FMPC-0307, 12-19-91) 4. All radioactive waste not classified as high-level waste, spent nuclear fuel, transuranic (TRU) waste, uranium mill tailings, or mixed wastes (MW). Low-level waste can contain TRU nuclides in concentrations not greater that 100 nanocuries per gram, where TRU means transuranic and MW means mixed waste. (SSOP-0075, 12-14-92)

<u>low-level waste</u> - Waste that contains radioactivity and is not classified as high-level waste, transuranic waste, or spent nuclear fuel or 11e(2) by product material as defined by this Order. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic is less that 100 nCi/g. (DOE 5820.2 A, 09-26-88)

<u>lower explosive limit (LEL)</u> - The concentration of a compound in air below which a flame will not conflagrate if the mixture is ignited. (EPA 0992)

<u>lowest achievable emission rate</u> - Under the Clean Air Act (CAA), the rate of emissions that reflects (a) the most stringent emission limitation in the implementation plan of any state for such source unless the owner or operator demonstrates such limitations are not achievable; or (b) the most stringent emissions limitation achieved in practice, whichever is more stringent. A proposed new or modified source may not emit pollutants in excess of existing new source standards. (EPA 0992)

M

magnetic separation - Use of magnets to separate ferrous materials from mixed municipal waste stream. (EPA 0992)

major modification - This term is used to define modifications of major stationary sources of emissions with respect to Prevention of Significant Deterioration and New Source Review under the Clean Air Act (CAA.) (EPA 0992)

major revision - A change to a document that is 20% or more of the document text. (SSOP-0103, 10-14-92)

major stationary source - Term used to determine the applicability of Prevention of Significant Deterioration (PSD) and new source regulations. In a nonattainment area, any stationary pollutant source with potential to emit more than 100 tons per year is considered a major stationary source. In PSD areas, the cut off level may be either 100 or 250 tons, depending upon the source. (EPA 0992)

majors - Larger publicly owned treatment works (POTWs) with flows equal to at least one million gallons per day (mgd) or servicing population equivalent to 10,000 persons; certain other POTWs having significant waste quality impacts. (See: minors) (EPA 0992)

management plan - Under the Asbestos Hazard Emergency Response Act (AHERA), a document that each Local Education Agency (LEA) is required to prepare, describing all activities planned and undertaken by a school to comply with AHERA regulations, including building inspections to identify asbestos-containing materials, response actions, and operations and maintenance programs to minimize the risk of exposure. (EPA 0992)

mandatory recycling - Programs which by law require consumers to separate trash so that some or all recyclable materials are recovered for recycling rather than going to landfills. (EPA 0992)

mandatory training - Training required for WMCO employees based on their responsibilities or work assignments and/or applicable DOE Orders and state and federal regulations. (FMPC-0102, 01-16-91)

manhole 175 - Monitoring the FEMP wastewater discharges to the Great Miami River occurs just downstream of Manhole 175 (MH 175). The term MH 175 is used synonymously to refer to the adjacent monitoring station. (PL-2194, 04-30-93)

manifest system - Tracking of hazardous waste from "cradle to grave" (generation through disposal) with accompanying documents known as manifests. (See: Cradle to Grave) (EPA 0992)

manual separation - Hand separation of recyclable or compostable materials from waste. (EPA 0992)

manufacturer's formulation - A list of substances or component parts as described by the maker of a coating, pesticide, or other product containing chemicals or other substances. (EPA 0992)

marine sanitation device - Any equipment or process installed on board a vessel to receive, retain, treat, or discharge sewage. (EPA 0992)

marsh - A type of wetland that does not accumulate appreciable peat deposits and is dominated by herbaceous vegetation. Marshes may be either fresh or saltwater, tidal or non-tidal. (See: Wetlands, EPA 0992) (EPA 0992) material - For purposes of this procedure, any material classified as non-hazardous items or hazardous materials, including hazardous substances, hazardous wastes, nuclear, and radioactive materials. (PP-0314, 12-20-91)

material nalance account (MBA) - A subsidiary account of the facility for a specific process to establish accountability and to localize inventory differences. (FMPC-0307, 12-19-91)

material category - In the asbestos program, broad classification of materials into thermal surfacing insulation, surfacing material, and miscellaneous material. (EPA 0992)

material generator - A person at the originating facility who is authorized to prepare raw material, process material, and waste material for transfer. (SSOP-0002, 10-22-91)

Material Safety Data Sheet (MSDS) - A compilation of information required under the Occupational Safety and Health Administration (OSHA) Communication Standard on the identify of hazardous chemicals, health, and physical hazards, exposure limits, and precautions. Section 311 of the Superfund Amendments and Reauthorization Act of 1986 (SARA) requires facilities to submit MSDSs under certain circumstances. (EPA 0992)

material type - Is a classification of suspect material by its specific use or application, e.g., pipe insulation, fireproofing, and floor tile. (EPA 0992)

materials recovery facility (MRF) - A facility that processes residentially collected mixed recyclables into new products available for market. (EPA 0992)

matrix interference - Obstruction.

maximum contaminant level (MCL) - The maximum permissible level of a contaminant in water delivered to any user of a public system. MCLs are enforceable standards. (EPA 0992)

mechanical aeration - Use of mechanical energy to inject air into water to cause a waste stream to absorb oxygen. (EPA 0992)

mechanical separation - Using mechanical means to separate waste into various components. (EPA 0992)

mechanical turbulence - Random irregularities of fluid motion in air caused by buildings or other non-thermal, processes. (EPA 0992)

media - Specific environments-air, water, soil-which are the subject of regulatory concern and activities. (EPA 0992)

medical surveillance - A periodic comprehensive review of a worker's health status; acceptable elements of such surveillance program are listed in the Occupational Safety and Health Administration (OSHA) standards for asbestos. (EPA 0992)

medical waste - Any solid waste generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals, excluding hazardous waste identified or listed under 40 CFR 261, "Protection of Environment/Identification and Listing of Hazardous Waste" or any household waste as defined in 40 CFR Sub-section 261.4(b)(1). (EPA 0992) mercury - A heavy metal that can accumulate in the environment and is highly toxic if breathed or swallowed. (See: heavy metals, EPA 0992) (EPA 0992)

metabolites - Any substances produced by biological processes, such as those from pesticides. (EPA 0992)

metal refuse - Metal not suitable for reclamation due to a hard-to-remove non-metallic wrapping, mixed metal composition, heavily rusted, less than 1/4-inch thick, or internal non-decontaminatable surfaces. (SSOP-0044, 06-19-92)

methane - A colorless, nonpoisonous, flammable gas created by anaerobic decomposition of organic compounds. (EPA 0992)

method 18 - An EPA test method which uses gas chromatographic techniques to measure the concentration of volatile organic compounds in a gas stream. (EPA 0992)

method 24 - An EPA reference method to determine density, water content and total volatile content (water and Volatile Organic Compounds (VOC)) of coatings. (EPA 0992)

method 25 - An EPA reference method to determine the Volatile Organic Compounds (VOC) concentration in a gas stream. (EPA 0992)

microbes - Microscopic organisms (algae, animals, viruses, bacteria, fungus, and protozoa) some of which cause diseases. (See: microorganism, EPA 0992) (EPA 0992)

microbial pesticide - A microorganism that is used to control a pest, but of minimum toxicity to man. (EPA 0992)

microclimate - The localized climate conditions with in an urban area or neighborhood. (EPA 0992)

microorganism - Living organism so small that individually it can only be seen through a microscope. (EPA 0992)

million gallons per day (mgd) - A measure of water flow. (EPA 0992)

minimization - A comprehensive program to minimize or eliminate wastes, usually applied to wastes at their point of origin. (See: waste minimization, EPA 0992) (EPA 0992)

minimum critical mass - The smallest mass of fissile material that will support a self-sustaining chain reaction under specified conditions. (FMPC-2117 0189)

minor revision - A change to a document that is less than 20% of the document text. (SSOP-0103, 10-14-92)

minors - Publicly owned treatment works (POTWs) with flows less than 1 million gallons per day. (See: majors, EPA 0992) (EPA 0992)

miscellaneous asbestos containing material (ACM) - Interior asbestos-containing building material or structural components, members or fixtures, such as floor and ceiling tiles; does not include surfacing materials or thermal system insulation. (EPA 0992) miscellaneous materials - Interior building materials on structural components, such as floor or ceiling tiles. (EPA 0992)

miscible liquids - Two or more liquids that can be mixed and will remain mixed under normal conditions. (EPA 0992)

missed detection -The situation that occurs when a test indicates that aa tank is "tight" when in facti it is leaking. (EPA 0992)

mist - Liquid particles measuring 40 to 500 microns, are formed by condensation of vapor. By comparison, fog particles are smaller than 40 microns. (EPA 0992)

mitigation - Measures taken to reduce adverse impacts on the environment. (EPA 0992)

mixed funding - Settlements in which potentially responsible parties and EPA share to cost of a response action. (EPA 0992)

mixed liquor - A mixture of activated sludge and water containing organic material undergoing activated sludge treatment in an aeration tank. (EPA 0992)

mixed waste - 1. Waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the Resources Conservation and Recovery Act (RCRA), respectively. (DOE 5820.2A, 09-26-88 and DOE/EH-0256T, 0692) 2. Contains Resource Conservation Recovery Act (RCRA) constituents and radiological contamination. (SSOP-0044, 06-19-92)

mixture - Any combination of two or more elements and/or compounds in solid, liquid, or gaseous form, except where such substances have undergone a chemical reaction so as to become inseparable by physical means. (PL-2194, 04-30-93)

mobile incinerator systems - Hazardous waste incinerators that can be transported from one site to another. (EPA 0992)

mobile source - Any non-stationary source of air pollution such as cars, trucks, motorcycles, buses, airplanes, locomotives. (EPA 0992)

model plant - A hypothetical plant design used for developing economic, environmental, and energy impact analyses as support for regulations or regulatory guidelines; first step in exploring the economic impact of a potential New Source Performance Standards (NSPS). (EPA 0992)

modeling - Development of a mathematical or physical representation of a system or theory that accounts for all or some of its known properties. Models are often used to test the effect of changes of components on the overall performance of the system. (EPA 0992)

moderator - A material used to reduce the kinetic energy of neutrons by scattering collisions without appreciable neutron capture (e.g., water, oil, graphite.) (FMPC-2117 0189)

modification - Any change or alteration to a facility/system which affects the form, fit, or function of equipment, systems, processes, or facilities, and which does not involve: a. direct same-for-same replacement of components (or like-for-like, if substitutes were previously analyzed and approved), or b. routine maintenance utilizing approved procedures. (FMPC-2116 0189)

<u>molten salt reactor</u> - A thermal treatment unit that rapidly heats waste in a heat conducting fluid bath of carbonate salt. (EPA 0992)

<u>monitoring</u> - 1. Actions intended to detect and evaluate radiological conditions. (DOE 5480.11, 12-21-88) 2. The making of observations and measurements to provide data to evaluate the performances of a waste management operation. (DOE 5820.2A, 09-26-88) 3. Periodic or continuous surveillance or testing to determine the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, plants, and animals. (EPA 0992)

<u>monitoring well</u> - 1. A well used to obtain water quality samples or measure groundwater levels. (EPA 0992) 2. Well drilled at a hazardous waste management facility or Superfund site to collect groundwater samples for the purpose of physical, chemical, or biological analysis to determine the amounts, types, and distribution of contaminants in the groundwater beneath the site. (EPA 0992)

<u>monoclonal antibodies (MABs or MCAs)</u> - 1. Man-made clones of a molecule, produced in quantity for medical or research purposes. (EPA 0992) 2. Molecules of living organisms that selectively find and attach to other molecules to which their structure conforms exactly. This could also apply to equivalent activity by chemical molecules. (EPA 0992)

<u>moraine</u> - Deposits of glacial till formed either as curved or bowed mounds at the front of the glacier (terminal moraine) or as sheets of till over considerable areas (boulder clay). Successive terminal moraines often mark retreat stages of glaciers (recessional moraine). Moraines are made up of a variety of unsorted rock fragments in unbedded clay matrix.

<u>moratorium</u> - During the negotiation process, a period of 60 to 90 days during which EPA and potentially responsible parties may reach settlement but not site response activities can be conducted. (EPA 0992)

<u>morbidity</u> - Rate of disease incidence. (EPA 0992)

<u>muck soils</u> - Earth made from decaying plant materials. (EPA 0992)

<u>mrem</u> - A unit of radiation dosage equal to one-thousandth of a rem. A member of the public can safely receive up to 500 millirems per year, according to federal standards, but the U.S. EPA ordinarily limits public exposure to 25 to 200 mrem per year.

<u>mulch</u> - A layer of material (wood chips, straw, leaves, etc.) placed around plants to hold moisture, prevent weed growth, and enrich or sterilize the soil. (EPA 0992)

<u>multiple use</u> - Use of land for more than one purpose; e.g., grazing of livestock, watershed, and wildlife protection, recreation, and timber production. Also applies to use of bodies of water for recreational purposes, fishing, and water supply. (EPA 0992)

<u>mutagen</u> - A substance capable of producing a change in Deoxyribonucleic Acid (DNA). (EPA 0992)

<u>mutagenesis</u> - Any process by which cells are mutated. (EPA 0992)

<u>mutate</u> - To bring about a change in the genetic constitution of a cell by altering its Deoxyribonucleic Acid (DNA). (EPA 0992)

0283

N

National Ambient Air Quality Standards (NAAQS) - Standards established by EPA that apply for outside air throughout the country. (See: criteria pollutants, state implementation plans, emissions trading, EPA 0992) (EPA 0992)

National Emissions Standards for Hazardous Air Pollutants (NESHAPS) - Emissions standards set by EPA for an air pollutant not covered by National Ambient Air Quality Standards (NAAQS) that may cause an increase in fatalities or in serious, irreversible, or incapacitating illness. Primary standards are designed to protect human health, secondary standards to protect public welfare (e.g., building facades, visibility, crops, and domestic animals.) (EPA 0992)

National Estuary Program - A program established under the Clean Water Act Amendments of 1987 to develop and implement conservation and management plans for protecting estuaries and restoring and maintaining their chemical, physical, and biological integrity, as well as controlling point and nonpoint pollution sources. (EPA 0992)

National Municipal Plan - A policy created in 1984 by EPA and the states in 1984 to bring all publicly owned treatment works (POTWs) into compliance with Clean Water Act requirements. (EPA 0992)

National Oil and Hazardous Substances Contingency Plan (NOHSCP/NCP) - The federal regulation that guides determination of the sites to be corrected under both the Superfund program and the program to prevent or control spills into surface waters or elsewhere. (EPA 0992)

National Pollutant Discharge Elimination System (NPDES) - A provision of the Clean Water Act which prohibits discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, or, where delegated, a tribal government on an Indian Reservation. (EPA 0992)

National Pollution Discharge Elimination System (NPDES) Permit - A NPDES permit, authorized, license, or equivalent control document, used by the Environmental Protection Agency (EPA) or and "approved State" to implement the requirements of 40 CFR Parts 122, 123, and 124, "Protection of Environment/Water Programs." (PL-2194, 04-30-93)

National Priorities List (NPL) - EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund. The list is based primarily on the score a site receives from the Hazard Ranking System. EPA is required to update the NPL at least once a year. A site must be on the NPL to receive money from the Trust Fund for remedial action. (EPA 0992)

National Response Team (NRT) - Representatives of 13 federal agencies that, as a team, coordinate federal responses to nationally significant incidents of pollution-an oil spill, a major chemical release, or a Superfund response action-and provide advice and technical assistance to the responding agency(ies) before and during a response action. (EPA 0992)

National Response Center - The federal operations center that receives notifications of all releases of oil and hazardous substances into the environment; open 24 hours a day, is operated by the U.S. Coast Guard, which evaluates all reports and notifies the appropriate agency. (EPA 0992)

0284

natural barrier - The physical, chemical, and hydrological characteristics of the geological environment at the disposal site that, individually and collectively, as to retard or preclude waste migration. (DOE 5820.2A, 09-26-88)

natural gas - A natural fuel containing primarily methane and ethane that occurs in certain petrological formations. (EPA 0992)

natural selection - The process of survival of the fittest, by which organisms that adapt to their environment survive and those that do not disappear. (EPA 0992)

naturally occurring and accelerator produced radioactive material - Any radioactive material that can be considered naturally occurring and is not source, special nuclear, or byproduct material or that is produced in a charged particulate accelerator. (DOE 5820.2A, 09-26-88)

navigable waters - 1. Traditionally, waters sufficiently deep and wide for navigation by all, or specified vessels; such waters in the United States come under federal jurisdiction and are protected by certain provisions of the Clean Water Act. (EPA 0992) 2. Water is defined in Section 502 (7) of the Clean Water Act (CWA). (PL-2194, 04-30-93)

near surface disposal - Disposal in the upper 30 meters of the earth's surface, (e.g., shallow land burial.) (DOE 5820.2A, 09-26-88)

nebraskan glaciation - The oldest of four classical glacial ages of the Pleistocene of North America.

necrosis - Death of plant or animal cells or tissues. In plants, necrosis can discolor stems or leaves or kill a plant entirely. (EPA 0992)

negotiations (under Superfund) - After potentially responsible parties are identified for a site, EPA coordinates with them to reach a settlement that will result in the potentially responsible party (PRP) paying for or conducting the cleanup under EPA supervision. If negotiations fail, EPA can order the PRP to conduct the cleanup or EPA can pay for the cleanup using Superfund monies and then sue to recover the costs. (EPA 0992)

nematocide - A chemical agent which is destructive to nematodes (round worms or threadworms). (EPA 0992)

neutralized slag leach slurry - After 1965, the slurry resulting from the addition of lime following nitric acid digestion of enriched uranium from magnesium fluoride (mgF^4) in the Refinery.

neutralization - Decreasing the acidity or alkalinity of a substance by adding alkaline or acidic materials, respectively. (EPA 0992)

new source - Any stationary source built or modified after publication of final or proposed regulations that prescribe a given standard of performance. (EPA 0992)

New Source Performance Standards (NSPS) -Uniform national EPA air emission and water effluent standards which limit the amount of pollution allowed from new sources or from modified existing sources modified. (EPA 0992)

0285

nitrate - A compound containing nitrogen that can exist in the atmosphere or as a dissolved gas in water and which can have harmful effects on humans and animals. Nitrates in water can cause severe illness in infants and domestic animals. (EPA 0992)

nitric oxide (NO) - A gas formed by combustion under high temperature and high pressure in an internal combustion engine; changes into nitrogen dioxide in the ambient air and contributes to photochemical smog. (EPA 0992)

nitrification - The process whereby ammonia in wastewater is oxidized to nitrite and then to nitrate by bacterial or chemical reactions. (EPA 0992)

nitrilotriacetic acid (NTA) - A compound now replacing phosphates in detergents. (EPA 0992)

nitrite - 1. An intermediate in the process of nitrification. (EPA 0992) 2. Nitrous oxide salts used in food preservation. (EPA 0992)

nitrogen dioxide (NO_2) - The result of nitric oxide combining with oxygen in the atmosphere; major component of photochemical smog. (EPA 0992)

nitrogen oxide (NOx) - Product of combustion from transportation and stationary sources and a major contributor to the formation of ozone in the troposphere and to acid disposition. (EPA 0992)

nitrogenous wastes - Animal or vegetable residues that contain significant amounts of nitrogen. (EPA 0992)

nitrophenols - Synthetic organopesticides containing carbon, hydrogen, nitrogen, and oxygen. (EPA 0992)

no further remedial action planned - Determination made by EPA following a preliminary assessment that a site does not pose a significant risk and so requires no further activity under Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). (EPA 0992)

noise - Product-level or product-volume changes occurring during a test that are not related to a leak but may be mistaken for one. (EPA 0992)

non-attainment area - Area that does not meet one or more of the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act. (EPA 0992)

non-binding allocations of responsibility (NBAR) - Process for EPA to propose a way for potentially responsible parties (PRP) to allocate costs among themselves. (EPA 0992)

non-community water system - A public water system that is not a community water system, e.g., the water supply at a camp site or national park. (EPA 0992)

non-contact cooling water - Water used for cooling which does not come into direct contact with any raw material, product, byproduct or waste. (EPA 0992)

non-conventional pollutant - Any pollutant not statutorily listed or which is poorly understood by the scientific community. (EPA 0992)

0286

non-degradation - An environmental policy which disallows any lowering of naturally occurring quality regardless of pre-established health standards. (EPA 0992)

non-ionizing electromagnetic radiation - 1. Radiation that does not change the structure of atoms but does heat tissue and may cause harmful biological effects. (EPA 0992) 2. Microwaves, radiowaves, and low-frequency electromagnetic fields from high-voltage transmission lines. (EPA 0992)

non-point source - Diffuse pollution sources (i.e., without a single point of origin or not introduced into a receiving stream from a specific outlet.) The pollutants are generally carried off the land by stormwater. Common non-point sources are agriculture, forestry, uranium mining, construction, dams, channels, land disposal, saltwater intrusion, and city streets. (EPA 0992)

non-road emissions - Pollutants emitted by combustion engines on farm and construction equipment, gasoline-powered lawn and garden equipment, and power boats and outboard motors. (EPA 0992)

non-standard hazard - Hazards which are not routinely encountered in industry and are not routinely accepted by the public. (FMPC-2116 0189)

non-stochastic effects - Effects such as the opacity of the lens of the eye for which the severity of the effect varies with the dose, and for which a threshold may exist. (DOE 5480.11, 12-21-88)

nondischarging treatment plant - A treatment plant that does not discharge treated wastewater into any stream or river. Most are pond systems that dispose of the total flow they receive by means of evaporation or percolation to groundwater, or facilities that dispose of their effluent by recycling or reuse (e.g., spray irrigation or groundwater discharge.) (EPA 0992)

nonfriable asbestos-containing materials - Any material containing more than one percent asbestos (as determined by Polarized Light Microscopy) that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. (EPA 0992)

nonpenetrating dose - The radiation dose to the skin at a depth of 0.007 cm. (RM-0009, 05-13-92)

nonradiological area - Any area within a Controlled Area which does not exceed radiological conditions which would require posting as a Radiological Area as defined in RM-0009, 05-13-92. (RM-0009, 05-13-92)

normal operating losses (NOL) - Measured or estimated loss of nuclear material (whether in the form of a solid, liquid, or gas) from a process stream which includes operating losses, measured discards and accidental losses. These losses must be categorized, reported to DOE, and removed from the nuclear materials inventory. (FMPC-0307, 12-19-91)

normal uranium - Uranium containing 0.711 percent by weight of U-235, which is that isotopic content which occurs in nature. (FMPC-0307, 12-19-91)

notice of deficiency - An EPA request to a facility owner or operator requesting additional information before a preliminary decision on a permit application can be made. (EPA 0992)

notice of intent to deny - Notification by EPA of its preliminary intent to deny a permit application. (EPA 0992)

0287

nuclear criticality - A self-sustaining chain reaction of fissions, i.e., the state in which the effective neutron multiplication constant of a system of fissionable material equals or exceeds unity. (DOE 5480.5, 09-23-86, DOE/EH-0256T, 0692 and FMPC-2116 & FMPC-2117 0189)

nuclear criticality safety (NCS) - The prevention or termination of inadvertent nuclear criticality, mitigation of consequences, and protection against injury or damage due to an accidental nuclear criticality. (DOE 5480.5, 09-23-86 and FMPC-2116 & FMPC-2117 0189)

nuclear criticality safety group (NCS group) - Personnel who provide technical support for the Nuclear Criticality Safety Program and report to the Nuclear and System Safety Manager. (FMPC-2117 0189)

nuclear criticality safety inspection report (NCSIR) - A report form completed as a result of a nuclear criticality safety inspection of a facility where fissile material is processed, stored, or handled, describing the finding and it's location, characterizing the finding, and describing the corrective action to be taken to correct the finding. (FMPC-2117 0189)

nuclear criticality safety limit - A design or administrative limit imposed on equipment or container dimensions or on the quantities of enriched material that may be processed or stored in order to maintain nuclear criticality safety. (FMPC-2117 0189)

nuclear facility - 1. A facility whose operations involve radioactive materials in such form and quantity that a significant nuclear hazard potentially exists to the employees or the general public. Included are facilities that: (1.) produce, process, or store radioactive liquid or solid waste, fissionable materials, or tritium; (2.) conduct separations operations; (3.) conduct irradiated materials inspection, fuel fabrication, decontamination, or recovery operations; or (4.) conduct fuel enrichment operations. Incidental use of radioactive materials in a facility operation (e.g., check sources, radioactive sources, and X-ray machines) does not necessarily require the facility be included in this definition. Accelerators and reactors and their operations are not included. (DOE 5480.5, 090-23-86) 2. A facility whose operations involve radioactive materials in such form and quantity that a significant nuclear hazard potentially exists to the employees or the general public. (FMPC-2117 0189)

nuclear material (NM) - Collective term that includes all such materials designated by the DOE. A listing of designated nuclear materials may be found in DOE Order 5633.3, Control and Accountability of Nuclear Materials, dated: 02-03-88; however, at the Fernald Environmental Management Project (FEMP) site, nuclear materials shall mean depleted, normal, or enriched (less than 20% U-235 by weight) uranium or thorium. (FMPC-0307, 12-19-91 and PP-0314, 12-20-91)

nuclear material discard - Nuclear material removed intentionally from process inventory and disposed of as waste by approved methods. (FMPC-0307, 12-19-91)

nuclear materials management and safeguards system (NMMSS) - The national database and information support system for nuclear materials controlled by the U.S. Government. (FMPC-0307, 12-19-91)

nuclear power plant - A facility that converts nuclear energy into usable power; heat produced by a reactor makes steam to drive turbines which produce electricity. (EPA 0992)

nuclear reactors and support facilities - Uranium mills, commercial power reactors, fuel reprocessing plants, and uranium enrichment facilities. (EPA 0992) nuclear safety operational authorization - A form used by line management to describe a temporary procedure to be followed and by the Nuclear Criticality Safety Group to provide final authorization of the temporary procedure. (FMPC-2117 0189)

nuclear and system safety (N&SS) - An Organizational Group of the Operations, Safety, and Health (OS&H) Department responsible for the implementation of the Department of Energy (DOE) system safety and criticality safety programs at the Feed Materials Production Center (FMPC.) This includes the analysis and evaluation of potential accidents and their associated risks at the site. The identified hazards and potential accidents are those associated with: a. Nuclear Criticality, b. Facilities, c. Equipment, and d. People. (FMPC-2116 0189)

nuclear winter - Prediction by some scientists that smoke and debris rising from massive fires of a nuclear war could block sunlight for weeks or months, cooling the earth's surface and producing climate changes that could, for example, negatively effect world agricultural and weather patterns. (EPA 0992)

nuclide - A species of atom characterized by the constitution of its nucleus and hence by the 1/254 mm in diameter.

nutrient - Any substance assimilated by living things that promotes growth. The term is generally applied to nitrogen and phosphorus in wastewater, but is also applied to other essential and trace elements. (EPA 0992)

0289

O

occupational dose - The dose received by a person during employment in which the person's assigned duties involve exposure to radiation and to radioactive material. Occupational dose does not include dose received from background radiation, as a patient form medical practices, from voluntary participation in medical research programs, or as a member of the public. (DOE/EH-0256T, 0692)

occupational worker - An individual who is either a DOE or DOE contractor employee; an employee of a subcontractor to a DOE contractor; or an individual who visits to perform work for or in conjunction with DOE or utilizes DOE facilities. (DOE 5480.11, 12-21-88)

ocean discharge waiver - A variance from Clean Water Act (CWA) requirements for discharges into marine waters. (EPA 0992)

odor threshold - The lowest concentration of vapor in the air that can be smelled. Odor thresholds vary widely among individuals. (EPA 0992)

off-site - All areas outside the main perimeter security fence that are not controlled at all times by guards and security gates. (PP-0314, 12-20-91)

off-site facility - A hazardous waste treatment, storage or disposal area that is located away from the generating site. (EPA 0992)

on-site - All areas inside the main perimeter security fence that are controlled at all times by guards and security gates to gain entrance to the Fernald Environmental Management Project (FEMP) Site. (PP-0314, 12-20-91)

oil - Oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil. 40 CFR 110.1, "Protection of Environment/Water Programs." (PL-2194, 04-30-93)

oil fingerprinting - A method that identifies sources of oil and allows spills to be traced to their source. (EPA 0992)

oil spill - An accidental or intentional discharge of oil which reaches bodies of water. Can be controlled by chemical dispersion, combustion, mechanical containment, and /or adsorption. Spills from tanks and pipelines can also occur away from water bodies, contaminating the soil, getting into sewer systems and threatening underground water sources. (EPA 0992)

oligotrophic lakes - Deep clear lakes with few nutrients, little organic matter and a high dissolved-oxygen level. (EPA 0992)

on-scene coordinator (OSC) - The predesignated EPA, Coast Guard, or Department of Defense official who coordinates and directs Superfund removal actions or Clean Waste Act (CWA) oil-or hazardous-spill response actions. (EPA 0992)

on-site facility - A hazardous waste treatment, storage or disposal area that is located on the generating site. (EPA 0992)

onboard controls - Device(s) placed on a vehicle to capture gasoline vapor during refueling and route them to the engine when the vehicle is starting so that it can be efficiently burned. (EPA 0992)

0290

788

oncogenic - A substance that causes tumors, benign or malignant. (EPA 0992)

one-time deviation - A task requiring deviation from normal procedures that will be accomplished one time. (SSOP-0103, 10-14-92)

opacity - The amount of light obscured by particulate pollution in the air; clear window glass has zero opacity, a brick wall is 100 percent opaque. Opacity is an indicator of changes in performance of particulate control system. (EPA 0992)

open burning - Uncontrolled fires in an open dump. (EPA 0992)

open dump - An uncovered site used for disposal of waste without environmental controls. (See: dump, EPA 0992) (EPA 0992)

operable unit - Term for each of a number of separate activities undertaken as part of a Superfund site cleanup. A typical operable unit would be removal of drums and tanks from the surface of a site. (EPA 0992)

operating conditions - Conditions specified in a RCRA permit that dictate how an incinerator must operate as it burns different waste types. A trial burn is used to identify operating conditions needed to meet specified performance standards. (EPA 0992)

operation and maintenance - 1. Activities conducted after a Superfund site action is completed to ensure that the action is effective. (EPA 0992) 2. Actions taken after construction to assure that facilities constructed to treat wastewater will be properly operated and maintained to achieve normative efficiency levels and prescribed effluent limitations in an optimum manner. (EPA 0992) 3. On-going asbestos management plan in a school or other public building, including regular inspections, various methods of maintaining asbestos in place, and removal when necessary. (EPA 0992)

operational readiness review - A structured method for determining that a project, process, or facility is ready to operate and occupy and includes, as a minimum,, review of the readiness of the plant and hardware, personnel, and procedures. The review includes a determination of compliance with ES&H Orders. (DOE 5480.5, 09-23-86)

Operational Safety Requirements (OSR) - A binding agreement between the operating contractor and Department of Energy (DOE) which defines conditions, limitations, administrative controls, and bases thereof required to assure safe operation of a facility. Operational Safety Requirements (OSR) documents are comprised of Safety Limits, Limiting Conditions for Operation, Surveillance Requirements, Administrative Controls for Safety, and other information deemed necessary for the reduction of risk in a facility/system. (FMPC-2116 0189)

Operations, Safety, and Health Department (OS&H) - An organization whose purpose is to assure that all aspects of environment, safety, and health-related activities at the program, project, and contract level are adequately addressed. Organized elements of Operations, Safety, and Health (OS&H) are Medical Services, OS&H Dosimetry and Instrumentation, Radiological Safety, Industrial Hygiene and Safety, and Regulatory Compliance. Nuclear and Systems Safety (N&SS) is a subsection of Regulatory Compliance. (FMPC-2116 0189)

operator - An individual designated by management to perform operations or conduct activities with radioactive materials at a nuclear facility. (DOE 5480.5, 09-23-86)

0291

operator error - A human action that exceeds some limit of acceptability; i.e., an operator error is an out-of-tolerance action where the limits of tolerable performance are defined by the system being analyzed. (FMPC-2116 0189)

Operational Safety Requirements-Effected Procedures (OSR-AP) - Procedures which contain Operational Safety Requirements (OSRs) (i.e., Safety System settings, surveillance criteria, calibration needs, Administrative Controls for Safety, maintenance standards, etc.) as specified in a Department of Energy (DOE)-approved OSR document addressing the operation governed by those procedures. These procedures which can be in the form of Standard Operating Procedures (SOPs), Manufacturing Specifications, and Maintenance Standards, are regulated by configuration control. (FMPC-2116 0189)

oral toxicity - Ability of a pesticide to cause injury when ingested. (EPA 0992)

order of magnitude - One factor of 10.

organic - 1. Referring to or derived from living organisms. (EPA 0992) 2. In chemistry, any compound containing carbon. (EPA 0992)

organic chemicals/compounds - Animal or plant-produced substances containing mainly carbon, hydrogen, nitrogen, and oxygen. (EPA 0992)

organic matter - Carbonaceous waste contained in plant or animal matter and originating from domestic or industrial sources. (EPA 0992)

organophosphates - Pesticides that contain phosphorus; short-lived, but some can be toxic when first applied. (EPA 0992)

organotins - Chemical compounds used in anti-foulant paints to protect the hulls of boats and ships, buoys, and pilings from marine organisms such as barnacles. (EPA 0992)

orientation - 1. New employee training that covers the following: the scope and organization of WMCO; employee benefits; and policies and procedures, which include rules of conduct, health and safety matters, and security. (FMPC 0102, 01-16-91) 2. A class provided by Documentation Control (DC) to introduce a Site Document System to SMEs, DRCs, and other applicable personnel. (SSOP-0103, 10-14-92)

Original Asbestos Hazard Emergency Response Act (AHERA) inspection/original inspection - Examination of school buildings arranged by Local Education Agencies (LEA) to identify asbestos-containing-materials, evaluate their condition, take samples of materials suspected to contain asbestos; performed by EPA-accredited inspectors. (EPA 0992)

original generation point - Where regulated medical or other material first becomes waste. (EPA 0992)

osmosis - The tendency of a fluid to pass through a permeable membrane (like the wall of a living cell) into a less concentrated solution, so equalizing the density on both sides. (EPA 0992)

outfall - The place where effluent is discharged into receiving waters. (EPA 0992)

overburden - Rock and soil cleared away before mining. (EPA 0992)

0292

overfire air - Air forced into the top of an incinerator or boiler to fan the flames. (EPA 0992)

overland flow - A land application technique that cleanses waste water by allowing it to flow over a sloped surface. As the water flows over the surface, contaminants are absorbed and the water is collected at the bottom of the slope for reuse. (EPA 0992)

oversized regulated medical waste - Medical waste that is too large for plastic bags or standard containers. (EPA 0992)

overturn - One complete cycle of top to bottom mixing of previously stratified water masses. This phenomenon may occur in spring or fall, or after storms, and results in uniformity of chemical and physical properties of water at all depths. (EPA 0992)

oxidant - A substance containing oxygen that reacts chemically in air to produce a new substance; the primary ingredient of photochemical smog. (EPA 0992)

oxidation - 1. The addition of oxygen which breaks down organic waste or chemicals such as cyanides, phenols, and organic sulfur compounds in sewage by bacterial and chemical means. (EPA 0992) 2. Any combination of oxygen with other elements. (EPA 0992) 3. In chemistry, a process in which electrons are removed from a molecule. (EPA 0992)

oxidation pond - A man-made body of water in which waste is consumed by bacteria, used most frequently with other waste-treatment processes; a sewage lagoon. (EPA 0992)

oxidized strata - That portion of an ore or sedimentary deposit which has been subjected to the action of surface waters carrying oxygen and carbon dioxide.

oxygenated fuels - Gasoline which has been blended with alcohols or ethers that contain oxygen in order to reduce carbon monoxide and other emissions. (EPA 0992)

oxygenated solvents - An organic solvent containing oxygen as part of the molecular structure. Alcohols and ketones are oxygenated compounds often used as paint solvents. (EPA 0992)

ozone (O_3) - Found in two layers of the atmosphere, the stratosphere and the troposphere. In the stratosphere (the atmospheric layer 7 to 10 miles or more above the earth's surface) ozone is an natural form of oxygen that provides a protective layer shielding the earth from ultraviolet radiation. In the troposphere (the layer extending up 7 to 10 miles from the earth's surface), ozone is a chemical oxidant and major component of photochemical smog. It can seriously impair the respiratory system and is one of the most widespread of all the criteria pollutants for which the Clean Air Act (CAA) required EPA to set standards. Ozone in the troposphere is produced through complex chemical reactions of nitrogen oxides, which are among the primary pollutants emitted by combustion sources; hydrocarbons, released into the atmosphere through the combustion, handling and processing of petroleum products; and sunlight. (EPA 0992)

ozonator - A device that adds ozone to water. (EPA 0992)

ozone depletion - Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbons or halons), which break down when they reach the stratosphere and the catalytically destroy ozone molecules. (EPA 0992)

0293

ozone hole - Thinning break in the stratospheric ozone layer. Designation of amount of such depletion as an "ozone hole" is made when a detected amount of depletion exceeds fifty percent. Seasonal ozone holes have been observed over both the Antarctic region and the Arctic region, part of Canada and the extreme northeastern United States. (EPA 0992)

P

package - A packaging plus it contents as presented for transportation. (PP-0314, 12-20-91)

packaging - 1. The assembly of one or more containers and any other components necessary to assure minimum compliance with a program's storage and shipment packaging requirements. Also, the containers, etc., involved. (EPA 0992) 2. The assembly of one or more containers and any other components necessary to ensure compliance with the minimum packaging requirements of 49 CFR, Transportation. (PP-0314, 12-20-91)

packaging location - Any area where waste is stored or generated. (SSOP-0075, SSOP-0078, and SSOP-0079, 12-14-92)

packed bed scrubber - An air pollution control device in which emissions pass through alkaline water to neutralize hydrogen chloride gas. (EPA 0992)

packed tower - A pollution control device that forces dirty air through a tower packed with crushed rock or wood chips while liquid is sprayed over the packing material. The pollutants in the air stream either dissolve or chemically react with the liquid. (EPA 0992)

palustrine forested - Marshy forest.

pandemic - A "widespread..." throughout an area, nation or the world. (EPA 0992)

paraquat - A standard herbicide used to kill various types of crops, including marijuana. (EPA 0992)

part A - 1. (See: Interim Permit Status, EPA 0992) (EPA 0992) 2. The overview portion of a Treatment, Storage, and Disposal Facility (TSDF) Hazardous Waste (HW) Permit Application (RCRA). (W Abv&Acro 1992)

part B - 1. (See: Interim Permit Status) (EPA 0992) 2. The detailed portion of a Treatment, Storage, and Disposal Facility (TSDF) Hazardous Waste (HW) Permit Application (RCRA). (W Abv&Acro 1992)

participation rate - Portion of population participating in a recycling program. (EPA 0992)

particulate loading - The mass of particulates per unit volume of air or water. (EPA 0992)

particulates - Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog, found in air or emissions. (EPA 0992)

partition coefficient - In the equilibrium distribution of a solute between two liquid phases, the constant ratio of the solute's concentration in the upper phase to its concentration in the lower phase.

parts per billion/parts per million (ppb/ppm) - Units commonly used to express contaminant ratios, as in establishing the maximum permissible amount of a contaminant in water, land, or air. (EPA 0992) pathogens - Microorganisms that can cause disease in other organisms or in humans, animals and plants (e.g., bacteria, viruses, or parasites) found in sewage, in runoff from farms or rural areas populated with domestic and wild animals, and in water used for swimming. Fish and shellfish contaminated by pathogens, or the contaminated water itself, can cause serious illness. (EPA 0992)

pathway - A route by which a contaminant will travel through the environment. Pathways are typically described as air, water, and soil.

peak electricity demand - The maximum electricity used to meet the cooling load of a building or buildings in a given area. (EPA 0992)

peaks levels - Levels of airborne pollutant contaminants much higher than average or occurring for short periods of time in response to sudden releases. (EPA 0992)

penetrating dose - The radiation dose penetrating all tissue beyond the skin surface at a depth of 0.007 cm. (RM-0009, 05-13-92)

perched groundwater - Groundwater separated from an underlying body of groundwater by unsaturated rock or soil.

percolation - The movement of water downward and radially through sub-surface soil layers, usually continuing downward to groundwater; can also involve upward movement of water. (EPA 0992)

performance assessment - A systematic analysis of the potential risks posed by waste management systems to the public and environment, and a comparison of those risks to established performance objectives. (DOE 5820.2A, 09-26-88)

performance-based-training (PBT) - "is a systematic approach to training which is based on tasks and the related knowledge and skills required for competent job performance." (DOE 5480.18A, 07-19-91).

performance data (for incinerators) - Information collected, during a trial burn, on concentrations of designated organic compounds and pollutants found in incinerator emissions. Data analysis must show that the incinerator meets performance standards under operating conditions specified in the Resource Conservation and Recovery Act (RCRA) permit. (See: trial burn; performance standards, EPA 0992) (EPA 0992)

performance standards - 1. Regulatory requirements limiting the concentrations of designated organic compounds, particulate matter, and hydrogen chloride in emissions from incinerators. (EPA 0992) 2. Operating standards established by EPA for various permitted pollution control systems, asbestos inspections, and various program operations and maintenance requirements. (EPA 0992)

permeability - the rate at which liquids pass through soil or other materials in a specified direction. (EPA 0992)

permit - An authorization, license, or equivalent control document issued by EPA or an approved state agency to implement the requirements of an environmental regulation; e.g., a permit to operate a wastewater treatment plant or operate a facility that may generate harmful emissions. (EPA 0992)

persistence - Refers to the length of time a compound stays in the environment, once introduced. A compound may persist for less than a second or indefinitely. (EPA 0992) persistent pesticides - Pesticides that do not break down chemically or break down very slowly and remain in the environment after a growing season. (EPA 0992)

personal air samples - Air samples taken with a pump is directly attached to the worker with the collecting filter and cassette placed in the worker's breathing zone (required under OSHA asbestos standards and EPA worker protection rule.) (EPA 0992)

personnel dosimetry - Devices designed to be worn by a single person for the assessment of dose equivalent such as film badges, thermoluminescent dosimeters (TLDs), and pocket ionization chambers. (DOE/EH-0256T, 0692 and RM-0009, 05-13-92)

personnel monitoring - Systematic and periodic estimate of radiation dose received by personnel during working hours. Also, the monitoring of personnel, their excretions, skin or any part of their clothing to determine the amount of radioactivity present. (DOE/EH-0256T, 0692 and RM-0009, 05-13-92)

personal protective equipment - Equipment such as respirators, face shields and safety glasses used to protect workers from excessive exposure to radioactive or hazardous materials. (DOE/EH-0256T, 0692 and RM-0009, 05-13-92)

pest - An insect, rodent, nematode, fungus, weed or other form of terrestrial or aquatic plant or animal life that is injurious to health or the environment. (EPA 0992)

pesticide - Substances or mixture there of intended for preventing, destroying, repelling, or mitigating any pest. Also any substance or mixture intended for use as a plant regulator, defoliant, or desiccant. (EPA 0992)

pesticide tolerance - The amount of pesticide residue allowed by law to remain in or on a harvested crop. EPA sets these levels well below the point where the compounds might be harmful to consumers. (EPA 0992)

pH - 1. A measure of the acidity or alkalinity of a liquid or solid material (EPA 0992) 2. Concentration of hydrogen and/or hydroxide ions in a solution H+ and OH (W Abv&Acro 1992)

phenols - Organic compounds that are byproducts of petroleum refining, tanning, and textile, dye, and resin manufacturing. Low concentrations cause taste and odor problems in water; higher concentrations can kill aquatic life and humans. (EPA 0992)

pheromone - Hormones produced by the female of a species to attract a male. (EPA 0992)

phosphates - Certain chemical compounds containing phosphorus. (EPA 0992)

phosphogypsum piles (stacks) - Principal byproduct generated in production of phosphoric acid from phosphate rock. The piles may generate radioactive radon gas. (EPA 0992)

phosphorus - An essential chemical food element that can contribute to the eutrophication of lakes and other water bodies. Increased phosphorus levels result from discharge of phosphorus-containing materials into surface waters. (EPA 0992)

photochemical oxidants - Air pollutants formed by the action of sunlight on oxides of nitrogen and hydrocarbons. (EPA 0992) 0297 photolysis - The use of radiant energy to produce chemical changes.

photochemical smog - Air pollution caused by chemical reactions of various pollutants emitted from different sources. (EPA 0992)

photosynthesis - The manufacture by plants of carbohydrates and oxygen from carbon dioxide mediated by chlorophyll in the presence if sunlight. (EPA 0992)

physical and chemical treatment - Processes generally used in large-scale wastewater treatment facilities. Physical processes may include air-stripping or filtration. Chemical treatment includes coagulation, chlorination, zonation. The term can also refer to treatment of toxic materials in surface and groundwaters, oil spills, and some methods of dealing with hazardous materials on or in the ground. (EPA 0992)

physical inventory - Quantity of nuclear material determined to be on hand by counting or measuring it, usually sampling, weighing and analyzing samples taken; also by calculations, outage measurements and pressure-volume-temperature relationships. (FMPC-0307, 12-19-91)

phytoplankton - That portion of the plankton community comprised of tiny plants, e.g., algae, diatoms. (EPA 0992)

phytotoxic - Harmful to plants. (EPA 0992)

picoCurie - Measurement of radioactivity. A picoCurie is a trillionth of a curie, representing about 2.2 radioactive particle disintegrations per minute. (EPA 0992)

picocuries per liter pCi/L - A unit of measure for levels of radon gas. (EPA 0992)

pig - A container, usually lead, used to ship or store radioactive materials. (EPA 0992)

pilot tests - Testing a cleanup technology under actual site conditions to identify potential problems prior to fully-scale implementation. (EPA 0992)

plan (PL) - A site document defining the strategy and goals for establishing and implementing an activity, program, or system. (A plan is a document that defines what work will be done, not how work will be done. It is not an instructional document and is not to be used when performing work. This definition is not applicable to site work plans.) (SSOP-0103, 10-14-92)

plankton - Tiny plants and animals that live in water. (EPA 0992)

planned special exposure - Preplanned, infrequent exposure to radiation, separate from and in addition to the annual dose limits. (DOE/EH-0256t, 0692)

plant test authorization (PTA) - The Plant Test Authorization (PTA) documents the approval required to control equipment and process changes outside the scope of Standard Operating Procedures (SOPs) through closely controlled test conditions, closely monitored test results, and closely controlled and documented configuration changes. (FMPC-2116 0189)

plasma-arc reactor - An incinerator that operates at extremely high temperatures; treats highly toxic waste that do not combust easily. (EPA 0992) plasmid - A circular piece of DNA that exists apart from the chromosome and replicates independently of it. Bacterial plasmids carry information that renders the bacteria resistant to antibiotics. Plasmids are often used in genetic engineering to carry desired genes into organisms. (EPA 0992)

plastics - Non-metallic chemoreactive compounds molded into rigid or pliable construction materials, fabrics, etc. (EPA 0992)

plate tower scrubber - An air pollution control device that neutralizes hydrogen chloride gas by bubbling alkaline water through holes in a series of metal plates. (EPA 0992)

pleistocene - The earlier of the two epochs comprising the Quaternary Period.

plugging - 1. Act or process of stopping the flow of water, oil, or gas into or out of a formation through a borehole or well penetrating that formation. (EPA 0992) 2. Stopping a leak or sealing off a pipe or hose. (EPA 0992)

plume - 1. A visible or measurable discharge of a contaminant from a given point of origin. Can be visible or thermal in water, or visible in the air as, for example, a plume of smoke. (EPA 0992) 2. The area of radiation leaking from a damaged reactor. (EPA 0992) 3. Area downwind within which a release could be dangerous for those exposed to leaking fumes. (EPA 0992)

plutonium - A radioactive metallic element chemically similar to uranium. (EPA 0992)

PM-10 - A new standard for measuring the amount of solid or liquid matter suspended in the atmosphere, i.e., the amount of particulate matter over 10 micrometers in diameter; smaller PM-10 particles penetrate to the deeper portions of the lung, affecting sensitive population groups such as children and individuals with respiratory ailments. (EPA 0992)

point source - A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution, e.g., a pipe, ditch, ship, ore pit, factory smokestack. (EPA 0992)

policy (PO) - A site document that defines the fundamental principles that govern FEMP organizations. (SSOP-0103, 10-14-92)

pollen - The fertilizing element of flowering plants; background air pollutant. (EPA 0992)

pollutant - Generally, any substance introduced into the environment that adversely affects the usefulness of a resource. (EPA 0992)

pollutant/contaminant - A substance, not listed as hazardous, that may cause an adverse affect in organisms and/or the offspring of organisms if inhaled, absorbed, or ingested. (SSOP-0044, 06-19-92)

pollutant standard index (PSI) - Measure of adverse health effects of air pollution levels in major cities. (EPA 0992)

pollution - Generally, the presence of matter or energy whose nature, location, or quantity produces undesired environmental effects. Under the Clean Water Act (CWA), for example, the term is defined as the man-made or man-induced alteration of the physical, biological, chemical, and radiological integrity of water. (EPA 0992)

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pollution prevention - The active process of identifying areas, processes, and activities which create excessive waste byproducts for the purpose of substitution, alteration, or elimination of the process to prevent waste generation. (EPA 0992)

polonium - A radioactive element that occurs in pitchblende and other uranium- containing ores. (EPA 0992)

polychlorinated biphenyl (PCB) - (1962) :any of several compounds that are produced by replacing hydrogen atoms in biphenyl with chlorine, have various industrial applications, and are poisonous environmental pollutants which tend to accumulate in animal tissues. (Webster's 9th, 1985)

polychlorinated biphenyl (PCB) contaminated electrical equipment - Any electrical equipment including, but not limited to, transformers, capacitors, circuit breakers, reclosures, voltage regulators, switches, electromagnets, and cable that contains 50 ppm or greater PCBs, but less that 500 ppm PCBs. Oil filled electrical equipment other than circuit breakers, reclosures, and cable whose PCB concentration is unknown must be assumed to be PCB-contaminated electrical equipment - 40 CFR Pat 761, "Protection of Environment/Toxic Substances Control Act." (PL-2194, 04-30-93)

polychlorinated biphenyl (PCB) transformer - Any transformer that contains 500 ppm PCBs or greater - 40 CFR Part 761, "Protection of Environment/Toxic Substances Control Act." (PL-2194, 04-30-93)

polyelectrolytes - Synthetic chemicals that help solids to clump during sewage treatment. (EPA 0992)

polymer - Basic molecular ingredient is plastic. (EPA 0992)

polyvinyl chloride (PVC) - A tough, environmentally indestructible plastic that releases hydrochloric acid when burned. (EPA 0992)

poorly-sorted - Pertaining to sediments having no uniformity of particle size.

population - A group of interbreeding organisms occupying a particular space; the number of humans or other living creatures in a designated space. (EPA 0992)

post-closure - The time period following the shutdown of a waste management or manufacturing facility; for monitoring purposes, often considered to be 30 years. (EPA 0992)

post-consumer recycling - Reuse of materials generated from residential and consumer waste, e.g., converting wastepaper from offices into corrugated boxes or newsprint. (EPA 0992)

potable water - Water that is safe for drinking and cooking. (EPA 0992)

potentially responsible party (PRP) - Any individual or company-including owners, operators, transporters or generators-potentially responsible for, or contributing to a spill or other contamination at a Superfund site. (EPA 0992)

pre-engineering change proposal (P-ECP) - The Pre-Engineering Change Proposal (Pre-ECP) is an ECP prior to incorporation of all comments from a proposed Plant Test Authorization (PTA); or, until submitted to the Technical Review Board (TRB.) (NOTE: the ECP package and the Pre-ECP package are the same thing at different stages of development.) (FMPC-2116 0189)

precipitate - A solid that separates from a solutions. (EPA 0992) precipitation - Removal of hazardous solids from liquid waste to prevent safe disposal; removal of particles from airborne emissions. (EPA 0992)

precipitator - Pollution control devise that collects particles from an air stream. (EPA 0992)

precursor - In photochemistry, a compound antecedal to a volatile organic compound (VOC). Precursors react in sunlight to form ozone or other photochemical oxidants. (EPA 0992)

prefilter - Filter that provides first stage air filtration to remove larger particulates and prolong the efficient use of a HEPA filter. (DOE/EH-0256T, 0692)

preliminary assessment - The process of collecting and reviewing available information about a known or suspected waste site or release. (EPA 0992)

preliminary safety analysis report (PSAR) - A document produced early in the design phase of a project that systematically identifies safety design criteria; analyzes potential hazards of the operation of a facility and the proposed measures for their elimination, control, or mitigation; and evaluates the potential risks of operation. (FMPC-2116 0189)

prenatal radiation exposure - The exposure of an embryo/fetus to radiation. (DOE/EH-0256T, 0692)

preoperational readiness review (PRR) - Review of a facility or system in conjunction with its associated design and Operational Safety Requirements (OSR) documentation to ensure that all equipment, devices, methods, and training required for safety are in place and ready prior to operation. The Independent Safety Review (ISR) Committee conducts this review. For a configuration change, the Preoperational Readiness Review (PRR) ensures that the facility/system meets and requirements of the Safety Assessment and.or revised OSR document. (FMPC-2116 0189)

pressure sewers - A system of pipes in which water, wastewater, or other liquid is pumped to a higher elevation. (EPA 0992)

pretreatment - Processes used to reduce, eliminate, or alter the nature of wastewater pollutants from non-domestic sources before they are discharged into publicly owned treatment works (POTWs.) (EPA 0992)

prevalent level samples - Air samples taken under normal conditions (also known as ambient background samples. (EPA 0992)

prevalent levels - Levels of airborne contaminant occurring under normal conditions. (EPA 0992)

prevention of significant deterioration (PSD) - EPA program in which state and/or federal permits are required in order to restrict emissions from new or modified sources in places where air quality already meets or exceeds primary and secondary ambient air quality standards. (EPA 0992)

primary containment - The tank, container or other device used for holding hazardous substances, hazardous wastes, oils, PCBs. (PL-2194, 04-30-93)

primary drinking water regulation - Applies to public water systems and specifies a contaminant level, which in the judgement of the EPA Administrator, will not adversely affect human health. (EPA 0992)

0301

primary dosimeter - A dosimeter worn on the body used to obtain the formal record of whole body radiation dose. (DOE/EH-0256T, 0692)

primary waste treatment - First steps in wastewater treatment; screens and sedimentation tanks are used to remove most materials that float or will settle. Primary treatment removes about 30 percent of carbonaceous biochemical oxygen (BOD) demand from domestic sewage. (EPA 0992)

principal organic hazardous constituents (POHCs) - Hazardous compounds monitored during an incinerator's trial burn, selected for high concentration in the waste feed and difficulty of combustion. (EPA 0992)

probability of detection - The likelihood, expressed as a percentage, that a test method will correctly identify a leaking tank. (EPA 0992)

process - A series of actions that achieves and end or result. (DOE 5700.6C, 08-21-91)

process material - A substance which has gone through a physical state of change. (SSOP-0002, 10-22-91)

process wastewater - Any water that comes into contact with any raw material, product, byproduct, or waste. (EPA 0992)

process weight - Total weight of all materials, including fuel, used in a manufacturing process; used to calculate the allowable particulate emission rate. (EPA 0992)

product - In relation to underground storage tanks, the contents of a storage tank. (EPA 0992)

product level - The level of a product in a storage tank. (EPA 0992)

products of incomplete combustion (PICs) - Organic compounds formed by combustion. Usually generated in small amounts and sometimes toxic, PICs are heat-altered versions of the original material fed into the incinerator(e.g., charcoal is a PIC from burning wood. (EPA 0992)

progeny - Offspring; descendants.

proglacial streams - Streams forming from glacial melt waters and flow parallel to the front edge of a glacier.

program secretarial officer (PSO) - The heads of DOE offices with responsibility for specific facilities. These include the Assistant Secretaries for Conservation and Renewable Energy; Nuclear Energy; Defense Programs; and Fossil Energy and the Directors of the Offices of Energy Research; Civilian Radioactive Waste Management; Environmental Restoration and Waste Management; and New Production Reactors. (DOE 5700.6C, 08-21-91)

project - For purposes of SSOP-0044, Management of Soil, Debris, and Waste from a Project, Rev. 0, Effective 06-19-92, project is defined as any (1) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Removal Actions, (2) Construction projects, or (3) maintenance activities. (SSOP-0044, 06-19-92)

project authorization (PA) - A document which describes a proposed project and requests approval by valid authority. (FMPC-2116 0189) project budget and analysis (PBA) - Responsible for both financial and schedule administration which includes developing baselines, incorporating changes due to change procedures, analyzing variances, and preparing reports. (FMPC-2116 0189)

project engineer (PE) - The Project Engineer (PE) is the individual who has the secondary responsibilities of a line item project and reports to the Project Manager (PM.) The Westinghouse Material Company of Ohio (WMCO) Project Engineer (PE) can be a Project Manager of a project if the project is not a line item project (over $1.25 million.) (FMPC-2116 0189)

project manager - The Project Manager (PM) is the individual in charge of a project. If the project is a line item project, the PM must be a manager; otherwise, the PM can be an engineer. (FMPC-2116 0189)

project sampling plan - A plan developed by Environmental Monitoring that specifies the sampling to be conducted for a specific operation. (SSOP-0044, 06-19-92)

propellant - Liquid in a self-pressurized pesticide product that expels the active ingredient from its container. (EPA 0992)

proposed plan - A plan for a site cleanup that is available to the public for comment. (EPA 0992)

protective clothing - 1. Clothing provided to personnel to minimize the potential for skin, personal and company issued clothing contamination. Also referred to as "anti-contamination clothing," "anti-Cs" and "PCs" (DOE/EH-0256T, 0692 and RM-0009, 05-13-92) 2. Clothing provided by WEMCO to personnel to minimize the potential for skin, personal, and company-issued clothing contamination. (SSOP-0051, 09-04-92)

proteins - Complex nitrogenous organic compounds of high molecular weight made of amino acids; essential for growth and repair of animal tissue. Many, but not all, proteins are enzymes. (EPA 0992)

protocol - A series of formal steps for conducting a test. (EPA 0992)

protoplast - A membrane-bound cell from which the outer wall has been partially or completely removed. The term often is applied to plant cells. (EPA 0992)

protozoa - One-celled animals that are larger and more complex than bacteria. May cause disease. (EPA 0992)

public comment period - The time allowed for the public to express its views and concerns regarding an action by EPA (e.g., a FEDERAL REGISTER Notice of proposed rulemaking, a public notice of a draft permit, or a Notice of Intent to Deny.) (EPA 0992)

public hearing - A formal meeting wherein EPA officials hear the public's views and concerns about an EPA action or proposal. EPA is required to consider such comments when evaluating its actions. Public hearings must be held upon request during the public comment period. (EPA 0992)

public notice - 1. Notification by EPA informing the public of Agency actions such as the issuance of a draft permit or scheduling of a hearing. EPA is required to ensure proper public notice, including publication in newspapers and broadcast over radio stations. (EPA 0992) 2. In the safe drinking water program, water suppliers are required to publish and broadcast notices when pollution problems are discovered. (EPA 0992)

0303

public water system - A system that provides piped water for human consumption to at least 15 service connections or regularly serves 25 individuals. (EPA 0992)

publicly owned treatment works - A waste-treatment works owned by a state, unit of local government, or Indian tribe, usually designed to treat domestic wastewaters. (EPA 0992)

pumping station - Pumping devices installed in sewer or water systems or other liquid-carrying pipelines to move the liquids to a higher level. (EPA 0992)

putrescible - Able to rot quickly enough to cause odors and attract flies. (EPA 0992)

pyrolysis - Decomposition of a chemical by extreme heat. (EPA 0992)

pyrophoric material - A material which under normal conditions is liable to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious transportation, handling or disposal hazard. (DOE 5820.2A, 09-26-88)

Q

qualification (personnel) - The process of demonstrating abilities gained through education, training, or experience that qualifies an individual to perform a required function. (FMPC-0102, 01-16-91 and FMPC-0708, 12-15-89)

qualification standard - A document that states and defines the required physical attributes and the technical, academic and practical knowledge and skills developed through training, education and on-the-job performance for the successful completion of a training program. (DOE/EH-0256T, 0692)

qualified person - A person with specific training, knowledge and experience in the area for which the person has the responsibility and the authority to control. (29 CFR 1910.120, Labor)

qualitative risk assessment - A risk assessment that discusses the relative degree of risk but does not quantify the risks.

quality - The degree to which an item or process meets or exceeds the user's requirements and expectations. (DOE 5700.6C, 08-21-91)

quality assurance - 1. Actions that provide confidence that quality is achieved. (DOE 5700.6C, 08-21-91) 2. All those planned and systematic actions necessary to provide adequate confidence that a facility, structure, system, or component will perform satisfactorily and safely in service. Quality assurance includes quality control, which comprises all those actions necessary to control and verify the features and characteristics of a material, process, product, or service to specified requirements. (DOE 5820.2A, 09-26-88)

quality assurance program - 1. The overall program established by an organization to implement the requirements of this Order. The Program assigns responsibilities and authorities, defines policies and requirements, and provides for the performance and assessment of work. (DOE 5700.6C, 08-21-91) 2. The overall program established by Fernald Environmental Restoration Management Corporation (FERMCO) to implement the quality assurance requirements imposed on the Fernald Environmental Management Project (FEMP) by its customers. The Program assigns responsibilities and authorities, defines policies and requirements, and provides for the performance and assessment of work. (RM-0012, 04-30-93)

quality assurance program description - The formal, approved, and controlled text that describes the FERMCO QA Program which ensures adherence to FERMCO policies for achieving required quality levels in the operation of the FEMP. (RM-0012, 04-30-93)

quality assurance project plan (QAPjP) - An orderly assembly of detailed and specific procedures by which an agency delineates how it produces quality data for a specific project or measurement method. A given agency would have only one quality assurance program plan, but would have a quality assurance plan for each of its projects or programs (group of projects using the same measurement methods; for example, a laboratory service group might develop a plan by analytical instrument since the service is provided to a number of projects.) (RM-0012, 04-30-93)

quality assurance/quality control - A system of procedures, checks, audits, and corrective actions to ensure that all EPA research design and performance, environmental monitoring and sampling, and other technical and reporting activities are of the highest achievable quality. (EPA 0992)

0305

quality assurance record - A completed document that furnishes evidence of the quality of items and/or activities affecting quality. Records verifying compliance with regulatory requirements are quality assurance records. THESE RECORDS ARE OFTEN GENERATED BY ORGANIZATIONS OTHER THAN THE QUALITY ASSURANCE DIVISION. (RM-0012, 04-30-93)

quality control - The overall system of technical activities that measures and controls the quality of a process, item, or service so that it meets the stated needs of the user. (ANSI/ASQC-E4-19xx) (RM-0012, 04-30-93)

quality factor (Q) - A modifying factor that is employed to derive dose equivalent from absorbed dose (Paragraph 9f(5)). (DOE 5480.11, 12-21-88)

quality verification - The act of reviewing, inspecting, testing, measuring, checking, auditing, or otherwise determining and documenting whether items, processes, services, or documents conform to specified requirements. (FMPC-0708, 12-15-89)

quantitative risk assessment - A risk assessment that quantitatively or numerically analyzes risk.

quench tank - A water-filled tank used to cool incinerator residues or hot materials during industrial processes. (EPA 0992)

0306

R

rad - Unit of absorbed dose. One rad is equal to an absorbed dose of 100 ergs per gram or 0.01 joules per kilogram (0.01 J/kg or 0.01 gray.) (DOE/EH-0256T, 0692)

radiation - 1. Any form of electromagnetic energy propagated as rays, waves, or streams of energetic particles. (EPA 0992) 2. Energy emitted in the form of alpha, beta, gamma, neutron, or X-ray during the process of radioactive decay of an unstable atom, or by the operation of a radiation generating device. (RM-0009, 05-13-92)

radiation area - An area, accessible to personnel, in which radiation levels could result in a person receiving a dose equivalent in excess of 0.005 rem (0.05 mSv) in 1 hour at 30 centimeters from the source or from any surface that the radiation penetrates. (DOE/EH-0256T, 0692)

radiation detection alarms (RDAs) - Alarms which are placed in areas where fissile material is processed, handled, or stored according to DOE 5480.5, Safety of Nuclear Facilities, 09-23-86,in order to alert personnel of a criticality accident and afford immediate evacuation of the area. (FMPC-2117 0189)

radiation dose terms and units - (1.) Dose - the amount of energy per unit mass deposited in tissue (unit = rad.) (2.) Dose Equivalent - the dose multiplied by a quality factor (QF.) QF for Beta and Gamma is one; for alpha, it is twenty. (units = rem and Sievert (Sv).) (3.) Effective Dose Equivalent - the summation of organ dose equivalents multiplied by organ-specific weighing factor (Wt.) (unit = rem and Sievert (Sv).) See: RM-0009, 05-13-92, APPENDIX D, D.1.13 for Organ/Tissue (T) and Weight (Wt.) factors. (4.) Committed Effective Dose Equivalent - The effective dose equivalent that would be received over a fifty-year period by an individual with internally deposited radionuclides. (unit = rem and Sievert.)

radiation source - A discrete quantity of a radionuclide or a machine which produces ionizing radiation. (RM-0009, 05-13-92)

radiation standards - Regulations that set maximum exposure limits for protection of the public from radioactive materials. (EPA 0992)

radiation survey - Measurement with instrumentation to evaluate and assess the presence of radioactive materials or other sources of radiation under a specific set of conditions. (DOE/EH-0256T, 0692)

radiation work permit (RWP) - A permit to administratively control either nonroutine tasks or routine tasks which involve the exposure of radiation or radioactive material or for any task that involves the breaching of potentially contaminated systems. (RM-0009, 05-13-92)

radiation worker - An occupational worker whose job assignment requires work on, with, or in the proximity of radiation producing machines or radioactive materials, and/or who has the potential of being routinely exposed above 0.1 rem (1.0 mSv) per year, which is the sum of the annual effective dose equivalent from external irradiation and the committed effective dose equivalent form internal irradiation. (DOE 5480.11, 12-21-88)

radio frequency radiation - (See: Non-ionizing Radiation, EPA 0992) (EPA 0992)

0307

radioactive contaminated waste - Material such as concrete, liquid, or soil, that contain concentrations of radionuclides exceeding those specified in DOE Order 5400.5, "Radiation Protection of the Public and the Environment." Also non-bulk materials such as metal, which exhibit surface contamination in excess of unrestricted release criteria specified in Industrial Radiological Safety and Training (IRS&T) departmental procedures. (SSOP-0044, 06-19-92)

radioactive contamination - A deposit of uncontained or unwanted radioactive material on the surface of structures, areas, objects, or personnel (surface contamination) or embedded or contained in other materials (e.g., air, waster, etc.). RM-0009, 05-13-92)

radioactive material - 1. For the purposes of DOE/EH-0256T, DOE Radiological Control Manual, Issued June 1992, radioactive material includes any material, equipment or system component determined to be contaminated or suspected of being contaminated. Radioactive material also includes activated material, sealed and unsealed sources, and material that emits radiation. (DOE/EH-0256T, 0692) 2. Any material having a specific activity greater that 0.002 microCuries per gram per 49 CFR, Transportation. (PP-0314, 12-20-91)

radioactive material area - An area or structure where radioactive material is used, handled, or stored. (DOE/EH-0256T, 0692)

radioactive source - For the purpose of this procedure any source used as a standard for the radiation it emits sealed in a capsule or having a bonded cover in which the capsule or cover is strong enough to prevent contact with, or dispersion of, the radioactive material under normal conditions of use, including a one-meter drop onto an unyielding surface. (PP-0314, 12-20-91)

radioactive substances - Substances that emit ionizing radiation. (EPA 0992)

radioactive waste - Solid, liquid, or gaseous material that contains radionuclides regulated under the Atomic Energy Act of 1954, as amended, and is of negligible economic value considering the costs of recovery are considered. (DOE 5820.2A, 09-26-88; DOE/EH-0256T, 0692, and PP-0314, 12-20-91)

radioactivity - 1. A natural and spontaneous process by which the unstable atoms of an element emit or radiate excess energy from their nuclei and, thus, change (or decay) to atoms of a different element or to a lower energy state of the same element. (DOE/EH-0256T, 0692) 2. The spontaneous emission of radiation, generally alpha or beta particles, often accompanied by gamma rays or X-rays, from the nucleus of an unstable atom. (RM-0009, 05-13-92)

radiobiology - The study of radiation effects on living things. (EPA 0992)

radiography - Examination of the structure of materials by nondestructive methods, using a radioactive source or a radiation generating device. (DOE/EH-0256T, 0692)

radioisotopes - Chemical variants of an element with potentially oncogenic, teratogenic, and mutagenic effects on the human body. (EPA 0992)

radiological area - 1. Any area within a controlled area where an individual can receive a dose equivalent greater than 5 mrem (50 microsieverts) in 1 hour at 30 cm from the radiation source or any surface through which the radiation penetrates, or where airborne radioactive concentrations greater than 1/10 of the derived air concentrations are present (or are likely to be), or where surface contamination levels greater than those specified in Attachment 2, DOE 5480.11 Radiation Protection for Occupational Workers, Issued 12-21-88 are present. (DOE 5480.11 12-21-88) 2. Any area within a Controlled Area where an individual can receive a dose equivalent greater than 5 mrem (0.05 mSv) in one hour at 30 cm from the radiation source or any surface through which the radiation penetrates, or where airborne radioactive concentrations are present (or likely to be), or where surface contamination levels greater than those specified in Table 11-1 (in RM-0009, 05-13-92) are present. (RM-0009, 05-13-92.)

radiological buffer area (RBA) - An intermediate area established to prevent the spread of radioactive contamination and to protect personnel from radiation exposure. The area surrounds or is contiguous with: Contamination Areas, High Contamination Areas, Airborne Radioactivity Areas, Radiation Areas, or High Radiation Areas. (DOE/EH-0256T, 0692)

radiological control hold point - Cautionary step in a Technical Work Document (TWD) requiring the Radiological Control Organization to perform some action or verification. The Radiological Control Hold Point requirements should be satisfactorily completed before the work is continued. (DOE/EH-0256T, 0692)

radiological posting - Sign or label that indicates the presence or potential presence of radiation or radioactive materials. (DOE/EH-0256T, 0692)

radiological work - Any work that requires the handling of radioactive material or which requires access to Radiation Areas, High Radiation Areas, Contamination Areas, High Contamination Areas, or Airborne Radioactivity Areas. (DOE/EH-0256T, 0692)

radiological work permit (RWP) - Permit that identifies radiological conditions, establishes worker protection and monitoring requirements, and contains specific approvals for radiological work activities. The Radiological Work Permit (RWP) serves as an administrative process for planning and controlling radiological work and informing the worker of the radiological conditions. (DOE/EH-0256T, 0692)

radiological worker - Worker whose job assignment requires work on, with, or in the proximity of radiation producing machines or radioactive materials. A radiological worker has the potential of being exposed to more than 0.1 rem (1mSv) per year, which is the sum of the dose equivalent from external irradiation and the committed effective dose equivalent from internal irradiation. A "radiological worker" may also be referred to as a "radiation worker" or a "radworker." (DOE/EH-0256T, 0692)

radionuclide - Radioactive particle, man-made or natural, with a distinct atomic weight number. Can have a long life as soil and water pollutants. (EPA 0992)

radium - A highly radioactive white shining metallic element found in pitchblende, carnotite, and other uranic minerals. It emits alpha particles and gamma rays which produce radon gas. (EPA 0992)

radius of vulnerability zone - The maximum distance from the point of release of a hazardous substance in which the airborne concentration could reach the level of concern under specific weather conditions. (EPA 0992)

radon - A colorless naturally occurring, radioactive, inert gas formed by radioactive decay of radium atoms in soil or rocks. (EPA 0992) radon decay products - A term used to refer collectively to the immediate products of the radon decay chain. These include Po-218, Pb-214, Bi-214, and Po-214, which have an average combined half-life of about 30 minutes. (EPA 0992)

rasp - A machine that grinds waste into a manageable material and helps prevent odor. (EPA 0992)

raw material - A non-manufactured substance at the Fernald Environmental Management Project (FEMP.) (SSOP-0002, 10-22-91)

raw sewage - Untreated wastewater and its contents. (EPA 0992)

raw water - Intake water prior to any treatment or use. (EPA 0992)

reactive - Waste that exhibits properties such as reacting violently, forming potentially explosive mixtures or generating toxic gases when mixed with water, generating toxic gases (cyanide or sulfied) at pH between 2 and 12.5 or detonating or exploding at standard temperature and pressure or when heated under confinement. (SSOP-0002, 10-22-91)

reasonably available control measures (RACM) - A broadly defined term referring to technological and other measures for pollution control. (EPA 0992)

reasonably available control technology (RACT) - Control technology that is both reasonably available, and both technologically and economically feasible. Usually applied to existing sources in nonattainment areas; in most cases is less stringent than new source performance standards. (EPA 0992)

receiving waters - A river, lake, ocean, stream or other watercourse into which wastewater or treated effluent is discharged. (EPA 0992)

receptors - Hypothetical individual used to model exposure.

receptor point concentrations - The modelled concentration of a contaminant at the point that the hypothetical receptor is located.

recharge - The process by which water is added to a zone of saturation, usually by percolations from the soil surface, e.g., the recharge of an aquifer. (EPA 0992)

recharge area - The process by which water is added to a zone of saturation, usually by percolation from the soil surface, e.g., the recharge of an aquifer. (EPA 0992)

reclamation (in recycling) - Restoration of materials found in the waste stream to a beneficial use which may be for purposes other that the original use. (EPA 0992)

recombinant bacteria - A microorganism whose genetic makeup has been altered by deliberate introduction of new genetic elements. The offspring of these altered bacteria also contain these new genetic elements, i.e., they "breed true." (EPA 0992)

recombinant DNA - The new DNA that is formed by combining pieces of DNA from different organisms or cells. (EPA 0992) recommended maximum contaminant level (RMCL) - The maximum level of a contaminant in drinking water at which no known or anticipated adverse affect on human health would occur, and that includes an adequate margin of safety. Recommended levels are nonenforceable health goals. (See: maximum contaminant level, EPA 0992) (EPA 0992)

reconstructed source - Facility in which components are replaced to such an extent that the fixed capital cost of the new components exceed 50 percent of the capital cost of constructing a comparable brand-new facility. New-source performance standards may be applied to sources reconstructed after the proposal of the standard if it is technologically and economically feasible to meet the standard. (EPA 0992)

record of decision (ROD) - A public document that explains which cleanup alternative(s) will be used at National Priorities List sites where, under CERCLA, Trust Funds pay for the cleanup. (EPA 0992)

recoverable metals - Metals that are suitable for free release, reuse, or recycling. (SSOP-0044, 06-19-92)

recovery rate - Percentage of usable recycled materials that have been removed from the total amount of municipal solid waste generated in a specific area or by a specific business. (EPA 0992)

recycle/reuse - Minimizing waste generation by recovering and reprocessing usable products that might otherwise become waste (i.e., recycling of aluminum cans, paper, and bottles, etc.) (EPA 0992)

red bag waste - (See: infectious waste, EPA 0992) (EPA 0992)

red border - An EPA document undergoing review before being submitted for final management decision-making. (EPA 0992)

red tide - A proliferation of a marine plankton toxic and often fatal to fish, perhaps stimulated by the addition of nutrients. A tide can be red, green, or brown, depending on the coloration of the plankton. (EPA 0992)

re-entry interval - The period of time immediately following the application of a pesticide during which unprotected workers should not enter a field. (EPA 0992)

reference dose (RfD) - The concentration of a chemical known to cause health problems; also be referred to as the acceptable daily intake (ADI.) (EPA 0992)

reformulated gasoline - Gasoline with a different composition from conventional gasoline (e.g., lower aromatics content) that cuts air pollutants. (EPA 0992)

refresher training - Training scheduled on the alternate year when full retraining is not completed for Radiological Worker I and Radiological Worker II personnel. (DOE/EH-0256T, 0692)

refuse - (See: solid waste, EPA 0992) (EPA 0992)

refuse reclamation - Conversion of solid waste into useful products, e.g., composting organic wastes to make soil conditioners or separating aluminum and other metals for recycling. (EPA 0992)

regeneration - Manipulation of cells to cause them to develop into whole plants. (EPA 0992) regional response team (RRT) - Representatives of federal, local, and state agencies who may assist in coordination of activities at the request of the On-Scene-Coordinator before and during a significant pollution incident such as an oil spill, major chemical release, or a Superfund response. (EPA 0992)

registrant - Any manufacturer or formulator who obtains registration for a pesticide active ingredient or product. (EPA 0992)

registration - Formal listing with EPA of a new pesticide before it can be sold or distributed. Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). EPA is responsible for registration (pre-market licensing) of pesticides on the basis of data demonstrating no unreasonable adverse effects on human health or the environment when applied according to approved label directions. (EPA 0992)

registration standards - Published documents which include summary reviews of the data available on a pesticide's active ingredient, data gaps, and the Agency's existing regulatory position on the pesticide. (EPA 0992)

regulated asbestos-containing material (RACM) - Friable asbestos material or nonfriable asbestos-containing material (ACM) that will be or has been subjected to sanding, grinding, cutting, or abrading or has crumbled, or been pulverized or reduced to powder in the course of demolition or renovation operations. (EPA 0992)

regulated medical waste - Under the Medical Waste Tracking Act of 1988, any solid waste generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals. Included are cultures and stocks of infectious agents; human blood and blood product; human pathological body wastes from surgery and autopsy; contaminated animal carcasses from medical research; waste from patients with communicable diseases; and all used sharp implements, such as needles and scalpels, etc., and certain unused sharps. (See: treated medical waste; untreated medical waste; destroyed medical waste, EPA 0992) (EPA 0992)

release - 1. Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment of a hazardous or toxic chemical or extremely hazardous substance. (EPA 0992) 2. Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of closed containers in an unpermitted area). (PL-2194, 04-30-93)

release to uncontrolled areas - Release of material from administrative control after confirming that the residual radioactive material meets the guidelines in DOE 5400.5, Radiation Protection of the Public and the Environment, Issued 02-08-90. (DOE/EH-0256T, 0692)

rem - Unit of does equivalent. Dose equivalent in rem is numerically equal to the absorbed dose in rad multiplied by a quality factor, distribution factor and any other necessary modifying factor (1 rem = 0.01 sievert.) (DOE/EH-0256T, 0692)

remedial action (RA) - 1. Activities conducted at DOE facilities to reduce potential risks to people and/or harm to the environment from radioactive and/or hazardous substance contamination. (DOE 5820.2A, 09-26-88) 2. The actual construction or implementation phase of a Superfund site cleanup that follows remedial design. (EPA 0992) remedial design - A phase of remedial action that follows the remedial investigation/feasibility study and includes development of engineering drawings and specifications for a site cleanup. (EPA 0992)

remedial investigation - An in-depth study designed to gather data needed to determine the nature and extent of contamination at a Superfund site; establish site cleanup criteria; identify preliminary alternatives for remedial action; and support technical and cost analyses of alternatives. The remedial investigation is usually done with the feasibility study. Together they are usually referred to as the "RI/FS." (EPA 0992)

remedial project manager (RPM) - The EPA or state official responsible for over-seeing on-site remedial action. (EPA 0992)

remedial response - Long-term action that stops or substantially reduces a release or threat of a release of hazardous substances that is serious but not an immediate threat to public health. (EPA 0992)

remediation - 1. Cleanup or other methods used to remove or contain a toxic spill or hazardous materials from a Superfund site. (EPA 0992) 2. For the Asbestos Hazard Emergency Response program, abatement methods including evaluation, repair, enclosure, encapsulation, or removal of greater than 3 linear feet or square feet of asbestos containing materials from a building. (EPA 0992)

remote-handled transuranic waste - Packaged transuranic waste whose external surface dose rate exceeds 200 mrem per hour. Test specimens of fissionable material irradiated for research and development purposes only and not for the production of power or plutonium may be classified as remote-handled transuranic waste. (DOE 5820.2A, 09-26-88)

removable contamination - 1. Radioactive material that can be removed from surfaces by nondestructive means, such as casual contact, wiping, brushing, or washing. (DOE/EH-0256T, 0692 and RM-0009, 05-13-92) 2. Surface contamination that is readily removed using the filter paper smear technique. (SSOP-0044, 06-19-92)

removal action - Short-term immediate actions taken to address releases of hazardous substances that require expedited response. (See: cleanup, EPA 0992) (EPA 0992)

removal site evaluation (RSE) - The documented results of an inspection (if necessary) and assessment of a release or threat of release of a hazardous substance, pollutants, or contaminant to determine if a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 1980 response is required. The RSE is submitted to the Department of Energy (DOE) for review and is also maintained as a part of the Administrative Record File. (SSOP-0044, 06-19-92)

reportable quantities - Quantities of hazardous substances that may be harmful as set forth in 40 CFR 117, Table 117.3, "Protection of Environment/Water Programs", or toxic substances as set forth in 40 CFR 122.42, "Protection of Environment/Water Programs." The discharge of a reportable quantity of a substance is a violation of the Federal Water Pollution Control Act (FWPCA) and must be reported to Environmental Protection Agency (EPA). (PL-2194, 04-30-93)

reportable quantity (RQ) - Quantity of a hazardous substance that triggers reports under Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). If a substance exceeds its RQ, the release must be reported to the National Response Center (NRC), the State Emergency Response Center (SERC), and community emergency coordinators for areas likely to be affected. (EPA 0992) reporting units - Unit of measurement, for a given type of nuclear material, used for reporting transactions or inventory information to the Department of Energy-Oak Ridge Operations (DOE-ORO) and to the Nuclear Materials Management and Safeguards System (NMMSS). (FMPC-0307, 12-19-91)

repository - A facility for the permanent deep geologic disposal of High-Level or Transuranic Waste. (DOE 5820.2A, 09-26-88)

repowering - Replacement of an existing coal-fired boiler with one or more clean coal technologies in order to achieve significantly greater emission reduction relative to the performance of technology in widespread use at the time the Clean Air Act (CAA) amendments of 1990 were enacted. (See: Clean coal technology, EPA 0992) (EPA 0992)

reregistration - The reevaluation and relicensing of existing pesticides originally registered prior to current scientific and regulatory standards. EPA reregisters pesticides through it Registration Standards Program. (EPA 0992)

reserve capacity - Extra treatment capacity built into solid waste and wastewater treatment plants and interceptor sewers to accommodate flow increases due to future population growth. (EPA 0992)

reservoir - Any natural or artificial holding area used to store, regulate, or control water. (EPA 0992)

residual - Amount of a pollutant remaining in the environment after a natural or technological process has taken place, e.g., the sludge remaining after initial wastewater treatment, or particulates remaining in air after it passes through a scrubbing or other process. (EPA 0992)

residual risk - The extent of health risk from air pollutants remaining after application of the Maximum Achievable Control Technology (MACT.) (EPA 0992)

resistance - For plants and animals, the ability to withstand poor environmental conditions or attacks by chemicals or disease. May be inborn or acquired. (EPA 0992)

respirator area - Any area within a Radiological Area where actual airborne radioactivity concentrations exceed 2.0 DAC-hours per shift when averaged over one calendar quarter or 8.0 DAC-hours during any single shift. (RM-0009, 05-13-92)

respiratory protection equipment - Equipment used to protect personnel from inhalation of radioactive or hazardous materials. (DOE/EH-0256T, 0692)

Resource Conservation and Recovery Act (RCRA) (1976) - 1. An act which enabled the EPA to issue regulations for a national hazardous waste management program. The regulations govern hazardous waste from the time it is created to the time of its disposal. Any waste that is transported off the site for treatment, storage, or disposal must be accompanied by a manifest that: (a) Identifies who generated the waste (2) Provides a full description of the contents and quantity of the waste, and (#) Designates the facility to which it must be shipped. (RM-0012, 04-30-93) 2. The Congressional Act which established safe and environmentally acceptable management practices for specific wastes. RCRA requires strict "cradle to grave" control, documentation and proper management of hazardous wastes. (SSOP-0002, 10-22-91; SSOP-0075, SSOP-0078, and SSOP-0079, 12-14-92) 3. The regulatory statute that mandates "cradle-to-grave" control of specified hazardous waste by imposing management requirements on generators, transporters, and owners/operators of treatment, storage, and disposal (TSD) facilities. (SSOP-0044, 06-19-92)

Resource Conservation Recovery Act (RCRA) project file - A file that consists of a scope of work, "Construction Waste Identification/Disposition (CWID)" form, National Environmental Protection Agency (NEPA) documents, activity drawings, process knowledge, sampling plan, and analytical results. (SSOP-0044, 06-19-92)

resource recovery - The process of obtaining matter or energy from materials formerly discarded. (EPA 0992)

response action - 1. Generic term for actions taken in response to actual or potential health-threatening environmental events such as spills, sudden releases, and asbestos abatement/management problems. (EPA 0992) 2. A CERCLA-authorized action involving either a short-term removal response. This may include but is not limited to: removing hazardous materials from a site to an EPA-approved hazardous waste facility for treatment, containment or treating the waste on-site, identifying and removing the sources of ground-water contamination and halting further migration of contaminants. (EPA 0992) 3. Any of the following actions taken in school buildings in response to AHERA to reduce the risk of exposure to asbestos; removal, encapsulation, enclosure, repair, and operations and maintenance. (See: cleanup, EPA 0992) (EPA 0992)

responsiveness summary - A summary of oral and/or written public comments received by EPA during a comment period on key EPA documents, and EPA's response to those comments. (EPA 0992)

respresentativeness - Expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, process condition, or an environmental condition. Data representativeness is a function of sampling strategy; therefore, the sampling scheme should be designed to maximize representativeness. (RM-0012, 04-30-93)

restoration - 1. Measures taken to return a site to pre-violation conditions. (EPA 0992) 2. The environmental rejuvenation of the site and its surroundings to a former state or condition which (1) does not present a threat or hazard to the public health and welfare and the environment or (2) which effectively mitigates and minimizes the threat or hazard to the public health and welfare and the environment. (RM-0012, 04-30-93)

restricted use - A pesticide may be classified (under FIFRA regulations) for restricted use if it requires special handling because of its toxicity, and, if so, it may be applied only by trained, certified applicators or those under their direct supervision. (EPA 0992)

restriction enzymes - Enzymes that recognize specific regions of a long DNA molecule and cut it at those points. (EPA 0992)

reuse - Using a productor components of municipal solid waste in its original form more than once, e.g., refilling a glass bottle that has been returned or using a coffee can to hold nuts and bolts. (EPA 0992)

reverse osmosis - A treatment process used in water systems by adding pressure to force water through a semi-permeable membrane. Reverse osmosis removes most drinking water contaminants. Also used in wastewater treatment. Large-scale reverse osmosis plants are being developed. (EPA 0992)

ribonucleic acid (RNA) - A molecule that carries the genetic message from DNA to a cellular protein-producing mechanisms. (EPA 0992)

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Ringlemann chart - A series of shaded illustrations used to measure the opacity of air pollution emissions, ranging from light grey through black; used to set and enforce emissions standards. (EPA 0992)

riparian habitat - Areas adjacent to rivers and streams with a high density, diversity, and productivity of plant and animal species relative to nearby uplands. (EPA 0992)

risk - 1. A quantitative or qualitative expression of possible loss which considers both the probability that a hazard will cause harm and the consequences of that event. (DOE 5480.5, 09-23-86 and FMPC-2116 0189) 2. A measure of the probability that damage to life, health, property, and/or the environment will occur as a result of a given hazard. (EPA 0992) 3. A quantitative or qualitative expression of possible loss in terms of consequence severity and probability of occurrence. (RM-0012, 04-30-93)

risk assessment - Qualitative and quantitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence and/or use of specific pollutants. (EPA 0992)

risk communication - The exchange of information about health or environmental risks among risk assessors and managers, the general public, news media, interest groups, etc. (EPA 0992)

risk management - The process of evaluating and selecting alternative regulatory and non-regulatory responses to risk. The selection process necessarily requires the consideration of legal, economic, and behavioral factors. (EPA 0992)

river basin - The land area drained by a river and its tributaries. (EPA 0992)

rodenticide - A chemical or agent used to destroy rats or other rodent pests, or to prevent them from damaging food, crops, etc. (EPA 0992)

rotary kiln incinerator - An incinerator with a rotating combustion chamber that keeps waste moving, thereby allowing it to vaporize for easier burning. (EPA 0992)

rough fish - Fish not prized for eating, such as gar and suckers. Most are more tolerant of changing environmental conditions than game species. (EPA 0992)

rubbish - Solid waste, excluding food waste and ashes, from homes, institutions, and work-places. (EPA 0992)

rubble - Non-metallic and non-reusable material (such as tiles, gravel, concrete, asphalt, masonry) greater that 2 inches in thickness. (SSOP-0044, 06-19-92)

run-off - That part of precipitation, snow melt, or irrigation water that runs off the land into streams or other surface-water. It can carry pollutants from the air and land into receiving waters. (EPA 0992)

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safe mass - That mass of fissionable materials which is subcritical for all conditions to which it could reasonably be expected to be exposed, including processing, handling, storing, and procedural uncertainties. (DOE 5480.5, 09-23-86)

safener - A chemical added to a pesticide to keep it from injuring plants. (EPA 0992)

safeguards - Measures mandated by Department of Energy (DOE) orders designed to prevent theft or diversion of nuclear materials. At the Fernald Environmental Management Project (FEMP), these requirements are satisfied by the implementation of physical and administrative controls over the location and movements of nuclear materials. A set of graded safeguards requirements entails less stringent physical controls over the types of nuclear materials found at the FEMP, compared to requirements for weapons-grade materials located at other sites. (FMPC-0307, 12-19-91)

safety analysis report (SAR) - 1. A safety document which systematically identifies the hazards associated with a facility; describes and analyzes the measures taken to eliminate, control, or mitigate identified hazards; and evaluates potential accidents and associated risks. The parameters for concern are set down in DOE OR 5481.1, Safety Analysis and Review System, 05-23-84. the Preliminary Safety Analysis Report (PSAR), Final Safety Analysis Report (FSAR), and Safety Study are all types of SARs. (FMPC-2116 & FMPC-2117 0189) 2. A report that documents the adequacy of safety analysis for a nuclear facility to ensure that the facility can be constructed, operated, maintained, shut down, and decommissioned safely and in compliance with applicable laws and regulations. (SSOP-0103, 10-14-92)

safety analysis report for packaging (SARP) - 1. Provides the administrative requirement and procedures associated with the review and approval for designing, implementing, and testing of specific packages for transporting fissile material. (FMPC-2116 0189) 2. The Safety Analysis Report for Packaging is a document that provides a comprehensive technical evaluation and review of the design, testing, operational procedures, maintenance procedures, and quality assurance program for packaging. It demonstrates compliance with the Nuclear Regulatory Commission (NRC) and Department of Transportation (DOT) regulatory safety standards or equivalent standards established by the Department of Energy (DOE) for approving packaging and issuing Certificates of Compliance. (FMPC-2117 0189)

safety analysis and review system - A program required all Department of Energy (DOE) contract operators on non-reactor nuclear facilities, as established in DOE Order 5480.5, Safety at Nuclear Facilities, Issued 09-23-86 and DOE/ORO Order OR 5481,1B, Safety Analysis and Review System, Issued 05-23-84. This program provides for the analysis and review of all operations at facilities with the end goal of reducing the risks associated with operation of these facilities after accounting for all measures which have been taken to eliminate, mitigate, or control hazards identified during the course of the analysis process. Hazards of a standard industrial nature, i.e., those which are routinely encountered in industry and accepted by the public, are not governed by this system. Safety Documentation is generated to assist in fulfilling the requirements of this system. The Nuclear and Safety System (N&SS) subsection is responsible for implementing this program at the Feed Materials Production Center (FMPC.) (FMPC-2116 0189)

safety assessment (SA) - A brief, factual, and objective document which determines if activities involve hazards other than those common to industry that require elimination, control, or mitigation, thereby establishing the need for further safety documentation. (FMPC-2116 0189) 000317 safety documentation - Safety documentation is any of the following: Safety Assessment (SA), Safety Study (SS), Preliminary Safety Analysis Report (PSAR), Final Safety Analysis Report (FSAR), Existing-Site Final Safety Analysis Report (E-SFSAR), and Operational Safety Requirements (OSR) document. (FMPC-2116 0189)

safety guide - Documents designated or recognized as an acceptable basis for nuclear criticality safety evaluations. These guides may be used as aids by DOE field organizations in establishing acceptable safety practices, and include materials developed by DOE contractors, professional societies, industrial organizations, and foreign atomic energy industries. The guides are listed in paragraph 14 of DOE 5480.5, 09-23-86. (DOE 5480.5, 09-23-86)

safety study (SS) - The safety evaluation results which systematically describe an existing operating facility, identify the hazards associated with the operation of that facility, and analyze and evaluate potential accidents and their associated risks. Safety Studies (SS) will be compiled to form Sections 4.0 and 5.0 of the Existing-Site Final Safety Analysis Report. (FMPC-2116 0189)

safety system - Equipment and/or hardware items which are identified in a Safety Analysis Report (SAR) as providing a safety function by preventing or mitigating accidents, thus ensuring that the operation of the facility will not cause an unacceptable risk to the safety and health of employees or the general public. Safety Systems are generally active in nature. (FMPC-2116, 0189)

salinity - The percentage of salt in water. (EPA 0992)

salt water intrusion - The invasion of fresh surface or ground water by salt water. If it comes from the ocean it may be called sea water intrusion. (EPA 0992)

salts - Minerals that water picks up as it passes through the air, over and under the ground, or from households and industry. (EPA 0992)

salvage - The utilization of waste materials. (EPA 0992)

sample - A portion of material to be analyzed that is contained in single or multiple containers and identified by a unique sample number. (SSOP-0018, 05-07-92)

sampling requestor - An individual who requests that a sample be collected for any purpose. (SSOP-0018, 05-07-92)

sanctions - Actions taken by the federal government for failure to plan or implement a State Improvement Plan (SIP.) Such action may include withholding of highway funds and a ban on construction of new sources of potential pollution. (EPA 0992)

sand filters - Devices that remove some suspended solids from sewage. Air and bacteria decompose additional wastes filtering through the sand so that cleaner water drains from the bed. (EPA 0992)

sanitary landfill - (See: landfills, EPA 0992) (EPA 0992)

sanitary sewers - Underground pipes that carry off only domestic or industrial waste, not storm water. (EPA 0992)

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sanitary survey - An on-site review of the water sources, facilities, equipment, operation and maintenance of a public water system to evaluate the adequacy of those elements for producing and distributing safe drinking water. (EPA 0992)

sanitary water (a.k.a. gray water) - Water discharged from sinks, showers, kitchens, or other nonindustrial operations, but not from commodes. (EPA 0992)

sanitation - Control of physical factors in the human environment that could harm development, health, or survival. (EPA 0992)

saturated zone - A subsurface area in which all pores and cracks are filled with water under pressure equal to or greater than that of the atmosphere. (EPA 0992)

scrap - Materials discarded from manufacturing operations that may be suitable for reprocessing. (EPA 0992)

screening - Use of screens to remove coarse floating and suspended solids from sewage. (EPA 0992)

scrubber - An air pollution device that uses a spray of water or reactant or a dry process to trap pollutants in emissions. (EPA 0992)

secondary containment - Any device or facility designed to capture the accidental release or discharge of a liquid material and maintain positive control of the substance. (PL-2194, 04-30-93)

secondary containment volume - The actual volume sufficient to contain the capacity of the largest single container or tank which contains oil or a Clean Water Act (CWA) hazardous substance in a drainage system. If the drainage area is subject to precipitation, a reasonable allowance for its accumulation, based on local weather conditions and plant operation, shall be provided over and above the volume necessary to contain the largest single tank or container. (PL-2194, 04-30-93)

secondary drinking water regulations - Non-enforceable regulations applying to public waste systems and specifying the maximum contamination levels that, in the judgement of EPA, are required to protect the public welfare. These regulations apply to any contaminants that may adversely affect the odor or appearance of such water and consequently may caused people served by the system to discontinue it use. (EPA 0992)

secondary materials - Materials that have been manufactured and used at least once and are to be used again. (EPA 0992)

secondary treatment - The second step in most publicly owned waste treatment systems in which bacteria consume the organic parts of the waste. It is accomplished by bringing together waste, bacteria, and oxygen in trickling filters or in the activated sludge process. This treatment removes floating and settleable solids and about 90 percent of the oxygen-demanding substances and suspended solids. Disinfection is the final stage of secondary treatment. (See: primary, tertiary treatment, EPA 0992) (EPA 0992)

secure chemical landfill - (See: landfills, EPA 0992) (EPA 0992)

secure maximum contaminant level - Maximum permissible level of a contaminant in water delivered to the free flowing outlet of the ultimate user, or of contamination resulting from corrosion of piping or plumbing caused by water quality. (EPA 0992) security access authorization - An administrative determination by the DOE that an individual is eligible for access to the Fernald Environmental Management Project (FEMP). (See: Security clearance, SSOP-0051, 09-04-92) (SSOP-0051, 09-04-92))

security, acquisition, and materials logistics (SA&ML) - SA&ML is comprised of Safeguards & Security; Information Management & Communications Services; Procurement & Contracts; Transportation & Material Management; Emergency Preparedness; and Special Projects & Support Services. (FMPC-2116 0189).

security clearance - An administrative determination by the DOE that an individual is eligible for access to the Fernald Environmental Management Project (FEMP). (See: Security Access Authorization, SSOP-0051, 09-04-92) (SSOP-0051, 09-04-92)

sedimentation - Letting solids settle out of wastewater by gravity during treatment. (EPA 0992)

sedimentation tanks - Wastewater tanks in which floating wastes are skimmed off and settled solids are removed for disposal. (EPA 0992)

sediments - Soil, sand, and minerals washed from land into water, usually after rain. They pile up in reservoirs, rivers and harbors, destroying fish and wildlife habitat, and clouding the water so that sunlight cannot reach aquatic plants. Careless farming, mining, and building activities will expose sediment materials, allowing them to wash off the land after rainfall. (EPA 0992)

seed protectant - A chemical applied before planting to protect seeds and seedlings from disease or insects. (EPA 0992)

seismic risk zone - A measurement of earthquake intensity on a scale of less-than-one to four.

select pesticide - A chemical designed to affect only certain types of pests, leaving other plants and animals unharmed. (EPA 0992)

semi-confined aquifer - An aquifer partially confined by soil layers of low permeability through which recharge and discharge can still occur. (EPA 0992)

senescence - The aging process. Sometimes used to describe lakes or other bodies of water in advanced stages of eutrophication. (EPA 0992)

senior management - The manager or managers responsible for mission accomplishment and overall operations. For the DOE, the DOE Program Secretarial Officers (PSOs), and Field Office Managers are responsible for mission accomplishment and overall operations. For DOE M&O contractors, the General manager or similar top position is responsible for mission accomplishment and overall performance in accordance with the requirements of their contracts or other agreements. (DOE 5700.6C, 08-21-91)

senior nuclear managers group - The forum for senior DOE executives involved in nuclear activities to discuss items of mutual concern. Membership includes the Program Secretarial Officials for the Offices of Nuclear Energy, Defense Programs, Energy Research, Civilian Radioactive Waste Management, Environmental Restoration and Waste Management, Environment Safety and Health; the Directors for the Offices of Nuclear Safety and New Production Reactors; and the Department's Defense Nuclear Facility Safety Board (DNFSB) representative. The group has no additional authority beyond that possessed by individual members. (DOE/EH-0256T, 0692) septic tank - An underground storage tank for wastes from homes not connected to a sewer line. Waste goes directly from the home to the tank, where it is decomposed by bacteria. The sludge settles to the bottom and is pumped out periodically, but effluent flows into the ground through drains. (EPA 0992)

service - The performance of work, such as design, fabrication, inspection, nondestructive examination, repair, or installation. (DOE 5700.6C, 08-21-91)

service connector - The pipe that carries tap waster from a public water main to a building. (EPA 0992)

settling chamber - A series of screens placed in the way of flue gases to slow the stream of air, thus helping gravity to pull particles into a collection device. (EPA 0992)

settling tank - a holding area for wastewater, where heavier particles sink to the bottom for removal and disposal. (EPA 0992)

7Q10 - Seven-day, consecutive low flow with a ten year return frequency; the lowest stream flow for seven consecutive days that would be expected to occur once in ten years. (EPA 0992)

sewage - The waste and wastewater produced by residential and commercial sources and discharged into sewers. (EPA 0992)

sewage lagoon - (See: lagoon, EPA 0992) (EPA 0992)

sewage sludge - Sludge produced at a publicly owned treatment works (POTW), the disposal of which is regulated under the Clean Water Act. (EPA 0992)

sewer - A channel or conduit that carries wastewater and stormwater runoff from the source to a treatment plant or receiving stream. Sanitary sewers carry household, industrial, and commercial waste. Storm sewers carry runoff from rain or snow. Combined sewers handle both. (EPA 0992)

sewerage - The entire system of sewage collection, treatment, and disposal. (EPA 0992)

shallow dose equivalent - Applies to the external exposure of the skin or an extremity. It is taken as the dose equivalent at a tissue depth of 0.007 centimeter averaged over an area of 1 square centimeter. (DOE/EH-0256T, 0692)

sharps - Hypodermic needles, syringes (with or without the attached needle), pasteur pipettes, scalpel blades, blood vials, needles with attached tubing, and culture dishes used in animal or human patient care or treatment, or in medical, research or industrial laboratories. Also included are other types of broken or unbroken glassware that were in contact with infectious agents, such as used slides and cover slips, and unused hypodermic and suture needles, syringes, and scalpel blades. (EPA 0992)

sheen - An iridescent appearance on the surface of the water 40 CFR Part 110, "Protection of Environment/Water Programs." (PL-2194, 04-30-93)

shipment originator - The person, or WEMCO Section, who initiates an on-site movement or off-site shipment of material. (PP-0314, 12-20-91)

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shotgun - Non-scientific term for the process of breaking up the Deoxyribonucleic Acid (DNA) and then moving each fragment into a bacterium. (EPA 0992)

sievert (Sv) - SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor (1Sv - 100 rems.)

signal - The volume or product-level change produced by a leak in a tank. (EPA 0992)

signal words - The words used on a pesticide label-Danger, Warning, Caution-to indicate level of toxicity. (EPA 0992)

significant deterioration - Pollution resulting from a new source in previously "clean" areas. (See: prevention of significant deterioration, EPA 0992) (EPA 0992)

significant modification - 1. A change to a nuclear facility that involves an unreviewed safety question. The unreviewed safety question is addressed in DOE 5480.21, 12-24-91 "Unreviewed Safety Questions." (DOE 5480.5, 09-23-86) 2. A change that involves an Unreviewed Safety Question, as defined FMPC-2116, Implementing FMPC Policies and Procedures for System Safety Analysis, Rev. 0, January 1989. (FMPC-2116 0189)

significant municipal facilities - Those publicly owned sewage treatment plants that discharge a million gallons per day or more and are therefore considered by states to have the potential to substantially effect the quality of receiving waters. (EPA 0992)

significant quantities - Masses of fissionable materials greater than a safe mass. (See: Safe mass paragraph 5k., DOE 5480.5, 09-23-86) (DOE 5480.5, 09-23-86)

significant violations - Violations by point source dischargers of sufficient magnitude or duration to be a regulatory priority. (EPA 0992)

silt - Fine particles of sand or rock that can be picked up by the air or water and deposited as sediment. (EPA 0992)

silviculture - Management of forest land for timber. Sometimes contributes to water pollution, as in clear-cutting. (EPA 0992)

sinking - controlling oil spills by using an agent to trap the oil and sink it to the bottom of the body of water where the agent and the oil are biodegraded. (EPA 0992)

site - An area managed by DOE where access can be limited for any reason. The site boundary encompasses Controlled Areas. (DOE/EH-0256T, 0692)

site assessment program - A means of evaluating hazardous waste sites through preliminary assessments and site inspections to develop a Hazard Ranking System (HRS) score. (EPA 0992)

site document - A document detailing FEMP administrative, technical, and/or operational subject matter affecting matter affecting more than one department/contractor organization. (SSOP-0103, 10-14-92)

site document change (SDC) - The form by which an urgent change is processed and issued. (SSOP-0103, 10-14-92) site document request (SDR) - The form used to initiate development of the document draft and the processing of the document through the Site Document System. (SSOP-0103, 10-14-92)

site document system - The system controlling site documents at the FEMP that governs the performance of administrative, technical, and operational activities. (SSOP-0103, 10-14-92)

site inspection - The collection of information from a Superfund site to determine the extent and severity of hazards posed by the site. It follows and is more extensive than a preliminary assessment. The purpose is to gather information necessary to score the site, using the Hazard Ranking System (HRS), and to determine if it presents an immediate threat requiring prompt removal. (EPA 0992)

site requirement (SR) - A site document, previously titled a requirements manual, defining and establishing federal and state regulations/laws or management practices that are applicable to the FEMP. All organizations are responsible for implementing site requirements, as applicable, through a department procedure. (A site requirement is not an instructional document and is not to be used when performing work.) (SSOP-0103, 10-14-92)

site safety plan - A crucial element in all removal actions, it includes information on equipment being used, precautions to be taken, and steps to take in the event of an on-site emergency. (EPA 0992)

Site Standard Operating Procedure (SSOP) - A type of site document providing detailed operating or administrative instruction for an ongoing activity/process (a sequence of actions). (SSOP-0103, 10-14-92)

Site-wide Analysis Request/Custody Record (SWAR/CR) - The document used to record chain-of-custody activities. (SSOP-0018, 05-07-92)

Site Work Plan (SWP) - A site document providing detailed operating instructions for a required activity which will not be repeated. (SSOP-0103, 10-14-92)

Sitewide CERCLA Quality Assurance Project Plan (SCQ) - This document, as approved by DOE and EPA, provides overall sitewide quality assurance planning for environmental sampling and analysis at the FEMP. (RM-0012, 04-30-93)

siting The process of choosing a location for a facility. (EPA 0992)

skimming - Using a machine to remove oil or scum from the surface of the water. (EPA 0992)

slag - Magnesium fluoride. A reaction product resulting from the $UF^4 + 2Mg = U + 2MgF_2$ thermite reduction.

slow sand filtration - Passage of raw water through a bed of sand at low velocity, resulting in substantial removal of chemical and biological contaminants. (EPA 0992)

sludge - 1. A semi-solid residue from any of a number of air or water treatment processes; can be a hazardous waste. (EPA 0992) 2. An aggregate of oil, or oil and other matter of any kind, in any form other than dredged spoil, having a combined specific gravity equivalent to or greater that water, 40 CFR Part 110, "Protection of Environment/Water Programs." (PL-2194, 04-30-93)

slurry - A watery mixture of insoluble matter resulting from some pollution control techniques. (EPA 0992) slurry pump - A method of sampling material in the waste pits using a slurry pump mounted on a platform and placed into the wate pit.

slurried raffinate - To convert to a watery mixture of insoluble matter such as mud or slime.

small quantity generator (SQG) - Persons or enterprises that produce 220-2200 pounds per month of hazardous waste; are required to keep more records than conditionally exempt generators. The largest category of hazardous waste generators, SQGs include automotive shops, dry cleaners, photographic developers, and a host of other small businesses. (See: conditionally exempt generators and "Squeegee", EPA 0992) (EPA 0992)

smelter - A facility that melts or fuses ore, often with an accompanying chemical change, to separate its metal content. Emissions cause pollution. Smelting is the process involved. (EPA 0992)

smog - Air pollution associated with oxidants.. (See: photochemical smog. EPA 0992) (EPA 0992)

smoke - Particles suspended in air after incomplete combustion. (EPA 0992)

soft detergents - Cleaning agents that break down in nature. (EPA 0992)

soft water - Any water that does not contain a significant amount of dissolved minerals such as salts of calcium or magnesium. (EPA 0992)

soil - Unconsolidated earth material composing of the surficial geologic strata, consisting of clay, silt, or gravel size particles (sizes as classified by the U.S. Soil Conservation Service.) Soil may also include roots, grasses, weeds, or leaves, a mixture of the above-mentioned materials with other liquids, sludges, or solids that are inseparable by simple mechanical removal process. (SSOP-0044, 06-19-92)

soil adsorption field - A sub-surface area containing a trench or bed with clean stones and a system of piping through which treated sewage may seep into the surrounding soil for further treatment and disposal. (EPA 0992)

soil conditioner - An organic material like humus or compost that helps soil absorb water, build a bacterial community, and take up mineral nutrients. (EPA 0992)

soil gas - Gaseous elements and compounds in the small spaces between particles of the earth and soil. Such gases can be moved or driven out under pressure. (EPA 0992)

soil sterilant - A chemical that temporarily or permanently prevents the growth of all plants and animals depending on the chemical. (EPA 0992)

solder - A metallic compound used to seal the joints between pipes. Until recently, most solder contained 50-percent lead. (EPA 0992)

sole-source aquifer - An aquifer that supplies 50-percent or more of the drinking water of an area. (EPA 1992)

solid waste - Non-liquid, non-soluble materials ranging from municipal garbage to industrial wastes that contain complex and sometimes hazardous substances. Solid wastes also include sewage sludge, agricultural refuse, demolition wastes, and mining residues. Technically, solid waste also refers to liquids and gases in containers. (EPA 0992) solid waste disposal - The final placement of refuse that is not salvaged or recycled. (EPA 0992)

solid waste management - Supervised handling of waste materials from their source through recovery processes to disposal. (EPA 0992)

solidification and stabilization - Removal of wastewater from a waste or changing it chemically to make it less permeable and susceptible to transport by water. (EPA 0992)

solubility - The ability of a substance to form a solution with another substance.

solvent Liquid capable of dissolving or dispersing one or more substances. (EPA 0992)

soot - Carbon dust formed by incomplete combustion. (EPA 0992)

sorption - The action of soaking up or attracting substances; process used in many pollution control systems. (EPA 0992)

source reduction - Reducing the amount of materials entering the waste stream by redesigning products or patterns of production or consumption (e.g., using returnable beverage containers.) Synonymous with waste reduction. (EPA 0992)

source, sealed - Radioactive material that is contained in a sealed capsule, sealed between layers of nonradioactive material or firmly fixed to a nonradioactive surface by electroplating or other means. The confining barrier prevents dispersion of the radioactive material under normal and most accidental conditions related to use of the source. (DOE/EH-0256T, 0692)

source separation - Segregating various wastes at the point of generation (e.g., separation of paper, metal, and glass from other wastes to make recycling simpler and more efficient.) (EPA 0992)

special process - A process, the results of which are highly dependent on the control of the process and the skill of the operator, and in which the specified quality cannot be readily determined by inspection or test of the product. (FMPC-0708, 12-15-89)

special review - Formerly known as Rebuttable Presumption Against Registration (RPAR), this is the regulatory process through which existing pesticides suspected of posing unreasonable risks to human health, non-target organisms, or the environment are referred for review by EPA. Such review requires an intensive risk/benefit analysis with opportunity for public comment. If risk is found to outweigh social and economic benefits, regulatory actions ranging from label revisions and use-restriction to cancellation or suspended registration can be initiated. (EPA 0992)

special waste - Items such as household hazardous waste, bulky wastes (refrigerators, pieces of furniture, etc.), tires, and used oil. (EPA 0992)

specialized training record report - Any of the DOE/Subcontractor Reports and/or WEMCO Reports.

species - A reproductively isolated aggregate of interbreeding organisms. (EPA 0992)

spent nuclear fuel - Fuel that has been withdrawn from a nuclear reactor following irradiation, but that has not been reprocessed to remove its constituent elements. (DOE 5820.2A, 09-26-88)

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spill - A specific type of release usually involving a liquid. However, the term is often used synonymously with "release." PI-2194, 04-30-93)

spill prevention control and countermeasures plan (SPCP) - Plan covering the release of hazardous substances as defined in the Clean Water Act. (EPA 0992)

spoil - Dirt or rock removed from its original location-destroying the composition of the soil in the process-as in strip-mining, dredging, or construction. (EPA 0992)

sprawl - Unplanned development of open land. (EPA 0992)

spray tower scrubber - A device that sprays alkaline water into a chamber with acid gases present to aid in the neutralizing of the gas. (EPA 0992)

"squeegee" - Persons or enterprises that produce 220-2200 pounds per month of hazardous waste; are required to keep more records than conditionally exempt generators. The largest category of hazardous waste generators, small quantity generators (SQGs) include automotive shops, dry cleaners, photographic developers, and a host of other small businesses. (See: conditionally exempt generators and Small Quantity Generator (SQG), EPA 0992) (EPA 0992)

stable air - A motionless mass of air that holds instead of dispersing pollutants. (EPA 0992)

stabilization - Conversion of the active organic matter in sludge into inert, harmless material. (EPA 0992)

stabilization ponds - (See: lagoon, EPA 0992) (EPA 0992)

stack - A chimney, smokestack, or vertical pipe that discharges used air. (EPA 0992)

stack effect - Air, as in a chimney, that moves upward because it is warmer that the ambient atmosphere. (EPA 0992)

stack gas - (See: flue gas, EPA 0992) (EPA 0992)

staff manager(s) - A manager who reports directly to the Office of the President. (FMPC-0708, 12-15-89)

stage II controls - Systems placed on service station gasoline pumps to control and capture gasoline vapors during refueling. (EPA 0992)

stagnation - Lack of motion in a mass of air or water that holds pollutants in place. (EPA 0992)

standard industrial hazards - Hazards which are routinely encountered in industry and accepted by the public. (FMPC-2116 0189)

standard operating procedure (SOP) - An operation, analysis, or action whose mechanics are thoroughly prescribed and documented and which is commonly accepted as the usual or normal method for performing certain routine or repetitive tasks. (RM-0012, 04-30-93)

standard radiation symbol - Symbols designed and proportioned as illustrated in accordance with ANSI N2.1 for radiation symbols and ANSI N12.1 for fissile material. (DOE/EH-0256T, 0692) standards - Norms that impose limits on the amount of pollutants or emissions produced. EPA establishes minimum standards, but states are allowed to be stricter. (EPA 0992)

start of a response action - The point in time when there is a guarantee or set-aside of funding either by EPA, other federal agencies, states or Principal Responsible Parties in order to begin response actions at a Superfund site. (EPA 0992)

state emergency response commission (SERC) - Commission appointed by each state governor according to the requirements of SARA Title III. The SERCs designate emergency planning committees, and supervise and coordinate their activities. (EPA 0992)

state planar coordinates - A coordinate system based on the 1983 State of Ohio Survey.

stationary source - A fixed-site producer of pollution, mainly power plants and other facilities using industrial combustion processes. (EPA 0992)

step-off pad - Transition area between contaminated and non-contaminated areas that is used to allow exit of personnel and removal of equipment. (DOE/EH-0256T, 0692)

sterilization - 1. An pest control, the use of radiation and chemicals to damage body cells needed for reproduction. (EPA 0992) 2. The destruction of all living organisms in water or on the surface of various materials. By contrast, disinfection is the destruction of most such organisms. (EPA 0992)

sticky pad - Step-off pad provided by a tacky surface to reduce the potential for inadvertently tracking contamination out of a contaminated area. (DOE/EH-0256T, 0692)

stochastic effects - Malignant and hereditary disease for which the probability of an effect occurring, rather than its severity, is regarded as a function of dose without a threshold for radiation protection purposes. (DOE 5480.11, 12-21-88)

storage - 1. Retrievable retention of waste pending disposal. (DOE 5820.2A, 09-26-88) 2. Temporary holding of waste pending treatment or disposal, in containers, tanks, waste piles, and surface impoundments. (EPA 0992)

storage facility - Any facility or site (including equipment) that has no identified or planned programmatic use and is contaminated with radioactivity to levels that require controlled access. (DOE 5820.2A, 09-26-88)

storage unit - A discrete part of the storage facility in which waste is stored. (DOE 5820.2A, 09-26-88)

storm sewer - A system of pipes (separate from sanitary sewers) that carries only water runoff from buildings and land surface. (EPA 0992)

stratification - Separating into layers. (EPA 0992)

stratosphere - The portion of the atmosphere 10-to-25 miles above the earth's surface. (EPA 0992)

strip-cropping - Growing crops in a systematic arrangement of strips or bands that serve as barriers to wind and water erosion. (EPA 0992) strip-mining - A process that uses machines to scrape soil or rock away from mineral deposits just under the earth's surface. (EPA 0992)

structural deformation - Distortion in walls of a tank after liquid has been added or removed. (EPA 0992)

subcontractor - All non-WEMCO employees requiring access to the Fernald Environmental Management Project (FEMP) for the purpose of providing supplies, services, or a construction activity in performance of a contractual obligation. On-site employees of other DOE prime contractors will be considered subcontractors for the purposes of this procedure. (SSOP-0051, 09-04-92)

subject matter expert (SME) - An individual qualified, or previously qualified, and experienced in the applicable activity who has been documented per SSOP-0014 and is responsible for the content and update of a document. (SSOP-0103, 10-14-92)

sulfur dioxide (SO_2) - A pungent, colorless, gaseous pollutant formed primarily by the combustion of fossil fuels. (EPA 0992)

sump - A pit or tank that catches liquid runoff for drainage or disposal. (EPA 0992)

sump cakes - Waters from the cleanup of floors, equipment, etc. are collected in sumps and filtered; the sump cakes contain uranium and the filtrate is clean in this process.

sump pump - A mechanical device that removes water or wastewater from a sump. (EPA 0992)

supercritical water - A type of thermal treatment using moderate temperatures and high pressures to enhance the ability of water to break down large organic molecules into smaller, less toxic ones. Oxygen injected during this process combines with simple organic compounds to form carbon dioxide and water. (EPA 0992)

supervisor - An individual officially designated by management to direct the activities of operators or fissionable materials handlers and to supervise the operation of equipment that handles, produces, processes, stores, packages, or uses radioactive material or significant quantities of fissionable materials. (DOE 5480.5, 09-23-86)

Superfund - The program operated under the legislative authority of CERCLA and SARA that funds and carries out EPA solid waste emergency and long-term removal and remedial activities. These activities include establishing the National Priorities List (NPL), investigating sites for inclusion on the list, determining their priority, and conducting and /or supervising the cleanup and other remedial actions. (EPA 0992)

Superfund Innovative Technology Evaluation - EPA program to promote development and use of innovative treatment technologies in Superfund site cleanups. (EPA 0992)

surface impoundment - Treatment, storage, or disposal of liquid hazardous wastes in ponds. (EPA 0992)

surface uranium mines - Strip mining operations for removal of uranium-bearing ore. (EPA 0992)

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surface water - All water naturally open to the atmosphere (rivers, lakes, reservoirs, ponds, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other collectors directly influenced by surface water. (EPA 0992)

surfacing ACM - Asbestos-containing material that is sprayed or troweled on or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members. (EPA 0992)

surfacing material - Material sprayed or troweled onto structural members (beams, columns, or decking) for fireproofing, acoustical or decorative purposes. Includes textured plaster, and other textured wall and ceiling surfaces. (EPA 0992)

surfactant - A detergent compound that promotes lathering. (EPA 0992)

surplus facility - Any facility or site (including equipment) that has no identified or planned programmatic use and is contaminated with radioactivity to levels that require controlled access. (DOE 5820.2A, 09-26-88)

surveillance - 1. A deliberate and systematic inspection, test, calibration, or check of equipment to verify continuing safe performance in accordance with established criteria. (FMPC-2116 0189) 2. The act of monitoring or observing to verify whether an item or activity conforms to specified requirements. (RM-0012, 04-30-93)

surveillance system - A series of monitoring devices designed to check on environmental conditions. (EPA 0992)

suspect material - Building material suspected of containing asbestos, e.g., surfacing material, floor tile, ceiling tile, thermal system insulation, and miscellaneous other materials. (EPA 0992)

suspended solids -Small particles of solid pollutants that float on the surface of, or are suspended in sewage or other liquids. They resist removal by conventional means. (EPA 0992)

suspension - Suspending the use of a pesticide when EPA deems it necessary to prevent an imminent hazard resulting from its continued use. An emergency suspension takes effect immediately; under an ordinary suspension a registrant can request a hearing before the suspension goes into effect. Such a hearing process might take six months. (EPA 0992)

suspension culture - Cells growing in a liquid nutrient medium. (EPA 0992)

swamp - A type of wetland dominated by woody vegetation but without appreciable peat deposits. Swamps may be fresh or salt water and tidal or non-tidal. (See: wetlands, EPA 0992) (EPA 0992)

synergism - The cooperative interaction of two or more chemicals or other phenomena producing a greater total effect than the sum of their individual effects. (EPA 0992)

synthetic organic chemicals (SOCs) - Man-made organic chemicals. Some SOCs are volatile, others tend to stay dissolved in water instead of evaporating. (EPA 0992)

systemic pesticide - A chemical absorbed by an organism that makes the organism toxic to pests. (EPA 0992)

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tailings - Residue of raw material or waste separated out during the processing of crops or mineral ores. (EPA 0992)

tank - For the purpose of FMPC Spill Prevention Control and Countermeasure Plan, a tank is a stationary device constructed on non-earthen materials which provides structural support, exceeds 85 gallons, and is designed to contain an accumulation of regulated substances. Tanks are classified as Above Ground Storage Tanks (AGST) or Underground Storage Tanks (UST). A UST is one which has 10% or more of the storage volume below ground. (PL-2194, 04-30-93)

taxa - (Taxonomy) Study of general principles of scientific classification. Taxa: A taxonomic group or entity.

Technical Assistance Grant (TAG) - As part of the Superfund program, Technical Assistance Grants of up to $50,000.00 are provided to citizen's groups to obtain assistance in interpreting information related to cleanups at Superfund sites or those proposed for the National Priorities List (NPL). Grants are used by such groups to hire technical advisors to help them understand the site-related technical information for the duration of response activities. (EPA 0992)

technical department (TECH) - The Technical Department (TECH) is comprised of Technical Services, Capital Projects, 4A Program, Technical Department Administration, and the Vice President and Manager of the Rust Engineering company, who coordinates with TECH on construction projects. (FMPC-2116 0189)

technical instructor training - A course or course waiver provided by Centralized Training to prepare and/or certify WMCO employees or subcontractors as qualified technical instructors. (FMPC-0102, 01-16-91)

Technical Review Board (TRB) - A committee; composed of one representative from Technical Services, Production Technology, Waste Management (WM), Production Operations (PO), Quality Assurance (QA), RUST Engineering (RUST), and Operations, Safety, & Health (OS&H); that is responsible to the Technical Director of Westinghouse Materials Company of Ohio (WMCO) for the review, evaluation, and disposition of change proposals at the Feed Materials Production Center (FMPC.) (FMPC-2116 0189)

technical safety appraisal - A documented, multidiscipline appraisal of selected Department reactors and nuclear facilities conducted by a team selected by the Deputy Assistant Secretary for Safety, Health, and Quality Assurance (EH-30.) the assure proper Department-wide application of particular safety elements of the ES&H program, nuclear industry lessons learned, and appropriate licensed facility requirements as described in DOE 5482.1B, paragraph 9b. (DOE 5480.5, 09-23-86)

technical work document (TWD) - A term used to generically identify formally approved documents that direct work, such as procedures, work packages, or job or research plans. (DOE/EH-0256T, 0692)

technology-based limitations - Industry-specific effluent limitations applied to a discharge when it will not cause a violation of water quality standards at low stream flows. Usually applied to discharges into large rivers. (EPA 0992)

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technology-based standards - Effluent limitations applicable to direct and indirect sources which are developed on a category-by-category basis using statutory factors, not including water-quality effects. (EPA 0992)

teratogen - Substance that causes malformation or serious deviation from normal development of blastocysts, embryos and fetuses. (EPA 0992)

terracing - Dikes built along the contour of sloping farm land that hold runoff and sediment to reduce erosion. (EPA 0992)

tertiary treatment - Advanced cleaning of wastewater that goes beyond the secondary or biological stage, removing nutrients such as phosphorus, nitrogen, and most biological oxygen demand (BOD) and suspended solids. (EPA 0992)

thermal pollution - Discharge of heated water from industrial processes that can kill or injure aquatic organisms. (EPA 0992)

thermal system insulation (TSI) - Asbestos-containing material applied to pipes, fittings, boilers, breeching, tanks, ducts, or other interior structural components to prevent heat loss or gain or water condensation. (EPA 0992)

thermal treatment - Use of elevated temperatures to treat hazardous wastes. (EPA 0992)

thermoluminescent dosimeter (TLD) - Radiation monitoring device used to record the radiological exposure of personnel or areas to certain types of radiation. (DOE/EH-0256T, 0692)

threshold limit value (TLV) - The concentration of an airborne substance that an average person can be repeatedly exposed to without adverse effects. TLVs may be expressed in three ways: (1.) TLV-TWA (time weighted average) based on an allowable exposure averaged over a normal 8-hour workday or 40-hour workweek; (2.) TLV-STEL (short-term exposure limit) or maximum concentration for a brief specified period of time, depending on a specific chemical (TWA must still be met); and (3.) TLV-C (Ceiling Exposure Limit) or maximum exposure concentration not to be exceeded under any circumstances. (TWA must still be met.) (EPA 0992)

threshold planning quantity - A quantity designated for each chemical on the list of extremely hazardous substances that triggers notification by facilities to the State Emergency Response Commission (SERC) that such facilities are subject to emergency planning requirements under SARA Title III. (EPA 0992)

tidal marsh - Low, flat marshlands traversed by channels and tidal hollows, subject to tidal inundation; normally, the only vegetation present is salt-tolerant bushes and grasses. (See: wetlands, EPA 0992) (EPA 0992)

till - Nonsorted, nonstratified sediment carried or deposited by a glacier.

time-weighted average (TWA) - In air sampling, the average air concentration of contaminants during a given period. (EPA 0992)

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TITLE I and TITLE II Agency - An architect-engineering organization contracted by DOE or WMCO to perform engineering design activities, including preparation of both costs/schedule estimates and design intent documents in final approved form and issued as Certified for Construction (CFC). (W Abv&Acro 1992)

TITLE III Agency - An architect-engineering organization contracted by DOE or WMCO to perform engineering services during construction. (W Abv&Acro 1992)

tolerances - Permissible residue levels for pesticides in raw agricultural produce and processed foods. Whenever a pesticide is registered for use on a food or a feed crop, a tolerance (or exemption from the tolerance requirement) must be established. EPA establishes the tolerance levels, which are enforced by the Food and Drug Administration and the Department of Agriculture. (EPA 0992)

tonnage - The amount of waste that a landfill accepts, usually expressed in tons per month. The rate at which a landfill accepts waste is limited by the landfill's permit. (EPA 0992)

topography - The physical features of a surface area including relative elevations and the position of natural and man-made features. (EPA 0992)

total suspended solids (TSS) - A measure of the suspended solids in wastewater, effluent, or water bodies, determined by tests for "total suspended non-filterable solids." (See: suspended solids, EPA 0992) (EPA 0992)

tour - Continuously escorted visitor(s) observing various areas on the site primarily for educational purposes and remaining on the site for a relatively short period of time (e.g., school, civic groups, news media, and special corporate or government visitors). (SSOP-0051, 09-04-92)

toxic - A. Harmful to living organisms. (EPA 0992)
B. Chemical that causes deleterious but non-cancerous effects.

toxic chemical - Any chemical listed in EPA rules as "Toxic Chemicals Subject to Section 313 of the Emergency Planning and Community Right to Know Act of 1986." (EPA 0992)

toxic chemical use substitution - Replacing toxic chemicals with less harmful chemicals in industrial processes. (EPA 0992)

toxic cloud - Airborne plume of gases, vapors, fumes, or aerosols containing toxic materials. (EPA 0992)

toxic pollutants - Materials that cause death, disease, or birth defects in organisms that ingest or absorb them. The quantities and exposures necessary to cause these effects can vary widely. (EPA 0992)

toxic release inventory - Database of toxic releases in the United States compiled from SARA Title III, section 313 reports. (EPA 0992)

Toxic Substance Control Act (TSCA) - The law that enables the Environmental Protection Agency (EPA) to control chemicals and substances, such as Poly-Chlorinated Biphenyls (PCBs), dioxins, and asbestos, by requiring that all old and new materials entering the environment be tested. Also regulating the release of chemicals and substances when necessary. (SSOP-0044, 06-19-92) toxic substances - A chemical or mixture that may present an unreasonable risk of injury to health or the environment. (EPA 0992)

toxic waste - A waste that can produce injury if inhaled, swallowed, or absorbed through the skin. (EPA 0992)

toxicant - A poisonous agent that kills or injures animal or plant life. (EPA 0992)

toxicity - The degree of danger posed by a substance to animal or plant life. (See: acute, chronic toxicity, EPA 0992) (EPA 0992)

toxicity characteristic leaching process (TCLP) -A RCRA term referring to wastes, the extracts from which contain the contaminants listed in Table 1 of 40CFR261.24, Protection of the Environment, at a concentration equal to or greater than the respective value given in the table. (SSOP-0078, 12-14-92)

toxicology - The science and study of poisons control. (EPA 0992)

toxicological profile - An examination, summary, and interpretation of a hazardous substance to determine levels of exposure and associated health effects. (EPA 0992)

toxicological screening - A screening procedure applied in the CPC selection process that eliminates contaminants that are not a health concern.

Total Effective Dose Equivalent (TEDE) - The sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures.) (DOE/EH-0256T, 0692)

trace level - An extremely small but detectable quantity of a substance.

training - Providing for the systematic acquisition of skills, knowledge, and attitudes that will lead to an acceptable level of performance on a specific activity in a given job context. (FMPC-0102, 01-16-91)

training activity - A systematic, structured, and documented approach, based on relevant job/task information and analysis, for providing training. Formal training is conducted in a number of forms, including: classroom lecture, interactive workshops, training guides and manuals, correspondence study, individualized learning packages (including self-paced, with and without computers), audio-video (visual) programs produced in-house or purchased, on-the-job training, simulator usage, and plant drills and exercises. (FMPC-0102, 01-16-91)

training master records (TMR) - Completed records documenting proof of an individual's training to perform his/her assignment in a safe and proficient manner. The centralized TMR is housed in the Centralized Training Section. Records ar to be retained for 75 years in accordance with Code of Federal Regulations (CFR), 36 CFR 1228.22, "Central Records Filing." (FMPC-0102, 01-16-91)

training plan - A means of providing guidance to a department for technical, compliance, and WMCO health and safety training requirements by job category, and a means of providing guidance on responsibility and implementation of a training program requiring the interface of multiple lesson plans. (FMPC -0102, 01-16-91) training records management system (TRMS) - A centralized automated record-keeping system for maintaining employee training records. (FMPC-0102, 01-16-91)

transfer facility - Any transportation related facility including loading docks, parking areas, storage areas, and other similar areas where shipment of hazardous substances/wastes are held during the normal course of transportation. (PL-2194, 04-30-93)

transformation - The process of placing genes into a host cell, thereby inducing the host to exhibit functions encoded by the new DNA. (EPA 0992)

transpiration - The process by which water vapor is lost to the atmosphere from living plants. The term can also be applied to the quantity of water thus dissipated. (EPA 0992)

transport index - The number placed on a package to designate the degree of control to be exercised by the carrier during transportation. The transport index to be assigned to a package of radioactive material shall be determined by either paragraph (a or b), whichever is larger: (a.) The highest radiation dose rate in millirem per hour at 1 meter from any accessible external surface of the package. (b.) The transport index of each Fissile Class II package is calculated by dividing the number 50 by the number of such Fissile Class II packages that may be transported together as determined under the limitations of 10 CFR 71, Energy. NOTE: The number expressing the transport index shall be rounded up to the next higher tenth; e.g., 1.01 becomes 1.1. (FMPC-2116 0189)

transportation control measures (TCMs) - Steps taken by a locality to adjust traffic patterns (e.g., bus lanes, turnout, right turn on red) or reduce vehicle use (ridesharing, high-occupancy vehicle lanes) to cut vehicular emissions. (EPA 0992)

transuranics - Manmade, radioactive elements above atomic number 92.

transuranic waste - Without regard to source or form, waste that is contaminated with alpha-emitting transuranic radionuclides with half-lives greater that 20 years and concentrations greater that 100 nCi/g at the time of assay. Heads of Field Elements can determine that other alpha contaminated wastes, peculiar to a specific site, must be managed as transuranic waste. (DOE 5820.2A, 09-26-88 and DOE/EH-0256T, 0692)

trash - material considered worthless or offensive that is thrown away. Generally defined as dry waste material, but in common usage it is a synonym for garbage, rubbish, or refuse. (EPA 0992)

trash-to-energy plan - Burning trash to produce energy. (EPA 0992)

treatability studies - Tests of potential cleanup technologies conducted in a laboratory (See: bench-scales tests, EPA 0992) (EPA 0992)

treated regulated medical waste - Medical waste treated to substantially reduce or eliminate its pathogenicity, but that has not yet been destroyed. (EPA 0992)

treatment - 1. Any method, techniques, or process designed to change the physical or chemical character of waste to render it less hazardous, safer to transport, store or dispose of, or reduced in volume. (DOE 5820.2A, 09-26-88) 2. Any method techniques, or process designed to remove solids and/or pollutants from solid waste, wastestreams, effluents, and air emissions. (EPA 0992) 3. Methods used to change the biological character or composition of any regulated medical waste so as to substantially reduce or eliminate its potential for causing disease. (EPA 0992)

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treatment facility - The specific area of land, structures, and equipment dedicated to waste treatment and related activities. (DOE 5820.2A, 09-26-88)

treatment plant - A structure built to treat wastewater before discharging it into the environment. (EPA 0992)

Treatment, Storage, and Disposal Facility (TSD) - Site where a hazardous substance is treated, stored, or disposed of. TSD facilities are regulated by EPA and states under RCRA. (EPA 0992)

trial burn - An incinerator test in which emissions are monitored for the process of specific organic compounds, particulates, and hydrogen chloride. (EPA 0992)

trichloroethylene (TCE) - A stable, low boiling-point colorless liquid, toxic if inhaled. Used as a solvent or metal degreasing agent, and in other industrial applications. (EPA 0992)

trickling filter - A coarse treatment system in which wastewater is trickled over a bed of stones or other material covered with bacteria that break down the organic waste and produce clean water. (EPA 0992)

trihalomethane (THM) - One of a family of organic compounds named as derivatives of methane. THMs are generally by-products of chlorination of drinking water that contains organic material. (EPA 0992)

troposphere - The lower atmosphere, the portion of the atmosphere up to seventeen miles from the Earth's surface where clouds are formed. (EPA 0992)

trough - A long and narrow or shallow channel or depression as between hills.

trust fund (CERCLA) - A fund set up under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) to help pay for cleanup of hazardous waste sites and for legal action to force those responsible for the sites to clean them up. (EPA 0992)

tundra - A type of ecosystem dominated by lichens, mosses, grasses, and woody plants. Tundra is found at high latitudes (arctic tundra) and high altitudes (alpine tundra.) Arctic tundra is underlain by permafrost an is usually satrated. (See: wetlands, EPA 0992) (EPA 0992)

turbidmeter - A device that measures the density of suspended solids in a liquid. (EPA 0992)

turbidity - 1. Haziness in air caused by the presence of particles and pollutants. (EPA 0992) 2. A cloudy condition in water due to suspended silt or organic matter. (EPA 0992)

U

UAP - Uranyl ammonium phosphate, resulting from the hydrometallurgical process of scrap recovery.

ultra clean coal (UCC) - Coal that is washed, ground into fine particles, then chemically treated to remove sulfur, ash, silicone, and other substances; usually briguetted and coated with a sealant made from coal. (EPA 0992)

ultraviolet (UV) rays - Radiation from the sun that can be useful or potentially harmful. UV ray from one part of the spectrum (UV-A) enhance plant life and are useful in some medical and dental procedures; UV rays from other parts of the spectrum (UV-B) can cause skin cancer or other tissue damage. The ozone layer in the atmosphere partly shields us from ultraviolet rays reaching the earth's surface. (EPA 0992)

unconformable - Not succeeding the underlying strata in immediate order of age and in parallel position.

underground injection control (UIC) - The program under the Safe Drinking Water Act that regulates the use of wells to pump fluids into the ground. (EPA 0992)

underground sources of drinking water - Aquifers currently being used as a source of drinking water or those capable of supplying a public water system. They have a total dissolved solids content of 10,000 milligrams per liter or less, and are not "exempted aquifers." (See: exempted aquifer, EPA 0992) (EPA 0992)

underground storage tank - A tank located at least partially underground and designed to hold gasoline or other petroleum products or chemicals. (EPA 0992)

undue risk - A level of identifiable risk which is unacceptable to DOE. (DOE 5480.5, 09-23-86)

unreasonable risk - Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), "unreasonable adverse effects" means any unreasonable risk to man or the environment, taking into account the medical, economic, social, and environmental costs and benefits of any pesticide. (EPA 0992)

unreviewed safety question - A proposed change, test, or experiment shall be deemed by Nuclear & System Safety (N&SS) to involve an unreviewed safety question if: (a.) There could be a significant increase in the probability or consequences of an accident, human error, or equipment malfunction important to safety and previously evaluated by safety analyses, or (b.) The possibility of an accident or malfunction of a different type than any previously evaluated by safety analyses will be created which could result in significant safety consequences, or (c.) It involves non-standard hazards or standard industrial hazards and has not previously been analyzed to determine the risk of operation. (FMPC-2116 0189)

unsaturated zone - The area above the water table where soil pores are not fully saturated, although some water may be present. (EPA 0992) unusual occurrence - Nonemergency occurrence that has significant impact or potential for impact on safety, environment, health, security, or operations. Examples of the types of occurrences that are to be categorized as unusual occurrences are contained in DOE 5000.3A, Occurrence Reporting and Processing of Operations Information. (DOE/EH-0256T, 0692)

upper confidence limit (of the mean) - A statistical term describing upper bound of the arithmetic average.

uranium - A radioactive metallic element, used in nuclear reactors and the production of nuclear weapons, a small percentage of which comprises the fissionable isotope U-235. (EPA 0992)

uranium mill-tailings waste piles - Licensed active mills with tailings piles and evaporation ponds created by acid or alkaline leaching processes. (EPA 0992)

urban runoff - Stormwater from city streets and adjacent domestic or commercial properties that carries pollutants of various kinds into the sewer systems and receiving waters. (EPA 0992)

user - An individual who has been or will be directly involved in utilizing the document. (SSOP-0103, 10-14-92)

utility load - The total electricity demand for a utility district. (EPA 0992)

V

vaccine - Dead or modified antigen used to induce immunity to certain infectious diseases. (EPA 0992)

validation - 1. The process of evaluating a product at the end of the entire development process to ensure compliance with requirements, or the measurement of effectiveness regarding corrective actions. (RM-0012, 04-30-93) 2. The process of ensuring that a procedure or other instructional document is correct. The process will involve a walk-through of the procedure (where the procedure is used in the work area and verified under work conditions) or table-top review (a step by step examination of the procedure with appropriate personnel during a meeting.) (SSOP-0103, 10-14-92)

vapor - The gaseous phase of substances that are liquid or solid at atmospheric temperature and pressure, e.g., steam. (EPA 0992)

vapor capture system - Any combination of hoods and ventilation system that captures or contains organic vapors so they may be directed to an abatement or recovery device. (EPA 0992)

vapor dispersion - The movement of vapor clouds in air due to wind, thermal action, gravity spreading, and mixing. (EPA 0992)

vapor plumes - Flue gases visible because they contain water droplets. (EPA 0992)

vaporization - The change of state from liquid to gas. (EPA 0992)

variance - Government permission for a delay or exception in the application of a given law, ordinance, or regulation. (EPA 0992)

vector - 1. An organism, often an insect or rodent, that carries disease. (EPA 0992) 2. Plasmids, viruses, or bacteria used to transport genes into a host cell. A gene is placed in the vector; the vector then "infects" the bacterium. (EPA 0992)

vehicle miles travelled (VMT) - A measure of the extent of motor vehicle operation; the total number of vehicle miles travelled within a specific geographic area over a given period of time. (EPA 0992)

vendor - Non-Westinghouse Environmental Management Company of Ohio (WEMCO) employees requiring access to the Fernald Environmental Management Project (FEMP) for the purpose of providing supplies or another service at the FEMP in performance of their employers' contractual obligations resulting from WEMCO issued purchase orders. (SSOP-0051, 09-04-92)

vent - 1. The connection and piping through which gases enter and exit a piece of equipment. (EPA 0992) 2. A pipe or duct through which air-borne contaminants exit a building (e.g., from copying machines or laboratory equipment) (EPA 0992) 3. A ventilation duct in a basement or other part of a building. (EPA 0992)

ventilation/suction - The act of admitting fresh air into a space in order to replace stale or contaminated air; achieved by blowing air into the space. Similarly, suction represents the admission of fresh air into an interior space by lowering the pressure outside the space, thereby drawing the contaminated air outward. (EPA 0992) venturi scrubbers - Air pollution control devices that use water to remove particulate matter from emissions. (EPA 0992)

verification - The act of reviewing, inspecting, testing, checking, conducting surveillances, auditing, or otherwise determining and documenting whether items, processes, or services meet specified requirements. Verifications are performed by the line organization. (RM-0012, 04-30-93)

verification of training and retraining - The confirmation by an auditable record of the experience, education, medical conditions, training, and testing pertinent to a candidate's specific job assignment and responsibilities. This record should satisfy all applicable requirements to ensure safe operation and nuclear facilities. (DOE 5480.5, 09-23-86)

very high radiation area - An area, accessible to personnel, in which radiation levels could result in a person receiving an absorbed dose in excess of 500 rads (5 grays) in one hour at 1 meter from a radiation source or from any surface that the radiation penetrates. (DOE/EH-0256T, 0692)

vibra-core system - A 165-ton crane with a 220-foot long boom. This system utilizes acoustical vibrations imparted on the collection tube. These vibrations combined with the weight of the equipment liquifies the particles directly in contact with the collection tube instead of the churning and torquing as used in traditional drilling systems.

vinyl chloride - A chemical Compound, used in producing some plastics, that is believed to be oncogenic. (EPA 0992)

virgin materials - Resources extracted from nature in their raw form, such as timber or metal ore. (EPA 0992)

virus - the smallest form of microorganisms capable of causing disease. (EPA 0992)

visitor - Anyone who is not a Westinghouse Environmental Management Company of Ohio (WEMCO), Department of Energy (DOE), or Rust Engineering Company direct employee or a Rust Engineering Company subcontractor. **(FMPC-102, Rev. 1, Attachment A)

visitor - 1. A person requesting access to controlled areas, who has not been trained to the level required to permit unescorted access. (DOE/EH-0256T, 0692 and RM-0009, 05-13-92) 2. Any person other than Westinghouse Environmental Management Company of Ohio (WEMCO) and Department of Energy (DOE) employees, Interworks Requisition (IWR) personnel, and subcontractor or vendor personnel who has been properly authorized and issued temporary or permanent credentials for escorted access to the Fernald Environmental Management Project (FEMP). (SSOP-0051, 09-04-92) 3. Anyone who is not an employee of FERMCO or the DOE, and who wishes to visit the site. (SSOP-0099,) 4. ...one who makes an official or professional call; one that makes formal visits of inspection... (Webster's 9th, 1985)

vitrification - To convert into glass or glassy substance by heat and fusion.

volatile - Any substance that evaporates readily. (EPA 0992)

volatile organic compound (VOC) - Any organic compound that participates in atmospheric photochemical reactions except those designated by EPA as having negligible photochemical reactivity. (EPA 0992) volatile synthetic organic chemicals - Chemicals that tend to volatilize or evaporate. (EPA 0992)

volume reduction - Processing waste materials to decrease the amount of space they occupy, usually by compacting or shredding, incineration, or composing. (EPA 0992)

volumetric tank test - One of several tests to determine the physical integrity of a storage tank; the volume of fluid in the tank is measured directly or calculated from product-level changes. A marked drop in volume indicates a leak. (EPA 0992)

vulnerable zone - An area over which the airborne concentration of a chemical accidentally released could reach the level of concern. (EPA 0992)

vulnerability analysis - Assessment of elements in the community that are susceptible to damage should a release of hazardous materials occur. (EPA 0992)

W

waste - 1. Unwanted materials left over from a manufacturing process. (EPA 0992) 2. Refuse from places of human and animal habitation. (EPA 0992) 3. Material or equipment with low levels of uranium or thorium contamination or uncontaminated, generated during a construction, demolition, or maintenance activity and which is unusable for the project. (SSOP-0027, 02-07-92) 4. Refuse or discarded materials that are abandoned, inherently waste-like, or recycled. Waste can be comprised of solids, liquids, or gases. (SSOP-0044, 06-19-92)

waste container - 1. A receptacle for waste, including any liner or shielding material that is intended to accompany the waste in disposal. (DOE 5820.2A, 09-26-88) 2. White metal boxes or International Shipping Organization (ISO) containers (either top load or end load) into which waste will be loaded. (SSOP-0027, 02-07-92)

waste exchange - Arrangement in which companies exchange their wastes for the benefit of both parties. (EPA 0992)

waste feed - The continuous or intermittent flow of wastes into an incinerator. (EPA 0992)

waste generator - Individual who generates and/or packages wastes. (SSOP-0027, 02-07-92)

waste load allocation - The maximum load of pollutants each discharger of waste is allowed to release into a particular waterway. Discharge limits are usually required for each specific water quality criterion being, or expected to be, violated. The portion of a stream's total assimilative capacity assigned to an individual discharge. (EPA 0992)

waste management - The planning, coordination, and direction of those functions related to generation, handling, treatment, storage, transportation, and disposal of waste, as well as associated surveillance and maintenance activities. (DOE 5820.2A, 09-26-88)

waste material - A substance which has expended its usefulness, non-recyclable and non-recoverable. (SSOP-0002, 10-22-91)

waste minimization - Measures or techniques that reduce the amount of wastes generated during industrial production processes; the term is also applied to recycling and other efforts to reduce the amount of waste going into the waste stream. (EPA 0992)

waste originator - Any person, or WEMCO Section, whose operation or process generates hazardous waste, radioactive waste, or a mixed waste. (PP-0314, 12-20-91)

waste package - The waste, waste container, and any absorbent that are intended for disposal as a unit. In the case of surface contaminated, damaged, leaking, or breached waste packages, any overpack shall be considered the waste container, and the original container shall be considered part of the waste. (DOE 5820.2A, 09-26-88)

waste packaging area - An area adjacent to the construction site where empty waste containers are filled with construction waste. NOTE: The packaging area background radiation level shall not exceed limits established by IRS&T if waste will be transferred to a dedicated clean storage area or transported from the site. (SSOP-0044, 06-19-92) waste reduction - Using source reduction, recycling, or composting to prevent or reduce waste generation. (EPA 0992)

waste sampling request - Requirements provided by Environmental Engineering to Environmental Monitoring for number of samples, type, locations, and lab analysis necessary to characterize project waste. (SSOP-0044, 06-19-92)

waste stream - The total flow of solid waste from homes, businesses, institutions, and manufacturing plants that are recycled, burned, or disposed of in landfills, or segments thereof such as the "residential waste stream" or the "recyclable waste stream." (EPA 0992)

waste treatment plant - A facility containing a series of tanks, screens, filters, and other processes by which pollutants are removed from water. (EPA 0992)

waste treatment stream - The continuous movement of waste from generator to treater and disposer. (EPA 0992)

wastewater - The spent or used water from a home, community, farm, or industry that contains dissolved or suspended matter. (EPA 0992)

wastewater infrastructure - The plan or network for the collection, treatment, and disposal of sewage in a community. The level of treatment will depend on the size of the community, the type of discharge, and /or the designated use of the receiving water. (EPA 0992)

wastewater operations and maintenance - Actions taken after construction to assure that facilities constructed to treat wastewater will be operated, maintained, and managed to reach prescribed effluent levels in an optimum manner. (EPA 0992)

water pollution - The presence in water of enough harmful or objectionable material to damage the water's quality. (EPA 0992)

water purveyor - A public utility, mutual water company, county water district, or municipality that delivers drinking water to customers. (EPA 0992)

water quality criteria - Levels of water quality expected to render a body of water suitable for its designated use. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, fish production, or industrial processes. (EPA 0992)

water quality standards - State-adopted and EPA-approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses. (EPA 0992)

water quality-based limitations - Effluent limitations applied to dischargers when mere technology-based limitations would cause violations of water quality standards. Usually applied to discharges into small streams. (EPA 0992)

water quality-based permit - A permit with an effluent limit more stringent than one based on technology performance. Such limits may be necessary to protect the designated use of receiving waters, (i.e., recreation, irrigation, industry, or water supply.) (EPA 0992) water solubility - The maximum possible concentration of a chemical compound dissolved in water. If a substance is water soluble it can very readily disperse through the environment. (EPA 0992)

water supplier - One who owns or operates a public water system. (EPA 0992)

Water Supply System - The collection, treatment, storage, and distribution of potable water from source to consumer. (EPA 0992)

water table - the level of groundwater. (EPA 0992)

watershed - the land area that drains into a stream. (EPA 0992)

weighing factor - 1. Is used in the calculation of annual and committed effective dose equivalent to equate the risk arising from the irradiation of tissue T to the total risk when the whole body is uniformly irradiated. The weighing factors as defined in International Council on Radiation Protection (ICRP) Publication 26 and National Council on Radiation Protection (NCRP) Report 91 are:

Organs or Tissues	Weighing Factor
Gonads	0.25
Breasts	0.15
Red Bone Marrow	0.12
Lungs	0.12
Thyroid	0.03
Bone Surfaces	0.03
Remainder[1]	0.30

[1] "Remainder" means the five other organs or tissue with the highest dose (e.g., liver, kidney, spleen, thymus, adrenal, pancreas, stomach, small intestine, upper large intestine or lower large intestine.) The weighing factory for each remainder organ or tissue is 0.06. The extremities, skin, and lens of the eye are excluded from the "remainder" organs or tissue for assessment of effective dose equivalent. (DOE 5480.11, 12-21-88) 2. Factor that represents the proportion of the total stochastic (cancer plus genetic) risk resulting from irradiation to tissue to the total risk when the whole body is irradiated uniformly. (DOE/EH-0256T, 0692)

well - A shaft or a dug hole whose depth is greater that the largest surface diameter and whose purpose is to reach underground water supplies or oil, or to store or bury fluids below ground. (EPA 0992)

well logs - The written or recorded facts having to do with drilling a well.

well injection - The subsurface emplacement of fluids into a well. (EPA 0992)

well monitoring - Measurements by onsite instruments or laboratory methods of well water quality. (EPA 0992)

well plug - A watertight, gastight seal installed in a bore hole or well to prevent movement of fluids. (EPA 0992)

wellhead protection area - A protected surface and subsurface zone surrounding a well or wellfield supplying a public water system to keep contaminants from reaching the well water. (EPA 0992)

0343

wetlands - An area that is saturated by surface or groundwater with vegetation adapted for life under those soil conditions, as swamps, bogs, fens, marshes, and estuaries. (EPA 0992)

whole body dose - The sum of the annual deep dose equivalent for external exposures and the committed effective dose equivalent for internal exposures. (DOE/EH-0256T, 0692)

wildlife refuge - An area designated for the protection of wild animals, within which hunting and fishing are either prohibited or strictly controlled. (EPA 0992)

wood-burning stove pollution - Air pollution caused by emissions of particulate matter, carbon monoxide, total suspended particulates, and polycyclic organic matter from wood-burning stoves. (EPA 0992)

wood treatment facility - An industrial facility that treats lumber and other wood products for outdoor use. The process employs chromated copper arsenate, which is regulated as a hazardous material. (EPA 0992)

work - Process of performing a defined task or activity; for example, research and development, operations, maintenance and repair, administration, software development and use, inspection, safeguards and security, data collection, and analysis. (DOE 5700.6C, 08-21-91 and RM-0012, 04-30-93)

working level (WL) - A unit of measure for documenting exposure to radon decay products, the so-called "daughter." One working level is equal to approximately 200 picocuries per liter. (EPA 0992)

working level month (WLM) - A unit of measure used to determine cumulative exposure to radon. (EPA 0992)

X

xenobiote - Any biotum displaced from its normal habitat; a chemical foreign to a biological system. (EPA 0992)

Y

yard waste - The part of solid waste composed of grass clippings, leaves, twigs, branches, and garden refuse. (EPA 0992)

yellow-boy - Iron oxide flocculent (clumps of solids in waste or water); usually observed as orange-yellow deposits in surface streams with excess iron content. (See: floc, flocculation, EPA 0992) (EPA 0992)

Z

Z-list - Occupational Safety and Health Administration's (OSHA) tables of toxic and hazardous air contaminants. (EPA 0992)

Zimlo slurry - Neutralized zirconium/hydrofluoric acid residue generated by the decladding operation in Plant 9. This material was pumped directly to the waste pits.

zone of saturation - (See: saturated zone, EPA 0992) (EPA 09920

zooplankton - Tiny aquatic animals eaten by fish. (EPA 0992)

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APPENDIX F.5

REFERENCES FOR OPERABLE UNIT 1 RI REPORT

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APPENDIX F.6

PROCESS BACKGROUND

INDEX OF APPENDICES FOR SECTION F.6

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APPENDIX F.6.1
PLANT PRODUCTION

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PLANT PRODUCTION

The following tables summarize the production from each process at the facility. This data was compiled using Effective Production and Unit Cost Reports and Production Tonnage Report.

TABLE F.6.1-1

PRODUCTION - PLANT 2/3 (REFINERY)

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Fiscal Year	UO_3 Production (MTU)			
	Normal	Enriched	Depleted	Total
1952	0	0	0	0
1953	0	0	0	0
1954	642	0	0	642
1955	3,288	0	0	3,288
1956	5,379	0	0	5,379
1957	8,370	0	0	8,370
1958	10,039	0	0	10,039
1959	11,540	0	0	11,540
1960	12,187	0	0	12,187
1961	11,039	0	0	11,039
1962	6,288	0	0	6,288
1963	0	0	0	0
1964	0	0	0	0
1965	0	543	0	543
1966	196	1,151	0	1,347
1967	832	1,003	0	1,835
1968	1,557	1,694	0	3,251
1969	665	1,363	0	2,028
1970	259	580	41	880
1971	574	235	0	809
1972	2,395	366	0	2,761
1973	3,532	2	0	3,534
1974	7,114	0	0	7,114
1975	8,189	0	0	8,189
1976*	9,752	0	0	9,752
1977	1,673	518	0	2,191
1978	0	0	0	0
1979	0	0	0	0
1980	0	0	0	0

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TABLE F.6.1-1
(Continued)

Fiscal Year	UO_3 Production (MTU)			
	Normal	Enriched	Depleted	Total
1981	0	103	0	103
1982	0	203	0	203
1983	0	319	0	319
1984	0	306	0	306
1985	0	145	0	145
1986	0	2	0	2
1987	0	170	0	170
1988	0	93	0	93
1989	0	0	0	0
Totals	105,510	8,796	41	114,347

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TABLE F.6.1-2

PRODUCTION - PLANT 4 (GREEN SALT)

Fiscal Year	UF_4 Production (MTU)			
	Normal	Enriched (from UO3)	Depleted	Total
1952	0	0	0	0
1953	0	0	0	0
1954	1,568	0	0	1,568
1955	3,314	0	0	3,314
1956	5,029	0	0	5,029
1957	9,358	0	0	9,358
1958	11,577	0	0	11,577
1959	8,459	0	0	8,459
1960	10,426	0	0	10,426
1961	8,966	0	0	8,966
1962	7,849	0	0	7,849
1963	7,928	1,075	0	9,003
1964	4,145	997	0	5,142
1965	3,117	2,888	0	6,005
1966	2,052	3,381	107	5,540
1967	2,632	3,283	677	6,592
1968	1,219	3,590	1,549	6,358
1969	494	2,327	1,386	4,207
1970	1,009[a]	914	943	2,866
1971	55	525	876	1,456
1972	0	347	1,028	1,375
1973	0	0	2,159	2,159
1974	0	342	980	1,322
1975	0	634	1,144	1,778
1976*	0	0	1,276	1,276
1977	0	0	1,950	1,950
1978	0	544	1,735	2,279
1979	0	0	1,513	1,513
1980	0	479	2,059	2,538

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TABLE F.6.1-2
(Continued)

Fiscal Year	UF$_4$ Production (MTU)			
	Normal	Enriched (from UO3)	Depleted	Total
1981	0	562	2,105	2,667
1982	0	366	3,999	4,365
1983	0	1,145	3,599	4,744
1984	0	1,240	5,828	7,068
1985	60	1,086	4,292	5,438
1986	0	1,068	5,043	6,111
1987	0	280	5,093	5,373
1988	0	388	1,387	1,775
1989	0	0	0	0
Totals	89,257	27,461	50,728	167,446

Note: a) Includes 343 MTU of PNUR production.

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TABLE F.6.1-3

PRODUCTION - PLANT 5 (METAL PRODUCTION)[a]

Fiscal Year	Derby Production (MTU)				Ingot Casting (MTU)			
	Normal	Enriched	Depleted	Total	Normal	Enriched	Depleted	Total
1952	0	0	0	0	0	0	0	0
1953	45	0	0	45	90	0	0	90
1954	2,099	0	0	2,099	3,976	0	0	3,976
1955	5,824	0	(b)	5,824	9,528	0	(b)	9,528
1956	8,459	0	(b)	8,459	12,037	0	(b)	12,037
1957	6,113	0	0	6,113	12,680	0	0	12,680
1958	6,260	489	0	6,749	12,727	0	0	12,727
1959	6,881	878	0	7,759	13,365	0	0	13,365
1960	9,704	882	0	10,586	16,708	0	0	16,708
1961	7,052	1,418	0	8,470	12,691	0	0	12,691
1962	6,782	1,781	0	8,563	12,865	0	0	12,865
1963	7,655	2,588	0	10,243	14,285	0	0	14,285
1964	4,080	3,568	0	7,648	11,655	0	0	11,655
1965	2,991	3,441	0	6,432	10,234	0	0	10,234
1966	2,018	3,054	94	5,166	6,498	1,376	67	7,941
1967	2,756	3,547	236	6,539	5,266	5,271	432	10,969
1968	1,255	3,435	660	5,350	2,503	4,703	2,248	9,454
1969	95	2,578	1,344	4,017	192	3,906	2,540	6,638
1970	1,974	261	650	2,885	3,762	394	1,269	5,425
1971	172	205	967	1,344	435	102	1,838	2,375
1972	0	225	992	1,217	0	51	1,632	1,683
1973	0	170	1,969	2,139	0	32	3,260	3,292
1974	0	362	954	1,316	5	180	1,525	1,710
1975	0	325	797	1,122	0	132	1,041	1,173
1976*	0	140	1,564	1,704	0	61	2,080	2,141
1977	35	219	1,525	1,780	0	61	2,114	2,175
1978	0	291	1,848	2,139	0	58	1,910	1,968
1979	0	272	1,346	1,618	0	0	1,386	1,386
1980	0	217	1,806	2,023	0	0	1,989	1,989

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TABLE F.6.1-3
(Continued)

Fiscal Year	Derby Production (MTU)				Ingot Casting (MTU)			
	Normal	Enriched	Depleted	Total	Normal	Enriched	Depleted	Total
1981	0	588	2,020	2,608	0	0	2,047	2,047
1982	0	682	3,477	4,159	0	0	3,732	3,732
1983	0	1,085	3,717	4,802	0	610	3,959	4,569
1984	0	1,054	5,237	6,290	0	239	3,694	3,933
1985	218	1,111	3,746	5,075	691	125	3,743	4,559
1986	215	1,010	4,981	6,205	206	0	4,104	4,310
1987	0	346	4,260	4,606	0	0	4,501	4,501
1988	0	305	2,362	2,667	0	0	3,109	3,109
1989	0	0	23	23	0	0	883	883
Totals	82,683	36,528	46,573	147,208	162,399	17,301	55,103	234,803

Notes: a) Includes metal reduction and casting associated with Plant 9 and the Pilot Plant.

b) Production records for these years have been destroyed. However, records do indicate that production occurred since depleted residues were generated and discarded to Waste Pit 1.

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TABLE F.6.1-4

PRODUCTION - PLANT 6 (METALS FABRICATION)[a]

Fiscal Year	Rod Production (MTU)				Machining of Cores and Target Elements (MTU)			
	Depleted	Normal	Enriched	Total	Normal	Enriched	Depleted	Total
1952		0	0	0	0	0	0	0
1953		1,966	0	1,966	1,608	0	0	1,608
1954		5,679	0	5,679	3,581	0	0	3,581
1955		9,973	0	9,973	6,752	0	0	6,752
1956		12,470	0	12,470	8,086	0	0	8,086
1957		15,074	0	15,074	8,629	0	0	8,629
1958		12,937	728	13,665	7,961	0	0	7,961
1959		12,887	1,146	14,033	6,660	0	0	6,660
1960		17,255	1,277	18,532	8,330	0	0	8,330
1961		13,214	2,156	15,370	6,306	0	0	6,306
1962		13,518	1,912	15,430	6,906	0	0	6,906
1963		12,101	2,406	14,507	7,396	0	0	7,396
1964		8,958	2,355	11,313	6,428	0	0	6,428
1965		8,925	3,385	12,310	5,665	0	0	5,665
1966		4,981	2,702	7,683	3,312	1,786	0	5,098
1967	174	5,031	2,371	7,576	2,983	2,639	103	5,725
1968	5	1,895	3,129	5,029	1,246	1,818	1,012	4,076
1969	1	284	3,096	3,381	133	1,944	1,150	3,227
1970	4	2,801	504	3,309	1,779	326	777	2,882
1971		959	109	1,068	410	0	941	1,351
1972				0			922	922
1973				0			1,881	1,881
1974				0			870	870
1975				0			797	797
1976*				0			1,065	1,065
1977				0			1,110	1,110
1978				0			1,172	1,172
1979				0			900	900
1980				0			999	999

TABLE F.6.1-4
(Continued)

Fiscal Year	Rod Production (MTU)				Machining of Cores and Target Elements (MTU)			
	Depleted	Normal	Enriched	Total	Normal	Enriched	Depleted	Total
1981				0			1,127	1,127
1982				0			1,821	1,821
1983				0			2,011	2,011
1984				0			1,924	1,924
1985				0			1,860	1,860
1986				0			1,743	1,743
1987				0			426	426
1988				0			8	8
1989				0				0
Totals	184	160,908	27,276	188,368	94,171	8,513	24,617	127,301

Note: a) Includes production in Plant 9 and the Pilot Plant.

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TABLE F.6.1-5

PRODUCTION - PLANT 8 (REFINERY FEED)

Fiscal Year	Refinery Feed (MTU)				
	Normal	Enriched	Depleted	Total Uranium	Thorium
1952	0	0	0	0	
1953	0	0	0	0	
1954	266	0	0	266	
1955	1,160	0	0	1,160	
1956	1,764	0	0	1,764	
1957	1,927	0	0	1,927	
1958	2,018	0	0	2,018	
1959	2,568	0	0	2,568	
1960	3,188	0	0	3,188	
1961	2,902	0	0	2,902	
1962	2,820	0	0	2,820	
1963	2,115	542	0	2,657	
1964	2,380	1,125	0	3,505	
1965	1,182	952	0	2,134	
1966	650	967	0	1,617	59
1967	855	982	0	1,837	
1968	687	1,530	5	2,222	
1969	256	759	21	1,036	148
1970	423	204	22	649	100
1971	128	172	7	307	62
1972	7	103	1	111	
1973	21	45	0	66	
1974	3	0	0	3	
1975	11	32	0	43	
1976*	12	39	0	51	
1977	0	386	0	386	
1978	0	122	0	122	
1979	0	184	0	184	
1980	0	118	0	118	

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TABLE F.6.1-5
(Continued)

Fiscal Year	Refinery Feed (MTU)				
	Normal	Enriched	Depleted	Total Uranium	Thorium
1981	0	41	0	41	
1982	0	237	0	237	
1983	0	376	0	376	
1984	0	261	0	261	
1985	5	143	40	188	
1986	2	141	33	176	
1987	0	223	883	1,106	
1988	10	69	181	260	
1989	0	0	0	0	
Totals	27,360	9,753	1,193	38,306	369

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TABLE F.6.1-6

PRODUCTION - PLANT 9 (SPECIAL PRODUCTS)

Fiscal Year	Ingot Casting (MTU)					Cores and Target Element Production (MTU)				
	Depleted	NPR Normal	Enriched	NPR Enriched	Total	Depleted	Normal	Enriched	NPR Enriched	Total
1952		0	0	0	0	0	0	0	0	0
1953		0	0	0	0	0	0	0	0	0
1954		0	0	0	0	0	0	0	0	0
1955		0	0	0	0	0	0	0	0	0
1956		0	0	0	0	0	0	0	0	0
1957		0	0	0	0	0	0	0	0	0
1958		0	732	0	732	0	0	417	0	417
1959		0	1,251	0	1,251	0	0	660	0	660
1960		0	1,388	0	1,388	0	0	801	0	801
1961		0	2,364	0	2,364	0	0	1,246	0	1,246
1962		0	2,663	0	2,663	0	0	1,305	0	1,305
1963		0	3,660	0	3,660	0	0	1,836	0	1,836
1964		0	5,297	0	5,297	0	0	2,851	0	2,851
1965		0	5,361	0	5,361	0	0	3,009	0	3,009
1966		0	3,366	0	3,366	7	308	1,116	1868	3,299
1967	31	0		1,227	1,258	145	0	2,091	478	2,714
1968		0		690	690	1,847	5	1,404	910	4,166
1969		0		778	778	1,887	0	0	1093	2,980
1970		0		499	499	1,277	0	0	675	1,952
1971		0		422	422	1,550	0	0	132	1,682
1972		0		599	599	1,301	0	0	537	1,838
1973		0		452	452	2,666	0	26	375	3,067
1974		37		993	1,030	1,295	34	0	892	2,221
1975		0		697	697	835	0	0	697	1,532
1976*		0		304	304	1,711	0	0	284	1,995
1977		0		381	381	1,778	0	0	296	2,073
1978		0		480	480	1,487	0	0	445	1,932
1979		0		604	604	1,132	0	0	427	1,559
1980		0		380	380	1,525	0	0	263	1,788

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TABLE F.6.1-6
(Continued)

Fiscal Year	Ingot Casting (MTU)					Cores and Target Element Production (MTU)				
	Depleted	NPR Normal	Enriched	NPR Enriched	Total	Depleted	Normal	Enriched	NPR Enriched	Total
1981		0		796	796	1,613	0	0	601	2,214
1982		0		974	974	2,890	0	1[a]	675	3,566
1983		0		1,366	1,366	3,005	0	272[a]	1,114	4,390
1984		0		1,516	1,516	2,955	0	0	1,299	4,253
1985		48		1,026	1,074	2,083	47	0	1,299	3,428
1986		179		1,461	1,640	2,859	180	0	1,183	4,222
1987		10		735	745	227	31	0	451	709
1988		0		394	394	2	0	0	337	339
1989		0		0	0	0	0	0	0	0
Totals		274	26,082	16,774	43,161	36,074	605	17,035	16,331	70,044

Note: a) SRP - 1.1%

TABLE F.6.1-7

PRODUCTION - PILOT PLANT

Fiscal Year	UF4 Production (MTU)			
	Normal	Enriched	Depleted	Total
1952	0	0	0	0
1953	0	0	0	0
1954	0	0	0	0
1955	0	0	0	0
1956	0	0	0	0
1957	0	0	0	0
1958	0	540	0	540
1959	0	995	0	995
1960	0	962	0	962
1961	0	1,676	0	1,676
1962	0	1,619	0	1,619
1963	0	1,479	0	1,479
1964	0	2,061	0	2,061
1965	0	792	0	792
1966	0	741	0	741
1967	0	348	0	348
1968	0	0	0	0
1969	0	0	0	0
1970	0	0	0	0
1971	0	0	0	0
1972	0	0	0	0
1973	0	0	0	0
1974	0	0	0	0
1975	0	0	0	0
1976*	0	0	0	0
1977	0	0	0	0
1978	0	0	0	0
1979	0	0	0	0
1980	0	0	0	0

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TABLE F.6.1-7
(Continued)

Fiscal Year	UF4 Production (MTU)			
	Normal	Enriched	Depleted	Total
1981	0	0	0	0
1982	0	0	0	0
1983	0	0	0	0
1984	0	0	0	0
1985	511	111	0	622
1986	92	125	245	462
1987	0	160	382	542
1988	0	0	1,642	1,642
1989	0	0	0	0
Totals	602	11,610	2,269	14,481

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APPENDIX F.6.2
COMPOSITION OF ORE CONCENTRATES

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COMPOSITION OF ORE CONCENTRATES

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Ore concentrates were processed through the Refinery (Plant 2/3) throughout much of the life of the facility. This processing resulted in the generation of raffinates that were deposited in the Waste Pits, as described in Appendix F.6.4. Most of the impurities contained in the ore concentrates ended up in the Waste Pits with the raffinates. Table F.6.2-1 summarizes the range of concentrations of the impurities in the ore concentrates as well as the calculated average concentrations used to estimate the characteristics in the pits.

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TABLE F.6.2-1

COMPOSITION OF ORE CONCENTRATES

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Constituent	Composition (% - Sample Basis)[a]			
	Low	High	Average[b]	Adjusted[c]
U_3O_8 (84.8% U)			74.423	82.696
Aluminum (Al)	0.013	0.351	0.081	0.090
Antimony (Sb)	0.000	0.002	0.001	0.001
Arsenic (As)	0.003	0.800	0.110	0.122
Boron (B)	0.000	0.005	0.001	0.001
Bismuth (Bi)	0.001	0.001	0.001	0.001
Cadmium (Cd)	0.006	0.007	0.007	0.007
Calcium (Ca)	0.050	2.180	1.141	1.267
Chloride (Cl)	0.005	0.246	0.066	0.074
Chromium (Cr)	0.003	0.045	0.006	0.007
Cobalt (Co)	0.003	0.004	0.002	0.002
Copper (Cu)	0.003	0.200	0.025	0.028
Dysprosium (Dy)	0.000	0.027	0.004	0.004
Erbrium (Er)	0.000	0.002	0.000	0.000
Europium (Eu)	0.000	0.001	0.000	0.000
Flouride (F)	0.004	0.086	0.014	0.015
Gadolinium (Gd)	0.000	0.013	0.002	0.003
Holmium (Ho)	0.000	0.003	0.000	0.000
Iron (Fe)	0.019	4.140	1.267	1.408
Lead (Pb)	0.001	0.019	0.007	0.007
Lutetium (Lu)	0.000	0.001	0.000	0.000
Magnesium (Mg)	0.091	3.240	1.089	1.210
Manganese (Mn)	0.001	0.091	0.016	0.018
Molybdenum (Mo)	0.001	0.770	0.093	0.103
Nickel (Ni)	0.001	0.003	0.001	0.001
Samarium (Sm)	0.000	0.003	0.000	0.000
Sodium (Na)	0.001	9.900	1.651	1.835
Terbium (Tb)	0.000	0.001	0.000	0.000

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TABLE F.6.2-1
(Continued)

Constituent	Composition (% - Sample Basis)[a]			
	Low	High	Average[b]	Adjusted[c]
Thorium (Th)	0.001	1.060	0.163	0.181
Thulium (Tm)	0.000	0.001	0.000	0.000
Tin (Sn)	0.000	0.075	0.006	0.006
Vanadium (V)	0.003	2.590	0.679	0.755
Yttrium (Y0)	0.000	0.038	0.005	0.005
Ytterbium (Yb)	0.000	0.004	0.001	0.001
Zinc (Zn)	0.006	0.145	0.016	0.018
NH_3	0.000	1.137	0.086	0.095
CO_3	0.037	4.551	0.410	0.456
PO_4	0.005	3.480	0.344	0.382
P_2O_5	0.090	4.780	1.071	1.191
SiO_2	0.040	5.910	1.659	1.843
SO_4	0.005	42.032[d]	5.015	5.572
V_2O_5	0.010	3.880	0.533	0.592
Totals			89.996	100.000

Notes: a) (NLO 1959 and NLO 1959a).
b) Based on over 700 samples from 38 different mines. The averages were weighted based on the number of samples from each mine as an indication of the relative amounts processed.
c) Adjusted to make total equal 100%.
d) From Belgian Congo Pitchblend.

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APPENDIX F.6.3
GENERATION OF SLUDGE FROM THE GENERAL SUMP

GENERATION OF SLUDGE FROM THE GENERAL SUMP

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Table F.6.3-1 summarizes the estimated amount of sludge generated at the General Sump and deposited in the waste pits.

Basis of Estimates

The effluent flow, uranium and thorium losses from the General Sump to the waste pits are based on actual records for FY67 through FY84 (NLO Losses). The effluent flow and uranium losses for the remaining years are based on correlations with derby production in Plant 5.

The solids content in the water from the General Sump is reported to be in the range 2 to 10 percent (NLO 1958). Records for three months in 1979 (NMC Losses) were the only ones found documenting the solids content from the General Sump when solids were still being mixed in the General Sump. This information indicates a solids content of approximately 2 percent, suggesting that normal operation was in the lower end of the range. Therefore, a solids content in the effluent from the General Sump to the waste pits of 3 percent has been assumed for the period prior to 1984.

Records from 1985, after the solids in the General Sump were allowed to settle prior to discharge to the waste pits, indicates a solids content of 1 percent. This has been used as indicative of the average condition for the period 1984-1987.

Waste Pits

Effluent from the General Sump was primarily discharged to Waste Pits 3 and 5. Prior to the opening of Waste Pit 3 in December 1958, it is known that the effluent was discharged to Waste Pit 2. Prior to the opening of Waste Pit 2 in 1957, it has been assumed that the General Sump discharged to Waste Pit 1.

1. Waste Pit 1

   Effluent from the General Sump is assumed to have been pumped to Waste Pit 1 from FY52 through FY56 when Waste Pit 2 was opened.

   ==> (see Table F.6.3-1) 10,764 MT solids
   1.7 MT uranium

   At 1,440 Kg/m^3 (90 lb/ft^3), the solids account for 7,500 m^3 in Waste Pit 1.

2. Waste Pit 2

   Effluent from the General Sump is assumed to have been pumped to Waste Pit 2 in FY 57 and FY58, when Waste Pit 3 opened.

   ==> (see Table F.6.3-1) 6,578 MT solids
   1.0 MT uranium

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At 1,440 Kg/m^3 (90 lb/ft^3), the solids account for 4,600 m^3 in Waste Pit 2.

3. Waste Pit 3

   Effluent from the General Sump is assumed to have been pumped to Waste Pit 3 from FY 59 through FY68.

==> (see Table F.6.3-1)	41,720 MT solids
	11.5 MT uranium
	0.026 MT thorium

   At 1,440 Kg/m^3 (90 lb/ft^3), the solids account for 29,000 m^3 in Waste Pit 3.

4. Waste Pit 5

   Effluent from the General Sump is assumed to have been pumped to Waste Pit 5 from FY 69 through FY87. Note that the solids in the General Sump were allowed to settle prior to pumping the supernatant to the waste pits after 1983. The solids content for this period is assumed to be 1 percent.

==> (see Table F.6.3-1)	53,493 MT solids
	19.8 MT uranium
	3.989 MT thorium

   At 1,440 Kg/m^3 (90 lb/ft^3), the solids account for 37,100 m^3 in Waste Pit 5.

<u>Constituents</u>

Prior to being discharged to the General Sump, wastewater was neutralized to precipitate uranium and filtered at the individual processing plants. Fifty percent of the nonuranium solids in the effluent from the General Sump to the waste pits have been assumed to be lime used for pH adjustment.

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TABLE F.6.3-1

GENERATION OF SLUDGE FROM THE GENERAL SUMP

Fiscal Year	Plant 5 Derby Production (MTU)[a]	Effluent from General Sump to Waste Pits				Waste Pit
		Flow (MM Gal)[b]	Solids (MT)[c],[d]	Uranium (MTU)[d]	Thorium (MT)[d]	
1952	0	8.50	966	0.2		1
1953	45	8.65	982	0.2		1
1954	2,099	15.18	1,724	0.3		1
1955	5,824	27.02	3,070	0.4		1
1956	8,459	35.40	4,022	0.6		1
Sub-Total/Waste Pit 1			10,764	1.7		
1957	6,113	27.94	3,174	0.5		2
1958	6,749	29.97	3,404	0.5		2
Sub-Total/Waste Pit 2			6,578	1.0		
1959	7,759	33.18	3,769	0.5		3
1960	10,586	42.17	4,790	0.7		3
1961	8,470	35.44	4,026	0.6		3
1962	8,563	35.73	4,059	0.6		3
1963	10,243	41.08	4,666	0.7		3
1964	7,648	32.82	3,729	0.5		3
1965	6,432	28.96	3,289	0.5		3
1966	5,166	24.93	2,832	0.4		3
1967		43.93	4,991	3.5	0.004	3
1968		49.03	5,569	3.5	0.022	3
Sub-Total/Waste Pit 3			41,720	11.5	0.026	
1969		40.68	4,621	1.7	0.270	5
1970		46.48	5,280	5.0	3.444	5
1971		38.43	4,365	1.0	0.092	5
1972		50.11	5,692	1.8	0.114	5
1973		49.57	5,631	2.4	0.017	5
1974		48.19	5,474	1.8	0.035	5
1975		20.53	2,332	1.0	0.017	5
1976*		3.99	454	0.3		5

TABLE F.6.3-1
(Continued)

Fiscal Year	Plant 5 Derby Production (MTU)[a]	Effluent from General Sump to Waste Pits				Waste Pit
		Flow (MM Gal)[b]	Solids (MT)[c],[d]	Uranium (MTU)[d]	Thorium (MT)[d]	
1977		15.36	1,745	0.9		5
1978		12.83	1,457	0.4		5
1979		15.85	1,800	0.5		5
1980		15.66	1,779	0.2		5
1981		16.40	1,863	0.2		5
1982		22.80	2,589	0.5		5
1983		21.16	2,403	0.5		5
1984		29.73	1,689	0.3		5
1985	5,075	24.64	1,400	0.4		5
1986	6,205	28.24	1,604	0.5		5
1987	4,606	23.15	1,315	0.4		5
Sub-Total/Waste Pit 5			53,493	19.8	3.989	

Notes: a) From Table F.6.1-3 of Appendix F.6.1. Records for 1967 through 1984 are not shown because actual records of flow were used for these years.
b) Based on actual records for 1967 through 1984 and estimates for remaining years.
c) Assuming 3 percent solids in the liquid from the General Sump through FY84 and 1 thereafter.
d) Based on actual records for 1967 through 1984 and estimates for remaining years based on a correlation between Plant 5 Derby Production.

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APPENDIX F.6.4
NEUTRALIZED RAFFINATE GENERATION

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NEUTRALIZED RAFFINATE GENERATION

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1. Waste Production Factors

Raffinate Cake: 228 lb/100 lb UO_3[1] (Mallinckrodt 1957)

==> 2.74 lb/lb U

==> Waste Factor = 0.822 lb/lb U

(assuming 70% moisture (Cavendish 1975))

Concentrates are an average of 70.1% U (Appendix F.6.3).

==> 0.427 lb impurities/lb U

==> 0.822 - 0.427 = 0.395 lb chemicals/lb U

Residues are an estimated 75% U (and therefore produce less raffinate waste).

==> 0.333 lb impurities/lb U

==> Waste Factor = 0.333 + 0.395 (chemicals) = 0.728 lb/lb U[2]

2. Raffinate Generation

Table F.6.4-1 summarizes the raffinate generated from the production of UO_3 in the Refinery. Note that raffinates were dried and not neutralized through 1959. Therefore, the waste factor used for the raffinate generated during this period does not include neutralization chemicals.

In the early years of production (1953 to 1959), residues from other AEC sites were sent to FMPC for storage. This material (K-65 residues) had been processed to remove the uranium but had elevated radium levels and was, therefore, deposited directly in Silos 1 and 2. Although the volume of these residues has no bearing on the amount of residues generated at the site or deposited in the waste pits, this information is provided in anticipation of questions about the K-65 residues in regards to the waste pits.

In this same time frame, ore concentrates (from Australia) and Q-11 ores (from the former Belgian Congo), which both contained high radium levels were processed at FMPC for recovery of the uranium values. The residues from the processing of this material ("hot" raffinate) are included in the estimated amount of Raffinate Generated shown on Table F.6.4-1. Records indicate that 3,530 MT of this material was deposited in the Silos.

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[1] For processing of concentrates and includes moisture, residual chemicals, and lime for neutralization.

[2] This compares very favorably with the factor that was developed during the LLWPS Study (NLO 1983).

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Records also indicate that approximately 635 MT of cold metal oxides was shipped off-site for disposal (NLO 1963). This amount is also included in the estimated amount of Raffinate Generated.

3. Raffinate Deposited in Waste Pits

   A. Waste Pit 1

      No Neutralized Raffinates were deposited in Waste Pit 1.

   B. Waste Pit 2

      Records indicate that 882 drums of cold metal oxide were deposited in Waste Pit 2 in 1958 (NLO 1958a) and 1,500 drums in 1959 (NLO 1959b). This material was spray calcined or drum dried prior to disposal.

      Amount Deposited: 2,382 drums x 400 lb/drum (estimated) = 952,800 lb = 433 MT

      At 960 kg/m^3 (60 lb ft^3 - NLO 1975) this implies 500 m^3.

      At 1.667% U (Mallinckrodt 1957), this implies 7.2 MT uranium.

      Note that some of this material could have contained residual amounts of "hot" raffinate, since these concentrates were being processed during this time frame and mixed with the "cold" metal oxides to achieve a level necessary for disposal in the waste pits.

   C. Waste Pit 3

      Received raffinates from June 1959 through October 1968, including stored material from production prior to June 1959. Note that "cold" raffinates were not neutralized prior to FY60.

      From residues (see Table F.6.4-1): 13,559 MT

      From concentrates (see Table F.6.4-1): <u>26,195 MT</u>

      39,754 MT

      At 960 kg/m^3 (60 lb ft^3 - NLO 1975) this implies 41,400 m^3.

      At 1.667% U (Mallinckrodt 1957), this implies 663 MT uranium.

      Note that some of this material could have been from the "combined" processing of "hot" and "cold" concentrates. In the combined process, the residues from the processing of "hot" concentrates were mixed with those from the processing of "cold" concentrates to achieve an acceptable radium level for disposal in the waste pits.

   D. Waste Pit 4

      No Neutralized Raffinates were deposited in Waste Pit 4.

   E. Waste Pit 5

      Received raffinates from October 1968 through April 1983 (of FY83).

      From residues (see Table F.6.4-1): 7,274 MT

      From concentrates (see Table F.6.4-1): <u>22,796 MT</u>

      30,070 MT

      At 960 kg/m^3 (60 lb ft^3 - NLO 1975), this implies 31,300 m^3.

      At 1.667% U (Mallinckrodt 1957), this implies 501 MT uranium.

   F. Waste Pit 6

No Neutralized Raffinates were deposited in Waste Pit 6.

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5. Constituents of Neutralized Raffinate

As stated in paragraph 1 above, 0.395 pounds of chemicals are generated for every pound of uranium production. These chemicals included lime (the majority), hydrated alumina to complex flourides, barium to complex thorium and radium, and phosphates and nitrates (Mallinckrodt 1957).

The remaining constituents in the raffinate from the processing of concentrates are impurities from the ore concentrates. Table F.6.2-1 summarizes the average composition of the ore concentrates. This data is used in Table F.6.4-2 to estimate the composition of raffinates from the processing of concentrates deposited in the waste pits.

The raffinates generated from the processing of residues are different from those from the processing of concentrates, both in composition and quantity. The impurities in the raffinates from the processing of residues are associated with the process itself (i.e. corrosion products). One memo was found that documented the composition of UAP (Cavendish et al. 1962). This data has been used in Table F.6.4-2 to estimate the composition of raffinates from the processing of residues deposited in the waste pits.

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TABLE F.6.4-1

ESTIMATED NEUTRALIZED RAFFINATE GENERATION

Fiscal Year	Production (MTU)		Refinery Feed (MTU)			Raffinate Generated[a] (MT)	Waste Pit[f]
	Plant 2/3[a]	Plant 8[a],[b]	Inventory[c]	Concentrate	Residue		
1952	0	0	0	0	0	0	
1953	0	0	0	0	0	0	
1954	642	266	0	376	266	249	(g)
1955	3,288	1,160	0	2,128	1,160	1,295	(g)
1956	5,379	1,764	0	3,615	1,764	2,131	(g)
1957	8,370	1,927	0	6,443	1,927	3,393	(g),(h)
1958	10,039	2,018	0	8,021	2,018	4,097	(h)
1959	11,540	2,568	0	8,972	2,568	4,686	3
1960	12,187	3,188	0	8,999	3,188	9,718	3
1961	11,039	2,902	0	8,137	2,902	8,801	3
1962	6,288	2,820	0	3,468	2,820	4,904	3
1963	0	2,657	2,657	0	0	0	3
1964	0	3,505	6,162	0	0	0	3
1965	543	2,134[d]	7,753	0	543	395	3
1966	1,347	1,617[d]	8,023	0	1,347	981	3
1967	1,835	1,837[d]	8,025	0	1,835	1,336	3
1968	3,251	2,217[d]	6,991	0	3,251	2,367	3
Sub-Total/Pit 3						39,754	

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TABLE F.6.4-1
(Continued)

Fiscal Year	Production (MTU)		Refinery Feed (MTU)			Raffinate Generated[a] (MT)	Waste Pit[f]
	Plant 2/3[a]	Plant 8[a],[b]	Inventory[c]	Concentrate	Residue		
1969	2,028	1,015[d]	5,978	0	2,028	1,476	5
1970	880	627[d]	5,725	0	880	641	5
1971	809	300[d]	5,216	0	809	589	5
1972	2,761	110[d]	2,565	0	2,761	2,010	5
1973	3,534	66[e]	0	969	2,565	2,664	5
1974	7,114	3	0	7,111	3	5,847	5
1975	8,189	43	0	8,146	43	6,727	5
1976*	9,752	51	0	9,701	51	8,011	5
1977	2,191	386	0	1,805	386	1,765	5
1978	0	122	122	0	0	0	5
1979	0	184	306	0	0	0	5
1980	0	118	424	0	0	0	5
1981	103	41[d]	362	0	103	75	5
1982	203	237[d]	396	0	203	148	5
1983	319	376[d]	453	0	319	232	5
Sub-Total/Pit 5						30,070	
1984	306	261[d]	408	0	306	223	
1985	145	148[d]	411	0	145	106	
1986	2	143[d]	552	0	2	1	
1987	170	223[d]	605	0	170	124	
1988	93	79[d]	591	0	93	68	
1989	0	0	591	0	0	0	
Totals	114,347	37,113		77,891	36,456		

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TABLE F.6.4-1
(Continued)

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Notes: a) From Appendix F.6.1.

b) Plant 8 production is used as a gauge of the amount of residues fed to the Refinery. Only 72.8 lb of dry raffinate per 100 lb uranium is produced from processing residues, compared to 82.2 lb/100 lb for concentrates.

c) From Plant 8.

d) Assuming all processing was of residues to work off the previous years' accumulation.

e) Assuming that 903 MTU was concentrates and the remainder depleted the inventory of residue production.

f) Waste Pit 3 was in operation from June 1959 through October 1968, but received some raffinates that were generated and stored prior to opening (see Note h). Waste Pit 5 received neutralized raffinate from October 1968 through March 1983.

g) 3,530 MT of neutralized raffinate from the processing of radium bearing materials (K-65 material) was deposited in the silos (MC&A Final Activity List - 3/7/88). Also, 635 MT of cold metal oxide was shipped off-site (NLO-1963). These quantities are included in the neutralized raffinate generated from residues from 1954 through 1956, as well as 490 MT generated in 1957.

h) The neutralized raffinate from the processing of ore concentrates in 1958, including 2,903 MT generated from the processing of residues in 1957, was stored in drums. Of this, 433 MT was deposited in Waste Pit 2 and the remainder (6,567 MT) was deposited in Waste Pit 3 after it opened in FY59.

TABLE F.6.4-2

ESTIMATED CONTRIBUTION OF RAFFINATE CONSTITUENTS TO WASTE PITS

Constituent	Adjusted Composition of Ore Concentrates (%)[a]	Concentrate Processing				Residue Processing			Total to Waste Pits (MT)		
		Composition of Raffinate (%)[b]	To Waste Pits (MT)			Composition of Raffinate (%)[c]	To Waste Pits (MT)				
			Pit 2	Pit 3	Pit 5		Pit 3	Pit 5	Pit 2	Pit 3	Pit 5
U_3O_8	82.696										
U		1.667%	7.2	437	380	1.667%	226	121	7	663	501
Aluminum (Al)	0.090	2.769%	6	496	323	2.976%	214	97	6	710	420
Antimony (Sb)	0.001	0.003%	0	1	0				0	1	0
Arsenic (As)	0.122	0.355%	1	64	41				1	64	41
Barium (Ba)		0.300%	1	54	35	0.300%	22	10	1	75	45
Boron (B)	0.001	0.003%	0	1	0				0	1	0
Bismuth (Bi)	0.001	0.002%	0	0	0				0	0	0
Cadmium (Cd)	0.007	0.022%	0	4	3				0	4	3
Calcium (Ca)	1.267	3.701%	8	663	431				8	663	431
Calcium (from lime neutralization)			208	8,139	10,955		6,275	3,946	208	14,414	14,901
Chloride (Cl)	0.074	0.215%	0	39	25				0	39	25
Chromium (Cr)	0.007	0.020%	0	4	2				0	4	2
Cobalt (Co)	0.002	0.006%	0	1	1				0	1	1
Copper (Cu)	0.028	0.082%	0	15	10	0.106%	8	3	0	22	13
Dysprosium (Dy)	0.004	0.012%	0	2	1				0	2	1
Erbrium (Er)	0.000	0.001%	0	0	0				0	0	0
Europium (Eu)	0.000	0.001%	0	0	0				0	0	0

TABLE F.6.4-2
(Continued)

Constituent	Adjusted Composition of Ore Concentrates (%)[a]	Concentrate Processing				Residue Processing			Total to Waste Pits (MT)		
		Composition of Raffinate (%)[b]	To Waste Pits (MT)			Composition of Raffinate (%)[c]	To Waste Pits (MT)				
			Pit 2	Pit 3	Pit 5		Pit 3	Pit 5	Pit 2	Pit 3	Pit 5
Flouride (F)	0.015	0.044%	0	8	5	1.012%	73	33	0	81	38
Gadolinium (Gd)	0.003	0.008%	0	1	1				0	1	1
Holmium (Ho)	0.000	0.001%	0	0	0				0	0	0
Iron (Fe)	1.408	4.110%	9	736	479	1.056%	76	34	9	812	513
Lead (Pb)	0.007	0.022%	0	4	3				0	4	3
Lutetium (Lu)	0.000	0.001%	0	0	0				0	0	0
Magnesium (Mg)	1.210	3.532%	8	633	412	0.563%	40	18	8	673	430
Manganese (Mn)	0.018	0.053%	0	9	6	0.229%	16	7	0	26	14
Molybdenum (Mo)	0.103	0.302%	1	54	35				1	54	35
Nickel (Ni)	0.001	0.003%	0	1	0				0	1	0
Samarium (Sm)	0.000	0.001%	0	0	0				0	0	0
Sodium (Na)	1.835	5.357%	12	960	624				12	960	624
Terbium (Tb)	0.000	0.001%	0	0	0				0	0	0
Thorium (Th)	0.181	0.529%	1	95	62	0.030%	2	1	1	97	63
Thulium (Tm)	0.000	0.001%	0	0	0				0	0	0
Tin (Sn)	0.006	0.018%	0	3	2	0.053%	4	2	0	7	4
Vanadium (V)	0.755	2.204%	5	395	257				5	395	257
Yttrium (Y0)	0.005	0.015%	0	3	2				0	3	2
Ytterbium (Yb)	0.001	0.002%	0	0	0				0	0	0

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TABLE F.6.4-2
(Continued)

Constituent	Adjusted Composition of Ore Concentrates (%)[a]	Concentrate Processing: Composition of Raffinate (%)[b]	Concentrate Processing: To Waste Pits (MT) Pit 2	Pit 3	Pit 5	Residue Processing: Composition of Raffinate (%)[c]	Residue Processing: To Waste Pits (MT) Pit 3	Pit 5	Total to Waste Pits (MT) Pit 2	Pit 3	Pit 5
Zinc (Zn)	0.018	0.052%	0	9	6				0	9	6
NH_3	0.095	0.278%	1	50	32				1	50	32
CO_3	0.456	1.330%	3	238	155				3	238	155
PO_4	0.382	16.117%	36	2,888	1,878	50.204%	3,664	1,637	36	6,491	3,516
P_2O_5	1.191	3.476%	8	623	405				8	623	405
SiO_2	1.843	5.382%	12	964	627	11.804%	847	385	12	1,812	1,012
SO_4	5.572	16.270%	36	2,915	1,896				36	2,915	1,896
V_2O_5	0.592	1.730%	4	310	202				4	310	202
NO_3		30.000%	66	5,375	3,497	30.000%	2,153	978	66	7529	4475
	100.000	100.000%	433	26,195	22,796	100.000%	13,559	7,274	433	39,754	30,070

Notes: a) See Appendix F.6.2.
b) The ore concentrates are an average of 82.696 % U_3O_8.
c) Using the composition of UAP Product (Cavendish et al. 1962) as an estimate of corrosion products and adding the same chemicals that are added to the raffinate from concentrate processing, except filter aid (SiO_2).

APPENDIX F.6.5
MAGNESIUM FLOURIDE GENERATION

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MAGNESIUM FLOURIDE GENERATION

1. Waste Production Factors

Uranium derbies were produced in Plant 5 from UF_4 using magnesium as the reducing agent according to the reaction:

$$UF_4 + 2Mg \Longrightarrow U + 2MgF_2.$$

Theoretically, for every 227 kg (500 pounds) of UF_4 charged, a 172 kg (379 pound) uranium derby should be produced. However, the average yield was only approximately 97% so the result was 166.9 kg (367.63 pounds) of uranium product.

Residues from the processing of normal and enriched uranium were sent to Plants 8 and 2/3 for reprocessing to recover the uranium value. The resulting wastes were known as Trailer Cake (from Plant 8) and Slag Leach (from Plant 2/3). The Trailer Cake and Slag Leach were 96.5% magnesium flouride (MgF_2), 0.5% uranium and 3% filter aid. Therefore, every metric ton of normal and enriched uranium production generated 560.1 kg of Trailer Cake or Slag Leach. The amount of lime that was added to neutralize the slag leach is not known and has not been included in the generation factor.

Prior to 1958, calcined dolomite was used to line the reduction pots in Plant 5. Therefore, the Trailer Cake included an approximately equal amount of dolomite and MgF_2. The result was that twice as much residue was generated as when MgF_2 was used as liner.

Residues from the processing of depleted uranium are discussed in Appendix F.6.7.

2. Magnesium Flouride Deposited in Waste Pits

   A. Waste Pit 1

      a. Depleted Production

         See Appendix F.6.7 for details on residues from the processing of depleted uranium deposited in Waste Pit 1.

      b. Normal Production

         Received Trailer Cake from FY53 through FY56.

         ==> (see Table F.6.5-1) 18,401 MT

         At 1,440 kg/m^3 (90 lb/ft^3), this implies 13,000 m^3.

Constituents:	Uranium (0.5%)	92 MT
	MgF_2 (48.25%)	8,878 MT
	Dolomite (48.25%)	8,879 MT
	Filter Aid (3%)	552 MT

c. Enriched Production

Records do not indicate that any Trailer Cake from enriched production was deposited in Waste Pit 1.

B. Waste Pit 2

a. Depleted Production

See Appendix F.6.7 for details on residues from the processing of depleted uranium deposited in Waste Pit 1.

b. Normal Production

Received Trailer Cake from normal production from FY57 through FY59.

==>	Normal Production	14,208 MT
	(Trailer Cake - see Table F.6.5-1)	

At 1,440 kg/m^3 (90 lb/ft^3), this implies 9,900 m^3.

Constituents:	Uranium (0.5%)	71 MT
	MgF_2	10,407 MT
	(48.25% - FY57 only, 96.5% other years)	
	Dolomite	3,304 MT
	(48.25% - FY57 only)	
	Filter Aid (3%)	426 MT

c. Enriched Production

Records do not indicate that any Trailer Cake from the processing of Enriched Uranium were deposited in Waste Pit 2.

C. Waste Pit 3

a. Depleted Production

Records do not indicate that any Depleted Slag was deposited in Waste Pit 3, except in the cover.

b. Normal and Enriched Production

Received Trailer Cake from normal production from FY60 through FY68 and Slag Leach from enriched production from FY65 through FY68, including that from enriched production prior to FY65 that was stored and processed through the Slag Leach system after FY64. Also received Trailer Cake generated from processing C-Oxide and IRP Tailings from Mallinckodt from 1959 to 1965.

==>	Normal Production	15,117 MT
	(Trailer Cake - see Table F.6.5-1)	
	C-Oxide and IRP Tailings	14,955 MT
	(Trailer Cake - see Table F.6.5-1)	
==>	Enriched Production	<u>12,605 MT</u>
	(Slag Leach - see Table F.6.5-1)	
		42,677 MT

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At 1,440 kg/m^3 (90 lb/ft^3), this implies 20,900 m^3 of Trailer Cake and 8,700 m^3 of Slag Leach.

Constituents:	Uranium (0.5%)	
	Trailer Cake	150 MT
	Slag Leach	63 MT
	MgF_2 (96.5%)	
	Trailer Cake	29,019 MT
	Slag Leach	12,164 MT
	Filter Aid (3%)	
	Trailer Cake	902 MT
	Slag Leach	378 MT

D. Waste Pit 4

a. Depleted Production

See Appendix F.6.7 for details on residues from the processing of depleted uranium deposited in Waste Pit 4.

b. Normal Production

Records indicate that 9,692 MT of Trailer Cake from the processing of normal uranium was deposited in Waste Pit 4 from FY60 through FY64.

==> Normal Production 9,692 MT
(Trailer Cake - see Table F.6.5-1)

At 1,440 kg/m^3 (90 lb/ft^3), this implies 6,700 m^3.

Constituents:	Uranium (0.5%)	48 MT
	MgF_2 (96.5%)	9,353 MT
	Filter Aid (3%)	291 MT

c. Enriched Production

Records indicate that 1,445 MT of Trailer Cake from the processing of enriched uranium was deposited in Waste Pit 4 from FY62 through FY64.

==> Enriched Production 1,445 MT
(Trailer Cake - see Table F.6.5-1)

At 1,440 kg/m^3 (90 lb/ft^3), this implies 1,000 m^3.

Constituents:	Uranium (0.5%)	7 MT
	MgF_2 (96.5%)	1,394 MT
	Filter Aid (3%)	43 MT

E. Waste Pit 5

a. Depleted Production

Records do not indicate that any Depleted Slag was deposited in Waste Pit 5.

b. Normal and Enriched Production

Received Slag Leach from normal production from FY69 through FY77 and Slag Leach from from enriched production from FY69 through March 1983.

==>	Normal Production	1,275 MT
	(Slag leach - see Table F.6.5-1)	
==>	Enriched Production	3,964 MT
	(Slag leach - see Table F.6.5-1)	
		5,239 MT

At 1,440 kg/m^3 (90 lb/ft^3), this implies 3,600 m^3 of Slag leach.

Constituents:	Uranium (0.5%)	26 MT
	MgF_2 (96.5%)	5,056 MT
	Filter Aid (3%)	157 MT

F. Waste Pit 6

a. Depleted Production

See Appendix F.6.7 for details on residues from the processing of depleted uranium deposited in Waste Pit 6.

b. Normal and Enriched Production

Records do not indicate that any Slag Leach was deposited in Waste Pit 6.

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TABLE F.6.5-1

ESTIMATED MAGNESIUM FLOURIDE GENERATION[(a)]

Fiscal Year	Plant 5 Derby Production (MTU)[(b)]		Magnesium Flouride Generated (MT)[(c)]			
	Normal	Enriched	Normal	Waste Pit	Enriched	Waste Pit
1952	0	0	0		0	
1953	45	0	50[(d)]	1	0	
1954	2,099	0	2,351[(d)]	1	0	
1955	5,824	0	6,524[(d)]	1	0	
1956	8,459	0	9,476[(d)]	1	0	
1957	6,113	0	6,848[(d)]	2	0	
1958	6,260	489	3,506	2	274[(h)]	3
1959	6,881	878	3,854	2	492[(h)]	3
1960	9,704	882	5,435[(e)]	3	494[(h)]	3
1961	7,052	1,418	3,950[(e)]	3	794[(h)]	3
1962	6,782	1,781	3,799[(e)]	3	998[(f),(h)]	3
1963	7,655	2,588	4,288[(e)]	3	1,450[(f),(h)]	3
1964	4,080	3,568	2,285[(e)]	3	1,999[(f),(h)]	3
1965	2,991	3,441	1,675	3	1,927	3
1966	2,018	3,054	1,130	3	1,711	3
1967	2,756	3,547	1,544	3	1,987	3
1968	1,255	3,435	703	3	1,924	3
1969	95	2,578	53	5	1,444	5
1970	1,974	261	1,106	5	146	5
1971	172	205	96	5	115	5
1972	0	225	0		126	5
1973	0	170	0		95	5
1974	0	362	0		203	5

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TABLE F.6.5-1
(Continued)

Fiscal Year	Plant 5 Derby Production (MTU)[b]		Magnesium Flouride Generated (MT)[c]			
	Normal	Enriched	Normal	Waste Pit	Enriched	Waste Pit
1975	0	325	0		182	5
1976*	0	140	0		78	5
1977	35	219	20	5	123	5
1978	0	291	0		163	5
1979	0	272	0		152	5
1980	0	217	0		122	5
1981	0	588	0		329	5
1982	0	682	0		382	5
1983	0	1,085	0		608	5[g]
No further deposits to Waste Pits						
1984	0	1,054	0		590	
1985	218	1,111	122		623	
1986	215	1,010	120		566	
1987	0	346	0		194	
1988	0	305	0		171	
1989	0	0	0		0	
Totals	82,683	36,528	58,938		20,460	

Note:
a) See Appendix F.6.7 for details on residues from the processing of depleted uranium deposited in the Waste Pits.
b) From Appendix F.6.1.
c) 14,955 MT of Trailer Cake from processing Mallinckrodt C-Oxide and IRP Tailings were deposited in Waste Pit 3 from 1959 to 1965.
d) Prior to 1958, calcined dolomite was used instead of magnesium flouride (MgF_2) to line the reduction pots in Plant 5. The Trailer Cake from this time period includes approximately equal amounts of dolomite and MgF_2.
e) 9,692 MT of Trailer Cake from the processing of noraml uranium was deposited in Waste Pit 3 from FY60 through FY64.
f) 1,445 MT of Trailer Cake from the processing of enriched uranium was deposited in Waste Pit 3 from FY62 through FY64.
g) Slag leach was not deposited in Waste Pit 5 after March 1983 (NLO 1983). Therefore, only of the Slag Leach produced in FY83 is assumed to have been deposited in Waste Pit 5.
h) This material was stored and processed through the slag leach system after 1964 and deposited in Waste Pit 3.

APPENDIX F.6.6
PLANT 5 GRAPHITE/CERAMICS GENERATION

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PLANT 5 GRAPHITE/CERAMICS GENERATION

Graphite was used in the production process in the form of crucibles and ingot molds. This graphite was routinely replaced. The waste graphite generated from the processing of normal and enriched uranium was generally burned in the Graphite Burner to concentrate the uranium. The ash was then processed to recover uranium and became part of the raffinate deposited in the Waste Pits. Waste Graphite generated from depleted production was deposited in Waste Pits 1, 2 and 4.

Ceramic brick was used to line the Reduction Furnaces in Plants 5 and 9. This brick was periodically replaced, with the old brick being deposited in Waste Pits 1, 2 and 4. Ceramic furnace refractories used in the Remelt Furnaces in Plant 5 and 9 were also discarded in Waste Pits 1, 2 and 4.

Actual records (NLO Losses) were used to determine the amount of graphite/ceramics deposited and its uranium content. This information is summarized in Table F.6.6-1.

Based on this information, 384 MT of graphite/ceramics were deposited in Waste Pit 4 from 1967 through 1984. This material contained 0.75 MT of uranium and accounts for 200 m^3 of volume, using 2,400 kg/m^3 (150 lb/ft^3).

Records also indicate that 150 MT of graphite/ceramics (containing 2.8 MTU) was deposited in Waste Pit 1 from 1955 to 1959 and 13 MT (containing 0.3 MTU) to Waste Pit 2 from 1957 to 1963. This accounts for 60 m^3 and 5 m^3 of volume, respectively, in these pits.

Finally, 67 MT of graphite/ceramics from normal production (containing 0.3 MTU) were deposited in Waste Pit 4 from 1960 to 1964. This accounts for 30 m^3 of volume in this pit.

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TABLE F.6.6-1

PLANT 5 GRAPHITE/CERAMICS GENERATION[a]

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Fiscal Year	Plant 5 Ceramics (MT)[b]	Uranium (MTU)
1955 to 1964[c]	230.0	3.40
1967	22.3	0.05
1968	6.3	0.01
1969	37.5	0.07
1970	17.8	0.03
1971	6.1	0.01
1972	23.0	0.02
1973	29.0	0.04
1974	11.9	0.02
1975	6.7	0.01
1976*	13.8	0.04
1977	16.0	0.03
1978	9.8	0.02
1979	19.1	0.04
1980	17.8	0.04
1981	19.7	0.04
1982	31.4	0.06
1983	48.5	0.13
1984	42.1	0.09
Totals	613.8	4.15

Notes: a) Based on actual records (NLO Losses).

b) All of the material generated from 1967 through 1984 was from depleted production and was deposited in Waste Pit 4.

c) 150 MT of graphite/ceramics was deposited in Waste Pit 1 from 1955 to 1959 and 13 MT in Waste Pit 2 from 1957 to 1963. Also, 67 MT from normal production were deposited in Waste Pit 4 from 1960 to 1964.

APPENDIX F.6.7
DEPLETED RESIDUE GENERATION

DEPLETED RESIDUE GENERATION

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Various residues were generated from the following production of depleted materials in the following operations:

- Packaging in Plant 4 and the Pilot Plant
- Reduction in Plants 5 and 9
- Casting in Plants 5 and 9
- Machining in Plants 6 and 9

The following lists the types of residues associated with each of these operations.

1. Residue Generation

   A. Depleted Residues from Plant 4 and Pilot Plant Packaging

   Packaging of depleted materials in Plant 4 and the Pilot Plant generates the following residues:

Waste Material Code	Description
D003	Nonrecoverable trash
D027	Contaminated rags, paper, and polyethylene
D028	Contaminated asbestos materials
D029	Dust collector bags
D065	Scrap salts (high in flouride), including floor sweepings
D082	Off-Spec uranium tetraflouride (UF_4) or thorium tetraflouride (ThF_4)

   B. Depleted Residues from Plants 5 and 9 Reductions

   Reduction of depleted UF_4 to uranium metal in Plants 5 and 9 generates the following residues.

Waste Material Code	Description
D011	Contaminated soil, rocks, sand, brick and ceramics
D019	Contaminated magnesium
D020	Contaminated Merco-Dri and Hilco Cake
D021	Wet MgF_2
D027	Contaminated Rags, Paper and Polyethylene
D029	Dust collector bags
D031	Roasted MgF_2 (blended with other materials)

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D034	MgF_2 for milling
D035	MgF_2 liner
D037	MgF_2 (ground)
D038	MgF_2 (+20 mesh, low U)
D057	MgF_2 (wet, crushed)
D061	Furnace salt (solidified, non-chloride)
D062	Dust collector residues (high flouride)
D064	Dust collector residues (pyrophoric, high flouride)
D065	Scrap salts (high flouride, including floor sweepings)
D070	Rockwell spills
D071	Rockwell cleanings
D077	Dry crushed slag from furnace pot blowouts
D079	Unfired reduction charges plus MgF_2 from liner cave-ins
D081	Partially oxidized metal for sorting (containing no metl-x flame retardant)
D084	Bad reduction (no derby)
D125	Unrecycled slag (+20 mesh, ball mill product)
D129	Dirty prill (Code 5 derbies and Plant 1 Titan Mill cleanout, high U content)
D137	Miscellaneous material
D157	Reject UO_3

C. Depleted Residues from Plants 5 and 9 Casting

Casting depleted uranium in Plants 5 and 9 generates following residues:

Waste Material Code	Description
D011	Contaminated soil, rocks, sand, brick and ceramics
D020	Contaminated Merco-Dri and Hilco Cake
D021	Drum decontamination residues (wet MgF_2)
D027	Contaminated rags, paper and polyethylene
D028	Contaminated asbestos materials
D029	Dust collector bags
D030	Magnesium oxide and magnesium zirconate from crucible cleanout
D041	Sludges (oily - for oxidation, high free metal)
D042	Sludges (cleanout, nonoily, for roasting)
D044	Sludges (salt, soft, chloride - for Plant 8 recovery)
D046	Sludges (nonoily, for oxidation, including high or low free metal)
D047	Samples (nonmetallic, miscellaneous)

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D060	Furnace salt (solidified, chloride - for Plant 8 recovery)
D061	Furnace salt (solidified, nonchloride)
D062	Dust collector residues (high flouride)
D063	KOH reversion cake
D065	Scrap salts (high flouride, including floor sweepings)
D066	Scrap salts (low flouride, including floor sweepings)
D067	Wet sump or filter cake (Halide contained)
D068	Wet sump or filter cake (oil contained)
D070	Rockwell spills
D101	Scrap U_3O_8 or ThO_2 (low flouride)
D110	Non-briquettable chips and turnings for oxidation
D111	Briquettable chips and turnings from standard metal
D112	Briquettable chips and turnings (high impurities, for briquetting and double melting
D119	Solid metal, other than cores (with embedded steel)
D122	U_3O_8 (+8-mesh, low flouride)
D129	Dirty prill (Code 5 derbies and Plant 1 Titan Mill clean-out, high U content)
D132	Dust collector residues (low flouride)
D134	U_3O_8 (for reoxidation)
D135	Dust collector residue (high flouride, greater than 20% assay)
D154	U_3O_8 rotexed Plant 8 furnace product
D219	Metal from spills

D. Depleted Residues from Plants 6 and 9 Machining

Machining uranium metal in Plants 6 and 9 generates the following residues:

Waste Material Code	Description
D011	Contaminated soil, rocks, sand, brick and ceramics
D027	Contaminated rags, paper and polyethylene
D028	Contaminated asbestos materials
D029	Dust collector bags
D041	Sludges (oily - for oxidation, high free metal)
D044	Sludges (salt, soft, chloride - for Plant 8 recovery)
D060	Furnace salt (solidified, chloride - for Plant 8 recovery)
D061	Furnace salt (solidified, nonchloride)

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D062	Dust collector residues (high flouride)
D069	Wet sump or filter cake (nonoily, nonhalide)
D104	Metal spills and extrusion ends (metal high in impurities and spills)
D110	Nonbriquettable chips and turnings for oxidation
D112	Briquettable chips and turnings (high impurities, for briquetting and double melting
D131	Partially oxidized metal oxidation feed

2. Contribution to Waste Pits

   A. Waste Pits 1 and 2

Records of the production of depleted materials for the period 1955 through 1963 have been destroyed. However, there are records of depleted residues being deposited in the Waste Pits during this time. These records are summarized on Table F.6.7-1.

As shown on Table F.6.7-1, a total of 9,945 metric tons (MT) of depleted residues were generated during this period. Of this, 7,417 MT was C-Liner (C-Oxide and MgF_2), the disposition of which is as follows.

Records indicate that 6,783 MT of C-Liner from depleted production were deposited in Waste Pit 1 and 634 MT in Waste Pit 2 from 1955-1963 (listed as Depleted Slag in Table 1-10). C-Liner contained 9.37% uranium, the remainder being approximately equal parts of MgF_2 and calcined dolomite.

At 1,440 kg/m^3 (90 lb/ft^3), this implies 4,700 m^3 and 400 m^3, respectively, in Waste Pits 1 and 2.

Constituent	Waste Pit 1	Waste Pit 2
Uranium (9.37%)	636	59
MgF_2 (45.3%)	3,074	287
Dolomite (45.3%)	3,074	287

Also, 163 MT was Graphite, which is discussed in Appendix F.6.6.

Of the remainder (2,365 MT), records indicate that 2,163 MT was deposited in Waste Pit 1 and 202 MT in Waste Pit 2 (both listed as Depleted Residues on Table 1-10). This material was an average of 1,440 kg/m^3 (90 lb/ft^3), which implies volumes of 1,500 m^3 and 100 m^3,

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respectively, to Waste Pits 1 and 2. Included in these amounts are 339 MT of uranium to Waste Pit 1 and 32 MT to Waste Pit 2. Note that this material ranged from 0% to nearly 95% uranium.

B. Waste Pit 4

Table F.6.7-2 summarizes the residues deposited in Waste Pit 4. Actual data for the period FY79 through FY84 was used to estimate the mass and volume of residues generated per metric ton of depleted production. The production during the years when Waste Pit 4 was open was then used to estimate the amount of residues deposited.

An estimated total of 11,435 MT of residues from depleted production were deposited in Waste Pit 4. Of this, 7,845 MT is Depleted Slag[1] containing 329 MT of uranium and 7516 MT of MgF_2. The Depleted Slag accounts for a total volume of 5,300 m^3 in Waste Pit 4, indicating an average density of 1,470 kg/m^3 (92 lb/ft^3).

The remainder of the residues in Waste Pit 4 (listed as Depleted Residues on Table 1-10) account for 3,590 MT and 2,500 m^3 containing 1,818 MT of uranium. The uranium content of these residues ranges from 0% to 99% and the density varies from 400 kg/m^3 (25 lb/ft^3) and 8,000 (500 lb/ft^3).

C. Waste Pit 6

Table F.6.7-3 summarizes the residues deposited in Waste Pit 6. Actual data was used to determine the mass and volume of residues deposited in the pit.

A total of 9,934 MT of residues from depleted production were deposited in Waste Pit 6. Of this, 8,082 MT is Depleted Slag[1] containing 329 MT of uranium and 7750 MT of MgF_2. The MgF_2 residues account for a total volume of 5,500 m^3 in Waste Pit 6, indicating an average density of 1,470 kg/m^3 (92 lb/ft^3).

The remainder of the residues in Waste Pit 6 (listed as Depleted Residues on Table 1-10) account for 1,853 MT and 1,200 m^3 containing 1,100 MT of uranium. The uranium content of these residues ranges from 0% to 85% and the density varies from 48 kg/m^3 (30 lb/ft^3) and 6,400 (400 lb/ft^3).

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1 Includes Waste Material Codes D012, D034, D035, D037, D038, D057, D062, D077, and D125.

TABLE F.6.7-1

DEPLETED DISCARDS TO WASTE PITS 1 AND 2 (1955-1963)

Description	Discards To Waste Pits		
	Mass (MT)[a]	Uranium	
		(%)[a]	(MTU)[a]
Miscellaneous Depleted Residues	572	31.3%	179
Contaminated Residues	0	0.0%	0
D38 C-Liner[b]	7,417	9.4%	695
D38 Graphite[c]	163	1.9%	3
D38 Filter Cake	1,542	0.1%	2
D38 U_3O_8	53	82.8%	44
UF_4	56	66.1%	37
Scrap UF_6	13	31.8%	4
D38 Crop Shear Material	1	0.4%	0
Mill Sludge	20	33.9%	7
Turnings	74	91.6%	68
Sawdust	9	85.8%	7
Alloy Scrap	14	90.5%	13
Solid Scrap Material	11	94.7%	11
Totals	9,945		1,069

Notes: a) From actual records of materials deposited in the Waste Pits.
b) Included as Magnesium Flouride (see Appendix F.6.5).
c) Included as Graphite (see Appendix F.6.6).

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TABLE F.6.7-2

DEPLETED RESIDUES DEPOSITED TO WASTE PIT 4

Waste Material Code	Discards				
	Mass (MT)	Density (kg/m^3)	Volume (m^3)	Uranium (MT)	Uranium (%)
D003	0.1	802	0.2		0.0%
D007	0.1	1,443	0.1		0.0%
D011	28.0	2,405	11.7	0.4	1.5%
D012	2.8	994	2.8	0.1	2.1%
D019	10.0	481	20.8	1.0	10.0%
D020	2.0	481	4.1	0.2	7.6%
D021	68.9	641	107.5	6.3	9.1%
D027	10.1	401	25.3	1.8	17.4%
D028	2.1	401	5.1		0.0%
D029	11.8	401	29.4	0.9	7.7%
D030	28.9	481	60.1	0.1	0.4%
D031	0.7	1,443	0.5	0.1	8.0%
D032	18.1	1,122	16.1	0.6	3.5%
D033	162.4	802	202.7	4.8	3.0%
D034	6,982.6	1,443	4,839.7	189.7	2.7%
D035	13.1	1,603	8.2	0.7	5.2%
D037	2.5	1,443	1.7	0.1	2.9%
D038	0.2	2,084	0.1	0.1	29.3%
D041	340.8	2,004	170.1	189.6	55.6%
D042	9.9	1,603	6.2	0.9	9.3%
D043	0.2	1,603	0.1	0.0	0.6%
D044	51.7	1,603	32.2	5.8	11.3%
D046	73.3	1,603	45.7	15.2	20.7%
D047	0.7	1,603	0.4	0.4	59.9%
D048	0.1	401	0.3		0.0%
D057	3.9	1,443	2.7	0.1	2.5%
D060	125.9	1,282	98.2	1.1	0.9%
D061	153.7	1,282	119.9	49.2	32.0%

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TABLE F.6.7-2
(Continued)

D062	661.2	2,004	330.0	119.6	18.1%
D063	0.0	802	0.1	0.0	22.9%
D064	0.7	1,924	0.4	0.1	12.7%
D065	684.5	2,324	294.5	508.3	74.3%
D066	4.8	2,324	2.1	0.1	1.6%
D067	47.3	481	98.4	6.3	13.4%
D068	121.0	481	251.5	23.2	19.1%
D069	544.6	1,122	485.3	159.1	29.2%
D070	3.4	1,924	1.8	3.1	89.9%
D071	31.3	1,924	16.3	10.0	31.9%
D075	5.6	8,015	0.7	5.1	89.9%
D077	3.6	1,443	2.5	0.1	2.6%
D079	31.4	1,924	16.3	15.2	48.3%
D081	1.0	6,412	0.2	0.6	60.9%
D082	122.0	3,206	38.1	92.4	75.7%
D084	1.6	3,206	0.5	1.0	62.2%
D101	390.1	2,405	162.2	305.3	78.3%
D104	0.1	8,015	0.0	0.1	95.9%
D110	173.9	2,405	72.3	165.0	94.9%
D111	1.0	2,405	0.4	0.9	96.6%
D112	19.1	2,405	7.9	18.0	94.5%
D119	3.9	8,015	0.5	3.5	89.9%
D122	0.4	6,412	0.1	0.3	84.8%
D125	108.8	2,244	48.5	12.0	11.0%
D129	57.4	4,809	11.9	15.3	26.6%
D131	3.5	6,412	0.5	2.8	80.6%
D132	213.5	2,004	106.5	151.8	71.1%
D134	34.3	2,725	12.6	25.4	74.1%
D135	56.5	1,763	32.1	30.0	53.1%
D137	0.0	1,363	0.0	0.0	78.7%
D154	2.0	2,004	1.0	1.7	83.9%
D157	0.1	2,645	0.1	0.1	72.7%
D219	1.5	8,015	0.2	1.5	99.3%

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TABLE F.6.7-2
(Continued)

Totals	11,434.6		7,806.9	2,146.8	

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TABLE F.6.7-3

DEPLETED RESIDUES DEPOSITED TO WASTE PIT 6

Waste Material Code	Discards				
	Mass (MT)	Density (kg/m^3)	Volume (m^3)	Uranium	
				(MT)	(%)
D007	0.1	1,443	0.1		0.0%
D012	2.6	994	2.6	0.1	2.1%
D020	2.1	481	4.4	0.2	7.4%
D021	39.8	641	62.1	4.5	11.4%
D030	19.0	481	39.5	0.1	0.3%
D031	0.9	1,443	0.6	0.1	7.9%
D032	16.6	1,122	14.8	0.6	3.5%
D034	7,304.6	1,443	5,062.9	194.1	2.7%
D035	17.0	1,603	10.6	0.9	5.2%
D037	1.2	1,443	0.8	0.0	1.8%
D038	0.2	2,084	0.1	0.1	29.2%
D044	36.6	1,603	22.8	3.8	10.4%
D047	0.4	1,603	0.3	0.3	59.8%
D057	5.1	1,443	3.5	0.1	2.5%
D062	709.8	2,004	354.2	132.1	18.6%
D065	756.9	2,324	325.6	562.2	74.3%
D066	3.0	2,324	1.3	0.1	1.7%
D066	38.3	481	79.6	5.1	13.4%
D068	94.6	481	196.7	18.6	19.6%
D068	313.7	1,122	279.5	91.0	29.0%
D077	4.7	1,443	3.2	0.1	2.6%
D082	104.2	3,206	32.5	78.9	75.7%
D101	259.8	2,405	108.0	201.0	77.4%
D122	0.3	6,412	0.0	0.2	84.9%
D132	135.4	2,004	67.6	96.3	71.1%
D134	27.3	2,725	10.0	20.2	74.0%
D135	38.5	1,763	21.8	20.2	52.6%
D137	0.0	1,363	0.0	0.0	77.5%

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TABLE F.6.7-3
(Continued)

D154	1.6	2,004	0.8	1.3	84.0%
D157	0.2	2,645	0.1	0.1	72.9%
Totals	9,934.4		6,706.2	1,432.4	

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APPENDIX F.6.8
URANYL AMMONIUM PHOPHATE (UAP) FILTRATE GENERATION

URANYL AMMONIUM PHOSPHATE (UAP) FILTRATE GENERATION

Uranyl Ammonium Phosphate (UAP) was generated from 1953 through 1964 by first solubilizing the uranium associated with MgF_2 Slag with hydrochloric acid (HCl). The solubilized uranium was then reacted with phosphoric acid (H_3PO_4) and ammonium hydroxide (NH_4OH) to precipitate UAP. The precipitate was filtered and the UAP cake processed to recover the uranium. The filtrate was neutralized and filtered. The residue from the filtering operation was deposited in the Waste Pits at the FEMP and the filtrate pumped to the Waste Pits through the General Sump.

Approximately 744 MT of residue was generated for every 2,000 MT of MgF_2 processed (Johnson et al. 1957). This residue contained 75% water and 0.05% uranium (wet basis).

1. UAP Filtrate Deposited in Waste Pits
   A. Waste Pit 1
      UAP Filtrate was deposited in Waste Pit 1 in FY53 through FY56, when Waste Pit 2 opened.
      ==> 1,712 MT
      At 1,440 kg/m^3, this implies 1,200 m^3.
   B. Waste Pit 2
      UAP Filtrate was deposited in Waste Pit 2 in FY57 through FY64.
      ==> 3,763 MT
      At 1,440 kg/m^3, this implies 2,600 m^3.

2. Constituents
   The constituents of the UAP Filtrate are assumed to be similar to the raffinate generated from processing residues (i.e. primarily corrosion products from the piping and process equipment, adjusted for uranium content and the use of sodium hydroxide (NaOH) for neutralization. (see Appendix F.6.4). Table F.6.8-2 summarizes the estimated constituents in the UAP Filtrate deposited in the Waste Pits.

TABLE F.6.8-1

ESTIMATED GENERATION OF URANYL AMMONIUM PHOSPHATE (UAP) FILTRATE

Fiscal Year	Total MgF_2 Generated (MT)[a]	UAP Filtrate Generated (MT)[b]	Waste Pit
1952	0	0	
1953	50	5	1
1954	2,351	219	1
1955	6,524	607	1
1956	9,476	881	1
Sub-Total/Waste Pit 1		1,712	
1957	6,848	637	2
1958	3,780	352	2
1959	4,346	404	2
1960	5,930	551	2
1961	4,744	441	2
1962	4,796	446	2
1963	5,737	534	2
1964	4,284	398	2
Sub-Total/Waste Pit 2		3,763	

Notes: a) See Appendix F.6.5.
b) Based on 744 MT UAP filtrate generated for every 2,000 MT of MgF_2 processed (Johnson et al. 1957), and accounting for 75% moisture content (i.e. 186 MT (dry)/2,000 MT MgF_2).

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TABLE F.6.8-2

ESTIMATED CONTRIBUTION OF UAP FILTRATE CONSTITUENTS TO WASTE PITS

Constituent	Composition of UAP Filtrate (%)[a]	To Waste Pits (MT)	
		Pit 1	Pit 2
U	0.200%	3	8
Aluminum (Al)	3.020%	52	114
Barium (Ba)	0.304%	5	11
Copper (Cu)	0.107%	2	4
Flouride (F)	1.027%	18	39
Iron (Fe)	1.072%	18	40
Magnesium (Mg)	0.572%	10	22
Manganese (Mn)	0.232%	4	9
Sodium (Na)	28.326%	485	1,066
Thorium (Th)	0.030%	1	1
Tin (Sn)	0.054%	1	2
PO4	34.595%	592	1,302
SiO2	11.980%	205	451
Cl	18.481%	316	695
	100.000%	1,712	3,763

Notes: a) From Appendix F.6.4, adjusted for uranium content and the use of NaOH for neutralization

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APPENDIX F.6.9

WATER TREATMENT SLUDGE DEPOSITED IN THE WASTE PITS

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WATER TREATMENT SLUDGE DEPOSITED IN THE WASTE PITS

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Sludge from the softening of water for use in the production process was placed in the waste Pits to further neutralize and solidify the contents from 1964 into 1983. The amount of water treated during this period was obtained from FEMP records. According to operating personnel, water hardness was treated from 325 ppm to 100 ppm as $CaCO_3$. This was accomplished by adding approximately 20 grains per gallon (340 ppm) of lime, implying that 210 ppm was excess.

The amount of sludge generated during this period is summarized on Table F.6.9. This indicates that approximately 2,669 MT of Water Treatment Sludge was deposited in Waste Pit 3, and 3,857 MT in Waste Pit 5. At 1,440 kg/m^3 (90 lb/ft^3), these equate to 1,900 m^3 and 2,700 m^3, respectively, in Waste Pits 3 and 5.

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TABLE F.6.9-1

WATER TREATMENT SLUDGE DEPOSITED IN WASTE PITS

Calendar Year	Water Treated(b) (MM Gal)	Hardness Removed (d) (Lb)	Excess Lime Added (e) (Lb)	Total Solids Generated (MT)	Waste Pit (g)
1964	364.5	683,984	638,385	600	3
1965	304.4	571,207	533,126	501	3
1966	291.1	546,249	509,833	479	3
1967	327.9	615,304	574,284	540	3
1968	332.3	623,561	581,990	547	3
Sub-Total/Waste Pit 3	1620	3,040,305	2,837,618	2,669	
1969	262.1	491,831	459,042	432	5
1970	204.6	383,932	358,336	337	5
1971	223.8	419,961	391,963	369	5
1972	203.0	380,930	355,534	334	5
1973	213.5	400,633	373,924	352	5
1974	208.3	390,875	364,817	343	5
1975	203.3	381,492	356,060	335	5
1976*	159.2	298,739	278,823	262	5
1977	120.4	225,931	210,869	198	5
1978	109.0	204,539	190,903	180	5
1979	96.8	181,645	169,536	159	5
1980	90.9	170,574	159,202	150	5
1981	96.8	181,645	169,536	159	5
1982	120.6	226,306	211,219	199	5
1983	29.7	55,732	52,017	49	5
Sub-Total/Waste Pit 5	2342.0	4,394,763	4,101,779	3,857	
Totals	3962.2	7,435,068	6,939,397	6,526	

Notes:
a) Water treatment sludge was deposited in Waste Pits 3 and 5 through the from 1964 into 1983.
b) From ____________________.
c) Water treatment sludge was only deposited in the Waste Pits for three months in 1983.
d) Assuming water hardness was treated from 325 ppm to 100 ppm as $CaCO_3$.
e) Assuming 20 grains per gallon (340 ppm) of lime was added, implying that 210 ppm was excess.
f) Assuming 90 lb/cf.
g) Waste Pit 3 was in operation through October 1968 and Waste Pit 5 from October 1968 through August 1983.

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APPENDIX F.6.10
THORIUM WASTES

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THORIUM WASTES

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Thorium wastes were generated at the site from two sources. First of all, thorium isotopes were impurities in the ore concentrates, with concentrations ranging from 0.001% to 1.06% (see Appendix F.6.2). The impurities in the ore concentrates were concentrated in the raffinate by virtue of removing the uranium. Therefore, depending on the ore concentrate and the associated impurities, significant concentrations of thorium may be expected in Waste Pits 2, 3 and 5 associated with the raffinate.

A second source of thorium wastes was from the production of thorium-232 products, including purified thorium nitrate, thorium oxide, thorium flouride, and thorium metal. In the early 1950s, the residues from processing thorium were stored and later transported to Maxey Falts in Moorehead, KY, and Mallinckrodt in Weldon Springs, MO. However, some of these residues, as well as those generated in the 1960s and 70s, were deposited in the waste pits. Raffinates, and associated residual thorium (approximately 0.5%), from this processing were deposited in Waste Pits 1, 3 and 5. Solid residues, ranging from 0.5% to 100% thorium, were deposited in Waste Pit 4. Liquid wastes, and associated thorium content, from the processing operations were discharged to Waste Pits 2, 3 and 5 through the General Sump (see Appendix F.6.3 for further details).

Table F.6.10-1 summarizes the amount of thorium deposited in the waste pits, excluding that deposited through the General Sump. The residues deposited in Waste Pits 1, 3 and 5 were raffinates and totaled 80 MT, 89 MT, and 1,007 MT, respectively. At 0.5% thorium, this indicates thorium values of 0.399 MT, 0.433 MT and 5.033 MT, rspectively. At approximately 960 kg/m^3 (60 lb/ft^3), these equate to estimated volumes of 100 m^3, 100 m^3 and 1,000 m^3, respectively.

The 1,093 MT of residues deposited in Waste Pit 4 were solids, with an average thorium content of 6.7%. This implies 73.766 MT of thorium in Waste Pit 4 and equates to 800 m^3 of volume.

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TABLE F.6.10-1

THORIUM WASTE GENERATION[a]

Fiscal Year	Thorium discards to Waste Pits (MT)			
	Waste Pit 1	Waste Pit 3	Waste Pit 4	Waste Pit 5
1952				
1953				
1954	42.4			
1955	24.0			
1956	12.6			
1957	0.8			
1958				
1959				
1960				
1961				
1962				
1963				
1964				
1965		27.8		
1966		22.0		
1967		11.2		
1968		27.6		
1969				55.4
1970			38.7	546.8
1971			21.8	265.6
1972			509.3	23.6
1973			299.2	4.2
1974			27.8	7.4
1975			19.6	
1976*			18.6	
1977				84.4
1978				11.0
1979				4.2

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TABLE F.6.10-1
(Continued)

Fiscal Year	Thorium discards to Waste Pits (MT)			
	Waste Pit 1	Waste Pit 3	Waste Pit 4	Waste Pit 5
1980			152.4	
1981			2.3	
1982				
1983				
1984				
Totals	79.8	88.6	1,093.0	1,006.6

Notes: a) Based on actual records (NLO Losses), excluding that deposited through the General Sump.

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APPENDIX F.6.11
CONSTITUENTS OF WASTE PITS

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TABLE F.6.11-1

CONSTITUENTS - WASTE PIT 1

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
U	2		636	92		2.8	339	3			1,075
Aluminum (Al)								52			52
Antimony (Sb)											0
Arsenic (As)											0
Barium (Ba)								5			5
Boron (B)											0
Bismuth (Bi)											0
Cadmium (Cd)											0
Calcium (Ca)											0
Calcium (from lime neutralization)	3,776										3,776
Chloride (Cl)								316			316
Chromium (Cr)											0
Cobalt (Co)											0
Copper (Cu)								2			2
Dysprosium (Dy)											0
Erbrium (Er)											0
Europium (Eu)											0
Flouride (F)								18			18
Gadolinium (Gd)											0

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TABLE F.6.11-1
(Continued)

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
Holmium (Ho)											0
Iron (Fe)								18			18
Lead (Pb)											0
Lutetium (Lu)											0
Magnesium (Mg)								10			10
Manganese (Mn)								4			4
Molybdenum (Mo)											0
Nickel (Ni)											0
Samarium (Sm)											0
Sodium (Na)								485			485
Terbium (Tb)											0
Thorium (Th)								1		0.40	1
Thulium (Tm)											0
Tin (Sn)								1			1
Vanadium (V)											0
Yttrium (Y0)											0
Ytterbium (Yb)											0
Zinc (Zn)											0
NH3											0
CO3											0

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TABLE F.6.11-1
(Continued)

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
MgF2			3,074	8,878							11,952
PO4								592			592
P2O5											0
SiO2				552				205			757
SO4											0
V2O5											0
NO3											0
Dolomite			3,074	8,879							11,953
Unaccounted	6,986					147.2	1,824			79.60	9,037
Totals	10,764	0	6,783	18,401	0	150	2,163	1,712	0	80.00	40,054

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TABLE F.6.11-2

CONSTITUENTS - WASTE PIT 2

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
U	1	7	59	71		0.3	32	8			178
Aluminum (Al)		6						114			120
Antimony (Sb)		0									0
Arsenic (As)		1									1
Barium (Ba)		1						11			12
Boron (B)		0									0
Bismuth (Bi)		0									0
Cadmium (Cd)		0									0
Calcium (Ca)		8									8
Calcium (from lime neutralization)	2,308	208									2,516
Chloride (Cl)		0						695			695
Chromium (Cr)		0									0
Cobalt (Co)		0									0
Copper (Cu)		0						4			4
Dysprosium (Dy)		0									0
Erbrium (Er)		0									0
Europium (Eu)		0									0
Flouride (F)		0						39			39
Gadolinium (Gd)		0									0

TABLE F.6.11-2
(Continued)

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
Holmium (Ho)		0									0
Iron (Fe)		9						40			49
Lead (Pb)		0									0
Lutetium (Lu)		0									0
Magnesium (Mg)		8						22			30
Manganese (Mn)		0						9			9
Molybdenum (Mo)		1									1
Nickel (Ni)		0									0
Samarium (Sm)		0									0
Sodium (Na)		12						1,066			1,078
Terbium (Tb)		0									0
Thorium (Th)		1						1			2
Thulium (Tm)		0									0
Tin (Sn)		0						2			2
Vanadium (V)		5									5
Yttrium (Y0)		0									0
Ytterbium (Yb)		0									0
Zinc (Zn)		0									0
NH3		1									1
CO3		3									3

TABLE F.6.11-2
(Continued)

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
MgF2			287	10,407							10,694
PO4		36						1,302			1,338
P2O5		8									8
SiO2		12		426				451			889
SO4		36									36
V2O5		4									4
NO3		66									66
Dolomite			288	3,304							3,592
Unaccounted	4,269					12.7	170				4,452
											0
Totals	6,578	433	634	14,208	0	12.7	202	3,763	0	0	25,832

TABLE F.6.11-3

CONSTITUENTS - WASTE PIT 3

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
U	12	633		150	63						858
Aluminum (Al)		710									710
Antimony (Sb)		1									1
Arsenic (As)		64									64
Barium (Ba)		75									75
Boron (B)		1									1
Bismuth (Bi)		0									0
Cadmium (Cd)		4									4
Calcium (Ca)		663									663
Calcium (from lime neutralization)	14,635	14,414							1,873		30,922
Chloride (Cl)		39									39
Chromium (Cr)		4									4
Cobalt (Co)		1									1
Copper (Cu)		22									22
Dysprosium (Dy)		2									2
Erbrium (Er)		0									0
Europium (Eu)		0									0
Flouride (F)		81									81
Gadolinium (Gd)		1									1

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TABLE F.6.11-3
(Continued)

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
Holmium (Ho)		0									0
Iron (Fe)		812									812
Lead (Pb)		4									4
Lutetium (Lu)		0									0
Magnesium (Mg)		673									673
Manganese (Mn)		26									26
Molybdenum (Mo)		54									54
Nickel (Ni)		1									1
Samarium (Sm)		0									0
Sodium (Na)		960									960
Terbium (Tb)		0									0
Thorium (Th)		98								0.43	98
Thulium (Tm)		97									97
Tin (Sn)		7									7
Vanadium (V)		395									395
Yttrium (Y0)		3									3
Ytterbium (Yb)		0									0
Zinc (Zn)		9									9
NH3		50									50
CO3		238									238

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TABLE F.6.11-3
(Continued)

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
MgF2				29,019	12,164						41,183
PO4		6,491									6,491
P2O5		623									623
SiO2		1,812		902	378						3,092
SO4		2,915									2,915
V2O5		310									310
NO3		7,529									7,529
Dolomite											0
Unaccounted	27,074								796	88.57	27,959
Totals	41,720	39,754	0	30,072	12,605	0	0	0	2,669	89.00	126,909

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TABLE F.6.11-4

CONSTITUENTS - WASTE PIT 4

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
U			329	55		1.05	1,818				2,203
Aluminum (Al)											
Antimony (Sb)											
Arsenic (As)											
Barium (Ba)											
Boron (B)											
Bismuth (Bi)											
Cadmium (Cd)											
Calcium (Ca)											
Calcium (from lime neutralization)											
Chloride (Cl)											
Chromium (Cr)											
Cobalt (Co)											
Copper (Cu)											
Dysprosium (Dy)											
Erbrium (Er)											
Europium (Eu)											
Flouride (F)											
Gadolinium (Gd)											

TABLE F.6.11-4
(Continued)

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
Holmium (Ho)											
Iron (Fe)											
Lead (Pb)											
Lutetium (Lu)											
Magnesium (Mg)											
Manganese (Mn)											
Molybdenum (Mo)											
Nickel (Ni)											
Samarium (Sm)											
Sodium (Na)											
Terbium (Tb)											
Thorium (Th)										73.766	74
Thulium (Tm)											
Tin (Sn)											
Vanadium (V)											
Yttrium (Y0)											
Ytterbium (Yb)											
Zinc (Zn)											
NH3											
CO3											

TABLE F.6.11-4
(Continued)

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
MgF2			7,516	10,747							18,263
PO4											
P2O5											
SiO2				334							334
SO4											
V2O5											
NO3											
Dolomite											
Unaccounted						450	1,772			1,019	3,241
Totals	0	0	7,845	11,137	0	451	3,590	0	0	1,093	24,115

TABLE F.6.11-5

CONSTITUENTS - WASTE PIT 5

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
U	20	501			26						547
Aluminum (Al)		420									420
Antimony (Sb)		0									0
Arsenic (As)		41									41
Barium (Ba)		45									45
Boron (B)		0									0
Bismuth (Bi)		0									0
Cadmium (Cd)		3									3
Calcium (Ca)		431									431
Calcium (from lime neutralization)	18,761	14,901							2,707		36,369
Chloride (Cl)		25									25
Chromium (Cr)		2									2
Cobalt (Co)		1									1
Copper (Cu)		13									13
Dysprosium (Dy)		1									1
Erbium (Er)		0									0
Europium (Eu)		0									0
Flouride (F)		38									38
Gadolinium (Gd)		1									1

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TABLE F.6.11-5
(Continued)

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
Holmium (Ho)		0									0
Iron (Fe)		513									513
Lead (Pb)		3									3
Lutetium (Lu)		0									0
Magnesium (Mg)		430									430
Manganese (Mn)		14									14
Molybdenum (Mo)		35									35
Nickel (Ni)		0									0
Samarium (Sm)		0									0
Sodium (Na)		624									624
Terbium (Tb)		0									0
Thorium (Th)	4	63								5.03	72
Thulium (Tm)		0									0
Tin (Sn)		4									4
Vanadium (V)		257									257
Yttrium (Y0)		2									2
Ytterbium (Yb)		0									0
Zinc (Zn)		6									6
NH3		32									32
CO3		155									155

TABLE F.6.11-5
(Continued)

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
MgF2					5,056						5,056
PO4		3,516									3,516
P2O5		405									405
SiO2		1,012			157						1,169
SO4		1,896									1,896
V2O5		202									202
NO3		4,475									4,475
Dolomite											0
Unaccounted	34,708								1,150	1001.97	36,860
Totals	53,493	30,070	0	0	5,239	0	0	0	3,857	1007.00	93,666

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TABLE F.6.11-6

CONSTITUENTS - WASTE PIT 6

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
U			332				1100				1432
Aluminum (Al)											0
Antimony (Sb)											0
Arsenic (As)											0
Barium (Ba)											0
Boron (B)											0
Bismuth (Bi)											0
Cadmium (Cd)											0
Calcium (Ca)											0
Calcium (from lime neutralization)											0
Chloride (Cl)											0
Chromium (Cr)											0
Cobalt (Co)											0
Copper (Cu)											0
Dysprosium (Dy)											0
Erbrium (Er)											0
Europium (Eu)											0
Flouride (F)											0
Gadolinium (Gd)											0

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TABLE F.6.11-6
(Continued)

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
Holmium (Ho)											0
Iron (Fe)											0
Lead (Pb)											0
Lutetium (Lu)											0
Magnesium (Mg)											0
Manganese (Mn)											0
Molybdenum (Mo)											0
Nickel (Ni)											0
Samarium (Sm)											0
Sodium (Na)											0
Terbium (Tb)											0
Thorium (Th)											0
Thulium (Tm)											0
Tin (Sn)											0
Vanadium (V)											0
Yttrium (Y0)											0
Ytterbium (Yb)											0
Zinc (Zn)											0
NH3											0
CO3											0

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TABLE F.6.11-6
(Continued)

Constituent	General Sump Sludge	Raffinate	Magnesium Flouride			Graphite/ Ceramics	Depleted Residues	UAP Filtrate	Water Treatment Sludge	Thorium Wastes	Total
			Depleted Slag	Trailer Cake	Slag Leach						
MgF2			7750								7750
PO4											0
P2O5											0
SiO2											0
SO4											0
V2O5											0
NO3											0
Dolomite											0
Unaccounted							753				753
Totals	0	0	8,082	0	0	0	1,853	0	0	0	9,935

APPENDIX G
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APPENDIX G

QA/QC SAMPLE RESULTS

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G.1 CHARACTERIZATION INVESTIGATION STUDY

0471

G.1.1 RADIOLOGICAL

Well/Boring:				
Sample ID:		FB-54-012		
Sample Date:				
QA Type:		FIELD		
Pit:		54		
Parameters	**LQ**	**Result**	**Unit**	**VQ**
CESIUM-137	<	15	PCI/L	UJ
NEPTUNIUM-237			PCI/L	NV
PLUTONIUM-238	<	0.2	PCI/L	UJ
PLUTONIUM-239/240	<	0.2	PCI/L	UJ
RADIUM-226		0.3	PCI/L	-
RADIUM-228	<	4.0	PCI/L	UJ
RUTHENIUM-106	<	82	PCI/L	UJ
STRONTIUM-90	<	1.0	PCI/L	UJ
TECHNETIUM-99	<	3.0	PCI/L	UJ
THORIUM-228			PCI/L	NV
THORIUM-230	<	0.2	PCI/L	UJ
THORIUM-232	<	0.1	PCI/L	UJ
URANIUM-234		2.6	PCI/L	-
URANIUM-235		0.2	PCI/L	-
URANIUM-238		9.6	PCI/L	-

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J = Estimated
\- = Detected
NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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G.1.2 INORGANIC

Characterization Investigation Study - QA/QC Samples
Inorganic Results

	Well/Boring:															
	Sample ID:	FB-54-001				FB-54-002				FB-54-003				FB-54-004		
	Sample Date:															
	QA Type:	FIELD				FIELD				FIELD				FIELD		
	Pit:	54				54				54				54		
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
CYANIDE	U	10	UG/L	NV	U	10	UG/L	UJ	U	10	UG/L	R	U	10	UG/L	UJ
ALUMINUM	U	66	UG/L	NV	U	66	UG/L	U	U	66	UG/L	U	U	51	UG/L	U
ANTIMONY	U	1.9	UG/L	NV	U	1.9	UG/L	UJ	U	1.5	UG/L	U	U	2	UG/L	U
ARSENIC	U	0.6	UG/L	NV	UN	0.6	UG/L	UJ	U	1.4	UG/L	U	U	1.4	UG/L	U
BARIUM	U	27	UG/L	NV	U	27	UG/L	U	U	27	UG/L	U	U	27	UG/L	U
BERYLLIUM	U	0.8	UG/L	NV	U	0.8	UG/L	U	U	0.8	UG/L	U	U	1	UG/L	U
CADMIUM	U	1.3	UG/L	NV	U	1.3	UG/L	U	U	1.3	UG/L	U	U	1.9	UG/L	U
CALCIUM	E	17400	UG/L	NV	E	56	UG/L	UJ	U	56	UG/L	U		492	UG/L	J
CHROMIUM	U	5.8	UG/L	NV	U	5.8	UG/L	U	U	5.8	UG/L	U	U	4.4	UG/L	U
COBALT	U	11	UG/L	NV	U	11	UG/L	U	U	11	UG/L	U	U	9.5	UG/L	U
COPPER	U	6.9	UG/L	NV		145	UG/L	-		93	UG/L	-		587	UG/L	-
IRON		2760	UG/L	NV	U	17	UG/L	U	U	17	UG/L	U		70	UG/L	J
LEAD	U	1.2	UG/L	NV		354	UG/L	-		150	UG/L	-		24	UG/L	-
MAGNESIUM		9480	UG/L	NV	U	72	UG/L	U	U	72	UG/L	U	U	85	UG/L	U
MANGANESE		12	UG/L	NV	U	2.4	UG/L	U	U	2.4	UG/L	U		7	UG/L	J
MERCURY		0.2	UG/L	NV	U	0.2	UG/L	U	U	0.2	UG/L	U	U	0.2	UG/L	UJ
NICKEL	U	18	UG/L	NV	U	18	UG/L	U	U	18	UG/L	U	U	18	UG/L	U
POTASSIUM		1500	UG/L	NV	U	90	UG/L	U	U	90	UG/L	U	U	90	UG/L	U
SELENIUM	U	1.2	UG/L	NV	U	1.2	UG/L	UJ	U	1.2	UG/L	U	U	1.7	UG/L	U
SILVER	UN	6.8	UG/L	NV	UN	6.8	UG/L	UJ	U	6.8	UG/L	U	U	6.8	UG/L	U
SODIUM		8400	UG/L	NV	U	310	UG/L	U	U	310	UG/L	U	U	310	UG/L	U
THALLIUM	U	1.5	UG/L	NV	U	1.5	UG/L	U	U	1.5	UG/L	U	U	1.1	UG/L	U
VANADIUM	U	7.8	UG/L	NV	U	7.8	UG/L	U	U	7.8	UG/L	U	U	14	UG/L	U
ZINC		6	UG/L	NV		883	UG/L	-		1260	UG/L	-		593	UG/L	-

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Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Inorganic Results

Well/Boring: Sample ID: Sample Date: QA Type: Pit:	FB-54-005 FIELD 54				FB-54-006 FIELD 54				FB-54-007 FIELD 54				FB-54-008 FIELD 54			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
CYANIDE	U	10	UG/L	UJ	U	10	UG/L	UJ	U	10	UG/L	UJ	U	10	UG/L	R
ALUMINUM	U	51	UG/L	U	U	51	UG/L	U	U	51	UG/L	U	U	51	UG/L	U
ANTIMONY	U	1.9	UG/L	U	U	1.4	UG/L	U	UN	1.4	UG/L	UJ	U	1.4	UG/L	U
ARSENIC	U	1.4	UG/L	U	U	1.4	UG/L	U	UN	1.4	UG/L	UJ	U	1.4	UG/L	U
BARIUM	U	27	UG/L	U	U	27	UG/L	U	U	27	UG/L	U	U	27	UG/L	U
BERYLLIUM	U	1	UG/L	U	U	1	UG/L	U	U	1	UG/L	U	U	1	UG/L	U
CADMIUM	U	1.9	UG/L	U	U	1.9	UG/L	U	U	1.9	UG/L	U	U	1.9	UG/L	U
CALCIUM	U	64	UG/L	UJ		419	UG/L	J	U	64	UG/L	U		673	UG/L	-
CHROMIUM	U	4.4	UG/L	U	U	4.4	UG/L	U	U	4.4	UG/L	U	U	4.4	UG/L	U
COBALT	U	9.5	UG/L	U	U	9.5	UG/L	U	U	9.5	UG/L	U	U	9.5	UG/L	U
COPPER	U	12	UG/L	U		464	UG/L	-	U	12	UG/L	U		201	UG/L	-
IRON	U	14	UG/L	U		192	UG/L	-		491	UG/L	-		785	UG/L	-
LEAD	U	1.1	UG/L	U		7.4	UG/L	-	N	35	UG/L	J		13	UG/L	-
MAGNESIUM	U	85	UG/L	UJ		143	UG/L	J	U	85	UG/L	U	B	144	UG/L	J
MANGANESE	U	2.3	UG/L	U		10	UG/L	-		12	UG/L	J		16	UG/L	-
MERCURY	U	0.2	UG/L	U	U	0.2	UG/L	U	U	0.2	UG/L	U	U	0.2	UG/L	U
NICKEL	U	18	UG/L	U	U	18	UG/L	U	U	18	UG/L	U	U	18	UG/L	U
POTASSIUM	U	90	UG/L	U	U	90	UG/L	U	UN	90	UG/L	UJ	U	90	UG/L	U
SELENIUM	U	1.7	UG/L	U	U	1.7	UG/L	U	UN	1.7	UG/L	UJ	U	1.7	UG/L	U
SILVER	U	6.8	UG/L	U	U	6.8	UG/L	U	UN	6.7	UG/L	UJ	U	6.7	UG/L	U
SODIUM	U	310	UG/L	U	U	310	UG/L	U	U	310	UG/L	U	U	310	UG/L	U
THALLIUM	U	1.1	UG/L	U	U	1.1	UG/L	U	U	1.1	UG/L	U	U	1.1	UG/L	U
VANADIUM	U	14	UG/L	U	U	14	UG/L	U	U	14	UG/L	U	U	14	UG/L	U
ZINC	UE	4.3	UG/L	UJ	E	313	UG/L	J		483	UG/L	-		259	UG/L	-

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Inorganic Results

Well/Boring:																
Sample ID:		FB-54-009				FB-54-010				FB-54-011				FB-54-012		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
CYANIDE	U	10	UG/L	UJ	U	10	UG/L	U	U	10	UG/L	UJ	UN	10	UG/L	UJ
ALUMINUM	U	51	UG/L	U	U	51	UG/L	U	U	51	UG/L	U	U	51	UG/L	U
ANTIMONY	U	1.4	UG/L	UJ	U	1.4	UG/L	U	B	4.8	UG/L	J	UN	1.4	UG/L	UJ
ARSENIC	U	1.4	UG/L	UJ	U	1.4	UG/L	U	U	1.4	UG/L	U		1.9	UG/L	J
BARIUM	B	62	UG/L	-	U	27	UG/L	U		27	UG/L	-	U	27	UG/L	U
BERYLLIUM	B	0.7	UG/L	-	U	1	UG/L	U	U	1	UG/L	U	U	1	UG/L	U
CADMIUM	U	1.9	UG/L	U		2	UG/L	J	U	1.9	UG/L	U	N	2	UG/L	J
CALCIUM		2030	UG/L	-		845	UG/L	J	B	772	UG/L	J		1210	UG/L	J
CHROMIUM	U	4.4	UG/L	U		6	UG/L	J	U	4.4	UG/L	U		7	UG/L	J
COBALT	U	9.5	UG/L	U		11	UG/L	J	U	9.5	UG/L	U	U	9.5	UG/L	U
COPPER		362	UG/L	-		554	UG/L	-		647	UG/L	-	E	2090	UG/L	J
IRON		394	UG/L	-	E	1540	UG/L	J	J	993	UG/L	J		658	UG/L	-
LEAD		19	UG/L	J		27	UG/L	-		88	UG/L	-	*N	22	UG/L	J
MAGNESIUM	B	468	UG/L	-		214	UG/L	J		206	UG/L	J	N	1220	UG/L	J
MANGANESE	B	9	UG/L	U		18	UG/L	-	N	15	UG/L	J	N	11	UG/L	J
MERCURY	U	0.2	UG/L	U	U	0.2	UG/L	U	U	0.2	UG/L	U	U	0.2	UG/L	UJ
NICKEL	U	18	UG/L	U		22	UG/L	J	U	18	UG/L	U		19	UG/L	J
POTASSIUM	U	90	UG/L	U	U	90	UG/L	U	U	90	UG/L	U	UN	90	UG/L	UJ
SELENIUM	U	1.7	UG/L	UJ	U	1.7	UG/L	U	U	1.7	UG/L	U	UN	1.7	UG/L	UJ
SILVER	U	6.7	UG/L	U	U	6.7	UG/L	U	UN	6.7	UG/L	UJ	UN	6.7	UG/L	UJ
SODIUM	U	310	UG/L	U	U	310	UG/L	U	U	310	UG/L	U	U	310	UG/L	U
THALLIUM	U	1.1	UG/L	UJ	U	1.1	UG/L	U	UN	1.1	UG/L	UJ	UN	1.1	UG/L	UJ
VANADIUM	U	14	UG/L	U	U	14	UG/L	U	U	14	UG/L	U	U	14	UG/L	U
ZINC	E	295	UG/L	J	E	497	UG/L	J		754	UG/L	J		996	UG/L	-

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G-1-4

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Inorganic Results

Well/Boring:				
Sample ID:		FB-54-013		
Sample Date:				
QA Type:		FIELD		
Pit:		54		
Parameters	**LQ**	**Result**	**Unit**	**VQ**
CYANIDE	U	10	UG/L	U
ALUMINUM	U	51	UG/L	U
ANTIMONY	U	1.4	UG/L	U
ARSENIC	U	1.4	UG/L	UJ
BARIUM	U	27	UG/L	U
BERYLLIUM	U	1	UG/L	U
CADMIUM		2	UG/L	J
CALCIUM		242	UG/L	-
CHROMIUM		5	UG/L	-
COBALT		10	UG/L	-
COPPER		461	UG/L	-
IRON	U	14	UG/L	U
LEAD		15	UG/L	-
MAGNESIUM		154	UG/L	-
MANGANESE		7	UG/L	-
MERCURY	U	0.2	UG/L	UJ
NICKEL		21	UG/L	-
POTASSIUM	U	90	UG/L	U
SELENIUM	U	1.7	UG/L	UJ
SILVER	U	6.7	UG/L	U
SODIUM	U	310	UG/L	U
THALLIUM	U	1.1	UG/L	UJ
VANADIUM	U	14	UG/L	U
ZINC		295	UG/L	-

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G-1-5

G.1.3 ORGANIC

Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-054-004MSD				FB-236-0030				FB-54-001				FB-54-002		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:		05				23				54				54		
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
4,4-DDE					U	0.10	UG/L	U								
ALDRIN					U	0.05	UG/L	U								
ALPHA-BHC					U	0.05	UG/L	U								
AROCLOR 1016					U	0.50	UG/L	U								
AROCLOR 1221					U	0.50	UG/L	U								
AROCLOR 1232					U	0.50	UG/L	U								
AROCLOR 1242					U	0.50	UG/L	U								
AROCLOR 1248					U	0.50	UG/L	U								
AROCLOR 1254					U	1.0	UG/L	U								
AROCLOR 1260					U	1.0	UG/L	U								
BETA-BHC					U	0.05	UG/L	U								
CHLORDANE					U	0.50	UG/L	U								
DELTA-BHC					U	0.05	UG/L	U								
DIELDRIN					U	0.10	UG/L	U								
ENDOSULFAN I					U	0.05	UG/L	U								
ENDOSULFAN II					U	0.10	UG/L	U								
ENDOSULFAN SULFATE					U	0.10	UG/L	U								
ENDRIN					U	0.10	UG/L	U								
ENDRIN KETONE					U	0.10	UG/L	U								
HEPTACHLOR					U	0.05	UG/L	U								
HEPTACHLOR EPOXIDE					U	0.05	UG/L	U								
METHOXYCHLOR					U	0.50	UG/L	U								
TOXAPHENE					U	1.0	UG/L	U								
1,2,4-TRICHLOROBENZENE	%	82	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
1,2-DICHLOROBENZENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
1,3-DICHLOROBENZENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Well/Boring:																
Sample ID:		FB-54-003				FB-54-003-BSD				FB-54-004				FB-54-004MS		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
4,4-DDE	U	1.0	UG/L	U					U	0.1	UG/L	U				
ALDRIN	U	20	UG/L	U					U	0.05	UG/L	U				
ALPHA-BHC	U	20	UG/L	U					U	0.05	UG/L	U				
AROCLOR 1016	U	5.0	UG/L	U					U	0.5	UG/L	U				
AROCLOR 1221	U	5.0	UG/L	U					U	0.5	UG/L	U				
AROCLOR 1232	U	5.0	UG/L	U					U	0.5	UG/L	U				
AROCLOR 1242	U	5.0	UG/L	U					U	0.5	UG/L	U				
AROCLOR 1248	U	5.0	UG/L	U					U	0.5	UG/L	U				
AROCLOR 1254	U	10	UG/L	U					U	1.0	UG/L	U				
AROCLOR 1260	U	10	UG/L	U					U	1.0	UG/L	U				
BETA-BHC	U	20	UG/L	U					U	0.05	UG/L	U				
CHLORDANE	U	5.0	UG/L	U					U	0.5	UG/L	U				
DELTA-BHC	U	20	UG/L	U					U	0.05	UG/L	U				
DIELDRIN	U	0.5	UG/L	U					U	0.1	UG/L	U				
ENDOSULFAN I	U	0.5	UG/L	U					U	0.05	UG/L	U				
ENDOSULFAN II	U	1.0	UG/L	U					U	0.1	UG/L	U				
ENDOSULFAN SULFATE	U	1.0	UG/L	U					U	0.1	UG/L	U				
ENDRIN	U	1.0	UG/L	U					U	0.1	UG/L	U				
ENDRIN KETONE	U	1.0	UG/L	U					U	0.1	UG/L	U				
HEPTACHLOR	U	20	UG/L	U					U	0.05	UG/L	U				
HEPTACHLOR EPOXIDE	U	0.5	UG/L	U					U	0.05	UG/L	U				
METHOXYCHLOR	U	5.0	UG/L	U					U	0.5	UG/L	U				
TOXAPHENE	U	10	UG/L	U					U	1.0	UG/L	U				
1,2,4-TRICHLOROBENZENE	U	10	UG/L	U					U	10	UG/L	NV	%	80	UG/L	NV
1,2-DICHLOROBENZENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
1,3-DICHLOROBENZENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV

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G-1-7

Characterization Investigation Study - QA/QC Samples
Organic Results

	FB-54-004MSD				FB-54-005				FB-54-005-MS				FB-54-005-MSD			
Well/Boring:																
Sample ID:	FB-54-004MSD				FB-54-005				FB-54-005-MS				FB-54-005-MSD			
Sample Date:																
QA Type:	FIELD				FIELD				FIELD				FIELD			
Pit:	54				54				54				54			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
4,4-DDE					U	0.10	UG/L	U								
ALDRIN					U	0.05	UG/L	U								
ALPHA-BHC					U	0.05	UG/L	U								
AROCLOR 1016					U	0.5	UG/L	U								
AROCLOR 1221					U	0.5	UG/L	U								
AROCLOR 1232					U	0.5	UG/L	U								
AROCLOR 1242					U	0.5	UG/L	U								
AROCLOR 1248					U	0.5	UG/L	U								
AROCLOR 1254					U	1.0	UG/L	U								
AROCLOR 1260					U	1.0	UG/L	U								
BETA-BHC					U	0.05	UG/L	U								
CHLORDANE					U	0.5	UG/L	U								
DELTA-BHC					U	0.05	UG/L	U								
DIELDRIN					U	0.10	UG/L	U								
ENDOSULFAN I					U	0.05	UG/L	U								
ENDOSULFAN II					U	0.10	UG/L	U								
ENDOSULFAN SULFATE					U	0.10	UG/L	U								
ENDRIN					U	0.10	UG/L	U								
ENDRIN KETONE					U	0.10	UG/L	U								
HEPTACHLOR					U	0.05	UG/L	U								
HEPTACHLOR EPOXIDE					U	0.05	UG/L	U								
METHOXYCHLOR					U	0.5	UG/L	U								
TOXAPHENE					U	1.0	UG/L	U								
1,2,4-TRICHLOROBENZENE	%	82	UG/L	NV	U	10	UG/L	U	%	50	UG/L	NV	%	50	UG/L	NV
1,2-DICHLOROBENZENE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
1,3-DICHLOROBENZENE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV

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Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-005MS				FB-54-005MSD				FB-54-006				FB-54-006MSD		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
4,4-DDE									U	0.10	UG/L	U				
ALDRIN									U	0.05	UG/L	U				
ALPHA-BHC									U	0.05	UG/L	U				
AROCLOR 1016									U	0.5	UG/L	U				
AROCLOR 1221									U	0.5	UG/L	U				
AROCLOR 1232									U	0.5	UG/L	U				
AROCLOR 1242									U	0.5	UG/L	U				
AROCLOR 1248									U	0.5	UG/L	U				
AROCLOR 1254									U	1.0	UG/L	U				
AROCLOR 1260									U	1.0	UG/L	U				
BETA-BHC									U	0.05	UG/L	U				
CHLORDANE									U	0.5	UG/L	U				
DELTA-BHC									U	0.05	UG/L	U				
DIELDRIN									U	0.10	UG/L	U				
ENDOSULFAN I									U	0.05	UG/L	U				
ENDOSULFAN II									U	0.10	UG/L	U				
ENDOSULFAN SULFATE									U	0.10	UG/L	U				
ENDRIN									U	0.10	UG/L	U				
ENDRIN KETONE									U	0.10	UG/L	U				
HEPTACHLOR									U	0.05	UG/L	U				
HEPTACHLOR EPOXIDE									U	0.05	UG/L	U				
METHOXYCHLOR									U	0.5	UG/L	U				
TOXAPHENE									U	1.0	UG/L	U				
1,2,4-TRICHLOROBENZENE	%	50	UG/L	NV	%	50	UG/L	NV	U	10	UG/L	U				
1,2-DICHLOROBENZENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
1,3-DICHLOROBENZENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				

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Submittal Date: 12-OCT-93
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Well/Boring:																
Sample ID:		FB-54-007				FB-54-008				FB-54-008BS				FB-54-008BSD		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
4,4-DDE	U	0.10	UG/L	U	U	0.10	UG/L	U								
ALDRIN	U	0.05	UG/L	U	U	0.05	UG/L	U								
ALPHA-BHC	U	0.05	UG/L	U	U	0.05	UG/L	U								
AROCLOR 1016	U	0.5	UG/L	U	U	0.50	UG/L	U								
AROCLOR 1221	U	0.5	UG/L	U	U	0.50	UG/L	U								
AROCLOR 1232	U	0.5	UG/L	U	U	0.50	UG/L	U								
AROCLOR 1242	U	0.5	UG/L	U	U	0.50	UG/L	U								
AROCLOR 1248	U	0.5	UG/L	U	U	0.50	UG/L	U								
AROCLOR 1254	U	1.0	UG/L	U	U	1.0	UG/L	U								
AROCLOR 1260	U	1.0	UG/L	U	U	1.0	UG/L	U								
BETA-BHC	U	0.05	UG/L	U	U	0.05	UG/L	U								
CHLORDANE	U	0.5	UG/L	U	U	0.50	UG/L	U								
DELTA-BHC	U	0.05	UG/L	U	U	0.05	UG/L	U								
DIELDRIN	U	0.10	UG/L	U	U	0.10	UG/L	U								
ENDOSULFAN I	U	0.05	UG/L	U	U	0.05	UG/L	U								
ENDOSULFAN II	U	0.10	UG/L	U	U	0.10	UG/L	U								
ENDOSULFAN SULFATE	U	0.10	UG/L	U	U	0.10	UG/L	U								
ENDRIN	U	0.10	UG/L	U	U	0.10	UG/L	U								
ENDRIN KETONE	U	0.10	UG/L	U	U	0.10	UG/L	U								
HEPTACHLOR	U	0.05	UG/L	U	U	0.05	UG/L	U								
HEPTACHLOR EPOXIDE	U	0.05	UG/L	U	U	0.05	UG/L	U								
METHOXYCHLOR	U	0.5	UG/L	U	U	0.50	UG/L	U								
TOXAPHENE	U	1.0	UG/L	U	U	1.0	UG/L	U								
1,2,4-TRICHLOROBENZENE	U	10	UG/L	U	U	10	UG/L	UJ	%	92		NV	%	58		NV
1,2-DICHLOROBENZENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
1,3-DICHLOROBENZENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-009				FB-54-010				FB-54-011				FB-54-012		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
4,4-DDE																
ALDRIN																
ALPHA-BHC																
AROCLOR 1016																
AROCLOR 1221																
AROCLOR 1232																
AROCLOR 1242																
AROCLOR 1248																
AROCLOR 1254																
AROCLOR 1260																
BETA-BHC																
CHLORDANE																
DELTA-BHC																
DIELDRIN																
ENDOSULFAN I																
ENDOSULFAN II																
ENDOSULFAN SULFATE																
ENDRIN																
ENDRIN KETONE																
HEPTACHLOR																
HEPTACHLOR EPOXIDE																
METHOXYCHLOR																
TOXAPHENE																
1,2,4-TRICHLOROBENZENE	U	10	UG/L	UJ	U	10	UG/L	U								
1,2-DICHLOROBENZENE	U	10	UG/L	UJ	U	10	UG/L	U								
1,3-DICHLOROBENZENE	U	10	UG/L	UJ	U	10	UG/L	U								

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:				
Sample ID:	FB-54-013	TB-00-001	TB-00-003	TB-00-004
Sample Date:				
QA Type:	FIELD	TRIP	TRIP	TRIP
Pit:	54	00	00	00

Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
4,4-DDE																
ALDRIN																
ALPHA-BHC																
AROCLOR 1016																
AROCLOR 1221																
AROCLOR 1232																
AROCLOR 1242																
AROCLOR 1248																
AROCLOR 1254																
AROCLOR 1260																
BETA-BHC																
CHLORDANE																
DELTA-BHC																
DIELDRIN																
ENDOSULFAN I																
ENDOSULFAN II																
ENDOSULFAN SULFATE																
ENDRIN																
ENDRIN KETONE																
HEPTACHLOR																
HEPTACHLOR EPOXIDE																
METHOXYCHLOR																
TOXAPHENE																
1,2,4-TRICHLOROBENZENE	U	10	UG/L	U												
1,2-DICHLOROBENZENE	U	10	UG/L	U												
1,3-DICHLOROBENZENE	U	10	UG/L	U												

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:	TB-00-005				TB-00-006				TB-00-007				TB-00-008			
Sample Date:																
QA Type:	TRIP				TRIP				TRIP				TRIP			
Pit:	00				00				00				00			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
4,4-DDE																
ALDRIN																
ALPHA-BHC																
AROCLOR 1016																
AROCLOR 1221																
AROCLOR 1232																
AROCLOR 1242																
AROCLOR 1248																
AROCLOR 1254																
AROCLOR 1260																
BETA-BHC																
CHLORDANE																
DELTA-BHC																
DIELDRIN																
ENDOSULFAN I																
ENDOSULFAN II																
ENDOSULFAN SULFATE																
ENDRIN																
ENDRIN KETONE																
HEPTACHLOR																
HEPTACHLOR EPOXIDE																
METHOXYCHLOR																
TOXAPHENE																
1,2,4-TRICHLOROBENZENE																
1,2-DICHLOROBENZENE																
1,3-DICHLOROBENZENE																

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J = Estimated
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NV = Not Validated

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Well/Boring:																
Sample ID:		TB-00-009				TB-00-011				TB-00-012				TB-00-013		
Sample Date:																
QA Type:		TRIP				TRIP				TRIP				TRIP		
Pit:			00				00				00				00	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
4,4-DDE																
ALDRIN																
ALPHA-BHC																
AROCLOR 1016																
AROCLOR 1221																
AROCLOR 1232																
AROCLOR 1242																
AROCLOR 1248																
AROCLOR 1254																
AROCLOR 1260																
BETA-BHC																
CHLORDANE																
DELTA-BHC																
DIELDRIN																
ENDOSULFAN I																
ENDOSULFAN II																
ENDOSULFAN SULFATE																
ENDRIN																
ENDRIN KETONE																
HEPTACHLOR																
HEPTACHLOR EPOXIDE																
METHOXYCHLOR																
TOXAPHENE																
1,2,4-TRICHLOROBENZENE																
1,2-DICHLOROBENZENE																
1,3-DICHLOROBENZENE																

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		TB-00-015				TB-00-016				TB-00-017				TB-00-018		
Sample Date:																
QA Type:		TRIP				TRIP				TRIP				TRIP		
Pit:		00				00				00				00		
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
4,4-DDE																
ALDRIN																
ALPHA-BHC																
AROCLOR 1016																
AROCLOR 1221																
AROCLOR 1232																
AROCLOR 1242																
AROCLOR 1248																
AROCLOR 1254																
AROCLOR 1260																
BETA-BHC																
CHLORDANE																
DELTA-BHC																
DIELDRIN																
ENDOSULFAN I																
ENDOSULFAN II																
ENDOSULFAN SULFATE																
ENDRIN																
ENDRIN KETONE																
HEPTACHLOR																
HEPTACHLOR EPOXIDE																
METHOXYCHLOR																
TOXAPHENE																
1,2,4-TRICHLOROBENZENE																
1,2-DICHLOROBENZENE																
1,3-DICHLOROBENZENE																

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:	TB-00-019				TB-00-020				TB-00-021				TB-00-022			
Sample Date:																
QA Type:	TRIP				TRIP				TRIP				TRIP			
Pit:	00				00				00				00			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
4,4-DDE																
ALDRIN																
ALPHA-BHC																
AROCLOR 1016																
AROCLOR 1221																
AROCLOR 1232																
AROCLOR 1242																
AROCLOR 1248																
AROCLOR 1254																
AROCLOR 1260																
BETA-BHC																
CHLORDANE																
DELTA-BHC																
DIELDRIN																
ENDOSULFAN I																
ENDOSULFAN II																
ENDOSULFAN SULFATE																
ENDRIN																
ENDRIN KETONE																
HEPTACHLOR																
HEPTACHLOR EPOXIDE																
METHOXYCHLOR																
TOXAPHENE																
1,2,4-TRICHLOROBENZENE																
1,2-DICHLOROBENZENE																
1,3-DICHLOROBENZENE																

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:								
Sample ID:	TB-00-023				TB-05-002			
Sample Date:								
QA Type:	TRIP				TRIP			
Pit:	00				05			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
4,4-DDE								
ALDRIN								
ALPHA-BHC								
AROCLOR 1016								
AROCLOR 1221								
AROCLOR 1232								
AROCLOR 1242								
AROCLOR 1248								
AROCLOR 1254								
AROCLOR 1260								
BETA-BHC								
CHLORDANE								
DELTA-BHC								
DIELDRIN								
ENDOSULFAN I								
ENDOSULFAN II								
ENDOSULFAN SULFATE								
ENDRIN								
ENDRIN KETONE								
HEPTACHLOR								
HEPTACHLOR EPOXIDE								
METHOXYCHLOR								
TOXAPHENE								
1,2,4-TRICHLOROBENZENE								
1,2-DICHLOROBENZENE								
1,3-DICHLOROBENZENE								

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-054-004MSD				FB-236-0030				FB-54-001				FB-54-002		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			05				23				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
1,4-DICHLOROBENZENE									U	10	UG/L	NV	U	10	UG/L	U
2,4,5-TRICHLOROPHENOL	U	50	UG/L	NV					U	50	UG/L	NV	U	50	UG/L	U
2,4,6-TRICHLOROPHENOL	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
2,4-DICHLOROPHENOL	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
2,4-DIMETHYLPHENOL	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
2,4-DINITROPHENOL	U	50	UG/L	NV					U	50	UG/L	NV	U	50	UG/L	UJ
2,4-DINITROTOLUENE	%	70	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
2,6-DINITROTOLUENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
2-CHLORONAPHTHALENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
2-CHLOROPHENOL	%	79	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
2-METHYLNAPHTHALENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
2-METHYLPHENOL	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
2-NITROANILINE	U	50	UG/L	NV					U	50	UG/L	NV	U	50	UG/L	U
2-NITROBENZENE																
2-NITROPHENOL	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
3,3-DICHLOROBENZIDINE	U	20	UG/L	NV					U	20	UG/L	NV	U	20	UG/L	U
3-NITROANILINE	U	50	UG/L	NV					U	50	UG/L	NV	U	50	UG/L	U
4,6-DINITRO-2-METHYLPHENOL	U	50	UG/L	NV					U	50	UG/L	NV	U	50	UG/L	UJ
4-BROMOPHENYL PHENYL ETHER	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
4-CHLORO-3-METHYLPHENOL	%	89	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
4-CHLOROANILINE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
4-METHYLPHENOL	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
4-NITROANILINE	U	50	UG/L	NV					U	50	UG/L	NV	U	50	UG/L	U
4-NITROPHENOL	%	36	UG/L	NV					U	50	UG/L	NV	U	50	UG/L	U
ACENAPHTHENE																
ACENAPHTHYLENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-003				FB-54-003-BSD				FB-54-004				FB-54-004MS		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
1,4-DICHLOROBENZENE	U	10	UG/L	U					U	10	UG/L	NV	%	72	UG/L	NV
2,4,5-TRICHLOROPHENOL	U	50	UG/L	UJ					U	50	UG/L	NV	U	50	UG/L	NV
2,4,6-TRICHLOROPHENOL	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
2,4-DICHLOROPHENOL	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
2,4-DIMETHYLPHENOL	U	10	UG/L	R					U	10	UG/L	NV	U	10	UG/L	NV
2,4-DINITROPHENOL	U	50	UG/L	UJ					U	50	UG/L	NV	U	50	UG/L	NV
2,4-DINITROTOLUENE	U	10	UG/L	U					U	10	UG/L	NV	%	88	UG/L	NV
2,6-DINITROTOLUENE	U	10	UG/L	UJ					U	10	UG/L	NV	U	10	UG/L	NV
2-CHLORONAPHTHALENE	U	10	UG/L	UJ					U	10	UG/L	NV	U	10	UG/L	NV
2-CHLOROPHENOL	U	10	UG/L	U	%	83	UG/L	NV	U	10	UG/L	NV	%	83	UG/L	NV
2-METHYLNAPHTHALENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
2-METHYLPHENOL	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
2-NITROANILINE	U	50	UG/L	U					U	50	UG/L	NV	U	50	UG/L	NV
2-NITROBENZENE																
2-NITROPHENOL	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
3,3-DICHLOROBENZIDINE	U	20	UG/L	U					U	20	UG/L	NV	U	20	UG/L	NV
3-NITROANILINE	U	50	UG/L	UJ					U	50	UG/L	NV	U	50	UG/L	NV
4,6-DINITRO-2-METHYLPHENOL	U	50	UG/L	UJ					U	50	UG/L	NV	U	50	UG/L	NV
4-BROMOPHENYL PHENYL ETHER	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
4-CHLORO-3-METHYLPHENOL	U	10	UG/L	U					U	10	UG/L	NV	%	86	UG/L	NV
4-CHLOROANILINE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
4-METHYLPHENOL	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
4-NITROANILINE	U	50	UG/L	UJ					U	50	UG/L	NV	U	50	UG/L	NV
4-NITROPHENOL	U	50	UG/L	U					U	50	UG/L	NV	%	49	UG/L	NV
ACENAPHTHENE																
ACENAPHTHYLENE	U	10	UG/L	UJ					U	10	UG/L	NV	U	10	UG/L	NV

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Well/Boring: Sample ID: Sample Date: QA Type: Pit:	FB-54-004MSD FIELD 54				FB-54-005 FIELD 54				FB-54-005-MS FIELD 54				FB-54-005-MSD FIELD 54			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
1,4-DICHLOROBENZENE	%	66	UG/L	NV	U	10	UG/L	U	%	54	UG/L	NV	%	50	UG/L	NV
2,4,5-TRICHLOROPHENOL					U	50	UG/L	UJ	U	50	UG/L	NV	U	50	UG/L	NV
2,4,6-TRICHLOROPHENOL					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
2,4-DICHLOROPHENOL					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
2,4-DIMETHYLPHENOL					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
2,4-DINITROPHENOL					U	50	UG/L	U					U	50	UG/L	NV
2,4-DINITROTOLUENE	%	70	UG/L	NV	U	10	UG/L	U	%	64	UG/L	NV	%	66	UG/L	NV
2,6-DINITROTOLUENE					U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV
2-CHLORONAPHTHALENE					U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV
2-CHLOROPHENOL	%	29	UG/L	NV	U	10	UG/L	U	%	53	UG/L	NV	%	61	UG/L	NV
2-METHYLNAPHTHALENE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
2-METHYLPHENOL					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
2-NITROANILINE					U	50	UG/L	U					U	50	UG/L	NV
2-NITROBENZENE																
2-NITROPHENOL					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
3,3-DICHLOROBENZIDINE					U	20	UG/L	UJ					U	20	UG/L	NV
3-NITROANILINE					U	50	UG/L	UJ					U	50	UG/L	NV
4,6-DINITRO-2-METHYLPHENOL					U	50	UG/L	U					U	50	UG/L	NV
4-BROMOPHENYL PHENYL ETHER					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
4-CHLORO-3-METHYLPHENOL	%	89	UG/L	NV	U	10	UG/L	U	%	55	UG/L	NV	%	65	UG/L	NV
4-CHLOROANILINE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
4-METHYLPHENOL					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
4-NITROANILINE					U	50	UG/L	UJ					U	50	UG/L	NV
4-NITROPHENOL	%	36	UG/L	NV	U	50	UG/L	U					%	30	UG/L	NV
ACENAPHTHENE	%	48	UG/L	NV					%	36	UG/L	NV	%	36	UG/L	NV
ACENAPHTHYLENE					U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-005MS				FB-54-005MSD				FB-54-006				FB-54-006MSD		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
1,4-DICHLOROBENZENE	%	54	UG/L	NV	%	50	UG/L	NV	U	10	UG/L	U				
2,4,5-TRICHLOROPHENOL	U	50	UG/L	NV	U	50	UG/L	NV	U	50	UG/L	UJ				
2,4,6-TRICHLOROPHENOL	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
2,4-DICHLOROPHENOL	U	10	UG/L	NV	U	10	UG/L	NV					U	10	UG/L	U
2,4-DIMETHYLPHENOL	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
2,4-DINITROPHENOL	U	50	UG/L	NV	U	50	UG/L	NV	U	50	UG/L	U				
2,4-DINITROTOLUENE	%	64	UG/L	NV	%	66	UG/L	NV	U	10	UG/L	U				
2,6-DINITROTOLUENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	UJ				
2-CHLORONAPHTHALENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	UJ				
2-CHLOROPHENOL	%	53	UG/L	NV	%	61	UG/L	NV	U	10	UG/L	U				
2-METHYLNAPHTHALENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
2-METHYLPHENOL	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
2-NITROANILINE	U	50	UG/L	NV	U	50	UG/L	NV	U	50	UG/L	U				
2-NITROBENZENE																
2-NITROPHENOL	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
3,3-DICHLOROBENZIDINE	U	20	UG/L	NV	U	20	UG/L	NV	U	20	UG/L	UJ				
3-NITROANILINE	U	50	UG/L	NV	U	50	UG/L	NV	U	50	UG/L	UJ				
4,6-DINITRO-2-METHYLPHENOL	U	50	UG/L	NV	U	50	UG/L	NV	U	50	UG/L	U				
4-BROMOPHENYL PHENYL ETHER	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
4-CHLORO-3-METHYLPHENOL	%	55	UG/L	NV	%	65	UG/L	NV	U	10	UG/L	U				
4-CHLOROANILINE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
4-METHYLPHENOL	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
4-NITROANILINE	U	50	UG/L	NV	U	50	UG/L	NV	U	50	UG/L	UJ				
4-NITROPHENOL	%	35	UG/L	NV	%	30	UG/L	NV	U	50	UG/L	U				
ACENAPHTHENE																
ACENAPHTHYLENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	UJ				

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-007				FB-54-008				FB-54-008BS				FB-54-008BSD		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
1,4-DICHLOROBENZENE	U	10	UG/L	U	U	10	UG/L	UJ	%	52		NV	%	46		NV
2,4,5-TRICHLOROPHENOL	U	50	UG/L	UJ	U	50	UG/L	UJ	U	50	UG/L	NV				
2,4,6-TRICHLOROPHENOL	U	10	UG/L	UJ	U	10	UG/L	UJ	U	10	UG/L	NV				
2,4-DICHLOROPHENOL	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
2,4-DIMETHYLPHENOL	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
2,4-DINITROPHENOL	U	50	UG/L	UJ	U	50	UG/L	UJ	U	50	UG/L	NV				
2,4-DINITROTOLUENE	U	10	UG/L	U	U	10	UG/L	UJ	%	74		NV	%	80		NV
2,6-DINITROTOLUENE	U	10	UG/L	UJ	U	10	UG/L	UJ	U	10	UG/L	NV				
2-CHLORONAPHTHALENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
2-CHLOROPHENOL	U	10	UG/L	U	U	10	UG/L	UJ	%	73		NV	%	69		NV
2-METHYLNAPHTHALENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
2-METHYLPHENOL	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
2-NITROANILINE	U	50	UG/L	U	U	50	UG/L	UJ	U	50	UG/L	NV				
2-NITROBENZENE																
2-NITROPHENOL	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
3,3-DICHLOROBENZIDINE	U	20	UG/L	UJ	U	20	UG/L	UJ	U	20	UG/L	NV				
3-NITROANILINE	U	50	UG/L	UJ	U	50	UG/L	UJ	U	50	UG/L	NV				
4,6-DINITRO-2-METHYLPHENOL	U	50	UG/L	U	U	50	UG/L	UJ	U	50	UG/L	NV				
4-BROMOPHENYL PHENYL ETHER	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
4-CHLORO-3-METHYLPHENOL	U	10	UG/L	U	U	10	UG/L	UJ	%	69		NV	%	72		NV
4-CHLOROANILINE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
4-METHYLPHENOL	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
4-NITROANILINE	U	50	UG/L	UJ	U	50	UG/L	UJ	U	50	UG/L	NV				
4-NITROPHENOL	U	50	UG/L	U	U	50	UG/L	UJ	%	19		NV	%	30		NV
ACENAPHTHENE	U	10	UG/L	U												
ACENAPHTHYLENE	U	10	UG/L	UJ	U	10	UG/L	UJ	U	10	UG/L	NV	%	60		NV

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Submittal Date: 12-OCT-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-009				FB-54-010				FB-54-011				FB-54-012		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:		54				54				54				54		
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
1,4-DICHLOROBENZENE	U	10	UG/L	UJ	U	10	UG/L	U								
2,4,5-TRICHLOROPHENOL	U	50	UG/L	UJ	U	50	UG/L	U								
2,4,6-TRICHLOROPHENOL	U	10	UG/L	UJ	U	10	UG/L	U								
2,4-DICHLOROPHENOL	U	10	UG/L	UJ	U	10	UG/L	U								
2,4-DIMETHYLPHENOL	U	10	UG/L	UJ	U	10	UG/L	U								
2,4-DINITROPHENOL	U	50	UG/L	UJ	U	50	UG/L	U								
2,4-DINITROTOLUENE	U	10	UG/L	UJ	U	10	UG/L	U								
2,6-DINITROTOLUENE	U	10	UG/L	J	U	10	UG/L	U								
2-CHLORONAPHTHALENE	U	10	UG/L	UJ	U	10	UG/L	U								
2-CHLOROPHENOL	U	10	UG/L	UJ	U	10	UG/L	U								
2-METHYLNAPHTHALENE	U	10	UG/L	UJ	U	10	UG/L	U								
2-METHYLPHENOL	U	10	UG/L	UJ	U	10	UG/L	U								
2-NITROANILINE	U	50	UG/L	UJ	U	50	UG/L	U								
2-NITROBENZENE					U	10	UG/L	U								
2-NITROPHENOL	U	10	UG/L	J	U	10	UG/L	U								
3,3-DICHLOROBENZIDINE	U	20	UG/L	UJ	U	20	UG/L	U								
3-NITROANILINE	U	50	UG/L	UJ	U	50	UG/L	U								
4,6-DINITRO-2-METHYLPHENOL	U	50	UG/L	J	U	50	UG/L	U								
4-BROMOPHENYL PHENYL ETHER	U	10	UG/L	UJ	U	10	UG/L	U								
4-CHLORO-3-METHYLPHENOL	U	10	UG/L	UJ	U	10	UG/L	U								
4-CHLOROANILINE	U	10	UG/L	UJ	U	10	UG/L	U								
4-METHYLPHENOL	U	10	UG/L	UJ	U	10	UG/L	U								
4-NITROANILINE	U	50	UG/L	UJ	U	50	UG/L	U								
4-NITROPHENOL	U	50	UG/L	UJ	U	50	UG/L	U								
ACENAPHTHENE																
ACENAPHTHYLENE	U	10	UG/L	UJ	U	10	UG/L	U								

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:	FB-54-013				TB-00-001				TB-00-003				TB-00-004			
Sample Date:																
QA Type:	FIELD				TRIP				TRIP				TRIP			
Pit:	54				00				00				00			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
1,4-DICHLOROBENZENE	U	10	UG/L	U												
2,4,5-TRICHLOROPHENOL	U	50	UG/L	UJ												
2,4,6-TRICHLOROPHENOL	U	10	UG/L	U												
2,4-DICHLOROPHENOL	U	10	UG/L	U												
2,4-DIMETHYLPHENOL	U	10	UG/L	U												
2,4-DINITROPHENOL	U	50	UG/L	U												
2,4-DINITROTOLUENE	U	10	UG/L	UJ												
2,6-DINITROTOLUENE	U	10	UG/L	U												
2-CHLORONAPHTHALENE	U	10	UG/L	U												
2-CHLOROPHENOL	U	10	UG/L	U												
2-METHYLNAPHTHALENE	U	10	UG/L	U												
2-METHYLPHENOL	U	10	UG/L	U												
2-NITROANILINE	U	50	UG/L	UJ												
2-NITROBENZENE																
2-NITROPHENOL	U	10	UG/L	U												
3,3-DICHLOROBENZIDINE	U	20	UG/L	U												
3-NITROANILINE	U	50	UG/L	U												
4,6-DINITRO-2-METHYLPHENOL	U	50	UG/L	U												
4-BROMOPHENYL PHENYL ETHER	U	10	UG/L	UJ												
4-CHLORO-3-METHYLPHENOL	U	10	UG/L	U												
4-CHLOROANILINE	U	10	UG/L	U												
4-METHYLPHENOL	U	10	UG/L	U												
4-NITROANILINE	U	50	UG/L	U												
4-NITROPHENOL	U	50	UG/L	UJ												
ACENAPHTHENE																
ACENAPHTHYLENE	U	10	UG/L	U												

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Submittal Date: 12-OCT-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		TB-00-005				TB-00-006				TB-00-007				TB-00-008		
Sample Date:																
QA Type:		TRIP				TRIP				TRIP				TRIP		
Pit:		00				00				00				00		
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
1,4-DICHLOROBENZENE																
2,4,5-TRICHLOROPHENOL																
2,4,6-TRICHLOROPHENOL																
2,4-DICHLOROPHENOL																
2,4-DIMETHYLPHENOL																
2,4-DINITROPHENOL																
2,4-DINITROTOLUENE																
2,6-DINITROTOLUENE																
2-CHLORONAPHTHALENE																
2-CHLOROPHENOL																
2-METHYLNAPHTHALENE																
2-METHYLPHENOL																
2-NITROANILINE																
2-NITROBENZENE																
2-NITROPHENOL																
3,3-DICHLOROBENZIDINE																
3-NITROANILINE																
4,6-DINITRO-2-METHYLPHENOL																
4-BROMOPHENYL PHENYL ETHER																
4-CHLORO-3-METHYLPHENOL																
4-CHLOROANILINE																
4-METHYLPHENOL																
4-NITROANILINE																
4-NITROPHENOL																
ACENAPHTHENE																
ACENAPHTHYLENE																

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Well/Boring:																
Sample ID:	TB-00-009				TB-00-011				TB-00-012				TB-00-013			
Sample Date:																
QA Type:	TRIP				TRIP				TRIP				TRIP			
Pit:	00				00				00				00			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
1,4-DICHLOROBENZENE																
2,4,5-TRICHLOROPHENOL																
2,4,6-TRICHLOROPHENOL																
2,4-DICHLOROPHENOL																
2,4-DIMETHYLPHENOL																
2,4-DINITROPHENOL																
2,4-DINITROTOLUENE																
2,6-DINITROTOLUENE																
2-CHLORONAPHTHALENE																
2-CHLOROPHENOL																
2-METHYLNAPHTHALENE																
2-METHYLPHENOL																
2-NITROANILINE																
2-NITROBENZENE																
2-NITROPHENOL																
3,3-DICHLOROBENZIDINE																
3-NITROANILINE																
4,6-DINITRO-2-METHYLPHENOL																
4-BROMOPHENYL PHENYL ETHER																
4-CHLORO-3-METHYLPHENOL																
4-CHLOROANILINE																
4-METHYLPHENOL																
4-NITROANILINE																
4-NITROPHENOL																
ACENAPHTHENE																
ACENAPHTHYLENE																

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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0500

Characterization Investigation Study - QA/QC Samples
Organic Results

	Well/Boring:															
	Sample ID:		TB-00-015				TB-00-016				TB-00-017				TB-00-018	
	Sample Date:															
	QA Type:		TRIP				TRIP				TRIP				TRIP	
	Pit:			00				00				00				00
Parameters		LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
1,4-DICHLOROBENZENE																
2,4,5-TRICHLOROPHENOL																
2,4,6-TRICHLOROPHENOL																
2,4-DICHLOROPHENOL																
2,4-DIMETHYLPHENOL																
2,4-DINITROPHENOL																
2,4-DINITROTOLUENE																
2,6-DINITROTOLUENE																
2-CHLORONAPHTHALENE																
2-CHLOROPHENOL																
2-METHYLNAPHTHALENE																
2-METHYLPHENOL																
2-NITROANILINE																
2-NITROBENZENE																
2-NITROPHENOL																
3,3-DICHLOROBENZIDINE																
3-NITROANILINE																
4,6-DINITRO-2-METHYLPHENOL																
4-BROMOPHENYL PHENYL ETHER																
4-CHLORO-3-METHYLPHENOL																
4-CHLOROANILINE																
4-METHYLPHENOL																
4-NITROANILINE																
4-NITROPHENOL																
ACENAPHTHENE																
ACENAPHTHYLENE																

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Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:	TB-00-019				TB-00-020				TB-00-021				TB-00-022			
Sample Date:																
QA Type:	TRIP				TRIP				TRIP				TRIP			
Pit:	00				00				00				00			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
1,4-DICHLOROBENZENE																
2,4,5-TRICHLOROPHENOL																
2,4,6-TRICHLOROPHENOL																
2,4-DICHLOROPHENOL																
2,4-DIMETHYLPHENOL																
2,4-DINITROPHENOL																
2,4-DINITROTOLUENE																
2,6-DINITROTOLUENE																
2-CHLORONAPHTHALENE																
2-CHLOROPHENOL																
2-METHYLNAPHTHALENE																
2-METHYLPHENOL																
2-NITROANILINE																
2-NITROBENZENE																
2-NITROPHENOL																
3,3-DICHLOROBENZIDINE																
3-NITROANILINE																
4,6-DINITRO-2-METHYLPHENOL																
4-BROMOPHENYL PHENYL ETHER																
4-CHLORO-3-METHYLPHENOL																
4-CHLOROANILINE																
4-METHYLPHENOL																
4-NITROANILINE																
4-NITROPHENOL																
ACENAPHTHENE																
ACENAPHTHYLENE																

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Well/Boring:								
Sample ID:	TB-00-023				TB-05-002			
Sample Date:								
QA Type:	TRIP				TRIP			
Pit:	00				05			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
1,4-DICHLOROBENZENE								
2,4,5-TRICHLOROPHENOL								
2,4,6-TRICHLOROPHENOL								
2,4-DICHLOROPHENOL								
2,4-DIMETHYLPHENOL								
2,4-DINITROPHENOL								
2,4-DINITROTOLUENE								
2,6-DINITROTOLUENE								
2-CHLORONAPHTHALENE								
2-CHLOROPHENOL								
2-METHYLNAPHTHALENE								
2-METHYLPHENOL								
2-NITROANILINE								
2-NITROBENZENE								
2-NITROPHENOL								
3,3-DICHLOROBENZIDINE								
3-NITROANILINE								
4,6-DINITRO-2-METHYLPHENOL								
4-BROMOPHENYL PHENYL ETHER								
4-CHLORO-3-METHYLPHENOL								
4-CHLOROANILINE								
4-METHYLPHENOL								
4-NITROANILINE								
4-NITROPHENOL								
ACENAPHTHENE								
ACENAPHTHYLENE								

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-054-004MSD				FB-236-0030				FB-54-001				FB-54-002		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			05				23				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ANTHRACENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
BENZO(A)ANTHRACENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
BENZO(A)PYRENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	UJ
BENZO(B)FLUORANTHENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	UJ
BENZO(G,H,I)PERYLENE									U	10	UG/L	NV	U	10	UG/L	UJ
BENZO(K)FLUORANTHENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	UJ
BENZOIC ACID	U	50	UG/L	NV					U	50	UG/L	NV	U	50	UG/L	UJ
BENZYL ALCOHOL	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
BIS(2-CHLOROETHOXY)METHANE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
BIS(2-CHLOROETHYL)ETHER	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
BIS(2-CHLOROISOPROPYL)ETHER	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
BIS(2-ETHYLHEXYL)PHTHALATE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
BIS(CHLOROMETHYL)ETHER									U	10	UG/L	NV	U	10	UG/L	U
BUTYL BENZYL PHTHALATE									U	10	UG/L	NV	U	10	UG/L	U
CHRYSENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
DI-N-BUTYLPHTHALATE		NR	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
DI-N-OCTYLPHTHALATE	J	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
DIBENZO(A,H)ANTHRACENE									U	10	UG/L	NV	U	10	UG/L	U
DIBENZOFURAN	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
DIETHYL PHTHALATE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
DIMETHYL PHTHALATE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
FLUORANTHENE									U	10	UG/L	NV	U	10	UG/L	U
FLUORENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
HEXACHLOROBENZENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
HEXACHLOROBUTADIENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
HEXACHLOROCYCLOPENTADIENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U

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Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-003				FB-54-003-BSD				FB-54-004				FB-54-004MS		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ANTHRACENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
BENZO(A)ANTHRACENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
BENZO(A)PYRENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
BENZO(B)FLUORANTHENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
BENZO(G,H,I)PERYLENE	U	10	UG/L	UJ					U	10	UG/L	NV	U	10	UG/L	NV
BENZO(K)FLUORANTHENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
BENZOIC ACID	U	50	UG/L	U					U	50	UG/L	NV	U	50	UG/L	NV
BENZYL ALCOHOL	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
BIS(2-CHLOROETHOXY)METHANE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
BIS(2-CHLOROETHYL)ETHER	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
BIS(2-CHLOROISOPROPYL)ETHER	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
BIS(2-ETHYLHEXYL)PHTHALATE	J	5	UG/L	J					U	10	UG/L	NV	U	10	UG/L	NV
BIS(CHLOROMETHYL)ETHER																
BUTYL BENZYL PHTHALATE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
CHRYSENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
DI-N-BUTYLPHTHALATE	J	3	UG/L	J					U	10	UG/L	NV		NR	UG/L	NV
DI-N-OCTYLPHTHALATE	U	10	UG/L	U					J	3	UG/L	NV		10	UG/L	NV
DIBENZO(A,H)ANTHRACENE	U	10	UG/L	UJ					U	10	UG/L	NV	U	10	UG/L	NV
DIBENZOFURAN	U	10	UG/L	UJ					U	10	UG/L	NV	U	10	UG/L	NV
DIETHYL PHTHALATE	U	10	UG/L	UJ					U	10	UG/L	NV	U	10	UG/L	NV
DIMETHYL PHTHALATE	U	10	UG/L	UJ					U	10	UG/L	NV	U	10	UG/L	NV
FLUORANTHENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
FLUORENE	U	10	UG/L	UJ					U	10	UG/L	NV	U	10	UG/L	NV
HEXACHLOROBENZENE	U	10	UG/L	UJ					U	10	UG/L	NV	U	10	UG/L	NV
HEXACHLOROBUTADIENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
HEXACHLOROCYCLOPENTADIENE	U	10	UG/L	UJ					U	10	UG/L	NV	U	10	UG/L	NV

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:	FB-54-004MSD				FB-54-005				FB-54-005-MS				FB-54-005-MSD			
Sample Date:																
QA Type:	FIELD				FIELD				FIELD				FIELD			
Pit:	54				54				54				54			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ANTHRACENE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
BENZO(A)ANTHRACENE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
BENZO(A)PYRENE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
BENZO(B)FLUORANTHENE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
BENZO(G,H,I)PERYLENE	U	10	UG/L	NV	U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
BENZO(K)FLUORANTHENE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
BENZOIC ACID					U	50	UG/L	R					U	50	UG/L	NV
BENZYL ALCOHOL					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
BIS(2-CHLOROETHOXY)METHANE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
BIS(2-CHLOROETHYL)ETHER					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
BIS(2-CHLOROISOPROPYL)ETHER					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
BIS(2-ETHYLHEXYL)PHTHALATE					J	5	UG/L	J	U	10	UG/L	NV	U	10	UG/L	NV
BIS(CHLOROMETHYL)ETHER																
BUTYL BENZYL PHTHALATE	U	10	UG/L	NV	U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
CHRYSENE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
DI-N-BUTYLPHTHALATE		NR	UG/L	NV	J	2	UG/L	J			UG/L	NV			UG/L	NV
DI-N-OCTYLPHTHALATE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
DIBENZO(A,H)ANTHRACENE	U	10	UG/L	NV	U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
DIBENZOFURAN					U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV
DIETHYL PHTHALATE					U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV
DIMETHYL PHTHALATE					U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV
FLUORANTHENE	U	10	UG/L	NV	U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
FLUORENE					U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV
HEXACHLOROBENZENE					U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV
HEXACHLOROBUTADIENE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
HEXACHLOROCYCLOPENTADIENE					U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV

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Submittal Date: 1[illegible]OCT 93
Print Date: 25-SE[illegible]93
FEMP OU1RI - USEPA[illegible]

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:	FB-54-005MS				FB-54-005MSD				FB-54-006				FB-54-006MSD			
Sample Date:																
QA Type:	FIELD				FIELD				FIELD				FIELD			
Pit:	54				54				54				54			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ANTHRACENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
BENZO(A)ANTHRACENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
BENZO(A)PYRENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
BENZO(B)FLUORANTHENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
BENZO(G,H,I)PERYLENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
BENZO(K)FLUORANTHENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
BENZOIC ACID	U	50	UG/L	NV	U	50	UG/L	NV	U	50	UG/L	R				
BENZYL ALCOHOL	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
BIS(2-CHLOROETHOXY)METHANE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
BIS(2-CHLOROETHYL)ETHER	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
BIS(2-CHLOROISOPROPYL)ETHER	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
BIS(2-ETHYLHEXYL)PHTHALATE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
BIS(CHLOROMETHYL)ETHER																
BUTYL BENZYL PHTHALATE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
CHRYSENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
DI-N-BUTYLPHTHALATE	U	10	UG/L	NV	U	10	UG/L	NV	J	3	UG/L	J				
DI-N-OCTYLPHTHALATE	U	10	UG/L	NV	U	10	UG/L	NV	J	4	UG/L	J				
DIBENZO(A,H)ANTHRACENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
DIBENZOFURAN	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	UJ				
DIETHYL PHTHALATE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	UJ				
DIMETHYL PHTHALATE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	UJ				
FLUORANTHENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
FLUORENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	UJ				
HEXACHLOROBENZENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	UJ				
HEXACHLOROBUTADIENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
HEXACHLOROCYCLOPENTADIENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	UJ				

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-007				FB-54-008				FB-54-008BS				FB-54-008BSD		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:		54				54				54				54		
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ANTHRACENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
BENZO(A)ANTHRACENE	U	10	UG/L	UJ	U	10	UG/L	UJ	U	10	UG/L	NV				
BENZO(A)PYRENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
BENZO(B)FLUORANTHENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
BENZO(G,H,I)PERYLENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
BENZO(K)FLUORANTHENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
BENZOIC ACID	U	50	UG/L	U	U	50	UG/L	UJ	U	10	UG/L	NV				
BENZYL ALCOHOL	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
BIS(2-CHLOROETHOXY)METHANE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
BIS(2-CHLOROETHYL)ETHER	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
BIS(2-CHLOROISOPROPYL)ETHER	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
BIS(2-ETHYLHEXYL)PHTHALATE	J	2	UG/L	J	J	6	UG/L	J	U	10	UG/L	NV				
BIS(CHLOROMETHYL)ETHER																
BUTYL BENZYL PHTHALATE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
CHRYSENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
DI-N-BUTYLPHTHALATE	J	10	UG/L	U	J	10	UG/L	UJ		NR	UG/L	NV				
DI-N-OCTYLPHTHALATE	U	10	UG/L	U	J	2	UG/L	J	U	10	UG/L	NV				
DIBENZO(A,H)ANTHRACENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
DIBENZOFURAN	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
DIETHYL PHTHALATE	U	10	UG/L	UJ	U	10	UG/L	UJ	U	10	UG/L	NV				
DIMETHYL PHTHALATE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
FLUORANTHENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
FLUORENE	U	10	UG/L	UJ	U	10	UG/L	UJ	U	10	UG/L	NV				
HEXACHLOROBENZENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
HEXACHLOROBUTADIENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
HEXACHLOROCYCLOPENTADIENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				

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Submittal Date: 12-OCT-93
Print Date: 25-S 93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-009				FB-54-010				FB-54-011				FB-54-012		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ANTHRACENE	U	10	UG/L	UJ	U	10	UG/L	U								
BENZO(A)ANTHRACENE	U	10	UG/L	UJ	U	10	UG/L	U								
BENZO(A)PYRENE	U	10	UG/L	UJ	U	10	UG/L	U								
BENZO(B)FLUORANTHENE	U	10	UG/L	UJ	U	10	UG/L	U								
BENZO(G,H,I)PERYLENE	U	10	UG/L	UJ	U	10	UG/L	U								
BENZO(K)FLUORANTHENE	U	10	UG/L	UJ	U	10	UG/L	U								
BENZOIC ACID	U	50	UG/L	R	U	50	UG/L	R								
BENZYL ALCOHOL	U	10	UG/L	UJ	U	10	UG/L	U								
BIS(2-CHLOROETHOXY)METHANE	U	10	UG/L	UJ	U	10	UG/L	U								
BIS(2-CHLOROETHYL)ETHER	U	10	UG/L	UJ	U	10	UG/L	U								
BIS(2-CHLOROISOPROPYL)ETHER	U	10	UG/L	UJ	U	10	UG/L	U								
BIS(2-ETHYLHEXYL)PHTHALATE	J	10	UG/L	UJ	U	10	UG/L	U								
BIS(CHLOROMETHYL)ETHER																
BUTYL BENZYL PHTHALATE	U	10	UG/L	UJ	U	10	UG/L	U								
CHRYSENE	U	10	UG/L	UJ	U	10	UG/L	U								
DI-N-BUTYLPHTHALATE	U	10	UG/L	UJ	U	10	UG/L	U								
DI-N-OCTYLPHTHALATE	J	10	UG/L	UJ	U	10	UG/L	U								
DIBENZO(A,H)ANTHRACENE	U	10	UG/L	UJ	U	10	UG/L	U								
DIBENZOFURAN	U	10	UG/L	UJ	U	10	UG/L	U								
DIETHYL PHTHALATE	U	10	UG/L	UJ	U	10	UG/L	U								
DIMETHYL PHTHALATE	U	10	UG/L	J	U	10	UG/L	U								
FLUORANTHENE	U	10	UG/L	UJ	U	10	UG/L	U								
FLUORENE	U	10	UG/L	J	U	10	UG/L	U								
HEXACHLOROBENZENE	U	10	UG/L	UJ	U	10	UG/L	U								
HEXACHLOROBUTADIENE	U	10	UG/L	UJ	U	10	UG/L	U								
HEXACHLOROCYCLOPENTADIENE	U	10	UG/L	UJ	U	10	UG/L	U								

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Well/Boring:																
Sample ID:	FB-54-013				TB-00-001				TB-00-003				TB-00-004			
Sample Date:																
QA Type:	FIELD				TRIP				TRIP				TRIP			
Pit:	54				00				00				00			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ANTHRACENE	U	10	UG/L	U												
BENZO(A)ANTHRACENE	U	10	UG/L	U												
BENZO(A)PYRENE	U	10	UG/L	U												
BENZO(B)FLUORANTHENE	U	10	UG/L	U												
BENZO(G,H,I)PERYLENE	U	10	UG/L	UJ												
BENZO(K)FLUORANTHENE	U	10	UG/L	U												
BENZOIC ACID	U	50	UG/L	R												
BENZYL ALCOHOL	U	10	UG/L	UJ												
BIS(2-CHLOROETHOXY)METHANE	U	10	UG/L	U												
BIS(2-CHLOROETHYL)ETHER	U	10	UG/L	UJ												
BIS(2-CHLOROISOPROPYL)ETHER	U	10	UG/L	UJ												
BIS(2-ETHYLHEXYL)PHTHALATE	U	10	UG/L	U												
BIS(CHLOROMETHYL)ETHER									U	10	UG/L	NV	U	10	UG/L	NV
BUTYL BENZYL PHTHALATE	U	10	UG/L	U												
CHRYSENE	U	10	UG/L	U												
DI-N-BUTYLPHTHALATE	U	10	UG/L	U												
DI-N-OCTYLPHTHALATE	U	10	UG/L	U												
DIBENZO(A,H)ANTHRACENE	U	10	UG/L	UJ												
DIBENZOFURAN	U	10	UG/L	U												
DIETHYL PHTHALATE	U	10	UG/L	U												
DIMETHYL PHTHALATE	U	10	UG/L	U												
FLUORANTHENE	U	10	UG/L	U												
FLUORENE	U	10	UG/L	U												
HEXACHLOROBENZENE	U	10	UG/L	UJ												
HEXACHLOROBUTADIENE	U	10	UG/L	U												
HEXACHLOROCYCLOPENTADIENE	U	10	UG/L	U												

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Submittal Date: [illegible]-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:	TB-00-005				TB-00-006				TB-00-007				TB-00-008			
Sample Date:																
QA Type:	TRIP				TRIP				TRIP				TRIP			
Pit:	00				00				00				00			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ANTHRACENE																
BENZO(A)ANTHRACENE																
BENZO(A)PYRENE																
BENZO(B)FLUORANTHENE																
BENZO(G,H,I)PERYLENE																
BENZO(K)FLUORANTHENE																
BENZOIC ACID																
BENZYL ALCOHOL																
BIS(2-CHLOROETHOXY)METHANE																
BIS(2-CHLOROETHYL)ETHER																
BIS(2-CHLOROISOPROPYL)ETHER																
BIS(2-ETHYLHEXYL)PHTHALATE																
BIS(CHLOROMETHYL)ETHER																
BUTYL BENZYL PHTHALATE																
CHRYSENE																
DI-N-BUTYLPHTHALATE																
DI-N-OCTYLPHTHALATE																
DIBENZO(A,H)ANTHRACENE																
DIBENZOFURAN																
DIETHYL PHTHALATE																
DIMETHYL PHTHALATE																
FLUORANTHENE																
FLUORENE																
HEXACHLOROBENZENE																
HEXACHLOROBUTADIENE																
HEXACHLOROCYCLOPENTADIENE																

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

Characterization Investigation Study - QA/QC Samples
Organic Results

	Well/Boring:																
	Sample ID:	TB-00-009				TB-00-011				TB-00-012				TB-00-013			
	Sample Date:																
	QA Type:	TRIP				TRIP				TRIP				TRIP			
	Pit:	00				00				00				00			
Parameters		LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ANTHRACENE																	
BENZO(A)ANTHRACENE																	
BENZO(A)PYRENE																	
BENZO(B)FLUORANTHENE																	
BENZO(G,H,I)PERYLENE																	
BENZO(K)FLUORANTHENE																	
BENZOIC ACID																	
BENZYL ALCOHOL																	
BIS(2-CHLOROETHOXY)METHANE																	
BIS(2-CHLOROETHYL)ETHER																	
BIS(2-CHLOROISOPROPYL)ETHER																	
BIS(2-ETHYLHEXYL)PHTHALATE																	
BIS(CHLOROMETHYL)ETHER																	
BUTYL BENZYL PHTHALATE																	
CHRYSENE																	
DI-N-BUTYLPHTHALATE																	
DI-N-OCTYLPHTHALATE																	
DIBENZO(A,H)ANTHRACENE																	
DIBENZOFURAN																	
DIETHYL PHTHALATE																	
DIMETHYL PHTHALATE																	
FLUORANTHENE																	
FLUORENE																	
HEXACHLOROBENZENE																	
HEXACHLOROBUTADIENE																	
HEXACHLOROCYCLOPENTADIENE																	

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J = Estimated
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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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10513

Well/Boring:																
Sample ID:		TB-00-015				TB-00-016				TB-00-017				TB-00-018		
Sample Date:																
QA Type:		TRIP				TRIP				TRIP				TRIP		
Pit:			00				00				00				00	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ANTHRACENE																
BENZO(A)ANTHRACENE																
BENZO(A)PYRENE																
BENZO(B)FLUORANTHENE																
BENZO(G,H,I)PERYLENE																
BENZO(K)FLUORANTHENE																
BENZOIC ACID																
BENZYL ALCOHOL																
BIS(2-CHLOROETHOXY)METHANE																
BIS(2-CHLOROETHYL)ETHER																
BIS(2-CHLOROISOPROPYL)ETHER																
BIS(2-ETHYLHEXYL)PHTHALATE																
BIS(CHLOROMETHYL)ETHER														ND	UG/L	NV
BUTYL BENZYL PHTHALATE																
CHRYSENE																
DI-N-BUTYLPHTHALATE																
DI-N-OCTYLPHTHALATE																
DIBENZO(A,H)ANTHRACENE																
DIBENZOFURAN																
DIETHYL PHTHALATE																
DIMETHYL PHTHALATE																
FLUORANTHENE																
FLUORENE																
HEXACHLOROBENZENE																
HEXACHLOROBUTADIENE																
HEXACHLOROCYCLOPENTADIENE																

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		TB-00-019				TB-00-020				TB-00-021				TB-00-022		
Sample Date:																
QA Type:		TRIP				TRIP				TRIP				TRIP		
Pit:			00				00				00				00	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ANTHRACENE																
BENZO(A)ANTHRACENE																
BENZO(A)PYRENE																
BENZO(B)FLUORANTHENE																
BENZO(G,H,I)PERYLENE																
BENZO(K)FLUORANTHENE																
BENZOIC ACID																
BENZYL ALCOHOL																
BIS(2-CHLOROETHOXY)METHANE																
BIS(2-CHLOROETHYL)ETHER																
BIS(2-CHLOROISOPROPYL)ETHER																
BIS(2-ETHYLHEXYL)PHTHALATE																
BIS(CHLOROMETHYL)ETHER		ND	MG/KG	NV		ND	UG/L	NV		ND	UG/L	NV		ND	UG/L	NV
BUTYL BENZYL PHTHALATE																
CHRYSENE																
DI-N-BUTYLPHTHALATE																
DI-N-OCTYLPHTHALATE																
DIBENZO(A,H)ANTHRACENE																
DIBENZOFURAN																
DIETHYL PHTHALATE																
DIMETHYL PHTHALATE																
FLUORANTHENE																
FLUORENE																
HEXACHLOROBENZENE																
HEXACHLOROBUTADIENE																
HEXACHLOROCYCLOPENTADIENE																

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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000514

Characterization Investigation Study - QA/QC Samples
Organic Results

	Well/Boring:								
	Sample ID:	TB-00-023				TB-05-002			
	Sample Date:								
	QA Type:	TRIP				TRIP			
	Pit:	00				05			
Parameters		LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ANTHRACENE									
BENZO(A)ANTHRACENE									
BENZO(A)PYRENE									
BENZO(B)FLUORANTHENE									
BENZO(G,H,I)PERYLENE									
BENZO(K)FLUORANTHENE									
BENZOIC ACID									
BENZYL ALCOHOL									
BIS(2-CHLOROETHOXY)METHANE									
BIS(2-CHLOROETHYL)ETHER									
BIS(2-CHLOROISOPROPYL)ETHER									
BIS(2-ETHYLHEXYL)PHTHALATE									
BIS(CHLOROMETHYL)ETHER									
BUTYL BENZYL PHTHALATE									
CHRYSENE									
DI-N-BUTYLPHTHALATE									
DI-N-OCTYLPHTHALATE									
DIBENZO(A,H)ANTHRACENE									
DIBENZOFURAN									
DIETHYL PHTHALATE									
DIMETHYL PHTHALATE									
FLUORANTHENE									
FLUORENE									
HEXACHLOROBENZENE									
HEXACHLOROBUTADIENE									
HEXACHLOROCYCLOPENTADIENE									

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J = Estimated
\- = Detected
NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Well/Boring:																
Sample ID:		FB-054-004MSD				FB-236-0030				FB-54-001				FB-54-002		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			05				23				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
HEXACHLOROETHANE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
INDENO(1,2,3-CD)PYRENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	UJ
ISOPHORONE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
N-NITROSO-DI-N-PROPYLAMINE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
N-NITROSODIPHENYLAMINE	%	66	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
NAPHTHALENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
NITROBENZENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
PENTACHLOROPHENOL	%	28	UG/L	NV					U	50	UG/L	NV	U	50	UG/L	U
PHENANTHRENE	U	10	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
PHENOL	%	28	UG/L	NV					U	10	UG/L	NV	U	10	UG/L	U
PYRENE									U	10	UG/L	NV	U	10	UG/L	U
1,1,1-TRICHLOROETHANE									U	5	UG/L	NV		78	UG/L	-
1,1,2,2-TETRACHLOROETHANE									U	5	UG/L	NV	U	5	UG/L	U
1,1,2-TRICHLOROETHANE									U	5	UG/L	NV	U	5	UG/L	U
1,1-DICHLOROETHANE									U	5	UG/L	NV	U	5	UG/L	U
1,1-DICHLOROETHENE									U	5	UG/L	NV	U	5	UG/L	U
1,2-DICHLOROETHANE									U	5	UG/L	NV	U	5	UG/L	U
1,2-DICHLOROETHENE																
1,2-DICHLOROPROPANE									U	5	UG/L	NV	U	5	UG/L	U
1,3-DICHLOROPROPENE									U	5	UG/L	NV	U	5	UG/L	U
1,3-DICHLOROPROPYLENE																
2-BUTANONE									U	10	UG/L	NV	U	10	UG/L	R
2-CHLOROETHYL VINYL ETHER									U	10	UG/L	NV	U	10	UG/L	UJ
2-HEXANONE									U	10	UG/L	NV	U	10	UG/L	U
4-METHYL-2-PENTANONE									U	10	UG/L	NV	U	10	UG/L	U
ACETONE									B	15	UG/L	NV	B	11	UG/L	UJ

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
Well/Boring:																
Sample ID:		FB-54-003				FB-54-003-BSD				FB-54-004				FB-54-004MS		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
HEXACHLOROETHANE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
INDENO(1,2,3-CD)PYRENE	U	10	UG/L	UJ					U	10	UG/L	NV	U	10	UG/L	NV
ISOPHORONE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
N-NITROSO-DI-N-PROPYLAMINE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
N-NITROSODIPHENYLAMINE																
NAPHTHALENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
NITROBENZENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
PENTACHLOROPHENOL	U	50	UG/L	U					U	50	UG/L	NV	%	29	UG/L	NV
PHENANTHRENE	U	10	UG/L	U					U	10	UG/L	NV	U	10	UG/L	NV
PHENOL	U	10	UG/L	U					U	10	UG/L	NV	%	29	UG/L	NV
PYRENE	J	2	UG/L	J					U	10	UG/L	NV	%	100	UG/L	NV
1,1,1-TRICHLOROETHANE		24	UG/L	-					U	5	UG/L	U				
1,1,2,2-TETRACHLOROETHANE	U	5	UG/L	U					U	5	UG/L	U				
1,1,2-TRICHLOROETHANE	U	5	UG/L	U					U	5	UG/L	U				
1,1-DICHLOROETHANE	U	5	UG/L	U					U	5	UG/L	U				
1,1-DICHLOROETHENE	U	5	UG/L	U					U	5	UG/L	U				
1,2-DICHLOROETHANE	U	5	UG/L	U					U	5	UG/L	U				
1,2-DICHLOROETHENE																
1,2-DICHLOROPROPANE	U	5	UG/L	U					U	5	UG/L	U				
1,3-DICHLOROPROPENE	U	5	UG/L	U					U	5	UG/L	U				
1,3-DICHLOROPROPYLENE																
2-BUTANONE	U	10	UG/L	R					U	10	UG/L	R				
2-CHLOROETHYL VINYL ETHER	U	10	UG/L	UJ					U	10	UG/L	R				
2-HEXANONE	U	10	UG/L	U					U	10	UG/L	UJ				
4-METHYL-2-PENTANONE	U	10	UG/L	U					U	10	UG/L	UJ				
ACETONE	JB	10	UG/L	UJ					JB	10	UG/L	U				

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-004MSD				FB-54-005				FB-54-005-MS				FB-54-005-MSD		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:		54				54				54				54		
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
HEXACHLOROETHANE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
INDENO(1,2,3-CD)PYRENE					U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV
ISOPHORONE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
N-NITROSO-DI-N-PROPYLAMINE	%	66	UG/L	NV	U	10	UG/L	U	%	62	UG/L	NV	%	60	UG/L	NV
N-NITROSODIPHENYLAMINE									U	10	UG/L	NV	U	10	UG/L	NV
NAPHTHALENE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
NITROBENZENE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
PENTACHLOROPHENOL	%	28	UG/L	NV	U	50	UG/L	U					%	25	UG/L	NV
PHENANTHRENE					U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV
PHENOL	%	28	UG/L	NV	U	10	UG/L	U	%	21	UG/L	NV	%	22	UG/L	NV
PYRENE	%	152	UG/L	NV	U	10	UG/L	U	%	66	UG/L	NV	%	66	UG/L	NV
1,1,1-TRICHLOROETHANE					U	5	UG/L	UJ								
1,1,2,2-TETRACHLOROETHANE					U	5	UG/L	U								
1,1,2-TRICHLOROETHANE					U	5	UG/L	U								
1,1-DICHLOROETHANE					U	5	UG/L	U								
1,1-DICHLOROETHENE					U	5	UG/L	U								
1,2-DICHLOROETHANE					U	5	UG/L	U								
1,2-DICHLOROETHENE																
1,2-DICHLOROPROPANE					U	5	UG/L	U								
1,3-DICHLOROPROPENE					U	5	UG/L	U								
1,3-DICHLOROPROPYLENE																
2-BUTANONE					U	10	UG/L	R								
2-CHLOROETHYL VINYL ETHER					U	10	UG/L	R								
2-HEXANONE					U	10	UG/L	UJ								
4-METHYL-2-PENTANONE					U	10	UG/L	UJ								
ACETONE					B	11	UG/L	UJ								

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Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring: Sample ID: Sample Date: QA Type: Pit:		FB-54-005MS FIELD 54				FB-54-005MSD FIELD 54				FB-54-006 FIELD 54				FB-54-006MSD FIELD 54		
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
HEXACHLOROETHANE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
INDENO(1,2,3-CD)PYRENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	UJ				
ISOPHORONE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
N-NITROSO-DI-N-PROPYLAMINE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
N-NITROSODIPHENYLAMINE																
NAPHTHALENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
NITROBENZENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
PENTACHLOROPHENOL	%	30	UG/L	NV	%	25	UG/L	NV	U	50	UG/L	U				
PHENANTHRENE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	U				
PHENOL	%	21	UG/L	NV	%	22	UG/L	NV	U	10	UG/L	U				
PYRENE	%	66	UG/L	NV	%	66	UG/L	NV	U	10	UG/L	U				
1,1,1-TRICHLOROETHANE									U	5	UG/L	UJ				
1,1,2,2-TETRACHLOROETHANE									U	5	UG/L	U				
1,1,2-TRICHLOROETHANE									U	5	UG/L	U				
1,1-DICHLOROETHANE									U	5	UG/L	U				
1,1-DICHLOROETHENE									U	5	UG/L	U				
1,2-DICHLOROETHANE									U	5	UG/L	U				
1,2-DICHLOROETHENE																
1,2-DICHLOROPROPANE									U	5	UG/L	U				
1,3-DICHLOROPROPENE									U	5	UG/L	U				
1,3-DICHLOROPROPYLENE																
2-BUTANONE									U	10	UG/L	R				
2-CHLOROETHYL VINYL ETHER									U	10	UG/L	R				
2-HEXANONE									U	10	UG/L	UJ				
4-METHYL-2-PENTANONE									U	10	UG/L	UJ				
ACETONE									U	10	UG/L	UJ				

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Well/Boring:																
Sample ID:		FB-54-007				FB-54-008				FB-54-008BS				FB-54-008BSD		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
HEXACHLOROETHANE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
INDENO(1,2,3-CD)PYRENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
ISOPHORONE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
N-NITROSO-DI-N-PROPYLAMINE					U	10	UG/L	UJ	U	10	UG/L	NV	%	66		NV
N-NITROSODIPHENYLAMINE	U	10	UG/L	U												
NAPHTHALENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
NITROBENZENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
PENTACHLOROPHENOL	U	50	UG/L	U	U	50	UG/L	UJ	%	21		NV	%	24		NV
PHENANTHRENE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	NV				
PHENOL	U	10	UG/L	U	U	10	UG/L	UJ	%	29		NV	%	30		NV
PYRENE	U	10	UG/L	U	U	10	UG/L	UJ	%	70		NV	%	88		NV
1,1,1-TRICHLOROETHANE	U	5	UG/L	UJ	U	5	UG/L	U								
1,1,2,2-TETRACHLOROETHANE	U	5	UG/L	U	U	5	UG/L	U								
1,1,2-TRICHLOROETHANE	U	5	UG/L	U	U	5	UG/L	U								
1,1-DICHLOROETHANE	U	5	UG/L	U	U	5	UG/L	U								
1,1-DICHLOROETHENE	U	5	UG/L	U	U	5	UG/L	U								
1,2-DICHLOROETHANE	U	5	UG/L	U	U	5	UG/L	U								
1,2-DICHLOROETHENE																
1,2-DICHLOROPROPANE	U	5	UG/L	U	U	5	UG/L	U								
1,3-DICHLOROPROPENE	U	5	UG/L	U	U	5	UG/L	U								
1,3-DICHLOROPROPYLENE																
2-BUTANONE	U	10	UG/L	R	U	10	UG/L	R								
2-CHLOROETHYL VINYL ETHER	U	10	UG/L	U	U	10	UG/L	R								
2-HEXANONE	U	10	UG/L	UJ	U	10	UG/L	U								
4-METHYL-2-PENTANONE	U	10	UG/L	UJ	U	10	UG/L	UJ								
ACETONE	JB	10	UG/L	UJ	BJ	10	UG/L	U								

0520

G-1-46

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:	FB-54-009				FB-54-010				FB-54-011				FB-54-012			
Sample Date:																
QA Type:	FIELD				FIELD				FIELD				FIELD			
Pit:	54				54				54				54			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
HEXACHLOROETHANE	U	10	UG/L	UJ	U	10	UG/L	U								
INDENO(1,2,3-CD)PYRENE	U	10	UG/L	UJ	U	10	UG/L	U								
ISOPHORONE	U	10	UG/L	UJ	U	10	UG/L	U								
N-NITROSO-DI-N-PROPYLAMINE	U	10	UG/L	UJ	U	10	UG/L	U								
N-NITROSODIPHENYLAMINE																
NAPHTHALENE	U	10	UG/L	UJ	U	10	UG/L	U								
NITROBENZENE	U	10	UG/L	UJ	U	10	UG/L	U								
PENTACHLOROPHENOL	U	50	UG/L	UJ	U	50	UG/L	U								
PHENANTHRENE	U	10	UG/L	UJ	U	10	UG/L	U								
PHENOL	U	10	UG/L	UJ	U	10	UG/L	U								
PYRENE	U	10	UG/L	UJ	U	10	UG/L	U								
1,1,1-TRICHLOROETHANE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	UJ
1,1,2,2-TETRACHLOROETHANE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
1,1,2-TRICHLOROETHANE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
1,1-DICHLOROETHANE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
1,1-DICHLOROETHENE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
1,2-DICHLOROETHANE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
1,2-DICHLOROETHENE																
1,2-DICHLOROPROPANE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
1,3-DICHLOROPROPENE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
1,3-DICHLOROPROPYLENE																
2-BUTANONE	U	10	UG/L	R	U	10	UG/L	R	U	10	UG/L	R	U	10	UG/L	R
2-CHLOROETHYL VINYL ETHER	U	10	UG/L	UJ	U	10	UG/L	R	U	10	UG/L	U	U	10	UG/L	U
2-HEXANONE	U	10	UG/L	UJ	U	10	UG/L	UJ	U	10	UG/L	U	U	10	UG/L	UJ
4-METHYL-2-PENTANONE	U	10	UG/L	U	U	10	UG/L	U	U	10	UG/L	U	U	10	UG/L	U
ACETONE	B	10	UG/L	U	BJ	10	UG/L	U	BJ	10	UG/L	UJ	BJ	100	UG/L	UJ

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Well/Boring:																
Sample ID:		FB-54-013				TB-00-001				TB-00-003				TB-00-004		
Sample Date:																
QA Type:		FIELD				TRIP				TRIP				TRIP		
Pit:		54				00				00				00		
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
HEXACHLOROETHANE	U	10	UG/L	U												
INDENO(1,2,3-CD)PYRENE	U	10	UG/L	UJ												
ISOPHORONE	U	10	UG/L	UJ												
N-NITROSO-DI-N-PROPYLAMINE	U	10	UG/L	UJ												
N-NITROSODIPHENYLAMINE																
NAPHTHALENE	U	10	UG/L	U												
NITROBENZENE	U	10	UG/L	UJ												
PENTACHLOROPHENOL	U	50	UG/L	U												
PHENANTHRENE	U	10	UG/L	U												
PHENOL	U	10	UG/L	U												
PYRENE	U	10	UG/L	U												
1,1,1-TRICHLOROETHANE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1,2,2-TETRACHLOROETHANE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1,2-TRICHLOROETHANE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1-DICHLOROETHANE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1-DICHLOROETHENE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,2-DICHLOROETHANE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,2-DICHLOROETHENE																
1,2-DICHLOROPROPANE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,3-DICHLOROPROPENE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,3-DICHLOROPROPYLENE																
2-BUTANONE	U	10	UG/L	R	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
2-CHLOROETHYL VINYL ETHER	U	10	UG/L	J	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
2-HEXANONE	U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
4-METHYL-2-PENTANONE	U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
ACETONE	J	10	UG/L	U	J	6	UG/L	NV	JB	4	UG/L	NV	JB	8	UG/L	NV

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		TB-00-005				TB-00-006				TB-00-007				TB-00-008		
Sample Date:																
QA Type:		TRIP				TRIP				TRIP				TRIP		
Pit:			00				00				00				00	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
HEXACHLOROETHANE																
INDENO(1,2,3-CD)PYRENE																
ISOPHORONE																
N-NITROSO-DI-N-PROPYLAMINE																
N-NITROSODIPHENYLAMINE																
NAPHTHALENE																
NITROBENZENE																
PENTACHLOROPHENOL																
PHENANTHRENE																
PHENOL																
PYRENE																
1,1,1-TRICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1,2,2-TETRACHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1,2-TRICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1-DICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1-DICHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,2-DICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,2-DICHLOROETHENE																
1,2-DICHLOROPROPANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,3-DICHLOROPROPENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,3-DICHLOROPROPYLENE																
2-BUTANONE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
2-CHLOROETHYL VINYL ETHER	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
2-HEXANONE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
4-METHYL-2-PENTANONE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
ACETONE	JB	5	UG/L	NV	JB	2	UG/L	NV	JB	2	UG/L	NV	JB	2	UG/L	NV

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Well/Boring:																
Sample ID:	TB-00-009				TB-00-011				TB-00-012				TB-00-013			
Sample Date:																
QA Type:	TRIP				TRIP				TRIP				TRIP			
Pit:	00				00				00				00			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
HEXACHLOROETHANE																
INDENO(1,2,3-CD)PYRENE																
ISOPHORONE																
N-NITROSO-DI-N-PROPYLAMINE																
N-NITROSODIPHENYLAMINE																
NAPHTHALENE																
NITROBENZENE																
PENTACHLOROPHENOL																
PHENANTHRENE																
PHENOL																
PYRENE																
1,1,1-TRICHLOROETHANE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1,2,2-TETRACHLOROETHANE	U	1000	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1,2-TRICHLOROETHANE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1-DICHLOROETHANE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1-DICHLOROETHENE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,2-DICHLOROETHANE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,2-DICHLOROETHENE	U	500	UG/KG	NV												
1,2-DICHLOROPROPANE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,3-DICHLOROPROPENE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,3-DICHLOROPROPYLENE																
2-BUTANONE	BJ	740	UG/KG	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
2-CHLOROETHYL VINYL ETHER					U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
2-HEXANONE	U	1000	UG/KG	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
4-METHYL-2-PENTANONE					U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
ACETONE	BJ	7100	UG/KG	NV	JB	4	UG/L	NV	BJ	6	UG/L	NV	BJ	7	UG/L	NV

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G-1-50

0524

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		TB-00-015				TB-00-016				TB-00-017				TB-00-018		
Sample Date:																
QA Type:		TRIP				TRIP				TRIP				TRIP		
Pit:			00				00				00				00	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
HEXACHLOROETHANE																
INDENO(1,2,3-CD)PYRENE																
ISOPHORONE																
N-NITROSO-DI-N-PROPYLAMINE																
N-NITROSODIPHENYLAMINE																
NAPHTHALENE																
NITROBENZENE																
PENTACHLOROPHENOL																
PHENANTHRENE																
PHENOL																
PYRENE																
1,1,1-TRICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1,2,2-TETRACHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1,2-TRICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1-DICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1-DICHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,2-DICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,2-DICHLOROETHENE																
1,2-DICHLOROPROPANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,3-DICHLOROPROPENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,3-DICHLOROPROPYLENE														ND	UG/L	NV
2-BUTANONE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
2-CHLOROETHYL VINYL ETHER	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
2-HEXANONE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
4-METHYL-2-PENTANONE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
ACETONE	BJ	2	UG/L	NV	BJ	3	UG/L	NV	BJ	4	UG/L	NV	BJ	3	UG/L	NV

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Well/Boring:																
Sample ID:		TB-00-019				TB-00-020				TB-00-021				TB-00-022		
Sample Date:																
QA Type:		TRIP				TRIP				TRIP				TRIP		
Pit:			00				00				00				00	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
HEXACHLOROETHANE																
INDENO(1,2,3-CD)PYRENE																
ISOPHORONE																
N-NITROSO-DI-N-PROPYLAMINE																
N-NITROSODIPHENYLAMINE																
NAPHTHALENE																
NITROBENZENE																
PENTACHLOROPHENOL																
PHENANTHRENE																
PHENOL																
PYRENE																
1,1,1-TRICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1,2,2-TETRACHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1,2-TRICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1-DICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,1-DICHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,2-DICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,2-DICHLOROETHENE																
1,2-DICHLOROPROPANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,3-DICHLOROPROPENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
1,3-DICHLOROPROPYLENE						ND	UG/L	NV		ND	UG/L	NV		ND	UG/L	NV
2-BUTANONE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	J	2	UG/L	NV
2-CHLOROETHYL VINYL ETHER	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
2-HEXANONE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
4-METHYL-2-PENTANONE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
ACETONE	BJ	3	UG/L	NV	BJ	2	UG/L	NV	J	4	UG/L	NV	J	4	UG/L	NV

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0526

G-1-52

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Well/Boring:								
Sample ID:		TB-00-023				TB-05-002		
Sample Date:								
QA Type:		TRIP				TRIP		
Pit:		00				05		
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
HEXACHLOROETHANE								
INDENO(1,2,3-CD)PYRENE								
ISOPHORONE								
N-NITROSO-DI-N-PROPYLAMINE								
N-NITROSODIPHENYLAMINE								
NAPHTHALENE								
NITROBENZENE								
PENTACHLOROPHENOL								
PHENANTHRENE								
PHENOL								
PYRENE								
1,1,1-TRICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV
1,1,2,2-TETRACHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV
1,1,2-TRICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV
1,1-DICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV
1,1-DICHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV
1,2-DICHLOROETHANE	U	5	UG/L	NV	U	5	UG/L	NV
1,2-DICHLOROETHENE								
1,2-DICHLOROPROPANE	U	5	UG/L	NV	U	5	UG/L	NV
1,3-DICHLOROPROPENE	U	5	UG/L	NV	U	5	UG/L	NV
1,3-DICHLOROPROPYLENE								
2-BUTANONE	J	4	UG/L	NV	U	10	UG/L	NV
2-CHLOROETHYL VINYL ETHER	U	10	UG/L	NV	U	10	UG/L	NV
2-HEXANONE	U	10	UG/L	NV	U	10	UG/L	NV
4-METHYL-2-PENTANONE	U	10	UG/L	NV	U	10	UG/L	NV
ACETONE	J	6	UG/L	NV	J	9	UG/L	NV

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J = Estimated
- = Detected
NV = Not Validated

0528

G-1-54

Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-054-004MSD				FB-236-0030				FB-54-001				FB-54-002		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			05				23				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ACROLEIN									U	10	UG/L	NV	U	10	UG/L	R
ACRYLONITRILE									U	10	UG/L	NV	U	10	UG/L	UJ
BENZENE									U	5	UG/L	NV	U	5	UG/L	U
BROMODICHLOROMETHANE									U	5	UG/L	NV	U	5	UG/L	U
BROMOETHANE																
BROMOFORM									U	5	UG/L	NV	U	5	UG/L	U
BROMOMETHANE									U	10	UG/L	NV	U	10	UG/L	U
BUTANOIC ACID, METHYL ESTER																
CARBON DISULFIDE									U	5	UG/L	NV	U	5	UG/L	UJ
CARBON TETRACHLORIDE									U	5	UG/L	NV	U	5	UG/L	U
CHLOROBENZENE									U	5	UG/L	NV	U	5	UG/L	U
CHLOROETHANE									U	10	UG/L	NV	U	10	UG/L	U
CHLOROFORM									U	5	UG/L	NV	U	5	UG/L	U
CHLOROMETHANE									U	10	UG/L	NV	U	10	UG/L	U
CIS-1,2-DICHLOROETHYLENE																
CIS-1,2-DICHLOROPROPYLENE																
DIBROMOCHLOROMETHANE									U	5	UG/L	NV	U	5	UG/L	U
DICHLORODIFLUOROMETHANE									U	10	UG/L	NV	U	10	UG/L	U
ETHYLBENZENE									U	5	UG/L	NV	U	5	UG/L	U
METHYLENE CHLORIDE									U	6	UG/L	NV	JB	5	UG/L	U
STYRENE									U	5	UG/L	NV	U	5	UG/L	U
TETRACHLOROETHENE									U	5	UG/L	NV	J	2	UG/L	J
TOLUENE									J	3	UG/L	NV	U	5	UG/L	U
TOTAL XYLENE									U	5	UG/L	NV	U	5	UG/L	U
TRANS-1,2-DICHLOROETHENE									U	5	UG/L	NV	U	5	UG/L	U
TRICHLOROETHENE									U	5	UG/L	NV	U	5	UG/L	U

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-003				FB-54-003-BSD				FB-54-004				FB-54-004MS		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ACROLEIN	U	10	UG/L	R												
ACRYLONITRILE																
BENZENE	U	5	UG/L	U					U	5	UG/L	U				
BROMODICHLOROMETHANE	U	5	UG/L	U					U	5	UG/L	U				
BROMOETHANE																
BROMOFORM	U	5	UG/L	U					U	5	UG/L	UJ				
BROMOMETHANE	U	10	UG/L	U					U	10	UG/L	U				
BUTANOIC ACID, METHYL ESTER																
CARBON DISULFIDE	U	5	UG/L	U					J	1	UG/L	J				
CARBON TETRACHLORIDE	U	5	UG/L	U					U	5	UG/L	U				
CHLOROBENZENE	U	5	UG/L	U					U	5	UG/L	U				
CHLOROETHANE	U	10	UG/L	U					U	10	UG/L	U				
CHLOROFORM	U	5	UG/L	U					U	5	UG/L	U				
CHLOROMETHANE	U	10	UG/L	R					U	10	UG/L	UJ				
CIS-1,2-DICHLOROETHYLENE																
CIS-1,2-DICHLOROPROPYLENE																
DIBROMOCHLOROMETHANE	U	5	UG/L	U					U	5	UG/L	U				
DICHLORODIFLUOROMETHANE																
ETHYLBENZENE	U	5	UG/L	U					U	5	UG/L	U				
METHYLENE CHLORIDE	U	5	UG/L	R					U	5	UG/L	R				
STYRENE	U	5	UG/L	U					U	5	UG/L	U				
TETRACHLOROETHENE	U	5	UG/L	U					U	5	UG/L	UJ				
TOLUENE	U	5	UG/L	U					U	5	UG/L	U				
TOTAL XYLENE	U	5	UG/L	U					U	5	UG/L	U				
TRANS-1,2-DICHLOROETHENE	U	5	UG/L	UJ					U	5	UG/L	U				
TRICHLOROETHENE	U	5	UG/L	U					U	5	UG/L	U				

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Submittal Date: 12-OCT-93
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Well/Boring:																
Sample ID:	FB-54-004MSD				FB-54-005				FB-54-005-MS				FB-54-005-MSD			
Sample Date:																
QA Type:	FIELD				FIELD				FIELD				FIELD			
Pit:	54				54				54				54			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ACROLEIN																
ACRYLONITRILE																
BENZENE					U	5	UG/L	U								
BROMODICHLOROMETHANE					J	2	UG/L	J								
BROMOETHANE																
BROMOFORM					U	5	UG/L	UJ								
BROMOMETHANE					U	10	UG/L	R								
BUTANOIC ACID, METHYL ESTER																
CARBON DISULFIDE					U	5	UG/L	U								
CARBON TETRACHLORIDE					U	5	UG/L	UJ								
CHLOROBENZENE					U	5	UG/L	U								
CHLOROETHANE					U	10	UG/L	U								
CHLOROFORM						14	UG/L	-								
CHLOROMETHANE					U	10	UG/L	UJ								
CIS-1,2-DICHLOROETHYLENE																
CIS-1,2-DICHLOROPROPYLENE																
DIBROMOCHLOROMETHANE					U	5	UG/L	U								
DICHLORODIFLUOROMETHANE																
ETHYLBENZENE					U	5	UG/L	U								
METHYLENE CHLORIDE					J	5	UG/L	UJ								
STYRENE					U	5	UG/L	U								
TETRACHLOROETHENE					U	5	UG/L	U								
TOLUENE					J	1	UG/L	J								
TOTAL XYLENE					U	5	UG/L	U								
TRANS-1,2-DICHLOROETHENE					U	5	UG/L	U								
TRICHLOROETHENE					U	5	UG/L	U								

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NV = Not Validated

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G-1-56

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-005MS				FB-54-005MSD				FB-54-006				FB-54-006MSD		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:		54				54				54				54		
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ACROLEIN																
ACRYLONITRILE																
BENZENE									U	5	UG/L	U				
BROMODICHLOROMETHANE									J	2	UG/L	J				
BROMOETHANE																
BROMOFORM									U	5	UG/L	UJ				
BROMOMETHANE									U	10	UG/L	R				
BUTANOIC ACID, METHYL ESTER																
CARBON DISULFIDE									U	5	UG/L	U				
CARBON TETRACHLORIDE									U	5	UG/L	UJ				
CHLOROBENZENE									U	5	UG/L	U				
CHLOROETHANE									U	10	UG/L	U				
CHLOROFORM										10	UG/L	-				
CHLOROMETHANE									U	10	UG/L	UJ				
CIS-1,2-DICHLOROETHYLENE																
CIS-1,2-DICHLOROPROPYLENE																
DIBROMOCHLOROMETHANE									U	5	UG/L	U				
DICHLORODIFLUOROMETHANE																
ETHYLBENZENE									U	5	UG/L	U				
METHYLENE CHLORIDE									U	5	UG/L	UJ				
STYRENE									U	5	UG/L	U				
TETRACHLOROETHENE									U	5	UG/L	U				
TOLUENE									J	3	UG/L	J				
TOTAL XYLENE									U	5	UG/L	U				
TRANS-1,2-DICHLOROETHENE									U	5	UG/L	U				
TRICHLOROETHENE									U	5	UG/L	U				

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-007				FB-54-008				FB-54-008BS				FB-54-008BSD		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:		54				54				54				54		
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ACROLEIN																
ACRYLONITRILE																
BENZENE	U	5	UG/L	U	U	5	UG/L	U								
BROMODICHLOROMETHANE	J	2	UG/L	J	U	5	UG/L	U								
BROMOETHANE																
BROMOFORM	U	5	UG/L	UJ	U	5	UG/L	U								
BROMOMETHANE	U	10	UG/L	R	U	10	UG/L	UJ								
BUTANOIC ACID, METHYL ESTER																
CARBON DISULFIDE	U	5	UG/L	U	U	5	UG/L	U								
CARBON TETRACHLORIDE	U	5	UG/L	UJ	U	5	UG/L	U								
CHLOROBENZENE	U	5	UG/L	U	U	5	UG/L	U								
CHLOROETHANE	U	10	UG/L	U	U	10	UG/L	U								
CHLOROFORM		18	UG/L	-		15	UG/L	-								
CHLOROMETHANE	U	10	UG/L	UJ	U	10	UG/L	UJ								
CIS-1,2-DICHLOROETHYLENE																
CIS-1,2-DICHLOROPROPYLENE																
DIBROMOCHLOROMETHANE	U	5	UG/L	U	U	5	UG/L	U								
DICHLORODIFLUOROMETHANE																
ETHYLBENZENE	U	5	UG/L	U	U	5	UG/L	U								
METHYLENE CHLORIDE	J	5	UG/L	UJ	BJ	5	UG/L	U								
STYRENE	U	5	UG/L	U	U	5	UG/L	U								
TETRACHLOROETHENE	U	5	UG/L	U	U	5	UG/L	U								
TOLUENE	U	5	UG/L	U	U	5	UG/L	U								
TOTAL XYLENE	U	5	UG/L	U	U	5	UG/L	U								
TRANS-1,2-DICHLOROETHENE	U	5	UG/L	U	U	5	UG/L	U								
TRICHLOROETHENE	U	5	UG/L	U	U	5	UG/L	U								

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Characterization Investigation Study - QA/QC Samples
Organic Results

Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
Well/Boring:																
Sample ID:		FB-54-009				FB-54-010				FB-54-011				FB-54-012		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
ACROLEIN						ND	UG/L	R								
ACRYLONITRILE																
BENZENE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
BROMODICHLOROMETHANE	U	5	UG/L	U	U	5	UG/L	U	J	2	UG/L	J	J	2	UG/L	J
BROMOETHANE																
BROMOFORM	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
BROMOMETHANE	U	10	UG/L	UJ	U	10	UG/L	UJ	U	10	UG/L	UJ	U	10	UG/L	UJ
BUTANOIC ACID, METHYL ESTER																
CARBON DISULFIDE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	UJ	U	5	UG/L	U
CARBON TETRACHLORIDE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	UJ	U	5	UG/L	UJ
CHLOROBENZENE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
CHLOROETHANE	U	10	UG/L	UJ	U	10	UG/L	UJ	U	10	UG/L	UJ	U	10	UG/L	UJ
CHLOROFORM		10	UG/L	-		8	UG/L	-		10	UG/L	-		10	UG/L	-
CHLOROMETHANE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	J	U	10	UG/L	U
CIS-1,2-DICHLOROETHYLENE																
CIS-1,2-DICHLOROPROPYLENE																
DIBROMOCHLOROMETHANE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
DICHLORODIFLUOROMETHANE																
ETHYLBENZENE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
METHYLENE CHLORIDE	BJ	5	UG/L	UJ	BJ	5	UG/L	U	U	5	UG/L	U	BJ	50	UG/L	UJ
STYRENE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
TETRACHLOROETHENE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
TOLUENE	J	1	UG/L	J	U	5	UG/L	U	U	5	UG/L	U	J	1	UG/L	J
TOTAL XYLENE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
TRANS-1,2-DICHLOROETHENE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U
TRICHLOROETHENE	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U	U	5	UG/L	U

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Characterization Investigation Study - QA/QC Samples
Organic Results

Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
Well/Boring:																
Sample ID:		FB-54-013				TB-00-001				TB-00-003				TB-00-004		
Sample Date:																
QA Type:		FIELD				TRIP				TRIP				TRIP		
Pit:		54				00				00				00		
ACROLEIN					ND		UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
ACRYLONITRILE									U	10	UG/L	NV	U	10	UG/L	NV
BENZENE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMODICHLOROMETHANE	J	2	UG/L	J	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMOETHANE																
BROMOFORM	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMOMETHANE	U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
BUTANOIC ACID, METHYL ESTER																
CARBON DISULFIDE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CARBON TETRACHLORIDE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROBENZENE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROETHANE	U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
CHLOROFORM		12	UG/L	-	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROMETHANE	U	10	UG/L	UJ	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
CIS-1,2-DICHLOROETHYLENE													U	10	UG/L	NV
CIS-1,2-DICHLOROPROPYLENE													U	10	UG/L	NV
DIBROMOCHLOROMETHANE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
DICHLORODIFLUOROMETHANE									U	10	UG/L	NV	U	10	UG/L	NV
ETHYLBENZENE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
METHYLENE CHLORIDE	U	5	UG/L	U	J	1	UG/L	NV	B	5	UG/L	NV	JB	2	UG/L	NV
STYRENE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TETRACHLOROETHENE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TOLUENE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TOTAL XYLENE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TRANS-1,2-DICHLOROETHENE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TRICHLOROETHENE	U	5	UG/L	U	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:	TB-00-005				TB-00-006				TB-00-007				TB-00-008			
Sample Date:																
QA Type:	TRIP				TRIP				TRIP				TRIP			
Pit:	00				00				00				00			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ACROLEIN			UG/L	NV	ND		UG/L	NV	ND		UG/L	NV		ND	UG/L	NV
ACRYLONITRILE			UG/L	NV										ND	UG/L	NV
BENZENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMODICHLOROMETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMOETHANE																
BROMOFORM	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMOMETHANE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
BUTANOIC ACID, METHYL ESTER																
CARBON DISULFIDE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	J	1	UG/L	NV
CARBON TETRACHLORIDE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROBENZENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROETHANE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
CHLOROFORM	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROMETHANE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
CIS-1,2-DICHLOROETHYLENE																
CIS-1,2-DICHLOROPROPYLENE			UG/L	NV												
DIBROMOCHLOROMETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
DICHLORODIFLUOROMETHANE																
ETHYLBENZENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
METHYLENE CHLORIDE	J	2	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
STYRENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TETRACHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TOLUENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TOTAL XYLENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TRANS-1,2-DICHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TRICHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV

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Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		TB-00-009				TB-00-011				TB-00-012				TB-00-013		
Sample Date:																
QA Type:		TRIP				TRIP				TRIP				TRIP		
Pit:			00				00				00				00	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ACROLEIN						ND	UG/L	NV								
ACRYLONITRILE						ND	UG/L	NV								
BENZENE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMODICHLOROMETHANE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMOETHANE																
BROMOFORM	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMOMETHANE	U	1000	UG/KG	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
BUTANOIC ACID, METHYL ESTER	J	5	UG/KG	NV												
CARBON DISULFIDE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CARBON TETRACHLORIDE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROBENZENE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROETHANE	U	1000	UG/KG	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
CHLOROFORM	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROMETHANE	U	1000	UG/KG	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
CIS-1,2-DICHLOROETHYLENE																
CIS-1,2-DICHLOROPROPYLENE																
DIBROMOCHLOROMETHANE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
DICHLORODIFLUOROMETHANE																
ETHYLBENZENE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
METHYLENE CHLORIDE	B	3600	UG/KG	NV	U	5	UG/L	NV	J	3	UG/L	NV	J	3	UG/L	NV
STYRENE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TETRACHLOROETHENE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TOLUENE	BJ	380	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TOTAL XYLENE	B	710	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TRANS-1,2-DICHLOROETHENE					U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TRICHLOROETHENE	U	500	UG/KG	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV

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U = Undetected
J = Estimated
\- = Detected
NV = Not Validated

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		TB-00-015				TB-00-016				TB-00-017				TB-00-018		
Sample Date:																
QA Type:		TRIP				TRIP				TRIP				TRIP		
Pit:			00				00				00				00	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ACROLEIN						ND	UG/L	NV		ND	UG/L	NV		ND	UG/L	NV
ACRYLONITRILE						ND	UG/L	NV						ND	UG/L	NV
BENZENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMODICHLOROMETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMOETHANE													U	10	UG/L	NV
BROMOFORM	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMOMETHANE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV				
BUTANOIC ACID, METHYL ESTER																
CARBON DISULFIDE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CARBON TETRACHLORIDE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROBENZENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROETHANE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
CHLOROFORM	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROMETHANE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
CIS-1,2-DICHLOROETHYLENE																
CIS-1,2-DICHLOROPROPYLENE																
DIBROMOCHLOROMETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
DICHLORODIFLUOROMETHANE														ND	UG/L	NV
ETHYLBENZENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
METHYLENE CHLORIDE	BJ	2	UG/L	NV	BJ	3	UG/L	NV	BJ	3	UG/L	NV	BJ	2	UG/L	NV
STYRENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TETRACHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TOLUENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TOTAL XYLENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TRANS-1,2-DICHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TRICHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		TB-00-019				TB-00-020				TB-00-021				TB-00-022		
Sample Date:																
QA Type:		TRIP				TRIP				TRIP				TRIP		
Pit:			00				00				00				00	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ACROLEIN		ND	MG/KG	NV		ND	UG/L	NV		ND	UG/L	NV		ND	UG/L	NV
ACRYLONITRILE			MG/KG	NV		ND	UG/L	NV		ND	UG/L	NV		ND	UG/L	NV
BENZENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMODICHLOROMETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMOETHANE																
BROMOFORM	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
BROMOMETHANE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
BUTANOIC ACID, METHYL ESTER																
CARBON DISULFIDE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CARBON TETRACHLORIDE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROBENZENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROETHANE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
CHLOROFORM	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROMETHANE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
CIS-1,2-DICHLOROETHYLENE																
CIS-1,2-DICHLOROPROPYLENE										ND	UG/L	NV				
DIBROMOCHLOROMETHANE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
DICHLORODIFLUOROMETHANE			MG/KG	NV		ND	UG/L	NV		ND	UG/L	NV		ND	UG/L	NV
ETHYLBENZENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
METHYLENE CHLORIDE	J	1	UG/L	NV	BJ	4	UG/L	NV	J	2	UG/L	NV	J	2	UG/L	NV
STYRENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TETRACHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TOLUENE	U	5	UG/L	NV	U	5	UG/L	NV	J	1	UG/L	NV	U	5	UG/L	NV
TOTAL XYLENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TRANS-1,2-DICHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV
TRICHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV	U	5	UG/L	NV

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:								
Sample ID:		TB-00-023				TB-05-002		
Sample Date:								
QA Type:		TRIP				TRIP		
Pit:			00				05	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
ACROLEIN								
ACRYLONITRILE								
BENZENE	U	5	UG/L	NV	U	5	UG/L	NV
BROMODICHLOROMETHANE	U	5	UG/L	NV	U	5	UG/L	NV
BROMOETHANE								
BROMOFORM	U	5	UG/L	NV	U	5	UG/L	NV
BROMOMETHANE	U	10	UG/L	NV	U	10	UG/L	NV
BUTANOIC ACID, METHYL ESTER								
CARBON DISULFIDE	U	5	UG/L	NV	U	5	UG/L	NV
CARBON TETRACHLORIDE	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROBENZENE	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROETHANE	U	10	UG/L	NV	U	10	UG/L	NV
CHLOROFORM	U	5	UG/L	NV	U	5	UG/L	NV
CHLOROMETHANE	U	10	UG/L	NV	U	10	UG/L	NV
CIS-1,2-DICHLOROETHYLENE								
CIS-1,2-DICHLOROPROPYLENE								
DIBROMOCHLOROMETHANE	U	5	UG/L	NV	U	5	UG/L	NV
DICHLORODIFLUOROMETHANE								
ETHYLBENZENE	U	5	UG/L	NV	U	5	UG/L	NV
METHYLENE CHLORIDE	JB	2	UG/L	NV	J	1	UG/L	NV
STYRENE	U	5	UG/L	NV	U	5	UG/L	NV
TETRACHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV
TOLUENE	U	5	UG/L	NV	U	5	UG/L	NV
TOTAL XYLENE	U	5	UG/L	NV	U	5	UG/L	NV
TRANS-1,2-DICHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV
TRICHLOROETHENE	U	5	UG/L	NV	U	5	UG/L	NV

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-054-004MSD				FB-236-0030				FB-54-001				FB-54-002		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			05				23				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
TRICHLOROFLUOROMETHANE																
VINYL ACETATE									U	10	UG/L	NV	J	8	UG/L	J
VINYL CHLORIDE									U	10	UG/L	NV	U	10	UG/L	U

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NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-003				FB-54-003-BSD				FB-54-004				FB-54-004MS		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:			54				54				54				54	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
TRICHLOROFLUOROMETHANE																
VINYL ACETATE	U	10	UG/L	U					U	10	UG/L	UJ				
VINYL CHLORIDE	U	10	UG/L	U					U	10	UG/L	U				

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J = Estimated
\- = Detected
NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

Well/Boring:																
Sample ID:	FB-54-004MSD				FB-54-005				FB-54-005-MS				FB-54-005-MSD			
Sample Date:																
QA Type:	FIELD				FIELD				FIELD				FIELD			
Pit:	54				54				54				54			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
TRICHLOROFLUOROMETHANE																
VINYL ACETATE					U	10	UG/L	UJ								
VINYL CHLORIDE					U	10	UG/L	U								

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U = Undetected
J = Estimated
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NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-005MS				FB-54-005MSD				FB-54-006				FB-54-006MSD		
Sample Date:																
QA Type:		FIELD				FIELD				FIELD				FIELD		
Pit:		54				54				54				54		
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
TRICHLOROFLUOROMETHANE																
VINYL ACETATE									U	10	UG/L	UJ				
VINYL CHLORIDE									U	10	UG/L	U				

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LQ = Laboratory Qualifier (See list at front of Appendices)
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J = Estimated
- = Detected
NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

Well/Boring:																
Sample ID:	FB-54-007				FB-54-008				FB-54-008BS				FB-54-008BSD			
Sample Date:																
QA Type:	FIELD				FIELD				FIELD				FIELD			
Pit:	54				54				54				54			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
TRICHLOROFLUOROMETHANE																
VINYL ACETATE	U	10	UG/L	UJ	U	10	UG/L	UJ								
VINYL CHLORIDE	U	10	UG/L	U	U	10	UG/L	U								

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:	FB-54-009				FB-54-010				FB-54-011				FB-54-012			
Sample Date:																
QA Type:	FIELD				FIELD				FIELD				FIELD			
Pit:	54				54				54				54			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
TRICHLOROFLUOROMETHANE																
VINYL ACETATE	U	10	UG/L	U	U	10	UG/L	U	U	10	UG/L	U	U	10	UG/L	U
VINYL CHLORIDE	U	10	UG/L	U	U	10	UG/L	UJ	U	10	UG/L	U	U	10	UG/L	U

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		FB-54-013				TB-00-001				TB-00-003				TB-00-004		
Sample Date:																
QA Type:		FIELD				TRIP				TRIP				TRIP		
Pit:			54				00				00				00	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
TRICHLOROFLUOROMETHANE					U	5	UG/L	NV								
VINYL ACETATE	U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
VINYL CHLORIDE	U	10	UG/L	U	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:		TB-00-005				TB-00-006				TB-00-007				TB-00-008		
Sample Date:																
QA Type:		TRIP				TRIP				TRIP				TRIP		
Pit:			00				00				00				00	
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
TRICHLOROFLUOROMETHANE																
VINYL ACETATE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
VINYL CHLORIDE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV

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VQ = Validated Qualifier (See list at front of Appendices)
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J = Estimated
\- = Detected
NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:	TB-00-009				TB-00-011				TB-00-012				TB-00-013			
Sample Date:																
QA Type:	TRIP				TRIP				TRIP				TRIP			
Pit:	00				00				00				00			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
TRICHLOROFLUOROMETHANE																
VINYL ACETATE	U	1000	UG/KG	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
VINYL CHLORIDE	U	1000	UG/KG	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV

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VQ = Validated Qualifier (See list at front of Appendices)
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J = Estimated
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NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:																
Sample ID:	TB-00-015				TB-00-016				TB-00-017				TB-00-018			
Sample Date:																
QA Type:	TRIP				TRIP				TRIP				TRIP			
Pit:	00				00				00				00			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
TRICHLOROFLUOROMETHANE																
VINYL ACETATE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
VINYL CHLORIDE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV

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LQ = Laboratory Qualifier (See list at front of Appendices)
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J = Estimated
- = Detected
NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

Well/Boring:																
Sample ID:	TB-00-019				TB-00-020				TB-00-021				TB-00-022			
Sample Date:																
QA Type:	TRIP				TRIP				TRIP				TRIP			
Pit:	00				00				00				00			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
TRICHLOROFLUOROMETHANE																
VINYL ACETATE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV
VINYL CHLORIDE	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV	U	10	UG/L	NV

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LQ = Laboratory Qualifier (See list at front of Appendices)
Result = Laboratory result is presented if data is not validated; otherwise, validated result is presented.
VQ = Validated Qualifier (See list at front of Appendices)
U = Undetected
J = Estimated
- = Detected
NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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Characterization Investigation Study - QA/QC Samples
Organic Results

Well/Boring:								
Sample ID:	TB-00-023				TB-05-002			
Sample Date:								
QA Type:	TRIP				TRIP			
Pit:	00				05			
Parameters	LQ	Result	Unit	VQ	LQ	Result	Unit	VQ
TRICHLOROFLUOROMETHANE					U	5	UG/L	NV
VINYL ACETATE	U	10	UG/L	NV	U	10	UG/L	NV
VINYL CHLORIDE	U	10	UG/L	NV	U	10	UG/L	NV

LQ = Laboratory Qualifier (See list at front of Appendices)
Result = Laboratory result is presented if data is not validated; otherwise, validated result is presented.
VQ = Validated Qualifier (See list at front of Appendices)
U = Undetected
J = Estimated
\- = Detected
NV = Not Validated

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Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:		1773								
Sample ID:		063791					000166			
Sample Date:		08-SEP-91					24-SEP-87			
QA Type:		DUPLICATE					DUPLICATE			
Pit:		4								
CESIUM-137		20	PCI/L	J		U	.2	PCI/G	UJ	
GROSS ALPHA		3	PCI/L	NV						
GROSS BETA		4	PCI/L	NV						
NEPTUNIUM-237		1	PCI/L	J						
PLUTONIUM-238		1	PCI/L	J						
PLUTONIUM-239/240		1	PCI/L	-						
RADIUM-226										
RADIUM-228										
RUTHENIUM-106		150	PCI/L	J						
STRONTIUM-90		5	PCI/L	-		U	.5	PCI/G	U	
TECHNETIUM-99		30	PCI/L	-						
THORIUM-228		1	PCI/L	J						
THORIUM-230		1	PCI/L	J						
THORIUM-232		1	PCI/L	-						
THORIUM-TOTAL		2.3	UG/L	-						
URANIUM-234		1	PCI/L	J			.7	PCI/G	J	
URANIUM-235										
URANIUM-235/236		1	PCI/L	J		U	.6	PCI/G	UJ	
URANIUM-238		1	PCI/L	-			.7	PCI/G	J	
URANIUM-TOTAL		1	UG/L	J						

LQ = Laboratory Qualifier (See list at front of Appendices)
Result = Laboratory result is presented if data is not validated; otherwise, validated result is presented
VQ = Validated Qualifier (See list at front of Appendices)
U = Undetected
J = Estimated
- = Detected
NV = Not Validated

RI/FS - QA/QC Samples
Radiological Results

Well/Boring:		3003					2011			
Sample ID:		003243					003317			
Sample Date:		25-MAY-88					24-OCT-88			
QA Type:		DUPLICATE					DUPLICATE			
Pit:										
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
CESIUM-137	U	20	PCI/L	R		U	20	PCI/L	R	
GROSS ALPHA										
GROSS BETA										
NEPTUNIUM-237	U	1	PCI/L	U		U	1	PCI/L	UJ	
PLUTONIUM-238	U	1	PCI/L	U		U	1	PCI/L	UJ	
PLUTONIUM-239/240	U	1	PCI/L	U		U	1	PCI/L	UJ	
RADIUM-226	U	1	PCI/L	U		U	1	PCI/L	U	
RADIUM-228	U	3	PCI/L	U		U	3	PCI/L	U	
RUTHENIUM-106	U	150	PCI/L	R		U	150	PCI/L	R	
STRONTIUM-90	U	5	PCI/L	U		U	5	PCI/L	U	
TECHNETIUM-99	U	30	PCI/L	U		U	30	PCI/L	U	
THORIUM-228		1.1	PCI/L	-		U	1	PCI/L	UJ	
THORIUM-230		1.7	PCI/L	-		U	1	PCI/L	UJ	
THORIUM-232	U	1	PCI/L	U		U	1	PCI/L	UJ	
THORIUM-TOTAL						U	3	UG/L	UJ	
URANIUM-234		1.2	PCI/L	-		U	1	PCI/L	UJ	
URANIUM-235										
URANIUM-235/236	U	1	PCI/L	U		U	1	PCI/L	UJ	
URANIUM-238		1.1	PCI/L	-		U	1	PCI/L	UJ	
URANIUM-TOTAL		3	UG/L	K		U	1	UG/L	UK	

LQ = Laboratory Qualifier (See list at front of Appendices)
Result = Laboratory result is presented if data is not validated; otherwise, validated result is presented
VQ = Validated Qualifier (See list at front of Appendices)
U = Undetected
J = Estimated
- = Detected
NV = Not Validated

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RI/FS - QA/QC Samples
Radiological Results

Well/Boring:		2027					3084			
Sample ID:		003454					003460			
Sample Date:		10-AUG-88					29-NOV-88			
QA Type:		DUPLICATE					DUPLICATE			
Pit:										
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
CESIUM-137	U	20	PCI/L	R		U	20	PCI/L	R	
GROSS ALPHA										
GROSS BETA										
NEPTUNIUM-237	U	1	PCI/L	UJ		U	1	PCI/L	U	
PLUTONIUM-238	U	1	PCI/L	UJ		U	1	PCI/L	UJ	
PLUTONIUM-239/240	U	1	PCI/L	UJ		U	1	PCI/L	UJ	
RADIUM-226	U	1	PCI/L	U		U	1	PCI/L	U	
RADIUM-228	U	3	PCI/L	U		U	3	PCI/L	U	
RUTHENIUM-106	U	150	PCI/L	R		U	150	PCI/L	R	
STRONTIUM-90	U	5	PCI/L	U		U	5	PCI/L	U	
TECHNETIUM-99	U	30	PCI/L	U		U	30	PCI/L	UJ	
THORIUM-228	U	1	PCI/L	UJ		U	1	PCI/L	U	
THORIUM-230	U	1	PCI/L	UJ		U	1	PCI/L	U	
THORIUM-232	U	1	PCI/L	UJ		U	1	PCI/L	U	
THORIUM-TOTAL	U	5	UG/L	UJ		U	5	UG/L	U	
URANIUM-234		2.2	PCI/L	J			10.6	PCI/L	J	
URANIUM-235										
URANIUM-235/236	U	1	PCI/L	UJ		U	1	PCI/L	UJ	
URANIUM-238		3.1	PCI/L	J			9.8	PCI/L	J	
URANIUM-TOTAL		6	UG/L	K			27	UG/L	K	

LQ = Laboratory Qualifier (See list at front of Appendices)
Result = Laboratory result is presented if data is not validated; otherwise, validated result is presented
VQ = Validated Qualifier (See list at front of Appendices)
U = Undetected
J = Estimated
\- = Detected
NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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RI/FS - QA/QC Samples
Radiological Results

Well/Boring:	3005	3001
Sample ID:	003464	003467
Sample Date:	02-DEC-88	05-DEC-88
QA Type:	DUPLICATE	DUPLICATE
Pit:		

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
CESIUM-137	U	20	PCI/L	R		U	20	PCI/L	R	
GROSS ALPHA										
GROSS BETA										
NEPTUNIUM-237	U	1	PCI/L	UJ		U	1	PCI/L	UJ	
PLUTONIUM-238	U	1	PCI/L	U		U	1	PCI/L	UJ	
PLUTONIUM-239/240	U	1	PCI/L	U		U	1	PCI/L	UJ	
RADIUM-226	U	1	PCI/L	U		U	1	PCI/L	U	
RADIUM-228	U	3	PCI/L	R		U	3	PCI/L	R	
RUTHENIUM-106	U	150	PCI/L	R		U	150	PCI/L	R	
STRONTIUM-90	U	5	PCI/L	U		U	5	PCI/L	U	
TECHNETIUM-99	U	30	PCI/L	UJ		U	30	PCI/L	UJ	
THORIUM-228	U	1	PCI/L	U		U	1	PCI/L	UJ	
THORIUM-230	U	1	PCI/L	U		U	1	PCI/L	UJ	
THORIUM-232	U	1	PCI/L	U		U	1	PCI/L	UJ	
THORIUM-TOTAL	U	5	UG/L	UJ		U	4	UG/L	UJ	
URANIUM-234		1.5	PCI/L	J			6.9	PCI/L	J	
URANIUM-235										
URANIUM-235/236	U	1	PCI/L	U		U	1	PCI/L	UJ	
URANIUM-238		1.2	PCI/L	-			5.6	PCI/L	J	
URANIUM-TOTAL		4	UG/L	K			15	UG/L	J	

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VQ = Validated Qualifier (See list at front of Appendices)
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NV = Not Validated

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Well/Boring:	3019	2004
Sample ID:	003501	003511
Sample Date:	17-AUG-88	19-AUG-88
QA Type:	DUPLICATE	DUPLICATE
Pit:		

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
CESIUM-137	U	20	PCI/L	R		U	20	PCI/L	R	
GROSS ALPHA										
GROSS BETA										
NEPTUNIUM-237	U	1	PCI/L	UJ		U	1	PCI/L	UJ	
PLUTONIUM-238	U	1	PCI/L	UJ		U	1	PCI/L	U	
PLUTONIUM-239/240	U	1	PCI/L	UJ		U	1	PCI/L	U	
RADIUM-226	U	1	PCI/L	R		U	1	PCI/L	R	
RADIUM-228	U	3	PCI/L	U		U	3	PCI/L	UJ	
RUTHENIUM-106	U	150	PCI/L	R		U	150	PCI/L	R	
STRONTIUM-90	U	5	PCI/L	U		U	5	PCI/L	R	
TECHNETIUM-99	U	30	PCI/L	U		U	30	PCI/L	U	
THORIUM-228	U	1	PCI/L	UJ		U	1	PCI/L	U	
THORIUM-230	U	1	PCI/L	UJ		U	1	PCI/L	U	
THORIUM-232	U	1	PCI/L	UJ		U	1	PCI/L	U	
THORIUM-TOTAL		3	UG/L	J		U	2	UG/L	U	
URANIUM-234		7.6	PCI/L	J			1.2	PCI/L	-	
URANIUM-235										
URANIUM-235/236	U	1	PCI/L	UJ		U	1	PCI/L	U	
URANIUM-238		8	PCI/L	J			2.4	PCI/L	-	
URANIUM-TOTAL		22	UG/L	K			11	UG/L	K	

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VQ = Validated Qualifier (See list at front of Appendices)
U = Undetected
J = Estimated
\- = Detected
NV = Not Validated

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RI/FS - QA/QC Samples
Radiological Results

Parameters	LQ	Result	Unit	VQ TCLP	LQ	Result	Unit	VQ TCLP
Well/Boring:		3005						
Sample ID:		003514				005126		
Sample Date:		19-AUG-88				12-NOV-87		
QA Type:		DUPLICATE				DUPLICATE		
Pit:								
CESIUM-137	U	20	PCI/L	R	U	.2	PCI/G	UJ
GROSS ALPHA								
GROSS BETA								
NEPTUNIUM-237	U	1	PCI/L	UJ	U	.6	PCI/G	UJ
PLUTONIUM-238	U	1	PCI/L	U	U	.6	PCI/G	UJ
PLUTONIUM-239/240	U	1	PCI/L	U	U	.6	PCI/G	U
RADIUM-226	U	1	PCI/L	R	U	.5	PCI/G	UJD
RADIUM-228	U	3	PCI/L	UJ	U	.9	PCI/G	UJD
RUTHENIUM-106	U	150	PCI/L	R	U	1	PCI/G	UJ
STRONTIUM-90	U	5	PCI/L	U		.5	PCI/G	-
TECHNETIUM-99	U	30	PCI/L	U	U	.9	PCI/G	U
THORIUM-228	U	1	PCI/L	U		.9	PCI/G	-
THORIUM-230	U	1	PCI/L	U		2	PCI/G	-
THORIUM-232	U	1	PCI/L	U		.8	PCI/G	-
THORIUM-TOTAL		3	UG/L	-				
URANIUM-234		1.2	PCI/L	-		2.6	PCI/G	J
URANIUM-235								
URANIUM-235/236	U	1	PCI/L	U	U	.6	PCI/G	U
URANIUM-238		1.3	PCI/L	-		4.2	PCI/G	J
URANIUM-TOTAL		3	UG/L	K				

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VQ = Validated Qualifier (See list at front of Appendices)
U = Undetected
J = Estimated
\- = Detected
NV = Not Validated

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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	Well/Boring:	4001				2084			
	Sample ID:	066468				066475			
	Sample Date:	20-JUN-89				29-JUN-89			
	QA Type:	DUPLICATE				DUPLICATE			
	Pit:								
Parameters	LQ	Result	Unit	VQ TCLP	LQ	Result	Unit	VQ TCLP	
CESIUM-137									
GROSS ALPHA									
GROSS BETA									
NEPTUNIUM-237									
PLUTONIUM-238									
PLUTONIUM-239/240									
RADIUM-226									
RADIUM-228									
RUTHENIUM-106									
STRONTIUM-90									
TECHNETIUM-99	U	30	PCI/L	UJ	U	30	PCI/L	U	
THORIUM-228	U	1	PCI/L	U	U	1	PCI/L	U	
THORIUM-230	U	1	PCI/L	U	U	1	PCI/L	U	
THORIUM-232									
THORIUM-TOTAL									
URANIUM-234	U	1	PCI/L	U		10.1	PCI/L	-	
URANIUM-235									
URANIUM-235/236	U	1	PCI/L	U	U	1	PCI/L	U	
URANIUM-238	U	1	PCI/L	U		9.9	PCI/L	-	
URANIUM-TOTAL	U	1	UG/L	U		29	UG/L	-	

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LQ = Laboratory Qualifier (See list at front of Appendices)
Result = Laboratory result is presented if data is not validated; otherwise, validated result is presented
VQ = Validated Qualifier (See list at front of Appendices)
U = Undetected
J = Estimated
\- = Detected
NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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RI/FS - QA/QC Samples
Radiological Results

	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:		3001					2027			
Sample ID:		066525					066581			
Sample Date:		16-AUG-89					10-SEP-89			
QA Type:		DUPLICATE					DUPLICATE			
Pit:										
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
CESIUM-137										
GROSS ALPHA										
GROSS BETA										
NEPTUNIUM-237										
PLUTONIUM-238										
PLUTONIUM-239/240										
RADIUM-226										
RADIUM-228										
RUTHENIUM-106										
STRONTIUM-90										
TECHNETIUM-99	U	30	PCI/L	U		U	30	PCI/L	U	
THORIUM-228	U	1	PCI/L	U		U	1	PCI/L	U	
THORIUM-230	U	1	PCI/L	U		U	1	PCI/L	U	
THORIUM-232										
THORIUM-TOTAL										
URANIUM-234		6.8	PCI/L	-			7.9	PCI/L	-	
URANIUM-235	U	1	PCI/L	U						
URANIUM-235/236						U	1	PCI/L	U	
URANIUM-238		5.4	PCI/L	-			6.3	PCI/L	-	
URANIUM-TOTAL		15	UG/L	K			20	UG/L	K	

LQ = Laboratory Qualifier (See list at front of Appendices)
Result = Laboratory result is presented if data is not validated; otherwise, validated result is presented
VQ = Validated Qualifier (See list at front of Appendices)
U = Undetected
J = Estimated
\- = Detected
NV = Not Validated

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Submittal Date: 12-OCT-93
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Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:		2027					1083			
Sample ID:		066742					066744			
Sample Date:		16-NOV-89					21-NOV-89			
QA Type:		DUPLICATE					DUPLICATE			
Pit:										
CESIUM-137										
GROSS ALPHA										
GROSS BETA										
NEPTUNIUM-237										
PLUTONIUM-238										
PLUTONIUM-239/240										
RADIUM-226										
RADIUM-228										
RUTHENIUM-106										
STRONTIUM-90										
TECHNETIUM-99	U	30	PCI/L	UJ			1107	PCI/L	R	
THORIUM-228	U	1	PCI/L	U		U	1	PCI/L	R	
THORIUM-230	U	1	PCI/L	U		U	1	PCI/L	R	
THORIUM-232										
THORIUM-TOTAL										
URANIUM-234		5.96	PCI/L	J			8.9	PCI/L	R	
URANIUM-235										
URANIUM-235/236	U	1	PCI/L	U			1.19	PCI/L	R	
URANIUM-238		5.16	PCI/L	-			31.5	PCI/L	R	
URANIUM-TOTAL		12	UG/L	K			68	UG/L	R	

LQ = Laboratory Qualifier (See list at front of Appendices)
Result = Laboratory result is presented if data is not validated; otherwise, validated result is presented
VQ = Validated Qualifier (See list at front of Appendices)
U = Undetected
J = Estimated
\- = Detected
NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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RI/FS - QA/QC Samples
Radiological Results

	2011	3011
Well/Boring:	2011	3011
Sample ID:	066888	066889
Sample Date:	14-DEC-89	14-DEC-89
QA Type:	DUPLICATE	DUPLICATE
Pit:		

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
CESIUM-137										
GROSS ALPHA										
GROSS BETA										
NEPTUNIUM-237										
PLUTONIUM-238										
PLUTONIUM-239/240										
RADIUM-226										
RADIUM-228										
RUTHENIUM-106										
STRONTIUM-90										
TECHNETIUM-99	U	30	PCI/L	U		U	30	PCI/L	U	
THORIUM-228	U	1	PCI/L	U		U	1	PCI/L	U	
THORIUM-230	U	1	PCI/L	U		U	1	PCI/L	U	
THORIUM-232										
THORIUM-TOTAL										
URANIUM-234	U	1	PCI/L	U		U	1	PCI/L	U	
URANIUM-235	U	1	PCI/L	U		U	1	PCI/L	U	
URANIUM-235/236										
URANIUM-238	U	1	PCI/L	U		U	1	PCI/L	U	
URANIUM-TOTAL	U	1	UG/L	UK		U	1	UG/L	UK	

LQ = Laboratory Qualifier (See list at front of Appendices)
Result = Laboratory result is presented if data is not validated; otherwise, validated result is presented
VQ = Validated Qualifier (See list at front of Appendices)
U = Undetected
J = Estimated
- = Detected
NV = Not Validated

Submittal Date: 12-OCT-93
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RI/FS - QA/QC Samples
Radiological Results

Well/Boring:		1079					3011			
Sample ID:		007396					007611			
Sample Date:		20-OCT-87					20-NOV-87			
QA Type:		RINSATE					RINSATE			
Pit:										
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
CESIUM-137	U	20	PCI/L	R		U	20	PCI/L	R	
GROSS ALPHA										
GROSS BETA										
NEPTUNIUM-237	U	1	PCI/L	R			1.3	PCI/L	R	
PLUTONIUM-238	U	1	PCI/L	R		U	1	PCI/L	R	
PLUTONIUM-239/240	U	1	PCI/L	R		U	1	PCI/L	R	
RADIUM-226	U	1	PCI/L	R		U	1	PCI/L	R	
RADIUM-228	U	3	PCI/L	R		U	3	PCI/L	R	
RUTHENIUM-106	U	150	PCI/L	R		U	150	PCI/L	R	
STRONTIUM-90	U	5	PCI/L	R		U	5	PCI/L	R	
TECHNETIUM-99	U	30	PCI/L	R						
THORIUM-228	U	1	PCI/L	R		U	1	PCI/L	R	
THORIUM-230	U	1	PCI/L	R		U	1	PCI/L	R	
THORIUM-232	U	1	PCI/L	R		U	1	PCI/L	R	
THORIUM-TOTAL										
URANIUM-234	U	1	PCI/L	R			6.8	PCI/L	R	
URANIUM-235										
URANIUM-235/236	U	1	PCI/L	R		U	1	PCI/L	R	
URANIUM-238	U	1	PCI/L	R			1.1	PCI/L	R	
URANIUM-TOTAL		5	UG/L	R			3	UG/L	R	

LQ = Laboratory Qualifier (See list at front of Appendices)
Result = Laboratory result is presented if data is not validated; otherwise, validated result is presented
VQ = Validated Qualifier (See list at front of Appendices)
U = Undetected
J = Estimated
\- = Detected
NV = Not Validated

Submittal Date: 12-OCT-93
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RI/FS - QA/QC Samples
Radiological Results

Well/Boring:	3084	1081
Sample ID:	007630	007656
Sample Date:	13-NOV-87	03-DEC-87
QA Type:	RINSATE	RINSATE
Pit:		

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
CESIUM-137	U	20	PCI/L	R		U	20	PCI/L	R	
GROSS ALPHA										
GROSS BETA										
NEPTUNIUM-237	U	1	PCI/L	R		U	1	PCI/L	R	
PLUTONIUM-238	U	1	PCI/L	R		U	1	PCI/L	R	
PLUTONIUM-239/240	U	1	PCI/L	R		U	1	PCI/L	R	
RADIUM-226	U	1	PCI/L	R		U	1	PCI/L	R	
RADIUM-228	U	3.3	PCI/L	R		U	3	PCI/L	R	
RUTHENIUM-106	U	150	PCI/L	R		U	150	PCI/L	R	
STRONTIUM-90	U	5	PCI/L	R		U	5	PCI/L	R	
TECHNETIUM-99						U	30	PCI/L	R	
THORIUM-228	U	1	PCI/L	R		U	1	PCI/L	R	
THORIUM-230	U	1	PCI/L	R		U	1	PCI/L	R	
THORIUM-232	U	1	PCI/L	R		U	1	PCI/L	R	
THORIUM-TOTAL										
URANIUM-234		2.4	PCI/L	R		U	1	PCI/L	R	
URANIUM-235										
URANIUM-235/236	U	1	PCI/L	R		U	1	PCI/L	R	
URANIUM-238		2.3	PCI/L	R		U	1	PCI/L	R	
URANIUM-TOTAL		7	UG/L	R			2	UG/L	R	

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

RI/FS - QA/QC Samples
Radiological Results

Well/Boring:		1082					1025			
Sample ID:		007674					007816			
Sample Date:		07-DEC-87					10-JAN-88			
QA Type:		RINSATE					RINSATE			
Pit:										
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
CESIUM-137	U	20	PCI/L	R		U	20	PCI/L	R	
GROSS ALPHA										
GROSS BETA										
NEPTUNIUM-237	U	1	PCI/L	R		U	1	PCI/L	UJ	
PLUTONIUM-238	U	1	PCI/L	R		U	1	PCI/L	UJ	
PLUTONIUM-239/240	U	1	PCI/L	R		U	1	PCI/L	UJ	
RADIUM-226	U	1	PCI/L	R		U	1	PCI/L	UJ	
RADIUM-228	U	3	PCI/L	R		U	3	PCI/L	UJ	
RUTHENIUM-106	U	150	PCI/L	R		U	150	PCI/L	R	
STRONTIUM-90	U	5	PCI/L	R		U	5	PCI/L	UJ	
TECHNETIUM-99						U	30	PCI/L	UJ	
THORIUM-228	U	1	PCI/L	R		U	1	PCI/L	UJ	
THORIUM-230	U	1	PCI/L	R		U	1	PCI/L	UJ	
THORIUM-232	U	1	PCI/L	R		U	1	PCI/L	UJ	
THORIUM-TOTAL										
URANIUM-234	U	1	PCI/L	R			2.6	PCI/L	J	
URANIUM-235										
URANIUM-235/236	U	1	PCI/L	R		U	.1	PCI/L	UJ	
URANIUM-238	U	1	PCI/L	R			2.9	PCI/L	J	
URANIUM-TOTAL		3	UG/L	R			6	UG/L	J	

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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RI/FS - QA/QC Samples
Radiological Results

Well/Boring:	1028	1078
Sample ID:	007838	007840
Sample Date:	13-JAN-88	09-DEC-87
QA Type:	RINSATE	RINSATE
Pit:		

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
CESIUM-137	U	20	PCI/L	R		U	20	PCI/L	R	
GROSS ALPHA										
GROSS BETA										
NEPTUNIUM-237		.7	PCI/L	J		U	1	PCI/L	R	
PLUTONIUM-238	U	.6	PCI/L	UJ		U	1	PCI/L	R	
PLUTONIUM-239/240	U	.6	PCI/L	UJ		U	1	PCI/L	R	
RADIUM-226	U	1	PCI/L	UJ		U	1	PCI/L	R	
RADIUM-228	U	3	PCI/L	UJ		U	3	PCI/L	R	
RUTHENIUM-106	U	150	PCI/L	R		U	150	PCI/L	R	
STRONTIUM-90	U	5	PCI/L	UJ		U	5	PCI/L	R	
TECHNETIUM-99	U	30	PCI/L	UJ		U	30	PCI/L	R	
THORIUM-228	U	.6	PCI/L	UJ		U	1	PCI/L	R	
THORIUM-230		1.2	PCI/L	J			1.1	PCI/L	R	
THORIUM-232		.7	PCI/L	J		U	1	PCI/L	R	
THORIUM-TOTAL										
URANIUM-234		5.1	PCI/L	J		U	1	PCI/L	R	
URANIUM-235										
URANIUM-235/236		1	PCI/L	J		U	1	PCI/L	R	
URANIUM-238		1.6	PCI/L	J		U	1	PCI/L	R	
URANIUM-TOTAL	U	1	UG/L	UKJ			2	UG/L	R	

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

Well/Boring:		2027					1083			
Sample ID:		007877					007895			
Sample Date:		17-DEC-87					11-JAN-88			
QA Type:		RINSATE					RINSATE			
Pit:										
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
CESIUM-137	U	20	PCI/L	R		U	20	PCI/L	R	
GROSS ALPHA										
GROSS BETA										
NEPTUNIUM-237	U	1	PCI/L	R			.7	PCI/L	J	
PLUTONIUM-238	U	1	PCI/L	R		U	.6	PCI/L	UJ	
PLUTONIUM-239/240	U	1	PCI/L	R		U	.6	PCI/L	UJ	
RADIUM-226	U	1	PCI/L	R		U	1	PCI/L	UJ	
RADIUM-228	U	3	PCI/L	R		U	3	PCI/L	UJ	
RUTHENIUM-106	U	150	PCI/L	R		U	150	PCI/L	R	
STRONTIUM-90	U	5	PCI/L	R		U	5	PCI/L	UJ	
TECHNETIUM-99		30	PCI/L	R		U	30	PCI/L	UJ	
THORIUM-228	U	1	PCI/L	R			.9	PCI/L	J	
THORIUM-230	U	1	PCI/L	R			.8	PCI/L	J	
THORIUM-232	U	1	PCI/L	R		U	.6	PCI/L	UJ	
THORIUM-TOTAL										
URANIUM-234	U	1	PCI/L	R			3.1	PCI/L	J	
URANIUM-235										
URANIUM-235/236	U	1	PCI/L	R			1	PCI/L	EJ	
URANIUM-238	U	1	PCI/L	R			6.4	PCI/L	J	
URANIUM-TOTAL							19	UG/L	J	

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RI/FS - QA/QC Samples
Radiological Results

	Well/Boring:	3004				1076			
	Sample ID:	008187				008351			
	Sample Date:	05-MAR-88				09-MAR-88			
	QA Type:	RINSATE				RINSATE			
	Pit:								
Parameters	LQ	Result	Unit	VQ TCLP	LQ	Result	Unit	VQ TCLP
CESIUM-137	U	20	PCI/L	R	U	20	PCI/L	R
GROSS ALPHA								
GROSS BETA								
NEPTUNIUM-237	U	.6	PCI/L	UJ	U	.6	PCI/L	UJ
PLUTONIUM-238	U	.6	PCI/L	UJ	U	.6	PCI/L	UJ
PLUTONIUM-239/240	U	.6	PCI/L	UJ	U	.6	PCI/L	UJ
RADIUM-226	U	1	PCI/L	UJ	U	1	PCI/L	UJ
RADIUM-228	U	3	PCI/L	UJ	U	3	PCI/L	UJ
RUTHENIUM-106	U	150	PCI/L	R	U	150	PCI/L	R
STRONTIUM-90	U	5	PCI/L	UJ	U	.5	PCI/L	UJ
TECHNETIUM-99	U	30	PCI/L	UJ	U	30	PCI/L	NV
THORIUM-228	U	.6	PCI/L	UJ	U	.6	PCI/L	UJ
THORIUM-230		7.2	PCI/L	J		6.2	PCI/L	J
THORIUM-232	U	.6	PCI/L	UJ	U	.6	PCI/L	UJ
THORIUM-TOTAL								
URANIUM-234		1.5	PCI/L	J		4.8	PCI/L	J
URANIUM-235								
URANIUM-235/236	U	.6	PCI/L	UJ	U	.6	PCI/L	UJ
URANIUM-238		4.2	PCI/L	J		5.7	PCI/L	J
URANIUM-TOTAL		11	UG/L	J		15	UG/L	J

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

G.2.2 INORGANIC

Well/Boring:		1775					1774			
Sample ID:		063936					063939			
Sample Date:		12-NOV-91					13-NOV-91			
QA Type:		BLANK					BLANK			
Pit:		4					4			
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
Alkalinity as CaCO3		2.5	MG/L	-		U	5	MG/L	U	
Ammonia		40.6	MG/L	-			4.64	MG/L	-	
Bromide						U	1	MG/L	U	
Chemical Oxygen Demand										
Chloride	U	.5	MG/L	U			6883	MG/L	-	
Cyanide										
Fecal Coliform										
Fluoride						U	.4	MG/L	U	
Nitrate	U	.1	MG/L	U		U	.4	MG/L	U	
Nitrate/nitrite										
Oil and Grease										
Oxidation-Reduction Potential		155	MV	-			162	MV	-	
Phenols										
Phosphate	U	.02	MG/L	U						
Phosphorus						U	1	MG/L	U	
Specific conductivity										
Sulfate						U	1.5	MG/L	U	
Sulfide	U	.5	MG/L	U		U	.5	MG/L	U	
Total Kjeldahl Nitrogen										
Total Organic Carbon	U	1	MG/L	U		U	1	MG/L	U	
Total Organic Halides										
Total Organic Nitrogen										
pH		5.59	S.U.	-			5.5	S.U.	-	
Aluminum										
Antimony										
Arsenic										

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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RI/FS - QA/QC Samples
Inorganic Results

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:		1776					2821			
Sample ID:		063942					065174			
Sample Date:		14-NOV-91					05-OCT-92			
QA Type:		BLANK					BLANK			
Pit:		BURN_PIT								
Alkalinity as CaCO3	U	5	MG/L	U						
Ammonia		.131	MG/L	-						
Bromide	U	1	MG/L	U						
Chemical Oxygen Demand										
Chloride	U	.5	MG/L	U						
Cyanide										
Fecal Coliform										
Fluoride	U	.4	MG/L	U						
Nitrate	U	.4	MG/L	U						
Nitrate/nitrite										
Oil and Grease										
Oxidation-Reduction Potential		217.3	MV	-						
Phenols										
Phosphate										
Phosphorus	U	1	MG/L	U		-	30	UG/L	NV	
Specific conductivity										
Sulfate		2.65	MG/L	-		-	3000	UG/L	NV	
Sulfide	U	.5	MG/L	U						
Total Kjeldahl Nitrogen										
Total Organic Carbon	U	1	MG/L	U						
Total Organic Halides						-	20	UG/L	NV	
Total Organic Nitrogen										
pH		6.21	S.U.	-						
Aluminum										
Antimony										
Arsenic										

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

	2822					2027				
Well/Boring:	2822					2027				
Sample ID:	065404					066776				
Sample Date:	16-JUN-92					01-DEC-89				
QA Type:	BLANK					BLANK				
Pit:										
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
Alkalinity as CaCO3										
Ammonia		50	UG/L	NV						
Bromide										
Chemical Oxygen Demand										
Chloride		35000	UG/L	NV			100	MG/L	NV	
Cyanide										
Fecal Coliform										
Fluoride							.3	MG/L	NV	
Nitrate		200	UG/L	NV			.21	MG/L	NV	
Nitrate/nitrite										
Oil and Grease										
Oxidation-Reduction Potential										
Phenols		10	UG/L	NV						
Phosphate										
Phosphorus		30	UG/L	NV						
Specific conductivity										
Sulfate		63000	UG/L	NV			525	MG/L	NV	
Sulfide										
Total Kjeldahl Nitrogen										
Total Organic Carbon										
Total Organic Halides							.015	MG/L	NV	
Total Organic Nitrogen		1	MG/L	NV						
pH										
Aluminum										
Antimony										
Arsenic										

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G-2-19

000573

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1R1 - USEPA

4788

0574

RI/FS - QA/QC Samples
Inorganic Results

	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:		1646					1765			
Sample ID:		070021					063919			
Sample Date:		03-APR-92					31-OCT-91			
QA Type:		BLANK					DUPLICATE			
Pit:							1			
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
Alkalinity as CaCO3							2098	MG/L	-	
Ammonia	U	.1	MG/L	U			474	MG/L	-	
Bromide										
Chemical Oxygen Demand										
Chloride	U	.5	MG/L	U			5917.9	MG/L	-	
Cyanide	U	2	UG/L	U			577	UG/L	J	
Fecal Coliform										
Fluoride	U	.1	MG/L	U						
Nitrate							276	MG/L	-	
Nitrate/nitrite	U	.1	MG/L	U						
Oil and Grease										
Oxidation-Reduction Potential							57	MV	-	
Phenols	U	.01	MG/L	U						
Phosphate										
Phosphorus	U	.02	MG/L	UJ			6.36	MG/L	-	
Specific conductivity										
Sulfate	U	2	MG/L	UJ		U	2	MG/L	U	
Sulfide						U	.5	MG/L	U	
Total Kjeldahl Nitrogen										
Total Organic Carbon	U	1	MG/L	U			25.2	MG/L	-	
Total Organic Halides	U	.01	MG/L	U						
Total Organic Nitrogen										
pH							11.8	S.U.	-	
Aluminum							533	UG/L	-	
Antimony							112	UG/L	J	
Arsenic						BWN	2.3	UG/L	J	

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		1765					1773			
Sample ID:		063921					063791			
Sample Date:		31-OCT-91					08-SEP-91			
QA Type:		DUPLICATE					DUPLICATE			
Pit:		1					4			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Alkalinity as CaCO3		2190	MG/L	-						
Ammonia		568	MG/L	-			.304	MG/L	J	
Bromide										
Chemical Oxygen Demand										
Chloride		5511	MG/L	-		U	.5	MG/L	U	
Cyanide		623	UG/L	J		BN*	3.6	UG/L	UJ	
Fecal Coliform										
Fluoride						U	.1	MG/L	U	
Nitrate		83	% RECOVE	NV			11.3	MG/L	J	
Nitrate/nitrite										
Oil and Grease										
Oxidation-Reduction Potential		66.8	MV	NV						
Phenols						U	.01	MG/L	UJ	
Phosphate										
Phosphorus		1.32	MG/L	-			.04	MG/L	-	
Specific conductivity										
Sulfate	U	2	MG/L	U		U	.2	MG/L	U	
Sulfide	U	.5	MG/L	U		U	.5	MG/L	UJ	
Total Kjeldahl Nitrogen										
Total Organic Carbon		13.4	MG/L	-			1.8	MG/L	-	
Total Organic Halides						U	.01	MG/L	U	
Total Organic Nitrogen						U	.1	MG/L	UJ	
pH		11.9	S.U.	NV						
Aluminum		535	UG/L	-			101.3	% RECOVE	NV	
Antimony		108	UG/L	J			103.3	% RECOVE	NV	
Arsenic	BWN	2.7	UG/L	J			91.4	% RECOVE	NV	

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6576

4788

RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:	2004				3003			
Sample ID:	003023				003243			
Sample Date:	03-DEC-87				25-MAY-88			
QA Type:	DUPLICATE				DUPLICATE			
Pit:								

Parameters	LQ	Result	Unit	VQ TCLP	LQ	Result	Unit	VQ TCLP
Alkalinity as CaCO3								
Ammonia						.2	MG/L	-
Bromide								
Chemical Oxygen Demand	NV	10	UG/L	NV				
Chloride	NV	25	MG/L	NV		28.1	MG/L	-
Cyanide	NV	5	UG/L	NV				
Fecal Coliform								
Fluoride	NV	.39	MG/L	NV		.34	MG/L	-
Nitrate	NV	.63	MG/L	NV		.2	MG/L	-
Nitrate/nitrite								
Oil and Grease								
Oxidation-Reduction Potential								
Phenols	NV	.006	UG/L	NV		.01	MG/L	-
Phosphate								
Phosphorus	NV	.02	UG/L	NV		.06	MG/L	-
Specific conductivity								
Sulfate	NV	44	MG/L	NV		74	MG/L	-
Sulfide								
Total Kjeldahl Nitrogen								
Total Organic Carbon	NV	1	MG/L	NV				
Total Organic Halides	NV	54	MG/L	NV				
Total Organic Nitrogen						.1	MG/L	-
pH								
Aluminum								
Antimony								
Arsenic	NV	2.5	UG/L	NV		95	% RECOVE	NV

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G-2-22

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		2011					2027			
Sample ID:		003317					003454			
Sample Date:		24-OCT-88					10-AUG-88			
QA Type:		DUPLICATE					DUPLICATE			
Pit:										
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Alkalinity as CaCO3										
Ammonia		.842	MG/L	J			.5	MG/L	-	
Bromide										
Chemical Oxygen Demand										
Chloride		25	MG/L	-			98	MG/L	-	
Cyanide										
Fecal Coliform										
Fluoride		.3	MG/L	-			1.8	MG/L	-	
Nitrate	U	.1	MG/L	UJ			.1	MG/L	J	
Nitrate/nitrite										
Oil and Grease										
Oxidation-Reduction Potential										
Phenols		.01	MG/L	J		U	.05	MG/L	U	
Phosphate										
Phosphorus	U	.02	MG/L	U						
Specific conductivity										
Sulfate		60	MG/L	-			310	MG/L	-	
Sulfide										
Total Kjeldahl Nitrogen		1.14	MG/L	UJ		U	15	MG/L	U	
Total Organic Carbon										
Total Organic Halides	U	.05	MG/L	U						
Total Organic Nitrogen	U	.1	MG/L	U						
pH										
Aluminum										
Antimony										
Arsenic	U	2	UG/L	U		U	10	UG/L	U	

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RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		3084				3005		
Sample ID:		003460				003464		
Sample Date:		29-NOV-88				02-DEC-88		
QA Type:		DUPLICATE				DUPLICATE		
Pit:								

Parameters	LQ	Result	Unit	VQ TCLP	LQ	Result	Unit	VQ TCLP
Alkalinity as CaCO3								
Ammonia		101	% RECOVE	NV	U	.1	MG/L	U
Bromide								
Chemical Oxygen Demand								
Chloride		220	MG/L	-		32	MG/L	-
Cyanide								
Fecal Coliform								
Fluoride		108	% RECOVE	NV		.2	MG/L	-
Nitrate		18.1	MG/L	J	U	.1	MG/L	R
Nitrate/nitrite								
Oil and Grease								
Oxidation-Reduction Potential								
Phenols		96	% RECOVE	NV	U	.1	MG/L	U
Phosphate								
Phosphorus		88	% RECOVE	NV	U	.02	MG/L	U
Specific conductivity								
Sulfate		722	MG/L	-		54.4	MG/L	-
Sulfide								
Total Kjeldahl Nitrogen		106	% RECOVE	NV	U	.1	MG/L	U
Total Organic Carbon								
Total Organic Halides		94	% RECOVE	NV	U	.05	MG/L	U
Total Organic Nitrogen		.12	MG/L	-	U	.1	MG/L	U
pH								
Aluminum								
Antimony								
Arsenic	U	0	UG/L	U		99.4	% RECOVE	NV

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FEMP OU1RI - USEPA

RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		3001				3019		
Sample ID:		003467				003501		
Sample Date:		05-DEC-88				17-AUG-88		
QA Type:		DUPLICATE				DUPLICATE		
Pit:								
Parameters	**LQ**	**Result**	**Unit**	**VQ TCLP**	**LQ**	**Result**	**Unit**	**VQ TCLP**
Alkalinity as CaCO3								
Ammonia		.1	MG/L	-	U	.1	MG/L	U
Bromide								
Chemical Oxygen Demand								
Chloride		18.3	MG/L	-		70	MG/L	-
Cyanide								
Fecal Coliform								
Fluoride		.21	MG/L	-		.12	MG/L	-
Nitrate		.1	MG/L	R		7.6	MG/L	J
Nitrate/nitrite								
Oil and Grease								
Oxidation-Reduction Potential								
Phenols		.01	MG/L	-		.02	MG/L	J
Phosphate								
Phosphorus		.02	MG/L	-	U	.05	MG/L	U
Specific conductivity								
Sulfate		149	MG/L	-		360	MG/L	-
Sulfide								
Total Kjeldahl Nitrogen		.409	MG/L	-				
Total Organic Carbon								
Total Organic Halides		.05	MG/L	-	U	.05	MG/L	U
Total Organic Nitrogen		.409	MG/L	-	U	.1	MG/L	U
pH								
Aluminum								
Antimony								
Arsenic		2	UG/L	U		270	UG/L	-

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		2004					2004			
Sample ID:		003511					003512			
Sample Date:		19-AUG-88					19-AUG-88			
QA Type:		DUPLICATE					DUPLICATE			
Pit:										
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Alkalinity as CaCO3										
Ammonia		.1	MG/L	J		U	.1	MG/L	UJ	
Bromide										
Chemical Oxygen Demand										
Chloride		27.5	MG/L	J						
Cyanide										
Fecal Coliform										
Fluoride		.28	MG/L	-						
Nitrate		0	% RECOVE	NV		U	2.5	MG/L	UJ	
Nitrate/nitrite										
Oil and Grease										
Oxidation-Reduction Potential										
Phenols	U	.01	MG/L	UJ		U	.01	MG/L	U	
Phosphate							.75	MG/L	J	
Phosphorus		.065	MG/L	J						
Specific conductivity										
Sulfate		50	MG/L	-						
Sulfide										
Total Kjeldahl Nitrogen							99	% RECOVE	NV	
Total Organic Carbon										
Total Organic Halides	U	.05	MG/L	U			98	% RECOVE	NV	
Total Organic Nitrogen		.2	MG/L	J			.3	MG/L	J	
pH										
Aluminum										
Antimony										
Arsenic	U	2	UG/L	U						

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FEMP OU1RI - USEPA

Well/Boring:		3005					3821			
Sample ID:		003514					065169			
Sample Date:		19-AUG-88					02-OCT-92			
QA Type:		DUPLICATE					DUPLICATE			
Pit:										
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Alkalinity as CaCO3										
Ammonia	U	.1	MG/L	UJ		-	230	UG/L	NV	
Bromide										
Chemical Oxygen Demand										
Chloride		19.5	MG/L	-		-	24000	UG/L	NV	
Cyanide										
Fecal Coliform										
Fluoride		.23	MG/L	-		-	200	UG/L	NV	
Nitrate		.15	MG/L	J						
Nitrate/nitrite										
Oil and Grease										
Oxidation-Reduction Potential										
Phenols	U	.01	MG/L	UJ			100	UG/L	NV	
Phosphate										
Phosphorus	U	.05	MG/L	UJ		-	30	UG/L	NV	
Specific conductivity										
Sulfate		50	MG/L	-		-	67000	UG/L	NV	
Sulfide						-	1600	UG/L	NV	
Total Kjeldahl Nitrogen										
Total Organic Carbon										
Total Organic Halides	U	.05	MG/L	U			140	UG/L	NV	
Total Organic Nitrogen	U	.1	MG/L	UJ						
pH										
Aluminum										
Antimony										
Arsenic		96.2	% RECOVE	NV						

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Submittal Date: 12-OCT-93
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FEMP OU1RI - USEPA

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RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		3821					4001			
Sample ID:		065171					066468			
Sample Date:		02-OCT-92					20-JUN-89			
QA Type:		DUPLICATE					DUPLICATE			
Pit:										
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
Alkalinity as CaCO3										
Ammonia	-	230	UG/L	NV						
Bromide										
Chemical Oxygen Demand										
Chloride	-	24000	UG/L	NV			29	MG/L	-	
Cyanide										
Fecal Coliform										
Fluoride	-	200	UG/L	NV			.169	MG/L	-	
Nitrate							.1	MG/L	-	
Nitrate/nitrite										
Oil and Grease										
Oxidation-Reduction Potential										
Phenols										
Phosphate										
Phosphorus	-	10	UG/L	NV						
Specific conductivity										
Sulfate		69000	UG/L	NV			75.4	MG/L	-	
Sulfide	-	33000	UG/L	NV						
Total Kjeldahl Nitrogen										
Total Organic Carbon	-	1000	UG/L	NV			13.19	MG/L	-	
Total Organic Halides	-	10	UG/L	NV		U	.01	MG/L	R	
Total Organic Nitrogen										
pH										
Aluminum							98	UG/L	-	
Antimony										
Arsenic										

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Submittal Date: 12-OCT-93
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FEMP OU1RI - USEPA

Well/Boring:		2084					3001		
Sample ID:		066475					066525		
Sample Date:		29-JUN-89					16-AUG-89		
QA Type:		DUPLICATE					DUPLICATE		
Pit:									
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ TCLP
Alkalinity as CaCO3									
Ammonia									
Bromide									
Chemical Oxygen Demand									
Chloride		97.5	% RECOVE	NV			17.5	MG/L	-
Cyanide									
Fecal Coliform									
Fluoride		101	% RECOVE	NV			.13	MG/L	-
Nitrate		98.5	% RECOVE	NV			.1	MG/L	-
Nitrate/nitrite									
Oil and Grease									
Oxidation-Reduction Potential									
Phenols									
Phosphate									
Phosphorus									
Specific conductivity									
Sulfate		99.4	% RECOVE	NV			87.7	MG/L	-
Sulfide									
Total Kjeldahl Nitrogen									
Total Organic Carbon		3.346	MG/L	-			2.38	MG/L	-
Total Organic Halides		48	% RECOVE	NV			.021	MG/L	-
Total Organic Nitrogen									
pH									
Aluminum		227	UG/L	-			146	UG/L	-
Antimony									
Arsenic									

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0583

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RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:	2027	2027
Sample ID:	066581	066600
Sample Date:	10-SEP-89	10-SEP-89
QA Type:	DUPLICATE	DUPLICATE
Pit:		

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Alkalinity as CaCO3										
Ammonia										
Bromide										
Chemical Oxygen Demand										
Chloride		114	MG/L	-						
Cyanide							91.7	% RECOVE	NV	
Fecal Coliform										
Fluoride		.13	MG/L	-						
Nitrate		82.3	% RECOVE	NV						
Nitrate/nitrite										
Oil and Grease										
Oxidation-Reduction Potential										
Phenols										
Phosphate										
Phosphorus										
Specific conductivity										
Sulfate		1320	MG/L	-						
Sulfide							115	% RECOVE	NV	
Total Kjeldahl Nitrogen										
Total Organic Carbon		166	% RECOVE	NV						
Total Organic Halides		105	% RECOVE	NV						
Total Organic Nitrogen										
pH										
Aluminum							500	% RECOVE	NV	
Antimony							106.1	% RECOVE	NV	
Arsenic							82.8	% RECOVE	NV	

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RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		2027				1083			
Sample ID:		066743				066745			
Sample Date:		16-NOV-89				21-NOV-89			
QA Type:		DUPLICATE				DUPLICATE			
Pit:									
Parameters	LQ	Result	Unit	VQ TCLP	LQ	Result	Unit	VQ TCLP	
Alkalinity as CaCO3									
Ammonia									
Bromide									
Chemical Oxygen Demand									
Chloride		104	MG/L	NV		56	MG/L	NV	
Cyanide									
Fecal Coliform									
Fluoride		.72	MG/L	NV		.29	MG/L	NV	
Nitrate		.14	MG/L	NV		2.25	MG/L	NV	
Nitrate/nitrite									
Oil and Grease									
Oxidation-Reduction Potential									
Phenols		.005	UG/L	NV		.005	UG/L	NV	
Phosphate									
Phosphorus									
Specific conductivity									
Sulfate		515	MG/L	NV		134	MG/L	NV	
Sulfide									
Total Kjeldahl Nitrogen									
Total Organic Carbon		2	MG/L	NV		2	MG/L	NV	
Total Organic Halides		.01	MG/L	NV		.01	MG/L	NV	
Total Organic Nitrogen									
pH									
Aluminum		50	UG/L	NV		50	UG/L	NV	
Antimony									
Arsenic		6	UG/L	NV		2.5	UG/L	NV	

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RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:	3011				3084			
Sample ID:	007611				007630			
Sample Date:	20-NOV-87				13-NOV-87			
QA Type:	RINSATE				RINSATE			
Pit:								

Parameters	LQ	Result	Unit	VQ TCLP	LQ	Result	Unit	VQ TCLP
Alkalinity as CaCO3								
Ammonia								
Bromide								
Chemical Oxygen Demand								
Chloride		1.3	MG/L	-	U	.5	MG/L	U
Cyanide								
Fecal Coliform								
Fluoride	U	.1	MG/L	U	U	.1	MG/L	U
Nitrate	U	.1	MG/L	R	U	.1	MG/L	U
Nitrate/nitrite								
Oil and Grease								
Oxidation-Reduction Potential								
Phenols	U	.01	MG/L	U	U	.01	MG/L	UJ
Phosphate								
Phosphorus								
Specific conductivity								
Sulfate		3	MG/L	-		3.4	MG/L	J
Sulfide								
Total Kjeldahl Nitrogen								
Total Organic Carbon								
Total Organic Halides								
Total Organic Nitrogen								
pH								
Aluminum								
Antimony								
Arsenic	U	200	UG/L	U	U	.2	UG/L	U

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RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:	1081					1082				
Sample ID:	007656					007674				
Sample Date:	03-DEC-87					07-DEC-87				
QA Type:	RINSATE					RINSATE				
Pit:										
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Alkalinity as CaCO3										
Ammonia										
Bromide										
Chemical Oxygen Demand										
Chloride	U	.5	MG/L	UJ			.7	MG/L	J	
Cyanide										
Fecal Coliform										
Fluoride		110	% RECOVE	NV		U	.1	MG/L	UJ	
Nitrate	U	.1	MG/L	UJ		U	.1	MG/L	U	
Nitrate/nitrite										
Oil and Grease										
Oxidation-Reduction Potential										
Phenols		104	% RECOVE	NV		U	.01	MG/L	U	
Phosphate										
Phosphorus										
Specific conductivity										
Sulfate		4.1	% RECOVE	NV			6	MG/L	J	
Sulfide										
Total Kjeldahl Nitrogen										
Total Organic Carbon										
Total Organic Halides										
Total Organic Nitrogen										
pH										
Aluminum										
Antimony										
Arsenic	U	200	UG/L	UJ		U	200	UG/L	U	

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RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:	1025				1028				
Sample ID:	007816				007838				
Sample Date:	10-JAN-88				13-JAN-88				
QA Type:	RINSATE				RINSATE				
Pit:									
Parameters	**LQ**	**Result**	**Unit**	**VQ TCLP**	**LQ**	**Result**	**Unit**	**VQ TCLP**	
Alkalinity as CaCO3									
Ammonia									
Bromide									
Chemical Oxygen Demand									
Chloride	U	1	MG/L	U		106	% RECOVE	NV	
Cyanide						92	% RECOVE	NV	
Fecal Coliform									
Fluoride	U	.1	MG/L	U	U	.1	MG/L	U	
Nitrate		37	% RECOVE	NV	U	.05	MG/L	R	
Nitrate/nitrite									
Oil and Grease									
Oxidation-Reduction Potential									
Phenols		.01	MG/L	J	U	.01	MG/L	U	
Phosphate									
Phosphorus									
Specific conductivity									
Sulfate	U	.1	MG/L	UJ		2.2	MG/L	J	
Sulfide									
Total Kjeldahl Nitrogen									
Total Organic Carbon									
Total Organic Halides									
Total Organic Nitrogen									
pH									
Aluminum						2070	MG/L	NV	
Antimony						99.5	% RECOVE	NV	
Arsenic	U	200	UG/L	U		98.1	% RECOVE	NV	

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RI/FS - QA/QC Samples
Inorganic Results

	1078					2027				
Well/Boring:	1078					2027				
Sample ID:	007840					007877				
Sample Date:	09-DEC-87					17-DEC-87				
QA Type:	RINSATE					RINSATE				
Pit:										
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Alkalinity as CaCO3										
Ammonia										
Bromide										
Chemical Oxygen Demand										
Chloride		.6	MG/L	J			110	% RECOVE	NV	
Cyanide							98	% RECOVE	NV	
Fecal Coliform										
Fluoride	U	.1	MG/L	R		U	.1	MG/L	U	
Nitrate	U	.1	MG/L	R		U	.1	MG/L	U	
Nitrate/nitrite										
Oil and Grease										
Oxidation-Reduction Potential										
Phenols		.6	MG/L	J		U	.01	MG/L	U	
Phosphate										
Phosphorus										
Specific conductivity										
Sulfate	U	2	MG/L	R		U	2	MG/L	U	
Sulfide										
Total Kjeldahl Nitrogen										
Total Organic Carbon										
Total Organic Halides										
Total Organic Nitrogen										
pH										
Aluminum		345	UG/L	J		U	50	UG/L	U	
Antimony	U	30	UG/L	UJ		U	60	UG/L	U	
Arsenic	U	30	UG/L	UJ		U	5	UG/L	U	

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RI/FS - QA/QC Samples
Inorganic Results

	Well/Boring:	1083				3004			
	Sample ID:	007895				008187			
	Sample Date:	11-JAN-88				05-MAR-88			
	QA Type:	RINSATE				RINSATE			
	Pit:								
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ TCLP
Alkalinity as CaCO3									
Ammonia									
Bromide									
Chemical Oxygen Demand									
Chloride	U	1	MG/L	U		U	.5	MG/L	UJ
Cyanide									
Fecal Coliform									
Fluoride	U	.1	MG/L	U		U	.1	MG/L	U
Nitrate	U	2.2	MG/L	R		U	.1	MG/L	U
Nitrate/nitrite									
Oil and Grease									
Oxidation-Reduction Potential									
Phenols		63	% RECOVE	NV		U	.01	MG/L	U
Phosphate									
Phosphorus									
Specific conductivity									
Sulfate		.1	MG/L	J		U	2	MG/L	U
Sulfide									
Total Kjeldahl Nitrogen									
Total Organic Carbon									
Total Organic Halides									
Total Organic Nitrogen									
pH									
Aluminum									
Antimony									
Arsenic	U	200	UG/L	U		U	200	UG/L	UJ

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RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		1076					2004			
Sample ID:		008351					003024			
Sample Date:		09-MAR-88					03-DEC-87			
QA Type:		RINSATE					TRIPLICATE			
Pit:										
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
Alkalinity as CaCO3						NV	10	UG/L	NV	
Ammonia										
Bromide										
Chemical Oxygen Demand						NV	10	MG/L	NV	
Chloride	U	.5	MG/L	U		NV	24	MG/L	NV	
Cyanide						NV	.005	MG/L	NV	
Fecal Coliform										
Fluoride	U	.1	MG/L	U		NV	.32	MG/L	NV	
Nitrate	U	.1	MG/L	R		NV	.63	MG/L	NV	
Nitrate/nitrite										
Oil and Grease										
Oxidation-Reduction Potential										
Phenols	U	.01	MG/L	UJ		NV	.005	MG/L	NV	
Phosphate										
Phosphorus						NV	.02	MG/L	NV	
Specific conductivity										
Sulfate	U	2	MG/L	U		NV	52	MG/L	NV	
Sulfide										
Total Kjeldahl Nitrogen										
Total Organic Carbon						NV	1	MG/L	NV	
Total Organic Halides										
Total Organic Nitrogen										
pH										
Aluminum										
Antimony										
Arsenic	U	200	UG/L	U		NV	.0025	MG/L	NV	

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RI/FS - QA/QC Samples
Inorganic Results

	1775					1774				
Well/Boring:	1775					1774				
Sample ID:	063936					063939				
Sample Date:	12-NOV-91					13-NOV-91				
QA Type:	BLANK					BLANK				
Pit:	4					4				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Barium										
Beryllium										
Boron										
Cadmium										
Calcium										
Chromium										
Cobalt										
Copper										
Hexavalent Chromium										
Iron										
Lead										
Magnesium										
Manganese										
Mercury										
Molybdenum										
Nickel										
Osmium										
Potassium										
Selenium										
Silicon										
Silver										
Sodium										
Thallium										
Tin										
Vanadium										
Zinc										

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J = Estimated
\- = Detected
NV = Not Validated

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:	1776				2821				
Sample ID:	063942				065174				
Sample Date:	14-NOV-91				05-OCT-92				
QA Type:	BLANK				BLANK				
Pit:	BURN_PIT								
Parameters	LQ	Result	Unit	VQ TCLP	LQ	Result	Unit	VQ TCLP	
Barium									
Beryllium									
Boron									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Hexavalent Chromium									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Molybdenum									
Nickel									
Osmium									
Potassium									
Selenium									
Silicon									
Silver									
Sodium									
Thallium									
Tin									
Vanadium									
Zinc									

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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0563

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05594

RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:	2822					2027				
Sample ID:	065404					066776				
Sample Date:	16-JUN-92					01-DEC-89				
QA Type:	BLANK					BLANK				
Pit:										
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Barium										
Beryllium										
Boron										
Cadmium										
Calcium										
Chromium										
Cobalt										
Copper										
Hexavalent Chromium										
Iron										
Lead										
Magnesium										
Manganese										
Mercury										
Molybdenum										
Nickel										
Osmium										
Potassium										
Selenium										
Silicon										
Silver										
Sodium										
Thallium										
Tin										
Vanadium										
Zinc										

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

RI/FS - QA/QC Samples
Inorganic Results

	1646					1765				
Well/Boring:	1646					1765				
Sample ID:	070021					063919				
Sample Date:	03-APR-92					31-OCT-91				
QA Type:	BLANK					DUPLICATE				
Pit:						1				
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
Barium							1930	UG/L	-	
Beryllium						B	3.4	UG/L	-	
Boron							252	UG/L	-	
Cadmium						U	20	UG/L	U	
Calcium							3100000	UG/L	-	
Chromium							142	UG/L	-	
Cobalt						B	24.1	UG/L	J	
Copper							51.1	UG/L	-	
Hexavalent Chromium										
Iron							100	UG/L	-	
Lead						U	2	UG/L	U	
Magnesium						B	1160	UG/L	-	
Manganese						E	21.4	UG/L	J	
Mercury						U	.2	UG/L	U	
Molybdenum							39	UG/L	-	
Nickel						B	38.3	UG/L	J	
Osmium										
Potassium							307000	UG/L	-	
Selenium						UN	10	UG/L	UJ	
Silicon							600	UG/L	-	
Silver						N	115	UG/L	J	
Sodium							678000	UG/L	-	
Thallium						UWN	2	UG/L	UJ	
Tin						U	200	UG/L	U	
Vanadium							81.1	UG/L	-	
Zinc						B	6.4	UG/L	-	

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G-2-41

5595

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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0596

RI/FS - QA/QC Samples
Inorganic Results

		1765				1773		
Well/Boring:		1765				1773		
Sample ID:		063921				063791		
Sample Date:		31-OCT-91				08-SEP-91		
QA Type:		DUPLICATE				DUPLICATE		
Pit:		1				4		
Parameters	**LQ**	**Result**	**Unit**	**VQ TCLP**	**LQ**	**Result**	**Unit**	**VQ TCLP**
Barium		2050	UG/L	-		94.7	% RECOVE	NV
Beryllium	B	3.6	UG/L	-		95.7	% RECOVE	NV
Boron		252	UG/L	-		97.6	% RECOVE	NV
Cadmium	U	20	UG/L	U		82.7	% RECOVE	NV
Calcium		3220000	UG/L	-	B	45.6	UG/L	J
Chromium		145	UG/L	-		93.5	% RECOVE	NV
Cobalt	B	25.9	UG/L	J		94	% RECOVE	NV
Copper		48.5	UG/L	-		96.8	% RECOVE	NV
Hexavalent Chromium								
Iron		108	UG/L	-		99.7	% RECOVE	NV
Lead	U	2	UG/L	U		84.4	% RECOVE	NV
Magnesium	B	1410	UG/L	-	U	50	UG/L	U
Manganese	E	20	UG/L	J		95.1	% RECOVE	NV
Mercury	U	.2	UG/L	U		101.1	% RECOVE	NV
Molybdenum		38.6	UG/L	-		96.7	% RECOVE	NV
Nickel		41	UG/L	J		94.8	% RECOVE	NV
Osmium								
Potassium		308000	UG/L	-	U	100	UG/L	U
Selenium	BWN	11.6	UG/L	J		88.8	% RECOVE	NV
Silicon		584	UG/L	-		94.2	% RECOVE	NV
Silver	N	116	UG/L	-		90.8	% RECOVE	NV
Sodium		674000	UG/L	-	U	100	UG/L	U
Thallium	UWN	2	UG/L	UJ		97.6	% RECOVE	NV
Tin	U	200	UG/L	U				
Vanadium		83	UG/L	-		93.8	% RECOVE	NV
Zinc	B	5.7	UG/L	-		95	% RECOVE	NV

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G-2-42

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		2004					3003			
Sample ID:		003023					003243			
Sample Date:		03-DEC-87					25-MAY-88			
QA Type:		DUPLICATE					DUPLICATE			
Pit:										
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
Barium	NV	200	UG/L	NV			97.2	% RECOVE	NV	
Beryllium										
Boron										
Cadmium	NV	1	UG/L	NV			96	% RECOVE	NV	
Calcium	NV	81600	UG/L	NV			85.7	MG/L	NV	
Chromium	NV	5	UG/L	NV			96.8	% RECOVE	NV	
Cobalt										
Copper	NV	25	UG/L	NV			96.8	% RECOVE	NV	
Hexavalent Chromium	NV	.005	UG/L	NV						
Iron	NV	183	UG/L	NV			680	UG/L	-	
Lead	NV	5	UG/L	NV			93	% RECOVE	NV	
Magnesium	NV	21000	UG/L	NV			23.6	MG/L	NV	
Manganese	NV	15	UG/L	NV			580	UG/L	-	
Mercury	NV	.2	UG/L	NV			90	% RECOVE	NV	
Molybdenum							103.3	% RECOVE	NV	
Nickel	NV	5	UG/L	NV			97.9	% RECOVE	NV	
Osmium										
Potassium	NV	2810	UG/L	NV			99	% RECOVE	NV	
Selenium	NV	2.5	UG/L	NV			94	% RECOVE	NV	
Silicon										
Silver	NV	30	UG/L	NV			113.3	% RECOVE	NV	
Sodium	NV	14000	UG/L	NV			11500	UG/L	-	
Thallium										
Tin										
Vanadium										
Zinc	NV	20	UG/L	NV						

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Submittal Date: 12-OCT-93
Print Date: 29-SEP-93
FEMP OU1RI - USEPA

0597

RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:	2011				2027			
Sample ID:	003317				003454			
Sample Date:	24-OCT-88				10-AUG-88			
QA Type:	DUPLICATE				DUPLICATE			
Pit:								

Parameters	LQ	Result	Unit	VQ TCLP	LQ	Result	Unit	VQ TCLP
Barium		135	UG/L	-	U	200	UG/L	U
Beryllium								
Boron								
Cadmium		2	UG/L	-	U	5	UG/L	U
Calcium		100000	UG/L	-		210000	UG/L	-
Chromium	U	20	UG/L	U	U	10	UG/L	U
Cobalt								
Copper	U	10	UG/L	U	U	30	UG/L	U
Hexavalent Chromium								
Iron		1940	UG/L	-		6000	UG/L	-
Lead	U	2	UG/L	U	U	5	UG/L	U
Magnesium		26500	UG/L	-		43000	UG/L	-
Manganese		178	UG/L	-		480	UG/L	-
Mercury	U	.2	UG/L	UJ	U	.3	UG/L	U
Molybdenum	U	20	UG/L	U	U	50	UG/L	U
Nickel	U	20	UG/L	U	U	40	UG/L	U
Osmium								
Potassium		1020	UG/L	-	U	5000	UG/L	U
Selenium	U	2	UG/L	UJ	U	5	UG/L	U
Silicon								
Silver	U	.5	UG/L	U	U	10	UG/L	U
Sodium		9720	UG/L	-		33000	UG/L	-
Thallium								
Tin								
Vanadium								
Zinc								

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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Well/Boring:		3084					3005			
Sample ID:		003460					003464			
Sample Date:		29-NOV-88					02-DEC-88			
QA Type:		DUPLICATE					DUPLICATE			
Pit:										
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
Barium		98.9	% RECOVE	NV			80	UG/L	-	
Beryllium										
Boron										
Cadmium		98	% RECOVE	NV			97.3	% RECOVE	NV	
Calcium		278	MG/L	NV			99.7	MG/L	NV	
Chromium		97	% RECOVE	NV			98	% RECOVE	NV	
Cobalt										
Copper		91.7	% RECOVE	NV			17	UG/L	-	
Hexavalent Chromium										
Iron		98.3	% RECOVE	NV			93	% RECOVE	NV	
Lead		82.8	% RECOVE	NV			71	% RECOVE	NV	
Magnesium		82.8	MG/L	NV			26200	UG/L	-	
Manganese		2520	UG/L	-			580	UG/L	-	
Mercury	U	0	UG/L	U			83.4	% RECOVE	NV	
Molybdenum		109	% RECOVE	NV			106	% RECOVE	NV	
Nickel		95.6	% RECOVE	NV			99.9	% RECOVE	NV	
Osmium										
Potassium		15400	UG/L	J			90.5	% RECOVE	NV	
Selenium		96.3	% RECOVE	NV			87.4	% RECOVE	NV	
Silicon										
Silver		74	% RECOVE	NV			61.5	% RECOVE	NV	
Sodium		63.1	MG/L	NV			9130	UG/L	-	
Thallium										
Tin										
Vanadium										
Zinc										

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

4788

FEMP-01RI-4 DRAFT
October 12, 1993

RI/FS - QA/QC Samples
Inorganic Results

	3001					3019			
Well/Boring:	3001					3019			
Sample ID:	003467					003501			
Sample Date:	05-DEC-88					17-AUG-88			
QA Type:	DUPLICATE					DUPLICATE			
Pit:									
Parameters	**LQ**	**Result**	**Unit**	**VQ TCLP**	**LQ**	**Result**	**Unit**	**VQ TCLP**	
Barium		53	UG/L	-		24	UG/L	-	
Beryllium									
Boron									
Cadmium		2	UG/L	U	U	2	UG/L	U	
Calcium		89400	UG/L	-		272000	UG/L	-	
Chromium		20	UG/L	U	U	20	UG/L	U	
Cobalt									
Copper		10	UG/L	U	U	10	UG/L	U	
Hexavalent Chromium									
Iron		2860	UG/L	-		36	UG/L	-	
Lead		2	UG/L	U	U	50	UG/L	U	
Magnesium		23500	UG/L	-		30800	UG/L	-	
Manganese		531	UG/L	-		3100	UG/L	-	
Mercury		.2	UG/L	U	U	.2	UG/L	U	
Molybdenum		20	UG/L	-		46	UG/L	-	
Nickel		20	UG/L	U	U	20	UG/L	U	
Osmium									
Potassium		1830	UG/L	-		6500	UG/L	-	
Selenium		5	UG/L	-	U	200	UG/L	U	
Silicon									
Silver		20	UG/L	U	U	10	UG/L	U	
Sodium		9520	UG/L	-		42500	UG/L	-	
Thallium									
Tin									
Vanadium									
Zinc									

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

000609

RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:	2004					2004				
Sample ID:	003511					003512				
Sample Date:	19-AUG-88					19-AUG-88				
QA Type:	DUPLICATE					DUPLICATE				
Pit:										
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
Barium		40	UG/L	-						
Beryllium										
Boron										
Cadmium	U	2	UG/L	U						
Calcium		82800	UG/L	-						
Chromium	U	20	UG/L	U						
Cobalt										
Copper	U	10	UG/L	U						
Hexavalent Chromium										
Iron		110	UG/L	-						
Lead	U	2	UG/L	U						
Magnesium		22300	UG/L	J						
Manganese		10	UG/L	-						
Mercury	U	.2	UG/L	U						
Molybdenum	U	20	UG/L	U						
Nickel	U	20	UG/L	U						
Osmium										
Potassium	U	1000	UG/L	U						
Selenium	U	2	UG/L	U						
Silicon										
Silver	U	10	UG/L	U						
Sodium		13000	UG/L	-						
Thallium										
Tin										
Vanadium										
Zinc										

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0601

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

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0602

RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		3005					3821			
Sample ID:		003514					065169			
Sample Date:		19-AUG-88					02-OCT-92			
QA Type:		DUPLICATE					DUPLICATE			
Pit:										
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
Barium		96.4	% RECOVE	NV						
Beryllium										
Boron										
Cadmium		103	% RECOVE	NV						
Calcium		95.8	MG/L	NV						
Chromium		98	% RECOVE	NV						
Cobalt										
Copper		92.8	% RECOVE	NV						
Hexavalent Chromium										
Iron		95.1	% RECOVE	NV						
Lead	U	2	UG/L	U						
Magnesium		25600	UG/L	J						
Manganese		97.6	% RECOVE	NV						
Mercury	U	.2	UG/L	U						
Molybdenum		96.8	% RECOVE	NV						
Nickel		101	% RECOVE	NV						
Osmium										
Potassium		90	% RECOVE	NV						
Selenium	U	2	UG/L	U						
Silicon										
Silver	U	10	UG/L	U						
Sodium		8600	UG/L	-						
Thallium										
Tin										
Vanadium										
Zinc										

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	Well/Boring: 3821					Well/Boring: 4001				
	Sample ID: 065171					Sample ID: 066468				
	Sample Date: 02-OCT-92					Sample Date: 20-JUN-89				
	QA Type: DUPLICATE					QA Type: DUPLICATE				
	Pit:					Pit:				
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
Barium							81.6	UG/L	U	
Beryllium						U	1	UG/L	U	
Boron										
Cadmium										
Calcium							118000	UG/L	-	
Chromium							32.7	UG/L	-	
Cobalt						U	10	UG/L	U	
Copper						U	10	UG/L	U	
Hexavalent Chromium										
Iron							5510	UG/L	-	
Lead						U	2	UG/L	U	
Magnesium							33200	UG/L	-	
Manganese										
Mercury										
Molybdenum										
Nickel						U	20	UG/L	U	
Osmium										
Potassium										
Selenium										
Silicon										
Silver							1820	UG/L	-	
Sodium										
Thallium										
Tin										
Vanadium							21.1	UG/L	-	
Zinc							14.3	UG/L	UJ	

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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0663

C604

4788

RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		2084				3001			
Sample ID:		066475				066525			
Sample Date:		29-JUN-89				16-AUG-89			
QA Type:		DUPLICATE				DUPLICATE			
Pit:									
Parameters	**LQ**	**Result**	**Unit**	**VQ TCLP**	**LQ**	**Result**	**Unit**	**VQ TCLP**	
Barium		95.5	% RECOVE	NV		54	UG/L	-	
Beryllium		2.7	UG/L	-		2	UG/L	-	
Boron									
Cadmium									
Calcium		388	MG/L	NV		99600	UG/L	-	
Chromium		98.1	% RECOVE	NV		30	UG/L	-	
Cobalt		92.9	% RECOVE	NV		10	UG/L	-	
Copper		98.3	% RECOVE	NV		10	UG/L	-	
Hexavalent Chromium									
Iron		96.5	% RECOVE	NV		2620	UG/L	-	
Lead		89.5	% RECOVE	NV		12	UG/L	-	
Magnesium		96.2	MG/L	NV		24900	UG/L	-	
Manganese									
Mercury									
Molybdenum									
Nickel		98.3	% RECOVE	NV		24	UG/L	-	
Osmium									
Potassium									
Selenium									
Silicon									
Silver		95.6	% RECOVE	NV		12	UG/L	-	
Sodium									
Thallium									
Tin									
Vanadium		94.7	% RECOVE	NV		19	UG/L	-	
Zinc		97.2	% RECOVE	NV		46	UG/L	-	

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

Well/Boring:		2027				2027		
Sample ID:		066581				066600		
Sample Date:		10-SEP-89				10-SEP-89		
QA Type:		DUPLICATE				DUPLICATE		
Pit:								
Parameters	LQ	Result	Unit	VQ TCLP	LQ	Result	Unit	VQ TCLP
Barium						97.5	% RECOVE	NV
Beryllium						96.4	% RECOVE	NV
Boron								
Cadmium						95.2	% RECOVE	NV
Calcium						542	MG/L	NV
Chromium						92.2	% RECOVE	NV
Cobalt						92	% RECOVE	NV
Copper						94.8	% RECOVE	NV
Hexavalent Chromium								
Iron						97.9	% RECOVE	NV
Lead						90.8	% RECOVE	NV
Magnesium						86.4	MG/L	NV
Manganese						94.8	% RECOVE	NV
Mercury					UN	.2	UG/L	UJ
Molybdenum								
Nickel						91.9	% RECOVE	NV
Osmium						69	% RECOVE	NV
Potassium						5530	UG/L	-
Selenium						67	% RECOVE	NV
Silicon								
Silver						85.8	% RECOVE	NV
Sodium						35100	UG/L	NV
Thallium						85.6	% RECOVE	NV
Tin						87.3	% RECOVE	NV
Vanadium						94.5	% RECOVE	NV
Zinc						94.9	% RECOVE	NV

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

0606

4788

RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:	2027				1083				
Sample ID:	066743				066745				
Sample Date:	16-NOV-89				21-NOV-89				
QA Type:	DUPLICATE				DUPLICATE				
Pit:									

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Barium		200	UG/L	NV			265	UG/L	NV	
Beryllium		10	UG/L	NV			10	UG/L	NV	
Boron										
Cadmium										
Calcium		303000	UG/L	NV			147000	UG/L	NV	
Chromium		5	UG/L	NV			5	UG/L	NV	
Cobalt		25	UG/L	NV			25	UG/L	NV	
Copper		43	UG/L	NV			31	UG/L	NV	
Hexavalent Chromium										
Iron		7370	UG/L	NV			50	UG/L	NV	
Lead		5	UG/L	NV			5	UG/L	NV	
Magnesium		54200	UG/L	NV			47800	UG/L	NV	
Manganese		1370	UG/L	NV			42	UG/L	NV	
Mercury										
Molybdenum										
Nickel		5	UG/L	NV			5	UG/L	NV	
Osmium										
Potassium										
Selenium										
Silicon										
Silver		1	UG/L	NV			1	UG/L	NV	
Sodium		36900	UG/L	NV			19200	UG/L	NV	
Thallium										
Tin										
Vanadium		50	UG/L	NV			50	UG/L	NV	
Zinc		86	UG/L	NV			31	UG/L	NV	

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Submittal Date: 12-OCT-93
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FEMP OU1RI - USEPA

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:		3011					3084			
Sample ID:		007611					007630			
Sample Date:		20-NOV-87					13-NOV-87			
QA Type:		RINSATE					RINSATE			
Pit:										
Barium		.003	MG/L	NV		U	.002	UG/L	UJ	
Beryllium										
Boron										
Cadmium		88.4	% RECOVE	NV		U	.005	UG/L	UJ	
Calcium										
Chromium		100	% RECOVE	NV		U	.02	UG/L	U	
Cobalt										
Copper		104.4	% RECOVE	NV		U	.01	UG/L	UJ	
Hexavalent Chromium	U	.01	MG/L	R		U	.01	MG/L	R	
Iron		92.7	% RECOVE	NV		U	.005	UG/L	U	
Lead	U	50	UG/L	U		U	.05	UG/L	UJ	
Magnesium										
Manganese		94.2	% RECOVE	NV			.011	UG/L	-	
Mercury		120	% RECOVE	NV		U	.0002	UG/L	UJ	
Molybdenum	U	20	UG/L	U		U	.02	UG/L	U	
Nickel		90.8	% RECOVE	NV		U	.02	UG/L	U	
Osmium										
Potassium										
Selenium	U	200	UG/L	U		U	.2	UG/L	U	
Silicon										
Silver	U	10	UG/L	U		U	.01	UG/L	U	
Sodium		1090	UG/L	U			.38	UG/L	UJ	
Thallium										
Tin										
Vanadium										
Zinc										

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4788

06607

4788

0608

RI/FS - QA/QC Samples
Inorganic Results

	Well/Boring: 1081 Sample ID: 007656 Sample Date: 03-DEC-87 QA Type: RINSATE Pit:					Well/Boring: 1082 Sample ID: 007674 Sample Date: 07-DEC-87 QA Type: RINSATE Pit:				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Barium		43	UG/L	UJ			3	UG/L	U	
Beryllium										
Boron										
Cadmium	U	2	UG/L	UJ		U	5	UG/L	U	
Calcium										
Chromium	U	20	UG/L	UJ		U	20	UG/L	U	
Cobalt										
Copper	U	10	UG/L	UJ			50	UG/L	U	
Hexavalent Chromium	U	.01	MG/L	UJ		U	.01	MG/L	UJ	
Iron		821	UG/L	J			2800	UG/L	-	
Lead	U	50	UG/L	UJ		U	50	UG/L	U	
Magnesium										
Manganese		13	UG/L	J			38	UG/L	-	
Mercury	U	.2	UG/L	R		U	.2	UG/L	U	
Molybdenum	U	20	UG/L	UJ			50	UG/L	-	
Nickel	U	20	UG/L	UJ		U	20	UG/L	U	
Osmium										
Potassium										
Selenium	U	200	UG/L	UJ		U	200	UG/L	U	
Silicon										
Silver	U	10	UG/L	UJ		U	10	UG/L	U	
Sodium	JB	240	UG/L	UJ			300	UG/L	U	
Thallium										
Tin										
Vanadium										
Zinc										

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Submittal Date: 12-OCT-93
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FEMP OU1RI - USEPA

Well/Boring:		1025					1028			
Sample ID:		007816					007838			
Sample Date:		10-JAN-88					13-JAN-88			
QA Type:		RINSATE					RINSATE			
Pit:										
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
Barium		228	UG/L	U			99.8	% RECOVE	NV	
Beryllium							52.7	MG/L	NV	
Boron										
Cadmium	U	5	UG/L	U			95.8	% RECOVE	NV	
Calcium						B	400	UG/L	U	
Chromium	U	20	UG/L	U			205	MG/L	NV	
Cobalt							518	MG/L	NV	
Copper		40	UG/L	U			55	UG/L	-	
Hexavalent Chromium	U	.01	MG/L	UJ		U	.01	MG/L	R	
Iron		100	UG/L	U			110	% RECOVE	NV	
Lead	U	50	UG/L	U			108	% RECOVE	NV	
Magnesium						U	5	UG/L	U	
Manganese		20	UG/L	U			535	MG/L	NV	
Mercury	U	.2	UG/L	U		U	.2	UG/L	U	
Molybdenum	U	20	UG/L	U						
Nickel	U	20	UG/L	U			522	MG/L	NV	
Osmium										
Potassium							140	UG/L	NV	
Selenium	U	200	UG/L	U			55.5	% RECOVE	NV	
Silicon										
Silver	U	10	UG/L	U		U	5	UG/L	U	
Sodium		5000	UG/L	U		U	50	UG/L	U	
Thallium							96.2	% RECOVE	NV	
Tin										
Vanadium							98	% RECOVE	NV	
Zinc							650	MG/L	NV	

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0609

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

788

0610

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RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:	1078	2027
Sample ID:	007840	007877
Sample Date:	09-DEC-87	17-DEC-87
QA Type:	RINSATE	RINSATE
Pit:		

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Barium	B	4	UG/L	UJ		U	2	UG/L	UJ	
Beryllium	U	1	UG/L	UJ		U	1	UG/L	U	
Boron										
Cadmium	U	5	UG/L	UJ		U	2	UG/L	U	
Calcium	B	1580	UG/L	UJ		B	1600	UG/L	J	
Chromium	U	10	UG/L	UJ		U	20	UG/L	U	
Cobalt	U	20	UG/L	UJ		U	10	UG/L	U	
Copper	U	10	UG/L	UJ		U	10	UG/L	UJ	
Hexavalent Chromium	U	.01	MG/L	R		U	.01	MG/L	UJ	
Iron		2550	UG/L	J			349	UG/L	U	
Lead	U	30	UG/L	UJ			6	UG/L	J	
Magnesium	B	529	UG/L	UJ		B	240	UG/L	J	
Manganese		25	UG/L	J		B	5	UG/L	-	
Mercury	U	.2	UG/L	UJ			110	% RECOVE	NV	
Molybdenum	U	20	UG/L	UJ						
Nickel	U	20	UG/L	UJ		U	20	UG/L	U	
Osmium										
Potassium	U	1000	UG/L	UJ		B	416	UG/L	J	
Selenium	U	60	UG/L	UJ		U	2	UG/L	U	
Silicon										
Silver	U	5	UG/L	UJ		U	5	UG/L	UJ	
Sodium	B	663	UG/L	UJ		U	50	UG/L	UJ	
Thallium	U	30	UG/L	UJ		UW	5	UG/L	UJ	
Tin										
Vanadium	U	5	UG/L	UJ		U	10	UG/L	U	
Zinc		39	UG/L	UJ		U	10	UG/L	R	

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G-2-56

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

Well/Boring:		1083				3004		
Sample ID:		007895				008187		
Sample Date:		11-JAN-88				05-MAR-88		
QA Type:		RINSATE				RINSATE		
Pit:								
Parameters	**LQ**	**Result**	**Unit**	**VQ TCLP**	**LQ**	**Result**	**Unit**	**VQ TCLP**
Barium		200	UG/L	U		2	UG/L	-
Beryllium								
Boron								
Cadmium	U	5	UG/L	U		10	UG/L	-
Calcium						1400	UG/L	-
Chromium	U	20	UG/L	U	U	5	UG/L	U
Cobalt								
Copper		25	UG/L	U		92	UG/L	-
Hexavalent Chromium	U	.01	MG/L	UJ	J	.01	MG/L	R
Iron		100	UG/L	U		2010	UG/L	UJ
Lead	U	50	UG/L	U		70	UG/L	J
Magnesium						520	UG/L	-
Manganese		15	UG/L	U		30	UG/L	-
Mercury	U	.2	UG/L	U	U	.2	UG/L	UJ
Molybdenum	U	20	UG/L	U	U	20	UG/L	U
Nickel	U	20	UG/L	U	JB	12	UG/L	U
Osmium								
Potassium					JB	200	UG/L	U
Selenium	U	200	UG/L	U	U	200	UG/L	UJ
Silicon								
Silver	U	10	UG/L	U		38	UG/L	-
Sodium		14400	UG/L	U	JB	110	UG/L	U
Thallium								
Tin								
Vanadium								
Zinc								

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G-2-57

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

4788

0612

RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		1076					2004			
Sample ID:		008351					003024			
Sample Date:		09-MAR-88					03-DEC-87			
QA Type:		RINSATE					TRIPLICATE			
Pit:										
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Barium		3	UG/L	-		NV	.2	MG/L	NV	
Beryllium										
Boron										
Cadmium	U	2	UG/L	U		NV	.001	MG/L	NV	
Calcium		2200	UG/L	-		NV	83	MG/L	NV	
Chromium	U	20	UG/L	U		NV	.005	MG/L	NV	
Cobalt										
Copper	U	10	UG/L	U		NV	.025	MG/L	NV	
Hexavalent Chromium		94	% RECOVE	NV		NV	.005	MG/L	NV	
Iron		97	UG/L	-		NV	.179	MG/L	NV	
Lead	U	50	UG/L	U		NV	.005	MG/L	NV	
Magnesium		270	UG/L	-		NV	21.2	MG/L	NV	
Manganese		3	UG/L	-		NV	.015	MG/L	NV	
Mercury	U	.2	UG/L	U		NV	.0002	MG/L	NV	
Molybdenum	U	20	UG/L	U						
Nickel	U	20	UG/L	U		NV	.005	MG/L	NV	
Osmium										
Potassium	U	200	UG/L	U		NV	2.83	MG/L	NV	
Selenium	U	200	UG/L	U		NV	.0025	MG/L	NV	
Silicon										
Silver	U	10	UG/L	U		NV	.03	MG/L	NV	
Sodium		780	UG/L	J		NV	14.4	MG/L	NV	
Thallium										
Tin										
Vanadium										
Zinc						NV	.02	MG/L	NV	

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G-2-58

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

G.2.3 ORGANIC

G.3 1992 RI/FS

G.3.1 RADIOLOGICAL

1992 RI/FS - QA/QC Samples
Radiological Results

Well/Boring:		05-04					05					05					05			
Sample ID:		100219					100221					100222					100223			
Sample Date:		04/28/92					04/29/92					04/29/92					04/29/92			
QA Type:		QA					QA-EB					QA-RB					QA-WB			
Pit:			5					5					5					5		
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
CESIUM-137		106	PCI/G	J		ND	2.4	PCI/L	UJ		ND	2.5	PCI/L	UJ		ND	5.4	PCI/L	UJ	
GROSS ALPHA		4030	PCI/G	J		ND		PCI/L	NV		ND		PCI/L	NV		ND	0.12	PCI/L	J	
GROSS BETA		1280	PCI/G	J			14.5	PCI/L	J			11.5	PCI/L	J			12.9	PCI/L	J	
NEPTUNIUM-237		83	PCI/G	J		ND	0.16	PCI/L	UJ		ND	0.55	PCI/L	UJ		ND	0.77	PCI/L	UJ	
PLUTONIUM-238		0.04	PCI/G	UJ			0.36	PCI/L	UJ		ND	0.23	PCI/L	UJ		ND	0.29	PCI/L	UJ	
PLUTONIUM-239/240		0.11	PCI/G	UJ		ND	0.15	PCI/L	UJ		ND	0.10	PCI/L	UJ		ND	0.25	PCI/L	UJ	
PLUTONIUM-242																				
POTASSIUM-40		11	PCI/G	J																
RADIUM-226		180	PCI/G	J		ND	1.0	PCI/L	UJ		ND	0.56	PCI/L	UJ		ND	0.65	PCI/L	UJ	
RADIUM-228		49	PCI/G	J		ND	3.05	PCI/L	UJ		ND	2.54	PCI/L	UJ		ND	2.5	PCI/L	UJ	
RUTHENIUM-106	ND	2.4	PCI/G	UJ		ND	32	PCI/L	UJ		ND	22.9	PCI/L	UJ		ND	42.0	PCI/L	UJ	
STRONTIUM-90		18	PCI/G	J			1.16	PCI/L	UJ			1.02	PCI/L	UJ			2.92	PCI/L	UJ	
TECHNETIUM-99		1140	PCI/G	J			9.6	PCI/L	UJ			9.9	PCI/L	UJ			9.7	PCI/L	UJ	
THORIUM-228		4.5	PCI/G	J		ND	0.65	PCI/L	UJ		ND	0.3	PCI/L	UJ		ND	0.36	PCI/L	UJ	
THORIUM-230		59	PCI/G	J		ND	0.40	PCI/L	UJ			0.3	PCI/L	UJ		ND	0.40	PCI/L	UJ	
THORIUM-232		0.4	PCI/G	UJ		ND	0.33	PCI/L	UJ		ND	0.30	PCI/L	UJ		ND	0.36	PCI/L	UJ	
THORIUM-TOTAL		3.68	UG/G	J			0.33	UG/L	UJ			0.30	UG/L	UJ			1.0	UG/L	UJ	
URANIUM-234		1400	PCI/G	J			0.82	PCI/L	UJ			0.3	PCI/L	UJ			0.27	PCI/L	J	
URANIUM-235/236		58	PCI/G	J		ND	0.10	PCI/L	UJ		ND	0.1	PCI/L	UJ		ND	0.1	PCI/L	UJ	
URANIUM-238		2800	PCI/G	J			0.10	PCI/L	UJ		ND	0.1	PCI/L	UJ			0.29	PCI/L	UJ	
URANIUM-TOTAL		2400	UG/G	J			1.0	UG/L	UJ		ND	1.0	UG/L	UJ		ND	1.0	UG/L	UJ	

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RI/FS 1992 Formerly Referred to as WEMCO.

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

4788

0617

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1992 RI/FS - QA/QC Samples
Radiological Results

Well/Boring:		05					06					06					06			
Sample ID:		100224					100233					100235					100236			
Sample Date:		04/29/92					05/04/92					05/05/92					05/05/92			
QA Type:		QA-WB					QA-TB					QA-RB					QA-WB			
Pit:			5					6					6					6		
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
CESIUM-137	ND	41.5	PCI/L	UJ			0.9	PCI/G	J		ND	3.1	PCI/L	UJ		ND	6.6	PCI/L	UJ	
GROSS ALPHA	ND	4.4	PCI/L	J			4200	PCI/G	J			21	PCI/L	J			1.5	PCI/L	J	
GROSS BETA		13.3	PCI/L	J			7500	PCI/G	J			11	PCI/L	J			2.1	PCI/L	J	
NEPTUNIUM-237	ND		PCI/L	NV							ND	0.48	PCI/L	UJ						
PLUTONIUM-238	ND	0.30	PCI/L	UJ			0.1	PCI/G	UJ		ND	.34	PCI/L	UJ		ND	.3	PCI/L	UJ	
PLUTONIUM-239/240	ND	0.24	PCI/L	UJ			0.6	PCI/G	J		ND	.29	PCI/L	UJ		ND	.11	PCI/L	UJ	
PLUTONIUM-242																				
POTASSIUM-40																				
RADIUM-226	ND	0.77	PCI/L	UJ			3.3	PCI/G	J		ND	1.1	PCI/L	UJ		ND	1.0	PCI/L	UJ	
RADIUM-228	ND	3.53	PCI/L	UJ			4.9	PCI/G	J		ND	6.2	PCI/L	UJ		ND	7.5	PCI/L	UJ	
RUTHENIUM-106	ND	41.5	PCI/L	UJ		ND	1.7	PCI/G	UJ		ND	31	PCI/L	UJ		ND	57	PCI/L	UJ	
STRONTIUM-90		1.06	PCI/L	UJ		ND	0.9	PCI/G	UJ		ND	.89	PCI/L	UJ		ND	5	PCI/L	UJ	
TECHNETIUM-99		9.8	PCI/L	UJ		ND	3.7	PCI/G	UJ		ND	9	PCI/L	UJ		ND	10	PCI/L	J	
THORIUM-228	ND	0.41	PCI/L	UJ			.7	PCI/G	J		ND	.26	PCI/L	UJ		ND	.27	PCI/L	UJ	
THORIUM-230	ND	0.24	PCI/L	UJ			7.9	PCI/G	J			.38	PCI/L	UJ			.5	PCI/L	J	
THORIUM-232	ND	0.10	PCI/L	UJ			0.7	PCI/G	J		ND	.21	PCI/L	UJ		ND	.19	PCI/L	UJ	
THORIUM-TOTAL		0.10	UG/L	UJ																
URANIUM-234	ND	0.21	PCI/L	UJ			1031	PCI/G	J			4.5	PCI/L	J			.8	PCI/L	J	
URANIUM-235/236	ND	0.09	PCI/L	UJ			86	PCI/G	J		ND	1	PCI/L	UJ		ND	.2	PCI/L	UJ	
URANIUM-238		0.09	PCI/L	UJ			6186	PCI/G	J			10.1	PCI/L	J			.8	PCI/L	J	
URANIUM-TOTAL	ND	1.0	UG/L	UJ			1331	UG/G	J			22.5	UG/L	UJ			22.5	UG/L	UJ	

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RI/FS 1992 Formerly Referred to as WEMCO.

Submittal Date: 12-OCT-93
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1992 RI/FS - QA/QC Samples
Radiological Results

Well/Boring:		06					06					CW-B					NA			
Sample ID:		100238					100239					098532					098534			
Sample Date:		05/05/92					05/05/92					09/01/92					09/01/92			
QA Type:		QA-WB					QA					QA-DUP					QA-EB			
Pit:			6					6					CLEARWELL					CLEARWELL		
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
CESIUM-137	ND	7.1	PCI/L	UJ		ND	5.2	PCI/L	UJ			40.8	PCI/G	J			4.0	PCI/L	UJ	
GROSS ALPHA		4.3	PCI/L	J			4.6	PCI/L	J			528	PCI/G	J						
GROSS BETA							3.2	PCI/L	J			401	PCI/G	J						
NEPTUNIUM-237		1.0	PCI/L	J			0.4	PCI/L	J			1.6	PCI/G	J						
PLUTONIUM-238	ND	0.45	PCI/L	UJ		ND	0.45	PCI/L	UJ			0.18	PCI/G	J						
PLUTONIUM-239/240	ND	0.22	PCI/L	UJ		ND	0.35	PCI/L	UJ			0.30	PCI/G	J						
PLUTONIUM-242												ND	PCI/G	NV						
POTASSIUM-40																				
RADIUM-226	ND	0.74	PCI/L	UJ		ND	0.67	PCI/L	UJ			34	PCI/G	J						
RADIUM-228	ND	3.9	PCI/L	UJ		ND	5.1	PCI/L	UJ			10.7	PCI/G	J						
RUTHENIUM-106	ND	56	PCI/L	UJ		ND	42	PCI/L	UJ			1.51	PCI/G	UJ			33	PCI/L	UJ	
STRONTIUM-90	ND	5	PCI/L	UJ		ND	5	PCI/L	UJ			2.03	PCI/G	UJ						
TECHNETIUM-99	ND	10	PCI/L	UJ		ND	9	PCI/L	UJ			519	PCI/G	J						
THORIUM-228	ND	0.23	PCI/L	UJ		ND	0.33	PCI/L	UJ			16.7	PCI/G	J						
THORIUM-230		0.7	PCI/L	J			1.2	PCI/L	J			63.6	PCI/G	J						
THORIUM-232	ND	0.08	PCI/L	UJ		ND	0.09	PCI/L	UJ			2.42	PCI/G	J						
THORIUM-TOTAL												22.2	UG/G	J						
URANIUM-234		1.4	PCI/L	J			2.9	PCI/L	J			73.2	PCI/G	J						
URANIUM-235/236	ND	0.85	PCI/L	UJ		ND	1	PCI/L	UJ			4.51	PCI/G	J						
URANIUM-238		2.1	PCI/L	J			4.5	PCI/L	J			177	PCI/G	J						
URANIUM-TOTAL		1.65	UG/L	UJ			21.9	UG/L	UJ			13	UG/G	J			1.0	UG/L	J	

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FEMP-01RI-4 DRAFT
October 12, 1993

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1992 RI/FS - QA/QC Samples
Radiological Results

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:		NS					NA					NA			
Sample ID:		098535					098536					098537			
Sample Date:		09/01/92					09/01/92					09/01/92			
QA Type:		QA-RB					QA-RB					QA-RB			
Pit:			CLEARWELL					CLEARWELL					CLEARWELL		
CESIUM-137		4.1	PCI/G	UJ			4.1	PCI/L	UJ			3.3	PCI/L	UJ	
GROSS ALPHA							24.5	PCI/L	J			7.27	PCI/L	J	
GROSS BETA		0.825	PCI/G	J			12.8	PCI/L	J			3.32	PCI/L	J	
NEPTUNIUM-237															
PLUTONIUM-238															
PLUTONIUM-239/240															
PLUTONIUM-242															
POTASSIUM-40															
RADIUM-226															
RADIUM-228															
RUTHENIUM-106		34	PCI/G	UJ			33	PCI/L	UJ			31	PCI/L	UJ	
STRONTIUM-90															
TECHNETIUM-99															
THORIUM-228															
THORIUM-230															
THORIUM-232															
THORIUM-TOTAL															
URANIUM-234															
URANIUM-235/236															
URANIUM-238															
URANIUM-TOTAL		2.4	UG/L	J			9.3	UG/L	J			6.5	UG/L	J	

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G.3.2 INORGANIC

1992 RI/FS - QA/QC Samples
Inorganic Results

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:		05-08					05-08					05-04					05			
Sample ID:		100218S					100218SD					100219					100221			
Sample Date:		04/29/92					04/29/92					04/28/92					04/29/92			
QA Type:		QA					QA					QA					QA-EB			
Pit:			5					5					5					5		
AMMONIA, AS NITROGEN												1210	MG/KG	J						
BROMIDE											U	1440	MG/KG	UJ						
CHLORIDE												608	MG/KG	J						
CYANIDE											UJ	1.38	MG/KG	UJ						
NITRATE/NITRITE												18200	MG/KG	J						
OIL & GREASE																				
SILICON																				
SPECIFIC GRAVITY												1.840	S.U.	NV						
SULFATE												1570	MG/KG	J						
TOTAL KJELDAHL NITROGEN												1340	MG/KG	J						
TOTAL ORGANIC CARBON												17000	MG/KG	J						
TOTAL ORGANIC NITROGEN												130	MG/KG	J						
TOTAL PHOSPHORUS												530	MG/KG	J						
pH												9	S.U.	J						
ALUMINUM		9351.1649	MG/KG	NV			10452.1808	MG/KG	NV			9580	MG/KG	J		U	4.1	MG/KG	U	
ANTIMONY		219.2052	MG/KG	NV			212.1560	MG/KG	NV			12.1	MG/KG	J		U	1.0	MG/KG	UJ	
ARSENIC		80.4198	MG/KG	NV			58.6413	MG/KG	NV			447	MG/KG	J		U	1.1	MG/KG	UJ	
BARIUM		9648.6786	MG/KG	NV			10579.4958	MG/KG	NV			883	UG/L	J	Y	U	0.09	MG/KG	UJ	
BERYLLIUM		214.3269	MG/KG	NV			219.8137	MG/KG	NV			7.6	MG/KG	J		U	0.09	MG/KG	UJ	
CADMIUM		209.2648	MG/KG	NV			215.1987	MG/KG	NV			1.9	MG/KG	J			0.14	MG/KG	J	
CALCIUM		243700.92	MG/KG	NV			197037.19	MG/KG	NV			184000	MG/KG	J			5.3	MG/KG	J	
CHROMIUM		255.4744	MG/KG	NV			271.3934	MG/KG	NV			108	MG/KG	J			0.35	MG/KG	J	
COBALT		209.1133	MG/KG	NV			214.3666	MG/KG	NV			9.6	MG/KG	J		U	0.18	MG/KG	UJ	
COPPER		3357.6056	MG/KG	NV			3555.8594	MG/KG	NV			8680	MG/KG	J		U	0.18	MG/KG	UJ	
IRON		11037.0666	MG/KG	NV			12519.5082	MG/KG	NV			95.0	UG/L	J	Y		1.3	MG/KG	J	
LEAD		253.3333	MG/KG	NV			263.4128	MG/KG	NV			118	MG/KG	J			2.4	MG/KG	J	
MAGNESIUM		36150.0149	MG/KG	NV			38641.6269	MG/KG	NV			34400	MG/KG	J		U	2.2	MG/KG	UJ	
MANGANESE		617.5385	MG/KG	NV			649.3418	MG/KG	NV			599	MG/KG	J		U	0.09	MG/KG	UJ	
MERCURY		1.9672	MG/KG	NV				MG/KG	NV			1.1	MG/KG	J		U	0.05	MG/KG	UJ	

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1992 RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		05					05					05					06-01			
Sample ID:		100222					100223					100224					100225D			
Sample Date:		04/29/92					04/29/92					04/29/92					05/04/92			
QA Type:		QA-RB					QA-WB					QA-WB					QA			
Pit:		5					5					5					6			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
AMMONIA, AS NITROGEN																				
BROMIDE																				
CHLORIDE																				
CYANIDE																				
NITRATE/NITRITE																				
OIL & GREASE																				
SILICON																				
SPECIFIC GRAVITY																				
SULFATE																				
TOTAL KJELDAHL NITROGEN																				
TOTAL ORGANIC CARBON																				
TOTAL ORGANIC NITROGEN																				
TOTAL PHOSPHORUS																				
pH																				
ALUMINUM	U	4.4	MG/KG	UJ		U	5.3	MG/KG	UJ		U	5.2	MG/KG	UJ			22921.2374	MG/KG	NV	
ANTIMONY	U	1.0	MG/KG	UJ		U	1.0	MG/KG	UJ		U	1.0	MG/KG	UJ		U	6.9444	MG/KG	NV	
ARSENIC	U	1.1	MG/KG	UJ		U	1.1	MG/KG	UJ		U	1.1	MG/KG	UJ			60.7828	MG/KG	NV	
BARIUM	U	0.09	MG/KG	UJ			1.3	MG/KG	J			0.20	MG/KG	J			78.2260	MG/KG	NV	
BERYLLIUM	U	0.09	MG/KG	UJ		U	0.09	MG/KG	UJ		U	0.09	MG/KG	UJ			1.5088	MG/KG	NV	
CADMIUM	U	0.09	MG/KG	UJ			0.16	MG/KG	J			0.29	MG/KG	J		U	0.6313	MG/KG	NV	
CALCIUM		4.9	MG/KG	J			32.3	MG/KG	J			8.4	MG/KG	J			200983.79	MG/KG	NV	
CHROMIUM	U	0.18	MG/KG	UJ			0.31	MG/KG	J			0.32	MG/KG	J		U	12.6263	MG/KG	NV	
COBALT	U	0.18	MG/KG	UJ		U	0.18	MG/KG	UJ		U	0.18	MG/KG	UJ			3.9457	MG/KG	NV	
COPPER	U	0.18	MG/KG	UJ			0.58	MG/KG	J			0.33	MG/KG	J		U	1.2626	MG/KG	NV	
IRON		1.1	MG/KG	J			3.0	MG/KG	J			2.0	MG/KG	J			17068.1439	MG/KG	NV	
LEAD	U	1.3	MG/KG	UJ			2.1	MG/KG	J			3.1	MG/KG	J			68.6490	MG/KG	NV	
MAGNESIUM	U	2.2	MG/KG	UJ			4.9	MG/KG	J		U	2.2	MG/KG	UJ			25571.1174	MG/KG	NV	
MANGANESE	U	0.09	MG/KG	UJ			0.11	MG/KG	J		U	0.09	MG/KG	UJ			344.9495	MG/KG	NV	
MERCURY	U	0.05	MG/KG	UJ		U	0.05	MG/KG	UJ		U	0.05	MG/KG	UJ				MG/KG	NV	

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RI/FS 1992 Formerly Referred to as WEMCO.

1992 RI/FS - QA/QC Samples
Inorganic Results

	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:		06-01					06-01					06					06			
Sample ID:		100225S					100225SD					100233					100235			
Sample Date:		05/04/92					05/04/92					05/04/92					05/05/92			
QA Type:		QA					QA					QA-TB					QA-RB			
Pit:			6					6					6					6		
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
AMMONIA, AS NITROGEN												48.2	MG/KG	J						
BROMIDE											U	328	MG/KG	UJ						
CHLORIDE												2080	MG/KG	J						
CYANIDE												0.029	MG/L	J						
NITRATE/NITRITE												55.4	MG/KG	J						
OIL & GREASE											U	104	MG/KG	UJ						
SILICON																				
SPECIFIC GRAVITY												1.280	S.U.	NV						
SULFATE											U	656	MG/KG	UJ						
TOTAL KJELDAHL NITROGEN												1030	MG/KG	J						
TOTAL ORGANIC CARBON												19900	MG/KG	J						
TOTAL ORGANIC NITROGEN												982	MG/KG	J						
TOTAL PHOSPHORUS												3840	MG/KG	J						
pH												13	S.U.	J						
ALUMINUM		16885.8712	MG/KG	NV			12067.2222	MG/KG	NV			22800	MG/KG	J			9.9	MG/KG	J	
ANTIMONY		460.5808	MG/KG	NV			483.2702	MG/KG	NV		U	8.1	MG/KG	UJ		U	1.0	MG/KG	UJ	
ARSENIC		625.8333	MG/KG	NV			570.6061	MG/KG	NV			452	UG/L	J	Y	U	1.1	MG/KG	UJ	
BARIUM		646.3763	MG/KG	NV			603.3902	MG/KG	NV			66.1	MG/KG	J		U	0.09	MG/KG	UJ	
BERYLLIUM		566.7045	MG/KG	NV			552.6199	MG/KG	NV			6.6	UG/L	J	Y	U	0.09	MG/KG	UJ	
CADMIUM		548.7437	MG/KG	NV			534.6717	MG/KG	NV		U	10.0	UG/L	UJ	Y		0.10	MG/KG	J	
CALCIUM		171446.52	MG/KG	NV			128452.41	MG/KG	NV			1350000	UG/L	J	Y		3.3	MG/KG	J	
CHROMIUM		530.2083	MG/KG	NV			539.7664	MG/KG	NV			8.3	MG/KG	J		U	0.18	MG/KG	UJ	
COBALT		535.9533	MG/KG	NV			529.2487	MG/KG	NV			5.4	MG/KG	J		U	0.18	MG/KG	UJ	
COPPER		571.1364	MG/KG	NV			565.2399	MG/KG	NV			7.0	MG/KG	J		U	0.18	MG/KG	UJ	
IRON		13889.2487	MG/KG	NV			13972.0328	MG/KG	NV			224	UG/L	J	Y		5.7	MG/KG	J	
LEAD		614.8801	MG/KG	NV			556.5404	MG/KG	NV			498	UG/L	J	Y	U	1.3	MG/KG	UJ	
MAGNESIUM		20651.3258	MG/KG	NV			14953.8510	MG/KG	NV			18200	MG/KG	J			6.0	MG/KG	J	
MANGANESE		871.7109	MG/KG	NV			816.7740	MG/KG	NV			318	MG/KG	J		U	0.09	MG/KG	UJ	
MERCURY			MG/KG	NV				MG/KG	NV		U	1.34	MG/KG	UJ		U	0.20	MG/KG	UJ	

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1992 RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:	06					06					06					CW=B				
Sample ID:	100236					100238					100239					098532				
Sample Date:	05/05/92					05/05/92					05/05/92					09/01/92				
QA Type:	QA-WB					QA-WB					QA					QA-DUP				
Pit:	6					6					6					CLEARWELL				
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**
AMMONIA, AS NITROGEN																	131	MG/KG	NV	
BROMIDE																U	15.0	MG/KG	UJ	
CHLORIDE																U	297	MG/KG	UJ	
CYANIDE																U	0.37	MG/KG	U	
NITRATE/NITRITE																	14.6	MG/KG	J	
OIL & GREASE																	90.2	MG/KG	J	
SILICON																	6380	UG/L	J	Y
SPECIFIC GRAVITY																	1.56	S.U.	NV	
SULFATE																	520	MG/KG	NV	
TOTAL KJELDAHL NITROGEN																	1030	MG/KG	J	
TOTAL ORGANIC CARBON																	108000	MG/KG	J	
TOTAL ORGANIC NITROGEN																	899	MG/KG	NV	
TOTAL PHOSPHORUS																	276	MG/KG	NV	
pH																	6.80	S.U.	NV	
ALUMINUM		9.6	MG/KG	J			3.6	MG/KG	J			4.4	MG/KG	J			1940	UG/L	J	Y
ANTIMONY	U	1.0	MG/KG	UJ		U	1.0	MG/KG	UJ		U	1.0	MG/KG	UJ			101	UG/L	J	Y
ARSENIC	U	1.1	MG/KG	UJ		U	1.1	MG/KG	UJ			1.6	MG/KG	J			15.1	MG/KG	J	
BARIUM	U	0.09	MG/KG	UJ		U	0.09	MG/KG	UJ		U	0.09	MG/KG	U			744	MG/KG	J	
BERYLLIUM	U	0.09	MG/KG	UJ		U	0.09	MG/KG	UJ		U	0.09	MG/KG	UJ			0.56	MG/KG	J	
CADMIUM	U	0.09	MG/KG	UJ		U	0.09	MG/KG	UJ			0.32	MG/KG	J			7.6	UG/L	J	Y
CALCIUM		17.8	MG/KG	J			5.4	MG/KG	J			4.6	MG/KG	J			1460000	UG/L	J	Y
CHROMIUM	U	0.18	MG/KG	UJ		U	0.18	MG/KG	UJ			0.27	MG/KG	J			36.3	MG/KG	J	
COBALT	U	0.18	MG/KG	UJ		U	0.18	MG/KG	UJ		U	0.18	MG/KG	UJ			7.7	MG/KG	J	
COPPER	U	0.18	MG/KG	UJ		U	0.18	MG/KG	UJ		U	0.18	MG/KG	UJ			39.0	UG/L	J	Y
IRON		3.8	MG/KG	J			1.8	MG/KG	J			1.8	MG/KG	J			2320	UG/L	J	Y
LEAD	U	1.3	MG/KG	UJ		U	1.3	MG/KG	UJ			2.8	MG/KG	J			94.0	MG/KG	J	
MAGNESIUM		4.6	MG/KG	J		U	2.2	MG/KG	UJ		U	2.2	MG/KG	U			50900	UG/L	J	Y
MANGANESE	U	0.09	MG/KG	UJ		U	0.09	MG/KG	UJ		U	0.09	MG/KG	UJ			708	MG/KG	J	
MERCURY	U	0.20	MG/KG	UJ			0.49	MG/KG	J		U	0.05	UG/L	UJ			0.48	MG/KG	J	

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Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:		NA					NS					NA					NA			
Sample ID:		098534					098535					098536					098537			
Sample Date:		09/01/92					09/01/92					09/01/92					09/01/92			
QA Type:		QA-EB					QA-RB					QA-RB					QA-RB			
Pit:		CLEARWELL					CLEARWELL					CLEARWELL					CLEARWELL			
AMMONIA, AS NITROGEN																				
BROMIDE																				
CHLORIDE																				
CYANIDE																				
NITRATE/NITRITE																				
OIL & GREASE																				
SILICON																				
SPECIFIC GRAVITY																				
SULFATE																				
TOTAL KJELDAHL NITROGEN																				
TOTAL ORGANIC CARBON																				
TOTAL ORGANIC NITROGEN																				
TOTAL PHOSPHORUS																				
pH																				
ALUMINUM		1.5	MG/KG	J		U	1.2	MG/KG	U			1.3	MG/KG	J			4.4	MG/KG	J	
ANTIMONY	U	1.2	MG/KG	UJ		U	0.96	MG/KG	UJ			0.96	MG/KG	J		U	0.96	MG/KG	UJ	
ARSENIC	U	1.7	MG/KG	UJ		U	1.6	MG/KG	UJ		U	1.6	MG/KG	UJ		U	1.6	MG/KG	UJ	
BARIUM		0.12	MG/KG	J		U	0.10	MG/KG	UJ			0.10	MG/KG	J			0.17	MG/KG	J	
BERYLLIUM	U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ	
CADMIUM	U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ	
CALCIUM		3.1	MG/KG	J			2.1	MG/KG	J			2.7	MG/KG	J			3.2	MG/KG	J	
CHROMIUM		0.54	MG/KG	J			0.29	MG/KG	J			0.28	MG/KG	J		U	0.19	MG/KG	UJ	
COBALT		0.36	MG/KG	J		U	0.29	MG/KG	UJ			0.29	MG/KG	J			0.43	MG/KG	J	
COPPER		0.32	MG/KG	J		U	0.19	MG/KG	UJ		U	0.19	MG/KG	UJ		U	0.19	MG/KG	UJ	
IRON		22.5	MG/KG	J			4.9	MG/KG	J			2.9	MG/KG	J			2.2	MG/KG	J	
LEAD	U	1.4	MG/KG	UJ		U	1.3	MG/KG	U		U	1.3	MG/KG	UJ		U	1.3	MG/KG	UJ	
MAGNESIUM	U	1.7	MG/KG	UJ		U	1.6	MG/KG	UJ		U	1.6	MG/KG	UJ		U	1.6	MG/KG	UJ	
MANGANESE		0.14	MG/KG	J		U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ	
MERCURY		0.05	MG/KG	J			0.05	MG/KG	J			0.05	MG/KG	J			0.06	MG/KG	J	

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1992 RI/FS - QA/QC Samples
Inorganic Results

	Group 1	Group 2	Group 3	Group 4
Well/Boring:	05-08	05-08	05-04	05
Sample ID:	100218S	100218SD	100219	100221
Sample Date:	04/29/92	04/29/92	04/28/92	04/29/92
QA Type:	QA	QA	QA	QA-EB
Pit:	5	5	5	5

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
MOLYBDENUM			MG/KG	NV			248.7506	MG/KG	NV			247	MG/KG	J		U	0.36	MG/KG	U	
NICKEL		290.0397	MG/KG	NV			314.1431	MG/KG	NV			446	UG/L	J	Y	U	0.45	MG/KG	U	
POTASSIUM		2968.1148	MG/KG	NV			2939.6846	MG/KG	NV			16700	UG/L	J	Y	U	34.5	MG/KG	U	
SELENIUM		203.3259	MG/KG	NV			208.7208	MG/KG	NV		U	69.0	MG/KG	UJ		U	2.0	MG/KG	UJ	
SILVER		228.4426	MG/KG	NV			231.7462	MG/KG	NV			12.9	MG/KG	J		U	0.27	MG/KG	UJ	
SODIUM		3364.8882	MG/KG	NV			3355.8296	MG/KG	NV			8380	MG/KG	J		U	3.4	MG/KG	U	
THALLIUM		158.1669	MG/KG	NV			152.5534	MG/KG	NV			223	UG/L	J	Y	U	3.7	MG/KG	UJ	
TIN			MG/KG	NV			57.6230	MG/KG	NV			57.6	MG/KG	J		U	1.0	MG/KG	U	
VANADIUM		273.0899	MG/KG	NV			275.9637	MG/KG	NV			400	UG/L	J	Y	U	0.09	MG/KG	U	
ZINC		371.4829	MG/KG	NV			397.4267	MG/KG	NV			386	UG/L	J	Y		0.90	MG/KG	J	

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1992 RI/FS - QA/QC Samples
Inorganic Results

	05					05					05					06-01				
Well/Boring:	05					05					05					06-01				
Sample ID:	100222					100223					100224					1002250				
Sample Date:	04/29/92					04/29/92					04/29/92					05/04/92				
QA Type:	QA-RB					QA-WB					QA-WB					QA				
Pit:	5					5					5					6				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
MOLYBDENUM		0.43	MG/KG	J		U	0.36	MG/KG	UJ		U	0.36	MG/KG	UJ		U	2.5253	MG/KG	NV	
NICKEL	U	0.45	MG/KG	UJ		U	0.45	MG/KG	UJ		U	0.45	MG/KG	U			22.7715	MG/KG	NV	
POTASSIUM	U	34.5	MG/KG	UJ		U	34.5	MG/KG	UJ		U	34.5	MG/KG	UJ			5460.6818	MG/KG	NV	
SELENIUM	U	2.0	MG/KG	UJ		U	2.0	MG/KG	UJ		U	2.0	MG/KG	UJ		U	138.8889	MG/KG	NV	
SILVER	U	0.27	MG/KG	UJ		U	0.27	MG/KG	UJ		U	0.27	MG/KG	UJ			3.5101	MG/KG	NV	
SODIUM	U	3.9	MG/KG	UJ		U	4.6	MG/KG	UJ		U	3.8	MG/KG	UJ		-	390.9533	MG/KG	NV	
THALLIUM		5.8	MG/KG	J		U	3.7	MG/KG	UJ			4.2	MG/KG	J			40.9343	MG/KG	NV	
TIN	U	1.0	MG/KG	UJ		U	1.0	MG/KG	UJ		U	1.0	MG/KG	U			7.9545	MG/KG	NV	
VANADIUM	U	0.09	MG/KG	UJ		U	0.09	MG/KG	UJ		U	0.09	MG/KG	UJ		U	15.7828	MG/KG	NV	
ZINC		1.2	MG/KG	J			1.6	MG/KG	J			1.3	MG/KG	J			78.0997	MG/KG	NV	

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1992 RI/FS - QA/QC Samples
Inorganic Results

	Well/Boring:	06-01					06-01					06					06		
	Sample ID:	100225S					100225SD					100233					100235		
	Sample Date:	05/04/92					05/04/92					05/04/92					05/05/92		
	QA Type:	QA					QA					QA-TB					QA-RB		
	Pit:	6					6					6					6		
Parameters	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ**	**TCLP**	**LQ**	**Result**	**Unit**	**VQ** **TCLP**
MOLYBDENUM			MG/KG	NV			532.3801	MG/KG	NV		U	2.9	MG/KG	UJ		U	0.36	MG/KG	UJ
NICKEL		557.0013	MG/KG	NV			540.2841	MG/KG	NV			70.6	UG/L	J	Y	U	0.45	MG/KG	UJ
POTASSIUM		9278.3523	MG/KG	NV			7307.6452	MG/KG	NV			5750	MG/KG	J		U	34.5	MG/KG	UJ
SELENIUM		556.8813	MG/KG	NV			474.7980	MG/KG	NV		U	2200	UG/L	R	Y	U	2.0	MG/KG	UJ
SILVER		566.8561	MG/KG	NV			536.4394	MG/KG	NV			40.3	UG/L	J	Y	U	0.27	MG/KG	UJ
SODIUM		912.8725	MG/KG	NV			834.9811	MG/KG	NV			79200	UG/L	J	Y		5.3	MG/KG	J
THALLIUM		594.6528	MG/KG	NV			506.9192	MG/KG	NV			619	UG/L	J	Y	U	3.7	MG/KG	UJ
TIN			MG/KG	NV		U	6.9444	MG/KG	NV		U	8.1	MG/KG	UJ		U	1.0	MG/KG	UJ
VANADIUM		539.7096	MG/KG	NV			531.5909	MG/KG	NV		U	7.3	MG/KG	UJ		U	0.09	MG/KG	UJ
ZINC		608.2828	MG/KG	NV			574.3056	MG/KG	NV			779	UG/L	J	Y		0.72	MG/KG	J

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1992 RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:		06					06					06					CW-B			
Sample ID:		100236					100238					100239					098532			
Sample Date:		05/05/92					05/05/92					05/05/92					09/01/92			
QA Type:		QA-WB					QA-WB					QA					QA-DUP			
Pit:			6					6					6					CLEARWELL		
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
MOLYBDENUM	U	0.36	MG/KG	UJ		U	0.36	MG/KG	UJ		U	0.36	MG/KG	UJ			5.5	MG/KG	J	
NICKEL	U	0.45	MG/KG	UJ		U	0.45	MG/KG	UJ		U	0.45	MG/KG	UJ			31.9	MG/KG	J	
POTASSIUM	U	34.5	MG/KG	UJ		U	34.5	MG/KG	UJ		U	34.5	MG/KG	UJ			5270	UG/L	J	Y
SELENIUM	U	2.0	MG/KG	UJ		U	2.0	MG/KG	UJ		U	2.0	MG/KG	UJ		U	125	UG/L	UJ	Y
SILVER	U	0.27	MG/KG	UJ		U	0.27	MG/KG	UJ		U	0.27	MG/KG	UJ			1.3	MG/KG	J	
SODIUM		4.8	MG/KG	J			4.4	MG/KG	J			4.8	MG/KG	J			310	MG/KG	J	
THALLIUM	U	3.7	MG/KG	UJ		U	3.7	MG/KG	UJ		U	3.7	MG/KG	UJ		U	200	UG/L	UJ	Y
TIN	U	1.0	MG/KG	UJ		U	1.0	MG/KG	UJ		U	1.0	MG/KG	UJ			2.0	MG/KG	J	
VANADIUM	U	0.09	MG/KG	UJ		U	0.09	MG/KG	UJ		U	0.09	MG/KG	UJ			70.3	UG/L	J	Y
ZINC		1.1	MG/KG	J			1.4	MG/KG	J			1.2	MG/KG	J			731	UG/L	J	Y

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1992 RI/FS - QA/QC Samples
Inorganic Results

Well/Boring:	NA					NS					NA					NA				
Sample ID:	098534					098535					098536					098537				
Sample Date:	09/01/92					09/01/92					09/01/92					09/01/92				
QA Type:	QA-EB					QA-RB					QA-RB					QA-RB				
Pit:	CLEARWELL					CLEARWELL					CLEARWELL					CLEARWELL				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
MOLYBDENUM	U	0.20	MG/KG	UJ		U	0.19	MG/KG	UJ		U	0.19	MG/KG	UJ		U	0.19	MG/KG	UJ	
NICKEL	U	0.30	MG/KG	UJ		U	0.29	MG/KG	UJ		U	0.29	MG/KG	UJ		U	0.29	MG/KG	UJ	
POTASSIUM		40.5	MG/KG	J		U	27.1	MG/KG	UJ		U	27.1	MG/KG	UJ		U	27.1	MG/KG	UJ	
SELENIUM	U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ	
SILVER	U	0.40	MG/KG	UJ		U	0.38	MG/KG	UJ		U	0.38	MG/KG	UJ		U	0.38	MG/KG	UJ	
SODIUM	U	0.80	MG/KG	UJ		U	0.77	MG/KG	UJ		U	0.77	MG/KG	UJ		U	0.87	MG/KG	UJ	
THALLIUM	U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ		U	0.10	MG/KG	UJ	
TIN	U	0.90	MG/KG	UJ		U	0.87	MG/KG	UJ		U	0.87	MG/KG	UJ		U	0.87	MG/KG	UJ	
VANADIUM	U	0.20	MG/KG	UJ		U	0.19	MG/KG	UJ		U	0.19	MG/KG	UJ		U	0.10	MG/KG	UJ	
ZINC		0.42	MG/KG	J			0.48	MG/KG	J			0.44	MG/KG	J			0.84	MG/KG	J	

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G.3.3 ORGANIC

Well/Boring:		05-04					05					05					05			
Sample ID:		100219					100220					100221					100221RE			
Sample Date:		04/28/92					04/29/92					04/29/92					04/29/92			
QA Type:		QA					QA-TB					QA-EB					QA-EB			
Pit:			5					5					5					5		
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
2,4,5-T	U	85.67	UG/KG	R							U	0.20	UG/L	R						
2,4,5-TP (SILVEX)	U	85.67	UG/KG	R							U	0.20	UG/L	R						
2,4-D	U	430.0	UG/KG	R							U	1.0	UG/L	R						
DINOSEB	U	2900	UG/KG	R							U	26	UG/L	R						
DIMETHOATE	U	570	UG/KG	R							U	5	UG/L	R						
DISULFOTON	U	570	UG/KG	R							U	5	UG/L	R						
FAMPHUR	U	570	UG/KG	R							U	5	UG/L	R						
PARATHION	U	570	UG/KG	R							U	5	UG/L	R						
4,4-DDD	U	11	UG/KG	R							U	0.10	UG/L	R		U	0.10	UG/L	R	
4,4-DDE	U	11	UG/KG	R							U	0.10	UG/L	R		U	0.10	UG/L	R	
4,4-DDT	U	11	UG/KG	R							U	0.10	UG/L	R		U	0.10	UG/L	R	
ALDRIN	U	5.7	UG/KG	R							U	0.051	UG/L	R		U	0.051	UG/L	R	
ALPHA-BHC	U	5.7	UG/KG	R							U	0.051	UG/L	R		U	0.051	UG/L	R	
ALPHA-CHLORDANE	U	5.7	UG/KG	R							U	0.051	UG/L	R		U	0.051	UG/L	R	
AROCLOR 1016	U	140	UG/KG	R							U	1.3	UG/L	R		U	1.3	UG/L	R	
AROCLOR 1221	U	140	UG/KG	R							U	1.3	UG/L	R		U	1.3	UG/L	R	
AROCLOR 1232	U	140	UG/KG	R							U	1.3	UG/L	R		U	1.3	UG/L	R	
AROCLOR 1242	U	140	UG/KG	R							U	1.3	UG/L	R		U	1.3	UG/L	R	
AROCLOR 1248	U	140	UG/KG	R							U	1.3	UG/L	R		U	1.3	UG/L	R	
AROCLOR 1254	U	140	UG/KG	R							U	1.3	UG/L	R		U	1.3	UG/L	R	
AROCLOR 1260	U	140	UG/KG	R							U	1.3	UG/L	R		U	1.3	UG/L	R	
BETA-BHC	U	5.7	UG/KG	R							U	0.051	UG/L	R		U	0.051	UG/L	R	
CHLORDANE	U	110	UG/KG	R							U	1.0	UG/L	R		U	1.0	UG/L	R	
DELTA-BHC	U	5.7	UG/KG	R							U	0.051	UG/L	R		U	0.051	UG/L	R	
DIELDRIN	U	11	UG/KG	R							U	0.10	UG/L	R		U	0.10	UG/L	R	
ENDOSULFAN I	U	5.7	UG/KG	R							U	0.051	UG/L	R		U	0.051	UG/L	R	
ENDOSULFAN II	U	11	UG/KG	R							U	0.10	UG/L	R		U	0.10	UG/L	R	
ENDOSULFAN SULFATE	U	11	UG/KG	R							U	0.10	UG/L	R		U	0.10	UG/L	R	
ENDRIN	U	11	UG/KG	R							U	0.10	UG/L	R		U	0.10	UG/L	R	

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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	05					05					05					05				
Sample ID:	100222					100222RE					100223					100223RE				
Sample Date:	04/29/92					04/29/92					04/29/92					04/29/92				
QA Type:	QA-RB					QA-RB					QA-WB					QA-WB				
Pit:	5					5					5					5				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
2,4,5-T	U	0.21	UG/L	R							U	0.21	UG/L	R						
2,4,5-TP (SILVEX)	U	0.21	UG/L	R							U	0.21	UG/L	R						
2,4-D	U	1.0	UG/L	R							U	1.0	UG/L	R						
DINOSEB	U	26	UG/L	R							U	26	UG/L	R						
DIMETHOATE	U	5	UG/L	R							U	5	UG/L	R						
DISULFOTON	U	5	UG/L	R							U	5	UG/L	R						
FAMPHUR	U	5	UG/L	R							U	5	UG/L	R						
PARATHION	U	5	UG/L	R							U	5	UG/L	R						
4,4-DDD	U	0.11	UG/L	R		U	0.11	UG/L	R		U	0.10	UG/L	R		U	0.11	UG/L	R	
4,4-DDE	U	0.11	UG/L	R		U	0.11	UG/L	R		U	0.10	UG/L	R		U	0.11	UG/L	R	
4,4-DDT	U	0.11	UG/L	R		U	0.11	UG/L	R		U	0.10	UG/L	R		U	0.11	UG/L	R	
ALDRIN	U	0.053	UG/L	R		U	0.053	UG/L	R		U	0.052	UG/L	R		U	0.053	UG/L	R	
ALPHA-BHC	U	0.053	UG/L	R		U	0.053	UG/L	R		U	0.052	UG/L	R		U	0.053	UG/L	R	
ALPHA-CHLORDANE	U	0.053	UG/L	R		U	0.053	UG/L	R		U	0.052	UG/L	R		U	0.053	UG/L	R	
AROCLOR 1016	U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R	
AROCLOR 1221	U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R	
AROCLOR 1232	U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R	
AROCLOR 1242	U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R	
AROCLOR 1248	U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R	
AROCLOR 1254	U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R	
AROCLOR 1260	U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R		U	1.3	UG/L	R	
BETA-BHC	U	0.053	UG/L	R		U	0.053	UG/L	R		U	0.052	UG/L	R		U	0.053	UG/L	R	
CHLORDANE	U	1.1	UG/L	R		U	1.1	UG/L	R		U	1.0	UG/L	R		U	1.1	UG/L	R	
DELTA-BHC	U	0.053	UG/L	R		U	0.053	UG/L	R		U	0.052	UG/L	R		U	0.053	UG/L	R	
DIELDRIN	U	0.11	UG/L	R		U	0.11	UG/L	R		U	0.10	UG/L	R		U	0.11	UG/L	R	
ENDOSULFAN I	U	0.053	UG/L	R		U	0.053	UG/L	R		U	0.052	UG/L	R		U	0.053	UG/L	R	
ENDOSULFAN II	U	0.11	UG/L	R		U	0.11	UG/L	R		U	0.10	UG/L	R		U	0.11	UG/L	R	
ENDOSULFAN SULFATE	U	0.11	UG/L	R		U	0.11	UG/L	R		U	0.10	UG/L	R		U	0.11	UG/L	R	
ENDRIN	U	0.11	UG/L	R		U	0.11	UG/L	R		U	0.10	UG/L	R		U	0.11	UG/L	R	

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RI/FS 1992 Formerly Referred to as WEMCO.

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	05					05					06-05					06				
Sample ID:	100224					100224RE					100229BD					100233				
Sample Date:	04/29/92					04/29/92					05/05/92					05/04/92				
QA Type:	QA-WB					QA-WB					QA					QA-TB				
Pit:	5					5					6					6				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
2,4,5-T	U	0.21	UG/L	R												U	13.31	UG/KG	R	
2,4,5-TP (SILVEX)	U	0.21	UG/L	R												U	13.31	UG/KG	R	
2,4-D	U	1.0	UG/L	R												U	67.0	UG/KG	R	
DINOSEB	U	26	UG/L	R												U	6700	UG/KG	R	
DIMETHOATE	U	5	UG/L	R												U	1300	UG/KG	R	
DISULFOTON	U	5	UG/L	R												U	1300	UG/KG	R	
FAMPHUR	U	5	UG/L	R												U	1300	UG/KG	R	
PARATHION	U	5	UG/L	R												U	1300	UG/KG	R	
4,4-DDD	U	0.11	UG/L	R		U	0.10	UG/L	R							U	27	UG/KG	R	
4,4-DDE	U	0.11	UG/L	R		U	0.10	UG/L	R							U	27	UG/KG	R	
4,4-DDT	U	0.11	UG/L	R		U	0.10	UG/L	R							U	27	UG/KG	R	
ALDRIN	U	0.053	UG/L	R		U	0.052	UG/L	R							U	13	UG/KG	R	
ALPHA-BHC	U	0.053	UG/L	R		U	0.052	UG/L	R							U	13	UG/KG	R	
ALPHA-CHLORDANE	U	0.053	UG/L	R		U	0.052	UG/L	R							U	13	UG/KG	R	
AROCLOR 1016	U	1.3	UG/L	R		U	1.3	UG/L	R							U	340	UG/KG	R	
AROCLOR 1221	U	1.3	UG/L	R		U	1.3	UG/L	R							U	340	UG/KG	R	
AROCLOR 1232	U	1.3	UG/L	R		U	1.3	UG/L	R							U	340	UG/KG	R	
AROCLOR 1242	U	1.3	UG/L	R		U	1.3	UG/L	R							U	340	UG/KG	R	
AROCLOR 1248	U	1.3	UG/L	R		U	1.3	UG/L	R							U	340	UG/KG	R	
AROCLOR 1254	U	1.3	UG/L	R		U	1.3	UG/L	R							U	340	UG/KG	R	
AROCLOR 1260	U	1.3	UG/L	R		U	1.3	UG/L	R							U	340	UG/KG	R	
BETA-BHC	U	0.053	UG/L	R		U	0.052	UG/L	R							U	13	UG/KG	R	
CHLORDANE	U	1.1	UG/L	R		U	1.0	UG/L	R							U	270	UG/KG	R	
DELTA-BHC	U	0.053	UG/L	R		U	0.052	UG/L	R							U	13	UG/KG	R	
DIELDRIN	U	0.11	UG/L	R		U	0.10	UG/L	R							U	27	UG/KG	R	
ENDOSULFAN I	U	0.053	UG/L	R		U	0.052	UG/L	R							U	13	UG/KG	R	
ENDOSULFAN II	U	0.11	UG/L	R		U	0.10	UG/L	R							U	27	UG/KG	R	
ENDOSULFAN SULFATE	U	0.11	UG/L	R		U	0.10	UG/L	R							U	27	UG/KG	R	
ENDRIN	U	0.11	UG/L	R		U	0.10	UG/L	R							U	27	UG/KG	R	

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Submittal Date: 12-OCT-93
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G-3-17

0634

4788

1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:		06					06					06					06			
Sample ID:		100235					100236					100237					100238			
Sample Date:		05/05/92					05/05/92					05/05/92					05/05/92			
QA Type:		QA-RB					QA-WB					QA-WB					QA-WB			
Pit:			6					6					6					6		
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
2,4,5-T	U	0.21	UG/L	R		U	0.21	UG/L	R							U	0.21	UG/L	R	
2,4,5-TP (SILVEX)	U	0.21	UG/L	R		U	0.21	UG/L	R							U	0.21	UG/L	R	
2,4-D	U	1.0	UG/L	R		U	1.0	UG/L	R							U	1.0	UG/L	R	
DINOSEB	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	
DIMETHOATE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
DISULFOTON	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
FAMPHUR	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
PARATHION	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
4,4-DDD	U	0.10	UG/L	R		U	0.10	UG/L	R							U	0.10	UG/L	R	
4,4-DDE		0.10	UG/L	R			0.10	UG/L	R							U	0.10	UG/L	R	
4,4-DDT		0.10	UG/L	R			0.10	UG/L	R							U	0.10	UG/L	R	
ALDRIN		0.051	UG/L	R			0.051	UG/L	R							U	0.052	UG/L	R	
ALPHA-BHC		0.051	UG/L	R			0.051	UG/L	R							U	0.052	UG/L	R	
ALPHA-CHLORDANE	U	0.051	UG/L	R		U	0.051	UG/L	R							U	0.052	UG/L	R	
AROCLOR 1016	U	1.3	UG/L	R		U	1.3	UG/L	R							U	1.3	UG/L	R	
AROCLOR 1221	U	1.3	UG/L	R		U	1.3	UG/L	R							U	1.3	UG/L	R	
AROCLOR 1232	U	1.3	UG/L	R		U	1.3	UG/L	R							U	1.3	UG/L	R	
AROCLOR 1242	U	1.3	UG/L	R		U	1.3	UG/L	R							U	1.3	UG/L	R	
AROCLOR 1248	U	1.3	UG/L	R		U	1.3	UG/L	R							U	1.3	UG/L	R	
AROCLOR 1254	U	1.3	UG/L	R		U	1.3	UG/L	R							U	1.3	UG/L	R	
AROCLOR 1260	U	1.3	UG/L	R		U	1.3	UG/L	R							U	1.3	UG/L	R	
BETA-BHC		0.051	UG/L	R			0.051	UG/L	R							U	0.052	UG/L	R	
CHLORDANE		1.0	UG/L	R			1.0	UG/L	R							U	1.0	UG/L	R	
DELTA-BHC		0.051	UG/L	R			0.051	UG/L	R							U	0.052	UG/L	R	
DIELDRIN	U	0.10	UG/L	R		U	0.10	UG/L	R							U	0.10	UG/L	R	
ENDOSULFAN I		0.051	UG/L	R			0.051	UG/L	R							U	0.052	UG/L	R	
ENDOSULFAN II		0.10	UG/L	R			0.10	UG/L	R							U	0.10	UG/L	R	
ENDOSULFAN SULFATE		0.10	UG/L	R			0.10	UG/L	R							U	0.10	UG/L	R	
ENDRIN		0.10	UG/L	R			0.10	UG/L	R							U	0.10	UG/L	R	

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Submittal Date: 12-OCT-93
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0635

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Well/Boring:		06					CW-B					NA					NA			
Sample ID:		100239					098532					098533					098534			
Sample Date:		05/05/92					09/01/92					09/01/92					09/01/92			
QA Type:		QA					QA-DUP					QA-TB					QA-EB			
Pit:		6					CLEARWELL					CLEARWELL					CLEARWELL			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
2,4,5-T	U	0.21	UG/L	R		U	2.98	UG/KG	R							U	0.21	UG/L	R	
2,4,5-TP (SILVEX)	U	0.21	UG/L	R		U	2.98	UG/KG	R							U	0.21	UG/L	R	
2,4-D	U	1.0	UG/L	R		U	15.0	UG/KG	R							U	1.0	UG/L	R	
DINOSEB	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
DIMETHOATE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
DISULFOTON	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
FAMPHUR	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
PARATHION	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
4,4-DDD	U	0.10	UG/L	R		U	4.72	UG/KG	R							U	0.104	UG/L	R	
4,4-DDE		0.10	UG/L	R		U	4.72	UG/KG	R							U	0.104	UG/L	R	
4,4-DDT		0.10	UG/L	R		U	4.72	UG/KG	R							U	0.104	UG/L	R	
ALDRIN		0.052	UG/L	R		U	2.36	UG/KG	R							U	0.0521	UG/L	R	
ALPHA-BHC		0.052	UG/L	R		U	2.36	UG/KG	R							U	0.0521	UG/L	R	
ALPHA-CHLORDANE	U	0.052	UG/L	R		U	2.36	UG/KG	R							U	0.0521	UG/L	R	
AROCLOR 1016	U	1.3	UG/L	R		U	59.1	UG/KG	R							U	1.30	UG/L	R	
AROCLOR 1221	U	1.3	UG/L	R		U	59.1	UG/KG	R							U	1.30	UG/L	R	
AROCLOR 1232	U	1.3	UG/L	R		U	59.1	UG/KG	R							U	1.30	UG/L	R	
AROCLOR 1242	U	1.3	UG/L	R		U	59.1	UG/KG	R							U	1.30	UG/L	R	
AROCLOR 1248	U	1.3	UG/L	R		U	59.1	UG/KG	R							U	1.30	UG/L	R	
AROCLOR 1254	U	1.3	UG/L	R			190	UG/KG	R							U	1.30	UG/L	R	
AROCLOR 1260	U	1.3	UG/L	R		U	59.1	UG/KG	R							U	1.30	UG/L	R	
BETA-BHC		0.052	UG/L	R		U	2.36	UG/KG	R							U	0.0521	UG/L	R	
CHLORDANE		1.0	UG/L	R		U	47.2	UG/KG	R							U	1.04	UG/L	R	
DELTA-BHC		0.052	UG/L	R		U	2.36	UG/KG	R							U	0.0521	UG/L	R	
DIELDRIN	U	0.10	UG/L	R		U	4.72	UG/KG	R							U	0.104	UG/L	R	
ENDOSULFAN I		0.052	UG/L	R		U	2.36	UG/KG	R							U	0.0521	UG/L	R	
ENDOSULFAN II		0.10	UG/L	R		U	4.72	UG/KG	R							U	0.104	UG/L	R	
ENDOSULFAN SULFATE		0.10	UG/L	R		U	4.72	UG/KG	R							U	0.104	UG/L	R	
ENDRIN		0.10	UG/L	R		U	4.72	UG/KG	R							U	0.104	UG/L	R	

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1992 RI/FS - QA/QC Samples
Organic Results

	NS					NA					NA				
Well/Boring:	NS					NA					NA				
Sample ID:	098535					098536					098537				
Sample Date:	09/01/92					09/01/92					09/01/92				
QA Type:	QA-RB					QA-RB					QA-RB				
Pit:	CLEARWELL					CLEARWELL					CLEARWELL				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
2,4,5-T	U	0.21	UG/L	R		U	0.21	UG/L	R		U	0.21	UG/L	R	
2,4,5-TP (SILVEX)	U	0.21	UG/L	R		U	0.21	UG/L	R		U	0.21	UG/L	R	
2,4-D	U	1.0	UG/L	R		U	1.0	UG/L	R		U	1.0	UG/L	R	
DINOSEB	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
DIMETHOATE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
DISULFOTON	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
FAMPHUR	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
PARATHION	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
4,4-DDD	U	0.104	UG/L	R		U	0.104	UG/L	R		U	0.104	UG/L	R	
4,4-DDE	U	0.104	UG/L	R		U	0.104	UG/L	R		U	0.104	UG/L	R	
4,4-DDT	U	0.104	UG/L	R		U	0.104	UG/L	R		U	0.104	UG/L	R	
ALDRIN	U	0.0521	UG/L	R		U	0.0521	UG/L	R		U	0.0521	UG/L	R	
ALPHA-BHC	U	0.0521	UG/L	R		U	0.0521	UG/L	R		U	0.0521	UG/L	R	
ALPHA-CHLORDANE	U	0.0521	UG/L	R		U	0.0521	UG/L	R		U	0.0521	UG/L	R	
AROCLOR 1016	U	1.30	UG/L	R		U	1.30	UG/L	R		U	1.30	UG/L	R	
AROCLOR 1221	U	1.30	UG/L	R		U	1.30	UG/L	R		U	1.30	UG/L	R	
AROCLOR 1232	U	1.30	UG/L	R		U	1.30	UG/L	R		U	1.30	UG/L	R	
AROCLOR 1242	U	1.30	UG/L	R		U	1.30	UG/L	R		U	1.30	UG/L	R	
AROCLOR 1248	U	1.30	UG/L	R		U	1.30	UG/L	R		U	1.30	UG/L	R	
AROCLOR 1254	U	1.30	UG/L	R		U	1.30	UG/L	R		U	1.30	UG/L	R	
AROCLOR 1260	U	1.30	UG/L	R		U	1.30	UG/L	R		U	1.30	UG/L	R	
BETA-BHC	U	0.0521	UG/L	R		U	0.0521	UG/L	R		U	0.0521	UG/L	R	
CHLORDANE	U	1.04	UG/L	R		U	1.04	UG/L	R		U	1.04	UG/L	R	
DELTA-BHC	U	0.0521	UG/L	R		U	0.0521	UG/L	R		U	0.0521	UG/L	R	
DIELDRIN	U	0.104	UG/L	R		U	0.104	UG/L	R		U	0.104	UG/L	R	
ENDOSULFAN I	U	0.0521	UG/L	R		U	0.0521	UG/L	R		U	0.0521	UG/L	R	
ENDOSULFAN II	U	0.104	UG/L	R		U	0.104	UG/L	R		U	0.104	UG/L	R	
ENDOSULFAN SULFATE	U	0.104	UG/L	R		U	0.104	UG/L	R		U	0.104	UG/L	R	
ENDRIN	U	0.104	UG/L	R		U	0.104	UG/L	R		U	0.104	UG/L	R	

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FEMP-O1RI-4 DRAFT
October 12, 1993

1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:		05-04					05					05					05			
Sample ID:		100219					100220					100221					100221RE			
Sample Date:		04/28/92					04/29/92					04/29/92					04/29/92			
QA Type:		QA					QA-TB					QA-EB					QA-EB			
Pit:		5					5					5					5			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
ENDRIN ALDEHYDE	U	11	UG/KG	R							U	0.10	UG/L	R		U	0.10	UG/L	R	
ENDRIN KETONE	U	11	UG/KG	R							U	0.10	UG/L	R		U	0.10	UG/L	R	
GAMMA-BHC(Lindane)	U	5.7	UG/KG	R							U	0.051	UG/L	R		U	0.051	UG/L	R	
GAMMA-CHLORDANE	U	5.7	UG/KG	R							U	0.051	UG/L	R		U	0.051	UG/L	R	
HEPTACHLOR	U	5.7	UG/KG	R							U	0.051	UG/L	R		U	0.051	UG/L	R	
HEPTACHLOR EPOXIDE	U	5.7	UG/KG	R							U	0.051	UG/L	R		U	0.051	UG/L	R	
METHOXYCHLOR	U	57	UG/KG	R							U	0.51	UG/L	R		U	0.51	UG/L	R	
TOXAPHENE	U	570	UG/KG	R							U	5.1	UG/L	R		U	5.1	UG/L	R	
1,2,4,5-TETRACHLOROBENZENE	U	2900	UG/KG	R							U	26	UG/L	R						
1,2,4-TRICHLOROBENZENE	U	570	UG/KG	R							U	5	UG/L	R						
1,2-DICHLOROBENZENE	U	570	UG/KG	R							U	5	UG/L	R						
1,3,5-TRINITROBENZENE	U	570	UG/KG	R							U	5	UG/L	R						
1,3-DICHLOROBENZENE	U	570	UG/KG	R							U	5	UG/L	R						
1,3-DINITROBENZENE	U	570	UG/KG	R							U	5	UG/L	R						
1,4-DICHLOROBENZENE	U	570	UG/KG	R							U	5	UG/L	R						
1,4-NAPHTHOQUINONE	U	570	UG/KG	R							U	5	UG/L	R						
1-NAPHTHYLAMINE	U	2900	UG/KG	R							U	26	UG/L	R						
2,3,4,6-TETRACHLOROPHENOL	U	570	UG/KG	R							U	5	UG/L	R						
2,4,5-TRICHLOROPHENOL	U	51	UG/L	R	Y						U	26	UG/L	R						
2,4,6-TRICHLOROPHENOL	U	570	UG/KG	R							U	5	UG/L	R						
2,4-DICHLOROPHENOL	U	570	UG/KG	R							U	5	UG/L	R						
2,4-DIMETHYLPHENOL		300	UG/KG	R							U	5	UG/L	R						
2,4-DINITROPHENOL	U	51	UG/L	R	Y						U	26	UG/L	R						
2,4-DINITROTOLUENE	U	570	UG/KG	R							U	5	UG/L	R						
2,6-DICHLOROPHENOL	U	570	UG/KG	R							U	5	UG/L	R						
2,6-DINITROTOLUENE	U	570	UG/KG	R							U	5	UG/L	R						
2-ACETYLAMINOFLUORENE	U	1100	UG/KG	R							U	10	UG/L	R						
2-CHLORONAPHTHALENE	U	570	UG/KG	R							U	5	UG/L	R						
2-CHLOROPHENOL	U	570	UG/KG	R							U	5	UG/L	R						

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RI/FS 1992 Formerly Referred to as WEMCO.

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:		05					05					05					05			
Sample ID:		100222					100222RE					100223					100223RE			
Sample Date:		04/29/92					04/29/92					04/29/92					04/29/92			
QA Type:		QA-RB					QA-RB					QA-WB					QA-WB			
Pit:		5					5					5					5			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
ENDRIN ALDEHYDE	U	0.11	UG/L	R		U	0.11	UG/L	R		U	0.10	UG/L	R		U	0.11	UG/L	R	
ENDRIN KETONE	U	0.38	UG/L	R		U	0.11	UG/L	R		U	0.18	UG/L	R		U	0.11	UG/L	R	
GAMMA-BHC(Lindane)	U	0.053	UG/L	R		U	0.053	UG/L	R		U	0.052	UG/L	R		U	0.053	UG/L	R	
GAMMA-CHLORDANE	U	0.053	UG/L	R		U	0.053	UG/L	R		U	0.052	UG/L	R		U	0.053	UG/L	R	
HEPTACHLOR	U	0.053	UG/L	R		U	0.053	UG/L	R		U	0.052	UG/L	R		U	0.053	UG/L	R	
HEPTACHLOR EPOXIDE	U	0.053	UG/L	R		U	0.053	UG/L	R		U	0.052	UG/L	R		U	0.053	UG/L	R	
METHOXYCHLOR	U	0.53	UG/L	R		U	0.53	UG/L	R		U	0.52	UG/L	R		U	0.53	UG/L	R	
TOXAPHENE	U	5.3	UG/L	R		U	5.3	UG/L	R		U	5.2	UG/L	R		U	5.3	UG/L	R	
1,2,4,5-TETRACHLOROBENZENE	U	26	UG/L	R							U	26	UG/L	R						
1,2,4-TRICHLOROBENZENE	U	5	UG/L	R							U	5	UG/L	R						
1,2-DICHLOROBENZENE	U	5	UG/L	R							U	5	UG/L	R						
1,3,5-TRINITROBENZENE	U	5	UG/L	R							U	5	UG/L	R						
1,3-DICHLOROBENZENE	U	5	UG/L	R							U	5	UG/L	R						
1,3-DINITROBENZENE	U	5	UG/L	R							U	5	UG/L	R						
1,4-DICHLOROBENZENE	U	5	UG/L	R							U	5	UG/L	R						
1,4-NAPHTHOQUINONE	U	5	UG/L	R							U	5	UG/L	R						
1-NAPHTHYLAMINE	U	26	UG/L	R							U	26	UG/L	R						
2,3,4,6-TETRACHLOROPHENOL	U	5	UG/L	R							U	5	UG/L	R						
2,4,5-TRICHLOROPHENOL	U	26	UG/L	R							U	26	UG/L	R						
2,4,6-TRICHLOROPHENOL	U	5	UG/L	R							U	5	UG/L	R						
2,4-DICHLOROPHENOL	U	5	UG/L	R							U	5	UG/L	R						
2,4-DIMETHYLPHENOL	U	5	UG/L	R							U	5	UG/L	R						
2,4-DINITROPHENOL	U	26	UG/L	R							U	26	UG/L	R						
2,4-DINITROTOLUENE	U	5	UG/L	R							U	5	UG/L	R						
2,6-DICHLOROPHENOL	U	5	UG/L	R							U	5	UG/L	R						
2,6-DINITROTOLUENE	U	5	UG/L	R							U	5	UG/L	R						
2-ACETYLAMINOFLUORENE	U	10	UG/L	R							U	10	UG/L	R						
2-CHLORONAPHTHALENE	U	5	UG/L	R							U	5	UG/L	R						
2-CHLOROPHENOL	U	5	UG/L	R							U	5	UG/L	R						

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Submittal Date: 12-OCT-93
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Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:		05					05					06-05					06			
Sample ID:		100224					100224RE					100229BD					100233			
Sample Date:		04/29/92					04/29/92					05/05/92					05/04/92			
QA Type:		QA-WB					QA-WB					QA					QA-TB			
Pit:			5					5					6					6		
ENDRIN ALDEHYDE	U	0.11	UG/L	R		U	0.10	UG/L	R							U	27	UG/KG	R	
ENDRIN KETONE	U	0.11	UG/L	R		U	0.10	UG/L	R							U	27	UG/KG	R	
GAMMA-BHC(Lindane)	U	0.053	UG/L	R		U	0.052	UG/L	R							U	13	UG/KG	R	
GAMMA-CHLORDANE	U	0.053	UG/L	R		U	0.052	UG/L	R							U	13	UG/KG	R	
HEPTACHLOR	U	0.053	UG/L	R		U	0.052	UG/L	R							U	13	UG/KG	R	
HEPTACHLOR EPOXIDE	U	0.053	UG/L	R		U	0.052	UG/L	R							U	13	UG/KG	R	
METHOXYCHLOR	U	0.53	UG/L	R		U	0.52	UG/L	R							U	130	UG/KG	R	
TOXAPHENE	U	5.3	UG/L	R		U	5.2	UG/L	R							U	4.4	UG/L	R	Y
1,2,4,5-TETRACHLOROBENZENE	U	26	UG/L	R												U	6700	UG/KG	R	
1,2,4-TRICHLOROBENZENE	U	5	UG/L	R												U	9	UG/L	R	Y
1,2-DICHLOROBENZENE	U	5	UG/L	R												U	9	UG/L	R	Y
1,3,5-TRINITROBENZENE	U	5	UG/L	R												U	1300	UG/KG	R	
1,3-DICHLOROBENZENE	U	5	UG/L	R												U	9	UG/L	R	Y
1,3-DINITROBENZENE	U	5	UG/L	R												U	1300	UG/KG	R	
1,4-DICHLOROBENZENE	U	5	UG/L	R												U	9	UG/L	R	Y
1,4-NAPHTHOQUINONE	U	5	UG/L	R												U	1300	UG/KG	R	
1-NAPHTHYLAMINE	U	26	UG/L	R												U	6700	UG/KG	R	
2,3,4,6-TETRACHLOROPHENOL	U	5	UG/L	R												U	1300	UG/KG	R	
2,4,5-TRICHLOROPHENOL	U	26	UG/L	R												U	6700	UG/KG	R	
2,4,6-TRICHLOROPHENOL	U	5	UG/L	R												U	9	UG/L	R	Y
2,4-DICHLOROPHENOL	U	5	UG/L	R												U	9	UG/L	R	Y
2,4-DIMETHYLPHENOL	U	5	UG/L	R												U	9	UG/L	R	Y
2,4-DINITROPHENOL	U	26	UG/L	R												U	6700	UG/KG	R	
2,4-DINITROTOLUENE	U	5	UG/L	R												U	9	UG/L	R	Y
2,6-DICHLOROPHENOL	U	5	UG/L	R												U	1300	UG/KG	R	
2,6-DINITROTOLUENE	U	5	UG/L	R												U	9	UG/L	R	Y
2-ACETYLAMINOFLUORENE	U	11	UG/L	R												U	2700	UG/KG	R	
2-CHLORONAPHTHALENE	U	5	UG/L	R												U	9	UG/L	R	Y
2-CHLOROPHENOL	U	5	UG/L	R												U	9	UG/L	R	Y

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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:		06					06					06					06			
Sample ID:		100235					100236					100237					100238			
Sample Date:		05/05/92					05/05/92					05/05/92					05/05/92			
QA Type:		QA-RB					QA-WB					QA-WB					QA-WB			
Pit:			6					6					6					6		
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
ENDRIN ALDEHYDE	U	0.10	UG/L	R		U	0.10	UG/L	R							U	0.10	UG/L	R	
ENDRIN KETONE	U	0.10	UG/L	R		U	0.10	UG/L	R							U	0.10	UG/L	R	
GAMMA-BHC(Lindane)		0.051	UG/L	R			0.051	UG/L	R							U	0.052	UG/L	R	
GAMMA-CHLORDANE	U	0.051	UG/L	R		U	0.051	UG/L	R							U	0.052	UG/L	R	
HEPTACHLOR		0.051	UG/L	R			0.051	UG/L	R							U	0.052	UG/L	R	
HEPTACHLOR EPOXIDE		0.051	UG/L	R			0.051	UG/L	R							U	0.052	UG/L	R	
METHOXYCHLOR							0.51	UG/L	R							U	0.52	UG/L	R	
TOXAPHENE		5.1	UG/L	R			5.1	UG/L	R							U	5.2	UG/L	R	
1,2,4,5-TETRACHLOROBENZENE	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	
1,2,4-TRICHLOROBENZENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
1,2-DICHLOROBENZENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
1,3,5-TRINITROBENZENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
1,3-DICHLOROBENZENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
1,3-DINITROBENZENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
1,4-DICHLOROBENZENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
1,4-NAPHTHOQUINONE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
1-NAPHTHYLAMINE	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	
2,3,4,6-TETRACHLOROPHENOL	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
2,4,5-TRICHLOROPHENOL	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	
2,4,6-TRICHLOROPHENOL	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
2,4-DICHLOROPHENOL	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
2,4-DIMETHYLPHENOL	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
2,4-DINITROPHENOL	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	
2,4-DINITROTOLUENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
2,6-DICHLOROPHENOL	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
2,6-DINITROTOLUENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
2-ACETYLAMINOFLUORENE	U	10	UG/L	R		U	11	UG/L	R							U	10	UG/L	R	
2-CHLORONAPHTHALENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
2-CHLOROPHENOL	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	

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FEMP OU1RI - USEPA

1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	06	CW-B	NA	NA
Sample ID:	100239	098532	098533	098534
Sample Date:	05/05/92	09/01/92	09/01/92	09/01/92
QA Type:	QA	QA-DUP	QA-TB	QA-EB
Pit:	6	CLEARWELL	CLEARWELL	CLEARWELL

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
ENDRIN ALDEHYDE	U	0.10	UG/L	R		U	4.72	UG/KG	R							U	0.104	UG/L	R	
ENDRIN KETONE	U	0.10	UG/L	R		U	4.72	UG/KG	R							U	0.104	UG/L	R	
GAMMA-BHC(Lindane)		0.052	UG/L	R		U	2.36	UG/KG	R							U	0.0521	UG/L	R	
GAMMA-CHLORDANE	U	0.052	UG/L	R		U	2.36	UG/KG	R							U	0.0521	UG/L	R	
HEPTACHLOR		0.052	UG/L	R		U	2.36	UG/KG	R							U	0.0521	UG/L	R	
HEPTACHLOR EPOXIDE		0.052	UG/L	R		U	2.36	UG/KG	R							U	0.0521	UG/L	R	
METHOXYCHLOR		0.52	UG/L	R		U	23.6	UG/KG	R							U	0.521	UG/L	R	
TOXAPHENE		5.2	UG/L	R		U	5.09	UG/L	R	Y						U	5.21	UG/L	R	
1,2,4,5-TETRACHLOROBENZENE	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
1,2,4-TRICHLOROBENZENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
1,2-DICHLOROBENZENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
1,3,5-TRINITROBENZENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
1,3-DICHLOROBENZENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
1,3-DINITROBENZENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
1,4-DICHLOROBENZENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
1,4-NAPHTHOQUINONE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
1-NAPHTHYLAMINE	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
2,3,4,6-TETRACHLOROPHENOL	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
2,4,5-TRICHLOROPHENOL	U	27	UG/L	R		U	59	UG/L	R	Y						U	52	UG/L	R	
2,4,6-TRICHLOROPHENOL	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
2,4-DICHLOROPHENOL	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
2,4-DIMETHYLPHENOL	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
2,4-DINITROPHENOL	U	27	UG/L	R		U	59	UG/L	R	Y						U	52	UG/L	R	
2,4-DINITROTOLUENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
2,6-DICHLOROPHENOL	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
2,6-DINITROTOLUENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
2-ACETYLAMINOFLUORENE	U	11	UG/L	R		U	930	UG/KG	R							U	21	UG/L	R	
2-CHLORONAPHTHALENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
2-CHLOROPHENOL	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	

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G-3-25

Submittal Date: 12-OCT-93
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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	NS					NA					NA				
Sample ID:	098535					098536					098537				
Sample Date:	09/01/92					09/01/92					09/01/92				
QA Type:	QA-RB					QA-RB					QA-RB				
Pit:	CLEARWELL					CLEARWELL					CLEARWELL				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
ENDRIN ALDEHYDE	U	0.104	UG/L	R		U	0.104	UG/L	R		U	0.104	UG/L	R	
ENDRIN KETONE	U	0.104	UG/L	R		U	0.104	UG/L	R		U	0.104	UG/L	R	
GAMMA-BHC(Lindane)	U	0.0521	UG/L	R		U	0.0521	UG/L	R		U	0.0521	UG/L	R	
GAMMA-CHLORDANE	U	0.0521	UG/L	R		U	0.0521	UG/L	R		U	0.0521	UG/L	R	
HEPTACHLOR	U	0.0521	UG/L	R		U	0.0521	UG/L	R		U	0.0521	UG/L	R	
HEPTACHLOR EPOXIDE	U	0.0521	UG/L	R		U	0.0521	UG/L	R		U	0.0521	UG/L	R	
METHOXYCHLOR	U	0.521	UG/L	R		U	0.521	UG/L	R		U	0.521	UG/L	R	
TOXAPHENE	U	5.21	UG/L	R		U	5.21	UG/L	R		U	5.21	UG/L	R	
1,2,4,5-TETRACHLOROBENZENE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
1,2,4-TRICHLOROBENZENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
1,2-DICHLOROBENZENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
1,3,5-TRINITROBENZENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
1,3-DICHLOROBENZENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
1,3-DINITROBENZENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
1,4-DICHLOROBENZENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
1,4-NAPHTHOQUINONE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
1-NAPHTHYLAMINE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
2,3,4,6-TETRACHLOROPHENOL	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
2,4,5-TRICHLOROPHENOL	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
2,4,6-TRICHLOROPHENOL	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
2,4-DICHLOROPHENOL	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
2,4-DIMETHYLPHENOL	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
2,4-DINITROPHENOL	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
2,4-DINITROTOLUENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
2,6-DICHLOROPHENOL	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
2,6-DINITROTOLUENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
2-ACETYLAMINOFLUORENE	U	21	UG/L	R		U	21	UG/L	R		U	21	UG/L	R	
2-CHLORONAPHTHALENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
2-CHLOROPHENOL	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	

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RI/FS 1992 Formerly Referred to as WEMCO.

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	05-04					05					05					05				
Sample ID:	100219					100220					100221					100221RE				
Sample Date:	04/28/92					04/29/92					04/29/92					04/29/92				
QA Type:	QA					QA-TB					QA-EB					QA-EB				
Pit:	5					5					5					5				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
2-METHYLNAPHTHALENE	U	570	UG/KG	R							U	5	UG/L	R						
2-METHYLPHENOL	U	570	UG/KG	R							U	5	UG/L	R						
2-NAPHTHYLAMINE	U	570	UG/KG	R							U	5	UG/L	R						
2-NITROANILINE	U	51	UG/L	R	Y						U	26	UG/L	R						
2-NITROPHENOL	U	570	UG/KG	R							U	5	UG/L	R						
2-PICOLINE	U	2900	UG/KG	R							U	26	UG/L	R						
3,3-DICHLOROBENZIDINE	U	570	UG/KG	R							U	5	UG/L	R						
3-METHYLCHOLANTHRENE	U	2900	UG/KG	R							U	26	UG/L	R						
3-METHYLPHENOL	U	570	UG/KG	R							U	5	UG/L	R						
3-NITROANILINE	U	51	UG/L	R	Y						U	26	UG/L	R						
4,6-DINITRO-2-METHYLPHENOL	U	51	UG/L	R	Y						U	26	UG/L	R						
4-AMINOBIPHENYL	U	570	UG/KG	R							U	5	UG/L	R						
4-BROMOPHENYL PHENYL ETHER	U	570	UG/KG	R							U	5	UG/L	R						
4-CHLORO-3-METHYLPHENOL	U	20	UG/L	R	Y						U	10	UG/L	R						
4-CHLOROANILINE	U	20	UG/L	R	Y						U	10	UG/L	R						
4-CHLOROPHENOL PHENYL ETHER	U	570	UG/KG	R							U	5	UG/L	R						
4-METHYLPHENOL	U	570	UG/KG	R							U	5	UG/L	R						
4-NITROANILINE	U	51	UG/L	R	Y						U	26	UG/L	R						
4-NITROPHENOL	U	51	UG/L	R	Y						U	26	UG/L	R						
4-NITROQUINOLINE 1-OXIDE	U	570	UG/KG	R							U	5	UG/L	R						
5-NITRO-O-TOLUIDINE	U	2900	UG/KG	R							U	26	UG/L	R						
7,12-DIMETHYLBENZ(A)ANTHRACENE	U	2900	UG/KG	R							U	26	UG/L	R						
A,A-DIMETHYLPHENETHYLAMINE	U	570	UG/KG	R							U	5	UG/L	R						
ACENAPHTHENE																				
ACENAPHTHYLENE	U	570	UG/KG	R							U	5	UG/L	R						
ACETOPHENONE	U	570	UG/KG	R							U	5	UG/L	R						
ANILINE	U	570	UG/KG	R							U	5	UG/L	R						
ANTHRACENE	U	570	UG/KG	R							U	5	UG/L	R						
BENZO(A)ANTHRACENE	U	570	UG/KG	R							U	5	UG/L	R						

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Submittal Date: 12-OCT-93
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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	05	05	05	05
Sample ID:	100222	100222RE	100223	100223RE
Sample Date:	04/29/92	04/29/92	04/29/92	04/29/92
QA Type:	QA-RB	QA-RB	QA-WB	QA-WB
Pit:	5	5	5	5

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
2-METHYLNAPHTHALENE	U	5	UG/L	R							U	5	UG/L	R						
2-METHYLPHENOL	U	5	UG/L	R							U	5	UG/L	R						
2-NAPHTHYLAMINE	U	5	UG/L	R							U	5	UG/L	R						
2-NITROANILINE	U	26	UG/L	R							U	26	UG/L	R						
2-NITROPHENOL	U	5	UG/L	R							U	5	UG/L	R						
2-PICOLINE	U	26	UG/L	R							U	26	UG/L	R						
3,3-DICHLOROBENZIDINE	U	5	UG/L	R							U	5	UG/L	R						
3-METHYLCHOLANTHRENE	U	26	UG/L	R							U	26	UG/L	R						
3-METHYLPHENOL	U	5	UG/L	R							U	5	UG/L	R						
3-NITROANILINE	U	26	UG/L	R							U	26	UG/L	R						
4,6-DINITRO-2-METHYLPHENOL	U	26	UG/L	R							U	26	UG/L	R						
4-AMINOBIPHENYL	U	5	UG/L	R							U	5	UG/L	R						
4-BROMOPHENYL PHENYL ETHER	U	5	UG/L	R							U	5	UG/L	R						
4-CHLORO-3-METHYLPHENOL	U	10	UG/L	R							U	10	UG/L	R						
4-CHLOROANILINE	U	10	UG/L	R							U	10	UG/L	R						
4-CHLOROPHENOL PHENYL ETHER	U	5	UG/L	R							U	5	UG/L	R						
4-METHYLPHENOL	U	5	UG/L	R							U	5	UG/L	R						
4-NITROANILINE	U	26	UG/L	R							U	26	UG/L	R						
4-NITROPHENOL	U	26	UG/L	R							U	26	UG/L	R						
4-NITROQUINOLINE 1-OXIDE	U	5	UG/L	R							U	5	UG/L	R						
5-NITRO-O-TOLUIDINE	U	26	UG/L	R							U	26	UG/L	R						
7,12-DIMETHYLBENZ(A)ANTHRACENE	U	26	UG/L	R							U	26	UG/L	R						
A,A-DIMETHYLPHENETHYLAMINE	U	5	UG/L	R							U	5	UG/L	R						
ACENAPHTHENE																				
ACENAPHTHYLENE	U	5	UG/L	R							U	5	UG/L	R						
ACETOPHENONE	U	5	UG/L	R							U	5	UG/L	R						
ANILINE	U	5	UG/L	R							U	5	UG/L	R						
ANTHRACENE	U	5	UG/L	R							U	5	UG/L	R						
BENZO(A)ANTHRACENE	U	5	UG/L	R							U	5	UG/L	R						

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Submittal Date: 12-OCT-93
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Well/Boring:	05					05					06-05					06				
Sample ID:	100224					100224RE					100229BD					100233				
Sample Date:	04/29/92					04/29/92					05/05/92					05/04/92				
QA Type:	QA-WB					QA-WB					QA					QA-TB				
Pit:	5					5					6					6				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
2-METHYLNAPHTHALENE	U	5	UG/L	R												U	9	UG/L	R	Y
2-METHYLPHENOL	U	5	UG/L	R												U	9	UG/L	R	Y
2-NAPHTHYLAMINE	U	5	UG/L	R												U	1300	UG/KG	R	
2-NITROANILINE	U	26	UG/L	R												U	6700	UG/KG	R	
2-NITROPHENOL	U	5	UG/L	R												U	9	UG/L	R	Y
2-PICOLINE	U	26	UG/L	R												U	6700	UG/KG	R	
3,3-DICHLOROBENZIDINE	U	5	UG/L	R												U	18	UG/L	R	Y
3-METHYLCHOLANTHRENE	U	26	UG/L	R												U	6700	UG/KG	R	
3-METHYLPHENOL	U	5	UG/L	R												U	1300	UG/KG	R	
3-NITROANILINE	U	26	UG/L	R												U	6700	UG/KG	R	
4,6-DINITRO-2-METHYLPHENOL	U	26	UG/L	R												U	6700	UG/KG	R	
4-AMINOBIPHENYL	U	5	UG/L	R												U	1300	UG/KG	R	
4-BROMOPHENYL PHENYL ETHER	U	5	UG/L	R												U	9	UG/L	R	Y
4-CHLORO-3-METHYLPHENOL	U	11	UG/L	R												U	2700	UG/KG	R	
4-CHLOROANILINE	U	11	UG/L	R												U	2700	UG/KG	R	
4-CHLOROPHENOL PHENYL ETHER	U	5	UG/L	R												U	9	UG/L	R	Y
4-METHYLPHENOL	U	5	UG/L	R												U	9	UG/L	R	Y
4-NITROANILINE	U	26	UG/L	R												U	6700	UG/KG	R	
4-NITROPHENOL	U	26	UG/L	R												U	6700	UG/KG	R	
4-NITROQUINOLINE 1-OXIDE	U	5	UG/L	R												U	1300	UG/KG	R	
5-NITRO-O-TOLUIDINE	U	26	UG/L	R												U	6700	UG/KG	R	
7,12-DIMETHYLBENZ(A)ANTHRACENE	U	26	UG/L	R												U	6700	UG/KG	R	
A,A-DIMETHYLPHENETHYLAMINE	U	5	UG/L	R												U	1300	UG/KG	R	
ACENAPHTHENE																				
ACENAPHTHYLENE	U	5	UG/L	R												U	9	UG/L	R	Y
ACETOPHENONE	U	5	UG/L	R												U	1300	UG/KG	R	
ANILINE	U	5	UG/L	R												U	1300	UG/KG	R	
ANTHRACENE	U	5	UG/L	R												U	9	UG/L	R	Y
BENZO(A)ANTHRACENE	U	5	UG/L	R												U	9	UG/L	R	Y

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1992 RI/FS - QA/QC Samples
Organic Results

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:	06					06				
Sample ID:	100235					100236				
Sample Date:	05/05/92					05/05/92				
QA Type:	QA-RB					QA-WB				
Pit:	6					6				
2-METHYLNAPHTHALENE	U	5	UG/L	R		U	5	UG/L	R	
2-METHYLPHENOL	U	5	UG/L	R		U	5	UG/L	R	
2-NAPHTHYLAMINE	U	5	UG/L	R		U	5	UG/L	R	
2-NITROANILINE	U	26	UG/L	R		U	26	UG/L	R	
2-NITROPHENOL	U	5	UG/L	R		U	5	UG/L	R	
2-PICOLINE	U	26	UG/L	R		U	26	UG/L	R	
3,3-DICHLOROBENZIDINE	U	5	UG/L	R		U	5	UG/L	R	
3-METHYLCHOLANTHRENE	U	26	UG/L	R		U	26	UG/L	R	
3-METHYLPHENOL	U	5	UG/L	R		U	5	UG/L	R	
3-NITROANILINE	U	26	UG/L	R		U	26	UG/L	R	
4,6-DINITRO-2-METHYLPHENOL	U	26	UG/L	R		U	26	UG/L	R	
4-AMINOBIPHENYL	U	5	UG/L	R		U	5	UG/L	R	
4-BROMOPHENYL PHENYL ETHER	U	5	UG/L	R		U	5	UG/L	R	
4-CHLORO-3-METHYLPHENOL	U	10	UG/L	R		U	11	UG/L	R	
4-CHLOROANILINE	U	10	UG/L	R		U	11	UG/L	R	
4-CHLOROPHENOL PHENYL ETHER	U	5	UG/L	R		U	5	UG/L	R	
4-METHYLPHENOL	U	5	UG/L	R		U	5	UG/L	R	
4-NITROANILINE	U	26	UG/L	R		U	26	UG/L	R	
4-NITROPHENOL	U	26	UG/L	R		U	26	UG/L	R	
4-NITROQUINOLINE 1-OXIDE	U	5	UG/L	R		U	5	UG/L	R	
5-NITRO-O-TOLUIDINE	U	26	UG/L	R		U	26	UG/L	R	
7,12-DIMETHYLBENZ(A)ANTHRACENE	U	26	UG/L	R		U	26	UG/L	R	
A,A-DIMETHYLPHENETHYLAMINE	U	5	UG/L	R		U	5	UG/L	R	
ACENAPHTHENE										
ACENAPHTHYLENE	U	5	UG/L	R		U	5	UG/L	R	
ACETOPHENONE	U	5	UG/L	R		U	5	UG/L	R	
ANILINE	U	5	UG/L	R		U	5	UG/L	R	
ANTHRACENE	U	5	UG/L	R		U	5	UG/L	R	
BENZO(A)ANTHRACENE	U	5	UG/L	R		U	5	UG/L	R	

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLF
Well/Boring:	06					06				
Sample ID:	100237					100238				
Sample Date:	05/05/92					05/05/92				
QA Type:	QA-WB					QA-WB				
Pit:	6					6				
2-METHYLNAPHTHALENE						U	5	UG/L	R	
2-METHYLPHENOL						U	5	UG/L	R	
2-NAPHTHYLAMINE						U	5	UG/L	R	
2-NITROANILINE						U	26	UG/L	R	
2-NITROPHENOL						U	5	UG/L	R	
2-PICOLINE						U	26	UG/L	R	
3,3-DICHLOROBENZIDINE						U	5	UG/L	R	
3-METHYLCHOLANTHRENE						U	26	UG/L	R	
3-METHYLPHENOL						U	5	UG/L	R	
3-NITROANILINE						U	26	UG/L	R	
4,6-DINITRO-2-METHYLPHENOL						U	26	UG/L	R	
4-AMINOBIPHENYL						U	5	UG/L	R	
4-BROMOPHENYL PHENYL ETHER						U	5	UG/L	R	
4-CHLORO-3-METHYLPHENOL						U	10	UG/L	R	
4-CHLOROANILINE						U	10	UG/L	R	
4-CHLOROPHENOL PHENYL ETHER						U	5	UG/L	R	
4-METHYLPHENOL						U	5	UG/L	R	
4-NITROANILINE						U	26	UG/L	R	
4-NITROPHENOL						U	26	UG/L	R	
4-NITROQUINOLINE 1-OXIDE						U	5	UG/L	R	
5-NITRO-O-TOLUIDINE						U	26	UG/L	R	
7,12-DIMETHYLBENZ(A)ANTHRACENE						U	26	UG/L	R	
A,A-DIMETHYLPHENETHYLAMINE						U	5	UG/L	R	
ACENAPHTHENE										
ACENAPHTHYLENE						U	5	UG/L	R	
ACETOPHENONE						U	5	UG/L	R	
ANILINE						U	5	UG/L	R	
ANTHRACENE						U	5	UG/L	R	
BENZO(A)ANTHRACENE						U	5	UG/L	R	

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Well/Boring:		06					CW-B					NA					NA			
Sample ID:		100239					098532					098533					098534			
Sample Date:		05/05/92					09/01/92					09/01/92					09/01/92			
QA Type:		QA					QA-DUP					QA-TB					QA-EB			
Pit:		6					CLEARWELL					CLEARWELL					CLEARWELL			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
2-METHYLNAPHTHALENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
2-METHYLPHENOL	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
2-NAPHTHYLAMINE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
2-NITROANILINE	U	27	UG/L	R		U	59	UG/L	R	Y						U	52	UG/L	R	
2-NITROPHENOL	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
2-PICOLINE	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
3,3-DICHLOROBENZIDINE	U	5	UG/L	R		U	930	UG/KG	R							U	21	UG/L	R	
3-METHYLCHOLANTHRENE	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
3-METHYLPHENOL	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
3-NITROANILINE	U	27	UG/L	R		U	59	UG/L	R	Y						U	52	UG/L	R	
4,6-DINITRO-2-METHYLPHENOL	U	27	UG/L	R		U	59	UG/L	R	Y						U	52	UG/L	R	
4-AMINOBIPHENYL	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
4-BROMOPHENYL PHENYL ETHER	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
4-CHLORO-3-METHYLPHENOL	U	11	UG/L	R		U	930	UG/KG	R							U	21	UG/L	R	
4-CHLOROANILINE	U	11	UG/L	R		U	930	UG/KG	R							U	21	UG/L	R	
4-CHLOROPHENOL PHENYL ETHER	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
4-METHYLPHENOL	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
4-NITROANILINE	U	27	UG/L	R		U	59	UG/L	R	Y						U	52	UG/L	R	
4-NITROPHENOL	U	27	UG/L	R		U	59	UG/L	R	Y						U	52	UG/L	R	
4-NITROQUINOLINE 1-OXIDE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
5-NITRO-O-TOLUIDINE	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
7,12-DIMETHYLBENZ(A)ANTHRACENE	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
A,A-DIMETHYLPHENETHYLAMINE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
ACENAPHTHENE							560	UG/KG	R							U	10	UG/L	R	
ACENAPHTHYLENE	U	5	UG/L	R		U	560	UG/KG	R							U	10	UG/L	R	
ACETOPHENONE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
ANILINE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
ANTHRACENE	U	5	UG/L	R			810	UG/KG	R							U	10	UG/L	R	
BENZO(A)ANTHRACENE	U	5	UG/L	R		UJ	3300	UG/KG	R							U	10	UG/L	R	

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RI/FS 1992 Formerly Referred to as WEMCO.

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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	NS	NA	NA
Sample ID:	098535	098536	098537
Sample Date:	09/01/92	09/01/92	09/01/92
QA Type:	QA-RB	QA-RB	QA-RB
Pit:	CLEARWELL	CLEARWELL	CLEARWELL

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
2-METHYLNAPHTHALENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
2-METHYLPHENOL	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
2-NAPHTHYLAMINE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
2-NITROANILINE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
2-NITROPHENOL	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
2-PICOLINE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
3,3-DICHLOROBENZIDINE	U	21	UG/L	R		U	21	UG/L	R		U	21	UG/L	R	
3-METHYLCHOLANTHRENE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
3-METHYLPHENOL	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
3-NITROANILINE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
4,6-DINITRO-2-METHYLPHENOL	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
4-AMINOBIPHENYL	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
4-BROMOPHENYL PHENYL ETHER	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
4-CHLORO-3-METHYLPHENOL	U	21	UG/L	R		U	21	UG/L	R		U	21	UG/L	R	
4-CHLOROANILINE	U	21	UG/L	R		U	21	UG/L	R		U	21	UG/L	R	
4-CHLOROPHENOL PHENYL ETHER	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
4-METHYLPHENOL	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
4-NITROANILINE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
4-NITROPHENOL	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
4-NITROQUINOLINE 1-OXIDE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
5-NITRO-O-TOLUIDINE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
7,12-DIMETHYLBENZ(A)ANTHRACENE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
A,A-DIMETHYLPHENETHYLAMINE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
ACENAPHTHENE	U	10	UG/L	R		U	10	UG/L	R						
ACENAPHTHYLENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
ACETOPHENONE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
ANILINE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
ANTHRACENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
BENZO(A)ANTHRACENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	

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RI/FS 1992 Formerly Referred to as WEMCO.

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	NS					NA					NA			
Sample ID:	098535					098536					098537			
Sample Date:	09/01/92					09/01/92					09/01/92			
QA Type:	QA-RB					QA-RB					QA-RB			
Pit:	CLEARWELL					CLEARWELL					CLEARWELL			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
TOTAL XYLENE	U	5	UG/L	R							U	5	UG/L	R	
TRICHLOROETHENE	U	5	UG/L	R							U	5	UG/L	R	
TRICHLOROFLUOROMETHANE	U	5	UG/L	R							U	5	UG/L	R	
VINYL ACETATE	U	50	UG/L	R							U	50	UG/L	R	
VINYL CHLORIDE	U	10	UG/L	R							U	10	UG/L	R	

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:		06					CW-B					NA					NA			
Sample ID:		100239					098532					098533					098534			
Sample Date:		05/05/92					09/01/92					09/01/92					09/01/92			
QA Type:		QA					QA-DUP					QA-TB					QA-EB			
Pit:		6					CLEARWELL					CLEARWELL					CLEARWELL			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
TOTAL XYLENE	U	5	UG/L	R			14	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
TRICHLOROETHENE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
TRICHLOROFLUOROMETHANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
VINYL ACETATE	U	50	UG/L	R		U	74	UG/KG	R		U	50	UG/L	R		U	50	UG/L	R	
VINYL CHLORIDE	U	10	UG/L	R		U	15	UG/KG	R		U	10	UG/L	R		U	10	UG/L	R	

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RI/FS 1992 Formerly Referred to as WEMCO.

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Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI USEPA

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Well/Boring:	06					06					06					06				
Sample ID:	100235					100236					100237					100238				
Sample Date:	05/05/92					05/05/92					05/05/92					05/05/92				
QA Type:	QA-RB					QA-WB					QA-WB					QA-WB				
Pit:	6					6					6					6				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
TOTAL XYLENE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
TRICHLOROETHENE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
TRICHLOROFLUOROMETHANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
VINYL ACETATE						U	50	UG/L	R		U	50	UG/L	R		U	50	UG/L	R	
VINYL CHLORIDE						U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	

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RI/FS 1992 Formerly Referred to as WEMCO.

1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	05					05					06-05					06				
Sample ID:	100224					100224RE					100229BD					100233				
Sample Date:	04/29/92					04/29/92					05/05/92					05/04/92				
QA Type:	QA-WB					QA-WB					QA					QA-TB				
Pit:	5					5					6					6				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
TOTAL XYLENE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
TRICHLOROETHENE	U	5	UG/L	R							J	17	UG/KG	R			420	UG/KG	R	
TRICHLOROFLUOROMETHANE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
VINYL ACETATE	U	50	UG/L	R							U	340	UG/KG	R		U	50	UG/L	R	Y
VINYL CHLORIDE	U	10	UG/L	R							U	68	UG/KG	R		U	83	UG/KG	R	

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RI/FS 1992 Formerly Referred to as WEMCO.

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	05				05				05				05		
Sample ID:	100222				100222RE				100223				100223RE		
Sample Date:	04/29/92				04/29/92				04/29/92				04/29/92		
QA Type:	QA-RB				QA-RB				QA-WB				QA-WB		
Pit:	5				5				5				5		
Parameters	LQ	Result	Unit	VQ TCLP	LQ	Result	Unit	VQ TCLP	LQ	Result	Unit	VQ TCLP	LQ	Result	Unit	VQ TCLP
TOTAL XYLENE	U	5	UG/L	R					U	5	UG/L	R				
TRICHLOROETHENE	U	5	UG/L	R					U	5	UG/L	R				
TRICHLOROFLUOROMETHANE	U	5	UG/L	R					U	5	UG/L	R				
VINYL ACETATE	U	50	UG/L	R					U	50	UG/L	R				
VINYL CHLORIDE	U	10	UG/L	R					U	10	UG/L	R				

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RI/FS 1992 Formerly Referred to as WEMCO.

Submittal Date: 12-OCT-93
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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	05-04	05	05	05
Sample ID:	100219	100220	100221	100221RE
Sample Date:	04/28/92	04/29/92	04/29/92	04/29/92
QA Type:	QA	QA-TB	QA-EB	QA-EB
Pit:	5	5	5	5

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
TOTAL XYLENE	U	5	UG/L	R	Y	U	5	UG/L	R											
TRICHLOROETHENE	U	86	UG/KG	R		U	5	UG/L	R											
TRICHLOROFLUOROMETHANE	U	86	UG/KG	R		U	5	UG/L	R											
VINYL ACETATE	U	860	UG/KG	R		U	50	UG/L	R											
VINYL CHLORIDE	U	170	UG/KG	R		U	10	UG/L	R											

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RI/FS 1992 Formerly Referred to as WEMCO.

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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	NS					NA					NA				
Sample ID:	098535					098536					098537				
Sample Date:	09/01/92					09/01/92					09/01/92				
QA Type:	QA-RB					QA-RB					QA-RB				
Pit:	CLEARWELL					CLEARWELL					CLEARWELL				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
ACROLEIN	U	50	UG/L	R							U	50	UG/L	R	
ACRYLONITRILE	U	50	UG/L	R							U	50	UG/L	R	
ALLYL CHLORIDE	U	100	UG/L	R							U	100	UG/L	R	
BENZENE	U	5	UG/L	R							U	5	UG/L	R	
BROMODICHLOROMETHANE	U	5	UG/L	R							U	5	UG/L	R	
BROMOFORM	U	5	UG/L	R							U	5	UG/L	R	
BROMOMETHANE	U	10	UG/L	R							U	10	UG/L	R	
CARBON DISULFIDE	U	5	UG/L	R							U	5	UG/L	R	
CARBON TETRACHLORIDE	U	5	UG/L	R							U	5	UG/L	R	
CHLOROBENZENE	U	5	UG/L	R							U	5	UG/L	R	
CHLOROETHANE	U	10	UG/L	R							U	10	UG/L	R	
CHLOROFORM	U	5	UG/L	R							U	5	UG/L	R	
CHLOROMETHANE	U	10	UG/L	R							U	10	UG/L	R	
CHLOROPRENE	U	5	UG/L	R							U	5	UG/L	R	
DIBROMOCHLOROMETHANE	U	5	UG/L	R							U	5	UG/L	R	
DIBROMOMETHANE	U	5	UG/L	R							U	5	UG/L	R	
DICHLORODIFLUOROMETHANE	U	5	UG/L	R							U	5	UG/L	R	
ETHYL METHACRYLATE	U	5	UG/L	R							U	5	UG/L	R	
ETHYLBENZENE	U	5	UG/L	R							U	5	UG/L	R	
IODOMETHANE	U	5	UG/L	R							U	5	UG/L	R	
ISOBUTYL ALCOHOL	U	50	UG/L	R							U	50	UG/L	R	
METHACRYLONITRILE	U	5	UG/L	R							U	5	UG/L	R	
METHYL METHACRYLATE	U	5	UG/L	R							U	5	UG/L	R	
METHYLENE CHLORIDE	U	5	UG/L	R							U	5	UG/L	R	
PROPIONITRILE	U	5	UG/L	R							U	5	UG/L	R	
STYRENE	U	5	UG/L	R							U	5	UG/L	R	
TETRACHLOROETHENE	U	5	UG/L	R							U	5	UG/L	R	
TOLUENE	U	5	UG/L	R							U	5	UG/L	R	
TOTAL PETROLEUM HYDROCARBON															

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RI/FS 1992 Formerly Referred to as WEMCO.

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

1992 RI/FS - QA/QC Samples
Organic Results

	Sample 1	Sample 2	Sample 3	Sample 4
Well/Boring:	06	CW-B	NA	NA
Sample ID:	100239	098532	098533	098534
Sample Date:	05/05/92	09/01/92	09/01/92	09/01/92
QA Type:	QA	QA-DUP	QA-TB	QA-EB
Pit:	6	CLEARWELL	CLEARWELL	CLEARWELL

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
ACROLEIN	U	50	UG/L	R		U	74	UG/KG	R		U	50	UG/L	R		U	50	UG/L	R	
ACRYLONITRILE	U	50	UG/L	R		U	74	UG/KG	R		U	50	UG/L	R		U	50	UG/L	R	
ALLYL CHLORIDE	U	100	UG/L	R		U	150	UG/KG	R		U	100	UG/L	R		U	100	UG/L	R	
BENZENE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
BROMODICHLOROMETHANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
BROMOFORM	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
BROMOMETHANE	U	10	UG/L	R		U	15	UG/KG	R		U	10	UG/L	R		U	10	UG/L	R	
CARBON DISULFIDE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
CARBON TETRACHLORIDE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
CHLOROBENZENE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
CHLOROETHANE	U	10	UG/L	R		U	15	UG/KG	R		U	10	UG/L	R		U	10	UG/L	R	
CHLOROFORM	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
CHLOROMETHANE	U	10	UG/L	R		U	15	UG/KG	R		U	10	UG/L	R		U	10	UG/L	R	
CHLOROPRENE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
DIBROMOCHLOROMETHANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
DIBROMOMETHANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
DICHLORODIFLUOROMETHANE						U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
ETHYL METHACRYLATE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
ETHYLBENZENE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
IODOMETHANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
ISOBUTYL ALCOHOL	U	50	UG/L	R		U	74	UG/KG	R		U	50	UG/L	R		U	50	UG/L	R	
METHACRYLONITRILE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
METHYL METHACRYLATE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
METHYLENE CHLORIDE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
PROPIONITRILE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
STYRENE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
TETRACHLOROETHENE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
TOLUENE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
TOTAL PETROLEUM HYDROCARBON																				

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RI/FS 1992 Formerly Referred to as WEMCO.

Submittal Date: 12-OCT-93
Print Date: 25-SEP-93
FEMP OU1RI - USEPA

0672 G-3-55

4208

1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	06	06	06	06
Sample ID:	100235	100236	100237	100238
Sample Date:	05/05/92	05/05/92	05/05/92	05/05/92
QA Type:	QA-RB	QA-WB	QA-WB	QA-WB
Pit:	6	6	6	6

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
ACROLEIN						U	50	UG/L	R		U	50	UG/L	R		U	50	UG/L	R	
ACRYLONITRILE						U	50	UG/L	R		U	50	UG/L	R		U	50	UG/L	R	
ALLYL CHLORIDE						U	100	UG/L	R		U	100	UG/L	R		U	100	UG/L	R	
BENZENE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
BROMODICHLOROMETHANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
BROMOFORM						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
BROMOMETHANE						U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
CARBON DISULFIDE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
CARBON TETRACHLORIDE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
CHLOROBENZENE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
CHLOROETHANE						U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
CHLOROFORM						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
CHLOROMETHANE						U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
CHLOROPRENE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
DIBROMOCHLOROMETHANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
DIBROMOMETHANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
DICHLORODIFLUOROMETHANE																				
ETHYL METHACRYLATE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
ETHYLBENZENE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
IODOMETHANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
ISOBUTYL ALCOHOL						U	50	UG/L	R		U	50	UG/L	R		U	50	UG/L	R	
METHACRYLONITRILE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
METHYL METHACRYLATE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
METHYLENE CHLORIDE						J	4	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
PROPIONITRILE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
STYRENE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
TETRACHLOROETHENE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
TOLUENE						U	8	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
TOTAL PETROLEUM HYDROCARBON																				

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Print Date: 25-SEP-93
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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	05	05	06-05	06
Sample ID:	100224	100224RE	100229BD	100233
Sample Date:	04/29/92	04/29/92	05/05/92	05/04/92
QA Type:	QA-WB	QA-WB	QA	QA-TB
Pit:	5	5	6	6

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
ACROLEIN	U	50	UG/L	R							U	340	UG/KG	R		U	420	UG/KG	R	
ACRYLONITRILE	U	50	UG/L	R							U	340	UG/KG	R		U	420	UG/KG	R	
ALLYL CHLORIDE	U	100	UG/L	R							U	680	UG/KG	R		U	830	UG/KG	R	
BENZENE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
BROMODICHLOROMETHANE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
BROMOFORM	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
BROMOMETHANE	U	10	UG/L	R							U	68	UG/KG	R		U	83	UG/KG	R	
CARBON DISULFIDE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
CARBON TETRACHLORIDE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
CHLOROBENZENE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
CHLOROETHANE	U	10	UG/L	R							U	68	UG/KG	R		U	83	UG/KG	R	
CHLOROFORM	J	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
CHLOROMETHANE	U	10	UG/L	R							U	68	UG/KG	R		U	83	UG/KG	R	
CHLOROPRENE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
DIBROMOCHLOROMETHANE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
DIBROMOMETHANE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
DICHLORODIFLUOROMETHANE																				
ETHYL METHACRYLATE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
ETHYLBENZENE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
IODOMETHANE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
ISOBUTYL ALCOHOL	U	50	UG/L	R							U	340	UG/KG	R		U	420	UG/KG	R	
METHACRYLONITRILE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
METHYL METHACRYLATE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
METHYLENE CHLORIDE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
PROPIONITRILE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
STYRENE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
TETRACHLOROETHENE	U	5	UG/L	R								420	UG/KG	R			260	UG/KG	R	
TOLUENE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
TOTAL PETROLEUM HYDROCARBON																				

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Print Date: 25-SEP-93
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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:		05					05					05					05			
Sample ID:		100222					100222RE					100223					100223RE			
Sample Date:		04/29/92					04/29/92					04/29/92					04/29/92			
QA Type:		QA-RB					QA-RB					QA-WB					QA-WB			
Pit:			5					5					5					5		
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
ACROLEIN	U	50	UG/L	R							U	50	UG/L	R						
ACRYLONITRILE	U	50	UG/L	R							U	50	UG/L	R						
ALLYL CHLORIDE	U	100	UG/L	R							U	100	UG/L	R						
BENZENE	U	5	UG/L	R							U	5	UG/L	R						
BROMODICHLOROMETHANE	U	5	UG/L	R							U	5	UG/L	R						
BROMOFORM	U	5	UG/L	R								5	UG/L	R						
BROMOMETHANE	U	10	UG/L	R							U	10	UG/L	R						
CARBON DISULFIDE	U	5	UG/L	R							U	5	UG/L	R						
CARBON TETRACHLORIDE	U	5	UG/L	R							U	5	UG/L	R						
CHLOROBENZENE	U	5	UG/L	R							U	5	UG/L	R						
CHLOROETHANE	U	10	UG/L	R							U	10	UG/L	R						
CHLOROFORM	J	2	UG/L	R							J	5	UG/L	R						
CHLOROMETHANE	U	10	UG/L	R							U	10	UG/L	R						
CHLOROPRENE	U	5	UG/L	R							U	5	UG/L	R						
DIBROMOCHLOROMETHANE	U	5	UG/L	R							U	5	UG/L	R						
DIBROMOMETHANE	U	5	UG/L	R							U	5	UG/L	R						
DICHLORODIFLUOROMETHANE																				
ETHYL METHACRYLATE	U	5	UG/L	R							U	5	UG/L	R						
ETHYLBENZENE	U	5	UG/L	R							U	5	UG/L	R						
IODOMETHANE	U	5	UG/L	R							U	5	UG/L	R						
ISOBUTYL ALCOHOL	U	50	UG/L	R							U	50	UG/L	R						
METHACRYLONITRILE	U	5	UG/L	R							U	5	UG/L	R						
METHYL METHACRYLATE	U	5	UG/L	R							U	5	UG/L	R						
METHYLENE CHLORIDE	U	5	UG/L	R							U	5	UG/L	R						
PROPIONITRILE	U	5	UG/L	R							U	5	UG/L	R						
STYRENE	U	5	UG/L	R							U	5	UG/L	R						
TETRACHLOROETHENE	U	5	UG/L	R							U	5	UG/L	R						
TOLUENE	J	4	UG/L	R							J	5	UG/L	R						
TOTAL PETROLEUM HYDROCARBON																				

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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:		05-04					05					05					05			
Sample ID:		100219					100220					100221					100221RE			
Sample Date:		04/28/92					04/29/92					04/29/92					04/29/92			
QA Type:		QA					QA-TB					QA-EB					QA-EB			
Pit:		5					5					5					5			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
ACROLEIN	U	860	UG/KG	R		U	50	UG/L	R											
ACRYLONITRILE	U	860	UG/KG	R		U	50	UG/L	R											
ALLYL CHLORIDE	U	1700	UG/KG	R		U	100	UG/L	R											
BENZENE	U	86	UG/KG	R		U	5	UG/L	R											
BROMODICHLOROMETHANE	U	86	UG/KG	R		U	5	UG/L	R											
BROMOFORM	U	86	UG/KG	R		U	5	UG/L	R											
BROMOMETHANE	U	170	UG/KG	R		U	10	UG/L	R											
CARBON DISULFIDE	U	86	UG/KG	R		U	5	UG/L	R											
CARBON TETRACHLORIDE	U	86	UG/KG	R		U	5	UG/L	R											
CHLOROBENZENE	U	86	UG/KG	R		U	5	UG/L	R											
CHLOROETHANE	U	170	UG/KG	R		U	10	UG/L	R											
CHLOROFORM	U	86	UG/KG	R		U	5	UG/L	R											
CHLOROMETHANE	U	170	UG/KG	R		U	10	UG/L	R											
CHLOROPRENE	U	86	UG/KG	R		U	5	UG/L	R											
DIBROMOCHLOROMETHANE	U	86	UG/KG	R		U	5	UG/L	R											
DIBROMOMETHANE	U	86	UG/KG	R		U	5	UG/L	R											
DICHLORODIFLUOROMETHANE																				
ETHYL METHACRYLATE	U	86	UG/KG	R		U	5	UG/L	R											
ETHYLBENZENE	U	86	UG/KG	R		U	5	UG/L	R											
IODOMETHANE	U	86	UG/KG	R		U	5	UG/L	R											
ISOBUTYL ALCOHOL	U	860	UG/KG	R		U	50	UG/L	R											
METHACRYLONITRILE	U	86	UG/KG	R		U	5	UG/L	R											
METHYL METHACRYLATE	U	86	UG/KG	R		U	5	UG/L	R											
METHYLENE CHLORIDE	U	86	UG/KG	R		U	5	UG/L	R											
PROPIONITRILE	U	86	UG/KG	R		U	5	UG/L	R											
STYRENE	U	86	UG/KG	R		U	5	UG/L	R											
TETRACHLOROETHENE	U	5	UG/L	R	Y	U	5	UG/L	R											
TOLUENE	U	5	UG/L	R	Y		9	UG/L	R											
TOTAL PETROLEUM HYDROCARBON		1240	MG/KG	R																

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Submittal Date: 12-OCT-93
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G-3-50

Well/Boring:		NS					NA					NA			
Sample ID:		098535					098536					098537			
Sample Date:		09/01/92					09/01/92					09/01/92			
QA Type:		QA-RB					QA-RB					QA-RB			
Pit:			CLEARWELL					CLEARWELL					CLEARWELL		
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
PRONAMIDE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
PYRENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
PYRIDINE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
SAFROLE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
o,o,o-TRIETHYLPHOSPHOROTHIOATE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
o,o-DIETHYL-o,2-PYRAZINYLPHOSE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
o-TOLUIDINE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
p-DIMETHYLAMINOAZOBENZENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
1,1,1,2-TETRACHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R	
1,1,1-TRICHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R	
1,1,2,2-TETRACHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R	
1,1,2-TRICHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R	
1,1-DICHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R	
1,1-DICHLOROETHENE	U	5	UG/L	R							U	5	UG/L	R	
1,2,3-TRICHLOROPROPANE	U	5	UG/L	R							U	5	UG/L	R	
1,2-DIBROMO-3-CHLOROPROPANE	U	10	UG/L	R							U	10	UG/L	R	
1,2-DIBROMOETHANE	U	5	UG/L	R							U	5	UG/L	R	
1,2-DICHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R	
1,2-DICHLOROETHENE	U	5	UG/L	R							U	5	UG/L	R	
1,2-DICHLOROPROPANE	U	5	UG/L	R							U	5	UG/L	R	
1,3-DICHLOROPROPENE	U	5	UG/L	R							U	5	UG/L	R	
1,4-DICHLORO-2-BUTENE	U	5	UG/L	R							U	5	UG/L	R	
1,4-DIOXANE	U	150	UG/L	R							U	150	UG/L	R	
2-BUTANONE	U	100	UG/L	R							U	100	UG/L	R	
2-CHLOROETHYL VINYL ETHER	U	10	UG/L	R							U	10	UG/L	R	
2-HEXANONE	U	50	UG/L	R							U	50	UG/L	R	
4-METHYL-2-PENTANONE	U	50	UG/L	R							U	50	UG/L	R	
ACETONE	U	100	UG/L	R							U	100	UG/L	R	
ACETONITRILE	U	100	UG/L	R							U	100	UG/L	R	

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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:		06					CW-B					NA					NA			
Sample ID:		100239					098532					098533					098534			
Sample Date:		05/05/92					09/01/92					09/01/92					09/01/92			
QA Type:		QA					QA-DUP					QA-TB					QA-EB			
Pit:		6					CLEARWELL					CLEARWELL					CLEARWELL			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
PRONAMIDE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
PYRENE	U	5	UG/L	R			7700	UG/KG	R							U	10	UG/L	R	
PYRIDINE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
SAFROLE	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
o,o,o-TRIETHYLPHOSPHOROTHIOATE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
o,o-DIETHYL-o,2-PYRAZINYLPHOSE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
o-TOLUIDINE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
p-DIMETHYLAMINOAZOBENZENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
1,1,1,2-TETRACHLOROETHANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
1,1,1-TRICHLOROETHANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
1,1,2,2-TETRACHLOROETHANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
1,1,2-TRICHLOROETHANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
1,1-DICHLOROETHANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
1,1-DICHLOROETHENE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
1,2,3-TRICHLOROPROPANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
1,2-DIBROMO-3-CHLOROPROPANE	U	10	UG/L	R		U	15	UG/KG	R		U	10	UG/L	R		U	10	UG/L	R	
1,2-DIBROMOETHANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
1,2-DICHLOROETHANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
1,2-DICHLOROETHENE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
1,2-DICHLOROPROPANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
1,3-DICHLOROPROPENE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
1,4-DICHLORO-2-BUTENE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
1,4-DIOXANE	U	150	UG/L	R		U	220	UG/KG	R		U	150	UG/L	R		U	150	UG/L	R	
2-BUTANONE	U	100	UG/L	R		J	8	UG/KG	R		U	100	UG/L	R		U	100	UG/L	R	
2-CHLOROETHYL VINYL ETHER	U	10	UG/L	R		U	15	UG/KG	R		U	10	UG/L	R		U	10	UG/L	R	
2-HEXANONE	U	50	UG/L	R		U	74	UG/KG	R		U	50	UG/L	R		U	50	UG/L	R	
4-METHYL-2-PENTANONE	U	50	UG/L	R		U	74	UG/KG	R		U	50	UG/L	R		U	50	UG/L	R	
ACETONE	U	100	UG/L	R			5600	UG/KG	R		U	100	UG/L	R		U	100	UG/L	R	
ACETONITRILE	U	100	UG/L	R		U	150	UG/KG	R		U	100	UG/L	R		U	100	UG/L	R	

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Submittal Date: 12-OCT-93
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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:		06					06					06					06			
Sample ID:		100235					100236					100237					100238			
Sample Date:		05/05/92					05/05/92					05/05/92					05/05/92			
QA Type:		QA-RB					QA-WB					QA-WB					QA-WB			
Pit:			6					6					6					6		
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
PRONAMIDE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
PYRENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
PYRIDINE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
SAFROLE	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	
o,o,o-TRIETHYLPHOSPHOROTHIOATE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
o,o-DIETHYL-o,2-PYRAZINYLPHOSE	U	5	UG/L	R		U	5	UG/L	R											
o-TOLUIDINE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
p-DIMETHYLAMINOAZOBENZENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
1,1,1,2-TETRACHLOROETHANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
1,1,1-TRICHLOROETHANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
1,1,2,2-TETRACHLOROETHANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
1,1,2-TRICHLOROETHANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
1,1-DICHLOROETHANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
1,1-DICHLOROETHENE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
1,2,3-TRICHLOROPROPANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
1,2-DIBROMO-3-CHLOROPROPANE						U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
1,2-DIBROMOETHANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
1,2-DICHLOROETHANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
1,2-DICHLOROETHENE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
1,2-DICHLOROPROPANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
1,3-DICHLOROPROPENE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
1,4-DICHLORO-2-BUTENE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
1,4-DIOXANE						U	150	UG/L	R		U	150	UG/L	R		U	150	UG/L	R	
2-BUTANONE						U	100	UG/L	R		U	100	UG/L	R		U	100	UG/L	R	
2-CHLOROETHYL VINYL ETHER						U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
2-HEXANONE						U	50	UG/L	R		U	50	UG/L	R		U	50	UG/L	R	
4-METHYL-2-PENTANONE						U	50	UG/L	R		U	50	UG/L	R		U	50	UG/L	R	
ACETONE						U	100	UG/L	R		U	100	UG/L	R		U	100	UG/L	R	
ACETONITRILE						U	100	UG/L	R		U	100	UG/L	R		U	100	UG/L	R	

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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	05					05					06-05					06				
Sample ID:	100224					100224RE					100229BD					100233				
Sample Date:	04/29/92					04/29/92					05/05/92					05/04/92				
QA Type:	QA-WB					QA-WB					QA					QA-TB				
Pit:	5					5					6					6				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
PRONAMIDE	U	5	UG/L	R												U	1300	UG/KG	R	
PYRENE	U	5	UG/L	R												U	9	UG/L	R	Y
PYRIDINE	U	5	UG/L	R												U	1300	UG/KG	R	
SAFROLE	U	26	UG/L	R												U	6700	UG/KG	R	
o,o,o-TRIETHYLPHOSPHOROTHIOATE		5	UG/L	R												U	1300	UG/KG	R	
o,o-DIETHYL-o,2-PYRAZINYLPHOSE		5	UG/L	R												U	1300	UG/KG	R	
o-TOLUIDINE	U	5	UG/L	R												U	1300	UG/KG	R	
p-DIMETHYLAMINOAZOBENZENE	U	5	UG/L	R												U	1300	UG/KG	R	
1,1,1,2-TETRACHLOROETHANE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
1,1,1-TRICHLOROETHANE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
1,1,2,2-TETRACHLOROETHANE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
1,1,2-TRICHLOROETHANE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
1,1-DICHLOROETHANE	U	5	UG/L	R							J	19	UG/KG	R		U	5	UG/L	R	Y
1,1-DICHLOROETHENE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
1,2,3-TRICHLOROPROPANE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
1,2-DIBROMO-3-CHLOROPROPANE	U	10	UG/L	R							U	68	UG/KG	R		U	83	UG/KG	R	
1,2-DIBROMOETHANE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
1,2-DICHLOROETHANE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
1,2-DICHLOROETHENE	U	5	UG/L	R								300	UG/KG	R		U	5	UG/L	R	Y
1,2-DICHLOROPROPANE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
1,3-DICHLOROPROPENE	U	5	UG/L	R							U	34	UG/KG	R		U	5	UG/L	R	Y
1,4-DICHLORO-2-BUTENE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
1,4-DIOXANE	B	42	UG/L	R							U	1000	UG/KG	R		U	1300	UG/KG	R	
2-BUTANONE	U	100	UG/L	R							U	680	UG/KG	R		U	830	UG/KG	R	
2-CHLOROETHYL VINYL ETHER	U	10	UG/L	R							U	68	UG/KG	R		U	83	UG/KG	R	
2-HEXANONE	U	50	UG/L	R							U	340	UG/KG	R		U	50	UG/L	R	Y
4-METHYL-2-PENTANONE	U	50	UG/L	R							U	340	UG/KG	R		U	420	UG/KG	R	
ACETONE		170	UG/L	R							B	3800	UG/KG	R		J	210	UG/KG	R	
ACETONITRILE	U	100	UG/L	R							U	680	UG/KG	R		U	830	UG/KG	R	

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G-3-46

Well/Boring:		05					05					05					05			
Sample ID:		100222					100222RE					100223					100223RE			
Sample Date:		04/29/92					04/29/92					04/29/92					04/29/92			
QA Type:		QA-RB					QA-RB					QA-WB					QA-WB			
Pit:		5					5					5					5			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
PRONAMIDE	U	5	UG/L	R							U	5	UG/L	R						
PYRENE	U	5	UG/L	R							U	5	UG/L	R						
PYRIDINE	U	5	UG/L	R							U	5	UG/L	R						
SAFROLE	U	26	UG/L	R							U	26	UG/L	R						
o,o,o-TRIETHYLPHOSPHOROTHIOATE		5	UG/L	R								5	UG/L	R						
o,o-DIETHYL-o,2-PYRAZINYLPHOSE		5	UG/L	R								5	UG/L	R						
o-TOLUIDINE	U	5	UG/L	R							U	5	UG/L	R						
p-DIMETHYLAMINOAZOBENZENE	U	5	UG/L	R							U	5	UG/L	R						
1,1,1,2-TETRACHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R						
1,1,1-TRICHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R						
1,1,2,2-TETRACHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R						
1,1,2-TRICHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R						
1,1-DICHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R						
1,1-DICHLOROETHENE	U	5	UG/L	R							U	5	UG/L	R						
1,2,3-TRICHLOROPROPANE	U	5	UG/L	R							U	5	UG/L	R						
1,2-DIBROMO-3-CHLOROPROPANE	U	10	UG/L	R							U	10	UG/L	R						
1,2-DIBROMOETHANE	U	5	UG/L	R							U	5	UG/L	R						
1,2-DICHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R						
1,2-DICHLOROETHENE	U	5	UG/L	R							U	5	UG/L	R						
1,2-DICHLOROPROPANE	U	5	UG/L	R							U	5	UG/L	R						
1,3-DICHLOROPROPENE	U	5	UG/L	R							U	5	UG/L	R						
1,4-DICHLORO-2-BUTENE	U	5	UG/L	R							U	5	UG/L	R						
1,4-DIOXANE	B	57	UG/L	R							B	33	UG/L	R						
2-BUTANONE	U	100	UG/L	R							U	100	UG/L	R						
2-CHLOROETHYL VINYL ETHER	U	10	UG/L	R							U	10	UG/L	R						
2-HEXANONE	U	50	UG/L	R							U	50	UG/L	R						
4-METHYL-2-PENTANONE	U	50	UG/L	R							U	50	UG/L	R						
ACETONE	U	100	UG/L	R							U	100	UG/L	R						
ACETONITRILE	U	100	UG/L	R							U	100	UG/L	R						

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1992 RI/FS - QA/QC Samples
Organic Results

	05-04	05	05	05
Well/Boring:	05-04	05	05	05
Sample ID:	100219	100220	100221	100221RE
Sample Date:	04/28/92	04/29/92	04/29/92	04/29/92
QA Type:	QA	QA-TB	QA-EB	QA-EB
Pit:	5	5	5	5

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
PRONAMIDE	U	570	UG/KG	R							U	5	UG/L	R						
PYRENE	U	570	UG/KG	R							U	5	UG/L	R						
PYRIDINE	U	570	UG/KG	R							U	5	UG/L	R						
SAFROLE	U	2900	UG/KG	R							U	26	UG/L	R						
o,o,o-TRIETHYLPHOSPHOROTHIOATE		570	UG/KG	R							U	5	UG/L	R						
o,o-DIETHYL-o,2-PYRAZINYLPHOSE			UG/KG	R								5	UG/L	R						
o-TOLUIDINE	U	570	UG/KG	R							U	5	UG/L	R						
p-DIMETHYLAMINOAZOBENZENE	U	570	UG/KG	R							U	5	UG/L	R						
1,1,1,2-TETRACHLOROETHANE	U	86	UG/KG	R		U	5	UG/L	R											
1,1,1-TRICHLOROETHANE	U	86	UG/KG	R		U	5	UG/L	R											
1,1,2,2-TETRACHLOROETHANE	U	86	UG/KG	R		U	5	UG/L	R											
1,1,2-TRICHLOROETHANE	U	86	UG/KG	R		U	5	UG/L	R											
1,1-DICHLOROETHANE	U	86	UG/KG	R		U	5	UG/L	R											
1,1-DICHLOROETHENE	U	5	UG/L	R	Y	U	5	UG/L	R											
1,2,3-TRICHLOROPROPANE	U	86	UG/KG	R		U	5	UG/L	R											
1,2-DIBROMO-3-CHLOROPROPANE	U	170	UG/KG	R		U	10	UG/L	R											
1,2-DIBROMOETHANE	U	86	UG/KG	R		U	5	UG/L	R											
1,2-DICHLOROETHANE	U	86	UG/KG	R		U	5	UG/L	R											
1,2-DICHLOROETHENE	U	86	UG/KG	R		U	5	UG/L	R											
1,2-DICHLOROPROPANE	U	86	UG/KG	R		U	5	UG/L	R											
1,3-DICHLOROPROPENE	U	86	UG/KG	R		U	5	UG/L	R											
1,4-DICHLORO-2-BUTENE	U	86	UG/KG	R		U	5	UG/L	R											
1,4-DIOXANE	U	2600	UG/KG	R		U	150	UG/L	R											
2-BUTANONE	U	100	UG/L	R	Y	U	100	UG/L	R											
2-CHLOROETHYL VINYL ETHER	U	170	UG/KG	R		U	10	UG/L	R											
2-HEXANONE	U	50	UG/L	R	Y	U	50	UG/L	R											
4-METHYL-2-PENTANONE		83	UG/L	R	Y	U	50	UG/L	R											
ACETONE		2500	UG/KG	R		U	100	UG/L	R											
ACETONITRILE	U	1700	UG/KG	R		U	100	UG/L	R											

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0966

1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:		NS					NA					NA			
Sample ID:		098535					098536					098537			
Sample Date:		09/01/92					09/01/92					09/01/92			
QA Type:		QA-RB					QA-RB					QA-RB			
Pit:		CLEARWELL					CLEARWELL					CLEARWELL			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
HEXACHLOROPHENE	U	100	UG/L	R		U	100	UG/L	R		U	100	UG/L	R	
HEXACHLOROPROPENE	U	21	UG/L	R		U	21	UG/L	R		U	21	UG/L	R	
INDENO(1,2,3-CD)PYRENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
ISODRIN	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
ISOPHORONE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
ISOSAFROLE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
KEPONE	U	100	UG/L	R		U	100	UG/L	R		U	100	UG/L	R	
METHAPYRILENE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
METHYL METHANESULFONATE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
METHYL PARATHION	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
N-NITROSO-DI-N-BUTYLAMINE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
N-NITROSO-DI-N-PROPYLAMINE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
N-NITROSODIMETHYLAMINE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
N-NITROSODIPHENYLAMINE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
N-NITROSOMETHYLETHYLAMINE	U	21	UG/L	R		U	21	UG/L	R		U	21	UG/L	R	
N-NITROSOMORPHOLINE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
N-NITROSOPIPERIDINE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
N-NITROSOPYRROLIDINE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
NAPHTHALENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
NITROBENZENE		10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
PARATHION	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
PENTACHLOROBENZENE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
PENTACHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R	
PENTACHLORONITROBENZENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
PENTACHLOROPHENOL	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
PHENACETIN	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
PHENANTHRENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
PHENOL	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
PHORATE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	

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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:		06					CW-B					NA					NA			
Sample ID:		100239					098532					098533					098534			
Sample Date:		05/05/92					09/01/92					09/01/92					09/01/92			
QA Type:		QA					QA-DUP					QA-TB					QA-EB			
Pit:		6					CLEARWELL					CLEARWELL					CLEARWELL			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
HEXACHLOROPHENE	U	54	UG/L	R		U	4700	UG/KG	R							U	100	UG/L	R	
HEXACHLOROPROPENE	U	11	UG/L	R		U	930	UG/KG	R							U	21	UG/L	R	
INDENO(1,2,3-CD)PYRENE	U	5	UG/L	R			930	UG/KG	R							U	10	UG/L	R	
ISODRIN	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
ISOPHORONE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
ISOSAFROLE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
KEPONE	U	54	UG/L	R		U	4700	UG/KG	R							U	100	UG/L	R	
METHAPYRILENE	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
METHYL METHANESULFONATE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
METHYL PARATHION	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
N-NITROSO-DI-N-BUTYLAMINE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
N-NITROSO-DI-N-PROPYLAMINE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
N-NITROSODIMETHYLAMINE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
N-NITROSODIPHENYLAMINE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
N-NITROSOMETHYLETHYLAMINE	U	11	UG/L	R		U	930	UG/KG	R							U	21	UG/L	R	
N-NITROSOMORPHOLINE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
N-NITROSOPIPERIDINE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
N-NITROSOPYRROLIDINE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
NAPHTHALENE	U	5	UG/L	R		U	12	UG/L	R	Y						U	10	UG/L	R	
NITROBENZENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
PARATHION	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
PENTACHLOROBENZENE	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
PENTACHLOROETHANE	U	5	UG/L	R		U	7	UG/KG	R		U	5	UG/L	R		U	5	UG/L	R	
PENTACHLORONITROBENZENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
PENTACHLOROPHENOL	U	27	UG/L	R		U	59	UG/L	R	Y						U	52	UG/L	R	
PHENACETIN	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
PHENANTHRENE	U	5	UG/L	R			5600	UG/KG	R							U	10	UG/L	R	
PHENOL	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
PHORATE	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	

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Submittal Date: 12-OCT-93
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0660

1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	06	06	06	06
Sample ID:	100235	100236	100237	100238
Sample Date:	05/05/92	05/05/92	05/05/92	05/05/92
QA Type:	QA-RB	QA-WB	QA-WB	QA-WB
Pit:	6	6	6	6

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
HEXACHLOROPHENE	U	52	UG/L	R		U	53	UG/L	R							U	51	UG/L	R	
HEXACHLOROPROPENE	U	10	UG/L	R		U	11	UG/L	R							U	10	UG/L	R	
INDENO(1,2,3-CD)PYRENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
ISODRIN	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
ISOPHORONE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
ISOSAFROLE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
KEPONE	U	52	UG/L	R		U	53	UG/L	R							U	51	UG/L	R	
METHAPYRILENE	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	
METHYL METHANESULFONATE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
METHYL PARATHION	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
N-NITROSO-DI-N-BUTYLAMINE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
N-NITROSO-DI-N-PROPYLAMINE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
N-NITROSODIMETHYLAMINE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
N-NITROSODIPHENYLAMINE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
N-NITROSOMETHYLETHYLAMINE	U	10	UG/L	R		U	11	UG/L	R							U	10	UG/L	R	
N-NITROSOMORPHOLINE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
N-NITROSOPIPERIDINE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
N-NITROSOPYRROLIDINE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
NAPHTHALENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
NITROBENZENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
PARATHION	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
PENTACHLOROBENZENE	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	
PENTACHLOROETHANE						U	5	UG/L	R		U	5	UG/L	R		U	5	UG/L	R	
PENTACHLORONITROBENZENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
PENTACHLOROPHENOL	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	
PHENACETIN	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
PHENANTHRENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
PHENOL	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
PHORATE	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	

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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	05					05					06-05					06				
Sample ID:	100224					100224RE					100229BD					100233				
Sample Date:	04/29/92					04/29/92					05/05/92					05/04/92				
QA Type:	QA-WB					QA-WB					QA					QA-TB				
Pit:	5					5					6					6				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
HEXACHLOROPHENE	U	53	UG/L	R												U	13000	UG/KG	R	
HEXACHLOROPROPENE	U	11	UG/L	R												U	2700	UG/KG	R	
INDENO(1,2,3-CD)PYRENE	U	5	UG/L	R												U	9	UG/L	R	Y
ISODRIN	U	5	UG/L	R												U	1300	UG/KG	R	
ISOPHORONE	U	5	UG/L	R												U	9	UG/L	R	Y
ISOSAFROLE	U	5	UG/L	R												U	1300	UG/KG	R	
KEPONE	U	53	UG/L	R												U	13000	UG/KG	R	
METHAPYRILENE	U	26	UG/L	R												U	6700	UG/KG	R	
METHYL METHANESULFONATE	U	5	UG/L	R												U	1300	UG/KG	R	
METHYL PARATHION	U	5	UG/L	R												U	1300	UG/KG	R	
N-NITROSO-DI-N-BUTYLAMINE	U	5	UG/L	R												U	1300	UG/KG	R	
N-NITROSO-DI-N-PROPYLAMINE	U	5	UG/L	R												U	9	UG/L	R	Y
N-NITROSODIMETHYLAMINE	U	5	UG/L	R												U	1300	UG/KG	R	
N-NITROSODIPHENYLAMINE	U	5	UG/L	R												U	9	UG/L	R	Y
N-NITROSOMETHYLETHYLAMINE	U	11	UG/L	R												U	2700	UG/KG	R	
N-NITROSOMORPHOLINE	U	5	UG/L	R												U	1300	UG/KG	R	
N-NITROSOPIPERIDINE	U	5	UG/L	R												U	1300	UG/KG	R	
N-NITROSOPYRROLIDINE	U	5	UG/L	R												U	1300	UG/KG	R	
NAPHTHALENE	U	5	UG/L	R												U	9	UG/L	R	Y
NITROBENZENE	U	5	UG/L	R												U	9	UG/L	R	Y
PARATHION	U	5	UG/L	R												U	1300	UG/KG	R	
PENTACHLOROBENZENE	U	26	UG/L	R												U	6700	UG/KG	R	
PENTACHLOROETHANE	U	5	UG/L	R							U	34	UG/KG	R		U	42	UG/KG	R	
PENTACHLORONITROBENZENE	U	5	UG/L	R												U	1300	UG/KG	R	
PENTACHLOROPHENOL	U	26	UG/L	R												U	6700	UG/KG	R	
PHENACETIN	U	5	UG/L	R												U	1300	UG/KG	R	
PHENANTHRENE	U	5	UG/L	R												U	9	UG/L	R	Y
PHENOL	U	5	UG/L	R												U	1300	UG/KG	R	
PHORATE	U	26	UG/L	R												U	6700	UG/KG	R	

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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:	05					05					05					05				
Sample ID:	100222					100222RE					100223					100223RE				
Sample Date:	04/29/92					04/29/92					04/29/92					04/29/92				
QA Type:	QA-RB					QA-RB					QA-WB					QA-WB				
Pit:	5					5					5					5				
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
HEXACHLOROPHENE	U	51	UG/L	R							U	52	UG/L	R						
HEXACHLOROPROPENE	U	10	UG/L	R							U	10	UG/L	R						
INDENO(1,2,3-CD)PYRENE	U	5	UG/L	R							U	5	UG/L	R						
ISODRIN	U	5	UG/L	R							U	5	UG/L	R						
ISOPHORONE	U	5	UG/L	R							U	5	UG/L	R						
ISOSAFROLE	U	5	UG/L	R							U	5	UG/L	R						
KEPONE	U	51	UG/L	R							U	52	UG/L	R						
METHAPYRILENE	U	26	UG/L	R							U	26	UG/L	R						
METHYL METHANESULFONATE	U	5	UG/L	R							U	5	UG/L	R						
METHYL PARATHION	U	5	UG/L	R							U	5	UG/L	R						
N-NITROSO-DI-N-BUTYLAMINE	U	5	UG/L	R							U	5	UG/L	R						
N-NITROSO-DI-N-PROPYLAMINE	U	5	UG/L	R							U	5	UG/L	R						
N-NITROSODIMETHYLAMINE	U	5	UG/L	R							U	5	UG/L	R						
N-NITROSODIPHENYLAMINE	U	5	UG/L	R							U	5	UG/L	R						
N-NITROSOMETHYLETHYLAMINE	U	10	UG/L	R							U	10	UG/L	R						
N-NITROSOMORPHOLINE	U	5	UG/L	R							U	5	UG/L	R						
N-NITROSOPIPERIDINE	U	5	UG/L	R							U	5	UG/L	R						
N-NITROSOPYRROLIDINE	U	5	UG/L	R							U	5	UG/L	R						
NAPHTHALENE	U	5	UG/L	R							U	5	UG/L	R						
NITROBENZENE	U	5	UG/L	R							U	5	UG/L	R						
PARATHION	U	5	UG/L	R							U	5	UG/L	R						
PENTACHLOROBENZENE	U	26	UG/L	R							U	26	UG/L	R						
PENTACHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R						
PENTACHLORONITROBENZENE	U	5	UG/L	R							U	5	UG/L	R						
PENTACHLOROPHENOL	U	26	UG/L	R							U	26	UG/L	R						
PHENACETIN	U	5	UG/L	R							U	5	UG/L	R						
PHENANTHRENE	U	5	UG/L	R							U	5	UG/L	R						
PHENOL	U	5	UG/L	R							U	5	UG/L	R						
PHORATE	U	26	UG/L	R							U	26	UG/L	R						

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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:		05-04					05					05					05			
Sample ID:		100219					100220					100221					100221RE			
Sample Date:		04/28/92					04/29/92					04/29/92					04/29/92			
QA Type:		QA					QA-TB					QA-EB					QA-EB			
Pit:			5					5					5					5		
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
HEXACHLOROPHENE	U	5700	UG/KG	R							U	52	UG/L	R						
HEXACHLOROPROPENE	U	1100	UG/KG	R							U	10	UG/L	R						
INDENO(1,2,3-CD)PYRENE	U	570	UG/KG	R							U	5	UG/L	R						
ISODRIN	U	570	UG/KG	R							U	5	UG/L	R						
ISOPHORONE	U	570	UG/KG	R							U	5	UG/L	R						
ISOSAFROLE	U	570	UG/KG	R							U	5	UG/L	R						
KEPONE	U	5700	UG/KG	R							U	52	UG/L	R						
METHAPYRILENE	U	2900	UG/KG	R							U	26	UG/L	R						
METHYL METHANESULFONATE	U	570	UG/KG	R							U	5	UG/L	R						
METHYL PARATHION	U	570	UG/KG	R							U	5	UG/L	R						
N-NITROSO-DI-N-BUTYLAMINE	U	570	UG/KG	R							U	5	UG/L	R						
N-NITROSO-DI-N-PROPYLAMINE	U	570	UG/KG	R							U	5	UG/L	R						
N-NITROSODIMETHYLAMINE	U	570	UG/KG	R							U	5	UG/L	R						
N-NITROSODIPHENYLAMINE	U	570	UG/KG	R							U	5	UG/L	R						
N-NITROSOMETHYLETHYLAMINE	U	1100	UG/KG	R																
N-NITROSOMORPHOLINE	U	570	UG/KG	R							U	5	UG/L	R						
N-NITROSOPIPERIDINE	U	570	UG/KG	R							U	5	UG/L	R						
N-NITROSOPYRROLIDINE	U	570	UG/KG	R							U	5	UG/L	R						
NAPHTHALENE	U	570	UG/KG	R							U	5	UG/L	R						
NITROBENZENE	U	570	UG/KG	R							U	5	UG/L	R						
PARATHION	U	570	UG/KG	R							U	5	UG/L	R						
PENTACHLOROBENZENE	U	2900	UG/KG	R							U	26	UG/L	R						
PENTACHLOROETHANE	U	86	UG/KG	R		U	5	UG/L	R											
PENTACHLORONITROBENZENE	U	570	UG/KG	R							U	5	UG/L	R						
PENTACHLOROPHENOL	U	51	UG/L	R	Y						U	26	UG/L	R						
PHENACETIN	U	570	UG/KG	R							U	5	UG/L	R						
PHENANTHRENE	U	570	UG/KG	R							U	5	UG/L	R						
PHENOL	U	570	UG/KG	R							U	5	UG/L	R						
PHORATE	U	2900	UG/KG	R							U	26	UG/L	R						

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October 12, 1993

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1992 RI/FS - QA/QC Samples
Organic Results

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:		NS					NA					NA			
Sample ID:		098535					098536					098537			
Sample Date:		09/01/92					09/01/92					09/01/92			
QA Type:		QA-RB					QA-RB					QA-RB			
Pit:		CLEARWELL					CLEARWELL					CLEARWELL			
BENZO(A)PYRENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
BENZO(B)FLUORANTHENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
BENZO(G,H,I)PERYLENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
BENZO(K)FLUORANTHENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
BENZOIC ACID	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
BENZYL ALCOHOL	U	21	UG/L	R		U	21	UG/L	R		U	21	UG/L	R	
BIS(2-CHLOROETHOXY)METHANE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
BIS(2-CHLOROETHYL)ETHER	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
BIS(2-CHLOROISOPROPYL)ETHER	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
BIS(2-ETHYLHEXYL)PHTHALATE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
BUTYL BENZYL PHTHALATE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
CARBAZOLE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
CHLOROBENZILATE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
CHRYSENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
DI-N-BUTYLPHTHALATE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
DI-N-OCTYLPHTHALATE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
DIALLATE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
DIBENZO(A,H)ANTHRACENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
DIBENZOFURAN	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
DIETHYL PHTHALATE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
DIMETHYL PHTHALATE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
DIPHENYLAMINE	U	52	UG/L	R		U	52	UG/L	R		U	52	UG/L	R	
ETHYL METHANESULFONATE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
FLUORANTHENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
FLUORENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
HEXACHLOROBENZENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
HEXACHLOROBUTADIENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
HEXACHLOROCYCLOPENTADIENE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	
HEXACHLOROETHANE	U	10	UG/L	R		U	10	UG/L	R		U	10	UG/L	R	

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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:		06					CW-B					NA					NA			
Sample ID:		100239					098532					098533					098534			
Sample Date:		05/05/92					09/01/92					09/01/92					09/01/92			
QA Type:		QA					QA-DUP					QA-TB					QA-EB			
Pit:		6					CLEARWELL					CLEARWELL					CLEARWELL			
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCL[illegible]
BENZO(A)PYRENE	U	5	UG/L	R			1900	UG/KG	R							U	10	UG/L	R	
BENZO(B)FLUORANTHENE	U	5	UG/L	R			2700	UG/KG	R							U	10	UG/L	R	
BENZO(G,H,I)PERYLENE	U	5	UG/L	R			700	UG/KG	R							U	10	UG/L	R	
BENZO(K)FLUORANTHENE	U	5	UG/L	R			1100	UG/KG	R							U	10	UG/L	R	
BENZOIC ACID	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
BENZYL ALCOHOL	U	11	UG/L	R		U	930	UG/KG	R							U	21	UG/L	R	
BIS(2-CHLOROETHOXY)METHANE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
BIS(2-CHLOROETHYL)ETHER	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
BIS(2-CHLOROISOPROPYL)ETHER	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
BIS(2-ETHYLHEXYL)PHTHALATE	U	5	UG/L	R			6700	UG/KG	R							U	10	UG/L	R	
BUTYL BENZYL PHTHALATE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
CARBAZOLE	U	5	UG/L	R			940	UG/KG	R							U	10	UG/L	R	
CHLOROBENZILATE	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
CHRYSENE	U	5	UG/L	R			3700	UG/KG	R							U	10	UG/L	R	
DI-N-BUTYLPHTHALATE	U	5	UG/L	R		U	12	UG/L	R	Y						U	10	UG/L	R	
DI-N-OCTYLPHTHALATE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
DIALLATE	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
DIBENZO(A,H)ANTHRACENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
DIBENZOFURAN	U	5	UG/L	R		U	12	UG/L	R	Y						U	10	UG/L	R	
DIETHYL PHTHALATE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
DIMETHYL PHTHALATE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
DIPHENYLAMINE	U	27	UG/L	R		U	2300	UG/KG	R							U	52	UG/L	R	
ETHYL METHANESULFONATE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
FLUORANTHENE	U	5	UG/L	R		U	12	UG/L	R	Y						U	10	UG/L	R	
FLUORENE	U	5	UG/L	R		U	12	UG/L	R	Y						U	10	UG/L	R	
HEXACHLOROBENZENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
HEXACHLOROBUTADIENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
HEXACHLOROCYCLOPENTADIENE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	
HEXACHLOROETHANE	U	5	UG/L	R		U	470	UG/KG	R							U	10	UG/L	R	

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Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCL
Well/Boring:	06					06					06					06				
Sample ID:	100235					100236					100237					100238				
Sample Date:	05/05/92					05/05/92					05/05/92					05/05/92				
QA Type:	QA-RB					QA-WB					QA-WB					QA-WB				
Pit:	6					6					6					6				
BENZO(A)PYRENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
BENZO(B)FLUORANTHENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
BENZO(G,H,I)PERYLENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
BENZO(K)FLUORANTHENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
BENZOIC ACID	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	
BENZYL ALCOHOL	U	10	UG/L	R		U	11	UG/L	R							U	10	UG/L	R	
BIS(2-CHLOROETHOXY)METHANE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
BIS(2-CHLOROETHYL)ETHER	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
BIS(2-CHLOROISOPROPYL)ETHER	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
BIS(2-ETHYLHEXYL)PHTHALATE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
BUTYL BENZYL PHTHALATE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
CARBAZOLE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
CHLOROBENZILATE	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	
CHRYSENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
DI-N-BUTYLPHTHALATE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
DI-N-OCTYLPHTHALATE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
DIALLATE	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	
DIBENZO(A,H)ANTHRACENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
DIBENZOFURAN	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
DIETHYL PHTHALATE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
DIMETHYL PHTHALATE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
DIPHENYLAMINE	U	26	UG/L	R		U	26	UG/L	R							U	26	UG/L	R	
ETHYL METHANESULFONATE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
FLUORANTHENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
FLUORENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
HEXACHLOROBENZENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
HEXACHLOROBUTADIENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
HEXACHLOROCYCLOPENTADIENE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	
HEXACHLOROETHANE	U	5	UG/L	R		U	5	UG/L	R							U	5	UG/L	R	

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1992 RI/FS - QA/QC Samples
Organic Results

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
Well/Boring:		05					05					06-05					06			
Sample ID:		100224					100224RE					100229BD					100233			
Sample Date:		04/29/92					04/29/92					05/05/92					05/04/92			
QA Type:		QA-WB					QA-WB					QA					QA-TB			
Pit:			5					5					6					6		
BENZO(A)PYRENE	U	5	UG/L	R												U	9	UG/L	R	Y
BENZO(B)FLUORANTHENE	U	5	UG/L	R												U	9	UG/L	R	Y
BENZO(G,H,I)PERYLENE	U	5	UG/L	R												U	9	UG/L	R	Y
BENZO(K)FLUORANTHENE	U	5	UG/L	R												U	9	UG/L	R	Y
BENZOIC ACID	U	26	UG/L	R												U	6700	UG/KG	R	
BENZYL ALCOHOL	U	11	UG/L	R												U	2700	UG/KG	R	
BIS(2-CHLOROETHOXY)METHANE	U	5	UG/L	R												U	9	UG/L	R	Y
BIS(2-CHLOROETHYL)ETHER	U	5	UG/L	R												U	9	UG/L	R	Y
BIS(2-CHLOROISOPROPYL)ETHER	U	5	UG/L	R												U	9	UG/L	R	Y
BIS(2-ETHYLHEXYL)PHTHALATE	U	5	UG/L	R												U	9	UG/L	R	Y
BUTYL BENZYL PHTHALATE	U	5	UG/L	R												U	9	UG/L	R	Y
CARBAZOLE	U	5	UG/L	R												U	9	UG/L	R	Y
CHLOROBENZILATE	U	26	UG/L	R												U	6700	UG/KG	R	
CHRYSENE	U	5	UG/L	R												U	9	UG/L	R	Y
DI-N-BUTYLPHTHALATE	U	5	UG/L	R												U	9	UG/L	R	Y
DI-N-OCTYLPHTHALATE	U	5	UG/L	R												U	9	UG/L	R	Y
DIALLATE	U	26	UG/L	R												U	6700	UG/KG	R	
DIBENZO(A,H)ANTHRACENE	U	5	UG/L	R												U	9	UG/L	R	Y
DIBENZOFURAN	U	5	UG/L	R												U	9	UG/L	R	Y
DIETHYL PHTHALATE	U	5	UG/L	R												U	9	UG/L	R	Y
DIMETHYL PHTHALATE	U	5	UG/L	R												U	9	UG/L	R	Y
DIPHENYLAMINE	U	26	UG/L	R												U	6700	UG/KG	R	
ETHYL METHANESULFONATE	U	5	UG/L	R												U	1300	UG/KG	R	
FLUORANTHENE	U	5	UG/L	R												U	9	UG/L	R	Y
FLUORENE	U	5	UG/L	R												U	9	UG/L	R	Y
HEXACHLOROBENZENE	U	5	UG/L	R												U	9	UG/L	R	Y
HEXACHLOROBUTADIENE	U	5	UG/L	R												U	9	UG/L	R	Y
HEXACHLOROCYCLOPENTADIENE	U	5	UG/L	R												U	9	UG/L	R	Y
HEXACHLOROETHANE	U	5	UG/L	R												U	9	UG/L	R	Y

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1992 RI/FS - QA/QC Samples
Organic Results

	Sample 1	Sample 2	Sample 3	Sample 4
Well/Boring:	05	05	05	05
Sample ID:	100222	100222RE	100223	100223RE
Sample Date:	04/29/92	04/29/92	04/29/92	04/29/92
QA Type:	QA-RB	QA-RB	QA-WB	QA-WB
Pit:	5	5	5	5

Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP
BENZO(A)PYRENE	U	5	UG/L	R							U	5	UG/L	R						
BENZO(B)FLUORANTHENE	U	5	UG/L	R							U	5	UG/L	R						
BENZO(G,H,I)PERYLENE	U	5	UG/L	R							U	5	UG/L	R						
BENZO(K)FLUORANTHENE	U	5	UG/L	R							U	5	UG/L	R						
BENZOIC ACID	U	26	UG/L	R							U	26	UG/L	R						
BENZYL ALCOHOL	U	10	UG/L	R							U	10	UG/L	R						
BIS(2-CHLOROETHOXY)METHANE	U	5	UG/L	R							U	5	UG/L	R						
BIS(2-CHLOROETHYL)ETHER	U	5	UG/L	R							U	5	UG/L	R						
BIS(2-CHLOROISOPROPYL)ETHER	U	5	UG/L	R							U	5	UG/L	R						
BIS(2-ETHYLHEXYL)PHTHALATE	U	5	UG/L	R							U	5	UG/L	R						
BUTYL BENZYL PHTHALATE	U	5	UG/L	R							U	5	UG/L	R						
CARBAZOLE	U	5	UG/L	R							U	5	UG/L	R						
CHLOROBENZILATE	U	26	UG/L	R							U	26	UG/L	R						
CHRYSENE	U	5	UG/L	R							U	5	UG/L	R						
DI-N-BUTYLPHTHALATE	U	5	UG/L	R							U	5	UG/L	R						
DI-N-OCTYLPHTHALATE	U	5	UG/L	R							U	5	UG/L	R						
DIALLATE	U	26	UG/L	R							U	26	UG/L	R						
DIBENZO(A,H)ANTHRACENE	U	5	UG/L	R							U	5	UG/L	R						
DIBENZOFURAN	U	5	UG/L	R							U	5	UG/L	R						
DIETHYL PHTHALATE	U	5	UG/L	R							U	5	UG/L	R						
DIMETHYL PHTHALATE	U	5	UG/L	R							U	5	UG/L	R						
DIPHENYLAMINE	U	26	UG/L	R							U	26	UG/L	R						
ETHYL METHANESULFONATE	U	5	UG/L	R							U	5	UG/L	R						
FLUORANTHENE	U	5	UG/L	R							U	5	UG/L	R						
FLUORENE	U	5	UG/L	R							U	5	UG/L	R						
HEXACHLOROBENZENE	U	5	UG/L	R							U	5	UG/L	R						
HEXACHLOROBUTADIENE	U	5	UG/L	R							U	5	UG/L	R						
HEXACHLOROCYCLOPENTADIENE	U	5	UG/L	R							U	5	UG/L	R						
HEXACHLOROETHANE	U	5	UG/L	R							U	5	UG/L	R						

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1992 RI/FS - QA/QC Samples
Organic Results

Well/Boring:			05-04					05					05					05		
Sample ID:			100219					100220					100221					100221RE		
Sample Date:			04/28/92					04/29/92					04/29/92					04/29/92		
QA Type:			QA					QA-TB					QA-EB					QA-EB		
Pit:			5					5					5					5		
Parameters	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLP	LQ	Result	Unit	VQ	TCLF
BENZO(A)PYRENE	U	570	UG/KG	R							U	5	UG/L	R						
BENZO(B)FLUORANTHENE	U	570	UG/KG	R							U	5	UG/L	R						
BENZO(G,H,I)PERYLENE	U	570	UG/KG	R							U	5	UG/L	R						
BENZO(K)FLUORANTHENE	U	570	UG/KG	R							U	5	UG/L	R						
BENZOIC ACID	U	2900	UG/KG	R							U	26	UG/L	R						
BENZYL ALCOHOL	U	20	UG/L	R	Y						U	10	UG/L	R						
BIS(2-CHLOROETHOXY)METHANE	U	570	UG/KG	R							U	5	UG/L	R						
BIS(2-CHLOROETHYL)ETHER	U	570	UG/KG	R							U	5	UG/L	R						
BIS(2-CHLOROISOPROPYL)ETHER	U	570	UG/KG	R							U	5	UG/L	R						
BIS(2-ETHYLHEXYL)PHTHALATE	U	570	UG/KG	R							U	5	UG/L	R						
BUTYL BENZYL PHTHALATE	U	570	UG/KG	R							U	5	UG/L	R						
CARBAZOLE	U	570	UG/KG	R							U	5	UG/L	R						
CHLOROBENZILATE	U	2900	UG/KG	R							U	26	UG/L	R						
CHRYSENE	U	570	UG/KG	R							U	5	UG/L	R						
DI-N-BUTYLPHTHALATE	U	570	UG/KG	R							U	5	UG/L	R						
DI-N-OCTYLPHTHALATE	U	570	UG/KG	R							U	5	UG/L	R						
DIALLATE	U	2900	UG/KG	R							U	26	UG/L	R						
DIBENZO(A,H)ANTHRACENE	U	570	UG/KG	R							U	5	UG/L	R						
DIBENZOFURAN	U	570	UG/KG	R							U	5	UG/L	R						
DIETHYL PHTHALATE	U	570	UG/KG	R							U	5	UG/L	R						
DIMETHYL PHTHALATE	U	570	UG/KG	R							U	5	UG/L	R						
DIPHENYLAMINE	U	2900	UG/KG	R							U	26	UG/L	R						
ETHYL METHANESULFONATE	U	570	UG/KG	R							U	5	UG/L	R						
FLUORANTHENE	U	570	UG/KG	R							U	5	UG/L	R						
FLUORENE	U	570	UG/KG	R							U	5	UG/L	R						
HEXACHLOROBENZENE	U	570	UG/KG	R							U	5	UG/L	R						
HEXACHLOROBUTADIENE	U	570	UG/KG	R							U	5	UG/L	R						
HEXACHLOROCYCLOPENTADIENE	U	570	UG/KG	R							U	5	UG/L	R						
HEXACHLOROETHANE	U	570	UG/KG	R							U	5	UG/L	R						

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